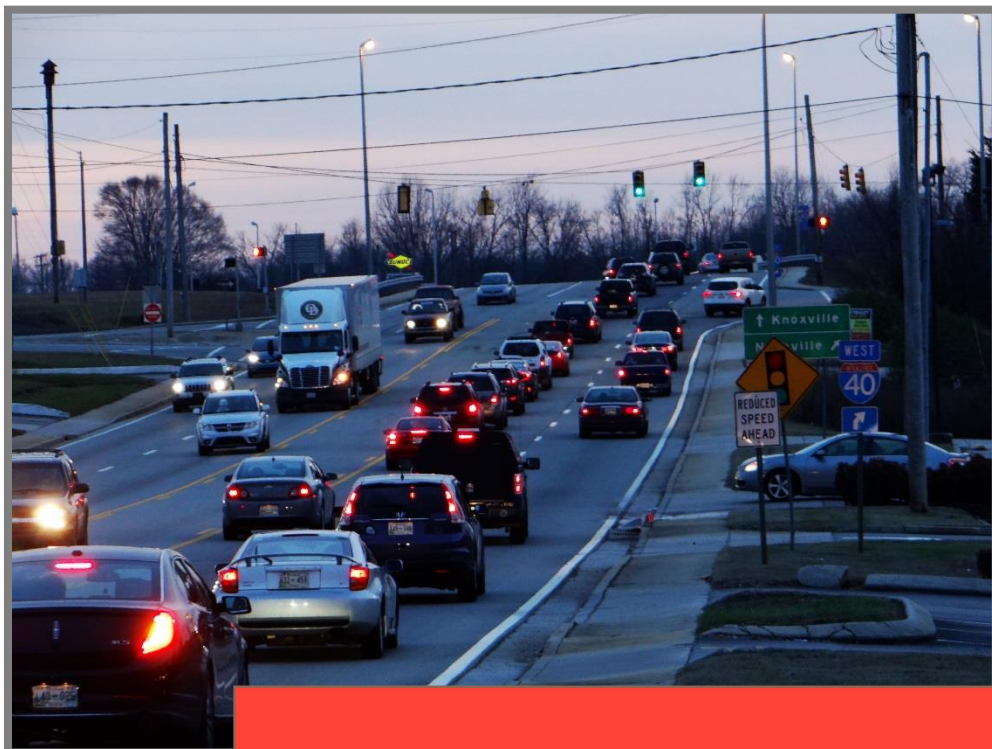




Cookeville Corridor Analysis

FUTURE CONDITIONS AND RECOMMENDATIONS

October 2017

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1. Short Term Signal Timing Improvements

1.1. Signal Coordination & Optimization

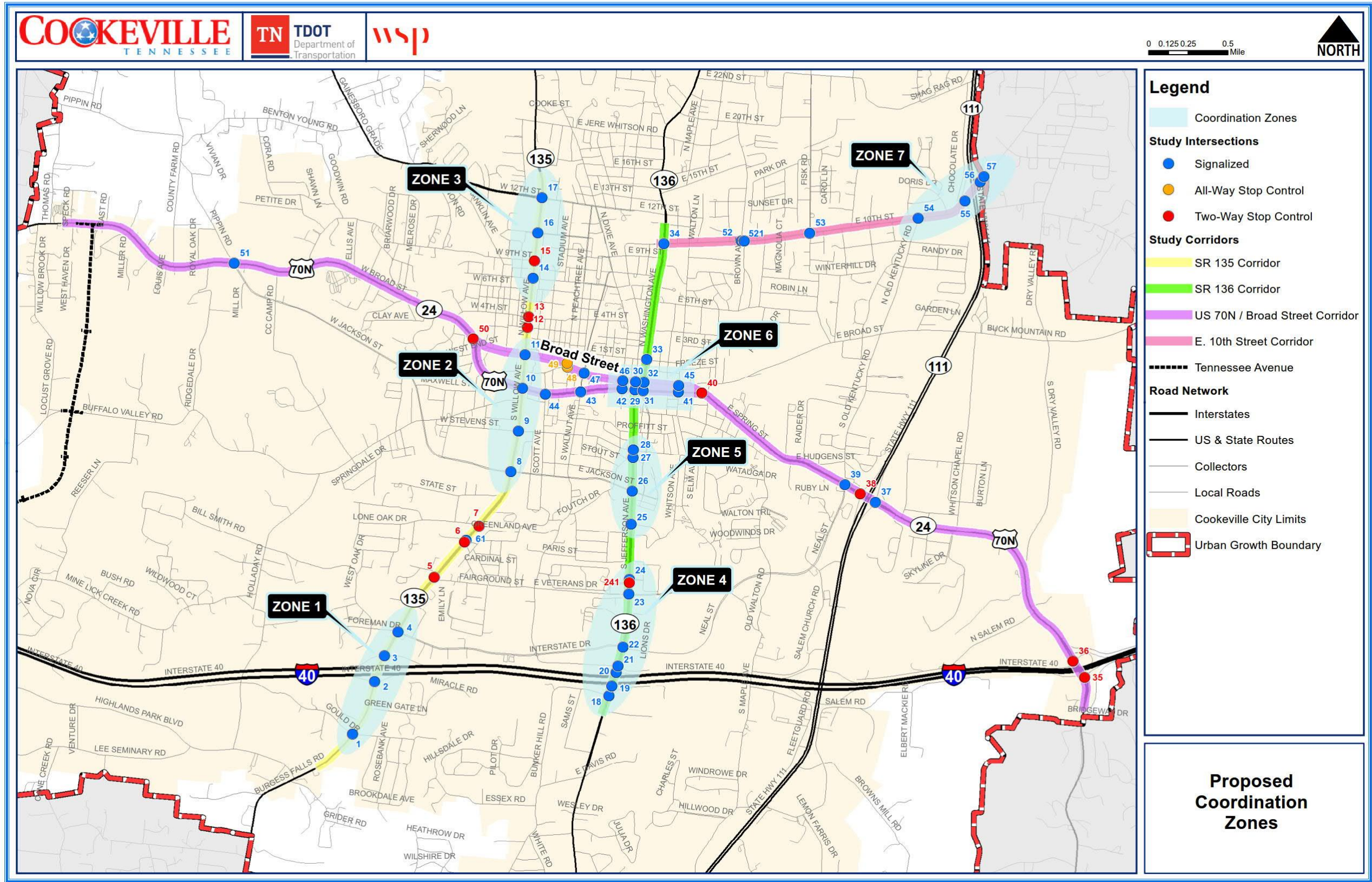
Updating existing signal timing and expanding the number of coordinated signals generally provides short-term improvements in traffic operations. Currently there are two groups of coordinated signals in the study area: near the Downtown Square (Group 6 in **Table 1**), and along S. Jefferson Avenue (SR 136) between Bunker Hill Road and Stevens Street (Group 5). Five additional signal group clusters were identified that would benefit from coordination. All seven proposed coordination zones are shown in **Table 1** and **Figure 1**.

Table 1: Proposed Signal Coordination Groups

Group 1	S. Willow Avenue (SR 135) at Gould Drive/Winston Drive
	S. Willow Avenue (SR 135) at I-40 Eastbound Ramps
	S. Willow Avenue (SR 135) at I-40 Westbound Ramps
	S. Willow Avenue (SR 135) at Interstate Drive
Group 2	S. Willow Avenue (SR 135) at Jackson Street
	S. Willow Avenue (SR 135) at Stevens Street
	S. Willow Avenue (SR 135) at Spring Street (US 70N, SR 24)
	S. Willow Avenue/N. Willow Avenue (SR 135) at W. Broad Street
Group 3	N. Willow Avenue (SR 135) at 7th Street
	N. Willow Avenue (SR 135) at University Drive
	N. Willow Avenue (SR 135) at W. 12th Street
Group 4 (currently coordinated)	S. Jefferson Avenue (SR 136) at Bunker Hill Road/Ferrell Drive
	S. Jefferson Avenue (SR 136) at I-40 Eastbound Ramps
	S. Jefferson Avenue (SR 136) at I-40 Westbound Ramps
	S. Jefferson Avenue (SR 136) at Interstate Drive/Neal Street
	S. Jefferson Avenue (SR 136) at Walmart Driveway
Group 5	S. Jefferson Avenue (SR 136) at Commerce Avenue
	S. Jefferson Avenue (SR 136) at Jackson Street
	S. Jefferson Avenue (SR 136) at Foutch Drive
	S. Jefferson Avenue (SR 136) at Stevens Street
Group 6 (currently coordinated)	E. Spring Street (US 70N, SR 24) at S. Dixie Avenue
	E. Spring Street (US 70N, SR 24) at S. Jefferson Avenue (SR 136)
	E. Spring Street (US 70N, SR 24) at S. Lowe Avenue/S. Washington Avenue (SR 136)
	*E. Spring Street (US 70N, SR 24) at S. Maple Avenue
	E. Broad Street at S. Dixie Avenue/N. Dixie Avenue
	E. Broad Street at S. Jefferson Avenue/N. Jefferson Avenue
	E. Broad Street at S. Washington Avenue/N. Washington Avenue (SR 136)
	*E. Broad Street at S. Maple Avenue/N. Maple Avenue
Group 7	10th Street at N. Old Kentucky Avenue
	10th Street at SR 111 Southbound Ramps
	10th Street at SR 111 Northbound Ramps
	10th Street at Burton Branch Road (located in City of Algood)

* Intersections not included in existing downtown coordination plan

Figure 1: Proposed Coordination Zones



1.2. Signal Retiming & Refinement

Synchro version 9.1.912.4 was used to model the study area intersections using the 2017 volumes collected as part of this project. Synchro was used to optimize the signal offsets; offsets were then further refined using the software's Time Space Diagram feature to ensure that traffic flows progressed through the network.

Signal split times and pedestrian crossing "Flashing Don't Walk" (FDW) times were also adjusted within Synchro for both the AM and PM peak hours.

Split times were adjusted to balance delays and Level of Service (LOS) across each intersection approach. In some cases, split times were also further adjusted based on field observations to compensate for movements with geometric constraints (e.g. hills, etc.).

Pedestrian crossing FDW times were adjusted where necessary to ensure that pedestrians had adequate crossing time. Each crosswalk in the study area was measured. This distance was divided by the standard walking speed of 4.0 feet per second per the Manual of Uniform Traffic Control Devices (MUTCD), section 4E.06¹, to calculate the minimum FDW time. Please see **Appendix A** for additional details about the FDW methodology and data.

1.3. LOS Analysis for Optimized Conditions

Synchro was used to estimate the intersection delay and LOS resulting from the recommended signal changes in both the AM and PM peak hour. The delay and LOS are listed in **Table 2**; **Figure 2** and **Figure 3** illustrate the AM and PM peak hour LOS, respectively. The AM and PM peak hour Synchro report for each intersection is included in **Appendix B**. Note that delay for signalized intersections is reported as overall delay, while delay at unsignalized intersection is reported based on the worst stop controlled movement.

Table 2 indicates that after coordinating and optimizing the study area intersections, the Synchro models do not project any failing signalized intersections in either the AM or PM peak hour in 2017 conditions. However, the Synchro models do not project any improvements to several stop-controlled intersections, which are currently failing in both the AM and PM peak hour: N. Willow Avenue (SR 135) at 3rd Street, 4th Street, and 9th Street.

¹ <https://mutcd.fhwa.dot.gov/htm/2009r1r2/part4/part4e.htm>

Table 2: 2017 Optimized Conditions AM and PM Peak Hour Intersection Delay and Level of Service

No.	Route	Intersecting Route	Int. Type	AM Peak Hour		PM Peak Hour	
				Delay (sec)	LOS	Delay (sec)	LOS
1	S. Willow Ave.	Gould Dr.	Sig.	8.5	A	19.1	B
2	S. Willow Ave.	I-40 EB Ramps	Sig.	18.1	B	21.7	C
3	S. Willow Ave.	I-40 WB Ramps	Sig.	14.6	B	13.9	B
4	S. Willow Ave.	Interstate Dr.	Sig.	25.2	C	33.4	C
5	S. Willow Ave.	Fairground St.	STOP	17.9	C	18.8	C
6	S. Willow Ave.	Ashwood Dr.	STOP	12.1	B	12.5	B
61	S. Willow Ave.	Orchard St.	Sig.	11.6	B	10.5	B
7	S. Willow Ave.	Lone Oak Dr.	STOP	20.7	C	21.8	C
8	S. Willow Ave.	W. Jackson St.	Sig.	23.0	C	32.8	C
9	S. Willow Ave.	W. Stevens St.	Sig.	20.1	C	21.9	C
10	S. Willow Ave.	W. Spring St.	Sig.	25.2	C	32.3	C
11	S. Willow Ave.	W. Broad St.	Sig.	20.5	C	22.4	C
12	N. Willow Ave.	W. 3rd St.	STOP	50.4	F	57.0	F
13	N. Willow Ave.	W. 4th St.	STOP	97.3	F	103.7	F
14	N. Willow Ave.	W. 7th St.	Sig.	14.9	B	16.5	B
15	N. Willow Ave.	W. 9th St.	STOP	213.0	F	120.9	F
16	N. Willow Ave.	University Dr.	Sig.	9.0	A	9.2	A
17	N. Willow Ave.	W. 12th St.	Sig.	24.3	C	21.3	C
18	S. Jefferson Ave.	Bunker Hill Rd.	Sig.	11.8	B	10.6	B
19	S. Jefferson Ave.	I-40 EB Ramps	Sig.	21.5	C	19.2	B
20	S. Jefferson Ave.	I-40 WB Ramps	Sig.	26.6	C	6.7	A
21	S. Jefferson Ave.	S. Walnut Ave.	Sig.	16.5	B	20.6	C
22	S. Jefferson Ave.	Interstate Dr.	Sig.	18.2	B	26.6	C
23	S. Jefferson Ave.	E. Veterans Dr.	Sig.	19.7	B	29.3	C
241	S. Jefferson Ave.	Fairground St.	STOP	17.7	C	24.1	C
24	S. Jefferson Ave.	Walmart Driveway	Sig.	2.4	A	8.3	A
25	S. Jefferson Ave.	Commerce Ave.	Sig.	4.2	A	10.8	B
26	S. Jefferson Ave.	E. Jackson St.	Sig.	12.5	B	24.1	C
27	S. Jefferson Ave.	Foutch Dr.	Sig.	9.0	A	14.1	B
28	S. Jefferson Ave.	E. Stevens St.	Sig.	11.7	B	13.8	B
29	S. Jefferson Ave.	US 70N/E. Spring St.	Sig.	19.1	B	33.1	C
30	N. Jefferson Ave.	E. Broad St.	Sig.	17.2	B	19.7	B
31	S. Washington Ave.	E. Spring St.	Sig.	23.6	C	22.3	C
32	N. Washington Ave.	E. Broad St.	Sig.	28.7	C	29.2	C
33	N. Washington Ave.	E. 1st St.	Sig.	27.6	C	25.8	C
34	N. Washington Ave.	E. 10th St.	Sig.	27.0	C	23.5	C
35	E. Spring St.	I-40 EB Ramps	STOP	13.1	B	15.3	C

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No.	Route	Intersecting Route	Int. Type	AM Peak Hour		PM Peak Hour	
				Delay (sec)	LOS	Delay (sec)	LOS
36	E. Spring St.	I-40 WB Ramps	STOP	12.0	B	10.6	B
37	E. Spring St.	SR 111 NB Ramps	Sig.	18.0	B	23.2	C
38	E. Spring St.	SR 111 SB Ramps	STOP	26.2	D	16.5	C
39	E. Spring St.	S. Old Kentucky Rd.	Sig.	30.7	C	36.8	D
40	E. Spring St.	E. Broad St.	STOP	17.5	C	22.5	C
41	E. Spring St.	S. Maple Ave.	Sig.	26.9	C	25.1	C
42	E. Spring St.	S. Dixie Ave.	Sig.	15.4	B	16.7	B
43	W. Spring St.	S. Walnut Ave.	Sig.	23.2	C	29.1	C
44	W. Spring St.	Scott Ave.	Sig.	11.9	B	19.8	B
45	E. Broad St.	S. Maple Ave.	Sig.	28.0	C	20.8	C
46	E. Broad St.	S. Dixie Ave.	Sig.	14.7	B	20.9	C
47	E. Broad St.	S. Walnut Ave.	Sig.	23.9	C	31.6	C
48	E. Broad St.	S. Cedar Ave.	STOP	10.4	B	14.1	B
49	W. Broad St.	N. Cedar Ave.	STOP	11.1	B	12.3	B
50	W. Spring St.	W. Broad St.	STOP	10.2	B	15.7	C
51	W. Broad St.	W. Jackson St.	Sig.	35.9	D	33.7	C
52	E. 10th St.	Brown Ave. N	Sig.	21.1	C	16.1	B
521	E. 10th St.	Brown Ave. S	Sig.	26.9	C	13.1	B
53	E. 10th St.	Fisk Rd.	Sig.	42.0	D	26.5	C
54	E. 10th St.	N. Old Kentucky Rd.	Sig.	15.5	B	17.6	B
55	E. 10th St.	SR 111 SB Ramps	Sig.	14.2	B	8.2	A
56	E. 10th St.	SR 111 NB Ramps	Sig.	19.0	B	18.7	B
57	E. 10th St.	Burton Branch Rd.	Sig.	14.2	B	12.0	B

Figure 2: 2017 Optimized Conditions Intersection Level of Service (AM Peak Hour)

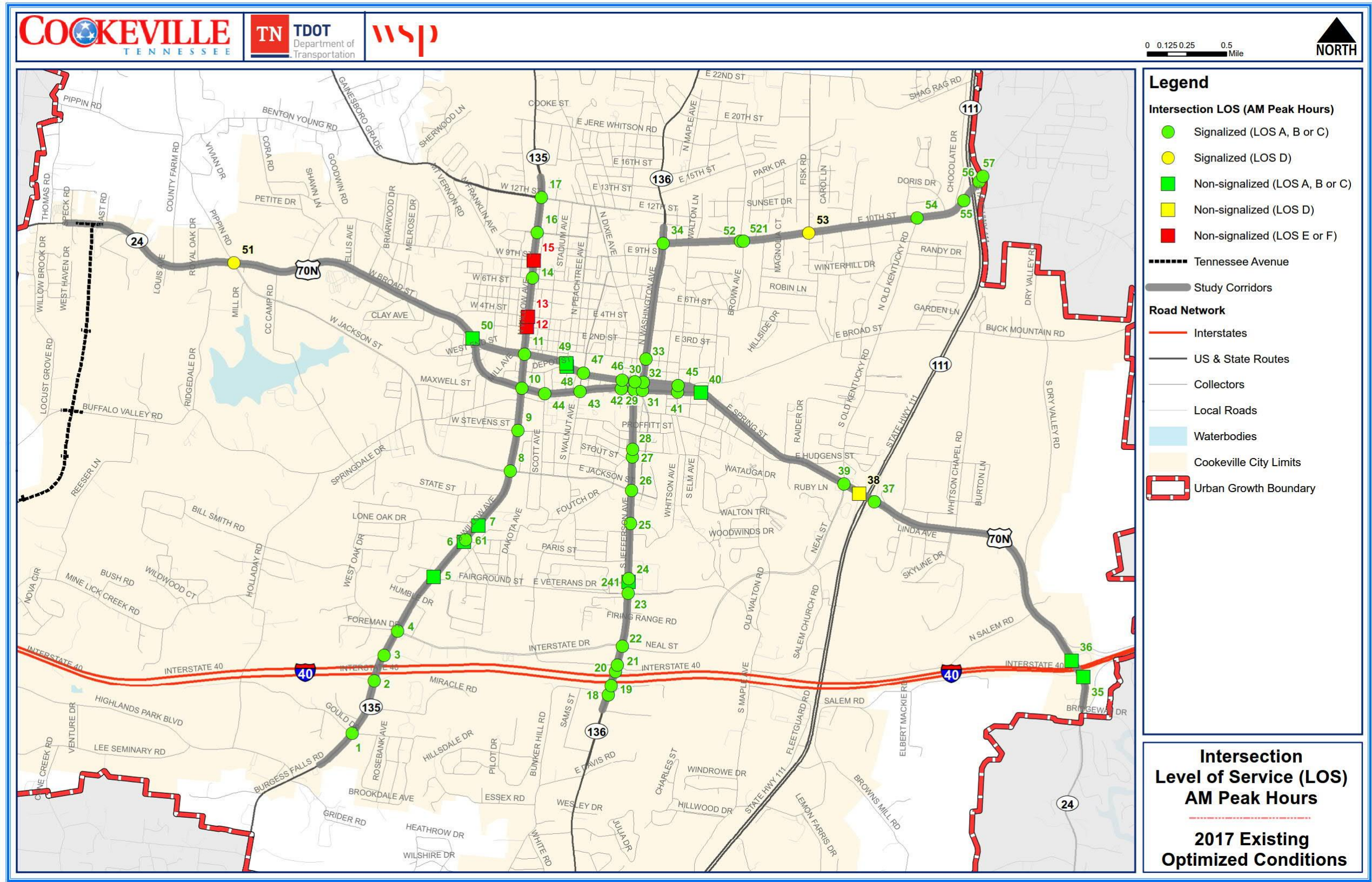
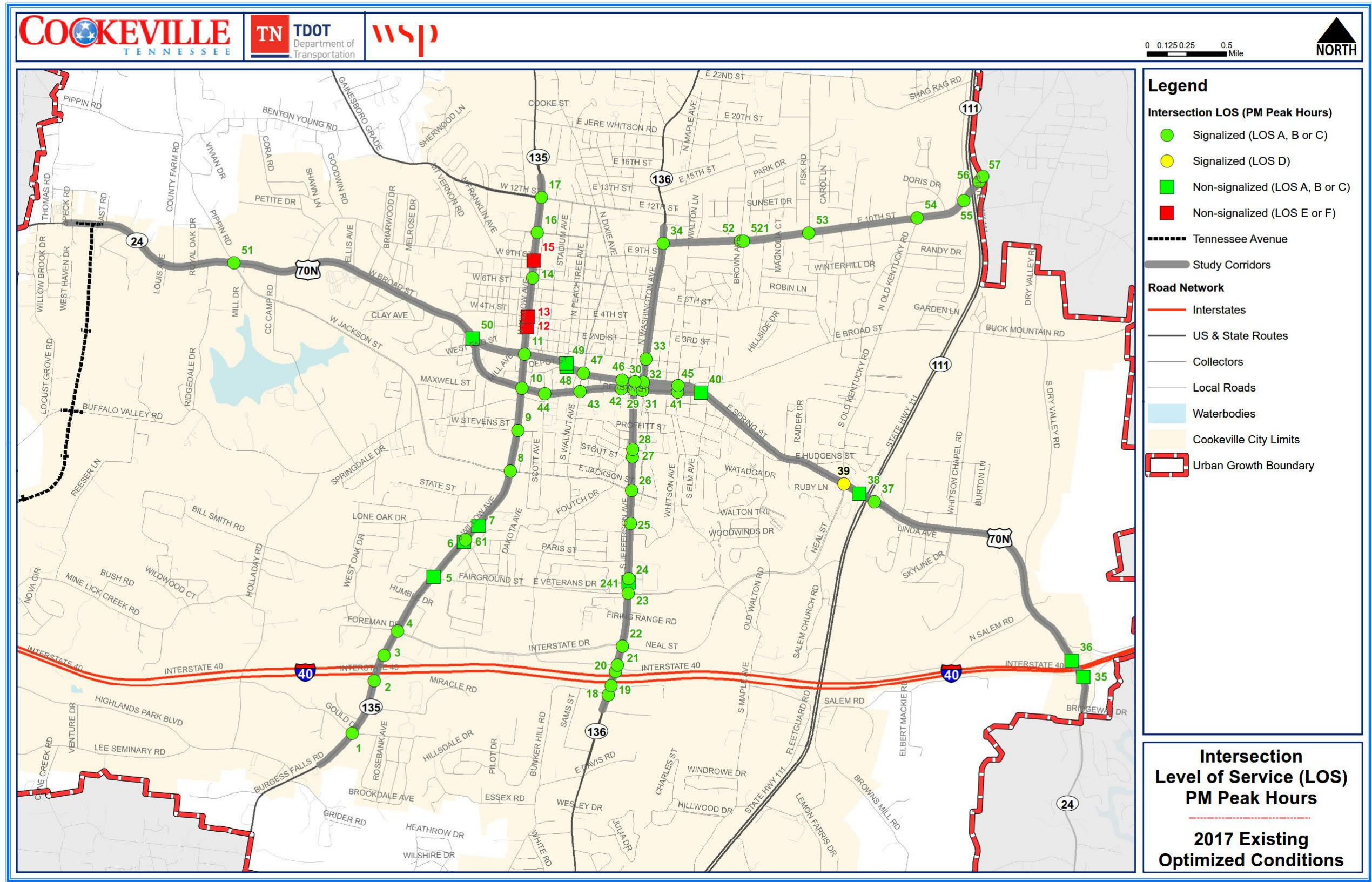


Figure 3: 2017 Optimized Conditions Intersection Level of Service (PM Peak Hour)



2. 2040 No-Build Conditions Intersection Analysis

Future (2040) No-Build intersection operations were evaluated using Synchro version 9.1.912.4 to assess future intersection operations and determine where intersection improvements will likely be needed.

2.1. Volume Development

As part of the 2040 No-Build analysis, traffic volumes were forecast using the growth rate developed as part of the Existing Conditions Report (*see Section 5 of the Existing Conditions Report*). Unique growth rates were developed for each study corridor and then applied to the 2017 Existing Conditions volumes collected as part of this project. These AM and PM peak hour volumes were then rounded up to the nearest 5 vehicles per hour and then balanced between intersections where necessary. These projected 2040 volumes are shown in **Figures 4** through **10**.

Figure 4: S. Willow Avenue (SR 135) 2040 Turning Movement Counts (southern portion)

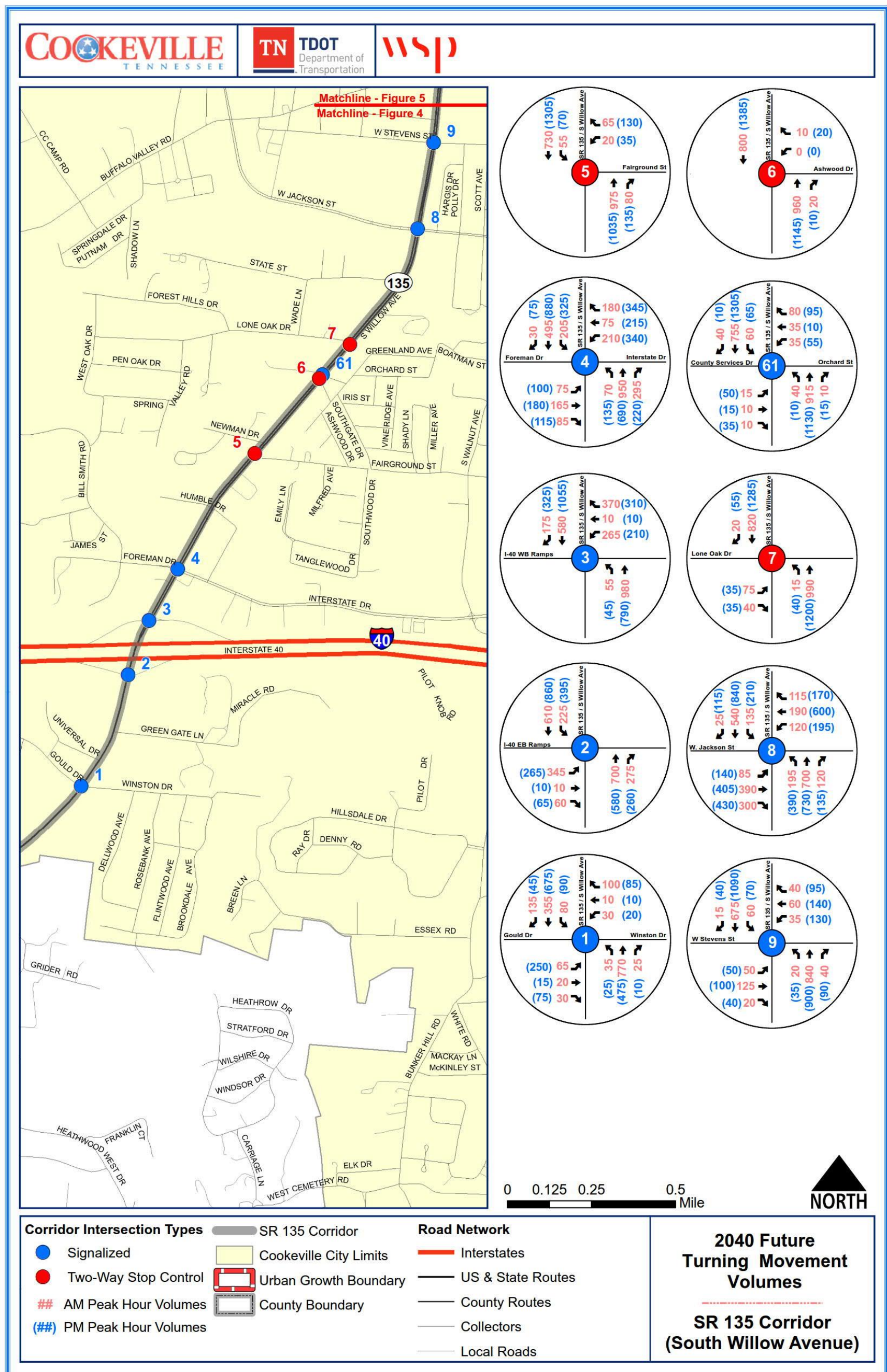


Figure 5: S. & N. Willow Avenue (SR 135) 2040 Turning Movement Counts

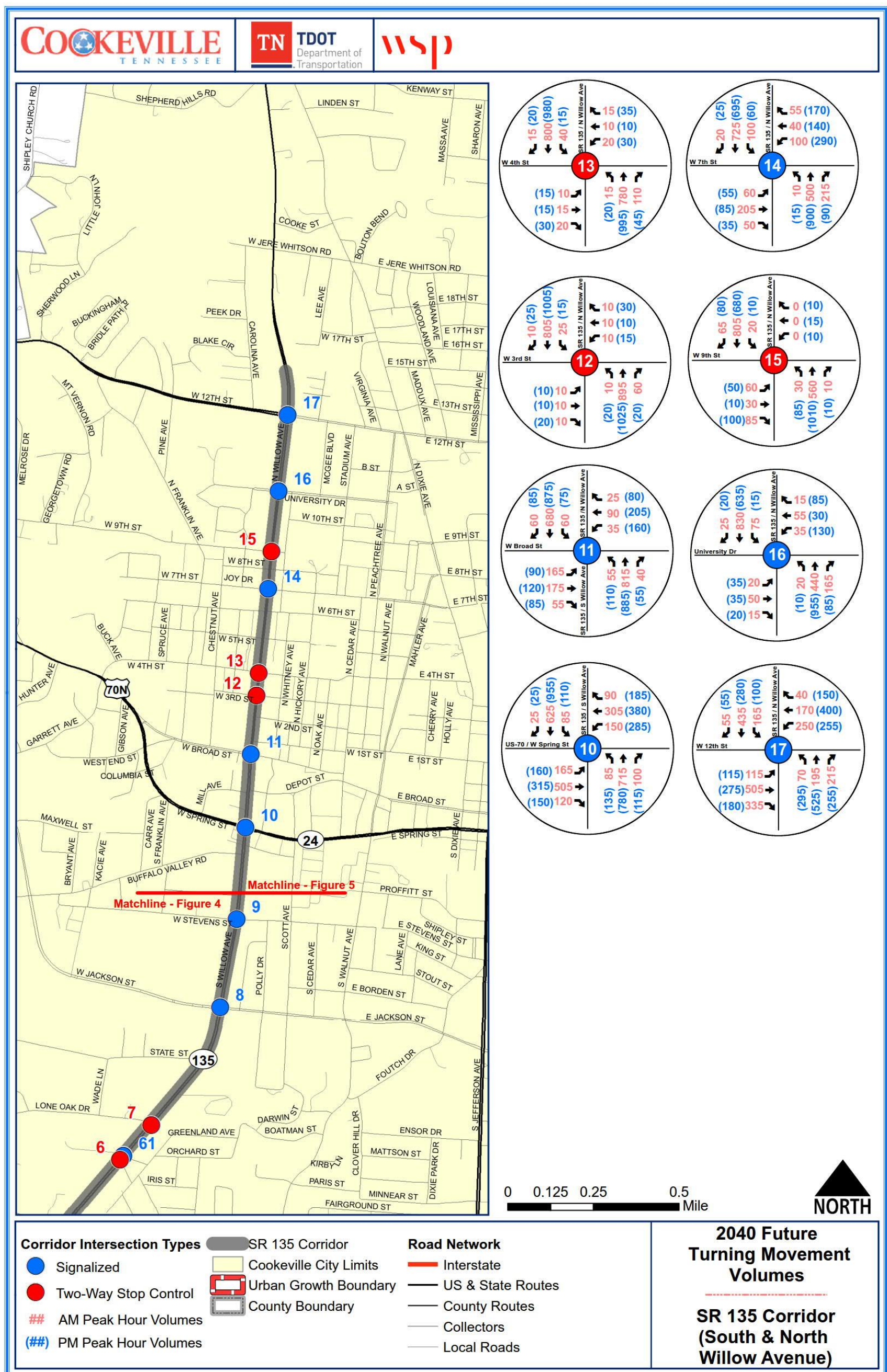


Figure 6: S. Jefferson Avenue (SR 136) 2040 Turning Movement Counts (southern portion)

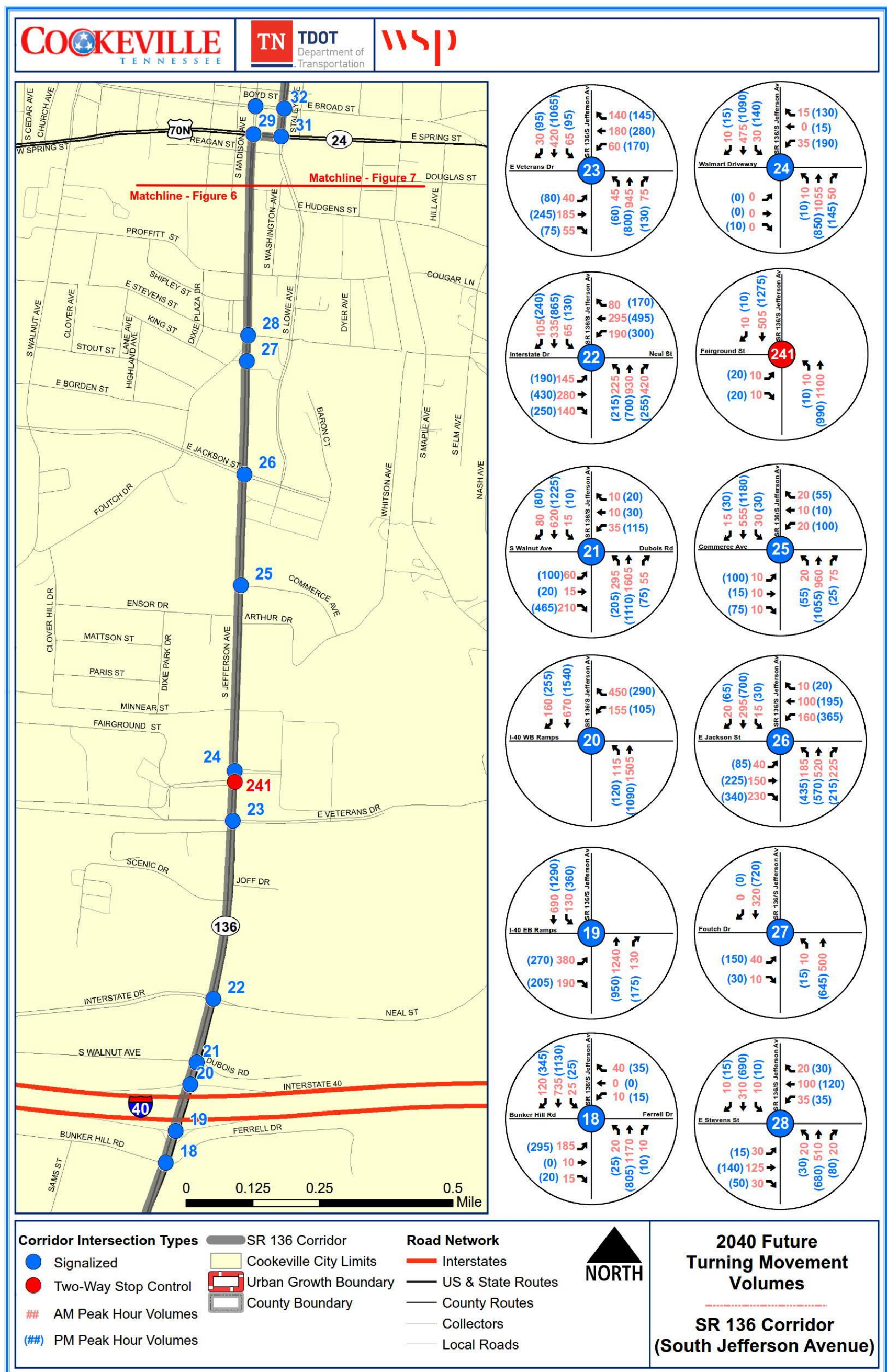


Figure 7: S. Jefferson Avenue, N. Washington Avenue (SR 136) 2040 Turning Movement Counts

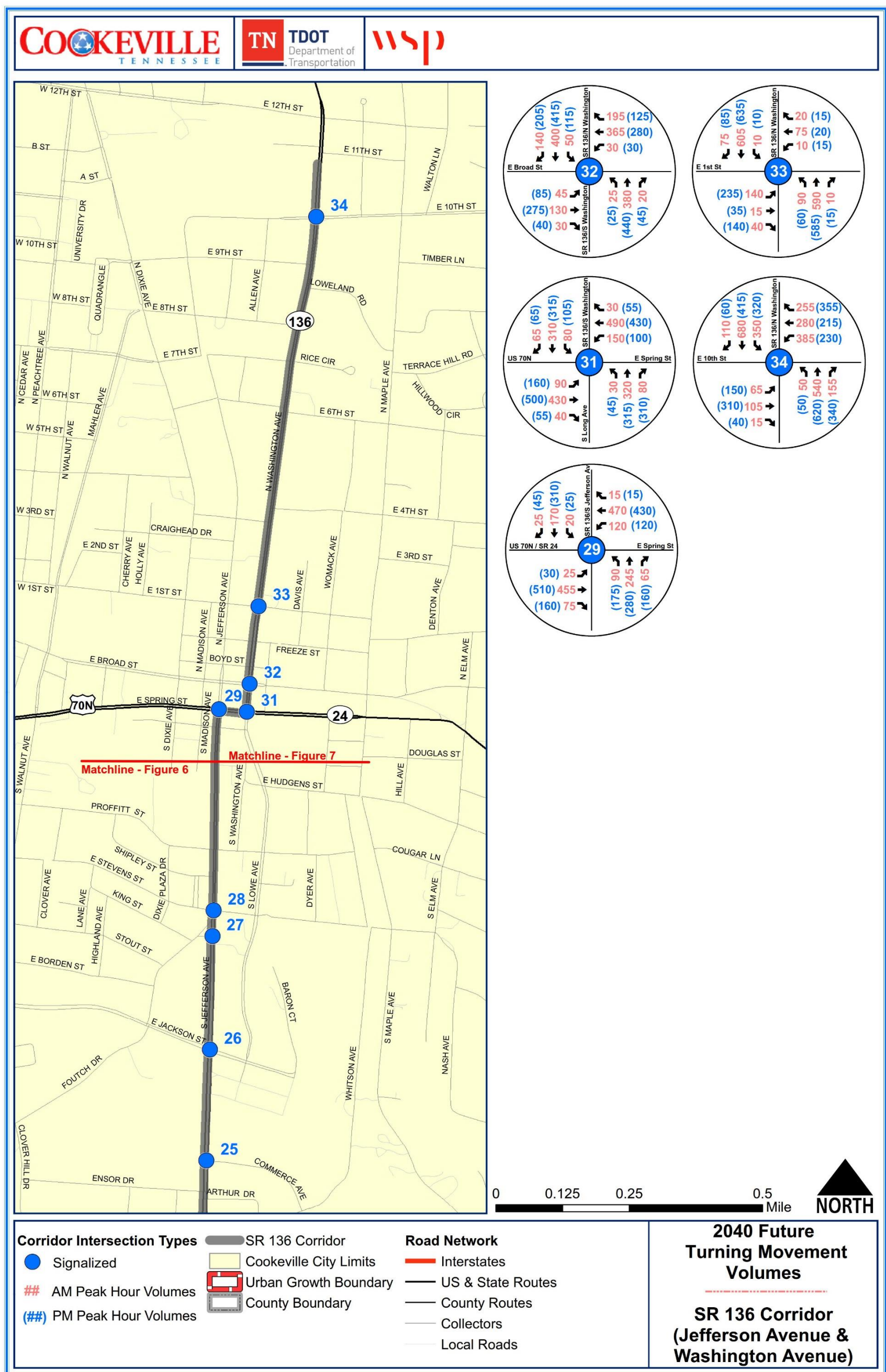


Figure 8: US 70N/SR 24, Broad Street 2040 Turning Movement Counts (Western Sections)

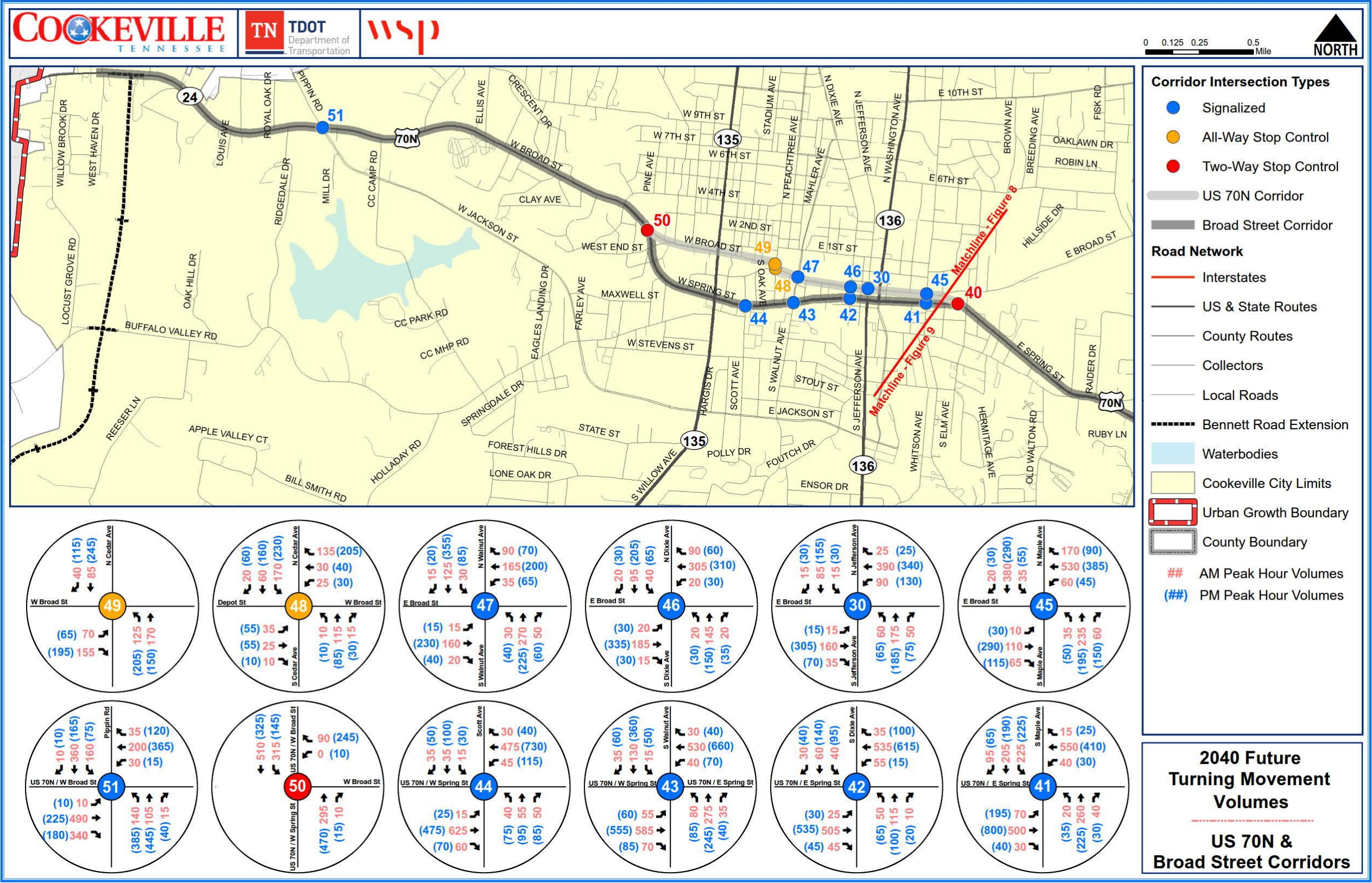


Figure 9: US 70N/SR 24, Broad Street 2040 Turning Movement Counts (Eastern Sections)

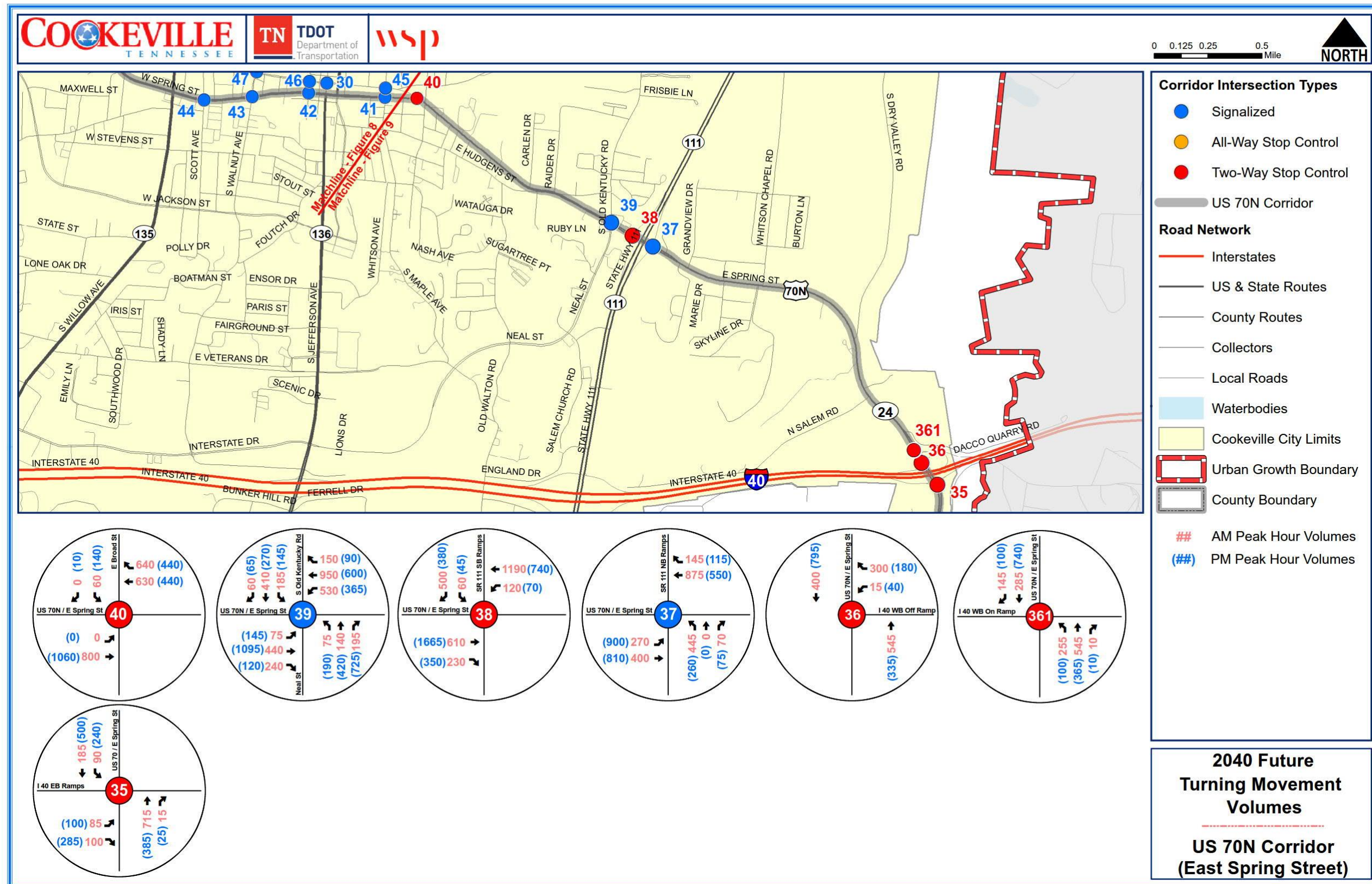
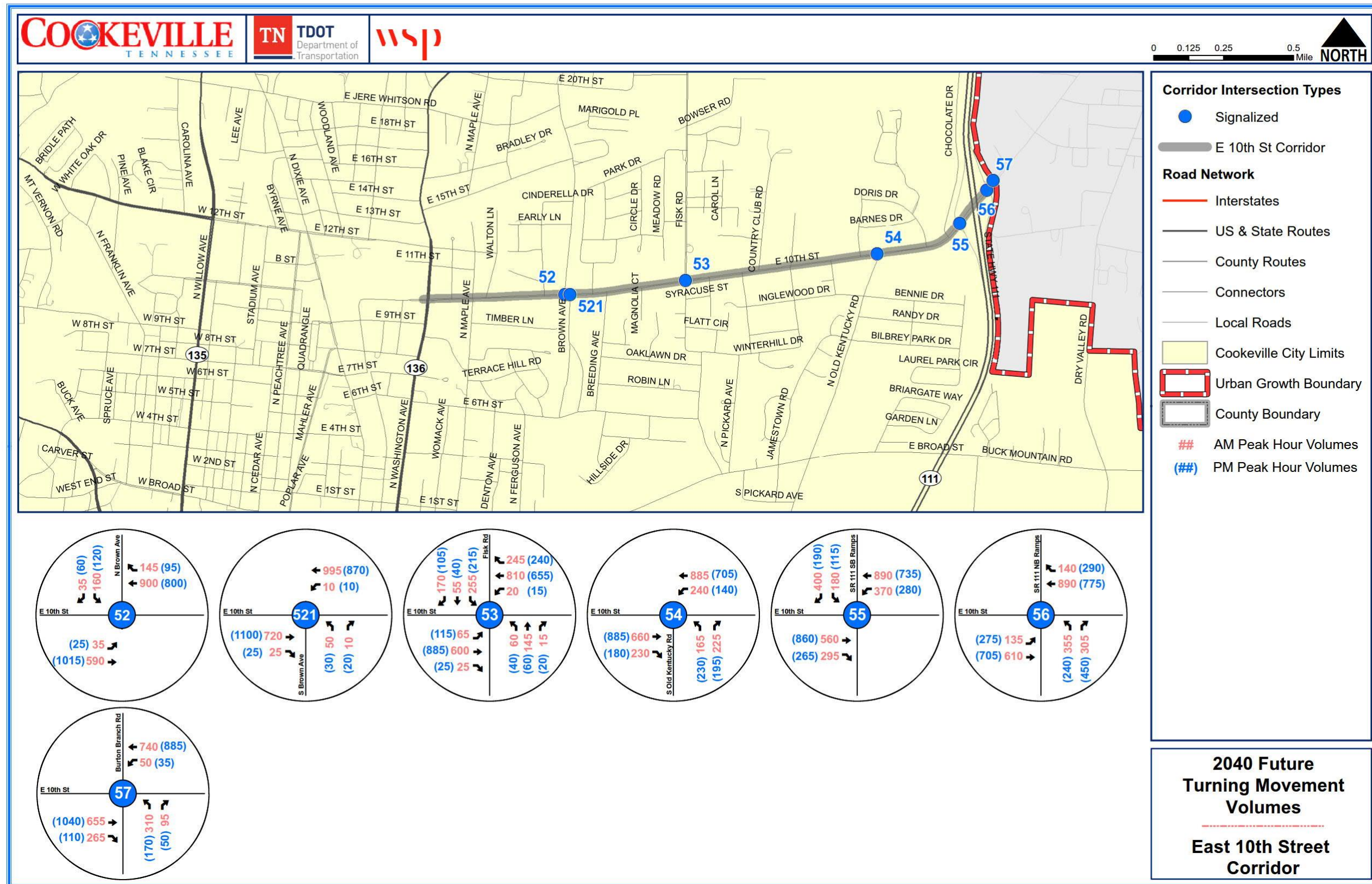


Figure 10: E. 10th Street 2040 Turning Movement Counts



2.2. 2040 No-Build Level of Service

Figures 11 and **12** show the 2040 No-Build LOS for the AM and PM peak hours, respectively. **Table 3** shows each intersection's AM and PM peak hour delay in seconds and corresponding LOS. The AM and PM peak hour Synchro report for each intersection is included in **Appendix C**.

In the 2040 No-Build Conditions, the Synchro models project 15 failing intersections (7 operating at LOS E, 8 operating at LOS F) during the AM peak hour and 17 failing intersections (7 operating at LOS E, 10 operating at LOS F) during the PM peak hour.

During the AM peak hour, of the 15 projected failing intersections, the model projects 4 stop-controlled failing intersections and 11 signalized failing intersections. During the PM peak hour, of the 17 projected failing intersections, the model projects 7 stop-controlled failing intersections and 10 signalized failing intersections.

The model also projects that 11 intersections will fail in both the 2040 No-Build AM and PM peak hours. Of these 11 intersections, 6 are projected to operate at LOS F in both the AM and PM peak hour, of which 2 are signalized.

Table 3: 2040 No-Build AM & PM Peak Hour Intersection Delay and Level of Service

No.	Route	Intersecting Route	Int. Type	AM Peak Hour		PM Peak Hour	
				Delay (sec)	LOS	Delay (sec)	LOS
1	S. Willow Ave.	Gould Dr.	Sig.	10.6	B	28.0	C
2	S. Willow Ave.	I-40 EB Ramps	Sig.	34.1	C	27.0	C
3	S. Willow Ave.	I-40 WB Ramps	Sig.	18.8	B	35.2	D
4	S. Willow Ave.	Interstate Dr.	Sig.	49.0	D	65.3	E
5	S. Willow Ave.	Fairground St.	STOP	19.3	C	24.4	C
6	S. Willow Ave.	Ashwood Dr.	STOP	12.9	B	13.4	B
61	S. Willow Ave.	Orchard St.	Sig.	14.3	B	14.3	B
7	S. Willow Ave.	Lone Oak Dr.	STOP	27.9	D	27.4	D
8	S. Willow Ave.	W. Jackson St.	Sig.	23.3	C	68.0	E
9	S. Willow Ave.	W. Stevens St.	Sig.	30.6	C	32.0	C
10	S. Willow Ave.	W. Spring St.	Sig.	58.9	E	76.8	E
11	S. Willow Ave.	W. Broad St.	Sig.	27.0	C	29.3	C
12	N. Willow Ave.	W. 3rd St.	STOP	135	F	335	F
13	N. Willow Ave.	W. 4th St.	STOP	591	F	835	F
14	N. Willow Ave.	W. 7th St.	Sig.	37.4	D	26.5	C
15	N. Willow Ave.	W. 9th St.	STOP	751	F	983	F
16	N. Willow Ave.	University Dr.	Sig.	12.7	B	13.8	B
17	N. Willow Ave.	W. 12th St.	Sig.	32.7	C	27.6	C
18	S. Jefferson Ave.	Bunker Hill Rd.	Sig.	15.9	B	13.0	B
19	S. Jefferson Ave.	I-40 EB Ramps	Sig.	34.0	C	67.6	E
20	S. Jefferson Ave.	I-40 WB Ramps	Sig.	74.2	E	48.4	D
21	S. Jefferson Ave.	S. Walnut Ave.	Sig.	44.0	D	41.6	D
22	S. Jefferson Ave.	Interstate Dr.	Sig.	24.7	C	42.9	D
23	S. Jefferson Ave.	E. Veterans Dr.	Sig.	35.7	D	47.8	D
241	S. Jefferson Ave.	Fairground St.	STOP	21.5	C	40.2	E
24	S. Jefferson Ave.	Walmart Driveway	Sig.	5.0	A	22.0	C
25	S. Jefferson Ave.	Commerce Ave.	Sig.	12.2	B	20.9	C
26	S. Jefferson Ave.	E. Jackson St.	Sig.	17.9	B	42.8	D
27	S. Jefferson Ave.	Foutch Dr.	Sig.	12.9	B	15.8	B
28	S. Jefferson Ave.	E. Stevens St.	Sig.	14.8	B	19.7	B
29	S. Jefferson Ave.	US 70N/E. Spring St.	Sig.	88.0	F	81.0	F
30	N. Jefferson Ave.	E. Broad St.	Sig.	25.1	C	22.5	C
31	S. Washington Ave.	E. Spring St.	Sig.	63.6	E	43.2	D
32	N. Washington Ave.	E. Broad St.	Sig.	39.1	D	42.3	D
33	N. Washington Ave.	E. 1st St.	Sig.	37.4	D	36.7	D
34	N. Washington Ave.	E. 10th St.	Sig.	45.8	D	30.2	C
35	E. Spring St.	I-40 EB Ramps	STOP	25.0	D	63.8	F

(continued from previous page)

No.	Route	Intersecting Route	Int. Type	AM Peak Hour		PM Peak Hour	
				Delay (sec)	LOS	Delay (sec)	LOS
36	E. Spring St.	I-40 WB Ramps	STOP	17.6	C	12.9	B
37	E. Spring St.	SR 111 NB Ramps	Sig.	59.2	E	130	F
38	E. Spring St.	SR 111 SB Ramps	STOP	251	F	72.1	F
39	E. Spring St.	S. Old Kentucky Rd.	Sig.	104	F	144	F
40	E. Spring St.	E. Broad St.	STOP	28.8	D	77.8	F
41	E. Spring St.	S. Maple Ave.	Sig.	68.4	E	86.1	F
42	E. Spring St.	S. Dixie Ave.	Sig.	28.8	C	43.0	D
43	W. Spring St.	S. Walnut Ave.	Sig.	32.2	C	54.3	D
44	W. Spring St.	Scott Ave.	Sig.	17.6	B	37.4	D
45	E. Broad St.	S. Maple Ave.	Sig.	57.5	E	42.2	D
46	E. Broad St.	S. Dixie Ave.	Sig.	21.2	C	30.9	C
47	E. Broad St.	S. Walnut Ave.	Sig.	27.3	C	38.5	D
48	E. Broad St.	S. Cedar Ave.	STOP	13.0	B	27.9	D
49	W. Broad St.	N. Cedar Ave.	STOP	14.3	B	18.6	C
50	W. Spring St.	W. Broad St.	STOP	11.0	B	22.7	C
51	W. Broad St.	W. Jackson St.	Sig.	61.2	E	57.3	E
52	E. 10th St.	Brown Ave. N	Sig.	51.5	D	31.3	C
521	E. 10th St.	Brown Ave. S	Sig.	131	F	40.5	D
53	E. 10th St.	Fisk Rd.	Sig.	87.3	F	70.9	E
54	E. 10th St.	N. Old Kentucky Rd.	Sig.	24.0	C	39.2	D
55	E. 10th St.	SR 111 SB Ramps	Sig.	30.0	C	19.3	B
56	E. 10th St.	SR 111 NB Ramps	Sig.	44.4	D	44.8	D
57	E. 10th St.	Burton Branch Rd.	Sig.	18.5	B	16.2	B

Figure 11: 2040 No-Build Conditions Intersection Level of Service (AM Peak Hour)

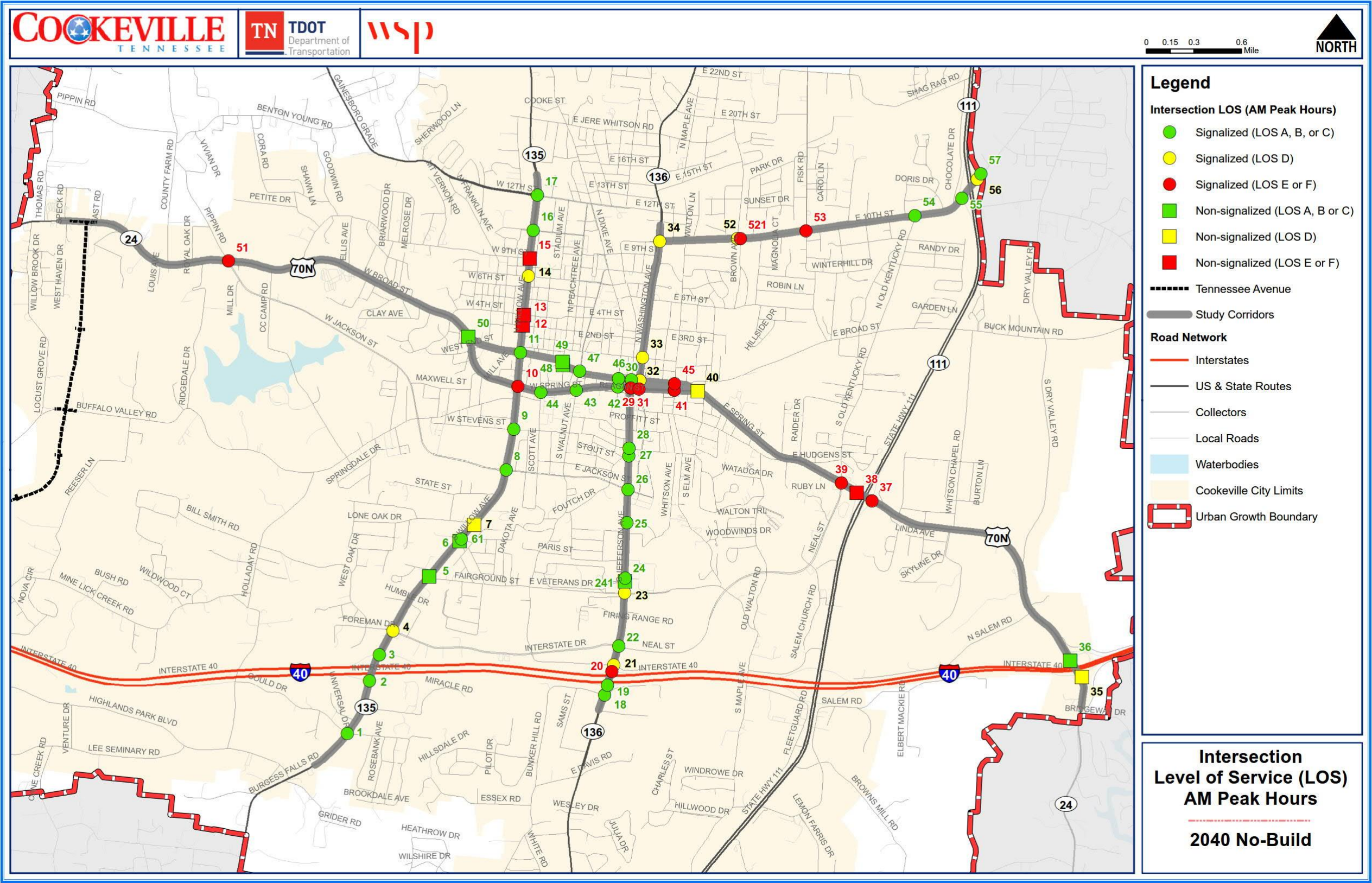
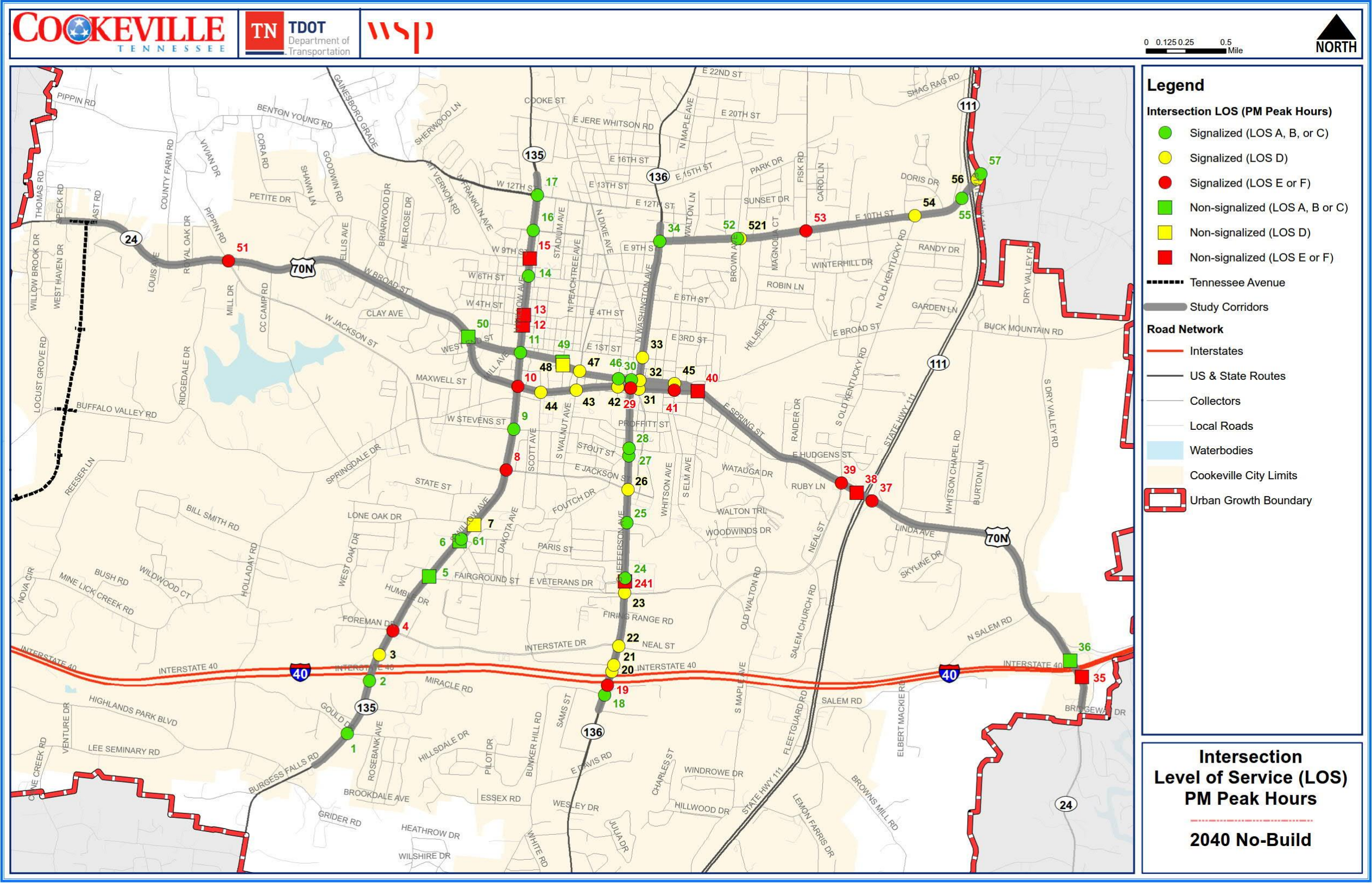


Figure 12: 2040 No-Build Conditions Intersection Level of Service (PM Peak Hour)



3. Recommended Intersection Improvements

This section outlines the capital projects recommended to enhance the operations at underperforming intersections. Underperforming intersections were identified through field observations, comments from City of Cookeville staff, existing conditions LOS analysis, and 2040 LOS analysis.

Recommendations for future conditions were developed in a two-step process that first optimized signal timing, and then identified areas where capital improvements are still needed to achieve acceptable LOS at certain intersections. The 2040 No-Build model was first modified by adding the same coordinated signal groups outlined in Section 1.1. As with the optimized 2017 conditions, the signal groups were grouped, coordinated, optimized, and then further refined. Offsets were refined using Synchro's Time-Space-Diagram tool, and splits were adjusted to balance delays across each intersection approach. Similar to the Short Term Recommendations Synchro models, pedestrian crossing FDW times were also adjusted at intersections with crosswalks. Yellow and all-red clearance times at each intersection were also rounded up to the nearest 0.5 second to ensure safe intersection clearance time. The Synchro model results (intersection delay and LOS output) from this first step are included in **Appendix D**. These intermediate results were then used to determine locations where specific capital improvements will be needed to supplement the benefits of signal coordination and optimization, as described below.

Recommendations are based on a planning level analysis. As improvements are implemented at each location, detailed engineering and a site-specific assessment (i.e., environmental, right-of-way, cost-benefit, turn-lane warrants, etc.) will be required. In cases where turn lanes are recommended, queue lengths will be need to be evaluated at each location to determine the exact turn bay lengths needed. For the purposes of this study, the length of new turn lanes were assumed based on turn bays already existing at the intersection. Generally, they were modeled as 150 feet in length with a 25-foot taper on major facilities, and as 100 feet with a 25-foot taper on unsignalized minor facilities.

3.1. S. Willow Avenue (SR 135) & I-40 Eastbound Ramps

Recommended improvements at this intersection include:

- Add a right-turn channelization island/pedestrian refuge island in the southeast corner of the intersection. This will increase safety for pedestrian crossings and reduce the time needed for the pedestrian phase.
- Consider eliminating the pedestrian crossing on the north side of intersection to remove the conflict with the green-arrow phase of the signal for the eastbound left-turning vehicles.
- Consider adding a pedestrian crossing on S. Willow Avenue (SR 135) on the south side of intersection and update the FDW (pedestrian clearance) time based on the appropriate pedestrian crossing distance.

Under the existing timing plan, the pedestrian crosswalk across the north side of the intersection has the “WALK” signal conflicting with the eastbound left-turn green arrow phase. This presents a safety issue as both pedestrians and vehicles are under the impression that they have the right-of-way. To avoid these safety issues and still enable pedestrians to navigate through this intersection, the crosswalk should be moved to the south side of the intersection. Additionally, if this new crosswalk is added in conjunction with the installation of a right-turn channelization island in the southeast corner of the intersection, the required pedestrian crossing time may be reduced.

3.2. S. Willow Avenue (SR 135) & I-40 Westbound Ramps

Recommended improvements at this intersection include:

- Consider removing pedestrian crossing on the south side of the intersection to increase the safety for pedestrians crossing this intersection.
- Consider providing a pedestrian crossing on the north side of the intersection to enhance pedestrian access at the intersection and update the FDW time based on the appropriate pedestrian crossing distance.

Similar to the previous recommendations at the I-40 eastbound ramps, the pedestrian crosswalk across the south side of the interaction is currently given a “WALK” signal at the same time that westbound left turning vehicles are given a green arrow to turn left. This presents a safety issue as both pedestrians and vehicles are under the impression that they have the right-of-way. To avoid these safety issues the pedestrian crosswalk could be moved to the north side of the intersection. In this case, a right-turn channelization island exists in the northeast corner of the intersection which will reduce the required crossing time for pedestrians at this intersection.

3.3. S. Willow Avenue (SR 135) & Interstate Drive/Foreman Drive

Recommended improvements at this intersection include:

- Provide dual southbound left-turn lanes;
- Change the southbound left-turn phasing to “protected” to improve operations on S. Willow Avenue (SR 135);
- Construct an additional eastbound through-right lane at the intersection to enhance the efficiency of the eastbound approach.

The southbound left-turn movement is a high volume movement that conflicts with a high volume northbound through movement in both peak periods. A dual southbound left turn will allow the southbound left-turn queue to clear more quickly and allow more green-phase time for the northbound through movement. An additional eastbound through lane would increase the capacity of the eastbound approach by modifying the intersection to include two eastbound approach lanes to match the existing two eastbound departure (receiving) lanes. This will allow through vehicles to queue and enter the intersection from two lanes. This optimization would

also allow more green time to be given to the high volume of westbound movements on Interstate Drive.

3.4. S. Willow Avenue (SR 135) & W. Jackson Street

Recommended improvements at this intersection include:

- Provide dual northbound left-turn lanes and change the northbound left-turn phasing to “protected” to improve operations on S. Willow Avenue (SR 135).
- Provide an exclusive westbound right-turn lane at the intersection to enhance the efficiency of the westbound approach.
- Consider changing the McDonald’s access points on eastbound approach (approximately 50 feet upstream of eastbound approach STOP bar) to provide more spacing between the driveway and the eastbound approach STOP bar.

The northbound left-turn movement is a high volume movement during the PM peak hour. Dual left-turn lanes on the northbound approach will allow the northbound left-turn queue to clear more quickly and distribute green time among other movement at the intersection. Addition of a westbound right-turn lane will allow right-turning vehicles the ability to turn right on red at the intersection and will relieve the long queues that were observed in the outside lane of the eastbound approach. This should help reduce the overall average delay at this intersection.

One of the two access points to McDonald’s property along the eastbound approach is very close to the eastbound approach STOP bar. Driveways that are located too close to intersections can be a common cause of congestion and crashes, as vehicles often attempt to cross multiple lanes of traffic close to the stop bar. In order to improve traffic flow along the eastbound approach and avoid congestion caused by vehicles attempting to exit McDonald’s from that access point, access management should be improved at this location.

3.5. S. Willow Avenue (SR 135) & W. Stevens Street

Recommended improvements at this intersection include:

- Consider providing an eastbound left-turn lane to increase capacity of the eastbound approach.
- Optimize the signal-phasing pattern to remove split phasing for the minor-street movement to increase the efficiency of the entire intersection.

Providing an eastbound left-turn lane will increase the capacity of the eastbound approach, which is expected to see an increase in volume in the near future due to the realignment of the intersection of W. Stevens Street and Buffalo Valley Road. Additionally, a left-turn lane will allow the signalization at the intersection to be updated to remove split phasing on the eastbound and westbound approaches, which will reduce lost time at the intersection.

3.6. S. Willow Avenue (SR 135) & W. Spring Street (US 70N, SR 24)

Recommended improvements at this intersection include:

- Consider providing right-turn lanes on the eastbound and westbound approaches to enhance the operations on W. Spring Street (US 70N, SR 24).
- Modify access to Shell station on westbound approach to improve safety and operations at the intersection.

The eastbound and westbound approaches consist of a dedicated left-turn lane and a shared through/right-turn lane. The relatively high volume of right turning vehicles on these approaches slows down through traffic and leads to excessive delays. The construction of right-turn lanes will allow the right turning vehicles to exit the flow of through moving vehicles before slowing down to make a right-turn.

The Shell station currently has two access points within 100 feet of the STOP bar of the westbound approach. The westbound left-turn STOP bar is located between these two access points. This setup poses safety and operational issues as vehicles stop to turn into the gas station from the eastbound lanes, and as vehicles attempt to exit the property without being able to see all oncoming traffic from the adjacent intersection.

3.7. N. Willow Avenue (SR 135): Between Broad Street and 12th Street

Recommendations along this route segment include:

- Provide right-turn lanes on the minor, unsignalized approaches (3rd, 4th, 9th) to allow right-turning vehicles to bypass through and left-turn queues.
- Consider providing a two-way left-turn lane on N. Willow Avenue (SR 135) to act as a refuge for left turning vehicles. This would be a continuous turn lane from W. Broad Street north to W. 12th Street. Also consider access management strategies to consolidate and direct left-turn traffic to specific locations only instead of a continuous turn-lane (e.g., using raised medians with median openings at specific locations).

The addition of a two-way left turn lane is a high priority project in the City's current Major Street Plan (Project 21) and is now designated for near-term funding through the recently approved IMPROVE Act. As this project enters preliminary engineering, the City and TDOT should coordinate to determine whether there are opportunities to improve access management. In addition to considering a partial median as described above, the construction may also provide an opportunity to work with adjacent property owners to consolidate access points on either side of the road, especially near intersections.

This project will provide multiple benefits along this segment of N. Willow Avenue. Stop-controlled intersections along this segment of N. Willow Avenue are forecast to operate at LOS F during the AM and PM peak hours in 2040. The addition of right-turn lanes on the unsignalized side streets may reduce delay at two-way stop-controlled intersections by allowing right turning vehicles to bypass vehicles waiting for an opportunity to proceed through the intersection or

make a left turn. Furthermore, constructing a two-way left-turn lane on N Willow Avenue (SR 135) may improve safety and operations at two-way stop-controlled intersections. This improvement would allow vehicles turning left onto 3rd, 4th, and 9th Streets from N. Willow Avenue (SR 135) to pull out of the through traffic and wait to make a turn. Similarly, vehicles turning left onto N. Willow Avenue (SR 135) from side streets and driveways can make a two-step left turn, crossing only one direction of traffic to the median refuge before entering traffic on the opposite side of the street.

If these solutions do not result in acceptable intersection performance, a signal warrant analysis may be undertaken to assess the feasibility of traffic signals. However, care should be taken when considering a traffic signal due to some of the intersections' proximity to other signals; e.g. the signalized intersection at W. Broad Street is only approximately 900 feet south of 3rd Street.

3.8. N. Willow Avenue (SR 135) & W. 12th Street

Recommended improvements at this intersection include:

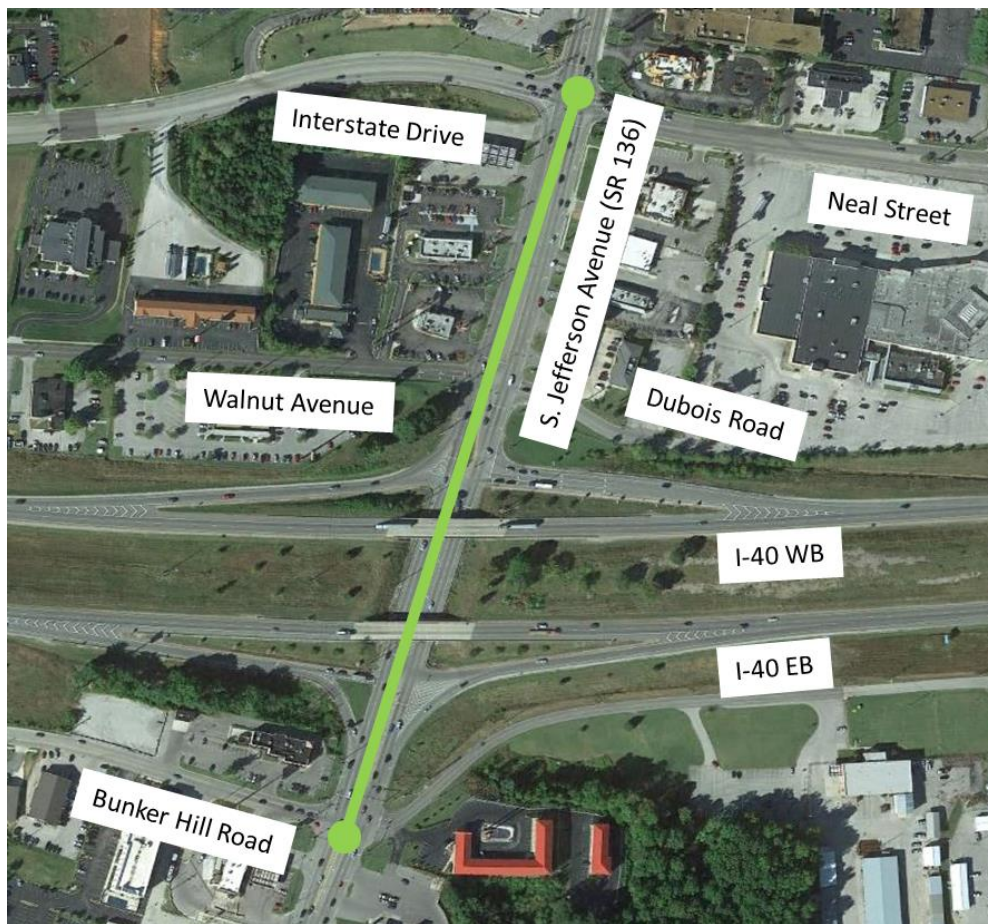
- Provide a right-turn channelization island in the northwest corner of the intersection to increase safety for pedestrians crossing at this location.
- Update pavement markings to clearly depict the pedestrian crosswalk on west side of the intersection, and update FDW time for the southbound movement.

While this intersection is not expected to operate at a failing LOS in 2040, optimizing the pedestrian crossing time will allow more flexibility in timing plans and enhance the safety for pedestrians at this intersection.

3.9. S. Jefferson Avenue (SR 136) near I-40

Congestion along S. Jefferson Avenue (SR 136) immediately north and south of I-40, between Bunker Hill Road/Ferrell Drive and Interstate Drive/Neal Street, area identified in **Figure 13**, was noted as a particular issue during the field observations and during project meetings with City staff. These issues were also mentioned in the Existing Conditions report, and are summarized below.

Figure 13: Congested Area of S. Jefferson Avenue (SR 136): Bunker Hill Road - Interstate Drive



Synchro analyses indicate that the congestion issues observed along this segment of S. Jefferson Avenue are likely driven more by operations than capacity issues, as Synchro projects none of the intersections to fail in the 2040 Optimized conditions.

Issues

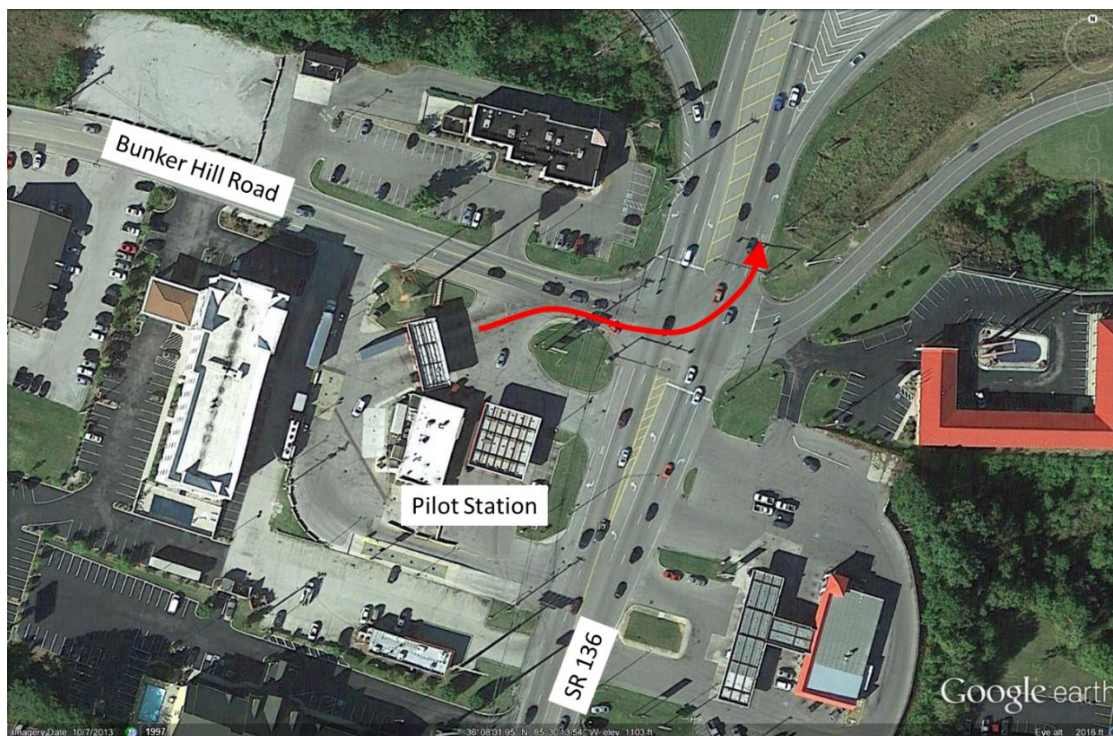
There are five intersections located in the 0.3-mile segment of S. Jefferson Avenue between the Bunker Hill Road and Interstate Drive intersections. In addition, Bunker Hill Road is within 325 feet of the adjacent I-40 eastbound ramps intersection and the S. Walnut Avenue intersection is only 225 feet from the I-40 westbound ramps intersection. This proximity, coupled with any spillback queues from downstream intersections, can result in blocked intersections that further impede traffic on conflicting approaches.

During field observations, two particular issues were noted that contributed to congestion. The first was along northbound S. Jefferson Avenue between the I-40 westbound ramps and S. Walnut Avenue. Many trucks were observed exiting westbound I-40, turning right, and then making an immediate left onto westbound S. Walnut Avenue. The limited intersection spacing hindered trucks' ability to properly enter the northbound left-turn lane, which resulted in their blocking the inside northbound through lane. This blockage impeded northbound through traffic

and contributed to congestion along northbound S. Jefferson Avenue. The same issue was observed to a lesser degree for trucks turning left from northbound S. Jefferson Avenue onto westbound Interstate Drive at the next intersection. The issue was most prevalent during the PM peak.

The second issue of note in this section of S. Jefferson Avenue was observed at the Pilot Fuel Station, located at the southwest quadrant of the Bunker Hill Road intersection, as shown in **Figure 14**. The site's internal circulation forces trucks to exit the station approximately 60 feet from the eastbound stop bar at the Bunker Hill Road at S. Jefferson Avenue (SR 136) intersection. When queues form on eastbound Bunker Hill Road, the queue either blocks trucks from exiting the Pilot, or the queue is further exacerbated as queued vehicles wait for trucks to exit from the Pilot. Once trucks have executed the eastbound to northbound left turn, they often encounter northbound queues along S. Jefferson Avenue. These queues were observed to extend to and into Bunker Hill Road. When they encounter the queues, the trucks often end up blocking multiple northbound through lanes along S. Jefferson Avenue. In one instance, multiple trucks were observed blocking all of northbound S. Jefferson Avenue and part of southbound S. Jefferson Avenue. These blockages caused northbound queues that extended north several hundred feet past the I-40 westbound ramps and exacerbated southbound congestion.

Figure 14: Operational Issues near Pilot Station, S. Jefferson Avenue (SR 136) at Bunker Hill Road



S. Jefferson Avenue near I-40 Recommendations

Multiple improvements could help traffic operations along this segment of the S. Jefferson Avenue corridor.

- *Interstate Drive / Neal Street*

Adding dual westbound left-turn lanes and changing the westbound left-turn phasing to “protected” would improve operations on Interstate Drive. Providing dual northbound left-turn lanes and changing the northbound left-turn phasing to “protected” would improve operations on S. Jefferson Avenue (SR 136).

- *S. Walnut Avenue / Dubois Street*

The westbound approach at this intersection is a relatively low volume approach; however, significant green time must be allocated to the east and west approaches to accommodate left-turning vehicles due to the existing split phase timing plan. It is likely that a majority of westbound left-turning vehicles are exiting the mall located just east of the intersection. The City could consider precluding westbound left-turns at this location, as the mall has several access points to Neal Street, which crosses S. Jefferson Avenue (SR 136) just north of Dubois Road and has more capacity to accommodate high left-turn volumes. Eliminating the left-turn movement at this intersection would allow for more efficient distribution of the green time currently allocated to the westbound left-turn movement and could improve the overall intersection operation.

- *I-40 Westbound Off-Ramp*

To mitigate queues north of I-40, implementing a No Right-Turn On-Red (No RTOR) policy on the westbound I-40 off-ramp (No RTOR) approach is recommended. Implementing a No RTOR policy would likely mitigate downstream queues along S. Jefferson Avenue, which should improve trucks’ ability to execute northbound left-turns from S. Jefferson Avenue onto S. Walnut Avenue.

The City should also consider improving the channelization of the two right-turn lanes at the approach. Further channelizing the turns should improve lane assignment and safety. If after implementing these changes, queues extend an unsafe distance along the off-ramp, the City and TDOT could conduct further analysis to evaluate converting the exclusive inner right-turn lane to a shared right/left turn lane.

- *I-40 Eastbound Off-Ramp*

Providing dual eastbound left-turn lanes and updating the eastbound left-turn signal phasing to “protected” would more efficiently process left turning vehicles from the ramp, as both the eastbound left and southbound left movements are forecast to operate at a failing LOS in 2040 during the PM peak hour. Construction of a second left-turn lane on the eastbound approach may reduce the green time allocated to the

eastbound movement enough to efficiently distribute green time to the southbound left-turn movement and avoid the need to add another southbound left-turn lane.

- *Bunker Hill Road*

Additional discussion and analysis is needed to determine how best to coordinate truck turning movements at Bunker Hill Road with northbound through traffic along S. Jefferson Avenue. Collaborating with Pilot to reconfigure its internal site circulation so that trucks exit at the upstream driveway would better align trucks on Bunker Hill before turning.

- *Access Management*

Access management improvements along S. Jefferson Avenue would also improve operations, as reducing the number of driveways would in turn reduce how often vehicles must brake for other vehicles entering and exiting traffic.

3.10. S. Jefferson Avenue (SR 136) & Jackson Street

Recommended improvements at this intersection include:

- Provide dual northbound left-turn lanes and change the northbound left-turn phasing to “protected” to accommodate high northbound left-turn volumes.

The northbound left-turn movement at this intersection is a high volume movement. An additional left-turn movement should be considered to accommodate this traffic volume and allow for more efficient overall intersection operations.

3.11. E. Spring Street (US 70N, SR 24) & I-40 Ramps

Recommendations at these intersections include:

- Perform a signal warrant analysis to determine if signalization is needed at these locations.

The stop-controlled intersection at the eastbound I-40 ramps is forecast to operate at LOS F during the PM peak hour in 2040, while the stop-controlled intersection at the westbound I-40 ramps is not forecast to fail during either peak hour in 2040. However, volumes at these intersections are forecast to be high enough that a signal warrant analysis should be undertaken to definitively determine whether the need for signalization exists. It is recommended that the City and TDOT continue to monitor queue lengths and delays at these intersections.

3.12. E. Spring Street (US 70N, SR 24) & SR 111 Northbound Ramps

Recommended improvements at this intersection include:

- Provide dual northbound left-turn lanes to accommodate high northbound left-turn volumes from SR 111.
- Add a receiving lane on the SR 111 on-ramp to accommodate increased traffic flow onto the on-ramp.

This intersection is forecast to operate at LOS E in both the AM and PM peak in 2040. Synchro projects the northbound approach, westbound through movement, and conflicting eastbound left-turn movements to fail in both the AM and PM models. The Synchro model projects that modifying the intersection to include two eastbound through lanes and two eastbound left turn lanes would significantly improve the intersection's operations. Adding a second eastbound left turn lane would require adding a second northbound on-ramp receiving lane, and further study to determine if and how this lane would be dropped before merging with northbound SR 111. The eastbound through movement volume at the intersection is projected to remain low enough to be served by one through lane.

Further study is needed to assess how these proposed changes would impact the SR 111 overpass and SR 111 operations. The City may also wish to work with TDOT to explore the potential benefits of alternative interchange designs such as a diverging diamond, in which the two directions of traffic on E. 10th Street would cross to the opposite side on both sides of the bridge at SR 111.

3.13. E. Spring Street (US 70N, SR 24) & SR 111 Southbound Ramps

Recommendations at this intersection include:

- Perform a signal warrant analysis to determine whether signalization is needed at this location.

This stop-controlled intersection is forecast to operate at LOS F during the AM and PM peak hours in 2040. A signal warrant analysis will help determine whether this location should be converted to a signalized intersection.

As volumes increase, the City should consider a traffic study to evaluate the Old Kentucky Road, SR 111 southbound ramps, and SR 111 northbound ramps intersection as a coordinated trio, to make signalization and operations recommendations.

3.14. W. Broad Street (US 70N, SR 24) & W. Jackson Street

Recommendations at this intersection include:

- Provide a southbound left-turn lane to accommodate left turning traffic.
- Consider removing the existing split phase pattern on the northbound and southbound approaches to enhance efficiency of signal timing at intersection.

This intersection is forecast to operate at LOS E during the AM and PM peak in 2040. Improving the southbound approach to include a dedicated left-turn lane would more efficiently distribute green time that is currently split between the northbound and southbound approaches.

3.15. E. 10th Street

This analysis assumes that the widening project identified in the Cookeville 2030 plan and designated in the Major Street Plan as a high priority project will be constructed by 2040. This project involves widening 10th Street from three lanes to five lanes from N. Washington Avenue

(SR 136) to Chocolate Drive. The additional capacity generated by widening 10th Street should improve operations to an acceptable LOS at the following intersections that would otherwise operate at failing LOS in a 2040 No-Build scenario:

- 10th Street & Brown Avenue N.
- 10th Street & Brown Avenue S.
- 10th Street and N. Old Kentucky Road

Additional improvements may be needed at the intersection of 10th Street & Fisk Road for the intersection to operate at an acceptable LOS in 2040. These recommendations include:

- Consider providing a dedicated southbound left-turn lane to increase the capacity of the southbound approach.
- Consider providing a dedicated northbound left-turn lane to allow split phasing to be eliminated at this intersection.

The southbound left-turn movement from Fisk Road onto E. 10th Street is a high volume movement and a dedicated left-turn lane would allow these turns to be processed more efficiently. Furthermore, the addition of a complementary left-turn lane on the northbound approach would allow existing split phasing for the minor street movements to be eliminated, which would allow for more efficient signal timing at the intersection.

All intersections on 10th Street outside the limits of the widening project are forecast to operate at an acceptable LOS during the AM and PM peak periods in 2040. The only additional recommended improvement is at the intersection of 10th Street & SR 111 northbound ramps:

- Provide an additional northbound right-turn lane and restrict right-turn-on-red movements to accommodate the high volume of right-turning vehicles at this intersection.

The northbound right-turn movement at this intersection is forecast to operate at an LOS F during the PM peak period in 2040. The proposed improvement may improve the capacity of the right-turn movement at this intersection, allowing it to use the allocated green time more efficiently.

Other Future Scenarios

Though the widening of E. 10th Street is identified in the current Major Street Plan, it may present significant challenges to implement (impact to adjacent right-of-way, cost, etc.) If this widening of E. 10th Street cannot be designed and implemented, projected traffic demand will require other methods of managing the road's existing capacity, as well as diverting some traffic to other facilities.

Diverting traffic demand to other facilities is typically achieved by identifying nearby roadways that can serve the same origins and destinations as E. 10th Street (and improving capacity of those facilities if needed) or by adding new roadway connections parallel to E. 10th Street.

The City's current Major Street Plan includes a new East-West roadway across the very northern portion of Cookeville that connects Gainesboro Grade (SR 290) and SR 111. Similarly, the Major Street Plan also proposes the widening of E. Spring Street and US 70N, which is a facility that is south of and parallel to E. 10th Street.

A travel demand model is the best tool to help quantify the extent to which these projects could help distribute the traffic that is otherwise projected to use E. 10th Street. While the Cookeville area does not currently have a travel demand model, it is likely after the 2020 Census to reach the population threshold at which it would become a federally designated Metropolitan Planning Organization (MPO). While smaller MPOs are not required to have a travel demand model, it has been the standard practice in Tennessee for all MPOs to have a travel demand model. MPO designation within the next few years could therefore lead to the availability of additional planning tools that can more precisely identify the shifts in traffic flows and demand associated with various roadway improvements. Such analysis can help guide decisions about using limited funds and resources, to avoid unnecessary improvements or more strategic decisions about the E. 10th Street corridor.

In the meantime, other planning and engineering strategies can be employed to help manage traffic congestion in this corridor. Re-aligning staggered/offset intersections, traffic signal timing, and phasing optimization can be used to improve traffic flow along E. 10th Street to levels that are much better than in No-Build conditions.

3.16. Planning Level Cost Estimates

A planning level cost estimate was developed for each of the above projects, using TDOT's most recent planning-level cost estimate spreadsheet and updating values to 2017 dollars. (The exception is the two-way left turn lane on N. Willow Avenue, for which a planning-level cost was recently developed by TDOT.) **Table 4** summarizes these cost estimates. As each improvement enters the formal project development process, these high-level costs will be further refined through detailed engineering and design.

Table 4: Cookeville Corridor Planning-Level Cost Estimates (2017 dollars)

Location of Proposed Improvement	Planning-Level Cost Estimate (2017 Dollars)
State Route 135 (South Willow Avenue) at Interstate 40 Eastbound	\$75,000
State Route 135 (South Willow Avenue) at Interstate 40 Westbound	\$40,000
State Route 135 (South Willow Avenue) at Interstate Drive / Foreman Drive	\$260,000
State Route 135 (South Willow Avenue) at West Jackson Street	\$592,000
State Route 135 (South Willow Avenue) at West Stevens Street	\$222,000
State Route 135 (South Willow Avenue) at State Route 24 (US Route 70N, West Spring Street)	\$640,000
State Route 135 (North Willow Avenue) from West Broad Street to West 12th Street	\$35,800,000
State Route 135 (North Willow Avenue) eastbound and westbound right-turn lanes at West 3 rd Street, West 4 th Street and West 9 th Street	\$1,182,000
State Route 135 (North Willow Avenue) at State Route 290 (West 12th Street)	\$55,000
State Route 136 (South Jefferson Avenue) at Interstate Drive / Neal Street	\$441,000
State Route 136 (South Jefferson Avenue) at South Walnut Avenue / Dubois Street	\$35,000
State Route 136 (South Jefferson Avenue) at Interstate 40 Westbound ramp	\$10,000
State Route 136 (South Jefferson Avenue) at Interstate 40 Eastbound ramp	\$98,000
State Route 136 (South Jefferson Avenue) at Bunker Hill Road	\$50,000
State Route 136 (South Jefferson Avenue) at Jackson Street	\$245,000
State Route 24 (US Route 70N, East Spring Street) at Interstate 40	\$30,000
State Route 24 (US Route 70N, East Spring Street) at State Route 111 Northbound ramp	\$346,000
State Route 24 (US Route 70N, East Spring Street) at State Route 111 Southbound ramp	\$15,000
State Route 24 (US Route 70N, West Broad Street) at West Jackson Street	\$197,000
East 10th Street from State Route 136 (North Washington Avenue) to Chocolate Drive	\$27,924,000
East 10th Street at Fisk Road	\$354,000
East 10th Street at State Route 111 Northbound ramp	\$108,000
GRAND TOTAL	\$68,719,000

As shown in Table 4, most of the projects are expected to cost less than \$500,000. Further cost estimate details for each specific improvement at a particular location is included in **Appendix E**.

4. 2040 Intersection Analysis with Implementation of Recommendations

The recommendations outlined in Section 3 were applied to the intermediate 2040 Coordinated Synchro models discussed in the introduction to Section 3. **Table 5** presents the delay in seconds and the LOS of each intersection of the 2040 Optimized with Recommendations Synchro analysis, while **Figures 15** and **16** show the results.

Table 5 indicates that the Synchro models project 4 failing intersections in the AM peak hour (all unsignalized) and 9 failing intersections in the PM peak hour (7 unsignalized, 2 signalized). The recommended signal optimization and intersection improvements reduce the number of intersections with a failing LOS versus the 2040 No-Build model from 15 to 4 in the AM peak hour and 17 to 9 in the PM peak hour. Of particular note is that the proposed optimization and improvements reduced the number of failing signalized intersections from 11 in the 2040 No-Build AM model to zero and from 9 in the 2040 No-Build PM model to 2. The Synchro reports for the 2040 Optimized with Recommendations Conditions models are included in **Appendix F**.

Table 5: 2040 Optimized Conditions with Recommendations Delay & Level of Service

No.	Route	Intersecting Route	Int. Type	AM Peak Hour		PM Peak Hour	
				Delay (sec)	LOS	Delay (sec)	LOS
1	S. Willow Ave.	Gould Dr.	Sig.	12.8	B	30.9	C
2	S. Willow Ave.	I-40 EB Ramps	Sig.	26.7	C	26.8	C
3	S. Willow Ave.	I-40 WB Ramps	Sig.	15.5	B	18.0	B
4	S. Willow Ave.	Interstate Dr.	Sig.	33.7	C	38.5	D
5	S. Willow Ave.	Fairground St.	STOP	17.3	C	28.5	D
6	S. Willow Ave.	Ashwood Dr.	STOP	12.0	B	13.4	B
61	S. Willow Ave.	Orchard St.	Sig.	13.7	B	15.7	B
7	S. Willow Ave.	Lone Oak Dr.	STOP	20.2	C	27.4	D
8	S. Willow Ave.	W. Jackson St.	Sig.	25.1	C	38.7	D
9	S. Willow Ave.	W. Stevens St.	Sig.	29.1	C	20.6	C
10	S. Willow Ave.	W. Spring St.	Sig.	37.7	D	45.0	D
11	S. Willow Ave.	W. Broad St.	Sig.	19.8	B	27.8	C
12	N. Willow Ave.	W. 3rd St.	STOP	87.4	F	208.7	F
13	N. Willow Ave.	W. 4th St.	STOP	139.8	F	369.2	F
14	N. Willow Ave.	W. 7th St.	Sig.	25.9	C	23.7	C
15	N. Willow Ave.	W. 9th St.	STOP	138.0	F	238.7	F
16	N. Willow Ave.	University Dr.	Sig.	10.4	B	10.5	B
17	N. Willow Ave.	W. 12th St.	Sig.	33.5	C	28.0	C
18	S. Jefferson Ave.	Bunker Hill Rd.	Sig.	15.6	B	18.5	B
19	S. Jefferson Ave.	I-40 EB Ramps	Sig.	17.0	B	22.1	C
20	S. Jefferson Ave.	I-40 WB Ramps	Sig.	28.2	C	17.5	B
21	S. Jefferson Ave.	S. Walnut Ave.	Sig.	20.1	C	24.7	C
22	S. Jefferson Ave.	Interstate Dr.	Sig.	25.2	C	42.4	D
23	S. Jefferson Ave.	E. Veterans Dr.	Sig.	28.3	C	44.1	D
241	S. Jefferson Ave.	Fairground St.	STOP	14.7	B	40.2	E
24	S. Jefferson Ave.	Walmart Driveway	Sig.	2.8	A	14.5	B
25	S. Jefferson Ave.	Commerce Ave.	Sig.	6.6	A	15.8	B
26	S. Jefferson Ave.	E. Jackson St.	Sig.	28.4	C	36.2	D
27	S. Jefferson Ave.	Foutch Dr.	Sig.	11.3	B	23.5	C
28	S. Jefferson Ave.	E. Stevens St.	Sig.	15.1	B	18.4	B
29	S. Jefferson Ave.	US 70N/E. Spring St.	Sig.	28.2	C	74.3	E
30	N. Jefferson Ave.	E. Broad St.	Sig.	25.1	C	28.2	C
31	S. Washington Ave.	E. Spring St.	Sig.	27.7	C	40.9	D
32	N. Washington Ave.	E. Broad St.	Sig.	42.4	D	41.2	D
33	N. Washington Ave.	E. 1st St.	Sig.	40.4	D	41.7	D
34	N. Washington Ave.	E. 10th St.	Sig.	30.7	C	34.2	C
35	E. Spring St.	I-40 EB Ramps	STOP	17.7	C	63.8	F

(continued from previous page)

No.	Route	Intersecting Route	Int. Type	AM Peak Hour		PM Peak Hour	
				Delay (sec)	LOS	Delay (sec)	LOS
36	E. Spring St.	I-40 WB Ramps	STOP	17.3	C	12.9	B
37	E. Spring St.	SR 111 NB Ramps	Sig.	27.8	C	26.2	C
38	E. Spring St.	SR 111 SB Ramps	STOP	279.3	F	477.5	F
39	E. Spring St.	S. Old Kentucky Rd.	Sig.	23.6	C	44.4	D
40	E. Spring St.	E. Broad St.	STOP	25.7	D	77.8	F
41	E. Spring St.	S. Maple Ave.	Sig.	54.6	D	79.5	E
42	E. Spring St.	S. Dixie Ave.	Sig.	22.5	C	33.3	C
43	W. Spring St.	S. Walnut Ave.	Sig.	37.7	D	54.8	D
44	W. Spring St.	Scott Ave.	Sig.	23.4	C	38.0	D
45	E. Broad St.	S. Maple Ave.	Sig.	50.4	D	51.4	D
46	E. Broad St.	S. Dixie Ave.	Sig.	17.6	B	30.2	C
47	E. Broad St.	S. Walnut Ave.	Sig.	33.4	C	47.0	D
48	E. Broad St.	S. Cedar Ave.	STOP	11.3	B	27.9	D
49	W. Broad St.	N. Cedar Ave.	STOP	12.1	B	18.6	C
50	W. Spring St.	W. Broad St.	STOP	11.4	B	22.6	C
51	W. Broad St.	W. Jackson St.	Sig.	39.7	D	32.6	C
52	E. 10th St.	Brown Ave. N	Sig.	10.6	B	12.1	B
521	E. 10th St.	Brown Ave. S	Sig.	14.5	B	11.1	B
53	E. 10th St.	Fisk Rd.	Sig.	31.5	C	21.0	C
54	E. 10th St.	N. Old Kentucky Rd.	Sig.	15.4	B	20.5	C
55	E. 10th St.	SR 111 SB Ramps	Sig.	25.7	C	10.4	B
56	E. 10th St.	SR 111 NB Ramps	Sig.	22.8	C	37.6	D
57	E. 10th St.	Burton Branch Rd.	Sig.	35.4	D	19.3	B

Figure 15: 2040 Recommended Conditions Intersection Level of Service (AM Peak Hour)

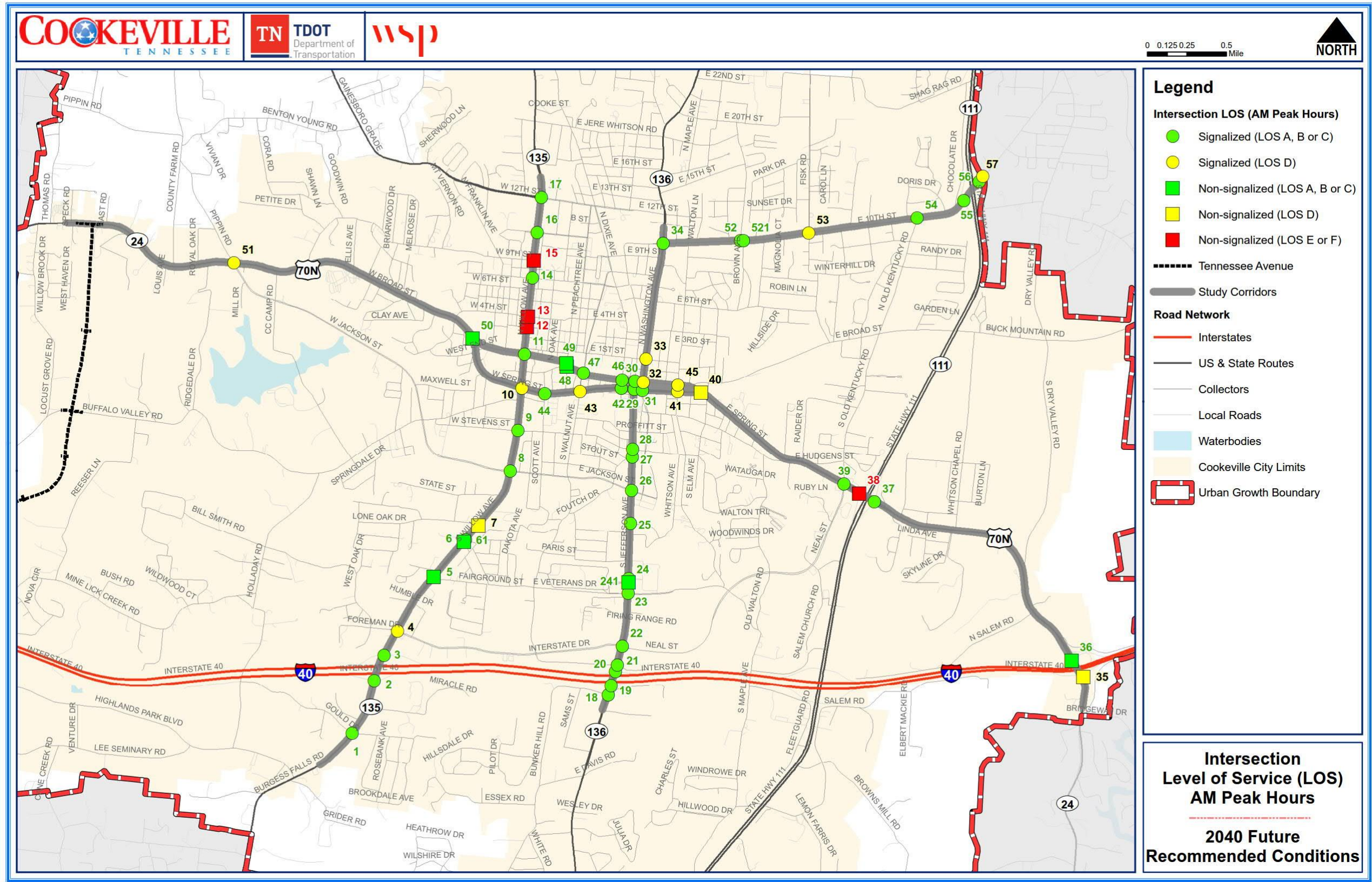
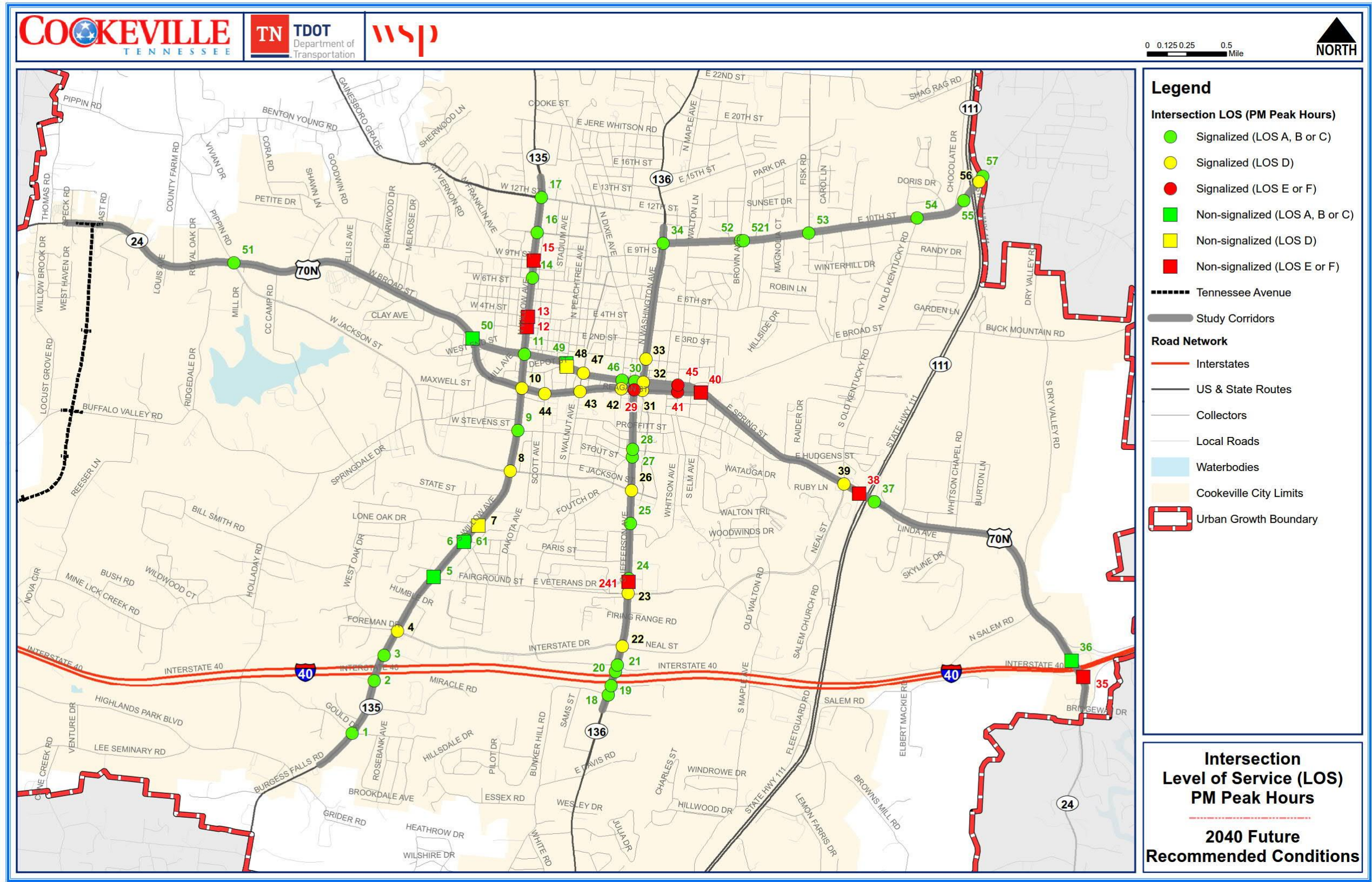


Figure 16: 2040 Recommended Conditions Intersection Level of Service (PM Peak Hour)



5. Downtown Circulation Recommendations

5.1. Observed Issues

In conjunction with the corridor analysis, the City requested specific recommendations to mitigate the gridlock and congestion observed in downtown Cookeville around the six intersections on E. Spring Street (US 70N, SR 24) and E. Broad Street between Dixie Avenue and N. Washington Avenue. The Existing Conditions report describes factors that contribute to the congestion in the downtown area, including:

- State Route 136 “jogs” from S. Jefferson Avenue to N. Washington Avenue in the downtown area at Spring Street (US 70N, SR 24) which results in high turning volumes at each of the study area intersections;
- The distance between intersections leaves little space for vehicles to queue before blocking an adjacent intersection;
- The location and type of on-street parking results in blocked traffic when drivers exit their parking space; and
- Pedestrians use mid-block crossings, which reduces traffic flow rates and efficiency.

5.2. Potential Solutions

Potential solutions to relieve congestion in downtown Cookeville include:

- Improve signal timing and coordination
- Remove some (or all) on-street parking
- Remove mid-block crossings
- Adjust signal timing along alternate routes and install wayfinding signage to promote their use
- Convert E. Spring Street (US 70N, SR 24) and Broad Street to one-way pairs

5.2.1. Improve Signal Timing and Coordination

Prior to this study, several attempts have been made to optimize the signal timing and coordination in downtown Cookeville. The existing downtown signal timing plans consist of three unique time-of-day (TOD) plans (morning, mid-day, evening) used during weekdays. In this study’s analysis, the signal timings were further refined in both the AM and PM peak hour models by focusing on 95th percentile queue lengths, turning volumes, and traffic patterns. However, many of the observed issues, including parking impacts, the mid-block crossing distance, and intersection spacing, limit the benefits of these coordinated timing plans – both now, and in the recommended scenarios.

Some of the signal timing changes recommended for the downtown network in the 2017 and 2040 optimized models include changing lagging left turns to leading left turns and decreasing the cycle length during the PM peak hour. Lagging left turn phases are recommended to be changed to leading left-turn phases because field observations showed that left-turn flow rates are limited by queues from adjacent intersections. By the time that left turn movements are

allowed, the adjacent intersection's queue significantly limits the number of vehicles that could turn. In the recommended scenarios, signal offsets have also been adjusted by focusing on each intersection approach queue lengths and the distance between intersections.

Based on a comparison of the field observations and Synchro analysis, the signal timing improvements alone likely will not fully mitigate the existing congestion and gridlock due to the impacts of parking maneuvers and mid-block pedestrian crossings. While additional field timing refinements may further improve operations, additional measures, such as removing on-street parking and pedestrian mid-block crossings are needed to produce more significant improvements.

5.2.2. Remove On-Street Parking

Field observations and comments from local business owners both indicate that vehicles entering and exiting parking spaces in downtown Cookeville can impede traffic flow. Parking's impact on traffic operations is especially prevalent around the Downtown Square, where diagonal parking along both sides of each surrounding street can significantly restrict space for vehicular operations. Angle parking offers certain advantages such as easier maneuverability while parking or exiting, and ability to fit more parking spaces into a given area. However, if drivers do not correctly judge the angle or do not pull far enough into the space to bring the nose of the vehicle to the curb, the back of the vehicle protrudes partially into the travel way, disrupting traffic flow in the adjacent travel lanes. **Figure 17** illustrates the current parking available adjacent to the Downtown Square.

Figure 17: Cookeville's Downtown Square



Conversations with City staff and findings outlined in the 2016 Downtown Parking Study indicate that parking demand exceeds parking supply in downtown Cookeville. Given the demand for parking, it is preferable to focus on removal of parking spaces that are most disruptive to traffic operations. For example, diagonal parking spaces on the far side of intersections or certain other locations are more likely to impede intersection traffic operations. Based on additional review, the City could consider removing a few high-impact parking spaces to balance parking needs and improved traffic operations.

5.2.3. Remove Pedestrian Mid-Block Crossings

In addition to on-street parking, each of the Downtown Square's four sides also has a pedestrian mid-block crossing, as shown in Figure 17. These mid-block crossings are located at the approximate halfway point of each of the Square's sides and reduce the time needed for pedestrians to cross each respective side. However, during field observations it was observed on multiple occasions that pedestrians using the mid-block crossings impeded traffic flow and disrupted the progression of the downtown coordinated signal network. Given that the distance between each of the intersection crosswalks around the square is approximately 200 feet, any pedestrian exiting a building who needs to cross a street adjacent to the Square would have to walk no more than 100 feet to get to a signalized crosswalk.

If these crosswalks are removed, it is recommended that the Walk and FDW timings of the surrounding signals be re-evaluated to ensure they provide safe and proper clearance.

5.2.4. Enhanced Wayfinding

Field observations, traffic patterns, and comments from City staff indicate that many of the traffic issues in downtown Cookeville are caused by the fact that SR 136 "jogs" between S. Jefferson Avenue and N. Washington Avenue. This shift forces many would-be through vehicles to execute consecutive right and left-turns to continue north or south through downtown.

One potential solution to reduce turning traffic in downtown is to emphasize the use of S. Lowe Avenue. While many vehicles will likely continue to use S. Jefferson Avenue, diverting some vehicles to continue south from N. Washington Avenue to S. Lowe Avenue and then access S. Jefferson Avenue at E. Jackson Street could improve operations in downtown. This would likely require updated signal timing, new wayfinding signage, and a marketing and education campaign to convince drivers to use an alternate route.

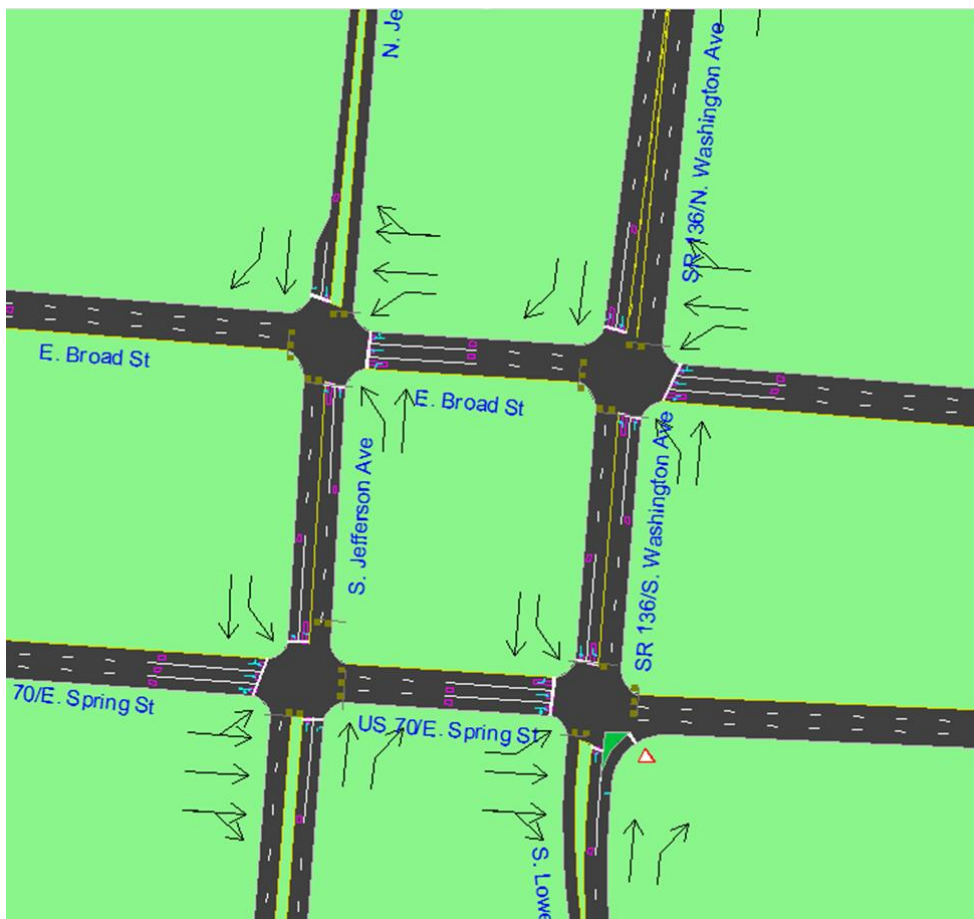
5.2.5. One-Way Pairs

Another potential solution to improve traffic operations in downtown Cookeville is to create a system of one-way pairs. In this scenario E. Spring Street (SR 24, US 70N) would be converted to one-way eastbound operations between S. Dixie Avenue and E. Broad Street, and E. Broad Street would be converted to one-way westbound operations from E. Spring Street west to S. Dixie Avenue. The proposed direction of flow is shown in **Figure 18**. An example of this configuration is shown in **Figure 19**. The lane configuration of all intersections affected by the one-way pair are shown in **Appendix G**.

Figure 18: Potential One-Way Pair Network in Downtown



Figure 19: One-Way Pair Lane Configuration at Jefferson Avenue and Washington Avenue



The majority of parcels and parking facilities in between E. Spring Street (SR 24, US 70N) and E. Broad Street have access to both streets, which would mitigate inconvenience for these vehicles. Vehicles accessing parcels immediately south of E. Spring Street or north of E. Broad Street would be forced to turn whichever direction is allowed by that specific street; however, the distance to the nearest north-south cross-street to turn around would be at most 900 feet. It is recommended that the one-way pair system end at S. Dixie Avenue for two reasons. First, the spacing between E. Spring Street and E. Broad Street increases such that fewer parcels have access to both streets. Second, the north-south cross street spacing increases west of Dixie Avenue. This increased spacing in turn increases the turn-around distance required for vehicles that exit a site by entering a one-way street in the opposite direction from their intended travel.

A system of one-way pairs simplifies signal-phasing patterns, which reduces lost time and increases signal efficiency. Given that each of the signalized intersections between Dixie Avenue and the E. Spring Street / E. Broad Street merge have crosswalks, and each of these crosswalks is relatively short, the system of one-way pairs was modeled assuming that each of the eight intersections would operate with a “pedestrian scramble” phase. This phase allows pedestrians from each approach to walk across and even through the crosswalk; during this time all vehicles are stopped. During vehicular phases, no pedestrians are allowed to cross; thus, pedestrians do not impede vehicles and vehicles do not impede pedestrians.

Further analysis would need to be undertaken before converting E. Spring Street (US 70N, SR 24) and E. Broad Street to a one-way pair to better understand the implications and potential impacts to traffic patterns, business access, and parking. A detailed travel pattern analysis in the downtown area would more accurately determine trip reassignments and turning volumes at affected intersections. Several methods can be used to assess travel patterns including a detailed sub-area analysis using a travel demand model or an origin-destination study. Additionally, the lane configurations needed to accommodate future traffic volumes in the downtown area may impact existing parking. A parking study that builds off of and incorporates the findings of the 2016 Cookeville Downtown Parking Study should be considered to determine the implications and assess alternatives for parking if a one-way pair is adopted. Finally, additional wayfinding signage may be needed to inform drivers of the one-way pair operations and direct them to appropriate through roadways as needed. Wayfinding signs would likely be needed inside and outside downtown to give drivers advance warning to avoid confusion at the conversion points.

5.2.6. Summary

While each of these solutions would likely alleviate some downtown congestion, the area’s intersection spacing and vehicles’ interaction with parking maneuvers and pedestrians requires a multifaceted approach. For example, if only signals are optimized, traffic must still stop for vehicles leaving on-street parking and yield to pedestrians at mid-block crossings, which can nullify the benefits of optimized signalization. Conversely, removing on-street parking and mid-block crossings without improving signal timing also limits the potential benefits that could be gained.

6. Access Management

Access management centers on the balance between providing accessibility and mobility. The higher the functional classification of a roadway facility (freeways, principal arterials, etc.), typically the more mobility it provides. The lower the functional classification (minor collectors, local roads), typically the more accessibility a facility provides. Planning strategically for mobility and accessibility and balancing these needs in a structured hierarchy across facilities can reduce congestion, improve safety, and improve the efficiency and use of existing pavement². Best practice access management takes a long-term view of existing and future development and both vehicular and pedestrian access to plan multi-modal access points in relation to current and planned intersections and other features such as medians.

Field observations identified frequent access points along the entire extents of each of the study corridors. In particular, close driveway spacing was observed to contribute to congestion along S. Willow Avenue (SR 135) and S. Jefferson Avenue (SR 136) just north of I-40 and E. 10th Street between Brown Avenue and SR 111.

The Cookeville Access Policy (Section 205.9 of the City Code) establishes criteria for driveway access points and frequency within a parcel, median spacing, and other access management parameters. It is recommended that City staff consider expanding the existing document to include more comprehensive criteria that considers functional classification, posted speed limit, and land use.

In parallel with reviewing the Access Policy, it is recommended that the City and TDOT ensure that their driveway spacing and design standards are well-integrated into its other development processes (such as by requiring compliance as a pre-requisite to approving a traffic impact study or granting an access permit). The standard criteria should be applied to all new development and for potential modifications of existing driveways that do not comply, particularly near major intersections or in other areas that pose significant traffic or safety concerns. In some cases, new connectivity could mitigate existing access density issues at certain locations.

² https://ops.fhwa.dot.gov/publications/amprimer/access_mgmt_primer.htm

Appendices

Appendix A: Intersection Pedestrian Crossing Time Calculations

Appendix B: 2017 Optimized Conditions Synchro Reports

Appendix C: 2040 No-Build Conditions Synchro Reports

Appendix D: 2040 Optimized Conditions Synchro Reports

Appendix E: Cost Estimate Details

Appendix F: 2040 Recommendations Conditions Synchro Reports

Appendix G: One-Way Pair Lane Configuration

Appendix A: Pedestrian Crossing Time Calculations

Appendix A: Pedestrian Crossing Time Values

Intersections with Pedestrian Timing	WB Through Phase		NB Through Phase		EB Through Phase		SB Through Phase	
	Crosswalk Length [ft]	Min FDW Time [s]	Crosswalk Length [ft]	Min FDW Time [s]	Crosswalk Length [ft]	Min FDW Time [s]	Crosswalk Length [ft]	Min FDW Time [s]
SR 135 / S. Willow Ave & I-40 EB Ramps	90	23	95	24	N/A	N/A	97	25
SR 135 / S. Willow Ave & I-40 WB Ramps	N/A	N/A	55	14	96	24	70	18
SR 135/ N. Willow Ave & University Dr	65	17	52	13	60	15	55	14
SR 135/ N. Willow Ave & W. 12th St	N/A	N/A	N/A	N/A	73	19	92	23
SR 136 / S. Jefferson Ave & Interstate Dr / Neal St	67	17	77	20	84	21	58	15
SR 136 / S. Jefferson Ave & Wal-Mart Driveway	60	15	62	16	60	15	62	16
SR 136 / S. Jefferson Ave & US 70 / E. Spring St	59	15	62	16	55	14	52	13
S. Jefferson Ave & E. Broad St	54	14	55	14	50	13	52	13
SR 136 / N. Washington St / S. Lowe Ave & US 70 / E. Spring St	61	16	58	15	42	11	67	17
SR 136 / N. Washington St & E. Broad St	59	15	55	14	53	14	46	12
SR 136 / N. Washington St & E. 10th St	72	18	59	15	72	18	82	21
E. 10th St & Fisk Rd	40	10	35	9	40	10	44	11
US 70 / W. Spring St & S. Walnut Ave	42	11	44	11	38	10	40	10
US 70 / E. Spring St & S. Maple Ave	48	12	45	12	47	12	49	13
E. Broad St & N. Walnut Ave	45	12	55	14	42	11	52	13
E. Broad St & S. Dixie Ave	46	12	66	17	39	10	62	16
E. Broad St & S. Maple Ave	50	13	50	13	53	14	50	13

Appendix B: 2017 Optimized Conditions Synchro Reports

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	15	20	20	5	75	30	685	20	70	315	120
Future Volume (vph)	50	15	20	20	5	75	30	685	20	70	315	120
Satd. Flow (prot)	1736	1688	0	1805	1596	0	1805	3518	0	1805	3239	0
Flt Permitted	0.690			0.720			0.453			0.291		
Satd. Flow (perm)	1261	1688	0	1368	1596	0	861	3518	0	553	3239	0
Satd. Flow (RTOR)		32			91			5			109	
Lane Group Flow (vph)	64	56	0	40	103	0	36	863	0	92	536	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		3			4		5	2		1	6	
Permitted Phases	3			4			2			6		
Total Split (s)	24.0	24.0		24.0	24.0		13.0	47.0		19.0	53.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	4.0		5.0	4.0	
Act Effct Green (s)	9.5	9.5		9.5	9.5		68.0	65.3		70.1	67.9	
Actuated g/C Ratio	0.11	0.11		0.11	0.11		0.76	0.73		0.78	0.75	
v/c Ratio	0.48	0.27		0.28	0.41		0.05	0.34		0.18	0.22	
Control Delay	48.9	22.5		40.5	15.2		3.1	6.8		2.8	1.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	48.9	22.5		40.5	15.2		3.1	6.8		2.8	1.8	
LOS	D	C		D	B		A	A		A	A	
Approach Delay		36.6			22.3			6.7			1.9	
Approach LOS		D			C			A			A	
Queue Length 50th (ft)	35	13		21	6		3	97		4	2	
Queue Length 95th (ft)	62	26		27	0		11	140		15	23	
Internal Link Dist (ft)		927			612			1063			1812	
Turn Bay Length (ft)	200			150			200			200		
Base Capacity (vph)	266	381		288	408		752	2553		640	2471	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.24	0.15		0.14	0.25		0.05	0.34		0.14	0.22	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 80 (89%), Referenced to phase 2:NBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.48

Intersection Signal Delay: 8.3

Intersection Capacity Utilization 45.7%

Analysis Period (min) 15

Intersection LOS: A

ICU Level of Service A

Splits and Phases: 1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

		
Ø1	Ø2 (R)	Ø3
19 s	47 s	24 s
		
Ø5	Ø6	Ø4
13 s	53 s	24 s

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	305	5	50	0	0	0	0	625	245	200	540	0
Future Volume (vph)	305	5	50	0	0	0	0	625	245	200	540	0
Satd. Flow (prot)	1681	1569	0	0	0	0	0	3417	0	1687	3438	0
Flt Permitted	0.950	0.968								0.146		
Satd. Flow (perm)	1681	1569	0	0	0	0	0	3417	0	259	3438	0
Satd. Flow (RTOR)		27						62				
Lane Group Flow (vph)	217	207	0	0	0	0	0	1100	0	235	684	0
Turn Type	Split	NA						NA		pm+pt	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases										6		
Total Split (s)	36.0	36.0						38.0		16.0	54.0	
Total Lost Time (s)	6.1	6.1						5.4		5.0	5.4	
Act Effct Green (s)	16.4	16.4						43.8		62.5	62.1	
Actuated g/C Ratio	0.18	0.18						0.49		0.69	0.69	
v/c Ratio	0.71	0.67						0.65		0.60	0.29	
Control Delay	46.6	39.9						18.0		15.0	5.7	
Queue Delay	0.0	0.0						0.0		0.0	0.0	
Total Delay	46.6	39.9						18.0		15.0	5.7	
LOS	D	D						B		B	A	
Approach Delay		43.3						18.0			8.0	
Approach LOS		D						B			A	
Queue Length 50th (ft)	124	102						161		49	75	
Queue Length 95th (ft)	174	163						215		76	55	
Internal Link Dist (ft)		409			271			1812			858	
Turn Bay Length (ft)	200									410		
Base Capacity (vph)	558	539						1696		398	2371	
Starvation Cap Reductn	0	0						0		0	0	
Spillback Cap Reductn	0	0						0		0	0	
Storage Cap Reductn	0	0						0		0	0	
Reduced v/c Ratio	0.39	0.38						0.65		0.59	0.29	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 55 (61%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 18.6

Intersection Capacity Utilization 60.0%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

		
Ø1	Ø2 (R)	Ø4
16 s	38 s	36 s
		
Ø6 (R)		
54 s		

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	235	5	330	45	875	0	0	515	155
Future Volume (vph)	0	0	0	235	5	330	45	875	0	0	515	155
Satd. Flow (prot)	0	0	0	0	1697	1553	1530	3574	0	0	3321	0
Flt Permitted					0.954		0.266					
Satd. Flow (perm)	0	0	0	0	1697	1553	428	3574	0	0	3321	0
Satd. Flow (RTOR)						85					50	
Lane Group Flow (vph)	0	0	0	0	313	375	60	1080	0	0	751	0
Turn Type				Split	NA	Perm	pm+pt	NA			NA	
Protected Phases				4	4		5	2			6	
Permitted Phases						4	2					
Total Split (s)				40.0	40.0	40.0	12.0	50.0			38.0	
Total Lost Time (s)					4.0	4.0	5.0	4.0			4.0	
Act Effct Green (s)					26.0	26.0	55.0	56.0			46.7	
Actuated g/C Ratio					0.29	0.29	0.61	0.62			0.52	
v/c Ratio					0.64	0.74	0.18	0.49			0.43	
Control Delay					33.0	30.2	4.0	5.9			11.7	
Queue Delay					0.0	0.0	0.0	0.0			0.0	
Total Delay					33.0	30.2	4.0	5.9			11.7	
LOS					C	C	A	A			B	
Approach Delay					31.5			5.8			11.7	
Approach LOS					C			A			B	
Queue Length 50th (ft)					154	148	4	110			107	
Queue Length 95th (ft)					128	203	m19	257			127	
Internal Link Dist (ft)		874			1170			858			839	
Turn Bay Length (ft)						200	200					
Base Capacity (vph)					678	672	348	2225			1750	
Starvation Cap Reductn					0	0	0	0			0	
Spillback Cap Reductn					0	0	0	0			0	
Storage Cap Reductn					0	0	0	0			0	
Reduced v/c Ratio					0.46	0.56	0.17	0.49			0.43	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 9 (10%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 14.4

Intersection LOS: B

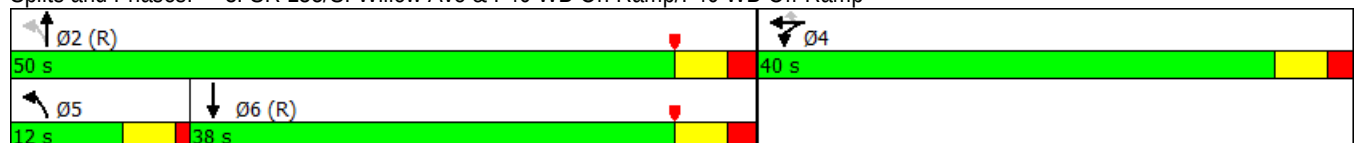
Intersection Capacity Utilization 60.0%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp



Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

4: SR 135/S. Willow Ave & Foreman Dr/Interstate Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	125	65	160	55	135	60	845	260	180	440	25
Future Volume (vph)	55	125	65	160	55	135	60	845	260	180	440	25
Satd. Flow (prot)	1719	1687	0	1752	1810	1553	1752	3428	0	1770	3373	0
Flt Permitted	0.708			0.269			0.462			0.104		
Satd. Flow (perm)	1281	1687	0	496	1810	1553	852	3428	0	194	3373	0
Satd. Flow (RTOR)		31				206		54			11	
Lane Group Flow (vph)	85	228	0	193	76	169	72	1273	0	220	514	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4		4	2			6		
Total Split (s)	14.0	21.0		14.0	21.0	21.0	11.0	39.0		16.0	44.0	
Total Lost Time (s)	5.0	4.0		5.0	4.0	6.5	5.0	4.0		5.0	4.0	
Act Effct Green (s)	22.5	15.8		25.4	19.2	16.7	42.0	37.2		50.9	43.4	
Actuated g/C Ratio	0.25	0.18		0.28	0.21	0.19	0.47	0.41		0.57	0.48	
v/c Ratio	0.24	0.71		0.73	0.20	0.37	0.16	0.88		0.77	0.31	
Control Delay	23.4	43.0		41.4	32.3	5.2	7.9	28.0		35.5	15.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	23.4	43.0		41.4	32.3	5.2	7.9	28.0		35.5	15.5	
LOS	C	D		D	C	A	A	C		D	B	
Approach Delay		37.7			25.8			26.9			21.5	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	34	105		81	36	0	11	314		68	95	
Queue Length 95th (ft)	48	181		#137	60	18	m21	#441		#130	133	
Internal Link Dist (ft)		811			944			839			2060	
Turn Bay Length (ft)	150			150			50			150		
Base Capacity (vph)	381	343		266	385	456	459	1447		302	1633	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.22	0.66		0.73	0.20	0.37	0.16	0.88		0.73	0.31	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 5 (6%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 26.5

Intersection LOS: C

Intersection Capacity Utilization 75.2%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: SR 135/S. Willow Ave & Foreman Dr/Interstate Dr

					
Ø1	Ø2 (R)		Ø3	Ø4	
16 s	39 s		14 s	21 s	
					
Ø5	Ø6 (R)		Ø7	Ø8	
11 s	44 s		14 s	21 s	

AM Peak Hour

WSP

Synchro 9 Report

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Lanes, Volumes, Timings 5: SR 135/S. Willow Ave & Fairground St

2017 Optimized AM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	15	50	870	70	45	650
Future Volume (vph)	15	50	870	70	45	650
Satd. Flow (prot)	1805	1583	3496	0	1805	3471
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1583	3496	0	1805	3471
Lane Group Flow (vph)	24	56	1104	0	64	691
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 42.9%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
5: SR 135/S. Willow Ave & Fairground St

2017 Optimized AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	50	870	70	45	650
Future Vol, veh/h	15	50	870	70	45	650
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	89	87	67	70	94
Heavy Vehicles, %	0	2	2	0	0	4
Mvmt Flow	24	56	1000	104	64	691

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1526	552	0	0	1104	0
Stage 1	1052	-	-	-	-	-
Stage 2	474	-	-	-	-	-
Critical Hdwy	6.8	6.94	-	-	4.1	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.32	-	-	2.2	-
Pot Cap-1 Maneuver	111	477	-	-	640	-
Stage 1	302	-	-	-	-	-
Stage 2	598	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	100	477	-	-	640	-
Mov Cap-2 Maneuver	217	-	-	-	-	-
Stage 1	302	-	-	-	-	-
Stage 2	538	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	16.6		0		1
HCM LOS	C				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	217	477	640	-
HCM Lane V/C Ratio	-	-	0.11	0.118	0.1	-
HCM Control Delay (s)	-	-	23.6	13.6	11.3	-
HCM Lane LOS	-	-	C	B	B	-
HCM 95th %tile Q(veh)	-	-	0.4	0.4	0.3	-

Lanes, Volumes, Timings 6: SR 135/S. Willow Ave & Ashwood Dr

2017 Optimized AM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (vph)	0	5	855	15	0	695
Future Volume (vph)	0	5	855	15	0	695
Satd. Flow (prot)	0	1522	3494	0	0	3438
Flt Permitted						
Satd. Flow (perm)	0	1522	3494	0	0	3438
Lane Group Flow (vph)	0	8	981	0	0	755
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 34.1%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
6: SR 135/S. Willow Ave & Ashwood Dr

2017 Optimized AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	5	855	15	0	695
Future Vol, veh/h	0	5	855	15	0	695
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	25	63	89	75	25	92
Heavy Vehicles, %	0	8	3	3	0	5
Mvmt Flow	0	8	961	20	0	755

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	480	0	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	7.06	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.38	-	-	-	-
Pot Cap-1 Maneuver	0	516	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	516	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	12.1		0		0
HCM LOS	B				

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 516	-
HCM Lane V/C Ratio	- 0.015	-
HCM Control Delay (s)	- 12.1	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0	-

Lanes, Volumes, Timings 7: SR 135/S. Willow Ave & Lone Oak Dr

2017 Optimized AM Timing Plan
07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				 	 	
Traffic Volume (vph)	55	30	10	880	730	15
Future Volume (vph)	55	30	10	880	730	15
Satd. Flow (prot)	1787	1568	1805	3505	3451	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1568	1805	3505	3451	0
Lane Group Flow (vph)	72	32	16	1023	887	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 34.3%

ICU Level of Service A

Analysis Period (min) 15

HCM 2010 TWSC
7: SR 135/S. Willow Ave & Lone Oak Dr

2017 Optimized AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	55	30	10	880	730	15
Future Vol, veh/h	55	30	10	880	730	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	30	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	76	94	63	86	85	54
Heavy Vehicles, %	1	3	0	3	4	7
Mvmt Flow	72	32	16	1023	859	28

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1416	443	887	0	-	0
Stage 1	873	-	-	-	-	-
Stage 2	543	-	-	-	-	-
Critical Hdwy	6.82	6.96	4.1	-	-	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.33	2.2	-	-	-
Pot Cap-1 Maneuver	129	560	772	-	-	-
Stage 1	371	-	-	-	-	-
Stage 2	549	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	126	560	772	-	-	-
Mov Cap-2 Maneuver	255	-	-	-	-	-
Stage 1	371	-	-	-	-	-
Stage 2	538	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.7	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	772	-	255	560	-	-
HCM Lane V/C Ratio	0.021	-	0.284	0.057	-	-
HCM Control Delay (s)	9.8	-	24.6	11.8	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	1.1	0.2	-	-

Lanes, Volumes, Timings

8: SR 135/S. Willow Ave & W. Jackson St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	300	230	90	145	85	170	625	105	120	480	20
Future Volume (vph)	65	300	230	90	145	85	170	625	105	120	480	20
Satd. Flow (prot)	1752	3574	1524	1787	3304	0	1736	3451	0	1787	3509	0
Flt Permitted	0.487			0.347			0.343			0.240		
Satd. Flow (perm)	898	3574	1524	653	3304	0	627	3451	0	451	3509	0
Satd. Flow (RTOR)			264		116			30			5	
Lane Group Flow (vph)	84	390	264	115	300	0	213	850	0	136	553	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4			2			6		
Total Split (s)	12.0	24.0	24.0	12.0	24.0		18.0	39.7		14.3	36.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.5		4.0	4.0	
Act Effct Green (s)	24.4	17.1	17.1	25.5	17.6		52.3	39.8		47.4	37.9	
Actuated g/C Ratio	0.27	0.19	0.19	0.28	0.20		0.58	0.44		0.53	0.42	
v/c Ratio	0.26	0.57	0.52	0.38	0.41		0.42	0.55		0.36	0.37	
Control Delay	22.2	36.3	8.1	24.5	20.2		12.4	21.2		24.6	30.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	22.2	36.3	8.1	24.5	20.2		12.4	21.2		24.6	30.8	
LOS	C	D	A	C	C		B	C		C	C	
Approach Delay		24.6			21.4			19.4			29.6	
Approach LOS		C			C			B			C	
Queue Length 50th (ft)	31	106	0	44	46		59	196		38	61	
Queue Length 95th (ft)	54	122	54	71	66		83	247		137	234	
Internal Link Dist (ft)		1238			1065			2054			612	
Turn Bay Length (ft)	225		175	150			150			150		
Base Capacity (vph)	328	794	544	304	824		546	1562		394	1492	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.26	0.49	0.49	0.38	0.36		0.39	0.54		0.35	0.37	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 80 (89%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 23.4

Intersection Capacity Utilization 54.3%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service A

Splits and Phases: 8: SR 135/S. Willow Ave & W. Jackson St

			
Ø1	Ø2 (R)	Ø3	Ø4
14.3 s	39.7 s	12 s	24 s
			
Ø5	Ø6 (R)	Ø7	Ø8
18 s	36 s	12 s	24 s

Lanes, Volumes, Timings

9: SR 135/S. Willow Ave & W. Stevens St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	95	15	25	45	30	15	750	35	50	600	10
Future Volume (vph)	35	95	15	25	45	30	15	750	35	50	600	10
Satd. Flow (prot)	0	1827	0	1805	1748	0	1805	3477	0	1805	3496	0
Flt Permitted		0.987		0.950			0.323			0.194		
Satd. Flow (perm)	0	1827	0	1805	1748	0	614	3477	0	369	3496	0
Satd. Flow (RTOR)		5			28			7			3	
Lane Group Flow (vph)	0	231	0	36	104	0	28	941	0	68	757	0
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	26.0	26.0		16.0	16.0		11.0	37.0		11.0	37.0	
Total Lost Time (s)		5.6		5.6	5.6		5.0	5.6		5.0	5.6	
Act Effct Green (s)		15.3		8.2	8.2		47.9	42.7		50.7	47.4	
Actuated g/C Ratio		0.17		0.09	0.09		0.53	0.47		0.56	0.53	
v/c Ratio		0.73		0.22	0.57		0.07	0.57		0.22	0.41	
Control Delay		48.1		40.1	40.6		11.1	15.9		8.5	15.0	
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		48.1		40.1	40.6		11.1	15.9		8.5	15.0	
LOS		D		D	D		B	B		A	B	
Approach Delay		48.1			40.5			15.7			14.4	
Approach LOS		D			D			B			B	
Queue Length 50th (ft)		123		19	42		5	107		5	133	
Queue Length 95th (ft)		122		36	65		12	174		m35	249	
Internal Link Dist (ft)		761			793			608			1346	
Turn Bay Length (ft)				75			100			150		
Base Capacity (vph)		417		208	226		407	1652		309	1842	
Starvation Cap Reductn		0		0	0		0	0		0	0	
Spillback Cap Reductn		0		0	0		0	0		0	0	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.55		0.17	0.46		0.07	0.57		0.22	0.41	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 1 (1%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 20.3

Intersection LOS: C

Intersection Capacity Utilization 54.9%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: SR 135/S. Willow Ave & W. Stevens St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	37 s	16 s	26 s
			
Ø5	Ø6 (R)		
11 s	37 s		

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

10: SR 135/S. Willow Ave & US 70/W. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	340	80	100	205	60	75	635	85	75	555	20
Future Volume (vph)	110	340	80	100	205	60	75	635	85	75	555	20
Satd. Flow (prot)	1787	1745	0	1752	1790	0	1787	3464	0	1652	3346	0
Flt Permitted	0.421			0.183			0.286			0.153		
Satd. Flow (perm)	792	1745	0	338	1790	0	538	3464	0	266	3346	0
Satd. Flow (RTOR)		17			19			15			6	
Lane Group Flow (vph)	139	474	0	135	295	0	76	890	0	80	656	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	13.0	35.0		12.0	34.0		11.0	32.0		11.0	32.0	
Total Lost Time (s)	5.0	5.7		5.0	5.7		5.0	5.4		5.0	5.4	
Act Effct Green (s)	35.0	26.7		34.0	26.2		36.4	31.1		36.5	31.1	
Actuated g/C Ratio	0.39	0.30		0.38	0.29		0.40	0.35		0.41	0.35	
v/c Ratio	0.35	0.90		0.56	0.55		0.25	0.74		0.40	0.57	
Control Delay	17.4	50.1		24.5	29.0		6.3	16.5		13.1	20.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	17.4	50.1		24.5	29.0		6.3	16.5		13.1	20.8	
LOS	B	D		C	C		A	B		B	C	
Approach Delay		42.7			27.6			15.7			19.9	
Approach LOS		D			C			B			B	
Queue Length 50th (ft)	44	239		43	128		5	225		24	197	
Queue Length 95th (ft)	68	#402		62	206		m9	117		m14	241	
Internal Link Dist (ft)		2100			700			1346			1053	
Turn Bay Length (ft)	125			125			175			150		
Base Capacity (vph)	399	579		242	575		302	1206		202	1161	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.35	0.82		0.56	0.51		0.25	0.74		0.40	0.57	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 30 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 24.7

Intersection LOS: C

Intersection Capacity Utilization 71.1%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: SR 135/S. Willow Ave & US 70/W. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	32 s	13 s	34 s
			
Ø5	Ø6 (R)	Ø7	Ø8
11 s	32 s	12 s	35 s

AM Peak Hour

WSP

Synchro 9 Report

Page 13

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	155	45	30	80	20	45	725	35	50	605	50
Future Volume (vph)	145	155	45	30	80	20	45	725	35	50	605	50
Satd. Flow (prot)	1770	1827	0	1752	1827	0	1546	3283	0	1652	3284	0
Flt Permitted	0.416			0.469			0.290			0.202		
Satd. Flow (perm)	775	1827	0	865	1827	0	472	3283	0	351	3284	0
Satd. Flow (RTOR)		12			13			7			13	
Lane Group Flow (vph)	191	310	0	44	136	0	60	928	0	76	744	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	17.0	27.0		11.0	21.0		11.0	41.0		11.0	41.0	
Total Lost Time (s)	5.0	4.0		5.0	4.0		5.0	5.6		5.0	5.6	
Act Effct Green (s)	28.7	22.9		18.7	13.6		47.2	41.7		47.4	41.8	
Actuated g/C Ratio	0.32	0.25		0.21	0.15		0.52	0.46		0.53	0.46	
v/c Ratio	0.52	0.66		0.18	0.47		0.19	0.61		0.28	0.49	
Control Delay	27.5	36.4		21.8	36.1		7.0	20.6		8.6	11.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	27.5	36.4		21.8	36.1		7.0	20.6		8.6	11.1	
LOS	C	D		C	D		A	C		A	B	
Approach Delay		33.0			32.6			19.8			10.9	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)	78	157		16	63		8	276		11	74	
Queue Length 95th (ft)	105	146		29	91		m24	308		m17	140	
Internal Link Dist (ft)		1729			1357			1053			841	
Turn Bay Length (ft)	75						150			50		
Base Capacity (vph)	381	488		243	355		320	1529		274	1538	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.50	0.64		0.18	0.38		0.19	0.61		0.28	0.48	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 20.5

Intersection LOS: C

Intersection Capacity Utilization 58.0%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	41 s	17 s	21 s
			
Ø5	Ø6 (R)	Ø7	Ø8
11 s	41 s	11 s	27 s

Lanes, Volumes, Timings
12: SR 135/N. Willow Ave & W. 3rd St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	5	5	5	5	5	5	795	50	20	715	5
Future Volume (vph)	5	5	5	5	5	5	5	795	50	20	715	5
Satd. Flow (prot)	0	1740	0	0	1785	0	0	3235	0	0	3296	0
Flt Permitted		0.989			0.984						0.998	
Satd. Flow (perm)	0	1740	0	0	1785	0	0	3235	0	0	3296	0
Lane Group Flow (vph)	0	22	0	0	15	0	0	1050	0	0	871	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 44.3%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
12: SR 135/N. Willow Ave & W. 3rd St

2017 Optimized AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	5	5	5	5	5	5	5	795	50	20	715	5
Future Vol, veh/h	5	5	5	5	5	5	5	795	50	20	715	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	42	100	100	100	63	84	52	63	86	63
Heavy Vehicles, %	0	0	0	0	0	0	0	3	0	0	2	0
Mvmt Flow	5	5	12	5	5	5	8	946	96	32	831	8

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1391	1957	420	1492	1913	521	839	0	0	1043	0	0
Stage 1	899	899	-	1010	1010	-	-	-	-	-	-	-
Stage 2	492	1058	-	482	903	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	103	64	588	87	69	505	804	-	-	675	-	-
Stage 1	304	360	-	261	320	-	-	-	-	-	-	-
Stage 2	532	304	-	540	359	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	88	57	588	73	61	505	804	-	-	675	-	-
Mov Cap-2 Maneuver	88	57	-	73	61	-	-	-	-	-	-	-
Stage 1	297	328	-	255	312	-	-	-	-	-	-	-
Stage 2	506	297	-	475	327	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	37.3	50.4	0.2	0.8
HCM LOS	E	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	804	-	-	133	94	675	-	-
HCM Lane V/C Ratio	0.01	-	-	0.165	0.16	0.047	-	-
HCM Control Delay (s)	9.5	0.1	-	37.3	50.4	10.6	0.4	-
HCM Lane LOS	A	A	-	E	F	B	A	-
HCM 95th %tile Q(veh)	0	-	-	0.6	0.5	0.1	-	-

Lanes, Volumes, Timings

13: SR 135/N. Willow Ave & W. 4th St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	10	15	15	5	10	10	695	95	35	710	10
Future Volume (vph)	5	10	15	15	5	10	10	695	95	35	710	10
Satd. Flow (prot)	0	1741	0	0	1762	0	0	3252	0	0	3322	0
Flt Permitted		0.993			0.973			0.999			0.997	
Satd. Flow (perm)	0	1741	0	0	1762	0	0	3252	0	0	3322	0
Lane Group Flow (vph)	0	35	0	0	57	0	0	976	0	0	913	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 56.6%

Analysis Period (min) 15

ICU Level of Service B

HCM 2010 TWSC
13: SR 135/N. Willow Ave & W. 4th St

2017 Optimized AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	10	15	15	5	10	10	695	95	35	710	10
Future Vol, veh/h	5	10	15	15	5	10	10	695	95	35	710	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	75	47	100	50	50	82	88	63	84	83
Heavy Vehicles, %	0	0	0	0	0	0	0	2	0	0	1	0
Mvmt Flow	5	10	20	32	5	20	20	848	108	56	845	12

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1428	1958	429	1481	1910	478	857	0	0	956	0	0
Stage 1	962	962	-	942	942	-	-	-	-	-	-	-
Stage 2	466	996	-	539	968	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	97	64	580	89	69	539	792	-	-	727	-	-
Stage 1	279	337	-	287	344	-	-	-	-	-	-	-
Stage 2	551	325	-	499	335	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	74	52	580	63	56	539	792	-	-	727	-	-
Mov Cap-2 Maneuver	74	52	-	63	56	-	-	-	-	-	-	-
Stage 1	264	287	-	271	325	-	-	-	-	-	-	-
Stage 2	494	307	-	397	286	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	47.4	97.3	0.5	1.3
HCM LOS	E	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	792	-	-	119	90	727	-	-
HCM Lane V/C Ratio	0.025	-	-	0.294	0.632	0.076	-	-
HCM Control Delay (s)	9.7	0.3	-	47.4	97.3	10.4	0.7	-
HCM Lane LOS	A	A	-	E	F	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.1	3	0.2	-	-

Lanes, Volumes, Timings

14: SR 135/N. Willow Ave & W. 7th St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	155	35	75	30	40	5	445	190	85	645	15
Future Volume (vph)	45	155	35	75	30	40	5	445	190	85	645	15
Satd. Flow (prot)	1770	1824	0	1703	1757	0	0	3111	0	0	3302	0
Flt Permitted	0.647			0.272				0.945			0.714	
Satd. Flow (perm)	1205	1824	0	488	1757	0	0	2943	0	0	2372	0
Satd. Flow (RTOR)		10			42			124			4	
Lane Group Flow (vph)	71	302	0	109	108	0	0	766	0	0	960	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	14.0	29.0		11.0	26.0		39.0	39.0		11.0	50.0	
Total Lost Time (s)	5.0	4.0		5.0	4.0			4.0			4.0	
Act Effct Green (s)	25.6	20.3		24.4	19.7			52.0			52.0	
Actuated g/C Ratio	0.28	0.23		0.27	0.22			0.58			0.58	
v/c Ratio	0.18	0.72		0.49	0.26			0.44			0.70	
Control Delay	20.0	40.8		28.2	19.4			4.7			12.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	20.0	40.8		28.2	19.4			4.7			12.5	
LOS	B	D		C	B			A			B	
Approach Delay		36.8			23.9			4.7			12.5	
Approach LOS		D			C			A			B	
Queue Length 50th (ft)	26	153		41	30			37			158	
Queue Length 95th (ft)	36	139		56	30			52			177	
Internal Link Dist (ft)		675			1002			1211			498	
Turn Bay Length (ft)	25			75								
Base Capacity (vph)	411	513		224	461			1753			1373	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.17	0.59		0.49	0.23			0.44			0.70	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 33 (37%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 14.9

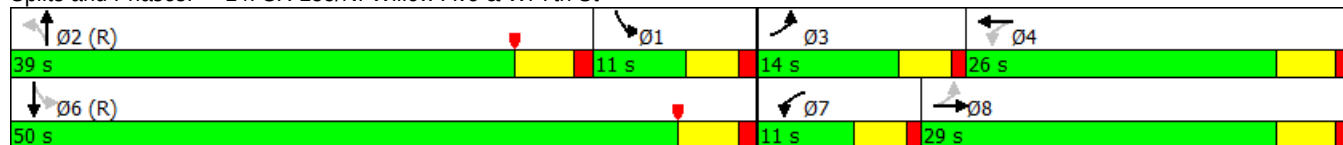
Intersection Capacity Utilization 67.9%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service C

Splits and Phases: 14: SR 135/N. Willow Ave & W. 7th St



Lanes, Volumes, Timings
15: SR 135/N. Willow Ave & W. 9th St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	20	65	0	0	0	25	500	5	15	715	55
Future Volume (vph)	45	20	65	0	0	0	25	500	5	15	715	55
Satd. Flow (prot)	0	1716	0	0	1900	0	0	3251	0	0	3292	0
Flt Permitted		0.981						0.997			0.999	
Satd. Flow (perm)	0	1716	0	0	1900	0	0	3251	0	0	3292	0
Lane Group Flow (vph)	0	168	0	0	0	0	0	632	0	0	1066	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 46.7%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
15: SR 135/N. Willow Ave & W. 9th St

2017 Optimized AM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 19.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	45	20	65	0	0	0	25	500	5	15	715	55
Future Vol, veh/h	45	20	65	0	0	0	25	500	5	15	715	55
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	70	71	86	25	25	25	78	84	100	75	74	69
Heavy Vehicles, %	4	0	1	0	0	0	8	3	0	0	1	3
Mvmt Flow	64	28	76	0	0	0	32	595	5	20	966	80

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1408	1710	523	1199	1748	300	1046	0	0	600	0	0
Stage 1	1046	1046	-	662	662	-	-	-	-	-	-	-
Stage 2	362	664	-	537	1086	-	-	-	-	-	-	-
Critical Hdwy	7.58	6.5	6.92	7.5	6.5	6.9	4.26	-	-	4.1	-	-
Critical Hdwy Stg 1	6.58	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.58	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.54	4	3.31	3.5	4	3.3	2.28	-	-	2.2	-	-
Pot Cap-1 Maneuver	97	92	501	143	87	702	626	-	-	987	-	-
Stage 1	241	308	-	422	462	-	-	-	-	-	-	-
Stage 2	624	461	-	501	295	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	88	81	501	81	76	702	626	-	-	987	-	-
Mov Cap-2 Maneuver	88	81	-	81	76	-	-	-	-	-	-	-
Stage 1	222	293	-	390	426	-	-	-	-	-	-	-
Stage 2	576	426	-	366	281	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	213	0	0.9	0.3
HCM LOS	F	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	626	-	-	137	-	987	-
HCM Lane V/C Ratio	0.051	-	-	1.227	-	0.02	-
HCM Control Delay (s)	11.1	0.4	-	213	0	8.7	0.2
HCM Lane LOS	B	A	-	F	A	A	A
HCM 95th %tile Q(veh)	0.2	-	-	10.1	-	0.1	-

Lanes, Volumes, Timings
16: SR 135/N. Willow Ave & University Dr

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	35	10	25	40	10	15	390	145	65	740	20
Future Volume (vph)	15	35	10	25	40	10	15	390	145	65	740	20
Satd. Flow (prot)	1805	1586	0	1736	1645	0	0	3105	0	0	3313	0
Flt Permitted	0.713			0.590				0.919			0.822	
Satd. Flow (perm)	1355	1586	0	1078	1645	0	0	2856	0	0	2734	0
Satd. Flow (RTOR)		20			16			174			5	
Lane Group Flow (vph)	28	76	0	36	68	0	0	664	0	0	1081	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	3	8		7	4			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	11.0	30.0		11.0	30.0		49.0	49.0		49.0	49.0	
Total Lost Time (s)	5.0	4.0		5.0	4.0			5.8			5.8	
Act Effct Green (s)	12.9	10.4		14.3	12.8			66.3			66.3	
Actuated g/C Ratio	0.14	0.12		0.16	0.14			0.74			0.74	
v/c Ratio	0.13	0.38		0.17	0.27			0.31			0.54	
Control Delay	27.7	33.2		28.6	29.8			3.1			8.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	27.7	33.2		28.6	29.8			3.1			8.4	
LOS	C	C		C	C			A			A	
Approach Delay		31.7			29.4			3.1			8.4	
Approach LOS		C			C			A			A	
Queue Length 50th (ft)	13	30		16	23			5			124	
Queue Length 95th (ft)	19	44		29	53			94			156	
Internal Link Dist (ft)		789			874			862			1102	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	226	472		218	486			2149			2015	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.12	0.16		0.17	0.14			0.31			0.54	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 19 (21%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 9.0

Intersection Capacity Utilization 59.9%

Analysis Period (min) 15

Intersection LOS: A

ICU Level of Service B

Splits and Phases: 16: SR 135/N. Willow Ave & University Dr

		
Ø2 (R)	Ø3	Ø4
49 s	11 s	30 s
		
Ø6 (R)	Ø7	Ø8
49 s	11 s	30 s

Lanes, Volumes, Timings
17: SR 135/N. Willow Ave & W. 12th St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	385	255	190	130	30	60	170	190	145	385	45
Future Volume (vph)	85	385	255	190	130	30	60	170	190	145	385	45
Satd. Flow (prot)	1770	1881	1599	1770	3317	0	1574	2965	0	1652	3292	0
Flt Permitted	0.627			0.135			0.409			0.258		
Satd. Flow (perm)	1168	1881	1599	251	3317	0	678	2965	0	449	3292	0
Satd. Flow (RTOR)			320		48			211			26	
Lane Group Flow (vph)	139	470	336	216	199	0	64	416	0	223	569	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8			6			2		
Total Split (s)	11.0	32.0	32.0	11.0	32.0		11.0	28.0		19.0	36.0	
Total Lost Time (s)	5.0	4.0	4.0	5.0	4.0		5.0	4.0		5.0	4.0	
Act Effct Green (s)	33.9	26.6	26.6	42.9	32.0		24.3	19.3		35.7	27.8	
Actuated g/C Ratio	0.38	0.30	0.30	0.48	0.36		0.27	0.21		0.40	0.31	
v/c Ratio	0.28	0.85	0.48	0.61	0.16		0.26	0.52		0.65	0.55	
Control Delay	15.0	45.1	6.0	26.5	15.8		21.3	15.2		28.5	27.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	15.0	45.1	6.0	26.5	15.8		21.3	15.2		28.5	27.8	
LOS	B	D	A	C	B		C	B		C	C	
Approach Delay		26.8			21.4			16.0			28.0	
Approach LOS		C			C			B			C	
Queue Length 50th (ft)	39	242	6	63	28		18	0		91	145	
Queue Length 95th (ft)	52	319	33	#190	55		46	59		91	157	
Internal Link Dist (ft)		1178			1081			1102			1094	
Turn Bay Length (ft)	100			220			100			220		
Base Capacity (vph)	495	587	718	352	1211		243	953		365	1236	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.28	0.80	0.47	0.61	0.16		0.26	0.44		0.61	0.46	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 87 (97%), Referenced to phase 2:SBTL and 6:NBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 24.3

Intersection LOS: C

Intersection Capacity Utilization 63.8%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 17: SR 135/N. Willow Ave & W. 12th St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	36 s	11 s	32 s
			
Ø5	Ø6 (R)	Ø7	Ø8
19 s	28 s	11 s	32 s

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	5	10	5	0	30	15	990	5	20	620	100
Future Volume (vph)	140	5	10	5	0	30	15	990	5	20	620	100
Satd. Flow (prot)	1570	1418	0	1289	1205	0	1583	3471	808	1492	3406	1553
Flt Permitted	0.430			0.930			0.324			0.161		
Satd. Flow (perm)	710	1418	0	1262	1205	0	540	3471	808	253	3406	1553
Satd. Flow (RTOR)		12			253				200			200
Lane Group Flow (vph)	173	17	0	20	36	0	20	1151	5	24	721	120
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2		2	6		6
Total Split (s)	23.0	21.0		14.0	12.0		11.0	44.0	44.0	11.0	44.0	44.0
Total Lost Time (s)	5.0	4.0		5.0	4.0		5.0	4.0	4.0	5.0	4.0	4.0
Act Effct Green (s)	20.5	19.0		10.5	8.0		57.5	56.1	56.1	57.5	56.1	56.1
Actuated g/C Ratio	0.23	0.21		0.12	0.09		0.64	0.62	0.62	0.64	0.62	0.62
v/c Ratio	0.60	0.06		0.14	0.11		0.05	0.53	0.01	0.10	0.34	0.12
Control Delay	36.8	16.3		25.4	0.6		8.7	14.2	0.0	5.0	5.2	0.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.1	0.0	0.0	0.1	0.0
Total Delay	36.8	16.3		25.4	0.7		8.7	14.3	0.0	5.0	5.3	0.3
LOS	D	B		C	A		A	B	A	A	A	A
Approach Delay		34.9			9.5			14.2			4.6	
Approach LOS		C			A			B			A	
Queue Length 50th (ft)	81	2		8	0		4	171	0	3	44	0
Queue Length 95th (ft)	112	20		6	0		12	331	0	m5	55	1
Internal Link Dist (ft)		573			734			200			263	
Turn Bay Length (ft)	200			25			175		150	100		50
Base Capacity (vph)	360	348		187	337		414	2163	579	244	2124	1043
Starvation Cap Reductn	0	0		0	0		0	0	0	0	352	0
Spillback Cap Reductn	0	0		0	18		0	250	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.05		0.11	0.11		0.05	0.60	0.01	0.10	0.41	0.12

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 83 (92%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 12.2

Intersection LOS: B

Intersection Capacity Utilization 48.5%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	44 s	23 s	12 s
			
Ø5	Ø6 (R)	Ø7	Ø8
11 s	44 s	14 s	21 s

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	320	0	160	0	0	0	0	1050	110	105	575	0
Future Volume (vph)	320	0	160	0	0	0	0	1050	110	105	575	0
Satd. Flow (prot)	1787	0	1538	0	0	0	0	3471	1495	1752	3438	0
Flt Permitted	0.950									0.098		
Satd. Flow (perm)	1787	0	1538	0	0	0	0	3471	1495	181	3438	0
Satd. Flow (RTOR)			176						128			
Lane Group Flow (vph)	421	0	176	0	0	0	0	1250	128	115	661	0
Turn Type	Prot		Perm					NA	Perm	pm+pt	NA	
Protected Phases	1							3		2	3	
Permitted Phases			1						3	3		
Total Split (s)	32.0		32.0					46.9	46.9	11.1	46.9	
Total Lost Time (s)	4.0		5.4					5.2	5.2	5.0	5.2	
Act Effct Green (s)	25.7		24.3					40.9	40.9	50.3	40.9	
Actuated g/C Ratio	0.29		0.27					0.45	0.45	0.56	0.45	
v/c Ratio	0.83		0.32					0.79	0.17	0.44	0.42	
Control Delay	44.6		5.7					22.1	3.4	25.2	15.6	
Queue Delay	0.0		0.0					0.3	0.0	0.0	0.0	
Total Delay	44.6		5.7					22.4	3.4	25.2	15.6	
LOS	D		A					C	A	C	B	
Approach Delay		33.1						20.6			17.0	
Approach LOS		C						C			B	
Queue Length 50th (ft)	215		0					322	6	37	110	
Queue Length 95th (ft)	257		46					182	21	#95	138	
Internal Link Dist (ft)		458			312			263			407	
Turn Bay Length (ft)			200							250		
Base Capacity (vph)	555		578					1608	761	262	1592	
Starvation Cap Reductn	0		0					63	0	0	0	
Spillback Cap Reductn	0		0					0	0	0	0	
Storage Cap Reductn	0		0					0	0	0	0	
Reduced v/c Ratio	0.76		0.30					0.81	0.17	0.44	0.42	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 77 (86%), Referenced to phase 3:NBSB, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 22.3

Intersection LOS: C

Intersection Capacity Utilization 64.4%

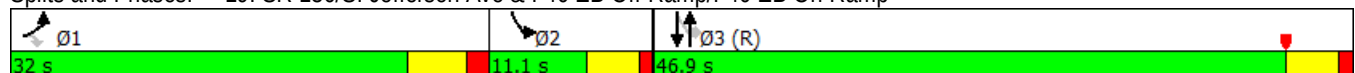
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp



Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	130	0	380	95	1275	0	0	565	135
Future Volume (vph)	0	0	0	130	0	380	95	1275	0	0	565	135
Satd. Flow (prot)	0	0	0	1641	0	2760	1626	3505	0	0	3505	1568
Flt Permitted				0.950			0.386					
Satd. Flow (perm)	0	0	0	1641	0	2760	661	3505	0	0	3505	1568
Satd. Flow (RTOR)						73						188
Lane Group Flow (vph)	0	0	0	165	0	475	116	1483	0	0	621	188
Turn Type				Prot		Prot	pm+pt	NA			NA	Perm
Protected Phases				1		1	2	3			3	
Permitted Phases							3	2				3
Total Split (s)				30.0		30.0	12.0	48.0			48.0	48.0
Total Lost Time (s)				5.8		5.8	5.0	5.0			5.0	4.5
Act Effct Green (s)				18.0		18.0	57.2	61.2			51.4	51.9
Actuated g/C Ratio				0.20		0.20	0.64	0.68			0.57	0.58
v/c Ratio				0.50		0.78	0.24	0.62			0.31	0.19
Control Delay				36.5		37.5	5.7	6.6			5.8	0.7
Queue Delay				0.0		0.6	0.0	0.3			0.1	0.3
Total Delay				36.5		38.1	5.7	6.8			5.9	0.9
LOS				D		D	A	A			A	A
Approach Delay					37.7			6.8			4.7	
Approach LOS					D			A			A	
Queue Length 50th (ft)				84		125	18	123			33	0
Queue Length 95th (ft)				115		143	m24	134			63	1
Internal Link Dist (ft)		382			483			407			133	
Turn Bay Length (ft)				275		275	250					
Base Capacity (vph)				441		795	499	2382			2003	984
Starvation Cap Reductn				0		0	0	291			523	366
Spillback Cap Reductn				0		93	0	293			0	0
Storage Cap Reductn				0		0	0	0			0	0
Reduced v/c Ratio				0.37		0.68	0.23	0.71			0.42	0.30

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 3:NBSB, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 12.7

Intersection LOS: B

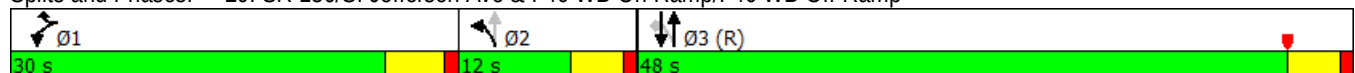
Intersection Capacity Utilization 64.4%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp



Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	10	160	25	5	5	250	1360	45	10	525	65
Future Volume (vph)	45	10	160	25	5	5	250	1360	45	10	525	65
Satd. Flow (prot)	0	1732	1583	1805	1790	0	1770	3505	1553	1805	4836	0
Flt Permitted		0.962		0.950			0.331			0.099		
Satd. Flow (perm)	0	1732	1583	1805	1790	0	617	3505	1553	188	4836	0
Satd. Flow (RTOR)			200		5				139		27	
Lane Group Flow (vph)	0	76	200	32	13	0	329	1619	56	10	643	0
Turn Type	Split	NA	Perm	Split	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			3				2		2	6		
Total Split (s)	15.0	15.0	15.0	15.0	15.0		23.0	43.0	43.0	17.0	37.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0	5.0	5.0	5.0	
Act Effct Green (s)		11.0	11.0	11.0	11.0		61.0	57.7	57.7	53.8	42.3	
Actuated g/C Ratio		0.12	0.12	0.12	0.12		0.68	0.64	0.64	0.60	0.47	
v/c Ratio		0.36	0.54	0.15	0.06		0.55	0.72	0.05	0.03	0.28	
Control Delay		41.7	11.7	37.2	28.7		7.9	12.4	0.1	11.7	19.7	
Queue Delay		0.0	0.0	0.0	0.0		0.3	0.5	0.0	0.0	0.0	
Total Delay		41.7	11.7	37.2	28.7		8.2	12.9	0.1	11.7	19.7	
LOS		D	B	D	C		A	B	A	B	B	
Approach Delay		19.9			34.7			11.8			19.6	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)		40	0	17	4		50	234	0	2	69	
Queue Length 95th (ft)		57	42	38	14		67	#603	m0	m8	145	
Internal Link Dist (ft)		530			587			133			582	
Turn Bay Length (ft)			100	25			50			100		
Base Capacity (vph)		211	369	220	223		648	2247	1045	329	2287	
Starvation Cap Reductn		0	0	0	0		59	253	0	0	0	
Spillback Cap Reductn		0	0	0	0		0	0	0	0	0	
Storage Cap Reductn		0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio		0.36	0.54	0.15	0.06		0.56	0.81	0.05	0.03	0.28	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 86 (96%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 14.6

Intersection LOS: B

Intersection Capacity Utilization 68.9%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd

			
Ø1	Ø2 (R)	Ø3	Ø4
17 s	43 s	15 s	15 s
Ø5	Ø6 (R)		
23 s	37 s		

AM Peak Hour

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	215	105	145	225	60	190	785	355	55	280	85
Future Volume (vph)	110	215	105	145	225	60	190	785	355	55	280	85
Satd. Flow (prot)	1770	1845	1538	1736	3420	0	1736	3438	1509	1770	3327	0
Flt Permitted	0.430			0.328			0.385			0.149		
Satd. Flow (perm)	801	1845	1538	599	3420	0	703	3438	1509	278	3327	0
Satd. Flow (RTOR)			139		34				418		49	
Lane Group Flow (vph)	155	256	108	173	339	0	224	957	418	76	419	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4			2		2	6		
Total Split (s)	17.0	29.0	29.0	17.0	29.0		15.0	29.0	29.0	15.0	29.0	
Total Lost Time (s)	5.0	4.0	5.0	5.0	4.0		5.0	4.0	4.0	5.0	4.0	
Act Effct Green (s)	29.4	18.8	17.8	29.6	18.9		42.8	34.8	34.8	39.1	30.6	
Actuated g/C Ratio	0.33	0.21	0.20	0.33	0.21		0.48	0.39	0.39	0.43	0.34	
v/c Ratio	0.40	0.66	0.26	0.50	0.46		0.49	0.72	0.50	0.27	0.36	
Control Delay	21.1	40.7	4.2	23.5	29.0		14.4	19.0	3.9	13.0	12.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	21.1	40.7	4.2	23.5	29.0		14.4	19.0	3.9	13.0	12.8	
LOS	C	D	A	C	C		B	B	A	B	B	
Approach Delay		27.2			27.1			14.4			12.8	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)	59	135	0	66	80		14	195	35	7	84	
Queue Length 95th (ft)	68	180	24	92	100		m0	#336	35	12	21	
Internal Link Dist (ft)		1125			846			582			1693	
Turn Bay Length (ft)	175			125			125			125		
Base Capacity (vph)	394	512	512	350	974		462	1331	840	287	1162	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.39	0.50	0.21	0.49	0.35		0.48	0.72	0.50	0.26	0.36	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow, Master Intersection

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 18.4

Intersection LOS: B

Intersection Capacity Utilization 65.5%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	29 s	17 s	29 s
			
Ø5	Ø6 (R)	Ø7	Ø8
15 s	29 s	17 s	29 s

AM Peak Hour

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
23: SR 136/S. Jefferson Ave & E. Veterans Dr

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	140	40	45	135	105	35	800	60	55	355	25
Future Volume (vph)	30	140	40	45	135	105	35	800	60	55	355	25
Satd. Flow (prot)	1805	1830	0	1543	1751	0	1805	3497	0	1671	3538	0
Flt Permitted	0.270			0.364			0.462			0.105		
Satd. Flow (perm)	513	1830	0	591	1751	0	878	3497	0	185	3538	0
Satd. Flow (RTOR)		17			43			8			10	
Lane Group Flow (vph)	40	211	0	71	321	0	52	1121	0	76	485	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	17.0	23.0		17.0	23.0		15.0	35.0		15.0	35.0	
Total Lost Time (s)	5.0	4.0		5.0	4.0		5.0	5.6		5.0	5.6	
Act Effct Green (s)	25.4	17.2		26.4	20.5		46.6	38.4		47.6	41.3	
Actuated g/C Ratio	0.28	0.19		0.29	0.23		0.52	0.43		0.53	0.46	
v/c Ratio	0.13	0.58		0.24	0.74		0.09	0.75		0.30	0.30	
Control Delay	18.8	36.8		20.7	40.0		5.3	14.7		22.9	9.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	18.8	36.8		20.7	40.0		5.3	14.7		22.9	9.9	
LOS	B	D		C	D		A	B		C	A	
Approach Delay		33.9			36.5			14.3			11.6	
Approach LOS		C			D			B			B	
Queue Length 50th (ft)	14	97		25	151		6	277		11	100	
Queue Length 95th (ft)	28	163		36	202		m8	74		46	44	
Internal Link Dist (ft)		1014			884			1693			283	
Turn Bay Length (ft)	150			150			150			125		
Base Capacity (vph)	319	405		302	451		561	1496		263	1628	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.13	0.52		0.24	0.71		0.09	0.75		0.29	0.30	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 42 (47%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 19.4

Intersection LOS: B

Intersection Capacity Utilization 71.4%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 23: SR 136/S. Jefferson Ave & E. Veterans Dr

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	35 s	17 s	23 s
			
Ø5	Ø6 (R)	Ø7	Ø8
15 s	35 s	17 s	23 s

Lanes, Volumes, Timings

24: SR 136/S. Jefferson Ave & Walmart Driveway

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	25	0	10	5	890	40	25	400	5
Future Volume (vph)	0	0	0	25	0	10	5	890	40	25	400	5
Satd. Flow (prot)	1900	1900	0	1787	1615	0	1805	3483	0	1805	3438	0
Flt Permitted				0.950			0.455			0.209		
Satd. Flow (perm)	1900	1900	0	1787	1615	0	864	3483	0	397	3438	0
Satd. Flow (RTOR)					510			4			1	
Lane Group Flow (vph)	0	0	0	36	16	0	5	1157	0	28	531	0
Turn Type	pm+pt			pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	17.0	27.0		17.0	27.0		15.0	31.0		15.0	31.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)				11.5	11.5		73.1	71.3		74.1	74.2	
Actuated g/C Ratio				0.13	0.13		0.81	0.79		0.82	0.82	
v/c Ratio				0.16	0.02		0.01	0.42		0.06	0.19	
Control Delay				36.9	0.1		0.4	1.6		1.8	2.3	
Queue Delay				0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay				36.9	0.1		0.4	1.6		1.8	2.3	
LOS				D	A		A	A		A	A	
Approach Delay					25.6			1.6			2.3	
Approach LOS					C			A			A	
Queue Length 50th (ft)				19	0		0	17		7	71	
Queue Length 95th (ft)				36	0		m0	50		2	12	
Internal Link Dist (ft)		175			382			47			1774	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)				238	780		808	2760		483	2834	
Starvation Cap Reductn				0	0		0	0		0	0	
Spillback Cap Reductn				0	0		0	0		0	0	
Storage Cap Reductn				0	0		0	0		0	0	
Reduced v/c Ratio				0.15	0.02		0.01	0.42		0.06	0.19	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 63 (70%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.42

Intersection Signal Delay: 2.5

Intersection LOS: A

Intersection Capacity Utilization 44.2%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 24: SR 136/S. Jefferson Ave & Walmart Driveway

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	31 s	17 s	27 s
			
Ø5	Ø6 (R)	Ø7	Ø8
15 s	31 s	17 s	27 s

Lanes, Volumes, Timings
25: SR 136/S. Jefferson Ave & Commerce Ave

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	5	5	15	5	15	15	810	60	25	470	10
Future Volume (vph)	5	5	5	15	5	15	15	810	60	25	470	10
Satd. Flow (prot)	1612	1699	0	1703	1449	0	1626	3489	0	1805	3561	0
Flt Permitted				0.625			0.414			0.208		
Satd. Flow (perm)	1696	1699	0	1120	1449	0	709	3489	0	395	3561	0
Satd. Flow (RTOR)		12			24			20			5	
Lane Group Flow (vph)	8	17	0	32	29	0	16	1095	0	44	626	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	11.0	12.0		12.0	13.0		11.0	54.0		12.0	55.0	
Total Lost Time (s)	5.0	4.0		5.0	4.0		5.0	5.6		5.0	5.6	
Act Effct Green (s)	8.6	7.7		11.0	10.6		69.4	67.6		71.8	72.1	
Actuated g/C Ratio	0.10	0.09		0.12	0.12		0.77	0.75		0.80	0.80	
v/c Ratio	0.05	0.11		0.18	0.15		0.03	0.42		0.11	0.22	
Control Delay	30.0	24.6		33.2	17.9		0.5	1.7		4.2	5.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	30.0	24.6		33.2	17.9		0.5	1.7		4.2	5.4	
LOS	C	C		C	B		A	A		A	A	
Approach Delay		26.3			25.9			1.7			5.3	
Approach LOS		C			C			A			A	
Queue Length 50th (ft)	4	3		18	3		1	38		1	9	
Queue Length 95th (ft)	10	23		19	28		m0	49		17	118	
Internal Link Dist (ft)		193			738			1774			1034	
Turn Bay Length (ft)				100			125			125		
Base Capacity (vph)	162	164		192	207		609	2639		424	2868	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.05	0.10		0.17	0.14		0.03	0.41		0.10	0.22	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 26 (29%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.42

Intersection Signal Delay: 4.1

Intersection LOS: A

Intersection Capacity Utilization 39.8%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 25: SR 136/S. Jefferson Ave & Commerce Ave

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	54 s	11 s	13 s
			
Ø5	Ø6 (R)	Ø7	Ø8
11 s	55 s	12 s	12 s

Lanes, Volumes, Timings
26: SR 136/S. Jefferson Ave & E. Jackson St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	115	175	120	75	5	155	440	190	10	250	15
Future Volume (vph)	30	115	175	120	75	5	155	440	190	10	250	15
Satd. Flow (prot)	1805	1900	1583	3502	1801	0	1770	3574	1599	1685	3295	0
Flt Permitted	0.692			0.950			0.463			0.437		
Satd. Flow (perm)	1315	1900	1583	3502	1801	0	862	3574	1599	775	3295	0
Satd. Flow (RTOR)			243		3				333		11	
Lane Group Flow (vph)	44	135	243	171	101	0	189	571	333	12	333	0
Turn Type	pm+pt	NA	Perm	Prot	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8				2		2	6		
Total Split (s)	12.0	25.0	25.0	16.0	29.0		20.0	37.0	37.0	12.0	29.0	
Total Lost Time (s)	5.0	4.0	4.0	5.0	4.0		5.0	4.0	5.3	5.0	4.0	
Act Effct Green (s)	18.6	13.3	13.3	9.0	20.2		53.7	52.5	51.2	44.6	40.0	
Actuated g/C Ratio	0.21	0.15	0.15	0.10	0.22		0.60	0.58	0.57	0.50	0.44	
v/c Ratio	0.14	0.48	0.55	0.49	0.25		0.31	0.27	0.32	0.03	0.23	
Control Delay	22.4	40.3	9.6	42.8	29.9		3.7	3.3	1.1	6.4	14.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	22.4	40.3	9.6	42.8	29.9		3.7	3.3	1.1	6.4	14.2	
LOS	C	D	A	D	C		A	A	A	A	B	
Approach Delay		20.7			38.0			2.7			13.9	
Approach LOS		C			D			A			B	
Queue Length 50th (ft)	18	72	0	47	49		29	45	0	1	55	
Queue Length 95th (ft)	28	112	23	59	74		11	13	0	11	116	
Internal Link Dist (ft)		578			301			1034			1031	
Turn Bay Length (ft)	100			175			150		500	180		
Base Capacity (vph)	319	443	555	428	502		665	2085	1053	467	1472	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.14	0.30	0.44	0.40	0.20		0.28	0.27	0.32	0.03	0.23	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 37 (41%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 12.6

Intersection Capacity Utilization 38.1%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 26: SR 136/S. Jefferson Ave & E. Jackson St

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	37 s	12 s	29 s
			
Ø5	Ø6 (R)	Ø7	Ø8
20 s	29 s	16 s	25 s

Lanes, Volumes, Timings
27: SR 136/S. Jefferson Ave & Foutch Dr

2017 Optimized AM Timing Plan

07/12/2017

							
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations							
Traffic Volume (vph)	30	5	5	420	270	0	
Future Volume (vph)	30	5	5	420	270	0	
Satd. Flow (prot)	1632	0	1685	3303	3303	0	
Flt Permitted	0.959		0.529				
Satd. Flow (perm)	1632	0	938	3303	3303	0	
Satd. Flow (RTOR)	8						
Lane Group Flow (vph)	52	0	8	494	375	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	3			1	1 2		2
Permitted Phases			1				
Total Split (s)	17.0		40.0	40.0			33.0
Total Lost Time (s)	4.0		4.0	4.0			
Act Effct Green (s)	13.0		31.0	31.0	69.0		
Actuated g/C Ratio	0.14		0.34	0.34	0.77		
v/c Ratio	0.21		0.02	0.43	0.15		
Control Delay	32.4		5.0	12.9	0.6		
Queue Delay	0.0		0.0	0.0	0.2		
Total Delay	32.4		5.0	12.9	0.8		
LOS	C		A	B	A		
Approach Delay	32.4			12.7	0.8		
Approach LOS	C			B	A		
Queue Length 50th (ft)	22		2	93	3		
Queue Length 95th (ft)	40		2	90	4		
Internal Link Dist (ft)	70			1031	110		
Turn Bay Length (ft)			125				
Base Capacity (vph)	242		375	1321	2506		
Starvation Cap Reductn	0		0	0	1447		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.21		0.02	0.37	0.35		

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 13 (14%), Referenced to phase 2:SBT and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.43

Intersection Signal Delay: 9.0

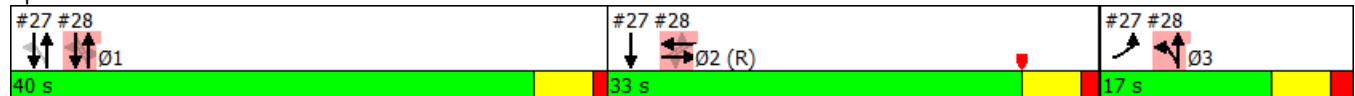
Intersection LOS: A

Intersection Capacity Utilization 23.3%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 27: SR 136/S. Jefferson Ave & Foutch Dr



Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

28: SR 136/S. Jefferson Ave & E. Stevens St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	95	20	25	75	15	15	430	15	5	235	5
Future Volume (vph)	20	95	20	25	75	15	15	430	15	5	235	5
Satd. Flow (prot)	0	1855	0	0	1802	0	0	3297	0	0	3293	0
Flt Permitted		0.962			0.894			0.938			0.942	
Satd. Flow (perm)	0	1795	0	0	1631	0	0	3099	0	0	3105	0
Satd. Flow (RTOR)		9			12			7			3	
Lane Group Flow (vph)	0	216	0	0	144	0	0	550	0	0	347	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		2			2		3	1 3			1	
Permitted Phases	2			2			1 3			1		
Total Split (s)	33.0	33.0		33.0	33.0		17.0			40.0	40.0	
Total Lost Time (s)		4.0			4.0						4.0	
Act Effct Green (s)		34.0			34.0			44.0			31.0	
Actuated g/C Ratio		0.38			0.38			0.49			0.34	
v/c Ratio		0.32			0.23			0.36			0.32	
Control Delay		22.4			20.8			3.2			14.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		22.4			20.8			3.3			14.5	
LOS		C			C			A			B	
Approach Delay		22.4			20.8			3.3			14.5	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)		89			54			11			50	
Queue Length 95th (ft)		89			101			12			56	
Internal Link Dist (ft)		321			386			1			1911	
Turn Bay Length (ft)												
Base Capacity (vph)		682			622			1719			1243	
Starvation Cap Reductn		0			0			138			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.32			0.23			0.35			0.28	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 13 (14%), Referenced to phase 2: SBT and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.43

Intersection Signal Delay: 11.7

Intersection Capacity Utilization 39.6%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 28: SR 136/S. Jefferson Ave & E. Stevens St

#27 #28	#27 #28	#27 #28
 Ø1	 Ø2 (R)	 Ø3
40 s	33 s	17 s

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	305	50	80	315	10	75	205	55	15	140	20
Future Volume (vph)	15	305	50	80	315	10	75	205	55	15	140	20
Satd. Flow (prot)	1805	1755	0	1787	1636	0	1620	1665	0	1685	1562	0
Flt Permitted	0.503			0.293			0.413			0.417		
Satd. Flow (perm)	956	1755	0	551	1636	0	704	1665	0	739	1562	0
Satd. Flow (RTOR)		10			3			18			10	
Lane Group Flow (vph)	24	459	0	88	355	0	88	312	0	24	232	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	30.0		11.0	30.0		11.0	38.0		11.0	38.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	45.6	40.9		50.2	46.6		26.9	24.5		24.4	19.7	
Actuated g/C Ratio	0.51	0.45		0.56	0.52		0.30	0.27		0.27	0.22	
v/c Ratio	0.04	0.57		0.22	0.42		0.32	0.67		0.09	0.66	
Control Delay	11.3	21.8		6.2	8.0		11.5	24.9		13.4	31.8	
Queue Delay	0.0	0.2		0.0	0.3		0.0	0.7		0.1	0.1	
Total Delay	11.3	22.0		6.2	8.3		11.5	25.6		13.5	31.9	
LOS	B	C		A	A		B	C		B	C	
Approach Delay		21.4			7.9			22.5			30.2	
Approach LOS		C			A			C			C	
Queue Length 50th (ft)	3	200		10	43		12	35		7	96	
Queue Length 95th (ft)	12	#312		m21	69		18	237		15	100	
Internal Link Dist (ft)		356			188			1911			200	
Turn Bay Length (ft)	200			65						65		
Base Capacity (vph)	544	802		410	848		274	621		264	579	
Starvation Cap Reductn	0	0		0	126		0	0		0	33	
Spillback Cap Reductn	0	37		0	0		0	103		36	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.04	0.60		0.21	0.49		0.32	0.60		0.11	0.42	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 81 (90%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 19.3

Intersection LOS: B

Intersection Capacity Utilization 59.9%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	30 s	11 s	38 s
			
Ø5	Ø6 (R)	Ø7	Ø8
11 s	30 s	11 s	38 s

AM Peak Hour
WSP

Synchro 9 Report
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Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	140	30	80	345	20	50	145	40	10	70	10
Future Volume (vph)	10	140	30	80	345	20	50	145	40	10	70	10
Satd. Flow (prot)	1805	1823	0	1787	1875	0	1652	1666	0	1685	1733	0
Flt Permitted	0.498			0.498			0.505			0.620		
Satd. Flow (perm)	946	1823	0	937	1875	0	878	1666	0	1099	1733	0
Satd. Flow (RTOR)		8			5			19			11	
Lane Group Flow (vph)	12	254	0	116	407	0	56	221	0	10	128	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	31.0		11.0	31.0		11.0	37.0		11.0	37.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	50.2	45.7		56.2	54.1		22.7	21.5		18.5	14.0	
Actuated g/C Ratio	0.56	0.51		0.62	0.60		0.25	0.24		0.21	0.16	
v/c Ratio	0.02	0.27		0.18	0.36		0.20	0.54		0.04	0.46	
Control Delay	7.3	11.8		7.1	8.3		26.2	30.4		20.9	36.0	
Queue Delay	0.0	0.0		0.0	1.2		0.0	0.1		0.0	0.0	
Total Delay	7.3	11.8		7.1	9.6		26.2	30.5		20.9	36.0	
LOS	A	B		A	A		C	C		C	D	
Approach Delay		11.6			9.0			29.7			34.9	
Approach LOS		B			A			C			C	
Queue Length 50th (ft)	2	53		24	88		17	59		4	63	
Queue Length 95th (ft)	m7	57		25	104		m22	58		14	70	
Internal Link Dist (ft)		353			196			200			580	
Turn Bay Length (ft)	200			65			65			50		
Base Capacity (vph)	588	930		657	1128		281	604		268	623	
Starvation Cap Reductn	0	0		0	494		0	45		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	4	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.02	0.27		0.18	0.64		0.20	0.40		0.04	0.21	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 84 (93%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 17.3

Intersection LOS: B

Intersection Capacity Utilization 46.9%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	31 s	11 s	37 s
			
Ø5	Ø6 (R)	Ø7	Ø8
11 s	31 s	11 s	37 s

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	290	25	100	330	20	25	270	65	65	260	55
Future Volume (vph)	60	290	25	100	330	20	25	270	65	65	260	55
Satd. Flow (prot)	1736	1774	0	1770	1845	1553	1694	1801	1473	1631	1763	0
Flt Permitted	0.446			0.298			0.317			0.238		
Satd. Flow (perm)	815	1774	0	555	1845	1553	565	1801	1473	409	1763	0
Satd. Flow (RTOR)		5				127			127		10	
Lane Group Flow (vph)	76	395	0	159	344	24	44	409	65	84	394	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2		2	4		4	8		
Total Split (s)	11.0	30.0		11.0	30.0	30.0	11.0	38.0	38.0	11.0	38.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Act Effct Green (s)	38.7	32.1		42.4	35.6	35.6	30.3	25.5	25.5	32.2	28.2	
Actuated g/C Ratio	0.43	0.36		0.47	0.40	0.40	0.34	0.28	0.28	0.36	0.31	
v/c Ratio	0.18	0.62		0.43	0.47	0.03	0.17	0.80	0.13	0.36	0.70	
Control Delay	16.4	25.1		12.7	21.5	1.1	15.5	41.5	0.7	13.4	19.6	
Queue Delay	0.0	0.8		0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.4	
Total Delay	16.4	25.9		12.7	21.5	1.1	15.5	41.9	0.7	13.4	20.0	
LOS	B	C		B	C	A	B	D	A	B	B	
Approach Delay		24.3			17.9			34.4			18.8	
Approach LOS		C			B			C			B	
Queue Length 50th (ft)	14	75		41	180	0	14	213	0	15	67	
Queue Length 95th (ft)	48	173		46	294	m0	19	188	3	m21	77	
Internal Link Dist (ft)		188			1101			264			195	
Turn Bay Length (ft)	60			100		100	100			50		
Base Capacity (vph)	420	636		369	729	691	266	660	620	234	656	
Starvation Cap Reductn	0	69		0	0	0	0	0	0	0	51	
Spillback Cap Reductn	0	0		0	0	2	0	36	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.18	0.70		0.43	0.47	0.03	0.17	0.66	0.10	0.36	0.65	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 75 (83%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 23.9

Intersection LOS: C

Intersection Capacity Utilization 61.1%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	30 s	11 s	38 s
			
Ø5	Ø6 (R)	Ø7	Ø8
11 s	30 s	11 s	38 s

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	115	25	25	325	170	20	320	15	40	335	115
Future Volume (vph)	40	115	25	25	325	170	20	320	15	40	335	115
Satd. Flow (prot)	1770	1827	0	1736	1789	0	1745	1793	0	1745	1783	1561
Flt Permitted	0.201			0.579			0.288			0.159		
Satd. Flow (perm)	374	1827	0	1058	1789	0	529	1793	0	292	1783	1561
Satd. Flow (RTOR)		10			31			2				160
Lane Group Flow (vph)	71	215	0	56	546	0	32	494	0	52	390	160
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		8
Total Split (s)	11.0	33.0		11.0	33.0		13.0	35.0		11.0	33.0	33.0
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Act Effct Green (s)	41.9	37.1		41.8	37.0		31.5	27.6		30.9	27.3	27.3
Actuated g/C Ratio	0.47	0.41		0.46	0.41		0.35	0.31		0.34	0.30	0.30
v/c Ratio	0.27	0.28		0.10	0.72		0.12	0.90		0.27	0.72	0.27
Control Delay	16.1	17.2		11.4	30.9		9.2	31.2		18.5	36.2	5.1
Queue Delay	0.0	0.2		0.0	0.0		0.0	0.8		0.0	0.0	0.0
Total Delay	16.1	17.4		11.4	30.9		9.2	32.0		18.5	36.2	5.1
LOS	B	B		B	C		A	C		B	D	A
Approach Delay		17.1			29.1			30.6			26.4	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)	11	45		25	323		4	65		16	187	0
Queue Length 95th (ft)	28	76		15	m#416		m9	95		31	275	20
Internal Link Dist (ft)		196			1084			195			349	
Turn Bay Length (ft)	60			100			65			100		
Base Capacity (vph)	267	759		536	754		298	599		196	572	609
Starvation Cap Reductn	0	163		0	0		0	16		0	0	0
Spillback Cap Reductn	0	0		0	1		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.27	0.36		0.10	0.73		0.11	0.85		0.27	0.68	0.26

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 76 (84%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 27.0

Intersection LOS: C

Intersection Capacity Utilization 68.5%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	33 s	11 s	35 s
			
Ø5	Ø6 (R)	Ø7	Ø8
11 s	33 s	13 s	33 s

AM Peak Hour

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

33: SR 136/N. Washington Ave & E. 1st St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	10	30	5	55	15	75	500	5	5	510	60
Future Volume (vph)	105	10	30	5	55	15	75	500	5	5	510	60
Satd. Flow (prot)	0	1760	0	0	1853	0	1745	1780	0	1745	3373	0
Flt Permitted		0.965			0.997		0.250			0.178		
Satd. Flow (perm)	0	1760	0	0	1853	0	459	1780	0	327	3373	0
Satd. Flow (RTOR)		12			9			1			18	
Lane Group Flow (vph)	0	179	0	0	149	0	109	702	0	5	686	0
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	17.0	17.0		15.0	15.0		11.4	47.4		10.6	46.6	
Total Lost Time (s)		5.6			5.6		5.0	5.2		5.0	5.2	
Act Effct Green (s)		10.4			8.8		34.3	33.0		29.0	23.1	
Actuated g/C Ratio		0.15			0.12		0.48	0.47		0.41	0.33	
v/c Ratio		0.67			0.63		0.32	0.84		0.02	0.62	
Control Delay		43.7			44.6		12.0	28.5		8.6	21.4	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		43.7			44.6		12.0	28.5		8.6	21.4	
LOS		D			D		B	C		A	C	
Approach Delay		43.7			44.6			26.3			21.3	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)		69			59		25	251		1	130	
Queue Length 95th (ft)		#170			67		35	337		5	157	
Internal Link Dist (ft)		234			474			256			166	
Turn Bay Length (ft)										50		
Base Capacity (vph)		303			262		342	1098		250	2047	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.59			0.57		0.32	0.64		0.02	0.34	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 70.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 27.6

Intersection Capacity Utilization 59.6%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service B

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 33: SR 136/N. Washington Ave & E. 1st St

			
10.6 s	47.4 s	17 s	15 s
			
11.4 s	46.6 s		

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

34: SR 136/N. Washington Ave & E. 10th St/E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	80	10	295	215	195	40	455	130	295	575	90
Future Volume (vph)	50	80	10	295	215	195	40	455	130	295	575	90
Satd. Flow (prot)	1770	3462	0	3467	1863	1599	1770	3539	1568	1736	3475	0
Flt Permitted	0.950			0.950			0.292			0.167		
Satd. Flow (perm)	1770	3462	0	3467	1863	1599	544	3539	1568	305	3475	0
Satd. Flow (RTOR)		20				247			200		22	
Lane Group Flow (vph)	56	120	0	347	269	247	68	679	140	393	848	0
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases						4	2		2	6		
Total Split (s)	13.0	13.0		31.0	31.0	31.0	11.0	28.0	28.0	18.0	35.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	
Act Effct Green (s)	8.6	8.6		19.9	19.9	19.9	26.8	21.7	21.7	39.4	32.3	
Actuated g/C Ratio	0.11	0.11		0.25	0.25	0.25	0.34	0.28	0.28	0.50	0.41	
v/c Ratio	0.29	0.30		0.39	0.57	0.42	0.24	0.69	0.24	0.98	0.59	
Control Delay	40.4	32.8		26.1	31.4	5.8	16.0	30.9	2.3	64.1	22.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	40.4	32.8		26.1	31.4	5.8	16.0	30.9	2.3	64.1	22.7	
LOS	D	C		C	C	A	B	C	A	E	C	
Approach Delay		35.2			22.0			25.2			35.8	
Approach LOS		D			C			C			D	
Queue Length 50th (ft)	28	25		78	124	0	18	165	0	~172	187	
Queue Length 95th (ft)	67	47		108	172	32	29	170	16	#274	232	
Internal Link Dist (ft)		135			2500			631			700	
Turn Bay Length (ft)	100			215		215	100			100		
Base Capacity (vph)	211	431		1244	668	731	285	1128	636	401	1479	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.27	0.28		0.28	0.40	0.34	0.24	0.60	0.22	0.98	0.57	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 78.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 29.0

Intersection LOS: C

Intersection Capacity Utilization 59.4%

ICU Level of Service B

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 34: SR 136/N. Washington Ave & E. 10th St/E.10th St

			
Ø1	Ø2	Ø3	Ø4
18 s	28 s	13 s	31 s
			
Ø5	Ø6		
11 s	35 s		

AM Peak Hour

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

35: US 70/E. Spring St & I-40 EB Off-Ramps/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	0	65	0	0	0	0	480	10	60	120	0
Future Volume (vph)	55	0	65	0	0	0	0	480	10	60	120	0
Satd. Flow (prot)	0	1687	1568	0	0	0	0	3472	0	1728	3172	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1687	1568	0	0	0	0	3472	0	1728	3172	0
Lane Group Flow (vph)	0	85	72	0	0	0	0	660	0	68	136	0
Sign Control		Stop			Free			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 30.3%

Analysis Period (min) 15

ICU Level of Service A

Intersection

Int Delay, s/veh 2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔					↔		↔	↔	
Traffic Vol, veh/h	55	0	65	0	0	0	0	480	10	60	120	0
Future Vol, veh/h	55	0	65	0	0	0	0	480	10	60	120	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	200	-	-	-	-	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	65	25	90	25	25	25	25	75	50	88	88	25
Heavy Vehicles, %	7	0	3	0	0	0	0	0	0	1	10	0
Mvmt Flow	85	0	72	0	0	0	0	640	20	68	136	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	593	913	68	-	0	0	640	0	0
Stage 1	273	273	-	-	-	-	-	-	-
Stage 2	320	640	-	-	-	-	-	-	-
Critical Hdwy	6.94	6.5	6.96	-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.94	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.94	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.57	4	3.33	-	-	-	2.21	-	-
Pot Cap-1 Maneuver	425	276	978	0	-	-	947	-	0
Stage 1	734	688	-	0	-	-	-	-	0
Stage 2	694	473	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	394	0	978	-	-	-	947	-	-
Mov Cap-2 Maneuver	394	0	-	-	-	-	-	-	-
Stage 1	681	0	-	-	-	-	-	-	-
Stage 2	694	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.1	0	3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	394	978	947	-
HCM Lane V/C Ratio	-	-	0.215	0.074	0.072	-
HCM Control Delay (s)	-	-	16.6	9	9.1	-
HCM Lane LOS	-	-	C	A	A	-
HCM 95th %tile Q(veh)	-	-	0.8	0.2	0.2	-

Lanes, Volumes, Timings
 36: US 70/E. Spring St & I-40 WB Off-Ramp

2017 Optimized AM Timing Plan
 07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (vph)	10	200	365	0	0	270
Future Volume (vph)	10	200	365	0	0	270
Satd. Flow (prot)	1444	1553	3388	0	0	3261
Flt Permitted	0.950					
Satd. Flow (perm)	1444	1553	3388	0	0	3261
Lane Group Flow (vph)	12	233	474	0	0	321
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 29.1%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
36: US 70/E. Spring St & I-40 WB Off-Ramp

2017 Optimized AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 2.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	200	365	0	0	270
Future Vol, veh/h	10	200	365	0	0	270
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	None
Storage Length	0	300	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	83	86	77	25	25	84
Heavy Vehicles, %	25	4	3	0	0	7
Mvmt Flow	12	233	474	0	0	321

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	635	237	0	-	-	-
Stage 1	474	-	-	-	-	-
Stage 2	161	-	-	-	-	-
Critical Hdwy	7.3	6.98	-	-	-	-
Critical Hdwy Stg 1	6.3	-	-	-	-	-
Critical Hdwy Stg 2	6.3	-	-	-	-	-
Follow-up Hdwy	3.75	3.34	-	-	-	-
Pot Cap-1 Maneuver	362	758	-	0	0	-
Stage 1	531	-	-	0	0	-
Stage 2	787	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	362	758	-	-	-	-
Mov Cap-2 Maneuver	362	-	-	-	-	-
Stage 1	531	-	-	-	-	-
Stage 2	787	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBWB	Ln1WBLn2	SBT
Capacity (veh/h)	-	362 758	-
HCM Lane V/C Ratio	-	0.033 0.307	-
HCM Control Delay (s)	-	15.3 11.8	-
HCM Lane LOS	-	C B	-
HCM 95th %tile Q(veh)	-	0.1 1.3	-

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	270	0	0	590	95	300	0	45	0	0	0
Future Volume (vph)	180	270	0	0	590	95	300	0	45	0	0	0
Satd. Flow (prot)	1703	3343	0	0	3357	0	0	1787	1455	0	0	0
Flt Permitted	0.165							0.950				
Satd. Flow (perm)	296	3343	0	0	3357	0	0	1787	1455	0	0	0
Satd. Flow (RTOR)					25				97			
Lane Group Flow (vph)	225	307	0	0	790	0	0	345	60	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA	Perm			
Protected Phases	1	6			2			3				
Permitted Phases	6						3		3			
Total Split (s)	22.0	57.0			35.0		33.0	33.0	33.0			
Total Lost Time (s)	5.0	4.0			4.0			4.0	4.0			
Act Effct Green (s)	39.2	40.3			24.7			20.8	20.8			
Actuated g/C Ratio	0.56	0.58			0.36			0.30	0.30			
v/c Ratio	0.60	0.16			0.65			0.64	0.12			
Control Delay	16.4	7.5			22.2			28.7	2.3			
Queue Delay	0.0	0.0			0.0			0.0	0.0			
Total Delay	16.4	7.5			22.2			28.7	2.3			
LOS	B	A			C			C	A			
Approach Delay		11.2			22.2			24.8				
Approach LOS		B			C			C				
Queue Length 50th (ft)	43	28			137			125	0			
Queue Length 95th (ft)	85	55			248			55	3			
Internal Link Dist (ft)		490			552			852			886	
Turn Bay Length (ft)	100								250			
Base Capacity (vph)	527	2619			1581			780	690			
Starvation Cap Reductn	0	0			0			0	0			
Spillback Cap Reductn	0	0			0			0	0			
Storage Cap Reductn	0	0			0			0	0			
Reduced v/c Ratio	0.43	0.12			0.50			0.44	0.09			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 69.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 19.4

Intersection Capacity Utilization 56.8%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

 Ø1	 Ø2	 Ø3
22 s	35 s	33 s
 Ø6		
57 s		

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

38: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	410	155	80	800	0	0	0	0	40	0	335
Future Volume (vph)	0	410	155	80	800	0	0	0	0	40	0	335
Satd. Flow (prot)	0	3270	0	1703	3505	0	0	0	0	0	1687	1568
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	3270	0	1703	3505	0	0	0	0	0	1687	1568
Lane Group Flow (vph)	0	653	0	100	899	0	0	0	0	0	52	360
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 56.8%

ICU Level of Service B

Analysis Period (min) 15

Intersection

Int Delay, s/veh 5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↑	↑↑						↑	↑
Traffic Vol, veh/h	0	410	155	80	800	0	0	0	0	40	0	335
Future Vol, veh/h	0	410	155	80	800	0	0	0	0	40	0	335
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	100	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	25	92	75	80	89	25	25	25	25	77	25	93
Heavy Vehicles, %	0	7	1	6	3	0	0	0	0	7	0	3
Mvmt Flow	0	446	207	100	899	0	0	0	0	52	0	360

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	-	0	0	446	0	0	1322	1545	449
Stage 1	-	-	-	-	-	-	1099	1099	-
Stage 2	-	-	-	-	-	-	223	446	-
Critical Hdwy	-	-	-	4.22	-	-	6.94	6.5	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	5.94	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.94	5.5	-
Follow-up Hdwy	-	-	-	2.26	-	-	3.57	4	3.33
Pot Cap-1 Maneuver	0	-	-	1083	-	0	142	116	555
Stage 1	0	-	-	-	-	0	270	291	-
Stage 2	0	-	-	-	-	0	778	577	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	1083	-	-	129	0	555
Mov Cap-2 Maneuver	-	-	-	-	-	-	129	0	-
Stage 1	-	-	-	-	-	-	245	0	-
Stage 2	-	-	-	-	-	-	778	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0.9	26.2
HCM LOS			D

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	1083	-	129	555
HCM Lane V/C Ratio	-	-	0.092	-	0.403	0.649
HCM Control Delay (s)	-	-	8.7	-	50.6	22.7
HCM Lane LOS	-	-	A	-	F	C
HCM 95th %tile Q(veh)	-	-	0.3	-	1.7	4.7

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

39: Neal St/S. Old Kentucky Rd & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	295	160	355	640	100	55	105	150	140	315	45
Future Volume (vph)	50	295	160	355	640	100	55	105	150	140	315	45
Satd. Flow (prot)	1703	3175	0	1752	1845	1615	1787	1810	1524	1752	1816	0
Flt Permitted	0.197			0.224			0.231			0.526		
Satd. Flow (perm)	353	3175	0	413	1845	1615	435	1810	1524	970	1816	0
Satd. Flow (RTOR)		166				142			195		8	
Lane Group Flow (vph)	64	537	0	394	703	141	68	108	165	184	478	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6		6	8		8	4		
Total Split (s)	11.0	28.0		23.0	40.0	40.0	11.0	24.0	24.0	15.0	28.0	
Total Lost Time (s)	5.0	4.0		5.0	4.0	4.0	5.0	4.0	5.7	5.0	4.0	
Act Effct Green (s)	26.2	21.2		41.6	34.4	34.4	23.3	18.3	16.6	31.1	24.7	
Actuated g/C Ratio	0.31	0.25		0.50	0.41	0.41	0.28	0.22	0.20	0.37	0.30	
v/c Ratio	0.31	0.58		0.85	0.93	0.19	0.31	0.27	0.36	0.41	0.88	
Control Delay	17.4	21.5		34.3	45.7	3.9	22.7	31.2	5.5	22.4	51.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	17.4	21.5		34.3	45.7	3.9	22.7	31.2	5.5	22.4	51.0	
LOS	B	C		C	D	A	C	C	A	C	D	
Approach Delay		21.1			37.3			17.1			43.1	
Approach LOS		C			D			B			D	
Queue Length 50th (ft)	18	93		134	379	0	25	51	0	71	265	
Queue Length 95th (ft)	33	145		#282	#612	16	47	97	36	100	#345	
Internal Link Dist (ft)		1084			512			1234			867	
Turn Bay Length (ft)	80					100	130			100		
Base Capacity (vph)	210	1066		501	818	795	221	446	495	456	542	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.30	0.50		0.79	0.86	0.18	0.31	0.24	0.33	0.40	0.88	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 83.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 32.8

Intersection Capacity Utilization 77.7%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service D

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 39: Neal St/S. Old Kentucky Rd & US 70/E. Spring St

			
23 s	28 s	11 s	28 s
			
11 s	40 s	15 s	24 s

Lanes, Volumes, Timings
40: US 70/E. Spring St & E. Broad St

2017 Optimized AM Timing Plan
07/12/2017

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	540	425	430	45	0
Future Volume (vph)	0	540	425	430	45	0
Satd. Flow (prot)	0	1810	1738	0	1805	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1810	1738	0	1805	0
Lane Group Flow (vph)	0	675	1037	0	56	0
Sign Control		Free	Free		Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 58.7%

ICU Level of Service B

Analysis Period (min) 15

HCM 2010 TWSC
40: US 70/E. Spring St & E. Broad St

2017 Optimized AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	540	425	430	45	0
Future Vol, veh/h	0	540	425	430	45	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	25	80	81	84	80	25
Heavy Vehicles, %	0	5	3	1	0	0
Mvmt Flow	0	675	525	512	56	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	525	0	-	0	1200	525
Stage 1	-	-	-	-	525	-
Stage 2	-	-	-	-	675	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1052	-	-	0	206	556
Stage 1	-	-	-	0	598	-
Stage 2	-	-	-	0	510	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	1052	-	-	-	206	556
Mov Cap-2 Maneuver	-	-	-	-	344	-
Stage 1	-	-	-	-	598	-
Stage 2	-	-	-	-	510	-

Approach	EB		WB		SB
HCM Control Delay, s	0		0		17.5
HCM LOS					C

Minor Lane/Major Mvmt	EBL	EBT	WBT	SBLn1
Capacity (veh/h)	1052	-	-	344
HCM Lane V/C Ratio	-	-	-	0.164
HCM Control Delay (s)	0	-	-	17.5
HCM Lane LOS	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	0.6

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	335	20	25	370	10	15	200	30	170	155	70
Future Volume (vph)	45	335	20	25	370	10	15	200	30	170	155	70
Satd. Flow (prot)	1736	1748	0	1671	1840	0	1805	1814	0	1787	1782	0
Flt Permitted	0.260			0.362			0.524			0.277		
Satd. Flow (perm)	475	1748	0	637	1840	0	996	1814	0	521	1782	0
Satd. Flow (RTOR)		5			1			13			22	
Lane Group Flow (vph)	56	417	0	40	467	0	20	312	0	243	322	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	30.0		11.0	30.0		13.0	36.0		13.0	36.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	43.7	39.3		42.0	36.8		25.6	19.8		32.3	29.1	
Actuated g/C Ratio	0.49	0.44		0.47	0.41		0.28	0.22		0.36	0.32	
v/c Ratio	0.17	0.54		0.11	0.62		0.06	0.76		0.78	0.55	
Control Delay	7.0	18.3		13.4	28.6		16.5	43.3		38.7	15.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	1.7	
Total Delay	7.0	18.3		13.4	28.6		16.5	43.4		38.7	17.2	
LOS	A	B		B	C		B	D		D	B	
Approach Delay		16.9			27.4			41.7			26.4	
Approach LOS		B			C			D			C	
Queue Length 50th (ft)	6	232		11	210		7	160		50	58	
Queue Length 95th (ft)	m11	#350		21	#344		16	188		85	53	
Internal Link Dist (ft)		1101			737			412			149	
Turn Bay Length (ft)	75			80			70			50		
Base Capacity (vph)	326	766		372	753		379	633		310	642	
Starvation Cap Reductn	0	0		0	0		0	0		0	177	
Spillback Cap Reductn	0	0		0	0		0	6		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.17	0.54		0.11	0.62		0.05	0.50		0.78	0.69	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 28 (31%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 27.0

Intersection LOS: C

Intersection Capacity Utilization 63.5%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	30 s	13 s	36 s
			
Ø5	Ø6	Ø7	Ø8
11 s	30 s	13 s	36 s

AM Peak Hour

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	340	30	20	360	35	35	85	5	30	45	20
Future Volume (vph)	15	340	30	20	360	35	35	85	5	30	45	20
Satd. Flow (prot)	1687	1779	0	1805	1803	0	1719	1880	0	1752	1828	0
Flt Permitted	0.441			0.459			0.695			0.563		
Satd. Flow (perm)	783	1779	0	872	1803	0	1258	1880	0	1039	1828	0
Satd. Flow (RTOR)		6			8			2			17	
Lane Group Flow (vph)	20	402	0	28	427	0	40	149	0	40	95	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	44.0		11.0	44.0		12.0	23.0		12.0	23.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	57.5	55.1		57.7	55.2		17.4	13.0		17.3	12.9	
Actuated g/C Ratio	0.64	0.61		0.64	0.61		0.19	0.14		0.19	0.14	
v/c Ratio	0.04	0.37		0.05	0.39		0.14	0.55		0.16	0.34	
Control Delay	8.0	13.1		4.8	6.8		25.2	42.9		17.3	19.7	
Queue Delay	0.0	0.0		0.0	0.2		0.0	0.0		0.0	0.0	
Total Delay	8.0	13.1		4.8	6.9		25.2	42.9		17.3	19.7	
LOS	A	B		A	A		C	D		B	B	
Approach Delay		12.9			6.8			39.1			19.0	
Approach LOS		B			A			D			B	
Queue Length 50th (ft)	4	96		4	67		17	80		11	22	
Queue Length 95th (ft)	12	248		9	93		37	83		21	27	
Internal Link Dist (ft)		1308			356			107			209	
Turn Bay Length (ft)	100			60			50			60		
Base Capacity (vph)	562	1093		622	1109		281	377		259	379	
Starvation Cap Reductn	0	0		0	170		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.04	0.37		0.05	0.45		0.14	0.40		0.15	0.25	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 10 (11%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 15.4

Intersection Capacity Utilization 39.4%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
11 s	44 s	12 s	23 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
11 s	44 s	12 s	23 s

Lanes, Volumes, Timings
43: S. Walnut Ave & US 70/W. Spring St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	395	45	25	355	20	60	210	25	10	100	25
Future Volume (vph)	35	395	45	25	355	20	60	210	25	10	100	25
Satd. Flow (prot)	1805	1767	0	1805	1831	0	1787	1840	0	1805	1828	0
Flt Permitted	0.346			0.295			0.552			0.569		
Satd. Flow (perm)	657	1767	0	560	1831	0	1038	1840	0	1081	1828	0
Satd. Flow (RTOR)		9			4			11			14	
Lane Group Flow (vph)	64	471	0	25	383	0	80	292	0	20	160	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	35.0		11.0	35.0		11.0	33.0		11.0	33.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.6		5.0	5.6	
Act Effct Green (s)	24.3	22.6		23.2	20.4		20.9	18.4		18.3	13.2	
Actuated g/C Ratio	0.41	0.38		0.39	0.34		0.35	0.31		0.31	0.22	
v/c Ratio	0.16	0.70		0.07	0.61		0.18	0.51		0.05	0.39	
Control Delay	12.1	25.0		11.6	23.9		15.9	24.2		15.6	24.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	12.1	25.0		11.6	23.9		15.9	24.2		15.6	24.9	
LOS	B	C		B	C		B	C		B	C	
Approach Delay		23.4			23.1			22.4			23.9	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	12	109		4	120		18	74		4	48	
Queue Length 95th (ft)	24	#349		20	261		44	199		11	96	
Internal Link Dist (ft)		1097			1308			83			571	
Turn Bay Length (ft)	75			75			65			150		
Base Capacity (vph)	403	1028		365	1063		450	1003		419	998	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.16	0.46		0.07	0.36		0.18	0.29		0.05	0.16	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 59.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 23.2

Intersection LOS: C

Intersection Capacity Utilization 59.7%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 43: S. Walnut Ave & US 70/W. Spring St

			
Ø1	Ø2	Ø3	Ø4
11 s	35 s	11 s	33 s
			
Ø5	Ø6	Ø7	Ø8
11 s	35 s	11 s	33 s

Lanes, Volumes, Timings

44: Scott Ave & US 70/W. Spring St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	420	40	30	320	20	30	40	35	10	25	25
Future Volume (vph)	10	420	40	30	320	20	30	40	35	10	25	25
Satd. Flow (prot)	1641	1801	0	1805	1847	0	1805	1662	0	1626	1663	0
Flt Permitted	0.539			0.392			0.769			0.930		
Satd. Flow (perm)	931	1801	0	745	1847	0	1461	1662	0	1592	1663	0
Satd. Flow (RTOR)		10			6			38			32	
Lane Group Flow (vph)	12	490	0	44	364	0	44	88	0	12	68	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	51.0		11.0	51.0		11.0	17.0		11.0	17.0	
Total Lost Time (s)	5.0	5.6		5.0	5.6		5.0	5.6		5.0	5.6	
Act Effct Green (s)	29.5	31.3		30.3	32.9		10.3	9.0		9.5	7.5	
Actuated g/C Ratio	0.63	0.67		0.65	0.71		0.22	0.19		0.20	0.16	
v/c Ratio	0.02	0.40		0.07	0.28		0.12	0.25		0.04	0.23	
Control Delay	6.4	12.1		6.2	8.8		18.3	16.8		18.4	18.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.4	12.1		6.2	8.8		18.3	16.8		18.4	18.8	
LOS	A	B		A	A		B	B		B	B	
Approach Delay		12.0			8.6			17.3			18.7	
Approach LOS		B			A			B			B	
Queue Length 50th (ft)	1	52		3	35		8	9		2	7	
Queue Length 95th (ft)	8	271		15	186		29	56		15	35	
Internal Link Dist (ft)		700			1097			288			469	
Turn Bay Length (ft)	75			75			40			75		
Base Capacity (vph)	703	1545		652	1584		388	557		345	519	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.02	0.32		0.07	0.23		0.11	0.16		0.03	0.13	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 46.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.40

Intersection Signal Delay: 11.9

Intersection Capacity Utilization 42.6%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 44: Scott Ave & US 70/W. Spring St

			
Ø1	Ø2	Ø3	Ø4
11 s	51 s	11 s	17 s
			
Ø5	Ø6	Ø7	Ø8
11 s	51 s	11 s	17 s

Lanes, Volumes, Timings
45: S, Maple Ave/N. Maple Ave & E. Broad St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	95	55	50	470	150	25	180	45	25	290	15
Future Volume (vph)	5	95	55	50	470	150	25	180	45	25	290	15
Satd. Flow (prot)	1805	1784	0	1770	1804	0	1805	1815	0	1736	1853	0
Flt Permitted	0.149			0.432			0.363			0.426		
Satd. Flow (perm)	283	1784	0	805	1804	0	690	1815	0	778	1853	0
Satd. Flow (RTOR)		33			24			15			2	
Lane Group Flow (vph)	8	233	0	56	703	0	28	292	0	36	398	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	32.0		15.0	32.0		16.0	27.0		16.0	27.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	38.0	30.4		41.0	39.1		35.0	29.3		36.0	32.2	
Actuated g/C Ratio	0.42	0.34		0.46	0.43		0.39	0.33		0.40	0.36	
v/c Ratio	0.03	0.37		0.12	0.88		0.07	0.49		0.09	0.60	
Control Delay	5.4	13.9		14.0	38.7		13.9	17.7		16.1	30.7	
Queue Delay	0.0	0.2		0.0	0.0		0.0	0.4		0.0	0.1	
Total Delay	5.4	14.1		14.0	38.7		13.9	18.1		16.1	30.9	
LOS	A	B		B	D		B	B		B	C	
Approach Delay		13.9			36.9			17.7			29.7	
Approach LOS		B			D			B			C	
Queue Length 50th (ft)	1	103		17	323		4	43		12	161	
Queue Length 95th (ft)	m2	72		37	#712		m17	104		23	257	
Internal Link Dist (ft)		1084			778			149			437	
Turn Bay Length (ft)	60			65			40			85		
Base Capacity (vph)	290	624		474	797		411	601		433	664	
Starvation Cap Reductn	0	0		0	0		0	70		0	0	
Spillback Cap Reductn	0	80		35	0		0	0		0	20	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.03	0.43		0.13	0.88		0.07	0.55		0.08	0.62	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 23 (26%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 28.5

Intersection LOS: C

Intersection Capacity Utilization 70.7%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 45: S, Maple Ave/N. Maple Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	32 s	16 s	27 s
			
Ø5	Ø6	Ø7	Ø8
15 s	32 s	16 s	27 s

AM Peak Hour
WSP

Synchro 9 Report
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Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

46: S. Dixie Ave/N. Dixie Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	165	10	15	270	80	15	110	15	30	70	15
Future Volume (vph)	15	165	10	15	270	80	15	110	15	30	70	15
Satd. Flow (prot)	1805	1850	0	1805	1814	0	1805	1860	0	1805	1820	0
Flt Permitted	0.425			0.614			0.690			0.416		
Satd. Flow (perm)	808	1850	0	1167	1814	0	1311	1860	0	790	1820	0
Satd. Flow (RTOR)		4			22			5			16	
Lane Group Flow (vph)	32	232	0	20	407	0	20	196	0	44	104	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	39.0		11.0	39.0		11.0	29.0		11.0	29.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	56.2	53.6		54.8	51.3		18.3	14.6		20.5	17.4	
Actuated g/C Ratio	0.62	0.60		0.61	0.57		0.20	0.16		0.23	0.19	
v/c Ratio	0.06	0.21		0.03	0.39		0.07	0.64		0.17	0.29	
Control Delay	9.0	12.5		5.1	8.6		10.9	24.5		23.8	27.1	
Queue Delay	0.0	0.0		0.0	0.1		0.0	0.0		0.0	0.0	
Total Delay	9.0	12.5		5.1	8.7		10.9	24.5		23.8	27.1	
LOS	A	B		A	A		B	C		C	C	
Approach Delay		12.1			8.6			23.3			26.1	
Approach LOS		B			A			C			C	
Queue Length 50th (ft)	7	54		3	145		4	40		18	38	
Queue Length 95th (ft)	11	114		5	58		10	45		29	82	
Internal Link Dist (ft)		1234			353			209			174	
Turn Bay Length (ft)	130			45			60			75		
Base Capacity (vph)	573	1103		755	1043		302	499		256	503	
Starvation Cap Reductn	0	0		0	96		0	7		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.06	0.21		0.03	0.43		0.07	0.40		0.17	0.21	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 5 (6%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 14.9

Intersection Capacity Utilization 46.6%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 46: S. Dixie Ave/N. Dixie Ave & E. Broad St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
11 s	39 s	11 s	29 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
11 s	39 s	11 s	29 s

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

47: S. Walnut Ave/N. Walnut Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	140	15	30	145	80	20	205	35	20	95	10
Future Volume (vph)	10	140	15	30	145	80	20	205	35	20	95	10
Satd. Flow (prot)	0	1856	0	0	1869	1599	1805	1854	0	1736	1820	0
Flt Permitted		0.998			0.992		0.668			0.415		
Satd. Flow (perm)	0	1856	0	0	1869	1599	1269	1854	0	758	1820	0
Satd. Flow (RTOR)		5				138		10			5	
Lane Group Flow (vph)	0	209	0	0	205	108	20	277	0	20	140	0
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	1	1		2	2		7	4		3	8	
Permitted Phases						2	4			8		
Total Split (s)	24.0	24.0		27.0	27.0	27.0	11.0	28.0		11.0	28.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	4.0		5.0	4.0	
Act Effct Green (s)		12.0			12.2	12.2	16.6	16.0		16.6	16.0	
Actuated g/C Ratio		0.20			0.21	0.21	0.28	0.27		0.28	0.27	
v/c Ratio		0.55			0.53	0.25	0.05	0.54		0.06	0.28	
Control Delay		29.9			29.6	4.7	15.9	25.0		16.1	21.7	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		29.9			29.6	4.7	15.9	25.0		16.1	21.7	
LOS		C			C	A	B	C		B	C	
Approach Delay		29.9			21.0			24.4			21.0	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)		53			54	0	4	65		4	30	
Queue Length 95th (ft)		144			153	10	21	200		21	86	
Internal Link Dist (ft)		512			1234			571			477	
Turn Bay Length (ft)							120			140		
Base Capacity (vph)		667			774	743	419	843		324	825	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.31			0.26	0.15	0.05	0.33		0.06	0.17	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 59

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 23.9

Intersection Capacity Utilization 41.9%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service A

Splits and Phases: 47: S. Walnut Ave/N. Walnut Ave & E. Broad St

 Ø1	 Ø2	 Ø3	 Ø4
24 s	27 s	11 s	28 s
		 Ø7	 Ø8
		11 s	28 s

Lanes, Volumes, Timings
48: S. Cedar Ave & E. Broad St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	20	5	20	25	120	5	85	10	130	45	15
Future Volume (vph)	30	20	5	20	25	120	5	85	10	130	45	15
Satd. Flow (prot)	0	1797	0	0	1685	0	0	1844	0	0	1795	0
Flt Permitted		0.973			0.994			0.998			0.968	
Satd. Flow (perm)	0	1797	0	0	1685	0	0	1844	0	0	1795	0
Lane Group Flow (vph)	0	88	0	0	216	0	0	140	0	0	241	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 33.6%

Analysis Period (min) 15

ICU Level of Service A

Intersection

Intersection Delay, s/veh 9.8
Intersection LOS A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↔				↔				↔	
Traffic Vol, veh/h	0	30	20	5	0	20	25	120	0	5	85	10
Future Vol, veh/h	0	30	20	5	0	20	25	120	0	5	85	10
Peak Hour Factor	0.92	0.63	0.63	0.63	0.92	0.71	0.69	0.79	0.92	1.00	0.69	0.83
Heavy Vehicles, %	2	3	0	0	2	0	0	2	2	20	1	0
Mvmt Flow	0	48	32	8	0	28	36	152	0	5	123	12
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0
Approach		EB				WB				NB		
Opposing Approach		WB				EB				SB		
Opposing Lanes		1				1				1		
Conflicting Approach Left		SB				NB				EB		
Conflicting Lanes Left		1				1				1		
Conflicting Approach Right		NB				SB				WB		
Conflicting Lanes Right		1				1				1		
HCM Control Delay		9.1				9.4				9.6		
HCM LOS		A				A				A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	55%	12%	68%
Vol Thru, %	85%	36%	15%	24%
Vol Right, %	10%	9%	73%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	100	55	165	190
LT Vol	5	30	20	130
Through Vol	85	20	25	45
RT Vol	10	5	120	15
Lane Flow Rate	140	87	216	240
Geometry Grp	1	1	1	1
Degree of Util (X)	0.203	0.127	0.274	0.328
Departure Headway (Hd)	5.217	5.23	4.557	4.91
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	682	679	783	726
Service Time	3.296	3.311	2.622	2.981
HCM Lane V/C Ratio	0.205	0.128	0.276	0.331
HCM Control Delay	9.6	9.1	9.4	10.4
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	0.8	0.4	1.1	1.4

Intersection
Intersection Delay, s/veh
Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	130	45	15
Future Vol, veh/h	0	130	45	15
Peak Hour Factor	0.92	0.83	0.75	0.63
Heavy Vehicles, %	2	1	2	0
Mvmt Flow	0	157	60	24
Number of Lanes	0	0	1	0
Approach		SB		
Opposing Approach		NB		
Opposing Lanes		1		
Conflicting Approach Left		WB		
Conflicting Lanes Left		1		
Conflicting Approach Right		EB		
Conflicting Lanes Right		1		
HCM Control Delay		10.4		
HCM LOS		B		

Lanes, Volumes, Timings

49: S. Cedar Ave/N. Cedar Ave & W, Broad St

2017 Optimized AM Timing Plan

07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	60	125	95	130	60	30
Future Volume (vph)	60	125	95	130	60	30
Satd. Flow (prot)	1787	1615	0	1838	1813	0
Flt Permitted	0.950			0.981		
Satd. Flow (perm)	1787	1615	0	1838	1813	0
Lane Group Flow (vph)	72	169	0	311	112	0
Sign Control	Stop			Stop	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 28.8%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 AWSC
49: S. Cedar Ave/N. Cedar Ave & W, Broad St

2017 Optimized AM Timing Plan
07/12/2017

Intersection

Intersection Delay, s/veh 9.9

Intersection LOS A

Movement	EBU	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations									
Traffic Vol, veh/h	0	60	125	0	95	130	0	60	30
Future Vol, veh/h	0	60	125	0	95	130	0	60	30
Peak Hour Factor	0.92	0.83	0.74	0.92	0.79	0.68	0.92	0.75	0.94
Heavy Vehicles, %	2	1	0	2	2	1	2	1	0
Mvmt Flow	0	72	169	0	120	191	0	80	32
Number of Lanes	0	1	1	0	0	1	0	1	0
Approach		EB			NB			SB	
Opposing Approach					SB			NB	
Opposing Lanes		0			1			1	
Conflicting Approach Left		SB			EB				
Conflicting Lanes Left		1			2			0	
Conflicting Approach Right		NB						EB	
Conflicting Lanes Right		1			0			2	
HCM Control Delay		9.1			11.1			8.5	
HCM LOS		A			B			A	

Lane	NBLn1	EBLn1	EBLn2	SBLn1
Vol Left, %	42%	100%	0%	0%
Vol Thru, %	58%	0%	0%	67%
Vol Right, %	0%	0%	100%	33%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	225	60	125	90
LT Vol	95	60	0	0
Through Vol	130	0	0	60
RT Vol	0	0	125	30
Lane Flow Rate	311	72	169	112
Geometry Grp	2	7	7	2
Degree of Util (X)	0.41	0.121	0.225	0.146
Departure Headway (Hd)	4.74	6.017	4.79	4.683
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	757	594	745	762
Service Time	2.783	3.772	2.544	2.737
HCM Lane V/C Ratio	0.411	0.121	0.227	0.147
HCM Control Delay	11.1	9.6	8.9	8.5
HCM Lane LOS	B	A	A	A
HCM 95th-tile Q	2	0.4	0.9	0.5

Lanes, Volumes, Timings

50: US 70/W. Spring St/US 70/W. Broad St & W. Broad St

2017 Optimized AM Timing Plan

07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	80	225	5	240	390
Future Volume (vph)	0	80	225	5	240	390
Satd. Flow (prot)	1900	1615	1823	0	0	1822
Flt Permitted						0.980
Satd. Flow (perm)	1900	1615	1823	0	0	1822
Lane Group Flow (vph)	0	96	258	0	0	769
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 52.6%

Analysis Period (min) 15

ICU Level of Service A

Intersection

Int Delay, s/veh 3.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	80	225	5	240	390
Future Vol, veh/h	0	80	225	5	240	390
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	25	83	89	100	76	86
Heavy Vehicles, %	0	0	4	0	1	3
Mvmt Flow	0	96	253	5	316	453

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1340	255	0	0	258	0
Stage 1	255	-	-	-	-	-
Stage 2	1085	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209	-
Pot Cap-1 Maneuver	170	789	-	-	1313	-
Stage 1	792	-	-	-	-	-
Stage 2	327	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	115	789	-	-	1313	-
Mov Cap-2 Maneuver	189	-	-	-	-	-
Stage 1	792	-	-	-	-	-
Stage 2	222	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	10.2		0		3.5
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	789	1313	-
HCM Lane V/C Ratio	-	-	-	0.122	0.241	-
HCM Control Delay (s)	-	-	0	10.2	8.6	0
HCM Lane LOS	-	-	A	B	A	A
HCM 95th %tile Q(veh)	-	-	-	0.4	0.9	-

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

51: W. Jackson St/Pippin Rd & US 70/W. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	435	300	25	175	30	105	80	10	120	275	5
Future Volume (vph)	5	435	300	25	175	30	105	80	10	120	275	5
Satd. Flow (prot)	1805	1845	1553	1752	1771	0	1719	1900	1615	0	1859	0
Flt Permitted	0.559			0.137			0.950				0.984	
Satd. Flow (perm)	1062	1845	1553	253	1771	0	1719	1900	1615	0	1859	0
Satd. Flow (RTOR)			211		10				218		1	
Lane Group Flow (vph)	5	530	385	36	244	0	115	119	12	0	543	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Free	Split	NA	
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases	6		6	2					Free			
Total Split (s)	11.0	32.0	32.0	11.0	32.0		14.0	14.0		33.0	33.0	
Total Lost Time (s)	5.0	4.0	4.0	5.0	4.0		4.0	4.0			4.0	
Act Effct Green (s)	29.4	27.4	27.4	31.6	31.5		10.0	10.0	83.0		27.4	
Actuated g/C Ratio	0.35	0.33	0.33	0.38	0.38		0.12	0.12	1.00		0.33	
v/c Ratio	0.01	0.87	0.59	0.18	0.36		0.56	0.52	0.01		0.89	
Control Delay	15.4	45.1	15.3	17.7	20.6		48.4	45.7	0.0		45.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay	15.4	45.1	15.3	17.7	20.6		48.4	45.7	0.0		45.9	
LOS	B	D	B	B	C		D	D	A		D	
Approach Delay		32.5			20.2			44.7			45.9	
Approach LOS		C			C			D			D	
Queue Length 50th (ft)	2	289	78	12	84		63	65	0		293	
Queue Length 95th (ft)	8	#411	125	23	159		#130	87	0		336	
Internal Link Dist (ft)		1551			2304			1891			664	
Turn Bay Length (ft)	100		100	100			350					
Base Capacity (vph)	433	631	669	205	699		210	232	1615		658	
Starvation Cap Reductn	0	0	0	0	0		0	0	0		0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0		0	
Storage Cap Reductn	0	0	0	0	0		0	0	0		0	
Reduced v/c Ratio	0.01	0.84	0.58	0.18	0.35		0.55	0.51	0.01		0.83	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 83

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 35.9

Intersection Capacity Utilization 57.6%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service B

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 51: W. Jackson St/Pippin Rd & US 70/W. Broad St

			
Ø1	Ø2	Ø3	Ø4
11 s	32 s	14 s	33 s
			
Ø5	Ø6		
11 s	32 s		

Lanes, Volumes, Timings
52: E.10th St & Brown Ave N

2017 Optimized AM Timing Plan

07/12/2017

								
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	25	475	725	115	120	25		
Future Volume (vph)	25	475	725	115	120	25		
Satd. Flow (prot)	1671	1845	1845	0	1645	0		
Flt Permitted	0.083				0.964			
Satd. Flow (perm)	146	1845	1845	0	1645	0		
Satd. Flow (RTOR)			16		15			
Lane Group Flow (vph)	28	495	975	0	220	0		
Turn Type	pm+pt	NA	NA		Prot			
Protected Phases	1	6	2 4		3		2	4
Permitted Phases	6							
Total Split (s)	11.0	61.0			22.0		50.0	17.0
Total Lost Time (s)	5.0	4.0			5.4			
Act Effct Green (s)	51.5	52.5	61.2		15.1			
Actuated g/C Ratio	0.55	0.56	0.65		0.16			
v/c Ratio	0.16	0.48	0.81		0.80			
Control Delay	12.0	14.6	8.6		58.3			
Queue Delay	0.0	0.0	0.0		0.0			
Total Delay	12.0	14.6	8.6		58.3			
LOS	B	B	A		E			
Approach Delay		14.4	8.6		58.3			
Approach LOS		B	A		E			
Queue Length 50th (ft)	8	174	38		126			
Queue Length 95th (ft)	20	254	m40		161			
Internal Link Dist (ft)		2500	23		665			
Turn Bay Length (ft)	100							
Base Capacity (vph)	177	1124	1204		304			
Starvation Cap Reductn	0	0	0		0			
Spillback Cap Reductn	0	0	0		0			
Storage Cap Reductn	0	0	0		0			
Reduced v/c Ratio	0.16	0.44	0.81		0.72			

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 94.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 16.8

Intersection Capacity Utilization 63.0%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 52: E.10th St & Brown Ave N

#52  Ø1	#52 #521  Ø2	#52 #521  Ø3	#52 #521  Ø4
11 s	50 s	22 s	17 s
#52 #521  Ø6			
61 s			

Lanes, Volumes, Timings

53: Fisk Rd & E.10th St

2017 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	480	20	15	650	195	45	110	10	195	40	130
Future Volume (vph)	50	480	20	15	650	195	45	110	10	195	40	130
Satd. Flow (prot)	1770	1832	0	1805	1863	1538	0	1820	0	0	1649	1583
Flt Permitted	0.101			0.180				0.990			0.959	
Satd. Flow (perm)	188	1832	0	342	1863	1538	0	1820	0	0	1649	1583
Satd. Flow (RTOR)		2				164		2				148
Lane Group Flow (vph)	60	602	0	20	677	235	0	288	0	0	288	148
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases	2			6		6						3
Total Split (s)	11.0	43.0		11.0	43.0	43.0	23.0	23.0		23.0	23.0	23.0
Total Lost Time (s)	5.0	4.0		5.0	4.0	4.0		5.0			5.0	5.0
Act Effct Green (s)	42.7	41.4		40.6	37.2	37.2		17.1			18.2	18.2
Actuated g/C Ratio	0.45	0.44		0.43	0.39	0.39		0.18			0.19	0.19
v/c Ratio	0.33	0.75		0.09	0.93	0.34		0.88			0.91	0.35
Control Delay	18.6	31.0		14.1	49.5	8.5		66.7			73.9	8.7
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	18.6	31.0		14.1	49.5	8.5		66.7			73.9	8.7
LOS	B	C		B	D	A		E			E	A
Approach Delay		29.9			38.4			66.7			51.8	
Approach LOS		C			D			E			D	
Queue Length 50th (ft)	19	273		6	406	28		179			184	0
Queue Length 95th (ft)	38	433		15	#637	67		139			#349	49
Internal Link Dist (ft)		2105			3570			811			723	
Turn Bay Length (ft)	200			175		175						250
Base Capacity (vph)	185	843		240	773	734		350			315	423
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.32	0.71		0.08	0.88	0.32		0.82			0.91	0.35

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 95.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 42.0

Intersection Capacity Utilization 68.6%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service C

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 53: Fisk Rd & E.10th St

			
Ø1	Ø2	Ø3	Ø4
11 s	43 s	23 s	23 s
			
Ø5	Ø6		
11 s	43 s		

Lanes, Volumes, Timings
54: N. Old Kentucky Rd & E.10th St

2017 Optimized AM Timing Plan

07/12/2017

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	530	185	190	710	125	170
Future Volume (vph)	530	185	190	710	125	170
Satd. Flow (prot)	1776	1553	1805	1845	1770	1583
Flt Permitted			0.248		0.950	
Satd. Flow (perm)	1776	1553	471	1845	1770	1583
Satd. Flow (RTOR)		264				288
Lane Group Flow (vph)	602	264	279	835	169	288
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	1 2	4	
Permitted Phases		2	1 2			4
Total Split (s)	47.0	47.0	24.0		19.0	19.0
Total Lost Time (s)	4.0	4.0	5.0		5.4	4.7
Act Effct Green (s)	45.0	45.0	62.7	67.7	11.9	12.6
Actuated g/C Ratio	0.50	0.50	0.70	0.75	0.13	0.14
v/c Ratio	0.68	0.29	0.46	0.60	0.72	0.61
Control Delay	22.7	2.7	10.3	9.7	55.2	10.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.7	2.7	10.3	9.7	55.2	10.6
LOS	C	A	B	A	E	B
Approach Delay	16.6			9.8	27.1	
Approach LOS	B			A	C	
Queue Length 50th (ft)	260	0	40	83	92	0
Queue Length 95th (ft)	373	11	87	352	126	0
Internal Link Dist (ft)	3570			975	734	
Turn Bay Length (ft)		400	125		175	
Base Capacity (vph)	887	907	622	1384	267	493
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.29	0.45	0.60	0.63	0.58

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 40 (44%), Referenced to phase 2:EBWB and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 15.5

Intersection LOS: B

Intersection Capacity Utilization 57.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 54: N. Old Kentucky Rd & E.10th St



Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

55: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	450	235	295	715	0	0	0	0	145	0	320
Future Volume (vph)	0	450	235	295	715	0	0	0	0	145	0	320
Satd. Flow (prot)	0	3243	0	1687	3471	0	0	0	0	1752	0	1583
Flt Permitted				0.207						0.950		
Satd. Flow (perm)	0	3243	0	368	3471	0	0	0	0	1752	0	1583
Satd. Flow (RTOR)		171										136
Lane Group Flow (vph)	0	842	0	328	894	0	0	0	0	196	0	390
Turn Type		NA		pm+pt	NA					Prot		Perm
Protected Phases		6		5	2					8		
Permitted Phases				2								8
Total Split (s)		31.0		24.0	55.0					35.0		35.0
Total Lost Time (s)		3.4		3.2	4.0					6.4		5.9
Act Effct Green (s)		39.6		59.9	59.1					20.5		21.0
Actuated g/C Ratio		0.44		0.67	0.66					0.23		0.23
v/c Ratio		0.55		0.67	0.39					0.49		0.82
Control Delay		10.0		12.2	5.5					33.1		35.1
Queue Delay		0.0		0.0	0.0					0.0		0.0
Total Delay		10.0		12.2	5.5					33.1		35.1
LOS		B		B	A					C		D
Approach Delay		10.0			7.3						34.4	
Approach LOS		B			A						C	
Queue Length 50th (ft)		43		61	124					97		140
Queue Length 95th (ft)		172		122	106					114		186
Internal Link Dist (ft)		570			785			708			972	
Turn Bay Length (ft)				120								150
Base Capacity (vph)		1523		552	2277					556		603
Starvation Cap Reductn		0		0	0					0		0
Spillback Cap Reductn		0		0	0					0		0
Storage Cap Reductn		0		0	0					0		0
Reduced v/c Ratio		0.55		0.59	0.39					0.35		0.65

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 57 (63%), Referenced to phase 2:WBTL and 6:EBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 14.2

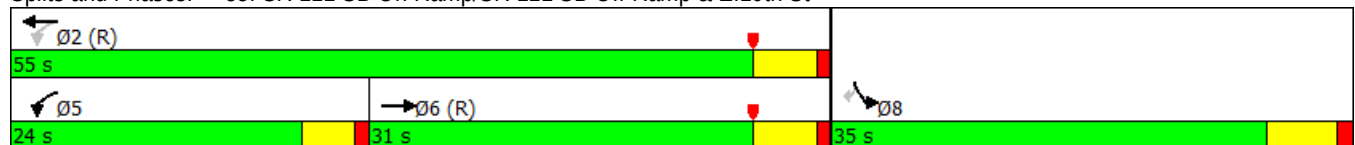
Intersection LOS: B

Intersection Capacity Utilization 59.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 55: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & E.10th St



Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	490	0	0	715	110	285	0	245	0	0	0
Future Volume (vph)	105	490	0	0	715	110	285	0	245	0	0	0
Satd. Flow (prot)	1719	3539	0	0	3385	0	1703	0	1509	0	0	0
Flt Permitted	0.174						0.950					
Satd. Flow (perm)	315	3539	0	0	3385	0	1703	0	1509	0	0	0
Satd. Flow (RTOR)					20				283			
Lane Group Flow (vph)	115	576	0	0	971	0	380	0	322	0	0	0
Turn Type	pm+pt	NA			NA		Prot		Perm			
Protected Phases	1	6			2		4					
Permitted Phases	6								4			
Total Split (s)	15.0	54.0			39.0		36.0		36.0			
Total Lost Time (s)	5.0	4.0			4.0		4.0		4.0			
Act Effct Green (s)	54.4	55.4			44.8		26.6		26.6			
Actuated g/C Ratio	0.60	0.62			0.50		0.30		0.30			
v/c Ratio	0.37	0.26			0.57		0.76		0.50			
Control Delay	7.8	5.6			23.6		38.3		7.1			
Queue Delay	0.0	0.1			1.1		0.0		0.1			
Total Delay	7.8	5.7			24.7		38.3		7.2			
LOS	A	A			C		D		A			
Approach Delay		6.0			24.7			24.0				
Approach LOS		A			C			C				
Queue Length 50th (ft)	21	67			250		193		16			
Queue Length 95th (ft)	43	100			311		212		40			
Internal Link Dist (ft)		785			131			909			832	
Turn Bay Length (ft)	400								150			
Base Capacity (vph)	346	2177			1695		605		718			
Starvation Cap Reductn	0	0			451		0		0			
Spillback Cap Reductn	0	469			0		0		37			
Storage Cap Reductn	0	0			0		0		0			
Reduced v/c Ratio	0.33	0.34			0.78		0.63		0.47			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 18 (20%), Referenced to phase 2:WBT and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 19.0

Intersection Capacity Utilization 59.1%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St

		
Ø1	Ø2 (R)	Ø4
15 s	39 s	36 s
		
Ø6 (R)		
54 s		

Lanes, Volumes, Timings
57: Burton Branch Rd & E.10th St

2017 Optimized AM Timing Plan

07/12/2017

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	525	210	40	595	235	70
Future Volume (vph)	525	210	40	595	235	70
Satd. Flow (prot)	3331	0	1612	3471	1703	1455
Flt Permitted			0.214		0.950	
Satd. Flow (perm)	3331	0	363	3471	1703	1455
Satd. Flow (RTOR)	89					88
Lane Group Flow (vph)	913	0	52	633	318	88
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			2			4
Total Split (s)	41.0		15.0	56.0	34.0	34.0
Total Lost Time (s)	4.0		5.0	4.0	4.0	4.0
Act Effct Green (s)	50.1		57.8	58.8	23.2	23.2
Actuated g/C Ratio	0.56		0.64	0.65	0.26	0.26
v/c Ratio	0.48		0.14	0.28	0.72	0.20
Control Delay	10.2		8.3	7.7	39.7	6.3
Queue Delay	0.3		0.0	0.3	0.5	0.0
Total Delay	10.5		8.3	8.0	40.3	6.3
LOS	B		A	A	D	A
Approach Delay	10.5			8.0	32.9	
Approach LOS	B			A	C	
Queue Length 50th (ft)	172		10	72	164	0
Queue Length 95th (ft)	277		24	122	179	24
Internal Link Dist (ft)	131			316	647	
Turn Bay Length (ft)			100			175
Base Capacity (vph)	1892		371	2267	567	543
Starvation Cap Reductn	392		0	0	0	0
Spillback Cap Reductn	0		0	917	57	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.61		0.14	0.47	0.62	0.16

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 20 (22%), Referenced to phase 2:WBTL and 6:EBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 14.2

Intersection Capacity Utilization 52.9%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 57: Burton Branch Rd & E.10th St



Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

61: SR 135/S. Willow Ave & County Services Dr/Orchard St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	5	5	25	25	60	35	815	5	50	670	35
Future Volume (vph)	10	5	5	25	25	60	35	815	5	50	670	35
Satd. Flow (prot)	1687	1444	0	0	1722	0	1787	3502	0	1805	3397	0
Flt Permitted	0.635				0.925		0.319			0.220		
Satd. Flow (perm)	1128	1444	0	0	1610	0	600	3502	0	418	3397	0
Satd. Flow (RTOR)		12			50			1			14	
Lane Group Flow (vph)	12	17	0	0	156	0	69	904	0	93	780	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			3		5	2		1	6	
Permitted Phases	4			3			2			6		
Total Split (s)	25.0	25.0		25.0	25.0		15.0	50.0		15.0	50.0	
Total Lost Time (s)	4.0	4.0			4.0		5.0	4.0		5.0	4.0	
Act Effct Green (s)	11.0	11.0			11.0		30.5	26.7		31.9	29.2	
Actuated g/C Ratio	0.20	0.20			0.20		0.56	0.49		0.58	0.53	
v/c Ratio	0.05	0.06			0.43		0.15	0.53		0.23	0.43	
Control Delay	20.5	13.7			18.8		5.3	12.4		6.0	10.2	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	20.5	13.7			18.8		5.3	12.4		6.0	10.2	
LOS	C	B			B		A	B		A	B	
Approach Delay		16.5			18.8			11.9			9.8	
Approach LOS		B			B			B			A	
Queue Length 50th (ft)	3	1			28		7	105		9	85	
Queue Length 95th (ft)	15	16			45		12	189		16	155	
Internal Link Dist (ft)		674			289			17			564	
Turn Bay Length (ft)	100						100			200		
Base Capacity (vph)	444	575			664		588	2992		517	2904	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.03	0.03			0.23		0.12	0.30		0.18	0.27	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 54.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 11.6

Intersection Capacity Utilization 51.6%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 61: SR 135/S. Willow Ave & County Services Dr/Orchard St

		
15 s	50 s	25 s
		
15 s	50 s	25 s

Lanes, Volumes, Timings 95: Foutch Dr

2017 Optimized AM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	5	0	0	35	0	40
Future Volume (vph)	5	0	0	35	0	40
Satd. Flow (prot)	1770	0	0	1611	0	1863
Flt Permitted	0.950					
Satd. Flow (perm)	1770	0	0	1611	0	1863
Lane Group Flow (vph)	5	0	0	38	0	43
Sign Control	Yield		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 13.3%

Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings

241: SR 136/S. Jefferson Ave & Fairground St

2017 Optimized AM Timing Plan

07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				  	 	
Traffic Volume (vph)	5	5	5	930	425	5
Future Volume (vph)	5	5	5	930	425	5
Satd. Flow (prot)	864	0	0	5037	3469	0
Flt Permitted	0.976					
Satd. Flow (perm)	864	0	0	5037	3469	0
Lane Group Flow (vph)	10	0	0	1156	572	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 31.4%

ICU Level of Service A

Analysis Period (min) 15

HCM 2010 TWSC
241: SR 136/S. Jefferson Ave & Fairground St

2017 Optimized AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	5	5	930	425	5
Future Vol, veh/h	5	5	5	930	425	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	63	81	75	100
Heavy Vehicles, %	100	100	0	3	4	0
Mvmt Flow	5	5	8	1148	567	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1044	286	572	0	-	0
Stage 1	569	-	-	-	-	-
Stage 2	475	-	-	-	-	-
Critical Hdwy	8.25	8.9	4.1	-	-	-
Critical Hdwy Stg 1	7.8	-	-	-	-	-
Critical Hdwy Stg 2	8	-	-	-	-	-
Follow-up Hdwy	4.65	4.3	2.2	-	-	-
Pot Cap-1 Maneuver	129	487	1011	-	-	-
Stage 1	319	-	-	-	-	-
Stage 2	360	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	126	487	1011	-	-	-
Mov Cap-2 Maneuver	210	-	-	-	-	-
Stage 1	319	-	-	-	-	-
Stage 2	352	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.7	0.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1011	-	293	-	-
HCM Lane V/C Ratio	0.008	-	0.034	-	-
HCM Control Delay (s)	8.6	0.1	17.7	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Lanes, Volumes, Timings
271: Foutch Dr & SR 136/S. Jefferson Ave

2017 Optimized AM Timing Plan
07/12/2017

						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	0	455	275	40	0	0
Future Volume (vph)	0	455	275	40	0	0
Satd. Flow (prot)	0	3336	3245	0	0	0
Flt Permitted						
Satd. Flow (perm)	0	3336	3245	0	0	0
Lane Group Flow (vph)	0	529	443	0	0	0
Sign Control		Free	Free		Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 15.9%

Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings

2017 Optimized AM Timing Plan

361: US 70/E. Spring St & I-40 WB On-Ramp (SB)/I-40 WB On-Ramp (NB)

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	170	365	5	0	190	95
Future Volume (vph)	0	0	0	0	0	0	170	365	5	0	190	95
Satd. Flow (prot)	0	0	0	0	0	0	0	3349	0	0	3007	0
Flt Permitted								0.984				
Satd. Flow (perm)	0	0	0	0	0	0	0	3349	0	0	3007	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	706	0	0	336	0
Sign Control		Free				Free		Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 30.1%

Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings
521: Brown Ave S & E.10th St

2017 Optimized AM Timing Plan

07/12/2017

	→	↘	↙	←	↖	↗			
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø1	Ø3	Ø6
Lane Configurations									
Traffic Volume (vph)	580	20	5	800	35	5			
Future Volume (vph)	580	20	5	800	35	5			
Satd. Flow (prot)	1836	0	1805	1881	1786	0			
Flt Permitted			0.382		0.959				
Satd. Flow (perm)	1836	0	726	1881	1786	0			
Satd. Flow (RTOR)	7				7				
Lane Group Flow (vph)	658	0	12	930	83	0			
Turn Type	NA		Perm	NA	Prot				
Protected Phases	3 6			2	4		1	3	6
Permitted Phases			2						
Total Split (s)			50.0	50.0	17.0		11.0	22.0	61.0
Total Lost Time (s)			4.0	4.0	5.4				
Act Effct Green (s)	71.6		46.3	46.3	11.7				
Actuated g/C Ratio	0.76		0.49	0.49	0.12				
v/c Ratio	0.47		0.03	1.01	0.37				
Control Delay	1.3		15.4	57.7	41.9				
Queue Delay	0.0		0.0	33.9	0.0				
Total Delay	1.3		15.4	91.6	41.9				
LOS	A		B	F	D				
Approach Delay	1.3			90.6	41.9				
Approach LOS	A			F	D				
Queue Length 50th (ft)	3		4	~660	45				
Queue Length 95th (ft)	17		7	#836	47				
Internal Link Dist (ft)	23			2105	565				
Turn Bay Length (ft)			115						
Base Capacity (vph)	1411		356	925	227				
Starvation Cap Reductn	0		0	0	0				
Spillback Cap Reductn	0		0	109	2				
Storage Cap Reductn	0		0	0	0				
Reduced v/c Ratio	0.47		0.03	1.14	0.37				

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 94.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 53.3

Intersection Capacity Utilization 59.9%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service B

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 521: Brown Ave S & E.10th St

#52 Ø1	#52 #521 Ø2	#52 #521 Ø3	#52 #521 Ø4
11 s	50 s	22 s	17 s
#52 #521 Ø6			
61 s			

WSP

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	10	55	15	5	65	20	420	5	80	600	40
Future Volume (vph)	190	10	55	15	5	65	20	420	5	80	600	40
Satd. Flow (prot)	1770	1700	0	1703	1639	0	1805	3452	0	1787	3486	0
Flt Permitted	0.700			0.705			0.322			0.369		
Satd. Flow (perm)	1304	1700	0	1264	1639	0	612	3452	0	694	3486	0
Satd. Flow (RTOR)		56			76			3			9	
Lane Group Flow (vph)	388	80	0	28	88	0	24	524	0	113	754	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		3			4		5	2		1	6	
Permitted Phases	3			4			2			6		
Total Split (s)	46.0	46.0		46.0	46.0		11.0	32.0		12.0	33.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	5.9		4.5	5.9	
Act Effct Green (s)	32.5	32.5		32.5	32.5		43.3	36.9		47.5	42.7	
Actuated g/C Ratio	0.36	0.36		0.36	0.36		0.48	0.41		0.53	0.47	
v/c Ratio	0.82	0.12		0.06	0.14		0.06	0.37		0.25	0.46	
Control Delay	40.2	7.0		15.9	5.2		13.3	22.1		7.7	10.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	40.2	7.0		15.9	5.2		13.3	22.1		7.7	10.9	
LOS	D	A		B	A		B	C		A	B	
Approach Delay		34.5			7.8			21.7			10.5	
Approach LOS		C			A			C			B	
Queue Length 50th (ft)	195	9		10	4		6	113		15	64	
Queue Length 95th (ft)	111	5		14	1		20	160		21	183	
Internal Link Dist (ft)		927			612			1063			1812	
Turn Bay Length (ft)	200			150			200			200		
Base Capacity (vph)	601	814		582	796		382	1417		464	1656	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.65	0.10		0.05	0.11		0.06	0.37		0.24	0.46	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 39 (43%), Referenced to phase 2:NBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 19.1

Intersection Capacity Utilization 52.5%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

		
Ø1	Ø2 (R)	Ø3
12 s	32 s	46 s
		
Ø5	Ø6	Ø4
11 s	33 s	46 s

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	5	55	0	0	0	0	515	230	350	765	0
Future Volume (vph)	235	5	55	0	0	0	0	515	230	350	765	0
Satd. Flow (prot)	1649	1568	0	0	0	0	0	3383	0	1770	3539	0
Flt Permitted	0.950	0.974								0.115		
Satd. Flow (perm)	1649	1568	0	0	0	0	0	3383	0	214	3539	0
Satd. Flow (RTOR)		44						89				
Lane Group Flow (vph)	168	163	0	0	0	0	0	998	0	438	832	0
Turn Type	Split	NA						NA		pm+pt	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases										6		
Total Split (s)	36.0	36.0						36.0		18.0	54.0	
Total Lost Time (s)	5.2	5.2						4.7		4.5	4.7	
Act Effct Green (s)	14.7	14.7						30.4		65.6	65.4	
Actuated g/C Ratio	0.16	0.16						0.34		0.73	0.73	
v/c Ratio	0.62	0.56						0.83		0.64	0.32	
Control Delay	44.6	31.5						34.6		15.8	2.8	
Queue Delay	0.0	0.0						0.0		0.0	0.0	
Total Delay	44.6	31.5						34.6		15.8	2.8	
LOS	D	C						C		B	A	
Approach Delay		38.2						34.6			7.2	
Approach LOS		D						C			A	
Queue Length 50th (ft)	94	65						177		97	45	
Queue Length 95th (ft)	150	71						303		165	7	
Internal Link Dist (ft)		409			271			1812			858	
Turn Bay Length (ft)	200									410		
Base Capacity (vph)	564	565						1244		683	2571	
Starvation Cap Reductn	0	0						0		0	0	
Spillback Cap Reductn	0	0						0		0	0	
Storage Cap Reductn	0	0						0		0	0	
Reduced v/c Ratio	0.30	0.29						0.80		0.64	0.32	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 36 (40%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 21.7

Intersection Capacity Utilization 63.6%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service B

Splits and Phases: 2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

		
Ø1	Ø2 (R)	Ø4
18 s	36 s	36 s
		
Ø6 (R)		
54 s		

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	185	5	275	40	700	0	0	940	290
Future Volume (vph)	0	0	0	185	5	275	40	700	0	0	940	290
Satd. Flow (prot)	0	0	0	0	1759	1583	1671	3539	0	0	3409	0
Flt Permitted					0.953		0.091					
Satd. Flow (perm)	0	0	0	0	1759	1583	160	3539	0	0	3409	0
Satd. Flow (RTOR)						125					58	
Lane Group Flow (vph)	0	0	0	0	218	324	52	864	0	0	1464	0
Turn Type				Split	NA	Perm	pm+pt	NA			NA	
Protected Phases				4	4		5	2			6	
Permitted Phases						4	2					
Total Split (s)				37.0	37.0	37.0	11.0	53.0			42.0	
Total Lost Time (s)					5.4	5.4	4.5	5.5			5.5	
Act Effct Green (s)					18.6	18.6	61.5	60.5			53.5	
Actuated g/C Ratio					0.21	0.21	0.68	0.67			0.59	
v/c Ratio					0.60	0.76	0.24	0.36			0.71	
Control Delay					38.0	31.3	4.5	4.2			12.5	
Queue Delay					0.0	0.0	0.0	0.0			0.0	
Total Delay					38.0	31.3	4.5	4.2			12.5	
LOS					D	C	A	A			B	
Approach Delay					34.0			4.2			12.5	
Approach LOS					C			A			B	
Queue Length 50th (ft)					113	107	2	41			183	
Queue Length 95th (ft)					161	159	m12	163			#497	
Internal Link Dist (ft)		874			1170			858			839	
Turn Bay Length (ft)						200	200					
Base Capacity (vph)					617	636	225	2378			2049	
Starvation Cap Reductn					0	0	0	0			0	
Spillback Cap Reductn					0	0	0	0			0	
Storage Cap Reductn					0	0	0	0			0	
Reduced v/c Ratio					0.35	0.51	0.23	0.36			0.71	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 86 (96%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 13.9

Intersection LOS: B

Intersection Capacity Utilization 63.6%

ICU Level of Service B

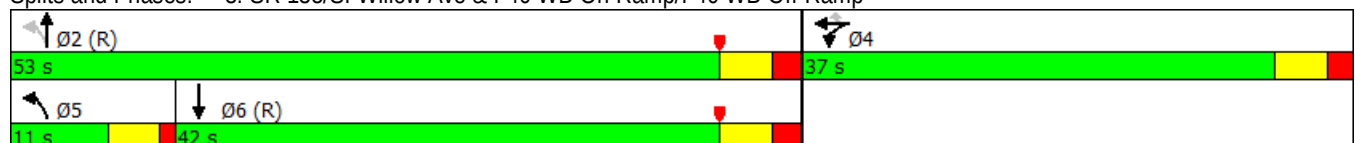
Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp



PM Peak HR

WSP

Synchro 9 Report

Page 3

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

4: SR 135/S. Willow Ave & Foreman Dr/Interstate Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	135	85	260	165	265	120	615	195	290	785	65
Future Volume (vph)	75	135	85	260	165	265	120	615	195	290	785	65
Satd. Flow (prot)	1736	1711	0	1805	1900	1615	1703	3412	0	1752	3528	0
Flt Permitted	0.630			0.266			0.215			0.133		
Satd. Flow (perm)	1151	1711	0	505	1900	1615	385	3412	0	245	3528	0
Satd. Flow (RTOR)		35				312		47			12	
Lane Group Flow (vph)	88	295	0	317	204	312	140	942	0	322	906	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4		4	2			6		
Total Split (s)	11.0	25.0		15.0	29.0	29.0	12.0	32.0		18.0	38.0	
Total Lost Time (s)	4.5	6.5		4.5	6.5	6.5	4.5	6.5		4.5	6.5	
Act Effct Green (s)	25.4	17.0		33.9	23.5	23.5	35.8	26.4		46.7	32.8	
Actuated g/C Ratio	0.28	0.19		0.38	0.26	0.26	0.40	0.29		0.52	0.36	
v/c Ratio	0.24	0.84		0.91	0.41	0.48	0.54	0.91		0.90	0.70	
Control Delay	19.9	52.8		55.5	31.2	6.1	20.6	32.1		49.9	28.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	19.9	52.8		55.5	31.2	6.1	20.6	32.1		49.9	28.0	
LOS	B	D		E	C	A	C	C		D	C	
Approach Delay		45.2			31.1			30.6			33.7	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	31	141		130	98	0	20	246		127	230	
Queue Length 95th (ft)	59	189		#199	144	50	61	#353		#287	302	
Internal Link Dist (ft)		811			944			839			2060	
Turn Bay Length (ft)	150			150			50			150		
Base Capacity (vph)	367	379		347	503	656	265	1032		358	1292	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.24	0.78		0.91	0.41	0.48	0.53	0.91		0.90	0.70	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 76 (84%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 33.4

Intersection LOS: C

Intersection Capacity Utilization 84.3%

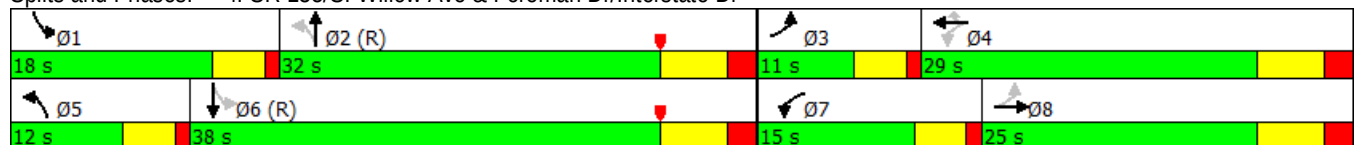
ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: SR 135/S. Willow Ave & Foreman Dr/Interstate Dr



Lanes, Volumes, Timings 5: SR 135/S. Willow Ave & Fairground St

2017 Optimized PM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	25	100	920	120	60	1165
Future Volume (vph)	25	100	920	120	60	1165
Satd. Flow (prot)	1805	1583	3507	0	1752	3574
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1583	3507	0	1752	3574
Lane Group Flow (vph)	36	116	1093	0	95	1294
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 45.9%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
5: SR 135/S. Willow Ave & Fairground St

2017 Optimized PM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	100	920	120	60	1165
Future Vol, veh/h	25	100	920	120	60	1165
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	86	97	83	63	90
Heavy Vehicles, %	0	2	1	0	3	1
Mvmt Flow	36	116	948	145	95	1294

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1859	547	0	0	1093	0
Stage 1	1021	-	-	-	-	-
Stage 2	838	-	-	-	-	-
Critical Hdwy	6.8	6.94	-	-	4.16	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.32	-	-	2.23	-
Pot Cap-1 Maneuver	66	481	-	-	628	-
Stage 1	313	-	-	-	-	-
Stage 2	390	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	56	481	-	-	628	-
Mov Cap-2 Maneuver	172	-	-	-	-	-
Stage 1	313	-	-	-	-	-
Stage 2	331	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	18.8		0		0.8
HCM LOS	C				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	172	481	628	-
HCM Lane V/C Ratio	-	-	0.211	0.242	0.152	-
HCM Control Delay (s)	-	-	31.4	14.9	11.8	-
HCM Lane LOS	-	-	D	B	B	-
HCM 95th %tile Q(veh)	-	-	0.8	0.9	0.5	-

Lanes, Volumes, Timings 6: SR 135/S. Willow Ave & Ashwood Dr

2017 Optimized PM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (vph)	0	15	1020	5	0	1225
Future Volume (vph)	0	15	1020	5	0	1225
Satd. Flow (prot)	0	1644	3571	0	0	3539
Flt Permitted						
Satd. Flow (perm)	0	1644	3571	0	0	3539
Lane Group Flow (vph)	0	20	1060	0	0	1346
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 38.4%

ICU Level of Service A

Analysis Period (min) 15

HCM 2010 TWSC
6: SR 135/S. Willow Ave & Ashwood Dr

2017 Optimized PM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	15	1020	5	0	1225
Future Vol, veh/h	0	15	1020	5	0	1225
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	25	75	97	63	25	91
Heavy Vehicles, %	0	0	1	0	0	2
Mvmt Flow	0	20	1052	8	0	1346

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	526	0	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.9	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-	-
Pot Cap-1 Maneuver	0	502	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	502	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 502	-
HCM Lane V/C Ratio	- 0.04	-
HCM Control Delay (s)	- 12.5	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0.1	-

Lanes, Volumes, Timings
7: SR 135/S. Willow Ave & Lone Oak Dr

2017 Optimized PM Timing Plan
07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	25	25	35	1070	1145	45
Future Volume (vph)	25	25	35	1070	1145	45
Satd. Flow (prot)	1736	1553	1805	3574	3548	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1736	1553	1805	3574	3548	0
Lane Group Flow (vph)	25	36	40	1081	1305	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 43.1%

ICU Level of Service A

Analysis Period (min) 15

HCM 2010 TWSC
7: SR 135/S. Willow Ave & Lone Oak Dr

2017 Optimized PM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	25	35	1070	1145	45
Future Vol, veh/h	25	25	35	1070	1145	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	30	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	69	88	99	92	75
Heavy Vehicles, %	4	4	0	1	1	2
Mvmt Flow	25	36	40	1081	1245	60

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1895	652	1305	0	-	0
Stage 1	1275	-	-	-	-	-
Stage 2	620	-	-	-	-	-
Critical Hdwy	6.88	6.98	4.1	-	-	-
Critical Hdwy Stg 1	5.88	-	-	-	-	-
Critical Hdwy Stg 2	5.88	-	-	-	-	-
Follow-up Hdwy	3.54	3.34	2.2	-	-	-
Pot Cap-1 Maneuver	60	406	537	-	-	-
Stage 1	222	-	-	-	-	-
Stage 2	493	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	56	406	537	-	-	-
Mov Cap-2 Maneuver	158	-	-	-	-	-
Stage 1	222	-	-	-	-	-
Stage 2	456	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.8	0.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	537	-	158	406	-	-
HCM Lane V/C Ratio	0.074	-	0.158	0.089	-	-
HCM Control Delay (s)	12.2	-	32	14.7	-	-
HCM Lane LOS	B	-	D	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.5	0.3	-	-

Lanes, Volumes, Timings

8: SR 135/S. Willow Ave & W. Jackson St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	310	330	150	460	130	345	650	120	185	750	100
Future Volume (vph)	105	310	330	150	460	130	345	650	120	185	750	100
Satd. Flow (prot)	1805	3574	1568	1787	3473	0	1787	3453	0	1770	3502	0
Flt Permitted	0.221			0.387			0.127			0.237		
Satd. Flow (perm)	420	3574	1568	728	3473	0	239	3453	0	441	3502	0
Satd. Flow (RTOR)			345		46			29			17	
Lane Group Flow (vph)	112	383	379	160	674	0	371	852	0	231	931	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4			2			6		
Total Split (s)	12.0	24.0	24.0	12.0	24.0		22.0	37.0		17.0	32.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5		5.5	6.6		5.5	6.6	
Act Effct Green (s)	23.5	17.0	17.0	24.9	19.7		49.4	32.6		39.0	27.4	
Actuated g/C Ratio	0.26	0.19	0.19	0.28	0.22		0.55	0.36		0.43	0.30	
v/c Ratio	0.54	0.57	0.66	0.57	0.85		0.92	0.67		0.67	0.87	
Control Delay	31.7	36.4	11.4	32.0	43.7		51.9	27.1		31.2	30.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	31.7	36.4	11.4	32.0	43.7		51.9	27.1		31.2	30.2	
LOS	C	D	B	C	D		D	C		C	C	
Approach Delay		24.9			41.5			34.6			30.4	
Approach LOS		C			D			C			C	
Queue Length 50th (ft)	44	102	16	65	185		153	213		50	286	
Queue Length 95th (ft)	84	131	87	115	#287		#319	282		102	#395	
Internal Link Dist (ft)		1238			1065			2054			612	
Turn Bay Length (ft)	225		175	150			150			150		
Base Capacity (vph)	209	734	596	280	794		415	1270		366	1076	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.54	0.52	0.64	0.57	0.85		0.89	0.67		0.63	0.87	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 27 (30%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 32.8

Intersection LOS: C

Intersection Capacity Utilization 85.0%

ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: SR 135/S. Willow Ave & W. Jackson St

			
Ø1	Ø2 (R)	Ø3	Ø4
17 s	37 s	12 s	24 s
			
Ø5	Ø6 (R)	Ø7	Ø8
22 s	32 s	12 s	24 s

Lanes, Volumes, Timings

9: SR 135/S. Willow Ave & W. Stevens St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	75	30	100	105	70	30	800	80	60	970	35
Future Volume (vph)	35	75	30	100	105	70	30	800	80	60	970	35
Satd. Flow (prot)	0	1811	0	1787	1785	0	1805	3524	0	1787	3554	0
Flt Permitted		0.989		0.950			0.166			0.200		
Satd. Flow (perm)	0	1811	0	1787	1785	0	315	3524	0	376	3554	0
Satd. Flow (RTOR)		18			31			14			5	
Lane Group Flow (vph)	0	179	0	141	200	0	36	896	0	72	1050	0
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	21.0	21.0		23.0	23.0		11.0	35.0		11.0	35.0	
Total Lost Time (s)		4.8		4.8	4.8		4.5	4.8		4.5	4.8	
Act Effct Green (s)		12.8		13.6	13.6		45.4	39.9		47.2	42.6	
Actuated g/C Ratio		0.14		0.15	0.15		0.50	0.44		0.52	0.47	
v/c Ratio		0.66		0.52	0.68		0.14	0.57		0.24	0.62	
Control Delay		44.0		41.5	41.6		8.5	19.7		7.5	15.1	
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		44.0		41.5	41.6		8.5	19.7		7.5	15.1	
LOS		D		D	D		A	B		A	B	
Approach Delay		44.0			41.5			19.3			14.6	
Approach LOS		D			D			B			B	
Queue Length 50th (ft)		87		75	91		7	220		7	289	
Queue Length 95th (ft)		133		96	143		m16	m300		m11	#423	
Internal Link Dist (ft)		761			793			608			1346	
Turn Bay Length (ft)				75			100			150		
Base Capacity (vph)		340		361	385		268	1571		306	1683	
Starvation Cap Reductn		0		0	0		0	0		0	0	
Spillback Cap Reductn		0		0	0		0	0		0	0	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.53		0.39	0.52		0.13	0.57		0.24	0.62	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 84 (93%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 21.9

Intersection LOS: C

Intersection Capacity Utilization 66.2%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: SR 135/S. Willow Ave & W. Stevens St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	35 s	23 s	21 s
			
Ø5	Ø6 (R)		
11 s	35 s		

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

10: SR 135/S. Willow Ave & US 70/W. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	210	100	190	255	125	120	695	100	95	850	20
Future Volume (vph)	105	210	100	190	255	125	120	695	100	95	850	20
Satd. Flow (prot)	1787	1758	0	1805	1791	0	1787	3511	0	1685	3323	0
Flt Permitted	0.165			0.252			0.139			0.163		
Satd. Flow (perm)	310	1758	0	479	1791	0	261	3511	0	289	3323	0
Satd. Flow (RTOR)		29			22			19			3	
Lane Group Flow (vph)	140	367	0	229	468	0	136	876	0	128	928	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	31.0		13.0	32.0		12.0	34.0		12.0	34.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	31.8	24.2		34.5	25.5		38.9	31.5		38.8	31.4	
Actuated g/C Ratio	0.35	0.27		0.38	0.28		0.43	0.35		0.43	0.35	
v/c Ratio	0.60	0.74		0.73	0.89		0.57	0.71		0.54	0.80	
Control Delay	27.5	37.2		33.1	50.3		20.5	25.7		17.5	31.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	27.5	37.2		33.1	50.3		20.5	25.7		17.5	31.9	
LOS	C	D		C	D		C	C		B	C	
Approach Delay		34.5			44.7			25.0			30.2	
Approach LOS		C			D			C			C	
Queue Length 50th (ft)	47	169		81	236		40	260		49	281	
Queue Length 95th (ft)	69	251		#122	274		51	326		51	#367	
Internal Link Dist (ft)		2100			700			1346			1053	
Turn Bay Length (ft)	125			125			175			150		
Base Capacity (vph)	236	538		314	562		243	1240		243	1162	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.59	0.68		0.73	0.83		0.56	0.71		0.53	0.80	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 40 (44%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 32.3

Intersection LOS: C

Intersection Capacity Utilization 73.5%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 10: SR 135/S. Willow Ave & US 70/W. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	34 s	12 s	32 s
			
Ø5	Ø6 (R)	Ø7	Ø8
12 s	34 s	13 s	31 s

PM Peak HR
WSP

Synchro 9 Report
Page 13

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	105	75	140	180	70	95	790	45	65	780	75
Future Volume (vph)	80	105	75	140	180	70	95	790	45	65	780	75
Satd. Flow (prot)	1805	1763	0	1805	1822	0	1668	3327	0	1620	3283	0
Flt Permitted	0.406			0.344			0.175			0.209		
Satd. Flow (perm)	771	1763	0	654	1822	0	307	3327	0	356	3283	0
Satd. Flow (RTOR)		42			21			9			16	
Lane Group Flow (vph)	84	211	0	173	325	0	116	909	0	65	939	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	11.0	24.0		17.0	30.0		13.0	38.0		11.0	36.0	
Total Lost Time (s)	4.5	5.2		4.5	5.2		4.5	4.8		4.5	4.8	
Act Effct Green (s)	22.2	14.9		30.7	21.3		47.6	40.4		45.1	39.1	
Actuated g/C Ratio	0.25	0.17		0.34	0.24		0.53	0.45		0.50	0.43	
v/c Ratio	0.32	0.65		0.48	0.73		0.41	0.61		0.24	0.65	
Control Delay	22.1	36.7		24.6	39.5		10.5	16.9		12.2	20.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	22.1	36.7		24.6	39.5		10.5	16.9		12.2	20.3	
LOS	C	D		C	D		B	B		B	C	
Approach Delay		32.6			34.4			16.2			19.7	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)	32	90		68	163		12	265		11	210	
Queue Length 95th (ft)	m58	m154		96	192		m17	m335		m35	266	
Internal Link Dist (ft)		1729			1357			1053			841	
Turn Bay Length (ft)	75						150			50		
Base Capacity (vph)	268	401		385	517		295	1497		276	1436	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.31	0.53		0.45	0.63		0.39	0.61		0.24	0.65	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 81 (90%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 22.4

Intersection LOS: C

Intersection Capacity Utilization 63.8%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	38 s	11 s	30 s
			
Ø5	Ø6 (R)	Ø7	Ø8
13 s	36 s	17 s	24 s

Lanes, Volumes, Timings
12: SR 135/N. Willow Ave & W. 3rd St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	5	15	10	5	20	15	915	15	10	895	20
Future Volume (vph)	5	5	15	10	5	20	15	915	15	10	895	20
Satd. Flow (prot)	0	1750	0	0	1723	0	0	3356	0	0	3321	0
Flt Permitted		0.988			0.989			0.999			0.999	
Satd. Flow (perm)	0	1750	0	0	1723	0	0	3356	0	0	3321	0
Lane Group Flow (vph)	0	32	0	0	52	0	0	1003	0	0	1024	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 46.4%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
12: SR 135/N. Willow Ave & W. 3rd St

2017 Optimized PM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	5	15	10	5	20	15	915	15	10	895	20
Future Vol, veh/h	5	5	15	10	5	20	15	915	15	10	895	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	63	94	83	63	63	75	95	75	83	91	71
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	1	0
Mvmt Flow	8	8	16	12	8	32	20	963	20	12	984	28

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1548	2045	506	1533	2049	492	1012	0	0	983	0	0
Stage 1	1022	1022	-	1013	1013	-	-	-	-	-	-	-
Stage 2	526	1023	-	520	1036	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	79	57	517	81	56	528	693	-	-	711	-	-
Stage 1	256	316	-	260	319	-	-	-	-	-	-	-
Stage 2	508	316	-	512	311	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	60	51	517	64	50	528	693	-	-	711	-	-
Mov Cap-2 Maneuver	60	51	-	64	50	-	-	-	-	-	-	-
Stage 1	240	304	-	243	299	-	-	-	-	-	-	-
Stage 2	435	296	-	464	299	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	57	51.6	0.5	0.3
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	693	-	-	100	127	711	-	-
HCM Lane V/C Ratio	0.029	-	-	0.318	0.407	0.017	-	-
HCM Control Delay (s)	10.3	0.3	-	57	51.6	10.2	0.2	-
HCM Lane LOS	B	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.2	1.7	0.1	-	-

Lanes, Volumes, Timings

13: SR 135/N. Willow Ave & W. 4th St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	10	20	20	5	25	15	885	40	10	875	15
Future Volume (vph)	10	10	20	20	5	25	15	885	40	10	875	15
Satd. Flow (prot)	0	1740	0	0	1704	0	0	3335	0	0	3321	0
Flt Permitted		0.985			0.979			0.999			0.999	
Satd. Flow (perm)	0	1740	0	0	1704	0	0	3335	0	0	3321	0
Lane Group Flow (vph)	0	54	0	0	65	0	0	1032	0	0	1027	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 47.9%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
13: SR 135/N. Willow Ave & W. 4th St

2017 Optimized PM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	10	20	20	5	25	15	885	40	10	875	15
Future Vol, veh/h	10	10	20	20	5	25	15	885	40	10	875	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	100	71	71	100	78	63	93	71	50	89	63
Heavy Vehicles, %	0	0	0	0	0	4	0	0	2	0	1	0
Mvmt Flow	16	10	28	28	5	32	24	952	56	20	983	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1561	2091	503	1564	2074	504	1007	0	0	1008	0	0
Stage 1	1035	1035	-	1027	1027	-	-	-	-	-	-	-
Stage 2	526	1056	-	537	1047	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.98	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.34	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	77	53	519	77	54	508	696	-	-	695	-	-
Stage 1	252	312	-	255	314	-	-	-	-	-	-	-
Stage 2	508	305	-	501	308	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	59	46	519	54	46	508	696	-	-	695	-	-
Mov Cap-2 Maneuver	59	46	-	54	46	-	-	-	-	-	-	-
Stage 1	232	291	-	235	289	-	-	-	-	-	-	-
Stage 2	431	281	-	427	288	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	77	103.7	0.6	0.5
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	696	-	-	100	94	695	-	-
HCM Lane V/C Ratio	0.034	-	-	0.54	0.694	0.029	-	-
HCM Control Delay (s)	10.4	0.4	-	77	103.7	10.3	0.3	-
HCM Lane LOS	B	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	2.5	3.5	0.1	-	-

Lanes, Volumes, Timings
14: SR 135/N. Willow Ave & W. 7th St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	65	25	220	105	130	10	800	80	50	620	20
Future Volume (vph)	40	65	25	220	105	130	10	800	80	50	620	20
Satd. Flow (prot)	1770	1754	0	1805	1727	0	0	3315	0	0	3272	0
Flt Permitted	0.590			0.492				0.936			0.774	
Satd. Flow (perm)	1099	1754	0	935	1727	0	0	3106	0	0	2542	0
Satd. Flow (RTOR)		29			77			15			6	
Lane Group Flow (vph)	48	124	0	256	275	0	0	945	0	0	801	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	13.0	27.0		16.0	30.0		36.0	36.0		11.0	47.0	
Total Lost Time (s)	4.5	5.3		4.5	5.3			5.3			5.3	
Act Effct Green (s)	19.3	11.4		30.6	22.8			49.3			49.3	
Actuated g/C Ratio	0.21	0.13		0.34	0.25			0.55			0.55	
v/c Ratio	0.17	0.50		0.56	0.56			0.55			0.57	
Control Delay	19.9	33.5		26.9	25.9			7.5			17.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	19.9	33.5		26.9	25.9			7.5			17.9	
LOS	B	C		C	C			A			B	
Approach Delay		29.7			26.4			7.5			17.9	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)	18	51		109	103			60			144	
Queue Length 95th (ft)	35	81		149	176			198			257	
Internal Link Dist (ft)		675			1002			1211			498	
Turn Bay Length (ft)	25			75								
Base Capacity (vph)	316	444		455	542			1706			1394	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.15	0.28		0.56	0.51			0.55			0.57	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 44 (49%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 16.5

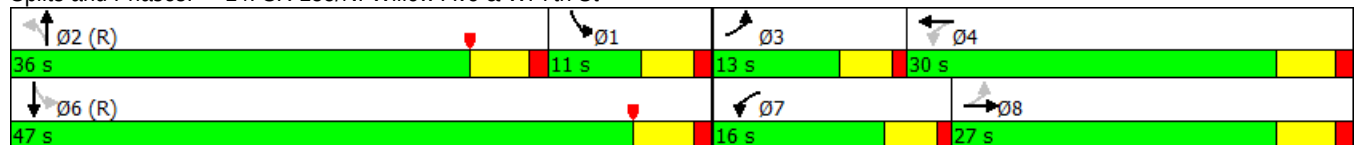
Intersection Capacity Utilization 79.7%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service D

Splits and Phases: 14: SR 135/N. Willow Ave & W. 7th St



Lanes, Volumes, Timings
15: SR 135/N. Willow Ave & W. 9th St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	5	75	5	10	5	75	900	5	5	605	70
Future Volume (vph)	35	5	75	5	10	5	75	900	5	5	605	70
Satd. Flow (prot)	0	1654	0	0	1791	0	0	3349	0	0	3283	0
Flt Permitted		0.984			0.989			0.995				
Satd. Flow (perm)	0	1654	0	0	1791	0	0	3349	0	0	3283	0
Lane Group Flow (vph)	0	137	0	0	23	0	0	1076	0	0	784	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 66.1%

Analysis Period (min) 15

ICU Level of Service C

HCM 2010 TWSC
15: SR 135/N. Willow Ave & W. 9th St

2017 Optimized PM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 10.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	5	75	5	10	5	75	900	5	5	605	70
Future Vol, veh/h	35	5	75	5	10	5	75	900	5	5	605	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	100	85	100	100	63	75	93	63	100	86	92
Heavy Vehicles, %	0	0	5	0	0	0	0	0	0	0	1	2
Mvmt Flow	44	5	88	5	10	8	100	968	8	5	703	76

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1441	1928	390	1536	1962	488	780	0	0	976	0	0
Stage 1	752	752	-	1172	1172	-	-	-	-	-	-	-
Stage 2	689	1176	-	364	790	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	7	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.35	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	95	67	600	81	64	531	846	-	-	715	-	-
Stage 1	373	421	-	208	269	-	-	-	-	-	-	-
Stage 2	407	267	-	633	404	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	63	49	600	51	47	531	846	-	-	715	-	-
Mov Cap-2 Maneuver	63	49	-	51	47	-	-	-	-	-	-	-
Stage 1	276	416	-	154	199	-	-	-	-	-	-	-
Stage 2	282	198	-	526	399	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	120.9	79.7	1.9	0.2
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	846	-	-	145	70	715	-	-
HCM Lane V/C Ratio	0.118	-	-	0.945	0.328	0.007	-	-
HCM Control Delay (s)	9.8	1.1	-	120.9	79.7	10.1	0.1	-
HCM Lane LOS	A	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.4	-	-	6.7	1.2	0	-	-

Lanes, Volumes, Timings
16: SR 135/N. Willow Ave & University Dr

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	25	15	100	20	65	5	850	75	10	565	15
Future Volume (vph)	25	25	15	100	20	65	5	850	75	10	565	15
Satd. Flow (prot)	1736	1678	0	1787	1628	0	0	3329	0	0	3315	0
Flt Permitted	0.816			0.426				0.953			0.921	
Satd. Flow (perm)	1491	1678	0	801	1628	0	0	3172	0	0	3056	0
Satd. Flow (RTOR)		16			108			14			6	
Lane Group Flow (vph)	32	44	0	152	144	0	0	1019	0	0	648	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	3	8		7	4			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	11.0	30.0		11.0	30.0		49.0	49.0		49.0	49.0	
Total Lost Time (s)	4.5	5.5		4.5	5.5			4.9			4.9	
Act Effct Green (s)	12.3	7.3		19.9	11.8			60.7			60.7	
Actuated g/C Ratio	0.14	0.08		0.22	0.13			0.67			0.67	
v/c Ratio	0.14	0.29		0.50	0.47			0.48			0.31	
Control Delay	25.6	32.4		33.1	16.5			4.8			6.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	25.6	32.4		33.1	16.5			4.8			6.6	
LOS	C	C		C	B			A			A	
Approach Delay		29.5			25.0			4.8			6.6	
Approach LOS		C			C			A			A	
Queue Length 50th (ft)	14	15		69	18			52			98	
Queue Length 95th (ft)	28	46		78	21			76			124	
Internal Link Dist (ft)		789			874			862			1102	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	226	468		305	521			2142			2061	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.14	0.09		0.50	0.28			0.48			0.31	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 9 (10%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 9.2

Intersection Capacity Utilization 50.3%

Analysis Period (min) 15

Intersection LOS: A

ICU Level of Service A

Splits and Phases: 16: SR 135/N. Willow Ave & University Dr

 Ø2 (R)	 Ø3	 Ø4
49 s	11 s	30 s
 Ø6 (R)	 Ø7	 Ø8
49 s	11 s	30 s

Lanes, Volumes, Timings
17: SR 135/N. Willow Ave & W. 12th St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	210	135	195	305	115	260	465	225	85	250	45
Future Volume (vph)	85	210	135	195	305	115	260	465	225	85	250	45
Satd. Flow (prot)	1752	1845	1615	1770	3420	0	1685	3176	0	1668	3288	0
Flt Permitted	0.422			0.353			0.506			0.287		
Satd. Flow (perm)	778	1845	1615	658	3420	0	897	3176	0	504	3288	0
Satd. Flow (RTOR)			148		63			106			26	
Lane Group Flow (vph)	96	244	148	212	475	0	271	726	0	123	327	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8			6			2		
Total Split (s)	11.0	32.0	32.0	11.0	32.0		11.0	34.0		13.0	36.0	
Total Lost Time (s)	4.5	5.5	5.5	4.5	5.5		4.5	5.9		4.5	5.9	
Act Effct Green (s)	26.0	17.3	17.3	30.6	21.6		46.2	33.7		41.4	31.2	
Actuated g/C Ratio	0.29	0.19	0.19	0.34	0.24		0.51	0.37		0.46	0.35	
v/c Ratio	0.31	0.69	0.34	0.61	0.55		0.48	0.58		0.36	0.28	
Control Delay	21.3	43.5	7.2	30.3	28.6		11.8	13.9		14.8	21.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.3	43.5	7.2	30.3	28.6		11.8	13.9		14.8	21.3	
LOS	C	D	A	C	C		B	B		B	C	
Approach Delay		28.1			29.1			13.4			19.5	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)	34	130	0	82	108		33	26		35	70	
Queue Length 95th (ft)	65	180	45	#146	149		100	127		49	99	
Internal Link Dist (ft)		1178			1081			1102			1094	
Turn Bay Length (ft)	100			220			100			220		
Base Capacity (vph)	309	543	579	345	1051		559	1254		357	1209	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.31	0.45	0.26	0.61	0.45		0.48	0.58		0.34	0.27	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 83 (92%), Referenced to phase 2:SBTL and 6:NBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 21.3

Intersection LOS: C

Intersection Capacity Utilization 63.9%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 17: SR 135/N. Willow Ave & W. 12th St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	36 s	11 s	32 s
			
Ø5	Ø6 (R)	Ø7	Ø8
13 s	34 s	11 s	32 s

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	225	0	15	10	0	25	20	680	5	20	920	280
Future Volume (vph)	225	0	15	10	0	25	20	680	5	20	920	280
Satd. Flow (prot)	1736	1615	0	1805	1615	0	1805	3539	1615	1687	3505	1599
Flt Permitted	0.430			0.833			0.193			0.288		
Satd. Flow (perm)	786	1615	0	1583	1615	0	367	3539	1615	511	3505	1599
Satd. Flow (RTOR)		325			266				200			200
Lane Group Flow (vph)	237	16	0	16	36	0	32	829	5	20	1022	354
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2		2	6		6
Total Split (s)	25.0	24.0		13.0	12.0		11.0	42.0	42.0	11.0	42.0	42.0
Total Lost Time (s)	4.5	6.0		4.5	6.0		4.5	6.0	6.0	4.5	6.0	6.0
Act Effct Green (s)	22.7	18.9		10.8	6.0		56.6	52.4	52.4	55.5	50.3	50.3
Actuated g/C Ratio	0.25	0.21		0.12	0.07		0.63	0.58	0.58	0.62	0.56	0.56
v/c Ratio	0.66	0.03		0.08	0.10		0.10	0.40	0.00	0.05	0.52	0.36
Control Delay	36.2	0.1		22.8	0.6		9.2	14.1	0.0	2.6	5.6	1.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.1	0.2
Total Delay	36.2	0.1		22.8	0.6		9.2	14.1	0.0	2.6	5.6	1.3
LOS	D	A		C	A		A	B	A	A	A	A
Approach Delay		34.0			7.4			13.8			4.5	
Approach LOS		C			A			B			A	
Queue Length 50th (ft)	108	0		6	0		7	126	0	1	30	0
Queue Length 95th (ft)	161	0		14	0		15	220	0	m2	92	1
Internal Link Dist (ft)		573			734			200			263	
Turn Bay Length (ft)	200			25			175		150	100		50
Base Capacity (vph)	444	639		249	355		334	2062	1024	400	1957	981
Starvation Cap Reductn	0	0		0	0		0	0	0	0	159	164
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.03		0.06	0.10		0.10	0.40	0.00	0.05	0.57	0.43

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 64 (71%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 10.6

Intersection LOS: B

Intersection Capacity Utilization 54.6%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	42 s	25 s	12 s
			
Ø5	Ø6 (R)	Ø7	Ø8
11 s	42 s	13 s	24 s

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	225	0	170	0	0	0	0	790	140	290	1050	0
Future Volume (vph)	225	0	170	0	0	0	0	790	140	290	1050	0
Satd. Flow (prot)	1736	0	1538	0	0	0	0	3574	1599	1787	3539	0
Flt Permitted	0.950									0.199		
Satd. Flow (perm)	1736	0	1538	0	0	0	0	3574	1599	374	3539	0
Satd. Flow (RTOR)			207						175			
Lane Group Flow (vph)	256	0	207	0	0	0	0	919	175	349	1154	0
Turn Type	Prot		Perm					NA	Perm	pm+pt	NA	
Protected Phases	1							3		2	3	
Permitted Phases			1						3	3		
Total Split (s)	25.0		25.0					44.0	44.0	21.0	44.0	
Total Lost Time (s)	5.4		5.4					4.6	4.6	4.5	4.6	
Act Effct Green (s)	17.3		17.3					39.2	39.2	58.3	39.2	
Actuated g/C Ratio	0.19		0.19					0.44	0.44	0.65	0.44	
v/c Ratio	0.77		0.45					0.59	0.22	0.65	0.75	
Control Delay	50.2		7.9					18.0	1.9	27.0	15.0	
Queue Delay	0.0		0.0					0.3	0.0	0.0	0.2	
Total Delay	50.2		7.9					18.4	1.9	27.0	15.2	
LOS	D		A					B	A	C	B	
Approach Delay		31.3						15.7			17.9	
Approach LOS		C						B			B	
Queue Length 50th (ft)	137		0					218	3	114	53	
Queue Length 95th (ft)	211		41					119	6	181	245	
Internal Link Dist (ft)		458			312			263			407	
Turn Bay Length (ft)			200							250		
Base Capacity (vph)	378		496					1564	798	540	1549	
Starvation Cap Reductn	0		0					207	0	0	54	
Spillback Cap Reductn	0		2					0	0	0	38	
Storage Cap Reductn	0		0					0	0	0	0	
Reduced v/c Ratio	0.68		0.42					0.68	0.22	0.65	0.77	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 57 (63%), Referenced to phase 3:NBSB, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 19.2

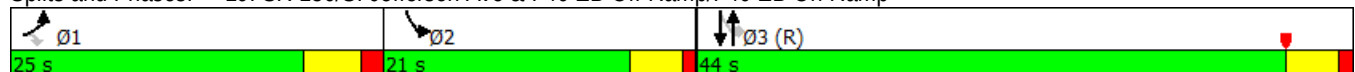
Intersection Capacity Utilization 66.1%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service C

Splits and Phases: 19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp



Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	85	0	245	100	910	0	0	1250	205
Future Volume (vph)	0	0	0	85	0	245	100	910	0	0	1250	205
Satd. Flow (prot)	0	0	0	1656	0	2707	1719	3574	0	0	3574	1599
Flt Permitted				0.950			0.136					
Satd. Flow (perm)	0	0	0	1656	0	2707	246	3574	0	0	3574	1599
Satd. Flow (RTOR)						299						225
Lane Group Flow (vph)	0	0	0	96	0	299	116	968	0	0	1330	225
Turn Type				Prot		Perm	pm+pt	NA			NA	Perm
Protected Phases				1			2	3			3	
Permitted Phases						1	3	2				3
Total Split (s)				18.0		18.0	17.0	55.0			55.0	55.0
Total Lost Time (s)				4.9		4.9	4.5	4.5			4.5	4.5
Act Effct Green (s)				12.3		12.3	64.7	68.3			55.1	55.1
Actuated g/C Ratio				0.14		0.14	0.72	0.76			0.61	0.61
v/c Ratio				0.43		0.48	0.31	0.36			0.61	0.21
Control Delay				42.0		7.2	9.6	3.2			6.9	0.5
Queue Delay				0.0		0.1	0.0	0.0			0.3	0.4
Total Delay				42.0		7.3	9.6	3.2			7.2	0.9
LOS				D		A	A	A			A	A
Approach Delay					15.7			3.9			6.3	
Approach LOS					B			A			A	
Queue Length 50th (ft)				51		0	10	63			95	0
Queue Length 95th (ft)				97		27	m49	114			125	m2
Internal Link Dist (ft)		382			483			407			133	
Turn Bay Length (ft)				275		275	250					
Base Capacity (vph)				241		649	382	2714			2189	1066
Starvation Cap Reductn				0		0	0	350			304	451
Spillback Cap Reductn				0		28	0	344			0	0
Storage Cap Reductn				0		0	0	0			0	0
Reduced v/c Ratio				0.40		0.48	0.30	0.41			0.71	0.37

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 59 (66%), Referenced to phase 3:NBSB, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 6.7

Intersection LOS: A

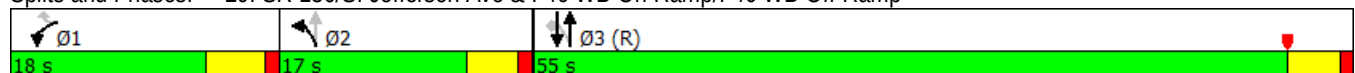
Intersection Capacity Utilization 66.1%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp



Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	15	365	90	20	15	170	940	60	5	1005	60
Future Volume (vph)	75	15	365	90	20	15	170	940	60	5	1005	60
Satd. Flow (prot)	0	1794	1599	1770	1780	0	1787	3539	1568	1805	5125	0
Flt Permitted		0.960		0.950			0.139			0.241		
Satd. Flow (perm)	0	1794	1599	1770	1780	0	261	3539	1568	458	5125	0
Satd. Flow (RTOR)			317		20				139		14	
Lane Group Flow (vph)	0	124	424	96	48	0	193	1000	64	12	1161	0
Turn Type	Split	NA	Perm	Split	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			3				2		2	6		
Total Split (s)	22.0	22.0	22.0	17.0	17.0		15.0	36.0	36.0	15.0	36.0	
Total Lost Time (s)		5.0	5.0	5.0	5.0		4.5	4.5	4.5	4.5	4.5	
Act Effct Green (s)		14.4	14.4	12.0	12.0		51.7	49.6	49.6	47.7	37.7	
Actuated g/C Ratio		0.16	0.16	0.13	0.13		0.57	0.55	0.55	0.53	0.42	
v/c Ratio		0.43	0.81	0.41	0.19		0.60	0.51	0.07	0.03	0.54	
Control Delay		38.4	23.2	41.5	25.4		28.0	15.4	1.6	6.0	19.7	
Queue Delay		0.0	0.2	0.0	0.0		0.1	0.5	0.0	0.0	0.0	
Total Delay		38.4	23.4	41.5	25.4		28.1	15.9	1.6	6.0	19.7	
LOS		D	C	D	C		C	B	A	A	B	
Approach Delay		26.8			36.1			17.0			19.6	
Approach LOS		C			D			B			B	
Queue Length 50th (ft)		65	56	51	14		72	127	0	2	233	
Queue Length 95th (ft)		93	145	99	34		139	344	7	m3	269	
Internal Link Dist (ft)		530			587			133			582	
Turn Bay Length (ft)			100	25			50			100		
Base Capacity (vph)		338	559	236	254		327	1948	925	402	2152	
Starvation Cap Reductn		0	0	0	0		5	485	0	0	0	
Spillback Cap Reductn		0	6	0	0		0	0	0	0	0	
Storage Cap Reductn		0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio		0.37	0.77	0.41	0.19		0.60	0.68	0.07	0.03	0.54	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 53 (59%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 20.6

Intersection LOS: C

Intersection Capacity Utilization 65.4%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	36 s	22 s	17 s
			
Ø5	Ø6 (R)		
15 s	36 s		

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	330	190	230	380	130	180	590	215	110	730	200
Future Volume (vph)	145	330	190	230	380	130	180	590	215	110	730	200
Satd. Flow (prot)	1770	1845	1599	1805	3480	0	1770	3539	1615	1805	3464	0
Flt Permitted	0.241			0.259			0.137			0.315		
Satd. Flow (perm)	449	1845	1599	492	3480	0	255	3539	1615	598	3464	0
Satd. Flow (RTOR)			200		46				229		39	
Lane Group Flow (vph)	165	337	200	240	582	0	225	615	229	128	953	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4			2		2	6		
Total Split (s)	15.0	29.0	29.0	15.0	29.0		15.0	31.0	31.0	15.0	31.0	
Total Lost Time (s)	4.5	5.0	5.0	4.5	5.0		4.5	5.5	5.5	4.5	5.5	
Act Effct Green (s)	31.4	20.6	20.6	31.6	20.7		41.1	29.3	29.3	39.8	28.6	
Actuated g/C Ratio	0.35	0.23	0.23	0.35	0.23		0.46	0.33	0.33	0.44	0.32	
v/c Ratio	0.54	0.80	0.38	0.74	0.70		0.75	0.53	0.34	0.32	0.85	
Control Delay	23.9	46.8	6.3	33.6	33.4		30.5	25.9	11.2	7.0	24.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	23.9	46.8	6.3	33.6	33.4		30.5	25.9	11.2	7.0	24.0	
LOS	C	D	A	C	C		C	C	B	A	C	
Approach Delay		29.9			33.5			23.7			21.9	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	58	177	0	89	144		62	185	37	8	278	
Queue Length 95th (ft)	96	266	50	#151	183		#136	245	148	m11	#398	
Internal Link Dist (ft)		1125			846			582			1693	
Turn Bay Length (ft)	175			125			125			125		
Base Capacity (vph)	311	492	573	326	961		301	1151	679	407	1127	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.53	0.68	0.35	0.74	0.61		0.75	0.53	0.34	0.31	0.85	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow, Master Intersection

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 26.6

Intersection LOS: C

Intersection Capacity Utilization 82.9%

ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	31 s	15 s	29 s
			
Ø5	Ø6 (R)	Ø7	Ø8
15 s	31 s	15 s	29 s

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
23: SR 136/S. Jefferson Ave & E. Veterans Dr

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	185	55	130	215	110	50	675	110	80	900	80
Future Volume (vph)	60	185	55	130	215	110	50	675	110	80	900	80
Satd. Flow (prot)	1805	1820	0	1752	1754	0	1805	3504	0	1752	3549	0
Flt Permitted	0.218			0.332			0.140			0.145		
Satd. Flow (perm)	414	1820	0	612	1754	0	266	3504	0	267	3549	0
Satd. Flow (RTOR)		16			30			20			14	
Lane Group Flow (vph)	72	291	0	140	408	0	52	838	0	92	1054	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	18.0	25.0		19.0	26.0		17.0	29.0		17.0	29.0	
Total Lost Time (s)	4.5	5.0		4.5	5.0		4.5	4.8		4.5	4.8	
Act Effct Green (s)	33.2	20.7		33.3	23.5		40.2	30.3		41.1	33.6	
Actuated g/C Ratio	0.37	0.23		0.37	0.26		0.45	0.34		0.46	0.37	
v/c Ratio	0.21	0.68		0.38	0.85		0.16	0.70		0.29	0.79	
Control Delay	16.7	37.9		19.2	48.1		11.0	20.3		20.5	30.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	16.7	37.9		19.2	48.1		11.0	20.3		20.5	30.8	
LOS	B	D		B	D		B	C		C	C	
Approach Delay		33.7			40.7			19.8			30.0	
Approach LOS		C			D			B			C	
Queue Length 50th (ft)	23	137		47	209		10	88		21	~335	
Queue Length 95th (ft)	44	205		85	#325		m19	#124		m70	#454	
Internal Link Dist (ft)		1014			884			1693			283	
Turn Bay Length (ft)	150			150			150			125		
Base Capacity (vph)	368	463		425	481		333	1191		328	1332	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.20	0.63		0.33	0.85		0.16	0.70		0.28	0.79	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 37 (41%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 29.3

Intersection LOS: C

Intersection Capacity Utilization 81.1%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 23: SR 136/S. Jefferson Ave & E. Veterans Dr

			
Ø1	Ø2 (R)	Ø3	Ø4
17 s	29 s	18 s	26 s
			
Ø5	Ø6 (R)	Ø7	Ø8
17 s	29 s	19 s	25 s

Lanes, Volumes, Timings

24: SR 136/S. Jefferson Ave & Walmart Driveway

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	5	145	10	100	5	720	120	115	920	10
Future Volume (vph)	0	0	5	145	10	100	5	720	120	115	920	10
Satd. Flow (prot)	1900	1615	0	1805	1645	0	1805	3486	0	1787	3526	0
Flt Permitted				0.580			0.299			0.230		
Satd. Flow (perm)	1900	1615	0	1102	1645	0	568	3486	0	433	3526	0
Satd. Flow (RTOR)		409			104			21			2	
Lane Group Flow (vph)	0	16	0	173	116	0	5	859	0	128	959	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	17.0	27.0		17.0	27.0		17.0	29.0		17.0	29.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		12.0		15.6	15.6		60.9	48.9		64.5	62.1	
Actuated g/C Ratio		0.13		0.17	0.17		0.68	0.54		0.72	0.69	
v/c Ratio		0.03		0.60	0.31		0.01	0.45		0.26	0.39	
Control Delay		0.0		42.0	9.5		4.4	7.0		4.9	3.8	
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		0.0		42.0	9.5		4.4	7.0		4.9	3.8	
LOS		A		D	A		A	A		A	A	
Approach Delay					29.0			7.0			3.9	
Approach LOS					C			A			A	
Queue Length 50th (ft)		0		95	6		0	44		9	36	
Queue Length 95th (ft)		0		116	34		m1	m113		m27	118	
Internal Link Dist (ft)		175			382			47			1774	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		710		290	511		559	1903		498	2433	
Starvation Cap Reductn		0		0	0		0	0		0	0	
Spillback Cap Reductn		0		0	0		0	0		0	0	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.02		0.60	0.23		0.01	0.45		0.26	0.39	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 45 (50%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 8.3

Intersection LOS: A

Intersection Capacity Utilization 61.7%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 24: SR 136/S. Jefferson Ave & Walmart Driveway

					
Ø1	Ø2 (R)		Ø3		Ø4
17 s	29 s		17 s		27 s
					
Ø5	Ø6 (R)		Ø7		Ø8
17 s	29 s		17 s		27 s

Lanes, Volumes, Timings
25: SR 136/S. Jefferson Ave & Commerce Ave

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	10	55	75	5	40	45	890	20	25	1000	25
Future Volume (vph)	75	10	55	75	5	40	45	890	20	25	1000	25
Satd. Flow (prot)	1805	1666	0	1752	1605	0	1805	3596	0	1719	3596	0
Flt Permitted	0.711			0.400			0.147			0.242		
Satd. Flow (perm)	1351	1666	0	738	1605	0	279	3596	0	438	3596	0
Satd. Flow (RTOR)		72			63			4			3	
Lane Group Flow (vph)	112	88	0	163	71	0	60	946	0	40	1177	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	11.0	15.0		19.0	23.0		11.0	45.0		11.0	45.0	
Total Lost Time (s)	4.5	5.3		4.5	5.3		4.5	4.8		4.5	4.8	
Act Effct Green (s)	14.2	7.2		21.6	11.7		56.1	51.7		54.9	49.5	
Actuated g/C Ratio	0.16	0.08		0.24	0.13		0.62	0.57		0.61	0.55	
v/c Ratio	0.45	0.44		0.52	0.27		0.21	0.46		0.11	0.60	
Control Delay	31.7	20.5		32.2	13.0		4.7	6.1		2.5	9.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	31.7	20.5		32.2	13.0		4.7	6.1		2.5	9.4	
LOS	C	C		C	B		A	A		A	A	
Approach Delay		26.8			26.4			6.1			9.1	
Approach LOS		C			C			A			A	
Queue Length 50th (ft)	50	9		75	4		4	98		2	52	
Queue Length 95th (ft)	62	24		56	17		7	119		m3	357	
Internal Link Dist (ft)		193			738			1774			1034	
Turn Bay Length (ft)				100			125			125		
Base Capacity (vph)	251	243		356	366		287	2068		361	1977	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.45	0.36		0.46	0.19		0.21	0.46		0.11	0.60	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 5 (6%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 10.8

Intersection LOS: B

Intersection Capacity Utilization 56.4%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 25: SR 136/S. Jefferson Ave & Commerce Ave

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	45 s	11 s	23 s
			
Ø5	Ø6 (R)	Ø7	Ø8
11 s	45 s	19 s	15 s

Lanes, Volumes, Timings

26: SR 136/S. Jefferson Ave & E. Jackson St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	170	260	280	150	15	365	480	180	25	590	55
Future Volume (vph)	65	170	260	280	150	15	365	480	180	25	590	55
Satd. Flow (prot)	1787	1863	1599	3502	1855	0	1805	3610	1599	1685	3329	0
Flt Permitted	0.630			0.950			0.170			0.443		
Satd. Flow (perm)	1185	1863	1599	3502	1855	0	323	3610	1599	786	3329	0
Satd. Flow (RTOR)			299		6				231		10	
Lane Group Flow (vph)	80	181	299	308	203	0	415	558	231	36	730	0
Turn Type	pm+pt	NA	Perm	Prot	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8				2		2	6		
Total Split (s)	11.0	20.0	20.0	18.0	27.0		26.0	41.0	41.0	11.0	26.0	
Total Lost Time (s)	4.5	5.4	5.4	4.5	5.4		4.5	5.3	5.3	4.5	5.3	
Act Effct Green (s)	20.0	12.7	12.7	12.3	20.7		50.6	43.2	43.2	33.9	26.8	
Actuated g/C Ratio	0.22	0.14	0.14	0.14	0.23		0.56	0.48	0.48	0.38	0.30	
v/c Ratio	0.26	0.69	0.62	0.65	0.47		0.86	0.32	0.26	0.10	0.73	
Control Delay	22.4	50.3	10.5	43.3	33.2		31.9	10.1	2.8	8.5	26.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	22.4	50.3	10.5	43.3	33.2		31.9	10.1	2.8	8.5	26.6	
LOS	C	D	B	D	C		C	B	A	A	C	
Approach Delay		25.0			39.3			16.2			25.8	
Approach LOS		C			D			B			C	
Queue Length 50th (ft)	30	98	0	85	97		127	74	11	6	217	
Queue Length 95th (ft)	53	165	61	127	144		#277	133	31	16	#320	
Internal Link Dist (ft)		578			301			1034			1031	
Turn Bay Length (ft)	100			175			150		500	180		
Base Capacity (vph)	308	302	509	525	454		535	1732	887	362	998	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.26	0.60	0.59	0.59	0.45		0.78	0.32	0.26	0.10	0.73	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 38 (42%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 24.1

Intersection LOS: C

Intersection Capacity Utilization 71.6%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 26: SR 136/S. Jefferson Ave & E. Jackson St

							
Ø1	Ø2 (R)			Ø3	Ø4		
11 s	41 s			11 s	27 s		
Ø5	Ø6 (R)			Ø7	Ø8		
26 s	26 s			18 s	20 s		

Lanes, Volumes, Timings
27: SR 136/S. Jefferson Ave & Foutch Dr

2017 Optimized PM Timing Plan

07/12/2017

							
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations							
Traffic Volume (vph)	115	20	10	545	610	0	
Future Volume (vph)	115	20	10	545	610	0	
Satd. Flow (prot)	1784	0	1452	3369	3369	0	
Flt Permitted	0.960		0.375				
Satd. Flow (perm)	1784	0	573	3369	3369	0	
Satd. Flow (RTOR)	10						
Lane Group Flow (vph)	175	0	12	580	670	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	3			1	1 2		2
Permitted Phases			1				
Total Split (s)	25.0		38.0	38.0			27.0
Total Lost Time (s)	5.6		5.0	5.0			
Act Effct Green (s)	17.3		34.1	34.1	62.1		
Actuated g/C Ratio	0.19		0.38	0.38	0.69		
v/c Ratio	0.50		0.06	0.45	0.29		
Control Delay	35.3		16.4	23.0	0.7		
Queue Delay	0.0		0.0	0.0	0.2		
Total Delay	35.3		16.4	23.0	0.9		
LOS	D		B	C	A		
Approach Delay	35.3			22.9	0.9		
Approach LOS	D			C	A		
Queue Length 50th (ft)	83		6	163	4		
Queue Length 95th (ft)	121		m20	221	5		
Internal Link Dist (ft)	70			1031	110		
Turn Bay Length (ft)			125				
Base Capacity (vph)	392		217	1277	2323		
Starvation Cap Reductn	0		0	0	819		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.45		0.06	0.45	0.45		

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 20 (22%), Referenced to phase 2:SBT and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 14.1

Intersection LOS: B

Intersection Capacity Utilization 33.3%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 27: SR 136/S. Jefferson Ave & Foutch Dr

#27 #28	#27 #28	#27 #28
 Ø1	 Ø2 (R)	 Ø3
38 s	27 s	25 s

Lanes, Volumes, Timings

28: SR 136/S. Jefferson Ave & E. Stevens St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	105	35	25	90	20	25	575	65	5	555	10
Future Volume (vph)	10	105	35	25	90	20	25	575	65	5	555	10
Satd. Flow (prot)	0	1824	0	0	1843	0	0	3298	0	0	3356	0
Flt Permitted		0.965			0.930			0.918			0.945	
Satd. Flow (perm)	0	1769	0	0	1728	0	0	3034	0	0	3174	0
Satd. Flow (RTOR)		18			10			29			2	
Lane Group Flow (vph)	0	172	0	0	171	0	0	753	0	0	637	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		2			2		3	1 3			1	
Permitted Phases	2			2			1 3			1		
Total Split (s)	27.0	27.0		27.0	27.0		25.0			38.0	38.0	
Total Lost Time (s)		5.3			5.3						5.0	
Act Effct Green (s)		22.6			22.6			52.1			34.1	
Actuated g/C Ratio		0.25			0.25			0.58			0.38	
v/c Ratio		0.38			0.39			0.41			0.53	
Control Delay		28.2			29.9			1.6			20.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		28.2			29.9			1.6			20.1	
LOS		C			C			A			C	
Approach Delay		28.2			29.9			1.6			20.1	
Approach LOS		C			C			A			C	
Queue Length 50th (ft)		73			77			11			110	
Queue Length 95th (ft)		132			115			5			m149	
Internal Link Dist (ft)		321			386			1			1911	
Turn Bay Length (ft)												
Base Capacity (vph)		458			442			1886			1204	
Starvation Cap Reductn		0			0			92			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.38			0.39			0.42			0.53	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 20 (22%), Referenced to phase 2: SBT and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 13.8

Intersection LOS: B

Intersection Capacity Utilization 59.2%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 28: SR 136/S. Jefferson Ave & E. Stevens St

#27 #28    Ø1	#27 #28    Ø2 (R)	#27 #28    Ø3
38 s	27 s	25 s

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	325	105	80	290	10	145	235	125	20	260	35
Future Volume (vph)	20	325	105	80	290	10	145	235	125	20	260	35
Satd. Flow (prot)	1805	1803	0	1752	1669	0	1668	1667	0	1685	1554	0
Flt Permitted	0.473			0.131			0.253			0.390		
Satd. Flow (perm)	899	1803	0	242	1669	0	444	1667	0	692	1554	0
Satd. Flow (RTOR)		19			2			36			8	
Lane Group Flow (vph)	20	502	0	100	331	0	165	411	0	28	357	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	32.0		15.0	32.0		15.0	28.0		15.0	28.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	39.8	31.8		41.8	37.7		35.9	31.7		32.5	22.5	
Actuated g/C Ratio	0.44	0.35		0.46	0.42		0.40	0.35		0.36	0.25	
v/c Ratio	0.04	0.77		0.36	0.47		0.52	0.67		0.08	0.90	
Control Delay	12.8	34.6		25.8	15.1		18.0	19.6		13.0	55.1	
Queue Delay	0.0	1.6		0.0	0.5		0.0	0.0		0.0	17.0	
Total Delay	12.8	36.3		25.8	15.6		18.0	19.6		13.0	72.1	
LOS	B	D		C	B		B	B		B	E	
Approach Delay		35.4			17.9			19.1			67.8	
Approach LOS		D			B			B			E	
Queue Length 50th (ft)	4	274		23	65		27	54		8	190	
Queue Length 95th (ft)	m14	#268		m65	m123		64	#138		m18	#300	
Internal Link Dist (ft)		356			188			1911			200	
Turn Bay Length (ft)	200			65						65		
Base Capacity (vph)	507	650		288	701		320	609		370	411	
Starvation Cap Reductn	0	2		0	108		0	0		0	52	
Spillback Cap Reductn	0	50		0	0		0	1		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.04	0.84		0.35	0.56		0.52	0.68		0.08	0.99	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 1 (1%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 33.1

Intersection LOS: C

Intersection Capacity Utilization 75.1%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	32 s	15 s	28 s
			
Ø5	Ø6 (R)	Ø7	Ø8
15 s	32 s	15 s	28 s

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	270	60	115	300	20	55	155	60	25	130	25
Future Volume (vph)	10	270	60	115	300	20	55	155	60	25	130	25
Satd. Flow (prot)	1805	1829	0	1805	1867	0	1668	1696	0	1685	1736	0
Flt Permitted	0.538			0.347			0.456			0.467		
Satd. Flow (perm)	1022	1829	0	659	1867	0	801	1696	0	828	1736	0
Satd. Flow (RTOR)		14			3			20			9	
Lane Group Flow (vph)	16	379	0	144	377	0	68	236	0	32	182	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	32.0		15.0	32.0		15.0	26.0		17.0	28.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	47.9	37.9		52.2	49.9		25.6	19.5		24.6	16.6	
Actuated g/C Ratio	0.53	0.42		0.58	0.55		0.28	0.22		0.27	0.18	
v/c Ratio	0.03	0.49		0.28	0.36		0.21	0.62		0.10	0.55	
Control Delay	10.8	17.3		8.7	10.4		18.9	29.9		18.5	37.4	
Queue Delay	0.0	0.1		0.4	1.0		0.0	0.2		0.0	0.4	
Total Delay	10.8	17.4		9.1	11.4		18.9	30.1		18.5	37.8	
LOS	B	B		A	B		B	C		B	D	
Approach Delay		17.1			10.8			27.6			34.9	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	3	80		26	72		13	39		12	90	
Queue Length 95th (ft)	9	145		m41	114		m23	m75		24	129	
Internal Link Dist (ft)		353			196			200			580	
Turn Bay Length (ft)	200			65			65			50		
Base Capacity (vph)	640	778		517	1035		331	444		364	459	
Starvation Cap Reductn	0	30		122	415		0	18		0	0	
Spillback Cap Reductn	0	4		0	0		0	0		0	64	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.03	0.51		0.36	0.61		0.21	0.55		0.09	0.46	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 3 (3%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 19.7

Intersection LOS: B

Intersection Capacity Utilization 61.3%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	32 s	17 s	26 s
			
Ø5	Ø6 (R)	Ø7	Ø8
15 s	32 s	15 s	28 s

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	335	35	65	290	35	35	265	260	85	265	55
Future Volume (vph)	105	335	35	65	290	35	35	265	260	85	265	55
Satd. Flow (prot)	1787	1840	0	1752	1863	1615	1745	1783	1546	1728	1782	0
Flt Permitted	0.459			0.354			0.211			0.343		
Satd. Flow (perm)	863	1840	0	653	1863	1615	388	1783	1546	624	1782	0
Satd. Flow (RTOR)		6				127			347		12	
Lane Group Flow (vph)	115	400	0	80	305	48	56	291	347	108	369	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2		2	4		4	8		
Total Split (s)	15.0	31.0		15.0	31.0	31.0	15.0	29.0	29.0	15.0	29.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Act Effct Green (s)	44.4	36.3		44.2	36.2	36.2	29.4	21.4	21.4	29.6	21.5	
Actuated g/C Ratio	0.49	0.40		0.49	0.40	0.40	0.33	0.24	0.24	0.33	0.24	
v/c Ratio	0.22	0.54		0.18	0.41	0.07	0.20	0.69	0.55	0.33	0.85	
Control Delay	10.9	19.1		14.9	28.5	5.3	17.3	39.7	6.7	9.6	30.5	
Queue Delay	0.1	0.9		0.0	0.0	0.0	0.0	0.1	0.0	0.0	2.0	
Total Delay	11.0	20.0		14.9	28.5	5.3	17.3	39.8	6.7	9.6	32.5	
LOS	B	B		B	C	A	B	D	A	A	C	
Approach Delay		18.0			23.4			21.4			27.3	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)	29	103		31	161	2	19	146	0	14	197	
Queue Length 95th (ft)	m40	m182		59	240	10	27	228	25	19	48	
Internal Link Dist (ft)		188			1101			264			195	
Turn Bay Length (ft)	60			100		100	100			50		
Base Capacity (vph)	536	745		451	749	725	286	487	674	336	497	
Starvation Cap Reductn	0	137		0	0	0	0	0	0	0	45	
Spillback Cap Reductn	69	0		0	0	139	0	5	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.25	0.66		0.18	0.41	0.08	0.20	0.60	0.51	0.32	0.82	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 4 (4%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 22.3

Intersection LOS: C

Intersection Capacity Utilization 68.7%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	31 s	15 s	29 s
			
Ø5	Ø6 (R)	Ø7	Ø8
15 s	31 s	15 s	29 s

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	245	35	25	250	110	20	345	35	95	350	170
Future Volume (vph)	75	245	35	25	250	110	20	345	35	95	350	170
Satd. Flow (prot)	1787	1844	0	1805	1799	0	1745	1789	0	1745	1818	1546
Flt Permitted	0.176			0.432			0.416			0.184		
Satd. Flow (perm)	331	1844	0	821	1799	0	764	1789	0	338	1818	1546
Satd. Flow (RTOR)		9			28			6				200
Lane Group Flow (vph)	84	316	0	36	450	0	20	436	0	128	402	200
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		8
Total Split (s)	15.0	30.0		15.0	30.0		15.0	30.0		15.0	30.0	30.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effct Green (s)	39.4	33.3		38.4	30.4		34.3	24.3		37.4	33.2	33.2
Actuated g/C Ratio	0.44	0.37		0.43	0.34		0.38	0.27		0.42	0.37	0.37
v/c Ratio	0.27	0.46		0.08	0.72		0.05	0.90		0.43	0.60	0.29
Control Delay	17.5	19.9		10.8	34.4		15.6	43.2		19.9	29.4	5.0
Queue Delay	0.0	0.3		0.0	0.5		0.0	1.0		0.0	4.0	0.0
Total Delay	17.5	20.3		10.8	34.8		15.6	44.2		19.9	33.4	5.0
LOS	B	C		B	C		B	D		B	C	A
Approach Delay		19.7			33.1			42.9			23.3	
Approach LOS		B			C			D			C	
Queue Length 50th (ft)	14	103		14	248		4	99		42	156	0
Queue Length 95th (ft)	m60	155		m18	#343		m14	#355		61	#309	41
Internal Link Dist (ft)		196			1084			195			349	
Turn Bay Length (ft)	60			100			65			100		
Base Capacity (vph)	315	688		468	625		409	513		304	670	695
Starvation Cap Reductn	0	91		0	0		0	12		0	0	0
Spillback Cap Reductn	0	0		0	25		0	0		0	187	2
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.27	0.53		0.08	0.75		0.05	0.87		0.42	0.83	0.29

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 87 (97%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 29.2

Intersection LOS: C

Intersection Capacity Utilization 71.8%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	30 s	15 s	30 s
			
Ø5	Ø6 (R)	Ø7	Ø8
15 s	30 s	15 s	30 s

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

33: SR 136/N. Washington Ave & E. 1st St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	25	105	10	15	10	50	495	10	5	535	70
Future Volume (vph)	180	25	105	10	15	10	50	495	10	5	535	70
Satd. Flow (prot)	0	1764	0	0	1794	0	1711	1794	0	1745	3387	0
Flt Permitted		0.971			0.991		0.231			0.221		
Satd. Flow (perm)	0	1764	0	0	1794	0	416	1794	0	406	3387	0
Satd. Flow (RTOR)		26			20			2			25	
Lane Group Flow (vph)	0	380	0	0	58	0	64	635	0	5	701	0
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	27.0	27.0		11.0	11.0		11.0	41.0		11.0	41.0	
Total Lost Time (s)		4.8			4.8		4.5	4.6		4.5	4.6	
Act Effct Green (s)		19.5			6.5		33.2	32.1		28.7	22.1	
Actuated g/C Ratio		0.28			0.09		0.48	0.47		0.42	0.32	
v/c Ratio		0.74			0.31		0.20	0.76		0.02	0.63	
Control Delay		33.8			31.1		12.5	25.5		11.0	22.6	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		33.8			31.1		12.5	25.5		11.0	22.6	
LOS		C			C		B	C		B	C	
Approach Delay		33.8			31.1			24.3			22.5	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)		150			17		17	249		1	147	
Queue Length 95th (ft)		#335			30		31	390		6	196	
Internal Link Dist (ft)		234			474			256			166	
Turn Bay Length (ft)										50		
Base Capacity (vph)		626			190		331	1016		307	1928	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.61			0.31		0.19	0.63		0.02	0.36	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 68.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 25.8

Intersection Capacity Utilization 67.6%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 33: SR 136/N. Washington Ave & E. 1st St

			
Ø1	Ø2	Ø3	Ø4
11 s	41 s	27 s	11 s
			
Ø5	Ø6		
11 s	41 s		

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

34: SR 136/N. Washington Ave & E. 10th St/E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	235	30	175	165	270	40	525	285	270	350	50
Future Volume (vph)	115	235	30	175	165	270	40	525	285	270	350	50
Satd. Flow (prot)	1805	3538	0	3467	1900	1615	1719	3505	1615	1752	3517	0
Flt Permitted	0.950			0.950			0.471			0.240		
Satd. Flow (perm)	1805	3538	0	3467	1900	1615	852	3505	1615	443	3517	0
Satd. Flow (RTOR)		16				288			331		16	
Lane Group Flow (vph)	128	293	0	203	179	300	48	610	331	287	494	0
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases						4	2		2	6		
Total Split (s)	14.0	14.0		31.0	31.0	31.0	11.0	28.0	28.0	17.0	34.0	
Total Lost Time (s)	5.2	5.2		5.3	5.3	5.3	4.5	5.2	5.2	4.5	5.2	
Act Effct Green (s)	8.8	8.8		13.6	13.6	13.6	26.2	19.1	19.1	36.2	29.4	
Actuated g/C Ratio	0.12	0.12		0.18	0.18	0.18	0.35	0.26	0.26	0.49	0.40	
v/c Ratio	0.60	0.67		0.32	0.51	0.56	0.13	0.67	0.50	0.68	0.35	
Control Delay	47.1	40.4		27.8	33.1	8.7	12.5	29.4	6.0	21.8	17.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	47.1	40.4		27.8	33.1	8.7	12.5	29.4	6.0	21.8	17.8	
LOS	D	D		C	C	A	B	C	A	C	B	
Approach Delay		42.4			20.8			20.7			19.3	
Approach LOS		D			C			C			B	
Queue Length 50th (ft)	58	66		43	77	5	11	132	0	74	86	
Queue Length 95th (ft)	#149	#138		70	138	67	29	198	52	#164	126	
Internal Link Dist (ft)		135			2500			631			700	
Turn Bay Length (ft)	100			215		215	100			100		
Base Capacity (vph)	218	442		1226	672	757	382	1100	734	441	1451	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.59	0.66		0.17	0.27	0.40	0.13	0.55	0.45	0.65	0.34	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 73.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 23.5

Intersection Capacity Utilization 61.4%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service B

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 34: SR 136/N. Washington Ave & E. 10th St/E.10th St

			
Ø1	Ø2	Ø3	Ø4
17 s	28 s	14 s	31 s
			
Ø5	Ø6		
11 s	34 s		

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

35: US 70/E. Spring St & I-40 EB Off-Ramps/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	0	190	0	0	0	0	260	15	160	335	0
Future Volume (vph)	65	0	190	0	0	0	0	260	15	160	335	0
Satd. Flow (prot)	0	1656	1615	0	0	0	0	3426	0	1711	3490	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1656	1615	0	0	0	0	3426	0	1711	3490	0
Lane Group Flow (vph)	0	76	221	0	0	0	0	322	0	184	372	0
Sign Control		Stop			Free			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 30.1%

Analysis Period (min) 15

ICU Level of Service A

Intersection

Int Delay, s/veh 5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔					↔		↔	↔	
Traffic Vol, veh/h	65	0	190	0	0	0	0	260	15	160	335	0
Future Vol, veh/h	65	0	190	0	0	0	0	260	15	160	335	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	200	-	-	-	-	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	25	86	25	25	25	25	86	75	87	90	25
Heavy Vehicles, %	9	0	0	0	0	0	0	1	0	2	0	0
Mvmt Flow	76	0	221	0	0	0	0	302	20	184	372	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	891	1042	186	-	0	0	302	0	0
Stage 1	740	740	-	-	-	-	-	-	-
Stage 2	151	302	-	-	-	-	-	-	-
Critical Hdwy	6.98	6.5	6.9	-	-	-	4.14	-	-
Critical Hdwy Stg 1	5.98	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.98	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.59	4	3.3	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	269	232	831	0	-	-	1256	-	0
Stage 1	415	426	-	0	-	-	-	-	0
Stage 2	841	668	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	230	0	831	-	-	-	1256	-	-
Mov Cap-2 Maneuver	230	0	-	-	-	-	-	-	-
Stage 1	354	0	-	-	-	-	-	-	-
Stage 2	841	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.3	0	2.8
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	230	831	1256	-
HCM Lane V/C Ratio	-	-	0.329	0.266	0.146	-
HCM Control Delay (s)	-	-	28.1	10.9	8.4	-
HCM Lane LOS	-	-	D	B	A	-
HCM 95th %tile Q(veh)	-	-	1.4	1.1	0.5	-

Lanes, Volumes, Timings
 36: US 70/E. Spring St & I-40 WB Off-Ramp

2017 Optimized PM Timing Plan
 07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	25	120	225	0	0	535
Future Volume (vph)	25	120	225	0	0	535
Satd. Flow (prot)	1687	1568	3323	0	0	3455
Flt Permitted	0.950					
Satd. Flow (perm)	1687	1568	3323	0	0	3455
Lane Group Flow (vph)	36	152	268	0	0	569
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 24.8%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
36: US 70/E. Spring St & I-40 WB Off-Ramp

2017 Optimized PM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	120	225	0	0	535
Future Vol, veh/h	25	120	225	0	0	535
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	None
Storage Length	0	300	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	79	84	25	25	94
Heavy Vehicles, %	7	3	5	0	0	1
Mvmt Flow	36	152	268	0	0	569

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	553	134	0	-	-	-
Stage 1	268	-	-	-	-	-
Stage 2	285	-	-	-	-	-
Critical Hdwy	6.94	6.96	-	-	-	-
Critical Hdwy Stg 1	5.94	-	-	-	-	-
Critical Hdwy Stg 2	5.94	-	-	-	-	-
Follow-up Hdwy	3.57	3.33	-	-	-	-
Pot Cap-1 Maneuver	451	887	-	0	0	-
Stage 1	738	-	-	0	0	-
Stage 2	723	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	451	887	-	-	-	-
Mov Cap-2 Maneuver	451	-	-	-	-	-
Stage 1	738	-	-	-	-	-
Stage 2	723	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NB	WBLn1	WBLn2	SBT
Capacity (veh/h)	-	451	887	-
HCM Lane V/C Ratio	-	0.08	0.171	-
HCM Control Delay (s)	-	13.7	9.9	-
HCM Lane LOS	-	B	A	-
HCM 95th %tile Q(veh)	-	0.3	0.6	-

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	605	545	0	0	370	75	175	0	50	0	0	0
Future Volume (vph)	605	545	0	0	370	75	175	0	50	0	0	0
Satd. Flow (prot)	1770	3574	0	0	3434	0	0	1736	1583	0	0	0
Flt Permitted	0.297							0.950				
Satd. Flow (perm)	553	3574	0	0	3434	0	0	1736	1583	0	0	0
Satd. Flow (RTOR)					29				97			
Lane Group Flow (vph)	703	619	0	0	477	0	0	240	83	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA	Perm			
Protected Phases	1	6			2			3				
Permitted Phases	6						3		3			
Total Split (s)	30.0	60.0			30.0		30.0	30.0	30.0			
Total Lost Time (s)	4.5	6.5			6.5			5.9	5.9			
Act Effct Green (s)	47.5	45.5			15.1			15.5	15.5			
Actuated g/C Ratio	0.65	0.62			0.21			0.21	0.21			
v/c Ratio	0.90	0.28			0.66			0.66	0.20			
Control Delay	29.9	7.4			30.3			36.1	5.8			
Queue Delay	0.0	0.0			0.0			0.0	0.0			
Total Delay	29.9	7.4			30.3			36.1	5.8			
LOS	C	A			C			D	A			
Approach Delay		19.4			30.3			28.3				
Approach LOS		B			C			C				
Queue Length 50th (ft)	196	58			97			99	0			
Queue Length 95th (ft)	#482	110			163			43	4			
Internal Link Dist (ft)		490			552			852			886	
Turn Bay Length (ft)	100								250			
Base Capacity (vph)	785	2636			1132			576	590			
Starvation Cap Reductn	0	0			0			0	0			
Spillback Cap Reductn	0	0			0			0	0			
Storage Cap Reductn	0	0			0			0	0			
Reduced v/c Ratio	0.90	0.23			0.42			0.42	0.14			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 73.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 23.2

Intersection Capacity Utilization 69.9%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

 Ø1	 Ø2	 Ø3
30 s	30 s	30 s
 Ø6		
60 s		

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

38: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1110	235	45	500	0	0	0	0	30	0	255
Future Volume (vph)	0	1110	235	45	500	0	0	0	0	30	0	255
Satd. Flow (prot)	0	3449	0	1703	3539	0	0	0	0	0	1703	1599
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	3449	0	1703	3539	0	0	0	0	0	1703	1599
Lane Group Flow (vph)	0	1577	0	60	575	0	0	0	0	0	32	293
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 69.9%

ICU Level of Service C

Analysis Period (min) 15

Intersection

Int Delay, s/veh 2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↑	↑↑						↑	↑
Traffic Vol, veh/h	0	1110	235	45	500	0	0	0	0	30	0	255
Future Vol, veh/h	0	1110	235	45	500	0	0	0	0	30	0	255
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	100	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	25	87	78	75	87	25	25	25	25	94	25	87
Heavy Vehicles, %	0	2	0	6	2	0	0	0	0	6	0	1
Mvmt Flow	0	1276	301	60	575	0	0	0	0	32	0	293

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	-	0	0	1276	0	0	1333	1971	287
Stage 1	-	-	-	-	-	-	695	695	-
Stage 2	-	-	-	-	-	-	638	1276	-
Critical Hdwy	-	-	-	4.22	-	-	6.92	6.5	6.92
Critical Hdwy Stg 1	-	-	-	-	-	-	5.92	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.92	5.5	-
Follow-up Hdwy	-	-	-	2.26	-	-	3.56	4	3.31
Pot Cap-1 Maneuver	0	-	-	519	-	0	140	63	713
Stage 1	0	-	-	-	-	0	446	447	-
Stage 2	0	-	-	-	-	0	478	240	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	519	-	-	124	0	713
Mov Cap-2 Maneuver	-	-	-	-	-	-	124	0	-
Stage 1	-	-	-	-	-	-	394	0	-
Stage 2	-	-	-	-	-	-	478	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	1.2	16.5
HCM LOS			C

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	519	-	124	713
HCM Lane V/C Ratio	-	-	0.116	-	0.257	0.411
HCM Control Delay (s)	-	-	12.8	-	43.8	13.5
HCM Lane LOS	-	-	B	-	E	B
HCM 95th %tile Q(veh)	-	-	0.4	-	1	2

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

39: Neal St/S. Old Kentucky Rd & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	670	80	245	405	60	145	320	555	110	205	50
Future Volume (vph)	95	670	80	245	405	60	145	320	555	110	205	50
Satd. Flow (prot)	1787	3493	0	1787	1845	1599	1805	1900	1615	1752	1817	0
Flt Permitted	0.309			0.137			0.347			0.360		
Satd. Flow (perm)	581	3493	0	258	1845	1599	659	1900	1615	664	1817	0
Satd. Flow (RTOR)		19				142			303		13	
Lane Group Flow (vph)	108	880	0	263	466	68	216	390	677	120	303	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6		6	8		8	4		
Total Split (s)	11.0	29.0		15.0	33.0	33.0	14.0	34.0	34.0	12.0	32.0	
Total Lost Time (s)	4.5	5.6		4.5	5.6	5.6	4.5	5.7	5.7	4.5	5.7	
Act Effct Green (s)	31.1	23.5		39.3	30.2	30.2	36.0	27.5	27.5	31.4	22.9	
Actuated g/C Ratio	0.36	0.27		0.45	0.35	0.35	0.42	0.32	0.32	0.36	0.26	
v/c Ratio	0.36	0.91		0.87	0.73	0.10	0.55	0.65	0.94	0.36	0.62	
Control Delay	19.1	46.5		48.6	35.6	0.3	21.0	32.1	40.1	17.8	32.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	19.1	46.5		48.6	35.6	0.3	21.0	32.1	40.1	17.8	32.5	
LOS	B	D		D	D	A	C	C	D	B	C	
Approach Delay		43.5			36.9			34.4			28.3	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	36	254		98	245	0	72	190	228	38	139	
Queue Length 95th (ft)	66	#365		#243	#383	0	84	254	#373	71	200	
Internal Link Dist (ft)		1084			512			1234			867	
Turn Bay Length (ft)	80					100	130			100		
Base Capacity (vph)	300	962		303	641	648	399	623	733	336	563	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.36	0.91		0.87	0.73	0.10	0.54	0.63	0.92	0.36	0.54	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 86.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 36.8

Intersection LOS: D

Intersection Capacity Utilization 74.7%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 39: Neal St/S. Old Kentucky Rd & US 70/E. Spring St

			
15 s	29 s	14 s	32 s
			
11 s	33 s	12 s	34 s

Lanes, Volumes, Timings
40: US 70/E. Spring St & E. Broad St

2017 Optimized PM Timing Plan
07/12/2017

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	715	295	295	105	5
Future Volume (vph)	0	715	295	295	105	5
Satd. Flow (prot)	0	1881	1739	0	1800	0
Flt Permitted					0.955	
Satd. Flow (perm)	0	1881	1739	0	1800	0
Lane Group Flow (vph)	0	831	628	0	144	0
Sign Control		Free	Free		Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 50.4%

ICU Level of Service A

Analysis Period (min) 15

HCM 2010 TWSC
40: US 70/E. Spring St & E. Broad St

2017 Optimized PM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 2.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	715	295	295	105	5
Future Vol, veh/h	0	715	295	295	105	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	25	86	92	96	77	63
Heavy Vehicles, %	0	1	3	1	0	0
Mvmt Flow	0	831	321	307	136	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	321	0	-	0	1152	321
Stage 1	-	-	-	-	321	-
Stage 2	-	-	-	-	831	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1250	-	-	0	221	724
Stage 1	-	-	-	0	740	-
Stage 2	-	-	-	0	431	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	1250	-	-	-	221	724
Mov Cap-2 Maneuver	-	-	-	-	338	-
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	431	-

Approach	EB		WB		SB
HCM Control Delay, s	0		0		22.5
HCM LOS					C

Minor Lane/Major Mvmt	EBL	EBT	WBT	SBLn1
Capacity (veh/h)	1250	-	-	348
HCM Lane V/C Ratio	-	-	-	0.415
HCM Control Delay (s)	0	-	-	22.5
HCM Lane LOS	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	2

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	540	25	20	275	15	25	170	20	170	145	50
Future Volume (vph)	130	540	25	20	275	15	25	170	20	170	145	50
Satd. Flow (prot)	1805	1869	0	1703	1846	0	1805	1862	0	1805	1823	0
Flt Permitted	0.444			0.181			0.609			0.309		
Satd. Flow (perm)	844	1869	0	324	1846	0	1157	1862	0	587	1823	0
Satd. Flow (RTOR)		3			5			8			16	
Lane Group Flow (vph)	144	683	0	36	304	0	32	239	0	221	217	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	43.0		11.0	43.0		11.0	25.0		11.0	25.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	50.2	45.5		46.4	40.1		22.3	16.0		26.4	22.2	
Actuated g/C Ratio	0.56	0.51		0.52	0.45		0.25	0.18		0.29	0.25	
v/c Ratio	0.26	0.72		0.14	0.37		0.10	0.71		0.78	0.47	
Control Delay	8.3	19.6		10.2	18.4		21.2	44.9		44.9	23.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.8	
Total Delay	8.3	19.6		10.2	18.5		21.2	44.9		44.9	23.8	
LOS	A	B		B	B		C	D		D	C	
Approach Delay		17.7			17.6			42.1			34.5	
Approach LOS		B			B			D			C	
Queue Length 50th (ft)	23	239		8	111		13	124		80	58	
Queue Length 95th (ft)	56	415		14	179		27	171		#101	87	
Internal Link Dist (ft)		1101			737			412			149	
Turn Bay Length (ft)	75			80			70			50		
Base Capacity (vph)	551	946		268	825		336	430		285	481	
Starvation Cap Reductn	0	0		0	0		0	0		0	92	
Spillback Cap Reductn	11	0		0	24		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.27	0.72		0.13	0.38		0.10	0.56		0.78	0.56	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 37 (41%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 25.1

Intersection LOS: C

Intersection Capacity Utilization 69.5%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	43 s	11 s	25 s
			
Ø5	Ø6	Ø7	Ø8
11 s	43 s	11 s	25 s

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	360	30	10	415	65	50	75	15	70	105	30
Future Volume (vph)	20	360	30	10	415	65	50	75	15	70	105	30
Satd. Flow (prot)	1805	1849	0	1805	1842	0	1805	1854	0	1787	1812	0
Flt Permitted	0.323			0.423			0.657			0.535		
Satd. Flow (perm)	614	1849	0	804	1842	0	1248	1854	0	1006	1812	0
Satd. Flow (RTOR)		7			12			9			13	
Lane Group Flow (vph)	24	448	0	12	517	0	52	124	0	100	151	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	41.0		15.0	41.0		15.0	19.0		15.0	19.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	55.5	53.5		54.6	50.6		20.9	12.9		22.1	15.9	
Actuated g/C Ratio	0.62	0.59		0.61	0.56		0.23	0.14		0.25	0.18	
v/c Ratio	0.05	0.41		0.02	0.50		0.15	0.45		0.30	0.46	
Control Delay	8.3	13.6		7.2	12.1		23.1	38.2		17.1	22.4	
Queue Delay	0.0	0.0		0.0	0.2		0.0	0.0		0.0	0.0	
Total Delay	8.3	13.6		7.2	12.3		23.1	38.2		17.1	22.4	
LOS	A	B		A	B		C	D		B	C	
Approach Delay		13.3			12.2			33.8			20.3	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	5	119		2	145		21	61		19	24	
Queue Length 95th (ft)	14	283		m4	m164		46	87		33	52	
Internal Link Dist (ft)		1308			356			107			209	
Turn Bay Length (ft)	100			60			50			60		
Base Capacity (vph)	518	1101		606	1040		359	306		339	352	
Starvation Cap Reductn	0	0		0	124		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.05	0.41		0.02	0.56		0.14	0.41		0.29	0.43	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 12 (13%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 16.7

Intersection LOS: B

Intersection Capacity Utilization 55.4%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	41 s	15 s	19 s
			
Ø5	Ø6 (R)	Ø7	Ø8
15 s	41 s	15 s	19 s

Lanes, Volumes, Timings
43: S. Walnut Ave & US 70/W. Spring St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	375	55	45	445	25	65	185	30	35	275	45
Future Volume (vph)	40	375	55	45	445	25	65	185	30	35	275	45
Satd. Flow (prot)	1770	1845	0	1805	1860	0	1770	1841	0	1805	1854	0
Flt Permitted	0.164			0.221			0.264			0.546		
Satd. Flow (perm)	305	1845	0	420	1860	0	492	1841	0	1037	1854	0
Satd. Flow (RTOR)		9			5			15			11	
Lane Group Flow (vph)	44	510	0	56	561	0	76	251	0	52	395	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	38.0		11.0	38.0		11.0	30.0		11.0	30.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.8		4.5	4.8	
Act Effct Green (s)	30.2	27.0		30.2	27.0		26.9	23.3		25.7	20.7	
Actuated g/C Ratio	0.42	0.38		0.42	0.38		0.37	0.32		0.36	0.29	
v/c Ratio	0.16	0.73		0.18	0.80		0.24	0.41		0.12	0.73	
Control Delay	13.3	28.7		13.4	32.7		17.9	24.8		16.5	35.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	13.3	28.7		13.4	32.7		17.9	24.8		16.5	35.0	
LOS	B	C		B	C		B	C		B	D	
Approach Delay		27.5			30.9			23.2			32.9	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	12	234		15	269		25	108		17	194	
Queue Length 95th (ft)	30	327		31	385		52	183		29	273	
Internal Link Dist (ft)		1097			1308			83			571	
Turn Bay Length (ft)	75			75			65			150		
Base Capacity (vph)	282	995		322	1002		318	782		452	764	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.16	0.51		0.17	0.56		0.24	0.32		0.12	0.52	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 71.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 29.1

Intersection Capacity Utilization 67.4%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

Splits and Phases: 43: S. Walnut Ave & US 70/W. Spring St

			
Ø1	Ø2	Ø3	Ø4
11 s	38 s	11 s	30 s
			
Ø5	Ø6	Ø7	Ø8
11 s	38 s	11 s	30 s

Lanes, Volumes, Timings

44: Scott Ave & US 70/W. Spring St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	320	45	75	490	25	55	70	65	20	75	35
Future Volume (vph)	15	320	45	75	490	25	55	70	65	20	75	35
Satd. Flow (prot)	1805	1848	0	1805	1863	0	1805	1785	0	1656	1791	0
Flt Permitted	0.259			0.355			0.591			0.638		
Satd. Flow (perm)	492	1848	0	674	1863	0	1123	1785	0	1112	1791	0
Satd. Flow (RTOR)		11			4			30			21	
Lane Group Flow (vph)	20	408	0	100	622	0	72	189	0	24	148	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	47.0		11.0	47.0		11.0	21.0		11.0	21.0	
Total Lost Time (s)	4.5	4.8		4.5	4.8		4.5	4.8		4.5	4.8	
Act Effct Green (s)	30.3	25.2		32.8	30.6		15.8	13.6		14.7	11.3	
Actuated g/C Ratio	0.49	0.41		0.53	0.50		0.26	0.22		0.24	0.18	
v/c Ratio	0.05	0.53		0.20	0.67		0.20	0.45		0.07	0.43	
Control Delay	8.0	18.1		8.6	18.7		20.9	26.3		20.4	29.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	8.0	18.1		8.6	18.7		20.9	26.3		20.4	29.0	
LOS	A	B		A	B		C	C		C	C	
Approach Delay		17.6			17.3			24.9			27.8	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	3	124		18	156		17	40		5	41	
Queue Length 95th (ft)	11	226		35	347		51	88		25	93	
Internal Link Dist (ft)		700			1097			288			469	
Turn Bay Length (ft)	75			75			40			75		
Base Capacity (vph)	405	1351		498	1360		371	594		334	563	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.05	0.30		0.20	0.46		0.19	0.32		0.07	0.26	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 61.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 19.8

Intersection Capacity Utilization 60.5%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 44: Scott Ave & US 70/W. Spring St

 Ø1	 Ø2	 Ø3	 Ø4
11 s	47 s	11 s	21 s
 Ø5	 Ø6	 Ø7	 Ø8
11 s	47 s	11 s	21 s

Lanes, Volumes, Timings
45: S, Maple Ave/N. Maple Ave & E. Broad St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	255	100	40	340	80	35	150	115	40	220	20
Future Volume (vph)	25	255	100	40	340	80	35	150	115	40	220	20
Satd. Flow (prot)	1805	1802	0	1805	1818	0	1805	1763	0	1805	1872	0
Flt Permitted	0.269			0.298			0.418			0.386		
Satd. Flow (perm)	511	1802	0	566	1818	0	794	1763	0	733	1872	0
Satd. Flow (RTOR)		25			16			51			6	
Lane Group Flow (vph)	32	459	0	44	487	0	56	340	0	48	281	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	39.0		11.0	39.0		11.0	29.0		11.0	29.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	42.8	38.9		42.8	38.9		32.8	28.9		31.9	26.7	
Actuated g/C Ratio	0.48	0.43		0.48	0.43		0.36	0.32		0.35	0.30	
v/c Ratio	0.10	0.58		0.12	0.61		0.16	0.57		0.14	0.50	
Control Delay	7.2	15.4		12.3	24.5		14.5	18.1		18.2	30.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.6		0.0	0.1	
Total Delay	7.2	15.4		12.3	24.5		14.5	18.7		18.2	30.5	
LOS	A	B		B	C		B	B		B	C	
Approach Delay		14.8			23.4			18.1			28.7	
Approach LOS		B			C			B			C	
Queue Length 50th (ft)	5	144		12	219		15	79		17	134	
Queue Length 95th (ft)	m11	145		29	317		24	119		36	204	
Internal Link Dist (ft)		1084			778			149			437	
Turn Bay Length (ft)	60			65			40			85		
Base Capacity (vph)	336	793		358	795		362	601		337	559	
Starvation Cap Reductn	0	0		0	0		0	64		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	13	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.10	0.58		0.12	0.61		0.15	0.63		0.14	0.51	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 34 (38%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 20.8

Intersection LOS: C

Intersection Capacity Utilization 62.7%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 45: S, Maple Ave/N. Maple Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	39 s	11 s	29 s
			
Ø5	Ø6	Ø7	Ø8
11 s	39 s	11 s	29 s

Lanes, Volumes, Timings

46: S. Dixie Ave/N. Dixie Ave & E. Broad St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	295	25	25	275	50	20	115	25	50	155	20
Future Volume (vph)	25	295	25	25	275	50	20	115	25	50	155	20
Satd. Flow (prot)	1805	1845	0	1736	1839	0	1805	1845	0	1805	1866	0
Flt Permitted	0.421			0.457			0.538			0.446		
Satd. Flow (perm)	800	1845	0	835	1839	0	1022	1845	0	847	1866	0
Satd. Flow (RTOR)		7			11			13			7	
Lane Group Flow (vph)	32	343	0	32	380	0	28	164	0	68	240	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	31.0		15.0	31.0		15.0	29.0		15.0	29.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	51.1	45.1		51.1	45.1		23.6	15.6		25.4	21.4	
Actuated g/C Ratio	0.57	0.50		0.57	0.50		0.26	0.17		0.28	0.24	
v/c Ratio	0.06	0.37		0.06	0.41		0.08	0.50		0.20	0.54	
Control Delay	10.7	19.3		9.1	14.7		13.3	25.1		20.7	33.6	
Queue Delay	0.0	0.0		0.0	0.1		0.0	0.0		0.0	0.0	
Total Delay	10.7	19.3		9.1	14.8		13.3	25.1		20.7	33.6	
LOS	B	B		A	B		B	C		C	C	
Approach Delay		18.5			14.4			23.4			30.8	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	7	128		6	85		8	47		28	105	
Queue Length 95th (ft)	21	243		13	103		m15	81		40	145	
Internal Link Dist (ft)		1234			353			209			174	
Turn Bay Length (ft)	130			45			60			75		
Base Capacity (vph)	573	928		582	927		363	511		352	532	
Starvation Cap Reductn	0	0		0	70		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.06	0.37		0.05	0.44		0.08	0.32		0.19	0.45	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 6 (7%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 20.9

Intersection LOS: C

Intersection Capacity Utilization 50.4%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 46: S. Dixie Ave/N. Dixie Ave & E. Broad St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
15 s	31 s	15 s	29 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
15 s	31 s	15 s	29 s

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

47: S. Walnut Ave/N. Walnut Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	205	35	55	175	60	30	170	45	65	270	15
Future Volume (vph)	10	205	35	55	175	60	30	170	45	65	270	15
Satd. Flow (prot)	0	1850	0	0	1870	1583	1805	1837	0	1770	1885	0
Flt Permitted		0.998			0.987		0.407			0.469		
Satd. Flow (perm)	0	1850	0	0	1870	1583	773	1837	0	874	1885	0
Satd. Flow (RTOR)		10				138		15			3	
Lane Group Flow (vph)	0	292	0	0	279	68	40	233	0	92	319	0
Turn Type	custom	NA		custom	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	1	1		2	2		7	4		3	8	
Permitted Phases	1			2		2	4			8		
Total Split (s)	28.0	28.0		24.0	24.0	24.0	11.0	27.0		11.0	27.0	
Total Lost Time (s)		4.5			4.5	4.5	4.5	5.4		4.5	5.4	
Act Effct Green (s)		17.1			16.0	16.0	22.5	16.8		23.6	19.3	
Actuated g/C Ratio		0.23			0.22	0.22	0.31	0.23		0.32	0.26	
v/c Ratio		0.67			0.69	0.15	0.12	0.54		0.25	0.64	
Control Delay		35.2			39.0	0.7	18.2	31.0		19.5	33.8	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		35.2			39.0	0.7	18.2	31.0		19.5	33.8	
LOS		D			D	A	B	C		B	C	
Approach Delay		35.2			31.5			29.1			30.6	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)		131			130	0	12	95		29	146	
Queue Length 95th (ft)		215			221	0	29	181		52	254	
Internal Link Dist (ft)		512			1234			571			477	
Turn Bay Length (ft)							120			140		
Base Capacity (vph)		642			533	550	335	590		365	605	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.45			0.52	0.12	0.12	0.39		0.25	0.53	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 73.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 31.6

Intersection Capacity Utilization 61.6%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service B

Splits and Phases: 47: S. Walnut Ave/N. Walnut Ave & E. Broad St

			
Ø1	Ø2	Ø3	Ø4
28 s	24 s	11 s	27 s
			
		Ø7	Ø8
		11 s	27 s

Lanes, Volumes, Timings
48: S. Cedar Ave & E. Broad St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	45	5	25	35	160	5	65	20	175	120	45
Future Volume (vph)	45	45	5	25	35	160	5	65	20	175	120	45
Satd. Flow (prot)	0	1839	0	0	1722	0	0	1798	0	0	1794	0
Flt Permitted		0.973			0.994			0.998			0.975	
Satd. Flow (perm)	0	1839	0	0	1722	0	0	1798	0	0	1794	0
Lane Group Flow (vph)	0	128	0	0	276	0	0	105	0	0	372	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 47.0%

Analysis Period (min) 15

ICU Level of Service A

Intersection

Intersection Delay, s/veh 12

Intersection LOS B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↔				↔				↔	
Traffic Vol, veh/h	0	45	45	5	0	25	35	160	0	5	65	20
Future Vol, veh/h	0	45	45	5	0	25	35	160	0	5	65	20
Peak Hour Factor	0.92	0.63	0.87	1.00	0.92	0.69	0.58	0.89	0.92	1.00	0.86	0.83
Heavy Vehicles, %	2	0	0	0	2	0	0	0	2	0	3	0
Mvmt Flow	0	71	52	5	0	36	60	180	0	5	76	24
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0
Approach		EB				WB				NB		
Opposing Approach		WB				EB				SB		
Opposing Lanes		1				1				1		
Conflicting Approach Left		SB				NB				EB		
Conflicting Lanes Left		1				1				1		
Conflicting Approach Right		NB				SB				WB		
Conflicting Lanes Right		1				1				1		
HCM Control Delay		10.2				11.1				9.5		
HCM LOS		B				B				A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	6%	47%	11%	51%
Vol Thru, %	72%	47%	16%	35%
Vol Right, %	22%	5%	73%	13%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	90	95	220	340
LT Vol	5	45	25	175
Through Vol	65	45	35	120
RT Vol	20	5	160	45
Lane Flow Rate	105	128	276	372
Geometry Grp	1	1	1	1
Degree of Util (X)	0.158	0.202	0.383	0.536
Departure Headway (Hd)	5.448	5.688	4.991	5.187
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	657	631	721	696
Service Time	3.492	3.732	3.028	3.218
HCM Lane V/C Ratio	0.16	0.203	0.383	0.534
HCM Control Delay	9.5	10.2	11.1	14.1
HCM Lane LOS	A	B	B	B
HCM 95th-tile Q	0.6	0.8	1.8	3.2

Intersection
Intersection Delay, s/veh
Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	175	120	45
Future Vol, veh/h	0	175	120	45
Peak Hour Factor	0.92	0.93	0.94	0.80
Heavy Vehicles, %	2	1	2	0
Mvmt Flow	0	188	128	56
Number of Lanes	0	0	1	0
Approach		SB		
Opposing Approach		NB		
Opposing Lanes		1		
Conflicting Approach Left		WB		
Conflicting Lanes Left		1		
Conflicting Approach Right		EB		
Conflicting Lanes Right		1		
HCM Control Delay		14.1		
HCM LOS		B		

Lanes, Volumes, Timings

49: S. Cedar Ave/N. Cedar Ave & W, Broad St

2017 Optimized PM Timing Plan

07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	55	160	155	115	175	85
Future Volume (vph)	55	160	155	115	175	85
Satd. Flow (prot)	1787	1599	0	1837	1795	0
Flt Permitted	0.950			0.971		
Satd. Flow (perm)	1787	1599	0	1837	1795	0
Lane Group Flow (vph)	64	163	0	331	311	0
Sign Control	Stop			Stop	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 42.4%

Analysis Period (min) 15

ICU Level of Service A

Intersection
Intersection Delay, s/veh
Intersection LOS

11.2
B

Movement	EBU	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations									
Traffic Vol, veh/h	0	55	160	0	155	115	0	175	85
Future Vol, veh/h	0	55	160	0	155	115	0	175	85
Peak Hour Factor	0.92	0.86	0.98	0.92	0.79	0.85	0.92	0.88	0.76
Heavy Vehicles, %	2	1	1	2	0	1	2	1	0
Mvmt Flow	0	64	163	0	196	135	0	199	112
Number of Lanes	0	1	1	0	0	1	0	1	0
Approach		EB			NB			SB	
Opposing Approach					SB			NB	
Opposing Lanes		0			1			1	
Conflicting Approach Left		SB			EB				
Conflicting Lanes Left		1			2			0	
Conflicting Approach Right		NB						EB	
Conflicting Lanes Right		1			0			2	
HCM Control Delay		9.9			12.3			11.1	
HCM LOS		A			B			B	

Lane	NBLn1	EBLn1	EBLn2	SBLn1
Vol Left, %	57%	100%	0%	0%
Vol Thru, %	43%	0%	0%	67%
Vol Right, %	0%	0%	100%	33%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	270	55	160	260
LT Vol	155	55	0	0
Through Vol	115	0	0	175
RT Vol	0	0	160	85
Lane Flow Rate	331	64	163	311
Geometry Grp	2	7	7	2
Degree of Util (X)	0.458	0.117	0.244	0.408
Departure Headway (Hd)	4.976	6.596	5.38	4.729
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	716	547	671	752
Service Time	3.065	4.296	3.08	2.817
HCM Lane V/C Ratio	0.462	0.117	0.243	0.414
HCM Control Delay	12.3	10.2	9.8	11.1
HCM Lane LOS	B	B	A	B
HCM 95th-tile Q	2.4	0.4	1	2

Lanes, Volumes, Timings

50: US 70/W. Spring St/US 70/W. Broad St & W. Broad St

2017 Optimized PM Timing Plan

07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	5	215	360	10	110	250
Future Volume (vph)	5	215	360	10	110	250
Satd. Flow (prot)	1805	1615	1855	0	0	1833
Flt Permitted	0.950					0.985
Satd. Flow (perm)	1805	1615	1855	0	0	1833
Lane Group Flow (vph)	8	272	466	0	0	415
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 52.1%

Analysis Period (min) 15

ICU Level of Service A

Intersection

Int Delay, s/veh 4.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	215	360	10	110	250
Future Vol, veh/h	5	215	360	10	110	250
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	79	80	63	86	87
Heavy Vehicles, %	0	0	2	0	0	3
Mvmt Flow	8	272	450	16	128	287

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1001	458	0	0	466	0
Stage 1	458	-	-	-	-	-
Stage 2	543	-	-	-	-	-
Critical Hdwy	7.1	6.2	-	-	4.1	-
Critical Hdwy Stg 1	6.1	-	-	-	-	-
Critical Hdwy Stg 2	6.1	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	223	607	-	-	1106	-
Stage 1	587	-	-	-	-	-
Stage 2	528	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	199	607	-	-	1106	-
Mov Cap-2 Maneuver	322	-	-	-	-	-
Stage 1	587	-	-	-	-	-
Stage 2	455	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	15.7		0		2.7
HCM LOS	C				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	322	607	1106	-
HCM Lane V/C Ratio	-	-	0.025	0.448	0.116	-
HCM Control Delay (s)	-	-	16.5	15.7	8.7	0
HCM Lane LOS	-	-	C	C	A	A
HCM 95th %tile Q(veh)	-	-	0.1	2.3	0.4	-

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

51: W. Jackson St/Pippin Rd & US 70/W. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	200	160	10	325	105	295	340	30	55	125	5
Future Volume (vph)	5	200	160	10	325	105	295	340	30	55	125	5
Satd. Flow (prot)	1805	1863	1553	1805	1807	0	1805	1900	1615	0	1858	0
Flt Permitted	0.186			0.559			0.950				0.984	
Satd. Flow (perm)	353	1863	1553	1062	1807	0	1805	1900	1615	0	1858	0
Satd. Flow (RTOR)			176		22				218		1	
Lane Group Flow (vph)	12	233	176	16	501	0	355	370	32	0	213	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Free	Split	NA	
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases	6		6	2					Free			
Total Split (s)	11.0	33.0	33.0	11.0	33.0		26.0	26.0		20.0	20.0	
Total Lost Time (s)	4.5	5.9	5.9	4.5	5.9		5.5	5.5			5.1	
Act Effct Green (s)	27.0	24.5	24.5	27.0	24.5		19.1	19.1	75.3		13.0	
Actuated g/C Ratio	0.36	0.33	0.33	0.36	0.33		0.25	0.25	1.00		0.17	
v/c Ratio	0.05	0.38	0.28	0.04	0.83		0.78	0.77	0.02		0.67	
Control Delay	15.8	23.3	5.1	15.6	37.6		41.6	40.4	0.0		42.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay	15.8	23.3	5.1	15.6	37.6		41.6	40.4	0.0		42.3	
LOS	B	C	A	B	D		D	D	A		D	
Approach Delay		15.5			36.9			39.2			42.3	
Approach LOS		B			D			D			D	
Queue Length 50th (ft)	4	84	0	5	207		159	166	0		97	
Queue Length 95th (ft)	6	163	45	12	#449		#301	#355	0		#204	
Internal Link Dist (ft)		1551			2304			1891			664	
Turn Bay Length (ft)	100		100	100			350					
Base Capacity (vph)	255	686	683	447	680		503	529	1615		377	
Starvation Cap Reductn	0	0	0	0	0		0	0	0		0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0		0	
Storage Cap Reductn	0	0	0	0	0		0	0	0		0	
Reduced v/c Ratio	0.05	0.34	0.26	0.04	0.74		0.71	0.70	0.02		0.56	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 75.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 33.7

Intersection LOS: C

Intersection Capacity Utilization 65.1%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 51: W. Jackson St/Pippin Rd & US 70/W. Broad St

			
Ø1	Ø2	Ø3	Ø4
11 s	33 s	26 s	20 s
			
Ø5	Ø6		
11 s	33 s		

Lanes, Volumes, Timings
52: E.10th St & Brown Ave N

2017 Optimized PM Timing Plan

07/12/2017

								
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	20	815	645	75	90	45		
Future Volume (vph)	20	815	645	75	90	45		
Satd. Flow (prot)	1719	1900	1847	0	1722	0		
Flt Permitted	0.152				0.968			
Satd. Flow (perm)	275	1900	1847	0	1722	0		
Satd. Flow (RTOR)			11		24			
Lane Group Flow (vph)	28	867	808	0	180	0		
Turn Type	pm+pt	NA	NA		Prot			
Protected Phases	1	6	2 4		3		2	4
Permitted Phases	6							
Total Split (s)	11.0	60.0			19.0		49.0	11.0
Total Lost Time (s)	4.5	6.6			4.7			
Act Effct Green (s)	48.4	46.2	51.1		12.9			
Actuated g/C Ratio	0.59	0.56	0.62		0.16			
v/c Ratio	0.10	0.81	0.70		0.62			
Control Delay	7.5	21.3	5.5		39.8			
Queue Delay	0.0	0.0	0.0		0.0			
Total Delay	7.5	21.3	5.5		39.8			
LOS	A	C	A		D			
Approach Delay		20.8	5.5		39.8			
Approach LOS		C	A		D			
Queue Length 50th (ft)	6	339	11		83			
Queue Length 95th (ft)	12	505	#99		120			
Internal Link Dist (ft)		2500	23		665			
Turn Bay Length (ft)	100							
Base Capacity (vph)	279	1266	1229		326			
Starvation Cap Reductn	0	0	0		0			
Spillback Cap Reductn	0	0	0		0			
Storage Cap Reductn	0	0	0		0			
Reduced v/c Ratio	0.10	0.68	0.66		0.55			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 81.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 16.1

Intersection LOS: B

Intersection Capacity Utilization 60.0%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 52: E.10th St & Brown Ave N

 Ø1	 #52 #521  Ø2	 #52 #521  Ø3	 #52 #521  Ø4
11 s	49 s	19 s	11 s
 #52 #521  Ø6			
60 s			

PM Peak HR
WSP

Synchro 9 Report
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Lanes, Volumes, Timings

53: Fisk Rd & E.10th St

2017 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	710	20	10	525	190	30	45	15	165	30	80
Future Volume (vph)	90	710	20	10	525	190	30	45	15	165	30	80
Satd. Flow (prot)	1805	1872	0	1805	1900	1599	0	1802	0	0	1737	1599
Flt Permitted	0.205			0.155				0.986			0.960	
Satd. Flow (perm)	390	1872	0	294	1900	1599	0	1802	0	0	1737	1599
Satd. Flow (RTOR)		2				184		7				123
Lane Group Flow (vph)	103	768	0	10	597	241	0	123	0	0	219	92
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases	2			6		6						3
Total Split (s)	12.0	42.0		12.0	42.0	42.0	24.0	24.0		22.0	22.0	22.0
Total Lost Time (s)	4.5	5.3		4.5	5.3	5.3		4.5			4.5	4.5
Act Effct Green (s)	45.8	43.7		42.0	36.6	36.6		11.0			15.0	15.0
Actuated g/C Ratio	0.55	0.53		0.50	0.44	0.44		0.13			0.18	0.18
v/c Ratio	0.30	0.78		0.04	0.71	0.30		0.51			0.70	0.24
Control Delay	13.6	26.8		11.4	29.2	6.8		41.7			47.4	4.8
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	13.6	26.8		11.4	29.2	6.8		41.7			47.4	4.8
LOS	B	C		B	C	A		D			D	A
Approach Delay		25.2			22.6			41.7			34.8	
Approach LOS		C			C			D			C	
Queue Length 50th (ft)	27	329		3	293	20		63			117	0
Queue Length 95th (ft)	56	#742		11	#488	53		79			187	21
Internal Link Dist (ft)		2105			3570			811			723	
Turn Bay Length (ft)	200			175		175						250
Base Capacity (vph)	346	983		292	882	841		441			377	444
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.30	0.78		0.03	0.68	0.29		0.28			0.58	0.21

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 83.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 26.5

Intersection Capacity Utilization 72.9%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 53: Fisk Rd & E.10th St

			
Ø1	Ø2	Ø3	Ø4
12 s	42 s	22 s	24 s
			
Ø5	Ø6		
12 s	42 s		

Lanes, Volumes, Timings
54: N. Old Kentucky Rd & E.10th St

2017 Optimized PM Timing Plan

07/12/2017

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	710	145	110	565	175	150
Future Volume (vph)	710	145	110	565	175	150
Satd. Flow (prot)	1863	1583	1787	1881	1770	1615
Flt Permitted			0.184		0.950	
Satd. Flow (perm)	1863	1583	346	1881	1770	1615
Satd. Flow (RTOR)		156				217
Lane Group Flow (vph)	772	156	133	601	233	217
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	1 2	4	
Permitted Phases		2	1 2			4
Total Split (s)	54.0	54.0	14.0		22.0	22.0
Total Lost Time (s)	5.5	5.5	4.5		4.7	4.7
Act Effct Green (s)	49.4	49.4	60.8	65.3	15.5	15.5
Actuated g/C Ratio	0.55	0.55	0.68	0.73	0.17	0.17
v/c Ratio	0.75	0.17	0.33	0.44	0.76	0.47
Control Delay	21.9	2.2	10.0	7.5	52.3	8.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.9	2.2	10.0	7.5	52.3	8.4
LOS	C	A	B	A	D	A
Approach Delay	18.6			7.9	31.1	
Approach LOS	B			A	C	
Queue Length 50th (ft)	325	0	26	127	125	0
Queue Length 95th (ft)	483	27	59	220	163	18
Internal Link Dist (ft)	3570			975	734	
Turn Bay Length (ft)		400	125		175	
Base Capacity (vph)	1023	939	399	1364	340	485
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.17	0.33	0.44	0.69	0.45

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 32 (36%), Referenced to phase 2:EBWB and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 17.6

Intersection LOS: B

Intersection Capacity Utilization 65.4%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 54: N. Old Kentucky Rd & E.10th St



Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

55: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	690	210	225	590	0	0	0	0	90	0	150
Future Volume (vph)	0	690	210	225	590	0	0	0	0	90	0	150
Satd. Flow (prot)	0	3441	0	1752	3574	0	0	0	0	1770	0	1583
Flt Permitted				0.182						0.950		
Satd. Flow (perm)	0	3441	0	336	3574	0	0	0	0	1770	0	1583
Satd. Flow (RTOR)		55										176
Lane Group Flow (vph)	0	1056	0	256	615	0	0	0	0	100	0	176
Turn Type		NA		pm+pt	NA					Prot		Perm
Protected Phases		6		5	2					8		
Permitted Phases				2								8
Total Split (s)		44.0		25.0	69.0					21.0		21.0
Total Lost Time (s)		5.3		4.5	5.3					5.9		5.9
Act Effct Green (s)		48.9		66.3	65.5					13.3		13.3
Actuated g/C Ratio		0.54		0.74	0.73					0.15		0.15
v/c Ratio		0.56		0.58	0.24					0.38		0.46
Control Delay		7.5		9.6	3.3					39.3		9.8
Queue Delay		0.0		0.0	0.0					0.0		0.0
Total Delay		7.5		9.6	3.3					39.3		9.8
LOS		A		A	A					D		A
Approach Delay		7.5			5.2						20.5	
Approach LOS		A			A						C	
Queue Length 50th (ft)		71		42	60					52		0
Queue Length 95th (ft)		116		20	3					99		47
Internal Link Dist (ft)		570			785			708			972	
Turn Bay Length (ft)				120								150
Base Capacity (vph)		1893		570	2601					296		412
Starvation Cap Reductn		0		0	0					0		0
Spillback Cap Reductn		0		0	0					0		0
Storage Cap Reductn		0		0	0					0		0
Reduced v/c Ratio		0.56		0.45	0.24					0.34		0.43

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 57 (63%), Referenced to phase 2:WBTL and 6:EBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 8.2

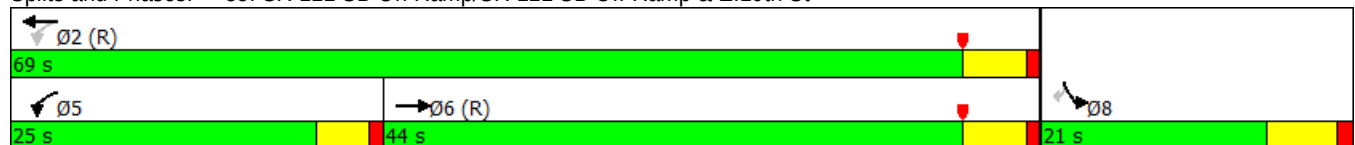
Intersection Capacity Utilization 62.2%

Analysis Period (min) 15

Intersection LOS: A

ICU Level of Service B

Splits and Phases: 55: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & E.10th St



Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	220	565	0	0	625	230	190	0	360	0	0	0
Future Volume (vph)	220	565	0	0	625	230	190	0	360	0	0	0
Satd. Flow (prot)	1770	3574	0	0	3424	0	1787	0	1599	0	0	0
Flt Permitted	0.199						0.950					
Satd. Flow (perm)	371	3574	0	0	3424	0	1787	0	1599	0	0	0
Satd. Flow (RTOR)					83				276			
Lane Group Flow (vph)	286	642	0	0	942	0	211	0	414	0	0	0
Turn Type	pm+pt	NA			NA		Prot		Perm			
Protected Phases	1	6			2		4					
Permitted Phases	6								4			
Total Split (s)	23.0	60.0			37.0		30.0		30.0			
Total Lost Time (s)	4.5	5.3			5.3		5.9		5.9			
Act Effct Green (s)	62.9	62.1			44.0		16.7		16.7			
Actuated g/C Ratio	0.70	0.69			0.49		0.19		0.19			
v/c Ratio	0.61	0.26			0.55		0.64		0.79			
Control Delay	10.9	5.5			21.4		41.8		23.0			
Queue Delay	0.0	0.0			1.4		0.0		0.2			
Total Delay	10.9	5.5			22.9		41.8		23.2			
LOS	B	A			C		D		C			
Approach Delay		7.2			22.9			29.5				
Approach LOS		A			C			C				
Queue Length 50th (ft)	47	58			195		113		73			
Queue Length 95th (ft)	95	123			316		166		152			
Internal Link Dist (ft)		785			131			909			832	
Turn Bay Length (ft)	400								150			
Base Capacity (vph)	547	2466			1715		478		630			
Starvation Cap Reductn	0	0			539		0		0			
Spillback Cap Reductn	0	215			0		0		16			
Storage Cap Reductn	0	0			0		0		0			
Reduced v/c Ratio	0.52	0.29			0.80		0.44		0.67			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 7 (8%), Referenced to phase 2:WBT and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 18.7

Intersection Capacity Utilization 62.2%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St

 Ø1	 Ø2 (R)	 Ø4
23 s	37 s	30 s
 Ø6 (R)		
60 s		

Lanes, Volumes, Timings
57: Burton Branch Rd & E.10th St

2017 Optimized PM Timing Plan

07/12/2017

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	835	85	25	710	130	35
Future Volume (vph)	835	85	25	710	130	35
Satd. Flow (prot)	3521	0	1805	3574	1805	1615
Flt Permitted			0.203		0.950	
Satd. Flow (perm)	3521	0	386	3574	1805	1615
Satd. Flow (RTOR)	18					64
Lane Group Flow (vph)	1046	0	28	780	228	64
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			2			4
Total Split (s)	47.0		15.0	62.0	28.0	28.0
Total Lost Time (s)	5.6		4.5	5.6	5.4	5.4
Act Effct Green (s)	56.2		63.1	62.0	17.0	17.0
Actuated g/C Ratio	0.62		0.70	0.69	0.19	0.19
v/c Ratio	0.47		0.07	0.32	0.67	0.18
Control Delay	8.7		5.4	6.4	43.5	8.9
Queue Delay	0.9		0.0	0.2	0.0	0.0
Total Delay	9.5		5.4	6.6	43.5	8.9
LOS	A		A	A	D	A
Approach Delay	9.5			6.6	35.9	
Approach LOS	A			A	D	
Queue Length 50th (ft)	26		4	78	122	0
Queue Length 95th (ft)	354		14	131	107	7
Internal Link Dist (ft)	131			316	647	
Turn Bay Length (ft)			100			175
Base Capacity (vph)	2205		436	2461	453	453
Starvation Cap Reductn	790		0	0	0	0
Spillback Cap Reductn	0		0	880	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.74		0.06	0.49	0.50	0.14

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 5 (6%), Referenced to phase 2:WBTL and 6:EBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 12.0

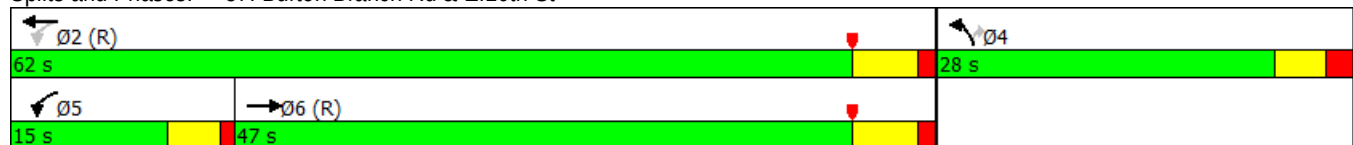
Intersection Capacity Utilization 45.8%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 57: Burton Branch Rd & E.10th St



Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

61: SR 135/S. Willow Ave & County Services Dr/Orchard St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	10	25	40	5	70	5	1005	10	55	1165	5
Future Volume (vph)	35	10	25	40	5	70	5	1005	10	55	1165	5
Satd. Flow (prot)	1787	1634	0	0	1678	0	1626	3568	0	1787	3534	0
Flt Permitted	0.771				0.849		0.176			0.210		
Satd. Flow (perm)	1450	1634	0	0	1449	0	301	3568	0	395	3534	0
Satd. Flow (RTOR)		64			76			2			1	
Lane Group Flow (vph)	69	84	0	0	125	0	8	1048	0	64	1285	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			3		5	2		1	6	
Permitted Phases	4			3			2			6		
Total Split (s)	25.0	25.0		25.0	25.0		11.0	54.0		11.0	54.0	
Total Lost Time (s)	5.5	5.5			5.5		4.5	6.5		4.5	6.5	
Act Effct Green (s)	9.2	9.2			9.2		35.6	32.3		37.5	36.5	
Actuated g/C Ratio	0.17	0.17			0.17		0.65	0.59		0.69	0.67	
v/c Ratio	0.28	0.26			0.41		0.02	0.50		0.14	0.54	
Control Delay	28.1	13.3			17.1		3.8	11.0		4.3	8.6	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	28.1	13.3			17.1		3.8	11.0		4.3	8.6	
LOS	C	B			B		A	B		A	A	
Approach Delay		19.9			17.1			11.0			8.4	
Approach LOS		B			B			B			A	
Queue Length 50th (ft)	20	6			14		1	136		6	107	
Queue Length 95th (ft)	38	13			72		3	221		18	295	
Internal Link Dist (ft)		674			289			17			564	
Turn Bay Length (ft)	100						100			200		
Base Capacity (vph)	571	682			617		371	3017		454	2988	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.12	0.12			0.20		0.02	0.35		0.14	0.43	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 54.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 10.5

Intersection Capacity Utilization 64.6%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service C

Splits and Phases: 61: SR 135/S. Willow Ave & County Services Dr/Orchard St

		
Ø1	Ø2	Ø3
11 s	54 s	25 s
		
Ø5	Ø6	Ø4
11 s	54 s	25 s

Lanes, Volumes, Timings 95: Foutch Dr

2017 Optimized PM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	10	0	0	135	0	50
Future Volume (vph)	10	0	0	135	0	50
Satd. Flow (prot)	1805	0	0	1644	0	1900
Flt Permitted	0.950					
Satd. Flow (perm)	1805	0	0	1644	0	1900
Lane Group Flow (vph)	12	0	0	175	0	52
Sign Control	Yield		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 13.3%

Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings

241: SR 136/S. Jefferson Ave & Fairground St

2017 Optimized PM Timing Plan

07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				  	 	
Traffic Volume (vph)	15	15	5	835	1070	5
Future Volume (vph)	15	15	5	835	1070	5
Satd. Flow (prot)	1721	0	0	5136	3606	0
Flt Permitted	0.978					
Satd. Flow (perm)	1721	0	0	5136	3606	0
Lane Group Flow (vph)	44	0	0	869	1111	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 39.7%

ICU Level of Service A

Analysis Period (min) 15

HCM 2010 TWSC
241: SR 136/S. Jefferson Ave & Fairground St

2017 Optimized PM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	15	15	5	835	1070	5
Future Vol, veh/h	15	15	5	835	1070	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	63	63	97	97	63
Heavy Vehicles, %	0	0	0	1	0	0
Mvmt Flow	20	24	8	861	1103	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1467	556	1111	0	-	0
Stage 1	1107	-	-	-	-	-
Stage 2	360	-	-	-	-	-
Critical Hdwy	6.25	6.9	4.1	-	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	6	-	-	-	-	-
Follow-up Hdwy	3.65	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	148	480	636	-	-	-
Stage 1	276	-	-	-	-	-
Stage 2	646	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	144	480	636	-	-	-
Mov Cap-2 Maneuver	144	-	-	-	-	-
Stage 1	276	-	-	-	-	-
Stage 2	630	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24.1	0.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	636	-	232	-	-
HCM Lane V/C Ratio	0.012	-	0.189	-	-
HCM Control Delay (s)	10.7	0.1	24.1	-	-
HCM Lane LOS	B	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.7	-	-

Lanes, Volumes, Timings
271: Foutch Dr & SR 136/S. Jefferson Ave

2017 Optimized PM Timing Plan
07/12/2017

						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	5	660	605	50	0	0
Future Volume (vph)	5	660	605	50	0	0
Satd. Flow (prot)	0	3346	3327	0	0	0
Flt Permitted						
Satd. Flow (perm)	0	3346	3327	0	0	0
Lane Group Flow (vph)	0	730	717	0	0	0
Sign Control		Free	Free		Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 25.1%

Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings

2017 Optimized PM Timing Plan

361: US 70/E. Spring St & I-40 WB On-Ramp (SB)/I-40 WB On-Ramp (NB)

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	60	225	5	0	500	65
Future Volume (vph)	0	0	0	0	0	0	60	225	5	0	500	65
Satd. Flow (prot)	0	0	0	0	0	0	0	3296	0	0	3389	0
Flt Permitted								0.990				
Satd. Flow (perm)	0	0	0	0	0	0	0	3296	0	0	3389	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	344	0	0	597	0
Sign Control		Free				Free		Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 30.7%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
521: Brown Ave S & E.10th St

2017 Optimized PM Timing Plan

07/12/2017

	→	↘	↙	←	↖	↗			
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø1	Ø3	Ø6
Lane Configurations									
Traffic Volume (vph)	885	20	5	700	20	15			
Future Volume (vph)	885	20	5	700	20	15			
Satd. Flow (prot)	1890	0	1805	1881	1743	0			
Flt Permitted			0.191		0.972				
Satd. Flow (perm)	1890	0	363	1881	1743	0			
Satd. Flow (RTOR)	9				20				
Lane Group Flow (vph)	988	0	8	778	48	0			
Turn Type	NA		Perm	NA	Prot				
Protected Phases	3 6			2	4		1	3	6
Permitted Phases			2						
Total Split (s)			49.0	49.0	11.0		11.0	19.0	60.0
Total Lost Time (s)			6.6	6.6	4.7				
Act Effct Green (s)	65.9		42.2	42.2	6.4				
Actuated g/C Ratio	0.80		0.52	0.52	0.08				
v/c Ratio	0.65		0.04	0.80	0.31				
Control Delay	1.8		13.2	25.8	32.3				
Queue Delay	0.0		0.0	0.3	0.5				
Total Delay	1.8		13.2	26.1	32.9				
LOS	A		B	C	C				
Approach Delay	1.8			26.0	32.9				
Approach LOS	A			C	C				
Queue Length 50th (ft)	5		2	282	15				
Queue Length 95th (ft)	10		7	#619	36				
Internal Link Dist (ft)	23			2105	565				
Turn Bay Length (ft)			115						
Base Capacity (vph)	1587		201	1045	155				
Starvation Cap Reductn	0		0	0	0				
Spillback Cap Reductn	0		0	39	18				
Storage Cap Reductn	0		0	0	0				
Reduced v/c Ratio	0.62		0.04	0.77	0.35				

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 81.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 13.1

Intersection LOS: B

Intersection Capacity Utilization 60.6%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 521: Brown Ave S & E.10th St

#52	#52 #521	#52 #521	#52 #521
11 s	49 s	19 s	11 s
#52 #521			
60 s			

PM Peak HR
WSP

Synchro 9 Report
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Appendix C: 2040 No-Build Conditions Synchro Reports

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	20	30	30	10	100	35	770	25	80	355	135
Future Volume (vph)	65	20	30	30	10	100	35	770	25	80	355	135
Satd. Flow (prot)	1736	1679	0	1805	1597	0	1805	3518	0	1805	3239	0
Flt Permitted	0.664			0.705			0.424			0.205		
Satd. Flow (perm)	1213	1679	0	1340	1597	0	806	3518	0	390	3239	0
Satd. Flow (RTOR)		48			122			5			91	
Lane Group Flow (vph)	83	80	0	60	146	0	42	974	0	105	603	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		3			4		5	2		1	6	
Permitted Phases	3			4			2			6		
Total Split (s)	32.0	32.0		32.0	32.0		13.0	42.0		16.0	45.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	4.0		5.0	4.0	
Act Effct Green (s)	9.4	9.4		9.4	9.4		31.9	29.9		34.8	34.8	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.60	0.57		0.66	0.66	
v/c Ratio	0.39	0.24		0.25	0.38		0.07	0.49		0.24	0.28	
Control Delay	27.9	13.6		24.7	10.6		4.6	11.5		5.6	6.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	27.9	13.6		24.7	10.6		4.6	11.5		5.6	6.4	
LOS	C	B		C	B		A	B		A	A	
Approach Delay		20.9			14.7			11.2			6.3	
Approach LOS		C			B			B			A	
Queue Length 50th (ft)	24	9		17	6		4	113		10	26	
Queue Length 95th (ft)	59	25		28	0		13	176		24	86	
Internal Link Dist (ft)		927			612			1063			1812	
Turn Bay Length (ft)	200			150			200			200		
Base Capacity (vph)	666	943		736	932		674	2594		582	2544	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.12	0.08		0.08	0.16		0.06	0.38		0.18	0.24	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 52.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 10.6

Intersection Capacity Utilization 49.0%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

		
16 s	42 s	32 s
		
13 s	45 s	32 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	345	10	60	0	0	0	0	700	275	225	610	0
Future Volume (vph)	345	10	60	0	0	0	0	700	275	225	610	0
Satd. Flow (prot)	1681	1541	0	0	0	0	0	3417	0	1687	3438	0
Flt Permitted	0.950	0.969								0.148		
Satd. Flow (perm)	1681	1541	0	0	0	0	0	3417	0	263	3438	0
Satd. Flow (RTOR)		33						52				
Lane Group Flow (vph)	249	239	0	0	0	0	0	1233	0	265	772	0
Turn Type	Split	NA						NA		pm+pt	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases										6		
Total Split (s)	45.0	45.0						27.0		18.0	45.0	
Total Lost Time (s)	6.1	6.1						5.4		5.0	5.4	
Act Effct Green (s)	14.2	14.2						21.8		38.1	37.7	
Actuated g/C Ratio	0.22	0.22						0.34		0.60	0.59	
v/c Ratio	0.66	0.65						1.02		0.66	0.38	
Control Delay	31.7	27.9						55.2		19.2	8.1	
Queue Delay	0.0	0.0						0.0		0.0	0.0	
Total Delay	31.7	27.9						55.2		19.2	8.1	
LOS	C	C						E		B	A	
Approach Delay		29.8						55.2			10.9	
Approach LOS		C						E			B	
Queue Length 50th (ft)	92	74						~244		42	70	
Queue Length 95th (ft)	156	147						#365		123	114	
Internal Link Dist (ft)		409			271			1812			858	
Turn Bay Length (ft)	200									410		
Base Capacity (vph)	1040	966						1208		452	2165	
Starvation Cap Reductn	0	0						0		0	0	
Spillback Cap Reductn	0	0						0		0	0	
Storage Cap Reductn	0	0						0		0	0	
Reduced v/c Ratio	0.24	0.25						1.02		0.59	0.36	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 63.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 34.1

Intersection Capacity Utilization 66.0%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

		
Ø1	Ø2	Ø4
18 s	27 s	45 s
		
Ø6		
45 s		

AM Peak Hour

WSP

Synchro 9 Report

Page 2

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	265	10	370	55	980	0	0	580	175
Future Volume (vph)	0	0	0	265	10	370	55	980	0	0	580	175
Satd. Flow (prot)	0	0	0	0	1699	1553	1530	3574	0	0	3321	0
Flt Permitted					0.954		0.160					
Satd. Flow (perm)	0	0	0	0	1699	1553	258	3574	0	0	3321	0
Satd. Flow (RTOR)						85					46	
Lane Group Flow (vph)	0	0	0	0	360	420	73	1210	0	0	846	0
Turn Type				Split	NA	Perm	pm+pt	NA			NA	
Protected Phases				4	4		5	2			6	
Permitted Phases						4	2					
Total Split (s)				45.0	45.0	45.0	11.0	45.0			34.0	
Total Lost Time (s)					4.0	4.0	5.0	4.0			4.0	
Act Effct Green (s)					24.2	24.2	32.4	33.5			25.3	
Actuated g/C Ratio					0.37	0.37	0.49	0.51			0.38	
v/c Ratio					0.58	0.68	0.30	0.67			0.65	
Control Delay					21.9	20.7	14.3	15.7			21.2	
Queue Delay					0.0	0.0	0.0	0.0			0.0	
Total Delay					21.9	20.7	14.3	15.7			21.2	
LOS					C	C	B	B			C	
Approach Delay					21.2			15.6			21.2	
Approach LOS					C			B			C	
Queue Length 50th (ft)					118	114	15	176			145	
Queue Length 95th (ft)					133	216	39	299			269	
Internal Link Dist (ft)		874			1170			858			839	
Turn Bay Length (ft)						200	200					
Base Capacity (vph)					1123	1056	250	2363			1649	
Starvation Cap Reductn					0	0	0	0			0	
Spillback Cap Reductn					0	0	0	0			0	
Storage Cap Reductn					0	0	0	0			0	
Reduced v/c Ratio					0.32	0.40	0.29	0.51			0.51	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 66.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 18.8

Intersection Capacity Utilization 66.0%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service C

Splits and Phases: 3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

 Ø2	 Ø4
45 s	45 s
 Ø5	 Ø6
11 s	34 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	165	85	210	75	180	70	950	295	205	495	30
Future Volume (vph)	75	165	85	210	75	180	70	950	295	205	495	30
Satd. Flow (prot)	1719	1687	0	1752	1810	1553	1752	3428	0	1770	3372	0
Flt Permitted	0.690			0.237			0.430			0.105		
Satd. Flow (perm)	1249	1687	0	437	1810	1553	793	3428	0	196	3372	0
Satd. Flow (RTOR)		29				225		54			12	
Lane Group Flow (vph)	115	300	0	253	104	225	84	1435	0	250	581	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4		4	2			6		
Total Split (s)	14.0	18.0		17.0	21.0	21.0	11.0	39.0		16.0	44.0	
Total Lost Time (s)	5.0	4.0		5.0	4.0	6.5	5.0	4.0		5.0	4.0	
Act Effct Green (s)	21.1	14.0		28.6	20.0	17.5	39.9	35.0		49.6	41.9	
Actuated g/C Ratio	0.24	0.16		0.32	0.22	0.20	0.45	0.39		0.55	0.47	
v/c Ratio	0.34	1.05		0.80	0.26	0.46	0.20	1.05		0.85	0.37	
Control Delay	25.0	100.7		45.0	33.0	8.4	11.2	64.5		44.8	16.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	25.0	100.7		45.0	33.0	8.4	11.2	64.5		44.8	16.5	
LOS	C	F		D	C	A	B	E		D	B	
Approach Delay		79.7			28.7			61.5			25.0	
Approach LOS		E			C			E			C	
Queue Length 50th (ft)	46	~172		111	51	0	21	~463		86	110	
Queue Length 95th (ft)	61	#327		#180	77	41	38	#563		#173	152	
Internal Link Dist (ft)		811			944			839			2060	
Turn Bay Length (ft)	150			150			50			150		
Base Capacity (vph)	354	287		315	404	484	418	1372		302	1582	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.32	1.05		0.80	0.26	0.46	0.20	1.05		0.83	0.37	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 89.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 49.0

Intersection Capacity Utilization 86.7%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service E

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: SR 135/S. Willow Ave & Foreman Dr/Interstate Dr

 Ø1	 Ø2	 Ø3	 Ø4
16 s	39 s	14 s	21 s
 Ø5	 Ø6	 Ø7	 Ø8
11 s	44 s	17 s	18 s

AM Peak Hour

WSP

Synchro 9 Report

Page 4

Lanes, Volumes, Timings
5: SR 135/S. Willow Ave & Fairground St

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	20	65	975	80	55	730
Future Volume (vph)	20	65	975	80	55	730
Satd. Flow (prot)	1805	1583	3496	0	1805	3471
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1583	3496	0	1805	3471
Lane Group Flow (vph)	32	73	1240	0	79	777
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 46.2%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
6: SR 135/S. Willow Ave & Ashwood Dr

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (vph)	0	10	960	20	0	800
Future Volume (vph)	0	10	960	20	0	800
Satd. Flow (prot)	0	1522	3491	0	0	3438
Flt Permitted						
Satd. Flow (perm)	0	1522	3491	0	0	3438
Lane Group Flow (vph)	0	16	1106	0	0	870
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 37.2%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
7: SR 135/S. Willow Ave & Lone Oak Dr

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				 	 	
Traffic Volume (vph)	75	40	15	990	820	20
Future Volume (vph)	75	40	15	990	820	20
Satd. Flow (prot)	1787	1568	1805	3505	3447	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1568	1805	3505	3447	0
Lane Group Flow (vph)	99	43	24	1151	1002	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 38.2%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
8: SR 135/S. Willow Ave & W. Jackson St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	390	300	120	190	115	195	700	120	135	540	25
Future Volume (vph)	85	390	300	120	190	115	195	700	120	135	540	25
Satd. Flow (prot)	1752	3574	1524	1787	3299	0	1736	3451	0	1787	3504	0
Flt Permitted	0.446			0.273			0.253			0.150		
Satd. Flow (perm)	823	3574	1524	514	3299	0	462	3451	0	282	3504	0
Satd. Flow (RTOR)			329		156			31			5	
Lane Group Flow (vph)	110	506	345	154	399	0	244	955	0	153	625	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4			2			6		
Total Split (s)	12.0	24.0	24.0	12.0	24.0		18.0	40.0		14.0	36.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.5		4.0	4.0	
Act Effct Green (s)	26.3	18.3	18.3	27.4	21.3		43.3	30.3		37.3	27.8	
Actuated g/C Ratio	0.32	0.22	0.22	0.33	0.26		0.52	0.37		0.45	0.34	
v/c Ratio	0.31	0.64	0.58	0.52	0.42		0.56	0.75		0.51	0.53	
Control Delay	21.9	34.3	8.8	27.0	18.6		15.9	26.4		18.2	24.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.9	34.3	8.8	27.0	18.6		15.9	26.4		18.2	24.2	
LOS	C	C	A	C	B		B	C		B	C	
Approach Delay		23.7			20.9			24.2			23.0	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	40	131	7	57	58		67	225		39	141	
Queue Length 95th (ft)	68	158	70	91	84		95	286		74	194	
Internal Link Dist (ft)		1238			1065			2054			612	
Turn Bay Length (ft)	225		175	150			150			150		
Base Capacity (vph)	352	872	620	294	977		464	1512		312	1371	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.31	0.58	0.56	0.52	0.41		0.53	0.63		0.49	0.46	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 82.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 23.3

Intersection Capacity Utilization 61.8%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service B

Splits and Phases: 8: SR 135/S. Willow Ave & W. Jackson St

 Ø1	 Ø2	 Ø3	 Ø4
14 s	40 s	12 s	24 s
 Ø5	 Ø6	 Ø7	 Ø8
18 s	36 s	12 s	24 s

Lanes, Volumes, Timings
9: SR 135/S. Willow Ave & W. Stevens St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	125	20	35	60	40	20	840	40	60	675	15
Future Volume (vph)	50	125	20	35	60	40	20	840	40	60	675	15
Satd. Flow (prot)	0	1824	0	1805	1750	0	1805	3477	0	1805	3494	0
Flt Permitted		0.986		0.950			0.225			0.125		
Satd. Flow (perm)	0	1824	0	1805	1750	0	428	3477	0	238	3494	0
Satd. Flow (RTOR)		5			28			7			4	
Lane Group Flow (vph)	0	311	0	51	139	0	37	1055	0	81	857	0
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	24.0	24.0		15.0	15.0		11.0	40.0		11.0	40.0	
Total Lost Time (s)		5.6		5.6	5.6		5.0	5.6		5.0	5.6	
Act Effct Green (s)		16.5		8.4	8.4		34.4	29.4		35.5	31.6	
Actuated g/C Ratio		0.21		0.10	0.10		0.43	0.37		0.44	0.39	
v/c Ratio		0.82		0.27	0.67		0.13	0.82		0.36	0.62	
Control Delay		51.2		40.8	48.0		12.2	29.8		16.1	22.6	
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		51.2		40.8	48.0		12.2	29.8		16.1	22.6	
LOS		D		D	D		B	C		B	C	
Approach Delay		51.2			46.1			29.2			22.1	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)		165		27	61		10	272		22	204	
Queue Length 95th (ft)		168		47	88		15	317		37	232	
Internal Link Dist (ft)		761			793			608			1346	
Turn Bay Length (ft)				75			100			150		
Base Capacity (vph)		444		222	240		292	1573		228	1621	
Starvation Cap Reductn		0		0	0		0	0		0	0	
Spillback Cap Reductn		0		0	0		0	0		0	0	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.70		0.23	0.58		0.13	0.67		0.36	0.53	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 80.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 30.6

Intersection Capacity Utilization 60.2%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service B

Splits and Phases: 9: SR 135/S. Willow Ave & W. Stevens St

			
Ø1	Ø2	Ø3	Ø4
11 s	40 s	15 s	24 s
			
Ø5	Ø6		
11 s	40 s		

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

10: SR 135/S. Willow Ave & US 70/W. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	165	505	120	150	305	90	85	715	100	85	625	25
Future Volume (vph)	165	505	120	150	305	90	85	715	100	85	625	25
Satd. Flow (prot)	1787	1744	0	1752	1790	0	1787	3460	0	1652	3342	0
Flt Permitted	0.265			0.141			0.212			0.148		
Satd. Flow (perm)	499	1744	0	260	1790	0	399	3460	0	257	3342	0
Satd. Flow (RTOR)		17			19			15			7	
Lane Group Flow (vph)	209	705	0	203	440	0	86	1006	0	90	742	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	34.0		12.0	34.0		11.0	33.0		11.0	33.0	
Total Lost Time (s)	5.0	5.7		5.0	5.7		5.0	5.4		5.0	5.4	
Act Effct Green (s)	36.2	28.4		36.2	28.4		32.0	26.9		32.0	26.9	
Actuated g/C Ratio	0.42	0.33		0.42	0.33		0.37	0.31		0.37	0.31	
v/c Ratio	0.67	1.21		0.89	0.74		0.36	0.93		0.48	0.71	
Control Delay	28.7	140.7		57.6	34.8		19.8	45.4		24.3	31.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	28.7	140.7		57.6	34.8		19.8	45.4		24.3	31.4	
LOS	C	F		E	C		B	D		C	C	
Approach Delay		115.1			42.0			43.4			30.7	
Approach LOS		F			D			D			C	
Queue Length 50th (ft)	71	~505		69	215		28	287		30	194	
Queue Length 95th (ft)	101	#722		#128	#356		56	314		59	256	
Internal Link Dist (ft)		2100			700			1346			1053	
Turn Bay Length (ft)	125			125			175			150		
Base Capacity (vph)	310	581		228	596		242	1111		191	1068	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.67	1.21		0.89	0.74		0.36	0.91		0.47	0.69	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 87.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.21

Intersection Signal Delay: 58.9

Intersection Capacity Utilization 87.7%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service E

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 10: SR 135/S. Willow Ave & US 70/W. Spring St

 Ø1	 Ø2	 Ø3	 Ø4
11 s	33 s	12 s	34 s
 Ø5	 Ø6	 Ø7	 Ø8
11 s	33 s	12 s	34 s

AM Peak Hour
WSPSynchro 9 Report
Page 10

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	165	175	55	35	90	25	55	815	40	60	680	60
Future Volume (vph)	165	175	55	35	90	25	55	815	40	60	680	60
Satd. Flow (prot)	1770	1823	0	1752	1823	0	1546	3283	0	1652	3280	0
Flt Permitted	0.411			0.478			0.210			0.134		
Satd. Flow (perm)	766	1823	0	882	1823	0	342	3283	0	233	3280	0
Satd. Flow (RTOR)		13			14			7			14	
Lane Group Flow (vph)	217	356	0	51	157	0	73	1044	0	91	841	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	17.5	27.0		10.8	20.3		11.4	41.2		11.0	40.8	
Total Lost Time (s)	5.0	4.0		5.0	4.0		5.0	5.6		5.0	5.6	
Act Effct Green (s)	28.5	24.0		18.4	13.4		34.9	29.7		34.5	29.4	
Actuated g/C Ratio	0.37	0.31		0.24	0.17		0.45	0.38		0.44	0.38	
v/c Ratio	0.52	0.62		0.18	0.48		0.29	0.83		0.42	0.67	
Control Delay	24.8	32.4		21.0	34.9		13.7	29.1		17.0	23.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	24.8	32.4		21.0	34.9		13.7	29.1		17.0	23.7	
LOS	C	C		C	C		B	C		B	C	
Approach Delay		29.5			31.5			28.1			23.0	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	86	177		18	72		20	268		25	197	
Queue Length 95th (ft)	119	168		32	105		34	303		35	258	
Internal Link Dist (ft)		1729			1357			1053			841	
Turn Bay Length (ft)	75						150			50		
Base Capacity (vph)	454	602		280	421		260	1617		221	1602	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.48	0.59		0.18	0.37		0.28	0.65		0.41	0.52	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 77.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 27.0

Intersection Capacity Utilization 62.7%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service B

Splits and Phases: 11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

			
Ø1	Ø2	Ø3	Ø4
11 s	41.2 s	17.5 s	20.3 s
			
Ø5	Ø6	Ø7	Ø8
11.4 s	40.8 s	10.8 s	27 s

Lanes, Volumes, Timings
12: SR 135/N. Willow Ave & W. 3rd St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	10	10	10	10	10	10	895	60	25	805	10
Future Volume (vph)	10	10	10	10	10	10	10	895	60	25	805	10
Satd. Flow (prot)	0	1740	0	0	1785	0	0	3232	0	0	3294	0
Flt Permitted		0.989			0.984			0.999			0.998	
Satd. Flow (perm)	0	1740	0	0	1785	0	0	3232	0	0	3294	0
Lane Group Flow (vph)	0	44	0	0	30	0	0	1196	0	0	992	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 50.7%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

13: SR 135/N. Willow Ave & W. 4th St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	15	20	20	10	15	15	780	110	40	800	15
Future Volume (vph)	10	15	20	20	10	15	15	780	110	40	800	15
Satd. Flow (prot)	0	1749	0	0	1762	0	0	3253	0	0	3319	0
Flt Permitted		0.990			0.975			0.999			0.997	
Satd. Flow (perm)	0	1749	0	0	1762	0	0	3253	0	0	3319	0
Lane Group Flow (vph)	0	52	0	0	83	0	0	1106	0	0	1033	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 63.7%

ICU Level of Service B

Analysis Period (min) 15

Lanes, Volumes, Timings
14: SR 135/N. Willow Ave & W. 7th St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	205	50	100	40	55	10	500	215	100	725	20
Future Volume (vph)	60	205	50	100	40	55	10	500	215	100	725	20
Satd. Flow (prot)	1770	1822	0	1703	1755	0	0	3115	0	0	3301	0
Flt Permitted	0.664			0.175				0.925			0.634	
Satd. Flow (perm)	1237	1822	0	314	1755	0	0	2884	0	0	2106	0
Satd. Flow (RTOR)		11			44			121			5	
Lane Group Flow (vph)	95	404	0	145	146	0	0	871	0	0	1091	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	14.0	25.0		15.0	26.0		38.0	38.0		12.0	50.0	
Total Lost Time (s)	5.0	4.0		5.0	4.0			4.0			4.0	
Act Effct Green (s)	27.7	21.0		31.6	24.7			46.0			46.0	
Actuated g/C Ratio	0.31	0.24		0.35	0.28			0.52			0.52	
v/c Ratio	0.22	0.93		0.57	0.28			0.56			1.00	
Control Delay	19.6	62.7		27.9	20.7			14.3			51.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	19.6	62.7		27.9	20.7			14.3			51.6	
LOS	B	E		C	C			B			D	
Approach Delay		54.4			24.3			14.3			51.6	
Approach LOS		D			C			B			D	
Queue Length 50th (ft)	34	220		54	46			145			~321	
Queue Length 95th (ft)	45	199		71	42			202			#374	
Internal Link Dist (ft)		675			1002			1211			498	
Turn Bay Length (ft)	25			75								
Base Capacity (vph)	454	436		267	518			1544			1087	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.21	0.93		0.54	0.28			0.56			1.00	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 89.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 37.4

Intersection Capacity Utilization 77.3%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service D

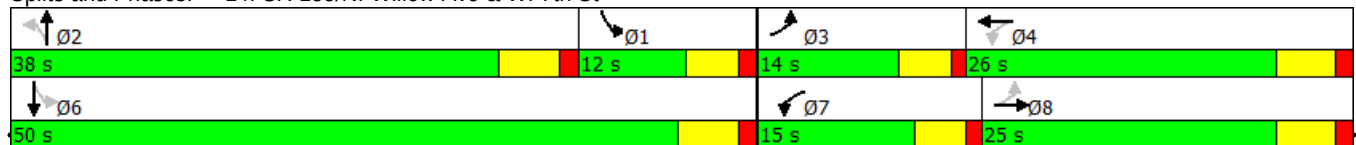
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 14: SR 135/N. Willow Ave & W. 7th St



AM Peak Hour
WSP

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Lanes, Volumes, Timings
15: SR 135/N. Willow Ave & W. 9th St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	30	85	0	0	0	30	560	10	20	805	65
Future Volume (vph)	60	30	85	0	0	0	30	560	10	20	805	65
Satd. Flow (prot)	0	1720	0	0	1900	0	0	3248	0	0	3288	0
Flt Permitted		0.981						0.997			0.999	
Satd. Flow (perm)	0	1720	0	0	1900	0	0	3248	0	0	3288	0
Lane Group Flow (vph)	0	227	0	0	0	0	0	715	0	0	1209	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 55.6%

ICU Level of Service B

Analysis Period (min) 15

Lanes, Volumes, Timings
16: SR 135/N. Willow Ave & University Dr

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	50	15	35	55	15	20	440	165	75	830	25
Future Volume (vph)	20	50	15	35	55	15	20	440	165	75	830	25
Satd. Flow (prot)	1805	1583	0	1736	1644	0	0	3105	0	0	3310	0
Flt Permitted	0.695			0.687				0.904			0.805	
Satd. Flow (perm)	1320	1583	0	1255	1644	0	0	2810	0	0	2675	0
Satd. Flow (RTOR)		19			17			221			7	
Lane Group Flow (vph)	37	109	0	51	95	0	0	754	0	0	1219	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	3	8		7	4			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	10.5	20.5		10.5	20.5		59.0	59.0		59.0	59.0	
Total Lost Time (s)	5.0	4.0		5.0	4.0			5.8			5.8	
Act Effct Green (s)	13.0	11.9		13.0	11.9			42.4			42.4	
Actuated g/C Ratio	0.20	0.19		0.20	0.19			0.66			0.66	
v/c Ratio	0.12	0.35		0.17	0.30			0.39			0.69	
Control Delay	22.8	28.4		23.2	27.4			6.2			13.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	22.8	28.4		23.2	27.4			6.2			13.4	
LOS	C	C		C	C			A			B	
Approach Delay		27.0			26.0			6.2			13.4	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)	12	36		16	31			61			206	
Queue Length 95th (ft)	22	60		37	68			113			250	
Internal Link Dist (ft)		789			874			862			1102	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	317	486		303	503			2285			2134	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.12	0.22		0.17	0.19			0.33			0.57	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 64

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 12.7

Intersection Capacity Utilization 65.5%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service C

Splits and Phases: 16: SR 135/N. Willow Ave & University Dr

 Ø2	 Ø3	 Ø4
59 s	10.5 s	20.5 s
 Ø6	 Ø7	 Ø8
59 s	10.5 s	20.5 s

Lanes, Volumes, Timings
17: SR 135/N. Willow Ave & W. 12th St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	505	335	250	170	40	70	195	215	165	435	55
Future Volume (vph)	115	505	335	250	170	40	70	195	215	165	435	55
Satd. Flow (prot)	1770	1881	1599	1770	3317	0	1574	2965	0	1652	3285	0
Flt Permitted	0.591			0.128			0.326			0.207		
Satd. Flow (perm)	1101	1881	1599	238	3317	0	540	2965	0	360	3285	0
Satd. Flow (RTOR)			286		54			239			26	
Lane Group Flow (vph)	189	616	441	284	261	0	74	474	0	254	652	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8			6			2		
Total Split (s)	12.0	34.0	34.0	15.0	37.0		11.0	23.0		18.0	30.0	
Total Lost Time (s)	5.0	4.0	4.0	5.0	4.0		5.0	4.0		5.0	4.0	
Act Effct Green (s)	36.0	30.1	30.1	42.2	33.2		20.6	15.7		32.3	24.7	
Actuated g/C Ratio	0.42	0.35	0.35	0.49	0.38		0.24	0.18		0.37	0.29	
v/c Ratio	0.37	0.94	0.59	0.97	0.20		0.37	0.65		0.79	0.68	
Control Delay	15.8	53.5	12.2	68.1	15.2		23.8	20.0		39.2	31.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	15.8	53.5	12.2	68.1	15.2		23.8	20.0		39.2	31.0	
LOS	B	D	B	E	B		C	C		D	C	
Approach Delay		33.1			42.7			20.6			33.3	
Approach LOS		C			D			C			C	
Queue Length 50th (ft)	57	335	63	108	40		26	60		100	164	
Queue Length 95th (ft)	64	#482	100	#265	64		54	95		109	192	
Internal Link Dist (ft)		1178			1081			1102			1094	
Turn Bay Length (ft)	100			220			100			220		
Base Capacity (vph)	514	654	742	293	1307		201	839		329	1008	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.37	0.94	0.59	0.97	0.20		0.37	0.56		0.77	0.65	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 86.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 32.7

Intersection LOS: C

Intersection Capacity Utilization 76.0%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 17: SR 135/N. Willow Ave & W. 12th St

 Ø1	 Ø2	 Ø3	 Ø4
11 s	30 s	15 s	34 s
 Ø5	 Ø6	 Ø7	 Ø8
18 s	23 s	12 s	37 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	185	10	15	10	0	40	20	1170	10	25	735	120
Future Volume (vph)	185	10	15	10	0	40	20	1170	10	25	735	120
Satd. Flow (prot)	1570	1456	0	1289	1205	0	1583	3471	808	1492	3406	1553
Flt Permitted	0.513						0.277			0.102		
Satd. Flow (perm)	848	1456	0	1357	1205	0	462	3471	808	160	3406	1553
Satd. Flow (RTOR)		18			302				145			145
Lane Group Flow (vph)	228	28	0	40	48	0	27	1360	10	30	855	145
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2		2	6		6
Total Split (s)	18.0	22.0		18.0	22.0		15.0	35.0	35.0	15.0	35.0	35.0
Total Lost Time (s)	5.0	4.0		5.0	4.0		5.0	4.0	4.0	5.0	4.0	4.0
Act Effct Green (s)	16.9	11.6		13.8	8.0		57.1	54.5	54.5	58.3	56.7	56.7
Actuated g/C Ratio	0.19	0.13		0.15	0.09		0.63	0.61	0.61	0.65	0.63	0.63
v/c Ratio	0.88	0.14		0.20	0.13		0.07	0.65	0.02	0.16	0.40	0.14
Control Delay	65.8	22.2		28.7	0.7		7.3	16.2	0.1	7.6	5.2	0.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	65.8	22.2		28.7	0.7		7.3	16.3	0.1	7.6	5.2	0.6
LOS	E	C		C	A		A	B	A	A	A	A
Approach Delay		61.0			13.4			16.0			4.7	
Approach LOS		E			B			B			A	
Queue Length 50th (ft)	~133	5		17	0		6	316	0	3	42	1
Queue Length 95th (ft)	160	30		11	0		13	384	0	m8	67	1
Internal Link Dist (ft)		573			734			200			263	
Turn Bay Length (ft)	200			25			175		150	100		50
Base Capacity (vph)	267	305		263	482		430	2102	546	254	2147	1032
Starvation Cap Reductn	0	0		0	0		0	0	0	0	141	0
Spillback Cap Reductn	0	0		0	8		0	105	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.09		0.15	0.10		0.06	0.68	0.02	0.12	0.43	0.14

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 50 (56%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 15.9

Intersection LOS: B

Intersection Capacity Utilization 55.9%

ICU Level of Service B

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	35 s	18 s	22 s
			
Ø5	Ø6 (R)	Ø7	Ø8
15 s	35 s	18 s	22 s

AM Peak Hour

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	380	0	190	0	0	0	0	1240	130	130	690	0
Future Volume (vph)	380	0	190	0	0	0	0	1240	130	130	690	0
Satd. Flow (prot)	1787	0	1538	0	0	0	0	3471	1495	1752	3438	0
Flt Permitted	0.950									0.098		
Satd. Flow (perm)	1787	0	1538	0	0	0	0	3471	1495	181	3438	0
Satd. Flow (RTOR)			204						151			
Lane Group Flow (vph)	500	0	209	0	0	0	0	1476	151	143	793	0
Turn Type	Prot		Perm					NA	Perm	pm+pt	NA	
Protected Phases	1							3		2	3	
Permitted Phases			1						3	3		
Total Split (s)	29.0		29.0					46.0	46.0	15.0	46.0	
Total Lost Time (s)	4.0		5.4					5.2	5.2	5.0	5.2	
Act Effct Green (s)	25.0		23.6					40.8	40.8	51.0	40.8	
Actuated g/C Ratio	0.28		0.26					0.45	0.45	0.57	0.45	
v/c Ratio	1.01		0.38					0.94	0.20	0.52	0.51	
Control Delay	76.8		6.5					27.3	2.1	25.2	26.9	
Queue Delay	0.0		0.0					4.1	0.0	0.0	0.0	
Total Delay	76.8		6.5					31.4	2.1	25.2	26.9	
LOS	E		A					C	A	C	C	
Approach Delay		56.1						28.6			26.7	
Approach LOS		E						C			C	
Queue Length 50th (ft)	~288		2					127	0	63	168	
Queue Length 95th (ft)	#369		54					#221	m11	111	205	
Internal Link Dist (ft)		458			312			263			407	
Turn Bay Length (ft)			200							250		
Base Capacity (vph)	496		553					1573	760	277	1558	
Starvation Cap Reductn	0		0					64	0	0	0	
Spillback Cap Reductn	0		0					0	0	0	0	
Storage Cap Reductn	0		0					0	0	0	0	
Reduced v/c Ratio	1.01		0.38					0.98	0.20	0.52	0.51	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 47 (52%), Referenced to phase 3:NBSB, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 34.0

Intersection LOS: C

Intersection Capacity Utilization 78.5%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

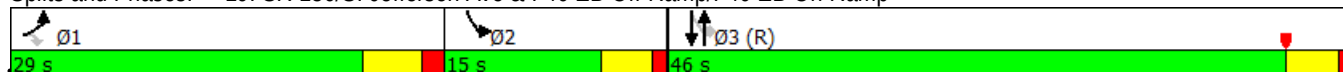
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	155	0	450	115	1505	0	0	670	160
Future Volume (vph)	0	0	0	155	0	450	115	1505	0	0	670	160
Satd. Flow (prot)	0	0	0	3183	0	1568	1626	3505	0	0	3505	1568
Flt Permitted				0.950			0.335					
Satd. Flow (perm)	0	0	0	3183	0	1568	573	3505	0	0	3505	1568
Satd. Flow (RTOR)						73						222
Lane Group Flow (vph)	0	0	0	196	0	563	140	1750	0	0	736	222
Turn Type				Prot		Perm	pm+pt	NA			NA	Perm
Protected Phases				1			2	3			3	
Permitted Phases						1	3	2				3
Total Split (s)				20.0		20.0	24.0	46.0			46.0	46.0
Total Lost Time (s)				5.8		5.8	5.0	5.0			5.0	4.5
Act Effct Green (s)				14.2		14.2	60.0	65.0			52.7	53.2
Actuated g/C Ratio				0.16		0.16	0.67	0.72			0.59	0.59
v/c Ratio				0.39		1.83	0.30	0.69			0.36	0.22
Control Delay				36.6		408.6	3.3	4.5			4.7	0.7
Queue Delay				0.0		0.9	0.0	9.9			0.7	0.6
Total Delay				36.6		409.5	3.3	14.4			5.4	1.3
LOS				D		F	A	B			A	A
Approach Delay					313.2			13.6			4.5	
Approach LOS					F			B			A	
Queue Length 50th (ft)				52		~457	15	145			37	0
Queue Length 95th (ft)				73		#561	m16	m152			75	2
Internal Link Dist (ft)		382			483			407			133	
Turn Bay Length (ft)				275		275	250					
Base Capacity (vph)				502		308	636	2531			2050	1017
Starvation Cap Reductn				0		0	0	221			896	494
Spillback Cap Reductn				0		22	0	770			0	0
Storage Cap Reductn				0		0	0	0			0	0
Reduced v/c Ratio				0.39		1.97	0.22	0.99			0.64	0.42

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 57 (63%), Referenced to phase 3:NBSB, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.83

Intersection Signal Delay: 74.2

Intersection LOS: E

Intersection Capacity Utilization 78.5%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

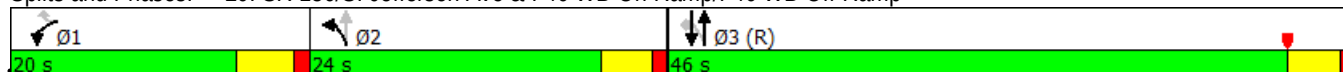
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	15	210	35	10	10	295	1605	55	15	620	80
Future Volume (vph)	60	15	210	35	10	10	295	1605	55	15	620	80
Satd. Flow (prot)	0	1736	1583	1805	1790	0	1770	3505	1553	1805	4837	0
Flt Permitted		0.963		0.950			0.279			0.100		
Satd. Flow (perm)	0	1736	1583	1805	1790	0	520	3505	1553	190	4837	0
Satd. Flow (RTOR)			263		10				139		32	
Lane Group Flow (vph)	0	104	263	45	26	0	388	1911	69	15	763	0
Turn Type	Split	NA	Perm	Split	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			3				2		2	6		
Total Split (s)	15.0	15.0	15.0	15.0	15.0		17.0	43.0	43.0	17.0	43.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0	5.0	5.0	5.0	
Act Effct Green (s)		11.0	11.0	11.0	11.0		57.1	54.7	54.7	52.6	41.1	
Actuated g/C Ratio		0.12	0.12	0.12	0.12		0.63	0.61	0.61	0.58	0.46	
v/c Ratio		0.49	0.62	0.20	0.11		0.78	0.90	0.07	0.05	0.34	
Control Delay		45.5	12.0	38.2	27.0		16.5	21.1	0.4	9.8	21.6	
Queue Delay		0.0	0.0	0.0	0.0		2.8	43.5	0.0	0.0	0.0	
Total Delay		45.5	12.0	38.2	27.0		19.3	64.5	0.4	9.8	21.6	
LOS		D	B	D	C		B	E	A	A	C	
Approach Delay		21.5			34.1			55.2			21.4	
Approach LOS		C			C			E			C	
Queue Length 50th (ft)		56	0	23	8		97	482	0	5	139	
Queue Length 95th (ft)		72	44	48	21		m99	m#667	m0	m10	167	
Internal Link Dist (ft)		530			587			133			582	
Turn Bay Length (ft)			100	25			50			100		
Base Capacity (vph)		212	424	220	227		496	2130	998	327	2226	
Starvation Cap Reductn		0	0	0	0		44	383	0	0	0	
Spillback Cap Reductn		0	0	0	0		0	0	0	0	0	
Storage Cap Reductn		0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio		0.49	0.62	0.20	0.11		0.86	1.09	0.07	0.05	0.34	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 66 (73%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 44.0

Intersection LOS: D

Intersection Capacity Utilization 76.8%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd

			
Ø1	Ø2 (R)	Ø3	Ø4
17 s	43 s	15 s	15 s
			
Ø5	Ø6 (R)		
17 s	43 s		

AM Peak Hour

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	280	140	190	295	80	225	930	420	65	335	105
Future Volume (vph)	145	280	140	190	295	80	225	930	420	65	335	105
Satd. Flow (prot)	1770	1845	1538	1736	3417	0	1736	3438	1509	1770	3323	0
Flt Permitted	0.302			0.237			0.342			0.136		
Satd. Flow (perm)	563	1845	1538	433	3417	0	625	3438	1509	253	3323	0
Satd. Flow (RTOR)			144		32				494		57	
Lane Group Flow (vph)	204	333	144	226	446	0	265	1134	494	90	504	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4			2		2	6		
Total Split (s)	18.0	22.0	22.0	18.0	22.0		15.0	35.0	35.0	15.0	35.0	
Total Lost Time (s)	5.0	4.0	5.0	5.0	4.0		5.0	4.0	4.0	5.0	4.0	
Act Effct Green (s)	29.4	18.1	17.1	29.9	18.4		41.8	34.8	34.8	40.0	31.5	
Actuated g/C Ratio	0.33	0.20	0.19	0.33	0.20		0.46	0.39	0.39	0.44	0.35	
v/c Ratio	0.59	0.90	0.35	0.70	0.62		0.64	0.85	0.56	0.33	0.42	
Control Delay	26.9	63.5	8.3	32.5	34.4		12.5	25.6	9.0	14.1	12.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	26.9	63.5	8.3	32.5	34.4		12.5	25.6	9.0	14.1	12.6	
LOS	C	E	A	C	C		B	C	A	B	B	
Approach Delay		40.9			33.8			19.5			12.8	
Approach LOS		D			C			B			B	
Queue Length 50th (ft)	78	186	0	88	112		63	358	126	8	118	
Queue Length 95th (ft)	99	#304	49	134	148		m27	#400	m242	20	165	
Internal Link Dist (ft)		1125			846			582			1693	
Turn Bay Length (ft)	175			125			125			125		
Base Capacity (vph)	363	373	410	334	727		413	1327	886	282	1199	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.56	0.89	0.35	0.68	0.61		0.64	0.85	0.56	0.32	0.42	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 24.7

Intersection LOS: C

Intersection Capacity Utilization 73.7%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	35 s	18 s	22 s
			
Ø5	Ø6 (R)	Ø7	Ø8
15 s	35 s	18 s	22 s

AM Peak Hour

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
23: SR 136/S. Jefferson Ave & E. Veterans Dr

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	185	55	60	180	140	45	945	75	65	420	30
Future Volume (vph)	40	185	55	60	180	140	45	945	75	65	420	30
Satd. Flow (prot)	1805	1828	0	1543	1751	0	1805	3493	0	1671	3538	0
Flt Permitted	0.188			0.321			0.347			0.129		
Satd. Flow (perm)	357	1828	0	521	1751	0	659	3493	0	227	3538	0
Satd. Flow (RTOR)		17			43			8			10	
Lane Group Flow (vph)	53	281	0	95	428	0	67	1328	0	90	575	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	18.0	22.0		18.0	22.0		15.0	35.0		15.0	35.0	
Total Lost Time (s)	5.0	4.0		5.0	4.0		5.0	5.6		5.0	5.6	
Act Effct Green (s)	30.3	22.1		31.4	25.5		41.6	33.4		41.7	33.4	
Actuated g/C Ratio	0.34	0.25		0.35	0.28		0.46	0.37		0.46	0.37	
v/c Ratio	0.17	0.61		0.30	0.81		0.16	1.02		0.35	0.44	
Control Delay	19.2	36.6		21.2	44.3		7.2	43.4		20.6	20.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.2	36.6		21.2	44.3		7.2	43.4		20.6	20.6	
LOS	B	D		C	D		A	D		C	C	
Approach Delay		33.8			40.1			41.7			20.6	
Approach LOS		C			D			D			C	
Queue Length 50th (ft)	19	139		34	~244		9	~151		17	137	
Queue Length 95th (ft)	35	220		46	#335		m13	#161		36	85	
Internal Link Dist (ft)		1014			884			1693			283	
Turn Bay Length (ft)	150			150			150			125		
Base Capacity (vph)	334	466		334	526		434	1299		266	1321	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.16	0.60		0.28	0.81		0.15	1.02		0.34	0.44	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 40 (44%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 35.7

Intersection LOS: D

Intersection Capacity Utilization 81.2%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 23: SR 136/S. Jefferson Ave & E. Veterans Dr

 Ø1	 Ø2 (R)	 Ø3	 Ø4
15 s	35 s	18 s	22 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
15 s	35 s	18 s	22 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	35	0	15	10	1055	50	30	475	10
Future Volume (vph)	0	0	0	35	0	15	10	1055	50	30	475	10
Satd. Flow (prot)	1900	1900	0	1787	1615	0	1805	3482	0	1805	3415	0
Flt Permitted				0.950			0.411			0.146		
Satd. Flow (perm)	1900	1900	0	1787	1615	0	781	3482	0	277	3415	0
Satd. Flow (RTOR)					483			5			2	
Lane Group Flow (vph)	0	0	0	51	24	0	10	1374	0	34	635	0
Turn Type	pm+pt			pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	18.0	21.0		19.0	22.0		15.0	35.0		15.0	35.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)				11.5	11.5		72.1	68.4		74.1	74.2	
Actuated g/C Ratio				0.13	0.13		0.80	0.76		0.82	0.82	
v/c Ratio				0.22	0.04		0.01	0.52		0.09	0.23	
Control Delay				38.1	0.1		0.5	4.4		3.0	4.1	
Queue Delay				0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay				38.1	0.1		0.5	4.4		3.0	4.1	
LOS				D	A		A	A		A	A	
Approach Delay					25.9			4.3			4.0	
Approach LOS					C			A			A	
Queue Length 50th (ft)				26	0		0	53		4	44	
Queue Length 95th (ft)				46	0		m0	m52		10	93	
Internal Link Dist (ft)		175			382			47			1774	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)				277	696		742	2647		398	2815	
Starvation Cap Reductn				0	0		0	0		0	0	
Spillback Cap Reductn				0	0		0	0		0	0	
Storage Cap Reductn				0	0		0	0		0	0	
Reduced v/c Ratio				0.18	0.03		0.01	0.52		0.09	0.23	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 51 (57%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.52

Intersection Signal Delay: 5.0

Intersection LOS: A

Intersection Capacity Utilization 49.1%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 24: SR 136/S. Jefferson Ave & Walmart Driveway

 Ø1	 Ø2 (R)	 Ø3	 Ø4
15 s	35 s	19 s	21 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
15 s	35 s	18 s	22 s

Lanes, Volumes, Timings
25: SR 136/S. Jefferson Ave & Commerce Ave

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	10	10	20	10	20	20	960	75	30	555	15
Future Volume (vph)	10	10	10	20	10	20	20	960	75	30	555	15
Satd. Flow (prot)	1612	1699	0	1703	1480	0	1626	3490	0	1805	3558	0
Flt Permitted	0.952			0.606			0.355			0.134		
Satd. Flow (perm)	1615	1699	0	1086	1480	0	608	3490	0	255	3558	0
Satd. Flow (RTOR)		24			32			17			5	
Lane Group Flow (vph)	16	34	0	43	42	0	21	1305	0	53	745	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	22.0		12.0	22.0		11.0	44.0		12.0	45.0	
Total Lost Time (s)	5.0	4.0		5.0	4.0		5.0	5.6		5.0	5.6	
Act Effct Green (s)	10.2	9.0		12.2	12.8		42.2	42.8		43.6	44.7	
Actuated g/C Ratio	0.16	0.14		0.20	0.21		0.68	0.69		0.70	0.72	
v/c Ratio	0.06	0.13		0.15	0.13		0.04	0.54		0.15	0.29	
Control Delay	23.9	19.5		24.6	15.3		6.1	13.5		6.5	8.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	23.9	19.5		24.6	15.3		6.1	13.5		6.5	8.9	
LOS	C	B		C	B		A	B		A	A	
Approach Delay		20.9			20.0			13.4			8.8	
Approach LOS		C			B			B			A	
Queue Length 50th (ft)	6	5		16	4		3	251		8	77	
Queue Length 95th (ft)	15	31		21	34		12	314		14	137	
Internal Link Dist (ft)		193			738			1774			1034	
Turn Bay Length (ft)				100			125			125		
Base Capacity (vph)	301	587		311	530		529	2412		382	2568	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.05	0.06		0.14	0.08		0.04	0.54		0.14	0.29	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 62.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 12.2

Intersection Capacity Utilization 44.7%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 25: SR 136/S. Jefferson Ave & Commerce Ave

 Ø1	 Ø2	 Ø3	 Ø4
12 s	44 s	12 s	22 s
 Ø5	 Ø6	 Ø7	 Ø8
11 s	45 s	12 s	22 s

Lanes, Volumes, Timings
26: SR 136/S. Jefferson Ave & E. Jackson St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	150	230	160	100	10	185	520	225	15	295	20
Future Volume (vph)	40	150	230	160	100	10	185	520	225	15	295	20
Satd. Flow (prot)	1805	1900	1583	3502	1796	0	1770	3574	1599	1685	3292	0
Flt Permitted	0.669			0.950			0.383			0.395		
Satd. Flow (perm)	1271	1900	1583	3502	1796	0	713	3574	1599	700	3292	0
Satd. Flow (RTOR)			319		4				395		12	
Lane Group Flow (vph)	59	176	319	229	138	0	226	675	395	18	397	0
Turn Type	pm+pt	NA	Perm	Prot	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8				2		2	6		
Total Split (s)	12.0	25.0	25.0	16.0	29.0		20.0	37.0	37.0	12.0	29.0	
Total Lost Time (s)	5.0	4.0	4.0	5.0	4.0		5.0	4.0	5.3	5.0	4.0	
Act Effct Green (s)	19.8	14.3	14.3	9.4	22.2		40.7	37.7	36.4	30.2	25.5	
Actuated g/C Ratio	0.25	0.18	0.18	0.12	0.28		0.52	0.48	0.46	0.38	0.32	
v/c Ratio	0.16	0.51	0.58	0.55	0.27		0.44	0.39	0.41	0.05	0.37	
Control Delay	18.6	35.0	8.3	39.2	25.3		14.4	16.2	3.7	12.3	22.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	18.6	35.0	8.3	39.2	25.3		14.4	16.2	3.7	12.3	22.6	
LOS	B	C	A	D	C		B	B	A	B	C	
Approach Delay		17.9			34.0			12.1			22.2	
Approach LOS		B			C			B			C	
Queue Length 50th (ft)	19	79	0	55	56		57	93	0	4	76	
Queue Length 95th (ft)	34	136	20	76	92		106	168	0	15	122	
Internal Link Dist (ft)		578			301			1034			1031	
Turn Bay Length (ft)	100			175			150		500	180		
Base Capacity (vph)	377	513	660	495	582		573	1714	952	369	1074	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.16	0.34	0.48	0.46	0.24		0.39	0.39	0.41	0.05	0.37	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 78.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 17.9

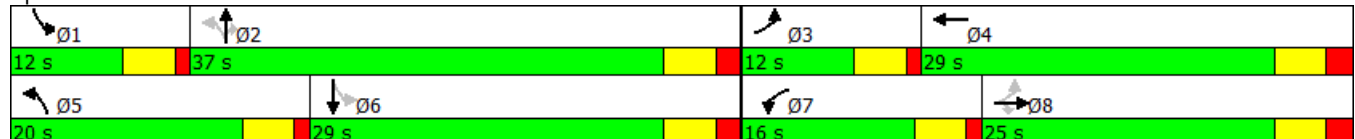
Intersection Capacity Utilization 47.3%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 26: SR 136/S. Jefferson Ave & E. Jackson St



Lanes, Volumes, Timings
27: SR 136/S. Jefferson Ave & Foutch Dr

Cookeville 2040 No-Build Conditions

06/20/2017

							
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations							
Traffic Volume (vph)	40	10	10	500	320	0	
Future Volume (vph)	40	10	10	500	320	0	
Satd. Flow (prot)	1633	0	1685	3303	3303	0	
Flt Permitted	0.962		0.495				
Satd. Flow (perm)	1633	0	878	3303	3303	0	
Satd. Flow (RTOR)	13						
Lane Group Flow (vph)	75	0	16	588	444	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	3			1	1 2		2
Permitted Phases			1				
Total Split (s)	17.0		36.0	36.0			37.0
Total Lost Time (s)	4.0		4.0	4.0			
Act Effct Green (s)	12.6		30.0	30.0	56.1		
Actuated g/C Ratio	0.16		0.39	0.39	0.73		
v/c Ratio	0.27		0.05	0.46	0.18		
Control Delay	30.2		18.1	20.0	0.4		
Queue Delay	0.0		0.0	0.0	0.1		
Total Delay	30.2		18.1	20.0	0.5		
LOS	C		B	B	A		
Approach Delay	30.2			19.9	0.5		
Approach LOS	C			B	A		
Queue Length 50th (ft)	27		5	108	2		
Queue Length 95th (ft)	52		14	173	2		
Internal Link Dist (ft)	70			1031	110		
Turn Bay Length (ft)			125				
Base Capacity (vph)	294		375	1412	2889		
Starvation Cap Reductn	0		0	0	1223		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.26		0.04	0.42	0.27		

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 76.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 12.9

Intersection Capacity Utilization 25.5%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 27: SR 136/S. Jefferson Ave & Foutch Dr

#27 #28  Ø1	#27 #28  Ø2	#27 #28  Ø3
36 s	37 s	17 s

Lanes, Volumes, Timings
28: SR 136/S. Jefferson Ave & E. Stevens St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	125	30	35	100	20	20	510	20	10	310	10
Future Volume (vph)	30	125	30	35	100	20	20	510	20	10	310	10
Satd. Flow (prot)	0	1853	0	0	1803	0	0	3292	0	0	3285	0
Flt Permitted		0.945			0.828			0.929			0.926	
Satd. Flow (perm)	0	1761	0	0	1513	0	0	3064	0	0	3048	0
Satd. Flow (RTOR)		11			12			7			4	
Lane Group Flow (vph)	0	294	0	0	195	0	0	659	0	0	469	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		2			2		3	1 3			1	
Permitted Phases	2			2			1 3			1		
Total Split (s)	37.0	37.0		37.0	37.0		17.0			36.0	36.0	
Total Lost Time (s)		4.0			4.0						4.0	
Act Effct Green (s)		22.0			22.0			42.6			30.0	
Actuated g/C Ratio		0.29			0.29			0.55			0.39	
v/c Ratio		0.58			0.44			0.38			0.39	
Control Delay		27.4			24.4			3.2			19.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		27.4			24.4			3.2			19.2	
LOS		C			C			A			B	
Approach Delay		27.4			24.4			3.2			19.2	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)		120			74			15			83	
Queue Length 95th (ft)		110			128			20			111	
Internal Link Dist (ft)		321			386			1			1911	
Turn Bay Length (ft)												
Base Capacity (vph)		782			673			1884			1305	
Starvation Cap Reductn		0			0			25			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.38			0.29			0.35			0.36	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 76.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 14.8

Intersection Capacity Utilization 47.2%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 28: SR 136/S. Jefferson Ave & E. Stevens St

#27 #28  Ø1	#27 #28  Ø2	#27 #28  Ø3
36 s	37 s	17 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	455	75	120	470	15	90	245	65	20	170	25
Future Volume (vph)	25	455	75	120	470	15	90	245	65	20	170	25
Satd. Flow (prot)	1805	1755	0	1787	1636	0	1620	1667	0	1685	1562	0
Flt Permitted	0.293			0.105			0.382			0.296		
Satd. Flow (perm)	557	1755	0	198	1636	0	651	1667	0	525	1562	0
Satd. Flow (RTOR)		10			3			16			10	
Lane Group Flow (vph)	40	684	0	132	529	0	106	372	0	32	283	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	34.0		11.0	34.0		11.0	34.0		11.0	34.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	42.2	36.3		46.3	41.8		28.5	24.9		27.4	22.7	
Actuated g/C Ratio	0.47	0.40		0.51	0.46		0.32	0.28		0.30	0.25	
v/c Ratio	0.12	0.96		0.58	0.70		0.39	0.79		0.14	0.71	
Control Delay	5.8	49.0		29.6	21.8		22.3	41.0		13.8	35.6	
Queue Delay	0.1	43.6		0.0	13.9		5.9	165.6		73.5	44.7	
Total Delay	5.9	92.6		29.6	35.7		28.2	206.6		87.3	80.3	
LOS	A	F		C	D		C	F		F	F	
Approach Delay		87.8			34.5			167.0			81.0	
Approach LOS		F			C			F			F	
Queue Length 50th (ft)	4	~453		17	311		39	190		11	148	
Queue Length 95th (ft)	m6	#559		m#62	m#528		62	249		14	152	
Internal Link Dist (ft)		356			188			1911			200	
Turn Bay Length (ft)	200			65						65		
Base Capacity (vph)	347	714		229	760		270	547		237	510	
Starvation Cap Reductn	0	18		0	216		0	0		0	82	
Spillback Cap Reductn	65	199		0	81		115	534		243	242	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.14	1.33		0.58	0.97		0.68	28.62		32.00	1.06	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 20 (22%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 88.0

Intersection LOS: F

Intersection Capacity Utilization 73.7%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
11 s	34 s	11 s	34 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
11 s	34 s	11 s	34 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	160	35	90	390	25	60	175	50	15	85	15
Future Volume (vph)	15	160	35	90	390	25	60	175	50	15	85	15
Satd. Flow (prot)	1805	1823	0	1787	1872	0	1652	1664	0	1685	1724	0
Flt Permitted	0.428			0.449			0.452			0.540		
Satd. Flow (perm)	813	1823	0	845	1872	0	786	1664	0	958	1724	0
Satd. Flow (RTOR)		9			6			19			14	
Lane Group Flow (vph)	18	291	0	130	464	0	67	268	0	15	161	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	34.0		11.0	34.0		11.0	34.0		11.0	34.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	47.8	42.1		54.1	50.4		24.2	23.0		19.8	15.2	
Actuated g/C Ratio	0.53	0.47		0.60	0.56		0.27	0.26		0.22	0.17	
v/c Ratio	0.04	0.34		0.22	0.44		0.24	0.61		0.06	0.53	
Control Delay	7.7	12.2		12.5	16.9		35.4	44.8		19.8	36.6	
Queue Delay	0.0	0.0		0.0	2.8		0.0	1.6		0.0	0.1	
Total Delay	7.7	12.2		12.5	19.7		35.4	46.4		19.8	36.7	
LOS	A	B		B	B		D	D		B	D	
Approach Delay		11.9			18.2			44.2			35.3	
Approach LOS		B			B			D			D	
Queue Length 50th (ft)	3	63		42	159		37	147		6	80	
Queue Length 95th (ft)	m9	57		m37	m155		m58	226		17	80	
Internal Link Dist (ft)		353			196			200			580	
Turn Bay Length (ft)	200			65			65			50		
Base Capacity (vph)	502	858		589	1051		280	549		260	565	
Starvation Cap Reductn	0	0		0	459		0	143		0	0	
Spillback Cap Reductn	0	0		9	0		0	0		0	46	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.04	0.34		0.22	0.78		0.24	0.66		0.06	0.31	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 25.1

Intersection LOS: C

Intersection Capacity Utilization 52.0%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
11 s	34 s	11 s	34 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
11 s	34 s	11 s	34 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	430	40	150	490	30	30	320	80	80	310	65
Future Volume (vph)	90	430	40	150	490	30	30	320	80	80	310	65
Satd. Flow (prot)	1736	1772	0	1770	1845	1553	1694	1801	1473	1631	1763	0
Flt Permitted	0.256			0.123			0.225			0.165		
Satd. Flow (perm)	468	1772	0	229	1845	1553	401	1801	1473	283	1763	0
Satd. Flow (RTOR)		6				127			127		10	
Lane Group Flow (vph)	114	589	0	238	510	36	53	485	80	104	469	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2		2	4		4	8		
Total Split (s)	11.0	34.0		11.0	34.0	34.0	11.0	34.0	34.0	11.0	34.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Act Effct Green (s)	35.7	29.6		40.7	35.3	35.3	31.6	26.9	26.9	32.7	29.1	
Actuated g/C Ratio	0.40	0.33		0.45	0.39	0.39	0.35	0.30	0.30	0.36	0.32	
v/c Ratio	0.42	1.01		0.88	0.71	0.05	0.24	0.90	0.15	0.54	0.82	
Control Delay	31.8	68.3		57.9	33.0	0.1	17.4	51.9	2.0	29.6	25.4	
Queue Delay	0.2	36.3		0.0	54.7	0.0	0.0	9.0	0.0	0.0	1.9	
Total Delay	31.9	104.6		57.9	87.7	0.1	17.4	60.9	2.0	29.6	27.3	
LOS	C	F		E	F	A	B	E	A	C	C	
Approach Delay		92.8			74.6			49.6			27.7	
Approach LOS		F			E			D			C	
Queue Length 50th (ft)	56	~328		~125	269	0	17	253	0	20	66	
Queue Length 95th (ft)	m65	m#388		#141	#447	0	24	244	11	m47	117	
Internal Link Dist (ft)		188			1101			264			195	
Turn Bay Length (ft)	60			100		100	100			50		
Base Capacity (vph)	274	586		270	723	686	227	580	560	192	606	
Starvation Cap Reductn	0	229		0	0	0	0	0	0	0	50	
Spillback Cap Reductn	11	0		0	308	49	0	72	0	0	1	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.43	1.65		0.88	1.23	0.06	0.23	0.95	0.14	0.54	0.84	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow, Master Intersection

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 63.6

Intersection LOS: E

Intersection Capacity Utilization 75.3%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
11 s	34 s	11 s	34 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
11 s	34 s	11 s	34 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	130	30	30	365	195	25	380	20	50	400	140
Future Volume (vph)	45	130	30	30	365	195	25	380	20	50	400	140
Satd. Flow (prot)	1770	1825	0	1736	1787	0	1745	1793	0	1745	1783	1561
Flt Permitted	0.136			0.515			0.276			0.123		
Satd. Flow (perm)	253	1825	0	941	1787	0	507	1793	0	226	1783	1561
Satd. Flow (RTOR)		11			32			2				194
Lane Group Flow (vph)	80	244	0	67	618	0	40	588	0	65	465	194
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		8
Total Split (s)	11.0	34.0		11.0	34.0		11.0	34.0		11.0	34.0	34.0
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Act Effct Green (s)	37.0	32.2		37.0	32.2		34.9	30.2		36.0	32.4	32.4
Actuated g/C Ratio	0.41	0.36		0.41	0.36		0.39	0.34		0.40	0.36	0.36
v/c Ratio	0.39	0.37		0.15	0.94		0.14	0.98		0.34	0.72	0.28
Control Delay	23.4	16.5		15.6	52.7		12.9	44.0		19.8	34.1	4.7
Queue Delay	0.0	0.7		0.0	5.8		0.0	8.0		0.0	0.0	0.0
Total Delay	23.4	17.2		15.6	58.5		12.9	52.0		19.8	34.1	4.7
LOS	C	B		B	E		B	D		B	C	A
Approach Delay		18.7			54.3			49.5			25.0	
Approach LOS		B			D			D			C	
Queue Length 50th (ft)	19	122		21	~369		6	~106		21	240	0
Queue Length 95th (ft)	20	42		22	#578		m12	135		38	#365	20
Internal Link Dist (ft)		196			1084			195			349	
Turn Bay Length (ft)	60			100			65			100		
Base Capacity (vph)	205	659		439	659		279	603		191	642	686
Starvation Cap Reductn	0	184		0	0		0	21		0	0	0
Spillback Cap Reductn	0	0		0	27		0	0		0	0	11
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.39	0.51		0.15	0.98		0.14	1.01		0.34	0.72	0.29

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 39.1

Intersection LOS: D

Intersection Capacity Utilization 76.1%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
11 s	34 s	11 s	34 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
11 s	34 s	11 s	34 s

Lanes, Volumes, Timings
33: SR 136/N. Washington Ave & E. 1st St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	15	40	10	75	20	90	590	10	10	605	75
Future Volume (vph)	140	15	40	10	75	20	90	590	10	10	605	75
Satd. Flow (prot)	0	1761	0	0	1853	0	1745	1779	0	1745	3374	0
Flt Permitted		0.965			0.996		0.219			0.109		
Satd. Flow (perm)	0	1761	0	0	1853	0	402	1779	0	200	3374	0
Satd. Flow (RTOR)		11			8			1			20	
Lane Group Flow (vph)	0	241	0	0	208	0	130	835	0	10	819	0
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	17.0	17.0		15.0	15.0		11.4	47.4		10.6	46.6	
Total Lost Time (s)		5.6			5.6		5.0	5.2		5.0	5.2	
Act Effct Green (s)		11.4			9.4		43.7	42.3		38.6	32.9	
Actuated g/C Ratio		0.14			0.12		0.54	0.52		0.47	0.40	
v/c Ratio		0.94			0.94		0.41	0.90		0.05	0.60	
Control Delay		79.4			85.1		13.0	34.0		8.9	20.6	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		79.4			85.1		13.0	34.0		8.9	20.6	
LOS		E			F		B	C		A	C	
Approach Delay		79.4			85.1			31.2			20.4	
Approach LOS		E			F			C			C	
Queue Length 50th (ft)		114			100		30	340		2	163	
Queue Length 95th (ft)		#257			91		41	439		9	194	
Internal Link Dist (ft)		234			474			256			166	
Turn Bay Length (ft)										50		
Base Capacity (vph)		256			221		320	923		201	1727	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.94			0.94		0.41	0.90		0.05	0.47	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 81.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 37.4

Intersection LOS: D

Intersection Capacity Utilization 67.5%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 33: SR 136/N. Washington Ave & E. 1st St

			
10.6 s	47.4 s	17 s	15 s
			
11.4 s	46.6 s		

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

34: SR 136/N. Washington Ave & E. 10th St/E.10th St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	105	15	385	280	255	50	540	155	350	680	110
Future Volume (vph)	65	105	15	385	280	255	50	540	155	350	680	110
Satd. Flow (prot)	1770	3453	0	3467	1863	1599	1770	3539	1568	1736	3471	0
Flt Permitted	0.950			0.950			0.176			0.147		
Satd. Flow (perm)	1770	3453	0	3467	1863	1599	328	3539	1568	269	3471	0
Satd. Flow (RTOR)		24				323			167		25	
Lane Group Flow (vph)	73	161	0	453	350	323	85	806	167	467	1008	0
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases						4	2		2	6		
Total Split (s)	11.2	11.2		24.0	24.0	24.0	17.0	37.8	37.8	17.0	37.8	
Total Lost Time (s)	4.0	4.0		4.0	4.0	4.0	5.0	4.0	4.0	5.0	4.0	
Act Effct Green (s)	7.2	7.2		19.3	19.3	19.3	33.1	27.1	27.1	42.7	34.6	
Actuated g/C Ratio	0.09	0.09		0.23	0.23	0.23	0.40	0.33	0.33	0.52	0.42	
v/c Ratio	0.47	0.50		0.56	0.81	0.52	0.34	0.70	0.27	1.33	0.69	
Control Delay	49.1	37.9		32.0	47.3	7.0	14.3	27.7	4.4	187.5	23.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	49.1	37.9		32.0	47.3	7.0	14.3	27.7	4.4	187.5	23.1	
LOS	D	D		C	D	A	B	C	A	F	C	
Approach Delay		41.4			29.6			22.9			75.2	
Approach LOS		D			C			C			E	
Queue Length 50th (ft)	38	37		109	175	0	21	191	0	~270	228	
Queue Length 95th (ft)	#85	62		157	#274	37	27	171	39	#356	254	
Internal Link Dist (ft)		135			2500			631			700	
Turn Bay Length (ft)	100			215		215	100			100		
Base Capacity (vph)	154	324		842	452	633	361	1453	742	352	1504	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.47	0.50		0.54	0.77	0.51	0.24	0.55	0.23	1.33	0.67	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 82.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.33

Intersection Signal Delay: 45.8

Intersection Capacity Utilization 68.2%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service C

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 34: SR 136/N. Washington Ave & E. 10th St/E.10th St

			
Ø1	Ø2	Ø3	Ø4
17 s	37.8 s	11.2 s	24 s
			
Ø5	Ø6		
17 s	37.8 s		

AM Peak Hour
WSPSynchro 9 Report
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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

35: US 70/E. Spring St & I-40 EB Off-Ramps/I-40 EB On-Ramp

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	0	100	0	0	0	0	715	15	90	185	0
Future Volume (vph)	85	0	100	0	0	0	0	715	15	90	185	0
Satd. Flow (prot)	0	1687	1568	0	0	0	0	3472	0	1728	3172	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1687	1568	0	0	0	0	3472	0	1728	3172	0
Lane Group Flow (vph)	0	131	111	0	0	0	0	983	0	102	210	0
Sign Control		Stop			Free			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 39.9%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
 36: US 70/E. Spring St & I-40 WB Off-Ramp

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (vph)	15	300	545	0	0	400
Future Volume (vph)	15	300	545	0	0	400
Satd. Flow (prot)	1444	1553	3388	0	0	3261
Flt Permitted	0.950					
Satd. Flow (perm)	1444	1553	3388	0	0	3261
Lane Group Flow (vph)	18	349	708	0	0	476
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 40.3%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	270	400	0	0	875	145	445	0	70	0	0	0
Future Volume (vph)	270	400	0	0	875	145	445	0	70	0	0	0
Satd. Flow (prot)	1703	3343	0	0	3356	0	0	1787	1455	0	0	0
Flt Permitted	0.124							0.950				
Satd. Flow (perm)	222	3343	0	0	3356	0	0	1787	1455	0	0	0
Satd. Flow (RTOR)					25				97			
Lane Group Flow (vph)	338	455	0	0	1178	0	0	511	93	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA	Perm			
Protected Phases	1	6			2			3				
Permitted Phases	6						3		3			
Total Split (s)	11.0	45.0			34.0		45.0	45.0	45.0			
Total Lost Time (s)	5.0	4.0			4.0			4.0	4.0			
Act Effct Green (s)	40.4	41.4			30.3			29.5	29.5			
Actuated g/C Ratio	0.51	0.52			0.38			0.37	0.37			
v/c Ratio	1.50	0.26			0.91			0.76	0.15			
Control Delay	263.8	12.2			35.9			29.6	3.8			
Queue Delay	0.0	0.0			0.0			0.0	0.0			
Total Delay	263.8	12.2			35.9			29.6	3.8			
LOS	F	B			D			C	A			
Approach Delay		119.4			35.9			25.6				
Approach LOS		F			D			C				
Queue Length 50th (ft)	~184	61			276			214	0			
Queue Length 95th (ft)	#341	114			#490			62	15			
Internal Link Dist (ft)		490			552			852			886	
Turn Bay Length (ft)	100								250			
Base Capacity (vph)	226	1750			1301			936	808			
Starvation Cap Reductn	0	0			0			0	0			
Spillback Cap Reductn	0	0			0			0	0			
Storage Cap Reductn	0	0			0			0	0			
Reduced v/c Ratio	1.50	0.26			0.91			0.55	0.12			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 79

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.50

Intersection Signal Delay: 59.2

Intersection Capacity Utilization 79.3%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service D

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

 Ø1	 Ø2	 Ø3
11 s	34 s	45 s
 Ø6		
45 s		

AM Peak Hour
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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

38: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & US 70/E. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	610	230	120	1190	0	0	0	0	60	0	500
Future Volume (vph)	0	610	230	120	1190	0	0	0	0	60	0	500
Satd. Flow (prot)	0	3273	0	1703	3505	0	0	0	0	0	1687	1568
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	3273	0	1703	3505	0	0	0	0	0	1687	1568
Lane Group Flow (vph)	0	970	0	150	1337	0	0	0	0	0	78	538
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 79.3%

ICU Level of Service D

Analysis Period (min) 15

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	440	240	530	950	150	75	140	195	185	410	60
Future Volume (vph)	75	440	240	530	950	150	75	140	195	185	410	60
Satd. Flow (prot)	1703	3171	0	1752	1845	1615	1787	1810	1524	1752	1814	0
Flt Permitted	0.184			0.150			0.238			0.450		
Satd. Flow (perm)	330	3171	0	277	1845	1615	448	1810	1524	830	1814	0
Satd. Flow (RTOR)		169				142			214		9	
Lane Group Flow (vph)	96	804	0	589	1044	211	93	144	214	243	625	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6		6	8		8	4		
Total Split (s)	11.0	28.0		23.0	40.0	40.0	11.0	24.0	24.0	15.0	28.0	
Total Lost Time (s)	5.0	4.0		5.0	4.0	4.0	5.0	4.0	5.7	5.0	4.0	
Act Effct Green (s)	27.6	22.7		44.9	37.4	37.4	22.8	17.9	16.2	30.9	24.2	
Actuated g/C Ratio	0.32	0.26		0.52	0.43	0.43	0.26	0.21	0.19	0.36	0.28	
v/c Ratio	0.48	0.84		1.30	1.31	0.27	0.44	0.39	0.47	0.61	1.22	
Control Delay	22.5	33.4		176.2	174.4	7.6	26.1	33.1	8.3	27.9	145.9	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	22.5	33.4		176.2	174.4	7.6	26.1	33.1	8.3	27.9	145.9	
LOS	C	C		F	F	A	C	C	A	C	F	
Approach Delay		32.3			155.9			19.9			112.9	
Approach LOS		C			F			B			F	
Queue Length 50th (ft)	27	181		~393	~807	24	34	70	0	98	~454	
Queue Length 95th (ft)	45	#265		#599	#1043	41	59	124	57	130	#512	
Internal Link Dist (ft)		1084			512			1234			867	
Turn Bay Length (ft)	80					100	130			100		
Base Capacity (vph)	201	1007		452	797	778	211	421	493	402	513	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.48	0.80		1.30	1.31	0.27	0.44	0.34	0.43	0.60	1.22	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 86.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.31

Intersection Signal Delay: 104.2

Intersection Capacity Utilization 100.2%

Analysis Period (min) 15

Intersection LOS: F

ICU Level of Service G

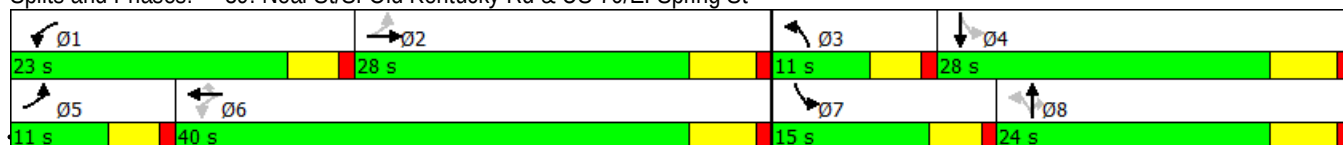
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 39: Neal St/S. Old Kentucky Rd & US 70/E. Spring St



Lanes, Volumes, Timings
40: US 70/E. Spring St & E. Broad St

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	800	630	640	60	0
Future Volume (vph)	0	800	630	640	60	0
Satd. Flow (prot)	0	1810	1738	0	1805	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1810	1738	0	1805	0
Lane Group Flow (vph)	0	1000	1540	0	75	0
Sign Control		Free	Free		Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 82.3%

ICU Level of Service E

Analysis Period (min) 15

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	500	30	40	550	15	20	260	40	225	205	95
Future Volume (vph)	70	500	30	40	550	15	20	260	40	225	205	95
Satd. Flow (prot)	1736	1748	0	1671	1840	0	1805	1814	0	1787	1780	0
Flt Permitted	0.111			0.113			0.371			0.170		
Satd. Flow (perm)	203	1748	0	199	1840	0	705	1814	0	320	1780	0
Satd. Flow (RTOR)		5			1			11			17	
Lane Group Flow (vph)	88	623	0	63	694	0	27	407	0	321	429	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	40.0		15.0	40.0		15.0	30.0		15.0	30.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	42.2	36.0		41.0	35.3		29.2	23.1		37.5	33.8	
Actuated g/C Ratio	0.45	0.38		0.44	0.38		0.31	0.25		0.40	0.36	
v/c Ratio	0.41	0.93		0.32	1.00		0.09	0.90		1.12	0.66	
Control Delay	19.4	51.2		17.9	66.8		19.1	57.8		116.3	32.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	58.1	
Total Delay	19.4	51.2		17.9	66.8		19.1	57.8		116.3	90.9	
LOS	B	D		B	E		B	E		F	F	
Approach Delay		47.2			62.8			55.4			101.8	
Approach LOS		D			E			E			F	
Queue Length 50th (ft)	28	373		20	~474		10	236		~169	194	
Queue Length 95th (ft)	48	#588		29	#604		23	#318		#228	235	
Internal Link Dist (ft)		1101			737			412			149	
Turn Bay Length (ft)	75			80			70			50		
Base Capacity (vph)	259	673		249	693		367	496		286	651	
Starvation Cap Reductn	0	0		0	0		0	0		0	346	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.34	0.93		0.25	1.00		0.07	0.82		1.12	1.41	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 93.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.12

Intersection Signal Delay: 68.4

Intersection Capacity Utilization 80.1%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service D

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St

 Ø1	 Ø2	 Ø3	 Ø4
15 s	40 s	15 s	30 s
 Ø5	 Ø6	 Ø7	 Ø8
15 s	40 s	15 s	30 s

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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	505	45	30	535	55	50	115	10	40	60	30
Future Volume (vph)	25	505	45	30	535	55	50	115	10	40	60	30
Satd. Flow (prot)	1687	1779	0	1805	1801	0	1719	1872	0	1752	1822	0
Flt Permitted	0.246			0.276			0.590			0.507		
Satd. Flow (perm)	437	1779	0	524	1801	0	1068	1872	0	935	1822	0
Satd. Flow (RTOR)		5			7			3			22	
Lane Group Flow (vph)	33	597	0	42	638	0	57	205	0	53	131	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	34.0		11.0	34.0		11.0	34.0		11.0	34.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	53.2	49.4		53.4	49.5		20.7	17.1		19.7	14.9	
Actuated g/C Ratio	0.59	0.55		0.59	0.55		0.23	0.19		0.22	0.17	
v/c Ratio	0.10	0.61		0.11	0.64		0.20	0.57		0.21	0.41	
Control Delay	9.3	20.9		18.6	33.6		24.0	39.1		17.6	21.9	
Queue Delay	0.0	1.6		0.0	2.2		0.0	0.0		0.5	0.0	
Total Delay	9.3	22.5		18.6	35.8		24.0	39.1		18.1	21.9	
LOS	A	C		B	D		C	D		B	C	
Approach Delay		21.8			34.7			35.9			20.8	
Approach LOS		C			C			D			C	
Queue Length 50th (ft)	7	250		17	351		24	109		14	60	
Queue Length 95th (ft)	18	#479		m32	#547		47	103		24	36	
Internal Link Dist (ft)		1308			356			107			209	
Turn Bay Length (ft)	100			60			50			60		
Base Capacity (vph)	345	979		400	993		289	605		259	602	
Starvation Cap Reductn	0	0		0	220		0	0		0	0	
Spillback Cap Reductn	0	215		0	0		0	0		67	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.10	0.78		0.10	0.83		0.20	0.34		0.28	0.22	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 28.8

Intersection LOS: C

Intersection Capacity Utilization 59.0%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
11 s	34 s	11 s	34 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
11 s	34 s	11 s	34 s

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Lanes, Volumes, Timings
43: S. Walnut Ave & US 70/W. Spring St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	585	70	40	530	30	80	275	35	15	130	35
Future Volume (vph)	55	585	70	40	530	30	80	275	35	15	130	35
Satd. Flow (prot)	1805	1765	0	1805	1831	0	1787	1838	0	1805	1825	0
Flt Permitted	0.206			0.120			0.428			0.318		
Satd. Flow (perm)	391	1765	0	228	1831	0	805	1838	0	604	1825	0
Satd. Flow (RTOR)		10			4			11			14	
Lane Group Flow (vph)	100	702	0	40	571	0	107	387	0	30	212	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	38.0		11.0	38.0		13.0	28.0		13.0	28.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.6		5.0	5.6	
Act Effct Green (s)	37.8	34.6		36.6	32.2		24.5	21.1		20.8	15.5	
Actuated g/C Ratio	0.49	0.45		0.48	0.42		0.32	0.28		0.27	0.20	
v/c Ratio	0.33	0.87		0.17	0.74		0.30	0.75		0.11	0.56	
Control Delay	14.2	37.5		12.8	29.3		20.3	37.4		18.3	33.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.2	37.5		12.8	29.3		20.3	37.4		18.3	33.4	
LOS	B	D		B	C		C	D		B	C	
Approach Delay		34.6			28.2			33.7			31.5	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	23	332		9	239		38	160		10	95	
Queue Length 95th (ft)	33	#656		27	#474		59	#321		15	136	
Internal Link Dist (ft)		1097			1308			83			571	
Turn Bay Length (ft)	75			75			65			150		
Base Capacity (vph)	307	803		236	817		362	582		304	560	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.33	0.87		0.17	0.70		0.30	0.66		0.10	0.38	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 76.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 32.2

Intersection LOS: C

Intersection Capacity Utilization 78.8%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 43: S. Walnut Ave & US 70/W. Spring St

			
Ø1	Ø2	Ø3	Ø4
11 s	38 s	13 s	28 s
			
Ø5	Ø6	Ø7	Ø8
11 s	38 s	13 s	28 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

44: Scott Ave & US 70/W. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	625	60	45	475	30	40	55	50	15	35	35
Future Volume (vph)	15	625	60	45	475	30	40	55	50	15	35	35
Satd. Flow (prot)	1641	1801	0	1805	1847	0	1805	1659	0	1626	1665	0
Flt Permitted	0.413			0.195			0.543			0.678		
Satd. Flow (perm)	713	1801	0	370	1847	0	1032	1659	0	1161	1665	0
Satd. Flow (RTOR)		9			5			43			44	
Lane Group Flow (vph)	18	729	0	66	541	0	59	123	0	18	96	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	45.0		11.0	45.0		11.0	23.0		11.0	23.0	
Total Lost Time (s)	5.0	5.6		5.0	5.6		5.0	5.6		5.0	5.6	
Act Effct Green (s)	43.2	40.7		46.3	46.9		13.6	12.1		11.9	8.4	
Actuated g/C Ratio	0.63	0.59		0.68	0.68		0.20	0.18		0.17	0.12	
v/c Ratio	0.03	0.68		0.17	0.43		0.21	0.38		0.07	0.40	
Control Delay	6.7	20.8		7.2	11.1		25.5	23.6		23.6	25.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.7	20.8		7.2	11.1		25.5	23.6		23.6	25.4	
LOS	A	C		A	B		C	C		C	C	
Approach Delay		20.4			10.7			24.2			25.1	
Approach LOS		C			B			C			C	
Queue Length 50th (ft)	3	288		11	122		23	33		7	25	
Queue Length 95th (ft)	11	#568		22	323		39	81		21	46	
Internal Link Dist (ft)		700			1097			288			469	
Turn Bay Length (ft)	75			75			40			75		
Base Capacity (vph)	544	1111		391	1266		284	518		251	508	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.03	0.66		0.17	0.43		0.21	0.24		0.07	0.19	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 68.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 17.6

Intersection LOS: B

Intersection Capacity Utilization 55.6%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 44: Scott Ave & US 70/W. Spring St

			
Ø1	Ø2	Ø3	Ø4
11 s	45 s	11 s	23 s
			
Ø5	Ø6	Ø7	Ø8
11 s	45 s	11 s	23 s

Lanes, Volumes, Timings
45: S, Maple Ave/N. Maple Ave & E. Broad St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	110	65	60	530	170	35	235	60	35	380	20
Future Volume (vph)	10	110	65	60	530	170	35	235	60	35	380	20
Satd. Flow (prot)	1805	1784	0	1770	1802	0	1805	1813	0	1736	1853	0
Flt Permitted	0.107			0.456			0.152			0.228		
Satd. Flow (perm)	203	1784	0	849	1802	0	289	1813	0	417	1853	0
Satd. Flow (RTOR)		32			23			14			2	
Lane Group Flow (vph)	16	272	0	67	794	0	39	383	0	51	521	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	40.0		15.0	40.0		15.0	30.0		15.0	30.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	42.8	35.7		44.7	41.1		32.6	25.5		33.6	28.2	
Actuated g/C Ratio	0.46	0.38		0.48	0.44		0.35	0.27		0.36	0.30	
v/c Ratio	0.06	0.39		0.13	0.98		0.15	0.76		0.18	0.93	
Control Delay	13.2	22.4		13.7	56.5		19.9	43.3		20.2	59.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	56.8		0.0	0.0	
Total Delay	13.2	22.4		13.7	56.5		19.9	100.1		20.2	59.4	
LOS	B	C		B	E		B	F		C	E	
Approach Delay		21.9			53.2			92.7			55.9	
Approach LOS		C			D			F			E	
Queue Length 50th (ft)	5	112		21	415		15	220		20	~378	
Queue Length 95th (ft)	11	117		43	#845		35	278		33	#442	
Internal Link Dist (ft)		1084			778			149			437	
Turn Bay Length (ft)	60			65			40			85		
Base Capacity (vph)	269	702		509	808		268	506		295	562	
Starvation Cap Reductn	0	0		0	0		0	210		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.06	0.39		0.13	0.98		0.15	1.29		0.17	0.93	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 93.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 57.5

Intersection LOS: E

Intersection Capacity Utilization 87.3%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 45: S, Maple Ave/N. Maple Ave & E. Broad St

 Ø1	 Ø2	 Ø3	 Ø4
15 s	40 s	15 s	30 s
 Ø5	 Ø6	 Ø7	 Ø8
15 s	40 s	15 s	30 s

AM Peak Hour
WSP

Synchro 9 Report
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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

46: S. Dixie Ave/N. Dixie Ave & E. Broad St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	185	15	20	305	90	20	145	20	40	95	20
Future Volume (vph)	20	185	15	20	305	90	20	145	20	40	95	20
Satd. Flow (prot)	1805	1847	0	1805	1814	0	1805	1860	0	1805	1821	0
Flt Permitted	0.347			0.575			0.668			0.329		
Satd. Flow (perm)	659	1847	0	1092	1814	0	1269	1860	0	625	1821	0
Satd. Flow (RTOR)		4			20			5			17	
Lane Group Flow (vph)	43	265	0	27	460	0	27	259	0	59	140	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	34.0		11.0	34.0		11.0	34.0		11.0	34.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Act Effct Green (s)	51.6	48.8		50.0	46.4		22.0	17.3		24.9	22.2	
Actuated g/C Ratio	0.57	0.54		0.56	0.52		0.24	0.19		0.28	0.25	
v/c Ratio	0.09	0.26		0.04	0.49		0.08	0.72		0.23	0.30	
Control Delay	10.8	15.3		11.1	16.4		14.8	36.5		21.9	25.3	
Queue Delay	0.0	0.0		0.0	0.1		0.0	0.1		0.0	0.0	
Total Delay	10.8	15.3		11.1	16.5		14.8	36.5		21.9	25.3	
LOS	B	B		B	B		B	D		C	C	
Approach Delay		14.6			16.2			34.5			24.3	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	10	70		5	227		12	117		23	50	
Queue Length 95th (ft)	14	136		15	148		m11	57		35	102	
Internal Link Dist (ft)		1234			353			209			174	
Turn Bay Length (ft)	130			45			60			75		
Base Capacity (vph)	458	1003		657	944		348	602		258	598	
Starvation Cap Reductn	0	0		0	61		0	16		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.09	0.26		0.04	0.52		0.08	0.44		0.23	0.23	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 21.2

Intersection LOS: C

Intersection Capacity Utilization 49.0%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 46: S. Dixie Ave/N. Dixie Ave & E. Broad St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
11 s	34 s	11 s	34 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
11 s	34 s	11 s	34 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

47: S. Walnut Ave/N. Walnut Ave & E. Broad St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	160	20	35	165	90	30	270	50	30	125	15
Future Volume (vph)	15	160	20	35	165	90	30	270	50	30	125	15
Satd. Flow (prot)	0	1851	0	0	1869	1599	1805	1851	0	1736	1816	0
Flt Permitted		0.997			0.992		0.580			0.276		
Satd. Flow (perm)	0	1851	0	0	1869	1599	1102	1851	0	504	1816	0
Satd. Flow (RTOR)		6				138		11			6	
Lane Group Flow (vph)	0	247	0	0	233	122	30	370	0	30	187	0
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	1	1		2	2		7	4		3	8	
Permitted Phases						2	4			8		
Total Split (s)	24.0	24.0		28.0	28.0	28.0	11.0	27.0		11.0	27.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	4.0		5.0	4.0	
Act Effct Green (s)		13.8			14.0	14.0	20.1	19.4		20.1	19.4	
Actuated g/C Ratio		0.21			0.21	0.21	0.31	0.29		0.31	0.29	
v/c Ratio		0.63			0.59	0.27	0.07	0.67		0.11	0.35	
Control Delay		34.1			32.5	6.0	17.2	30.1		17.7	23.4	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		34.1			32.5	6.0	17.2	30.1		17.7	23.4	
LOS		C			C	A	B	C		B	C	
Approach Delay		34.1			23.4			29.2			22.6	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)		85			83	0	8	115		8	52	
Queue Length 95th (ft)		170			170	16	28	#302		29	115	
Internal Link Dist (ft)		512			1234			571			477	
Turn Bay Length (ft)							120			140		
Base Capacity (vph)		584			709	692	407	709		276	693	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.42			0.33	0.18	0.07	0.52		0.11	0.27	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 65.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 27.3

Intersection LOS: C

Intersection Capacity Utilization 54.6%

ICU Level of Service A

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 47: S. Walnut Ave/N. Walnut Ave & E. Broad St

 Ø1	 Ø2	 Ø3	 Ø4
24 s	28 s	11 s	27 s
		 Ø7	 Ø8
		11 s	27 s

Lanes, Volumes, Timings
48: S. Cedar Ave & E. Broad St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	25	10	25	30	135	10	115	15	170	60	20
Future Volume (vph)	35	25	10	25	30	135	10	115	15	170	60	20
Satd. Flow (prot)	0	1792	0	0	1688	0	0	1837	0	0	1795	0
Flt Permitted		0.976			0.993			0.997			0.969	
Satd. Flow (perm)	0	1792	0	0	1688	0	0	1837	0	0	1795	0
Lane Group Flow (vph)	0	112	0	0	249	0	0	195	0	0	317	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 42.7%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
 49: S. Cedar Ave/N. Cedar Ave & W, Broad St

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	70	155	125	170	85	40
Future Volume (vph)	70	155	125	170	85	40
Satd. Flow (prot)	1787	1615	0	1838	1817	0
Flt Permitted	0.950			0.981		
Satd. Flow (perm)	1787	1615	0	1838	1817	0
Lane Group Flow (vph)	84	209	0	408	156	0
Sign Control	Stop			Stop	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 36.7%

ICU Level of Service A

Analysis Period (min) 15

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	90	295	10	315	510
Future Volume (vph)	0	90	295	10	315	510
Satd. Flow (prot)	1900	1615	1822	0	0	1822
Flt Permitted						0.980
Satd. Flow (perm)	1900	1615	1822	0	0	1822
Lane Group Flow (vph)	0	108	341	0	0	1007
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 67.1%

ICU Level of Service C

Analysis Period (min) 15

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

51: W. Jackson St/Pippin Rd & US 70/W. Broad St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	490	340	30	200	35	140	105	15	160	360	10
Future Volume (vph)	10	490	340	30	200	35	140	105	15	160	360	10
Satd. Flow (prot)	1805	1845	1553	1752	1769	0	1719	1900	1615	0	1853	0
Flt Permitted	0.511			0.106			0.950				0.984	
Satd. Flow (perm)	971	1845	1553	196	1769	0	1719	1900	1615	0	1853	0
Satd. Flow (RTOR)			190		9				187		1	
Lane Group Flow (vph)	10	598	436	43	280	0	154	157	18	0	719	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Free	Split	NA	
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases	6		6	2					Free			
Total Split (s)	12.0	40.0	40.0	12.0	40.0		15.0	15.0		38.0	38.0	
Total Lost Time (s)	5.0	4.0	4.0	5.0	4.0		4.0	4.0			4.0	
Act Effct Green (s)	37.5	35.3	35.3	40.3	40.0		11.1	11.1	99.4		34.2	
Actuated g/C Ratio	0.38	0.36	0.36	0.41	0.40		0.11	0.11	1.00		0.34	
v/c Ratio	0.02	0.91	0.65	0.24	0.39		0.81	0.74	0.01		1.13	
Control Delay	16.5	52.1	20.4	20.0	22.8		75.5	66.4	0.0		109.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay	16.5	52.1	20.4	20.0	22.8		75.5	66.4	0.0		109.0	
LOS	B	D	C	C	C		E	E	A		F	
Approach Delay		38.5			22.4			67.0			109.0	
Approach LOS		D			C			E			F	
Queue Length 50th (ft)	4	387	139	16	114		103	105	0		~590	
Queue Length 95th (ft)	13	#516	186	28	196		#220	126	0		#625	
Internal Link Dist (ft)		1551			2304			1891			664	
Turn Bay Length (ft)	100		100	100			350					
Base Capacity (vph)	433	671	686	189	733		191	211	1615		637	
Starvation Cap Reductn	0	0	0	0	0		0	0	0		0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0		0	
Storage Cap Reductn	0	0	0	0	0		0	0	0		0	
Reduced v/c Ratio	0.02	0.89	0.64	0.23	0.38		0.81	0.74	0.01		1.13	

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 99.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.13

Intersection Signal Delay: 61.2

Intersection Capacity Utilization 67.5%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service C

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 51: W. Jackson St/Pippin Rd & US 70/W. Broad St

 Ø1	 Ø2	 Ø3	 Ø4
12 s	40 s	15 s	38 s
 Ø5	 Ø6		
12 s	40 s		

AM Peak Hour
WSPSynchro 9 Report
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Lanes, Volumes, Timings
52: E.10th St & Brown Ave N

Cookeville 2040 No-Build Conditions

06/20/2017

								
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	35	590	900	145	160	35		
Future Volume (vph)	35	590	900	145	160	35		
Satd. Flow (prot)	1671	1845	1845	0	1643	0		
Flt Permitted	0.082				0.964			
Satd. Flow (perm)	144	1845	1845	0	1643	0		
Satd. Flow (RTOR)			11		14			
Lane Group Flow (vph)	39	615	1214	0	297	0		
Turn Type	pm+pt	NA	NA		Prot			
Protected Phases	1	6	2 4		3		2	4
Permitted Phases	6							
Total Split (s)	15.0	65.0			40.0		50.0	20.0
Total Lost Time (s)	5.0	4.0			5.4			
Act Effct Green (s)	53.8	54.8	65.1		24.6			
Actuated g/C Ratio	0.49	0.50	0.60		0.22			
v/c Ratio	0.19	0.67	1.10		0.78			
Control Delay	18.2	25.7	65.2		53.2			
Queue Delay	0.0	0.0	0.0		0.0			
Total Delay	18.2	25.7	65.2		53.2			
LOS	B	C	E		D			
Approach Delay		25.2	65.2		53.2			
Approach LOS		C	E		D			
Queue Length 50th (ft)	14	317	~327		201			
Queue Length 95th (ft)	36	510	m128		229			
Internal Link Dist (ft)		2500	23		665			
Turn Bay Length (ft)	100							
Base Capacity (vph)	212	1047	1102		538			
Starvation Cap Reductn	0	0	0		0			
Spillback Cap Reductn	0	0	0		0			
Storage Cap Reductn	0	0	0		0			
Reduced v/c Ratio	0.18	0.59	1.10		0.55			

Intersection Summary

Cycle Length: 125

Actuated Cycle Length: 109.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.44

Intersection Signal Delay: 51.5

Intersection LOS: D

Intersection Capacity Utilization 75.0%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 52: E.10th St & Brown Ave N

 Ø1	 Ø2	 Ø3	 Ø4
15 s	50 s	40 s	20 s
 Ø6			
65 s			

AM Peak Hour

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
53: Fisk Rd & E.10th St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	600	25	20	810	245	60	145	15	255	55	170
Future Volume (vph)	65	600	25	20	810	245	60	145	15	255	55	170
Satd. Flow (prot)	1770	1832	0	1805	1863	1538	0	1820	0	0	1652	1583
Flt Permitted	0.083			0.088				0.990			0.960	
Satd. Flow (perm)	155	1832	0	167	1863	1538	0	1820	0	0	1652	1583
Satd. Flow (RTOR)		2				127		2				193
Lane Group Flow (vph)	78	753	0	27	844	295	0	382	0	0	379	193
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases	2			6		6						3
Total Split (s)	15.0	50.0		15.0	50.0	50.0	30.0	30.0		30.0	30.0	30.0
Total Lost Time (s)	5.0	4.0		5.0	4.0	4.0		5.0			5.0	5.0
Act Effct Green (s)	54.3	50.0		50.0	46.1	46.1		25.1			25.1	25.1
Actuated g/C Ratio	0.45	0.41		0.41	0.38	0.38		0.21			0.21	0.21
v/c Ratio	0.45	0.99		0.18	1.19	0.44		1.01			1.11	0.40
Control Delay	26.2	67.4		20.3	133.4	18.3		96.8			126.1	8.4
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	26.2	67.4		20.3	133.4	18.3		96.8			126.1	8.4
LOS	C	E		C	F	B		F			F	A
Approach Delay		63.5			101.6			96.8			86.4	
Approach LOS		E			F			F			F	
Queue Length 50th (ft)	33	~652		11	~820	96		~323			~349	0
Queue Length 95th (ft)	57	#790		23	#1088	156		217			#556	59
Internal Link Dist (ft)		2105			3570			811			723	
Turn Bay Length (ft)	200			175		175						250
Base Capacity (vph)	204	758		209	710	665		378			342	481
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.38	0.99		0.13	1.19	0.44		1.01			1.11	0.40

Intersection Summary

Cycle Length: 125

Actuated Cycle Length: 120.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.19

Intersection Signal Delay: 87.3

Intersection Capacity Utilization 92.3%

Analysis Period (min) 15

Intersection LOS: F

ICU Level of Service F

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 53: Fisk Rd & E.10th St

 Ø1	 Ø2	 Ø3	 Ø4
15 s	50 s	30 s	30 s
 Ø5	 Ø6		
15 s	50 s		

AM Peak Hour
WSP

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Lanes, Volumes, Timings
54: N. Old Kentucky Rd & E.10th St

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	660	230	240	885	165	225
Future Volume (vph)	660	230	240	885	165	225
Satd. Flow (prot)	1776	1553	1805	1845	1770	1583
Flt Permitted			0.103		0.950	
Satd. Flow (perm)	1776	1553	196	1845	1770	1583
Satd. Flow (RTOR)		329				381
Lane Group Flow (vph)	750	329	353	1041	223	381
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	1 2	4	
Permitted Phases		2	1 2			4
Total Split (s)	45.0	45.0	26.0		19.0	19.0
Total Lost Time (s)	4.0	4.0	5.0		5.4	4.7
Act Effct Green (s)	41.0	41.0	61.0	66.0	13.1	13.8
Actuated g/C Ratio	0.46	0.46	0.68	0.74	0.15	0.15
v/c Ratio	0.92	0.37	0.69	0.76	0.86	0.67
Control Delay	41.9	3.0	26.7	12.0	68.8	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.9	3.0	26.7	12.0	68.8	10.5
LOS	D	A	C	B	E	B
Approach Delay	30.1			15.7	32.0	
Approach LOS	C			B	C	
Queue Length 50th (ft)	388	0	124	299	125	0
Queue Length 95th (ft)	#605	10	137	401	#175	0
Internal Link Dist (ft)	3570			975	734	
Turn Bay Length (ft)		400	125		175	
Base Capacity (vph)	814	889	511	1361	269	572
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.92	0.37	0.69	0.76	0.83	0.67

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 89.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 24.0

Intersection LOS: C

Intersection Capacity Utilization 69.2%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 54: N. Old Kentucky Rd & E.10th St

		
26 s	45 s	19 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

55: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & E.10th St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	560	295	370	890	0	0	0	0	180	0	400
Future Volume (vph)	0	560	295	370	890	0	0	0	0	180	0	400
Satd. Flow (prot)	0	3243	0	1687	3471	0	0	0	0	1752	0	1583
Flt Permitted				0.132						0.950		
Satd. Flow (perm)	0	3243	0	234	3471	0	0	0	0	1752	0	1583
Satd. Flow (RTOR)		282										148
Lane Group Flow (vph)	0	1051	0	411	1113	0	0	0	0	243	0	488
Turn Type		NA		pm+pt	NA					Prot		Perm
Protected Phases		6		5	2					8		
Permitted Phases				2								8
Total Split (s)		55.0		15.0	70.0					20.0		20.0
Total Lost Time (s)		3.4		3.2	4.0					6.4		5.9
Act Effct Green (s)		27.6		42.9	42.1					13.7		14.2
Actuated g/C Ratio		0.42		0.65	0.64					0.21		0.21
v/c Ratio		0.69		1.00	0.50					0.67		1.07
Control Delay		13.8		63.7	7.3					36.8		85.2
Queue Delay		0.0		0.0	0.0					0.0		0.0
Total Delay		13.8		63.7	7.3					36.8		85.2
LOS		B		E	A					D		F
Approach Delay		13.8			22.5						69.1	
Approach LOS		B			C						E	
Queue Length 50th (ft)		125		112	107					87		~162
Queue Length 95th (ft)		176		#317	120					145		#333
Internal Link Dist (ft)		570			785			708			972	
Turn Bay Length (ft)				120								150
Base Capacity (vph)		2602		412	3372					361		455
Starvation Cap Reductn		0		0	0					0		0
Spillback Cap Reductn		0		0	0					0		0
Storage Cap Reductn		0		0	0					0		0
Reduced v/c Ratio		0.40		1.00	0.33					0.67		1.07

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 66.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 30.0

Intersection LOS: C

Intersection Capacity Utilization 68.3%

ICU Level of Service C

Analysis Period (min) 15

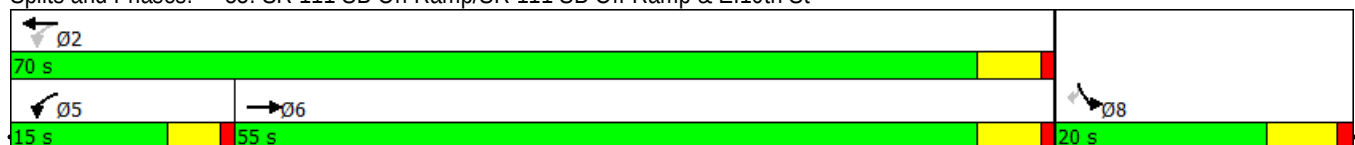
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 55: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & E.10th St

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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	135	610	0	0	890	140	355	0	305	0	0	0
Future Volume (vph)	135	610	0	0	890	140	355	0	305	0	0	0
Satd. Flow (prot)	1719	3539	0	0	3385	0	1703	0	1509	0	0	0
Flt Permitted	0.101						0.950					
Satd. Flow (perm)	183	3539	0	0	3385	0	1703	0	1509	0	0	0
Satd. Flow (RTOR)					23				242			
Lane Group Flow (vph)	148	718	0	0	1212	0	473	0	401	0	0	0
Turn Type	pm+pt	NA			NA		Prot		Perm			
Protected Phases	1	6			2		4					
Permitted Phases	6								4			
Total Split (s)	15.0	60.0			45.0		30.0		30.0			
Total Lost Time (s)	5.0	4.0			4.0		4.0		4.0			
Act Effct Green (s)	48.8	49.8			36.6		26.0		26.0			
Actuated g/C Ratio	0.58	0.59			0.44		0.31		0.31			
v/c Ratio	0.58	0.34			0.81		0.90		0.63			
Control Delay	20.0	9.0			25.5		51.7		15.7			
Queue Delay	0.0	0.0			49.6		0.0		0.0			
Total Delay	20.0	9.0			75.1		51.7		15.7			
LOS	B	A			E		D		B			
Approach Delay		10.9			75.1			35.2				
Approach LOS		B			E			D				
Queue Length 50th (ft)	33	92			278		250		69			
Queue Length 95th (ft)	82	113			334		#332		114			
Internal Link Dist (ft)		785			131			909			832	
Turn Bay Length (ft)	400								150			
Base Capacity (vph)	291	2380			1678		531		638			
Starvation Cap Reductn	0	0			698		0		0			
Spillback Cap Reductn	0	0			0		0		0			
Storage Cap Reductn	0	0			0		0		0			
Reduced v/c Ratio	0.51	0.30			1.24		0.89		0.63			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 83.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 44.4

Intersection LOS: D

Intersection Capacity Utilization 68.3%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St

 01	 02	 04
15 s	45 s	30 s
 06		
60 s		

Lanes, Volumes, Timings
57: Burton Branch Rd & E.10th St

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	655	265	50	740	310	95
Future Volume (vph)	655	265	50	740	310	95
Satd. Flow (prot)	3331	0	1612	3471	1703	1455
Flt Permitted			0.120		0.950	
Satd. Flow (perm)	3331	0	204	3471	1703	1455
Satd. Flow (RTOR)	123					111
Lane Group Flow (vph)	1143	0	65	787	419	119
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			2			4
Total Split (s)	55.0		15.0	70.0	20.0	20.0
Total Lost Time (s)	4.0		5.0	4.0	4.0	4.0
Act Effct Green (s)	30.5		36.9	37.9	17.0	17.0
Actuated g/C Ratio	0.48		0.58	0.60	0.27	0.27
v/c Ratio	0.69		0.19	0.38	0.92	0.25
Control Delay	14.2		5.8	6.3	57.3	8.7
Queue Delay	0.2		0.0	0.0	0.0	0.0
Total Delay	14.4		5.8	6.3	57.3	8.7
LOS	B		A	A	E	A
Approach Delay	14.4			6.3	46.6	
Approach LOS	B			A	D	
Queue Length 50th (ft)	180		9	67	~202	3
Queue Length 95th (ft)	210		17	90	#334	35
Internal Link Dist (ft)	131			316	647	
Turn Bay Length (ft)			100			175
Base Capacity (vph)	2720		354	3229	457	471
Starvation Cap Reductn	670		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.56		0.18	0.24	0.92	0.25

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 63.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 18.5

Intersection LOS: B

Intersection Capacity Utilization 62.9%

ICU Level of Service B

Analysis Period (min) 15

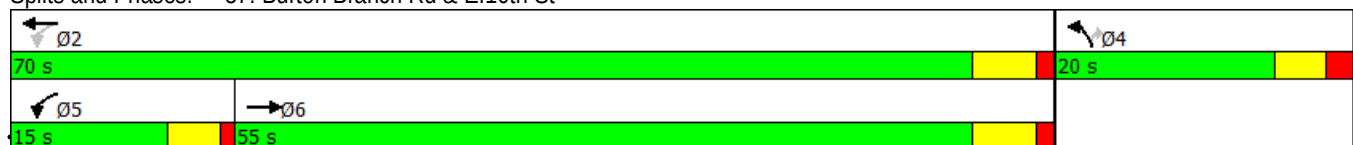
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 57: Burton Branch Rd & E.10th St



AM Peak Hour
WSP

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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

61: SR 135/S. Willow Ave & County Services Dr/Orchard St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	10	10	35	35	80	40	915	10	60	755	40
Future Volume (vph)	15	10	10	35	35	80	40	915	10	60	755	40
Satd. Flow (prot)	1687	1444	0	0	1724	0	1787	3499	0	1805	3397	0
Flt Permitted	0.537				0.918		0.241			0.176		
Satd. Flow (perm)	954	1444	0	0	1602	0	453	3499	0	334	3397	0
Satd. Flow (RTOR)		24			47			3			15	
Lane Group Flow (vph)	18	34	0	0	213	0	78	1021	0	111	881	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			3		5	2		1	6	
Permitted Phases	4			3			2			6		
Total Split (s)	25.0	25.0		25.0	25.0		14.0	50.0		15.0	51.0	
Total Lost Time (s)	4.0	4.0			4.0		5.0	4.0		5.0	4.0	
Act Effct Green (s)	13.9	13.9			13.9		33.3	29.5		33.9	29.8	
Actuated g/C Ratio	0.23	0.23			0.23		0.55	0.48		0.56	0.49	
v/c Ratio	0.08	0.10			0.53		0.20	0.60		0.31	0.53	
Control Delay	23.2	13.1			23.6		6.5	14.5		7.8	13.1	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	23.2	13.1			23.6		6.5	14.5		7.8	13.1	
LOS	C	B			C		A	B		A	B	
Approach Delay		16.6			23.6			14.0			12.5	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)	5	3			53		9	142		14	113	
Queue Length 95th (ft)	22	26			71		16	253		22	204	
Internal Link Dist (ft)		674			289			17			564	
Turn Bay Length (ft)	100						100			200		
Base Capacity (vph)	352	548			621		472	2686		457	2652	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.05	0.06			0.34		0.17	0.38		0.24	0.33	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 60.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 14.3

Intersection Capacity Utilization 56.8%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 61: SR 135/S. Willow Ave & County Services Dr/Orchard St

 Ø1	 Ø2	 Ø3
15 s	50 s	25 s
 Ø5	 Ø6	 Ø4
14 s	51 s	25 s

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	10	0	0	50	0	55
Future Volume (vph)	10	0	0	50	0	55
Satd. Flow (prot)	1770	0	0	1611	0	1863
Flt Permitted	0.950					
Satd. Flow (perm)	1770	0	0	1611	0	1863
Lane Group Flow (vph)	11	0	0	54	0	60
Sign Control	Yield		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 13.3%

ICU Level of Service A

Analysis Period (min) 15

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	10	10	10	1100	505	10
Future Volume (vph)	10	10	10	1100	505	10
Satd. Flow (prot)	864	0	0	5033	3466	0
Flt Permitted	0.976			0.999		
Satd. Flow (perm)	864	0	0	5033	3466	0
Lane Group Flow (vph)	20	0	0	1374	683	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 38.2%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
271: Foutch Dr & SR 136/S. Jefferson Ave

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	0	540	325	50	0	0
Future Volume (vph)	0	540	325	50	0	0
Satd. Flow (prot)	0	3336	3241	0	0	0
Flt Permitted						
Satd. Flow (perm)	0	3336	3241	0	0	0
Lane Group Flow (vph)	0	628	528	0	0	0
Sign Control		Free	Free		Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 18.3%

ICU Level of Service A

Analysis Period (min) 15

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	255	545	10	0	285	145
Future Volume (vph)	0	0	0	0	0	0	255	545	10	0	285	145
Satd. Flow (prot)	0	0	0	0	0	0	0	3349	0	0	3002	0
Flt Permitted								0.984				
Satd. Flow (perm)	0	0	0	0	0	0	0	3349	0	0	3002	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	1060	0	0	507	0
Sign Control		Free				Free		Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 42.0%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
521: Brown Ave S & E.10th St

Cookeville 2040 No-Build Conditions

06/20/2017

	→	↘	↙	←	↖	↗			
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø1	Ø3	Ø6
Lane Configurations	↰		↱	↰	↱				
Traffic Volume (vph)	720	25	10	995	50	10			
Future Volume (vph)	720	25	10	995	50	10			
Satd. Flow (prot)	1836	0	1805	1881	1778	0			
Flt Permitted			0.264		0.961				
Satd. Flow (perm)	1836	0	502	1881	1778	0			
Satd. Flow (RTOR)	6				8				
Lane Group Flow (vph)	818	0	24	1157	126	0			
Turn Type	NA		Perm	NA	Prot				
Protected Phases	3 6			2	4		1	3	6
Permitted Phases			2						
Total Split (s)			50.0	50.0	20.0		15.0	40.0	65.0
Total Lost Time (s)			4.0	4.0	5.4				
Act Effct Green (s)	83.5		46.9	46.9	14.9				
Actuated g/C Ratio	0.76		0.43	0.43	0.14				
v/c Ratio	0.58		0.11	1.44	0.51				
Control Delay	1.6		26.1	230.5	52.6				
Queue Delay	0.0		0.0	3.0	0.2				
Total Delay	1.6		26.1	233.5	52.8				
LOS	A		C	F	D				
Approach Delay	1.6			229.3	52.8				
Approach LOS	A			F	D				
Queue Length 50th (ft)	3		11	~1219	84				
Queue Length 95th (ft)	4		15	#1518	79				
Internal Link Dist (ft)	23			2105	565				
Turn Bay Length (ft)			115						
Base Capacity (vph)	1550		215	806	248				
Starvation Cap Reductn	0		0	0	0				
Spillback Cap Reductn	0		0	285	8				
Storage Cap Reductn	0		0	0	0				
Reduced v/c Ratio	0.53		0.11	2.22	0.53				

Intersection Summary

Cycle Length: 125

Actuated Cycle Length: 109.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.44

Intersection Signal Delay: 131.2

Intersection LOS: F

Intersection Capacity Utilization 70.2%

ICU Level of Service C

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 521: Brown Ave S & E.10th St

#52 ↰ Ø1	#52 #521 ← Ø2	#52 #521 ↱ Ø3	#52 #521 ← Ø4
15 s	50 s	40 s	20 s
#52 #521 ↰ Ø6			
65 s			

WSP

Intersection

Intersection Delay, s/veh 11.6
Intersection LOS B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↔				↔				↔	
Traffic Vol, veh/h	0	35	25	10	0	25	30	135	0	10	115	15
Future Vol, veh/h	0	35	25	10	0	25	30	135	0	10	115	15
Peak Hour Factor	0.92	0.63	0.63	0.63	0.92	0.71	0.69	0.79	0.92	1.00	0.69	0.83
Heavy Vehicles, %	2	3	0	0	2	0	0	2	2	20	1	0
Mvmt Flow	0	56	40	16	0	35	43	171	0	10	167	18
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	10.1	10.9	11.2
HCM LOS	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	50%	13%	68%
Vol Thru, %	82%	36%	16%	24%
Vol Right, %	11%	14%	71%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	140	70	190	250
LT Vol	10	35	25	170
Through Vol	115	25	30	60
RT Vol	15	10	135	20
Lane Flow Rate	195	111	250	317
Geometry Grp	1	1	1	1
Degree of Util (X)	0.307	0.179	0.354	0.467
Departure Headway (Hd)	5.679	5.798	5.105	5.316
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	633	618	704	677
Service Time	3.721	3.848	3.146	3.353
HCM Lane V/C Ratio	0.308	0.18	0.355	0.468
HCM Control Delay	11.2	10.1	10.9	13
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	1.3	0.6	1.6	2.5

Intersection

Intersection Delay, s/veh
Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	170	60	20
Future Vol, veh/h	0	170	60	20
Peak Hour Factor	0.92	0.83	0.75	0.63
Heavy Vehicles, %	2	1	2	0
Mvmt Flow	0	205	80	32
Number of Lanes	0	0	1	0
Approach	SB			
Opposing Approach	NB			
Opposing Lanes	1			
Conflicting Approach Left	WB			
Conflicting Lanes Left	1			
Conflicting Approach Right	EB			
Conflicting Lanes Right	1			
HCM Control Delay	13			
HCM LOS	B			

Intersection

Intersection Delay, s/veh 12
Intersection LOS B

Movement	EBU	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations									
Traffic Vol, veh/h	0	70	155	0	125	170	0	85	40
Future Vol, veh/h	0	70	155	0	125	170	0	85	40
Peak Hour Factor	0.92	0.83	0.74	0.92	0.79	0.68	0.92	0.75	0.94
Heavy Vehicles, %	2	1	0	2	2	1	2	1	0
Mvmt Flow	0	84	209	0	158	250	0	113	43
Number of Lanes	0	1	1	0	0	1	0	1	0
Approach	EB				NB			SB	
Opposing Approach					SB			NB	
Opposing Lanes	0				1			1	
Conflicting Approach Left	SB				EB				
Conflicting Lanes Left	1				2			0	
Conflicting Approach Right	NB							EB	
Conflicting Lanes Right	1				0			2	
HCM Control Delay	10.2				14.3			9.5	
HCM LOS	B				B			A	

Lane	NBLn1	EBLn1	EBLn2	SBLn1
Vol Left, %	42%	100%	0%	0%
Vol Thru, %	58%	0%	0%	68%
Vol Right, %	0%	0%	100%	32%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	295	70	155	125
LT Vol	125	70	0	0
Through Vol	170	0	0	85
RT Vol	0	0	155	40
Lane Flow Rate	408	84	209	156
Geometry Grp	2	7	7	2
Degree of Util (X)	0.562	0.149	0.299	0.216
Departure Headway (Hd)	4.952	6.369	5.138	4.985
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	723	558	691	711
Service Time	3.025	4.167	2.935	3.079
HCM Lane V/C Ratio	0.564	0.151	0.302	0.219
HCM Control Delay	14.3	10.3	10.2	9.5
HCM Lane LOS	B	B	B	A
HCM 95th-tile Q	3.5	0.5	1.3	0.8

Intersection

Int Delay, s/veh 1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	65	975	80	55	730
Future Vol, veh/h	20	65	975	80	55	730
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	89	87	67	70	94
Heavy Vehicles, %	0	2	2	0	0	4
Mvmt Flow	32	73	1121	119	79	777

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1725	620	0	0	1240	0
Stage 1	1180	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Critical Hdwy	7.5	6.94	-	-	4.1	-
Critical Hdwy Stg 1	6.5	-	-	-	-	-
Critical Hdwy Stg 2	6.5	-	-	-	-	-
Follow-up Hdwy	3.5	3.32	-	-	2.2	-
Pot Cap-1 Maneuver	58	431	-	-	569	-
Stage 1	205	-	-	-	-	-
Stage 2	495	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	52	431	-	-	569	-
Mov Cap-2 Maneuver	147	-	-	-	-	-
Stage 1	205	-	-	-	-	-
Stage 2	426	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	21.4		0		1.1
HCM LOS	C				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	147	431	569	-
HCM Lane V/C Ratio	-	-	0.216	0.169	0.138	-
HCM Control Delay (s)	-	-	36.1	15	12.3	-
HCM Lane LOS	-	-	E	C	B	-
HCM 95th %tile Q(veh)	-	-	0.8	0.6	0.5	-

Intersection

Int Delay, s/veh 0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	10	960	20	0	800
Future Vol, veh/h	0	10	960	20	0	800
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	25	63	89	75	25	92
Heavy Vehicles, %	0	8	3	3	0	5
Mvmt Flow	0	16	1079	27	0	870

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	-	539	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	7.06	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.38	-
Pot Cap-1 Maneuver	0	472	0
Stage 1	0	-	0
Stage 2	0	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	472	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 472	-
HCM Lane V/C Ratio	- 0.034	-
HCM Control Delay (s)	- 12.9	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0.1	-

Intersection

Int Delay, s/veh 1.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	75	40	15	990	820	20
Future Vol, veh/h	75	40	15	990	820	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	30	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	76	94	63	86	85	54
Heavy Vehicles, %	1	3	0	3	4	7
Mvmt Flow	99	43	24	1151	965	37

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1606	501	1002	0	-	0
Stage 1	983	-	-	-	-	-
Stage 2	623	-	-	-	-	-
Critical Hdwy	6.82	6.96	4.1	-	-	-
Critical Hdwy Stg 1	5.82	-	-	-	-	-
Critical Hdwy Stg 2	5.82	-	-	-	-	-
Follow-up Hdwy	3.51	3.33	2.2	-	-	-
Pot Cap-1 Maneuver	~ 97	513	699	-	-	-
Stage 1	325	-	-	-	-	-
Stage 2	500	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 94	513	699	-	-	-
Mov Cap-2 Maneuver	218	-	-	-	-	-
Stage 1	325	-	-	-	-	-
Stage 2	483	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	27.9	0.2	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	699	-	218	513	-	-
HCM Lane V/C Ratio	0.034	-	0.453	0.083	-	-
HCM Control Delay (s)	10.3	-	34.5	12.7	-	-
HCM Lane LOS	B	-	D	B	-	-
HCM 95th %tile Q(veh)	0.1	-	2.2	0.3	-	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	10	10	10	10	10	10	10	895	60	25	805	10
Future Vol, veh/h	10	10	10	10	10	10	10	895	60	25	805	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	42	100	100	100	63	84	52	63	86	63
Heavy Vehicles, %	0	0	0	0	0	0	0	3	0	0	2	0
Mvmt Flow	10	10	24	10	10	10	16	1065	115	40	936	16

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1592	2236	476	1707	2186	590	952	0	0	1181	0	0
Stage 1	1023	1023	-	1155	1155	-	-	-	-	-	-	-
Stage 2	569	1213	-	552	1031	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	73	43	541	60	46	456	730	-	-	599	-	-
Stage 1	256	316	-	213	274	-	-	-	-	-	-	-
Stage 2	479	257	-	491	313	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	48	34	541	38	37	456	730	-	-	599	-	-
Mov Cap-2 Maneuver	48	34	-	38	37	-	-	-	-	-	-	-
Stage 1	239	271	-	199	256	-	-	-	-	-	-	-
Stage 2	420	240	-	388	269	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	94.7	135	0.4	1.1
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	730	-	-	80	54	599	-	-
HCM Lane V/C Ratio	0.022	-	-	0.548	0.556	0.066	-	-
HCM Control Delay (s)	10	0.3	-	94.7	135	11.4	0.7	-
HCM Lane LOS	B	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	2.4	2.2	0.2	-	-

Intersection

Int Delay, s/veh 26.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	10	15	20	20	10	15	15	780	110	40	800	15
Future Vol, veh/h	10	15	20	20	10	15	15	780	110	40	800	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	75	47	100	50	50	82	88	63	84	83
Heavy Vehicles, %	0	0	0	0	0	0	0	2	0	0	1	0
Mvmt Flow	10	15	27	43	10	30	30	951	125	63	952	18

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1629	2224	485	1685	2171	538	970	0	0	1076	0	0
Stage 1	1088	1088	-	1074	1074	-	-	-	-	-	-	-
Stage 2	541	1136	-	611	1097	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	69	44	533	63	47	493	719	-	-	656	-	-
Stage 1	234	294	-	238	299	-	-	-	-	-	-	-
Stage 2	498	279	-	453	291	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	39	31	533	~ 29	33	493	719	-	-	656	-	-
Mov Cap-2 Maneuver	39	31	-	~ 29	33	-	-	-	-	-	-	-
Stage 1	209	233	-	213	267	-	-	-	-	-	-	-
Stage 2	402	249	-	318	230	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	162.4	\$ 591	0.7	1.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	719	-	-	65 45	656	-	-
HCM Lane V/C Ratio	0.042	-	-	0.795 1.835	0.097	-	-
HCM Control Delay (s)	10.2	0.5	-	162.4 \$ 591	11.1	1	-
HCM Lane LOS	B	A	-	F F	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	3.6 8.4	0.3	-	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 80

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	60	30	85	0	0	0	30	560	10	20	805	65
Future Vol, veh/h	60	30	85	0	0	0	30	560	10	20	805	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	70	71	86	25	25	25	78	84	100	75	74	69
Heavy Vehicles, %	4	0	1	0	0	0	8	3	0	0	1	3
Mvmt Flow	86	42	99	0	0	0	38	667	10	27	1088	94

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1598	1942	591	1367	1984	338	1182	0	0	677	0	0
Stage 1	1188	1188	-	749	749	-	-	-	-	-	-	-
Stage 2	410	754	-	618	1235	-	-	-	-	-	-	-
Critical Hdwy	7.58	6.5	6.92	7.5	6.5	6.9	4.26	-	-	4.1	-	-
Critical Hdwy Stg 1	6.58	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.58	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.54	4	3.31	3.5	4	3.3	2.28	-	-	2.2	-	-
Pot Cap-1 Maneuver	~ 70	66	453	108	62	664	554	-	-	924	-	-
Stage 1	197	264	-	375	422	-	-	-	-	-	-	-
Stage 2	584	420	-	448	251	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 60	54	453	26	50	664	554	-	-	924	-	-
Mov Cap-2 Maneuver	~ 60	54	-	26	50	-	-	-	-	-	-	-
Stage 1	175	241	-	334	376	-	-	-	-	-	-	-
Stage 2	520	374	-	263	229	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	\$ 751.2	0	1.2	0.6
HCM LOS	F	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	554	-	-	93	-	924	-
HCM Lane V/C Ratio	0.069	-	-	2.439	-	0.029	-
HCM Control Delay (s)	12	0.6	\$ 751.2	0	9	0.4	-
HCM Lane LOS	B	A	-	F	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	20.8	-	0.1	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔					↔		↔	↔	
Traffic Vol, veh/h	85	0	100	0	0	0	0	715	15	90	185	0
Future Vol, veh/h	85	0	100	0	0	0	0	715	15	90	185	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	200	-	-	-	-	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	65	25	90	25	25	25	25	75	50	88	88	25
Heavy Vehicles, %	7	0	3	0	0	0	0	0	0	1	10	0
Mvmt Flow	131	0	111	0	0	0	0	953	30	102	210	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	892	1368	105	-	0	0	953	0	0
Stage 1	415	415	-	-	-	-	-	-	-
Stage 2	477	953	-	-	-	-	-	-	-
Critical Hdwy	6.94	6.5	6.96	-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.94	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.94	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.57	4	3.33	-	-	-	2.21	-	-
Pot Cap-1 Maneuver	272	148	926	0	-	-	723	-	0
Stage 1	620	596	-	0	-	-	-	-	0
Stage 2	576	340	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	234	0	926	-	-	-	723	-	-
Mov Cap-2 Maneuver	234	0	-	-	-	-	-	-	-
Stage 1	533	0	-	-	-	-	-	-	-
Stage 2	576	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	25	0	3.5
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	234	926	723	-
HCM Lane V/C Ratio	-	-	0.559	0.12	0.141	-
HCM Control Delay (s)	-	-	38.3	9.4	10.8	-
HCM Lane LOS	-	-	E	A	B	-
HCM 95th %tile Q(veh)	-	-	3.1	0.4	0.5	-

Intersection

Int Delay, s/veh 4.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	300	545	0	0	400
Future Vol, veh/h	15	300	545	0	0	400
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	None
Storage Length	0	300	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	83	86	77	25	25	84
Heavy Vehicles, %	25	4	3	0	0	7
Mvmt Flow	18	349	708	0	0	476

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	946	354	0	-	-	-
Stage 1	708	-	-	-	-	-
Stage 2	238	-	-	-	-	-
Critical Hdwy	7.3	6.98	-	-	-	-
Critical Hdwy Stg 1	6.3	-	-	-	-	-
Critical Hdwy Stg 2	6.3	-	-	-	-	-
Follow-up Hdwy	3.75	3.34	-	-	-	-
Pot Cap-1 Maneuver	222	637	-	0	0	-
Stage 1	393	-	-	0	0	-
Stage 2	715	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	222	637	-	-	-	-
Mov Cap-2 Maneuver	222	-	-	-	-	-
Stage 1	393	-	-	-	-	-
Stage 2	715	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	17.6		0		0
HCM LOS	C				

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBT
Capacity (veh/h)	-	222	637	-
HCM Lane V/C Ratio	-	0.081	0.548	-
HCM Control Delay (s)	-	22.6	17.3	-
HCM Lane LOS	-	C	C	-
HCM 95th %tile Q(veh)	-	0.3	3.3	-

Intersection

Int Delay, s/veh 50.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑						↖	↖
Traffic Vol, veh/h	0	610	230	120	1190	0	0	0	0	60	0	500
Future Vol, veh/h	0	610	230	120	1190	0	0	0	0	60	0	500
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	100	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	25	92	75	80	89	25	25	25	25	77	25	93
Heavy Vehicles, %	0	7	1	6	3	0	0	0	0	7	0	3
Mvmt Flow	0	663	307	150	1337	0	0	0	0	78	0	538

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	-	0	0	663	0	0	1969	2300	669
Stage 1	-	-	-	-	-	-	1637	1637	-
Stage 2	-	-	-	-	-	-	332	663	-
Critical Hdwy	-	-	-	4.22	-	-	6.94	6.5	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	5.94	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.94	5.5	-
Follow-up Hdwy	-	-	-	2.26	-	-	3.57	4	3.33
Pot Cap-1 Maneuver	0	-	-	895	-	0	~ 52	39	~ 398
Stage 1	0	-	-	-	-	0	137	160	-
Stage 2	0	-	-	-	-	0	684	462	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	895	-	-	~ 43	0	~ 398
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 43	0	-
Stage 1	-	-	-	-	-	-	114	0	-
Stage 2	-	-	-	-	-	-	684	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	1	250.5
HCM LOS			F

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	895	-	43	398
HCM Lane V/C Ratio	-	-	0.168	-	1.812	1.351
HCM Control Delay (s)	-	-	9.8	-	\$ 590.3	201.3
HCM Lane LOS	-	-	A	-	F	F
HCM 95th %tile Q(veh)	-	-	0.6	-	8	25.4

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	800	630	640	60	0
Future Vol, veh/h	0	800	630	640	60	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	25	80	81	84	80	25
Heavy Vehicles, %	0	5	3	1	0	0
Mvmt Flow	0	1000	778	762	75	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	778	0	1778
Stage 1	-	-	778
Stage 2	-	-	1000
Critical Hdwy	4.1	-	6.4
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	2.2	-	3.5
Pot Cap-1 Maneuver	848	0	92
Stage 1	-	0	456
Stage 2	-	0	359
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	848	-	92
Mov Cap-2 Maneuver	-	-	225
Stage 1	-	-	456
Stage 2	-	-	359

Approach	EB	WB	SB
HCM Control Delay, s	0	0	28.8
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	SBLn1
Capacity (veh/h)	848	-	-	225
HCM Lane V/C Ratio	-	-	-	0.333
HCM Control Delay (s)	0	-	-	28.8
HCM Lane LOS	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	1.4

Intersection

Int Delay, s/veh 3.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	90	295	10	315	510
Future Vol, veh/h	0	90	295	10	315	510
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	25	83	89	100	76	86
Heavy Vehicles, %	0	0	4	0	1	3
Mvmt Flow	0	108	331	10	414	593

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1758	336	0	0	341	0
Stage 1	336	-	-	-	-	-
Stage 2	1422	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209	-
Pot Cap-1 Maneuver	94	711	-	-	1224	-
Stage 1	728	-	-	-	-	-
Stage 2	225	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	47	711	-	-	1224	-
Mov Cap-2 Maneuver	97	-	-	-	-	-
Stage 1	728	-	-	-	-	-
Stage 2	112	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	11		0		3.9
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	711	1224	-
HCM Lane V/C Ratio	-	-	-	0.153	0.339	-
HCM Control Delay (s)	-	-	0	11	9.4	0
HCM Lane LOS	-	-	A	B	A	A
HCM 95th %tile Q(veh)	-	-	-	0.5	1.5	-

Intersection

Int Delay, s/veh 0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	10	10	1100	505	10
Future Vol, veh/h	10	10	10	1100	505	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	63	81	75	100
Heavy Vehicles, %	100	100	0	3	4	0
Mvmt Flow	10	10	16	1358	673	10

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1253	342	683	0	-	0
Stage 1	678	-	-	-	-	-
Stage 2	575	-	-	-	-	-
Critical Hdwy	8.25	8.9	4.1	-	-	-
Critical Hdwy Stg 1	7.8	-	-	-	-	-
Critical Hdwy Stg 2	8	-	-	-	-	-
Follow-up Hdwy	4.65	4.3	2.2	-	-	-
Pot Cap-1 Maneuver	88	438	919	-	-	-
Stage 1	267	-	-	-	-	-
Stage 2	306	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	82	438	919	-	-	-
Mov Cap-2 Maneuver	163	-	-	-	-	-
Stage 1	267	-	-	-	-	-
Stage 2	284	-	-	-	-	-

Approach	EB		NB		SB
HCM Control Delay, s	21.5		0.3		0
HCM LOS	C				

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	919	-	238	-	-
HCM Lane V/C Ratio	0.017	-	0.084	-	-
HCM Control Delay (s)	9	0.2	21.5	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	0.3	-	-

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	15	75	20	10	85	25	475	10	90	675	45
Future Volume (vph)	250	15	75	20	10	85	25	475	10	90	675	45
Satd. Flow (prot)	1770	1706	0	1703	1657	0	1805	3435	0	1787	3486	0
Flt Permitted	0.678			0.684			0.193			0.287		
Satd. Flow (perm)	1263	1706	0	1226	1657	0	367	3435	0	540	3486	0
Satd. Flow (RTOR)		77			99			5			10	
Lane Group Flow (vph)	510	113	0	37	123	0	30	603	0	127	848	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		3			4		5	2		1	6	
Permitted Phases	3			4			2			6		
Total Split (s)	45.0	45.0		45.0	45.0		11.0	33.0		12.0	34.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	5.9		4.5	5.9	
Act Effct Green (s)	35.8	35.8		35.8	35.8		28.7	22.5		31.0	25.6	
Actuated g/C Ratio	0.46	0.46		0.46	0.46		0.37	0.29		0.40	0.33	
v/c Ratio	0.88	0.14		0.07	0.15		0.12	0.61		0.38	0.74	
Control Delay	40.5	6.5		14.3	5.3		15.1	28.1		18.2	29.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	40.5	6.5		14.3	5.3		15.1	28.1		18.2	29.1	
LOS	D	A		B	A		B	C		B	C	
Approach Delay		34.4			7.4			27.5			27.7	
Approach LOS		C			A			C			C	
Queue Length 50th (ft)	256	11		11	7		9	150		41	225	
Queue Length 95th (ft)	155	5		17	0		23	182		58	279	
Internal Link Dist (ft)		927			612			1063			1812	
Turn Bay Length (ft)	200			150			200			200		
Base Capacity (vph)	691	969		671	952		261	1262		340	1337	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.74	0.12		0.06	0.13		0.11	0.48		0.37	0.63	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 78.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 28.0

Intersection Capacity Utilization 58.0%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service B

Splits and Phases: 1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

 Ø1	 Ø2	 Ø3
12 s	33 s	45 s
 Ø5	 Ø6	 Ø4
11 s	34 s	45 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	265	10	65	0	0	0	0	580	260	395	860	0
Future Volume (vph)	265	10	65	0	0	0	0	580	260	395	860	0
Satd. Flow (prot)	1649	1571	0	0	0	0	0	3383	0	1770	3539	0
Flt Permitted	0.950	0.976								0.149		
Satd. Flow (perm)	1649	1571	0	0	0	0	0	3383	0	278	3539	0
Satd. Flow (RTOR)		53						77				
Lane Group Flow (vph)	196	188	0	0	0	0	0	1124	0	494	935	0
Turn Type	Split	NA						NA		pm+pt	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases										6		
Total Split (s)	45.0	45.0						27.0		18.0	45.0	
Total Lost Time (s)	5.2	5.2						4.7		4.5	4.7	
Act Effct Green (s)	12.8	12.8						22.4		40.6	40.4	
Actuated g/C Ratio	0.20	0.20						0.35		0.64	0.64	
v/c Ratio	0.59	0.52						0.90		0.99	0.41	
Control Delay	30.2	21.2						31.0		57.4	6.8	
Queue Delay	0.0	0.0						0.0		0.0	0.0	
Total Delay	30.2	21.2						31.0		57.4	6.8	
LOS	C	C						C		E	A	
Approach Delay		25.8						31.0			24.3	
Approach LOS		C						C			C	
Queue Length 50th (ft)	71	47						195		134	76	
Queue Length 95th (ft)	131	61						236		#293	144	
Internal Link Dist (ft)		409			271			1812			858	
Turn Bay Length (ft)	200									410		
Base Capacity (vph)	1042	1012						1248		498	2265	
Starvation Cap Reductn	0	0						0		0	0	
Spillback Cap Reductn	0	0						0		0	0	
Storage Cap Reductn	0	0						0		0	0	
Reduced v/c Ratio	0.19	0.19						0.90		0.99	0.41	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 63.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 27.0

Intersection LOS: C

Intersection Capacity Utilization 69.5%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

		
18 s	27 s	45 s
		
45 s		

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	210	10	310	45	790	0	0	1055	325
Future Volume (vph)	0	0	0	210	10	310	45	790	0	0	1055	325
Satd. Flow (prot)	0	0	0	0	1762	1583	1671	3539	0	0	3409	0
Flt Permitted					0.954		0.116					
Satd. Flow (perm)	0	0	0	0	1762	1583	204	3539	0	0	3409	0
Satd. Flow (RTOR)						85					51	
Lane Group Flow (vph)	0	0	0	0	251	365	58	975	0	0	1642	0
Turn Type				Split	NA	Perm	pm+pt	NA			NA	
Protected Phases				4	4		5	2			6	
Permitted Phases						4	2					
Total Split (s)				45.0	45.0	45.0	10.6	45.0			34.4	
Total Lost Time (s)					5.4	5.4	4.5	5.5			5.5	
Act Effct Green (s)					18.5	18.5	36.6	35.5			29.9	
Actuated g/C Ratio					0.28	0.28	0.56	0.54			0.46	
v/c Ratio					0.50	0.72	0.23	0.51			1.03	
Control Delay					23.5	24.7	10.6	11.5			54.3	
Queue Delay					0.0	0.0	0.0	0.0			0.0	
Total Delay					23.5	24.7	10.6	11.5			54.3	
LOS					C	C	B	B			D	
Approach Delay					24.2			11.5			54.3	
Approach LOS					C			B			D	
Queue Length 50th (ft)					90	108	9	115			~429	
Queue Length 95th (ft)					151	175	28	195			#639	
Internal Link Dist (ft)		874			1170			858			839	
Turn Bay Length (ft)						200	200					
Base Capacity (vph)					1107	1025	256	2217			1590	
Starvation Cap Reductn					0	0	0	0			0	
Spillback Cap Reductn					0	0	0	0			0	
Storage Cap Reductn					0	0	0	0			0	
Reduced v/c Ratio					0.23	0.36	0.23	0.44			1.03	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 65.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 35.2

Intersection LOS: D

Intersection Capacity Utilization 69.5%

ICU Level of Service C

Analysis Period (min) 15

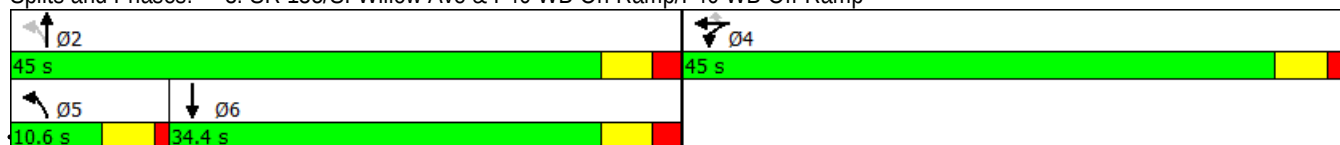
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp



PM Peak HR

WSP

Synchro 9 Report

Page 3

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	180	115	340	215	345	135	690	220	325	880	75
Future Volume (vph)	100	180	115	340	215	345	135	690	220	325	880	75
Satd. Flow (prot)	1736	1711	0	1805	1900	1615	1703	3412	0	1752	3524	0
Flt Permitted	0.596			0.200			0.155			0.129		
Satd. Flow (perm)	1089	1711	0	380	1900	1615	278	3412	0	238	3524	0
Satd. Flow (RTOR)		33				328		48			13	
Lane Group Flow (vph)	118	396	0	415	265	406	157	1058	0	361	1019	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4		4	2			6		
Total Split (s)	11.0	22.0		17.0	28.0	28.0	12.0	33.0		18.0	39.0	
Total Lost Time (s)	4.5	6.5		4.5	6.5	6.5	4.5	6.5		4.5	6.5	
Act Effct Green (s)	24.0	15.5		34.5	21.5	21.5	36.0	26.5		46.5	32.5	
Actuated g/C Ratio	0.27	0.17		0.38	0.24	0.24	0.40	0.29		0.52	0.36	
v/c Ratio	0.35	1.23		1.21	0.58	0.64	0.69	1.02		1.03	0.79	
Control Delay	22.7	161.0		143.0	36.3	12.0	31.8	64.2		80.8	31.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	22.7	161.0		143.0	36.3	12.0	31.8	64.2		80.8	31.0	
LOS	C	F		F	D	B	C	E		F	C	
Approach Delay		129.2			68.0			60.0			44.0	
Approach LOS		F			E			E			D	
Queue Length 50th (ft)	44	~266		~235	134	36	45	~315		~168	265	
Queue Length 95th (ft)	76	#349		#356	188	106	#102	#420		#342	345	
Internal Link Dist (ft)		811			944			839			2060	
Turn Bay Length (ft)	150			150			50			150		
Base Capacity (vph)	337	321		343	454	635	229	1038		350	1282	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.35	1.23		1.21	0.58	0.64	0.69	1.02		1.03	0.79	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.23

Intersection Signal Delay: 65.3

Intersection Capacity Utilization 97.8%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service F

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: SR 135/S. Willow Ave & Foreman Dr/Interstate Dr

 Ø1	 Ø2	 Ø3	 Ø4
18 s	33 s	11 s	28 s
 Ø5	 Ø6	 Ø7	 Ø8
12 s	39 s	17 s	22 s

PM Peak HR

WSP

Synchro 9 Report

Page 4

Lanes, Volumes, Timings
5: SR 135/S. Willow Ave & Fairground St

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	35	130	1035	135	70	1305
Future Volume (vph)	35	130	1035	135	70	1305
Satd. Flow (prot)	1805	1583	3507	0	1752	3574
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1583	3507	0	1752	3574
Lane Group Flow (vph)	51	151	1230	0	111	1450
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 50.1%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
6: SR 135/S. Willow Ave & Ashwood Dr

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (vph)	0	20	1145	10	0	1385
Future Volume (vph)	0	20	1145	10	0	1385
Satd. Flow (prot)	0	1644	3568	0	0	3539
Flt Permitted						
Satd. Flow (perm)	0	1644	3568	0	0	3539
Lane Group Flow (vph)	0	27	1196	0	0	1522
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 42.0%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
7: SR 135/S. Willow Ave & Lone Oak Dr

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				 	 	
Traffic Volume (vph)	35	35	40	1200	1285	55
Future Volume (vph)	35	35	40	1200	1285	55
Satd. Flow (prot)	1736	1553	1805	3574	3547	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1736	1553	1805	3574	3547	0
Lane Group Flow (vph)	35	51	45	1212	1470	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 47.3%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

8: SR 135/S. Willow Ave & W. Jackson St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	405	430	195	600	170	390	730	135	210	840	115
Future Volume (vph)	140	405	430	195	600	170	390	730	135	210	840	115
Satd. Flow (prot)	1805	3574	1568	1787	3473	0	1787	3453	0	1770	3502	0
Flt Permitted	0.229			0.283			0.131			0.167		
Satd. Flow (perm)	435	3574	1568	532	3473	0	246	3453	0	311	3502	0
Satd. Flow (RTOR)			317		45			29			18	
Lane Group Flow (vph)	149	500	494	207	880	0	419	956	0	263	1047	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4			2			6		
Total Split (s)	13.0	23.0	23.0	13.0	23.0		22.0	37.0		17.0	32.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5		5.5	6.6		5.5	6.6	
Act Effct Green (s)	24.9	17.5	17.5	25.0	17.5		48.1	30.7		37.8	25.4	
Actuated g/C Ratio	0.28	0.19	0.19	0.28	0.19		0.53	0.34		0.42	0.28	
v/c Ratio	0.64	0.72	0.88	0.82	1.24		1.01	0.80		0.84	1.05	
Control Delay	35.8	40.7	31.9	51.6	150.2		72.8	32.3		43.8	73.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	35.8	40.7	31.9	51.6	150.2		72.8	32.3		43.8	73.5	
LOS	D	D	C	D	F		E	C		D	E	
Approach Delay		36.3			131.4			44.6			67.5	
Approach LOS		D			F			D			E	
Queue Length 50th (ft)	60	141	100	87	~320		~191	250		87	~340	
Queue Length 95th (ft)	#115	173	#262	#168	#442		#383	328		#167	#467	
Internal Link Dist (ft)		1238			1065			2054			612	
Turn Bay Length (ft)	225		175	150			150			150		
Base Capacity (vph)	235	694	560	252	711		414	1195		317	1001	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.63	0.72	0.88	0.82	1.24		1.01	0.80		0.83	1.05	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.24

Intersection Signal Delay: 68.0

Intersection Capacity Utilization 97.5%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service F

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: SR 135/S. Willow Ave & W. Jackson St

 Ø1	 Ø2	 Ø3	 Ø4
17 s	37 s	13 s	23 s
 Ø5	 Ø6	 Ø7	 Ø8
22 s	32 s	13 s	23 s

PM Peak HR

WSP

Synchro 9 Report

Page 8

Lanes, Volumes, Timings
9: SR 135/S. Willow Ave & W. Stevens St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	100	40	130	140	95	35	900	90	70	1090	40
Future Volume (vph)	50	100	40	130	140	95	35	900	90	70	1090	40
Satd. Flow (prot)	0	1811	0	1787	1783	0	1805	3524	0	1787	3554	0
Flt Permitted		0.988		0.950			0.126			0.125		
Satd. Flow (perm)	0	1811	0	1787	1783	0	239	3524	0	235	3554	0
Satd. Flow (RTOR)		17			30			15			5	
Lane Group Flow (vph)	0	242	0	183	268	0	42	1008	0	84	1180	0
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	19.0	19.0		20.0	20.0		11.0	39.0		12.0	40.0	
Total Lost Time (s)		4.8		4.8	4.8		4.5	4.8		4.5	4.8	
Act Effct Green (s)		13.4		14.3	14.3		35.7	30.7		37.9	33.5	
Actuated g/C Ratio		0.16		0.17	0.17		0.44	0.37		0.46	0.41	
v/c Ratio		0.78		0.59	0.80		0.19	0.76		0.34	0.81	
Control Delay		51.7		42.3	50.3		13.0	27.3		15.3	28.0	
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		51.7		42.3	50.3		13.0	27.3		15.3	28.0	
LOS		D		D	D		B	C		B	C	
Approach Delay		51.7			47.0			26.8			27.2	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)		125		97	132		11	252		23	314	
Queue Length 95th (ft)		#208		126	#235		25	327		42	402	
Internal Link Dist (ft)		761			793			608			1346	
Turn Bay Length (ft)				75			100			150		
Base Capacity (vph)		337		341	365		232	1525		254	1612	
Starvation Cap Reductn		0		0	0		0	0		0	0	
Spillback Cap Reductn		0		0	0		0	0		0	0	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.72		0.54	0.73		0.18	0.66		0.33	0.73	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 82

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 32.0

Intersection Capacity Utilization 75.8%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service D

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 9: SR 135/S. Willow Ave & W. Stevens St

 Ø1	 Ø2	 Ø3	 Ø4
12 s	39 s	20 s	19 s
 Ø5	 Ø6		
11 s	40 s		

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	315	150	285	380	185	135	780	115	110	955	25
Future Volume (vph)	160	315	150	285	380	185	135	780	115	110	955	25
Satd. Flow (prot)	1787	1758	0	1805	1791	0	1787	3507	0	1685	3324	0
Flt Permitted	0.163			0.145			0.136			0.136		
Satd. Flow (perm)	307	1758	0	276	1791	0	256	3507	0	241	3324	0
Satd. Flow (RTOR)		28			21			20			3	
Lane Group Flow (vph)	213	551	0	343	696	0	153	986	0	149	1046	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	29.0		15.0	32.0		12.0	34.0		12.0	34.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	32.0	24.5		38.0	27.5		37.0	29.5		37.0	29.5	
Actuated g/C Ratio	0.36	0.27		0.42	0.31		0.41	0.33		0.41	0.33	
v/c Ratio	0.92	1.11		1.17	1.24		0.66	0.85		0.68	0.96	
Control Delay	63.3	103.9		128.8	151.9		30.4	35.9		33.1	49.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	63.3	103.9		128.8	151.9		30.4	35.9		33.1	49.6	
LOS	E	F		F	F		C	D		C	D	
Approach Delay		92.6			144.3			35.2			47.6	
Approach LOS		F			F			D			D	
Queue Length 50th (ft)	75	~349		~182	~491		49	267		48	303	
Queue Length 95th (ft)	#135	#512		#307	#530		#104	#358		69	#440	
Internal Link Dist (ft)		2100			700			1346			1053	
Turn Bay Length (ft)	125			125			175			150		
Base Capacity (vph)	232	498		294	561		232	1163		219	1091	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.92	1.11		1.17	1.24		0.66	0.85		0.68	0.96	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.24

Intersection Signal Delay: 76.8

Intersection Capacity Utilization 91.2%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service F

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 10: SR 135/S. Willow Ave & US 70/W. Spring St

			
Ø1	Ø2	Ø3	Ø4
12 s	34 s	12 s	32 s
			
Ø5	Ø6	Ø7	Ø8
12 s	34 s	15 s	29 s

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	120	85	160	205	80	110	885	55	75	875	85
Future Volume (vph)	90	120	85	160	205	80	110	885	55	75	875	85
Satd. Flow (prot)	1805	1763	0	1805	1822	0	1668	3323	0	1620	3283	0
Flt Permitted	0.355			0.344			0.124			0.135		
Satd. Flow (perm)	674	1763	0	654	1822	0	218	3323	0	230	3283	0
Satd. Flow (RTOR)		42			20			10			16	
Lane Group Flow (vph)	95	241	0	198	370	0	134	1025	0	75	1054	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	11.0	24.0		14.0	27.0		13.0	40.0		12.0	39.0	
Total Lost Time (s)	4.5	5.2		4.5	5.2		4.5	4.8		4.5	4.8	
Act Effct Green (s)	23.3	15.9		29.7	22.0		38.7	32.2		37.0	31.3	
Actuated g/C Ratio	0.29	0.20		0.36	0.27		0.48	0.40		0.45	0.38	
v/c Ratio	0.33	0.64		0.53	0.73		0.54	0.78		0.33	0.83	
Control Delay	22.5	34.5		25.4	39.0		20.8	27.2		14.9	30.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	22.5	34.5		25.4	39.0		20.8	27.2		14.9	30.3	
LOS	C	C		C	D		C	C		B	C	
Approach Delay		31.1			34.3			26.5			29.3	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	35	102		78	189		37	262		20	277	
Queue Length 95th (ft)	69	181		116	233		63	342		42	363	
Internal Link Dist (ft)		1729			1357			1053			841	
Turn Bay Length (ft)	75						150			50		
Base Capacity (vph)	288	457		379	524		261	1507		239	1450	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.33	0.53		0.52	0.71		0.51	0.68		0.31	0.73	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 81.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 29.3

Intersection Capacity Utilization 69.5%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

Splits and Phases: 11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

			
Ø1	Ø2	Ø3	Ø4
12 s	40 s	11 s	27 s
			
Ø5	Ø6	Ø7	Ø8
13 s	39 s	14 s	24 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

12: SR 135/N. Willow Ave & W. 3rd St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	10	20	15	10	30	20	1025	20	15	1005	25
Future Volume (vph)	10	10	20	15	10	30	20	1025	20	15	1005	25
Satd. Flow (prot)	0	1772	0	0	1731	0	0	3353	0	0	3317	0
Flt Permitted		0.985			0.989			0.999			0.999	
Satd. Flow (perm)	0	1772	0	0	1731	0	0	3353	0	0	3317	0
Lane Group Flow (vph)	0	53	0	0	82	0	0	1133	0	0	1157	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 54.3%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
13: SR 135/N. Willow Ave & W. 4th St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	15	30	30	10	35	20	995	45	15	980	20
Future Volume (vph)	15	15	30	30	10	35	20	995	45	15	980	20
Satd. Flow (prot)	0	1740	0	0	1711	0	0	3335	0	0	3321	0
Flt Permitted		0.985			0.979			0.999			0.999	
Satd. Flow (perm)	0	1740	0	0	1711	0	0	3335	0	0	3321	0
Lane Group Flow (vph)	0	81	0	0	97	0	0	1165	0	0	1163	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 57.0%

ICU Level of Service B

Analysis Period (min) 15

Lanes, Volumes, Timings
14: SR 135/N. Willow Ave & W. 7th St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	85	35	290	140	170	15	900	90	60	695	25
Future Volume (vph)	55	85	35	290	140	170	15	900	90	60	695	25
Satd. Flow (prot)	1770	1751	0	1805	1727	0	0	3315	0	0	3268	0
Flt Permitted	0.544			0.404				0.920			0.678	
Satd. Flow (perm)	1013	1751	0	768	1727	0	0	3053	0	0	2225	0
Satd. Flow (RTOR)		27			69			15			7	
Lane Group Flow (vph)	66	166	0	337	364	0	0	1070	0	0	907	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	16.0	17.0		23.0	24.0		39.0	39.0		11.0	50.0	
Total Lost Time (s)	4.5	5.3		4.5	5.3			5.3			5.3	
Act Effct Green (s)	18.9	10.4		31.9	21.7			37.4			37.4	
Actuated g/C Ratio	0.24	0.13		0.40	0.27			0.47			0.47	
v/c Ratio	0.21	0.66		0.65	0.70			0.74			0.86	
Control Delay	19.7	43.5		25.6	32.7			20.6			28.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	19.7	43.5		25.6	32.7			20.6			28.8	
LOS	B	D		C	C			C			C	
Approach Delay		36.7			29.3			20.6			28.8	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	22	74		136	152			230			215	
Queue Length 95th (ft)	45	125		205	#307			307			295	
Internal Link Dist (ft)		675			1002			1211			498	
Turn Bay Length (ft)	25			75								
Base Capacity (vph)	408	289		558	527			1562			1297	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.16	0.57		0.60	0.69			0.69			0.70	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 79.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 26.5

Intersection Capacity Utilization 89.7%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service E

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 14: SR 135/N. Willow Ave & W. 7th St

 Ø2	 Ø1	 Ø3	 Ø4
39 s	11 s	16 s	24 s
 Ø6	 Ø7	 Ø8	
50 s	23 s	17 s	

Lanes, Volumes, Timings
15: SR 135/N. Willow Ave & W. 9th St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	10	100	10	15	10	85	1010	10	10	680	80
Future Volume (vph)	50	10	100	10	15	10	85	1010	10	10	680	80
Satd. Flow (prot)	0	1663	0	0	1778	0	0	3346	0	0	3280	0
Flt Permitted		0.984			0.988			0.995			0.999	
Satd. Flow (perm)	0	1663	0	0	1778	0	0	3346	0	0	3280	0
Lane Group Flow (vph)	0	191	0	0	41	0	0	1215	0	0	888	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 75.3%

ICU Level of Service D

Analysis Period (min) 15

Lanes, Volumes, Timings
16: SR 135/N. Willow Ave & University Dr

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	35	20	130	30	85	10	955	85	15	635	20
Future Volume (vph)	35	35	20	130	30	85	10	955	85	15	635	20
Satd. Flow (prot)	1736	1679	0	1787	1630	0	0	3329	0	0	3312	0
Flt Permitted	0.833			0.430				0.948			0.899	
Satd. Flow (perm)	1522	1679	0	809	1630	0	0	3156	0	0	2983	0
Satd. Flow (RTOR)		21			142			13			6	
Lane Group Flow (vph)	45	60	0	197	196	0	0	1149	0	0	739	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	3	8		7	4			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	33.0		12.0	33.0		45.0	45.0		45.0	45.0	
Total Lost Time (s)	4.5	5.5		4.5	5.5			4.9			4.9	
Act Effct Green (s)	12.5	8.6		13.9	9.1			27.6			27.6	
Actuated g/C Ratio	0.23	0.16		0.26	0.17			0.51			0.51	
v/c Ratio	0.12	0.21		0.55	0.50			0.71			0.48	
Control Delay	16.2	20.3		23.2	14.5			13.7			10.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	16.2	20.3		23.2	14.5			13.7			10.5	
LOS	B	C		C	B			B			B	
Approach Delay		18.6			18.9			13.7			10.5	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	10	13		50	17			152			83	
Queue Length 95th (ft)	30	47		82	23			266			150	
Internal Link Dist (ft)		789			874			862			1102	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	419	966		361	991			2412			2278	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.11	0.06		0.55	0.20			0.48			0.32	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 53.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 13.8

Intersection Capacity Utilization 58.7%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 16: SR 135/N. Willow Ave & University Dr

 Ø2	 Ø3	 Ø4
45 s	12 s	33 s
 Ø6	 Ø7	 Ø8
45 s	12 s	33 s

Lanes, Volumes, Timings
17: SR 135/N. Willow Ave & W. 12th St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	275	180	255	400	150	295	525	255	100	280	55
Future Volume (vph)	115	275	180	255	400	150	295	525	255	100	280	55
Satd. Flow (prot)	1752	1845	1615	1770	3420	0	1685	3176	0	1668	3285	0
Flt Permitted	0.376			0.269			0.412			0.197		
Satd. Flow (perm)	694	1845	1615	501	3420	0	731	3176	0	346	3285	0
Satd. Flow (RTOR)			198		63			107			26	
Lane Group Flow (vph)	129	320	198	277	621	0	307	821	0	145	371	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8			6			2		
Total Split (s)	11.0	28.0	28.0	15.0	32.0		17.0	34.0		13.0	30.0	
Total Lost Time (s)	4.5	5.5	5.5	4.5	5.5		4.5	5.9		4.5	5.9	
Act Effct Green (s)	25.9	18.3	18.3	33.9	24.8		37.3	23.9		29.8	20.2	
Actuated g/C Ratio	0.32	0.22	0.22	0.42	0.30		0.46	0.29		0.37	0.25	
v/c Ratio	0.42	0.77	0.38	0.75	0.57		0.65	0.81		0.56	0.44	
Control Delay	21.0	44.0	6.7	32.3	25.2		22.1	30.9		23.0	26.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.0	44.0	6.7	32.3	25.2		22.1	30.9		23.0	26.3	
LOS	C	D	A	C	C		C	C		C	C	
Approach Delay		28.0			27.4			28.5			25.4	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	42	161	0	100	137		102	184		43	81	
Queue Length 95th (ft)	80	243	51	#174	194		172	265		60	126	
Internal Link Dist (ft)		1178			1081			1102			1094	
Turn Bay Length (ft)	100			220			100			220		
Base Capacity (vph)	306	517	595	374	1172		487	1182		268	1005	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.42	0.62	0.33	0.74	0.53		0.63	0.69		0.54	0.37	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 81.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 27.6

Intersection LOS: C

Intersection Capacity Utilization 73.8%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 17: SR 135/N. Willow Ave & W. 12th St

			
17 s	30 s	15 s	28 s
			
13 s	34 s	11 s	32 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	295	0	20	15	0	35	25	805	10	25	1130	345
Future Volume (vph)	295	0	20	15	0	35	25	805	10	25	1130	345
Satd. Flow (prot)	1736	1615	0	1805	1615	0	1805	3539	1615	1687	3505	1599
Flt Permitted	0.422			0.744			0.115			0.221		
Satd. Flow (perm)	771	1615	0	1414	1615	0	218	3539	1615	392	3505	1599
Satd. Flow (RTOR)		487			274				131			131
Lane Group Flow (vph)	311	21	0	24	51	0	40	982	10	25	1256	437
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2		2	6		6
Total Split (s)	25.0	15.0		25.0	15.0		17.0	43.0	43.0	17.0	43.0	43.0
Total Lost Time (s)	4.5	6.0		4.5	6.0		4.5	6.0	6.0	4.5	6.0	6.0
Act Effct Green (s)	28.3	22.0		12.6	6.0		61.1	56.7	56.7	59.8	54.3	54.3
Actuated g/C Ratio	0.28	0.22		0.13	0.06		0.61	0.57	0.57	0.60	0.54	0.54
v/c Ratio	0.78	0.03		0.12	0.14		0.17	0.49	0.01	0.08	0.66	0.47
Control Delay	44.8	0.1		26.3	0.9		10.4	16.2	0.0	2.2	6.9	1.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.3	0.0	0.0	0.3	0.4
Total Delay	44.8	0.1		26.3	0.9		10.4	16.5	0.0	2.2	7.1	1.6
LOS	D	A		C	A		B	B	A	A	A	A
Approach Delay		42.0			9.0			16.1			5.7	
Approach LOS		D			A			B			A	
Queue Length 50th (ft)	162	0		10	0		10	183	0	1	50	0
Queue Length 95th (ft)	250	0		20	0		16	268	0	m2	m55	m2
Internal Link Dist (ft)		573			734			200			263	
Turn Bay Length (ft)	200			25			175		150	100		50
Base Capacity (vph)	425	735		455	394		335	2006	972	407	1904	928
Starvation Cap Reductn	0	0		0	0		0	0	0	0	181	155
Spillback Cap Reductn	0	0		0	30		0	394	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.03		0.05	0.14		0.12	0.61	0.01	0.06	0.73	0.57

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 37 (37%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 13.0

Intersection LOS: B

Intersection Capacity Utilization 64.2%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

 Ø1	 Ø2 (R)	 Ø3	 Ø4
17 s	43 s	25 s	15 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
17 s	43 s	25 s	15 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	270	0	205	0	0	0	0	950	175	360	1290	0
Future Volume (vph)	270	0	205	0	0	0	0	950	175	360	1290	0
Satd. Flow (prot)	1736	0	1538	0	0	0	0	3574	1599	1787	3539	0
Flt Permitted	0.950									0.120		
Satd. Flow (perm)	1736	0	1538	0	0	0	0	3574	1599	226	3539	0
Satd. Flow (RTOR)			250						219			
Lane Group Flow (vph)	307	0	250	0	0	0	0	1105	219	434	1418	0
Turn Type	Prot		Perm					NA	Perm	pm+pt	NA	
Protected Phases	1							3		2	3	
Permitted Phases			1						3	3		
Total Split (s)	37.0		37.0					38.0	38.0	25.0	38.0	
Total Lost Time (s)	5.4		5.4					4.6	4.6	4.5	4.6	
Act Effct Green (s)	23.1		23.1					33.4	33.4	62.5	33.4	
Actuated g/C Ratio	0.23		0.23					0.33	0.33	0.62	0.33	
v/c Ratio	0.77		0.46					0.93	0.32	0.73	1.20	
Control Delay	48.3		6.4					39.2	2.5	41.8	114.4	
Queue Delay	0.0		0.0					10.3	0.3	0.0	0.0	
Total Delay	48.3		6.4					49.5	2.8	41.8	114.5	
LOS	D		A					D	A	D	F	
Approach Delay		29.5						41.8			97.4	
Approach LOS		C						D			F	
Queue Length 50th (ft)	184		0					369	16	182	~588	
Queue Length 95th (ft)	244		38					#450	6	m#295	m#648	
Internal Link Dist (ft)		458			312			263			407	
Turn Bay Length (ft)			200							250		
Base Capacity (vph)	548		657					1193	679	594	1182	
Starvation Cap Reductn	0		0					90	142	0	6	
Spillback Cap Reductn	0		0					0	0	0	0	
Storage Cap Reductn	0		0					0	0	0	0	
Reduced v/c Ratio	0.56		0.38					1.00	0.41	0.73	1.21	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 3:NBSB, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.20

Intersection Signal Delay: 67.6

Intersection LOS: E

Intersection Capacity Utilization 74.2%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp



PM Peak HR
WSP

Synchro 9 Report
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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	105	0	290	120	1090	0	0	1540	255
Future Volume (vph)	0	0	0	105	0	290	120	1090	0	0	1540	255
Satd. Flow (prot)	0	0	0	3213	0	1538	1719	3574	0	0	3574	1599
Flt Permitted				0.950			0.080					
Satd. Flow (perm)	0	0	0	3213	0	1538	145	3574	0	0	3574	1599
Satd. Flow (RTOR)						78						193
Lane Group Flow (vph)	0	0	0	118	0	354	140	1160	0	0	1638	280
Turn Type				Prot		Perm	pm+pt	NA			NA	Perm
Protected Phases				1			2	3			3	
Permitted Phases						1	3	2				3
Total Split (s)				37.0		37.0	25.0	38.0			38.0	38.0
Total Lost Time (s)				4.9		4.9	4.5	4.5			4.5	4.5
Act Effct Green (s)				23.8		23.8	62.3	66.8			49.8	49.8
Actuated g/C Ratio				0.24		0.24	0.62	0.67			0.50	0.50
v/c Ratio				0.15		0.83	0.49	0.49			0.92	0.31
Control Delay				28.6		44.3	28.6	17.4			22.8	1.3
Queue Delay				0.0		61.5	0.0	0.5			45.8	1.4
Total Delay				28.6		105.8	28.6	17.9			68.6	2.8
LOS				C		F	C	B			E	A
Approach Delay					86.5			19.1			59.0	
Approach LOS					F			B			E	
Queue Length 50th (ft)				30		170	74	262			544	0
Queue Length 95th (ft)				47		216	m95	m301			m#790	m18
Internal Link Dist (ft)		382			483			407			133	
Turn Bay Length (ft)				275		275	250					
Base Capacity (vph)				1031		546	419	2387			1779	893
Starvation Cap Reductn				0		0	0	685			394	425
Spillback Cap Reductn				0		315	0	99			444	0
Storage Cap Reductn				0		0	0	0			0	0
Reduced v/c Ratio				0.11		1.53	0.33	0.68			1.23	0.60

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 20 (20%), Referenced to phase 3:NBSB, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 48.4

Intersection LOS: D

Intersection Capacity Utilization 74.2%

ICU Level of Service D

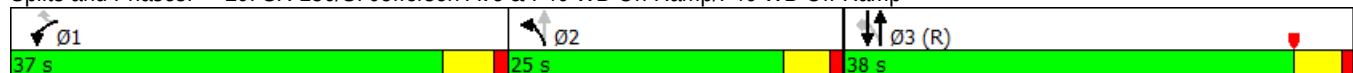
Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp



Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	20	465	115	30	20	205	1110	75	10	1225	80
Future Volume (vph)	100	20	465	115	30	20	205	1110	75	10	1225	80
Satd. Flow (prot)	0	1794	1599	1770	1788	0	1787	3539	1568	1805	5118	0
Flt Permitted		0.960		0.950			0.100			0.121		
Satd. Flow (perm)	0	1794	1599	1770	1788	0	188	3539	1568	230	5118	0
Satd. Flow (RTOR)			294		27				125		14	
Lane Group Flow (vph)	0	166	541	122	69	0	233	1181	80	24	1424	0
Turn Type	Split	NA	Perm	Split	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			3				2		2	6		
Total Split (s)	27.0	27.0	27.0	20.0	20.0		15.0	38.0	38.0	15.0	38.0	
Total Lost Time (s)		5.0	5.0	5.0	5.0		4.5	4.5	4.5	4.5	4.5	
Act Effct Green (s)		20.7	20.7	13.0	13.0		50.3	45.9	45.9	45.3	35.3	
Actuated g/C Ratio		0.21	0.21	0.13	0.13		0.50	0.46	0.46	0.45	0.35	
v/c Ratio		0.45	0.96	0.53	0.27		0.82	0.73	0.10	0.09	0.78	
Control Delay		38.4	47.7	49.2	28.6		51.0	28.3	2.7	18.7	32.7	
Queue Delay		0.0	7.9	0.0	0.0		8.0	1.6	0.5	0.0	13.4	
Total Delay		38.4	55.6	49.2	28.6		59.0	29.9	3.2	18.7	46.1	
LOS		D	E	D	C		E	C	A	B	D	
Approach Delay		51.6			41.8			33.0			45.7	
Approach LOS		D			D			C			D	
Queue Length 50th (ft)		92	169	75	24		97	277	2	9	228	
Queue Length 95th (ft)		126	#340	129	46		#248	#560	m10	m10	m245	
Internal Link Dist (ft)		530			587			133			582	
Turn Bay Length (ft)			100	25			50			100		
Base Capacity (vph)		394	581	265	291		284	1626	787	270	1817	
Starvation Cap Reductn		0	0	0	0		29	262	477	0	0	
Spillback Cap Reductn		0	31	0	0		0	0	0	0	401	
Storage Cap Reductn		0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio		0.42	0.98	0.46	0.24		0.91	0.87	0.26	0.09	1.01	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 41.6

Intersection LOS: D

Intersection Capacity Utilization 76.3%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd

 Ø1	 Ø2 (R)	 Ø3	 Ø4
15 s	38 s	27 s	20 s
 Ø5	 Ø6 (R)		
15 s	38 s		

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	430	250	300	495	170	215	700	255	130	865	240
Future Volume (vph)	190	430	250	300	495	170	215	700	255	130	865	240
Satd. Flow (prot)	1770	1845	1599	1805	3480	0	1770	3539	1615	1805	3464	0
Flt Permitted	0.182			0.177			0.122			0.233		
Satd. Flow (perm)	339	1845	1599	336	3480	0	227	3539	1615	443	3464	0
Satd. Flow (RTOR)			263		39				271		39	
Lane Group Flow (vph)	216	439	263	313	759	0	269	729	271	151	1133	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4			2		2	6		
Total Split (s)	18.0	27.0	27.0	18.0	27.0		17.0	38.0	38.0	17.0	38.0	
Total Lost Time (s)	4.5	5.0	5.0	4.5	5.0		4.5	5.5	5.5	4.5	5.5	
Act Effct Green (s)	35.4	22.0	22.0	36.6	22.6		46.4	32.9	32.9	45.6	32.5	
Actuated g/C Ratio	0.35	0.22	0.22	0.37	0.23		0.46	0.33	0.33	0.46	0.32	
v/c Ratio	0.71	1.08	0.47	0.98	0.93		0.90	0.63	0.38	0.41	0.98	
Control Delay	35.3	107.5	7.3	71.9	55.4		70.9	20.5	6.9	14.2	31.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	35.3	107.5	7.3	71.9	55.4		70.9	20.5	6.9	14.2	31.6	
LOS	D	F	A	E	E		E	C	A	B	C	
Approach Delay		61.8			60.2			28.3			29.6	
Approach LOS		E			E			C			C	
Queue Length 50th (ft)	91	~315	0	147	241		133	35	0	21	198	
Queue Length 95th (ft)	#154	#504	64	#323	#333		#220	166	m73	m24	m#440	
Internal Link Dist (ft)		1125			846			582			1693	
Turn Bay Length (ft)	175			125			125			125		
Base Capacity (vph)	315	405	556	321	816		298	1164	713	374	1152	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.69	1.08	0.47	0.98	0.93		0.90	0.63	0.38	0.40	0.98	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 42.9

Intersection LOS: D

Intersection Capacity Utilization 99.0%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
17 s	38 s	18 s	27 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
17 s	38 s	18 s	27 s

Lanes, Volumes, Timings
23: SR 136/S. Jefferson Ave & E. Veterans Dr

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	245	75	170	280	145	60	800	130	95	1065	95
Future Volume (vph)	80	245	75	170	280	145	60	800	130	95	1065	95
Satd. Flow (prot)	1805	1818	0	1752	1754	0	1805	3504	0	1752	3549	0
Flt Permitted	0.163			0.174			0.122			0.114		
Satd. Flow (perm)	310	1818	0	321	1754	0	232	3504	0	210	3549	0
Satd. Flow (RTOR)		15			27			20			14	
Lane Group Flow (vph)	96	388	0	183	533	0	63	992	0	109	1247	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	17.0	28.0		17.0	28.0		17.0	38.0		17.0	38.0	
Total Lost Time (s)	4.5	5.0		4.5	5.0		4.5	4.8		4.5	4.8	
Act Effct Green (s)	36.1	23.6		37.0	26.8		46.0	33.7		46.9	37.0	
Actuated g/C Ratio	0.36	0.24		0.37	0.27		0.46	0.34		0.47	0.37	
v/c Ratio	0.33	0.88		0.64	1.09		0.21	0.83		0.39	0.94	
Control Delay	22.2	58.5		31.0	103.2		9.3	29.1		23.4	41.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.1		0.0	2.1	
Total Delay	22.2	58.5		31.0	103.2		9.3	29.2		23.4	44.0	
LOS	C	E		C	F		A	C		C	D	
Approach Delay		51.3			84.7			28.0			42.3	
Approach LOS		D			F			C			D	
Queue Length 50th (ft)	38	233		76	~411		9	307		24	~456	
Queue Length 95th (ft)	65	#351		129	#546		m14	m362		75	#570	
Internal Link Dist (ft)		1014			884			1693			283	
Turn Bay Length (ft)	150			150			150			125		
Base Capacity (vph)	300	440		298	489		304	1194		292	1322	
Starvation Cap Reductn	0	0		0	0		0	0		0	29	
Spillback Cap Reductn	0	0		0	0		0	7		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.32	0.88		0.61	1.09		0.21	0.84		0.37	0.96	

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 58 (58%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.09
 Intersection Signal Delay: 47.8
 Intersection Capacity Utilization 91.7%
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Intersection LOS: D
 ICU Level of Service F

Splits and Phases: 23: SR 136/S. Jefferson Ave & E. Veterans Dr

 Ø1	 Ø2 (R)	 Ø3	 Ø4
17 s	38 s	17 s	28 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
17 s	38 s	17 s	28 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	10	190	15	130	10	850	145	140	1090	15
Future Volume (vph)	0	0	10	190	15	130	10	850	145	140	1090	15
Satd. Flow (prot)	1900	1615	0	1805	1649	0	1805	3486	0	1787	3504	0
Flt Permitted				0.453			0.211			0.156		
Satd. Flow (perm)	1900	1615	0	861	1649	0	401	3486	0	293	3504	0
Satd. Flow (RTOR)		330			135			21			3	
Lane Group Flow (vph)	0	32	0	226	153	0	10	1016	0	156	1142	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	16.0	21.0		24.0	29.0		17.0	38.0		17.0	38.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		12.0		25.8	25.8		60.1	48.1		64.9	61.9	
Actuated g/C Ratio		0.12		0.26	0.26		0.60	0.48		0.65	0.62	
v/c Ratio		0.07		0.61	0.29		0.02	0.60		0.41	0.53	
Control Delay		0.3		36.7	6.9		18.0	30.3		12.2	15.5	
Queue Delay		0.0		0.0	0.0		0.0	0.1		0.0	0.2	
Total Delay		0.3		36.7	6.9		18.0	30.4		12.2	15.7	
LOS		A		D	A		B	C		B	B	
Approach Delay		0.3			24.7			30.3			15.3	
Approach LOS		A			C			C			B	
Queue Length 50th (ft)		0		112	8		4	262		41	215	
Queue Length 95th (ft)		0		153	40		m6	m320		79	432	
Internal Link Dist (ft)		175			382			47			1774	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		542		426	591		418	1688		384	2170	
Starvation Cap Reductn		0		0	0		0	61		0	0	
Spillback Cap Reductn		28		0	0		0	0		0	308	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.06		0.53	0.26		0.02	0.62		0.41	0.61	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 46 (46%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 22.0

Intersection LOS: C

Intersection Capacity Utilization 69.1%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 24: SR 136/S. Jefferson Ave & Walmart Driveway

 Ø1	 Ø2 (R)	 Ø3	 Ø4
17 s	38 s	24 s	21 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
17 s	38 s	16 s	29 s

Lanes, Volumes, Timings
25: SR 136/S. Jefferson Ave & Commerce Ave

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	15	75	100	10	55	55	1055	25	30	1180	30
Future Volume (vph)	100	15	75	100	10	55	55	1055	25	30	1180	30
Satd. Flow (prot)	1805	1670	0	1752	1618	0	1805	3592	0	1719	3596	0
Flt Permitted	0.478			0.678			0.099			0.159		
Satd. Flow (perm)	908	1670	0	1251	1618	0	188	3592	0	288	3596	0
Satd. Flow (RTOR)		99			87			4			3	
Lane Group Flow (vph)	149	123	0	217	103	0	73	1123	0	48	1390	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	15.0	29.0		15.0	29.0		11.0	45.0		11.0	45.0	
Total Lost Time (s)	4.5	5.3		4.5	5.3		4.5	4.8		4.5	4.8	
Act Effct Green (s)	19.9	7.7		17.3	7.9		44.4	40.5		43.4	38.3	
Actuated g/C Ratio	0.25	0.10		0.22	0.10		0.56	0.51		0.55	0.48	
v/c Ratio	0.40	0.49		0.64	0.43		0.31	0.61		0.18	0.80	
Control Delay	26.9	18.9		34.9	17.5		10.8	16.8		8.6	22.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	26.9	18.9		34.9	17.5		10.8	16.8		8.6	22.7	
LOS	C	B		C	B		B	B		A	C	
Approach Delay		23.3			29.3			16.5			22.3	
Approach LOS		C			C			B			C	
Queue Length 50th (ft)	62	12		94	8		14	218		9	304	
Queue Length 95th (ft)	79	26		72	23		27	317		17	412	
Internal Link Dist (ft)		193			738			1774			1034	
Turn Bay Length (ft)				100			125			125		
Base Capacity (vph)	380	576		344	551		239	1948		276	1853	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.39	0.21		0.63	0.19		0.31	0.58		0.17	0.75	

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 79.6
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 20.9
Intersection Capacity Utilization 62.9%
Analysis Period (min) 15

Intersection LOS: C
ICU Level of Service B

Splits and Phases: 25: SR 136/S. Jefferson Ave & Commerce Ave

 Ø1	 Ø2	 Ø3	 Ø4
11 s	45 s	15 s	29 s
 Ø5	 Ø6	 Ø7	 Ø8
11 s	45 s	15 s	29 s

Lanes, Volumes, Timings
26: SR 136/S. Jefferson Ave & E. Jackson St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	225	340	365	195	20	435	570	215	30	700	65
Future Volume (vph)	85	225	340	365	195	20	435	570	215	30	700	65
Satd. Flow (prot)	1787	1863	1599	3502	1855	0	1805	3610	1599	1685	3329	0
Flt Permitted	0.582			0.950			0.129			0.400		
Satd. Flow (perm)	1095	1863	1599	3502	1855	0	245	3610	1599	709	3329	0
Satd. Flow (RTOR)			391		5				276		9	
Lane Group Flow (vph)	105	239	391	401	265	0	494	663	276	43	866	0
Turn Type	pm+pt	NA	Perm	Prot	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8				2		2	6		
Total Split (s)	12.0	23.0	23.0	18.0	29.0		29.0	45.0	45.0	14.0	30.0	
Total Lost Time (s)	4.5	5.4	5.4	4.5	5.4		4.5	5.3	5.3	4.5	5.3	
Act Effct Green (s)	24.3	16.1	16.1	13.3	24.4		54.2	46.5	46.5	32.3	24.7	
Actuated g/C Ratio	0.25	0.16	0.16	0.14	0.25		0.55	0.47	0.47	0.33	0.25	
v/c Ratio	0.33	0.78	0.66	0.85	0.57		0.95	0.39	0.31	0.14	1.02	
Control Delay	25.2	58.0	10.0	59.5	38.2		56.2	18.9	3.3	14.3	74.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	25.2	58.0	10.0	59.5	38.2		56.2	18.9	3.3	14.3	74.1	
LOS	C	E	A	E	D		E	B	A	B	E	
Approach Delay		27.7			51.0			28.8			71.3	
Approach LOS		C			D			C			E	
Queue Length 50th (ft)	45	146	0	130	148		258	152	0	12	~315	
Queue Length 95th (ft)	74	#252	69	#208	207		#444	195	26	22	#423	
Internal Link Dist (ft)		578			301			1034			1031	
Turn Bay Length (ft)	100			175			150		500	180		
Base Capacity (vph)	326	334	608	482	470		525	1712	903	348	847	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.32	0.72	0.64	0.83	0.56		0.94	0.39	0.31	0.12	1.02	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 98

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 42.8

Intersection Capacity Utilization 84.2%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service E

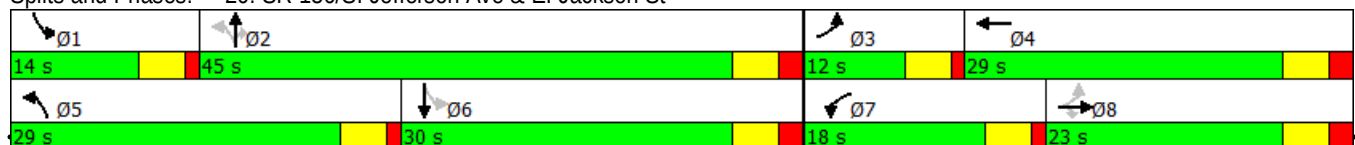
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 26: SR 136/S. Jefferson Ave & E. Jackson St



PM Peak HR
WSP

Synchro 9 Report
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Lanes, Volumes, Timings
27: SR 136/S. Jefferson Ave & Foutch Dr

Cookeville 2040 No-Build Conditions

06/20/2017

							
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations							
Traffic Volume (vph)	150	30	15	645	720	0	
Future Volume (vph)	150	30	15	645	720	0	
Satd. Flow (prot)	1782	0	1452	3369	3369	0	
Flt Permitted	0.961		0.312				
Satd. Flow (perm)	1782	0	477	3369	3369	0	
Satd. Flow (RTOR)	10						
Lane Group Flow (vph)	234	0	18	686	791	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	3			1	1 2		2
Permitted Phases			1				
Total Split (s)	28.0		42.0	42.0			30.0
Total Lost Time (s)	5.6		5.0	5.0			
Act Effct Green (s)	19.9		37.3	37.3	63.7		
Actuated g/C Ratio	0.21		0.40	0.40	0.68		
v/c Ratio	0.61		0.10	0.52	0.35		
Control Delay	40.3		22.4	24.6	0.6		
Queue Delay	0.0		0.0	0.0	0.3		
Total Delay	40.3		22.4	24.6	0.9		
LOS	D		C	C	A		
Approach Delay	40.3			24.5	0.9		
Approach LOS	D			C	A		
Queue Length 50th (ft)	128		7	179	3		
Queue Length 95th (ft)	173		22	237	4		
Internal Link Dist (ft)	70			1031	110		
Turn Bay Length (ft)			125				
Base Capacity (vph)	433		188	1331	2412		
Starvation Cap Reductn	0		0	0	870		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.54		0.10	0.52	0.51		

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 94.3
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.65
 Intersection Signal Delay: 15.8
 Intersection Capacity Utilization 38.9%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 27: SR 136/S. Jefferson Ave & Foutch Dr

#27 #28  Ø1	#27 #28  Ø2	#27 #28  Ø3
42 s	30 s	28 s

Lanes, Volumes, Timings
28: SR 136/S. Jefferson Ave & E. Stevens St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	140	50	35	120	30	30	680	80	10	690	15
Future Volume (vph)	15	140	50	35	120	30	30	680	80	10	690	15
Satd. Flow (prot)	0	1822	0	0	1840	0	0	3295	0	0	3356	0
Flt Permitted		0.947			0.871			0.900			0.928	
Satd. Flow (perm)	0	1735	0	0	1615	0	0	2971	0	0	3117	0
Satd. Flow (RTOR)		17			10			28			3	
Lane Group Flow (vph)	0	236	0	0	235	0	0	895	0	0	801	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		2			2		3	1 3			1	
Permitted Phases	2			2			1 3			1		
Total Split (s)	30.0	30.0		30.0	30.0		28.0			42.0	42.0	
Total Lost Time (s)		5.3			5.3						5.0	
Act Effct Green (s)		21.1			21.1			57.8			37.3	
Actuated g/C Ratio		0.22			0.22			0.61			0.40	
v/c Ratio		0.59			0.64			0.47			0.65	
Control Delay		36.9			40.4			2.9			27.4	
Queue Delay		0.0			0.0			0.1			0.0	
Total Delay		36.9			40.4			3.0			27.4	
LOS		D			D			A			C	
Approach Delay		36.9			40.4			3.0			27.4	
Approach LOS		D			D			A			C	
Queue Length 50th (ft)		121			126			16			223	
Queue Length 95th (ft)		199			172			20			293	
Internal Link Dist (ft)		321			386			1			1911	
Turn Bay Length (ft)												
Base Capacity (vph)		470			433			1971			1234	
Starvation Cap Reductn		0			0			147			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.50			0.54			0.49			0.65	

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 94.3
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 19.7
Intersection Capacity Utilization 71.2%
Analysis Period (min) 15

Intersection LOS: B
ICU Level of Service C

Splits and Phases: 28: SR 136/S. Jefferson Ave & E. Stevens St

#27 #28  Ø1	#27 #28  Ø2	#27 #28  Ø3
42 s	30 s	28 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	510	160	120	430	15	175	280	160	25	310	45
Future Volume (vph)	30	510	160	120	430	15	175	280	160	25	310	45
Satd. Flow (prot)	1805	1804	0	1752	1669	0	1668	1662	0	1685	1551	0
Flt Permitted	0.278			0.105			0.148			0.168		
Satd. Flow (perm)	528	1804	0	194	1669	0	260	1662	0	298	1551	0
Satd. Flow (RTOR)		18			2			35			7	
Lane Group Flow (vph)	30	781	0	150	491	0	199	506	0	35	429	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	40.0		15.0	40.0		15.0	30.0		15.0	30.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	45.8	35.8		48.0	41.8		38.1	31.8		35.6	25.6	
Actuated g/C Ratio	0.46	0.36		0.48	0.42		0.38	0.32		0.36	0.26	
v/c Ratio	0.08	1.19		0.60	0.70		0.81	0.92		0.14	1.07	
Control Delay	11.4	124.5		40.1	20.2		48.6	56.4		24.5	100.8	
Queue Delay	0.0	1.6		0.0	1.3		0.2	18.0		0.0	12.2	
Total Delay	11.4	126.2		40.1	21.5		48.8	74.5		24.5	113.0	
LOS	B	F		D	C		D	E		C	F	
Approach Delay		121.9			25.8			67.2			106.3	
Approach LOS		F			C			E			F	
Queue Length 50th (ft)	6	~602		63	107		84	~353		13	~283	
Queue Length 95th (ft)	m14	#755		m106	m#305		#189	#556		34	#449	
Internal Link Dist (ft)		356			188			1911			200	
Turn Bay Length (ft)	200			65						65		
Base Capacity (vph)	378	657		256	698		246	552		252	401	
Starvation Cap Reductn	0	12		0	45		0	0		0	41	
Spillback Cap Reductn	0	132		0	76		1	55		9	11	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.08	1.49		0.59	0.79		0.81	1.02		0.14	1.19	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.19

Intersection Signal Delay: 81.0

Intersection LOS: F

Intersection Capacity Utilization 92.7%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
15 s	40 s	15 s	30 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
15 s	40 s	15 s	30 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	305	70	130	340	25	65	185	75	30	155	30
Future Volume (vph)	15	305	70	130	340	25	65	185	75	30	155	30
Satd. Flow (prot)	1805	1827	0	1805	1865	0	1668	1694	0	1685	1736	0
Flt Permitted	0.452			0.317			0.391			0.359		
Satd. Flow (perm)	859	1827	0	602	1865	0	687	1694	0	637	1736	0
Satd. Flow (RTOR)		14			3			19			8	
Lane Group Flow (vph)	24	431	0	163	430	0	80	286	0	38	217	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	40.0		15.0	40.0		15.0	30.0		15.0	30.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	54.6	44.6		58.1	53.7		28.9	22.8		27.8	19.8	
Actuated g/C Ratio	0.55	0.45		0.58	0.54		0.29	0.23		0.28	0.20	
v/c Ratio	0.04	0.52		0.34	0.43		0.27	0.71		0.14	0.62	
Control Delay	5.4	16.5		8.7	13.6		11.6	25.7		21.1	42.5	
Queue Delay	0.0	1.4		0.6	1.8		0.0	11.0		0.5	0.4	
Total Delay	5.4	18.0		9.3	15.5		11.6	36.6		21.6	42.8	
LOS	A	B		A	B		B	D		C	D	
Approach Delay		17.3			13.8			31.2			39.7	
Approach LOS		B			B			C			D	
Queue Length 50th (ft)	2	212		24	68		16	56		16	121	
Queue Length 95th (ft)	5	318		m44	326		m11	m198		30	168	
Internal Link Dist (ft)		353			196			200			580	
Turn Bay Length (ft)	200			65			65			50		
Base Capacity (vph)	572	822		478	1003		302	460		289	448	
Starvation Cap Reductn	0	137		83	402		0	70		0	0	
Spillback Cap Reductn	0	215		116	0		0	145		103	40	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.04	0.71		0.45	0.72		0.26	0.91		0.20	0.53	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 20 (20%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 22.5

Intersection LOS: C

Intersection Capacity Utilization 66.3%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
15 s	40 s	15 s	30 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
15 s	40 s	15 s	30 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	500	55	100	430	55	45	315	310	105	315	65
Future Volume (vph)	160	500	55	100	430	55	45	315	310	105	315	65
Satd. Flow (prot)	1787	1840	0	1752	1863	1615	1745	1783	1546	1728	1784	0
Flt Permitted	0.270			0.114			0.164			0.234		
Satd. Flow (perm)	508	1840	0	210	1863	1615	301	1783	1546	426	1784	0
Satd. Flow (RTOR)		6				115			367		11	
Lane Group Flow (vph)	176	600	0	123	453	75	71	346	413	133	438	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2		2	4		4	8		
Total Split (s)	15.0	40.0		15.0	40.0	40.0	15.0	30.0	30.0	15.0	30.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Act Effct Green (s)	47.9	37.6		47.7	37.5	37.5	34.0	23.9	23.9	35.3	27.0	
Actuated g/C Ratio	0.48	0.38		0.48	0.38	0.38	0.34	0.24	0.24	0.35	0.27	
v/c Ratio	0.47	0.86		0.48	0.65	0.11	0.29	0.81	0.64	0.47	0.90	
Control Delay	12.8	24.5		21.0	31.9	1.9	21.9	51.6	10.3	27.7	42.7	
Queue Delay	0.6	50.0		0.0	0.7	0.1	0.0	17.1	0.0	0.0	12.8	
Total Delay	13.4	74.6		21.0	32.7	1.9	21.9	68.8	10.3	27.7	55.5	
LOS	B	E		C	C	A	C	E	B	C	E	
Approach Delay		60.7			26.9			35.7			49.0	
Approach LOS		E			C			D			D	
Queue Length 50th (ft)	45	202		40	243	0	28	204	23	19	274	
Queue Length 95th (ft)	m43	m166		64	357	1	38	#333	48	76	#213	
Internal Link Dist (ft)		188			1101			264			195	
Turn Bay Length (ft)	60			100		100	100			50		
Base Capacity (vph)	378	695		262	698	677	255	456	668	287	489	
Starvation Cap Reductn	0	186		0	0	0	0	0	0	0	46	
Spillback Cap Reductn	45	0		0	68	157	0	101	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.53	1.18		0.47	0.72	0.14	0.28	0.97	0.62	0.46	0.99	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow, Master Intersection

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 43.2

Intersection LOS: D

Intersection Capacity Utilization 81.8%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
15 s	40 s	15 s	30 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
15 s	40 s	15 s	30 s

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	275	40	30	280	125	25	440	45	115	415	205
Future Volume (vph)	85	275	40	30	280	125	25	440	45	115	415	205
Satd. Flow (prot)	1787	1844	0	1805	1799	0	1745	1789	0	1745	1818	1546
Flt Permitted	0.124			0.365			0.331			0.106		
Satd. Flow (perm)	233	1844	0	694	1799	0	608	1789	0	195	1818	1546
Satd. Flow (RTOR)		9			28			5				241
Lane Group Flow (vph)	96	356	0	43	506	0	25	556	0	155	477	241
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		8
Total Split (s)	15.0	40.0		15.0	40.0		15.0	30.0		15.0	30.0	30.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effct Green (s)	42.9	36.8		41.8	33.8		40.7	30.7		43.9	39.7	39.7
Actuated g/C Ratio	0.43	0.37		0.42	0.34		0.41	0.31		0.44	0.40	0.40
v/c Ratio	0.38	0.52		0.11	0.81		0.07	1.01		0.63	0.66	0.32
Control Delay	25.5	27.6		14.0	39.8		16.6	64.5		33.9	34.5	5.2
Queue Delay	0.0	1.8		0.0	7.7		0.0	9.7		0.0	3.5	0.0
Total Delay	25.5	29.4		14.0	47.6		16.6	74.2		33.9	38.0	5.2
LOS	C	C		B	D		B	E		C	D	A
Approach Delay		28.6			44.9			71.8			28.2	
Approach LOS		C			D			E			C	
Queue Length 50th (ft)	24	94		14	279		6	~389		60	229	0
Queue Length 95th (ft)	m84	262		24	351		m14	#599		95	#489	47
Internal Link Dist (ft)		196			1084			195			349	
Turn Bay Length (ft)	60			100			65			100		
Base Capacity (vph)	263	693		409	658		369	551		249	721	759
Starvation Cap Reductn	0	194		0	0		0	17		0	0	0
Spillback Cap Reductn	0	0		0	116		0	0		0	158	15
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.37	0.71		0.11	0.93		0.07	1.04		0.62	0.85	0.32

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 42.3

Intersection LOS: D

Intersection Capacity Utilization 79.9%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
15 s	40 s	15 s	30 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
15 s	40 s	15 s	30 s

Lanes, Volumes, Timings
33: SR 136/N. Washington Ave & E. 1st St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	35	140	15	20	15	60	585	15	10	635	85
Future Volume (vph)	235	35	140	15	20	15	60	585	15	10	635	85
Satd. Flow (prot)	0	1764	0	0	1791	0	1711	1793	0	1745	3384	0
Flt Permitted		0.971			0.991		0.180			0.114		
Satd. Flow (perm)	0	1764	0	0	1791	0	324	1793	0	209	3384	0
Satd. Flow (RTOR)		24			22			2			23	
Lane Group Flow (vph)	0	501	0	0	82	0	77	755	0	10	834	0
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	31.0	31.0		11.0	11.0		13.0	45.0		13.0	45.0	
Total Lost Time (s)		4.8			4.8		4.5	4.6		4.5	4.6	
Act Effct Green (s)		26.4			6.2		43.0	41.4		37.6	31.4	
Actuated g/C Ratio		0.30			0.07		0.49	0.47		0.43	0.36	
v/c Ratio		0.92			0.56		0.28	0.89		0.05	0.68	
Control Delay		53.7			48.1		15.0	37.5		12.4	27.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		53.7			48.1		15.0	37.5		12.4	27.1	
LOS		D			D		B	D		B	C	
Approach Delay		53.7			48.1			35.4			26.9	
Approach LOS		D			D			D			C	
Queue Length 50th (ft)		252			32		23	367		3	206	
Queue Length 95th (ft)		#513			44		39	#592		11	270	
Internal Link Dist (ft)		234			474			256			166	
Turn Bay Length (ft)										50		
Base Capacity (vph)		547			148		294	847		245	1580	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.92			0.55		0.26	0.89		0.04	0.53	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 87.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 36.7

Intersection Capacity Utilization 78.4%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service D

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 33: SR 136/N. Washington Ave & E. 1st St

 Ø1	 Ø2	 Ø3	 Ø4
13 s	45 s	31 s	11 s
 Ø5	 Ø6		
13 s	45 s		

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	310	40	230	215	355	50	620	340	320	415	60
Future Volume (vph)	150	310	40	230	215	355	50	620	340	320	415	60
Satd. Flow (prot)	1805	3534	0	3467	1900	1615	1719	3505	1615	1752	3517	0
Flt Permitted	0.950			0.950			0.431			0.160		
Satd. Flow (perm)	1805	3534	0	3467	1900	1615	780	3505	1615	295	3517	0
Satd. Flow (RTOR)		16				323			395		17	
Lane Group Flow (vph)	167	386	0	267	234	394	60	721	395	340	586	0
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases						4	2		2	6		
Total Split (s)	17.0	17.0		24.0	24.0	24.0	12.0	29.0	29.0	20.0	37.0	
Total Lost Time (s)	5.2	5.2		5.3	5.3	5.3	4.5	5.2	5.2	4.5	5.2	
Act Effct Green (s)	11.5	11.5		16.0	16.0	16.0	29.8	22.2	22.2	42.3	32.7	
Actuated g/C Ratio	0.14	0.14		0.19	0.19	0.19	0.35	0.26	0.26	0.50	0.39	
v/c Ratio	0.68	0.78		0.41	0.66	0.70	0.17	0.79	0.55	0.85	0.43	
Control Delay	52.5	47.8		32.7	41.9	14.4	14.1	36.8	6.3	39.7	21.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	52.5	47.8		32.7	41.9	14.4	14.1	36.8	6.3	39.7	21.3	
LOS	D	D		C	D	B	B	D	A	D	C	
Approach Delay		49.2			27.0			25.4			28.1	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	92	109		67	121	34	17	200	0	127	128	
Queue Length 95th (ft)	#182	#180		98	197	128	35	251	56	#278	153	
Internal Link Dist (ft)		135			2500			631			700	
Turn Bay Length (ft)	100			215		215	100			100		
Base Capacity (vph)	253	510		772	422	610	364	993	740	415	1365	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.66	0.76		0.35	0.55	0.65	0.16	0.73	0.53	0.82	0.43	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 84.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 30.2

Intersection Capacity Utilization 71.3%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 34: SR 136/N. Washington Ave & E. 10th St/E.10th St

			
20 s	29 s	17 s	24 s
			
12 s	37 s		

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

35: US 70/E. Spring St & I-40 EB Off-Ramps/I-40 EB On-Ramp

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	0	285	0	0	0	0	385	25	240	500	0
Future Volume (vph)	100	0	285	0	0	0	0	385	25	240	500	0
Satd. Flow (prot)	0	1656	1615	0	0	0	0	3423	0	1711	3490	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1656	1615	0	0	0	0	3423	0	1711	3490	0
Lane Group Flow (vph)	0	116	331	0	0	0	0	481	0	276	556	0
Sign Control		Stop			Free			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 40.3%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
 36: US 70/E. Spring St & I-40 WB Off-Ramp

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	40	180	335	0	0	795
Future Volume (vph)	40	180	335	0	0	795
Satd. Flow (prot)	1687	1568	3323	0	0	3455
Flt Permitted	0.950					
Satd. Flow (perm)	1687	1568	3323	0	0	3455
Lane Group Flow (vph)	58	228	399	0	0	846
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 32.0%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	900	810	0	0	550	115	260	0	75	0	0	0
Future Volume (vph)	900	810	0	0	550	115	260	0	75	0	0	0
Satd. Flow (prot)	1770	3574	0	0	3434	0	0	1736	1583	0	0	0
Flt Permitted	0.233							0.950				
Satd. Flow (perm)	434	3574	0	0	3434	0	0	1736	1583	0	0	0
Satd. Flow (RTOR)					26			97				
Lane Group Flow (vph)	1047	920	0	0	714	0	0	356	125	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA	Perm			
Protected Phases	1	6			2			3				
Permitted Phases	6						3		3			
Total Split (s)	26.0	45.0			19.0		45.0	45.0	45.0			
Total Lost Time (s)	4.5	6.5			6.5			5.9	5.9			
Act Effct Green (s)	40.8	38.8			12.6			19.9	19.9			
Actuated g/C Ratio	0.57	0.55			0.18			0.28	0.28			
v/c Ratio	1.60	0.47			1.14			0.74	0.24			
Control Delay	296.0	11.9			109.4			32.6	7.6			
Queue Delay	0.0	0.0			0.0			0.0	0.0			
Total Delay	296.0	11.9			109.4			32.6	7.6			
LOS	F	B			F			C	A			
Approach Delay		163.2			109.4			26.1				
Approach LOS		F			F			C				
Queue Length 50th (ft)	~612	115			~187			140	9			
Queue Length 95th (ft)	#938	210			#351			48	17			
Internal Link Dist (ft)		490			552			852			886	
Turn Bay Length (ft)	100								250			
Base Capacity (vph)	655	1948			629			961	919			
Starvation Cap Reductn	0	0			0			0	0			
Spillback Cap Reductn	0	0			0			0	0			
Storage Cap Reductn	0	0			0			0	0			
Reduced v/c Ratio	1.60	0.47			1.14			0.37	0.14			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 71.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.60

Intersection Signal Delay: 130.2

Intersection Capacity Utilization 97.2%

Analysis Period (min) 15

Intersection LOS: F

ICU Level of Service F

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

		
Ø1	Ø2	Ø3
26 s	19 s	45 s
		
Ø6		
45 s		

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

38: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & US 70/E. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	0	1665	350	70	740	0	0	0	0	45	0	380
Future Volume (vph)	0	1665	350	70	740	0	0	0	0	45	0	380
Satd. Flow (prot)	0	3449	0	1703	3539	0	0	0	0	0	1703	1599
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	3449	0	1703	3539	0	0	0	0	0	1703	1599
Lane Group Flow (vph)	0	2363	0	93	851	0	0	0	0	0	48	437
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 97.2%

ICU Level of Service F

Analysis Period (min) 15

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

39: Neal St/S. Old Kentucky Rd & US 70/E. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	1095	120	365	600	90	190	420	725	145	270	65
Future Volume (vph)	145	1095	120	365	600	90	190	420	725	145	270	65
Satd. Flow (prot)	1787	3498	0	1787	1845	1599	1805	1900	1615	1752	1817	0
Flt Permitted	0.157			0.136			0.244			0.158		
Satd. Flow (perm)	295	3498	0	256	1845	1599	464	1900	1615	291	1817	0
Satd. Flow (RTOR)		18				142			220		12	
Lane Group Flow (vph)	165	1423	0	392	690	102	284	512	884	158	398	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6		6	8		8	4		
Total Split (s)	11.0	31.0		15.0	35.0	35.0	13.0	33.0	33.0	11.0	31.0	
Total Lost Time (s)	4.5	5.6		4.5	5.6	5.6	4.5	5.7	5.7	4.5	5.7	
Act Effct Green (s)	33.0	25.4		41.0	29.4	29.4	37.0	27.3	27.3	33.0	25.3	
Actuated g/C Ratio	0.37	0.28		0.46	0.33	0.33	0.41	0.30	0.30	0.37	0.28	
v/c Ratio	0.77	1.42		1.33	1.15	0.17	0.90	0.89	1.37	0.75	0.77	
Control Delay	41.3	224.4		192.3	114.4	2.3	51.6	49.7	201.2	40.3	40.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	41.3	224.4		192.3	114.4	2.3	51.6	49.7	201.2	40.3	40.2	
LOS	D	F		F	F	A	D	D	F	D	D	
Approach Delay		205.4			130.5			129.7			40.2	
Approach LOS		F			F			F			D	
Queue Length 50th (ft)	54	~582		~241	~464	0	104	276	~583	54	201	
Queue Length 95th (ft)	#130	#694		#419	#641	16	115	#388	#698	#129	276	
Internal Link Dist (ft)		1084			512			1234			867	
Turn Bay Length (ft)	80					100	130			100		
Base Capacity (vph)	215	1000		295	602	617	317	576	643	212	519	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.77	1.42		1.33	1.15	0.17	0.90	0.89	1.37	0.75	0.77	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.42

Intersection Signal Delay: 144.0

Intersection Capacity Utilization 101.4%

Analysis Period (min) 15

Intersection LOS: F

ICU Level of Service G

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 39: Neal St/S. Old Kentucky Rd & US 70/E. Spring St

			
15 s	31 s	13 s	31 s
			
11 s	35 s	11 s	33 s

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
 40: US 70/E. Spring St & E. Broad St

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1060	440	440	140	10
Future Volume (vph)	0	1060	440	440	140	10
Satd. Flow (prot)	0	1881	1739	0	1796	0
Flt Permitted					0.956	
Satd. Flow (perm)	0	1881	1739	0	1796	0
Lane Group Flow (vph)	0	1233	936	0	198	0
Sign Control		Free	Free		Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 70.8%

ICU Level of Service C

Analysis Period (min) 15

Lanes, Volumes, Timings
41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	195	800	40	30	410	25	35	225	30	225	190	65
Future Volume (vph)	195	800	40	30	410	25	35	225	30	225	190	65
Satd. Flow (prot)	1805	1867	0	1703	1845	0	1805	1858	0	1805	1823	0
Flt Permitted	0.246			0.111			0.586			0.171		
Satd. Flow (perm)	467	1867	0	199	1845	0	1113	1858	0	325	1823	0
Satd. Flow (RTOR)		3			5			8			15	
Lane Group Flow (vph)	217	1015	0	54	456	0	45	322	0	292	284	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	16.0	45.0		16.0	45.0		11.0	22.0		17.0	28.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	49.3	40.6		42.2	35.0		23.9	17.5		34.6	28.2	
Actuated g/C Ratio	0.53	0.43		0.45	0.37		0.26	0.19		0.37	0.30	
v/c Ratio	0.55	1.25		0.26	0.66		0.14	0.91		0.92	0.51	
Control Delay	17.0	150.0		14.0	29.4		22.1	68.2		60.3	32.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		33.7	5.4	
Total Delay	17.0	150.0		14.0	29.4		22.1	68.2		94.0	37.4	
LOS	B	F		B	C		C	E		F	D	
Approach Delay		126.5			27.8			62.6			66.1	
Approach LOS		F			C			E			E	
Queue Length 50th (ft)	64	~794		15	222		18	190		134	146	
Queue Length 95th (ft)	105	#934		20	330		36	#310		#216	230	
Internal Link Dist (ft)		1101			737			412			149	
Turn Bay Length (ft)	75			80			70			50		
Base Capacity (vph)	411	811		284	803		334	354		318	559	
Starvation Cap Reductn	0	0		0	0		0	0		43	211	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.53	1.25		0.19	0.57		0.13	0.91		1.06	0.82	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 93.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.25

Intersection Signal Delay: 86.1

Intersection Capacity Utilization 90.7%

Analysis Period (min) 15

Intersection LOS: F

ICU Level of Service E

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St

 Ø1	 Ø2	 Ø3	 Ø4
16 s	45 s	17 s	22 s
 Ø5	 Ø6	 Ø7	 Ø8
16 s	45 s	11 s	28 s

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	535	45	15	615	100	65	100	20	95	140	40
Future Volume (vph)	30	535	45	15	615	100	65	100	20	95	140	40
Satd. Flow (prot)	1805	1849	0	1805	1841	0	1805	1854	0	1787	1812	0
Flt Permitted	0.111			0.222			0.499			0.442		
Satd. Flow (perm)	211	1849	0	422	1841	0	948	1854	0	831	1812	0
Satd. Flow (RTOR)		6			10			9			13	
Lane Group Flow (vph)	36	667	0	18	770	0	68	166	0	136	202	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	40.0		15.0	40.0		15.0	30.0		15.0	30.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	58.4	54.4		57.5	51.5		26.1	16.0		27.4	19.1	
Actuated g/C Ratio	0.58	0.54		0.58	0.52		0.26	0.16		0.27	0.19	
v/c Ratio	0.13	0.66		0.05	0.81		0.20	0.55		0.42	0.57	
Control Delay	10.5	23.4		11.4	25.5		25.2	42.7		20.8	27.5	
Queue Delay	0.0	52.6		0.0	0.7		0.0	0.0		0.0	0.1	
Total Delay	10.5	76.0		11.4	26.2		25.2	42.7		20.8	27.6	
LOS	B	E		B	C		C	D		C	C	
Approach Delay		72.7			25.9			37.6			24.8	
Approach LOS		E			C			D			C	
Queue Length 50th (ft)	9	239		4	232		31	94		23	28	
Queue Length 95th (ft)	23	#602		m8	m#723		58	114		61	101	
Internal Link Dist (ft)		1308			356			107			209	
Turn Bay Length (ft)	100			60			50			60		
Base Capacity (vph)	290	1008		389	952		341	479		328	475	
Starvation Cap Reductn	0	0		0	37		0	0		0	18	
Spillback Cap Reductn	0	429		0	0		0	1		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.12	1.15		0.05	0.84		0.20	0.35		0.41	0.44	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 43.0

Intersection LOS: D

Intersection Capacity Utilization 68.0%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
15 s	40 s	15 s	30 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
15 s	40 s	15 s	30 s

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
43: S. Walnut Ave & US 70/W. Spring St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	555	85	70	660	40	85	245	40	50	360	60
Future Volume (vph)	60	555	85	70	660	40	85	245	40	50	360	60
Satd. Flow (prot)	1770	1844	0	1805	1858	0	1770	1841	0	1805	1852	0
Flt Permitted	0.098			0.098			0.142			0.344		
Satd. Flow (perm)	183	1844	0	186	1858	0	265	1841	0	654	1852	0
Satd. Flow (RTOR)		9			6			13			10	
Lane Group Flow (vph)	66	760	0	88	837	0	99	332	0	75	520	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	45.0		11.0	45.0		11.0	33.0		11.0	33.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.8		4.5	4.8	
Act Effct Green (s)	45.9	41.0		45.9	41.0		33.3	28.1		33.3	28.1	
Actuated g/C Ratio	0.48	0.43		0.48	0.43		0.35	0.30		0.35	0.30	
v/c Ratio	0.34	0.95		0.44	1.04		0.51	0.60		0.25	0.94	
Control Delay	17.3	51.2		19.9	73.1		29.1	34.5		21.4	61.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	17.3	51.2		19.9	73.1		29.1	34.5		21.4	61.2	
LOS	B	D		B	E		C	C		C	E	
Approach Delay		48.5			68.1			33.2			56.2	
Approach LOS		D			E			C			E	
Queue Length 50th (ft)	20	~484		27	~612		40	177		30	323	
Queue Length 95th (ft)	42	#654		47	#788		71	273		43	#469	
Internal Link Dist (ft)		1097			1308			83			571	
Turn Bay Length (ft)	75			75			65			150		
Base Capacity (vph)	198	799		201	803		196	560		308	562	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.33	0.95		0.44	1.04		0.51	0.59		0.24	0.93	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 95.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 54.3

Intersection Capacity Utilization 85.0%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service E

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 43: S. Walnut Ave & US 70/W. Spring St

			
Ø1	Ø2	Ø3	Ø4
11 s	45 s	11 s	33 s
			
Ø5	Ø6	Ø7	Ø8
11 s	45 s	11 s	33 s

PM Peak HR
WSP

Synchro 9 Report
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Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

44: Scott Ave & US 70/W. Spring St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	475	70	115	730	40	75	95	85	30	100	50
Future Volume (vph)	25	475	70	115	730	40	75	95	85	30	100	50
Satd. Flow (prot)	1805	1846	0	1805	1863	0	1805	1787	0	1656	1787	0
Flt Permitted	0.106			0.176			0.377			0.465		
Satd. Flow (perm)	201	1846	0	334	1863	0	716	1787	0	811	1787	0
Satd. Flow (RTOR)		9			3			27			20	
Lane Group Flow (vph)	33	608	0	153	931	0	99	252	0	36	202	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	45.0		15.0	45.0		15.0	25.0		15.0	25.0	
Total Lost Time (s)	4.5	4.8		4.5	4.8		4.5	4.8		4.5	4.8	
Act Effct Green (s)	42.4	35.4		48.6	43.0		23.8	18.2		19.9	14.2	
Actuated g/C Ratio	0.51	0.42		0.58	0.51		0.28	0.22		0.24	0.17	
v/c Ratio	0.14	0.77		0.44	0.97		0.31	0.62		0.14	0.63	
Control Delay	11.1	30.7		13.6	48.2		24.5	35.7		22.7	40.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.1	30.7		13.6	48.2		24.5	35.7		22.7	40.7	
LOS	B	C		B	D		C	D		C	D	
Approach Delay		29.7			43.3			32.6			37.9	
Approach LOS		C			D			C			D	
Queue Length 50th (ft)	7	279		36	~594		39	118		14	96	
Queue Length 95th (ft)	19	#520		62	#830		67	125		34	133	
Internal Link Dist (ft)		700			1097			288			469	
Turn Bay Length (ft)	75			75			40			75		
Base Capacity (vph)	321	928		387	960		351	493		332	464	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.10	0.66		0.40	0.97		0.28	0.51		0.11	0.44	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 83.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 37.4

Intersection LOS: D

Intersection Capacity Utilization 76.5%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 44: Scott Ave & US 70/W. Spring St

 Ø1	 Ø2	 Ø3	 Ø4
15 s	45 s	15 s	25 s
 Ø5	 Ø6	 Ø7	 Ø8
15 s	45 s	15 s	25 s

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
45: S, Maple Ave/N. Maple Ave & E. Broad St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	290	115	45	385	90	50	195	150	55	290	30
Future Volume (vph)	30	290	115	45	385	90	50	195	150	55	290	30
Satd. Flow (prot)	1805	1802	0	1805	1820	0	1805	1763	0	1805	1868	0
Flt Permitted	0.252			0.251			0.280			0.185		
Satd. Flow (perm)	479	1802	0	477	1820	0	532	1763	0	352	1868	0
Satd. Flow (RTOR)		24			15			47			6	
Lane Group Flow (vph)	38	524	0	49	551	0	79	443	0	66	375	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	11.0	45.0		11.0	45.0		11.0	33.0		11.0	33.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	45.8	40.9		46.7	43.0		33.8	28.8		33.8	28.8	
Actuated g/C Ratio	0.48	0.43		0.49	0.45		0.35	0.30		0.35	0.30	
v/c Ratio	0.12	0.67		0.15	0.67		0.29	0.79		0.30	0.66	
Control Delay	13.0	27.5		13.4	26.9		22.2	40.2		22.8	36.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	55.3		0.0	0.0	
Total Delay	13.0	27.5		13.4	26.9		22.2	95.6		22.8	36.9	
LOS	B	C		B	C		C	F		C	D	
Approach Delay		26.5			25.8			84.5			34.8	
Approach LOS		C			C			F			C	
Queue Length 50th (ft)	12	261		15	285		31	238		26	210	
Queue Length 95th (ft)	24	302		33	395		42	#357		49	300	
Internal Link Dist (ft)		1084			778			149			437	
Turn Bay Length (ft)	60			65			40			85		
Base Capacity (vph)	321	785		324	826		275	564		224	566	
Starvation Cap Reductn	0	0		0	0		0	232		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.12	0.67		0.15	0.67		0.29	1.33		0.29	0.66	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 95.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 42.2

Intersection LOS: D

Intersection Capacity Utilization 70.2%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 45: S, Maple Ave/N. Maple Ave & E. Broad St

			
Ø1	Ø2	Ø3	Ø4
11 s	45 s	11 s	33 s
			
Ø5	Ø6	Ø7	Ø8
11 s	45 s	11 s	33 s

Lanes, Volumes, Timings
46: S. Dixie Ave/N. Dixie Ave & E. Broad St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	335	30	30	310	60	30	150	35	65	205	30
Future Volume (vph)	30	335	30	30	310	60	30	150	35	65	205	30
Satd. Flow (prot)	1805	1845	0	1736	1837	0	1805	1841	0	1805	1862	0
Flt Permitted	0.376			0.413			0.294			0.398		
Satd. Flow (perm)	714	1845	0	755	1837	0	559	1841	0	756	1862	0
Satd. Flow (RTOR)		7			11			13			7	
Lane Group Flow (vph)	38	392	0	38	432	0	42	217	0	88	323	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	40.0		15.0	40.0		15.0	30.0		15.0	30.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	56.3	50.3		56.3	50.3		28.3	20.3		29.4	23.3	
Actuated g/C Ratio	0.56	0.50		0.56	0.50		0.28	0.20		0.29	0.23	
v/c Ratio	0.07	0.42		0.07	0.47		0.15	0.57		0.27	0.74	
Control Delay	12.0	21.6		21.6	30.9		18.8	35.5		23.4	45.2	
Queue Delay	0.0	0.0		0.0	0.1		0.0	0.7		0.0	0.0	
Total Delay	12.0	21.6		21.6	31.1		18.8	36.2		23.4	45.2	
LOS	B	C		C	C		B	D		C	D	
Approach Delay		20.7			30.3			33.4			40.6	
Approach LOS		C			C			C			D	
Queue Length 50th (ft)	11	183		12	174		18	115		37	191	
Queue Length 95th (ft)	24	294		37	317		m22	m107		54	210	
Internal Link Dist (ft)		1234			353			209			174	
Turn Bay Length (ft)	130			45			60			75		
Base Capacity (vph)	518	931		530	929		291	479		333	492	
Starvation Cap Reductn	0	0		0	74		0	84		0	0	
Spillback Cap Reductn	0	11		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.07	0.43		0.07	0.51		0.14	0.55		0.26	0.66	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 30.9

Intersection LOS: C

Intersection Capacity Utilization 57.1%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 46: S. Dixie Ave/N. Dixie Ave & E. Broad St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
15 s	40 s	15 s	30 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
15 s	40 s	15 s	30 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

47: S. Walnut Ave/N. Walnut Ave & E. Broad St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	230	40	65	200	70	40	225	60	85	355	20
Future Volume (vph)	15	230	40	65	200	70	40	225	60	85	355	20
Satd. Flow (prot)	0	1848	0	0	1868	1583	1805	1835	0	1770	1885	0
Flt Permitted		0.997			0.986		0.242			0.327		
Satd. Flow (perm)	0	1848	0	0	1868	1583	460	1835	0	609	1885	0
Satd. Flow (RTOR)		8				124		14			3	
Lane Group Flow (vph)	0	332	0	0	323	80	53	308	0	120	420	0
Turn Type	custom	NA		custom	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	1	1		2	2		7	4		3	8	
Permitted Phases	1			2		2	4			8		
Total Split (s)	28.0	28.0		31.0	31.0	31.0	11.0	29.0		12.0	30.0	
Total Lost Time (s)		4.5			4.5	4.5	4.5	5.4		4.5	5.4	
Act Effct Green (s)		20.1			20.7	20.7	26.6	20.9		28.9	24.0	
Actuated g/C Ratio		0.23			0.24	0.24	0.31	0.24		0.34	0.28	
v/c Ratio		0.76			0.72	0.17	0.21	0.67		0.39	0.79	
Control Delay		44.4			41.3	2.5	22.3	39.0		24.6	44.3	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		44.4			41.3	2.5	22.3	39.0		24.6	44.3	
LOS		D			D	A	C	D		C	D	
Approach Delay		44.4			33.6			36.6			39.9	
Approach LOS		D			C			D			D	
Queue Length 50th (ft)		180			180	0	20	158		46	237	
Queue Length 95th (ft)		#286			262	11	40	268		71	#429	
Internal Link Dist (ft)		512			1234			571			477	
Turn Bay Length (ft)							120			140		
Base Capacity (vph)		538			607	598	250	541		312	587	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.62			0.53	0.13	0.21	0.57		0.38	0.72	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 85.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 38.5

Intersection LOS: D

Intersection Capacity Utilization 70.1%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 47: S. Walnut Ave/N. Walnut Ave & E. Broad St

			
Ø1	Ø2	Ø3	Ø4
28 s	31 s	12 s	29 s
			
		Ø7	Ø8
		11 s	30 s

Lanes, Volumes, Timings
48: S. Cedar Ave & E. Broad St

Cookeville 2040 No-Build Conditions

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	55	10	30	40	205	10	85	30	230	160	60
Future Volume (vph)	55	55	10	30	40	205	10	85	30	230	160	60
Satd. Flow (prot)	0	1836	0	0	1717	0	0	1793	0	0	1794	0
Flt Permitted		0.974			0.994			0.997			0.976	
Satd. Flow (perm)	0	1836	0	0	1717	0	0	1793	0	0	1794	0
Lane Group Flow (vph)	0	160	0	0	342	0	0	145	0	0	492	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 57.0%

ICU Level of Service B

Analysis Period (min) 15

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	65	195	205	150	245	115
Future Volume (vph)	65	195	205	150	245	115
Satd. Flow (prot)	1787	1599	0	1837	1797	0
Flt Permitted	0.950			0.971		
Satd. Flow (perm)	1787	1599	0	1837	1797	0
Lane Group Flow (vph)	76	199	0	435	429	0
Sign Control	Stop			Stop	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 52.7%

ICU Level of Service A

Analysis Period (min) 15

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	10	245	470	15	145	325
Future Volume (vph)	10	245	470	15	145	325
Satd. Flow (prot)	1805	1615	1855	0	0	1834
Flt Permitted	0.950					0.985
Satd. Flow (perm)	1805	1615	1855	0	0	1834
Lane Group Flow (vph)	16	310	612	0	0	543
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 64.1%

ICU Level of Service C

Analysis Period (min) 15

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

51: W. Jackson St/Pippin Rd & US 70/W. Broad St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	225	180	15	365	120	385	445	40	75	165	10
Future Volume (vph)	10	225	180	15	365	120	385	445	40	75	165	10
Satd. Flow (prot)	1805	1863	1553	1805	1807	0	1805	1900	1615	0	1854	0
Flt Permitted	0.144			0.519			0.950				0.984	
Satd. Flow (perm)	274	1863	1553	986	1807	0	1805	1900	1615	0	1854	0
Satd. Flow (RTOR)			198		24				218		2	
Lane Group Flow (vph)	24	262	198	24	566	0	464	484	43	0	288	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Free	Split	NA	
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases	6		6	2					Free			
Total Split (s)	11.0	36.0	36.0	11.0	36.0		26.0	26.0		17.0	17.0	
Total Lost Time (s)	4.5	5.9	5.9	4.5	5.9		5.5	5.5			5.1	
Act Effct Green (s)	31.5	27.8	27.8	31.5	27.8		20.7	20.7	81.1		12.0	
Actuated g/C Ratio	0.39	0.34	0.34	0.39	0.34		0.26	0.26	1.00		0.15	
v/c Ratio	0.11	0.41	0.30	0.05	0.89		1.01	1.00	0.03		1.04	
Control Delay	14.3	23.5	4.7	13.6	43.7		78.0	74.8	0.0		104.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay	14.3	23.5	4.7	13.6	43.7		78.0	74.8	0.0		104.2	
LOS	B	C	A	B	D		E	E	A		F	
Approach Delay		15.4			42.5			73.1			104.2	
Approach LOS		B			D			E			F	
Queue Length 50th (ft)	7	91	0	7	234		228	237	0		~148	
Queue Length 95th (ft)	9	173	45	14	#498		#437	#509	0		#351	
Internal Link Dist (ft)		1551			2304			1891			664	
Turn Bay Length (ft)	100		100	100			350					
Base Capacity (vph)	230	698	705	449	692		460	484	1615		276	
Starvation Cap Reductn	0	0	0	0	0		0	0	0		0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0		0	
Storage Cap Reductn	0	0	0	0	0		0	0	0		0	
Reduced v/c Ratio	0.10	0.38	0.28	0.05	0.82		1.01	1.00	0.03		1.04	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 81.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 57.3

Intersection Capacity Utilization 77.1%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service D

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 51: W. Jackson St/Pippin Rd & US 70/W. Broad St

 Ø1	 Ø2	 Ø3	 Ø4
11 s	36 s	26 s	17 s
 Ø5	 Ø6		
11 s	36 s		

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
52: E.10th St & Brown Ave N

Cookeville 2040 No-Build Conditions

06/20/2017

								
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	25	1015	800	95	120	60		
Future Volume (vph)	25	1015	800	95	120	60		
Satd. Flow (prot)	1719	1900	1845	0	1722	0		
Flt Permitted	0.078				0.968			
Satd. Flow (perm)	141	1900	1845	0	1722	0		
Satd. Flow (RTOR)			11		24			
Lane Group Flow (vph)	35	1080	1005	0	240	0		
Turn Type	pm+pt	NA	NA		Prot			
Protected Phases	1	6	2 4		3		2	4
Permitted Phases	6							
Total Split (s)	11.0	60.0			19.3		49.0	10.7
Total Lost Time (s)	4.5	6.6			4.7			
Act Effct Green (s)	55.5	53.4	53.7		14.3			
Actuated g/C Ratio	0.62	0.60	0.60		0.16			
v/c Ratio	0.18	0.95	0.91		0.82			
Control Delay	8.8	36.6	13.2		55.9			
Queue Delay	0.0	6.7	0.0		0.0			
Total Delay	8.8	43.3	13.2		55.9			
LOS	A	D	B		E			
Approach Delay		42.2	13.2		55.9			
Approach LOS		D	B		E			
Queue Length 50th (ft)	7	533	~88		120			
Queue Length 95th (ft)	14	#856	m#80		#162			
Internal Link Dist (ft)		2500	23		665			
Turn Bay Length (ft)	100							
Base Capacity (vph)	201	1131	1108		300			
Starvation Cap Reductn	0	0	0		0			
Spillback Cap Reductn	0	47	0		0			
Storage Cap Reductn	0	0	0		0			
Reduced v/c Ratio	0.17	1.00	0.91		0.80			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 89.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 31.3

Intersection LOS: C

Intersection Capacity Utilization 73.2%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 52: E.10th St & Brown Ave N

#52  Ø1	#52 #521  Ø2	#52 #521  Ø3	#52 #521  Ø4
11 s	49 s	19.3 s	10.7 s
#52 #521  Ø6			
60 s			

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

53: Fisk Rd & E.10th St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	885	25	15	655	240	40	60	20	215	40	105
Future Volume (vph)	115	885	25	15	655	240	40	60	20	215	40	105
Satd. Flow (prot)	1805	1872	0	1805	1900	1599	0	1804	0	0	1737	1599
Flt Permitted	0.108			0.123				0.986			0.960	
Satd. Flow (perm)	205	1872	0	234	1900	1599	0	1804	0	0	1737	1599
Satd. Flow (RTOR)		2				192		7				137
Lane Group Flow (vph)	132	957	0	15	744	304	0	164	0	0	287	121
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases	2			6		6						3
Total Split (s)	12.0	34.0		12.0	34.0	34.0	24.0	24.0		20.0	20.0	20.0
Total Lost Time (s)	4.5	5.3		4.5	5.3	5.3		4.5			4.5	4.5
Act Effct Green (s)	40.7	38.5		35.7	28.8	28.8		12.4			15.5	15.5
Actuated g/C Ratio	0.49	0.46		0.43	0.35	0.35		0.15			0.19	0.19
v/c Ratio	0.55	1.10		0.07	1.13	0.45		0.59			0.88	0.29
Control Delay	23.0	86.6		12.7	104.9	10.7		40.4			63.4	6.8
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	23.0	86.6		12.7	104.9	10.7		40.4			63.4	6.8
LOS	C	F		B	F	B		D			E	A
Approach Delay		78.9			76.7			40.4			46.6	
Approach LOS		E			E			D			D	
Queue Length 50th (ft)	35	~545		4	~455	40		77			147	0
Queue Length 95th (ft)	81	#1000		15	#701	84		90			#274	33
Internal Link Dist (ft)		2105			3570			811			723	
Turn Bay Length (ft)	200			175		175						250
Base Capacity (vph)	245	870		247	659	680		430			325	411
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.54	1.10		0.06	1.13	0.45		0.38			0.88	0.29

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 82.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.13

Intersection Signal Delay: 70.9

Intersection Capacity Utilization 85.7%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service E

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 53: Fisk Rd & E.10th St

 Ø1	 Ø2	 Ø3	 Ø4
12 s	34 s	20 s	24 s
 Ø5	 Ø6		
12 s	34 s		

PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
54: N. Old Kentucky Rd & E.10th St

Cookeville 2040 No-Build Conditions

06/20/2017

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	885	180	140	705	230	195
Future Volume (vph)	885	180	140	705	230	195
Satd. Flow (prot)	1863	1583	1787	1881	1770	1615
Flt Permitted			0.101		0.950	
Satd. Flow (perm)	1863	1583	190	1881	1770	1615
Satd. Flow (RTOR)		194				258
Lane Group Flow (vph)	962	194	169	750	307	283
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	1 2	4	
Permitted Phases		2	1 2			4
Total Split (s)	45.0	45.0	14.0		31.0	31.0
Total Lost Time (s)	5.5	5.5	4.5		4.7	4.7
Act Effct Green (s)	39.7	39.7	50.2	54.7	19.1	19.1
Actuated g/C Ratio	0.48	0.48	0.60	0.66	0.23	0.23
v/c Ratio	1.08	0.23	0.57	0.61	0.75	0.50
Control Delay	79.6	3.1	20.4	11.7	41.9	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.6	3.1	20.4	11.7	41.9	7.9
LOS	E	A	C	B	D	A
Approach Delay	66.8			13.3	25.6	
Approach LOS	E			B	C	
Queue Length 50th (ft)	~570	0	29	195	149	10
Queue Length 95th (ft)	#894	37	90	379	186	24
Internal Link Dist (ft)	3570			975	734	
Turn Bay Length (ft)		400	125		175	
Base Capacity (vph)	888	856	298	1238	562	689
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.08	0.23	0.57	0.61	0.55	0.41

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 83.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 39.2

Intersection LOS: D

Intersection Capacity Utilization 79.3%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 54: N. Old Kentucky Rd & E.10th St

↙ Ø1	↔ Ø2	↗ Ø4
14 s	45 s	31 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	860	265	280	735	0	0	0	0	115	0	190
Future Volume (vph)	0	860	265	280	735	0	0	0	0	115	0	190
Satd. Flow (prot)	0	3441	0	1752	3574	0	0	0	0	1770	0	1583
Flt Permitted				0.098						0.950		
Satd. Flow (perm)	0	3441	0	181	3574	0	0	0	0	1770	0	1583
Satd. Flow (RTOR)		71										224
Lane Group Flow (vph)	0	1320	0	318	766	0	0	0	0	128	0	224
Turn Type		NA		pm+pt	NA					Prot		Perm
Protected Phases		6		5	2					8		
Permitted Phases				2								8
Total Split (s)		55.0		15.0	70.0					20.0		20.0
Total Lost Time (s)		5.3		4.5	5.3					5.9		5.9
Act Effct Green (s)		36.2		52.2	51.4					13.4		13.4
Actuated g/C Ratio		0.48		0.69	0.68					0.18		0.18
v/c Ratio		0.79		0.92	0.32					0.41		0.48
Control Delay		19.3		54.0	5.3					35.2		8.9
Queue Delay		0.0		0.0	0.0					0.0		0.0
Total Delay		19.3		54.0	5.3					35.2		8.9
LOS		B		D	A					D		A
Approach Delay		19.3			19.6						18.5	
Approach LOS		B			B						B	
Queue Length 50th (ft)		243		95	65					54		0
Queue Length 95th (ft)		293		#277	91					123		51
Internal Link Dist (ft)		570			785			708			972	
Turn Bay Length (ft)				120								150
Base Capacity (vph)		2301		344	3072					332		478
Starvation Cap Reductn		0		0	0					0		0
Spillback Cap Reductn		0		0	0					0		0
Storage Cap Reductn		0		0	0					0		0
Reduced v/c Ratio		0.57		0.92	0.25					0.39		0.47

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 76.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 19.3

Intersection LOS: B

Intersection Capacity Utilization 72.3%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 55: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & E.10th St



Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	275	705	0	0	775	290	240	0	450	0	0	0
Future Volume (vph)	275	705	0	0	775	290	240	0	450	0	0	0
Satd. Flow (prot)	1770	3574	0	0	3420	0	1787	0	1599	0	0	0
Flt Permitted	0.107						0.950					
Satd. Flow (perm)	199	3574	0	0	3420	0	1787	0	1599	0	0	0
Satd. Flow (RTOR)					99				194			
Lane Group Flow (vph)	357	801	0	0	1174	0	267	0	517	0	0	0
Turn Type	pm+pt	NA			NA		Prot		Perm			
Protected Phases	1	6			2		4					
Permitted Phases	6								4			
Total Split (s)	15.0	60.0			45.0		30.0		30.0			
Total Lost Time (s)	4.5	5.3			5.3		5.9		5.9			
Act Effct Green (s)	48.9	48.1			32.8		21.7		21.7			
Actuated g/C Ratio	0.60	0.59			0.40		0.27		0.27			
v/c Ratio	1.10	0.38			0.82		0.56		0.91			
Control Delay	101.0	9.4			24.9		31.9		40.8			
Queue Delay	0.0	0.0			31.6		0.0		0.0			
Total Delay	101.0	9.4			56.5		31.9		40.8			
LOS	F	A			E		C		D			
Approach Delay		37.7			56.5			37.8				
Approach LOS		D			E			D				
Queue Length 50th (ft)	~172	110			261		120		170			
Queue Length 95th (ft)	#269	141			343		210		#357			
Internal Link Dist (ft)		785			131			909			832	
Turn Bay Length (ft)	400								150			
Base Capacity (vph)	326	2450			1751		539		618			
Starvation Cap Reductn	0	0			639		0		0			
Spillback Cap Reductn	0	0			0		0		0			
Storage Cap Reductn	0	0			0		0		0			
Reduced v/c Ratio	1.10	0.33			1.06		0.50		0.84			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 81.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.10

Intersection Signal Delay: 44.8

Intersection Capacity Utilization 72.3%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service C

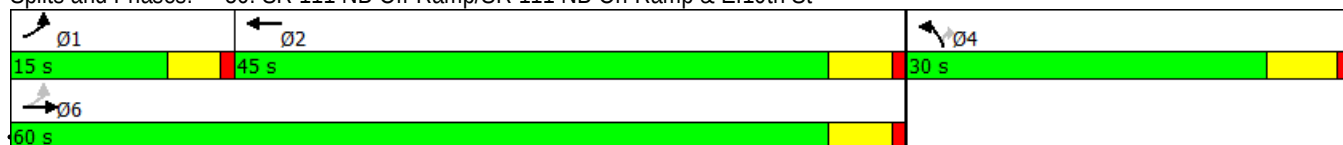
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St



PM Peak HR

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
57: Burton Branch Rd & E.10th St

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1040	110	35	885	170	50
Future Volume (vph)	1040	110	35	885	170	50
Satd. Flow (prot)	3517	0	1805	3574	1805	1615
Flt Permitted			0.106		0.950	
Satd. Flow (perm)	3517	0	201	3574	1805	1615
Satd. Flow (RTOR)	22					91
Lane Group Flow (vph)	1308	0	39	973	298	91
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			2			4
Total Split (s)	55.0		15.0	70.0	20.0	20.0
Total Lost Time (s)	5.6		4.5	5.6	5.4	5.4
Act Effct Green (s)	33.4		41.8	40.7	15.8	15.8
Actuated g/C Ratio	0.49		0.61	0.60	0.23	0.23
v/c Ratio	0.76		0.10	0.46	0.72	0.21
Control Delay	17.3		4.4	7.4	42.3	9.1
Queue Delay	0.4		0.0	0.0	0.0	0.0
Total Delay	17.7		4.4	7.4	42.3	9.1
LOS	B		A	A	D	A
Approach Delay	17.7			7.2	34.5	
Approach LOS	B			A	C	
Queue Length 50th (ft)	254		5	95	138	0
Queue Length 95th (ft)	320		13	124	153	7
Internal Link Dist (ft)	131			316	647	
Turn Bay Length (ft)			100			175
Base Capacity (vph)	2683		389	3113	416	443
Starvation Cap Reductn	783		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.69		0.10	0.31	0.72	0.21

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 68.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 16.2

Intersection Capacity Utilization 52.3%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 57: Burton Branch Rd & E.10th St

 Ø2	 Ø4
70 s	20 s
 Ø5	 Ø6
15 s	55 s

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

61: SR 135/S. Willow Ave & County Services Dr/Orchard St

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	15	35	55	10	95	10	1130	15	65	1305	10
Future Volume (vph)	50	15	35	55	10	95	10	1130	15	65	1305	10
Satd. Flow (prot)	1787	1636	0	0	1682	0	1626	3568	0	1787	3533	0
Flt Permitted	0.613				0.837		0.130			0.147		
Satd. Flow (perm)	1153	1636	0	0	1433	0	223	3568	0	277	3533	0
Satd. Flow (RTOR)		90			72			3			1	
Lane Group Flow (vph)	98	120	0	0	173	0	16	1183	0	76	1444	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			3		5	2		1	6	
Permitted Phases	4			3			2			6		
Total Split (s)	22.0	22.0		22.0	22.0		12.0	56.0		12.0	56.0	
Total Lost Time (s)	5.5	5.5			5.5		4.5	6.5		4.5	6.5	
Act Effct Green (s)	11.2	11.2			11.2		38.9	32.2		42.3	39.1	
Actuated g/C Ratio	0.17	0.17			0.17		0.60	0.50		0.65	0.61	
v/c Ratio	0.49	0.34			0.56		0.06	0.66		0.22	0.68	
Control Delay	36.7	13.5			25.0		4.6	15.2		5.6	11.3	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	36.7	13.5			25.0		4.6	15.2		5.6	11.3	
LOS	D	B			C		A	B		A	B	
Approach Delay		23.9			25.0			15.1			11.0	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)	34	10			34		2	182		8	153	
Queue Length 95th (ft)	52	13			116		5	286		22	381	
Internal Link Dist (ft)		674			289			17			564	
Turn Bay Length (ft)	100						100			200		
Base Capacity (vph)	311	508			440		310	2876		367	2847	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.32	0.24			0.39		0.05	0.41		0.21	0.51	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 64.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 14.3

Intersection Capacity Utilization 71.2%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service C

Splits and Phases: 61: SR 135/S. Willow Ave & County Services Dr/Orchard St

 Ø1	 Ø2	 Ø3
12 s	56 s	22 s
 Ø5	 Ø6	 Ø4
12 s	56 s	22 s

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	15	0	0	180	0	65
Future Volume (vph)	15	0	0	180	0	65
Satd. Flow (prot)	1805	0	0	1644	0	1900
Flt Permitted	0.950					
Satd. Flow (perm)	1805	0	0	1644	0	1900
Lane Group Flow (vph)	18	0	0	234	0	68
Sign Control	Yield		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 14.5%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
 241: SR 136/S. Jefferson Ave & Fairground St

Cookeville 2040 No-Build Conditions

06/20/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	20	20	10	990	1275	10
Future Volume (vph)	20	20	10	990	1275	10
Satd. Flow (prot)	1723	0	0	5131	3603	0
Flt Permitted	0.978			0.999		
Satd. Flow (perm)	1723	0	0	5131	3603	0
Lane Group Flow (vph)	59	0	0	1037	1330	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 45.6%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
 271: Foutch Dr & SR 136/S. Jefferson Ave

Cookeville 2040 No-Build Conditions
 06/20/2017

						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	10	780	715	60	0	0
Future Volume (vph)	10	780	715	60	0	0
Satd. Flow (prot)	0	3328	3327	0	0	0
Flt Permitted		0.999				
Satd. Flow (perm)	0	3328	3327	0	0	0
Lane Group Flow (vph)	0	867	849	0	0	0
Sign Control		Free	Free		Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 31.9%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings

Cookeville 2040 No-Build Conditions

361: US 70/E. Spring St & I-40 WB On-Ramp (SB)/I-40 WB On-Ramp (NB)

06/20/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	100	365	10	0	740	100
Future Volume (vph)	0	0	0	0	0	0	100	365	10	0	740	100
Satd. Flow (prot)	0	0	0	0	0	0	0	3294	0	0	3386	0
Flt Permitted								0.990				
Satd. Flow (perm)	0	0	0	0	0	0	0	3294	0	0	3386	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	565	0	0	887	0
Sign Control		Free				Free		Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 43.6%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
521: Brown Ave S & E.10th St

Cookeville 2040 No-Build Conditions

06/20/2017

	→	↘	↙	←	↖	↗			
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø1	Ø3	Ø6
Lane Configurations	↗		↖	↗	↖				
Traffic Volume (vph)	1100	25	10	870	30	20			
Future Volume (vph)	1100	25	10	870	30	20			
Satd. Flow (prot)	1890	0	1805	1881	1745	0			
Flt Permitted			0.085		0.970				
Satd. Flow (perm)	1890	0	162	1881	1745	0			
Satd. Flow (RTOR)	9				27				
Lane Group Flow (vph)	1228	0	16	967	69	0			
Turn Type	NA		Perm	NA	Prot				
Protected Phases	3 6			2	4		1	3	6
Permitted Phases			2						
Total Split (s)			49.0	49.0	10.7		11.0	19.3	60.0
Total Lost Time (s)			6.6	6.6	4.7				
Act Effct Green (s)	74.3		46.9	46.9	6.0				
Actuated g/C Ratio	0.83		0.52	0.52	0.07				
v/c Ratio	0.78		0.19	0.98	0.49				
Control Delay	3.0		21.0	49.5	39.6				
Queue Delay	0.0		0.0	38.9	0.3				
Total Delay	3.0		21.0	88.3	39.9				
LOS	A		C	F	D				
Approach Delay	3.0			87.2	39.9				
Approach LOS	A			F	D				
Queue Length 50th (ft)	3		5	~622	23				
Queue Length 95th (ft)	m14		14	#859	47				
Internal Link Dist (ft)	23			2105	565				
Turn Bay Length (ft)			115						
Base Capacity (vph)	1574		84	983	141				
Starvation Cap Reductn	0		0	0	0				
Spillback Cap Reductn	0		0	143	4				
Storage Cap Reductn	0		0	0	0				
Reduced v/c Ratio	0.78		0.19	1.15	0.50				

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 89.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 40.5

Intersection LOS: D

Intersection Capacity Utilization 72.2%

ICU Level of Service C

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 521: Brown Ave S & E.10th St

#52 Ø1	#52 #521 Ø2	#52 #521 Ø3	#52 #521 Ø4
11 s	49 s	19.3 s	10.7 s
#52 #521 Ø6			
60 s			

Intersection

Intersection Delay, s/veh 20
Intersection LOS C

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↕				↕				↕	
Traffic Vol, veh/h	0	55	55	10	0	30	40	205	0	10	85	30
Future Vol, veh/h	0	55	55	10	0	30	40	205	0	10	85	30
Peak Hour Factor	0.92	0.63	0.87	1.00	0.92	0.69	0.58	0.89	0.92	1.00	0.86	0.83
Heavy Vehicles, %	2	0	0	0	2	0	0	0	2	0	3	0
Mvmt Flow	0	87	63	10	0	43	69	230	0	10	99	36
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	12.5	15.7	11.6
HCM LOS	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	8%	46%	11%	51%
Vol Thru, %	68%	46%	15%	36%
Vol Right, %	24%	8%	75%	13%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	125	120	275	450
LT Vol	10	55	30	230
Through Vol	85	55	40	160
RT Vol	30	10	205	60
Lane Flow Rate	145	161	343	493
Geometry Grp	1	1	1	1
Degree of Util (X)	0.255	0.295	0.55	0.798
Departure Headway (Hd)	6.334	6.62	5.774	5.83
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	565	541	624	626
Service Time	4.396	4.684	3.827	3.83
HCM Lane V/C Ratio	0.257	0.298	0.55	0.788
HCM Control Delay	11.6	12.5	15.7	27.9
HCM Lane LOS	B	B	C	D
HCM 95th-tile Q	1	1.2	3.3	7.9

Intersection

Intersection Delay, s/veh
Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	230	160	60
Future Vol, veh/h	0	230	160	60
Peak Hour Factor	0.92	0.93	0.94	0.80
Heavy Vehicles, %	2	1	2	0
Mvmt Flow	0	247	170	75
Number of Lanes	0	0	1	0
Approach	SB			
Opposing Approach	NB			
Opposing Lanes	1			
Conflicting Approach Left	WB			
Conflicting Lanes Left	1			
Conflicting Approach Right	EB			
Conflicting Lanes Right	1			
HCM Control Delay	27.9			
HCM LOS	D			

Intersection

Intersection Delay, s/veh 16.1
Intersection LOS C

Movement	EBU	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations									
Traffic Vol, veh/h	0	65	195	0	205	150	0	245	115
Future Vol, veh/h	0	65	195	0	205	150	0	245	115
Peak Hour Factor	0.92	0.86	0.98	0.92	0.79	0.85	0.92	0.88	0.76
Heavy Vehicles, %	2	1	1	2	0	1	2	1	0
Mvmt Flow	0	76	199	0	259	176	0	278	151
Number of Lanes	0	1	1	0	0	1	0	1	0
Approach	EB				NB			SB	
Opposing Approach					SB			NB	
Opposing Lanes	0				1			1	
Conflicting Approach Left	SB				EB				
Conflicting Lanes Left	1				2			0	
Conflicting Approach Right	NB							EB	
Conflicting Lanes Right	1				0			2	
HCM Control Delay	11.6				18.6			16.4	
HCM LOS	B				C			C	

Lane	NBLn1	EBLn1	EBLn2	SBLn1
Vol Left, %	58%	100%	0%	0%
Vol Thru, %	42%	0%	0%	68%
Vol Right, %	0%	0%	100%	32%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	355	65	195	360
LT Vol	205	65	0	0
Through Vol	150	0	0	245
RT Vol	0	0	195	115
Lane Flow Rate	436	76	199	430
Geometry Grp	2	7	7	2
Degree of Util (X)	0.661	0.151	0.331	0.621
Departure Headway (Hd)	5.455	7.209	5.985	5.2
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	663	497	599	692
Service Time	3.497	4.963	3.739	3.244
HCM Lane V/C Ratio	0.658	0.153	0.332	0.621
HCM Control Delay	18.6	11.3	11.7	16.4
HCM Lane LOS	C	B	B	C
HCM 95th-tile Q	5	0.5	1.4	4.3

Intersection

Int Delay, s/veh 2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	35	130	1035	135	70	1305
Future Vol, veh/h	35	130	1035	135	70	1305
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	86	97	83	63	90
Heavy Vehicles, %	0	2	1	0	3	1
Mvmt Flow	51	151	1067	163	111	1450

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2095	615	0	0	1230	0
Stage 1	1148	-	-	-	-	-
Stage 2	947	-	-	-	-	-
Critical Hdwy	6.8	6.94	-	-	4.16	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.32	-	-	2.23	-
Pot Cap-1 Maneuver	~ 46	434	-	-	557	-
Stage 1	269	-	-	-	-	-
Stage 2	342	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 37	434	-	-	557	-
Mov Cap-2 Maneuver	141	-	-	-	-	-
Stage 1	269	-	-	-	-	-
Stage 2	274	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	24.4		0		0.9
HCM LOS	C				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	141	434	557	-
HCM Lane V/C Ratio	-	-	0.36	0.348	0.199	-
HCM Control Delay (s)	-	-	44.2	17.7	13.1	-
HCM Lane LOS	-	-	E	C	B	-
HCM 95th %tile Q(veh)	-	-	1.5	1.5	0.7	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	20	1145	10	0	1385
Future Vol, veh/h	0	20	1145	10	0	1385
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	25	75	97	63	25	91
Heavy Vehicles, %	0	0	1	0	0	2
Mvmt Flow	0	27	1180	16	0	1522

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	-	590	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.9	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.3	-
Pot Cap-1 Maneuver	0	456	0
Stage 1	0	-	0
Stage 2	0	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	456	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 456	-
HCM Lane V/C Ratio	- 0.058	-
HCM Control Delay (s)	- 13.4	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0.2	-

Intersection

Int Delay, s/veh 1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	35	35	40	1200	1285	55
Future Vol, veh/h	35	35	40	1200	1285	55
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	30	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	69	88	99	92	75
Heavy Vehicles, %	4	4	0	1	1	2
Mvmt Flow	35	51	45	1212	1397	73

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2130	735	1470	0	-	0
Stage 1	1433	-	-	-	-	-
Stage 2	697	-	-	-	-	-
Critical Hdwy	6.88	6.98	4.1	-	-	-
Critical Hdwy Stg 1	5.88	-	-	-	-	-
Critical Hdwy Stg 2	5.88	-	-	-	-	-
Follow-up Hdwy	3.54	3.34	2.2	-	-	-
Pot Cap-1 Maneuver	41	358	465	-	-	-
Stage 1	183	-	-	-	-	-
Stage 2	450	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	37	358	465	-	-	-
Mov Cap-2 Maneuver	129	-	-	-	-	-
Stage 1	183	-	-	-	-	-
Stage 2	406	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	27.4	0.5	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	465	-	129	358	-	-
HCM Lane V/C Ratio	0.098	-	0.271	0.142	-	-
HCM Control Delay (s)	13.6	-	43	16.7	-	-
HCM Lane LOS	B	-	E	C	-	-
HCM 95th %tile Q(veh)	0.3	-	1	0.5	-	-

Intersection

Int Delay, s/veh 18.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	10	10	20	15	10	30	20	1025	20	15	1005	25
Future Vol, veh/h	10	10	20	15	10	30	20	1025	20	15	1005	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	63	94	83	63	63	75	95	75	83	91	71
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	1	0
Mvmt Flow	16	16	21	18	16	48	27	1079	27	18	1104	35

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1759	2317	570	1742	2322	553	1140	0	0	1106	0	0
Stage 1	1158	1158	-	1146	1146	-	-	-	-	-	-	-
Stage 2	601	1159	-	596	1176	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	55	38	470	57	38	482	620	-	-	639	-	-
Stage 1	212	273	-	215	276	-	-	-	-	-	-	-
Stage 2	459	272	-	462	267	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	26	31	470	28	31	482	620	-	-	639	-	-
Mov Cap-2 Maneuver	26	31	-	28	31	-	-	-	-	-	-	-
Stage 1	188	252	-	190	245	-	-	-	-	-	-	-
Stage 2	343	241	-	381	246	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	\$ 334.9	\$ 303.6	0.8	0.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	620	-	-	45	65	639	-	-
HCM Lane V/C Ratio	0.043	-	-	1.178	1.255	0.028	-	-
HCM Control Delay (s)	11.1	0.6	-	\$ 334.9	\$ 303.6	10.8	0.4	-
HCM Lane LOS	B	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	5	6.7	0.1	-	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 47.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	15	15	30	30	10	35	20	995	45	15	980	20
Future Vol, veh/h	15	15	30	30	10	35	20	995	45	15	980	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	100	71	71	100	78	63	93	71	50	89	63
Heavy Vehicles, %	0	0	0	0	0	4	0	0	2	0	1	0
Mvmt Flow	24	15	42	42	10	45	32	1070	63	30	1101	32

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1780	2374	566	1783	2358	567	1133	0	0	1133	0	0
Stage 1	1177	1177	-	1165	1165	-	-	-	-	-	-	-
Stage 2	603	1197	-	618	1193	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.98	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.34	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	53	35	473	53	36	462	624	-	-	624	-	-
Stage 1	206	267	-	210	271	-	-	-	-	-	-	-
Stage 2	458	261	-	448	263	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	28	26	473	~ 22	27	462	624	-	-	624	-	-
Mov Cap-2 Maneuver	28	26	-	~ 22	27	-	-	-	-	-	-	-
Stage 1	177	232	-	180	233	-	-	-	-	-	-	-
Stage 2	340	224	-	332	229	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	\$ 438.9	\$ 834.9	0.9	0.9
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	624	-	-	53	41	624	-	-
HCM Lane V/C Ratio	0.051	-	-	1.529	2.369	0.048	-	-
HCM Control Delay (s)	11.1	0.7	-	\$ 438.9	\$ 834.9	11.1	0.7	-
HCM Lane LOS	B	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.2	-	-	7.5	10.5	0.2	-	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 86.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	50	10	100	10	15	10	85	1010	10	10	680	80
Future Vol, veh/h	50	10	100	10	15	10	85	1010	10	10	680	80
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	100	85	100	100	63	75	93	63	100	86	92
Heavy Vehicles, %	0	0	5	0	0	0	0	0	0	0	1	2
Mvmt Flow	63	10	118	10	15	16	113	1086	16	10	791	87

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1631	2183	439	1741	2219	551	878	0	0	1102	0	0
Stage 1	854	854	-	1321	1321	-	-	-	-	-	-	-
Stage 2	777	1329	-	420	898	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	7	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.35	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	69	47	557	57	44	483	778	-	-	641	-	-
Stage 1	324	378	-	168	228	-	-	-	-	-	-	-
Stage 2	360	226	-	587	361	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 27	28	557	23	27	483	778	-	-	641	-	-
Mov Cap-2 Maneuver	~ 27	28	-	23	27	-	-	-	-	-	-	-
Stage 1	202	366	-	105	142	-	-	-	-	-	-	-
Stage 2	194	141	-	436	350	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	\$ 982.6	\$ 303.4	2.4	0.3
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	778	-	-	66	40	641	-	-
HCM Lane V/C Ratio	0.146	-	-	2.881	1.022	0.016	-	-
HCM Control Delay (s)	10.4	1.6	\$ 982.6	\$ 303.4	10.7	0.2	-	-
HCM Lane LOS	B	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.5	-	-	19.2	4	0	-	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 17.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗					↕↗		↗	↕↕	
Traffic Vol, veh/h	100	0	285	0	0	0	0	385	25	240	500	0
Future Vol, veh/h	100	0	285	0	0	0	0	385	25	240	500	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	200	-	-	-	-	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	25	86	25	25	25	25	86	75	87	90	25
Heavy Vehicles, %	9	0	0	0	0	0	0	1	0	2	0	0
Mvmt Flow	116	0	331	0	0	0	0	448	33	276	556	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	1331	1555	278	-	0	0	448	0	0
Stage 1	1107	1107	-	-	-	-	-	-	-
Stage 2	224	448	-	-	-	-	-	-	-
Critical Hdwy	6.98	6.5	6.9	-	-	-	4.14	-	-
Critical Hdwy Stg 1	5.98	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.98	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.59	4	3.3	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	137	114	725	0	-	-	1109	-	0
Stage 1	263	288	-	0	-	-	-	-	0
Stage 2	771	576	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	~ 103	0	725	-	-	-	1109	-	-
Mov Cap-2 Maneuver	~ 103	0	-	-	-	-	-	-	-
Stage 1	198	0	-	-	-	-	-	-	-
Stage 2	771	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	63.8	0	3.1
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	103	725	1109	-
HCM Lane V/C Ratio	-	-	1.129	0.457	0.249	-
HCM Control Delay (s)	-	-	205.3	14.1	9.3	-
HCM Lane LOS	-	-	F	B	A	-
HCM 95th %tile Q(veh)	-	-	7.5	2.4	1	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 2.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	40	180	335	0	0	795
Future Vol, veh/h	40	180	335	0	0	795
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	None
Storage Length	0	300	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	79	84	25	25	94
Heavy Vehicles, %	7	3	5	0	0	1
Mvmt Flow	58	228	399	0	0	846

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	822	199	0	-	-	-
Stage 1	399	-	-	-	-	-
Stage 2	423	-	-	-	-	-
Critical Hdwy	6.94	6.96	-	-	-	-
Critical Hdwy Stg 1	5.94	-	-	-	-	-
Critical Hdwy Stg 2	5.94	-	-	-	-	-
Follow-up Hdwy	3.57	3.33	-	-	-	-
Pot Cap-1 Maneuver	302	806	-	0	0	-
Stage 1	632	-	-	0	0	-
Stage 2	614	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	302	806	-	-	-	-
Mov Cap-2 Maneuver	302	-	-	-	-	-
Stage 1	632	-	-	-	-	-
Stage 2	614	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	12.9		0		0
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBT
Capacity (veh/h)	-	302	806	-
HCM Lane V/C Ratio	-	0.192	0.283	-
HCM Control Delay (s)	-	19.7	11.2	-
HCM Lane LOS	-	C	B	-
HCM 95th %tile Q(veh)	-	0.7	1.2	-

Intersection

Int Delay, s/veh 12.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↑	↑↑						↑	↑
Traffic Vol, veh/h	0	1665	350	70	740	0	0	0	0	45	0	380
Future Vol, veh/h	0	1665	350	70	740	0	0	0	0	45	0	380
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	100	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	25	87	78	75	87	25	25	25	25	94	25	87
Heavy Vehicles, %	0	2	0	6	2	0	0	0	0	6	0	1
Mvmt Flow	0	1914	449	93	851	0	0	0	0	48	0	437

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	-	0	0	1914	0	0	1994	2951	425
Stage 1	-	-	-	-	-	-	1037	1037	-
Stage 2	-	-	-	-	-	-	957	1914	-
Critical Hdwy	-	-	-	4.22	-	-	7.62	6.5	6.92
Critical Hdwy Stg 1	-	-	-	-	-	-	6.62	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.5	-
Follow-up Hdwy	-	-	-	2.26	-	-	3.56	4	3.31
Pot Cap-1 Maneuver	0	-	-	290	-	0	~ 34	15	580
Stage 1	0	-	-	-	-	0	240	311	-
Stage 2	0	-	-	-	-	0	269	117	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	290	-	-	~ 26	10	580
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 26	10	-
Stage 1	-	-	-	-	-	-	240	211	-
Stage 2	-	-	-	-	-	-	269	117	-

Approach	EB	WB	SB
HCM Control Delay, s	0	2.3	96.2
HCM LOS			F

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	290	-	26	580
HCM Lane V/C Ratio	-	-	0.322	-	1.841	0.753
HCM Control Delay (s)	-	-	23.2	-	720.8	27.7
HCM Lane LOS	-	-	C	-	F	D
HCM 95th %tile Q(veh)	-	-	1.4	-	5.8	6.7

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 8.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↱	↱		↱	
Traffic Vol, veh/h	0	1060	440	440	140	10
Future Vol, veh/h	0	1060	440	440	140	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	25	86	92	96	77	63
Heavy Vehicles, %	0	1	3	1	0	0
Mvmt Flow	0	1233	478	458	182	16

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	478	0	1711
Stage 1	-	-	478
Stage 2	-	-	1233
Critical Hdwy	4.1	-	6.4
Critical Hdwy Stg 1	-	-	5.4
Critical Hdwy Stg 2	-	-	5.4
Follow-up Hdwy	2.2	-	3.5
Pot Cap-1 Maneuver	1095	0	~ 101
Stage 1	-	0	628
Stage 2	-	0	278
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1095	-	~ 101
Mov Cap-2 Maneuver	-	-	213
Stage 1	-	-	628
Stage 2	-	-	278

Approach	EB	WB	SB
HCM Control Delay, s	0	0	77.8
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	SBLn1
Capacity (veh/h)	1095	-	-	225
HCM Lane V/C Ratio	-	-	-	0.879
HCM Control Delay (s)	0	-	-	77.8
HCM Lane LOS	A	-	-	F
HCM 95th %tile Q(veh)	0	-	-	7.1

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh

6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	245	470	15	145	325
Future Vol, veh/h	10	245	470	15	145	325
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	79	80	63	86	87
Heavy Vehicles, %	0	0	2	0	0	3
Mvmt Flow	16	310	588	24	169	374

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1310	599	0	0	611	0
Stage 1	599	-	-	-	-	-
Stage 2	711	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	177	505	-	-	978	-
Stage 1	553	-	-	-	-	-
Stage 2	490	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	138	505	-	-	978	-
Mov Cap-2 Maneuver	267	-	-	-	-	-
Stage 1	553	-	-	-	-	-
Stage 2	383	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	22.6		0		2.9
HCM LOS	C				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	267	505	978	-
HCM Lane V/C Ratio	-	-	0.059	0.614	0.172	-
HCM Control Delay (s)	-	-	19.3	22.8	9.4	0
HCM Lane LOS	-	-	C	C	A	A
HCM 95th %tile Q(veh)	-	-	0.2	4.1	0.6	-

Intersection

Int Delay, s/veh 1.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	20	10	990	1275	10
Future Vol, veh/h	20	20	10	990	1275	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	63	63	97	97	63
Heavy Vehicles, %	0	0	0	1	0	0
Mvmt Flow	27	32	16	1021	1314	16

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1762	665	1330	0	-	0
Stage 1	1322	-	-	-	-	-
Stage 2	440	-	-	-	-	-
Critical Hdwy	6.25	6.9	4.1	-	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	6	-	-	-	-	-
Follow-up Hdwy	3.65	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	99	407	526	-	-	-
Stage 1	213	-	-	-	-	-
Stage 2	587	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	92	407	526	-	-	-
Mov Cap-2 Maneuver	92	-	-	-	-	-
Stage 1	213	-	-	-	-	-
Stage 2	546	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	40.2	0.5	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	526	-	159	-	-
HCM Lane V/C Ratio	0.03	-	0.367	-	-
HCM Control Delay (s)	12.1	0.3	40.2	-	-
HCM Lane LOS	B	A	E	-	-
HCM 95th %tile Q(veh)	0.1	-	1.6	-	-

Appendix D: 2040 Optimized Conditions Synchro Reports

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	20	30	30	10	100	35	770	25	80	355	135
Future Volume (vph)	65	20	30	30	10	100	35	770	25	80	355	135
Satd. Flow (prot)	1770	1788	0	1703	1651	0	1805	3416	0	1787	3216	0
Flt Permitted	0.630			0.706			0.424			0.224		
Satd. Flow (perm)	1174	1788	0	1265	1651	0	806	3416	0	421	3216	0
Satd. Flow (RTOR)		31			116			9			120	
Lane Group Flow (vph)	133	79	0	56	140	0	42	999	0	113	603	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		3			4		5	2		1	6	
Permitted Phases	3			4			2			6		
Total Split (s)	27.0	27.0		27.0	27.0		12.0	47.0		16.0	51.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	6.0		5.5	6.0	
Act Effct Green (s)	14.9	14.9		14.9	14.9		58.6	52.9		61.7	56.3	
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.65	0.59		0.69	0.63	
v/c Ratio	0.69	0.25		0.27	0.38		0.07	0.50		0.28	0.29	
Control Delay	52.2	21.7		33.9	11.6		5.6	13.7		5.1	1.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	52.2	21.7		33.9	11.6		5.6	13.7		5.1	1.8	
LOS	D	C		C	B		A	B		A	A	
Approach Delay		40.8			17.9			13.3			2.3	
Approach LOS		D			B			B			A	
Queue Length 50th (ft)	72	24		28	12		6	169		4	4	
Queue Length 95th (ft)	60	18		33	0		17	243		11	9	
Internal Link Dist (ft)		927			612			1063			1812	
Turn Bay Length (ft)	200			150			200			200		
Base Capacity (vph)	280	450		302	482		600	2012		454	2061	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.47	0.18		0.19	0.29		0.07	0.50		0.25	0.29	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 54 (60%), Referenced to phase 2:NBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 12.8

Intersection Capacity Utilization 51.5%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

		
Ø1	Ø2 (R)	Ø3
16 s	47 s	27 s
		
Ø5	Ø6	Ø4
12 s	51 s	27 s

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	345	10	60	0	0	0	0	700	275	225	610	0
Future Volume (vph)	345	10	60	0	0	0	0	700	275	225	610	0
Satd. Flow (prot)	1649	1594	0	0	0	0	0	3397	0	1770	3539	0
Flt Permitted	0.950	0.971								0.091		
Satd. Flow (perm)	1649	1594	0	0	0	0	0	3397	0	170	3539	0
Satd. Flow (RTOR)		29						74				
Lane Group Flow (vph)	236	229	0	0	0	0	0	1305	0	281	663	0
Turn Type	Split	NA						NA		pm+pt	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases										6		
Total Split (s)	36.0	36.0						38.0		16.0	54.0	
Total Lost Time (s)	6.0	6.0						5.5		5.5	5.5	
Act Effct Green (s)	18.7	18.7						38.6		59.8	59.8	
Actuated g/C Ratio	0.21	0.21						0.43		0.66	0.66	
v/c Ratio	0.69	0.65						0.87		0.72	0.28	
Control Delay	42.9	36.2						32.8		25.2	6.2	
Queue Delay	0.0	0.0						0.0		0.0	0.0	
Total Delay	42.9	36.2						32.8		25.2	6.2	
LOS	D	D						C		C	A	
Approach Delay		39.6						32.8			11.8	
Approach LOS		D						C			B	
Queue Length 50th (ft)	132	110						204		82	85	
Queue Length 95th (ft)	191	105						395		#155	122	
Internal Link Dist (ft)		409			271			1812			858	
Turn Bay Length (ft)	200									410		
Base Capacity (vph)	549	550						1499		392	2353	
Starvation Cap Reductn	0	0						0		0	0	
Spillback Cap Reductn	0	0						0		0	0	
Storage Cap Reductn	0	0						0		0	0	
Reduced v/c Ratio	0.43	0.42						0.87		0.72	0.28	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 32 (36%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 26.7

Intersection LOS: C

Intersection Capacity Utilization 66.4%

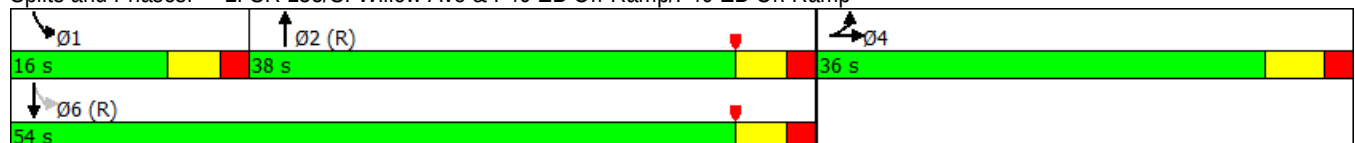
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp



Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	265	10	370	55	980	0	0	580	175
Future Volume (vph)	0	0	0	265	10	370	55	980	0	0	580	175
Satd. Flow (prot)	0	0	0	0	1761	1583	1671	3539	0	0	3413	0
Flt Permitted					0.954		0.201					
Satd. Flow (perm)	0	0	0	0	1761	1583	354	3539	0	0	3413	0
Satd. Flow (RTOR)						97					53	
Lane Group Flow (vph)	0	0	0	0	315	435	71	1210	0	0	898	0
Turn Type				Split	NA	Perm	pm+pt	NA			NA	
Protected Phases				4	4		5	2			6	
Permitted Phases						4	2					
Total Split (s)				40.0	40.0	40.0	11.7	50.0			38.3	
Total Lost Time (s)					5.5	5.5	5.5	5.5			5.5	
Act Effct Green (s)					26.4	26.4	52.6	52.6			42.6	
Actuated g/C Ratio					0.29	0.29	0.58	0.58			0.47	
v/c Ratio					0.61	0.82	0.23	0.59			0.55	
Control Delay					31.4	34.7	3.9	6.3			14.0	
Queue Delay					0.0	0.0	0.0	0.0			0.0	
Total Delay					31.4	34.7	3.9	6.3			14.0	
LOS					C	C	A	A			B	
Approach Delay					33.3			6.2			14.0	
Approach LOS					C			A			B	
Queue Length 50th (ft)					151	178	2	26			107	
Queue Length 95th (ft)					208	236	m16	301			m160	
Internal Link Dist (ft)		874			1170			858			839	
Turn Bay Length (ft)						200	200					
Base Capacity (vph)					675	666	306	2066			1642	
Starvation Cap Reductn					0	0	0	0			0	
Spillback Cap Reductn					0	0	0	0			0	
Storage Cap Reductn					0	0	0	0			0	
Reduced v/c Ratio					0.47	0.65	0.23	0.59			0.55	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 74 (82%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 15.5

Intersection LOS: B

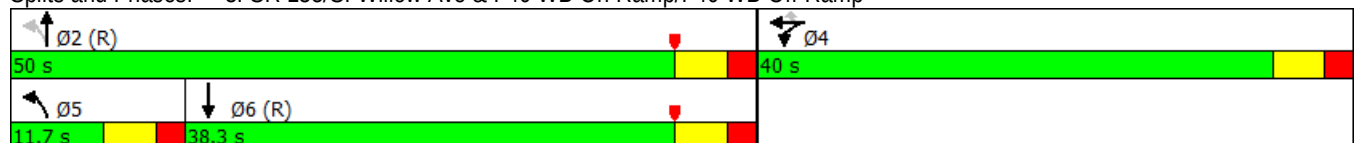
Intersection Capacity Utilization 66.4%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp



Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

4: SR 135/S. Willow Ave & Foreman Dr/Interstate Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	165	85	210	75	180	70	950	295	205	495	30
Future Volume (vph)	75	165	85	210	75	180	70	950	295	205	495	30
Satd. Flow (prot)	1736	1730	0	1805	1900	1615	1703	3412	0	1752	3539	0
Flt Permitted	0.697			0.212			0.410			0.109		
Satd. Flow (perm)	1273	1730	0	403	1900	1615	735	3412	0	201	3539	0
Satd. Flow (RTOR)		26				212		55			10	
Lane Group Flow (vph)	88	334	0	256	93	212	81	1448	0	228	558	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4		4	2			6		
Total Split (s)	12.0	20.0		15.0	23.0	23.0	12.0	43.0		12.0	43.0	
Total Lost Time (s)	5.5	6.5		5.5	6.5	6.5	5.5	6.5		5.5	6.5	
Act Effct Green (s)	20.9	13.5		27.5	18.9	18.9	43.9	36.5		45.1	38.9	
Actuated g/C Ratio	0.23	0.15		0.31	0.21	0.21	0.49	0.41		0.50	0.43	
v/c Ratio	0.27	1.19		0.95	0.23	0.42	0.19	1.02		1.08	0.36	
Control Delay	24.3	148.2		71.1	33.2	7.6	6.7	48.9		104.9	18.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	24.3	148.2		71.1	33.2	7.6	6.7	48.9		104.9	18.5	
LOS	C	F		E	C	A	A	D		F	B	
Approach Delay		122.4			40.8			46.7			43.5	
Approach LOS		F			D			D			D	
Queue Length 50th (ft)	35	~219		113	46	0	12	~391		~95	112	
Queue Length 95th (ft)	66	#303		#203	80	48	m20	#527		#240	155	
Internal Link Dist (ft)		811			944			839			2060	
Turn Bay Length (ft)	150			150			50			150		
Base Capacity (vph)	330	281		270	399	506	429	1416		212	1535	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.27	1.19		0.95	0.23	0.42	0.19	1.02		1.08	0.36	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 78 (87%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.19

Intersection Signal Delay: 54.6

Intersection LOS: D

Intersection Capacity Utilization 92.5%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: SR 135/S. Willow Ave & Foreman Dr/Interstate Dr

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	43 s	12 s	23 s
			
Ø5	Ø6 (R)	Ø7	Ø8
12 s	43 s	15 s	20 s

WSJ

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Lanes, Volumes, Timings 5: SR 135/S. Willow Ave & Fairground St

2040 Optimized AM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	20	65	975	80	55	730
Future Volume (vph)	20	65	975	80	55	730
Satd. Flow (prot)	1805	1583	3531	0	1752	3574
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1583	3531	0	1752	3574
Lane Group Flow (vph)	29	76	1101	0	87	811
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 46.2%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
5: SR 135/S. Willow Ave & Fairground St

2040 Optimized AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	65	975	80	55	730
Future Vol, veh/h	20	65	975	80	55	730
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	86	97	83	63	90
Heavy Vehicles, %	0	2	1	0	3	1
Mvmt Flow	29	76	1005	96	87	811

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1633	551	0	0	1102	0
Stage 1	1053	-	-	-	-	-
Stage 2	580	-	-	-	-	-
Critical Hdwy	6.8	6.94	-	-	4.16	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.32	-	-	2.23	-
Pot Cap-1 Maneuver	94	478	-	-	623	-
Stage 1	301	-	-	-	-	-
Stage 2	529	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	81	478	-	-	623	-
Mov Cap-2 Maneuver	200	-	-	-	-	-
Stage 1	301	-	-	-	-	-
Stage 2	455	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	17.3		0		1.1
HCM LOS	C				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	200	478	623	-
HCM Lane V/C Ratio	-	-	0.145	0.158	0.14	-
HCM Control Delay (s)	-	-	26	13.9	11.7	-
HCM Lane LOS	-	-	D	B	B	-
HCM 95th %tile Q(veh)	-	-	0.5	0.6	0.5	-

Lanes, Volumes, Timings 6: SR 135/S. Willow Ave & Ashwood Dr

2040 Optimized AM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (vph)	0	10	960	20	0	800
Future Volume (vph)	0	10	960	20	0	800
Satd. Flow (prot)	0	1644	3557	0	0	3539
Flt Permitted						
Satd. Flow (perm)	0	1644	3557	0	0	3539
Lane Group Flow (vph)	0	13	1022	0	0	879
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 37.2%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
6: SR 135/S. Willow Ave & Ashwood Dr

2040 Optimized AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	10	960	20	0	800
Future Vol, veh/h	0	10	960	20	0	800
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	25	75	97	63	25	91
Heavy Vehicles, %	0	0	1	0	0	2
Mvmt Flow	0	13	990	32	0	879

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	495	0	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.9	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-	-
Pot Cap-1 Maneuver	0	525	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	525	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	12		0		0
HCM LOS	B				

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 525	-
HCM Lane V/C Ratio	- 0.025	-
HCM Control Delay (s)	- 12	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0.1	-

Lanes, Volumes, Timings 7: SR 135/S. Willow Ave & Lone Oak Dr

2040 Optimized AM Timing Plan
07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	75	40	15	990	820	20
Future Volume (vph)	75	40	15	990	820	20
Satd. Flow (prot)	1736	1553	1805	3574	3559	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1736	1553	1805	3574	3559	0
Lane Group Flow (vph)	75	58	17	1000	918	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 38.2%

ICU Level of Service A

Analysis Period (min) 15

HCM 2010 TWSC
7: SR 135/S. Willow Ave & Lone Oak Dr

2040 Optimized AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 1.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	75	40	15	990	820	20
Future Vol, veh/h	75	40	15	990	820	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	30	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	69	88	99	92	75
Heavy Vehicles, %	4	4	0	1	1	2
Mvmt Flow	75	58	17	1000	891	27

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1439	459	918	0	-	0
Stage 1	905	-	-	-	-	-
Stage 2	534	-	-	-	-	-
Critical Hdwy	6.88	6.98	4.1	-	-	-
Critical Hdwy Stg 1	5.88	-	-	-	-	-
Critical Hdwy Stg 2	5.88	-	-	-	-	-
Follow-up Hdwy	3.54	3.34	2.2	-	-	-
Pot Cap-1 Maneuver	121	544	752	-	-	-
Stage 1	350	-	-	-	-	-
Stage 2	546	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	118	544	752	-	-	-
Mov Cap-2 Maneuver	244	-	-	-	-	-
Stage 1	350	-	-	-	-	-
Stage 2	534	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.2	0.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	752	-	244	544	-	-
HCM Lane V/C Ratio	0.023	-	0.307	0.107	-	-
HCM Control Delay (s)	9.9	-	26.2	12.4	-	-
HCM Lane LOS	A	-	D	B	-	-
HCM 95th %tile Q(veh)	0.1	-	1.3	0.4	-	-

Lanes, Volumes, Timings

8: SR 135/S. Willow Ave & W. Jackson St

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	390	300	120	190	115	195	700	120	135	540	25
Future Volume (vph)	85	390	300	120	190	115	195	700	120	135	540	25
Satd. Flow (prot)	1805	3574	1568	1787	3386	0	1787	3460	0	1770	3548	0
Flt Permitted	0.538			0.261			0.308			0.176		
Satd. Flow (perm)	1022	3574	1568	491	3386	0	579	3460	0	328	3548	0
Satd. Flow (RTOR)			345		149			27			6	
Lane Group Flow (vph)	90	481	345	128	358	0	210	906	0	169	616	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4			2			6		
Total Split (s)	12.0	23.0	23.0	14.0	25.0		18.0	37.0		16.0	35.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5		5.5	6.0		5.5	6.0	
Act Effct Green (s)	23.3	16.5	16.5	27.7	20.6		44.3	33.1		41.5	31.7	
Actuated g/C Ratio	0.26	0.18	0.18	0.31	0.23		0.49	0.37		0.46	0.35	
v/c Ratio	0.28	0.73	0.61	0.47	0.40		0.49	0.70		0.56	0.49	
Control Delay	22.8	41.8	8.8	26.7	18.8		15.6	27.8		25.2	20.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	22.8	41.8	8.8	26.7	18.8		15.6	27.8		25.2	20.8	
LOS	C	D	A	C	B		B	C		C	C	
Approach Delay		27.5			20.9			25.5			21.8	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	34	135	0	49	52		62	233		78	180	
Queue Length 95th (ft)	68	166	62	92	93		101	303		68	232	
Internal Link Dist (ft)		1238			1065			2054			612	
Turn Bay Length (ft)	225		175	150			150			150		
Base Capacity (vph)	326	694	582	278	893		463	1294		324	1254	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.28	0.69	0.59	0.46	0.40		0.45	0.70		0.52	0.49	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 7 (8%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 24.5

Intersection Capacity Utilization 66.8%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

Splits and Phases: 8: SR 135/S. Willow Ave & W. Jackson St

			
Ø1	Ø2 (R)	Ø3	Ø4
16 s	37 s	12 s	25 s
			
Ø5	Ø6 (R)	Ø7	Ø8
18 s	35 s	14 s	23 s

Lanes, Volumes, Timings
9: SR 135/S. Willow Ave & W. Stevens St

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	125	20	35	60	40	20	840	40	60	675	15
Future Volume (vph)	50	125	20	35	60	40	20	840	40	60	675	15
Satd. Flow (prot)	0	1843	0	1787	1785	0	1805	3551	0	1787	3561	0
Flt Permitted		0.988		0.950			0.334			0.204		
Satd. Flow (perm)	0	1843	0	1787	1785	0	635	3551	0	384	3561	0
Satd. Flow (RTOR)		8			27			6			3	
Lane Group Flow (vph)	0	241	0	49	114	0	24	892	0	72	720	0
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	24.0	24.0		16.0	16.0		12.0	38.0		12.0	38.0	
Total Lost Time (s)		5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)		15.6		9.0	9.0		46.5	41.5		49.0	46.4	
Actuated g/C Ratio		0.17		0.10	0.10		0.52	0.46		0.54	0.52	
v/c Ratio		0.74		0.28	0.56		0.06	0.54		0.23	0.39	
Control Delay		47.6		40.9	40.2		5.3	17.3		8.8	15.3	
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		47.6		40.9	40.2		5.3	17.3		8.8	15.3	
LOS		D		D	D		A	B		A	B	
Approach Delay		47.6			40.4			17.0			14.7	
Approach LOS		D			D			B			B	
Queue Length 50th (ft)		125		26	47		2	242		13	164	
Queue Length 95th (ft)		178		47	92		m8	311		m26	m239	
Internal Link Dist (ft)		761			793			608			1346	
Turn Bay Length (ft)				75			100			150		
Base Capacity (vph)		385		208	232		413	1639		312	1837	
Starvation Cap Reductn		0		0	0		0	0		0	0	
Spillback Cap Reductn		0		0	0		0	0		0	0	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.63		0.24	0.49		0.06	0.54		0.23	0.39	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 61 (68%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 21.4

Intersection LOS: C

Intersection Capacity Utilization 60.5%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: SR 135/S. Willow Ave & W. Stevens St

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	38 s	16 s	24 s
			
Ø5	Ø6 (R)		
12 s	38 s		

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

10: SR 135/S. Willow Ave & US 70/W. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	165	505	120	150	305	90	85	715	100	85	625	25
Future Volume (vph)	165	505	120	150	305	90	85	715	100	85	625	25
Satd. Flow (prot)	1787	1800	0	1805	1814	0	1787	3511	0	1685	3317	0
Flt Permitted	0.187			0.130			0.209			0.169		
Satd. Flow (perm)	352	1800	0	247	1814	0	393	3511	0	300	3317	0
Satd. Flow (RTOR)		16			14			17			5	
Lane Group Flow (vph)	220	735	0	181	499	0	97	898	0	115	695	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	15.0	40.0		11.0	36.0		11.0	28.0		11.0	28.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	43.8	34.5		36.2	30.7		28.0	22.5		29.1	24.7	
Actuated g/C Ratio	0.49	0.38		0.40	0.34		0.31	0.25		0.32	0.27	
v/c Ratio	0.69	1.05		0.93	0.79		0.47	1.01		0.64	0.76	
Control Delay	25.4	76.9		69.2	37.1		23.9	52.9		38.2	40.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	25.4	76.9		69.2	37.1		23.9	52.9		38.2	40.1	
LOS	C	E		E	D		C	D		D	D	
Approach Delay		65.0			45.7			50.1			39.8	
Approach LOS		E			D			D			D	
Queue Length 50th (ft)	67	~455		54	248		8	~268		61	211	
Queue Length 95th (ft)	89	#626		#152	283		m47	#377		94	#292	
Internal Link Dist (ft)		2100			700			1346			1053	
Turn Bay Length (ft)	125			125			175			150		
Base Capacity (vph)	323	699		195	629		207	890		181	914	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.68	1.05		0.93	0.79		0.47	1.01		0.64	0.76	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 84 (93%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 51.0

Intersection LOS: D

Intersection Capacity Utilization 88.2%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

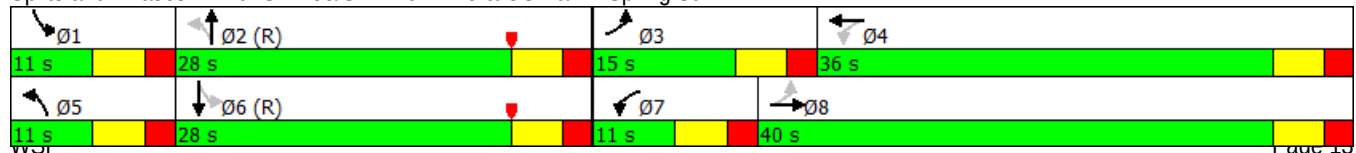
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: SR 135/S. Willow Ave & US 70/W. Spring St



Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	165	175	55	35	90	25	55	815	40	60	680	60
Future Volume (vph)	165	175	55	35	90	25	55	815	40	60	680	60
Satd. Flow (prot)	1805	1819	0	1805	1841	0	1668	3331	0	1620	3286	0
Flt Permitted	0.446			0.595			0.240			0.188		
Satd. Flow (perm)	847	1819	0	1130	1841	0	421	3331	0	321	3286	0
Satd. Flow (RTOR)		20			13			7			14	
Lane Group Flow (vph)	174	263	0	43	149	0	67	929	0	60	811	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	17.0	29.0		13.0	25.0		12.0	36.0		12.0	36.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	28.4	21.4		19.8	13.0		45.6	40.0		45.4	39.8	
Actuated g/C Ratio	0.32	0.24		0.22	0.14		0.51	0.44		0.50	0.44	
v/c Ratio	0.46	0.59		0.14	0.54		0.22	0.63		0.23	0.55	
Control Delay	25.3	33.9		20.2	38.6		6.5	11.3		13.8	22.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	25.3	33.9		20.2	38.6		6.5	11.3		13.8	22.3	
LOS	C	C		C	D		A	B		B	C	
Approach Delay		30.5			34.5			11.0			21.7	
Approach LOS		C			C			B			C	
Queue Length 50th (ft)	73	131		17	73		7	51		15	183	
Queue Length 95th (ft)	m109	m196		31	99		m8	m282		40	275	
Internal Link Dist (ft)		1729			1357			1053			841	
Turn Bay Length (ft)	75						150			50		
Base Capacity (vph)	390	498		313	409		310	1482		261	1462	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.45	0.53		0.14	0.36		0.22	0.63		0.23	0.55	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 31 (34%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 20.0

Intersection LOS: B

Intersection Capacity Utilization 64.7%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	36 s	17 s	25 s
			
Ø5	Ø6 (R)	Ø7	Ø8
12 s	36 s	13 s	29 s

Lanes, Volumes, Timings
12: SR 135/N. Willow Ave & W. 3rd St

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	10	10	10	10	10	10	895	60	25	805	10
Future Volume (vph)	10	10	10	10	10	10	10	895	60	25	805	10
Satd. Flow (prot)	0	1800	0	0	1783	0	0	3326	0	0	3324	0
Flt Permitted		0.982			0.987			0.999			0.998	
Satd. Flow (perm)	0	1800	0	0	1783	0	0	3326	0	0	3324	0
Lane Group Flow (vph)	0	43	0	0	44	0	0	1035	0	0	929	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 50.7%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
12: SR 135/N. Willow Ave & W. 3rd St

2040 Optimized AM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	10	10	10	10	10	10	895	60	25	805	10
Future Vol, veh/h	10	10	10	10	10	10	10	895	60	25	805	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	63	94	83	63	63	75	95	75	83	91	71
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	1	0
Mvmt Flow	16	16	11	12	16	16	13	942	80	30	885	14

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1458	2001	449	1519	1968	511	899	0	0	1022	0	0
Stage 1	952	952	-	1009	1009	-	-	-	-	-	-	-
Stage 2	506	1049	-	510	959	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	92	61	563	83	63	513	764	-	-	687	-	-
Stage 1	283	341	-	261	320	-	-	-	-	-	-	-
Stage 2	522	307	-	519	338	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	63	53	563	57	55	513	764	-	-	687	-	-
Mov Cap-2 Maneuver	63	53	-	57	55	-	-	-	-	-	-	-
Stage 1	272	311	-	251	307	-	-	-	-	-	-	-
Stage 2	461	295	-	441	309	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	105.1	90.8	0.3	0.7
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	764	-	-	74	82	687	-	-
HCM Lane V/C Ratio	0.017	-	-	0.573	0.534	0.044	-	-
HCM Control Delay (s)	9.8	0.2	-	105.1	90.8	10.5	0.4	-
HCM Lane LOS	A	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	2.5	2.3	0.1	-	-

Lanes, Volumes, Timings

13: SR 135/N. Willow Ave & W. 4th St

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	15	20	20	10	15	15	780	110	40	800	15
Future Volume (vph)	10	15	20	20	10	15	15	780	110	40	800	15
Satd. Flow (prot)	0	1755	0	0	1748	0	0	3279	0	0	3313	0
Flt Permitted		0.987			0.976			0.999			0.996	
Satd. Flow (perm)	0	1755	0	0	1748	0	0	3279	0	0	3313	0
Lane Group Flow (vph)	0	59	0	0	57	0	0	1018	0	0	1003	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 63.7%

Analysis Period (min) 15

ICU Level of Service B

HCM 2010 TWSC
13: SR 135/N. Willow Ave & W. 4th St

2040 Optimized AM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 11.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	15	20	20	10	15	15	780	110	40	800	15
Future Vol, veh/h	10	15	20	20	10	15	15	780	110	40	800	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	100	71	71	100	78	63	93	71	50	89	63
Heavy Vehicles, %	0	0	0	0	0	4	0	0	2	0	1	0
Mvmt Flow	16	15	28	28	10	19	24	839	155	80	899	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1543	2112	461	1581	2047	497	923	0	0	994	0	0
Stage 1	1071	1071	-	964	964	-	-	-	-	-	-	-
Stage 2	472	1041	-	617	1083	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.98	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.34	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	80	52	553	75	57	513	748	-	-	704	-	-
Stage 1	239	300	-	278	336	-	-	-	-	-	-	-
Stage 2	547	310	-	449	296	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	49	37	553	38	40	513	748	-	-	704	-	-
Mov Cap-2 Maneuver	49	37	-	38	40	-	-	-	-	-	-	-
Stage 1	221	230	-	257	311	-	-	-	-	-	-	-
Stage 2	472	287	-	305	227	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	140.3	247.2	0.5	1.8
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	748	-	-	76	56	704	-	-
HCM Lane V/C Ratio	0.032	-	-	0.777	1.025	0.114	-	-
HCM Control Delay (s)	10	0.3	-	140.3	247.2	10.8	1.1	-
HCM Lane LOS	A	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	3.8	4.7	0.4	-	-

07/12/2017

Synchro 9 Report
Page 19

Lanes, Volumes, Timings
15: SR 135/N. Willow Ave & W. 9th St

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	30	85	0	0	0	30	560	10	20	805	65
Future Volume (vph)	60	30	85	0	0	0	30	560	10	20	805	65
Satd. Flow (prot)	0	1701	0	0	1900	0	0	3346	0	0	3298	0
Flt Permitted		0.982						0.997			0.999	
Satd. Flow (perm)	0	1701	0	0	1900	0	0	3346	0	0	3298	0
Lane Group Flow (vph)	0	205	0	0	0	0	0	658	0	0	1027	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 55.6%

Analysis Period (min) 15

ICU Level of Service B

Intersection

Int Delay, s/veh 29

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	60	30	85	0	0	0	30	560	10	20	805	65
Future Vol, veh/h	60	30	85	0	0	0	30	560	10	20	805	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	100	85	100	100	63	75	93	63	100	86	92
Heavy Vehicles, %	0	0	5	0	0	0	0	0	0	0	1	2
Mvmt Flow	75	30	100	0	0	0	40	602	16	20	936	71

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1392	1709	503	1213	1737	309	1007	0	0	618	0	0
Stage 1	1011	1011	-	690	690	-	-	-	-	-	-	-
Stage 2	381	698	-	523	1047	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	7	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.35	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	103	92	506	140	88	693	696	-	-	972	-	-
Stage 1	260	320	-	406	449	-	-	-	-	-	-	-
Stage 2	619	445	-	510	308	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	93	80	506	72	76	693	696	-	-	972	-	-
Mov Cap-2 Maneuver	93	80	-	72	76	-	-	-	-	-	-	-
Stage 1	237	305	-	370	409	-	-	-	-	-	-	-
Stage 2	565	406	-	351	293	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	262.4	0	1	0.4
HCM LOS	F	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	696	-	-	149	-	972	-
HCM Lane V/C Ratio	0.057	-	-	1.376	-	0.021	-
HCM Control Delay (s)	10.5	0.4	-	262.4	0	8.8	0.2
HCM Lane LOS	B	A	-	F	A	A	A
HCM 95th %tile Q(veh)	0.2	-	-	12.9	-	0.1	-

Lanes, Volumes, Timings
16: SR 135/N. Willow Ave & University Dr

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	50	15	35	55	15	20	440	165	75	830	25
Future Volume (vph)	20	50	15	35	55	15	20	440	165	75	830	25
Satd. Flow (prot)	1736	1692	0	1787	1658	0	0	3235	0	0	3301	0
Flt Permitted	0.678			0.551				0.906			0.756	
Satd. Flow (perm)	1239	1692	0	1037	1658	0	0	2934	0	0	2511	0
Satd. Flow (RTOR)		14			12			69			6	
Lane Group Flow (vph)	26	72	0	53	123	0	0	680	0	0	1051	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	3	8		7	4			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	15.0	30.0		15.0	30.0		55.0	55.0		55.0	55.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5			5.5	
Act Effct Green (s)	15.9	10.3		19.7	16.1			67.6			67.6	
Actuated g/C Ratio	0.16	0.10		0.20	0.16			0.68			0.68	
v/c Ratio	0.11	0.39		0.20	0.44			0.34			0.62	
Control Delay	28.4	39.2		29.8	39.0			6.0			9.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	28.4	39.2		29.8	39.0			6.0			9.4	
LOS	C	D		C	D			A			A	
Approach Delay		36.3			36.2			6.0			9.4	
Approach LOS		D			D			A			A	
Queue Length 50th (ft)	13	36		27	59			64			52	
Queue Length 95th (ft)	27	73		38	68			91			342	
Internal Link Dist (ft)		789			874			862			1102	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	275	425		282	415			2005			1699	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.09	0.17		0.19	0.30			0.34			0.62	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 68 (68%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 11.9

Intersection Capacity Utilization 66.3%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service C

Splits and Phases: 16: SR 135/N. Willow Ave & University Dr

 Ø2 (R)	 Ø3	 Ø4
55 s	15 s	30 s
 Ø6 (R)	 Ø7	 Ø8
55 s	15 s	30 s

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

17: SR 135/N. Willow Ave & W. 12th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	505	335	250	170	40	70	195	215	165	435	55
Future Volume (vph)	115	505	335	250	170	40	70	195	215	165	435	55
Satd. Flow (prot)	1752	1845	1615	1770	3478	0	1685	3063	0	1668	3312	0
Flt Permitted	0.604			0.104			0.450			0.204		
Satd. Flow (perm)	1114	1845	1615	194	3478	0	798	3063	0	358	3312	0
Satd. Flow (RTOR)			283		31			236			15	
Lane Group Flow (vph)	129	587	368	272	237	0	73	437	0	239	541	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8			6			2		
Total Split (s)	12.0	39.0	39.0	12.0	39.0		12.0	27.0		22.0	37.0	
Total Lost Time (s)	5.5	6.0	6.0	5.5	6.0		5.5	6.5		5.5	6.5	
Act Effct Green (s)	41.9	33.0	33.0	51.7	39.1		21.5	14.1		35.5	24.9	
Actuated g/C Ratio	0.42	0.33	0.33	0.52	0.39		0.22	0.14		0.36	0.25	
v/c Ratio	0.25	0.97	0.51	0.83	0.17		0.32	0.69		0.74	0.65	
Control Delay	14.7	63.3	9.4	47.4	18.8		22.6	23.1		38.2	36.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.7	63.3	9.4	47.4	18.8		22.6	23.1		38.2	36.8	
LOS	B	E	A	D	B		C	C		D	D	
Approach Delay		39.2			34.1			23.0			37.2	
Approach LOS		D			C			C			D	
Queue Length 50th (ft)	39	365	38	115	44		25	83		114	164	
Queue Length 95th (ft)	79	#541	117	#343	77		46	136		117	204	
Internal Link Dist (ft)		1178			1081			1102			1094	
Turn Bay Length (ft)	100			220			100			220		
Base Capacity (vph)	520	608	722	329	1377		230	815		343	1020	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.25	0.97	0.51	0.83	0.17		0.32	0.54		0.70	0.53	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 3 (3%), Referenced to phase 2:SBTL and 6:NBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 34.9

Intersection LOS: C

Intersection Capacity Utilization 81.5%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 17: SR 135/N. Willow Ave & W. 12th St

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	37 s	12 s	39 s
			
Ø5	Ø6 (R)	Ø7	Ø8
22 s	27 s	12 s	39 s

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	185	10	15	10	0	40	20	1170	10	25	735	120
Future Volume (vph)	185	10	15	10	0	40	20	1170	10	25	735	120
Satd. Flow (prot)	1736	1061	0	1805	1615	0	1805	3539	1615	1687	3505	1599
Flt Permitted	0.400			0.720			0.282			0.099		
Satd. Flow (perm)	731	1061	0	1368	1615	0	536	3539	1615	176	3505	1599
Satd. Flow (RTOR)		16			213			213				213
Lane Group Flow (vph)	195	56	0	16	58	0	32	1427	10	25	817	152
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2		2	6		6
Total Split (s)	20.0	20.0		12.0	12.0		12.0	56.0	56.0	12.0	56.0	56.0
Total Lost Time (s)	5.5	6.0		5.5	6.0		5.5	6.0	6.0	5.5	6.0	6.0
Act Effct Green (s)	22.4	17.1		11.4	6.0		64.4	61.3	61.3	63.2	58.9	58.9
Actuated g/C Ratio	0.22	0.17		0.11	0.06		0.64	0.61	0.61	0.63	0.59	0.59
v/c Ratio	0.67	0.29		0.09	0.20		0.08	0.66	0.01	0.12	0.40	0.15
Control Delay	44.3	32.6		29.5	1.5		7.6	16.9	0.0	4.1	6.0	0.3
Queue Delay	1.7	0.0		0.0	0.2		0.0	0.5	0.0	0.0	0.1	0.0
Total Delay	46.0	32.6		29.5	1.7		7.6	17.3	0.0	4.1	6.1	0.3
LOS	D	C		C	A		A	B	A	A	A	A
Approach Delay		43.0			7.7			17.0			5.2	
Approach LOS		D			A			B			A	
Queue Length 50th (ft)	104	20		8	0		7	273	0	2	50	0
Queue Length 95th (ft)	170	10		17	0		12	407	0	m4	50	0
Internal Link Dist (ft)		573			734			200			263	
Turn Bay Length (ft)	200			25			175		150	100		50
Base Capacity (vph)	316	205		188	297		427	2168	1072	209	2065	1030
Starvation Cap Reductn	0	0		0	0		0	0	0	0	207	0
Spillback Cap Reductn	38	0		0	53		0	309	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.27		0.09	0.24		0.07	0.77	0.01	0.12	0.44	0.15

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 88 (88%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 14.9

Intersection LOS: B

Intersection Capacity Utilization 59.3%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	56 s	20 s	12 s
			
Ø5	Ø6 (R)	Ø7	Ø8
12 s	56 s	12 s	20 s

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	380	0	190	0	0	0	0	1240	130	130	690	0
Future Volume (vph)	380	0	190	0	0	0	0	1240	130	130	690	0
Satd. Flow (prot)	1736	0	1538	0	0	0	0	3574	1599	1787	3539	0
Flt Permitted	0.950									0.094		
Satd. Flow (perm)	1736	0	1538	0	0	0	0	3574	1599	177	3539	0
Satd. Flow (RTOR)			232						148			
Lane Group Flow (vph)	432	0	232	0	0	0	0	1442	163	157	758	0
Turn Type	Prot		Perm					NA	Perm	pm+pt	NA	
Protected Phases	1							3		2	3	
Permitted Phases			1						3	3		
Total Split (s)	37.0		37.0					48.0	48.0	15.0	48.0	
Total Lost Time (s)	6.0		6.0					5.5	5.5	5.5	5.5	
Act Effct Green (s)	28.3		28.3					42.5	42.5	54.7	42.5	
Actuated g/C Ratio	0.28		0.28					0.42	0.42	0.55	0.42	
v/c Ratio	0.88		0.39					0.95	0.21	0.54	0.50	
Control Delay	54.4		5.5					36.3	5.4	36.2	20.5	
Queue Delay	0.0		0.0					13.4	0.0	0.0	0.0	
Total Delay	54.4		5.5					49.8	5.4	36.2	20.5	
LOS	D		A					D	A	D	C	
Approach Delay		37.3						45.3			23.2	
Approach LOS		D						D			C	
Queue Length 50th (ft)	254		0					468	4	80	88	
Queue Length 95th (ft)	#389		37					#428	32	136	212	
Internal Link Dist (ft)		458			312			263			407	
Turn Bay Length (ft)			200							250		
Base Capacity (vph)	538		636					1518	764	293	1504	
Starvation Cap Reductn	0		0					106	0	0	0	
Spillback Cap Reductn	0		0					3	0	0	0	
Storage Cap Reductn	0		0					0	0	0	0	
Reduced v/c Ratio	0.80		0.36					1.02	0.21	0.54	0.50	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 73 (73%), Referenced to phase 3:NBSB, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 37.3

Intersection LOS: D

Intersection Capacity Utilization 79.5%

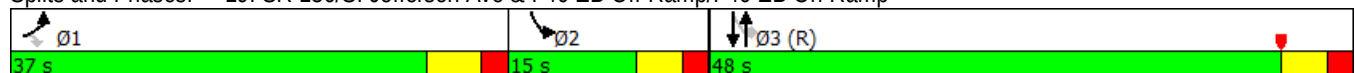
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp



Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations						 		 			 	
Traffic Volume (vph)	0	0	0	155	0	450	115	1505	0	0	670	160
Future Volume (vph)	0	0	0	155	0	450	115	1505	0	0	670	160
Satd. Flow (prot)	0	0	0	1656	0	2707	1719	3574	0	0	3574	1599
Flt Permitted				0.950			0.309					
Satd. Flow (perm)	0	0	0	1656	0	2707	559	3574	0	0	3574	1599
Satd. Flow (RTOR)												176
Lane Group Flow (vph)	0	0	0	174	0	549	134	1601	0	0	713	176
Turn Type				Prot		Perm	pm+pt	NA			NA	Perm
Protected Phases				1			2	3			3	
Permitted Phases						1	3	2				3
Total Split (s)				35.0		35.0	20.0	45.0			45.0	45.0
Total Lost Time (s)				6.0		6.0	5.5	5.5			5.5	5.5
Act Effct Green (s)				24.9		24.9	58.1	63.6			46.1	46.1
Actuated g/C Ratio				0.25		0.25	0.58	0.64			0.46	0.46
v/c Ratio				0.42		0.81	0.29	0.70			0.43	0.21
Control Delay				34.0		45.4	7.0	7.6			9.7	0.9
Queue Delay				0.0		6.2	0.0	2.1			0.2	0.4
Total Delay				34.0		51.6	7.0	9.6			9.9	1.3
LOS				C		D	A	A			A	A
Approach Delay					47.3			9.4			8.2	
Approach LOS					D			A			A	
Queue Length 50th (ft)				93		186	21	133			65	0
Queue Length 95th (ft)				146		214	m23	m143			77	3
Internal Link Dist (ft)		382			483			407			133	
Turn Bay Length (ft)				275		275	250					
Base Capacity (vph)				480		785	506	2271			1646	831
Starvation Cap Reductn				0		0	0	327			269	320
Spillback Cap Reductn				0		183	0	495			0	0
Storage Cap Reductn				0		0	0	0			0	0
Reduced v/c Ratio				0.36		0.91	0.26	0.90			0.52	0.34

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 87 (87%), Referenced to phase 3:NBSB, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 17.3

Intersection LOS: B

Intersection Capacity Utilization 79.5%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp



Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	15	210	35	10	10	295	1605	55	15	620	80
Future Volume (vph)	60	15	210	35	10	10	295	1605	55	15	620	80
Satd. Flow (prot)	0	1797	1599	1770	1763	0	1787	3539	1568	1805	5057	0
Flt Permitted		0.961		0.950			0.267			0.096		
Satd. Flow (perm)	0	1797	1599	1770	1763	0	502	3539	1568	182	5057	0
Satd. Flow (RTOR)			244		13				147		32	
Lane Group Flow (vph)	0	103	244	37	27	0	335	1707	59	36	774	0
Turn Type	Split	NA	Perm	Split	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			3				2		2	6		
Total Split (s)	17.0	17.0	17.0	19.0	19.0		26.0	48.0	48.0	16.0	38.0	
Total Lost Time (s)		5.5	5.5	5.5	5.5		5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)		11.5	11.5	12.0	12.0		63.3	54.2	54.2	52.9	42.9	
Actuated g/C Ratio		0.12	0.12	0.12	0.12		0.63	0.54	0.54	0.53	0.43	
v/c Ratio		0.50	0.61	0.17	0.12		0.66	0.89	0.06	0.14	0.35	
Control Delay		50.7	12.7	41.9	27.4		12.5	22.9	0.1	15.9	28.9	
Queue Delay		0.0	0.0	0.0	0.0		0.9	14.8	0.0	0.0	0.0	
Total Delay		50.7	12.7	41.9	27.4		13.4	37.7	0.1	15.9	28.9	
LOS		D	B	D	C		B	D	A	B	C	
Approach Delay		24.0			35.7			32.8			28.3	
Approach LOS		C			D			C			C	
Queue Length 50th (ft)		63	0	22	8		61	~650	0	11	149	
Queue Length 95th (ft)		95	60	52	25		119	#780	m0	14	216	
Internal Link Dist (ft)		530			587			133			582	
Turn Bay Length (ft)			100	25			50			100		
Base Capacity (vph)		206	399	238	249		583	1917	917	267	2188	
Starvation Cap Reductn		0	0	0	0		79	241	0	0	0	
Spillback Cap Reductn		0	0	0	0		0	0	0	0	0	
Storage Cap Reductn		0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio		0.50	0.61	0.16	0.11		0.66	1.02	0.06	0.13	0.35	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 30.8

Intersection LOS: C

Intersection Capacity Utilization 77.2%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

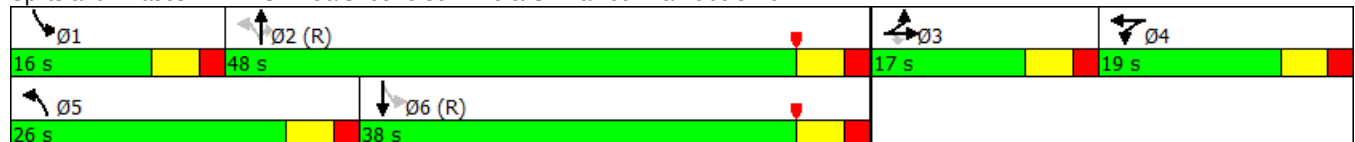
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd



Lanes, Volumes, Timings

22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	280	140	190	295	80	225	930	420	65	335	105
Future Volume (vph)	145	280	140	190	295	80	225	930	420	65	335	105
Satd. Flow (prot)	1770	1845	1599	1805	3502	0	1770	3539	1615	1805	3454	0
Flt Permitted	0.359			0.315			0.360			0.184		
Satd. Flow (perm)	669	1845	1599	598	3502	0	671	3539	1615	350	3454	0
Satd. Flow (RTOR)			207		30				447		40	
Lane Group Flow (vph)	165	286	147	198	429	0	281	969	447	76	451	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4			2		2	6		
Total Split (s)	16.0	32.0	32.0	16.0	32.0		23.0	36.0	36.0	16.0	29.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5		5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)	31.0	20.6	20.6	31.0	20.6		51.6	40.1	40.1	42.7	32.7	
Actuated g/C Ratio	0.31	0.21	0.21	0.31	0.21		0.52	0.40	0.40	0.43	0.33	
v/c Ratio	0.51	0.75	0.30	0.64	0.58		0.56	0.68	0.49	0.26	0.39	
Control Delay	27.2	49.6	2.8	31.9	35.6		8.1	10.4	3.3	11.6	24.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	27.2	49.6	2.8	31.9	35.6		8.1	10.4	3.3	11.6	24.0	
LOS	C	D	A	C	D		A	B	A	B	C	
Approach Delay		31.9			34.5			8.1			22.2	
Approach LOS		C			C			A			C	
Queue Length 50th (ft)	72	172	0	89	121		10	74	9	15	137	
Queue Length 95th (ft)	108	246	16	130	149		m12	m250	m56	m15	188	
Internal Link Dist (ft)		1125			846			582			1693	
Turn Bay Length (ft)	175			125			125			125		
Base Capacity (vph)	323	488	575	312	950		544	1417	914	303	1155	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.51	0.59	0.26	0.63	0.45		0.52	0.68	0.49	0.25	0.39	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow, Master Intersection

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 19.2

Intersection LOS: B

Intersection Capacity Utilization 77.6%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St

					
Ø1	Ø2 (R)		Ø3	Ø4	
16 s	36 s		16 s	32 s	
					
Ø5	Ø6 (R)		Ø7	Ø8	
23 s	29 s		16 s	32 s	

Lanes, Volumes, Timings
23: SR 136/S. Jefferson Ave & E. Veterans Dr

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	185	55	60	180	140	45	945	75	65	420	30
Future Volume (vph)	40	185	55	60	180	140	45	945	75	65	420	30
Satd. Flow (prot)	1805	1820	0	1752	1724	0	1805	3538	0	1752	3563	0
Flt Permitted	0.202			0.335			0.448			0.105		
Satd. Flow (perm)	384	1820	0	618	1724	0	851	3538	0	194	3563	0
Satd. Flow (RTOR)		14			40			9			11	
Lane Group Flow (vph)	48	291	0	65	406	0	47	1087	0	75	481	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	18.0	29.0		17.0	28.0		18.0	36.0		18.0	36.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	32.3	22.7		32.0	25.4		48.7	39.1		49.8	42.6	
Actuated g/C Ratio	0.32	0.23		0.32	0.25		0.49	0.39		0.50	0.43	
v/c Ratio	0.16	0.69		0.20	0.87		0.09	0.78		0.27	0.32	
Control Delay	20.2	42.9		20.9	53.3		6.9	19.8		20.7	13.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	20.2	42.9		20.9	53.3		6.9	19.8		20.7	13.1	
LOS	C	D		C	D		A	B		C	B	
Approach Delay		39.7			48.8			19.2			14.1	
Approach LOS		D			D			B			B	
Queue Length 50th (ft)	18	160		25	234		7	314		10	124	
Queue Length 95th (ft)	38	225		53	#365		m10	#486		57	47	
Internal Link Dist (ft)		1014			884			1693			283	
Turn Bay Length (ft)	150			150			150			125		
Base Capacity (vph)	303	445		330	467		537	1388		292	1524	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.16	0.65		0.20	0.87		0.09	0.78		0.26	0.32	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 41 (41%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 26.4

Intersection LOS: C

Intersection Capacity Utilization 84.9%

ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 23: SR 136/S. Jefferson Ave & E. Veterans Dr

			
Ø1	Ø2 (R)	Ø3	Ø4
18 s	36 s	18 s	28 s
			
Ø5	Ø6 (R)	Ø7	Ø8
18 s	36 s	17 s	29 s

AM Peak
WSP

Synchro 9 Report
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Lanes, Volumes, Timings

24: SR 136/S. Jefferson Ave & Walmart Driveway

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	35	0	15	10	1055	50	30	475	10
Future Volume (vph)	0	0	0	35	0	15	10	1055	50	30	475	10
Satd. Flow (prot)	1900	1900	0	1805	1615	0	1805	3546	0	1787	3452	0
Flt Permitted				0.950			0.466			0.202		
Satd. Flow (perm)	1900	1900	0	1805	1615	0	885	3546	0	380	3452	0
Satd. Flow (RTOR)					496			5			4	
Lane Group Flow (vph)	0	0	0	42	16	0	10	1129	0	33	505	0
Turn Type	pm+pt			pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	18.0	28.0		18.0	28.0		18.0	36.0		18.0	36.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)				12.0	12.0		80.7	75.7		82.9	82.7	
Actuated g/C Ratio				0.12	0.12		0.81	0.76		0.83	0.83	
v/c Ratio				0.19	0.03		0.01	0.42		0.07	0.18	
Control Delay				42.2	0.1		0.4	2.4		1.1	1.1	
Queue Delay				0.0	0.0		0.0	0.1		0.0	0.0	
Total Delay				42.2	0.1		0.4	2.5		1.1	1.1	
LOS				D	A		A	A		A	A	
Approach Delay					30.6			2.5			1.1	
Approach LOS					C			A			A	
Queue Length 50th (ft)				25	0		0	66		0	0	
Queue Length 95th (ft)				53	0		m1	m78		1	6	
Internal Link Dist (ft)		175			382			47			1774	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)				225	747		832	2685		491	2855	
Starvation Cap Reductn				0	0		0	400		0	0	
Spillback Cap Reductn				0	0		0	0		0	0	
Storage Cap Reductn				0	0		0	0		0	0	
Reduced v/c Ratio				0.19	0.02		0.01	0.49		0.07	0.18	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 61 (61%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.42

Intersection Signal Delay: 3.0

Intersection LOS: A

Intersection Capacity Utilization 49.9%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 24: SR 136/S. Jefferson Ave & Walmart Driveway

			
Ø1	Ø2 (R)	Ø3	Ø4
18 s	36 s	18 s	28 s
			
Ø5	Ø6 (R)	Ø7	Ø8
18 s	36 s	18 s	28 s

Lanes, Volumes, Timings
25: SR 136/S. Jefferson Ave & Commerce Ave

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	10	10	20	10	20	20	960	75	30	555	15
Future Volume (vph)	10	10	10	20	10	20	20	960	75	30	555	15
Satd. Flow (prot)	1805	1773	0	1752	1676	0	1805	3556	0	1719	3596	0
Flt Permitted	0.726			0.546			0.382			0.207		
Satd. Flow (perm)	1379	1773	0	1007	1676	0	726	3556	0	375	3596	0
Satd. Flow (RTOR)		13			32			17			4	
Lane Group Flow (vph)	15	29	0	43	48	0	27	1096	0	48	655	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	13.0	14.0		14.0	15.0		13.0	58.0		14.0	59.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	10.9	6.8		14.1	10.4		72.3	69.6		73.0	69.9	
Actuated g/C Ratio	0.11	0.07		0.14	0.10		0.72	0.70		0.73	0.70	
v/c Ratio	0.08	0.22		0.21	0.24		0.05	0.44		0.13	0.26	
Control Delay	32.4	33.1		35.4	23.1		0.9	2.3		5.9	10.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	32.4	33.1		35.4	23.1		0.9	2.3		5.9	10.4	
LOS	C	C		D	C		A	A		A	B	
Approach Delay		32.9			28.9			2.3			10.1	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)	8	10		23	8		1	14		13	128	
Queue Length 95th (ft)	18	24		25	24		1	81		23	201	
Internal Link Dist (ft)		193			738			1774			1034	
Turn Bay Length (ft)				100			125			125		
Base Capacity (vph)	196	162		216	226		610	2483		391	2521	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.08	0.18		0.20	0.21		0.04	0.44		0.12	0.26	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 17 (17%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.44

Intersection Signal Delay: 7.0

Intersection LOS: A

Intersection Capacity Utilization 45.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 25: SR 136/S. Jefferson Ave & Commerce Ave

			
Ø1	Ø2 (R)	Ø3	Ø4
14 s	58 s	13 s	15 s
			
Ø5	Ø6 (R)	Ø7	Ø8
13 s	59 s	14 s	14 s

Lanes, Volumes, Timings
26: SR 136/S. Jefferson Ave & E. Jackson St

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	150	230	160	100	10	185	520	225	15	295	20
Future Volume (vph)	40	150	230	160	100	10	185	520	225	15	295	20
Satd. Flow (prot)	1787	1863	1599	3502	1857	0	1805	3610	1599	1685	3339	0
Flt Permitted	0.671			0.950			0.459			0.423		
Satd. Flow (perm)	1262	1863	1599	3502	1857	0	872	3610	1599	750	3339	0
Satd. Flow (RTOR)			264		5				288		6	
Lane Group Flow (vph)	49	160	264	176	135	0	210	605	288	22	357	0
Turn Type	pm+pt	NA	Perm	Prot	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8				2		2	6		
Total Split (s)	13.0	29.0	29.0	18.0	34.0		22.0	40.0	40.0	13.0	31.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5		5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)	21.3	14.2	14.2	10.2	19.7		59.1	54.1	54.1	48.6	42.3	
Actuated g/C Ratio	0.21	0.14	0.14	0.10	0.20		0.59	0.54	0.54	0.49	0.42	
v/c Ratio	0.16	0.61	0.58	0.49	0.36		0.34	0.31	0.29	0.05	0.25	
Control Delay	24.5	49.2	10.1	47.0	36.1		3.9	5.0	1.6	4.4	13.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	24.5	49.2	10.1	47.0	36.1		3.9	5.0	1.6	4.4	13.9	
LOS	C	D	B	D	D		A	A	A	A	B	
Approach Delay		24.8			42.2			3.9			13.4	
Approach LOS		C			D			A			B	
Queue Length 50th (ft)	22	97	0	55	75		10	15	0	4	88	
Queue Length 95th (ft)	40	154	58	87	108		15	81	20	4	142	
Internal Link Dist (ft)		578			301			1034			1031	
Turn Bay Length (ft)	100			175			150		500	180		
Base Capacity (vph)	313	437	577	437	532		668	1953	997	443	1415	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.16	0.37	0.46	0.40	0.25		0.31	0.31	0.29	0.05	0.25	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 15.1

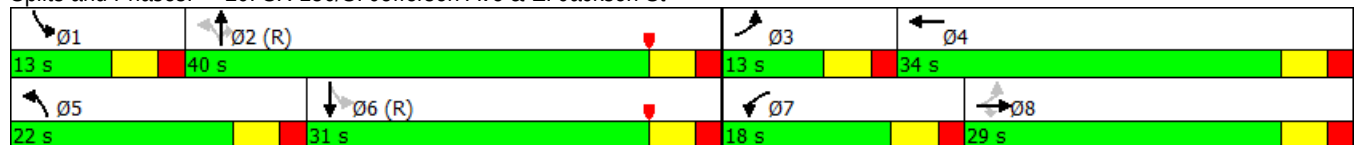
Intersection Capacity Utilization 50.6%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 26: SR 136/S. Jefferson Ave & E. Jackson St



Lanes, Volumes, Timings
27: SR 136/S. Jefferson Ave & Foutch Dr

2040 Optimized AM Timing Plan

07/12/2017

							
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations							
Traffic Volume (vph)	40	10	10	500	320	0	
Future Volume (vph)	40	10	10	500	320	0	
Satd. Flow (prot)	1775	0	1452	3369	3369	0	
Flt Permitted	0.962		0.541				
Satd. Flow (perm)	1775	0	827	3369	3369	0	
Satd. Flow (RTOR)	11						
Lane Group Flow (vph)	65	0	12	532	352	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	3			1	1 2		2
Permitted Phases			1				
Total Split (s)	20.0		41.0	41.0			39.0
Total Lost Time (s)	6.0		6.0	6.0			
Act Effct Green (s)	14.0		31.6	31.6	74.0		
Actuated g/C Ratio	0.14		0.32	0.32	0.74		
v/c Ratio	0.25		0.05	0.50	0.14		
Control Delay	35.6		17.0	27.2	0.4		
Queue Delay	0.0		0.0	0.0	0.2		
Total Delay	35.6		17.0	27.2	0.7		
LOS	D		B	C	A		
Approach Delay	35.6			27.0	0.7		
Approach LOS	D			C	A		
Queue Length 50th (ft)	31		6	177	2		
Queue Length 95th (ft)	60		20	235	2		
Internal Link Dist (ft)	70			1031	110		
Turn Bay Length (ft)			125				
Base Capacity (vph)	257		289	1179	2480		
Starvation Cap Reductn	0		0	0	1457		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.25		0.04	0.45	0.34		

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 15 (15%), Referenced to phase 2:SBT and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 17.9

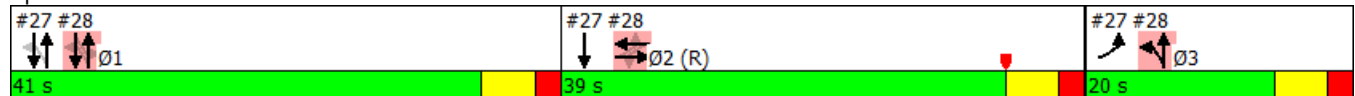
Intersection Capacity Utilization 28.8%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 27: SR 136/S. Jefferson Ave & Foutch Dr



Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

28: SR 136/S. Jefferson Ave & E. Stevens St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	125	30	35	100	20	20	510	20	10	310	10
Future Volume (vph)	30	125	30	35	100	20	20	510	20	10	310	10
Satd. Flow (prot)	0	1836	0	0	1845	0	0	3338	0	0	3346	0
Flt Permitted		0.894			0.903			0.930			0.915	
Satd. Flow (perm)	0	1660	0	0	1683	0	0	3110	0	0	3068	0
Satd. Flow (RTOR)		11			9			7			4	
Lane Group Flow (vph)	0	219	0	0	195	0	0	611	0	0	372	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		2			2		3	1 3			1	
Permitted Phases	2			2			1 3			1		
Total Split (s)	39.0	39.0		39.0	39.0		20.0			41.0	41.0	
Total Lost Time (s)		6.0			6.0						6.0	
Act Effct Green (s)		36.4			36.4			45.6			31.6	
Actuated g/C Ratio		0.36			0.36			0.46			0.32	
v/c Ratio		0.36			0.32			0.42			0.38	
Control Delay		25.4			24.8			2.5			19.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		25.4			24.8			2.5			19.6	
LOS		C			C			A			B	
Approach Delay		25.4			24.8			2.5			19.6	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)		101			89			10			58	
Queue Length 95th (ft)		168			125			6			m75	
Internal Link Dist (ft)		321			386			1			1911	
Turn Bay Length (ft)												
Base Capacity (vph)		611			618			1559			1076	
Starvation Cap Reductn		0			0			9			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.36			0.32			0.39			0.35	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 15 (15%), Referenced to phase 2: SBT and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 13.8

Intersection LOS: B

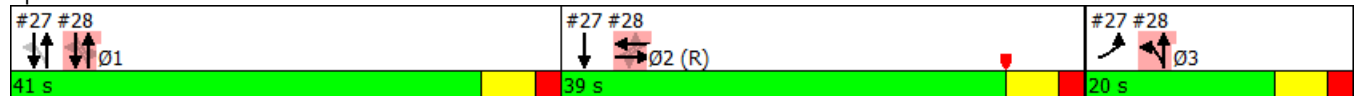
Intersection Capacity Utilization 52.1%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 28: SR 136/S. Jefferson Ave & E. Stevens St



Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	455	75	120	470	15	90	245	65	20	170	25
Future Volume (vph)	25	455	75	120	470	15	90	245	65	20	170	25
Satd. Flow (prot)	1805	1829	0	1752	1669	0	1668	1706	0	1685	1551	0
Flt Permitted	0.322			0.137			0.407			0.304		
Satd. Flow (perm)	612	1829	0	253	1669	0	715	1706	0	539	1551	0
Satd. Flow (RTOR)		9			2			16			7	
Lane Group Flow (vph)	25	617	0	150	534	0	102	344	0	28	236	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	14.0	42.0		14.0	42.0		14.0	30.0		14.0	30.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	50.3	42.3		54.2	50.8		29.8	24.7		27.9	21.5	
Actuated g/C Ratio	0.50	0.42		0.54	0.51		0.30	0.25		0.28	0.22	
v/c Ratio	0.06	0.79		0.57	0.63		0.35	0.80		0.12	0.70	
Control Delay	12.7	27.4		33.2	15.7		11.9	30.6		16.2	37.2	
Queue Delay	0.0	2.3		0.6	1.2		0.0	0.0		0.0	2.1	
Total Delay	12.7	29.7		33.8	16.9		11.9	30.6		16.2	39.3	
LOS	B	C		C	B		B	C		B	D	
Approach Delay		29.0			20.6			26.3			36.8	
Approach LOS		C			C			C			D	
Queue Length 50th (ft)	3	315		55	91		13	45		8	121	
Queue Length 95th (ft)	m13	#518		m99	m#478		21	#327		20	146	
Internal Link Dist (ft)		356			188			1911			200	
Turn Bay Length (ft)	200			65						65		
Base Capacity (vph)	412	778		264	849		294	458		250	385	
Starvation Cap Reductn	0	20		16	142		0	0		0	60	
Spillback Cap Reductn	0	73		0	2		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.06	0.88		0.60	0.76		0.35	0.75		0.11	0.73	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 73 (73%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 26.6

Intersection LOS: C

Intersection Capacity Utilization 77.0%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
14 s	42 s	14 s	30 s
			
Ø5	Ø6	Ø7	Ø8
14 s	42 s	14 s	30 s

AM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	160	35	90	390	25	60	175	50	15	85	15
Future Volume (vph)	15	160	35	90	390	25	60	175	50	15	85	15
Satd. Flow (prot)	1805	1829	0	1805	1867	0	1668	1713	0	1685	1740	0
Flt Permitted	0.398			0.524			0.553			0.503		
Satd. Flow (perm)	756	1829	0	996	1867	0	971	1713	0	892	1740	0
Satd. Flow (RTOR)		14			3			13			7	
Lane Group Flow (vph)	24	224	0	113	489	0	74	247	0	19	117	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	14.0	44.0		14.0	44.0		14.0	28.0		14.0	28.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	55.9	47.9		60.0	56.4		25.4	21.8		22.1	15.7	
Actuated g/C Ratio	0.56	0.48		0.60	0.56		0.25	0.22		0.22	0.16	
v/c Ratio	0.05	0.25		0.17	0.46		0.24	0.64		0.07	0.42	
Control Delay	8.3	13.1		9.5	13.7		27.1	40.3		23.1	39.1	
Queue Delay	0.0	0.0		0.0	6.6		0.0	6.5		0.0	0.0	
Total Delay	8.3	13.1		9.5	20.2		27.1	46.8		23.1	39.2	
LOS	A	B		A	C		C	D		C	D	
Approach Delay		12.7			18.2			42.2			36.9	
Approach LOS		B			B			D			D	
Queue Length 50th (ft)	5	59		37	172		48	160		9	67	
Queue Length 95th (ft)	10	92		m21	m99		m17	m51		20	99	
Internal Link Dist (ft)		353			196			200			580	
Turn Bay Length (ft)	200			65			65			50		
Base Capacity (vph)	515	883		667	1054		308	422		268	396	
Starvation Cap Reductn	0	0		0	505		0	126		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	3	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.05	0.25		0.17	0.89		0.24	0.83		0.07	0.30	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 80 (80%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 25.0

Intersection LOS: C

Intersection Capacity Utilization 54.9%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
14 s	44 s	14 s	28 s
			
Ø5	Ø6 (R)	Ø7	Ø8
14 s	44 s	14 s	28 s

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	430	40	150	490	30	30	320	80	80	310	65
Future Volume (vph)	90	430	40	150	490	30	30	320	80	80	310	65
Satd. Flow (prot)	1787	1843	0	1752	1863	1615	1745	1783	1546	1728	1782	0
Flt Permitted	0.242			0.202			0.220			0.279		
Satd. Flow (perm)	455	1843	0	373	1863	1615	404	1783	1546	507	1782	0
Satd. Flow (RTOR)		5				147			147		11	
Lane Group Flow (vph)	99	508	0	185	516	41	48	352	107	101	432	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2		2	4		4	8		
Total Split (s)	14.0	38.0		14.0	38.0	38.0	14.0	34.0	34.0	14.0	34.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)	46.3	38.0		48.3	41.1	41.1	32.2	25.7	25.7	33.7	28.6	
Actuated g/C Ratio	0.46	0.38		0.48	0.41	0.41	0.32	0.26	0.26	0.34	0.29	
v/c Ratio	0.31	0.72		0.62	0.67	0.05	0.20	0.77	0.21	0.37	0.84	
Control Delay	10.8	19.8		17.4	24.8	0.8	19.8	46.2	2.9	19.3	35.0	
Queue Delay	0.1	3.1		0.0	0.2	0.0	0.0	3.4	0.0	0.0	3.2	
Total Delay	10.9	22.9		17.4	25.0	0.8	19.8	49.6	2.9	19.3	38.2	
LOS	B	C		B	C	A	B	D	A	B	D	
Approach Delay		21.0			21.8			36.9			34.6	
Approach LOS		C			C			D			C	
Queue Length 50th (ft)	17	88		34	342	0	18	199	0	13	259	
Queue Length 95th (ft)	m28	m#436		m53	m#456	m0	27	301	5	m26	#140	
Internal Link Dist (ft)		188			1101			264			195	
Turn Bay Length (ft)	60			100		100	100			50		
Base Capacity (vph)	324	703		302	765	750	245	508	545	274	543	
Starvation Cap Reductn	0	111		0	0	0	0	0	0	0	50	
Spillback Cap Reductn	16	0		0	27	73	1	84	0	0	5	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.32	0.86		0.61	0.70	0.06	0.20	0.83	0.20	0.37	0.88	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 73 (73%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 27.7

Intersection LOS: C

Intersection Capacity Utilization 78.6%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
14 s	38 s	14 s	34 s
			
Ø5	Ø6	Ø7	Ø8
14 s	38 s	14 s	34 s

AM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	130	30	30	365	195	25	380	20	50	400	140
Future Volume (vph)	45	130	30	30	365	195	25	380	20	50	400	140
Satd. Flow (prot)	1787	1827	0	1805	1787	0	1745	1803	0	1745	1818	1546
Flt Permitted	0.108			0.643			0.261			0.160		
Satd. Flow (perm)	203	1827	0	1222	1787	0	479	1803	0	294	1818	1546
Satd. Flow (RTOR)		15			33			3				165
Lane Group Flow (vph)	51	182	0	43	704	0	25	457	0	68	460	165
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		8
Total Split (s)	14.0	41.0		14.0	41.0		15.0	30.0		15.0	30.0	30.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	5.5
Act Effct Green (s)	47.5	42.6		46.3	39.9		33.4	27.0		36.5	32.8	32.8
Actuated g/C Ratio	0.48	0.43		0.46	0.40		0.33	0.27		0.36	0.33	0.33
v/c Ratio	0.23	0.23		0.07	0.96		0.10	0.94		0.30	0.77	0.27
Control Delay	16.0	15.4		6.5	45.7		15.9	50.3		22.8	42.2	6.0
Queue Delay	0.0	0.4		0.0	6.7		0.0	4.7		0.0	7.0	0.1
Total Delay	16.0	15.9		6.5	52.3		15.9	55.0		22.8	49.2	6.0
LOS	B	B		A	D		B	D		C	D	A
Approach Delay		15.9			49.7			52.9			36.3	
Approach LOS		B			D			D			D	
Queue Length 50th (ft)	10	95		11	~501		5	106		27	233	0
Queue Length 95th (ft)	m34	84		m5	m#640		m14	#466		44	#465	41
Internal Link Dist (ft)		196			1084			195			349	
Turn Bay Length (ft)	60			100			65			100		
Base Capacity (vph)	231	787		619	732		286	488		245	597	618
Starvation Cap Reductn	0	296		0	0		0	16		0	0	0
Spillback Cap Reductn	0	0		0	26		11	0		0	98	39
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.22	0.37		0.07	1.00		0.09	0.97		0.28	0.92	0.28

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 74 (74%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 42.5

Intersection LOS: D

Intersection Capacity Utilization 79.0%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
14 s	41 s	15 s	30 s
			
Ø5	Ø6 (R)	Ø7	Ø8
14 s	41 s	15 s	30 s

WSJ

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Lanes, Volumes, Timings

33: SR 136/N. Washington Ave & E. 1st St

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	15	40	10	75	20	90	590	10	10	605	75
Future Volume (vph)	140	15	40	10	75	20	90	590	10	10	605	75
Satd. Flow (prot)	0	1786	0	0	1839	0	1711	1796	0	1745	3391	0
Flt Permitted		0.965			0.997		0.212			0.123		
Satd. Flow (perm)	0	1786	0	0	1839	0	382	1796	0	226	3391	0
Satd. Flow (RTOR)		7			8			1			15	
Lane Group Flow (vph)	0	241	0	0	189	0	115	754	0	10	787	0
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	35.0	35.0		30.0	30.0		16.0	73.0		12.0	69.0	
Total Lost Time (s)		5.5			5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)		21.5			17.6		58.7	55.4		49.8	43.2	
Actuated g/C Ratio		0.19			0.15		0.51	0.48		0.43	0.37	
v/c Ratio		0.72			0.66		0.37	0.88		0.05	0.62	
Control Delay		59.5			60.5		19.5	42.3		16.7	31.0	
Queue Delay		0.0			0.0		0.0	0.2		0.0	0.0	
Total Delay		59.5			60.5		19.5	42.5		16.7	31.0	
LOS		E			E		B	D		B	C	
Approach Delay		59.5			60.5			39.5			30.9	
Approach LOS		E			E			D			C	
Queue Length 50th (ft)		164			127		43	447		4	240	
Queue Length 95th (ft)		310			140		78	732		15	355	
Internal Link Dist (ft)		234			474			256			166	
Turn Bay Length (ft)										50		
Base Capacity (vph)		492			423		322	1122		189	1999	
Starvation Cap Reductn		0			0		0	57		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.49			0.45		0.36	0.71		0.05	0.39	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 115.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 40.4

Intersection Capacity Utilization 68.1%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service C

Splits and Phases: 33: SR 136/N. Washington Ave & E. 1st St

			
Ø1	Ø2	Ø3	Ø4
12 s	73 s	35 s	30 s
			
Ø5	Ø6		
16 s	69 s		

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

34: SR 136/N. Washington Ave & E. 10th St/E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	105	15	385	280	255	50	540	155	350	680	110
Future Volume (vph)	65	105	15	385	280	255	50	540	155	350	680	110
Satd. Flow (prot)	1805	3527	0	3467	1900	1615	1719	3505	1615	1752	3511	0
Flt Permitted	0.950			0.950			0.194			0.197		
Satd. Flow (perm)	1805	3527	0	3467	1900	1615	351	3505	1615	363	3511	0
Satd. Flow (RTOR)		17				283			230		19	
Lane Group Flow (vph)	72	133	0	448	304	283	60	628	180	372	974	0
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases						4	2		2	6		
Total Split (s)	12.0	12.0		31.0	31.0	31.0	12.0	28.0	28.0	19.0	35.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)	6.5	6.5		20.4	20.4	20.4	26.4	20.0	20.0	39.2	30.1	
Actuated g/C Ratio	0.08	0.08		0.25	0.25	0.25	0.32	0.24	0.24	0.47	0.36	
v/c Ratio	0.51	0.46		0.53	0.65	0.46	0.28	0.74	0.32	0.93	0.76	
Control Delay	53.3	39.3		29.4	35.3	6.0	17.6	35.6	3.3	50.4	29.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	53.3	39.3		29.4	35.3	6.0	17.6	35.6	3.3	50.4	29.3	
LOS	D	D		C	D	A	B	D	A	D	C	
Approach Delay		44.2			24.7			27.6			35.1	
Approach LOS		D			C			C			D	
Queue Length 50th (ft)	39	32		107	147	0	17	162	0	131	246	
Queue Length 95th (ft)	#94	63		143	231	57	37	220	20	#325	287	
Internal Link Dist (ft)		135			2500			631			700	
Turn Bay Length (ft)	100			215		215	100			100		
Base Capacity (vph)	143	296		1081	592	698	221	965	611	401	1308	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.50	0.45		0.41	0.51	0.41	0.27	0.65	0.29	0.93	0.74	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 82.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 30.7

Intersection LOS: C

Intersection Capacity Utilization 72.4%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 34: SR 136/N. Washington Ave & E. 10th St/E.10th St

			
Ø1	Ø2	Ø3	Ø4
19 s	28 s	12 s	31 s
Ø5	Ø6		
12 s	35 s		

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

35: US 70/E. Spring St & I-40 EB Off-Ramps/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	0	100	0	0	0	0	715	15	90	185	0
Future Volume (vph)	85	0	100	0	0	0	0	715	15	90	185	0
Satd. Flow (prot)	0	1656	1615	0	0	0	0	3442	0	1711	3490	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1656	1615	0	0	0	0	3442	0	1711	3490	0
Lane Group Flow (vph)	0	99	116	0	0	0	0	851	0	103	206	0
Sign Control		Stop			Free			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 39.9%

Analysis Period (min) 15

ICU Level of Service A

Intersection

Int Delay, s/veh 3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗					↖↗		↖	↖↗	
Traffic Vol, veh/h	85	0	100	0	0	0	0	715	15	90	185	0
Future Vol, veh/h	85	0	100	0	0	0	0	715	15	90	185	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	200	-	-	-	-	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	25	86	25	25	25	25	86	75	87	90	25
Heavy Vehicles, %	9	0	0	0	0	0	0	1	0	2	0	0
Mvmt Flow	99	0	116	0	0	0	0	831	20	103	206	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	828	1243	103	-	0	0	831	0	0
Stage 1	412	412	-	-	-	-	-	-	-
Stage 2	416	831	-	-	-	-	-	-	-
Critical Hdwy	6.98	6.5	6.9	-	-	-	4.14	-	-
Critical Hdwy Stg 1	5.98	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.98	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.59	4	3.3	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	296	176	938	0	-	-	797	-	0
Stage 1	617	598	-	0	-	-	-	-	0
Stage 2	614	387	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	258	0	938	-	-	-	797	-	-
Mov Cap-2 Maneuver	258	0	-	-	-	-	-	-	-
Stage 1	537	0	-	-	-	-	-	-	-
Stage 2	614	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.7	0	3.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	258	938	797	-
HCM Lane V/C Ratio	-	-	0.383	0.124	0.13	-
HCM Control Delay (s)	-	-	27.4	9.4	10.2	-
HCM Lane LOS	-	-	D	A	B	-
HCM 95th %tile Q(veh)	-	-	1.7	0.4	0.4	-

Lanes, Volumes, Timings
 36: US 70/E. Spring St & I-40 WB Off-Ramp

2040 Optimized AM Timing Plan
 07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	15	300	545	0	0	400
Future Volume (vph)	15	300	545	0	0	400
Satd. Flow (prot)	1687	1568	3323	0	0	3455
Flt Permitted	0.950					
Satd. Flow (perm)	1687	1568	3323	0	0	3455
Lane Group Flow (vph)	22	380	649	0	0	426
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 40.3%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
36: US 70/E. Spring St & I-40 WB Off-Ramp

2040 Optimized AM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	300	545	0	0	400
Future Vol, veh/h	15	300	545	0	0	400
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	None
Storage Length	0	300	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	79	84	25	25	94
Heavy Vehicles, %	7	3	5	0	0	1
Mvmt Flow	22	380	649	0	0	426

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	862	324	0	-	-	-
Stage 1	649	-	-	-	-	-
Stage 2	213	-	-	-	-	-
Critical Hdwy	6.94	6.96	-	-	-	-
Critical Hdwy Stg 1	5.94	-	-	-	-	-
Critical Hdwy Stg 2	5.94	-	-	-	-	-
Follow-up Hdwy	3.57	3.33	-	-	-	-
Pot Cap-1 Maneuver	285	669	-	0	0	-
Stage 1	469	-	-	0	0	-
Stage 2	787	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	285	669	-	-	-	-
Mov Cap-2 Maneuver	285	-	-	-	-	-
Stage 1	469	-	-	-	-	-
Stage 2	787	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.3	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NB	WBLn1	WBLn2	SBT
Capacity (veh/h)	-	285	669	-
HCM Lane V/C Ratio	-	0.076	0.568	-
HCM Control Delay (s)	-	18.7	17.2	-
HCM Lane LOS	-	C	C	-
HCM 95th %tile Q(veh)	-	0.2	3.6	-

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	270	400	0	0	875	145	445	0	70	0	0	0
Future Volume (vph)	270	400	0	0	875	145	445	0	70	0	0	0
Satd. Flow (prot)	1770	3574	0	0	3453	0	1736	0	1583	0	0	0
Flt Permitted	0.088						0.950					
Satd. Flow (perm)	164	3574	0	0	3453	0	1736	0	1583	0	0	0
Satd. Flow (RTOR)					19				99			
Lane Group Flow (vph)	314	455	0	0	1092	0	610	0	117	0	0	0
Turn Type	pm+pt	NA			NA		Prot		Perm			
Protected Phases	1	6			2		3					
Permitted Phases	6								3			
Total Split (s)	23.0	70.0			47.0		50.0		50.0			
Total Lost Time (s)	5.5	6.5			6.5		7.0		7.0			
Act Effct Green (s)	63.7	62.7			39.7		42.9		42.9			
Actuated g/C Ratio	0.53	0.53			0.33		0.36		0.36			
v/c Ratio	0.97	0.24			0.94		0.98		0.18			
Control Delay	76.7	15.7			53.5		69.0		7.8			
Queue Delay	0.0	0.0			0.0		0.0		0.0			
Total Delay	76.7	15.7			53.5		69.0		7.8			
LOS	E	B			D		E		A			
Approach Delay		40.6			53.5			59.1				
Approach LOS		D			D			E				
Queue Length 50th (ft)	191	96			421		464		9			
Queue Length 95th (ft)	#347	124			#557		462		15			
Internal Link Dist (ft)		490			552			852			886	
Turn Bay Length (ft)	100								250			
Base Capacity (vph)	323	1906			1186		627		634			
Starvation Cap Reductn	0	0			0		0		0			
Spillback Cap Reductn	0	0			0		0		0			
Storage Cap Reductn	0	0			0		0		0			
Reduced v/c Ratio	0.97	0.24			0.92		0.97		0.18			

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 119.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 51.3

Intersection Capacity Utilization 84.3%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service E

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

		
Ø1	Ø2	Ø3
23 s	47 s	50 s
		
Ø6		
70 s		

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

38: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	610	230	120	1190	0	0	0	0	60	0	500
Future Volume (vph)	0	610	230	120	1190	0	0	0	0	60	0	500
Satd. Flow (prot)	0	3403	0	1703	3539	0	0	0	0	0	1703	1599
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	3403	0	1703	3539	0	0	0	0	0	1703	1599
Lane Group Flow (vph)	0	996	0	160	1368	0	0	0	0	0	64	575
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 84.3%

Analysis Period (min) 15

ICU Level of Service E

Intersection

Int Delay, s/veh 56.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↑	↑↑						↑	↑
Traffic Vol, veh/h	0	610	230	120	1190	0	0	0	0	60	0	500
Future Vol, veh/h	0	610	230	120	1190	0	0	0	0	60	0	500
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	100	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	25	87	78	75	87	25	25	25	25	94	25	87
Heavy Vehicles, %	0	2	0	6	2	0	0	0	0	6	0	1
Mvmt Flow	0	701	295	160	1368	0	0	0	0	64	0	575

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	-	0	0	701	0	0	2039	2389	684
Stage 1	-	-	-	-	-	-	1688	1688	-
Stage 2	-	-	-	-	-	-	351	701	-
Critical Hdwy	-	-	-	4.22	-	-	6.92	6.5	6.92
Critical Hdwy Stg 1	-	-	-	-	-	-	5.92	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.92	5.5	-
Follow-up Hdwy	-	-	-	2.26	-	-	3.56	4	3.31
Pot Cap-1 Maneuver	0	-	-	866	-	0	~ 47	34	~ 393
Stage 1	0	-	-	-	-	0	130	151	-
Stage 2	0	-	-	-	-	0	672	444	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	866	-	-	~ 38	0	~ 393
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 38	0	-
Stage 1	-	-	-	-	-	-	106	0	-
Stage 2	-	-	-	-	-	-	672	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	1.1	279.3
HCM LOS			F

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	866	-	38	393
HCM Lane V/C Ratio	-	-	0.185	-	1.68	1.462
HCM Control Delay (s)	-	-	10.1	\$ 560.9	248	
HCM Lane LOS	-	-	B	-	F	F
HCM 95th %tile Q(veh)	-	-	0.7	-	6.8	29.9

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

39: Neal St/S. Old Kentucky Rd & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	440	240	530	950	150	75	140	195	185	410	60
Future Volume (vph)	75	440	240	530	950	150	75	140	195	185	410	60
Satd. Flow (prot)	1787	3322	0	1787	1845	1599	1805	1900	1615	1752	1834	0
Flt Permitted	0.130			0.110			0.188			0.422		
Satd. Flow (perm)	245	3322	0	207	1845	1599	357	1900	1615	778	1834	0
Satd. Flow (RTOR)		144				182			238		5	
Lane Group Flow (vph)	85	858	0	570	1092	170	112	171	238	201	561	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6		6	8		8	4		
Total Split (s)	12.0	37.0		37.0	62.0	62.0	12.0	27.0	27.0	19.0	34.0	
Total Lost Time (s)	5.5	6.5		5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.5	
Act Effct Green (s)	36.9	29.5		67.5	57.0	57.0	28.8	21.3	21.3	40.1	27.5	
Actuated g/C Ratio	0.31	0.25		0.57	0.48	0.48	0.24	0.18	0.18	0.34	0.23	
v/c Ratio	0.53	0.92		1.07	1.24	0.20	0.68	0.50	0.49	0.55	1.31	
Control Delay	33.2	52.2		91.1	146.1	2.8	51.9	50.8	9.2	35.9	193.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	33.2	52.2		91.1	146.1	2.8	51.9	50.8	9.2	35.9	193.5	
LOS	C	D		F	F	A	D	D	A	D	F	
Approach Delay		50.5			115.7			32.0			151.9	
Approach LOS		D			F			C			F	
Queue Length 50th (ft)	28	289		~437	~1072	0	61	122	0	116	~563	
Queue Length 95th (ft)	61	#386		#662	#1261	30	77	176	48	182	#696	
Internal Link Dist (ft)		1084			512			1234			867	
Turn Bay Length (ft)	80					100	130			100		
Base Capacity (vph)	160	958		535	883	860	165	339	484	375	428	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.53	0.90		1.07	1.24	0.20	0.68	0.50	0.49	0.54	1.31	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 119

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.31

Intersection Signal Delay: 96.6

Intersection Capacity Utilization 105.2%

Analysis Period (min) 15

Intersection LOS: F

ICU Level of Service G

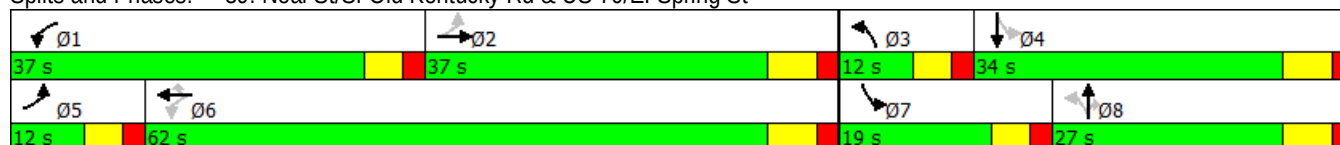
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 39: Neal St/S. Old Kentucky Rd & US 70/E. Spring St



AM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
40: US 70/E. Spring St & E. Broad St

2040 Optimized AM Timing Plan
07/12/2017

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	800	630	640	60	0
Future Volume (vph)	0	800	630	640	60	0
Satd. Flow (prot)	0	1881	1738	0	1805	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1881	1738	0	1805	0
Lane Group Flow (vph)	0	930	1352	0	78	0
Sign Control		Free	Free		Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 82.3%

Analysis Period (min) 15

ICU Level of Service E

HCM 2010 TWSC
40: US 70/E. Spring St & E. Broad St

2040 Optimized AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	800	630	640	60	0
Future Vol, veh/h	0	800	630	640	60	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	25	86	92	96	77	63
Heavy Vehicles, %	0	1	3	1	0	0
Mvmt Flow	0	930	685	667	78	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	685	0	-	0	1615	685
Stage 1	-	-	-	-	685	-
Stage 2	-	-	-	-	930	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	918	-	-	0	115	452
Stage 1	-	-	-	0	504	-
Stage 2	-	-	-	0	387	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	918	-	-	-	115	452
Mov Cap-2 Maneuver	-	-	-	-	251	-
Stage 1	-	-	-	-	504	-
Stage 2	-	-	-	-	387	-

Approach	EB		WB		SB
HCM Control Delay, s	0		0		25.7
HCM LOS					D

Minor Lane/Major Mvmt	EBL	EBT	WBT	SBLn1
Capacity (veh/h)	918	-	-	251
HCM Lane V/C Ratio	-	-	-	0.31
HCM Control Delay (s)	0	-	-	25.7
HCM Lane LOS	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	1.3

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	500	30	40	550	15	20	260	40	225	205	95
Future Volume (vph)	70	500	30	40	550	15	20	260	40	225	205	95
Satd. Flow (prot)	1805	1865	0	1703	1855	0	1805	1852	0	1805	1804	0
Flt Permitted	0.118			0.118			0.560			0.177		
Satd. Flow (perm)	224	1865	0	212	1855	0	1064	1852	0	336	1804	0
Satd. Flow (RTOR)		4			2			9			22	
Lane Group Flow (vph)	78	640	0	71	587	0	26	380	0	292	332	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	12.0	41.0		12.0	41.0		12.0	27.0		20.0	35.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	43.6	38.4		43.6	38.4		27.6	21.4		41.0	36.2	
Actuated g/C Ratio	0.44	0.38		0.44	0.38		0.28	0.21		0.41	0.36	
v/c Ratio	0.39	0.89		0.38	0.82		0.08	0.95		0.84	0.50	
Control Delay	15.9	44.1		20.7	40.5		18.9	72.0		61.0	21.7	
Queue Delay	0.1	0.0		0.0	2.3		0.0	0.0		55.6	18.6	
Total Delay	16.0	44.1		20.7	42.8		18.9	72.0		116.6	40.3	
LOS	B	D		C	D		B	E		F	D	
Approach Delay		41.1			40.4			68.6			76.0	
Approach LOS		D			D			E			E	
Queue Length 50th (ft)	17	411		24	348		10	235		160	94	
Queue Length 95th (ft)	m28	#560		29	#552		22	#352		m183	m113	
Internal Link Dist (ft)		1101			737			412			149	
Turn Bay Length (ft)	75			80			70			50		
Base Capacity (vph)	200	717		188	712		344	405		350	667	
Starvation Cap Reductn	0	0		0	0		0	0		109	323	
Spillback Cap Reductn	5	0		0	49		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.40	0.89		0.38	0.89		0.08	0.94		1.21	0.97	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 26 (26%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 54.6

Intersection LOS: D

Intersection Capacity Utilization 81.8%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	41 s	20 s	27 s
			
Ø5	Ø6	Ø7	Ø8
12 s	41 s	12 s	35 s

AM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	505	45	30	535	55	50	115	10	40	60	30
Future Volume (vph)	25	505	45	30	535	55	50	115	10	40	60	30
Satd. Flow (prot)	1805	1847	0	1805	1855	0	1805	1879	0	1787	1769	0
Flt Permitted	0.259			0.259			0.692			0.481		
Satd. Flow (perm)	492	1847	0	492	1855	0	1315	1879	0	905	1769	0
Satd. Flow (RTOR)		8			7			3			20	
Lane Group Flow (vph)	30	633	0	36	633	0	52	173	0	57	100	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	14.0	50.0		14.0	50.0		15.0	21.0		15.0	21.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	60.4	55.6		60.4	55.6		20.8	14.0		20.9	14.1	
Actuated g/C Ratio	0.60	0.56		0.60	0.56		0.21	0.14		0.21	0.14	
v/c Ratio	0.07	0.61		0.09	0.61		0.17	0.65		0.22	0.38	
Control Delay	9.0	21.4		6.2	12.3		27.3	51.8		33.5	37.7	
Queue Delay	0.0	0.6		0.0	0.2		0.0	0.0		0.0	0.0	
Total Delay	9.0	22.0		6.2	12.5		27.3	51.8		33.5	37.7	
LOS	A	C		A	B		C	D		C	D	
Approach Delay		21.4			12.1			46.1			36.2	
Approach LOS		C			B			D			D	
Queue Length 50th (ft)	7	306		8	269		25	104		17	21	
Queue Length 95th (ft)	18	458		m8	140		52	132		52	95	
Internal Link Dist (ft)		1308			356			107			209	
Turn Bay Length (ft)	100			60			50			60		
Base Capacity (vph)	410	1030		410	1034		331	296		280	294	
Starvation Cap Reductn	0	0		0	62		0	0		0	0	
Spillback Cap Reductn	0	127		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.07	0.70		0.09	0.65		0.16	0.58		0.20	0.34	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 81 (81%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 22.4

Intersection LOS: C

Intersection Capacity Utilization 61.9%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
14 s	50 s	15 s	21 s
			
Ø5	Ø6	Ø7	Ø8
14 s	50 s	15 s	21 s

Lanes, Volumes, Timings

43: S. Walnut Ave & US 70/W. Spring St

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	585	70	40	530	30	80	275	35	15	130	35
Future Volume (vph)	55	585	70	40	530	30	80	275	35	15	130	35
Satd. Flow (prot)	1770	1851	0	1805	1860	0	1770	1852	0	1805	1832	0
Flt Permitted	0.187			0.101			0.415			0.303		
Satd. Flow (perm)	348	1851	0	192	1860	0	773	1852	0	576	1832	0
Satd. Flow (RTOR)		6			4			6			10	
Lane Group Flow (vph)	60	777	0	50	669	0	93	356	0	22	207	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	12.0	80.0		12.0	80.0		17.0	43.0		15.0	41.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	59.8	55.1		59.9	55.1		35.4	29.9		29.6	24.6	
Actuated g/C Ratio	0.53	0.49		0.53	0.49		0.31	0.26		0.26	0.22	
v/c Ratio	0.22	0.86		0.24	0.74		0.28	0.72		0.09	0.51	
Control Delay	14.5	38.4		15.4	30.8		33.8	51.7		32.3	47.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.5	38.4		15.4	30.8		33.8	51.7		32.3	47.9	
LOS	B	D		B	C		C	D		C	D	
Approach Delay		36.7			29.7			48.0			46.4	
Approach LOS		D			C			D			D	
Queue Length 50th (ft)	20	541		17	424		52	267		12	143	
Queue Length 95th (ft)	46	728		35	599		102	439		26	227	
Internal Link Dist (ft)		1097			1308			83			571	
Turn Bay Length (ft)	75			75			65			150		
Base Capacity (vph)	280	1258		210	1263		362	725		282	681	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.21	0.62		0.24	0.53		0.26	0.49		0.08	0.30	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 112.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 37.7

Intersection Capacity Utilization 80.0%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service D

Splits and Phases: 43: S. Walnut Ave & US 70/W. Spring St

			
Ø1	Ø2	Ø3	Ø4
12 s	80 s	15 s	43 s
			
Ø5	Ø6	Ø7	Ø8
12 s	80 s	17 s	41 s

Lanes, Volumes, Timings

44: Scott Ave & US 70/W. Spring St

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	625	60	45	475	30	40	55	50	15	35	35
Future Volume (vph)	15	625	60	45	475	30	40	55	50	15	35	35
Satd. Flow (prot)	1805	1857	0	1805	1861	0	1805	1785	0	1656	1739	0
Flt Permitted	0.311			0.146			0.581			0.663		
Satd. Flow (perm)	591	1857	0	277	1861	0	1104	1785	0	1156	1739	0
Satd. Flow (RTOR)		6			4			17			26	
Lane Group Flow (vph)	20	763	0	60	610	0	53	148	0	18	93	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	12.0	97.0		12.0	97.0		12.0	29.0		12.0	29.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	49.9	45.4		52.5	50.5		18.9	16.9		16.4	11.8	
Actuated g/C Ratio	0.57	0.52		0.60	0.58		0.22	0.19		0.19	0.14	
v/c Ratio	0.05	0.79		0.20	0.57		0.18	0.41		0.07	0.36	
Control Delay	7.4	25.7		8.8	15.8		32.4	38.3		32.0	35.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	7.4	25.7		8.8	15.8		32.4	38.3		32.0	35.8	
LOS	A	C		A	B		C	D		C	D	
Approach Delay		25.2			15.2			36.8			35.2	
Approach LOS		C			B			D			D	
Queue Length 50th (ft)	4	339		11	163		23	60		8	35	
Queue Length 95th (ft)	12	595		26	367		57	102		29	75	
Internal Link Dist (ft)		700			1097			288			469	
Turn Bay Length (ft)	75			75			40			75		
Base Capacity (vph)	442	1714		297	1717		298	562		261	554	
Starvation Cap Reductn	0	38		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.05	0.46		0.20	0.36		0.18	0.26		0.07	0.17	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 87.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 23.4

Intersection Capacity Utilization 55.4%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service B

Splits and Phases: 44: Scott Ave & US 70/W. Spring St

			
Ø1	Ø2	Ø3	Ø4
12 s	97 s	12 s	29 s
			
Ø5	Ø6	Ø7	Ø8
12 s	97 s	12 s	29 s

Lanes, Volumes, Timings
45: S, Maple Ave/N. Maple Ave & E. Broad St

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	110	65	60	530	170	35	235	60	35	380	20
Future Volume (vph)	10	110	65	60	530	170	35	235	60	35	380	20
Satd. Flow (prot)	1805	1778	0	1805	1801	0	1805	1832	0	1805	1883	0
Flt Permitted	0.099			0.521			0.141			0.318		
Satd. Flow (perm)	188	1778	0	990	1801	0	268	1832	0	604	1883	0
Satd. Flow (RTOR)		36			21			15			3	
Lane Group Flow (vph)	13	226	0	66	814	0	56	362	0	42	465	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	12.0	47.0		12.0	47.0		12.0	29.0		12.0	29.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	48.8	43.9		52.4	51.1		32.2	28.3		31.0	25.9	
Actuated g/C Ratio	0.49	0.44		0.52	0.51		0.32	0.28		0.31	0.26	
v/c Ratio	0.07	0.28		0.12	0.88		0.30	0.68		0.16	0.95	
Control Delay	9.1	15.9		11.9	34.4		26.9	25.6		23.1	68.9	
Queue Delay	0.0	84.6		3.8	0.0		0.0	1.9		0.0	14.2	
Total Delay	9.1	100.5		15.7	34.4		26.9	27.5		23.1	83.1	
LOS	A	F		B	C		C	C		C	F	
Approach Delay		95.6			33.0			27.4			78.1	
Approach LOS		F			C			C			E	
Queue Length 50th (ft)	5	86		19	406		13	83		18	~323	
Queue Length 95th (ft)	m9	m94		40	#763		m17	m104		38	#493	
Internal Link Dist (ft)		1084			778			149			437	
Turn Bay Length (ft)	60			65			40			85		
Base Capacity (vph)	197	800		571	930		186	529		266	489	
Starvation Cap Reductn	0	0		0	0		0	68		0	0	
Spillback Cap Reductn	0	721		438	0		0	0		0	32	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.07	2.86		0.50	0.88		0.30	0.79		0.16	1.02	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 33 (33%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 50.4

Intersection LOS: D

Intersection Capacity Utilization 86.1%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 45: S, Maple Ave/N. Maple Ave & E. Broad St



Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

46: S. Dixie Ave/N. Dixie Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	185	15	20	305	90	20	145	20	40	95	20
Future Volume (vph)	20	185	15	20	305	90	20	145	20	40	95	20
Satd. Flow (prot)	1805	1847	0	1736	1820	0	1805	1862	0	1805	1849	0
Flt Permitted	0.386			0.610			0.645			0.417		
Satd. Flow (perm)	733	1847	0	1114	1820	0	1226	1862	0	792	1849	0
Satd. Flow (RTOR)		6			17			7			10	
Lane Group Flow (vph)	26	215	0	26	463	0	28	193	0	54	158	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	40.0		15.0	40.0		15.0	30.0		15.0	30.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	59.9	56.7		59.9	56.7		22.2	15.8		24.0	18.8	
Actuated g/C Ratio	0.60	0.57		0.60	0.57		0.22	0.16		0.24	0.19	
v/c Ratio	0.05	0.20		0.04	0.45		0.09	0.65		0.20	0.44	
Control Delay	10.2	14.5		4.3	7.9		13.1	28.5		25.8	37.4	
Queue Delay	0.0	0.0		0.0	0.3		0.0	0.2		0.0	0.0	
Total Delay	10.2	14.5		4.3	8.2		13.1	28.7		25.8	37.4	
LOS	B	B		A	A		B	C		C	D	
Approach Delay		14.1			8.0			26.7			34.5	
Approach LOS		B			A			C			C	
Queue Length 50th (ft)	6	55		3	150		7	49		25	88	
Queue Length 95th (ft)	17	145		m7	65		m11	62		40	109	
Internal Link Dist (ft)		1234			353			209			174	
Turn Bay Length (ft)	130			45			60			75		
Base Capacity (vph)	544	1049		732	1038		341	461		290	467	
Starvation Cap Reductn	0	0		0	155		0	34		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.05	0.20		0.04	0.52		0.08	0.45		0.19	0.34	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 89 (89%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 17.6

Intersection LOS: B

Intersection Capacity Utilization 51.9%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 46: S. Dixie Ave/N. Dixie Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	40 s	15 s	30 s
			
Ø5	Ø6 (R)	Ø7	Ø8
15 s	40 s	15 s	30 s

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

47: S. Walnut Ave/N. Walnut Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	160	20	35	165	90	30	270	50	30	125	15
Future Volume (vph)	15	160	20	35	165	90	30	270	50	30	125	15
Satd. Flow (prot)	0	1858	0	0	1877	1583	1805	1852	0	1770	1872	0
Flt Permitted		0.996			0.990		0.643			0.339		
Satd. Flow (perm)	0	1858	0	0	1877	1583	1222	1852	0	631	1872	0
Satd. Flow (RTOR)		4				102		7			4	
Lane Group Flow (vph)	0	227	0	0	241	102	40	344	0	42	156	0
Turn Type	custom	NA		custom	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	1	1		2	2		7	4		3	8	
Permitted Phases	1			2		2	4			8		
Total Split (s)	39.0	39.0		45.0	45.0	45.0	13.0	53.0		13.0	53.0	
Total Lost Time (s)		5.5			5.5	5.5	5.5	5.5		5.5	5.5	
Act Effct Green (s)		18.0			18.9	18.9	27.5	23.7		27.4	23.7	
Actuated g/C Ratio		0.21			0.22	0.22	0.32	0.28		0.32	0.28	
v/c Ratio		0.58			0.58	0.24	0.09	0.66		0.14	0.30	
Control Delay		40.4			39.9	9.1	20.1	36.5		20.7	29.0	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		40.4			39.9	9.1	20.1	36.5		20.7	29.0	
LOS		D			D	A	C	D		C	C	
Approach Delay		40.4			30.7			34.8			27.2	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)		114			122	0	13	169		14	68	
Queue Length 95th (ft)		234			243	43	35	336		34	150	
Internal Link Dist (ft)		512			1234			571			477	
Turn Bay Length (ft)							120			140		
Base Capacity (vph)		811			963	862	450	1146		313	1157	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.28			0.25	0.12	0.09	0.30		0.13	0.13	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 85.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 33.4

Intersection Capacity Utilization 56.3%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service B

Splits and Phases: 47: S. Walnut Ave/N. Walnut Ave & E. Broad St

			
Ø1	Ø2	Ø3	Ø4
39 s	45 s	13 s	53 s
		Ø7	Ø8
		13 s	53 s

Lanes, Volumes, Timings
48: S. Cedar Ave & E. Broad St

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	25	10	25	30	135	10	115	15	170	60	20
Future Volume (vph)	35	25	10	25	30	135	10	115	15	170	60	20
Satd. Flow (prot)	0	1819	0	0	1724	0	0	1821	0	0	1795	0
Flt Permitted		0.971			0.993			0.997			0.967	
Satd. Flow (perm)	0	1819	0	0	1724	0	0	1821	0	0	1795	0
Lane Group Flow (vph)	0	95	0	0	240	0	0	162	0	0	272	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 42.7%

Analysis Period (min) 15

ICU Level of Service A

Intersection

Intersection Delay, s/veh 10.3

Intersection LOS B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↕				↕				↕	
Traffic Vol, veh/h	0	35	25	10	0	25	30	135	0	10	115	15
Future Vol, veh/h	0	35	25	10	0	25	30	135	0	10	115	15
Peak Hour Factor	0.92	0.63	0.87	1.00	0.92	0.69	0.58	0.89	0.92	1.00	0.86	0.83
Heavy Vehicles, %	2	0	0	0	2	0	0	0	2	0	3	0
Mvmt Flow	0	56	29	10	0	36	52	152	0	10	134	18
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0
Approach		EB				WB				NB		
Opposing Approach		WB				EB				SB		
Opposing Lanes		1				1				1		
Conflicting Approach Left		SB				NB				EB		
Conflicting Lanes Left		1				1				1		
Conflicting Approach Right		NB				SB				WB		
Conflicting Lanes Right		1				1				1		
HCM Control Delay		9.3				10				9.6		
HCM LOS		A				A				A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	50%	13%	68%
Vol Thru, %	82%	36%	16%	24%
Vol Right, %	11%	14%	71%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	140	70	190	250
LT Vol	10	35	25	170
Through Vol	115	25	30	60
RT Vol	15	10	135	20
Lane Flow Rate	162	94	240	272
Geometry Grp	1	1	1	1
Degree of Util (X)	0.23	0.142	0.313	0.386
Departure Headway (Hd)	5.11	5.406	4.81	5.114
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	705	664	752	709
Service Time	3.125	3.432	2.81	3.114
HCM Lane V/C Ratio	0.23	0.142	0.319	0.384
HCM Control Delay	9.6	9.3	10	11.3
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	0.9	0.5	1.3	1.8

Intersection
Intersection Delay, s/veh
Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	170	60	20
Future Vol, veh/h	0	170	60	20
Peak Hour Factor	0.92	0.93	0.94	0.80
Heavy Vehicles, %	2	1	2	0
Mvmt Flow	0	183	64	25
Number of Lanes	0	0	1	0
Approach		SB		
Opposing Approach		NB		
Opposing Lanes		1		
Conflicting Approach Left		WB		
Conflicting Lanes Left		1		
Conflicting Approach Right		EB		
Conflicting Lanes Right		1		
HCM Control Delay		11.3		
HCM LOS		B		

Lanes, Volumes, Timings

49: S. Cedar Ave/N. Cedar Ave & W, Broad St

2040 Optimized AM Timing Plan

07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	70	155	125	170	85	40
Future Volume (vph)	70	155	125	170	85	40
Satd. Flow (prot)	1787	1599	0	1848	1797	0
Flt Permitted	0.950			0.978		
Satd. Flow (perm)	1787	1599	0	1848	1797	0
Lane Group Flow (vph)	81	158	0	358	150	0
Sign Control	Stop			Stop	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 36.7%

Analysis Period (min) 15

ICU Level of Service A

Intersection

Intersection Delay, s/veh 10.6
Intersection LOS B

Movement	EBU	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations									
Traffic Vol, veh/h	0	70	155	0	125	170	0	85	40
Future Vol, veh/h	0	70	155	0	125	170	0	85	40
Peak Hour Factor	0.92	0.86	0.98	0.92	0.79	0.85	0.92	0.88	0.76
Heavy Vehicles, %	2	1	1	2	0	1	2	1	0
Mvmt Flow	0	81	158	0	158	200	0	97	53
Number of Lanes	0	1	1	0	0	1	0	1	0
Approach		EB			NB			SB	
Opposing Approach					SB			NB	
Opposing Lanes		0			1			1	
Conflicting Approach Left		SB			EB				
Conflicting Lanes Left		1			2			0	
Conflicting Approach Right		NB						EB	
Conflicting Lanes Right		1			0			2	
HCM Control Delay		9.5			12.1			9	
HCM LOS		A			B			A	

Lane	NBLn1	EBLn1	EBLn2	SBLn1
Vol Left, %	42%	100%	0%	0%
Vol Thru, %	58%	0%	0%	68%
Vol Right, %	0%	0%	100%	32%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	295	70	155	125
LT Vol	125	70	0	0
Through Vol	170	0	0	85
RT Vol	0	0	155	40
Lane Flow Rate	358	81	158	149
Geometry Grp	2	7	7	2
Degree of Util (X)	0.475	0.14	0.219	0.198
Departure Headway (Hd)	4.769	6.204	4.993	4.765
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	752	575	713	748
Service Time	2.819	3.979	2.766	2.829
HCM Lane V/C Ratio	0.476	0.141	0.222	0.199
HCM Control Delay	12.1	10	9.2	9
HCM Lane LOS	B	A	A	A
HCM 95th-tile Q	2.6	0.5	0.8	0.7

Lanes, Volumes, Timings

50: US 70/W. Spring St/US 70/W. Broad St & W. Broad St

2040 Optimized AM Timing Plan

07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	90	295	10	315	510
Future Volume (vph)	0	90	295	10	315	510
Satd. Flow (prot)	1900	1615	1853	0	0	1830
Flt Permitted						0.981
Satd. Flow (perm)	1900	1615	1853	0	0	1830
Lane Group Flow (vph)	0	114	385	0	0	952
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 67.1%

Analysis Period (min) 15

ICU Level of Service C

Intersection

Int Delay, s/veh 3.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	90	295	10	315	510
Future Vol, veh/h	0	90	295	10	315	510
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	79	80	63	86	87
Heavy Vehicles, %	0	0	2	0	0	3
Mvmt Flow	0	114	369	16	366	586

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1696	377	0	0	385	0
Stage 1	377	-	-	-	-	-
Stage 2	1319	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	103	674	-	-	1185	-
Stage 1	698	-	-	-	-	-
Stage 2	252	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	56	674	-	-	1185	-
Mov Cap-2 Maneuver	117	-	-	-	-	-
Stage 1	698	-	-	-	-	-
Stage 2	137	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	11.4		0		3.6
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	674	1185	-
HCM Lane V/C Ratio	-	-	-	0.169	0.309	-
HCM Control Delay (s)	-	-	0	11.4	9.4	0
HCM Lane LOS	-	-	A	B	A	A
HCM 95th %tile Q(veh)	-	-	-	0.6	1.3	-

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

51: W. Jackson St/Pippin Rd & US 70/W. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	490	340	30	200	35	140	105	15	160	360	10
Future Volume (vph)	10	490	340	30	200	35	140	105	15	160	360	10
Satd. Flow (prot)	1805	1863	1553	1805	1835	0	1805	1900	1615	0	1860	0
Flt Permitted	0.495			0.103			0.950				0.984	
Satd. Flow (perm)	940	1863	1553	196	1835	0	1805	1900	1615	0	1860	0
Satd. Flow (RTOR)			141		9				191		1	
Lane Group Flow (vph)	24	570	374	48	269	0	169	114	16	0	612	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Free	Split	NA	
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases	6		6	2					Free			
Total Split (s)	12.0	43.0	43.0	12.0	43.0		21.0	21.0		44.0	44.0	
Total Lost Time (s)	5.5	6.5	6.5	5.5	6.5		6.5	6.5			5.5	
Act Effct Green (s)	42.6	36.6	36.6	43.8	39.0		13.6	13.6	116.8		38.6	
Actuated g/C Ratio	0.36	0.31	0.31	0.38	0.33		0.12	0.12	1.00		0.33	
v/c Ratio	0.06	0.98	0.64	0.30	0.44		0.80	0.52	0.01		1.00	
Control Delay	21.6	73.1	27.4	26.4	33.3		78.1	58.1	0.0		75.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay	21.6	73.1	27.4	26.4	33.3		78.1	58.1	0.0		75.2	
LOS	C	E	C	C	C		E	E	A		E	
Approach Delay		54.2			32.3			66.3			75.2	
Approach LOS		D			C			E			E	
Queue Length 50th (ft)	11	~446	158	22	163		129	84	0		~505	
Queue Length 95th (ft)	13	#631	269	32	247		#206	145	0		#720	
Internal Link Dist (ft)		1551			2304			1891			664	
Turn Bay Length (ft)	100		100	100			350					
Base Capacity (vph)	391	583	583	163	618		225	236	1615		615	
Starvation Cap Reductn	0	0	0	0	0		0	0	0		0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0		0	
Storage Cap Reductn	0	0	0	0	0		0	0	0		0	
Reduced v/c Ratio	0.06	0.98	0.64	0.29	0.44		0.75	0.48	0.01		1.00	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 116.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 58.5

Intersection Capacity Utilization 70.9%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service C

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 51: W. Jackson St/Pippin Rd & US 70/W. Broad St

			
Ø1	Ø2	Ø3	Ø4
12 s	43 s	21 s	44 s
			
Ø5	Ø6		
12 s	43 s		

AM Peak

WSP

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Lanes, Volumes, Timings
52: E.10th St & Brown Ave N

2040 Optimized AM Timing Plan

07/12/2017

								
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	35	590	900	145	160	35		
Future Volume (vph)	35	590	900	145	160	35		
Satd. Flow (prot)	1719	1900	1835	0	1739	0		
Flt Permitted	0.070				0.961			
Satd. Flow (perm)	127	1900	1835	0	1739	0		
Satd. Flow (RTOR)			15		9			
Lane Group Flow (vph)	49	628	1177	0	260	0		
Turn Type	pm+pt	NA	NA		Prot			
Protected Phases	1	6	2 4		3		2	4
Permitted Phases	6							
Total Split (s)	12.0	69.0			19.0		57.0	12.0
Total Lost Time (s)	5.5	5.5			5.5			
Act Effct Green (s)	60.9	60.9	59.4		13.5			
Actuated g/C Ratio	0.62	0.62	0.61		0.14			
v/c Ratio	0.27	0.53	1.05		1.04			
Control Delay	10.6	12.1	34.7		111.3			
Queue Delay	0.0	0.0	0.0		0.0			
Total Delay	10.6	12.1	34.7		111.3			
LOS	B	B	C		F			
Approach Delay		12.0	34.7		111.3			
Approach LOS		B	C		F			
Queue Length 50th (ft)	11	199	~138		~180			
Queue Length 95th (ft)	19	285	m#78		#254			
Internal Link Dist (ft)		2500	23		665			
Turn Bay Length (ft)	100							
Base Capacity (vph)	185	1240	1123		249			
Starvation Cap Reductn	0	0	0		0			
Spillback Cap Reductn	0	0	0		0			
Storage Cap Reductn	0	0	0		0			
Reduced v/c Ratio	0.26	0.51	1.05		1.04			

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 97.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 36.9

Intersection Capacity Utilization 76.3%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service D

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 52: E.10th St & Brown Ave N

 Ø1	 Ø2	 Ø3	 Ø4
12 s	57 s	19 s	12 s
 Ø6			
69 s			

Lanes, Volumes, Timings

53: Fisk Rd & E.10th St

2040 Optimized AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	600	25	20	810	245	60	145	15	255	55	170
Future Volume (vph)	65	600	25	20	810	245	60	145	15	255	55	170
Satd. Flow (prot)	1805	1867	0	1805	1900	1599	0	1833	0	0	1741	1599
Flt Permitted	0.055			0.194				0.989			0.961	
Satd. Flow (perm)	104	1867	0	369	1900	1599	0	1833	0	0	1741	1599
Satd. Flow (RTOR)		2				118		2				182
Lane Group Flow (vph)	75	660	0	20	920	310	0	318	0	0	349	195
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases	2			6		6						3
Total Split (s)	12.0	74.0		12.0	74.0	74.0	30.0	30.0		34.0	34.0	34.0
Total Lost Time (s)	5.5	6.5		5.5	6.5	6.5		5.5			5.5	5.5
Act Effct Green (s)	77.3	72.4		74.7	67.5	67.5		24.5			28.5	28.5
Actuated g/C Ratio	0.52	0.48		0.50	0.45	0.45		0.16			0.19	0.19
v/c Ratio	0.59	0.73		0.08	1.08	0.40		1.06			1.06	0.43
Control Delay	41.3	38.1		17.2	92.7	18.1		125.5			122.1	11.7
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	41.3	38.1		17.2	92.7	18.1		125.5			122.1	11.7
LOS	D	D		B	F	B		F			F	B
Approach Delay		38.4			73.0			125.5			82.6	
Approach LOS		D			E			F			F	
Queue Length 50th (ft)	35	539		9	~999	121		~338			~372	11
Queue Length 95th (ft)	#77	710		23	#1210	157		285			#506	74
Internal Link Dist (ft)		2105			3570			811			723	
Turn Bay Length (ft)	200			175		175						250
Base Capacity (vph)	127	901		246	855	784		301			330	451
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.59	0.73		0.08	1.08	0.40		1.06			1.06	0.43

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 71.8

Intersection Capacity Utilization 95.7%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service F

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 53: Fisk Rd & E.10th St

			
Ø1	Ø2	Ø3	Ø4
12 s	74 s	34 s	30 s
			
Ø5	Ø6		
12 s	74 s		

AM Peak
WSP

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Lanes, Volumes, Timings
54: N. Old Kentucky Rd & E.10th St

2040 Optimized AM Timing Plan

07/12/2017

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	660	230	240	885	165	225
Future Volume (vph)	660	230	240	885	165	225
Satd. Flow (prot)	1863	1583	1787	1881	1770	1615
Flt Permitted			0.124		0.950	
Satd. Flow (perm)	1863	1583	233	1881	1770	1615
Satd. Flow (RTOR)		247				326
Lane Group Flow (vph)	717	247	289	941	220	326
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	1 2	4	
Permitted Phases		2	1 2			4
Total Split (s)	45.2	45.2	23.0		21.8	21.8
Total Lost Time (s)	6.5	6.5	5.5		5.5	5.5
Act Effct Green (s)	39.3	39.3	58.8	64.3	14.7	14.7
Actuated g/C Ratio	0.44	0.44	0.65	0.71	0.16	0.16
v/c Ratio	0.88	0.30	0.61	0.70	0.76	0.61
Control Delay	37.9	3.2	21.6	15.3	53.4	9.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.9	3.2	21.6	15.3	53.4	9.3
LOS	D	A	C	B	D	A
Approach Delay	29.0			16.7	27.0	
Approach LOS	C			B	C	
Queue Length 50th (ft)	367	0	92	312	118	0
Queue Length 95th (ft)	#592	42	m138	m382	157	14
Internal Link Dist (ft)	3570			975	734	
Turn Bay Length (ft)		400	125		175	
Base Capacity (vph)	814	830	470	1343	320	559
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.88	0.30	0.61	0.70	0.69	0.58

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 24 (27%), Referenced to phase 2:EBWB and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 23.1

Intersection LOS: C

Intersection Capacity Utilization 71.8%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 54: N. Old Kentucky Rd & E.10th St



Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

55: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	560	295	370	890	0	0	0	0	180	0	400
Future Volume (vph)	0	560	295	370	890	0	0	0	0	180	0	400
Satd. Flow (prot)	0	3381	0	1752	3574	0	0	0	0	1770	0	1583
Flt Permitted				0.112						0.950		
Satd. Flow (perm)	0	3381	0	207	3574	0	0	0	0	1770	0	1583
Satd. Flow (RTOR)		109										140
Lane Group Flow (vph)	0	1002	0	420	927	0	0	0	0	200	0	471
Turn Type		NA		pm+pt	NA					Prot		Perm
Protected Phases		6		5	2					8		
Permitted Phases				2								8
Total Split (s)		35.0		25.0	60.0					30.0		30.0
Total Lost Time (s)		6.5		5.5	6.5					7.0		7.0
Act Effct Green (s)		30.2		55.3	54.3					22.2		22.2
Actuated g/C Ratio		0.34		0.61	0.60					0.25		0.25
v/c Ratio		0.83		0.94	0.43					0.46		0.95
Control Delay		17.9		42.4	7.5					32.4		54.6
Queue Delay		0.0		0.0	0.0					0.0		0.0
Total Delay		17.9		42.4	7.5					32.4		54.6
LOS		B		D	A					C		D
Approach Delay		17.9			18.4						48.0	
Approach LOS		B			B						D	
Queue Length 50th (ft)		115		176	113					95		192
Queue Length 95th (ft)		227		m#329	114					160		#341
Internal Link Dist (ft)		570			785			708			972	
Turn Bay Length (ft)				120								150
Base Capacity (vph)		1206		462	2155					452		508
Starvation Cap Reductn		0		0	0					0		0
Spillback Cap Reductn		0		0	0					0		0
Storage Cap Reductn		0		0	0					0		0
Reduced v/c Ratio		0.83		0.91	0.43					0.44		0.93

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 44 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 24.8

Intersection LOS: C

Intersection Capacity Utilization 72.1%

ICU Level of Service C

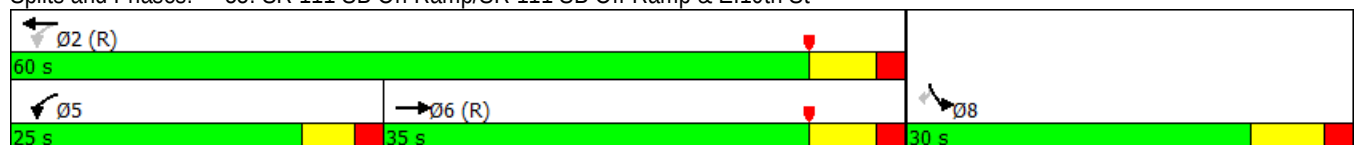
Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 55: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & E.10th St



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Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	135	610	0	0	890	140	355	0	305	0	0	0
Future Volume (vph)	135	610	0	0	890	140	355	0	305	0	0	0
Satd. Flow (prot)	1770	3574	0	0	3497	0	1787	0	1599	0	0	0
Flt Permitted	0.118						0.950					
Satd. Flow (perm)	220	3574	0	0	3497	0	1787	0	1599	0	0	0
Satd. Flow (RTOR)					27				217			
Lane Group Flow (vph)	175	693	0	0	1110	0	394	0	351	0	0	0
Turn Type	pm+pt	NA			NA		Prot		Perm			
Protected Phases	1	6			2		4					
Permitted Phases	6								4			
Total Split (s)	16.0	57.0			41.0		33.0		33.0			
Total Lost Time (s)	5.5	6.5			6.5		7.0		7.0			
Act Effct Green (s)	54.0	53.0			38.4		23.5		23.5			
Actuated g/C Ratio	0.60	0.59			0.43		0.26		0.26			
v/c Ratio	0.61	0.33			0.74		0.85		0.61			
Control Delay	11.9	4.1			25.0		48.7		15.4			
Queue Delay	0.0	0.5			1.7		0.0		0.4			
Total Delay	11.9	4.5			26.7		48.7		15.8			
LOS	B	A			C		D		B			
Approach Delay		6.0			26.7			33.2				
Approach LOS		A			C			C				
Queue Length 50th (ft)	28	88			143		204		59			
Queue Length 95th (ft)	m33	m102			250		#338		135			
Internal Link Dist (ft)		785			131			909			832	
Turn Bay Length (ft)	400								150			
Base Capacity (vph)	312	2104			1507		516		616			
Starvation Cap Reductn	0	0			231		0		0			
Spillback Cap Reductn	0	883			0		0		53			
Storage Cap Reductn	0	0			0		0		0			
Reduced v/c Ratio	0.56	0.57			0.87		0.76		0.62			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 1 (1%), Referenced to phase 2:WBT and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 21.9

Intersection LOS: C

Intersection Capacity Utilization 72.1%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St

		
Ø1	Ø2 (R)	Ø4
16 s	41 s	33 s
		
Ø6 (R)		
57 s		

AM Peak

WSP

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Lanes, Volumes, Timings
57: Burton Branch Rd & E.10th St

2040 Optimized AM Timing Plan

07/12/2017

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	655	265	50	740	310	95
Future Volume (vph)	655	265	50	740	310	95
Satd. Flow (prot)	3406	0	1805	3574	1805	1615
Flt Permitted			0.103		0.950	
Satd. Flow (perm)	3406	0	196	3574	1805	1615
Satd. Flow (RTOR)	84					165
Lane Group Flow (vph)	1071	0	56	813	544	173
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			2			4
Total Split (s)	34.0		16.0	50.0	40.0	40.0
Total Lost Time (s)	6.5		5.5	6.5	5.5	5.5
Act Effct Green (s)	34.6		48.0	47.0	31.0	31.0
Actuated g/C Ratio	0.38		0.53	0.52	0.34	0.34
v/c Ratio	0.79		0.20	0.44	0.87	0.26
Control Delay	26.1		13.2	14.9	43.6	4.7
Queue Delay	1.8		0.0	0.1	33.4	0.0
Total Delay	27.9		13.2	15.0	77.0	4.7
LOS	C		B	B	E	A
Approach Delay	27.9			14.9	59.5	
Approach LOS	C			B	E	
Queue Length 50th (ft)	316		15	151	275	3
Queue Length 95th (ft)	#434		35	205	205	2
Internal Link Dist (ft)	131			316	647	
Turn Bay Length (ft)			100			175
Base Capacity (vph)	1359		292	1864	691	720
Starvation Cap Reductn	150		0	0	0	0
Spillback Cap Reductn	0		0	190	173	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.89		0.19	0.49	1.05	0.24

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 88 (98%), Referenced to phase 2:WBTL and 6:EBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 32.2

Intersection LOS: C

Intersection Capacity Utilization 66.7%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 57: Burton Branch Rd & E.10th St



Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

61: SR 135/S. Willow Ave & County Services Dr/Orchard St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	10	10	35	35	80	40	915	10	60	755	40
Future Volume (vph)	15	10	10	35	35	80	40	915	10	60	755	40
Satd. Flow (prot)	1787	1700	0	0	1708	0	1626	3568	0	1787	3494	0
Flt Permitted	0.692				0.904		0.274			0.237		
Satd. Flow (perm)	1302	1700	0	0	1563	0	469	3568	0	446	3494	0
Satd. Flow (RTOR)		26			62			2			7	
Lane Group Flow (vph)	29	46	0	0	160	0	63	955	0	70	870	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			3		5	2		1	6	
Permitted Phases	4			3			2			6		
Total Split (s)	26.0	26.0		26.0	26.0		14.0	50.0		14.0	50.0	
Total Lost Time (s)	5.5	5.5			5.5		5.5	6.5		5.5	6.5	
Act Effct Green (s)	9.6	9.6			9.6		30.3	25.5		30.0	25.3	
Actuated g/C Ratio	0.18	0.18			0.18		0.56	0.47		0.55	0.47	
v/c Ratio	0.13	0.14			0.49		0.15	0.57		0.17	0.53	
Control Delay	23.5	14.9			20.4		5.6	13.7		5.7	13.3	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	23.5	14.9			20.4		5.6	13.7		5.7	13.3	
LOS	C	B			C		A	B		A	B	
Approach Delay		18.3			20.4			13.2			12.7	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)	8	6			29		6	127		7	113	
Queue Length 95th (ft)	17	13			91		14	220		22	198	
Internal Link Dist (ft)		674			289			17			564	
Turn Bay Length (ft)	100						100			200		
Base Capacity (vph)	520	695			661		459	2911		475	2851	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.06	0.07			0.24		0.14	0.33		0.15	0.31	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 54.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 13.7

Intersection Capacity Utilization 60.5%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 61: SR 135/S. Willow Ave & County Services Dr/Orchard St

		
Ø1	Ø2	Ø3
14 s	50 s	26 s
		
Ø5	Ø6	Ø4
14 s	50 s	26 s

Lanes, Volumes, Timings 95: Foutch Dr

2040 Optimized AM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	10	0	0	50	0	55
Future Volume (vph)	10	0	0	50	0	55
Satd. Flow (prot)	1805	0	0	1644	0	1900
Flt Permitted	0.950					
Satd. Flow (perm)	1805	0	0	1644	0	1900
Lane Group Flow (vph)	12	0	0	65	0	57
Sign Control	Yield		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 13.3%

Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings
 241: SR 136/S. Jefferson Ave & Fairground St

2040 Optimized AM Timing Plan
 07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				  	 	
Traffic Volume (vph)	10	10	10	1100	505	10
Future Volume (vph)	10	10	10	1100	505	10
Satd. Flow (prot)	1721	0	0	5131	3596	0
Flt Permitted	0.978			0.999		
Satd. Flow (perm)	1721	0	0	5131	3596	0
Lane Group Flow (vph)	29	0	0	1150	537	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 38.2%

ICU Level of Service A

Analysis Period (min) 15

HCM 2010 TWSC
241: SR 136/S. Jefferson Ave & Fairground St

2040 Optimized AM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	10	10	1100	505	10
Future Vol, veh/h	10	10	10	1100	505	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	63	63	97	97	63
Heavy Vehicles, %	0	0	0	1	0	0
Mvmt Flow	13	16	16	1134	521	16

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1014	268	536	0	-	0
Stage 1	529	-	-	-	-	-
Stage 2	485	-	-	-	-	-
Critical Hdwy	6.25	6.9	4.1	-	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	6	-	-	-	-	-
Follow-up Hdwy	3.65	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	271	736	1042	-	-	-
Stage 1	543	-	-	-	-	-
Stage 2	556	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	260	736	1042	-	-	-
Mov Cap-2 Maneuver	260	-	-	-	-	-
Stage 1	543	-	-	-	-	-
Stage 2	533	-	-	-	-	-

Approach	EB		NB		SB
HCM Control Delay, s	14.7		0.2		0
HCM LOS	B				

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1042	-	401	-	-
HCM Lane V/C Ratio	0.015	-	0.073	-	-
HCM Control Delay (s)	8.5	0.1	14.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Lanes, Volumes, Timings
271: Foutch Dr & SR 136/S. Jefferson Ave

2040 Optimized AM Timing Plan
07/12/2017

						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	0	540	325	50	0	0
Future Volume (vph)	0	540	325	50	0	0
Satd. Flow (prot)	0	3369	3297	0	0	0
Flt Permitted						
Satd. Flow (perm)	0	3369	3297	0	0	0
Lane Group Flow (vph)	0	593	409	0	0	0
Sign Control		Free	Free		Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 18.3%

Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings

2040 Optimized AM Timing Plan

361: US 70/E. Spring St & I-40 WB On-Ramp (SB)/I-40 WB On-Ramp (NB)

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	255	545	10	0	285	145
Future Volume (vph)	0	0	0	0	0	0	255	545	10	0	285	145
Satd. Flow (prot)	0	0	0	0	0	0	0	3285	0	0	3269	0
Flt Permitted								0.985				
Satd. Flow (perm)	0	0	0	0	0	0	0	3285	0	0	3269	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	955	0	0	466	0
Sign Control		Free				Free		Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 42.0%

ICU Level of Service A

Analysis Period (min) 15

Lanes, Volumes, Timings
521: Brown Ave S & E.10th St

2040 Optimized AM Timing Plan

07/12/2017

							Ø1	Ø3	Ø6
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR			
Lane Configurations									
Traffic Volume (vph)	720	25	10	995	50	10			
Future Volume (vph)	720	25	10	995	50	10			
Satd. Flow (prot)	1887	0	1805	1881	1786	0			
Flt Permitted			0.357		0.960				
Satd. Flow (perm)	1887	0	678	1881	1786	0			
Satd. Flow (RTOR)	12				7				
Lane Group Flow (vph)	819	0	16	1106	83	0			
Turn Type	NA		Perm	NA	Prot				
Protected Phases	3 6			2	4		1	3	6
Permitted Phases			2						
Total Split (s)			57.0	57.0	12.0		12.0	19.0	69.0
Total Lost Time (s)			5.5	5.5	5.5				
Act Effct Green (s)	80.0		51.6	51.6	6.5				
Actuated g/C Ratio	0.82		0.53	0.53	0.07				
v/c Ratio	0.53		0.04	1.11	0.66				
Control Delay	1.5		12.6	89.1	67.4				
Queue Delay	0.0		0.0	1.1	12.6				
Total Delay	1.5		12.6	90.3	80.1				
LOS	A		B	F	F				
Approach Delay	1.5			89.1	80.1				
Approach LOS	A			F	F				
Queue Length 50th (ft)	0		5	~829	48				
Queue Length 95th (ft)	m0		11	#1076	#76				
Internal Link Dist (ft)	23			2105	565				
Turn Bay Length (ft)			115						
Base Capacity (vph)	1530		359	995	125				
Starvation Cap Reductn	0		0	0	0				
Spillback Cap Reductn	0		0	194	25				
Storage Cap Reductn	0		0	0	0				
Reduced v/c Ratio	0.54		0.04	1.38	0.83				

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 97.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 53.3

Intersection LOS: D

Intersection Capacity Utilization 66.5%

ICU Level of Service C

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 521: Brown Ave S & E.10th St

			
12 s	57 s	19 s	12 s
			
69 s			

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	15	75	20	10	85	25	475	10	90	675	45
Future Volume (vph)	250	15	75	20	10	85	25	475	10	90	675	45
Satd. Flow (prot)	1770	1706	0	1703	1657	0	1805	3435	0	1787	3486	0
Flt Permitted	0.678			0.684			0.216			0.266		
Satd. Flow (perm)	1263	1706	0	1226	1657	0	410	3435	0	500	3486	0
Satd. Flow (RTOR)		77			99			4			8	
Lane Group Flow (vph)	510	113	0	37	123	0	30	603	0	127	848	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		3			4		5	2		1	6	
Permitted Phases	3			4			2			6		
Total Split (s)	60.0	60.0		60.0	60.0		11.6	36.0		14.0	38.4	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	6.0		5.5	6.0	
Act Effct Green (s)	49.4	49.4		49.4	49.4		41.7	35.0		48.0	42.0	
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.38	0.32		0.44	0.38	
v/c Ratio	0.90	0.14		0.07	0.15		0.13	0.55		0.40	0.63	
Control Delay	47.8	6.3		15.6	4.9		21.0	34.5		17.7	20.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	47.8	6.3		15.6	4.9		21.0	34.5		17.7	20.8	
LOS	D	A		B	A		C	C		B	C	
Approach Delay		40.3			7.4			33.8			20.4	
Approach LOS		D			A			C			C	
Queue Length 50th (ft)	307	13		14	9		12	195		25	184	
Queue Length 95th (ft)	169	4		18	0		29	229		39	130	
Internal Link Dist (ft)		927			612			1063			1812	
Turn Bay Length (ft)	200			150			200			200		
Base Capacity (vph)	625	884		607	870		233	1096		322	1337	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.82	0.13		0.06	0.14		0.13	0.55		0.39	0.63	

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 34 (31%), Referenced to phase 2:NBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 28.2

Intersection Capacity Utilization 59.8%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service B

Splits and Phases: 1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

		
Ø1	Ø2 (R)	Ø3
14 s	36 s	60 s
		
Ø5	Ø6	Ø4
11.6 s	38.4 s	60 s

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	265	10	65	0	0	0	0	580	260	395	860	0
Future Volume (vph)	265	10	65	0	0	0	0	580	260	395	860	0
Satd. Flow (prot)	1649	1571	0	0	0	0	0	3383	0	1770	3539	0
Flt Permitted	0.950	0.976								0.085		
Satd. Flow (perm)	1649	1571	0	0	0	0	0	3383	0	158	3539	0
Satd. Flow (RTOR)		33						71				
Lane Group Flow (vph)	196	188	0	0	0	0	0	1124	0	494	935	0
Turn Type	Split	NA						NA		pm+pt	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases										6		
Total Split (s)	36.0	36.0						42.0		32.0	74.0	
Total Lost Time (s)	6.0	6.0						5.5		5.5	5.5	
Act Effct Green (s)	18.5	18.5						41.7		80.0	80.0	
Actuated g/C Ratio	0.17	0.17						0.38		0.73	0.73	
v/c Ratio	0.71	0.64						0.85		0.83	0.36	
Control Delay	56.4	44.4						32.0		26.6	5.5	
Queue Delay	0.0	0.0						0.0		0.0	0.0	
Total Delay	56.4	44.4						32.0		26.6	5.5	
LOS	E	D						C		C	A	
Approach Delay		50.5						32.0			12.8	
Approach LOS		D						C			B	
Queue Length 50th (ft)	138	108						230		183	125	
Queue Length 95th (ft)	205	107						265		#330	191	
Internal Link Dist (ft)		409			271			1812			858	
Turn Bay Length (ft)	200									410		
Base Capacity (vph)	449	452						1326		594	2572	
Starvation Cap Reductn	0	0						0		0	0	
Spillback Cap Reductn	0	0						0		0	0	
Storage Cap Reductn	0	0						0		0	0	
Reduced v/c Ratio	0.44	0.42						0.85		0.83	0.36	

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 50 (45%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 25.1

Intersection LOS: C

Intersection Capacity Utilization 70.5%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

		
Ø1	Ø2 (R)	Ø4
32 s	42 s	36 s
		
Ø6 (R)		
74 s		

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	210	10	310	45	790	0	0	1055	325
Future Volume (vph)	0	0	0	210	10	310	45	790	0	0	1055	325
Satd. Flow (prot)	0	0	0	0	1762	1583	1671	3539	0	0	3409	0
Flt Permitted					0.954		0.061					
Satd. Flow (perm)	0	0	0	0	1762	1583	107	3539	0	0	3409	0
Satd. Flow (RTOR)						134					58	
Lane Group Flow (vph)	0	0	0	0	251	365	58	975	0	0	1642	0
Turn Type				Split	NA	Perm	pm+pt	NA			NA	
Protected Phases				4	4		5	2			6	
Permitted Phases						4	2					
Total Split (s)				37.0	37.0	37.0	11.6	73.0			61.4	
Total Lost Time (s)					5.5	5.5	5.5	5.5			5.5	
Act Effct Green (s)					23.4	23.4	75.6	75.6			65.9	
Actuated g/C Ratio					0.21	0.21	0.69	0.69			0.60	
v/c Ratio					0.67	0.83	0.35	0.40			0.79	
Control Delay					47.8	41.1	12.1	3.5			15.2	
Queue Delay					0.0	0.0	0.0	0.0			0.0	
Total Delay					47.8	41.1	12.1	3.5			15.2	
LOS					D	D	B	A			B	
Approach Delay					43.9			4.0			15.2	
Approach LOS					D			A			B	
Queue Length 50th (ft)					163	160	4	80			256	
Queue Length 95th (ft)					228	226	m11	177			m256	
Internal Link Dist (ft)		874			1170			858			839	
Turn Bay Length (ft)						200	200					
Base Capacity (vph)					504	548	166	2432			2066	
Starvation Cap Reductn					0	0	0	0			0	
Spillback Cap Reductn					0	0	0	0			0	
Storage Cap Reductn					0	0	0	0			0	
Reduced v/c Ratio					0.50	0.67	0.35	0.40			0.79	

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 109 (99%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 17.0

Intersection LOS: B

Intersection Capacity Utilization 70.5%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

 Ø2 (R)	 Ø4
73 s	37 s
 Ø5	 Ø6 (R)
11.6 s	61.4 s

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

4: SR 135/S. Willow Ave & Foreman Dr/Interstate Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	180	115	340	215	345	135	690	220	325	880	75
Future Volume (vph)	100	180	115	340	215	345	135	690	220	325	880	75
Satd. Flow (prot)	1736	1711	0	1805	1900	1615	1703	3412	0	1752	3524	0
Flt Permitted	0.596			0.154			0.144			0.108		
Satd. Flow (perm)	1089	1711	0	293	1900	1615	258	3412	0	199	3524	0
Satd. Flow (RTOR)		28				314		39			11	
Lane Group Flow (vph)	118	396	0	415	265	406	157	1058	0	361	1019	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4		4	2			6		
Total Split (s)	13.0	27.0		24.0	38.0	38.0	13.0	38.0		21.0	46.0	
Total Lost Time (s)	5.5	6.5		5.5	6.5	6.5	5.5	6.5		5.5	6.5	
Act Effct Green (s)	28.9	20.5		45.5	31.6	31.6	40.0	31.5		53.5	39.5	
Actuated g/C Ratio	0.26	0.19		0.41	0.29	0.29	0.36	0.29		0.49	0.36	
v/c Ratio	0.36	1.16		1.11	0.49	0.59	0.82	1.05		1.15	0.80	
Control Delay	25.5	138.1		108.1	36.1	12.0	58.9	69.3		125.5	37.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	25.5	138.1		108.1	36.1	12.0	58.9	69.3		125.5	37.2	
LOS	C	F		F	D	B	E	E		F	D	
Approach Delay		112.2			54.6			68.0			60.3	
Approach LOS		F			D			E			E	
Queue Length 50th (ft)	52	~316		~281	155	49	51	~412		~248	334	
Queue Length 95th (ft)	85	#395		#405	208	123	m#154	#508		#436	417	
Internal Link Dist (ft)		811			944			839			2060	
Turn Bay Length (ft)	150			150			50			150		
Base Capacity (vph)	331	341		375	546	687	192	1004		315	1272	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.36	1.16		1.11	0.49	0.59	0.82	1.05		1.15	0.80	

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 96 (87%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.16

Intersection Signal Delay: 67.4

Intersection LOS: E

Intersection Capacity Utilization 99.4%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

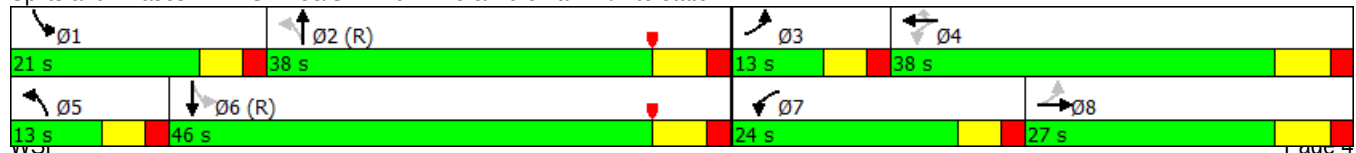
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: SR 135/S. Willow Ave & Foreman Dr/Interstate Dr



Lanes, Volumes, Timings
5: SR 135/S. Willow Ave & Fairground St

2040 Optimized PM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	35	130	1035	135	70	1305
Future Volume (vph)	35	130	1035	135	70	1305
Satd. Flow (prot)	1805	1583	3507	0	1752	3574
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1583	3507	0	1752	3574
Lane Group Flow (vph)	51	151	1230	0	111	1450
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 50.1%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
5: SR 135/S. Willow Ave & Fairground St

2040 Optimized PM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	35	130	1035	135	70	1305
Future Vol, veh/h	35	130	1035	135	70	1305
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	86	97	83	63	90
Heavy Vehicles, %	0	2	1	0	3	1
Mvmt Flow	51	151	1067	163	111	1450

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2095	615	0	0	1230	0
Stage 1	1148	-	-	-	-	-
Stage 2	947	-	-	-	-	-
Critical Hdwy	6.8	6.94	-	-	4.16	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.32	-	-	2.23	-
Pot Cap-1 Maneuver	~ 46	434	-	-	557	-
Stage 1	269	-	-	-	-	-
Stage 2	342	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 37	434	-	-	557	-
Mov Cap-2 Maneuver	141	-	-	-	-	-
Stage 1	269	-	-	-	-	-
Stage 2	274	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	24.4	0	0.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	141	434	557	-
HCM Lane V/C Ratio	-	-	0.36	0.348	0.199	-
HCM Control Delay (s)	-	-	44.2	17.7	13.1	-
HCM Lane LOS	-	-	E	C	B	-
HCM 95th %tile Q(veh)	-	-	1.5	1.5	0.7	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lanes, Volumes, Timings
6: SR 135/S. Willow Ave & Ashwood Dr

2040 Optimized PM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (vph)	0	20	1145	10	0	1385
Future Volume (vph)	0	20	1145	10	0	1385
Satd. Flow (prot)	0	1644	3568	0	0	3539
Flt Permitted						
Satd. Flow (perm)	0	1644	3568	0	0	3539
Lane Group Flow (vph)	0	27	1196	0	0	1522
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 42.0%

ICU Level of Service A

Analysis Period (min) 15

HCM 2010 TWSC
6: SR 135/S. Willow Ave & Ashwood Dr

2040 Optimized PM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	20	1145	10	0	1385
Future Vol, veh/h	0	20	1145	10	0	1385
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	25	75	97	63	25	91
Heavy Vehicles, %	0	0	1	0	0	2
Mvmt Flow	0	27	1180	16	0	1522

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	590	0	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.9	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-	-
Pot Cap-1 Maneuver	0	456	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	456	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	13.4		0		0
HCM LOS	B				

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 456	-
HCM Lane V/C Ratio	- 0.058	-
HCM Control Delay (s)	- 13.4	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0.2	-

Lanes, Volumes, Timings
7: SR 135/S. Willow Ave & Lone Oak Dr

2040 Optimized PM Timing Plan
07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	35	35	40	1200	1285	55
Future Volume (vph)	35	35	40	1200	1285	55
Satd. Flow (prot)	1736	1553	1805	3574	3547	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1736	1553	1805	3574	3547	0
Lane Group Flow (vph)	35	51	45	1212	1470	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 47.3%

ICU Level of Service A

Analysis Period (min) 15

HCM 2010 TWSC
7: SR 135/S. Willow Ave & Lone Oak Dr

2040 Optimized PM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	35	35	40	1200	1285	55
Future Vol, veh/h	35	35	40	1200	1285	55
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	30	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	69	88	99	92	75
Heavy Vehicles, %	4	4	0	1	1	2
Mvmt Flow	35	51	45	1212	1397	73

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2130	735	1470	0	-	0
Stage 1	1433	-	-	-	-	-
Stage 2	697	-	-	-	-	-
Critical Hdwy	6.88	6.98	4.1	-	-	-
Critical Hdwy Stg 1	5.88	-	-	-	-	-
Critical Hdwy Stg 2	5.88	-	-	-	-	-
Follow-up Hdwy	3.54	3.34	2.2	-	-	-
Pot Cap-1 Maneuver	41	358	465	-	-	-
Stage 1	183	-	-	-	-	-
Stage 2	450	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	37	358	465	-	-	-
Mov Cap-2 Maneuver	129	-	-	-	-	-
Stage 1	183	-	-	-	-	-
Stage 2	406	-	-	-	-	-

Approach	EB		NB		SB
HCM Control Delay, s	27.4		0.5		0
HCM LOS	D				

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	465	-	129	358	-	-
HCM Lane V/C Ratio	0.098	-	0.271	0.142	-	-
HCM Control Delay (s)	13.6	-	43	16.7	-	-
HCM Lane LOS	B	-	E	C	-	-
HCM 95th %tile Q(veh)	0.3	-	1	0.5	-	-

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

8: SR 135/S. Willow Ave & W. Jackson St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	405	430	195	600	170	390	730	135	210	840	115
Future Volume (vph)	140	405	430	195	600	170	390	730	135	210	840	115
Satd. Flow (prot)	1805	3574	1568	1787	3473	0	1787	3453	0	1770	3502	0
Flt Permitted	0.178			0.294			0.115			0.160		
Satd. Flow (perm)	338	3574	1568	553	3473	0	216	3453	0	298	3502	0
Satd. Flow (RTOR)			330		43			26			16	
Lane Group Flow (vph)	149	500	494	207	880	0	419	956	0	263	1047	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4			2			6		
Total Split (s)	11.8	28.0	28.0	12.8	29.0		24.0	40.3		18.9	35.2	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5		5.5	6.0		5.5	6.0	
Act Effct Green (s)	28.8	22.5	22.5	30.8	23.5		53.4	34.9		42.5	29.2	
Actuated g/C Ratio	0.29	0.22	0.22	0.31	0.24		0.53	0.35		0.42	0.29	
v/c Ratio	0.79	0.62	0.81	0.80	1.04		1.03	0.78		0.83	1.01	
Control Delay	54.6	38.9	24.1	49.6	77.3		82.3	34.0		43.0	53.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	54.6	38.9	24.1	49.6	77.3		82.3	34.0		43.0	53.8	
LOS	D	D	C	D	E		F	C		D	D	
Approach Delay		34.5			72.0			48.7			51.6	
Approach LOS		C			E			D			D	
Queue Length 50th (ft)	66	152	99	96	~308		~236	280		64	~342	
Queue Length 95th (ft)	#143	182	#229	#156	#434		#427	360		#143	#502	
Internal Link Dist (ft)		1238			1065			2054			612	
Turn Bay Length (ft)	225		175	150			150			150		
Base Capacity (vph)	189	804	608	260	849		405	1220		325	1033	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.79	0.62	0.81	0.80	1.04		1.03	0.78		0.81	1.01	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 70 (70%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 51.4

Intersection LOS: D

Intersection Capacity Utilization 97.0%

ICU Level of Service F

Analysis Period (min) 15

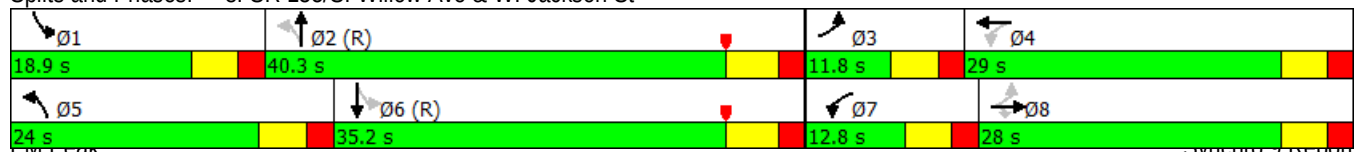
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: SR 135/S. Willow Ave & W. Jackson St



WSP

Synchro 5 Report

Lanes, Volumes, Timings

9: SR 135/S. Willow Ave & W. Stevens St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	100	40	130	140	95	35	900	90	70	1090	40
Future Volume (vph)	50	100	40	130	140	95	35	900	90	70	1090	40
Satd. Flow (prot)	0	1811	0	1787	1783	0	1805	3524	0	1787	3554	0
Flt Permitted		0.988		0.950			0.103			0.146		
Satd. Flow (perm)	0	1811	0	1787	1783	0	196	3524	0	275	3554	0
Satd. Flow (RTOR)		15			27			13			5	
Lane Group Flow (vph)	0	242	0	183	268	0	42	1008	0	84	1180	0
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	22.0	22.0		23.0	23.0		11.6	43.4		11.6	43.4	
Total Lost Time (s)		5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)		15.5		16.4	16.4		47.1	42.2		48.3	44.7	
Actuated g/C Ratio		0.16		0.16	0.16		0.47	0.42		0.48	0.45	
v/c Ratio		0.83		0.63	0.85		0.22	0.68		0.37	0.74	
Control Delay		61.9		48.8	61.2		9.9	22.7		8.7	15.6	
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		61.9		48.8	61.2		9.9	22.7		8.7	15.6	
LOS		E		D	E		A	C		A	B	
Approach Delay		61.9			56.2			22.2			15.2	
Approach LOS		E			E			C			B	
Queue Length 50th (ft)		140		108	150		13	304		10	354	
Queue Length 95th (ft)		#218		137	#251		m13	m344		m9	m334	
Internal Link Dist (ft)		761			793			608			1346	
Turn Bay Length (ft)				75			100			150		
Base Capacity (vph)		311		312	334		190	1493		227	1590	
Starvation Cap Reductn		0		0	0		0	0		0	0	
Spillback Cap Reductn		0		0	0		0	0		0	0	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.78		0.59	0.80		0.22	0.68		0.37	0.74	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 27.5

Intersection LOS: C

Intersection Capacity Utilization 78.4%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: SR 135/S. Willow Ave & W. Stevens St

			
Ø1	Ø2 (R)	Ø3	Ø4
11.6 s	43.4 s	23 s	22 s
			
Ø5	Ø6 (R)		
11.6 s	43.4 s		

PM Peak

WSP

Synchro 9 Report

Page 12

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

10: SR 135/S. Willow Ave & US 70/W. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	315	150	285	380	185	135	780	115	110	955	25
Future Volume (vph)	160	315	150	285	380	185	135	780	115	110	955	25
Satd. Flow (prot)	1787	1758	0	1805	1791	0	1787	3507	0	1685	3324	0
Flt Permitted	0.140			0.117			0.140			0.137		
Satd. Flow (perm)	263	1758	0	222	1791	0	263	3507	0	243	3324	0
Satd. Flow (RTOR)		25			20			17			3	
Lane Group Flow (vph)	213	551	0	343	696	0	153	986	0	149	1046	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	14.0	34.1		19.8	39.9		11.3	34.1		12.0	34.8	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	37.1	28.6		48.4	34.4		34.4	28.6		35.8	29.3	
Actuated g/C Ratio	0.37	0.29		0.48	0.34		0.34	0.29		0.36	0.29	
v/c Ratio	0.94	1.06		1.03	1.11		0.86	0.97		0.83	1.07	
Control Delay	70.7	90.6		84.8	100.4		53.1	54.0		46.6	81.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	70.7	90.6		84.8	100.4		53.1	54.0		46.6	81.7	
LOS	E	F		F	F		D	D		D	F	
Approach Delay		85.0			95.2			53.9			77.3	
Approach LOS		F			F			D			E	
Queue Length 50th (ft)	83	~376		~183	~502		70	346		71	~396	
Queue Length 95th (ft)	#155	#542		#311	#530		m#121	#468		m#103	#527	
Internal Link Dist (ft)		2100			700			1346			1053	
Turn Bay Length (ft)	125			125			175			150		
Base Capacity (vph)	227	520		333	629		178	1015		180	976	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.94	1.06		1.03	1.11		0.86	0.97		0.83	1.07	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 81 (81%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 76.8

Intersection LOS: E

Intersection Capacity Utilization 94.5%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

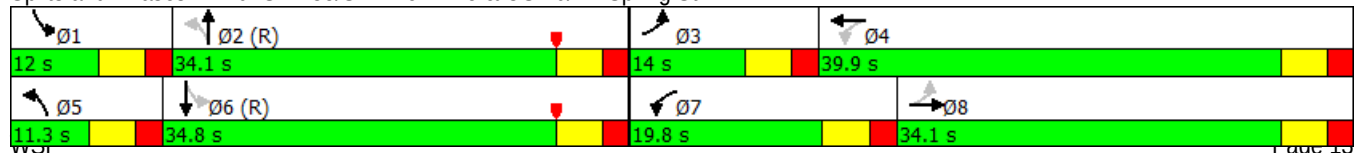
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: SR 135/S. Willow Ave & US 70/W. Spring St



Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	120	85	160	205	80	110	885	55	75	875	85
Future Volume (vph)	90	120	85	160	205	80	110	885	55	75	875	85
Satd. Flow (prot)	1805	1763	0	1805	1822	0	1668	3323	0	1620	3283	0
Flt Permitted	0.283			0.310			0.119			0.171		
Satd. Flow (perm)	538	1763	0	589	1822	0	209	3323	0	292	3283	0
Satd. Flow (RTOR)		38			18			10			15	
Lane Group Flow (vph)	95	241	0	198	370	0	134	1025	0	75	1054	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	11.8	26.4		15.4	30.0		14.6	46.4		11.8	43.6	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	24.8	18.2		32.4	24.2		52.6	45.5		47.5	41.1	
Actuated g/C Ratio	0.25	0.18		0.32	0.24		0.53	0.46		0.48	0.41	
v/c Ratio	0.44	0.68		0.63	0.81		0.58	0.68		0.34	0.78	
Control Delay	29.1	41.9		33.7	49.9		20.3	17.3		14.4	27.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	29.1	41.9		33.7	49.9		20.3	17.3		14.4	27.9	
LOS	C	D		C	D		C	B		B	C	
Approach Delay		38.3			44.3			17.7			27.0	
Approach LOS		D			D			B			C	
Queue Length 50th (ft)	41	119		89	212		18	323		17	288	
Queue Length 95th (ft)	m75	m194		129	256		m18	m327		m27	376	
Internal Link Dist (ft)		1729			1357			1053			841	
Turn Bay Length (ft)	75						150			50		
Base Capacity (vph)	217	398		315	463		243	1517		224	1359	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.44	0.61		0.63	0.80		0.55	0.68		0.33	0.78	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 27 (27%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 27.9

Intersection LOS: C

Intersection Capacity Utilization 72.0%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
11.8 s	46.4 s	11.8 s	30 s
			
Ø5	Ø6 (R)	Ø7	Ø8
14.6 s	43.6 s	15.4 s	26.4 s

Lanes, Volumes, Timings

12: SR 135/N. Willow Ave & W. 3rd St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	10	20	15	10	30	20	1025	20	15	1005	25
Future Volume (vph)	10	10	20	15	10	30	20	1025	20	15	1005	25
Satd. Flow (prot)	0	1772	0	0	1731	0	0	3353	0	0	3317	0
Flt Permitted		0.985			0.989			0.999			0.999	
Satd. Flow (perm)	0	1772	0	0	1731	0	0	3353	0	0	3317	0
Lane Group Flow (vph)	0	53	0	0	82	0	0	1133	0	0	1157	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 54.3%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
12: SR 135/N. Willow Ave & W. 3rd St

2040 Optimized PM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 18.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	10	10	20	15	10	30	20	1025	20	15	1005	25
Future Vol, veh/h	10	10	20	15	10	30	20	1025	20	15	1005	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	63	94	83	63	63	75	95	75	83	91	71
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	1	0
Mvmt Flow	16	16	21	18	16	48	27	1079	27	18	1104	35

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1759	2317	570	1742	2322	553	1140	0	0	1106	0	0
Stage 1	1158	1158	-	1146	1146	-	-	-	-	-	-	-
Stage 2	601	1159	-	596	1176	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	55	38	470	57	38	482	620	-	-	639	-	-
Stage 1	212	273	-	215	276	-	-	-	-	-	-	-
Stage 2	459	272	-	462	267	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	26	31	470	28	31	482	620	-	-	639	-	-
Mov Cap-2 Maneuver	26	31	-	28	31	-	-	-	-	-	-	-
Stage 1	188	252	-	190	245	-	-	-	-	-	-	-
Stage 2	343	241	-	381	246	-	-	-	-	-	-	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	\$ 334.9			\$ 303.6			0.8			0.6		
HCM LOS	F			F								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	620	-	-	45	65	639	-	-
HCM Lane V/C Ratio	0.043	-	-	1.178	1.255	0.028	-	-
HCM Control Delay (s)	11.1	0.6	-	\$ 334.9	\$ 303.6	10.8	0.4	-
HCM Lane LOS	B	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	5	6.7	0.1	-	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lanes, Volumes, Timings

13: SR 135/N. Willow Ave & W. 4th St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	15	30	30	10	35	20	995	45	15	980	20
Future Volume (vph)	15	15	30	30	10	35	20	995	45	15	980	20
Satd. Flow (prot)	0	1740	0	0	1711	0	0	3335	0	0	3321	0
Flt Permitted		0.985			0.979			0.999			0.999	
Satd. Flow (perm)	0	1740	0	0	1711	0	0	3335	0	0	3321	0
Lane Group Flow (vph)	0	81	0	0	97	0	0	1165	0	0	1163	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 57.0%

Analysis Period (min) 15

ICU Level of Service B

Intersection

Int Delay, s/veh 47.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	15	15	30	30	10	35	20	995	45	15	980	20
Future Vol, veh/h	15	15	30	30	10	35	20	995	45	15	980	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	100	71	71	100	78	63	93	71	50	89	63
Heavy Vehicles, %	0	0	0	0	0	4	0	0	2	0	1	0
Mvmt Flow	24	15	42	42	10	45	32	1070	63	30	1101	32

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1780	2374	566	1783	2358	567	1133	0	0	1133	0	0
Stage 1	1177	1177	-	1165	1165	-	-	-	-	-	-	-
Stage 2	603	1197	-	618	1193	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.98	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.34	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	53	35	473	53	36	462	624	-	-	624	-	-
Stage 1	206	267	-	210	271	-	-	-	-	-	-	-
Stage 2	458	261	-	448	263	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	28	26	473	~ 22	27	462	624	-	-	624	-	-
Mov Cap-2 Maneuver	28	26	-	~ 22	27	-	-	-	-	-	-	-
Stage 1	177	232	-	180	233	-	-	-	-	-	-	-
Stage 2	340	224	-	332	229	-	-	-	-	-	-	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	\$ 438.9			\$ 834.9			0.9			0.9		
HCM LOS	F			F								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	624	-	-	53	41	624	-	-
HCM Lane V/C Ratio	0.051	-	-	1.529	2.369	0.048	-	-
HCM Control Delay (s)	11.1	0.7	-	\$ 438.9	\$ 834.9	11.1	0.7	-
HCM Lane LOS	B	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.2	-	-	7.5	10.5	0.2	-	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lanes, Volumes, Timings

14: SR 135/N. Willow Ave & W. 7th St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	85	35	290	140	170	15	900	90	60	695	25
Future Volume (vph)	55	85	35	290	140	170	15	900	90	60	695	25
Satd. Flow (prot)	1770	1751	0	1805	1727	0	0	3315	0	0	3268	0
Flt Permitted	0.494			0.362				0.917			0.675	
Satd. Flow (perm)	920	1751	0	688	1727	0	0	3043	0	0	2215	0
Satd. Flow (RTOR)		24			64			14			7	
Lane Group Flow (vph)	66	166	0	337	364	0	0	1070	0	0	907	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	20.0		21.0	29.0		47.0	47.0		12.0	59.0	
Total Lost Time (s)	5.5	6.0		5.5	6.0			6.0			6.0	
Act Effct Green (s)	19.4	12.1		35.5	25.0			53.0			53.0	
Actuated g/C Ratio	0.19	0.12		0.36	0.25			0.53			0.53	
v/c Ratio	0.28	0.72		0.77	0.76			0.66			0.77	
Control Delay	25.7	53.1		39.4	40.9			9.0			25.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	25.7	53.1		39.4	40.9			9.0			25.9	
LOS	C	D		D	D			A			C	
Approach Delay		45.3			40.2			9.0			25.9	
Approach LOS		D			D			A			C	
Queue Length 50th (ft)	26	87		155	176			83			192	
Queue Length 95th (ft)	53	136		#263	#332			86			328	
Internal Link Dist (ft)		675			1002			1211			498	
Turn Bay Length (ft)	25			75								
Base Capacity (vph)	237	265		438	480			1620			1199	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.28	0.63		0.77	0.76			0.66			0.76	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 73 (73%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 24.7

Intersection LOS: C

Intersection Capacity Utilization 92.3%

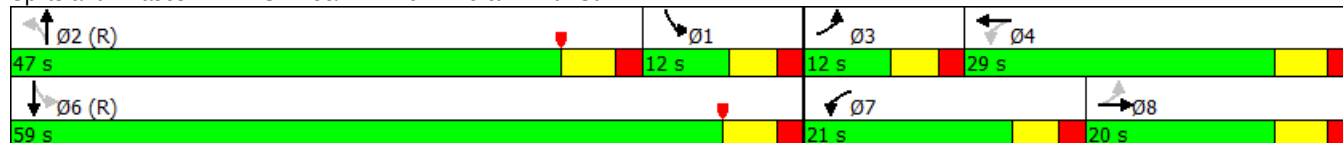
ICU Level of Service F

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 14: SR 135/N. Willow Ave & W. 7th St



Lanes, Volumes, Timings
15: SR 135/N. Willow Ave & W. 9th St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	10	100	10	15	10	85	1010	10	10	680	80
Future Volume (vph)	50	10	100	10	15	10	85	1010	10	10	680	80
Satd. Flow (prot)	0	1663	0	0	1778	0	0	3346	0	0	3280	0
Flt Permitted		0.984			0.988			0.995			0.999	
Satd. Flow (perm)	0	1663	0	0	1778	0	0	3346	0	0	3280	0
Lane Group Flow (vph)	0	191	0	0	41	0	0	1215	0	0	888	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 75.3%

Analysis Period (min) 15

ICU Level of Service D

HCM 2010 TWSC
15: SR 135/N. Willow Ave & W. 9th St

2040 Optimized PM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 86.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	50	10	100	10	15	10	85	1010	10	10	680	80
Future Vol, veh/h	50	10	100	10	15	10	85	1010	10	10	680	80
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	100	85	100	100	63	75	93	63	100	86	92
Heavy Vehicles, %	0	0	5	0	0	0	0	0	0	0	1	2
Mvmt Flow	63	10	118	10	15	16	113	1086	16	10	791	87

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1631	2183	439	1741	2219	551	878	0	0	1102	0	0
Stage 1	854	854	-	1321	1321	-	-	-	-	-	-	-
Stage 2	777	1329	-	420	898	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	7	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.35	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	69	47	557	57	44	483	778	-	-	641	-	-
Stage 1	324	378	-	168	228	-	-	-	-	-	-	-
Stage 2	360	226	-	587	361	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 27	28	557	23	27	483	778	-	-	641	-	-
Mov Cap-2 Maneuver	~ 27	28	-	23	27	-	-	-	-	-	-	-
Stage 1	202	366	-	105	142	-	-	-	-	-	-	-
Stage 2	194	141	-	436	350	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	\$ 982.6	\$ 303.4	2.4	0.3
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	778	-	-	66	40	641	-	-
HCM Lane V/C Ratio	0.146	-	-	2.881	1.022	0.016	-	-
HCM Control Delay (s)	10.4	1.6	\$ 982.6	\$ 303.4	10.7	0.2	-	-
HCM Lane LOS	B	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.5	-	-	19.2	4	0	-	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lanes, Volumes, Timings
16: SR 135/N. Willow Ave & University Dr

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	35	20	130	30	85	10	955	85	15	635	20
Future Volume (vph)	35	35	20	130	30	85	10	955	85	15	635	20
Satd. Flow (prot)	1736	1679	0	1787	1630	0	0	3329	0	0	3312	0
Flt Permitted	0.634			0.428				0.948			0.889	
Satd. Flow (perm)	1158	1679	0	805	1630	0	0	3156	0	0	2950	0
Satd. Flow (RTOR)		21			127			13			7	
Lane Group Flow (vph)	45	60	0	197	196	0	0	1149	0	0	739	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	3	8		7	4			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	28.0		15.0	31.0		57.0	57.0		57.0	57.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5			5.5	
Act Effct Green (s)	14.4	8.2		25.5	17.4			63.4			63.4	
Actuated g/C Ratio	0.14	0.08		0.26	0.17			0.63			0.63	
v/c Ratio	0.21	0.38		0.57	0.51			0.57			0.39	
Control Delay	28.3	37.4		36.3	19.2			5.1			9.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	28.3	37.4		36.3	19.2			5.1			9.7	
LOS	C	D		D	B			A			A	
Approach Delay		33.5			27.8			5.1			9.7	
Approach LOS		C			C			A			A	
Queue Length 50th (ft)	21	24		101	39			78			125	
Queue Length 95th (ft)	40	61		109	33			117			m192	
Internal Link Dist (ft)		789			874			862			1102	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	211	394		344	511			2004			1872	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.21	0.15		0.57	0.38			0.57			0.39	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 12 (12%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 11.5

Intersection LOS: B

Intersection Capacity Utilization 59.2%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 16: SR 135/N. Willow Ave & University Dr

		
Ø2 (R)	Ø3	Ø4
57 s	12 s	31 s
		
Ø6 (R)	Ø7	Ø8
57 s	15 s	28 s

Lanes, Volumes, Timings
17: SR 135/N. Willow Ave & W. 12th St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	275	180	255	400	150	295	525	255	100	280	55
Future Volume (vph)	115	275	180	255	400	150	295	525	255	100	280	55
Satd. Flow (prot)	1752	1845	1615	1770	3420	0	1685	3176	0	1668	3285	0
Flt Permitted	0.274			0.247			0.452			0.220		
Satd. Flow (perm)	505	1845	1615	460	3420	0	802	3176	0	386	3285	0
Satd. Flow (RTOR)			198		54			100			25	
Lane Group Flow (vph)	129	320	198	277	621	0	307	821	0	145	371	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8			6			2		
Total Split (s)	15.0	32.0	32.0	15.0	32.0		15.0	40.0		13.0	38.0	
Total Lost Time (s)	5.5	6.0	6.0	5.5	6.0		5.5	6.5		5.5	6.5	
Act Effct Green (s)	31.4	21.8	21.8	37.4	25.0		46.7	34.2		40.3	31.0	
Actuated g/C Ratio	0.31	0.22	0.22	0.37	0.25		0.47	0.34		0.40	0.31	
v/c Ratio	0.48	0.80	0.39	0.84	0.69		0.65	0.71		0.56	0.36	
Control Delay	25.4	51.6	6.7	47.6	35.4		15.0	18.5		24.6	26.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	25.4	51.6	6.7	47.6	35.4		15.0	18.5		24.6	26.4	
LOS	C	D	A	D	D		B	B		C	C	
Approach Delay		32.6			39.2			17.6			25.9	
Approach LOS		C			D			B			C	
Queue Length 50th (ft)	50	193	0	119	171		79	214		52	94	
Queue Length 95th (ft)	89	262	53	#250	228		101	238		66	128	
Internal Link Dist (ft)		1178			1081			1102			1094	
Turn Bay Length (ft)	100			220			100			220		
Base Capacity (vph)	281	479	566	331	930		475	1180		263	1093	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.46	0.67	0.35	0.84	0.67		0.65	0.70		0.55	0.34	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 27 (27%), Referenced to phase 2:SBTL and 6:NBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 28.1

Intersection LOS: C

Intersection Capacity Utilization 76.4%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 17: SR 135/N. Willow Ave & W. 12th St

					
Ø1	Ø2 (R)	Ø3	Ø4	Ø5	Ø6 (R)
15 s	38 s	15 s	32 s	13 s	40 s
					
Ø5	Ø6 (R)	Ø7	Ø8		
13 s	40 s	15 s	32 s		

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	295	0	20	15	0	35	25	805	10	25	1130	345
Future Volume (vph)	295	0	20	15	0	35	25	805	10	25	1130	345
Satd. Flow (prot)	1736	1615	0	1805	1615	0	1805	3539	1615	1687	3505	1599
Flt Permitted	0.403			0.744			0.116			0.215		
Satd. Flow (perm)	736	1615	0	1414	1615	0	220	3539	1615	382	3505	1599
Satd. Flow (RTOR)		202			198				177			177
Lane Group Flow (vph)	311	21	0	24	51	0	40	982	10	25	1256	437
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2		2	6		6
Total Split (s)	35.0	35.0		12.0	12.0		12.0	61.0	61.0	12.0	61.0	61.0
Total Lost Time (s)	5.5	6.0		5.5	6.0		5.5	6.0	6.0	5.5	6.0	6.0
Act Effct Green (s)	33.7	28.4		11.5	6.0		72.2	67.7	67.7	70.7	65.2	65.2
Actuated g/C Ratio	0.28	0.24		0.10	0.05		0.60	0.56	0.56	0.59	0.54	0.54
v/c Ratio	0.76	0.04		0.15	0.19		0.18	0.49	0.01	0.09	0.66	0.46
Control Delay	49.4	0.1		32.7	1.6		13.0	19.6	0.0	3.6	7.4	1.9
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.4	0.5
Total Delay	49.4	0.1		32.7	1.6		13.0	19.6	0.0	3.6	7.7	2.4
LOS	D	A		C	A		B	B	A	A	A	A
Approach Delay		46.3			11.5			19.1			6.3	
Approach LOS		D			B			B			A	
Queue Length 50th (ft)	197	0		13	0		13	281	0	2	53	0
Queue Length 95th (ft)	282	0		22	0		20	315	0	m3	78	3
Internal Link Dist (ft)		573			734			200			263	
Turn Bay Length (ft)	200			25			175		150	100		50
Base Capacity (vph)	468	572		159	268		219	1995	987	296	1903	949
Starvation Cap Reductn	0	0		0	0		0	0	0	0	209	198
Spillback Cap Reductn	0	0		0	0		0	21	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.04		0.15	0.19		0.18	0.50	0.01	0.08	0.74	0.58

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 31 (26%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 14.8

Intersection LOS: B

Intersection Capacity Utilization 64.2%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	61 s	35 s	12 s
			
Ø5	Ø6 (R)	Ø7	Ø8
12 s	61 s	12 s	35 s

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	270	0	205	0	0	0	0	950	175	360	1290	0
Future Volume (vph)	270	0	205	0	0	0	0	950	175	360	1290	0
Satd. Flow (prot)	1736	0	1538	0	0	0	0	3574	1599	1787	3539	0
Flt Permitted	0.950									0.136		
Satd. Flow (perm)	1736	0	1538	0	0	0	0	3574	1599	256	3539	0
Satd. Flow (RTOR)			250						219			
Lane Group Flow (vph)	307	0	250	0	0	0	0	1105	219	434	1418	0
Turn Type	Prot		Perm					NA	Perm	pm+pt	NA	
Protected Phases	1							3		2	3	
Permitted Phases			1						3	3		
Total Split (s)	30.0		30.0					60.0	60.0	30.0	60.0	
Total Lost Time (s)	6.0		6.0					5.5	5.5	5.5	5.5	
Act Effct Green (s)	23.2		23.2					54.5	54.5	79.8	54.5	
Actuated g/C Ratio	0.19		0.19					0.45	0.45	0.66	0.45	
v/c Ratio	0.91		0.50					0.68	0.26	0.88	0.88	
Control Delay	79.3		8.7					21.0	2.0	58.3	21.5	
Queue Delay	0.0		0.0					0.5	0.4	0.0	4.1	
Total Delay	79.3		8.7					21.5	2.4	58.3	25.6	
LOS	E		A					C	A	E	C	
Approach Delay		47.7						18.4			33.3	
Approach LOS		D						B			C	
Queue Length 50th (ft)	233		0					161	6	269	126	
Queue Length 95th (ft)	#379		47					176	8	#362	268	
Internal Link Dist (ft)		458			312			263			407	
Turn Bay Length (ft)			200							250		
Base Capacity (vph)	347		507					1623	845	493	1607	
Starvation Cap Reductn	0		0					178	285	0	130	
Spillback Cap Reductn	0		1					0	0	0	25	
Storage Cap Reductn	0		0					0	0	0	0	
Reduced v/c Ratio	0.88		0.49					0.76	0.39	0.88	0.96	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 24 (20%), Referenced to phase 3:NBSB, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 30.1

Intersection LOS: C

Intersection Capacity Utilization 76.7%

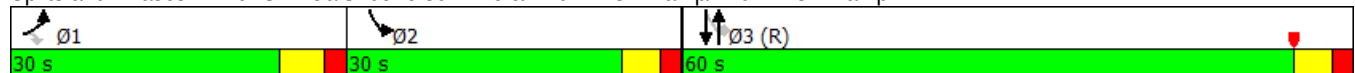
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp



Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	105	0	290	120	1090	0	0	1540	255
Future Volume (vph)	0	0	0	105	0	290	120	1090	0	0	1540	255
Satd. Flow (prot)	0	0	0	1656	0	2707	1719	3574	0	0	3574	1599
Flt Permitted				0.950			0.059					
Satd. Flow (perm)	0	0	0	1656	0	2707	107	3574	0	0	3574	1599
Satd. Flow (RTOR)												139
Lane Group Flow (vph)	0	0	0	118	0	354	140	1160	0	0	1638	280
Turn Type				Prot		Perm	pm+pt	NA			NA	Perm
Protected Phases				1			2	3			3	
Permitted Phases						1	3	2				3
Total Split (s)				69.0		69.0	18.0	33.0			33.0	33.0
Total Lost Time (s)				6.0		6.0	5.5	5.5			5.5	5.5
Act Effct Green (s)				21.7		21.7	81.3	86.8			68.2	68.2
Actuated g/C Ratio				0.18		0.18	0.68	0.72			0.57	0.57
v/c Ratio				0.39		0.72	0.56	0.45			0.81	0.29
Control Delay				46.1		54.6	45.7	5.3			13.3	2.0
Queue Delay				0.0		0.4	0.0	0.1			7.8	1.2
Total Delay				46.1		55.0	45.7	5.4			21.0	3.1
LOS				D		D	D	A			C	A
Approach Delay					52.8			9.7			18.4	
Approach LOS					D			A			B	
Queue Length 50th (ft)				81		148	77	111			134	2
Queue Length 95th (ft)				129		173	m122	m126			#801	m14
Internal Link Dist (ft)		382			483			407			133	
Turn Bay Length (ft)				275		275	250					
Base Capacity (vph)				869		1421	252	2583			2029	968
Starvation Cap Reductn				0		0	0	286			364	472
Spillback Cap Reductn				71		624	0	454			55	0
Storage Cap Reductn				0		0	0	0			0	0
Reduced v/c Ratio				0.15		0.44	0.56	0.54			0.98	0.56

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 32 (27%), Referenced to phase 3:NBSB, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 19.8

Intersection LOS: B

Intersection Capacity Utilization 76.7%

ICU Level of Service D

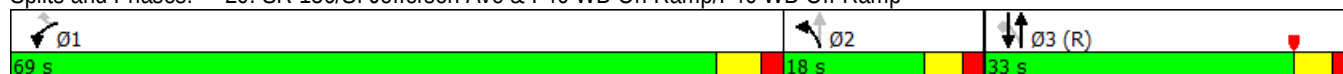
Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp



Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	20	465	115	30	20	205	1110	75	10	1225	80
Future Volume (vph)	100	20	465	115	30	20	205	1110	75	10	1225	80
Satd. Flow (prot)	0	1794	1599	1770	1788	0	1787	3539	1568	1805	5118	0
Flt Permitted		0.960		0.950			0.077			0.144		
Satd. Flow (perm)	0	1794	1599	1770	1788	0	145	3539	1568	274	5118	0
Satd. Flow (RTOR)			362		24				123		11	
Lane Group Flow (vph)	0	166	541	122	69	0	233	1181	80	24	1424	0
Turn Type	Split	NA	Perm	Split	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			3				2		2	6		
Total Split (s)	31.0	31.0	31.0	31.0	31.0		20.0	42.0	42.0	16.0	38.0	
Total Lost Time (s)		5.5	5.5	5.5	5.5		5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)		21.5	21.5	14.4	14.4		67.6	58.3	58.3	56.2	46.2	
Actuated g/C Ratio		0.18	0.18	0.12	0.12		0.56	0.49	0.49	0.47	0.38	
v/c Ratio		0.52	0.93	0.58	0.29		0.78	0.69	0.10	0.09	0.72	
Control Delay		49.4	38.8	60.4	35.4		53.8	24.3	1.7	14.1	25.6	
Queue Delay		0.0	3.9	0.3	0.0		23.6	1.2	0.3	0.0	0.0	
Total Delay		49.4	42.8	60.7	35.4		77.3	25.5	2.0	14.1	25.6	
LOS		D	D	E	D		E	C	A	B	C	
Approach Delay		44.3			51.6			32.3			25.4	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)		112	144	91	32		145	278	1	7	175	
Queue Length 95th (ft)		148	#301	149	54		240	#584	7	m8	m#432	
Internal Link Dist (ft)		530			587			133			582	
Turn Bay Length (ft)			100	25			50			100		
Base Capacity (vph)		381	624	376	398		316	1718	824	263	1977	
Starvation Cap Reductn		0	0	0	0		79	301	417	0	0	
Spillback Cap Reductn		0	40	52	0		0	0	0	0	21	
Storage Cap Reductn		0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio		0.44	0.93	0.38	0.17		0.98	0.83	0.20	0.09	0.73	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 12 (10%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 32.9

Intersection LOS: C

Intersection Capacity Utilization 78.0%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd

					
Ø1	Ø2 (R)		Ø3		Ø4
16 s	42 s		31 s		31 s
Ø5	Ø6 (R)				
20 s	38 s				

PM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	430	250	300	495	170	215	700	255	130	865	240
Future Volume (vph)	190	430	250	300	495	170	215	700	255	130	865	240
Satd. Flow (prot)	1770	1845	1599	1805	3480	0	1770	3539	1615	1805	3464	0
Flt Permitted	0.147			0.128			0.096			0.254		
Satd. Flow (perm)	274	1845	1599	243	3480	0	179	3539	1615	483	3464	0
Satd. Flow (RTOR)			245		34				271		32	
Lane Group Flow (vph)	216	439	263	313	759	0	269	729	271	151	1133	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4			2		2	6		
Total Split (s)	20.0	34.0	34.0	22.0	36.0		20.0	46.0	46.0	18.0	44.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5		5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)	42.2	28.5	28.5	47.8	31.3		56.3	41.8	41.8	49.7	38.5	
Actuated g/C Ratio	0.35	0.24	0.24	0.40	0.26		0.47	0.35	0.35	0.41	0.32	
v/c Ratio	0.81	1.00	0.46	1.01	0.81		0.97	0.59	0.37	0.47	1.00	
Control Delay	51.1	89.7	8.9	86.7	48.0		91.6	41.5	12.7	14.9	37.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	51.1	89.7	8.9	86.7	48.0		91.6	41.5	12.7	14.9	37.6	
LOS	D	F	A	F	D		F	D	B	B	D	
Approach Delay		57.5			59.3			46.0			34.9	
Approach LOS		E			E			D			C	
Queue Length 50th (ft)	109	~343	11	~197	282		197	165	37	25	~96	
Queue Length 95th (ft)	#215	#558	82	#387	337		#277	254	120	m28	m#134	
Internal Link Dist (ft)		1125			846			582			1693	
Turn Bay Length (ft)	175			125			125			125		
Base Capacity (vph)	278	438	566	311	933		276	1232	738	342	1133	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.78	1.00	0.46	1.01	0.81		0.97	0.59	0.37	0.44	1.00	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow, Master Intersection

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 48.3

Intersection LOS: D

Intersection Capacity Utilization 101.1%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

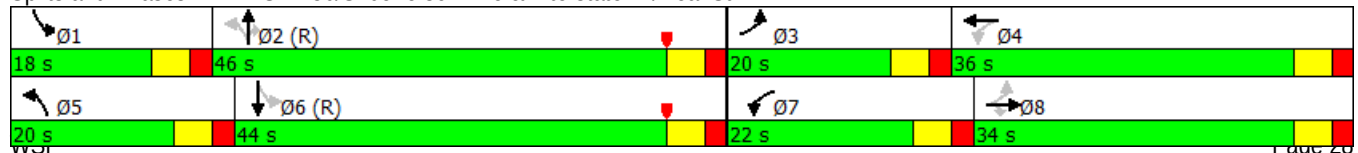
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St



Lanes, Volumes, Timings
23: SR 136/S. Jefferson Ave & E. Veterans Dr

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	245	75	170	280	145	60	800	130	95	1065	95
Future Volume (vph)	80	245	75	170	280	145	60	800	130	95	1065	95
Satd. Flow (prot)	1805	1818	0	1752	1754	0	1805	3504	0	1752	3549	0
Flt Permitted	0.131			0.308			0.099			0.094		
Satd. Flow (perm)	249	1818	0	568	1754	0	188	3504	0	173	3549	0
Satd. Flow (RTOR)		15			28			16			11	
Lane Group Flow (vph)	96	388	0	183	533	0	63	992	0	109	1247	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	14.0	50.0		14.0	50.0		14.0	42.0		14.0	42.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	48.0	39.5		48.0	39.5		50.0	40.6		51.1	43.7	
Actuated g/C Ratio	0.40	0.33		0.40	0.33		0.42	0.34		0.43	0.36	
v/c Ratio	0.46	0.64		0.59	0.90		0.31	0.83		0.55	0.96	
Control Delay	25.6	37.3		28.8	54.6		19.0	40.5		39.0	48.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	1.9	
Total Delay	25.6	37.3		28.8	54.6		19.0	40.5		39.0	50.7	
LOS	C	D		C	D		B	D		D	D	
Approach Delay		35.0			48.0			39.2			49.7	
Approach LOS		D			D			D			D	
Queue Length 50th (ft)	41	238		83	364		26	381		23	~578	
Queue Length 95th (ft)	64	295		126	435		m48	#417		m99	#715	
Internal Link Dist (ft)		1014			884			1693			283	
Turn Bay Length (ft)	150			150			150			125		
Base Capacity (vph)	209	683		310	668		205	1197		197	1300	
Starvation Cap Reductn	0	0		0	0		0	0		0	20	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.46	0.57		0.59	0.80		0.31	0.83		0.55	0.97	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 80 (67%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 44.3

Intersection LOS: D

Intersection Capacity Utilization 91.0%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

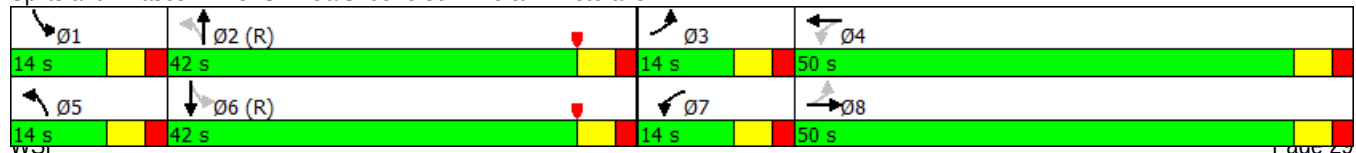
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 23: SR 136/S. Jefferson Ave & E. Veterans Dr



Lanes, Volumes, Timings

24: SR 136/S. Jefferson Ave & Walmart Driveway

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	10	190	15	130	10	850	145	140	1090	15
Future Volume (vph)	0	0	10	190	15	130	10	850	145	140	1090	15
Satd. Flow (prot)	1900	1615	0	1805	1649	0	1805	3486	0	1787	3504	0
Flt Permitted				0.417			0.218			0.179		
Satd. Flow (perm)	1900	1615	0	792	1649	0	414	3486	0	337	3504	0
Satd. Flow (RTOR)		268			135			18			3	
Lane Group Flow (vph)	0	32	0	226	153	0	10	1016	0	156	1142	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	20.0	28.0		22.0	30.0		18.0	49.0		21.0	52.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)		12.0		26.3	26.3		76.1	64.1		82.5	79.2	
Actuated g/C Ratio		0.10		0.22	0.22		0.63	0.53		0.69	0.66	
v/c Ratio		0.08		0.74	0.33		0.02	0.54		0.40	0.49	
Control Delay		0.4		54.9	9.4		5.3	9.9		6.8	10.9	
Queue Delay		0.0		0.0	0.0		0.0	0.1		0.0	0.4	
Total Delay		0.4		54.9	9.4		5.3	10.0		6.8	11.3	
LOS		A		D	A		A	B		A	B	
Approach Delay		0.4			36.5			10.0			10.8	
Approach LOS		A			D			A			B	
Queue Length 50th (ft)		0		144	10		1	120		52	297	
Queue Length 95th (ft)		0		202	49		m2	155		m30	502	
Internal Link Dist (ft)		175			382			47			1774	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		520		317	515		408	1869		421	2313	
Starvation Cap Reductn		0		0	0		0	163		0	0	
Spillback Cap Reductn		47		0	0		0	0		0	614	
Storage Cap Reductn		0		0	0		0	0		0	0	
Reduced v/c Ratio		0.07		0.71	0.30		0.02	0.60		0.37	0.67	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 89 (74%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 13.9

Intersection LOS: B

Intersection Capacity Utilization 71.6%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 24: SR 136/S. Jefferson Ave & Walmart Driveway

					
Ø1	Ø2 (R)	Ø3	Ø4	Ø5	Ø6 (R)
21 s	49 s	22 s	28 s	18 s	52 s
					
Ø7	Ø8	Ø9	Ø10	Ø11	Ø12
20 s	30 s				

Lanes, Volumes, Timings
25: SR 136/S. Jefferson Ave & Commerce Ave

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	15	75	100	10	55	55	1055	25	30	1180	30
Future Volume (vph)	100	15	75	100	10	55	55	1055	25	30	1180	30
Satd. Flow (prot)	1805	1670	0	1752	1618	0	1805	3592	0	1719	3596	0
Flt Permitted	0.690			0.294			0.102			0.178		
Satd. Flow (perm)	1311	1670	0	542	1618	0	194	3592	0	322	3596	0
Satd. Flow (RTOR)		99			87			4			3	
Lane Group Flow (vph)	149	123	0	217	103	0	73	1123	0	48	1390	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	19.0	18.0		25.0	24.0		13.0	65.0		12.0	64.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	20.2	8.3		30.6	13.6		74.1	68.2		73.0	67.7	
Actuated g/C Ratio	0.17	0.07		0.26	0.11		0.62	0.57		0.61	0.56	
v/c Ratio	0.55	0.59		0.70	0.40		0.34	0.55		0.18	0.69	
Control Delay	43.4	27.5		48.9	17.7		12.7	6.7		3.5	9.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	43.4	27.5		48.9	17.7		12.7	6.7		3.5	9.7	
LOS	D	C		D	B		B	A		A	A	
Approach Delay		36.2			38.9			7.1			9.5	
Approach LOS		D			D			A			A	
Queue Length 50th (ft)	93	18		142	11		6	66		3	68	
Queue Length 95th (ft)	102	30		94	24		12	218		m4	431	
Internal Link Dist (ft)		193			738			1774			1034	
Turn Bay Length (ft)				100			125			125		
Base Capacity (vph)	293	262		336	323		222	2043		274	2029	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.51	0.47		0.65	0.32		0.33	0.55		0.18	0.69	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 20 (17%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 13.8

Intersection LOS: B

Intersection Capacity Utilization 64.5%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 25: SR 136/S. Jefferson Ave & Commerce Ave

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	65 s	19 s	24 s
			
Ø5	Ø6 (R)	Ø7	Ø8
13 s	64 s	25 s	18 s

Lanes, Volumes, Timings

26: SR 136/S. Jefferson Ave & E. Jackson St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	225	340	365	195	20	435	570	215	30	700	65
Future Volume (vph)	85	225	340	365	195	20	435	570	215	30	700	65
Satd. Flow (prot)	1787	1863	1599	3502	1855	0	1805	3610	1599	1685	3329	0
Flt Permitted	0.543			0.950			0.099			0.400		
Satd. Flow (perm)	1021	1863	1599	3502	1855	0	188	3610	1599	709	3329	0
Satd. Flow (RTOR)			391		4				276		8	
Lane Group Flow (vph)	105	239	391	401	265	0	494	663	276	43	866	0
Turn Type	pm+pt	NA	Perm	Prot	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8				2		2	6		
Total Split (s)	12.0	24.0	24.0	21.0	33.0		36.0	63.0	63.0	12.0	39.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5		5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)	24.3	17.8	17.8	15.5	26.7		70.3	60.7	60.7	41.4	35.0	
Actuated g/C Ratio	0.20	0.15	0.15	0.13	0.22		0.59	0.51	0.51	0.34	0.29	
v/c Ratio	0.42	0.87	0.69	0.89	0.64		0.97	0.36	0.29	0.15	0.89	
Control Delay	36.6	78.9	11.4	74.0	49.2		55.2	22.4	8.0	13.8	37.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	36.6	78.9	11.4	74.0	49.2		55.2	22.4	8.0	13.8	37.5	
LOS	D	E	B	E	D		E	C	A	B	D	
Approach Delay		37.0			64.1			31.0			36.4	
Approach LOS		D			E			C			D	
Queue Length 50th (ft)	58	182	0	159	183		341	238	48	10	137	
Queue Length 95th (ft)	91	#317	77	#246	245		#528	272	103	m23	#424	
Internal Link Dist (ft)		578			301			1034			1031	
Turn Bay Length (ft)	100			175			150		500	180		
Base Capacity (vph)	248	287	577	452	428		520	1826	945	298	978	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.42	0.83	0.68	0.89	0.62		0.95	0.36	0.29	0.14	0.89	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 79 (66%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 39.4

Intersection LOS: D

Intersection Capacity Utilization 86.1%

ICU Level of Service E

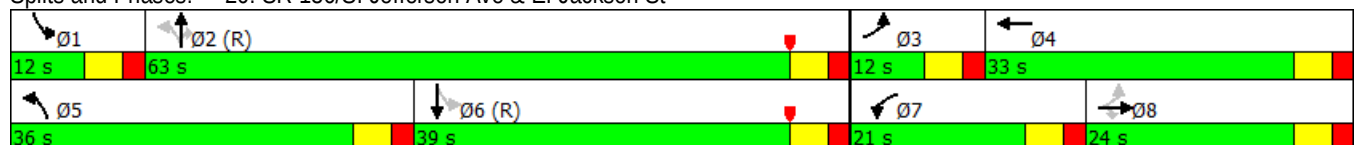
Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 26: SR 136/S. Jefferson Ave & E. Jackson St



PM Peak
WSP

Synchro 9 Report
Page 32

Lanes, Volumes, Timings
27: SR 136/S. Jefferson Ave & Foutch Dr

2040 Optimized PM Timing Plan

07/12/2017

							
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations							
Traffic Volume (vph)	150	30	15	645	720	0	
Future Volume (vph)	150	30	15	645	720	0	
Satd. Flow (prot)	1782	0	1452	3369	3369	0	
Flt Permitted	0.961		0.317				
Satd. Flow (perm)	1782	0	485	3369	3369	0	
Satd. Flow (RTOR)	8						
Lane Group Flow (vph)	234	0	18	686	791	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	3			1	1 2		2
Permitted Phases			1				
Total Split (s)	31.0		52.0	52.0			37.0
Total Lost Time (s)	6.0		6.0	6.0			
Act Effct Green (s)	23.7		47.3	47.3	84.3		
Actuated g/C Ratio	0.20		0.39	0.39	0.70		
v/c Ratio	0.66		0.09	0.52	0.33		
Control Delay	52.0		13.5	14.0	0.6		
Queue Delay	0.0		0.0	0.0	0.4		
Total Delay	52.0		13.5	14.0	0.9		
LOS	D		B	B	A		
Approach Delay	52.0			14.0	0.9		
Approach LOS	D			B	A		
Queue Length 50th (ft)	160		4	82	3		
Queue Length 95th (ft)	208		m12	122	3		
Internal Link Dist (ft)	70			1031	110		
Turn Bay Length (ft)			125				
Base Capacity (vph)	377		190	1328	2367		
Starvation Cap Reductn	0		0	0	941		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.62		0.09	0.52	0.55		

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 106 (88%), Referenced to phase 2:SBT and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 13.1

Intersection LOS: B

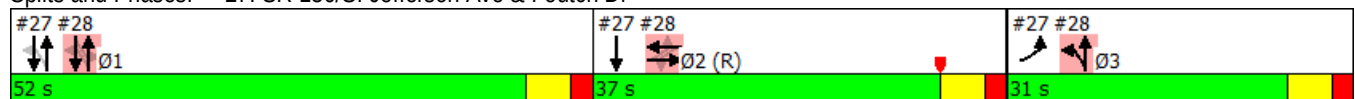
Intersection Capacity Utilization 40.0%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 27: SR 136/S. Jefferson Ave & Foutch Dr



Lanes, Volumes, Timings

28: SR 136/S. Jefferson Ave & E. Stevens St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	140	50	35	120	30	30	680	80	10	690	15
Future Volume (vph)	15	140	50	35	120	30	30	680	80	10	690	15
Satd. Flow (prot)	0	1822	0	0	1840	0	0	3295	0	0	3356	0
Flt Permitted		0.952			0.885			0.886			0.924	
Satd. Flow (perm)	0	1744	0	0	1641	0	0	2925	0	0	3104	0
Satd. Flow (RTOR)		15			9			23			2	
Lane Group Flow (vph)	0	236	0	0	235	0	0	895	0	0	801	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		2			2		3	1 3			1	
Permitted Phases	2			2			1 3			1		
Total Split (s)	37.0	37.0		37.0	37.0		31.0			52.0	52.0	
Total Lost Time (s)		6.0			6.0						6.0	
Act Effct Green (s)		31.0			31.0			71.0			47.3	
Actuated g/C Ratio		0.26			0.26			0.59			0.39	
v/c Ratio		0.51			0.55			0.49			0.65	
Control Delay		40.1			42.5			5.9			23.2	
Queue Delay		0.0			0.0			0.1			0.0	
Total Delay		40.1			42.5			6.0			23.2	
LOS		D			D			A			C	
Approach Delay		40.1			42.5			6.0			23.2	
Approach LOS		D			D			A			C	
Queue Length 50th (ft)		147			152			44			221	
Queue Length 95th (ft)		229			197			65			m216	
Internal Link Dist (ft)		321			386			1			1911	
Turn Bay Length (ft)												
Base Capacity (vph)		461			430			1849			1225	
Starvation Cap Reductn		0			0			153			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.51			0.55			0.53			0.65	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 106 (88%), Referenced to phase 2:SBT and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 20.0

Intersection LOS: C

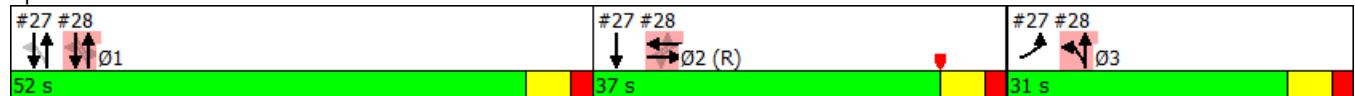
Intersection Capacity Utilization 72.6%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 28: SR 136/S. Jefferson Ave & E. Stevens St



Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	510	160	120	430	15	175	280	160	25	310	45
Future Volume (vph)	30	510	160	120	430	15	175	280	160	25	310	45
Satd. Flow (prot)	1805	1804	0	1752	1669	0	1668	1662	0	1685	1551	0
Flt Permitted	0.292			0.084			0.164			0.166		
Satd. Flow (perm)	555	1804	0	155	1669	0	288	1662	0	294	1551	0
Satd. Flow (RTOR)		15			2			29			6	
Lane Group Flow (vph)	30	781	0	150	491	0	199	506	0	35	429	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	16.0	51.0		16.0	51.0		16.0	37.0		16.0	37.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	55.7	45.7		58.5	52.2		44.5	38.2		41.5	31.5	
Actuated g/C Ratio	0.46	0.38		0.49	0.44		0.37	0.32		0.35	0.26	
v/c Ratio	0.08	1.12		0.71	0.68		0.88	0.92		0.16	1.04	
Control Delay	15.7	102.7		56.7	19.7		59.3	51.4		21.2	92.5	
Queue Delay	0.0	2.1		0.0	3.2		0.0	10.7		0.0	21.7	
Total Delay	15.7	104.9		56.7	22.9		59.3	62.1		21.3	114.2	
LOS	B	F		E	C		E	E		C	F	
Approach Delay		101.6			30.8			61.3			107.2	
Approach LOS		F			C			E			F	
Queue Length 50th (ft)	8	~700		85	132		108	~175		13	~323	
Queue Length 95th (ft)	m20	#856		m131	m182		#223	#480		29	#479	
Internal Link Dist (ft)		356			188			1911			200	
Turn Bay Length (ft)	200			65						65		
Base Capacity (vph)	369	696		215	727		227	548		224	411	
Starvation Cap Reductn	0	22		0	55		0	0		0	67	
Spillback Cap Reductn	0	178		0	146		0	38		6	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.08	1.51		0.70	0.85		0.88	0.99		0.16	1.25	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 73 (61%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.12

Intersection Signal Delay: 74.4

Intersection LOS: E

Intersection Capacity Utilization 96.1%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
16 s	51 s	16 s	37 s
			
Ø5	Ø6 (R)	Ø7	Ø8
16 s	51 s	16 s	37 s

Lanes, Volumes, Timings

30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	305	70	130	340	25	65	185	75	30	155	30
Future Volume (vph)	15	305	70	130	340	25	65	185	75	30	155	30
Satd. Flow (prot)	1805	1827	0	1805	1865	0	1668	1694	0	1685	1736	0
Flt Permitted	0.432			0.336			0.389			0.351		
Satd. Flow (perm)	821	1827	0	638	1865	0	683	1694	0	622	1736	0
Satd. Flow (RTOR)		11			3			16			7	
Lane Group Flow (vph)	24	431	0	163	430	0	80	286	0	38	217	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	16.0	49.0		18.0	51.0		16.0	37.0		16.0	37.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	66.4	56.4		70.8	63.7		33.1	26.7		31.2	23.2	
Actuated g/C Ratio	0.55	0.47		0.59	0.53		0.28	0.22		0.26	0.19	
v/c Ratio	0.04	0.50		0.34	0.43		0.29	0.74		0.15	0.64	
Control Delay	10.7	18.6		12.5	17.5		30.0	46.3		26.8	50.7	
Queue Delay	0.0	0.4		0.1	1.4		0.0	2.2		0.1	5.6	
Total Delay	10.7	19.0		12.7	19.0		30.0	48.5		26.8	56.3	
LOS	B	B		B	B		C	D		C	E	
Approach Delay		18.5			17.2			44.5			51.9	
Approach LOS		B			B			D			D	
Queue Length 50th (ft)	6	133		48	163		48	172		20	149	
Queue Length 95th (ft)	12	172		m51	m152		m16	m48		35	196	
Internal Link Dist (ft)		353			196			200			580	
Turn Bay Length (ft)	200			65			65			50		
Base Capacity (vph)	543	867		500	991		276	462		256	460	
Starvation Cap Reductn	0	72		27	363		0	80		0	0	
Spillback Cap Reductn	0	133		45	0		0	58		20	183	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.04	0.59		0.36	0.68		0.29	0.75		0.16	0.78	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 82 (68%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 28.9

Intersection LOS: C

Intersection Capacity Utilization 69.6%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
16 s	51 s	16 s	37 s
			
Ø5	Ø6 (R)	Ø7	Ø8
18 s	49 s	16 s	37 s

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	500	55	100	430	55	45	315	310	105	315	65
Future Volume (vph)	160	500	55	100	430	55	45	315	310	105	315	65
Satd. Flow (prot)	1787	1840	0	1752	1863	1615	1745	1783	1546	1728	1784	0
Flt Permitted	0.286			0.136			0.188			0.264		
Satd. Flow (perm)	538	1840	0	251	1863	1615	345	1783	1546	480	1784	0
Satd. Flow (RTOR)		5				123			343		9	
Lane Group Flow (vph)	176	600	0	123	453	75	71	346	413	133	438	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2		2	4		4	8		
Total Split (s)	16.0	49.0		16.0	49.0	49.0	16.0	39.0	39.0	16.0	39.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)	57.3	46.9		57.0	46.8	46.8	40.7	30.6	30.6	42.2	33.9	
Actuated g/C Ratio	0.48	0.39		0.48	0.39	0.39	0.34	0.26	0.26	0.35	0.28	
v/c Ratio	0.48	0.83		0.50	0.62	0.11	0.30	0.76	0.64	0.48	0.86	
Control Delay	11.8	24.1		18.5	32.8	6.1	25.9	52.7	12.1	21.2	36.5	
Queue Delay	0.7	51.1		0.0	0.1	0.1	0.0	1.8	0.0	0.0	11.8	
Total Delay	12.4	75.2		18.5	33.0	6.2	25.9	54.5	12.1	21.2	48.3	
LOS	B	E		B	C	A	C	D	B	C	D	
Approach Delay		61.0			27.1			31.0			42.0	
Approach LOS		E			C			C			D	
Queue Length 50th (ft)	50	281		63	316	10	33	240	41	25	80	
Queue Length 95th (ft)	m48	m261		78	447	25	44	350	62	55	#198	
Internal Link Dist (ft)		188			1101			264			195	
Turn Bay Length (ft)	60			100		100	100			50		
Base Capacity (vph)	366	722		251	726	704	240	497	678	278	515	
Starvation Cap Reductn	0	211		0	0	0	0	0	0	0	64	
Spillback Cap Reductn	45	0		0	18	162	3	56	0	0	19	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.55	1.17		0.49	0.64	0.14	0.30	0.78	0.61	0.48	0.97	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 76 (63%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 40.5

Intersection LOS: D

Intersection Capacity Utilization 85.2%

ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
16 s	49 s	16 s	39 s
			
Ø5	Ø6 (R)	Ø7	Ø8
16 s	49 s	16 s	39 s

PM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	275	40	30	280	125	25	440	45	115	415	205
Future Volume (vph)	85	275	40	30	280	125	25	440	45	115	415	205
Satd. Flow (prot)	1787	1844	0	1805	1799	0	1745	1789	0	1745	1818	1546
Flt Permitted	0.107			0.357			0.292			0.118		
Satd. Flow (perm)	201	1844	0	678	1799	0	536	1789	0	217	1818	1546
Satd. Flow (RTOR)		7			22			5				241
Lane Group Flow (vph)	96	356	0	43	506	0	25	556	0	155	477	241
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		8
Total Split (s)	16.0	42.0		16.0	42.0		16.0	46.0		16.0	46.0	46.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	5.5
Act Effct Green (s)	49.6	41.4		48.1	38.1		49.3	39.3		52.2	45.9	45.9
Actuated g/C Ratio	0.41	0.34		0.40	0.32		0.41	0.33		0.44	0.38	0.38
v/c Ratio	0.44	0.56		0.12	0.86		0.08	0.94		0.69	0.69	0.33
Control Delay	34.6	30.0		17.8	54.0		14.0	48.0		37.6	38.5	4.7
Queue Delay	0.0	1.7		0.0	3.7		0.0	5.2		0.0	0.2	0.0
Total Delay	34.6	31.7		17.8	57.7		14.0	53.1		37.6	38.7	4.7
LOS	C	C		B	E		B	D		D	D	A
Approach Delay		32.3			54.6			51.5			29.2	
Approach LOS		C			D			D			C	
Queue Length 50th (ft)	21	229		26	389		7	187		68	328	0
Queue Length 95th (ft)	m96	196		m31	#497		m14	#578		91	439	44
Internal Link Dist (ft)		196			1084			195			349	
Turn Bay Length (ft)	60			100			65			100		
Base Capacity (vph)	222	641		373	586		328	608		227	695	739
Starvation Cap Reductn	0	145		0	0		0	29		0	0	0
Spillback Cap Reductn	0	0		0	36		0	0		0	18	4
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.43	0.72		0.12	0.92		0.08	0.96		0.68	0.70	0.33

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 72 (60%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 40.7

Intersection LOS: D

Intersection Capacity Utilization 83.2%

ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
16 s	42 s	16 s	46 s
			
Ø5	Ø6 (R)	Ø7	Ø8
16 s	42 s	16 s	46 s

PM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

33: SR 136/N. Washington Ave & E. 1st St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	35	140	15	20	15	60	585	15	10	635	85
Future Volume (vph)	235	35	140	15	20	15	60	585	15	10	635	85
Satd. Flow (prot)	0	1764	0	0	1791	0	1711	1793	0	1745	3384	0
Flt Permitted		0.971			0.991		0.201			0.119		
Satd. Flow (perm)	0	1764	0	0	1791	0	362	1793	0	219	3384	0
Satd. Flow (RTOR)		15			15			2			20	
Lane Group Flow (vph)	0	501	0	0	82	0	77	755	0	10	834	0
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	35.0	35.0		16.0	16.0		12.0	87.0		12.0	87.0	
Total Lost Time (s)		5.5			5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)		31.2			9.0		54.9	54.0		49.5	43.1	
Actuated g/C Ratio		0.28			0.08		0.50	0.49		0.45	0.39	
v/c Ratio		0.98			0.51		0.29	0.86		0.05	0.62	
Control Delay		76.7			59.1		16.4	35.7		12.9	27.1	
Queue Delay		0.0			0.0		0.0	0.1		0.0	0.0	
Total Delay		76.7			59.1		16.4	35.8		12.9	27.1	
LOS		E			E		B	D		B	C	
Approach Delay		76.7			59.1			34.0			26.9	
Approach LOS		E			E			C			C	
Queue Length 50th (ft)		331			44		28	449		4	243	
Queue Length 95th (ft)		#859			67		43	599		11	294	
Internal Link Dist (ft)		234			474			256			166	
Turn Bay Length (ft)										50		
Base Capacity (vph)		511			194		265	1370		194	2589	
Starvation Cap Reductn		0			0		0	52		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.98			0.42		0.29	0.57		0.05	0.32	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 110

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 41.7

Intersection Capacity Utilization 80.5%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service D

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 33: SR 136/N. Washington Ave & E. 1st St

			
Ø1	Ø2	Ø3	Ø4
12 s	87 s	35 s	16 s
			
Ø5	Ø6		
12 s	87 s		

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

34: SR 136/N. Washington Ave & E. 10th St/E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	310	40	230	215	355	50	620	340	320	415	60
Future Volume (vph)	150	310	40	230	215	355	50	620	340	320	415	60
Satd. Flow (prot)	1805	3534	0	3467	1900	1615	1719	3505	1615	1752	3517	0
Flt Permitted	0.950			0.950			0.431			0.140		
Satd. Flow (perm)	1805	3534	0	3467	1900	1615	780	3505	1615	258	3517	0
Satd. Flow (RTOR)		15				319			395		15	
Lane Group Flow (vph)	167	386	0	267	234	394	60	721	395	340	586	0
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases						4	2		2	6		
Total Split (s)	19.0	19.0		30.0	30.0	30.0	12.0	29.0	29.0	22.0	39.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)	12.9	12.9		18.3	18.3	18.3	29.1	22.7	22.7	44.4	35.2	
Actuated g/C Ratio	0.14	0.14		0.20	0.20	0.20	0.32	0.25	0.25	0.48	0.38	
v/c Ratio	0.66	0.76		0.39	0.62	0.69	0.19	0.84	0.57	0.88	0.43	
Control Delay	53.0	48.6		33.8	41.7	14.2	17.4	44.1	7.0	48.5	23.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	53.0	48.6		33.8	41.7	14.2	17.4	44.1	7.0	48.5	23.8	
LOS	D	D		C	D	B	B	D	A	D	C	
Approach Delay		49.9			27.2			30.3			32.8	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	96	114		72	129	38	19	216	0	148	138	
Queue Length 95th (ft)	#192	#190		102	205	133	41	#306	60	#335	175	
Internal Link Dist (ft)		135			2500			631			700	
Turn Bay Length (ft)	100			215		215	100			100		
Base Capacity (vph)	266	534		928	508	665	313	900	708	393	1351	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.63	0.72		0.29	0.46	0.59	0.19	0.80	0.56	0.87	0.43	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 92.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 33.2

Intersection Capacity Utilization 72.8%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 34: SR 136/N. Washington Ave & E. 10th St/E.10th St

					
22 s	29 s	19 s	30 s		
12 s	39 s				

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

35: US 70/E. Spring St & I-40 EB Off-Ramps/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	0	285	0	0	0	0	385	25	240	500	0
Future Volume (vph)	100	0	285	0	0	0	0	385	25	240	500	0
Satd. Flow (prot)	0	1656	1615	0	0	0	0	3423	0	1711	3490	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1656	1615	0	0	0	0	3423	0	1711	3490	0
Lane Group Flow (vph)	0	116	331	0	0	0	0	481	0	276	556	0
Sign Control		Stop			Free			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 40.3%

Analysis Period (min) 15

ICU Level of Service A

Intersection

Int Delay, s/veh 17.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗					↖↗		↖	↖↗	
Traffic Vol, veh/h	100	0	285	0	0	0	0	385	25	240	500	0
Future Vol, veh/h	100	0	285	0	0	0	0	385	25	240	500	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	200	-	-	-	-	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	25	86	25	25	25	25	86	75	87	90	25
Heavy Vehicles, %	9	0	0	0	0	0	0	1	0	2	0	0
Mvmt Flow	116	0	331	0	0	0	0	448	33	276	556	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	1331	1555	278	-	0	0	448	0	0
Stage 1	1107	1107	-	-	-	-	-	-	-
Stage 2	224	448	-	-	-	-	-	-	-
Critical Hdwy	6.98	6.5	6.9	-	-	-	4.14	-	-
Critical Hdwy Stg 1	5.98	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.98	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.59	4	3.3	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	137	114	725	0	-	-	1109	-	0
Stage 1	263	288	-	0	-	-	-	-	0
Stage 2	771	576	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	~ 103	0	725	-	-	-	1109	-	-
Mov Cap-2 Maneuver	~ 103	0	-	-	-	-	-	-	-
Stage 1	198	0	-	-	-	-	-	-	-
Stage 2	771	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	63.8	0	3.1
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	103	725	1109	-
HCM Lane V/C Ratio	-	-	1.129	0.457	0.249	-
HCM Control Delay (s)	-	-	205.3	14.1	9.3	-
HCM Lane LOS	-	-	F	B	A	-
HCM 95th %tile Q(veh)	-	-	7.5	2.4	1	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lanes, Volumes, Timings
 36: US 70/E. Spring St & I-40 WB Off-Ramp

2040 Optimized PM Timing Plan
 07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	40	180	335	0	0	795
Future Volume (vph)	40	180	335	0	0	795
Satd. Flow (prot)	1687	1568	3323	0	0	3455
Flt Permitted	0.950					
Satd. Flow (perm)	1687	1568	3323	0	0	3455
Lane Group Flow (vph)	58	228	399	0	0	846
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 32.0%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
36: US 70/E. Spring St & I-40 WB Off-Ramp

2040 Optimized PM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 2.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	40	180	335	0	0	795
Future Vol, veh/h	40	180	335	0	0	795
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	None
Storage Length	0	300	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	79	84	25	25	94
Heavy Vehicles, %	7	3	5	0	0	1
Mvmt Flow	58	228	399	0	0	846

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	822	199	0	-	-	-
Stage 1	399	-	-	-	-	-
Stage 2	423	-	-	-	-	-
Critical Hdwy	6.94	6.96	-	-	-	-
Critical Hdwy Stg 1	5.94	-	-	-	-	-
Critical Hdwy Stg 2	5.94	-	-	-	-	-
Follow-up Hdwy	3.57	3.33	-	-	-	-
Pot Cap-1 Maneuver	302	806	-	0	0	-
Stage 1	632	-	-	0	0	-
Stage 2	614	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	302	806	-	-	-	-
Mov Cap-2 Maneuver	302	-	-	-	-	-
Stage 1	632	-	-	-	-	-
Stage 2	614	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBTWBLn1	WBLn2	SBT
Capacity (veh/h)	-	302 806	-
HCM Lane V/C Ratio	-	0.192 0.283	-
HCM Control Delay (s)	-	19.7 11.2	-
HCM Lane LOS	-	C B	-
HCM 95th %tile Q(veh)	-	0.7 1.2	-

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	900	810	0	0	550	115	260	0	75	0	0	0
Future Volume (vph)	900	810	0	0	550	115	260	0	75	0	0	0
Satd. Flow (prot)	1770	3574	0	0	3434	0	1736	0	1583	0	0	0
Flt Permitted	0.118						0.950					
Satd. Flow (perm)	220	3574	0	0	3434	0	1736	0	1583	0	0	0
Satd. Flow (RTOR)					17				114			
Lane Group Flow (vph)	1047	920	0	0	714	0	356	0	125	0	0	0
Turn Type	pm+pt	NA			NA		Prot		Perm			
Protected Phases	1	6			2		3					
Permitted Phases	6								3			
Total Split (s)	80.0	115.0			35.0		35.0		35.0			
Total Lost Time (s)	5.5	6.5			6.5		7.0		7.0			
Act Effct Green (s)	109.5	108.5			28.5		28.0		28.0			
Actuated g/C Ratio	0.73	0.72			0.19		0.19		0.19			
v/c Ratio	1.13	0.36			1.07		1.10		0.32			
Control Delay	102.0	8.2			110.6		134.0		13.1			
Queue Delay	0.0	0.0			0.0		0.0		0.0			
Total Delay	102.0	8.2			110.6		134.0		13.1			
LOS	F	A			F		F		B			
Approach Delay		58.1			110.6			102.6				
Approach LOS		E			F			F				
Queue Length 50th (ft)	~1130	160			~400		~393		9			
Queue Length 95th (ft)	#1290	186			#531		#424		12			
Internal Link Dist (ft)		490			552			852			886	
Turn Bay Length (ft)	100								250			
Base Capacity (vph)	930	2585			666		324		388			
Starvation Cap Reductn	0	0			0		0		0			
Spillback Cap Reductn	0	0			0		0		0			
Storage Cap Reductn	0	0			0		0		0			
Reduced v/c Ratio	1.13	0.36			1.07		1.10		0.32			

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.13

Intersection Signal Delay: 76.7

Intersection Capacity Utilization 99.0%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service F

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

		
Ø1	Ø2	Ø3
80 s	35 s	35 s
		
Ø6		
115 s		

PM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

38: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1665	350	70	740	0	0	0	0	45	0	380
Future Volume (vph)	0	1665	350	70	740	0	0	0	0	45	0	380
Satd. Flow (prot)	0	3449	0	1703	3539	0	0	0	0	0	1703	1599
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	3449	0	1703	3539	0	0	0	0	0	1703	1599
Lane Group Flow (vph)	0	2363	0	93	851	0	0	0	0	0	48	437
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 99.0%

Analysis Period (min) 15

ICU Level of Service F

Intersection

Int Delay, s/veh 9.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↑	↑↑						↑	↑
Traffic Vol, veh/h	0	1665	350	70	740	0	0	0	0	45	0	380
Future Vol, veh/h	0	1665	350	70	740	0	0	0	0	45	0	380
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	100	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	25	87	78	75	87	25	25	25	25	94	25	87
Heavy Vehicles, %	0	2	0	6	2	0	0	0	0	6	0	1
Mvmt Flow	0	1914	449	93	851	0	0	0	0	48	0	437

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	-	0	0	1914	0	0	1994	2951	425
Stage 1	-	-	-	-	-	-	1037	1037	-
Stage 2	-	-	-	-	-	-	957	1914	-
Critical Hdwy	-	-	-	4.22	-	-	6.92	6.5	6.92
Critical Hdwy Stg 1	-	-	-	-	-	-	5.92	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.92	5.5	-
Follow-up Hdwy	-	-	-	2.26	-	-	3.56	4	3.31
Pot Cap-1 Maneuver	0	-	-	290	-	0	50	15	580
Stage 1	0	-	-	-	-	0	294	311	-
Stage 2	0	-	-	-	-	0	324	117	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	290	-	-	~ 34	0	580
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 34	0	-
Stage 1	-	-	-	-	-	-	200	0	-
Stage 2	-	-	-	-	-	-	324	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	2.3	72.1
HCM LOS			F

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	290	-	34	580
HCM Lane V/C Ratio	-	-	0.322	-	1.408	0.753
HCM Control Delay (s)	-	-	23.2	-	477.5	27.7
HCM Lane LOS	-	-	C	-	F	D
HCM 95th %tile Q(veh)	-	-	1.4	-	5.2	6.7

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

39: Neal St/S. Old Kentucky Rd & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	1095	120	365	600	90	190	420	725	145	270	65
Future Volume (vph)	145	1095	120	365	600	90	190	420	725	145	270	65
Satd. Flow (prot)	1787	3498	0	1787	1845	1599	1805	1900	1615	1752	1817	0
Flt Permitted	0.142			0.071			0.103			0.148		
Satd. Flow (perm)	267	3498	0	134	1845	1599	196	1900	1615	273	1817	0
Satd. Flow (RTOR)		11				145			261		7	
Lane Group Flow (vph)	165	1423	0	392	690	102	284	512	884	158	398	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6		6	8		8	4		
Total Split (s)	14.0	57.0		28.0	71.0	71.0	25.0	52.0	52.0	13.0	40.0	
Total Lost Time (s)	5.5	6.5		5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.5	
Act Effct Green (s)	60.0	50.5		79.5	64.5	64.5	59.5	45.5	45.5	42.0	33.5	
Actuated g/C Ratio	0.40	0.34		0.53	0.43	0.43	0.40	0.30	0.30	0.28	0.22	
v/c Ratio	0.86	1.20		1.23	0.87	0.13	0.99	0.89	1.32	1.05	0.97	
Control Delay	61.0	141.6		168.3	52.1	1.3	93.8	68.4	182.6	124.7	93.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	61.0	141.6		168.3	52.1	1.3	93.8	68.4	182.6	124.7	93.2	
LOS	E	F		F	D	A	F	E	F	F	F	
Approach Delay		133.2			86.2			132.8			102.2	
Approach LOS		F			F			F			F	
Queue Length 50th (ft)	81	~886		~421	609	0	227	479	~928	~110	384	
Queue Length 95th (ft)	#187	#991		#636	755	9	223	556	#1006	#253	#520	
Internal Link Dist (ft)		1084			512			1234			867	
Turn Bay Length (ft)	80					100	130			100		
Base Capacity (vph)	192	1184		318	793	770	286	576	671	150	411	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.86	1.20		1.23	0.87	0.13	0.99	0.89	1.32	1.05	0.97	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.32

Intersection Signal Delay: 118.5

Intersection Capacity Utilization 104.5%

Analysis Period (min) 15

Intersection LOS: F

ICU Level of Service G

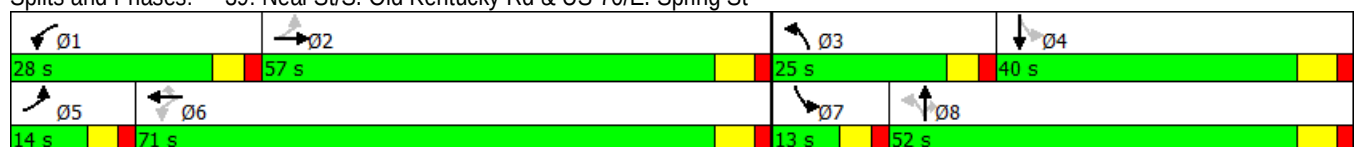
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 39: Neal St/S. Old Kentucky Rd & US 70/E. Spring St



PM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
40: US 70/E. Spring St & E. Broad St

2040 Optimized PM Timing Plan
07/12/2017

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1060	440	440	140	10
Future Volume (vph)	0	1060	440	440	140	10
Satd. Flow (prot)	0	1881	1739	0	1796	0
Flt Permitted					0.956	
Satd. Flow (perm)	0	1881	1739	0	1796	0
Lane Group Flow (vph)	0	1233	936	0	198	0
Sign Control		Free	Free		Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 70.8%

ICU Level of Service C

Analysis Period (min) 15

HCM 2010 TWSC
40: US 70/E. Spring St & E. Broad St

2040 Optimized PM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 8.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	1060	440	440	140	10
Future Vol, veh/h	0	1060	440	440	140	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	25	86	92	96	77	63
Heavy Vehicles, %	0	1	3	1	0	0
Mvmt Flow	0	1233	478	458	182	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	478	0	-	0	1711	478
Stage 1	-	-	-	-	478	-
Stage 2	-	-	-	-	1233	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1095	-	-	0	~ 101	591
Stage 1	-	-	-	0	628	-
Stage 2	-	-	-	0	278	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	1095	-	-	-	~ 101	591
Mov Cap-2 Maneuver	-	-	-	-	213	-
Stage 1	-	-	-	-	628	-
Stage 2	-	-	-	-	278	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	77.8
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	SBLn1
Capacity (veh/h)	1095	-	-	225
HCM Lane V/C Ratio	-	-	-	0.879
HCM Control Delay (s)	0	-	-	77.8
HCM Lane LOS	A	-	-	F
HCM 95th %tile Q(veh)	0	-	-	7.1

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lanes, Volumes, Timings
41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	195	800	40	30	410	25	35	225	30	225	190	65
Future Volume (vph)	195	800	40	30	410	25	35	225	30	225	190	65
Satd. Flow (prot)	1805	1867	0	1703	1845	0	1805	1858	0	1805	1823	0
Flt Permitted	0.300			0.077			0.493			0.153		
Satd. Flow (perm)	570	1867	0	138	1845	0	937	1858	0	291	1823	0
Satd. Flow (RTOR)		3			4			6			12	
Lane Group Flow (vph)	217	1015	0	54	456	0	45	322	0	292	284	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	19.0	64.0		12.0	57.0		12.0	25.0		19.0	32.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	70.3	60.9		59.6	53.2		25.9	19.5		38.5	28.9	
Actuated g/C Ratio	0.59	0.51		0.50	0.44		0.22	0.16		0.32	0.24	
v/c Ratio	0.48	1.07		0.36	0.56		0.18	1.05		1.11	0.64	
Control Delay	11.3	76.1		18.9	28.0		31.0	113.4		118.0	34.8	
Queue Delay	13.7	0.0		0.0	67.7		0.0	2.3		1.5	10.5	
Total Delay	25.1	76.1		18.9	95.7		31.0	115.8		119.4	45.3	
LOS	C	E		B	F		C	F		F	D	
Approach Delay		67.1			87.6			105.4			82.9	
Approach LOS		E			F			F			F	
Queue Length 50th (ft)	57	~912		17	255		24	~268		~195	200	
Queue Length 95th (ft)	m74	#1005		21	368		45	#391		#281	263	
Internal Link Dist (ft)		1101			737			412			149	
Turn Bay Length (ft)	75			80			70			50		
Base Capacity (vph)	473	949		153	821		250	306		263	447	
Starvation Cap Reductn	0	0		0	0		0	0		27	133	
Spillback Cap Reductn	231	0		0	655		0	2		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.90	1.07		0.35	2.75		0.18	1.06		1.24	0.90	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 20 (17%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 79.6

Intersection LOS: E

Intersection Capacity Utilization 94.0%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

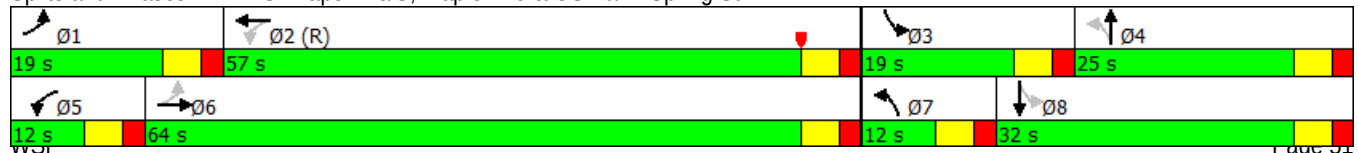
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St



Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	535	45	15	615	100	65	100	20	95	140	40
Future Volume (vph)	30	535	45	15	615	100	65	100	20	95	140	40
Satd. Flow (prot)	1805	1849	0	1805	1841	0	1805	1854	0	1787	1812	0
Flt Permitted	0.144			0.245			0.465			0.448		
Satd. Flow (perm)	274	1849	0	466	1841	0	884	1854	0	843	1812	0
Satd. Flow (RTOR)		6			9			7			9	
Lane Group Flow (vph)	36	667	0	18	770	0	68	166	0	136	202	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	16.0	58.0		16.0	58.0		23.0	30.0		16.0	23.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	72.8	68.8		71.7	65.7		28.5	18.2		29.6	21.2	
Actuated g/C Ratio	0.61	0.57		0.60	0.55		0.24	0.15		0.25	0.18	
v/c Ratio	0.12	0.63		0.05	0.76		0.24	0.58		0.47	0.62	
Control Delay	11.0	23.3		10.3	23.5		32.6	52.8		23.7	30.2	
Queue Delay	0.0	4.8		0.0	1.3		0.0	2.1		1.3	1.2	
Total Delay	11.0	28.1		10.3	24.8		32.6	54.9		25.0	31.5	
LOS	B	C		B	C		C	D		C	C	
Approach Delay		27.3			24.5			48.4			28.9	
Approach LOS		C			C			D			C	
Queue Length 50th (ft)	10	280		4	390		39	116		26	91	
Queue Length 95th (ft)	25	594		m7	m#800		70	137		75	124	
Internal Link Dist (ft)		1308			356			107			209	
Turn Bay Length (ft)	100			60			50			60		
Base Capacity (vph)	300	1062		396	1012		384	384		290	333	
Starvation Cap Reductn	0	0		0	97		0	0		0	35	
Spillback Cap Reductn	0	319		0	0		0	116		52	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.12	0.90		0.05	0.84		0.18	0.62		0.57	0.68	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 86 (72%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 28.9

Intersection LOS: C

Intersection Capacity Utilization 70.5%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
16 s	58 s	16 s	30 s
			
Ø5	Ø6 (R)	Ø7	Ø8
16 s	58 s	23 s	23 s

PM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
43: S. Walnut Ave & US 70/W. Spring St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	555	85	70	660	40	85	245	40	50	360	60
Future Volume (vph)	60	555	85	70	660	40	85	245	40	50	360	60
Satd. Flow (prot)	1770	1844	0	1805	1858	0	1770	1841	0	1805	1852	0
Flt Permitted	0.060			0.083			0.090			0.359		
Satd. Flow (perm)	112	1844	0	158	1858	0	168	1841	0	682	1852	0
Satd. Flow (RTOR)		7			4			9			7	
Lane Group Flow (vph)	66	760	0	88	837	0	99	332	0	75	520	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	12.0	77.0		12.0	77.0		12.0	49.0		12.0	49.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	71.8	65.3		73.3	68.3		49.5	44.6		48.0	41.5	
Actuated g/C Ratio	0.50	0.46		0.52	0.48		0.35	0.31		0.34	0.29	
v/c Ratio	0.50	0.90		0.56	0.94		0.75	0.57		0.27	0.95	
Control Delay	31.4	49.2		30.0	54.1		66.2	46.9		33.7	78.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.6	
Total Delay	31.4	49.2		30.0	54.1		66.2	46.9		33.7	78.8	
LOS	C	D		C	D		E	D		C	E	
Approach Delay		47.8			51.8			51.3			73.1	
Approach LOS		D			D			D			E	
Queue Length 50th (ft)	29	645		39	764		65	275		48	498	
Queue Length 95th (ft)	61	745		59	#965		#134	384		63	#631	
Internal Link Dist (ft)		1097			1308			83			571	
Turn Bay Length (ft)	75			75			65			150		
Base Capacity (vph)	133	942		157	948		132	582		282	579	
Starvation Cap Reductn	0	0		0	0		0	0		0	5	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.50	0.81		0.56	0.88		0.75	0.57		0.27	0.91	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 142.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 55.1

Intersection Capacity Utilization 88.1%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service E

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 43: S. Walnut Ave & US 70/W. Spring St

			
Ø1	Ø2	Ø3	Ø4
12 s	77 s	12 s	49 s
			
Ø5	Ø6	Ø7	Ø8
12 s	77 s	12 s	49 s

Lanes, Volumes, Timings

44: Scott Ave & US 70/W. Spring St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	475	70	115	730	40	75	95	85	30	100	50
Future Volume (vph)	25	475	70	115	730	40	75	95	85	30	100	50
Satd. Flow (prot)	1805	1846	0	1805	1863	0	1805	1787	0	1656	1787	0
Flt Permitted	0.078			0.191			0.328			0.507		
Satd. Flow (perm)	148	1846	0	363	1863	0	623	1787	0	884	1787	0
Satd. Flow (RTOR)		6			2			21			16	
Lane Group Flow (vph)	33	608	0	153	931	0	99	252	0	36	202	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	12.0	58.0		17.0	63.0		20.0	55.0		20.0	55.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	55.0	48.7		64.6	58.3		31.6	25.2		24.2	16.8	
Actuated g/C Ratio	0.51	0.45		0.59	0.54		0.29	0.23		0.22	0.15	
v/c Ratio	0.19	0.73		0.43	0.93		0.34	0.59		0.15	0.70	
Control Delay	13.8	32.0		14.6	42.9		31.8	42.7		29.4	54.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	13.8	32.0		14.6	42.9		31.8	42.7		29.4	54.2	
LOS	B	C		B	D		C	D		C	D	
Approach Delay		31.1			38.9			39.6			50.4	
Approach LOS		C			D			D			D	
Queue Length 50th (ft)	9	341		44	639		54	161		19	130	
Queue Length 95th (ft)	22	559		74	#942		80	152		40	164	
Internal Link Dist (ft)		700			1097			288			469	
Turn Bay Length (ft)	75			75			40			75		
Base Capacity (vph)	175	906		370	999		346	835		357	833	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.19	0.67		0.41	0.93		0.29	0.30		0.10	0.24	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 108.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 38.0

Intersection Capacity Utilization 79.4%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service D

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 44: Scott Ave & US 70/W. Spring St

			
Ø1	Ø2	Ø3	Ø4
12 s	63 s	20 s	55 s
			
Ø5	Ø6	Ø7	Ø8
17 s	58 s	20 s	55 s

Lanes, Volumes, Timings
45: S, Maple Ave/N. Maple Ave & E. Broad St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	290	115	45	385	90	50	195	150	55	290	30
Future Volume (vph)	30	290	115	45	385	90	50	195	150	55	290	30
Satd. Flow (prot)	1805	1802	0	1805	1820	0	1805	1763	0	1805	1868	0
Flt Permitted	0.223			0.225			0.328			0.244		
Satd. Flow (perm)	424	1802	0	428	1820	0	623	1763	0	464	1868	0
Satd. Flow (RTOR)		19			12			41			6	
Lane Group Flow (vph)	38	524	0	49	551	0	79	443	0	66	375	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	12.0	53.0		12.0	53.0		12.0	43.0		12.0	43.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	55.0	49.9		56.2	52.3		45.1	39.9		45.1	39.9	
Actuated g/C Ratio	0.46	0.42		0.47	0.44		0.38	0.33		0.38	0.33	
v/c Ratio	0.14	0.69		0.18	0.69		0.27	0.72		0.27	0.60	
Control Delay	10.6	27.9		17.4	33.5		33.0	44.7		24.6	38.6	
Queue Delay	0.0	13.1		0.2	0.0		0.2	56.4		0.0	13.7	
Total Delay	10.6	41.0		17.7	33.5		33.2	101.0		24.6	52.3	
LOS	B	D		B	C		C	F		C	D	
Approach Delay		38.9			32.2			90.7			48.1	
Approach LOS		D			C			F			D	
Queue Length 50th (ft)	7	329		19	356		42	236		31	245	
Queue Length 95th (ft)	m10	350		41	472		m45	m256		55	337	
Internal Link Dist (ft)		1084			778			149			437	
Turn Bay Length (ft)	60			65			40			85		
Base Capacity (vph)	269	760		275	799		298	613		246	624	
Starvation Cap Reductn	0	0		0	0		25	278		0	0	
Spillback Cap Reductn	0	218		51	0		0	0		0	228	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.14	0.97		0.22	0.69		0.29	1.32		0.27	0.95	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 6 (5%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 51.7

Intersection LOS: D

Intersection Capacity Utilization 73.5%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 45: S, Maple Ave/N. Maple Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	53 s	12 s	43 s
			
Ø5	Ø6	Ø7	Ø8
12 s	53 s	12 s	43 s

Lanes, Volumes, Timings

46: S. Dixie Ave/N. Dixie Ave & E. Broad St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	335	30	30	310	60	30	150	35	65	205	30
Future Volume (vph)	30	335	30	30	310	60	30	150	35	65	205	30
Satd. Flow (prot)	1805	1845	0	1736	1837	0	1805	1841	0	1805	1862	0
Flt Permitted	0.389			0.425			0.235			0.428		
Satd. Flow (perm)	739	1845	0	776	1837	0	446	1841	0	813	1862	0
Satd. Flow (RTOR)		6			10			11			6	
Lane Group Flow (vph)	38	392	0	38	432	0	42	217	0	88	323	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	16.0	50.0		16.0	50.0		16.0	38.0		16.0	38.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	67.7	61.7		67.7	61.7		33.1	25.1		34.1	25.6	
Actuated g/C Ratio	0.56	0.51		0.56	0.51		0.28	0.21		0.28	0.21	
v/c Ratio	0.08	0.41		0.07	0.46		0.18	0.55		0.28	0.80	
Control Delay	14.0	23.7		8.1	13.6		24.4	43.8		28.6	58.8	
Queue Delay	0.0	0.0		0.0	0.1		0.0	1.0		0.0	0.0	
Total Delay	14.0	23.7		8.1	13.8		24.4	44.8		28.6	58.8	
LOS	B	C		A	B		C	D		C	E	
Approach Delay		22.8			13.3			41.5			52.4	
Approach LOS		C			B			D			D	
Queue Length 50th (ft)	13	210		8	88		25	141		47	235	
Queue Length 95th (ft)	29	338		14	99		m27	m126		62	241	
Internal Link Dist (ft)		1234			353			209			174	
Turn Bay Length (ft)	130			45			60			75		
Base Capacity (vph)	512	951		523	949		243	506		322	511	
Starvation Cap Reductn	0	0		0	69		0	123		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.07	0.41		0.07	0.49		0.17	0.57		0.27	0.63	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 90 (75%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 30.8

Intersection LOS: C

Intersection Capacity Utilization 59.6%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 46: S. Dixie Ave/N. Dixie Ave & E. Broad St

 Ø1	 Ø2 (R)	 Ø3	 Ø4
16 s	50 s	16 s	38 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
16 s	50 s	16 s	38 s

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

47: S. Walnut Ave/N. Walnut Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	230	40	65	200	70	40	225	60	85	355	20
Future Volume (vph)	15	230	40	65	200	70	40	225	60	85	355	20
Satd. Flow (prot)	0	1848	0	0	1868	1583	1805	1835	0	1770	1885	0
Flt Permitted		0.997			0.986		0.280			0.277		
Satd. Flow (perm)	0	1848	0	0	1868	1583	532	1835	0	516	1885	0
Satd. Flow (RTOR)		6				138		9			2	
Lane Group Flow (vph)	0	332	0	0	323	80	53	308	0	120	420	0
Turn Type	custom	NA		custom	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	1	1		2	2		7	4		3	8	
Permitted Phases	1			2		2	4			8		
Total Split (s)	44.0	44.0		44.0	44.0	44.0	12.0	44.0		18.0	50.0	
Total Lost Time (s)		5.5			5.5	5.5	5.5	5.5		5.5	5.5	
Act Effct Green (s)		26.7			26.6	26.6	33.9	27.1		42.7	34.5	
Actuated g/C Ratio		0.23			0.23	0.23	0.30	0.24		0.37	0.30	
v/c Ratio		0.76			0.75	0.17	0.23	0.70		0.39	0.74	
Control Delay		54.8			54.7	0.8	29.2	50.3		30.4	48.1	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		54.8			54.7	0.8	29.2	50.3		30.4	48.1	
LOS		D			D	A	C	D		C	D	
Approach Delay		54.8			44.0			47.2			44.2	
Approach LOS		D			D			D			D	
Queue Length 50th (ft)		223			221	0	24	200		57	283	
Queue Length 95th (ft)		389			375	0	54	371		98	496	
Internal Link Dist (ft)		512			1234			571			477	
Turn Bay Length (ft)							120			140		
Base Capacity (vph)		665			668	655	234	662		341	781	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.50			0.48	0.12	0.23	0.47		0.35	0.54	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 114.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 47.0

Intersection Capacity Utilization 72.7%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service C

Splits and Phases: 47: S. Walnut Ave/N. Walnut Ave & E. Broad St

			
Ø1	Ø2	Ø3	Ø4
44 s	44 s	18 s	44 s
		Ø7	Ø8
		12 s	50 s

Lanes, Volumes, Timings
48: S. Cedar Ave & E. Broad St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	55	10	30	40	205	10	85	30	230	160	60
Future Volume (vph)	55	55	10	30	40	205	10	85	30	230	160	60
Satd. Flow (prot)	0	1836	0	0	1717	0	0	1793	0	0	1794	0
Flt Permitted		0.974			0.994			0.997			0.976	
Satd. Flow (perm)	0	1836	0	0	1717	0	0	1793	0	0	1794	0
Lane Group Flow (vph)	0	160	0	0	342	0	0	145	0	0	492	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 57.0%

Analysis Period (min) 15

ICU Level of Service B

HCM 2010 AWSC
48: S. Cedar Ave & E. Broad St

2040 Optimized PM Timing Plan

07/12/2017

Intersection

Intersection Delay, s/veh 20

Intersection LOS C

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↕				↕				↕	
Traffic Vol, veh/h	0	55	55	10	0	30	40	205	0	10	85	30
Future Vol, veh/h	0	55	55	10	0	30	40	205	0	10	85	30
Peak Hour Factor	0.92	0.63	0.87	1.00	0.92	0.69	0.58	0.89	0.92	1.00	0.86	0.83
Heavy Vehicles, %	2	0	0	0	2	0	0	0	2	0	3	0
Mvmt Flow	0	87	63	10	0	43	69	230	0	10	99	36
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0
Approach		EB				WB				NB		
Opposing Approach		WB				EB				SB		
Opposing Lanes		1				1				1		
Conflicting Approach Left		SB				NB				EB		
Conflicting Lanes Left		1				1				1		
Conflicting Approach Right		NB				SB				WB		
Conflicting Lanes Right		1				1				1		
HCM Control Delay		12.5				15.7				11.6		
HCM LOS		B				C				B		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	8%	46%	11%	51%
Vol Thru, %	68%	46%	15%	36%
Vol Right, %	24%	8%	75%	13%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	125	120	275	450
LT Vol	10	55	30	230
Through Vol	85	55	40	160
RT Vol	30	10	205	60
Lane Flow Rate	145	161	343	493
Geometry Grp	1	1	1	1
Degree of Util (X)	0.255	0.295	0.55	0.798
Departure Headway (Hd)	6.334	6.62	5.774	5.83
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	565	541	624	626
Service Time	4.396	4.684	3.827	3.83
HCM Lane V/C Ratio	0.257	0.298	0.55	0.788
HCM Control Delay	11.6	12.5	15.7	27.9
HCM Lane LOS	B	B	C	D
HCM 95th-tile Q	1	1.2	3.3	7.9

Intersection
Intersection Delay, s/veh
Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	230	160	60
Future Vol, veh/h	0	230	160	60
Peak Hour Factor	0.92	0.93	0.94	0.80
Heavy Vehicles, %	2	1	2	0
Mvmt Flow	0	247	170	75
Number of Lanes	0	0	1	0
Approach		SB		
Opposing Approach		NB		
Opposing Lanes		1		
Conflicting Approach Left		WB		
Conflicting Lanes Left		1		
Conflicting Approach Right		EB		
Conflicting Lanes Right		1		
HCM Control Delay		27.9		
HCM LOS		D		

Lanes, Volumes, Timings

49: S. Cedar Ave/N. Cedar Ave & W, Broad St

2040 Optimized PM Timing Plan

07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	65	195	205	150	245	115
Future Volume (vph)	65	195	205	150	245	115
Satd. Flow (prot)	1787	1599	0	1837	1797	0
Flt Permitted	0.950			0.971		
Satd. Flow (perm)	1787	1599	0	1837	1797	0
Lane Group Flow (vph)	76	199	0	435	429	0
Sign Control	Stop			Stop	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 52.7%

ICU Level of Service A

Analysis Period (min) 15

Intersection

Intersection Delay, s/veh 16.1
Intersection LOS C

Movement	EBU	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations									
Traffic Vol, veh/h	0	65	195	0	205	150	0	245	115
Future Vol, veh/h	0	65	195	0	205	150	0	245	115
Peak Hour Factor	0.92	0.86	0.98	0.92	0.79	0.85	0.92	0.88	0.76
Heavy Vehicles, %	2	1	1	2	0	1	2	1	0
Mvmt Flow	0	76	199	0	259	176	0	278	151
Number of Lanes	0	1	1	0	0	1	0	1	0
Approach		EB			NB			SB	
Opposing Approach					SB			NB	
Opposing Lanes		0			1			1	
Conflicting Approach Left		SB			EB				
Conflicting Lanes Left		1			2			0	
Conflicting Approach Right		NB						EB	
Conflicting Lanes Right		1			0			2	
HCM Control Delay		11.6			18.6			16.4	
HCM LOS		B			C			C	

Lane	NBLn1	EBLn1	EBLn2	SBLn1
Vol Left, %	58%	100%	0%	0%
Vol Thru, %	42%	0%	0%	68%
Vol Right, %	0%	0%	100%	32%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	355	65	195	360
LT Vol	205	65	0	0
Through Vol	150	0	0	245
RT Vol	0	0	195	115
Lane Flow Rate	436	76	199	430
Geometry Grp	2	7	7	2
Degree of Util (X)	0.661	0.151	0.331	0.621
Departure Headway (Hd)	5.455	7.209	5.985	5.2
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	663	497	599	692
Service Time	3.497	4.963	3.739	3.244
HCM Lane V/C Ratio	0.658	0.153	0.332	0.621
HCM Control Delay	18.6	11.3	11.7	16.4
HCM Lane LOS	C	B	B	C
HCM 95th-tile Q	5	0.5	1.4	4.3

Lanes, Volumes, Timings

50: US 70/W. Spring St/US 70/W. Broad St & W. Broad St

2040 Optimized PM Timing Plan

07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	10	245	470	15	145	325
Future Volume (vph)	10	245	470	15	145	325
Satd. Flow (prot)	1805	1615	1855	0	0	1834
Flt Permitted	0.950					0.985
Satd. Flow (perm)	1805	1615	1855	0	0	1834
Lane Group Flow (vph)	16	310	612	0	0	543
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 64.1%

Analysis Period (min) 15

ICU Level of Service C

Intersection

Int Delay, s/veh 6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	245	470	15	145	325
Future Vol, veh/h	10	245	470	15	145	325
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	79	80	63	86	87
Heavy Vehicles, %	0	0	2	0	0	3
Mvmt Flow	16	310	588	24	169	374

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1310	599	0	0	611	0
Stage 1	599	-	-	-	-	-
Stage 2	711	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	177	505	-	-	978	-
Stage 1	553	-	-	-	-	-
Stage 2	490	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	138	505	-	-	978	-
Mov Cap-2 Maneuver	267	-	-	-	-	-
Stage 1	553	-	-	-	-	-
Stage 2	383	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	22.6		0		2.9
HCM LOS	C				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	267	505	978	-
HCM Lane V/C Ratio	-	-	0.059	0.614	0.172	-
HCM Control Delay (s)	-	-	19.3	22.8	9.4	0
HCM Lane LOS	-	-	C	C	A	A
HCM 95th %tile Q(veh)	-	-	0.2	4.1	0.6	-

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

51: W. Jackson St/Pippin Rd & US 70/W. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	225	180	15	365	120	385	445	40	75	165	10
Future Volume (vph)	10	225	180	15	365	120	385	445	40	75	165	10
Satd. Flow (prot)	1805	1863	1553	1805	1807	0	1805	1900	1615	0	1854	0
Flt Permitted	0.135			0.500			0.950				0.984	
Satd. Flow (perm)	256	1863	1553	950	1807	0	1805	1900	1615	0	1854	0
Satd. Flow (RTOR)			193		20				229		2	
Lane Group Flow (vph)	24	262	198	24	566	0	464	484	43	0	288	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Free	Split	NA	
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases	6		6	2					Free			
Total Split (s)	12.0	36.0	36.0	12.0	36.0		31.0	31.0		21.0	21.0	
Total Lost Time (s)	5.5	6.5	6.5	5.5	6.5		6.5	6.5			5.5	
Act Effct Green (s)	33.0	29.6	29.6	33.0	29.6		24.6	24.6	92.8		15.6	
Actuated g/C Ratio	0.36	0.32	0.32	0.36	0.32		0.27	0.27	1.00		0.17	
v/c Ratio	0.12	0.44	0.32	0.06	0.96		0.97	0.96	0.03		0.92	
Control Delay	18.9	29.0	5.8	17.9	60.5		70.8	67.9	0.0		74.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	
Total Delay	18.9	29.0	5.8	17.9	60.5		70.8	67.9	0.0		74.9	
LOS	B	C	A	B	E		E	E	A		E	
Approach Delay		19.0			58.8			66.3			74.9	
Approach LOS		B			E			E			E	
Queue Length 50th (ft)	9	111	2	9	289		250	260	0		156	
Queue Length 95th (ft)	11	202	53	17	#592		#455	#531	0		#350	
Internal Link Dist (ft)		1551			2304			1891			664	
Turn Bay Length (ft)	100		100	100			350					
Base Capacity (vph)	200	594	626	398	590		478	503	1615		312	
Starvation Cap Reductn	0	0	0	0	0		0	0	0		0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0		0	
Storage Cap Reductn	0	0	0	0	0		0	0	0		0	
Reduced v/c Ratio	0.12	0.44	0.32	0.06	0.96		0.97	0.96	0.03		0.92	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 92.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 55.8

Intersection LOS: E

Intersection Capacity Utilization 78.8%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 51: W. Jackson St/Pippin Rd & US 70/W. Broad St

			
Ø1	Ø2	Ø3	Ø4
12 s	36 s	31 s	21 s
			
Ø5	Ø6		
12 s	36 s		

Lanes, Volumes, Timings
52: E.10th St & Brown Ave N

2040 Optimized PM Timing Plan

07/12/2017

								
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	25	1015	800	95	120	60		
Future Volume (vph)	25	1015	800	95	120	60		
Satd. Flow (prot)	1719	1900	1845	0	1722	0		
Flt Permitted	0.068				0.968			
Satd. Flow (perm)	123	1900	1845	0	1722	0		
Satd. Flow (RTOR)			8		15			
Lane Group Flow (vph)	35	1080	1005	0	240	0		
Turn Type	pm+pt	NA	NA		Prot			
Protected Phases	1	6	2 4		3		2	4
Permitted Phases	6							
Total Split (s)	12.0	101.0			36.0		89.0	13.0
Total Lost Time (s)	5.5	5.5			5.5			
Act Effct Green (s)	88.5	88.5	88.7		25.3			
Actuated g/C Ratio	0.64	0.64	0.64		0.18			
v/c Ratio	0.23	0.89	0.85		0.73			
Control Delay	13.4	31.9	7.4		65.2			
Queue Delay	0.0	0.1	0.0		0.0			
Total Delay	13.4	32.0	7.4		65.2			
LOS	B	C	A		E			
Approach Delay		31.4	7.4		65.2			
Approach LOS		C	A		E			
Queue Length 50th (ft)	11	800	18		205			
Queue Length 95th (ft)	21	#1129	#104		242			
Internal Link Dist (ft)		2500	23		665			
Turn Bay Length (ft)	100							
Base Capacity (vph)	155	1338	1261		399			
Starvation Cap Reductn	0	0	0		0			
Spillback Cap Reductn	0	12	0		0			
Storage Cap Reductn	0	0	0		0			
Reduced v/c Ratio	0.23	0.81	0.80		0.60			

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 138.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 24.6

Intersection Capacity Utilization 72.9%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 52: E.10th St & Brown Ave N

#52	#52 #521	#52 #521	#52 #521
			
Ø4 Ø1	Ø2	Ø3	Ø3
12 s	89 s	36 s	13 s
#52 #521			
			
Ø6			
101 s			

PM Peak
WSP

Synchro 9 Report
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Lanes, Volumes, Timings

53: Fisk Rd & E.10th St

2040 Optimized PM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	885	25	15	655	240	40	60	20	215	40	105
Future Volume (vph)	115	885	25	15	655	240	40	60	20	215	40	105
Satd. Flow (prot)	1805	1872	0	1805	1900	1599	0	1804	0	0	1737	1599
Flt Permitted	0.072			0.071				0.986			0.960	
Satd. Flow (perm)	137	1872	0	135	1900	1599	0	1804	0	0	1737	1599
Satd. Flow (RTOR)		1				121		4				121
Lane Group Flow (vph)	132	957	0	15	744	304	0	164	0	0	287	121
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases	2			6		6						3
Total Split (s)	13.0	60.0		12.0	59.0	59.0	37.0	37.0		41.0	41.0	41.0
Total Lost Time (s)	5.5	6.5		5.5	6.5	6.5		5.5			5.5	5.5
Act Effct Green (s)	65.4	61.7		60.1	52.9	52.9		16.6			25.8	25.8
Actuated g/C Ratio	0.52	0.49		0.48	0.42	0.42		0.13			0.20	0.20
v/c Ratio	0.77	1.04		0.10	0.93	0.41		0.68			0.81	0.29
Control Delay	53.3	75.2		19.7	56.1	18.5		66.5			66.1	8.8
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	53.3	75.2		19.7	56.1	18.5		66.5			66.1	8.8
LOS	D	E		B	E	B		E			E	A
Approach Delay		72.6			44.8			66.5			49.1	
Approach LOS		E			D			E			D	
Queue Length 50th (ft)	52	732		6	569	99		126			224	0
Queue Length 95th (ft)	#187	#1436		21	#969	168		143			312	46
Internal Link Dist (ft)		2105			3570			811			723	
Turn Bay Length (ft)	200			175		175						250
Base Capacity (vph)	171	916		151	797	741		457			492	540
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.77	1.04		0.10	0.93	0.41		0.36			0.58	0.22

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 126.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 57.9

Intersection Capacity Utilization 88.4%

Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service E

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 53: Fisk Rd & E.10th St

			
Ø1	Ø2	Ø3	Ø4
12 s	60 s	41 s	37 s
			
Ø5	Ø6		
13 s	59 s		

Lanes, Volumes, Timings
54: N. Old Kentucky Rd & E.10th St

2040 Optimized PM Timing Plan

07/12/2017

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	885	180	140	705	230	195
Future Volume (vph)	885	180	140	705	230	195
Satd. Flow (prot)	1863	1583	1787	1881	1770	1615
Flt Permitted			0.076		0.950	
Satd. Flow (perm)	1863	1583	143	1881	1770	1615
Satd. Flow (RTOR)		194				205
Lane Group Flow (vph)	962	194	169	750	307	283
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	1 2	4	
Permitted Phases		2	1 2			4
Total Split (s)	59.0	59.0	12.0		29.0	29.0
Total Lost Time (s)	6.5	6.5	5.5		5.5	5.5
Act Effct Green (s)	52.5	52.5	62.5	68.0	21.0	21.0
Actuated g/C Ratio	0.52	0.52	0.62	0.68	0.21	0.21
v/c Ratio	0.98	0.21	0.71	0.59	0.83	0.56
Control Delay	49.8	2.4	45.8	12.8	56.7	14.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.8	2.4	45.8	12.8	56.7	14.9
LOS	D	A	D	B	E	B
Approach Delay	41.8			18.8	36.7	
Approach LOS	D			B	D	
Queue Length 50th (ft)	574	0	80	156	184	41
Queue Length 95th (ft)	#870	32	#155	265	221	55
Internal Link Dist (ft)	3570			975	734	
Turn Bay Length (ft)		400	125		175	
Base Capacity (vph)	978	923	237	1279	415	536
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.21	0.71	0.59	0.74	0.53

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 38 (38%), Referenced to phase 2:EBWB and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 32.7

Intersection LOS: C

Intersection Capacity Utilization 81.7%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 54: N. Old Kentucky Rd & E.10th St



Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

55: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	860	265	280	735	0	0	0	0	115	0	190
Future Volume (vph)	0	860	265	280	735	0	0	0	0	115	0	190
Satd. Flow (prot)	0	3441	0	1752	3574	0	0	0	0	1770	0	1583
Flt Permitted				0.097						0.950		
Satd. Flow (perm)	0	3441	0	179	3574	0	0	0	0	1770	0	1583
Satd. Flow (RTOR)		54										224
Lane Group Flow (vph)	0	1320	0	318	766	0	0	0	0	128	0	224
Turn Type		NA		pm+pt	NA					Prot		Perm
Protected Phases		6		5	2					8		
Permitted Phases				2								8
Total Split (s)		53.0		27.0	80.0					20.0		20.0
Total Lost Time (s)		6.5		5.5	6.5					7.0		7.0
Act Effct Green (s)		50.7		74.5	73.5					13.0		13.0
Actuated g/C Ratio		0.51		0.74	0.74					0.13		0.13
v/c Ratio		0.75		0.79	0.29					0.56		0.56
Control Delay		10.6		20.2	3.0					50.9		11.5
Queue Delay		0.0		0.0	0.0					0.0		0.0
Total Delay		10.6		20.2	3.0					50.9		11.5
LOS		B		C	A					D		B
Approach Delay		10.6			8.0						25.8	
Approach LOS		B			A						C	
Queue Length 50th (ft)		99		55	41					78		0
Queue Length 95th (ft)		m218		m98	m95					138		55
Internal Link Dist (ft)		570			785			708			972	
Turn Bay Length (ft)				120								150
Base Capacity (vph)		1770		471	2626					230		400
Starvation Cap Reductn		0		0	0					0		0
Spillback Cap Reductn		0		0	0					0		0
Storage Cap Reductn		0		0	0					0		0
Reduced v/c Ratio		0.75		0.68	0.29					0.56		0.56

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 64 (64%), Referenced to phase 2:WBTL and 6:EBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 11.5

Intersection LOS: B

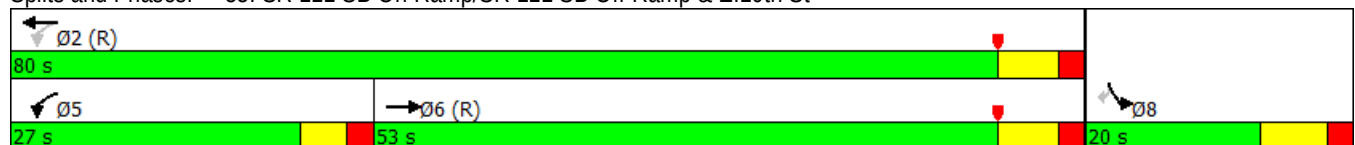
Intersection Capacity Utilization 75.1%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 55: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & E.10th St



Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	275	705	0	0	775	290	240	0	450	0	0	0
Future Volume (vph)	275	705	0	0	775	290	240	0	450	0	0	0
Satd. Flow (prot)	1770	3574	0	0	3420	0	1787	0	1599	0	0	0
Flt Permitted	0.091						0.950					
Satd. Flow (perm)	170	3574	0	0	3420	0	1787	0	1599	0	0	0
Satd. Flow (RTOR)					78				193			
Lane Group Flow (vph)	357	801	0	0	1174	0	267	0	517	0	0	0
Turn Type	pm+pt	NA			NA		Prot		Perm			
Protected Phases	1	6			2		4					
Permitted Phases	6								4			
Total Split (s)	24.0	67.0			43.0		33.0		33.0			
Total Lost Time (s)	5.5	6.5			6.5		7.0		7.0			
Act Effct Green (s)	62.7	61.7			38.5		24.8		24.8			
Actuated g/C Ratio	0.63	0.62			0.38		0.25		0.25			
v/c Ratio	0.92	0.36			0.86		0.60		0.95			
Control Delay	43.5	5.5			35.8		39.3		52.9			
Queue Delay	0.0	0.2			10.7		0.0		46.6			
Total Delay	43.5	5.8			46.5		39.3		99.5			
LOS	D	A			D		D		F			
Approach Delay		17.4			46.5			79.0				
Approach LOS		B			D			E				
Queue Length 50th (ft)	156	137			368		148		214			
Queue Length 95th (ft)	#209	61			#243		232		#391			
Internal Link Dist (ft)		785			131			909			832	
Turn Bay Length (ft)	400								150			
Base Capacity (vph)	402	2203			1365		464		558			
Starvation Cap Reductn	0	0			184		0		0			
Spillback Cap Reductn	0	616			0		0		127			
Storage Cap Reductn	0	0			0		0		0			
Reduced v/c Ratio	0.89	0.50			0.99		0.58		1.20			

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 1 (1%), Referenced to phase 2:WBT and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 43.8

Intersection LOS: D

Intersection Capacity Utilization 75.1%

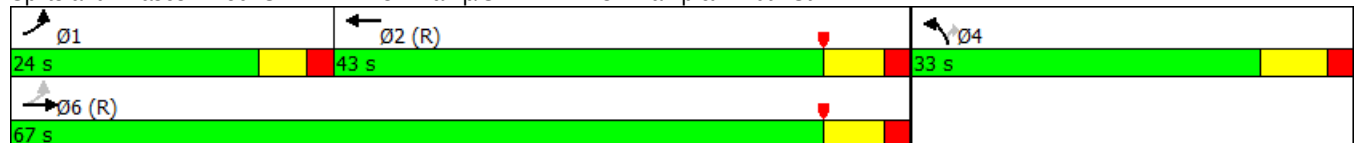
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St



Lanes, Volumes, Timings
57: Burton Branch Rd & E.10th St

2040 Optimized PM Timing Plan

07/12/2017

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	1040	110	35	885	170	50
Future Volume (vph)	1040	110	35	885	170	50
Satd. Flow (prot)	3517	0	1805	3574	1805	1615
Flt Permitted			0.119		0.950	
Satd. Flow (perm)	3517	0	226	3574	1805	1615
Satd. Flow (RTOR)	17					91
Lane Group Flow (vph)	1308	0	39	973	298	91
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			2			4
Total Split (s)	53.0		16.0	69.0	31.0	31.0
Total Lost Time (s)	6.5		5.5	6.5	5.5	5.5
Act Effct Green (s)	57.8		68.1	67.1	20.9	20.9
Actuated g/C Ratio	0.58		0.68	0.67	0.21	0.21
v/c Ratio	0.64		0.13	0.41	0.79	0.22
Control Delay	17.5		7.1	8.6	52.5	7.8
Queue Delay	0.4		0.0	0.2	0.2	0.0
Total Delay	17.9		7.1	8.7	52.7	7.8
LOS	B		A	A	D	A
Approach Delay	17.9			8.7	42.2	
Approach LOS	B			A	D	
Queue Length 50th (ft)	410		7	134	180	0
Queue Length 95th (ft)	m486		20	196	149	5
Internal Link Dist (ft)	131			316	647	
Turn Bay Length (ft)			100			175
Base Capacity (vph)	2039		319	2397	460	479
Starvation Cap Reductn	291		0	0	0	0
Spillback Cap Reductn	0		0	554	13	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.75		0.12	0.53	0.67	0.19

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 4 (4%), Referenced to phase 2:WBTL and 6:EBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 18.0

Intersection LOS: B

Intersection Capacity Utilization 53.1%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 57: Burton Branch Rd & E.10th St

← Ø2 (R)		↖ Ø4
69 s		31 s
↙ Ø5	→ Ø6 (R)	
16 s	53 s	

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

61: SR 135/S. Willow Ave & County Services Dr/Orchard St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	15	35	55	10	95	10	1130	15	65	1305	10
Future Volume (vph)	50	15	35	55	10	95	10	1130	15	65	1305	10
Satd. Flow (prot)	1787	1636	0	0	1682	0	1626	3568	0	1787	3533	0
Flt Permitted	0.607				0.837		0.125			0.147		
Satd. Flow (perm)	1142	1636	0	0	1433	0	214	3568	0	277	3533	0
Satd. Flow (RTOR)		90			74			3			1	
Lane Group Flow (vph)	98	120	0	0	173	0	16	1183	0	76	1444	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			3		5	2		1	6	
Permitted Phases	4			3			2			6		
Total Split (s)	24.0	24.0		24.0	24.0		12.0	54.0		12.0	54.0	
Total Lost Time (s)	5.5	5.5			5.5		5.5	6.5		5.5	6.5	
Act Effct Green (s)	11.4	11.4			11.4		37.9	32.2		41.4	39.4	
Actuated g/C Ratio	0.17	0.17			0.17		0.58	0.49		0.63	0.60	
v/c Ratio	0.49	0.33			0.56		0.06	0.67		0.23	0.68	
Control Delay	36.6	13.3			24.3		5.3	15.9		6.4	11.9	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	36.6	13.3			24.3		5.3	15.9		6.4	11.9	
LOS	D	B			C		A	B		A	B	
Approach Delay		23.7			24.3			15.7			11.6	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)	35	10			35		2	188		9	153	
Queue Length 95th (ft)	51	12			112		6	302		26	415	
Internal Link Dist (ft)		674			289			17			564	
Turn Bay Length (ft)	100						100			200		
Base Capacity (vph)	343	554			482		274	2681		335	2654	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.29	0.22			0.36		0.06	0.44		0.23	0.54	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 65.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 14.7

Intersection Capacity Utilization 72.0%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service C

Splits and Phases: 61: SR 135/S. Willow Ave & County Services Dr/Orchard St

		
Ø1	Ø2	Ø3
12 s	54 s	24 s
		
Ø5	Ø6	Ø4
12 s	54 s	24 s

Lanes, Volumes, Timings 95: Foutch Dr

2040 Optimized PM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	15	0	0	180	0	65
Future Volume (vph)	15	0	0	180	0	65
Satd. Flow (prot)	1805	0	0	1644	0	1900
Flt Permitted	0.950					
Satd. Flow (perm)	1805	0	0	1644	0	1900
Lane Group Flow (vph)	18	0	0	234	0	68
Sign Control	Yield		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 14.5%

Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings

241: SR 136/S. Jefferson Ave & Fairground St

2040 Optimized PM Timing Plan

07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				  	 	
Traffic Volume (vph)	20	20	10	990	1275	10
Future Volume (vph)	20	20	10	990	1275	10
Satd. Flow (prot)	1723	0	0	5131	3603	0
Flt Permitted	0.978			0.999		
Satd. Flow (perm)	1723	0	0	5131	3603	0
Lane Group Flow (vph)	59	0	0	1037	1330	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 45.6%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
241: SR 136/S. Jefferson Ave & Fairground St

2040 Optimized PM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 1.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	20	10	990	1275	10
Future Vol, veh/h	20	20	10	990	1275	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	63	63	97	97	63
Heavy Vehicles, %	0	0	0	1	0	0
Mvmt Flow	27	32	16	1021	1314	16

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1762	665	1330	0	-	0
Stage 1	1322	-	-	-	-	-
Stage 2	440	-	-	-	-	-
Critical Hdwy	6.25	6.9	4.1	-	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	6	-	-	-	-	-
Follow-up Hdwy	3.65	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	99	407	526	-	-	-
Stage 1	213	-	-	-	-	-
Stage 2	587	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	92	407	526	-	-	-
Mov Cap-2 Maneuver	92	-	-	-	-	-
Stage 1	213	-	-	-	-	-
Stage 2	546	-	-	-	-	-

Approach	EB		NB		SB
HCM Control Delay, s	40.2		0.5		0
HCM LOS	E				

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	526	-	159	-	-
HCM Lane V/C Ratio	0.03	-	0.367	-	-
HCM Control Delay (s)	12.1	0.3	40.2	-	-
HCM Lane LOS	B	A	E	-	-
HCM 95th %tile Q(veh)	0.1	-	1.6	-	-

Lanes, Volumes, Timings
271: Foutch Dr & SR 136/S. Jefferson Ave

2040 Optimized PM Timing Plan
07/12/2017

						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	10	780	715	60	0	0
Future Volume (vph)	10	780	715	60	0	0
Satd. Flow (prot)	0	3328	3327	0	0	0
Flt Permitted		0.999				
Satd. Flow (perm)	0	3328	3327	0	0	0
Lane Group Flow (vph)	0	867	849	0	0	0
Sign Control		Free	Free		Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 31.9%

Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings

2040 Optimized PM Timing Plan

361: US 70/E. Spring St & I-40 WB On-Ramp (SB)/I-40 WB On-Ramp (NB)

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	100	365	10	0	740	100
Future Volume (vph)	0	0	0	0	0	0	100	365	10	0	740	100
Satd. Flow (prot)	0	0	0	0	0	0	0	3294	0	0	3386	0
Flt Permitted								0.990				
Satd. Flow (perm)	0	0	0	0	0	0	0	3294	0	0	3386	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	565	0	0	887	0
Sign Control		Free				Free		Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 43.6%

Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings
521: Brown Ave S & E.10th St

2040 Optimized PM Timing Plan

07/12/2017

	→	↘	↙	←	↖	↗			
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø1	Ø3	Ø6
Lane Configurations									
Traffic Volume (vph)	1100	25	10	870	30	20			
Future Volume (vph)	1100	25	10	870	30	20			
Satd. Flow (prot)	1890	0	1805	1881	1745	0			
Flt Permitted			0.168		0.970				
Satd. Flow (perm)	1890	0	319	1881	1745	0			
Satd. Flow (RTOR)	7				16				
Lane Group Flow (vph)	1228	0	16	967	69	0			
Turn Type	NA		Perm	NA	Prot				
Protected Phases	3 6			2	4		1	3	6
Permitted Phases			2						
Total Split (s)			89.0	89.0	13.0		12.0	36.0	101.0
Total Lost Time (s)			5.5	5.5	5.5				
Act Effct Green (s)	119.4		79.6	79.6	7.7				
Actuated g/C Ratio	0.86		0.58	0.58	0.06				
v/c Ratio	0.75		0.09	0.89	0.62				
Control Delay	2.5		16.9	39.2	77.7				
Queue Delay	0.0		0.0	0.8	0.0				
Total Delay	2.5		16.9	40.0	77.7				
LOS	A		B	D	E				
Approach Delay	2.5			39.7	77.7				
Approach LOS	A			D	E				
Queue Length 50th (ft)	2		7	802	51				
Queue Length 95th (ft)	2		14	#1161	81				
Internal Link Dist (ft)	23			2105	565				
Turn Bay Length (ft)			115						
Base Capacity (vph)	1703		196	1159	111				
Starvation Cap Reductn	0		0	0	0				
Spillback Cap Reductn	0		0	49	0				
Storage Cap Reductn	0		0	0	0				
Reduced v/c Ratio	0.72		0.08	0.87	0.62				

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 138.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 20.8

Intersection Capacity Utilization 73.6%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service D

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 521: Brown Ave S & E.10th St

#52 Ø4 Ø1	#52 #521 ← Ø2	#52 #521 ↘ Ø3	#52 #521 ← Ø6
12 s	89 s	36 s	13 s
#52 #521 → Ø6			
101 s			

PM Peak
WSP

Synchro 9 Report
Page 78

Appendix E: Cost Estimate Details

APPENDIX E – Details of Preliminary Cost Estimates

LOCATION OF PROPOSED IMPROVEMENT	PRELIMINARY COST ESTIMATE
State Route 135 (South Willow Avenue) at Interstate 40 Eastbound	
Addition of Channelization Island at Southeast Corner of Intersection	\$35,000
Removal of Pedestrian Crossing at North Side of Intersection	\$15,000
Addition of Pedestrian Crossing at South Side of Intersection	\$25,000
LOCATION TOTAL	\$75,000
State Route 135 (South Willow Avenue) at Interstate 40 Westbound	
Removal of Pedestrian Crossing at South Side of Intersection	\$15,000
Addition of Pedestrian Crossing at North Side of Intersection	\$25,000
LOCATION TOTAL	\$40,000
State Route 135 (South Willow Avenue) at Interstate Drive / Foreman Drive	
Addition of Dual Southbound Left-Turn Lanes	\$260,000
LOCATION TOTAL	\$260,000
State Route 135 (South Willow Avenue) at West Jackson Street	
Addition of Dual Northbound Left-Turn Lanes	\$245,000
Addition of Westbound Right-Turn Lane	\$197,000
Modification of Driveway Access at Southwest Corner of Intersection	\$150,000
LOCATION TOTAL	\$592,000
State Route 135 (South Willow Avenue) at West Stevens Street	
Addition of Eastbound Left-Turn Lane	\$197,000
Signal Phasing Optimization	\$25,000
LOCATION TOTAL	\$222,000
State Route 24 (US Route 70N, West Spring Street) at State Route 135 (South Willow Avenue)	
Addition of Eastbound and Westbound Right-Turn Lanes	\$490,000
Modification of Driveway Access at Northeast Corner of Intersection	\$150,000
LOCATION TOTAL	\$640,000
State Route 135 (North Willow Avenue) from West Broad Street to West 12th Street	
Addition of EB and WB Right-Turn Lanes at West 3 rd Street, West 4 th Street, and West 9 th Street	\$1,182,000
Addition of Two-Way Left-Turn Lane from West Broad Street to West 12 th Street	\$35,800,000
LOCATION TOTAL	\$36,982,000
State Route 135 (North Willow Avenue) at State Route 290 (West 12th Street)	
Addition of Channelization Island at Northwest Corner of Intersection	\$35,000
Refurbishment of Pedestrian Crossing at West Side of Intersection	\$20,000
LOCATION TOTAL	\$55,000
State Route 136 (South Jefferson Avenue) at Interstate Drive / Neal Street	
Addition of Dual Westbound Left-Turn Lanes	\$197,000
Addition of Dual Northbound Left-Turn Lanes	\$244,000
LOCATION TOTAL	\$441,000
State Route 136 (South Jefferson Avenue) at South Walnut Avenue / Dubois Street	
Removal of Westbound Left-Turn Phase and Signal Phasing Optimization	\$35,000
LOCATION TOTAL	\$35,000
State Route 136 (South Jefferson Avenue) at Interstate 40 Westbound	
Implementation of Westbound No Right-Turn on Red	\$10,000
LOCATION TOTAL	\$10,000

LOCATION OF PROPOSED IMPROVEMENT	PRELIMINARY COST ESTIMATE
State Route 136 (South Jefferson Avenue) at Interstate 40 Eastbound	
Addition of Dual Eastbound Left-Turn Lanes	\$98,000
LOCATION TOTAL	\$98,000
State Route 136 (South Jefferson Avenue) at Bunker Hill Road	
Signal Timing and Coordination Improvements Study	\$50,000
LOCATION TOTAL	\$50,000
State Route 136 (South Jefferson Avenue) at Jackson Street	
Addition of Dual Northbound Left-Turn Lanes	\$245,000
LOCATION TOTAL	\$245,000
State Route 24 (US Route 70N, East Spring Street) at Interstate 40	
Signal Warrant Analysis for Two Intersections	\$30,000
LOCATION TOTAL	\$30,000
State Route 24 (US Route 70N, East Spring Street) at State Route 111 Northbound	
Addition of Dual Northbound Left-Turn Lanes	\$98,000
Widening of State Route 111 Northbound On-Ramp	\$248,000
LOCATION TOTAL	\$346,000
State Route 24 (US Route 70N, East Spring Street) at State Route 111 Southbound	
Signal Warrant Analysis for Intersection	\$15,000
LOCATION TOTAL	\$15,000
State Route 24 (US Route 70N, West Broad Street) at West Jackson Street	
Addition of Southbound Left-Turn Lane	\$172,000
Signal Phasing Optimization	\$25,000
LOCATION TOTAL	\$197,000
East 10th Street from State Route 136 (North Washington Avenue) to Chocolate Drive	
Widen Roadway from Three to Five Lanes	\$27,924,000
LOCATION TOTAL	\$27,924,000
East 10th Street at Fisk Road	
Addition of Southbound Left-Turn Lane	\$172,000
Addition of Northbound Left-Turn Lane	\$172,000
LOCATION TOTAL	\$354,000
East 10th Street at State Route 111 Northbound	
Addition of Northbound Right-Turn Lane	\$98,000
Implementation of Northbound No Right-Turn on Red	\$10,000
LOCATION TOTAL	\$108,000
GRAND TOTAL	\$68,719,000

Appendix F: 2040 Recommendations Synchro Reports

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	20	30	30	10	100	35	770	25	80	355	135
Future Volume (vph)	65	20	30	30	10	100	35	770	25	80	355	135
Satd. Flow (prot)	1770	1788	0	1703	1651	0	1805	3416	0	1787	3216	0
Flt Permitted	0.630			0.706			0.424			0.224		
Satd. Flow (perm)	1174	1788	0	1265	1651	0	806	3416	0	421	3216	0
Satd. Flow (RTOR)		31			116			9			120	
Lane Group Flow (vph)	133	79	0	56	140	0	42	999	0	113	603	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		3			4		5	2		1	6	
Permitted Phases	3			4			2			6		
Total Split (s)	27.0	27.0		27.0	27.0		12.0	47.0		16.0	51.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	6.0		5.5	6.0	
Act Effct Green (s)	14.9	14.9		14.9	14.9		58.6	52.9		61.7	56.3	
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.65	0.59		0.69	0.63	
v/c Ratio	0.69	0.25		0.27	0.38		0.07	0.50		0.28	0.29	
Control Delay	52.2	21.7		33.9	11.6		5.6	13.7		5.2	1.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	52.2	21.7		33.9	11.6		5.6	13.7		5.2	1.7	
LOS	D	C		C	B		A	B		A	A	
Approach Delay		40.8			17.9			13.3			2.3	
Approach LOS		D			B			B			A	
Queue Length 50th (ft)	72	24		28	12		6	169		4	4	
Queue Length 95th (ft)	60	18		33	0		17	243		11	9	
Internal Link Dist (ft)		927			612			1063			1812	
Turn Bay Length (ft)	200			150			200			200		
Base Capacity (vph)	280	450		302	482		600	2012		454	2061	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.47	0.18		0.19	0.29		0.07	0.50		0.25	0.29	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 54 (60%), Referenced to phase 2:NBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 12.8

Intersection Capacity Utilization 51.5%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 1: SR 135/S. Willow Ave & Gould Dr/Winston Dr

		
Ø1	Ø2 (R)	Ø3
16 s	47 s	27 s
		
Ø5	Ø6	Ø4
12 s	51 s	27 s

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	345	10	60	0	0	0	0	700	275	225	610	0
Future Volume (vph)	345	10	60	0	0	0	0	700	275	225	610	0
Satd. Flow (prot)	1649	1594	0	0	0	0	0	3397	0	1770	3539	0
Flt Permitted	0.950	0.971								0.091		
Satd. Flow (perm)	1649	1594	0	0	0	0	0	3397	0	170	3539	0
Satd. Flow (RTOR)		29						74				
Lane Group Flow (vph)	236	229	0	0	0	0	0	1305	0	281	663	0
Turn Type	Split	NA						NA		pm+pt	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases										6		
Total Split (s)	36.0	36.0						38.0		16.0	54.0	
Total Lost Time (s)	6.0	6.0						5.5		5.5	5.5	
Act Effct Green (s)	18.7	18.7						38.6		59.8	59.8	
Actuated g/C Ratio	0.21	0.21						0.43		0.66	0.66	
v/c Ratio	0.69	0.65						0.87		0.72	0.28	
Control Delay	42.9	36.2						32.8		25.4	6.2	
Queue Delay	0.0	0.0						0.0		0.0	0.0	
Total Delay	42.9	36.2						32.8		25.4	6.2	
LOS	D	D						C		C	A	
Approach Delay		39.6						32.8			11.9	
Approach LOS		D						C			B	
Queue Length 50th (ft)	132	110						204		81	84	
Queue Length 95th (ft)	191	105						395		#176	127	
Internal Link Dist (ft)		409			271			1812			858	
Turn Bay Length (ft)	200									410		
Base Capacity (vph)	549	550						1499		392	2353	
Starvation Cap Reductn	0	0						0		0	0	
Spillback Cap Reductn	0	0						0		0	0	
Storage Cap Reductn	0	0						0		0	0	
Reduced v/c Ratio	0.43	0.42						0.87		0.72	0.28	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 32 (36%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 26.7

Intersection LOS: C

Intersection Capacity Utilization 66.4%

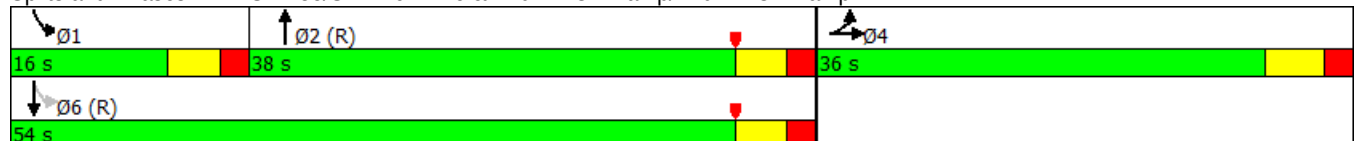
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: SR 135/S. Willow Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp



Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	265	10	370	55	980	0	0	580	175
Future Volume (vph)	0	0	0	265	10	370	55	980	0	0	580	175
Satd. Flow (prot)	0	0	0	0	1761	1583	1671	3539	0	0	3413	0
Flt Permitted					0.954		0.201					
Satd. Flow (perm)	0	0	0	0	1761	1583	354	3539	0	0	3413	0
Satd. Flow (RTOR)						97					53	
Lane Group Flow (vph)	0	0	0	0	315	435	71	1210	0	0	898	0
Turn Type				Split	NA	Perm	pm+pt	NA			NA	
Protected Phases				4	4		5	2			6	
Permitted Phases						4	2					
Total Split (s)				40.0	40.0	40.0	12.0	50.0			38.0	
Total Lost Time (s)					5.5	5.5	5.5	5.5			5.5	
Act Effct Green (s)					26.4	26.4	52.6	52.6			42.5	
Actuated g/C Ratio					0.29	0.29	0.58	0.58			0.47	
v/c Ratio					0.61	0.82	0.23	0.59			0.55	
Control Delay					31.4	34.7	3.8	6.2			14.0	
Queue Delay					0.0	0.0	0.0	0.0			0.0	
Total Delay					31.4	34.7	3.8	6.2			14.0	
LOS					C	C	A	A			B	
Approach Delay					33.3			6.1			14.0	
Approach LOS					C			A			B	
Queue Length 50th (ft)					151	178	2	14			122	
Queue Length 95th (ft)					208	236	m14	298			168	
Internal Link Dist (ft)		874			1170			858			839	
Turn Bay Length (ft)						200	200					
Base Capacity (vph)					675	666	308	2066			1640	
Starvation Cap Reductn					0	0	0	0			0	
Spillback Cap Reductn					0	0	0	0			0	
Storage Cap Reductn					0	0	0	0			0	
Reduced v/c Ratio					0.47	0.65	0.23	0.59			0.55	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 73 (81%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 15.5

Intersection LOS: B

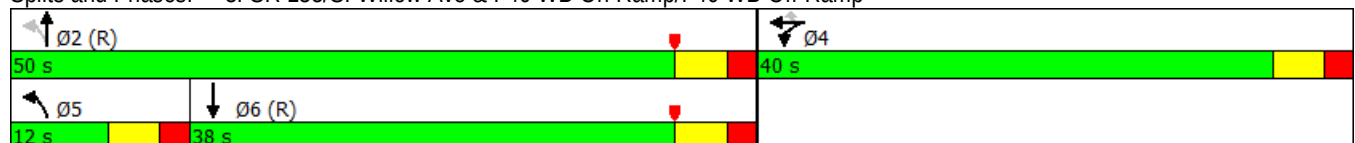
Intersection Capacity Utilization 66.4%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: SR 135/S. Willow Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp



Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

4: SR 135/S. Willow Ave & Foreman Dr/Interstate Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	165	85	210	75	180	70	950	295	205	495	30
Future Volume (vph)	75	165	85	210	75	180	70	950	295	205	495	30
Satd. Flow (prot)	1736	3288	0	1805	1900	1615	1703	3412	0	3400	3539	0
Flt Permitted	0.697			0.270			0.431			0.950		
Satd. Flow (perm)	1273	3288	0	513	1900	1615	773	3412	0	3400	3539	0
Satd. Flow (RTOR)		95				212		57			10	
Lane Group Flow (vph)	88	334	0	256	93	212	81	1448	0	228	558	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA		Prot	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4		4	2					
Total Split (s)	12.0	15.0		17.0	20.0	20.0	12.0	45.0		13.0	46.0	
Total Lost Time (s)	5.5	6.5		5.5	6.5	6.5	5.5	6.5		5.5	6.5	
Act Effct Green (s)	15.9	8.5		26.1	15.9	15.9	45.9	38.5		7.5	41.9	
Actuated g/C Ratio	0.18	0.09		0.29	0.18	0.18	0.51	0.43		0.08	0.47	
v/c Ratio	0.34	0.84		0.82	0.28	0.46	0.18	0.97		0.81	0.34	
Control Delay	28.4	48.9		48.9	36.5	8.8	5.9	35.0		63.0	16.4	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	28.4	48.9		48.9	36.5	8.8	5.9	35.0		63.0	16.4	
LOS	C	D		D	D	A	A	C		E	B	
Approach Delay		44.6			31.7			33.4			29.9	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	37	71		119	48	0	11	371		67	105	
Queue Length 95th (ft)	69	#96		#175	83	50	m18	#506		#126	145	
Internal Link Dist (ft)		811			944			839			2060	
Turn Bay Length (ft)	150			150			50			150		
Base Capacity (vph)	259	396		314	336	459	462	1492		283	1652	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.34	0.84		0.82	0.28	0.46	0.18	0.97		0.81	0.34	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 77 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 33.7

Intersection LOS: C

Intersection Capacity Utilization 80.4%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: SR 135/S. Willow Ave & Foreman Dr/Interstate Dr

			
Ø1	Ø2 (R)	Ø3	Ø4
13 s	45 s	12 s	20 s
			
Ø5	Ø6 (R)	Ø7	Ø8
12 s	46 s	17 s	15 s

AM Peak

WSP

Synchro 9 Report

Page 4

Lanes, Volumes, Timings
5: SR 135/S. Willow Ave & Fairground St

2040 Recommended AM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	20	65	975	80	55	730
Future Volume (vph)	20	65	975	80	55	730
Satd. Flow (prot)	1805	1583	3531	0	1752	3574
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1583	3531	0	1752	3574
Lane Group Flow (vph)	29	76	1101	0	87	811
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 46.2%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
5: SR 135/S. Willow Ave & Fairground St

2040 Recommended AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	65	975	80	55	730
Future Vol, veh/h	20	65	975	80	55	730
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	86	97	83	63	90
Heavy Vehicles, %	0	2	1	0	3	1
Mvmt Flow	29	76	1005	96	87	811

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1633	551	0	0	1102	0
Stage 1	1053	-	-	-	-	-
Stage 2	580	-	-	-	-	-
Critical Hdwy	6.8	6.94	-	-	4.16	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.32	-	-	2.23	-
Pot Cap-1 Maneuver	94	478	-	-	623	-
Stage 1	301	-	-	-	-	-
Stage 2	529	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	81	478	-	-	623	-
Mov Cap-2 Maneuver	200	-	-	-	-	-
Stage 1	301	-	-	-	-	-
Stage 2	455	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	17.3		0		1.1
HCM LOS	C				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	200	478	623	-
HCM Lane V/C Ratio	-	-	0.145	0.158	0.14	-
HCM Control Delay (s)	-	-	26	13.9	11.7	-
HCM Lane LOS	-	-	D	B	B	-
HCM 95th %tile Q(veh)	-	-	0.5	0.6	0.5	-

Lanes, Volumes, Timings
6: SR 135/S. Willow Ave & Ashwood Dr

2040 Recommended AM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (vph)	0	10	960	20	0	800
Future Volume (vph)	0	10	960	20	0	800
Satd. Flow (prot)	0	1644	3557	0	0	3539
Flt Permitted						
Satd. Flow (perm)	0	1644	3557	0	0	3539
Lane Group Flow (vph)	0	13	1022	0	0	879
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 37.2%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
6: SR 135/S. Willow Ave & Ashwood Dr

2040 Recommended AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	10	960	20	0	800
Future Vol, veh/h	0	10	960	20	0	800
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	25	75	97	63	25	91
Heavy Vehicles, %	0	0	1	0	0	2
Mvmt Flow	0	13	990	32	0	879

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	495	0	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.9	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-	-
Pot Cap-1 Maneuver	0	525	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	525	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	12		0		0
HCM LOS	B				

Minor Lane/Major Mvmt	NBTWBLn1	SBT
Capacity (veh/h)	- 525	-
HCM Lane V/C Ratio	- 0.025	-
HCM Control Delay (s)	- 12	-
HCM Lane LOS	- B	-
HCM 95th %tile Q(veh)	- 0.1	-

Lanes, Volumes, Timings
7: SR 135/S. Willow Ave & Lone Oak Dr

2040 Recommended AM Timing Plan
07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	75	40	15	990	820	20
Future Volume (vph)	75	40	15	990	820	20
Satd. Flow (prot)	1736	1553	1805	3574	3559	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1736	1553	1805	3574	3559	0
Lane Group Flow (vph)	75	58	17	1000	918	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 38.2%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
7: SR 135/S. Willow Ave & Lone Oak Dr

2040 Recommended AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 1.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	75	40	15	990	820	20
Future Vol, veh/h	75	40	15	990	820	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	30	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	69	88	99	92	75
Heavy Vehicles, %	4	4	0	1	1	2
Mvmt Flow	75	58	17	1000	891	27

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1439	459	918	0	-	0
Stage 1	905	-	-	-	-	-
Stage 2	534	-	-	-	-	-
Critical Hdwy	6.88	6.98	4.1	-	-	-
Critical Hdwy Stg 1	5.88	-	-	-	-	-
Critical Hdwy Stg 2	5.88	-	-	-	-	-
Follow-up Hdwy	3.54	3.34	2.2	-	-	-
Pot Cap-1 Maneuver	121	544	752	-	-	-
Stage 1	350	-	-	-	-	-
Stage 2	546	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	118	544	752	-	-	-
Mov Cap-2 Maneuver	244	-	-	-	-	-
Stage 1	350	-	-	-	-	-
Stage 2	534	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.2	0.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	752	-	244	544	-	-
HCM Lane V/C Ratio	0.023	-	0.307	0.107	-	-
HCM Control Delay (s)	9.9	-	26.2	12.4	-	-
HCM Lane LOS	A	-	D	B	-	-
HCM 95th %tile Q(veh)	0.1	-	1.3	0.4	-	-

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

8: SR 135/S. Willow Ave & W. Jackson St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	390	300	120	190	115	195	700	120	135	540	25
Future Volume (vph)	85	390	300	120	190	115	195	700	120	135	540	25
Satd. Flow (prot)	1805	3574	1568	1787	3610	1615	3467	3460	0	1770	3548	0
Flt Permitted	0.621			0.271			0.950			0.174		
Satd. Flow (perm)	1180	3574	1568	510	3610	1615	3467	3460	0	324	3548	0
Satd. Flow (RTOR)			345			170		27			6	
Lane Group Flow (vph)	90	481	345	128	209	149	210	906	0	169	616	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4		4				6		
Total Split (s)	12.0	23.0	23.0	13.0	24.0	24.0	16.0	38.0		16.0	38.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	6.0		5.5	6.0	
Act Effct Green (s)	23.5	16.5	16.5	26.7	20.0	20.0	9.8	33.5		42.9	33.1	
Actuated g/C Ratio	0.26	0.18	0.18	0.30	0.22	0.22	0.11	0.37		0.48	0.37	
v/c Ratio	0.25	0.73	0.61	0.48	0.26	0.30	0.56	0.69		0.56	0.47	
Control Delay	22.8	41.8	8.8	27.9	30.7	5.5	44.0	27.1		28.3	13.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	22.8	41.8	8.8	27.9	30.7	5.5	44.0	27.1		28.3	13.8	
LOS	C	D	A	C	C	A	D	C		C	B	
Approach Delay		27.5			22.2			30.3			16.9	
Approach LOS		C			C			C			B	
Queue Length 50th (ft)	34	135	0	49	53	0	58	232		12	184	
Queue Length 95th (ft)	70	166	62	94	84	20	94	297		101	58	
Internal Link Dist (ft)		1238			1065			2054			612	
Turn Bay Length (ft)	225		175	150		150	150			150		
Base Capacity (vph)	358	694	582	267	801	491	404	1317		327	1326	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.25	0.69	0.59	0.48	0.26	0.30	0.52	0.69		0.52	0.46	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 7 (8%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 25.1

Intersection Capacity Utilization 66.8%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

Splits and Phases: 8: SR 135/S. Willow Ave & W. Jackson St

			
Ø1	Ø2 (R)	Ø3	Ø4
16 s	38 s	12 s	24 s
			
Ø5	Ø6 (R)	Ø7	Ø8
16 s	38 s	13 s	23 s

Lanes, Volumes, Timings
9: SR 135/S. Willow Ave & W. Stevens St

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	125	20	35	60	40	20	840	40	60	675	15
Future Volume (vph)	50	125	20	35	60	40	20	840	40	60	675	15
Satd. Flow (prot)	1805	1851	0	1787	1785	0	1805	3551	0	1787	3561	0
Flt Permitted	0.615			0.568			0.348			0.221		
Satd. Flow (perm)	1168	1851	0	1069	1785	0	661	3551	0	416	3561	0
Satd. Flow (RTOR)		10			30			7			3	
Lane Group Flow (vph)	57	184	0	49	114	0	24	892	0	72	720	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	12.0	22.0		12.0	22.0		12.0	44.0		12.0	44.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	19.7	15.0		18.3	12.4		51.2	46.2		54.2	51.3	
Actuated g/C Ratio	0.22	0.17		0.20	0.14		0.57	0.51		0.60	0.57	
v/c Ratio	0.19	0.58		0.18	0.42		0.05	0.49		0.20	0.35	
Control Delay	23.9	40.4		23.9	30.0		17.4	31.7		19.1	25.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	23.9	40.4		23.9	30.0		17.4	31.7		19.1	25.1	
LOS	C	D		C	C		B	C		B	C	
Approach Delay		36.5			28.1			31.3			24.6	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	24	94		20	43		11	273		33	201	
Queue Length 95th (ft)	48	140		34	83		m21	347		m52	m273	
Internal Link Dist (ft)		761			793			608			1346	
Turn Bay Length (ft)	100			75			100			150		
Base Capacity (vph)	308	363		274	351		460	1854		354	2049	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.19	0.51		0.18	0.32		0.05	0.48		0.20	0.35	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 29.1

Intersection LOS: C

Intersection Capacity Utilization 60.6%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: SR 135/S. Willow Ave & W. Stevens St

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	44 s	12 s	22 s
			
Ø5	Ø6 (R)	Ø7	Ø8
12 s	44 s	12 s	22 s

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

10: SR 135/S. Willow Ave & US 70/W. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	165	505	120	150	305	90	85	715	100	85	625	25
Future Volume (vph)	165	505	120	150	305	90	85	715	100	85	625	25
Satd. Flow (prot)	1787	1863	1553	1805	1863	1599	1787	3511	0	1685	3317	0
Flt Permitted	0.266			0.142			0.240			0.153		
Satd. Flow (perm)	500	1863	1553	270	1863	1599	451	3511	0	271	3317	0
Satd. Flow (RTOR)			164			164		17			5	
Lane Group Flow (vph)	220	587	148	181	407	92	97	898	0	115	695	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8	4		4	2			6		
Total Split (s)	15.0	37.0	37.0	12.0	34.0	34.0	11.0	30.0		11.0	30.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5		5.5	5.5	
Act Effct Green (s)	39.8	30.5	30.5	35.0	28.1	28.1	30.5	24.9		31.7	27.3	
Actuated g/C Ratio	0.44	0.34	0.34	0.39	0.31	0.31	0.34	0.28		0.35	0.30	
v/c Ratio	0.62	0.93	0.23	0.82	0.70	0.15	0.41	0.91		0.62	0.69	
Control Delay	22.6	52.0	3.8	46.9	34.7	0.8	28.9	43.7		35.6	35.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	22.6	52.0	3.8	46.9	34.7	0.8	28.9	43.7		35.6	35.9	
LOS	C	D	A	D	C	A	C	D		D	D	
Approach Delay		37.7			33.4			42.2			35.9	
Approach LOS		D			C			D			D	
Queue Length 50th (ft)	71	313	0	57	201	0	15	71		59	207	
Queue Length 95th (ft)	94	#473	22	#133	237	4	90	#351		92	273	
Internal Link Dist (ft)		2100			700			1346			1053	
Turn Bay Length (ft)	125		125	125		125	175			150		
Base Capacity (vph)	357	652	650	221	589	618	235	983		185	1010	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.62	0.90	0.23	0.82	0.69	0.15	0.41	0.91		0.62	0.69	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 84 (93%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 37.7

Intersection LOS: D

Intersection Capacity Utilization 80.9%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 10: SR 135/S. Willow Ave & US 70/W. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
11 s	30 s	15 s	34 s
			
Ø5	Ø6 (R)	Ø7	Ø8
11 s	30 s	12 s	37 s

AM Peak

WSP

Synchro 9 Report

Page 13

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	165	175	55	35	90	25	55	815	40	60	680	60
Future Volume (vph)	165	175	55	35	90	25	55	815	40	60	680	60
Satd. Flow (prot)	1805	1819	0	1805	1841	0	1668	3331	0	1620	3286	0
Flt Permitted	0.446			0.595			0.240			0.188		
Satd. Flow (perm)	847	1819	0	1130	1841	0	421	3331	0	321	3286	0
Satd. Flow (RTOR)		20			13			7			14	
Lane Group Flow (vph)	174	263	0	43	149	0	67	929	0	60	811	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	17.0	29.0		13.0	25.0		12.0	36.0		12.0	36.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	28.4	21.4		19.8	13.0		45.6	40.0		45.4	39.8	
Actuated g/C Ratio	0.32	0.24		0.22	0.14		0.51	0.44		0.50	0.44	
v/c Ratio	0.46	0.59		0.14	0.54		0.22	0.63		0.23	0.55	
Control Delay	25.3	33.9		20.2	38.6		5.8	10.9		13.8	22.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	25.3	33.9		20.2	38.6		5.8	10.9		13.8	22.3	
LOS	C	C		C	D		A	B		B	C	
Approach Delay		30.5			34.5			10.5			21.7	
Approach LOS		C			C			B			C	
Queue Length 50th (ft)	73	131		17	73		5	39		15	183	
Queue Length 95th (ft)	m110	m198		31	99		m7	m300		40	275	
Internal Link Dist (ft)		1729			1357			1053			841	
Turn Bay Length (ft)	75						150			50		
Base Capacity (vph)	390	498		313	409		310	1482		261	1462	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.45	0.53		0.14	0.36		0.22	0.63		0.23	0.55	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 31 (34%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 19.8

Intersection LOS: B

Intersection Capacity Utilization 64.7%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: SR 135/S. Willow Ave/SR 135/N. Willow Ave & W. Broad St/W, Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	36 s	17 s	25 s
			
Ø5	Ø6 (R)	Ø7	Ø8
12 s	36 s	13 s	29 s

Lanes, Volumes, Timings

12: SR 135/N. Willow Ave & W. 3rd St

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	10	10	10	10	10	10	895	60	25	805	10
Future Volume (vph)	10	10	10	10	10	10	10	895	60	25	805	10
Satd. Flow (prot)	0	1854	1615	0	1860	1615	1805	3329	0	1805	3330	0
Flt Permitted		0.976			0.979		0.950			0.950		
Satd. Flow (perm)	0	1854	1615	0	1860	1615	1805	3329	0	1805	3330	0
Lane Group Flow (vph)	0	32	11	0	28	16	13	1022	0	30	899	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 43.3%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
12: SR 135/N. Willow Ave & W. 3rd St

2040 Recommended AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	10	10	10	10	10	10	895	60	25	805	10
Future Vol, veh/h	10	10	10	10	10	10	10	895	60	25	805	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	100	-	-	100	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	63	94	83	63	63	75	95	75	83	91	71
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	1	0
Mvmt Flow	16	16	11	12	16	16	13	942	80	30	885	14

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1458	2001	449	1519	1968	511	899	0	0	1022	0	0
Stage 1	952	952	-	1009	1009	-	-	-	-	-	-	-
Stage 2	506	1049	-	510	959	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	92	61	563	83	63	513	764	-	-	687	-	-
Stage 1	283	341	-	261	320	-	-	-	-	-	-	-
Stage 2	522	307	-	519	338	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	68	57	563	61	59	513	764	-	-	687	-	-
Mov Cap-2 Maneuver	68	57	-	61	59	-	-	-	-	-	-	-
Stage 1	278	326	-	257	315	-	-	-	-	-	-	-
Stage 2	472	302	-	463	323	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	87.4	74	0.1	0.3
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	764	-	-	62	563	60	513	687	-	-
HCM Lane V/C Ratio	0.017	-	-	0.512	0.019	0.465	0.031	0.044	-	-
HCM Control Delay (s)	9.8	-	-	112.8	11.5	109.1	12.2	10.5	-	-
HCM Lane LOS	A	-	-	F	B	F	B	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2	0.1	1.8	0.1	0.1	-	-

Lanes, Volumes, Timings

13: SR 135/N. Willow Ave & W. 4th St

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	15	20	20	10	15	15	780	110	40	800	15
Future Volume (vph)	10	15	20	20	10	15	15	780	110	40	800	15
Satd. Flow (prot)	0	1852	1615	0	1832	1553	1805	3282	0	1805	3323	0
Flt Permitted		0.975			0.964		0.950			0.950		
Satd. Flow (perm)	0	1852	1615	0	1832	1553	1805	3282	0	1805	3323	0
Lane Group Flow (vph)	0	31	28	0	38	19	24	994	0	80	923	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 46.7%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
13: SR 135/N. Willow Ave & W. 4th St

2040 Recommended AM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 6.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	15	20	20	10	15	15	780	110	40	800	15
Future Vol, veh/h	10	15	20	20	10	15	15	780	110	40	800	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	100	-	-	100	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	100	71	71	100	78	63	93	71	50	89	63
Heavy Vehicles, %	0	0	0	0	0	4	0	0	2	0	1	0
Mvmt Flow	16	15	28	28	10	19	24	839	155	80	899	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1543	2112	461	1581	2047	497	923	0	0	994	0	0
Stage 1	1071	1071	-	964	964	-	-	-	-	-	-	-
Stage 2	472	1041	-	617	1083	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.98	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.34	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	80	52	553	75	57	513	748	-	-	704	-	-
Stage 1	239	300	-	278	336	-	-	-	-	-	-	-
Stage 2	547	310	-	449	296	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	58	45	553	47	49	513	748	-	-	704	-	-
Mov Cap-2 Maneuver	58	45	-	47	49	-	-	-	-	-	-	-
Stage 1	231	266	-	269	325	-	-	-	-	-	-	-
Stage 2	494	300	-	356	262	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	84.9	139.8	0.2	0.9
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	748	-	-	51	553	48	513	704	-	-
HCM Lane V/C Ratio	0.032	-	-	0.605	0.051	0.795	0.037	0.114	-	-
HCM Control Delay (s)	10	-	-	151.5	11.9	204.1	12.3	10.8	-	-
HCM Lane LOS	A	-	-	F	B	F	B	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2.4	0.2	3.2	0.1	0.4	-	-

Lanes, Volumes, Timings
14: SR 135/N. Willow Ave & W. 7th St

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	205	50	100	40	55	10	500	215	100	725	20
Future Volume (vph)	60	205	50	100	40	55	10	500	215	100	725	20
Satd. Flow (prot)	1770	1773	0	1805	1720	0	1805	3201	0	1805	3280	0
Flt Permitted	0.685			0.243			0.234			0.255		
Satd. Flow (perm)	1276	1773	0	462	1720	0	445	3201	0	484	3280	0
Satd. Flow (RTOR)		17			68			101			6	
Lane Group Flow (vph)	72	341	0	116	112	0	16	780	0	128	856	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases	3	8		7	4			2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	31.0		12.0	31.0		45.0	45.0		12.0	57.0	
Total Lost Time (s)	5.5	6.0		5.5	6.0		6.0	6.0		5.5	6.0	
Act Effct Green (s)	30.9	22.5		35.5	26.6		38.8	38.8		50.8	50.3	
Actuated g/C Ratio	0.31	0.22		0.36	0.27		0.39	0.39		0.51	0.50	
v/c Ratio	0.17	0.83		0.39	0.22		0.09	0.60		0.40	0.52	
Control Delay	19.6	52.4		23.4	14.1		23.8	24.2		24.0	19.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.6	52.4		23.4	14.1		23.8	24.2		24.0	19.7	
LOS	B	D		C	B		C	C		C	B	
Approach Delay		46.7			18.8			24.2			20.3	
Approach LOS		D			B			C			C	
Queue Length 50th (ft)	28	195		46	21		7	186		38	147	
Queue Length 95th (ft)	52	255		80	65		15	250		71	216	
Internal Link Dist (ft)		675			1002			1211			498	
Turn Bay Length (ft)	25			75			150			150		
Base Capacity (vph)	434	462		295	515		183	1377		333	1739	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.17	0.74		0.39	0.22		0.09	0.57		0.38	0.49	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 25.9

Intersection Capacity Utilization 68.0%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

Splits and Phases: 14: SR 135/N. Willow Ave & W. 7th St

			
Ø2 (R)	Ø1	Ø3	Ø4
45 s	12 s	12 s	31 s
			
Ø6 (R)	Ø7	Ø8	
57 s	12 s	31 s	

Lanes, Volumes, Timings
15: SR 135/N. Willow Ave & W. 9th St

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	30	85	5	10	5	30	560	10	20	805	65
Future Volume (vph)	60	30	85	5	10	5	30	560	10	20	805	65
Satd. Flow (prot)	0	1835	1538	0	1870	1615	1805	3356	0	1643	3158	0
Flt Permitted		0.966			0.984		0.950			0.950		
Satd. Flow (perm)	0	1835	1538	0	1870	1615	1805	3356	0	1643	3158	0
Lane Group Flow (vph)	0	105	100	0	15	8	40	618	0	18	1009	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 44.1%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
15: SR 135/N. Willow Ave & W. 9th St

2040 Recommended AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 15.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	60	30	85	5	10	5	30	560	10	20	805	65
Future Vol, veh/h	60	30	85	5	10	5	30	560	10	20	805	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	100	-	-	100	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	100	85	100	100	63	75	93	63	100	86	92
Heavy Vehicles, %	0	0	5	0	0	0	0	0	0	0	1	2
Mvmt Flow	75	30	100	5	10	8	40	602	16	20	936	71

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1397	1709	503	1213	1737	309	1007	0	0	618	0	0
Stage 1	1011	1011	-	690	690	-	-	-	-	-	-	-
Stage 2	386	698	-	523	1047	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	7	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.35	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	102	92	506	140	88	693	696	-	-	972	-	-
Stage 1	260	320	-	406	449	-	-	-	-	-	-	-
Stage 2	614	445	-	510	308	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	86	85	506	77	81	693	696	-	-	972	-	-
Mov Cap-2 Maneuver	86	85	-	77	81	-	-	-	-	-	-	-
Stage 1	245	313	-	383	423	-	-	-	-	-	-	-
Stage 2	559	419	-	362	302	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	138	42.9	0.6	0.3
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	696	-	-	86	506	80	693	972	-	-
HCM Lane V/C Ratio	0.057	-	-	1.221	0.198	0.188	0.011	0.021	-	-
HCM Control Delay (s)	10.5	-	-	256.2	13.9	60.1	10.3	8.8	0.1	-
HCM Lane LOS	B	-	-	F	B	F	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	7.6	0.7	0.6	0	0.1	-	-

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	50	15	35	55	15	20	440	165	75	830	25
Future Volume (vph)	20	50	15	35	55	15	20	440	165	75	830	25
Satd. Flow (prot)	1736	1692	0	1787	1658	0	1805	3235	0	0	3301	0
Flt Permitted	0.678			0.551			0.229				0.763	
Satd. Flow (perm)	1239	1692	0	1037	1658	0	435	3235	0	0	2534	0
Satd. Flow (RTOR)		14			12			73			6	
Lane Group Flow (vph)	26	72	0	53	123	0	20	660	0	0	1051	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	3	8		7	4			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	15.0	30.0		15.0	30.0		55.0	55.0		55.0	55.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5			5.5	
Act Effct Green (s)	15.9	10.3		19.7	16.1		67.6	67.6			67.6	
Actuated g/C Ratio	0.16	0.10		0.20	0.16		0.68	0.68			0.68	
v/c Ratio	0.11	0.39		0.20	0.44		0.07	0.30			0.61	
Control Delay	28.4	39.2		29.8	39.0		5.7	4.2			7.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	28.4	39.2		29.8	39.0		5.7	4.2			7.6	
LOS	C	D		C	D		A	A			A	
Approach Delay		36.3			36.2			4.2			7.6	
Approach LOS		D			D			A			A	
Queue Length 50th (ft)	13	36		27	59		2	35			65	
Queue Length 95th (ft)	27	73		38	68		m7	66			m283	
Internal Link Dist (ft)		789			874			862			1102	
Turn Bay Length (ft)	100			100			150					
Base Capacity (vph)	275	425		282	415		294	2210			1714	
Starvation Cap Reductn	0	0		0	0		0	0			0	
Spillback Cap Reductn	0	0		0	0		0	0			0	
Storage Cap Reductn	0	0		0	0		0	0			0	
Reduced v/c Ratio	0.09	0.17		0.19	0.30		0.07	0.30			0.61	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 64 (64%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 10.4

Intersection Capacity Utilization 65.7%

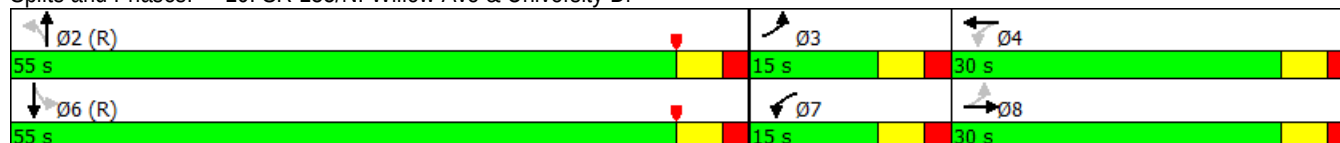
Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Intersection LOS: B

ICU Level of Service C

Splits and Phases: 16: SR 135/N. Willow Ave & University Dr



Lanes, Volumes, Timings
17: SR 135/N. Willow Ave & W. 12th St

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	505	335	250	170	40	70	195	215	165	435	55
Future Volume (vph)	115	505	335	250	170	40	70	195	215	165	435	55
Satd. Flow (prot)	1752	1845	1615	1770	3478	0	1685	3063	0	1668	3312	0
Flt Permitted	0.604			0.112			0.450			0.227		
Satd. Flow (perm)	1114	1845	1615	209	3478	0	798	3063	0	399	3312	0
Satd. Flow (RTOR)			288		34			236			13	
Lane Group Flow (vph)	129	587	368	272	237	0	73	437	0	239	541	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases	4		4	8			6			2		
Total Split (s)	16.0	43.0	43.0	18.0	45.0		12.0	20.0		19.0	27.0	
Total Lost Time (s)	5.5	6.0	6.0	5.5	6.0		5.5	6.5		5.5	6.5	
Act Effct Green (s)	44.5	35.1	35.1	52.0	38.9		23.0	15.5		35.3	24.5	
Actuated g/C Ratio	0.44	0.35	0.35	0.52	0.39		0.23	0.16		0.35	0.24	
v/c Ratio	0.23	0.91	0.49	0.89	0.17		0.30	0.65		0.77	0.66	
Control Delay	12.6	50.0	8.1	54.1	17.2		23.1	23.5		44.2	39.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	12.6	50.0	8.1	54.1	17.2		23.1	23.5		44.2	39.4	
LOS	B	D	A	D	B		C	C		D	D	
Approach Delay		31.3			36.9			23.4			40.9	
Approach LOS		C			D			C			D	
Queue Length 50th (ft)	37	341	33	112	42		34	88		117	168	
Queue Length 95th (ft)	65	#492	105	#265	68		46	137		135	#233	
Internal Link Dist (ft)		1178			1081			1102			1094	
Turn Bay Length (ft)	100			220			100			220		
Base Capacity (vph)	580	682	778	307	1404		243	678		315	823	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.22	0.86	0.47	0.89	0.17		0.30	0.64		0.76	0.66	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 99 (99%), Referenced to phase 2:SBTL and 6:NBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 33.5

Intersection LOS: C

Intersection Capacity Utilization 81.5%

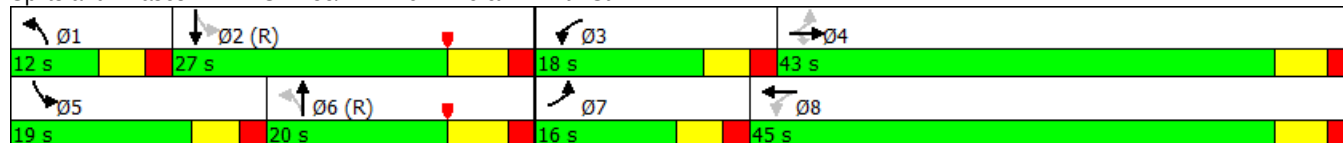
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 17: SR 135/N. Willow Ave & W. 12th St



Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	185	10	15	10	0	40	20	1170	10	25	735	120
Future Volume (vph)	185	10	15	10	0	40	20	1170	10	25	735	120
Satd. Flow (prot)	1736	1061	0	1805	1615	0	1805	3539	1615	1687	3505	1599
Flt Permitted	0.400			0.720			0.282			0.099		
Satd. Flow (perm)	731	1061	0	1368	1615	0	536	3539	1615	176	3505	1599
Satd. Flow (RTOR)		16			213				213			213
Lane Group Flow (vph)	195	56	0	16	58	0	32	1427	10	25	817	152
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2		2	6		6
Total Split (s)	20.0	20.0		12.0	12.0		12.0	56.0	56.0	12.0	56.0	56.0
Total Lost Time (s)	5.5	6.0		5.5	6.0		5.5	6.0	6.0	5.5	6.0	6.0
Act Effct Green (s)	22.4	17.1		11.4	6.0		64.4	61.3	61.3	63.2	58.9	58.9
Actuated g/C Ratio	0.22	0.17		0.11	0.06		0.64	0.61	0.61	0.63	0.59	0.59
v/c Ratio	0.67	0.29		0.09	0.20		0.08	0.66	0.01	0.12	0.40	0.15
Control Delay	44.3	32.6		29.5	1.5		7.6	16.9	0.0	7.0	8.8	1.1
Queue Delay	0.0	0.0		0.0	0.1		0.0	0.4	0.0	0.0	0.2	0.0
Total Delay	44.3	32.6		29.5	1.5		7.6	17.3	0.0	7.0	8.9	1.1
LOS	D	C		C	A		A	B	A	A	A	A
Approach Delay		41.7			7.6			17.0			7.7	
Approach LOS		D			A			B			A	
Queue Length 50th (ft)	104	20		8	0		7	273	0	2	40	0
Queue Length 95th (ft)	170	10		17	0		12	407	0	m12	173	3
Internal Link Dist (ft)		573			734			200			263	
Turn Bay Length (ft)	200			25			175		150	100		50
Base Capacity (vph)	316	205		188	297		427	2168	1072	209	2065	1030
Starvation Cap Reductn	0	0		0	0		0	0	0	0	472	0
Spillback Cap Reductn	0	0		0	17		0	285	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.27		0.09	0.21		0.07	0.76	0.01	0.12	0.51	0.15

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 81 (81%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 15.6

Intersection LOS: B

Intersection Capacity Utilization 59.3%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: SR 136/S. Jefferson Ave & Bunker Hill Rd/Ferrell Dr

			
Ø1	Ø2 (R)	Ø3	Ø4
12 s	56 s	20 s	12 s
			
Ø5	Ø6 (R)	Ø7	Ø8
12 s	56 s	12 s	20 s

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	380	0	190	0	0	0	0	1240	130	130	690	0
Future Volume (vph)	380	0	190	0	0	0	0	1240	130	130	690	0
Satd. Flow (prot)	3367	0	1538	0	0	0	0	3574	1599	1787	3539	0
Flt Permitted	0.950									0.072		
Satd. Flow (perm)	3367	0	1538	0	0	0	0	3574	1599	135	3539	0
Satd. Flow (RTOR)			232						163			
Lane Group Flow (vph)	432	0	232	0	0	0	0	1442	163	157	758	0
Turn Type	Prot		Perm					NA	Perm	pm+pt	NA	
Protected Phases	4							2		1	6	
Permitted Phases			4						2	6		
Total Split (s)	24.0		24.0					57.6	57.6	18.4	76.0	
Total Lost Time (s)	6.0		6.0					5.5	5.5	5.5	5.5	
Act Effct Green (s)	16.7		16.7					52.1	52.1	71.8	71.8	
Actuated g/C Ratio	0.17		0.17					0.52	0.52	0.72	0.72	
v/c Ratio	0.77		0.52					0.77	0.18	0.47	0.30	
Control Delay	49.7		9.4					15.7	1.2	33.0	0.4	
Queue Delay	0.0		0.0					1.5	0.0	0.0	0.0	
Total Delay	49.7		9.4					17.2	1.2	33.0	0.4	
LOS	D		A					B	A	C	A	
Approach Delay		35.6						15.6			6.0	
Approach LOS		D						B			A	
Queue Length 50th (ft)	135		0					428	13	58	2	
Queue Length 95th (ft)	182		45					109	0	97	2	
Internal Link Dist (ft)		458			312			263			407	
Turn Bay Length (ft)			200							250		
Base Capacity (vph)	606		467					1862	911	332	2542	
Starvation Cap Reductn	0		0					239	0	0	0	
Spillback Cap Reductn	0		0					35	0	0	0	
Storage Cap Reductn	0		0					0	0	0	0	
Reduced v/c Ratio	0.71		0.50					0.89	0.18	0.47	0.30	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 82 (82%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 17.0

Intersection LOS: B

Intersection Capacity Utilization 69.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 19: SR 136/S. Jefferson Ave & I-40 EB Off-Ramp/I-40 EB On-Ramp

		
Ø1	Ø2 (R)	Ø4
18.4 s	57.6 s	24 s
		
Ø6 (R)		
76 s		

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	155	0	450	115	1505	0	0	670	160
Future Volume (vph)	0	0	0	155	0	450	115	1505	0	0	670	160
Satd. Flow (prot)	0	0	0	1656	0	2707	1719	3574	0	0	3574	1599
Flt Permitted				0.950			0.252					
Satd. Flow (perm)	0	0	0	1656	0	2707	456	3574	0	0	3574	1599
Satd. Flow (RTOR)						87						176
Lane Group Flow (vph)	0	0	0	174	0	549	134	1601	0	0	713	176
Turn Type				Prot		Perm	pm+pt	NA			NA	Perm
Protected Phases				8			5	2			6	
Permitted Phases						8	2	5				6
Total Split (s)				32.0		32.0	18.0	68.0			50.0	50.0
Total Lost Time (s)				6.0		6.0	5.5	5.5			5.5	5.5
Act Effct Green (s)				22.1		22.1	66.4	66.4			31.5	31.5
Actuated g/C Ratio				0.22		0.22	0.66	0.66			0.32	0.32
v/c Ratio				0.48		0.82	0.20	0.68			0.63	0.28
Control Delay				37.6		41.7	8.1	9.1			26.4	5.6
Queue Delay				0.0		51.4	0.0	0.4			0.4	0.3
Total Delay				37.6		93.1	8.1	9.6			26.8	5.9
LOS				D		F	A	A			C	A
Approach Delay					79.7			9.5			22.6	
Approach LOS					E			A			C	
Queue Length 50th (ft)				96		160	21	135			236	0
Queue Length 95th (ft)				153		191	m28	151			160	20
Internal Link Dist (ft)		382			483			407			133	
Turn Bay Length (ft)				275		275	250					
Base Capacity (vph)				430		768	672	2371			1590	809
Starvation Cap Reductn				0		0	0	314			401	271
Spillback Cap Reductn				0		267	0	114			0	0
Storage Cap Reductn				0		0	0	0			0	0
Reduced v/c Ratio				0.40		1.10	0.20	0.78			0.60	0.33

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 77 (77%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 28.2

Intersection LOS: C

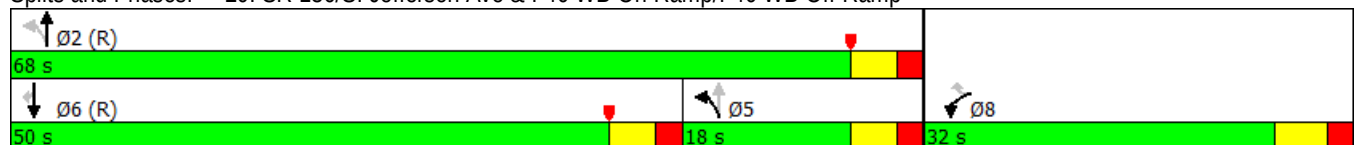
Intersection Capacity Utilization 69.3%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 20: SR 136/S. Jefferson Ave & I-40 WB On-Ramp/I-40 WB Off-Ramp



Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	15	210	0	10	10	295	1605	55	15	620	80
Future Volume (vph)	60	15	210	0	10	10	295	1605	55	15	620	80
Satd. Flow (prot)	0	1797	1599	0	1776	0	1787	3539	1568	1805	5057	0
Flt Permitted		0.961					0.282			0.085		
Satd. Flow (perm)	0	1797	1599	0	1776	0	530	3539	1568	162	5057	0
Satd. Flow (RTOR)			244		13				147		32	
Lane Group Flow (vph)	0	103	244	0	27	0	335	1707	59	36	774	0
Turn Type	Split	NA	Perm		NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3			4		5	2		1	6	
Permitted Phases			3				2		2	6		
Total Split (s)	18.0	18.0	18.0		18.0		26.0	48.0	48.0	16.0	38.0	
Total Lost Time (s)		5.5	5.5		5.5		5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)		12.2	12.2		12.0		68.9	60.5	60.5	60.5	50.5	
Actuated g/C Ratio		0.12	0.12		0.12		0.69	0.60	0.60	0.60	0.50	
v/c Ratio		0.47	0.60		0.12		0.62	0.80	0.06	0.14	0.30	
Control Delay		48.6	12.0		27.4		10.8	16.7	0.1	14.7	26.3	
Queue Delay		0.0	1.1		0.0		0.3	2.3	0.0	0.0	0.0	
Total Delay		48.6	13.1		27.4		11.1	19.0	0.1	14.7	26.3	
LOS		D	B		C		B	B	A	B	C	
Approach Delay		23.7			27.4			17.2			25.8	
Approach LOS		C			C			B			C	
Queue Length 50th (ft)		62	0		8		9	164	0	9	140	
Queue Length 95th (ft)		94	59		25		131	#801	m0	14	219	
Internal Link Dist (ft)		530			587			133			582	
Turn Bay Length (ft)			100				50			100		
Base Capacity (vph)		224	413		233		628	2141	1006	271	2571	
Starvation Cap Reductn		0	0		0		49	294	0	0	0	
Spillback Cap Reductn		0	50		0		0	0	0	0	150	
Storage Cap Reductn		0	0		0		0	0	0	0	0	
Reduced v/c Ratio		0.46	0.67		0.12		0.58	0.92	0.06	0.13	0.32	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 20.1

Intersection LOS: C

Intersection Capacity Utilization 77.2%

ICU Level of Service D

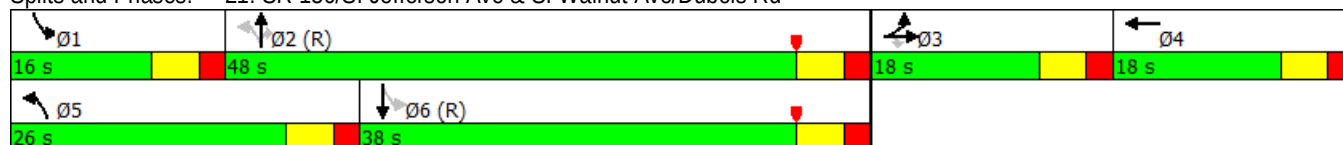
Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 21: SR 136/S. Jefferson Ave & S. Walnut Ave/Dubois Rd



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Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	280	140	225	295	80	225	930	420	65	335	105
Future Volume (vph)	145	280	140	225	295	80	225	930	420	65	335	105
Satd. Flow (prot)	1770	1845	1599	3502	3502	0	3433	3539	1615	1805	3454	0
Flt Permitted	0.367			0.950			0.950			0.181		
Satd. Flow (perm)	684	1845	1599	3502	3502	0	3433	3539	1615	344	3454	0
Satd. Flow (RTOR)			207		29				447		41	
Lane Group Flow (vph)	165	286	147	234	429	0	281	969	447	76	451	0
Turn Type	pm+pt	NA	Perm	Prot	NA		Prot	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8						2	6		
Total Split (s)	16.0	29.0	29.0	17.0	30.0		24.0	38.0	38.0	16.0	30.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5		5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)	30.2	19.8	19.8	11.0	20.4		13.5	40.3	40.3	43.7	33.7	
Actuated g/C Ratio	0.30	0.20	0.20	0.11	0.20		0.14	0.40	0.40	0.44	0.34	
v/c Ratio	0.52	0.78	0.30	0.61	0.58		0.61	0.68	0.49	0.26	0.38	
Control Delay	27.7	53.0	3.0	49.5	36.1		52.0	13.0	3.7	11.1	23.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	27.7	53.0	3.0	49.5	36.1		52.0	13.0	3.7	11.1	23.8	
LOS	C	D	A	D	D		D	B	A	B	C	
Approach Delay		33.7			40.8			17.0			22.0	
Approach LOS		C			D			B			C	
Queue Length 50th (ft)	71	173	0	74	120		74	268	81	8	134	
Queue Length 95th (ft)	112	257	16	113	154		m93	216	m48	m19	188	
Internal Link Dist (ft)		1125			846			582			1693	
Turn Bay Length (ft)	175			125			125			125		
Base Capacity (vph)	321	433	534	402	879		635	1424	917	305	1191	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.51	0.66	0.28	0.58	0.49		0.44	0.68	0.49	0.25	0.38	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow, Master Intersection

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 25.2

Intersection LOS: C

Intersection Capacity Utilization 75.4%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 22: SR 136/S. Jefferson Ave & Interstate Dr/Neal St

			
Ø1	Ø2 (R)	Ø3	Ø4
16 s	38 s	16 s	30 s
			
Ø5	Ø6 (R)	Ø7	Ø8
24 s	30 s	17 s	29 s

Lanes, Volumes, Timings
23: SR 136/S. Jefferson Ave & E. Veterans Dr

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	185	55	60	180	140	45	945	75	65	420	30
Future Volume (vph)	40	185	55	60	180	140	45	945	75	65	420	30
Satd. Flow (prot)	1805	1820	0	1752	1724	0	1805	3538	0	1752	3563	0
Flt Permitted	0.202			0.335			0.448			0.105		
Satd. Flow (perm)	384	1820	0	618	1724	0	851	3538	0	194	3563	0
Satd. Flow (RTOR)		14			40			9			11	
Lane Group Flow (vph)	48	291	0	65	406	0	47	1087	0	75	481	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	18.0	29.0		17.0	28.0		18.0	36.0		18.0	36.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	32.3	22.7		32.0	25.4		48.7	39.1		49.8	42.6	
Actuated g/C Ratio	0.32	0.23		0.32	0.25		0.49	0.39		0.50	0.43	
v/c Ratio	0.16	0.69		0.20	0.87		0.09	0.78		0.27	0.32	
Control Delay	20.2	42.9		20.9	53.3		6.9	19.5		22.6	23.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	20.2	42.9		20.9	53.3		6.9	19.5		22.6	23.0	
LOS	C	D		C	D		A	B		C	C	
Approach Delay		39.7			48.8			19.0			23.0	
Approach LOS		D			D			B			C	
Queue Length 50th (ft)	18	160		25	234		7	381		15	155	
Queue Length 95th (ft)	38	225		53	#365		m11	#480		54	166	
Internal Link Dist (ft)		1014			884			1693			283	
Turn Bay Length (ft)	150			150			150			125		
Base Capacity (vph)	303	445		330	467		537	1388		292	1524	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.16	0.65		0.20	0.87		0.09	0.78		0.26	0.32	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 40 (40%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 28.3

Intersection LOS: C

Intersection Capacity Utilization 84.9%

ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 23: SR 136/S. Jefferson Ave & E. Veterans Dr

			
Ø1	Ø2 (R)	Ø3	Ø4
18 s	36 s	18 s	28 s
			
Ø5	Ø6 (R)	Ø7	Ø8
18 s	36 s	17 s	29 s

AM Peak
WSP

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Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

24: SR 136/S. Jefferson Ave & Walmart Driveway

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	35	0	15	10	1055	50	30	475	10
Future Volume (vph)	0	0	0	35	0	15	10	1055	50	30	475	10
Satd. Flow (prot)	1900	1900	0	1805	1615	0	1805	3546	0	1787	3452	0
Flt Permitted				0.950			0.466			0.202		
Satd. Flow (perm)	1900	1900	0	1805	1615	0	885	3546	0	380	3452	0
Satd. Flow (RTOR)					496			5			4	
Lane Group Flow (vph)	0	0	0	42	16	0	10	1129	0	33	505	0
Turn Type	pm+pt			pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	18.0	28.0		18.0	28.0		18.0	36.0		18.0	36.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)				12.0	12.0		80.7	75.7		82.9	82.7	
Actuated g/C Ratio				0.12	0.12		0.81	0.76		0.83	0.83	
v/c Ratio				0.19	0.03		0.01	0.42		0.07	0.18	
Control Delay				42.2	0.1		0.6	2.2		1.0	1.0	
Queue Delay				0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay				42.2	0.1		0.6	2.3		1.0	1.0	
LOS				D	A		A	A		A	A	
Approach Delay					30.6			2.2			1.0	
Approach LOS					C			A			A	
Queue Length 50th (ft)				25	0		0	64		0	3	
Queue Length 95th (ft)				53	0		m0	m74		4	0	
Internal Link Dist (ft)		175			382			47			1774	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)				225	747		832	2685		491	2855	
Starvation Cap Reductn				0	0		0	180		0	0	
Spillback Cap Reductn				0	0		0	0		0	0	
Storage Cap Reductn				0	0		0	0		0	0	
Reduced v/c Ratio				0.19	0.02		0.01	0.45		0.07	0.18	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 52 (52%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.42

Intersection Signal Delay: 2.8

Intersection LOS: A

Intersection Capacity Utilization 49.9%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 24: SR 136/S. Jefferson Ave & Walmart Driveway

							
Ø1	Ø2 (R)		Ø3		Ø4		
18 s	36 s		18 s		28 s		
							
Ø5	Ø6 (R)		Ø7		Ø8		
18 s	36 s		18 s		28 s		

Lanes, Volumes, Timings
25: SR 136/S. Jefferson Ave & Commerce Ave

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	10	10	20	10	20	20	960	75	30	555	15
Future Volume (vph)	10	10	10	20	10	20	20	960	75	30	555	15
Satd. Flow (prot)	1805	1773	0	1752	1676	0	3502	3556	0	1719	3596	0
Flt Permitted	0.726			0.546			0.384			0.206		
Satd. Flow (perm)	1379	1773	0	1007	1676	0	1415	3556	0	373	3596	0
Satd. Flow (RTOR)		13			32			17			4	
Lane Group Flow (vph)	15	29	0	43	48	0	27	1096	0	48	655	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Total Split (s)	13.0	14.0		14.0	15.0		13.0	58.0		14.0	59.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	10.9	6.8		14.1	10.4		72.1	69.6		73.2	70.1	
Actuated g/C Ratio	0.11	0.07		0.14	0.10		0.72	0.70		0.73	0.70	
v/c Ratio	0.08	0.22		0.21	0.24		0.02	0.44		0.13	0.26	
Control Delay	32.4	33.1		35.4	23.1		1.1	3.0		6.4	7.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	32.4	33.1		35.4	23.1		1.1	3.0		6.4	7.9	
LOS	C	C		D	C		A	A		A	A	
Approach Delay		32.9			28.9			3.0			7.8	
Approach LOS		C			C			A			A	
Queue Length 50th (ft)	8	10		23	8		0	22		10	90	
Queue Length 95th (ft)	18	24		25	24		0	92		10	65	
Internal Link Dist (ft)		193			738			1774			1034	
Turn Bay Length (ft)				100			150			125		
Base Capacity (vph)	196	162		216	226		1189	2483		390	2522	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.08	0.18		0.20	0.21		0.02	0.44		0.12	0.26	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 13 (13%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.44

Intersection Signal Delay: 6.6

Intersection LOS: A

Intersection Capacity Utilization 45.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 25: SR 136/S. Jefferson Ave & Commerce Ave

			
Ø1	Ø2 (R)	Ø3	Ø4
14 s	58 s	13 s	15 s
			
Ø5	Ø6 (R)	Ø7	Ø8
13 s	59 s	14 s	14 s

Lanes, Volumes, Timings
26: SR 136/S. Jefferson Ave & E. Jackson St

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	150	230	160	100	10	185	520	225	15	295	20
Future Volume (vph)	40	150	230	160	100	10	185	520	225	15	295	20
Satd. Flow (prot)	1787	1863	1599	3502	1857	0	3502	3610	1599	1685	3339	0
Flt Permitted	0.671			0.950			0.950			0.423		
Satd. Flow (perm)	1262	1863	1599	3502	1857	0	3502	3610	1599	750	3339	0
Satd. Flow (RTOR)			264		5				288		7	
Lane Group Flow (vph)	49	160	264	176	135	0	210	605	288	22	357	0
Turn Type	pm+pt	NA	Perm	Prot	NA		Prot	NA	Perm	pm+pt	NA	
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8		8						2	6		
Total Split (s)	13.0	29.0	29.0	18.0	34.0		20.0	40.0	40.0	13.0	33.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5		5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)	21.3	14.2	14.2	10.2	19.7		11.3	54.1	54.1	48.6	42.3	
Actuated g/C Ratio	0.21	0.14	0.14	0.10	0.20		0.11	0.54	0.54	0.49	0.42	
v/c Ratio	0.16	0.61	0.58	0.49	0.36		0.53	0.31	0.29	0.05	0.25	
Control Delay	24.5	49.2	10.1	47.0	36.1		32.9	21.4	11.7	26.9	44.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	24.5	49.2	10.1	47.0	36.1		32.9	21.4	11.7	26.9	44.2	
LOS	C	D	B	D	D		C	C	B	C	D	
Approach Delay		24.8			42.2			21.0			43.2	
Approach LOS		C			D			C			D	
Queue Length 50th (ft)	22	97	0	55	75		54	128	49	12	120	
Queue Length 95th (ft)	40	154	58	87	108		105	255	146	27	164	
Internal Link Dist (ft)		578			301			1034			1031	
Turn Bay Length (ft)	100			175			150		500	180		
Base Capacity (vph)	313	437	577	437	532		507	1953	997	443	1415	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.16	0.37	0.46	0.40	0.25		0.41	0.31	0.29	0.05	0.25	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 66 (66%), Referenced to phase 2:NBT and 6:SBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 28.4

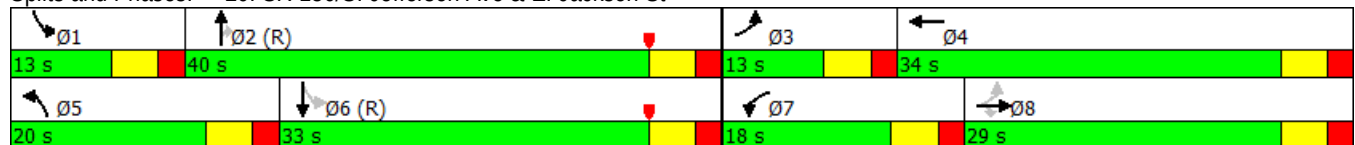
Intersection Capacity Utilization 50.6%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service A

Splits and Phases: 26: SR 136/S. Jefferson Ave & E. Jackson St



Lanes, Volumes, Timings
27: SR 136/S. Jefferson Ave & Foutch Dr

2040 Recommended AM Timing Plan

07/12/2017

							
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø2
Lane Configurations							
Traffic Volume (vph)	40	10	10	500	320	0	
Future Volume (vph)	40	10	10	500	320	0	
Satd. Flow (prot)	1775	0	1452	3369	3369	0	
Flt Permitted	0.962		0.541				
Satd. Flow (perm)	1775	0	827	3369	3369	0	
Satd. Flow (RTOR)	11						
Lane Group Flow (vph)	65	0	12	532	352	0	
Turn Type	Prot		Perm	NA	NA		
Protected Phases	3			1	1 2		2
Permitted Phases			1				
Total Split (s)	20.0		41.0	41.0			39.0
Total Lost Time (s)	6.0		6.0	6.0			
Act Effct Green (s)	14.0		31.6	31.6	74.0		
Actuated g/C Ratio	0.14		0.32	0.32	0.74		
v/c Ratio	0.25		0.05	0.50	0.14		
Control Delay	35.6		9.4	15.4	0.4		
Queue Delay	0.0		0.0	0.0	0.2		
Total Delay	35.6		9.4	15.4	0.7		
LOS	D		A	B	A		
Approach Delay	35.6			15.2	0.7		
Approach LOS	D			B	A		
Queue Length 50th (ft)	31		3	186	2		
Queue Length 95th (ft)	60		5	51	2		
Internal Link Dist (ft)	70			1031	110		
Turn Bay Length (ft)			125				
Base Capacity (vph)	257		289	1179	2480		
Starvation Cap Reductn	0		0	0	1457		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.25		0.04	0.45	0.34		

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 11 (11%), Referenced to phase 2:SBT and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 11.3

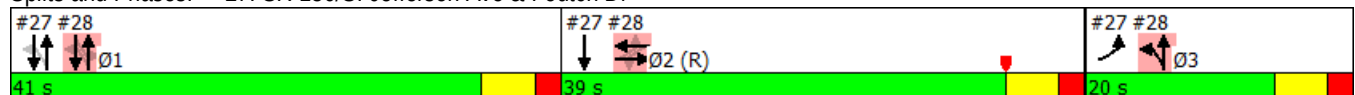
Intersection Capacity Utilization 28.8%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 27: SR 136/S. Jefferson Ave & Foutch Dr



Lanes, Volumes, Timings
28: SR 136/S. Jefferson Ave & E. Stevens St

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	125	30	35	100	20	20	510	20	10	310	10
Future Volume (vph)	30	125	30	35	100	20	20	510	20	10	310	10
Satd. Flow (prot)	0	1836	0	0	1845	0	0	3338	0	0	3346	0
Flt Permitted		0.894			0.903			0.930			0.915	
Satd. Flow (perm)	0	1660	0	0	1683	0	0	3110	0	0	3068	0
Satd. Flow (RTOR)		11			9			7			4	
Lane Group Flow (vph)	0	219	0	0	195	0	0	611	0	0	372	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		2			2		3	1 3			1	
Permitted Phases	2			2			1 3			1		
Total Split (s)	39.0	39.0		39.0	39.0		20.0			41.0	41.0	
Total Lost Time (s)		6.0			6.0						6.0	
Act Effct Green (s)		36.4			36.4			45.6			31.6	
Actuated g/C Ratio		0.36			0.36			0.46			0.32	
v/c Ratio		0.36			0.32			0.42			0.38	
Control Delay		25.4			24.8			5.5			19.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		25.4			24.8			5.5			19.6	
LOS		C			C			A			B	
Approach Delay		25.4			24.8			5.5			19.6	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)		101			89			11			58	
Queue Length 95th (ft)		168			125			66			m75	
Internal Link Dist (ft)		321			386			1			1911	
Turn Bay Length (ft)												
Base Capacity (vph)		611			618			1559			1076	
Starvation Cap Reductn		0			0			9			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.36			0.32			0.39			0.35	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 11 (11%), Referenced to phase 2: SBT and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 15.1

Intersection LOS: B

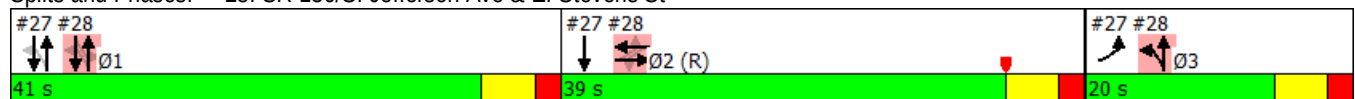
Intersection Capacity Utilization 52.1%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 28: SR 136/S. Jefferson Ave & E. Stevens St



Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	455	75	120	470	15	90	245	65	20	170	25
Future Volume (vph)	25	455	75	120	470	15	90	245	65	20	170	25
Satd. Flow (prot)	1805	1829	0	1752	1669	0	1668	1706	0	1685	1551	0
Flt Permitted	0.322			0.137			0.407			0.304		
Satd. Flow (perm)	612	1829	0	253	1669	0	715	1706	0	539	1551	0
Satd. Flow (RTOR)		9			2			16			7	
Lane Group Flow (vph)	25	617	0	150	534	0	102	344	0	28	236	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	14.0	42.0		14.0	42.0		14.0	30.0		14.0	30.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	50.3	42.3		54.2	50.8		29.8	24.7		27.9	21.5	
Actuated g/C Ratio	0.50	0.42		0.54	0.51		0.30	0.25		0.28	0.22	
v/c Ratio	0.06	0.79		0.57	0.63		0.35	0.80		0.12	0.70	
Control Delay	12.7	27.4		33.2	15.7		18.7	37.6		16.3	37.2	
Queue Delay	0.0	2.3		0.6	1.2		0.0	0.0		0.0	2.1	
Total Delay	12.7	29.7		33.8	16.9		18.7	37.6		16.3	39.3	
LOS	B	C		C	B		B	D		B	D	
Approach Delay		29.0			20.6			33.3			36.8	
Approach LOS		C			C			C			D	
Queue Length 50th (ft)	3	315		55	91		12	45		8	122	
Queue Length 95th (ft)	m13	#518		m99	m#478		66	#199		20	146	
Internal Link Dist (ft)		356			188			1911			200	
Turn Bay Length (ft)	200			65						65		
Base Capacity (vph)	412	778		264	849		294	458		250	385	
Starvation Cap Reductn	0	20		16	142		0	0		0	60	
Spillback Cap Reductn	0	73		0	2		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.06	0.88		0.60	0.76		0.35	0.75		0.11	0.73	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 69 (69%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 28.2

Intersection LOS: C

Intersection Capacity Utilization 77.0%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 29: SR 136/S. Jefferson Ave/S. Jefferson Ave & US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
14 s	42 s	14 s	30 s
			
Ø5	Ø6	Ø7	Ø8
14 s	42 s	14 s	30 s

AM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	160	35	90	390	25	60	175	50	15	85	15
Future Volume (vph)	15	160	35	90	390	25	60	175	50	15	85	15
Satd. Flow (prot)	1805	1829	0	1805	1867	0	1668	1713	0	1685	1740	0
Flt Permitted	0.398			0.524			0.553			0.503		
Satd. Flow (perm)	756	1829	0	996	1867	0	971	1713	0	892	1740	0
Satd. Flow (RTOR)		14			3			13			7	
Lane Group Flow (vph)	24	224	0	113	489	0	74	247	0	19	117	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	14.0	44.0		14.0	44.0		14.0	28.0		14.0	28.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	55.9	47.9		60.0	56.4		25.4	21.8		22.1	15.7	
Actuated g/C Ratio	0.56	0.48		0.60	0.56		0.25	0.22		0.22	0.16	
v/c Ratio	0.05	0.25		0.17	0.46		0.24	0.64		0.07	0.42	
Control Delay	8.3	13.1		9.5	13.7		27.3	40.4		23.1	39.1	
Queue Delay	0.0	0.0		0.0	6.6		0.0	6.5		0.0	0.0	
Total Delay	8.3	13.1		9.5	20.3		27.3	46.9		23.1	39.2	
LOS	A	B		A	C		C	D		C	D	
Approach Delay		12.7			18.3			42.4			36.9	
Approach LOS		B			B			D			D	
Queue Length 50th (ft)	5	59		37	170		48	160		9	67	
Queue Length 95th (ft)	10	92		m21	m99		m16	m51		20	99	
Internal Link Dist (ft)		353			196			200			580	
Turn Bay Length (ft)	200			65			65			50		
Base Capacity (vph)	515	883		667	1054		308	422		268	396	
Starvation Cap Reductn	0	0		0	505		0	126		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	3	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.05	0.25		0.17	0.89		0.24	0.83		0.07	0.30	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 76 (76%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 25.1

Intersection LOS: C

Intersection Capacity Utilization 54.9%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 30: S. Jefferson Ave/N. Jefferson Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
14 s	44 s	14 s	28 s
			
Ø5	Ø6 (R)	Ø7	Ø8
14 s	44 s	14 s	28 s

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	430	40	150	490	30	30	320	80	80	310	65
Future Volume (vph)	90	430	40	150	490	30	30	320	80	80	310	65
Satd. Flow (prot)	1787	1843	0	1752	1863	1615	1745	1783	1546	1728	1782	0
Flt Permitted	0.242			0.202			0.220			0.279		
Satd. Flow (perm)	455	1843	0	373	1863	1615	404	1783	1546	507	1782	0
Satd. Flow (RTOR)		5				147			147		11	
Lane Group Flow (vph)	99	508	0	185	516	41	48	352	107	101	432	0
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2		2	4		4	8		
Total Split (s)	14.0	38.0		14.0	38.0	38.0	14.0	34.0	34.0	14.0	34.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)	46.3	38.0		48.3	41.1	41.1	32.2	25.7	25.7	33.7	28.6	
Actuated g/C Ratio	0.46	0.38		0.48	0.41	0.41	0.32	0.26	0.26	0.34	0.29	
v/c Ratio	0.31	0.72		0.62	0.67	0.05	0.20	0.77	0.21	0.37	0.84	
Control Delay	10.8	19.8		17.4	24.8	0.8	19.8	46.2	2.9	19.3	35.0	
Queue Delay	0.1	3.1		0.0	0.2	0.0	0.0	3.4	0.0	0.0	3.2	
Total Delay	10.9	22.9		17.4	25.0	0.8	19.8	49.6	2.9	19.3	38.2	
LOS	B	C		B	C	A	B	D	A	B	D	
Approach Delay		21.0			21.8			36.9			34.6	
Approach LOS		C			C			D			C	
Queue Length 50th (ft)	17	88		34	342	0	18	199	0	13	259	
Queue Length 95th (ft)	m28	m#436		m53	m#456	m0	27	301	5	m26	#140	
Internal Link Dist (ft)		188			1101			264			195	
Turn Bay Length (ft)	60			100		100	100			50		
Base Capacity (vph)	324	703		302	765	750	245	508	545	274	543	
Starvation Cap Reductn	0	111		0	0	0	0	0	0	0	50	
Spillback Cap Reductn	16	0		0	27	73	1	84	0	0	5	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.32	0.86		0.61	0.70	0.06	0.20	0.83	0.20	0.37	0.88	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 69 (69%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 27.7

Intersection LOS: C

Intersection Capacity Utilization 78.6%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 31: S. Lowe Ave/SR 136/S. Washington Ave & US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
14 s	38 s	14 s	34 s
			
Ø5	Ø6	Ø7	Ø8
14 s	38 s	14 s	34 s

AM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	130	30	30	365	195	25	380	20	50	400	140
Future Volume (vph)	45	130	30	30	365	195	25	380	20	50	400	140
Satd. Flow (prot)	1787	1827	0	1805	1787	0	1745	1803	0	1745	1818	1546
Flt Permitted	0.108			0.643			0.261			0.160		
Satd. Flow (perm)	203	1827	0	1222	1787	0	479	1803	0	294	1818	1546
Satd. Flow (RTOR)		15			33			3				165
Lane Group Flow (vph)	51	182	0	43	704	0	25	457	0	68	460	165
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		8
Total Split (s)	14.0	41.0		14.0	41.0		15.0	30.0		15.0	30.0	30.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	5.5
Act Effct Green (s)	47.5	42.6		46.3	39.9		33.4	27.0		36.5	32.8	32.8
Actuated g/C Ratio	0.48	0.43		0.46	0.40		0.33	0.27		0.36	0.33	0.33
v/c Ratio	0.23	0.23		0.07	0.96		0.10	0.94		0.30	0.77	0.27
Control Delay	16.0	15.4		6.5	45.7		15.9	50.3		22.8	42.2	6.0
Queue Delay	0.0	0.4		0.0	6.3		0.0	4.7		0.0	7.0	0.0
Total Delay	16.0	15.9		6.5	52.0		15.9	55.0		22.8	49.2	6.0
LOS	B	B		A	D		B	D		C	D	A
Approach Delay		15.9			49.4			52.9			36.3	
Approach LOS		B			D			D			D	
Queue Length 50th (ft)	10	95		11	~501		5	106		27	233	0
Queue Length 95th (ft)	m34	84		m5	m#640		m14	#466		44	#465	41
Internal Link Dist (ft)		196			1084			195			349	
Turn Bay Length (ft)	60			100			65			100		
Base Capacity (vph)	231	787		619	732		286	488		245	597	618
Starvation Cap Reductn	0	296		0	0		0	16		0	0	0
Spillback Cap Reductn	0	0		0	25		8	0		0	98	31
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.22	0.37		0.07	1.00		0.09	0.97		0.28	0.92	0.28

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 70 (70%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 42.4

Intersection LOS: D

Intersection Capacity Utilization 79.0%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 32: SR 136/S. Washington Ave/SR 136/N. Washington Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
14 s	41 s	15 s	30 s
			
Ø5	Ø6 (R)	Ø7	Ø8
14 s	41 s	15 s	30 s

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

33: SR 136/N. Washington Ave & E. 1st St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	15	40	10	75	20	90	590	10	10	605	75
Future Volume (vph)	140	15	40	10	75	20	90	590	10	10	605	75
Satd. Flow (prot)	0	1786	0	0	1839	0	1711	1796	0	1745	3391	0
Flt Permitted		0.965			0.997		0.212			0.123		
Satd. Flow (perm)	0	1786	0	0	1839	0	382	1796	0	226	3391	0
Satd. Flow (RTOR)		7			8			1			15	
Lane Group Flow (vph)	0	241	0	0	189	0	115	754	0	10	787	0
Turn Type	Split	NA		Split	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	35.0	35.0		30.0	30.0		16.0	73.0		12.0	69.0	
Total Lost Time (s)		5.5			5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)		21.5			17.6		58.7	55.4		49.8	43.2	
Actuated g/C Ratio		0.19			0.15		0.51	0.48		0.43	0.37	
v/c Ratio		0.72			0.66		0.37	0.88		0.05	0.62	
Control Delay		59.5			60.5		19.5	42.3		16.7	31.0	
Queue Delay		0.0			0.0		0.0	0.2		0.0	0.0	
Total Delay		59.5			60.5		19.5	42.5		16.7	31.0	
LOS		E			E		B	D		B	C	
Approach Delay		59.5			60.5			39.5			30.9	
Approach LOS		E			E			D			C	
Queue Length 50th (ft)		164			127		43	447		4	240	
Queue Length 95th (ft)		310			140		78	732		15	355	
Internal Link Dist (ft)		234			474			256			166	
Turn Bay Length (ft)										50		
Base Capacity (vph)		492			423		322	1122		189	1999	
Starvation Cap Reductn		0			0		0	57		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.49			0.45		0.36	0.71		0.05	0.39	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 115.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 40.4

Intersection Capacity Utilization 68.1%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service C

Splits and Phases: 33: SR 136/N. Washington Ave & E. 1st St

			
Ø1	Ø2	Ø3	Ø4
12 s	73 s	35 s	30 s
			
Ø5	Ø6		
16 s	69 s		

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

34: SR 136/N. Washington Ave & E. 10th St/E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	105	15	385	280	255	50	540	155	350	680	110
Future Volume (vph)	65	105	15	385	280	255	50	540	155	350	680	110
Satd. Flow (prot)	1805	3527	0	3467	1900	1615	1719	3505	1615	1752	3511	0
Flt Permitted	0.950			0.950			0.194			0.197		
Satd. Flow (perm)	1805	3527	0	3467	1900	1615	351	3505	1615	363	3511	0
Satd. Flow (RTOR)		17				283			230		19	
Lane Group Flow (vph)	72	133	0	448	304	283	60	628	180	372	974	0
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases						4	2		2	6		
Total Split (s)	12.0	12.0		31.0	31.0	31.0	12.0	28.0	28.0	19.0	35.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
Act Effct Green (s)	6.5	6.5		20.4	20.4	20.4	26.4	20.0	20.0	39.2	30.1	
Actuated g/C Ratio	0.08	0.08		0.25	0.25	0.25	0.32	0.24	0.24	0.47	0.36	
v/c Ratio	0.51	0.46		0.53	0.65	0.46	0.28	0.74	0.32	0.93	0.76	
Control Delay	53.3	39.3		29.4	35.3	6.0	17.6	35.6	3.3	50.4	29.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	53.3	39.3		29.4	35.3	6.0	17.6	35.6	3.3	50.4	29.3	
LOS	D	D		C	D	A	B	D	A	D	C	
Approach Delay		44.2			24.7			27.6			35.1	
Approach LOS		D			C			C			D	
Queue Length 50th (ft)	39	32		107	147	0	17	162	0	131	246	
Queue Length 95th (ft)	#94	63		143	231	57	37	220	20	#325	287	
Internal Link Dist (ft)		135			2500			631			700	
Turn Bay Length (ft)	100			215		215	100			100		
Base Capacity (vph)	143	296		1081	592	698	221	965	611	401	1308	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.50	0.45		0.41	0.51	0.41	0.27	0.65	0.29	0.93	0.74	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 82.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 30.7

Intersection Capacity Utilization 72.4%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 34: SR 136/N. Washington Ave & E. 10th St/E.10th St

			
Ø1	Ø2	Ø3	Ø4
19 s	28 s	12 s	31 s
Ø5	Ø6		
12 s	35 s		

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

35: US 70/E. Spring St & I-40 EB Off-Ramps/I-40 EB On-Ramp

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	0	100	0	0	0	0	715	15	90	185	0
Future Volume (vph)	85	0	100	0	0	0	0	715	15	90	185	0
Satd. Flow (prot)	0	1656	1615	0	0	0	0	3442	0	1711	3490	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1656	1615	0	0	0	0	3442	0	1711	3490	0
Lane Group Flow (vph)	0	99	116	0	0	0	0	851	0	103	206	0
Sign Control		Stop			Free			Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 39.9%

Analysis Period (min) 15

ICU Level of Service A

Intersection

Int Delay, s/veh 3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔					↔↔		↔	↔↔	
Traffic Vol, veh/h	85	0	100	0	0	0	0	715	15	90	185	0
Future Vol, veh/h	85	0	100	0	0	0	0	715	15	90	185	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	Yield	-	-	None
Storage Length	-	-	200	-	-	-	-	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	25	86	25	25	25	25	86	75	87	90	25
Heavy Vehicles, %	9	0	0	0	0	0	0	1	0	2	0	0
Mvmt Flow	99	0	116	0	0	0	0	831	20	103	206	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	828	1243	103	-	0	0	831	0	0
Stage 1	412	412	-	-	-	-	-	-	-
Stage 2	416	831	-	-	-	-	-	-	-
Critical Hdwy	6.98	6.5	6.9	-	-	-	4.14	-	-
Critical Hdwy Stg 1	5.98	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.98	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.59	4	3.3	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	296	176	938	0	-	-	797	-	0
Stage 1	617	598	-	0	-	-	-	-	0
Stage 2	614	387	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	258	0	938	-	-	-	797	-	-
Mov Cap-2 Maneuver	258	0	-	-	-	-	-	-	-
Stage 1	537	0	-	-	-	-	-	-	-
Stage 2	614	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.7	0	3.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	258	938	797	-
HCM Lane V/C Ratio	-	-	0.383	0.124	0.13	-
HCM Control Delay (s)	-	-	27.4	9.4	10.2	-
HCM Lane LOS	-	-	D	A	B	-
HCM 95th %tile Q(veh)	-	-	1.7	0.4	0.4	-

Lanes, Volumes, Timings
 36: US 70/E. Spring St & I-40 WB Off-Ramp

2040 Recommended AM Timing Plan
 07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	15	300	545	0	0	400
Future Volume (vph)	15	300	545	0	0	400
Satd. Flow (prot)	1687	1568	3323	0	0	3455
Flt Permitted	0.950					
Satd. Flow (perm)	1687	1568	3323	0	0	3455
Lane Group Flow (vph)	22	380	649	0	0	426
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 40.3%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
36: US 70/E. Spring St & I-40 WB Off-Ramp

2040 Recommended AM Timing Plan

07/12/2017

Intersection

Int Delay, s/veh 4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	300	545	0	0	400
Future Vol, veh/h	15	300	545	0	0	400
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	None
Storage Length	0	300	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	79	84	25	25	94
Heavy Vehicles, %	7	3	5	0	0	1
Mvmt Flow	22	380	649	0	0	426

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	862	324	0	-	-	-
Stage 1	649	-	-	-	-	-
Stage 2	213	-	-	-	-	-
Critical Hdwy	6.94	6.96	-	-	-	-
Critical Hdwy Stg 1	5.94	-	-	-	-	-
Critical Hdwy Stg 2	5.94	-	-	-	-	-
Follow-up Hdwy	3.57	3.33	-	-	-	-
Pot Cap-1 Maneuver	285	669	-	0	0	-
Stage 1	469	-	-	0	0	-
Stage 2	787	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	285	669	-	-	-	-
Mov Cap-2 Maneuver	285	-	-	-	-	-
Stage 1	469	-	-	-	-	-
Stage 2	787	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.3	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBTWBLn1	WBLn2	SBT
Capacity (veh/h)	-	285 669	-
HCM Lane V/C Ratio	-	0.076 0.568	-
HCM Control Delay (s)	-	18.7 17.2	-
HCM Lane LOS	-	C C	-
HCM 95th %tile Q(veh)	-	0.2 3.6	-

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	270	400	0	0	875	145	445	0	70	0	0	0
Future Volume (vph)	270	400	0	0	875	145	445	0	70	0	0	0
Satd. Flow (prot)	3433	3574	0	0	3453	0	3367	0	1583	0	0	0
Flt Permitted	0.950						0.950					
Satd. Flow (perm)	3433	3574	0	0	3453	0	3367	0	1583	0	0	0
Satd. Flow (RTOR)					28				121			
Lane Group Flow (vph)	314	455	0	0	1092	0	610	0	117	0	0	0
Turn Type	Prot	NA			NA		Prot		Perm			
Protected Phases	1	6			2		3					
Permitted Phases									3			
Total Split (s)	19.0	62.0			43.0		28.0		28.0			
Total Lost Time (s)	6.5	6.5			6.5		7.0		7.0			
Act Effct Green (s)	11.5	49.5			31.5		18.7		18.7			
Actuated g/C Ratio	0.14	0.60			0.38		0.23		0.23			
v/c Ratio	0.66	0.21			0.81		0.79		0.26			
Control Delay	42.0	7.7			28.0		39.4		7.1			
Queue Delay	0.0	0.0			0.0		0.0		0.0			
Total Delay	42.0	7.7			28.0		39.4		7.1			
LOS	D	A			C		D		A			
Approach Delay		21.7			28.0			34.2				
Approach LOS		C			C			C				
Queue Length 50th (ft)	86	54			270		163		0			
Queue Length 95th (ft)	125	74			350		175		8			
Internal Link Dist (ft)		490			552			852			379	
Turn Bay Length (ft)	100						250		250			
Base Capacity (vph)	532	2459			1578		876		501			
Starvation Cap Reductn	0	0			0		0		0			
Spillback Cap Reductn	0	0			0		0		0			
Storage Cap Reductn	0	0			0		0		0			
Reduced v/c Ratio	0.59	0.19			0.69		0.70		0.23			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 82

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 27.8

Intersection Capacity Utilization 70.5%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

Splits and Phases: 37: SR 111 NB Off-Ramp/SR 111 On-Ramp & US 70/E. Spring St

 Ø1	 Ø2	 Ø3
19 s	43 s	28 s
 Ø6		
62 s		

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

38: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	610	230	120	1190	0	0	0	0	60	0	500
Future Volume (vph)	0	610	230	120	1190	0	0	0	0	60	0	500
Satd. Flow (prot)	0	3403	0	1703	3539	0	0	0	0	0	1703	1599
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	3403	0	1703	3539	0	0	0	0	0	1703	1599
Lane Group Flow (vph)	0	996	0	160	1368	0	0	0	0	0	64	575
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 70.5%

ICU Level of Service C

Analysis Period (min) 15

Intersection

Int Delay, s/veh 56.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↑	↑↑						↑	↑
Traffic Vol, veh/h	0	610	230	120	1190	0	0	0	0	60	0	500
Future Vol, veh/h	0	610	230	120	1190	0	0	0	0	60	0	500
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	100	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	25	87	78	75	87	25	25	25	25	94	25	87
Heavy Vehicles, %	0	2	0	6	2	0	0	0	0	6	0	1
Mvmt Flow	0	701	295	160	1368	0	0	0	0	64	0	575

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	-	0	0	701	0	0	2039	2389	684
Stage 1	-	-	-	-	-	-	1688	1688	-
Stage 2	-	-	-	-	-	-	351	701	-
Critical Hdwy	-	-	-	4.22	-	-	6.92	6.5	6.92
Critical Hdwy Stg 1	-	-	-	-	-	-	5.92	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.92	5.5	-
Follow-up Hdwy	-	-	-	2.26	-	-	3.56	4	3.31
Pot Cap-1 Maneuver	0	-	-	866	-	0	~ 47	34	~ 393
Stage 1	0	-	-	-	-	0	130	151	-
Stage 2	0	-	-	-	-	0	672	444	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	866	-	-	~ 38	0	~ 393
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 38	0	-
Stage 1	-	-	-	-	-	-	106	0	-
Stage 2	-	-	-	-	-	-	672	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	1.1	279.3
HCM LOS			F

Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	866	-	38	393
HCM Lane V/C Ratio	-	-	0.185	-	1.68	1.462
HCM Control Delay (s)	-	-	10.1	\$ 560.9	248	
HCM Lane LOS	-	-	B	-	F	F
HCM 95th %tile Q(veh)	-	-	0.7	-	6.8	29.9

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

39: Neal St/S. Old Kentucky Rd & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	440	240	530	950	150	75	140	195	185	410	60
Future Volume (vph)	75	440	240	530	950	150	75	140	195	185	410	60
Satd. Flow (prot)	1787	3574	1568	3467	3505	1599	1805	1900	1615	1752	3484	0
Flt Permitted	0.158			0.327			0.337			0.525		
Satd. Flow (perm)	297	3574	1568	1193	3505	1599	640	1900	1615	968	3484	0
Satd. Flow (RTOR)			267			176			242		15	
Lane Group Flow (vph)	85	500	358	570	1092	170	112	171	238	201	561	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		
Total Split (s)	12.0	35.0	35.0	19.0	42.0	42.0	12.0	23.0	23.0	13.0	24.0	
Total Lost Time (s)	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.5	6.5	5.5	6.5	
Act Effct Green (s)	31.3	23.7	23.7	42.9	32.9	32.9	22.0	14.4	14.4	25.4	18.8	
Actuated g/C Ratio	0.38	0.29	0.29	0.52	0.40	0.40	0.27	0.17	0.17	0.31	0.23	
v/c Ratio	0.37	0.49	0.56	0.59	0.79	0.23	0.43	0.52	0.50	0.55	0.70	
Control Delay	16.3	26.2	10.7	14.3	27.8	3.6	26.8	38.7	8.3	29.1	37.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	16.3	26.2	10.7	14.3	27.8	3.6	26.8	38.7	8.3	29.1	37.1	
LOS	B	C	B	B	C	A	C	D	A	C	D	
Approach Delay		19.5			21.4			22.3			35.0	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)	22	117	37	86	281	0	44	88	0	84	157	
Queue Length 95th (ft)	43	160	43	118	344	33	60	136	42	142	196	
Internal Link Dist (ft)		1084			512			1234			867	
Turn Bay Length (ft)	80		100	150		100	130			100		
Base Capacity (vph)	232	1260	725	996	1540	801	263	388	522	368	800	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.37	0.40	0.49	0.57	0.71	0.21	0.43	0.44	0.46	0.55	0.70	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 83

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 23.6

Intersection Capacity Utilization 69.5%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service C

Splits and Phases: 39: Neal St/S. Old Kentucky Rd & US 70/E. Spring St

			
19 s	35 s	12 s	24 s
			
12 s	42 s	13 s	23 s

Lanes, Volumes, Timings
40: US 70/E. Spring St & E. Broad St

2040 Recommended AM Timing Plan
07/12/2017

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	800	630	640	60	0
Future Volume (vph)	0	800	630	640	60	0
Satd. Flow (prot)	0	1881	1738	0	1805	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1881	1738	0	1805	0
Lane Group Flow (vph)	0	930	1352	0	78	0
Sign Control		Free	Free		Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 82.3%

Analysis Period (min) 15

ICU Level of Service E

HCM 2010 TWSC
40: US 70/E. Spring St & E. Broad St

2040 Recommended AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	800	630	640	60	0
Future Vol, veh/h	0	800	630	640	60	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	25	86	92	96	77	63
Heavy Vehicles, %	0	1	3	1	0	0
Mvmt Flow	0	930	685	667	78	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	685	0	-	0	1615	685
Stage 1	-	-	-	-	685	-
Stage 2	-	-	-	-	930	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	918	-	-	0	115	452
Stage 1	-	-	-	0	504	-
Stage 2	-	-	-	0	387	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	918	-	-	-	115	452
Mov Cap-2 Maneuver	-	-	-	-	251	-
Stage 1	-	-	-	-	504	-
Stage 2	-	-	-	-	387	-

Approach	EB		WB		SB
HCM Control Delay, s	0		0		25.7
HCM LOS					D

Minor Lane/Major Mvmt	EBL	EBT	WBT	SBLn1
Capacity (veh/h)	918	-	-	251
HCM Lane V/C Ratio	-	-	-	0.31
HCM Control Delay (s)	0	-	-	25.7
HCM Lane LOS	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	1.3

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	500	30	40	550	15	20	260	40	225	205	95
Future Volume (vph)	70	500	30	40	550	15	20	260	40	225	205	95
Satd. Flow (prot)	1805	1865	0	1703	1855	0	1805	1852	0	1805	1804	0
Flt Permitted	0.118			0.118			0.560			0.177		
Satd. Flow (perm)	224	1865	0	212	1855	0	1064	1852	0	336	1804	0
Satd. Flow (RTOR)		4			2			9			22	
Lane Group Flow (vph)	78	640	0	71	587	0	26	380	0	292	332	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	12.0	41.0		12.0	41.0		12.0	27.0		20.0	35.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	43.6	38.4		43.6	38.4		27.6	21.4		41.0	36.2	
Actuated g/C Ratio	0.44	0.38		0.44	0.38		0.28	0.21		0.41	0.36	
v/c Ratio	0.39	0.89		0.38	0.82		0.08	0.95		0.84	0.50	
Control Delay	15.9	44.1		20.7	40.5		18.9	72.0		61.0	21.7	
Queue Delay	0.1	0.0		0.0	2.3		0.0	0.0		55.6	18.6	
Total Delay	16.0	44.1		20.7	42.8		18.9	72.0		116.6	40.3	
LOS	B	D		C	D		B	E		F	D	
Approach Delay		41.1			40.4			68.6			76.0	
Approach LOS		D			D			E			E	
Queue Length 50th (ft)	17	411		24	348		10	235		160	94	
Queue Length 95th (ft)	m28	#560		29	#552		22	#352		m183	m113	
Internal Link Dist (ft)		1101			737			412			149	
Turn Bay Length (ft)	75			80			70			50		
Base Capacity (vph)	200	717		188	712		344	405		350	667	
Starvation Cap Reductn	0	0		0	0		0	0		109	323	
Spillback Cap Reductn	5	0		0	49		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.40	0.89		0.38	0.89		0.08	0.94		1.21	0.97	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 22 (22%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 54.6

Intersection LOS: D

Intersection Capacity Utilization 81.8%

ICU Level of Service D

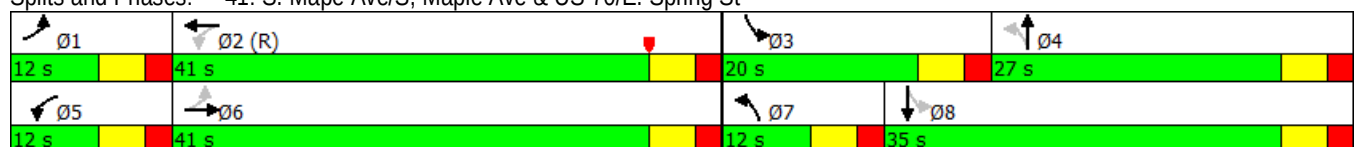
Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 41: S. Mape Ave/S, Maple Ave & US 70/E. Spring St



AM Peak
WSP

Synchro 9 Report
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Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	505	45	30	535	55	50	115	10	40	60	30
Future Volume (vph)	25	505	45	30	535	55	50	115	10	40	60	30
Satd. Flow (prot)	1805	1847	0	1805	1855	0	1805	1879	0	1787	1769	0
Flt Permitted	0.259			0.259			0.692			0.481		
Satd. Flow (perm)	492	1847	0	492	1855	0	1315	1879	0	905	1769	0
Satd. Flow (RTOR)		8			7			3			20	
Lane Group Flow (vph)	30	633	0	36	633	0	52	173	0	57	100	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	14.0	50.0		14.0	50.0		15.0	21.0		15.0	21.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	60.4	55.6		60.4	55.6		20.8	14.0		20.9	14.1	
Actuated g/C Ratio	0.60	0.56		0.60	0.56		0.21	0.14		0.21	0.14	
v/c Ratio	0.07	0.61		0.09	0.61		0.17	0.65		0.22	0.38	
Control Delay	9.0	21.4		6.6	12.6		27.3	51.8		33.5	37.7	
Queue Delay	0.0	0.6		0.0	0.2		0.0	0.0		0.0	0.0	
Total Delay	9.0	22.0		6.6	12.8		27.3	51.8		33.5	37.7	
LOS	A	C		A	B		C	D		C	D	
Approach Delay		21.4			12.4			46.1			36.2	
Approach LOS		C			B			D			D	
Queue Length 50th (ft)	7	306		8	278		25	104		17	21	
Queue Length 95th (ft)	18	458		m8	140		52	132		52	95	
Internal Link Dist (ft)		1308			356			107			209	
Turn Bay Length (ft)	100			60			50			60		
Base Capacity (vph)	410	1030		410	1034		331	296		280	294	
Starvation Cap Reductn	0	0		0	62		0	0		0	0	
Spillback Cap Reductn	0	127		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.07	0.70		0.09	0.65		0.16	0.58		0.20	0.34	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 77 (77%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 22.5

Intersection LOS: C

Intersection Capacity Utilization 61.9%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 42: S. Dixie Ave & US 70/W. Spring St/US 70/E. Spring St

			
Ø1	Ø2 (R)	Ø3	Ø4
14 s	50 s	15 s	21 s
			
Ø5	Ø6	Ø7	Ø8
14 s	50 s	15 s	21 s

Lanes, Volumes, Timings
43: S. Walnut Ave & US 70/W. Spring St

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	585	70	40	530	30	80	275	35	15	130	35
Future Volume (vph)	55	585	70	40	530	30	80	275	35	15	130	35
Satd. Flow (prot)	1770	1851	0	1805	1860	0	1770	1852	0	1805	1832	0
Flt Permitted	0.187			0.101			0.415			0.303		
Satd. Flow (perm)	348	1851	0	192	1860	0	773	1852	0	576	1832	0
Satd. Flow (RTOR)		6			4			6			10	
Lane Group Flow (vph)	60	777	0	50	669	0	93	356	0	22	207	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	12.0	80.0		12.0	80.0		17.0	43.0		15.0	41.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	59.8	55.1		59.9	55.1		35.4	29.9		29.6	24.6	
Actuated g/C Ratio	0.53	0.49		0.53	0.49		0.31	0.26		0.26	0.22	
v/c Ratio	0.22	0.86		0.24	0.74		0.28	0.72		0.09	0.51	
Control Delay	14.5	38.4		15.4	30.8		33.8	51.7		32.3	47.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.5	38.4		15.4	30.8		33.8	51.7		32.3	47.9	
LOS	B	D		B	C		C	D		C	D	
Approach Delay		36.7			29.7			48.0			46.4	
Approach LOS		D			C			D			D	
Queue Length 50th (ft)	20	541		17	424		52	267		12	143	
Queue Length 95th (ft)	46	728		35	599		102	439		26	227	
Internal Link Dist (ft)		1097			1308			83			571	
Turn Bay Length (ft)	75			75			65			150		
Base Capacity (vph)	280	1258		210	1263		362	725		282	681	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.21	0.62		0.24	0.53		0.26	0.49		0.08	0.30	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 112.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 37.7

Intersection Capacity Utilization 80.0%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service D

Splits and Phases: 43: S. Walnut Ave & US 70/W. Spring St

 Ø1	 Ø2	 Ø3	 Ø4
12 s	80 s	15 s	43 s
 Ø5	 Ø6	 Ø7	 Ø8
12 s	80 s	17 s	41 s

Lanes, Volumes, Timings
44: Scott Ave & US 70/W. Spring St

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	625	60	45	475	30	40	55	50	15	35	35
Future Volume (vph)	15	625	60	45	475	30	40	55	50	15	35	35
Satd. Flow (prot)	1805	1857	0	1805	1861	0	1805	1785	0	1656	1739	0
Flt Permitted	0.311			0.146			0.581			0.663		
Satd. Flow (perm)	591	1857	0	277	1861	0	1104	1785	0	1156	1739	0
Satd. Flow (RTOR)		6			4			17			26	
Lane Group Flow (vph)	20	763	0	60	610	0	53	148	0	18	93	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	12.0	97.0		12.0	97.0		12.0	29.0		12.0	29.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	49.9	45.4		52.5	50.5		18.9	16.9		16.4	11.8	
Actuated g/C Ratio	0.57	0.52		0.60	0.58		0.22	0.19		0.19	0.14	
v/c Ratio	0.05	0.79		0.20	0.57		0.18	0.41		0.07	0.36	
Control Delay	7.4	25.7		8.8	15.8		32.4	38.3		32.0	35.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	7.4	25.7		8.8	15.8		32.4	38.3		32.0	35.8	
LOS	A	C		A	B		C	D		C	D	
Approach Delay		25.2			15.2			36.8			35.2	
Approach LOS		C			B			D			D	
Queue Length 50th (ft)	4	339		11	163		23	60		8	35	
Queue Length 95th (ft)	12	595		26	367		57	102		29	75	
Internal Link Dist (ft)		700			1097			288			469	
Turn Bay Length (ft)	75			75			40			75		
Base Capacity (vph)	442	1714		297	1717		298	562		261	554	
Starvation Cap Reductn	0	38		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.05	0.46		0.20	0.36		0.18	0.26		0.07	0.17	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 87.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 23.4

Intersection Capacity Utilization 55.4%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service B

Splits and Phases: 44: Scott Ave & US 70/W. Spring St

			
Ø1	Ø2	Ø3	Ø4
12 s	97 s	12 s	29 s
			
Ø5	Ø6	Ø7	Ø8
12 s	97 s	12 s	29 s

Lanes, Volumes, Timings
45: S, Maple Ave/N. Maple Ave & E. Broad St

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	110	65	60	530	170	35	235	60	35	380	20
Future Volume (vph)	10	110	65	60	530	170	35	235	60	35	380	20
Satd. Flow (prot)	1805	1778	0	1805	1801	0	1805	1832	0	1805	1883	0
Flt Permitted	0.099			0.521			0.141			0.318		
Satd. Flow (perm)	188	1778	0	990	1801	0	268	1832	0	604	1883	0
Satd. Flow (RTOR)		36			21			15			3	
Lane Group Flow (vph)	13	226	0	66	814	0	56	362	0	42	465	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	12.0	47.0		12.0	47.0		12.0	29.0		12.0	29.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	48.8	43.9		52.4	51.1		32.2	28.3		31.0	25.9	
Actuated g/C Ratio	0.49	0.44		0.52	0.51		0.32	0.28		0.31	0.26	
v/c Ratio	0.07	0.28		0.12	0.88		0.30	0.68		0.16	0.95	
Control Delay	9.1	15.9		11.9	34.4		26.9	25.6		23.1	68.9	
Queue Delay	0.0	84.6		3.8	0.0		0.0	1.9		0.0	14.2	
Total Delay	9.1	100.5		15.7	34.4		26.9	27.5		23.1	83.1	
LOS	A	F		B	C		C	C		C	F	
Approach Delay		95.6			33.0			27.4			78.1	
Approach LOS		F			C			C			E	
Queue Length 50th (ft)	5	86		19	406		13	83		18	~323	
Queue Length 95th (ft)	m9	m94		40	#763		m17	m104		38	#493	
Internal Link Dist (ft)		1084			778			149			437	
Turn Bay Length (ft)	60			65			40			85		
Base Capacity (vph)	197	800		571	930		186	529		266	489	
Starvation Cap Reductn	0	0		0	0		0	68		0	0	
Spillback Cap Reductn	0	721		438	0		0	0		0	32	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.07	2.86		0.50	0.88		0.30	0.79		0.16	1.02	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 29 (29%), Referenced to phase 2:WBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 50.4

Intersection LOS: D

Intersection Capacity Utilization 86.1%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 45: S, Maple Ave/N. Maple Ave & E. Broad St



Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

46: S. Dixie Ave/N. Dixie Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	185	15	20	305	90	20	145	20	40	95	20
Future Volume (vph)	20	185	15	20	305	90	20	145	20	40	95	20
Satd. Flow (prot)	1805	1847	0	1736	1820	0	1805	1862	0	1805	1849	0
Flt Permitted	0.386			0.610			0.645			0.417		
Satd. Flow (perm)	733	1847	0	1114	1820	0	1226	1862	0	792	1849	0
Satd. Flow (RTOR)		6			17			7			10	
Lane Group Flow (vph)	26	215	0	26	463	0	28	193	0	54	158	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Total Split (s)	15.0	40.0		15.0	40.0		15.0	30.0		15.0	30.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	
Act Effct Green (s)	59.9	56.7		59.9	56.7		22.2	15.8		24.0	18.8	
Actuated g/C Ratio	0.60	0.57		0.60	0.57		0.22	0.16		0.24	0.19	
v/c Ratio	0.05	0.20		0.04	0.45		0.09	0.65		0.20	0.44	
Control Delay	10.2	14.5		4.3	7.9		13.1	28.5		25.8	37.4	
Queue Delay	0.0	0.0		0.0	0.3		0.0	0.2		0.0	0.0	
Total Delay	10.2	14.5		4.3	8.2		13.1	28.7		25.8	37.4	
LOS	B	B		A	A		B	C		C	D	
Approach Delay		14.1			8.0			26.7			34.5	
Approach LOS		B			A			C			C	
Queue Length 50th (ft)	6	55		3	151		7	49		25	88	
Queue Length 95th (ft)	17	145		m7	65		m11	62		40	109	
Internal Link Dist (ft)		1234			353			209			174	
Turn Bay Length (ft)	130			45			60			75		
Base Capacity (vph)	544	1049		732	1038		341	461		290	467	
Starvation Cap Reductn	0	0		0	155		0	34		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.05	0.20		0.04	0.52		0.08	0.45		0.19	0.34	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 17.6

Intersection LOS: B

Intersection Capacity Utilization 51.9%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 46: S. Dixie Ave/N. Dixie Ave & E. Broad St

			
Ø1	Ø2 (R)	Ø3	Ø4
15 s	40 s	15 s	30 s
			
Ø5	Ø6 (R)	Ø7	Ø8
15 s	40 s	15 s	30 s

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

47: S. Walnut Ave/N. Walnut Ave & E. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	160	20	35	165	90	30	270	50	30	125	15
Future Volume (vph)	15	160	20	35	165	90	30	270	50	30	125	15
Satd. Flow (prot)	0	1858	0	0	1877	1583	1805	1852	0	1770	1872	0
Flt Permitted		0.996			0.990		0.643			0.339		
Satd. Flow (perm)	0	1858	0	0	1877	1583	1222	1852	0	631	1872	0
Satd. Flow (RTOR)		4				102		7			4	
Lane Group Flow (vph)	0	227	0	0	241	102	40	344	0	42	156	0
Turn Type	custom	NA		custom	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	1	1		2	2		7	4		3	8	
Permitted Phases	1			2		2	4			8		
Total Split (s)	39.0	39.0		45.0	45.0	45.0	13.0	53.0		13.0	53.0	
Total Lost Time (s)		5.5			5.5	5.5	5.5	5.5		5.5	5.5	
Act Effct Green (s)		18.0			18.9	18.9	27.5	23.7		27.4	23.7	
Actuated g/C Ratio		0.21			0.22	0.22	0.32	0.28		0.32	0.28	
v/c Ratio		0.58			0.58	0.24	0.09	0.66		0.14	0.30	
Control Delay		40.4			39.9	9.1	20.1	36.5		20.7	29.0	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		40.4			39.9	9.1	20.1	36.5		20.7	29.0	
LOS		D			D	A	C	D		C	C	
Approach Delay		40.4			30.7			34.8			27.2	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)		114			122	0	13	169		14	68	
Queue Length 95th (ft)		234			243	43	35	336		34	150	
Internal Link Dist (ft)		512			1234			571			477	
Turn Bay Length (ft)							120			140		
Base Capacity (vph)		811			963	862	450	1146		313	1157	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.28			0.25	0.12	0.09	0.30		0.13	0.13	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 85.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 33.4

Intersection Capacity Utilization 56.3%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service B

Splits and Phases: 47: S. Walnut Ave/N. Walnut Ave & E. Broad St

			
Ø1	Ø2	Ø3	Ø4
39 s	45 s	13 s	53 s
			
		Ø7	Ø8
		13 s	53 s

Lanes, Volumes, Timings
48: S. Cedar Ave & E. Broad St

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	25	10	25	30	135	10	115	15	170	60	20
Future Volume (vph)	35	25	10	25	30	135	10	115	15	170	60	20
Satd. Flow (prot)	0	1819	0	0	1724	0	0	1821	0	0	1795	0
Flt Permitted		0.971			0.993			0.997			0.967	
Satd. Flow (perm)	0	1819	0	0	1724	0	0	1821	0	0	1795	0
Lane Group Flow (vph)	0	95	0	0	240	0	0	162	0	0	272	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 42.7%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 AWSC
48: S. Cedar Ave & E. Broad St

2040 Recommended AM Timing Plan
07/12/2017

Intersection

Intersection Delay, s/veh 10.3

Intersection LOS B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			↕				↕				↕	
Traffic Vol, veh/h	0	35	25	10	0	25	30	135	0	10	115	15
Future Vol, veh/h	0	35	25	10	0	25	30	135	0	10	115	15
Peak Hour Factor	0.92	0.63	0.87	1.00	0.92	0.69	0.58	0.89	0.92	1.00	0.86	0.83
Heavy Vehicles, %	2	0	0	0	2	0	0	0	2	0	3	0
Mvmt Flow	0	56	29	10	0	36	52	152	0	10	134	18
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0
Approach		EB				WB				NB		
Opposing Approach		WB				EB				SB		
Opposing Lanes		1				1				1		
Conflicting Approach Left		SB				NB				EB		
Conflicting Lanes Left		1				1				1		
Conflicting Approach Right		NB				SB				WB		
Conflicting Lanes Right		1				1				1		
HCM Control Delay		9.3				10				9.6		
HCM LOS		A				A				A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	50%	13%	68%
Vol Thru, %	82%	36%	16%	24%
Vol Right, %	11%	14%	71%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	140	70	190	250
LT Vol	10	35	25	170
Through Vol	115	25	30	60
RT Vol	15	10	135	20
Lane Flow Rate	162	94	240	272
Geometry Grp	1	1	1	1
Degree of Util (X)	0.23	0.142	0.313	0.386
Departure Headway (Hd)	5.11	5.406	4.81	5.114
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	705	664	752	709
Service Time	3.125	3.432	2.81	3.114
HCM Lane V/C Ratio	0.23	0.142	0.319	0.384
HCM Control Delay	9.6	9.3	10	11.3
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	0.9	0.5	1.3	1.8

Intersection
Intersection Delay, s/veh
Intersection LOS

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	170	60	20
Future Vol, veh/h	0	170	60	20
Peak Hour Factor	0.92	0.93	0.94	0.80
Heavy Vehicles, %	2	1	2	0
Mvmt Flow	0	183	64	25
Number of Lanes	0	0	1	0
Approach		SB		
Opposing Approach		NB		
Opposing Lanes		1		
Conflicting Approach Left		WB		
Conflicting Lanes Left		1		
Conflicting Approach Right		EB		
Conflicting Lanes Right		1		
HCM Control Delay		11.3		
HCM LOS		B		

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

49: S. Cedar Ave/N. Cedar Ave & W, Broad St

07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	70	155	125	170	85	40
Future Volume (vph)	70	155	125	170	85	40
Satd. Flow (prot)	1787	1599	0	1848	1797	0
Flt Permitted	0.950			0.978		
Satd. Flow (perm)	1787	1599	0	1848	1797	0
Lane Group Flow (vph)	81	158	0	358	150	0
Sign Control	Stop			Stop	Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 36.7%

ICU Level of Service A

Analysis Period (min) 15

HCM 2010 AWSC
49: S. Cedar Ave/N. Cedar Ave & W, Broad St

2040 Recommended AM Timing Plan
07/12/2017

Intersection

Intersection Delay, s/veh 10.6

Intersection LOS B

Movement	EBU	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations									
Traffic Vol, veh/h	0	70	155	0	125	170	0	85	40
Future Vol, veh/h	0	70	155	0	125	170	0	85	40
Peak Hour Factor	0.92	0.86	0.98	0.92	0.79	0.85	0.92	0.88	0.76
Heavy Vehicles, %	2	1	1	2	0	1	2	1	0
Mvmt Flow	0	81	158	0	158	200	0	97	53
Number of Lanes	0	1	1	0	0	1	0	1	0
Approach	EB			NB			SB		
Opposing Approach				SB			NB		
Opposing Lanes	0			1			1		
Conflicting Approach Left	SB			EB					
Conflicting Lanes Left	1			2			0		
Conflicting Approach Right	NB						EB		
Conflicting Lanes Right	1			0			2		
HCM Control Delay	9.5			12.1			9		
HCM LOS	A			B			A		

Lane	NBLn1	EBLn1	EBLn2	SBLn1
Vol Left, %	42%	100%	0%	0%
Vol Thru, %	58%	0%	0%	68%
Vol Right, %	0%	0%	100%	32%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	295	70	155	125
LT Vol	125	70	0	0
Through Vol	170	0	0	85
RT Vol	0	0	155	40
Lane Flow Rate	358	81	158	149
Geometry Grp	2	7	7	2
Degree of Util (X)	0.475	0.14	0.219	0.198
Departure Headway (Hd)	4.769	6.204	4.993	4.765
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	752	575	713	748
Service Time	2.819	3.979	2.766	2.829
HCM Lane V/C Ratio	0.476	0.141	0.222	0.199
HCM Control Delay	12.1	10	9.2	9
HCM Lane LOS	B	A	A	A
HCM 95th-tile Q	2.6	0.5	0.8	0.7

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

50: US 70/W. Spring St/US 70/W. Broad St & W. Broad St

07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	90	295	10	315	510
Future Volume (vph)	0	90	295	10	315	510
Satd. Flow (prot)	1900	1615	1853	0	0	1830
Flt Permitted						0.981
Satd. Flow (perm)	1900	1615	1853	0	0	1830
Lane Group Flow (vph)	0	114	385	0	0	952
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 67.1%

ICU Level of Service C

Analysis Period (min) 15

Intersection

Int Delay, s/veh 3.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	90	295	10	315	510
Future Vol, veh/h	0	90	295	10	315	510
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	79	80	63	86	87
Heavy Vehicles, %	0	0	2	0	0	3
Mvmt Flow	0	114	369	16	366	586

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1696	377	0	0	385	0
Stage 1	377	-	-	-	-	-
Stage 2	1319	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	103	674	-	-	1185	-
Stage 1	698	-	-	-	-	-
Stage 2	252	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	56	674	-	-	1185	-
Mov Cap-2 Maneuver	117	-	-	-	-	-
Stage 1	698	-	-	-	-	-
Stage 2	137	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	11.4		0		3.6
HCM LOS	B				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	-	674	1185	-
HCM Lane V/C Ratio	-	-	-	0.169	0.309	-
HCM Control Delay (s)	-	-	0	11.4	9.4	0
HCM Lane LOS	-	-	A	B	A	A
HCM 95th %tile Q(veh)	-	-	-	0.6	1.3	-

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

51: W. Jackson St/Pippin Rd & US 70/W. Broad St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	490	340	30	200	35	140	105	15	160	360	10
Future Volume (vph)	10	490	340	30	200	35	140	105	15	160	360	10
Satd. Flow (prot)	1805	1863	1553	1805	1835	0	1805	1900	1615	1787	1892	0
Flt Permitted	0.531			0.121			0.950			0.950		
Satd. Flow (perm)	1009	1863	1553	230	1835	0	1805	1900	1615	1787	1892	0
Satd. Flow (RTOR)			218		11				289		1	
Lane Group Flow (vph)	24	570	374	48	269	0	169	114	16	198	414	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Prot	NA	Free	Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2					Free			
Total Split (s)	12.0	37.0	37.0	12.0	37.0		21.0	21.0		30.0	30.0	
Total Lost Time (s)	5.5	6.5	6.5	5.5	6.5		6.5	5.5		5.5	5.5	
Act Effct Green (s)	35.5	30.9	30.9	36.5	33.1		12.5	18.4	91.5	21.2	22.7	
Actuated g/C Ratio	0.39	0.34	0.34	0.40	0.36		0.14	0.20	1.00	0.23	0.25	
v/c Ratio	0.05	0.90	0.56	0.24	0.40		0.68	0.30	0.01	0.48	0.88	
Control Delay	16.8	51.5	15.1	19.5	25.3		54.2	34.9	0.0	39.0	56.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	16.8	51.5	15.1	19.5	25.3		54.2	34.9	0.0	39.0	56.1	
LOS	B	D	B	B	C		D	C	A	D	E	
Approach Delay		36.6			24.4			44.0			50.6	
Approach LOS		D			C			D			D	
Queue Length 50th (ft)	9	~364	79	17	108		103	59	0	120	255	
Queue Length 95th (ft)	11	#545	177	27	210		158	116	0	161	#422	
Internal Link Dist (ft)		1551			2304			1891			664	
Turn Bay Length (ft)	100		100	100			350			150		
Base Capacity (vph)	449	630	669	205	671		289	419	1615	522	514	
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.05	0.90	0.56	0.23	0.40		0.58	0.27	0.01	0.38	0.81	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 91.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 39.7

Intersection Capacity Utilization 67.7%

Analysis Period (min) 15

Intersection LOS: D

ICU Level of Service C

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 51: W. Jackson St/Pippin Rd & US 70/W. Broad St

			
Ø1	Ø2	Ø3	Ø4
12 s	37 s	30 s	21 s
			
Ø5	Ø6	Ø7	Ø8
12 s	37 s	21 s	30 s

AM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
52: E.10th St & Brown Ave N

2040 Recommended AM Timing Plan

07/12/2017

								
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	Ø2	Ø4
Lane Configurations								
Traffic Volume (vph)	35	590	900	145	160	35		
Future Volume (vph)	35	590	900	145	160	35		
Satd. Flow (prot)	1719	3610	3477	0	1739	0		
Flt Permitted	0.118				0.961			
Satd. Flow (perm)	214	3610	3477	0	1739	0		
Satd. Flow (RTOR)			32		11			
Lane Group Flow (vph)	49	628	1177	0	260	0		
Turn Type	pm+pt	NA	NA		Prot			
Protected Phases	1	6	2 4		3		2	4
Permitted Phases	6							
Total Split (s)	11.5	55.0			23.0		43.5	12.0
Total Lost Time (s)	5.5	5.5			5.5			
Act Effct Green (s)	43.2	43.2	46.1		15.8			
Actuated g/C Ratio	0.52	0.52	0.56		0.19			
v/c Ratio	0.22	0.33	0.60		0.76			
Control Delay	11.8	11.7	1.9		47.2			
Queue Delay	0.0	0.0	0.0		0.0			
Total Delay	11.8	11.7	1.9		47.2			
LOS	B	B	A		D			
Approach Delay		11.7	1.9		47.2			
Approach LOS		B	A		D			
Queue Length 50th (ft)	12	96	6		135			
Queue Length 95th (ft)	22	129	0		175			
Internal Link Dist (ft)		2500	23		665			
Turn Bay Length (ft)	100							
Base Capacity (vph)	223	2204	2030		384			
Starvation Cap Reductn	0	0	0		0			
Spillback Cap Reductn	0	0	0		0			
Storage Cap Reductn	0	0	0		0			
Reduced v/c Ratio	0.22	0.28	0.58		0.68			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 82.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 10.6

Intersection Capacity Utilization 49.7%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 52: E.10th St & Brown Ave N

 Ø1	 Ø2	 Ø3	 Ø4
11.5 s	43.5 s	23 s	12 s
 Ø6			
55 s			

Lanes, Volumes, Timings

53: Fisk Rd & E.10th St

2040 Recommended AM Timing Plan

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	600	25	20	810	245	60	145	15	255	55	170
Future Volume (vph)	65	600	25	20	810	245	60	145	15	255	55	170
Satd. Flow (prot)	1805	3548	0	1805	3464	0	1805	1838	0	1703	1900	1599
Flt Permitted	0.110			0.359			0.714			0.294		
Satd. Flow (perm)	209	3548	0	682	3464	0	1357	1838	0	527	1900	1599
Satd. Flow (RTOR)		7			57			4				195
Lane Group Flow (vph)	75	660	0	20	1230	0	72	246	0	283	66	195
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		4
Total Split (s)	12.0	38.0		12.0	38.0		11.0	24.0		16.0	29.0	29.0
Total Lost Time (s)	5.5	6.5		5.5	6.5		5.5	5.5		5.5	5.5	5.5
Act Effct Green (s)	39.7	36.3		37.3	31.6		20.8	15.3		31.1	23.1	23.1
Actuated g/C Ratio	0.47	0.43		0.44	0.37		0.25	0.18		0.37	0.27	0.27
v/c Ratio	0.34	0.43		0.05	0.92		0.20	0.73		0.83	0.13	0.34
Control Delay	16.3	19.3		12.0	38.6		20.2	46.3		43.7	26.6	6.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	16.3	19.3		12.0	38.6		20.2	46.3		43.7	26.6	6.0
LOS	B	B		B	D		C	D		D	C	A
Approach Delay		19.0			38.1			40.4			28.1	
Approach LOS		B			D			D			C	
Queue Length 50th (ft)	20	113		5	335		26	127		117	29	0
Queue Length 95th (ft)	43	207		17	#480		49	134		#206	56	45
Internal Link Dist (ft)		2105			3570			811			723	
Turn Bay Length (ft)	200			175			100			150		250
Base Capacity (vph)	223	1542		391	1344		365	410		342	547	599
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.34	0.43		0.05	0.92		0.20	0.60		0.83	0.12	0.33

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 84.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 31.5

Intersection Capacity Utilization 77.1%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service D

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 53: Fisk Rd & E.10th St

			
12 s	38 s	11 s	29 s
			
12 s	38 s	16 s	24 s

Lanes, Volumes, Timings
54: N. Old Kentucky Rd & E.10th St

2040 Recommended AM Timing Plan

07/12/2017

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	660	230	240	885	165	225
Future Volume (vph)	660	230	240	885	165	225
Satd. Flow (prot)	3405	0	1787	3574	1770	1615
Flt Permitted			0.207		0.950	
Satd. Flow (perm)	3405	0	389	3574	1770	1615
Satd. Flow (RTOR)	67					326
Lane Group Flow (vph)	964	0	289	941	220	326
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	1 2	4	
Permitted Phases			1 2			4
Total Split (s)	45.2		23.0		21.8	21.8
Total Lost Time (s)	6.5		5.5		5.5	5.5
Act Effct Green (s)	41.3		58.8	64.3	14.7	14.7
Actuated g/C Ratio	0.46		0.65	0.71	0.16	0.16
v/c Ratio	0.60		0.57	0.37	0.76	0.61
Control Delay	19.4		16.8	4.1	53.4	9.3
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	19.4		16.8	4.1	53.4	9.3
LOS	B		B	A	D	A
Approach Delay	19.4			7.0	27.0	
Approach LOS	B			A	C	
Queue Length 50th (ft)	205		74	50	118	0
Queue Length 95th (ft)	271		m104	m97	157	14
Internal Link Dist (ft)	3570			975	734	
Turn Bay Length (ft)			125		175	
Base Capacity (vph)	1600		530	2507	320	559
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.60		0.55	0.38	0.69	0.58

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 31 (34%), Referenced to phase 2:EBWB and 6:, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 15.4

Intersection LOS: B

Intersection Capacity Utilization 62.6%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 54: N. Old Kentucky Rd & E.10th St



Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

55: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	560	295	370	890	0	0	0	0	180	0	400
Future Volume (vph)	0	560	295	370	890	0	0	0	0	180	0	400
Satd. Flow (prot)	0	3381	0	1752	3574	0	0	0	0	1770	0	1583
Flt Permitted				0.112						0.950		
Satd. Flow (perm)	0	3381	0	207	3574	0	0	0	0	1770	0	1583
Satd. Flow (RTOR)		109										140
Lane Group Flow (vph)	0	1002	0	420	927	0	0	0	0	200	0	471
Turn Type		NA		pm+pt	NA					Prot		Perm
Protected Phases		6		5	2					8		
Permitted Phases				2								8
Total Split (s)		35.0		25.0	60.0					30.0		30.0
Total Lost Time (s)		6.5		5.5	6.5					7.0		7.0
Act Effct Green (s)		30.2		55.3	54.3					22.2		22.2
Actuated g/C Ratio		0.34		0.61	0.60					0.25		0.25
v/c Ratio		0.83		0.94	0.43					0.46		0.95
Control Delay		20.5		42.4	7.5					32.4		54.6
Queue Delay		0.0		0.0	0.0					0.0		0.0
Total Delay		20.5		42.4	7.5					32.4		54.6
LOS		C		D	A					C		D
Approach Delay		20.5			18.4						48.0	
Approach LOS		C			B						D	
Queue Length 50th (ft)		88		176	113					95		192
Queue Length 95th (ft)		150		m#329	114					160		#341
Internal Link Dist (ft)		570			785			708			972	
Turn Bay Length (ft)				120								150
Base Capacity (vph)		1206		462	2155					452		508
Starvation Cap Reductn		0		0	0					0		0
Spillback Cap Reductn		0		0	0					0		0
Storage Cap Reductn		0		0	0					0		0
Reduced v/c Ratio		0.83		0.91	0.43					0.44		0.93

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 44 (49%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 25.7

Intersection LOS: C

Intersection Capacity Utilization 72.1%

ICU Level of Service C

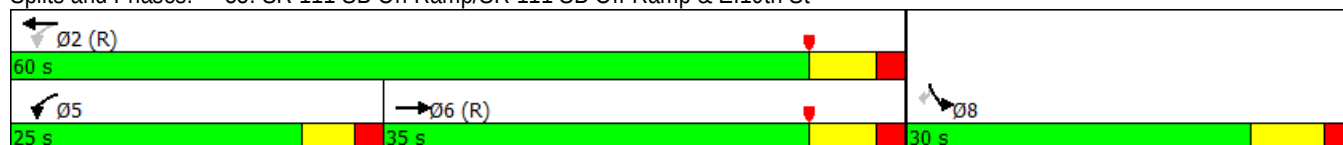
Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 55: SR 111 SB On-Ramp/SR 111 SB Off-Ramp & E.10th St



AM Peak
WSP

Synchro 9 Report
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Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	135	610	0	0	890	140	355	0	305	0	0	0
Future Volume (vph)	135	610	0	0	890	140	355	0	305	0	0	0
Satd. Flow (prot)	1770	3574	0	0	3497	0	1787	0	2814	0	0	0
Flt Permitted	0.118						0.950					
Satd. Flow (perm)	220	3574	0	0	3497	0	1787	0	2814	0	0	0
Satd. Flow (RTOR)					27							
Lane Group Flow (vph)	175	693	0	0	1110	0	394	0	351	0	0	0
Turn Type	pm+pt	NA			NA		Prot		Perm			
Protected Phases	1	6			2		4					
Permitted Phases	6								4			
Total Split (s)	16.0	57.0			41.0		33.0		33.0			
Total Lost Time (s)	5.5	6.5			6.5		7.0		7.0			
Act Effct Green (s)	54.0	53.0			38.4		23.5		23.5			
Actuated g/C Ratio	0.60	0.59			0.43		0.26		0.26			
v/c Ratio	0.61	0.33			0.74		0.85		0.48			
Control Delay	11.9	4.1			23.3		48.7		29.9			
Queue Delay	0.0	0.2			1.3		0.0		0.1			
Total Delay	11.9	4.3			24.6		48.7		30.0			
LOS	B	A			C		D		C			
Approach Delay		5.8			24.6			39.9				
Approach LOS		A			C			D				
Queue Length 50th (ft)	29	88			143		204		92			
Queue Length 95th (ft)	m33	m102			243		#338		130			
Internal Link Dist (ft)		785			131			909			832	
Turn Bay Length (ft)	400								150			
Base Capacity (vph)	312	2104			1507		516		812			
Starvation Cap Reductn	0	0			204		0		0			
Spillback Cap Reductn	0	592			0		0		57			
Storage Cap Reductn	0	0			0		0		0			
Reduced v/c Ratio	0.56	0.46			0.85		0.76		0.46			

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 1 (1%), Referenced to phase 2:WBT and 6:EBTL, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 22.8

Intersection LOS: C

Intersection Capacity Utilization 72.1%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 56: SR 111 NB Off-Ramp/SR 111 NB On-Ramp & E.10th St

		
Ø1	Ø2 (R)	Ø4
16 s	41 s	33 s
		
Ø6 (R)		
57 s		

AM Peak

WSP

Synchro 9 Report

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Lanes, Volumes, Timings
57: Burton Branch Rd & E.10th St

2040 Recommended AM Timing Plan

07/12/2017

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	655	265	50	740	310	95
Future Volume (vph)	655	265	50	740	310	95
Satd. Flow (prot)	3406	0	1805	3574	1805	1615
Flt Permitted			0.110		0.950	
Satd. Flow (perm)	3406	0	209	3574	1805	1615
Satd. Flow (RTOR)	75					173
Lane Group Flow (vph)	1071	0	56	813	544	173
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			2			4
Total Split (s)	26.0		16.0	42.0	48.0	48.0
Total Lost Time (s)	6.5		5.5	6.5	5.5	5.5
Act Effct Green (s)	32.0		45.4	44.4	33.6	33.6
Actuated g/C Ratio	0.36		0.50	0.49	0.37	0.37
v/c Ratio	0.85		0.20	0.46	0.81	0.24
Control Delay	38.4		15.7	17.4	34.7	3.3
Queue Delay	7.8		0.0	0.1	18.7	0.0
Total Delay	46.2		15.7	17.5	53.4	3.3
LOS	D		B	B	D	A
Approach Delay	46.2			17.4	41.3	
Approach LOS	D			B	D	
Queue Length 50th (ft)	328		16	155	269	0
Queue Length 95th (ft)	#493		42	244	173	0
Internal Link Dist (ft)	131			316	647	
Turn Bay Length (ft)			100			175
Base Capacity (vph)	1260		291	1764	852	853
Starvation Cap Reductn	162		0	0	0	0
Spillback Cap Reductn	0		0	190	305	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.98		0.19	0.52	0.99	0.20

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 88 (98%), Referenced to phase 2:WBTL and 6:EBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 35.4

Intersection LOS: D

Intersection Capacity Utilization 66.7%

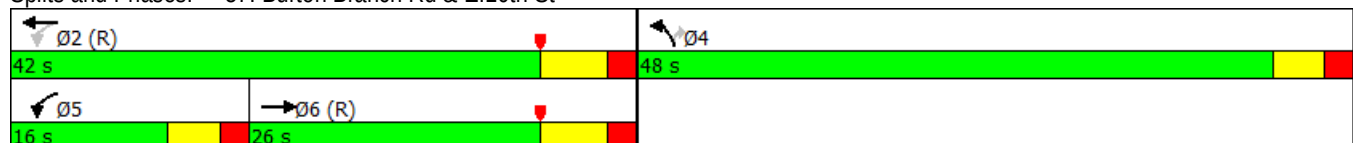
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 57: Burton Branch Rd & E.10th St



Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

61: SR 135/S. Willow Ave & County Services Dr/Orchard St

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	10	10	35	35	80	40	915	10	60	755	40
Future Volume (vph)	15	10	10	35	35	80	40	915	10	60	755	40
Satd. Flow (prot)	1787	1700	0	0	1708	0	1626	3568	0	1787	3494	0
Flt Permitted	0.692				0.904		0.274			0.237		
Satd. Flow (perm)	1302	1700	0	0	1563	0	469	3568	0	446	3494	0
Satd. Flow (RTOR)		26			62			2			7	
Lane Group Flow (vph)	29	46	0	0	160	0	63	955	0	70	870	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			3		5	2		1	6	
Permitted Phases	4			3			2			6		
Total Split (s)	26.0	26.0		26.0	26.0		14.0	50.0		14.0	50.0	
Total Lost Time (s)	5.5	5.5			5.5		5.5	6.5		5.5	6.5	
Act Effct Green (s)	9.6	9.6			9.6		30.3	25.5		30.0	25.3	
Actuated g/C Ratio	0.18	0.18			0.18		0.56	0.47		0.55	0.47	
v/c Ratio	0.13	0.14			0.49		0.15	0.57		0.17	0.53	
Control Delay	23.5	14.9			20.4		5.6	13.7		5.7	13.3	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	23.5	14.9			20.4		5.6	13.7		5.7	13.3	
LOS	C	B			C		A	B		A	B	
Approach Delay		18.3			20.4			13.2			12.7	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)	8	6			29		6	127		7	113	
Queue Length 95th (ft)	17	13			91		14	220		22	198	
Internal Link Dist (ft)		674			289			17			564	
Turn Bay Length (ft)	100						100			200		
Base Capacity (vph)	520	695			661		459	2911		475	2851	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.06	0.07			0.24		0.14	0.33		0.15	0.31	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 54.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 13.7

Intersection Capacity Utilization 60.5%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 61: SR 135/S. Willow Ave & County Services Dr/Orchard St

		
14 s	50 s	26 s
		
14 s	50 s	26 s

Lanes, Volumes, Timings
95: Foutch Dr

2040 Recommended AM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	10	0	0	50	0	55
Future Volume (vph)	10	0	0	50	0	55
Satd. Flow (prot)	1805	0	0	1644	0	1900
Flt Permitted	0.950					
Satd. Flow (perm)	1805	0	0	1644	0	1900
Lane Group Flow (vph)	12	0	0	65	0	57
Sign Control	Yield		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 13.3%

Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings
241: SR 136/S. Jefferson Ave & Fairground St

2040 Recommended AM Timing Plan
07/12/2017

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				  	 	
Traffic Volume (vph)	10	10	10	1100	505	10
Future Volume (vph)	10	10	10	1100	505	10
Satd. Flow (prot)	1721	0	0	5131	3596	0
Flt Permitted	0.978			0.999		
Satd. Flow (perm)	1721	0	0	5131	3596	0
Lane Group Flow (vph)	29	0	0	1150	537	0
Sign Control	Stop			Free	Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 38.2%

ICU Level of Service A

Analysis Period (min) 15

HCM 2010 TWSC
241: SR 136/S. Jefferson Ave & Fairground St

2040 Recommended AM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	10	10	1100	505	10
Future Vol, veh/h	10	10	10	1100	505	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	63	63	97	97	63
Heavy Vehicles, %	0	0	0	1	0	0
Mvmt Flow	13	16	16	1134	521	16

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1014	268	536	0	-	0
Stage 1	529	-	-	-	-	-
Stage 2	485	-	-	-	-	-
Critical Hdwy	6.25	6.9	4.1	-	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	6	-	-	-	-	-
Follow-up Hdwy	3.65	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	271	736	1042	-	-	-
Stage 1	543	-	-	-	-	-
Stage 2	556	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	260	736	1042	-	-	-
Mov Cap-2 Maneuver	260	-	-	-	-	-
Stage 1	543	-	-	-	-	-
Stage 2	533	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.7	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1042	-	401	-	-
HCM Lane V/C Ratio	0.015	-	0.073	-	-
HCM Control Delay (s)	8.5	0.1	14.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Lanes, Volumes, Timings
271: Foutch Dr & SR 136/S. Jefferson Ave

2040 Recommended AM Timing Plan
07/12/2017

						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	0	540	325	50	0	0
Future Volume (vph)	0	540	325	50	0	0
Satd. Flow (prot)	0	3369	3297	0	0	0
Flt Permitted						
Satd. Flow (perm)	0	3369	3297	0	0	0
Lane Group Flow (vph)	0	593	409	0	0	0
Sign Control		Free	Free		Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 18.3%

Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings

2040 Recommended AM Timing Plan

361: US 70/E. Spring St & I-40 WB On-Ramp (SB)/I-40 WB On-Ramp (NB)

07/12/2017

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	255	545	10	0	285	145
Future Volume (vph)	0	0	0	0	0	0	255	545	10	0	285	145
Satd. Flow (prot)	0	0	0	0	0	0	0	3285	0	0	3269	0
Flt Permitted								0.985				
Satd. Flow (perm)	0	0	0	0	0	0	0	3285	0	0	3269	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	955	0	0	466	0
Sign Control		Free				Free		Free			Free	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 42.0%

Analysis Period (min) 15

ICU Level of Service A

Lanes, Volumes, Timings
521: Brown Ave S & E.10th St

2040 Recommended AM Timing Plan

07/12/2017

	→	↘	↙	←	↖	↗	Ø1	Ø3	Ø6
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR			
Lane Configurations	↑↑		↘	↑↑	↘				
Traffic Volume (vph)	720	25	10	995	50	10			
Future Volume (vph)	720	25	10	995	50	10			
Satd. Flow (prot)	3581	0	1805	3574	1786	0			
Flt Permitted			0.343		0.960				
Satd. Flow (perm)	3581	0	652	3574	1786	0			
Satd. Flow (RTOR)	24				8				
Lane Group Flow (vph)	819	0	16	1106	83	0			
Turn Type	NA		Perm	NA	Prot				
Protected Phases	3 6			2	4		1	3	6
Permitted Phases			2						
Total Split (s)			43.5	43.5	12.0		11.5	23.0	55.0
Total Lost Time (s)			5.5	5.5	5.5				
Act Effct Green (s)	64.6		36.9	36.9	6.6				
Actuated g/C Ratio	0.78		0.45	0.45	0.08				
v/c Ratio	0.29		0.05	0.69	0.55				
Control Delay	0.4		16.1	22.1	51.9				
Queue Delay	0.0		0.0	0.0	0.0				
Total Delay	0.4		16.1	22.1	51.9				
LOS	A		B	C	D				
Approach Delay	0.4			22.0	51.9				
Approach LOS	A			C	D				
Queue Length 50th (ft)	0		5	269	42				
Queue Length 95th (ft)	0		13	346	68				
Internal Link Dist (ft)	23			2105	565				
Turn Bay Length (ft)			115						
Base Capacity (vph)	2898		305	1675	150				
Starvation Cap Reductn	0		0	0	0				
Spillback Cap Reductn	0		0	0	0				
Storage Cap Reductn	0		0	0	0				
Reduced v/c Ratio	0.28		0.05	0.66	0.55				

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 82.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 14.5

Intersection Capacity Utilization 41.7%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 521: Brown Ave S & E.10th St

#52 Ø1	#52 #521 Ø2	#52 #521 Ø3	#52 #521 Ø4
11.5 s	43.5 s	23 s	12 s
#52 #521 Ø6			
55 s			

Lanes, Volumes, Timings
5: SR 135/S. Willow Ave & Fairground St

2040 Recommended PM Timing Plan
07/12/2017

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	35	130	1035	135	70	1305
Future Volume (vph)	35	130	1035	135	70	1305
Satd. Flow (prot)	1805	1583	3507	0	1752	3574
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1583	3507	0	1752	3574
Lane Group Flow (vph)	51	151	1230	0	111	1450
Sign Control	Stop		Free			Free

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 50.1%

Analysis Period (min) 15

ICU Level of Service A

HCM 2010 TWSC
5: SR 135/S. Willow Ave & Fairground St

2040 Recommended PM Timing Plan
07/12/2017

Intersection

Int Delay, s/veh 2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	35	130	1035	135	70	1305
Future Vol, veh/h	35	130	1035	135	70	1305
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	86	97	83	63	90
Heavy Vehicles, %	0	2	1	0	3	1
Mvmt Flow	51	151	1067	163	111	1450

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2095	615	0	0	1230	0
Stage 1	1148	-	-	-	-	-
Stage 2	947	-	-	-	-	-
Critical Hdwy	6.8	6.94	-	-	4.16	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.32	-	-	2.23	-
Pot Cap-1 Maneuver	~ 46	434	-	-	557	-
Stage 1	269	-	-	-	-	-
Stage 2	342	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 37	434	-	-	557	-
Mov Cap-2 Maneuver	141	-	-	-	-	-
Stage 1	269	-	-	-	-	-
Stage 2	274	-	-	-	-	-

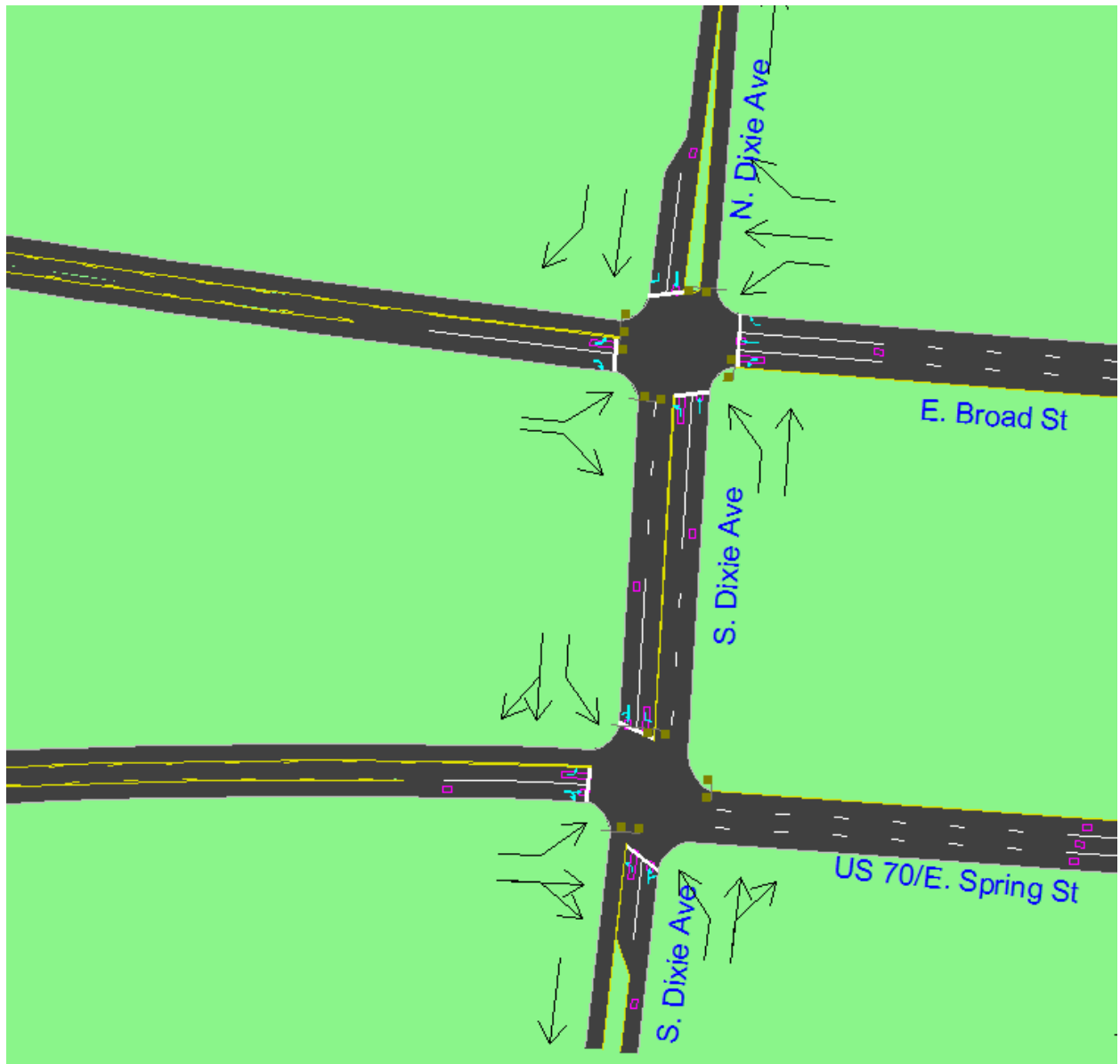
Approach	WB	NB	SB
HCM Control Delay, s	24.4	0	0.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	141	434	557	-
HCM Lane V/C Ratio	-	-	0.36	0.348	0.199	-
HCM Control Delay (s)	-	-	44.2	17.7	13.1	-
HCM Lane LOS	-	-	E	C	B	-
HCM 95th %tile Q(veh)	-	-	1.5	1.5	0.7	-

Notes

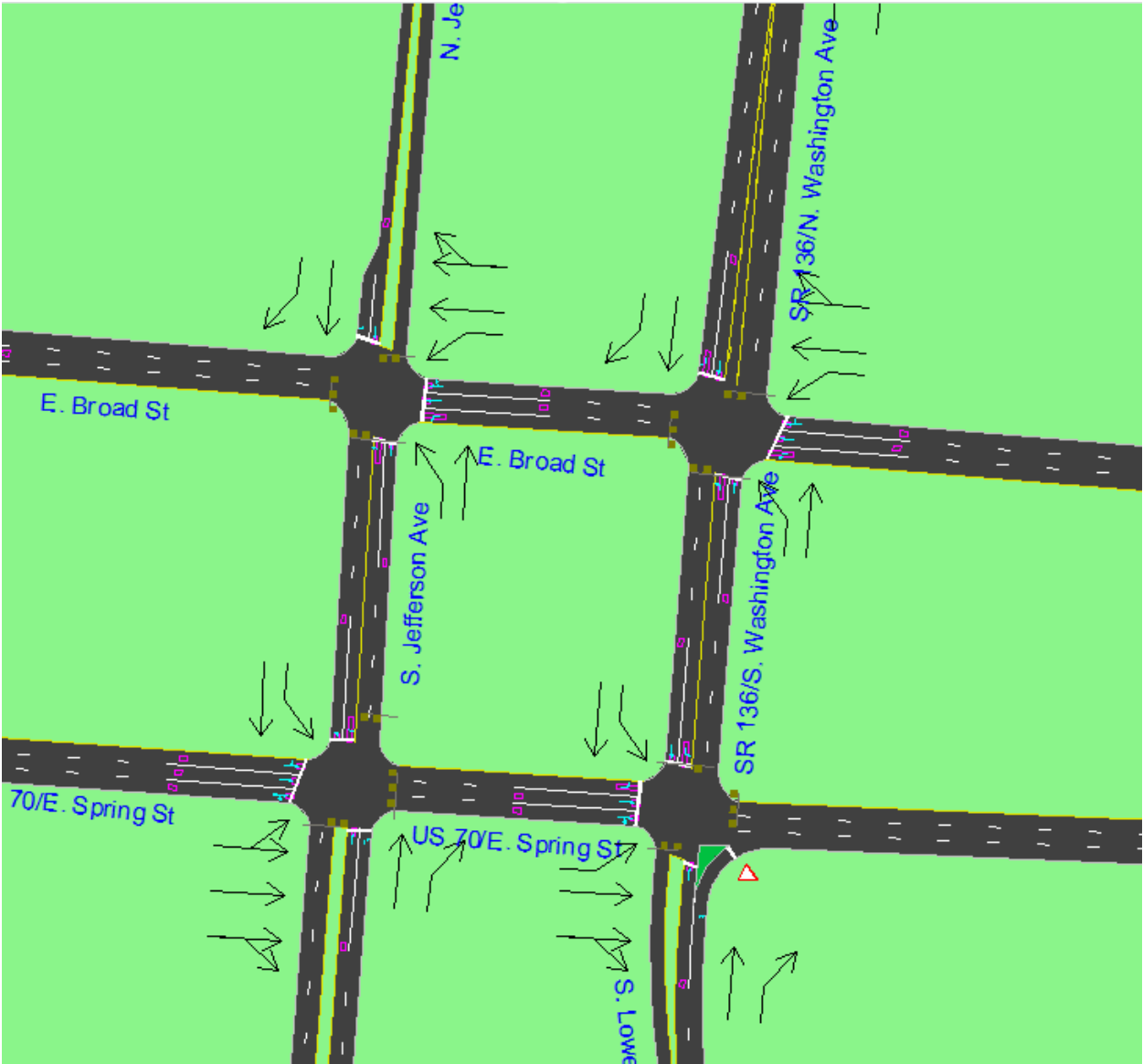
~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Appendix G: One-Way Pair Lane Configuration



One-Way Pair Lane Configuration at Dixie Avenue

One-Way Pair Lane Configuration at Jefferson Avenue and Washington Avenue



One-Way Pair Lane Configuration at Maple Avenue

