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DATE: March 8, 2021

SUBJECT: **TH 14 Modified Access Analysis**

1. Purpose

MnDOT has secured funding for access modifications at TH 14 and CSAH 3 and is considering expanding the project to include access modifications at TH 14 and CSAH 44 and TH 14 and 7th Street NW. Diverted traffic related to these access modifications is anticipated to impact adjacent roadways including the TH 14 interchange at West Circle Drive, located approximately 1.5 miles east of the TH 14 and 7th St NW intersection. In January 2021, MnDOT District 6 engaged Alliant Engineering to perform traffic forecasting and operations analysis related to the potential access modifications along TH 14 to understand impacts the proposed access modifications would have on the surrounding roadway network.

2. Existing Conditions

The study area consists of eight intersections, shown in **Figure 1**, and are as follows:

- TH 14 & CSAH 3
- TH 14 & CSAH 44
- TH 14 & 7th Street NW
- West Circle Drive & TH 14 EB Ramps
- West Circle Drive & TH 14 WB Ramps
- West Circle Drive & N Frontage Road
- West Circle Drive & 19th Street NW
- West Circle Drive & 7th Street NW

Existing intersection lane configurations and traffic control were inventoried and are shown in **Figure 1**. Peak hour turning movement count data for the CSAH 3, CSAH 44, and 7th Street NW intersections is based on 2019 StreetLight data obtained by SEH and provided to Alliant by MnDOT. Peak hour turning movement count data for the intersections along West Circle Drive is based on 2016 turning movement counts performed by Alliant as part of a larger signal retiming project along West Circle Drive. Existing signal timings for signals along West Circle Drive were obtained from the City of Rochester. Existing AM and PM peak hour intersection turning movement counts are shown in **Figure 1**.

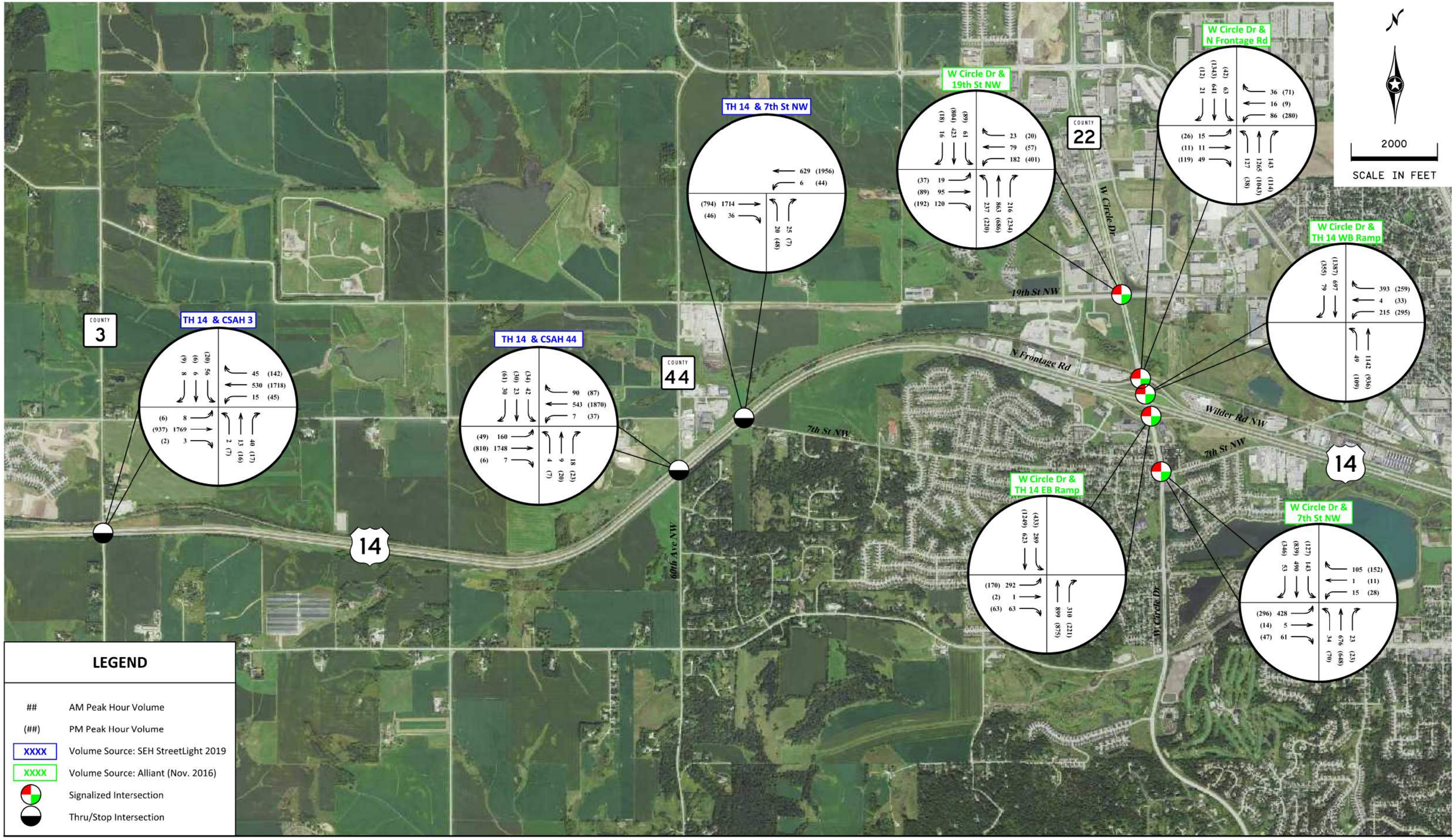

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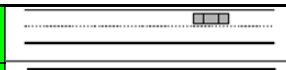
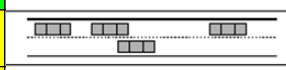
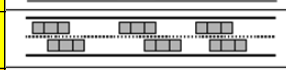
Figure 1
Existing Traffic Volumes

3. Existing Traffic Operations Analysis

An existing traffic operations analysis was completed using Synchro/SimTraffic software to establish a baseline condition to which alternatives could be compared. Operations analysis results identify a Level of Service (LOS) indicating the quality of traffic flow through an intersection. Intersections are given a ranking from LOS A through LOS F. The LOS results are based on average delay per vehicle, which correspond to the delay threshold values shown in **Table 1**.

LOS A indicates the best traffic operation, with vehicles experiencing minimal delays. LOS F indicates an intersection where demand exceeds capacity, or a breakdown of traffic flow. The LOS D/E boundary for overall operations is often used as the indicator of congestion in an urban area. For side-street stop-controlled intersections, a key measure of operational effectiveness is the side-street LOS. Long delays and poor LOS can occur on side-street approaches even if the overall intersection is functioning well, making side-street LOS a valuable design criterion.

Table 1. Level of Service Criteria

Level of Service		Description	Delay per Vehicle (seconds)	
			Signalized Intersection	Unsignalized Intersection
A		**Free Flow:** Low volumes and no delays.	0 - 10	0 - 10
B		**Stable Flow:** Speeds restricted by travel conditions, minor delays.	> 10 - 20	> 10 - 15
C		**Stable Flow:** Speeds and maneuverability closely controlled due to higher volumes.	> 20 - 35	> 15 - 25
D		**Stable Flow:** Speeds considerably affected by change in operating conditions. High density traffic restricts maneuverability, volume near capacity.	> 35 - 55	> 25 - 35
E		**Unstable Flow:** Low speeds, considerable delay, volume at or slightly over capacity.	> 55 - 80	> 35 - 50
F		**Forced Flow:** Very low speeds, volume exceed capacity, long delays with stop and go traffic.	> 80	> 50

Source: Highway Capacity Manual, 2010 Edition, Transportation Research Board, Exhibits 18-4 & 19-1.

After LOS, the second component of the operations analysis is a study of vehicular queuing, or the lineup of vehicles waiting to pass through an intersection. An intersection can operate with an acceptable LOS, but if queues from the intersection block entrances to turn lanes or adjacent driveways, unsafe operating conditions could result. The 95th percentile queue, or the length of queue with only a five percent probability of being exceeded during an analysis period, is considered the standard for design purposes.

Results of the existing traffic operations analysis, presented in **Table 2**, summarize the LOS and delay during both the AM and PM peak hours for existing conditions. Detailed operations and queuing analysis results are presented in **Appendix A**.

Table 2. Existing Operations Analysis Summary

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
West Circle Drive & 19th Street NW	C / D	23.5 / 45.6	C / D	32.3 / 44.5
West Circle Drive & N Frontage Road	A / D	7.7 / 39.8	B / D	17.0 / 45.3
West Circle Drive & TH 14 WB Ramp	B / C	12.7 / 30.6	B / D	14.9 / 41.0
West Circle Drive & TH 14 EB Ramp	B / B	13.4 / 16.2	B / B	13.6 / 17.6
West Circle Drive & 7th Street NW	C / C	23.0 / 33.9	C / D	20.5 / 44.7
TH 14 & 7th Street NW	A / B	1.9 / 13.8	A / C	5.0 / 23.1
TH 14 & CSAH 3	A / F	3.3 / 52.7	A / D	1.7 / 27.9
TH 14 & CSAH 44	A / D	2.9 / 32.2	A / F	7.7 / 112.6

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

- **West Circle Drive & 19th Street NW:** This intersection operates at an overall LOS C and side street approach LOS D.
- **West Circle Drive & N Frontage Road:** The intersection operates at an overall LOS A in the AM peak hour and LOS B in the PM peak hour, with side street approach LOS D.
- **West Circle Drive & TH 14 WB Ramp:** This intersection operates at an overall LOS B, with side street approach LOS C in the AM peak and LOS D in the PM peak. The movements with the highest delay are the TH 14 westbound off ramp movements and the northbound West Circle Drive left turn. The TH 14 westbound off ramp experiences delays of 55.0 seconds, 58.1 seconds, and 22.9 seconds for the left turn, through, and right turn movements in the PM peak hour. The westbound off ramp has a dedicated right turn lane with approximately 300 feet or storage and a shared through/left turn lane. During the PM peak hour, the westbound through movement operates at LOS E with average queues that are approximately 85% of the available right turn storage. The northbound left turn lane experiences delay of 54.0 seconds in the PM peak hour, operating at LOS D or E. The turn lane has approximately 180 feet of storage with average queues that do not exceed the available storage.
- **West Circle Drive & TH 14 EB Ramp:** This intersection operates at an overall and side street approach LOS B, in both the AM and PM peak hours. The movements with the highest delay are the TH 14 eastbound off ramp left turn and the southbound left turn. The TH 14 off ramp left turn movement experiences delay of 50.6 seconds in the PM peak, operating at LOS D. The southbound left turn lane experiences delay of 29.3 seconds in the AM peak and 26.1 seconds in the PM peak. The left turn lane has approximately 240 feet of available storage. Average queues during the PM peak hour are approximately 80% of the available storage capacity.
- **West Circle Drive & 7th Street NW:** This intersection operates at overall LOS C, with street approach LOS C in the AM peak hour and LOS D in the PM peak hour.
- **TH 14 & 7th Street NW:** This intersection operates at an overall LOS A, with side street approach LOS B in the AM peak hour and LOS C in the PM peak hour.
- **TH 14 & CSAH 3:** This intersection operates at an overall LOS A, with side street approach LOS F in the AM peak hour and LOS D in the PM peak hour.

- **TH 14 & CSAH 44:** This intersection operates at an overall LOS A, with side street approach LOS D in the AM peak hour and LOS F in the PM peak hour.

4. Build Options & Movement Diversion

Four build options were considered for the intersection improvements at CSAH 3, CSAH 44, and 7th Street NW. These options are labeled 1A, 1B, 2A, and 2B, and are depicted in **Figure 2**. It should be noted that each option represents a different combination of intersection improvements and that some intersections may not change between options, or at all.

4.1 CSAH 3 Build Options

All four options restrict the CSAH 3 direct through movement, instead providing downstream median U-turns (MUT) for both directions to facilitate the indirect crossing of TH 14.

Options 1A and 1B show a reduced conflict intersection (RCI) at CSAH 3. Both options restrict the CSAH 3 direct through movement but allow the TH 14 direct left turn movement onto CSAH 3. MUTs in both directions facilitate the indirect crossing of TH 14.

Options 2A and 2B build off of Options 1A and 1B by not allowing direct left turns from TH 14 to CSAH 3. MUTs in both directions are included in Options 2A and 2B, in order to facilitate the indirect left turn movement onto CSAH 3 and the indirect crossing of TH 14. It's assumed that there will be no diversion away from this intersection due to the changes, and that 100% of traffic will utilize the MUTs in order to complete their intended route. **Table 3** below shows a breakdown of the permitted and prohibited movements at the CSAH 3 intersection for each of the build options.

Table 3. Build Options Permitted and Prohibited Movements at CSAH 3

<table>
<tr><th>Movement</th><th>Direct Left Turn from TH 14</th><th>Direct Crossing of TH 14</th><th>Direct Left onto TH 14</th></tr>
<tr><td>Option 1A</td><td rowspan="2">Permitted</td><td rowspan="4">Prohibited</td><td rowspan="4">Prohibited</td></tr>
<tr><td>Option 1B</td></tr>
<tr><td>Option 2A</td><td rowspan="2">Prohibited</td></tr>
<tr><td>Option 2B</td></tr>
</table>

4.2 CSAH 44 Build Options

At the CSAH 44 intersection, the mainline left turn movements from TH 14 to CSAH 44 and the side street through movements along CSAH 44 are restricted in all four options. Options 1A and 2A show only these restrictions, while Options 1B and 2B include a MUT for eastbound TH 14 between the CSAH 44 and 7th Street NW intersection. The MUT would facilitate an indirect CSAH 44 northbound through movement and an indirect TH 14 eastbound left turn movement.

Table 4 shows a breakdown of the permitted and prohibited movements at the CSAH 44 intersection for each of the build options.

Table 4. Build Options Permitted and Prohibited Movements at CSAH 44

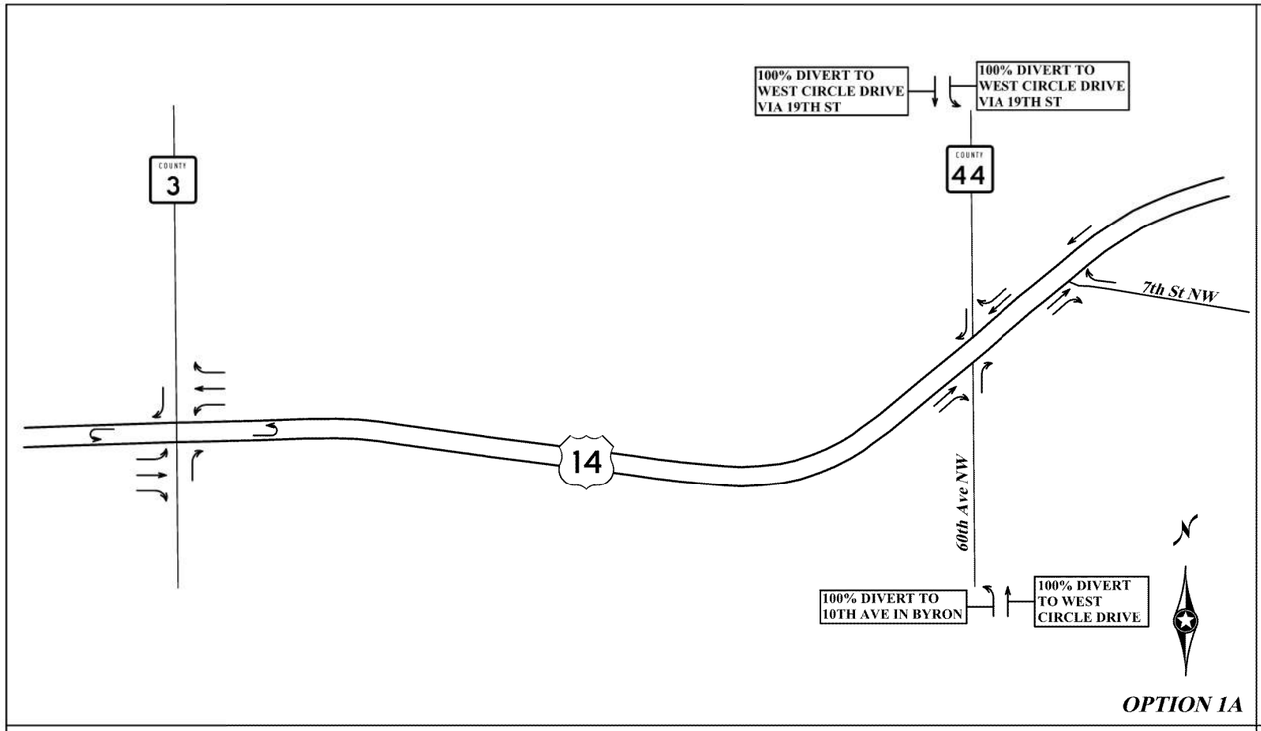
Movement	Direct Left Turn from TH 14	Direct Crossing of TH 14	Direct Left onto TH 14
Option 1A	Prohibited	Prohibited	Prohibited
Option 1B	Prohibited (Includes MUT)	Prohibited (Includes MUT)	Prohibited (Includes MUT)
Option 2A	Prohibited	Prohibited	Prohibited
Option 2B	Prohibited (Includes MUT)	Prohibited (Includes MUT)	Prohibited (Includes MUT)

4.3 7th Street NW Build Options

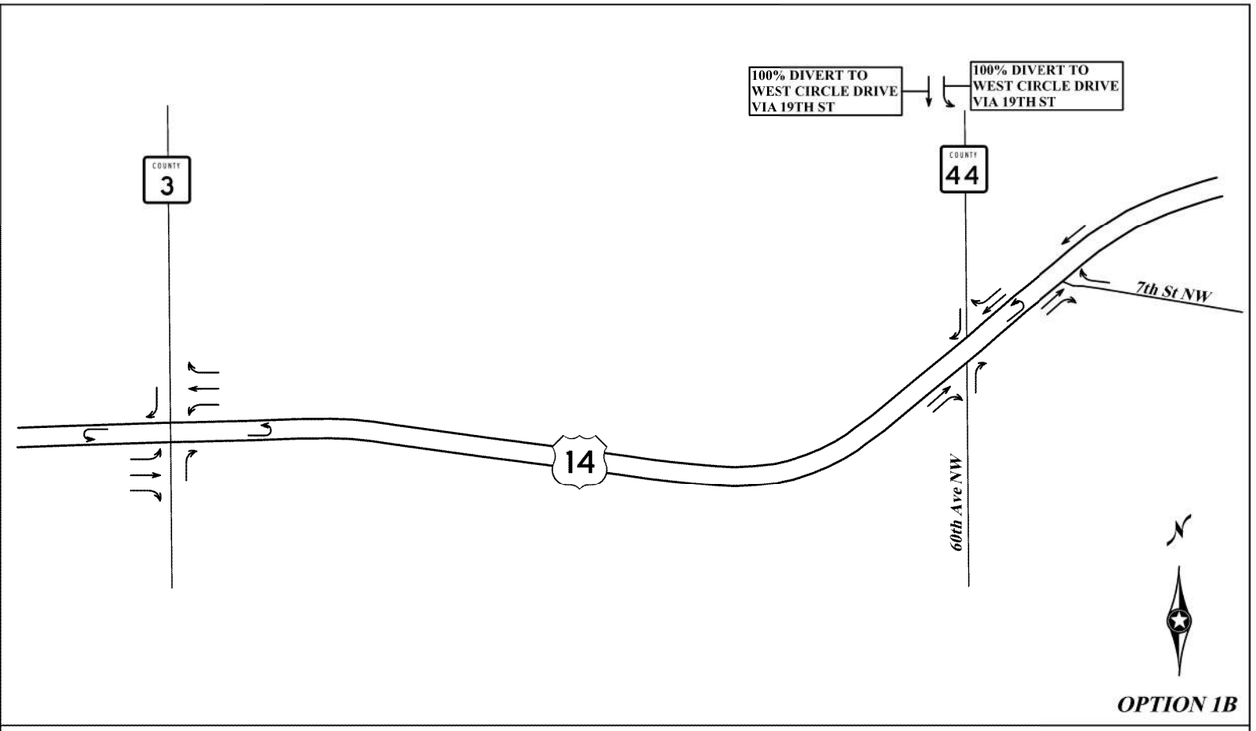
Each of the four options (1A, 1B, 2A, 2B) include a median closure at 7th Street NW. This will restrict left turn movements for both TH 14 and 7th Street NW at the intersection.

4.4 Traffic Volume Diversions

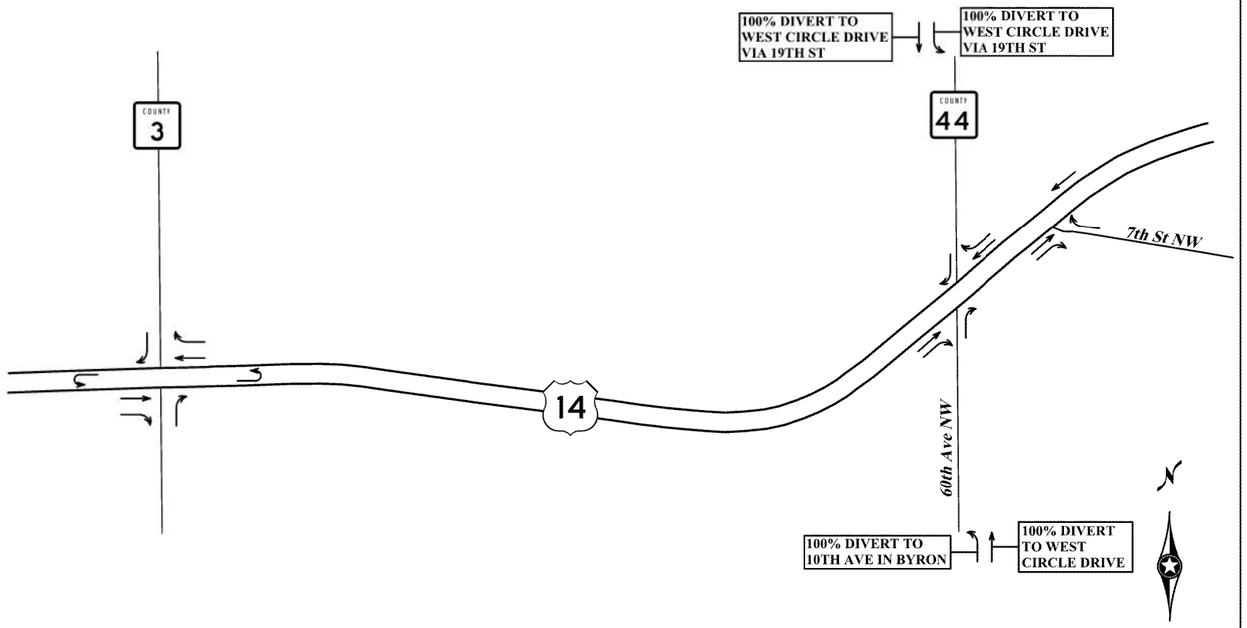
For each option where movements are restricted, it is assumed that one-hundred percent of vehicles intending to make that movement would utilize an alternative route once modifications are completed. The restricted movements and alternative routes are detailed in **Figure 2**. The traffic volumes for each of the restricted movements were diverted and applied elsewhere based on the diversion routes assumed. These incremental changes in volume are depicted in **Figure 3**, **Figure 4**, **Figure 5**, and **Figure 6**, where green arrows indicate volume added and red arrows indicate volume removed.



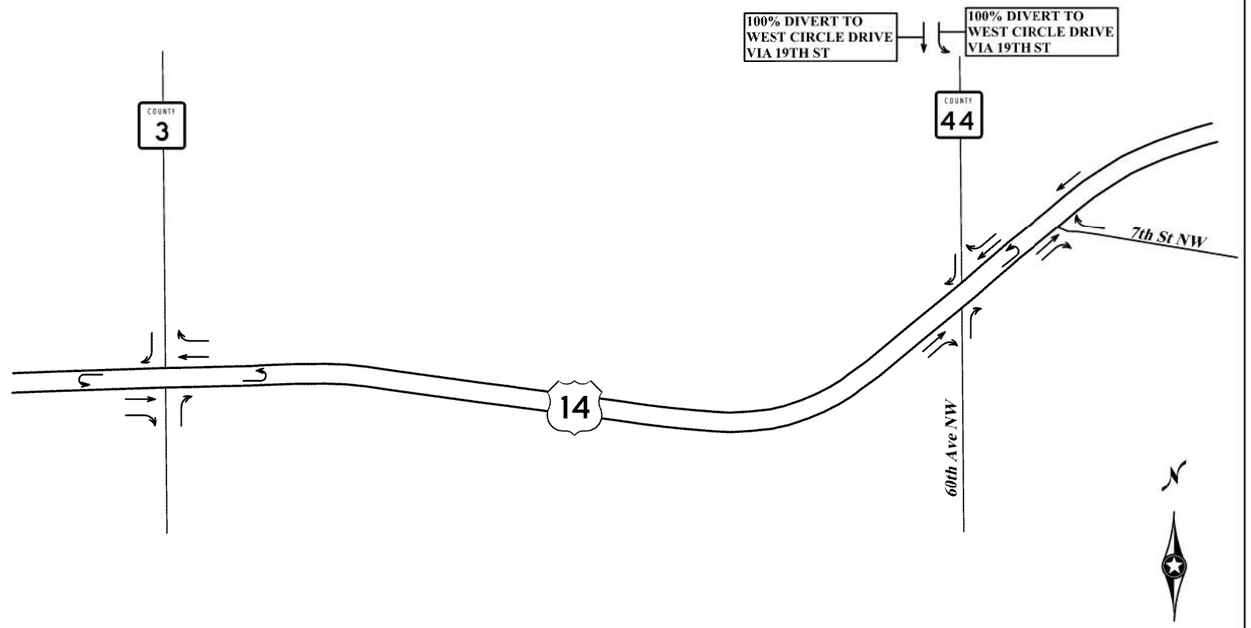
OPTION 1A



OPTION 1B



OPTION 2A



OPTION 2B

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Figure 2
TH 14 Modified Access Analysis
Options Movement Diversion

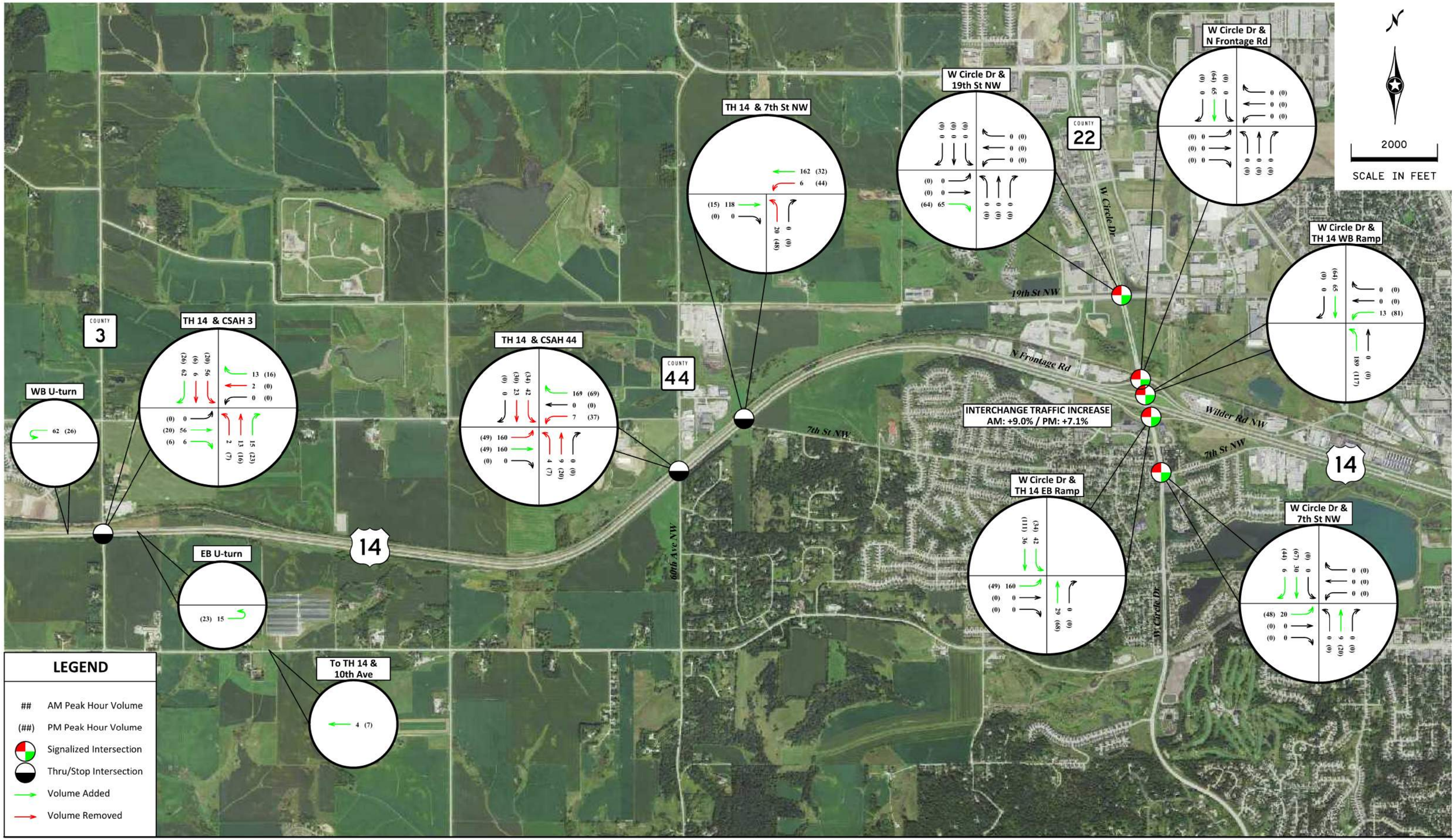

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Figure 3
Option 1A Traffic Volumes Differences

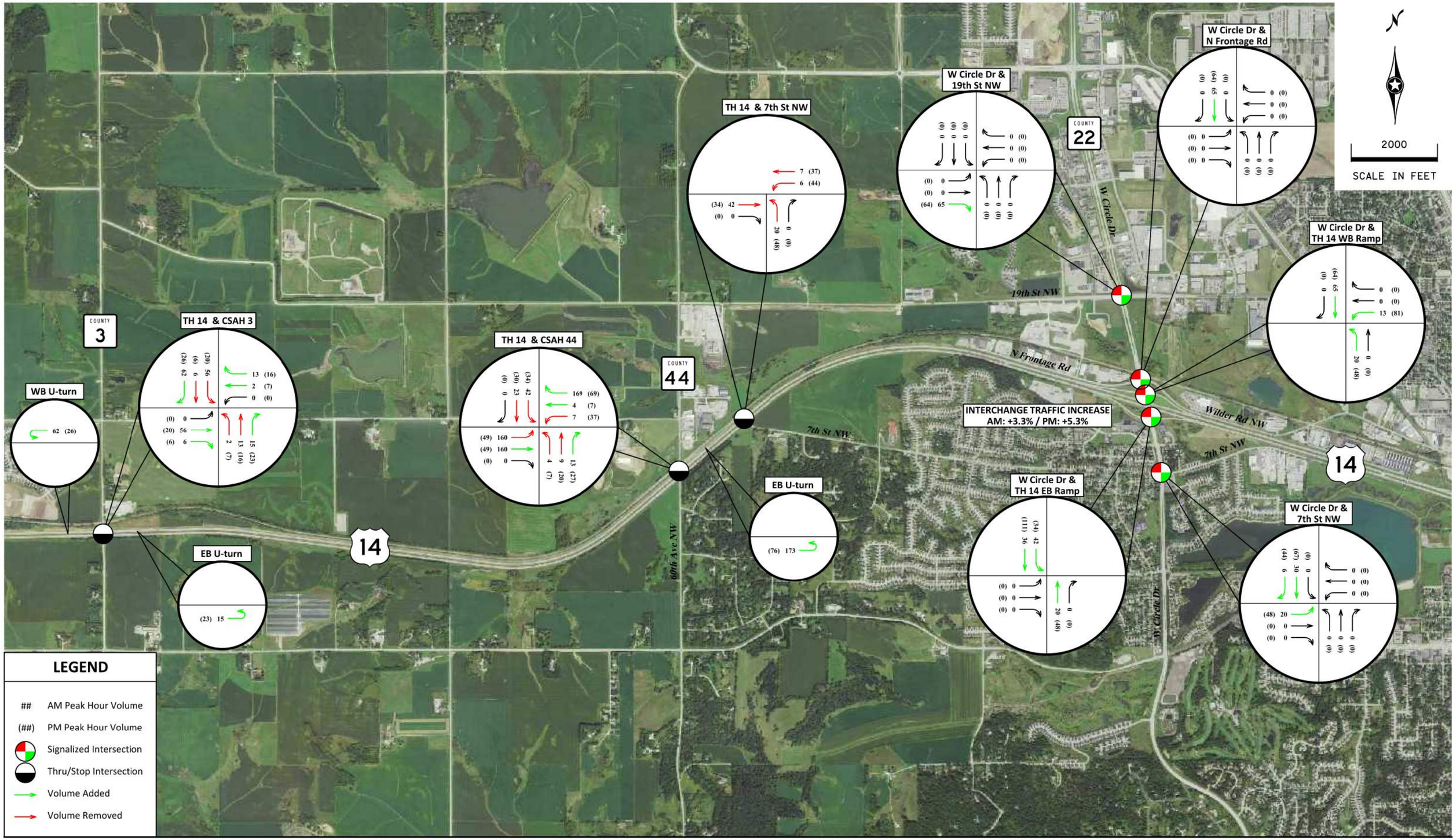

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Figure 4
Option 1B Traffic Volumes Differences

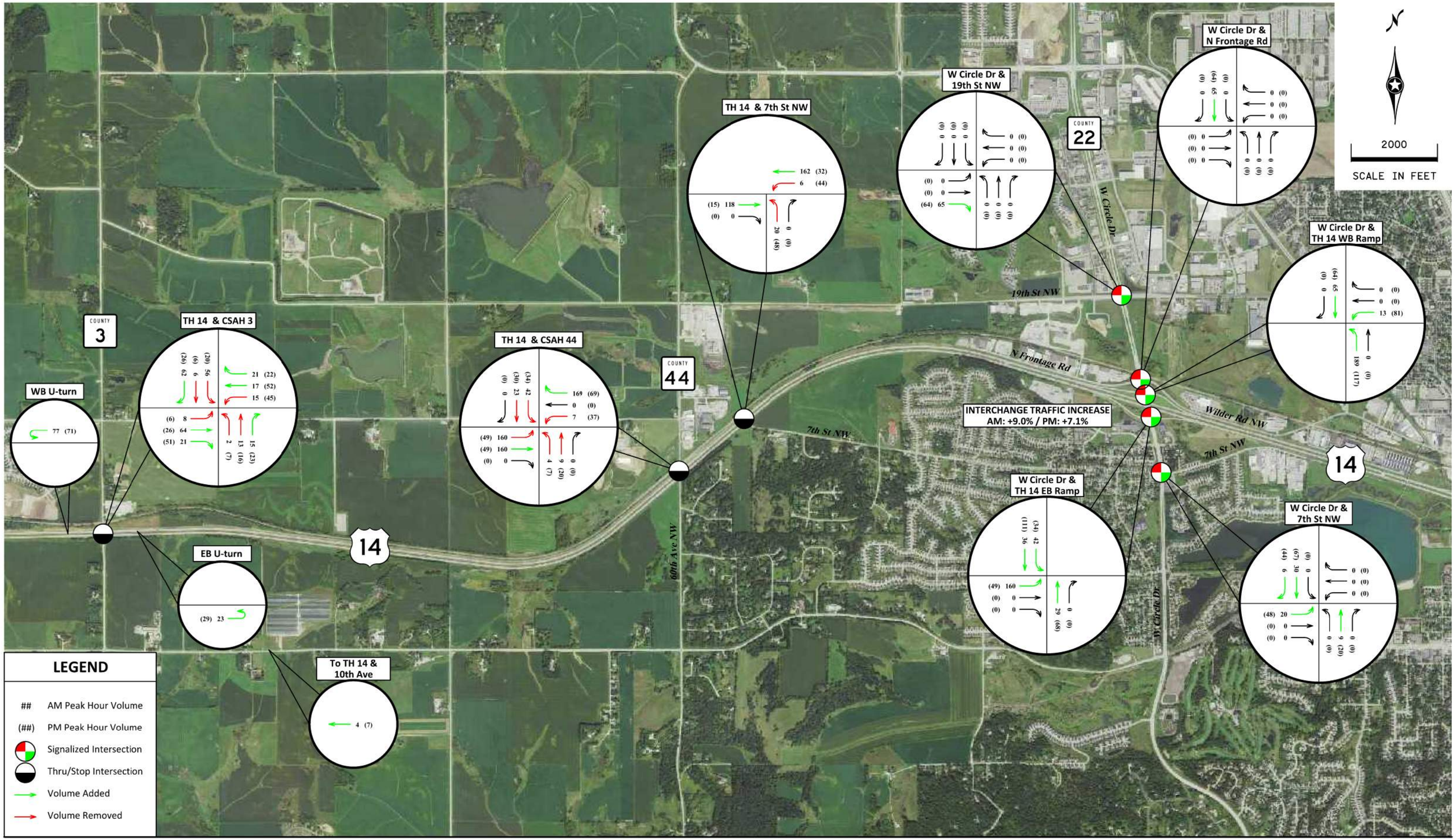

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Figure 5
Option 2A Traffic Volumes Differences

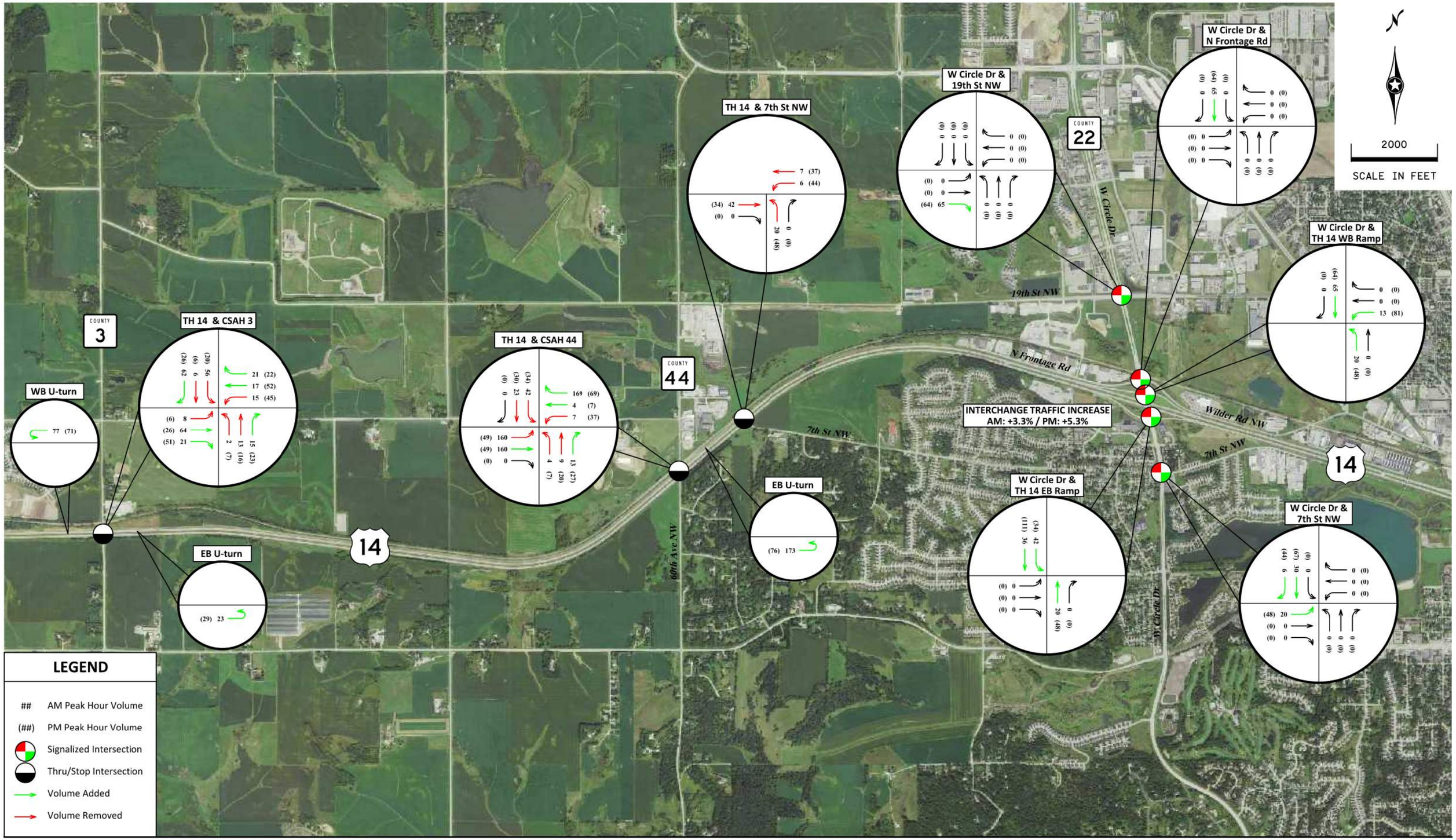

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Figure 6
Option 2B Traffic Volumes Differences

5. TH 14 Build Traffic Operations Analysis

An intersection-based traffic operations analysis was completed for all four options at each of the eight intersections using Synchro/SimTraffic.

5.1 TH 14 & CSAH 3

Under existing conditions, the TH 14 & CSAH 3 intersection operates at an overall LOS A but experiences moderate delay on the side street approaches. Side street approach delay is 52.7 seconds in the AM peak and 27.9 seconds in the PM peak for existing conditions, with LOS F and LOS D respectively. Under each of the four build options, overall LOS A is maintained for both the AM and PM peak hour. All four build options result in improvements to side street delay and LOS, with side street LOS D in the AM peak hour and LOS C in the PM peak hour. A summary of results is shown in **Table 5**.

Table 5. TH 14 & CSAH 3 Analysis Summary

Alternative	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
Existing Conditions	A / F	3.3 / 52.7	A / D	1.7 / 27.9
Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure	A / D	2.2 / 29.4	A / C	1.7 / 20.4
Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure	A / D	1.9 / 20.9	A / C	1.6 / 17.7
Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure	A / D	2.0 / 20.0	A / C	1.7 / 23.1
Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure	A / D	2.2 / 22.5	A / C	1.6 / 22.9

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

5.2 TH 14 & CSAH 44

Similar to the TH 14 & CSAH 3 intersection, the TH 14 and CSAH 44 intersection operates at an overall LOS A under existing conditions. Side street approaches, however, experience moderate delay of 32.2 seconds in the AM peak hour and significant delay of 112.6 seconds in the PM peak hour (LOS D and LOS F, respectively). All four build options maintain an overall LOS A for the intersection while improving delay and LOS for the side street approaches. Under all build options, side street approaches operate at LOS B in the AM peak hour and LOS C in the PM peak hour, with a maximum delay of 26.2 seconds. A summary of results is shown in **Table 6**.

Table 6. TH 14 & CSAH 44 Analysis Summary

Alternative	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
Existing Conditions	A / D	2.9 / 32.2	A / F	7.7 / 112.6
Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure	A / B	1.2 / 12.8	A / C	2.1 / 20.1
Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure	A / B	1.7 / 26.2	A / C	2.5 / 16.8
Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure	A / B	1.2 / 15.5	A / C	1.9 / 18.4
Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure	A / B	1.6 / 20.8	A / C	2.6 / 18.8

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

5.3 TH 14 & 7th Street NW

Under existing conditions, the TH 14 & 7th Street NW intersection operates at an overall LOS A in the AM and PM peak hours. Side street approaches experience delay of 13.8 seconds in the AM peak hour and 23.1 seconds in the PM peak hour, performing at LOS B and LOS C respectively. Each of the four build options maintains an overall LOS A at the intersection as well as improve side street delay and LOS, operating at LOS B or better in the AM and PM peak hour. A summary of results is shown in **Table 7**.

Table 7. TH 14 & 7th Street NW Analysis Summary

Alternative	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
Existing Conditions	A / B	1.9 / 13.8	A / C	5.0 / 23.1
Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure	A / A	2.5 / 4.5	A / B	6.9 / 10.3
Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure	A / A	2.3 / 4.5	A / A	6.3 / 9.2
Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure	A / A	2.6 / 5.8	A / A	6.6 / 9.8
Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure	A / A	2.2 / 4.6	A / A	6.3 / 9.3

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

5.4 Travel Time Analysis

The three movements impacted by the proposed intersection changes are the minor approach left turn, minor approach through movement, and the major approach left turn. To capture the overall impact of the proposed intersection modifications on these movements, travel time metrics were developed. Calculated values and the assumptions made for approach speeds, U-turn distances, and acceleration/deceleration rates can be seen in **Table 8**. The values in the table can be applied to movements at both the CSAH 3 and CSAH 44 intersection where a U-turn is provided.

"Baseline Free Flow Travel Time", for the ease of comparison, is calculated as the total time it takes the driver to complete a specific movement from the start of deceleration to the time they reach the speed limit of the destination roadway. Because these are free flow travel times, no control delay is included. "Additional RCI/MUT Travel Time" values describe the additional time it would take the driver to complete the same movement in the case of a median closure where a U-turn is provided downstream. These numbers take into consideration the additional distance the vehicle must travel to complete the movement, and the additional accelerations and decelerations that must take place. The resulting total, "Total Free Flow RCI/MUT Travel Time" is the summation of the baseline and added travel times, which is the total time it would take a vehicle to complete each movement under a median closure scenario.

Table 8. Travel Time Analysis

Movement	Major Design Speed	Minor Design Speed	U-Turn Distance	Acceleration Rate[1]	Deceleration Rate[2]	Baseline Free Flow Travel Time	Additional RCI / MUT Travel Time[3]	Total Free Flow RCI / MUT Travel Time
	(mi/hr)	(mi/hr)	(ft)	(ft/s^2)	(ft/s^2)	(sec)	(sec)	(sec)
Minor Approach Left-Turn	60	55	850	6.0	11.2	21.9	30.5	52.4
Minor Approach Through	60	55	850	6.0	11.2	20.6	41.7	62.4
Major Approach Left-Turn	60	55	850	6.0	11.2	22.0	30.5	52.5

Note: Travel Time measured from start of deceleration until return to design speed for destination roadway. Travel Time does not include any control delay.
[1]Acceleration rate of 6.0ft/s^2 per Acceleration Characteristics of Starting Vehicles, Garly Long, TRB January 2000.
[2]Deceleration rate of 11.2ft/s^2 per AASHTO Green Book, Table 3-1.
[3]Additional RCI / MUT travel time includes time beyond baseline movement.

Figure 7 and **Figure 8** show a travel time comparison between the CSAH 3 existing conditions and each of the intersection alternatives. **Figure 9** shows the travel time comparison between the CSAH 44 existing conditions and the partial MUT alternative.

Travel times at the CSAH 3 and CSAH 44 intersections typically increase less than 30 seconds on average for any single movement when utilizing the downstream MUTs (accounting for reductions to overall delay). The maximum travel time increase was 33.2 seconds for the PM peak hour southbound through movement at CSAH 3. AM eastbound left turn movements at both intersections and the PM westbound left turn movement at CSAH 3 see the largest percent-based travel time increase. The PM northbound left turn and northbound through movements at CSAH 44, and the AM southbound left turn movement at CSAH 3 all show decreased travel times (reduced by 22.0 seconds, 13.3 seconds, and 4.6 seconds, respectively) when compared to the existing conditions.

No Build

Southbound (sec/veh)						
Peak Hour	SBL			SBT		
	Free Flow	Model Delay	Travel Time	Free Flow	Model Delay	Travel Time
AM	21.9	58.2	80.1	20.6	54.6	75.2
PM	21.9	33.1	55.0	20.6	32.4	53.0

Westbound (sec/veh)			
Peak Hour	WBL		
	Free Flow	Model Delay	Travel Time
AM	22.0	34.1	56.1
PM	22.0	6.1	28.1

Eastbound (sec/veh)			
Peak Hour	EBL		
	Free Flow	Model Delay	Travel Time
AM	22.0	4.2	26.2
PM	22.0	22.1	44.1

Northbound (sec/veh)						
Peak Hour	NBL			NBT		
	Free Flow	Model Delay	Travel Time	Free Flow	Model Delay	Travel Time
AM	21.9	40.4	62.3	20.6	41.5	62.1
PM	21.9	25.5	47.4	20.6	36.1	56.7

CSAH 3 RCI

Southbound (sec/veh)										
Peak Hour	SBL					SBT				
	Free Flow	Model Delay	Travel Time	+/-	%	Free Flow	Model Delay	Travel Time	+/-	%
AM	52.4	23.1	75.5	-4.6	-6%	62.4	22.2	84.6	9.3	12%
PM	52.4	24.30	76.7	21.7	40%	62.4	23.90	86.3	33.2	63%

Westbound (sec/veh)					
Peak	WBL				
	Free Flow	Model Delay	Travel Time	+/-	%
AM	22.0	21.80	43.8	-12.3	-22%
PM	22.0	6.60	28.6	0.5	2%

Eastbound (sec/veh)					
Peak	EBL				
	Free Flow	Model Delay	Travel Time	+/-	%
AM	22.0	2.70	24.7	-1.5	-6%
PM	22.0	21.80	43.8	-0.3	-1%

Northbound (sec/veh)										
Peak Hour	NBL					NBT				
	Free Flow	Model Delay	Travel Time	+/-	%	Free Flow	Model Delay	Travel Time	+/-	%
AM	52.4	24.80	77.2	14.9	24%	62.4	24.10	86.5	24.3	39%
PM	52.4	23.10	75.5	28.1	59%	62.4	22.20	84.6	27.8	49%

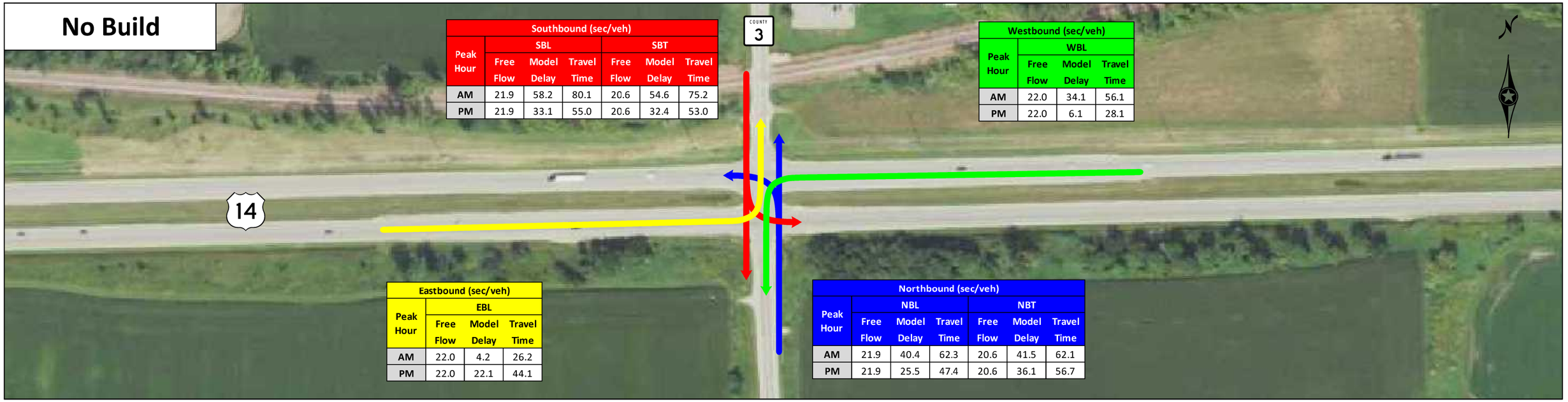
LEGEND

Median Closure

Note: Travel time values are based on a combination of modeled delay (Synchro/SimTraffic) and calculated travel time utilizing AASHTO Green Book and TRB documented acceleration and deceleration rates.

Figure 7
TH 14 & CSAH 3 RCI Alternative - Travel Time Comparison

No Build



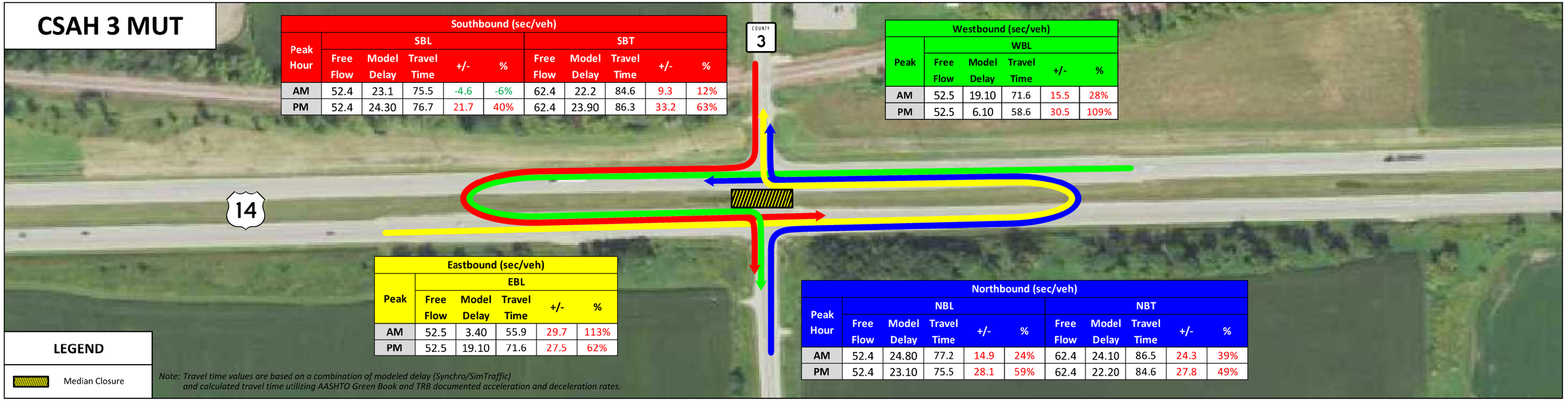
Southbound (sec/veh)						
Peak Hour	SBL			SBT		
	Free Flow	Model Delay	Travel Time	Free Flow	Model Delay	Travel Time
AM	21.9	58.2	80.1	20.6	54.6	75.2
PM	21.9	33.1	55.0	20.6	32.4	53.0

Westbound (sec/veh)			
Peak Hour	WBL		
	Free Flow	Model Delay	Travel Time
AM	22.0	34.1	56.1
PM	22.0	6.1	28.1

Eastbound (sec/veh)			
Peak Hour	EBL		
	Free Flow	Model Delay	Travel Time
AM	22.0	4.2	26.2
PM	22.0	22.1	44.1

Northbound (sec/veh)						
Peak Hour	NBL			NBT		
	Free Flow	Model Delay	Travel Time	Free Flow	Model Delay	Travel Time
AM	21.9	40.4	62.3	20.6	41.5	62.1
PM	21.9	25.5	47.4	20.6	36.1	56.7

CSAH 3 MUT



Southbound (sec/veh)										
Peak Hour	SBL					SBT				
	Free Flow	Model Delay	Travel Time	+/-	%	Free Flow	Model Delay	Travel Time	+/-	%
AM	52.4	23.1	75.5	-4.6	-6%	62.4	22.2	84.6	9.3	12%
PM	52.4	24.30	76.7	21.7	40%	62.4	23.90	86.3	33.2	63%

Westbound (sec/veh)					
Peak	WBL				
	Free Flow	Model Delay	Travel Time	+/-	%
AM	52.5	19.10	71.6	15.5	28%
PM	52.5	6.10	58.6	30.5	109%

Eastbound (sec/veh)					
Peak	EBL				
	Free Flow	Model Delay	Travel Time	+/-	%
AM	52.5	3.40	55.9	29.7	113%
PM	52.5	19.10	71.6	27.5	62%

Northbound (sec/veh)										
Peak Hour	NBL					NBT				
	Free Flow	Model Delay	Travel Time	+/-	%	Free Flow	Model Delay	Travel Time	+/-	%
AM	52.4	24.80	77.2	14.9	24%	62.4	24.10	86.5	24.3	39%
PM	52.4	23.10	75.5	28.1	59%	62.4	22.20	84.6	27.8	49%

LEGEND

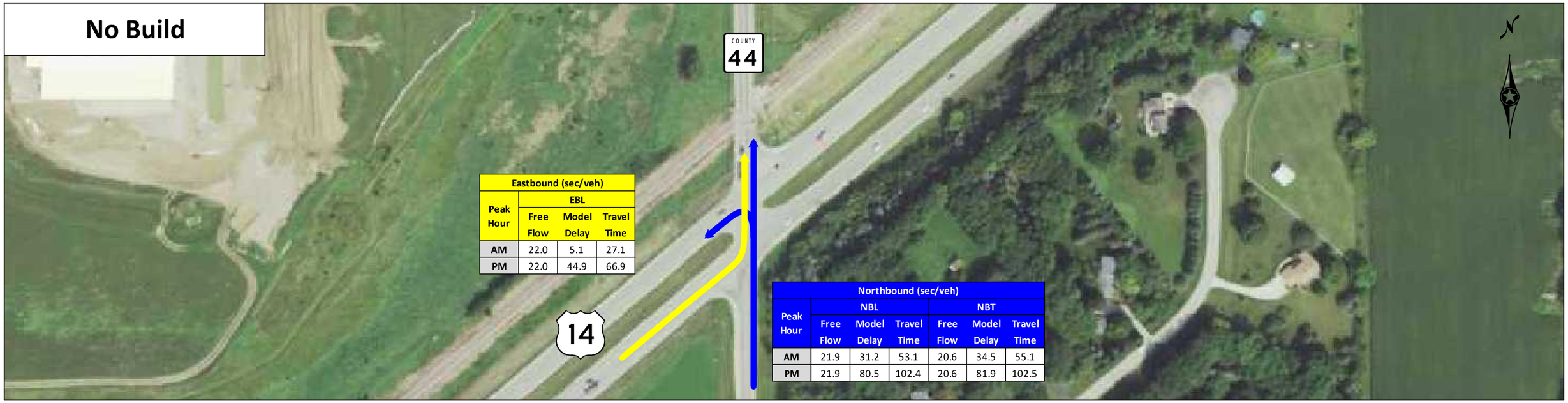
Median Closure

Note: Travel time values are based on a combination of modeled delay (Synchro/SimTraffic) and calculated travel time utilizing AASHTO Green Book and TRB documented acceleration and deceleration rates.

Figure 8

TH 14 & CSAH 3 MUTAlternative - Travel Time Comparison

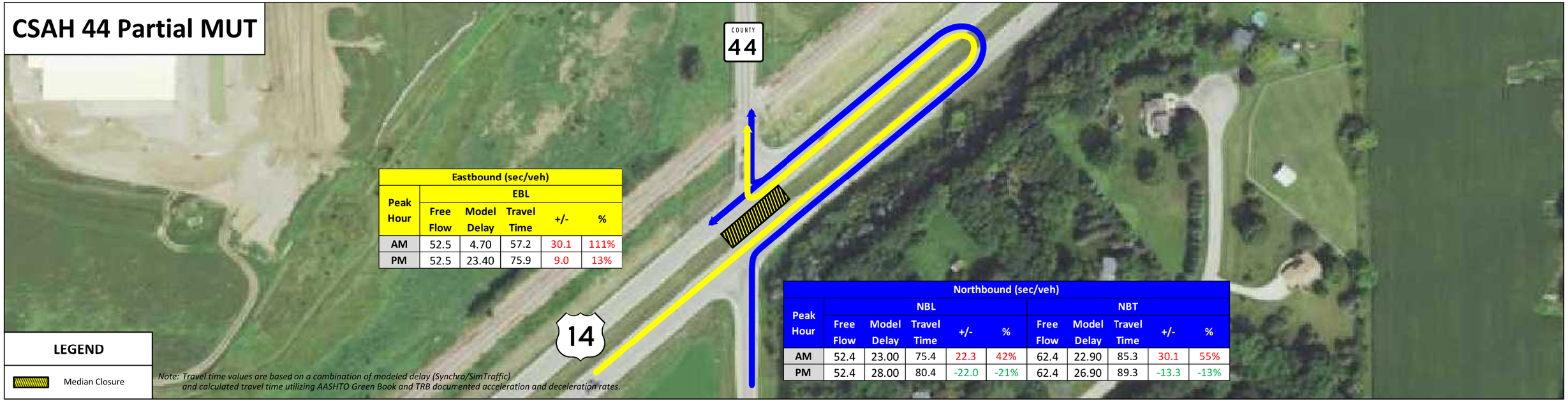
No Build



Eastbound (sec/veh)			
Peak Hour	EBL		
	Free Flow	Model Delay	Travel Time
AM	22.0	5.1	27.1
PM	22.0	44.9	66.9

Northbound (sec/veh)											
Peak Hour	NBL					NBT					
	Free Flow	Model Delay	Travel Time	+/-	%	Free Flow	Model Delay	Travel Time	+/-	%	
AM	21.9	31.2	53.1			20.6	34.5	55.1			
PM	21.9	80.5	102.4			20.6	81.9	102.5			

CSAH 44 Partial MUT



Eastbound (sec/veh)					
Peak Hour	EBL				
	Free Flow	Model Delay	Travel Time	+/-	%
AM	52.5	4.70	57.2	30.1	111%
PM	52.5	23.40	75.9	9.0	13%

Northbound (sec/veh)										
Peak Hour	NBL					NBT				
	Free Flow	Model Delay	Travel Time	+/-	%	Free Flow	Model Delay	Travel Time	+/-	%
AM	52.4	23.00	75.4	22.3	42%	62.4	22.90	85.3	30.1	55%
PM	52.4	28.00	80.4	-22.0	-21%	62.4	26.90	89.3	-13.3	-13%

LEGEND

Median Closure

Note: Travel time values are based on a combination of modeled delay (Synchro/SimTraffic) and calculated travel time utilizing AASHTO Green Book and TRB documented acceleration and deceleration rates.

Figure 9

TH 14 & CSAH 44 Partial MUT Alternative - Travel Time Comparison

6. West Circle Drive Traffic Operations Analysis

A traffic forecasting and operations analysis was performed at five intersections along West Circle Drive related to TH 14 access modification Options 1A, 1B, 2A, 2B.

6.1 Build Conditions

Under each of the build options, the West Circle Drive intersections with 19th Street NW and 7th Street NW have similar delay times and maintain LOS from existing conditions. The West Circle Drive & N Frontage Road intersection sees similar delay times and maintains LOS in all of the build options for the AM peak hour. The N Frontage Road intersection sees increased delay in the PM peak hour for the "A" options, resulting in overall LOS C.

The West Circle Drive & TH 14 Westbound Ramp intersection has similar delay times and maintains LOS for all build options in the AM peak hour. There is additional delay on the side street approaches in the PM peak hour for all build options, resulting in LOS E or LOS F. The West Circle Drive & TH 14 Eastbound Ramp intersection has similar delay times and maintains LOS for all build conditions in the PM peak hour. There is additional delay on the side street approaches for the "A" options in the AM peak hour, resulting in LOS E. Turn lane queuing between the two ramp intersections was analyzed based on 95th percentile and average queues relative to the exiting storage capacity, with summaries for both intersections included below:

<u>West Circle Drive & TH 14 Westbound Ramp</u>

- The northbound left turn has a storage capacity of 180 feet. During the PM peak, it operates at a low-performing LOS D or LOS E with average queues that are approximately half the available storage. With added diversion traffic ("A" options) it declines to LOS E or LOS F with average queues that exceeds the available storage. With a MUT provided ("B" options) the average queues remain below, with only 95th percentile queues exceeding the provided storage capacity.
- The westbound left turn does not have a dedicated lane, but the adjacent right turn lane has approximately 300 feet of storage capacity. During the PM peak, the westbound through movement operates at LOS E with average queues that are approximately 85% of the available right turn storage. Under all options it declines to LOS E or LOS F with average queues that exceeds the available right turn storage.

West Circle Drive & TH 14 Eastbound Ramp

- The southbound left has a storage capacity of 240 feet. During the AM peak, it operates at LOS C with average queues that are within the available storage. With added diversion traffic, it declines to LOS D with an average queue that is at approximately 85% of the available storage. Under all options it remains at LOS D with average queues below the available storage.
- The eastbound left turn does not have a dedicated lane, but the adjacent right turn lane has approximately 340 feet of storage. During both the AM and PM peaks, it operates at LOS D with average queues that match the available storage. With added diversion traffic ("A" options) it declines to LOS E with average queues that exceeds the available right turn lane storage. With a MUT provided ("B" options) both the average and 95th percentile queues remain below the provided storage capacity.

As noted previously, it is anticipated that the proposed intersection modifications on TH 14 may impact traffic volumes at the West Circle Drive intersections. Based on the traffic diversion assumptions, the interchange traffic would increase by approximately 9.0% during the AM peak and 7.1% during the PM peak for both Options 1A and 2A (no TH 14 eastbound MUT at CSAH 44). Interchange traffic would increase by approximately 3.3% during the AM peak and 5.3% in the PM peak for both Options 1B and 2B (includes TH 14 eastbound MUT). **Figure 10** and **Figure 11** show the interchange traffic volume increases for Option A and Option B, respectively, as well as the movements with anticipated increases in volume (green arrows).

6.2 Signal Revision Alternative

As indicated in the analysis results, side street delay and turn lane queuing is likely to increase along West Circle Drive for certain alternatives, more specifically when a TH 14 eastbound MUT is not provided at the CSAH 44 intersection (Options 1A and 2A). To address these potential impacts, an alternative was developed that adjusted some signal timing parameters, while balancing the overall West Circle Drive corridor demands. The signal timing revisions were applied to the TH 14 Eastbound and TH 14 Westbound Ramp intersections and was analyzed as a separate build option at each of the West Circle Drive intersections. Signal timing revisions at the West Circle Drive and TH 14 Ramps are listed below:

AM Peak

- Additional 6 seconds for the northbound left, 6 seconds less for the southbound through, and an offset change at the TH 14 Westbound Ramp.
- Additional 2 seconds for the southbound left, an additional 1 second for the eastbound approach, 3 seconds less for the northbound through, and an offset change at the TH 14 Eastbound Ramp.

PM Peak

- Additional 7 seconds for the northbound left, an additional 1 second for the westbound approach, 8 seconds less for the southbound through, and an offset change at the TH 14 Westbound Ramp.
- Offset change at the TH 14 Eastbound Ramp.

Under existing conditions, the West Circle Drive & TH 14 Westbound Ramp intersection operates at an overall LOS B, with side street delay of 30.6 seconds in the AM peak and 41.0 seconds in the PM peak (LOS C and LOS D, respectively). All build options maintain overall LOS B in the AM peak hour. In the PM peak hour however, delay increases and LOS decreases (overall and for side street approaches) for each build option.

By incorporating the revised signal timing, side street delay was reduced from both Option 1A and Option 2A during the PM peak hour at the West Circle Drive & TH 14 Westbound Ramp intersection. During the PM peak hour, side street approach LOS improved from LOS F in Option 1A to LOS E with the optimized timing. Although overall and side street approach delay did increase slightly in the AM peak hour with the optimized signal timing, overall LOS B is maintained at the intersection.

Under existing conditions, the West Circle Drive & TH 14 Eastbound Ramp operates at LOS B (overall and side street approaches) in the AM and PM peak hours. All build options maintain overall LOS B in the PM peak hour. In the AM peak hour, however, delay increases and LOS decreases (overall and for side street approaches) for each build option. Side street delay increases significantly for the "A" options in which a MUT is not provided at the CSAH 44 intersection, resulting in side street approach LOS E.

By incorporating the revised signal timing, side street delay was reduced from both Option 1A and Option 2A during the AM peak hour at the West Circle Drive & TH 14 Eastbound Ramp intersection. During the AM peak hour, side street approach LOS improved from LOS E in Option 1A and 2A to LOS D with the optimized timing.

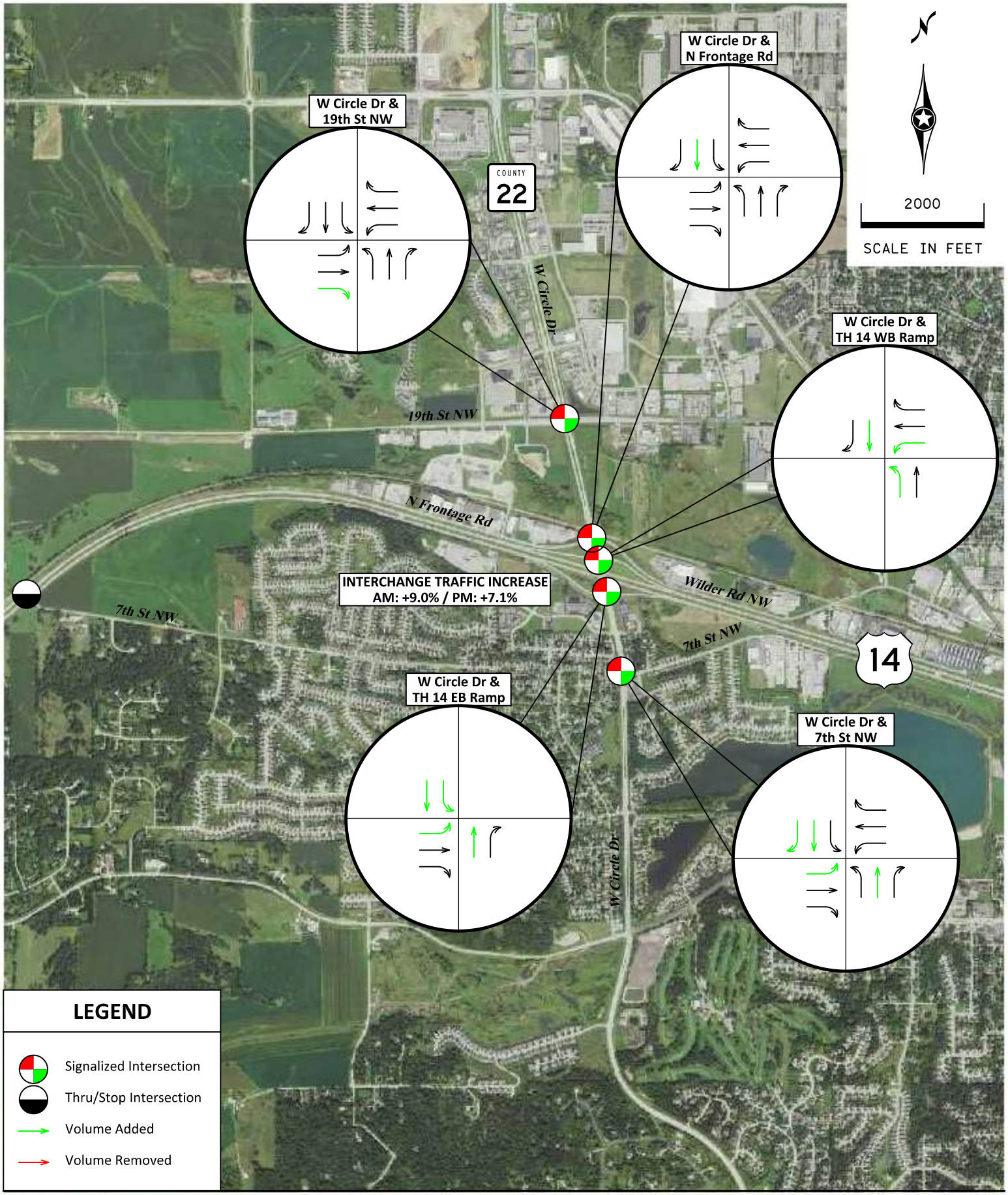
Despite the revised timing, turn lane queuing between the two ramp intersections will continue to be a concern with 95th percentile queues exceeding storage capacity and average queues at capacity. Additional information regarding the optimized signal timing can be found in **Appendix B** of this report. Specifically, the following results are provided for specific movements at each intersection:

<u>West Circle Drive & TH 14 Westbound Ramp</u>

- The northbound left turn has a storage capacity of 180 feet. During the PM peak, it operates at a low-performing LOS D or LOS E with average queues that are approximately half the available storage. With added diversion traffic, it declines to LOS F with an average queue that exceeds the available storage. With the revised timings the average queues remain below, with only 95th percentile queues exceeding the provided storage capacity.
- The westbound left turn does not have a dedicated lane, but the adjacent right turn lane has approximately 300 feet of storage capacity. During the PM peak, the westbound through movement operates at LOS E with average queues that are approximately 85% of the available right turn storage. With added diversion traffic, it declines to LOS F with an average queue that exceeds the available right turn storage. With the revised timings, the delay is reduced but the approach remains at LOS F and the average queue still exceeds the available right turn storage.

West Circle Drive & TH 14 Eastbound Ramp

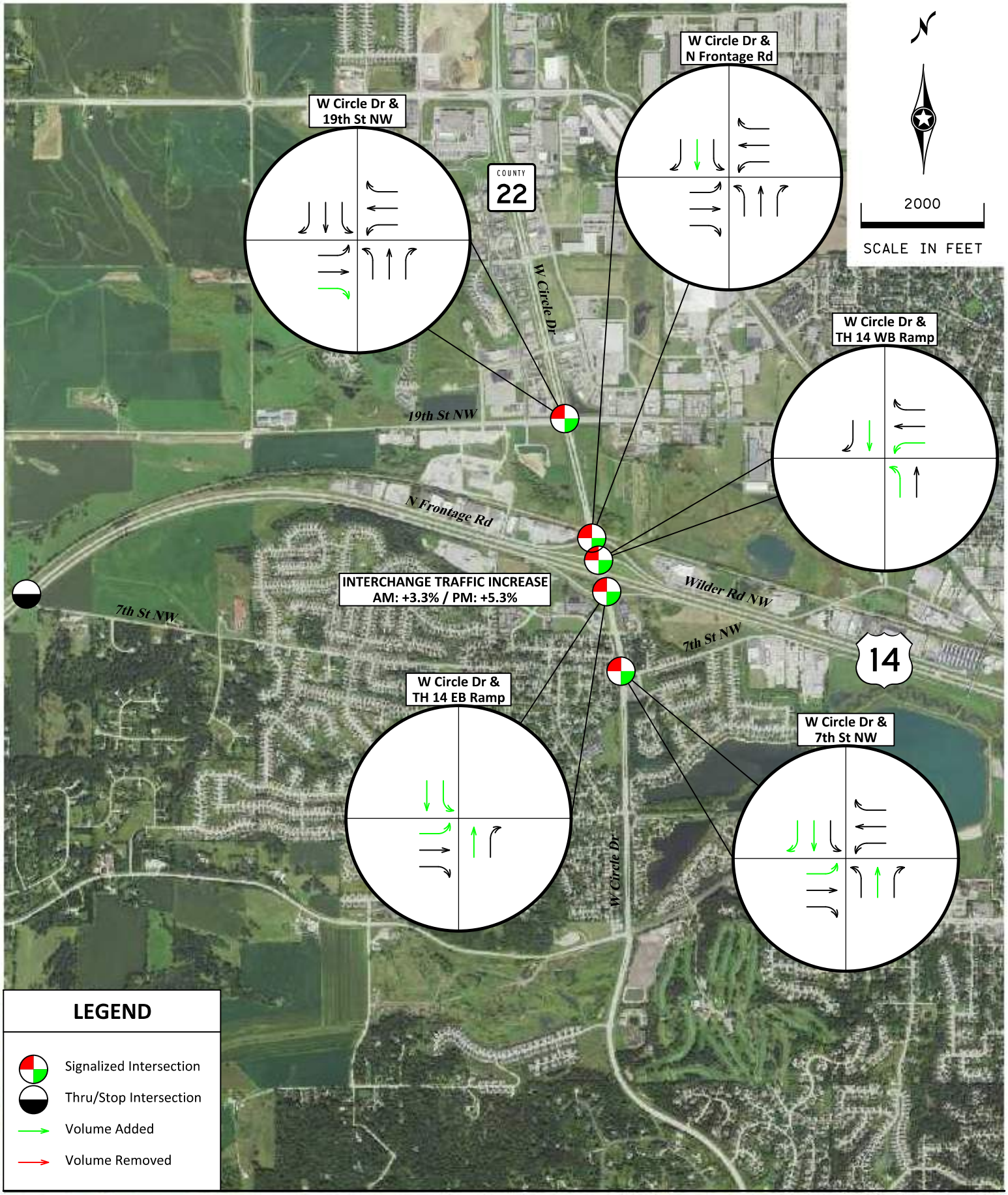
- The southbound left has a storage capacity of 240 feet. During the AM peak, it operates at LOS C with average queues that are within the available storage. With added diversion traffic, it declines to LOS D with an average queue that is at approximately 85% of the available storage. With the revised timings, it operates at a low-performing LOS D or LOS E with average queues slightly beyond the available storage.
- The eastbound left turn does not have a dedicated lane, but the adjacent right turn lane has approximately 340 feet of storage. During both the AM and PM peaks, it operates at LOS D with average queues that match the available storage. With the added diversion traffic it declines to LOS E during the AM peak with an average queue that slightly exceeds the right turn storage. With the revised timings, the delay is closer to existing with an average queue that is slightly less than the available right turn storage.



TH 14 Access Analysis

ALLIANT

Figure 10
Option A Interchange Traffic Increase
AM: +9.0% / PM: +7.1%



TH 14 Access Analysis

ALLIANT

Figure 11
Option B Interchange Traffic Increase
AM: +3.3% / PM: +5.3%

Results of the traffic operations analysis for the 19th Street NW, 7th Street NW, and N Frontage Road intersections are shown in **Table 9**, **Table 10**, and **Table 11**, respectively.

Table 9. West Circle Drive & 19th Street NW Analysis Summary

Alternative	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
Existing Conditions	C / D	23.5 / 45.6	C / D	32.3 / 44.5
Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure	C / D	23.2 / 44.1	C / D	33.2 / 44.8
Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure	C / D	23.5 / 45.1	C / D	32.7 / 45.4
Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure	C / D	23.5 / 45.1	C / D	33.0 / 44.8
Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure	C / D	24.0 / 45.3	C / D	32.8 / 45.8
Optimized - CSAH 44 Median Closure / 7th Street Median Closure	C / D	23.8 / 45.8	C / D	33.1 / 43.8

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

Table 10. West Circle Drive & 7th Street NW Analysis Summary

Alternative	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
Existing Conditions	C / C	23.0 / 33.9	C / D	20.5 / 44.7
Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure	C / C	23.8 / 33.8	C / D	23.3 / 43.7
Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure	C / D	24.2 / 39.1	C / D	22.5 / 44.0
Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure	C / D	24.6 / 38.7	C / D	23.9 / 46.3
Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure	C / D	23.8 / 35.6	C / D	23.4 / 45.0
Optimized - CSAH 44 Median Closure / 7th Street Median Closure	C / D	24.9 / 35.2	C / D	24.5 / 44.1

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

Table 11. West Circle Drive & N Frontage Road Analysis Summary

Alternative	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
Existing Conditions	A / D	7.7 / 39.8	B / D	17.0 / 45.3
Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure	A / D	8.4 / 41.5	C / D	20.4 / 51.4
Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure	A / D	8.4 / 42.1	B / D	19.7 / 46.0
Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure	A / D	8.3 / 40.2	C / D	21.7 / 46.3
Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure	A / D	8.2 / 41.2	B / D	19.7 / 47.0
Optimized - CSAH 44 Median Closure / 7th Street Median Closure	A / D	9.3 / 47.9	C / E	26.5 / 55.4

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

Results of the traffic operations analysis for the remaining intersections, TH 14 Westbound Ramp and TH 14 Eastbound Ramp, are shown in **Table 12** and **Table 13**, respectively.

Table 12. West Circle Drive & TH 14 Westbound Ramp Analysis Summary

Alternative	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
Existing Conditions	B / C	12.7 / 30.6	B / D	14.9 / 41.0
Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure	B / C	16.3 / 32.5	C / F	30.5 / 82.4
Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure	B / C	13.3 / 30.8	C / E	21.1 / 55.0
Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure	B / C	15.9 / 32.6	C / E	30.4 / 74.5
Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure	B / C	13.2 / 29.5	C / E	24.1 / 69.9
Optimized - CSAH 44 Median Closure / 7th Street Median Closure	B / D	18.6 / 39.9	C / E	24.9 / 56.1

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

Table 13. West Circle Drive & TH 14 Eastbound Ramp Analysis Summary

Alternative	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
Existing Conditions	B / B	13.4 / 16.2	B / B	13.6 / 17.6
Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure	C / E	27.9 / 56.9	B / D	19.8 / 42.5
Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure	C / D	20.7 / 35.4	B / D	16.6 / 42.1
Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure	C / E	28.1 / 56.8	B / D	19.7 / 44.1
Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure	C / D	22.1 / 38.3	B / D	16.5 / 45.0
Optimized - CSAH 44 Median Closure / 7th Street Median Closure	C / D	29.9 / 49.5	B / D	19.0 / 42.3

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

7. Recommendations

The selection of the recommended option for the TH 14 intersections with CSAH 3, CSAH 44, and 7th Street NW is made based upon discussions with MnDOT District 6, results of the intersection operations analyses, and consideration of potential impacts to adjacent intersections along West Circle Drive. Based on the information presented in this technical memorandum Option 1B: CSAH 3 RCI / CSAH 44 Partial MUT / 7th Street Median Closure is recommended, providing a safety benefit to the overall corridor while minimizing impacts to traffic operations.

7.1 TH 14 & CSAH 3

Although both geometric alternatives (RCI and MUT) would have similar LOS and side street approach delay, the RCI is recommended as it does not restrict TH 14 left turning traffic and typically the mainline left turns are not a safety concern at rural through/stop intersections. Both the RCI and the MUT at CSAH 3 maintain the existing overall LOS A while improving side street performance in comparison to the existing conditions. Side street approach LOS improves from LOS F to LOS D in the AM peak hour and from LOS D to LOS C in the PM peak hour for each of the build options. Furthermore, changes at the CSAH 3 intersection do not have any significant traffic impacts to the TH 14 & West Circle Drive interchange.

7.2 TH 14 & CSAH 44

Both geometric alternatives at CSAH 44 maintain the existing overall LOS A and improve side street delay and LOS compared to the existing conditions, however, the traffic operations analysis shows that options that do not include a MUT for eastbound TH 14 would result in greater impacts to the West Circle Drive interchange. As a result, the Partial MUT is recommended.

7.3 TH 14 & 7th Street NW

All four options include a median closure at the TH 14 intersection with 7th Street NW. Traffic operations are expected to perform at overall LOS A under all options, as restricted movements would utilize alternative routes. Minimal impacts to the adjacent roadway network would be expected as the diverted traffic volumes are relatively low.

7.4 West Circle Drive Interchange

Traffic at the CSAH 44 and 7th Street NW intersections would likely be diverted through the West Circle Drive and TH 14 interchange which will have operational impact, including queue spillback and increased delays, if the existing signal timing is not adjusted. Including a MUT at the TH 14 and CSAH 44 intersection will lessen the impact on the West Circle Drive and TH 14 interchange and is recommended (Option 1B and 2B).

Signal timing could be revised as a result of the increase in traffic. The timing revision alternative evaluated under worst case diversion traffic conditions would lessen the impact, but operational issues would remain. Timing revisions need to balance ramp demands with through traffic along the corridor. Broader corridor signal retiming is recommended if access modifications at CSAH 3, CSAH 44, and 7th Street NW are implemented, to account for new traffic patterns and demand.

Appendix

Appendix A: Detailed Traffic Operations Analysis Results
Appendix B: West Circle Drive & TH 14 Ramps Revised Signal Timings

Appendix A – Detailed Traffic Operations Analysis Results

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TH 14 Access Analysis - Measures of Effectiveness Summary

West Circle Drive & 19th Street NW

Alternative	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
Existing Conditions	C / D	23.5 / 45.6	C / D	32.3 / 44.5
Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure	C / D	23.2 / 44.1	C / D	33.2 / 44.8
Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure	C / D	23.5 / 45.1	C / D	32.7 / 45.4
Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure	C / D	23.5 / 45.1	C / D	33.0 / 44.8
Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure	C / D	24.0 / 45.3	C / D	32.8 / 45.8
Optimized - CSAH 44 Median Closure / 7th Street Median Closure	C / D	23.8 / 45.8	C / D	33.1 / 43.8

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

West Circle Drive & N Frontage Road

Alternative	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
Existing Conditions	A / D	7.7 / 39.8	B / D	17.0 / 45.3
Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure	A / D	8.4 / 41.5	C / D	20.4 / 51.4
Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure	A / D	8.4 / 42.1	B / D	19.7 / 46.0
Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure	A / D	8.3 / 40.2	C / D	21.7 / 46.3
Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure	A / D	8.2 / 41.2	B / D	19.7 / 47.0
Optimized - CSAH 44 Median Closure / 7th Street Median Closure	A / D	9.3 / 47.9	C / E	26.5 / 55.4

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

West Circle Drive & TH 14 WB Ramp

Alternative	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
Existing Conditions	B / C	12.7 / 30.6	B / D	14.9 / 41.0
Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure	B / C	16.3 / 32.5	C / F	30.5 / 82.4
Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure	B / C	13.3 / 30.8	C / E	21.1 / 55.0
Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure	B / C	15.9 / 32.6	C / E	30.4 / 74.5
Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure	B / C	13.2 / 29.5	C / E	24.1 / 69.9
Optimized - CSAH 44 Median Closure / 7th Street Median Closure	B / D	18.6 / 39.9	C / E	24.9 / 56.1

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

West Circle Drive & TH 14 EB Ramp

Alternative	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
Existing Conditions	B / B	13.4 / 16.2	B / B	13.6 / 17.6
Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure	C / E	27.9 / 56.9	B / D	19.8 / 42.5
Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure	C / D	20.7 / 35.4	B / D	16.6 / 42.1
Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure	C / E	28.1 / 56.8	B / D	19.7 / 44.1
Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure	C / D	22.1 / 38.3	B / D	16.5 / 45.0
Optimized - CSAH 44 Median Closure / 7th Street Median Closure	C / D	29.9 / 49.5	B / D	19.0 / 42.3

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

West Circle Drive & 7th Street NW

Alternative	AM Peak Hour		PM Peak Hour	
	LOS	Delay (s)	LOS	Delay (s)
Existing Conditions	C / C	23.0 / 33.9	C / D	20.5 / 44.7
Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure	C / C	23.8 / 33.8	C / D	23.3 / 43.7
Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure	C / D	24.2 / 39.1	C / D	22.5 / 44.0
Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure	C / D	24.6 / 38.7	C / D	23.9 / 46.3
Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure	C / D	23.8 / 35.6	C / D	23.4 / 45.0
Optimized - CSAH 44 Median Closure / 7th Street Median Closure	C / D	24.9 / 35.2	C / D	24.5 / 44.1

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Approach Delay

Existing Conditions - AM Peak Hour

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 19th Street NW	Movement Delay (sec/veh)	57.4	56.4	7.1	53.1	39.1	8.8	28.7	11.9	6.4	55.2	30.0	4.5	23.5
	Total Delay (hr)	0.3	1.5	0.2	2.6	0.9	0.1	1.9	2.9	0.4	1.0	3.7	0.0	15.5
	Travel Time (hr)	0.5	2.3	1.4	3.5	1.2	0.2	3.8	8.9	2.2	2.6	14.0	0.5	41.1
	Movement LOS	E	E	A	D	D	A	C	B	A	E	C	A	C
	Movement Volume	19	95	120	182	79	23	237	864	216	61	423	16	2335
	Maximum Queue (ft)	39	151	70	139	87	37	234	173	80	137	200	26	
	Average Queue (ft)	8	64	24	71	25	5	108	67	29	48	96	4	
	Movement 95th Queue (ft)	26	128	55	126	61	20	193	137	61	103	163	17	
	Storage Bay Distance (ft)	150	0	510	510	0	690	350	0	350	390	0	390	
	Approach Delay (sec/veh)	31.2			45.6			14.0			32.3			
	Approach LOS	C			D			B			C			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & N Frontage Road	Movement Delay (sec/veh)	45.7	46.2	8.9	49.8	45.1	13.4	12.4	3.6	1.5	20.4	6.6	4.4	7.7
	Total Delay (hr)	0.2	0.1	0.1	1.2	0.2	0.1	0.4	1.2	0.1	0.4	1.2	0.0	5.2
	Travel Time (hr)	0.3	0.2	0.4	1.9	0.3	0.5	0.7	3.3	0.3	1.0	6.0	0.2	15.1
	Movement LOS	D	D	A	D	D	B	B	A	A	C	A	A	A
	Movement Volume	15	11	49	86	16	36	127	1265	143	63	643	21	2475
	Maximum Queue (ft)	68	68	68	167	167	65	124	147	0	84	67	18	
	Average Queue (ft)	19	19	20	74	74	19	50	61	0	32	13	1	
	Movement 95th Queue (ft)	55	55	48	144	144	46	95	122	0	70	45	11	
	Storage Bay Distance (ft)	0	0	30	0	0	290	300	0	0	380	0	460	
	Approach Delay (sec/veh)	21.7			39.8			4.1			7.7			
	Approach LOS	C			D			A			A			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 WB Ramp	Movement Delay (sec/veh)	0.0	0.0	0.0	39.3	43.0	25.7	11.4	7.4	0.0	0.0	7.1	1.5	12.7
	Total Delay (hr)	0.0	0.0	0.0	2.4	0.1	2.8	0.2	2.3	0.0	0.0	1.3	0.0	9.1
	Travel Time (hr)	0.0	0.0	0.0	4.2	0.1	6.5	0.4	5.5	0.0	0.0	2.4	0.2	19.3
	Movement LOS	A	A	A	D	D	C	B	A	A	A	A	A	B
	Movement Volume	0	0	0	215	4	393	49	1142	0	0	698	79	2580
	Maximum Queue (ft)	0	0	0	291	291	328	82	160	0	0	149	0	
	Average Queue (ft)	0	0	0	147	147	164	28	71	0	0	60	0	
	Movement 95th Queue (ft)	0	0	0	250	250	285	65	150	0	0	122	0	
	Storage Bay Distance (ft)	0	0	0	0	0	300	180	0	0	0	0	0	
	Approach Delay (sec/veh)	0.0			30.6			7.6			6.5			
	Approach LOS	A			C			A			A			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 EB Ramp	Movement Delay (sec/veh)	46.2	3.4	9.1	0.0	0.0	0.0	0.0	18.8	8.7	29.3	7.9	0.0	13.4
	Total Delay (hr)	3.7	1.3	0.2	0.0	0.0	0.0	0.0	4.7	0.7	2.3	1.4	0.0	14.3
	Travel Time (hr)	6.5	7.4	0.8	0.0	0.0	0.0	0.0	7.0	2.0	3.4	3.2	0.0	30.3
	Movement LOS	D	A	A	A	A	A	A	B	A	C	A	A	B
	Movement Volume	292	1384	63	0	0	0	0	900	310	289	623	0	3861
	Maximum Queue (ft)	323	323	60	0	0	0	0	326	221	297	183	0	
	Average Queue (ft)	191	191	22	0	0	0	0	153	73	132	70	0	
	Movement 95th Queue (ft)	284	284	46	0	0	0	0	248	147	252	139	0	
	Storage Bay Distance (ft)	0	0	340	0	0	0	0	0	300	240	0	0	
	Approach Delay (sec/veh)	10.8			0.0			16.2			14.7			
	Approach LOS	B			A			B			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 7th Street NW	Movement Delay (sec/veh)	37.4	43.6	8.2	22.5	24.7	8.2	18.2	26.9	7.3	24.1	13.0	1.5	23.0
	Total Delay (hr)	4.4	0.0	0.1	0.1	0.0	0.3	0.2	5.1	0.1	1.0	1.8	0.0	13.1
	Travel Time (hr)	6.4	0.1	0.5	0.3	0.0	1.6	1.0	21.0	0.7	1.5	3.0	0.2	36.3
	Movement LOS	D	D	A	C	C	A	B	C	A	C	B	A	C
	Movement Volume	428	5	61	15	1	105	34	676	23	143	490	53	2034
	Maximum Queue (ft)	432	432	216	55	55	94	50	269	43	181	147	52	
	Average Queue (ft)	232	232	33	9	9	32	17	136	8	68	70	13	
	Movement 95th Queue (ft)	368	368	139	33	33	70	40	226	26	142	119	40	
	Storage Bay Distance (ft)	0	0	160	0	0	30	360	0	360	250	0	340	
	Approach Delay (sec/veh)	33.9			10.1			25.9			14.4			
	Approach LOS	C			B			C			B			

Existing Conditions - PM Peak Hour

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 19th Street NW	Movement Delay (sec/veh)	55.7	59.7	19.7	46.9	40.9	6.0	34.9	15.7	9.1	63.3	41.4	7.5	32.3
	Total Delay (hr)	0.6	1.5	1.1	5.4	0.6	0.0	2.2	3.2	0.6	1.5	9.5	0.0	26.2
	Travel Time (hr)	0.9	2.3	3.1	7.4	0.8	0.1	4.1	8.2	2.6	3.7	28.6	0.6	62.4
	Movement LOS	E	E	B	D	D	A	C	B	A	E	D	A	C
	Movement Volume	37	89	192	401	57	20	220	686	234	89	804	18	2847
	Maximum Queue (ft)	49	176	156	245	67	29	285	152	126	184	330	38	
	Average Queue (ft)	12	68	69	150	15	5	127	58	39	67	210	6	
	Movement 95th Queue (ft)	35	131	132	225	45	19	233	116	89	137	306	24	
	Storage Bay Distance (ft)	150	0	510	510	0	690	350	0	350	390	0	390	
	Approach Delay (sec/veh)		35.1			44.5			18.1			42.9		
	Approach LOS		D			D			B			D		

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & N Frontage Road	Movement Delay (sec/veh)	34.9	35.7	22.0	52.5	64.0	14.6	40.7	6.2	1.5	24.2	17.3	10.7	17.0
	Total Delay (hr)	0.2	0.1	0.7	4.4	0.2	0.3	0.4	1.9	0.0	0.3	6.5	0.0	15.0
	Travel Time (hr)	0.4	0.2	1.5	6.7	0.3	0.9	0.5	3.6	0.2	0.6	16.8	0.1	31.8
	Movement LOS	C	D	C	D	E	B	D	A	A	C	B	B	B
	Movement Volume	26	11	119	280	9	71	38	1044	114	42	1344	12	3110
	Maximum Queue (ft)	132	132	111	336	336	136	87	194	0	71	239	16	
	Average Queue (ft)	36	36	50	212	212	33	33	74	0	20	106	1	
	Movement 95th Queue (ft)	92	92	91	317	317	111	73	160	0	50	207	11	
	Storage Bay Distance (ft)	0	0	30	0	0	290	300	0	0	380	0	460	
	Approach Delay (sec/veh)		25.1			45.3			6.8			17.5		
	Approach LOS		C			D			A			B		

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 WB Ramp	Movement Delay (sec/veh)	0.0	0.0	0.0	55.0	58.1	22.9	54.0	6.6	0.0	0.0	9.5	2.4	14.9
	Total Delay (hr)	0.0	0.0	0.0	4.5	0.6	1.7	1.5	1.8	0.0	0.0	3.6	0.2	13.9
	Travel Time (hr)	0.0	0.0	0.0	7.0	0.8	4.3	1.9	4.4	0.0	0.0	5.9	0.9	25.2
	Movement LOS	A	A	A	D	E	C	D	A	A	A	A	A	B
	Movement Volume	0	0	0	295	33	259	109	936	0	0	1388	355	3375
	Maximum Queue (ft)	0	0	0	524	524	362	162	124	0	0	260	24	
	Average Queue (ft)	0	0	0	255	255	134	81	55	0	0	153	1	
	Movement 95th Queue (ft)	0	0	0	424	424	292	152	107	0	0	250	17	
	Storage Bay Distance (ft)	0	0	0	0	0	300	180	0	0	0	0	0	
	Approach Delay (sec/veh)		0.0			41.0			11.5			8.1		
	Approach LOS		A			D			B			A		

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 EB Ramp	Movement Delay (sec/veh)	50.6	1.2	15.8	0.0	0.0	0.0	0.0	20.0	8.1	26.1	6.1	0.0	13.6
	Total Delay (hr)	2.5	0.2	0.3	0.0	0.0	0.0	0.0	4.9	0.5	3.2	2.1	0.0	13.7
	Travel Time (hr)	4.2	2.7	0.9	0.0	0.0	0.0	0.0	7.2	1.4	4.7	5.6	0.0	26.7
	Movement LOS	D	A	B	A	A	A	A	B	A	C	A	A	B
	Movement Volume	170	568	63	0	0	0	0	876	221	433	1249	0	3580
	Maximum Queue (ft)	257	257	85	0	0	0	0	259	127	336	248	0	
	Average Queue (ft)	141	141	31	0	0	0	0	162	54	193	78	0	
	Movement 95th Queue (ft)	218	218	69	0	0	0	0	243	105	335	177	0	
	Storage Bay Distance (ft)	0	0	340	0	0	0	0	0	300	240	0	0	
	Approach Delay (sec/veh)		12.8			0.0			17.6			11.2		
	Approach LOS		B			A			B			B		

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 7th Street NW	Movement Delay (sec/veh)	50.1	45.9	10.1	38.0	31.7	9.0	22.9	21.3	7.3	16.5	17.3	6.6	20.5
	Total Delay (hr)	4.1	0.2	0.1	0.3	0.1	0.4	0.4	4.0	0.1	0.6	4.0	0.6	14.9
	Travel Time (hr)	5.7	0.2	0.4	0.6	0.2	2.3	2.0	19.6	0.6	1.1	6.3	2.1	41.1
	Movement LOS	D	D	B	D	C	A	C	C	A	B	B	A	C
	Movement Volume	296	14	47	28	11	152	70	648	23	127	840	346	2602
	Maximum Queue (ft)	392	392	260	135	135	116	77	215	34	135	286	184	
	Average Queue (ft)	218	218	32	28	28	43	31	121	6	51	151	67	
	Movement 95th Queue (ft)	351	351	138	82	82	86	64	201	23	100	247	125	
	Storage Bay Distance (ft)	0	0	160	0	0	30	360	0	360	250	0	340	
	Approach Delay (sec/veh)		44.7			14.6			21.0			14.4		
	Approach LOS		D			B			C			B		

Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure - AM Peak Hour

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 19th Street NW	Movement Delay (sec/veh)	49.9	53.5	7.9	50.4	39.8	8.7	24.3	11.7	6.7	58.4	34.6	4.3	23.2
	Total Delay (hr)	0.3	1.6	0.4	2.5	0.9	0.1	1.6	2.8	0.4	0.9	4.1	0.0	15.6
	Travel Time (hr)	0.4	2.4	2.4	3.4	1.2	0.2	3.5	8.9	2.3	2.3	14.1	0.5	41.6
	Movement LOS	D	D	A	D	D	A	C	B	A	E	C	A	C
	Movement Volume	19	95	185	182	79	23	237	864	216	61	423	16	2400
	Maximum Queue (ft)	31	154	106	138	78	25	208	148	83	116	233	21	
	Average Queue (ft)	7	68	37	67	23	6	97	71	31	43	107	5	
	Movement 95th Queue (ft)	23	126	80	121	58	19	170	133	64	93	187	18	
	Storage Bay Distance (ft)	150	0	510	510	0	690	350	0	350	390	0	390	
	Approach Delay (sec/veh)	25.1			44.1			13.1			36.5			
	Approach LOS	C			D			B			D			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & N Frontage Road	Movement Delay (sec/veh)	40.8	49.9	8.1	52.6	48.7	11.8	15.2	3.7	1.5	21.5	8.0	3.8	8.4
	Total Delay (hr)	0.2	0.2	0.1	1.2	0.2	0.1	0.5	1.3	0.1	0.4	1.6	0.0	5.9
	Travel Time (hr)	0.2	0.2	0.5	1.9	0.4	0.5	0.9	3.4	0.3	0.9	7.0	0.2	16.4
	Movement LOS	D	D	A	D	D	B	B	A	A	C	A	A	A
	Movement Volume	15	11	49	86	16	36	127	1265	143	63	708	21	2540
	Maximum Queue (ft)	74	74	58	147	147	50	128	152	0	100	84	29	
	Average Queue (ft)	18	18	19	71	71	16	56	60	0	31	24	1	
	Movement 95th Queue (ft)	55	55	43	127	127	41	103	116	0	71	64	13	
	Storage Bay Distance (ft)	0	0	30	0	0	290	300	0	0	380	0	460	
	Approach Delay (sec/veh)	20.8			41.5			4.4			9.0			
	Approach LOS	C			D			A			A			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 WB Ramp	Movement Delay (sec/veh)	0.0	0.0	0.0	36.4	44.3	30.1	29.9	8.3	0.0	0.0	12.2	1.5	16.3
	Total Delay (hr)	0.0	0.0	0.0	2.3	0.0	3.2	2.0	2.6	0.0	0.0	2.6	0.0	12.7
	Travel Time (hr)	0.0	0.0	0.0	4.2	0.0	6.8	2.8	6.1	0.0	0.0	3.7	0.2	23.8
	Movement LOS	A	A	A	D	D	C	C	A	A	A	B	A	B
	Movement Volume	0	0	0	228	4	393	238	1142	0	0	762	79	2846
	Maximum Queue (ft)	0	0	0	328	328	349	266	250	0	0	212	0	
	Average Queue (ft)	0	0	0	152	152	180	132	92	0	0	96	0	
	Movement 95th Queue (ft)	0	0	0	281	281	312	238	200	0	0	175	0	
	Storage Bay Distance (ft)	0	0	0	0	0	300	180	0	0	0	0	0	
	Approach Delay (sec/veh)	0.0			32.5			12.0			11.2			
	Approach LOS	A			C			B			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 EB Ramp	Movement Delay (sec/veh)	62.8	67.4	14.2	0.0	0.0	0.0	0.0	22.5	9.7	50.2	10.4	0.0	27.9
	Total Delay (hr)	8.3	0.0	0.3	0.0	0.0	0.0	0.0	5.8	0.9	4.6	1.9	0.0	21.8
	Travel Time (hr)	10.8	0.0	0.7	0.0	0.0	0.0	0.0	8.2	2.1	5.7	3.9	0.0	31.4
	Movement LOS	E	E	B	A	A	A	A	C	A	D	B	A	C
	Movement Volume	452	1	63	0	0	0	0	929	310	331	660	0	2746
	Maximum Queue (ft)	596	596	439	0	0	0	0	280	176	339	300	0	
	Average Queue (ft)	356	356	55	0	0	0	0	171	77	204	113	0	
	Movement 95th Queue (ft)	590	590	251	0	0	0	0	254	139	354	251	0	
	Storage Bay Distance (ft)	0	0	340	0	0	0	0	0	300	240	0	0	
	Approach Delay (sec/veh)	56.9			0.0			19.3			23.7			
	Approach LOS	E			A			B			C			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 7th Street NW	Movement Delay (sec/veh)	37.1	42.5	8.8	20.0	24.5	7.5	21.9	27.9	6.7	25.8	14.9	1.9	23.8
	Total Delay (hr)	4.8	0.1	0.1	0.1	0.0	0.2	0.2	5.4	0.0	1.0	2.2	0.0	14.1
	Travel Time (hr)	7.0	0.1	0.5	0.2	0.0	1.4	1.0	21.6	0.7	1.6	3.6	0.2	37.9
	Movement LOS	D	D	A	B	C	A	C	C	A	C	B	A	C
	Movement Volume	448	5	61	15	1	105	34	685	23	143	520	59	2099
	Maximum Queue (ft)	504	504	260	44	44	79	64	258	47	187	155	58	
	Average Queue (ft)	263	263	40	6	6	28	18	145	8	65	77	15	
	Movement 95th Queue (ft)	419	419	163	24	24	59	49	235	27	126	137	42	
	Storage Bay Distance (ft)	0	0	160	0	0	30	360	0	360	250	0	340	
	Approach Delay (sec/veh)	33.8			9.2			27.0			16.0			
	Approach LOS	C			A			C			B			

Option 1A - CSAH 3 RCI / CSAH 44 Median Closure / 7th Street Median Closure - PM Peak Hour

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 19th Street NW	Movement Delay (sec/veh)	62.6	56.9	25.3	46.0	39.7	5.9	39.0	15.4	8.8	61.5	43.8	8.0	33.2
	Total Delay (hr)	0.6	1.4	1.7	5.2	0.7	0.0	2.4	3.0	0.6	1.5	10.2	0.0	27.3
	Travel Time (hr)	1.0	2.1	4.3	7.2	0.9	0.1	4.3	7.8	2.7	3.6	29.6	0.5	64.1
	Movement LOS	E	E	C	D	D	A	D	B	A	E	D	A	C
	Movement Volume	37	89	256	401	57	20	220	686	234	89	804	18	2911
	Maximum Queue (ft)	64	129	204	252	57	33	297	162	107	178	388	38	
	Average Queue (ft)	15	59	92	144	16	4	126	58	41	69	226	7	
	Movement 95th Queue (ft)	42	117	160	220	43	17	239	117	87	137	341	24	
	Storage Bay Distance (ft)	150	0	510	510	0	690	350	0	350	390	0	390	
	Approach Delay (sec/veh)	36.3			43.6			18.6			44.8			
	Approach LOS	D			D			B			D			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & N Frontage Road	Movement Delay (sec/veh)	37.6	33.9	26.5	60.0	63.4	15.9	36.6	5.9	1.6	25.5	23.3	9.2	20.4
	Total Delay (hr)	0.2	0.1	0.8	4.5	0.2	0.3	0.4	1.8	0.1	0.3	9.2	0.0	17.9
	Travel Time (hr)	0.3	0.2	1.6	6.6	0.2	1.0	0.5	3.4	0.2	0.7	19.9	0.1	34.7
	Movement LOS	D	C	C	E	E	B	D	A	A	C	C	A	C
	Movement Volume	26	11	119	280	9	71	38	1044	114	42	1408	12	3174
	Maximum Queue (ft)	156	156	116	402	402	151	90	186	0	67	311	20	
	Average Queue (ft)	38	38	55	220	220	37	33	66	0	23	142	2	
	Movement 95th Queue (ft)	103	103	99	367	367	132	70	144	0	54	271	13	
	Storage Bay Distance (ft)	0	0	30	0	0	290	300	0	0	380	0	460	
	Approach Delay (sec/veh)	28.9			51.4			6.5			23.2			
	Approach LOS	C			D			A			C			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 WB Ramp	Movement Delay (sec/veh)	0.0	0.0	0.0	98.3	108.7	56.0	97.9	7.8	0.0	0.0	17.2	2.9	30.5
	Total Delay (hr)	0.0	0.0	0.0	10.8	1.1	4.1	6.3	2.1	0.0	0.0	6.9	0.3	31.6
	Travel Time (hr)	0.0	0.0	0.0	13.9	1.4	6.5	7.1	4.8	0.0	0.0	9.1	0.9	43.7
	Movement LOS	A	A	A	F	F	E	F	A	A	A	B	A	C
	Movement Volume	0	0	0	376	33	259	226	937	0	0	1470	335	3636
	Maximum Queue (ft)	0	0	0	946	946	400	278	311	0	0	260	141	
	Average Queue (ft)	0	0	0	510	510	233	207	103	0	0	218	12	
	Movement 95th Queue (ft)	0	0	0	1045	1045	480	292	244	0	0	284	80	
	Storage Bay Distance (ft)	0	0	0	0	0	300	180	0	0	0	0	0	
	Approach Delay (sec/veh)	0.0			82.4			25.3			14.5			
	Approach LOS	A			F			C			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 EB Ramp	Movement Delay (sec/veh)	48.9	56.2	19.7	0.0	0.0	0.0	0.0	23.0	10.1	37.1	8.5	0.0	19.8
	Total Delay (hr)	3.3	0.0	0.4	0.0	0.0	0.0	0.0	6.1	0.7	4.7	3.2	0.0	18.4
	Travel Time (hr)	4.2	0.0	0.7	0.0	0.0	0.0	0.0	8.6	1.6	6.3	7.0	0.0	28.4
	Movement LOS	D	E	B	A	A	A	A	C	B	D	A	A	B
	Movement Volume	219	2	63	0	0	0	0	943	221	467	1360	0	3275
	Maximum Queue (ft)	319	319	81	0	0	0	0	295	148	340	480	0	
	Average Queue (ft)	168	168	24	0	0	0	0	184	60	218	148	0	
	Movement 95th Queue (ft)	267	267	59	0	0	0	0	272	111	382	348	0	
	Storage Bay Distance (ft)	0	0	340	0	0	0	0	0	300	240	0	0	
	Approach Delay (sec/veh)	42.5			0.0			20.6			15.8			
	Approach LOS	D			A			C			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 7th Street NW	Movement Delay (sec/veh)	47.7	50.1	12.7	30.5	30.1	9.1	25.9	23.3	6.0	18.0	23.7	8.0	23.3
	Total Delay (hr)	4.6	0.2	0.2	0.2	0.1	0.4	0.6	4.5	0.0	0.7	5.9	0.9	18.3
	Travel Time (hr)	6.2	0.3	0.5	0.5	0.2	2.4	2.5	20.4	0.6	1.1	8.3	2.5	45.5
	Movement LOS	D	D	B	C	C	A	C	C	A	B	C	A	C
	Movement Volume	344	14	47	28	11	152	70	668	23	127	907	390	2781
	Maximum Queue (ft)	433	433	260	73	73	115	95	238	27	152	304	184	
	Average Queue (ft)	233	233	44	20	20	45	39	128	6	58	202	82	
	Movement 95th Queue (ft)	376	376	173	49	49	87	76	213	23	116	296	144	
	Storage Bay Distance (ft)	0	0	160	0	0	30	360	0	360	250	0	340	
	Approach Delay (sec/veh)	43.7			13.4			23.0			18.9			
	Approach LOS	D			B			C			B			

Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure - AM Peak Hour

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 19th Street NW	Movement Delay (sec/veh)	50.9	50.1	8.4	51.8	40.0	9.9	28.0	12.3	6.5	59.6	33.0	3.7	23.5
	Total Delay (hr)	0.3	1.3	0.4	2.7	0.9	0.1	1.8	3.0	0.4	0.9	4.0	0.0	15.8
	Travel Time (hr)	0.5	2.0	2.4	3.7	1.1	0.1	3.8	9.0	2.3	2.3	14.4	0.5	42.1
	Movement LOS	D	D	A	D	D	A	C	B	A	E	C	A	C
	Movement Volume	19	95	185	182	79	23	237	864	216	61	423	16	2400
	Maximum Queue (ft)	32	143	111	140	67	36	228	155	80	111	193	22	
	Average Queue (ft)	7	54	41	71	22	6	99	74	31	46	104	5	
	Movement 95th Queue (ft)	22	112	84	122	53	20	181	136	65	94	175	18	
	Storage Bay Distance (ft)	150	0	510	510	0	690	350	0	350	390	0	390	
	Approach Delay (sec/veh)	24.3			45.1			14.2			35.3			
	Approach LOS	C			D			B			D			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & N Frontage Road	Movement Delay (sec/veh)	45.4	46.8	9.7	53.9	44.5	13.0	15.8	3.7	1.6	24.0	7.7	4.0	8.4
	Total Delay (hr)	0.2	0.1	0.1	1.4	0.2	0.1	0.6	1.3	0.1	0.4	1.6	0.0	6.1
	Travel Time (hr)	0.3	0.2	0.5	2.0	0.2	0.4	0.9	3.4	0.3	1.0	7.1	0.2	16.5
	Movement LOS	D	D	A	D	D	B	B	A	A	C	A	A	A
	Movement Volume	15	11	49	86	16	36	127	1265	143	63	708	21	2540
	Maximum Queue (ft)	65	65	60	187	187	65	133	149	0	104	103	33	
	Average Queue (ft)	19	19	20	76	76	16	57	58	0	35	22	3	
	Movement 95th Queue (ft)	53	53	44	150	150	44	110	118	0	78	67	21	
	Storage Bay Distance (ft)	0	0	30	0	0	290	300	0	0	380	0	460	
	Approach Delay (sec/veh)	22.3			42.1			4.5			8.9			
	Approach LOS	C			D			A			A			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 WB Ramp	Movement Delay (sec/veh)	0.0	0.0	0.0	39.7	31.6	25.6	12.6	7.5	0.0	0.0	9.0	1.4	13.3
	Total Delay (hr)	0.0	0.0	0.0	2.5	0.1	2.8	0.3	2.4	0.0	0.0	1.9	0.0	10.0
	Travel Time (hr)	0.0	0.0	0.0	4.4	0.1	6.4	0.5	5.6	0.0	0.0	3.1	0.2	20.3
	Movement LOS	A	A	A	D	C	C	B	A	A	A	A	A	B
	Movement Volume	0	0	0	228	4	393	69	1143	0	0	762	79	2678
	Maximum Queue (ft)	0	0	0	304	304	328	90	166	0	0	198	0	
	Average Queue (ft)	0	0	0	154	154	163	36	76	0	0	74	0	
	Movement 95th Queue (ft)	0	0	0	267	267	274	75	154	0	0	147	0	
	Storage Bay Distance (ft)	0	0	0	0	0	300	180	0	0	0	0	0	
	Approach Delay (sec/veh)	0.0			30.8			7.8			8.3			
	Approach LOS	A			C			A			A			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 EB Ramp	Movement Delay (sec/veh)	41.6	39.5	6.4	0.0	0.0	0.0	0.0	18.7	8.3	46.7	8.2	0.0	20.7
	Total Delay (hr)	3.3	0.0	0.1	0.0	0.0	0.0	0.0	4.8	0.7	4.4	1.5	0.0	14.8
	Travel Time (hr)	4.5	0.0	0.5	0.0	0.0	0.0	0.0	7.3	1.9	5.5	3.5	0.0	23.2
	Movement LOS	D	D	A	A	A	A	A	B	A	D	A	A	C
	Movement Volume	292	1	63	0	0	0	0	920	310	331	660	0	2577
	Maximum Queue (ft)	303	303	52	0	0	0	0	286	161	330	302	0	
	Average Queue (ft)	187	187	18	0	0	0	0	160	66	194	94	0	
	Movement 95th Queue (ft)	277	277	41	0	0	0	0	251	125	349	229	0	
	Storage Bay Distance (ft)	0	0	340	0	0	0	0	0	300	240	0	0	
	Approach Delay (sec/veh)	35.4			0.0			16.1			21.1			
	Approach LOS	D			A			B			C			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 7th Street NW	Movement Delay (sec/veh)	42.6	37.9	13.8	25.8	31.3	9.5	20.5	26.1	5.7	22.0	14.1	1.8	24.2
	Total Delay (hr)	5.4	0.1	0.2	0.1	0.0	0.3	0.2	5.0	0.0	0.9	2.1	0.0	14.3
	Travel Time (hr)	7.8	0.1	0.6	0.3	0.0	1.7	1.1	20.8	0.6	1.4	3.5	0.3	38.2
	Movement LOS	D	D	B	C	C	A	C	C	A	C	B	A	C
	Movement Volume	448	5	61	15	1	105	34	676	23	143	520	59	2090
	Maximum Queue (ft)	546	546	260	52	52	91	63	270	26	141	148	51	
	Average Queue (ft)	276	276	54	9	9	36	19	130	5	61	75	15	
	Movement 95th Queue (ft)	490	490	205	33	33	72	45	224	19	117	129	40	
	Storage Bay Distance (ft)	0	0	160	0	0	30	360	0	360	250	0	340	
	Approach Delay (sec/veh)	39.1			11.7			25.2			14.7			
	Approach LOS	D			B			C			B			

Option 1B - CSAH 3 RCI / CSAH 44 Partial-MUT / 7th Street Median Closure - PM Peak Hour

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 19th Street NW	Movement Delay (sec/veh)	59.5	57.1	25.2	48.3	39.4	4.6	33.7	14.8	8.4	61.6	43.1	7.8	32.7
	Total Delay (hr)	0.6	1.4	1.8	5.4	0.6	0.0	2.0	2.9	0.6	1.7	10.1	0.0	27.1
	Travel Time (hr)	0.9	2.2	4.5	7.4	0.8	0.1	3.8	7.7	2.6	4.0	29.9	0.5	64.4
	Movement LOS	E	E	C	D	D	A	C	B	A	E	D	A	C
	Movement Volume	37	89	256	401	57	20	220	686	234	89	804	18	2911
	Maximum Queue (ft)	47	146	219	255	62	33	240	143	94	257	356	31	
	Average Queue (ft)	13	63	101	151	15	4	119	54	38	79	222	5	
	Movement 95th Queue (ft)	34	126	185	232	44	18	199	107	78	172	329	19	
	Storage Bay Distance (ft)	150	0	510	510	0	690	350	0	350	390	0	390	
	Approach Delay (sec/veh)	36.0			45.4			17.1			44.2			
	Approach LOS	D			D			B			D			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & N Frontage Road	Movement Delay (sec/veh)	37.6	43.3	26.2	53.9	56.1	13.4	42.7	6.2	1.6	26.1	22.7	9.7	19.7
	Total Delay (hr)	0.3	0.2	0.8	4.0	0.1	0.3	0.5	1.8	0.0	0.3	9.0	0.0	17.3
	Travel Time (hr)	0.4	0.2	1.7	6.1	0.2	0.9	0.6	3.5	0.2	0.7	19.9	0.2	34.6
	Movement LOS	D	D	C	D	E	B	D	A	A	C	C	A	B
	Movement Volume	26	11	119	280	9	71	38	1044	114	42	1408	12	3174
	Maximum Queue (ft)	150	150	124	355	355	143	92	176	0	140	340	21	
	Average Queue (ft)	46	46	56	201	201	30	34	67	0	25	143	2	
	Movement 95th Queue (ft)	110	110	102	316	316	91	77	141	0	95	287	14	
	Storage Bay Distance (ft)	0	0	30	0	0	290	300	0	0	380	0	460	
	Approach Delay (sec/veh)	29.3			46.0			6.9			22.7			
	Approach LOS	C			D			A			C			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 WB Ramp	Movement Delay (sec/veh)	0.0	0.0	0.0	71.0	72.7	29.6	68.5	7.0	0.0	0.0	13.8	2.4	21.1
	Total Delay (hr)	0.0	0.0	0.0	7.4	0.6	2.2	2.9	1.8	0.0	0.0	5.7	0.2	20.8
	Travel Time (hr)	0.0	0.0	0.0	10.5	0.8	4.7	3.4	4.3	0.0	0.0	8.0	0.8	32.5
	Movement LOS	A	A	A	E	E	C	E	A	A	A	B	A	C
	Movement Volume	0	0	0	376	33	259	157	936	0	0	1470	335	3566
	Maximum Queue (ft)	0	0	0	709	709	400	224	142	0	0	255	30	
	Average Queue (ft)	0	0	0	354	354	197	124	64	0	0	197	2	
	Movement 95th Queue (ft)	0	0	0	604	604	424	196	118	0	0	284	29	
	Storage Bay Distance (ft)	0	0	0	0	0	300	180	0	0	0	0	0	
	Approach Delay (sec/veh)	0.0			55.0			15.8			11.7			
	Approach LOS	A			E			B			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 EB Ramp	Movement Delay (sec/veh)	50.6	27.5	19.7	0.0	0.0	0.0	0.0	19.5	8.7	29.7	6.9	0.0	16.6
	Total Delay (hr)	2.4	0.0	0.4	0.0	0.0	0.0	0.0	5.0	0.5	3.8	2.6	0.0	14.7
	Travel Time (hr)	3.1	0.0	0.7	0.0	0.0	0.0	0.0	7.4	1.4	5.4	6.5	0.0	24.5
	Movement LOS	D	C	B	A	A	A	A	B	A	C	A	A	B
	Movement Volume	170	2	63	0	0	0	0	925	221	467	1360	0	3208
	Maximum Queue (ft)	231	231	82	0	0	0	0	267	120	340	366	0	
	Average Queue (ft)	130	130	25	0	0	0	0	165	55	200	100	0	
	Movement 95th Queue (ft)	209	209	58	0	0	0	0	238	105	357	255	0	
	Storage Bay Distance (ft)	0	0	340	0	0	0	0	0	300	240	0	0	
	Approach Delay (sec/veh)	42.1			0.0			17.4			12.7			
	Approach LOS	D			A			B			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 7th Street NW	Movement Delay (sec/veh)	47.9	53.9	12.1	33.3	33.1	8.9	25.4	22.5	7.3	17.7	22.2	7.4	22.5
	Total Delay (hr)	4.4	0.2	0.1	0.2	0.1	0.4	0.5	4.2	0.1	0.6	5.7	0.8	17.3
	Travel Time (hr)	6.0	0.2	0.4	0.5	0.3	2.3	2.2	19.5	0.7	1.1	8.1	2.4	43.7
	Movement LOS	D	D	B	C	C	A	C	C	A	B	C	A	C
	Movement Volume	344	14	47	28	11	152	70	648	23	127	907	390	2761
	Maximum Queue (ft)	386	386	259	112	112	106	94	242	36	129	322	202	
	Average Queue (ft)	239	239	45	24	24	40	37	122	7	54	192	76	
	Movement 95th Queue (ft)	366	366	179	64	64	78	78	200	24	102	288	145	
	Storage Bay Distance (ft)	0	0	160	0	0	30	360	0	360	250	0	340	
	Approach Delay (sec/veh)	44.0			13.9			22.3			17.7			
	Approach LOS	D			B			C			B			

Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure - AM Peak Hour

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 19th Street NW	Movement Delay (sec/veh)	61.6	55.3	7.6	52.8	38.4	7.6	27.9	11.8	6.7	54.5	33.5	3.7	23.5
	Total Delay (hr)	0.4	1.5	0.4	2.8	0.8	0.1	1.9	2.8	0.4	0.9	3.9	0.0	15.9
	Travel Time (hr)	0.6	2.4	2.3	3.7	1.1	0.2	4.0	8.8	2.4	2.3	13.9	0.4	42.1
	Movement LOS	E	E	A	D	D	A	C	B	A	D	C	A	C
	Movement Volume	19	95	185	182	79	23	237	864	216	61	423	16	2400
	Maximum Queue (ft)	42	156	99	153	66	41	227	160	78	129	176	22	
	Average Queue (ft)	8	70	37	73	21	6	111	69	31	45	99	4	
	Movement 95th Queue (ft)	26	132	75	128	53	23	191	137	62	100	162	17	
	Storage Bay Distance (ft)	150	0	510	510	0	690	350	0	350	390	0	390	
	Approach Delay (sec/veh)	26.2			45.1			13.9			35.1			
	Approach LOS	C			D			B			D			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & N Frontage Road	Movement Delay (sec/veh)	43.8	48.7	7.4	50.4	47.4	12.6	14.5	3.9	1.6	22.1	7.6	3.9	8.3
	Total Delay (hr)	0.1	0.2	0.1	1.2	0.2	0.1	0.5	1.4	0.1	0.4	1.5	0.0	5.8
	Travel Time (hr)	0.2	0.2	0.5	1.9	0.3	0.4	0.8	3.5	0.3	1.0	6.9	0.2	16.2
	Movement LOS	D	D	A	D	D	B	B	A	A	C	A	A	A
	Movement Volume	15	11	49	86	16	36	127	1265	143	63	708	21	2540
	Maximum Queue (ft)	68	68	60	154	154	57	118	153	0	100	78	19	
	Average Queue (ft)	18	18	20	69	69	15	49	63	0	36	21	1	
	Movement 95th Queue (ft)	49	49	43	129	129	40	92	128	0	75	57	9	
	Storage Bay Distance (ft)	0	0	30	0	0	290	300	0	0	380	0	460	
	Approach Delay (sec/veh)	20.7			40.2			4.6			8.7			
	Approach LOS	C			D			A			A			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 WB Ramp	Movement Delay (sec/veh)	0.0	0.0	0.0	38.0	36.1	29.4	26.5	8.4	0.0	0.0	11.6	1.5	15.9
	Total Delay (hr)	0.0	0.0	0.0	2.4	0.0	3.2	1.7	2.7	0.0	0.0	2.4	0.0	12.4
	Travel Time (hr)	0.0	0.0	0.0	4.3	0.1	6.9	2.5	6.2	0.0	0.0	3.6	0.2	23.8
	Movement LOS	A	A	A	D	D	C	C	A	A	A	B	A	B
	Movement Volume	0	0	0	228	4	393	238	1142	0	0	762	79	2846
	Maximum Queue (ft)	0	0	0	327	327	346	243	233	0	0	204	0	
	Average Queue (ft)	0	0	0	150	150	178	113	97	0	0	92	0	
	Movement 95th Queue (ft)	0	0	0	275	275	310	217	204	0	0	169	0	
	Storage Bay Distance (ft)	0	0	0	0	0	300	180	0	0	0	0	0	
	Approach Delay (sec/veh)	0.0			32.6			11.5			10.7			
	Approach LOS	A			C			B			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 EB Ramp	Movement Delay (sec/veh)	63.1	31.8	11.6	0.0	0.0	0.0	0.0	22.4	9.0	53.0	10.1	0.0	28.1
	Total Delay (hr)	8.2	0.0	0.2	0.0	0.0	0.0	0.0	5.7	0.8	4.8	1.8	0.0	21.5
	Travel Time (hr)	10.3	0.0	0.6	0.0	0.0	0.0	0.0	8.2	2.0	6.0	3.8	0.0	30.9
	Movement LOS	E	C	B	A	A	A	A	C	A	D	B	A	C
	Movement Volume	452	1	63	0	0	0	0	929	310	331	660	0	2746
	Maximum Queue (ft)	587	587	440	0	0	0	0	317	152	339	325	0	
	Average Queue (ft)	351	351	62	0	0	0	0	172	70	205	113	0	
	Movement 95th Queue (ft)	566	566	279	0	0	0	0	262	131	357	270	0	
	Storage Bay Distance (ft)	0	0	340	0	0	0	0	0	300	240	0	0	
	Approach Delay (sec/veh)	56.8			0.0			19.0			24.4			
	Approach LOS	E			A			B			C			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 7th Street NW	Movement Delay (sec/veh)	42.1	41.0	13.5	24.6	34.9	6.8	22.1	26.7	5.8	25.7	14.6	1.9	24.6
	Total Delay (hr)	5.3	0.1	0.2	0.1	0.0	0.2	0.2	5.2	0.0	1.0	2.2	0.0	14.5
	Travel Time (hr)	7.5	0.1	0.6	0.2	0.0	1.5	1.0	21.3	0.7	1.5	3.6	0.3	38.3
	Movement LOS	D	D	B	C	C	A	C	C	A	C	B	A	C
	Movement Volume	448	5	61	15	1	105	34	685	23	143	520	59	2099
	Maximum Queue (ft)	522	522	260	50	50	81	72	241	34	160	164	57	
	Average Queue (ft)	276	276	61	8	8	27	18	136	6	65	79	15	
	Movement 95th Queue (ft)	496	496	219	31	31	59	50	220	22	127	138	43	
	Storage Bay Distance (ft)	0	0	160	0	0	30	360	0	360	250	0	340	
	Approach Delay (sec/veh)	38.7			9.2			25.8			15.8			
	Approach LOS	D			A			C			B			

Option 2A - CSAH 3 MUT / CSAH 44 Median Closure / 7th Street Median Closure - PM Peak Hour

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 19th Street NW	Movement Delay (sec/veh)	50.9	56.4	23.3	46.7	39.2	6.6	37.2	16.1	9.2	64.0	43.5	8.7	33.0
	Total Delay (hr)	0.5	1.4	1.6	5.3	0.6	0.0	2.3	3.0	0.6	1.7	10.4	0.0	27.4
	Travel Time (hr)	0.8	2.1	4.2	7.3	0.7	0.1	4.2	7.8	2.6	4.1	30.4	0.5	64.8
	Movement LOS	D	E	C	D	D	A	D	B	A	E	D	A	C
	Movement Volume	37	89	256	401	57	20	220	686	234	89	804	18	2911
	Maximum Queue (ft)	46	129	162	287	68	39	247	123	106	228	342	53	
	Average Queue (ft)	11	60	88	147	14	4	117	57	39	80	229	7	
	Movement 95th Queue (ft)	31	110	148	230	46	14	211	107	80	167	320	26	
	Storage Bay Distance (ft)	150	0	510	510	0	690	350	0	350	390	0	390	
	Approach Delay (sec/veh)	33.7			44.1			18.8			44.8			
	Approach LOS	C			D			B			D			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & N Frontage Road	Movement Delay (sec/veh)	39.0	41.2	27.1	53.9	67.5	13.7	39.8	6.3	1.6	28.1	27.0	11.5	21.7
	Total Delay (hr)	0.2	0.1	0.9	4.3	0.2	0.3	0.4	1.8	0.1	0.3	10.9	0.0	19.5
	Travel Time (hr)	0.4	0.2	1.8	6.4	0.2	0.9	0.5	3.5	0.2	0.7	21.8	0.1	36.7
	Movement LOS	D	D	C	D	E	B	D	A	A	C	C	B	C
	Movement Volume	26	11	119	280	9	71	38	1044	114	42	1408	12	3174
	Maximum Queue (ft)	161	161	123	357	357	142	94	189	0	61	357	22	
	Average Queue (ft)	47	47	58	209	209	30	32	66	0	22	164	2	
	Movement 95th Queue (ft)	114	114	106	324	324	91	72	146	0	52	317	13	
	Storage Bay Distance (ft)	0	0	30	0	0	290	300	0	0	380	0	460	
	Approach Delay (sec/veh)	30.1			46.3			6.9			26.9			
	Approach LOS	C			D			A			C			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 WB Ramp	Movement Delay (sec/veh)	0.0	0.0	0.0	91.8	98.1	46.4	112.3	8.8	0.0	0.0	17.9	2.9	30.4
	Total Delay (hr)	0.0	0.0	0.0	10.2	0.9	3.3	7.3	2.3	0.0	0.0	7.4	0.3	31.7
	Travel Time (hr)	0.0	0.0	0.0	13.4	1.2	5.6	8.0	5.0	0.0	0.0	9.7	0.9	43.8
	Movement LOS	A	A	A	F	F	D	F	A	A	A	B	A	C
	Movement Volume	0	0	0	376	33	259	226	937	0	0	1470	335	3636
	Maximum Queue (ft)	0	0	0	990	990	400	279	387	0	0	261	172	
	Average Queue (ft)	0	0	0	472	472	248	211	145	0	0	220	10	
	Movement 95th Queue (ft)	0	0	0	867	867	497	320	377	0	0	285	75	
	Storage Bay Distance (ft)	0	0	0	0	0	300	180	0	0	0	0	0	
	Approach Delay (sec/veh)	0.0			74.5			28.9			15.1			
	Approach LOS	A			E			C			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 EB Ramp	Movement Delay (sec/veh)	51.4	51.6	18.5	0.0	0.0	0.0	0.0	23.0	9.3	35.5	8.5	0.0	19.7
	Total Delay (hr)	3.2	0.0	0.3	0.0	0.0	0.0	0.0	6.1	0.6	4.6	3.3	0.0	18.1
	Travel Time (hr)	4.1	0.0	0.6	0.0	0.0	0.0	0.0	8.6	1.5	6.2	7.2	0.0	28.2
	Movement LOS	D	D	B	A	A	A	A	C	A	D	A	A	B
	Movement Volume	219	2	63	0	0	0	0	943	221	467	1360	0	3275
	Maximum Queue (ft)	304	304	87	0	0	0	0	301	144	339	421	0	
	Average Queue (ft)	166	166	22	0	0	0	0	184	55	216	141	0	
	Movement 95th Queue (ft)	270	270	55	0	0	0	0	279	104	381	327	0	
	Storage Bay Distance (ft)	0	0	340	0	0	0	0	0	300	240	0	0	
	Approach Delay (sec/veh)	44.1			0.0			20.4			15.4			
	Approach LOS	D			A			C			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 7th Street NW	Movement Delay (sec/veh)	50.6	52.2	13.4	30.9	28.4	10.5	26.2	23.5	6.5	18.5	24.0	7.8	23.9
	Total Delay (hr)	4.9	0.2	0.2	0.2	0.1	0.5	0.6	4.5	0.0	0.7	6.1	0.9	18.9
	Travel Time (hr)	6.6	0.2	0.5	0.5	0.2	2.4	2.4	20.4	0.7	1.2	8.6	2.5	46.2
	Movement LOS	D	D	B	C	C	B	C	C	A	B	C	A	C
	Movement Volume	344	14	47	28	11	152	70	668	23	127	907	390	2781
	Maximum Queue (ft)	497	497	260	82	82	107	90	232	34	176	312	165	
	Average Queue (ft)	249	249	48	23	23	46	38	129	6	63	209	82	
	Movement 95th Queue (ft)	413	413	186	66	66	93	75	214	21	127	300	137	
	Storage Bay Distance (ft)	0	0	160	0	0	30	360	0	360	250	0	340	
	Approach Delay (sec/veh)	46.3			14.5			23.2			19.1			
	Approach LOS	D			B			C			B			

Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure - AM Peak Hour

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 19th Street NW	Movement Delay (sec/veh)	54.7	53.1	7.5	52.4	40.1	6.8	27.9	12.6	6.9	59.1	34.3	4.0	24.0
	Total Delay (hr)	0.3	1.5	0.4	2.7	0.9	0.0	1.8	3.1	0.4	1.1	4.1	0.0	16.3
	Travel Time (hr)	0.4	2.3	2.4	3.6	1.2	0.2	3.7	9.0	2.4	2.7	14.4	0.4	42.7
	Movement LOS	D	D	A	D	D	A	C	B	A	E	C	A	C
	Movement Volume	19	95	185	182	79	23	237	864	216	61	423	16	2400
	Maximum Queue (ft)	35	156	98	146	64	32	220	193	80	145	217	24	
	Average Queue (ft)	7	68	35	73	22	6	98	78	31	53	105	4	
	Movement 95th Queue (ft)	23	138	71	131	52	20	180	153	64	107	177	17	
	Storage Bay Distance (ft)	150	0	510	510	0	690	350	0	350	390	0	390	
	Approach Delay (sec/veh)	25.0			45.3			14.4			36.4			
	Approach LOS	C			D			B			D			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & N Frontage Road	Movement Delay (sec/veh)	43.9	49.7	8.8	51.6	51.6	11.7	14.4	3.8	1.6	21.2	7.4	3.9	8.2
	Total Delay (hr)	0.2	0.2	0.1	1.2	0.2	0.1	0.5	1.3	0.1	0.4	1.5	0.0	5.8
	Travel Time (hr)	0.3	0.2	0.5	1.9	0.4	0.5	0.9	3.4	0.3	0.9	7.0	0.2	16.5
	Movement LOS	D	D	A	D	D	B	B	A	A	C	A	A	A
	Movement Volume	15	11	49	86	16	36	127	1265	143	63	708	21	2540
	Maximum Queue (ft)	75	75	57	165	165	60	116	169	0	93	84	18	
	Average Queue (ft)	21	21	19	74	74	19	56	62	0	32	19	1	
	Movement 95th Queue (ft)	57	57	44	133	133	44	101	130	0	69	56	9	
	Storage Bay Distance (ft)	0	0	30	0	0	290	300	0	0	380	0	460	
	Approach Delay (sec/veh)	21.8			41.2			4.5			8.4			
	Approach LOS	C			D			A			A			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 WB Ramp	Movement Delay (sec/veh)	0.0	0.0	0.0	37.5	29.8	24.8	14.2	7.9	0.0	0.0	9.1	1.5	13.2
	Total Delay (hr)	0.0	0.0	0.0	2.4	0.0	2.8	0.3	2.5	0.0	0.0	1.9	0.0	9.9
	Travel Time (hr)	0.0	0.0	0.0	4.3	0.1	6.5	0.5	5.7	0.0	0.0	3.1	0.2	20.4
	Movement LOS	A	A	A	D	C	C	B	A	A	A	A	A	B
	Movement Volume	0	0	0	228	4	393	69	1143	0	0	762	79	2678
	Maximum Queue (ft)	0	0	0	295	295	328	93	160	0	0	209	0	
	Average Queue (ft)	0	0	0	148	148	159	35	80	0	0	74	0	
	Movement 95th Queue (ft)	0	0	0	254	254	281	79	155	0	0	152	0	
	Storage Bay Distance (ft)	0	0	0	0	0	300	180	0	0	0	0	0	
	Approach Delay (sec/veh)	0.0			29.5			8.3			8.4			
	Approach LOS	A			C			A			A			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 EB Ramp	Movement Delay (sec/veh)	44.7	56.7	8.1	0.0	0.0	0.0	0.0	18.2	9.2	54.3	8.8	0.0	22.1
	Total Delay (hr)	3.7	0.0	0.2	0.0	0.0	0.0	0.0	4.6	0.8	5.0	1.6	0.0	15.9
	Travel Time (hr)	4.9	0.0	0.5	0.0	0.0	0.0	0.0	7.0	2.1	6.2	3.6	0.0	24.3
	Movement LOS	D	E	A	A	A	A	A	B	A	D	A	A	C
	Movement Volume	292	1	63	0	0	0	0	920	310	331	660	0	2577
	Maximum Queue (ft)	331	331	62	0	0	0	0	312	211	339	381	0	
	Average Queue (ft)	193	193	19	0	0	0	0	153	76	199	113	0	
	Movement 95th Queue (ft)	306	306	48	0	0	0	0	247	152	362	295	0	
	Storage Bay Distance (ft)	0	0	340	0	0	0	0	0	300	240	0	0	
	Approach Delay (sec/veh)	38.3			0.0			15.9			24.0			
	Approach LOS	D			A			B			C			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 7th Street NW	Movement Delay (sec/veh)	39.0	37.0	10.3	24.7	47.2	7.8	19.2	27.9	6.9	20.9	14.5	1.9	23.8
	Total Delay (hr)	4.9	0.1	0.2	0.1	0.0	0.2	0.2	5.3	0.0	0.8	2.1	0.0	13.9
	Travel Time (hr)	7.1	0.1	0.5	0.3	0.0	1.5	0.9	21.1	0.6	1.4	3.5	0.3	37.3
	Movement LOS	D	D	B	C	D	A	B	C	A	C	B	A	C
	Movement Volume	448	5	61	15	1	105	34	676	23	143	520	59	2090
	Maximum Queue (ft)	506	506	260	43	43	79	55	270	41	164	169	56	
	Average Queue (ft)	256	256	48	9	9	27	14	145	6	64	80	15	
	Movement 95th Queue (ft)	425	425	188	33	33	59	40	234	24	129	140	41	
	Storage Bay Distance (ft)	0	0	160	0	0	30	360	0	360	250	0	340	
	Approach Delay (sec/veh)	35.6			10.2			26.8			14.7			
	Approach LOS	D			B			C			B			

Option 2B - CSAH 3 MUT / CSAH 44 Partial-MUT / 7th Street Median Closure - PM Peak Hour

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 19th Street NW	Movement Delay (sec/veh)	57.1	55.3	24.1	46.1	36.5	5.7	34.9	15.0	8.6	63.0	44.7	7.9	32.8
	Total Delay (hr)	0.6	1.4	1.7	5.4	0.6	0.0	2.2	2.9	0.6	1.7	10.6	0.0	27.7
	Travel Time (hr)	0.9	2.1	4.4	7.4	0.8	0.1	4.0	7.6	2.6	4.2	30.3	0.5	64.9
	Movement LOS	E	E	C	D	D	A	C	B	A	E	D	A	C
	Movement Volume	37	89	256	401	57	20	220	686	234	89	804	18	2911
	Maximum Queue (ft)	43	145	206	251	57	31	259	145	104	213	354	44	
	Average Queue (ft)	12	59	94	150	13	4	129	55	38	79	232	6	
	Movement 95th Queue (ft)	32	116	170	231	40	16	222	114	82	156	327	24	
	Storage Bay Distance (ft)	150	0	510	510	0	690	350	0	350	390	0	390	
	Approach Delay (sec/veh)	34.6			43.3			17.5			45.8			
	Approach LOS	C			D			B			D			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & N Frontage Road	Movement Delay (sec/veh)	37.7	47.9	27.3	54.8	61.5	14.2	44.2	6.0	1.6	23.6	22.4	10.0	19.7
	Total Delay (hr)	0.3	0.1	1.0	4.5	0.1	0.3	0.5	1.8	0.1	0.3	9.0	0.0	18.0
	Travel Time (hr)	0.4	0.2	2.0	6.7	0.2	0.9	0.5	3.4	0.2	0.6	20.1	0.1	35.3
	Movement LOS	D	D	C	D	E	B	D	A	A	C	C	A	B
	Movement Volume	26	11	119	280	9	71	38	1044	114	42	1408	12	3174
	Maximum Queue (ft)	185	185	128	405	405	212	78	188	0	65	295	25	
	Average Queue (ft)	54	54	64	206	206	32	32	64	0	22	142	2	
	Movement 95th Queue (ft)	136	136	112	326	326	112	69	137	0	50	253	13	
	Storage Bay Distance (ft)	0	0	30	0	0	290	300	0	0	380	0	460	
	Approach Delay (sec/veh)	30.5			47.0			6.8			22.3			
	Approach LOS	C			D			A			C			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 WB Ramp	Movement Delay (sec/veh)	0.0	0.0	0.0	87.9	95.5	40.5	68.1	6.9	0.0	0.0	14.4	2.8	24.1
	Total Delay (hr)	0.0	0.0	0.0	9.3	1.0	2.9	3.0	1.8	0.0	0.0	6.0	0.3	24.3
	Travel Time (hr)	0.0	0.0	0.0	12.4	1.3	5.3	3.5	4.4	0.0	0.0	8.4	0.9	36.2
	Movement LOS	A	A	A	F	F	D	E	A	A	A	B	A	C
	Movement Volume	0	0	0	376	33	259	157	936	0	0	1470	335	3566
	Maximum Queue (ft)	0	0	0	838	838	400	232	131	0	0	254	107	
	Average Queue (ft)	0	0	0	439	439	224	124	62	0	0	203	5	
	Movement 95th Queue (ft)	0	0	0	814	814	467	199	110	0	0	286	52	
	Storage Bay Distance (ft)	0	0	0	0	0	300	180	0	0	0	0	0	
	Approach Delay (sec/veh)	0.0			69.9			15.7			12.2			
	Approach LOS	A			E			B			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 EB Ramp	Movement Delay (sec/veh)	54.2	51.4	20.0	0.0	0.0	0.0	0.0	18.6	9.4	30.5	6.6	0.0	16.5
	Total Delay (hr)	2.6	0.0	0.4	0.0	0.0	0.0	0.0	4.8	0.6	4.0	2.5	0.0	14.9
	Travel Time (hr)	3.3	0.1	0.7	0.0	0.0	0.0	0.0	7.3	1.4	5.7	6.5	0.0	25.0
	Movement LOS	D	D	B	A	A	A	A	B	A	C	A	A	B
	Movement Volume	170	2	63	0	0	0	0	925	221	467	1360	0	3208
	Maximum Queue (ft)	243	243	76	0	0	0	0	251	134	338	336	0	
	Average Queue (ft)	133	133	26	0	0	0	0	163	57	201	93	0	
	Movement 95th Queue (ft)	214	214	61	0	0	0	0	239	108	351	244	0	
	Storage Bay Distance (ft)	0	0	340	0	0	0	0	0	300	240	0	0	
	Approach Delay (sec/veh)	45.0			0.0			16.8			12.7			
	Approach LOS	D			A			B			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 7th Street NW	Movement Delay (sec/veh)	48.9	54.5	13.8	34.1	34.4	9.8	27.0	23.5	6.2	19.5	22.8	7.9	23.4
	Total Delay (hr)	4.5	0.2	0.2	0.2	0.1	0.4	0.5	4.4	0.0	0.7	5.9	0.9	18.0
	Travel Time (hr)	6.1	0.3	0.5	0.5	0.3	2.3	2.3	20.0	0.7	1.1	8.4	2.5	45.0
	Movement LOS	D	D	B	C	C	A	C	C	A	B	C	A	C
	Movement Volume	344	14	47	28	11	152	70	648	23	127	907	390	2761
	Maximum Queue (ft)	436	436	229	110	110	112	91	254	32	122	316	178	
	Average Queue (ft)	236	236	42	27	27	45	39	128	5	57	199	78	
	Movement 95th Queue (ft)	384	384	164	73	73	90	74	220	21	106	300	140	
	Storage Bay Distance (ft)	0	0	160	0	0	30	360	0	360	250	0	340	
	Approach Delay (sec/veh)	45.0			14.8			23.3			18.4			
	Approach LOS	D			B			C			B			

Optimized Timing - CSAH 44 Median Closure / 7th Street Median Closure - AM Peak Hour

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 19th Street NW	Movement Delay (sec/veh)	53.5	54.5	8.5	53.0	39.6	9.9	27.5	12.1	6.4	57.2	34.2	4.1	23.8
	Total Delay (hr)	0.3	1.5	0.5	2.8	0.9	0.1	1.9	3.0	0.4	1.0	4.2	0.0	16.6
	Travel Time (hr)	0.4	2.3	2.5	3.7	1.2	0.2	3.8	9.1	2.3	2.6	14.5	0.4	43.0
	Movement LOS	D	D	A	D	D	A	C	B	A	E	C	A	C
	Movement Volume	19	95	185	182	79	23	237	864	216	61	423	16	2400
	Maximum Queue (ft)	32	171	110	149	69	36	255	167	63	123	204	21	
	Average Queue (ft)	6	66	44	75	23	6	113	71	27	49	106	4	
	Movement 95th Queue (ft)	22	133	87	135	56	20	199	138	54	100	174	16	
	Storage Bay Distance (ft)	150	0	510	510	0	690	350	0	350	390	0	390	
	Approach Delay (sec/veh)	26.0			45.8			13.9			36.0			
	Approach LOS	C			D			B			D			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & N Frontage Road	Movement Delay (sec/veh)	46.8	55.7	9.9	59.8	60.7	13.7	16.7	4.1	1.5	21.7	8.9	4.2	9.3
	Total Delay (hr)	0.2	0.2	0.1	1.4	0.3	0.2	0.6	1.5	0.1	0.4	1.8	0.0	6.8
	Travel Time (hr)	0.3	0.3	0.5	2.1	0.4	0.5	0.9	3.6	0.3	1.0	7.4	0.2	17.5
	Movement LOS	D	E	A	E	E	B	B	A	A	C	A	A	A
	Movement Volume	15	11	49	86	16	36	127	1265	143	63	708	21	2540
	Maximum Queue (ft)	60	60	54	189	189	70	142	171	0	98	111	32	
	Average Queue (ft)	21	21	19	78	78	18	54	76	0	33	28	2	
	Movement 95th Queue (ft)	52	52	43	155	155	45	105	137	0	71	78	14	
	Storage Bay Distance (ft)	0	0	30	0	0	290	300	0	0	380	0	460	
	Approach Delay (sec/veh)	24.0			47.9			4.9			9.8			
	Approach LOS	C			D			A			A			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 WB Ramp	Movement Delay (sec/veh)	0.0	0.0	0.0	41.6	34.6	39.0	19.3	6.1	0.0	0.0	21.3	1.6	18.6
	Total Delay (hr)	0.0	0.0	0.0	2.8	0.0	4.4	1.3	2.0	0.0	0.0	4.6	0.0	15.1
	Travel Time (hr)	0.0	0.0	0.0	4.8	0.1	8.1	2.1	5.5	0.0	0.0	5.7	0.2	26.5
	Movement LOS	A	A	A	D	C	D	B	A	A	A	C	A	B
	Movement Volume	0	0	0	228	4	393	238	1142	0	0	762	79	2846
	Maximum Queue (ft)	0	0	0	582	582	388	237	161	0	0	239	0	
	Average Queue (ft)	0	0	0	201	201	200	105	57	0	0	139	0	
	Movement 95th Queue (ft)	0	0	0	505	505	371	204	132	0	0	226	0	
	Storage Bay Distance (ft)	0	0	0	0	0	300	180	0	0	0	0	0	
	Approach Delay (sec/veh)	0.0			39.9			8.4			19.4			
	Approach LOS	A			D			A			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 EB Ramp	Movement Delay (sec/veh)	54.8	62.0	11.0	0.0	0.0	0.0	0.0	26.2	10.3	56.9	15.5	0.0	29.9
	Total Delay (hr)	7.1	0.0	0.2	0.0	0.0	0.0	0.0	6.8	0.9	5.5	2.9	0.0	23.4
	Travel Time (hr)	9.1	0.0	0.5	0.0	0.0	0.0	0.0	9.3	2.1	6.7	4.9	0.0	32.6
	Movement LOS	D	E	B	A	A	A	A	C	B	E	B	A	C
	Movement Volume	452	1	63	0	0	0	0	929	310	331	660	0	2746
	Maximum Queue (ft)	548	548	439	0	0	0	0	318	190	339	355	0	
	Average Queue (ft)	323	323	53	0	0	0	0	187	77	250	145	0	
	Movement 95th Queue (ft)	518	518	240	0	0	0	0	289	156	380	311	0	
	Storage Bay Distance (ft)	0	0	340	0	0	0	0	0	300	240	0	0	
	Approach Delay (sec/veh)	49.5			0.0			22.2			29.3			
	Approach LOS	D			A			C			C			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 7th Street NW	Movement Delay (sec/veh)	38.5	38.3	10.7	31.8	8.8	8.8	20.6	28.5	6.9	29.2	15.4	1.9	24.9
	Total Delay (hr)	5.0	0.1	0.2	0.1	0.0	0.3	0.2	5.5	0.0	1.1	2.3	0.0	14.8
	Travel Time (hr)	7.1	0.1	0.6	0.3	0.0	1.5	0.9	21.7	0.7	1.7	3.8	0.3	38.7
	Movement LOS	D	D	B	C	A	A	C	C	A	C	B	A	C
	Movement Volume	448	5	61	15	1	105	34	685	23	143	520	59	2099
	Maximum Queue (ft)	524	524	260	50	50	79	59	296	34	163	184	51	
	Average Queue (ft)	262	262	59	9	9	33	16	145	7	71	77	15	
	Movement 95th Queue (ft)	430	430	211	34	34	66	44	247	23	136	142	41	
	Storage Bay Distance (ft)	0	0	160	0	0	30	360	0	360	250	0	340	
	Approach Delay (sec/veh)	35.2			11.7			27.5			17.0			
	Approach LOS	D			B			C			B			

Optimized Timing - CSAH 44 Median Closure / 7th Street Median Closure - PM Peak Hour

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 19th Street NW	Movement Delay (sec/veh)	53.8	59.3	23.8	46.7	36.4	7.6	37.5	17.9	8.4	59.6	42.4	7.5	33.1
	Total Delay (hr)	0.6	1.5	1.7	5.3	0.6	0.0	2.3	3.4	0.6	1.6	9.7	0.0	27.3
	Travel Time (hr)	0.9	2.3	4.5	7.3	0.8	0.1	4.1	8.1	2.6	3.9	28.8	0.4	63.8
	Movement LOS	D	E	C	D	D	A	D	B	A	E	D	A	C
	Movement Volume	37	89	256	401	57	20	220	686	234	89	804	18	2911
	Maximum Queue (ft)	52	166	197	260	59	31	246	156	122	141	349	37	
	Average Queue (ft)	14	65	96	147	15	4	122	74	48	71	220	4	
	Movement 95th Queue (ft)	39	126	176	231	41	16	213	140	96	126	321	20	
	Storage Bay Distance (ft)	150	0	510	510	0	690	350	0	350	390	0	390	
	Approach Delay (sec/veh)	35.0			43.8			19.7			43.4			
	Approach LOS	C			D			B			D			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & N Frontage Road	Movement Delay (sec/veh)	38.3	39.2	28.0	66.1	57.7	12.8	29.5	7.5	1.3	27.0	34.8	11.7	26.5
	Total Delay (hr)	0.3	0.1	0.9	5.2	0.2	0.2	0.3	2.2	0.0	0.3	13.9	0.0	23.6
	Travel Time (hr)	0.4	0.2	1.7	7.3	0.3	0.8	0.4	3.8	0.2	0.7	24.7	0.1	40.6
	Movement LOS	D	D	C	E	E	B	C	A	A	C	C	B	C
	Movement Volume	26	11	119	280	9	71	38	1044	114	42	1408	12	3174
	Maximum Queue (ft)	167	167	122	484	484	267	65	176	0	61	451	26	
	Average Queue (ft)	48	48	56	234	234	36	27	86	0	24	217	4	
	Movement 95th Queue (ft)	124	124	106	403	403	140	58	152	0	52	384	18	
	Storage Bay Distance (ft)	0	0	30	0	0	290	300	0	0	380	0	460	
	Approach Delay (sec/veh)	30.5			55.4			7.6			34.4			
	Approach LOS	C			E			A			C			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 WB Ramp	Movement Delay (sec/veh)	0.0	0.0	0.0	73.9	71.7	28.2	68.4	5.8	0.0	0.0	21.4	3.0	24.9
	Total Delay (hr)	0.0	0.0	0.0	8.0	0.7	2.1	4.2	1.5	0.0	0.0	8.6	0.3	25.4
	Travel Time (hr)	0.0	0.0	0.0	11.2	0.9	4.5	5.0	4.1	0.0	0.0	10.9	0.9	37.5
	Movement LOS	A	A	A	E	E	C	E	A	A	A	C	A	C
	Movement Volume	0	0	0	376	33	259	226	937	0	0	1451	355	3637
	Maximum Queue (ft)	0	0	0	727	727	400	273	201	0	0	262	138	
	Average Queue (ft)	0	0	0	386	386	193	181	31	0	0	235	6	
	Movement 95th Queue (ft)	0	0	0	663	663	427	271	127	0	0	287	58	
	Storage Bay Distance (ft)	0	0	0	0	0	300	180	0	0	0	0	0	
	Approach Delay (sec/veh)	0.0			56.1			18.0			17.8			
	Approach LOS	A			E			B			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & TH 14 EB Ramp	Movement Delay (sec/veh)	47.8	59.0	22.8	0.0	0.0	0.0	0.0	23.8	7.6	29.0	9.3	0.0	19.0
	Total Delay (hr)	3.0	0.0	0.4	0.0	0.0	0.0	0.0	6.1	0.5	3.6	3.6	0.0	17.2
	Travel Time (hr)	3.9	0.0	0.8	0.0	0.0	0.0	0.0	8.5	1.4	5.2	7.5	0.0	27.3
	Movement LOS	D	E	C	A	A	A	A	C	A	C	A	A	B
	Movement Volume	219	2	63	0	0	0	0	943	221	467	1360	0	3275
	Maximum Queue (ft)	273	273	112	0	0	0	0	276	116	339	412	0	
	Average Queue (ft)	158	158	28	0	0	0	0	174	52	237	139	0	
	Movement 95th Queue (ft)	249	249	71	0	0	0	0	252	93	379	303	0	
	Storage Bay Distance (ft)	0	0	340	0	0	0	0	0	300	240	0	0	
	Approach Delay (sec/veh)	42.3			0.0			20.7			14.3			
	Approach LOS	D			A			C			B			

Intersection	MOE	Eastbound Approach			Westbound Approach			Northbound Approach			Southbound Approach			Intersection Total
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
West Circle Drive & 7th Street NW	Movement Delay (sec/veh)	48.0	53.6	12.3	34.8	32.9	9.8	23.9	22.4	5.6	21.7	26.6	9.9	24.5
	Total Delay (hr)	4.5	0.2	0.1	0.3	0.1	0.4	0.5	4.3	0.0	0.8	6.8	1.1	19.1
	Travel Time (hr)	6.2	0.2	0.4	0.6	0.2	2.2	2.4	20.0	0.6	1.3	9.2	2.8	46.1
	Movement LOS	D	D	B	C	C	A	C	C	A	C	C	A	C
	Movement Volume	344	14	47	28	11	152	70	668	23	127	907	390	2781
	Maximum Queue (ft)	442	442	212	130	130	111	91	236	30	262	364	268	
	Average Queue (ft)	245	245	41	31	31	43	35	123	4	70	225	99	
	Movement 95th Queue (ft)	386	386	167	83	83	86	72	210	18	166	340	199	
	Storage Bay Distance (ft)	0	0	160	0	0	30	360	0	360	250	0	340	
	Approach Delay (sec/veh)	44.1			14.8			22.0			21.6			
	Approach LOS	D			B			C			C			

Appendix B – West Circle Drive & TH 14 Ramps Revised Signal Timings

Timings
104: Circle Dr & 19th St

AM Peak opt timings

02/15/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	95	185	182	79	23	237	863	216	61	423	16
Future Volume (vph)	19	95	185	182	79	23	237	863	216	61	423	16
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	20.0	20.0	7.0	20.0	20.0
Minimum Split (s)	16.0	22.0	22.0	16.0	49.8	49.8	12.5	49.5	49.5	12.6	27.5	27.5
Total Split (s)	19.0	22.0	22.0	19.0	22.0	22.0	41.0	60.0	60.0	19.0	38.0	38.0
Total Split (%)	15.8%	18.3%	18.3%	15.8%	18.3%	18.3%	34.2%	50.0%	50.0%	15.8%	31.7%	31.7%
Yellow Time (s)	3.2	3.9	3.9	3.2	3.9	3.9	3.2	5.0	5.0	3.2	5.0	5.0
All-Red Time (s)	2.6	1.9	1.9	2.6	1.9	1.9	2.3	1.5	1.5	2.4	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	5.5	6.5	6.5	5.6	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	7.4	13.2	13.2	12.4	25.9	25.9	35.5	62.4	62.4	10.8	35.3	35.3
Actuated g/C Ratio	0.06	0.11	0.11	0.10	0.22	0.22	0.30	0.52	0.52	0.09	0.29	0.29
v/c Ratio	0.10	0.53	0.58	0.60	0.12	0.05	0.53	0.53	0.26	0.45	0.44	0.03
Control Delay	54.1	59.3	13.3	59.0	39.3	0.2	22.8	8.0	1.3	60.6	36.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.1	59.3	13.3	59.0	39.3	0.2	22.8	8.0	1.3	60.6	36.7	0.1
LOS	D	E	B	E	D	A	C	A	A	E	D	A
Approach Delay		30.5			48.7			9.6			38.5	
Approach LOS		C			D			A			D	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 101 (84%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green	
Natural Cycle: 130	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.60	
Intersection Signal Delay: 22.8	Intersection LOS: C
Intersection Capacity Utilization 57.0%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 104: Circle Dr & 19th St

AM Peak opt timings

Timings
105: Circle Dr & Frontage Rd

02/15/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	11	49	86	16	36	127	1265	143	63	706	21
Future Volume (vph)	15	11	49	86	16	36	127	1265	143	63	706	21
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	2 5	2	2	1 6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	5.0	20.0	20.0	5.0	20.0	20.0
Minimum Split (s)	21.5	21.5	21.5	42.4	42.4	42.4	10.5	27.0	27.0	10.5	26.5	26.5
Total Split (s)	30.0	30.0	30.0	30.0	30.0	30.0	12.0	78.0	78.0	12.0	78.0	78.0
Total Split (%)	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	10.0%	65.0%	65.0%	10.0%	65.0%	65.0%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.9	3.0	5.0	5.0	3.0	4.3	4.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	2.0	1.5	1.5	1.8	1.5	1.5
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.4	5.4		5.4	5.4	5.0	6.5	6.5	4.8	5.8	5.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)		15.9	15.9		15.9	15.9	90.9	82.8	82.8	87.8	80.1	80.1
Actuated g/C Ratio		0.13	0.13		0.13	0.13	0.76	0.69	0.69	0.73	0.67	0.67
v/c Ratio		0.15	0.20		0.64	0.15	0.28	0.59	0.14	0.26	0.34	0.02
Control Delay		45.3	6.1		64.6	2.5	2.6	5.4	0.3	5.6	2.4	0.1
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.2	0.3	0.0	0.0	0.0
Total Delay		45.3	6.1		64.6	2.5	2.6	5.6	0.7	5.6	2.4	0.1
LOS		D	A		E	A	A	A	A	A	A	A
Approach Delay		19.6			48.6			4.9			2.6	
Approach LOS		B			D			A			A	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 90 (75%), Referenced to phase 2:NBTL and 6:SBTL, Start of 1st Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 7.0	Intersection LOS: A
Intersection Capacity Utilization 65.3%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 105: Circle Dr & Frontage Rd

AM Peak opt timings

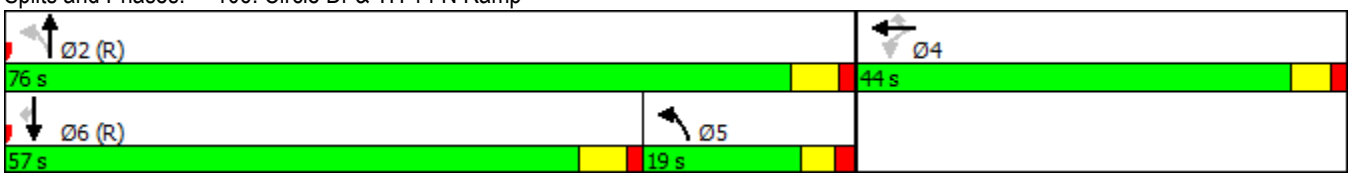
Timings
106: Circle Dr & TH 14 N Ramp

02/15/2021

Lane Group	WBT	WBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	4	393	238	1142	762	79
Future Volume (vph)	4	393	238	1142	762	79
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2 5	2	6	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	5.0	20.0	20.0	20.0
Minimum Split (s)	46.2	46.2	10.0	26.5	29.8	29.8
Total Split (s)	44.0	44.0	19.0	76.0	57.0	57.0
Total Split (%)	36.7%	36.7%	15.8%	63.3%	47.5%	47.5%
Yellow Time (s)	3.6	3.6	3.0	4.3	4.3	4.3
All-Red Time (s)	1.6	1.6	1.9	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.2	5.2	4.9	5.8	5.8	5.8
Lead/Lag			Lag		Lead	Lead
Lead-Lag Optimize?						
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	35.9	35.9	74.0	73.1	54.1	54.1
Actuated g/C Ratio	0.30	0.30	0.62	0.61	0.45	0.45
v/c Ratio	0.50	0.89	0.64	0.60	0.54	0.12
Control Delay	37.6	53.2	16.3	6.3	17.6	2.8
Queue Delay	0.0	0.0	0.0	0.6	0.6	0.0
Total Delay	37.6	53.2	16.3	7.0	18.2	2.8
LOS	D	D	B	A	B	A
Approach Delay	47.4			8.6	16.7	
Approach LOS	D			A	B	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 91 (76%), Referenced to phase 2:NBTL and 6:SBT, Start of 1st Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 19.5	Intersection LOS: B
Intersection Capacity Utilization 83.7%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 106: Circle Dr & TH 14 N Ramp



AM Peak opt timings

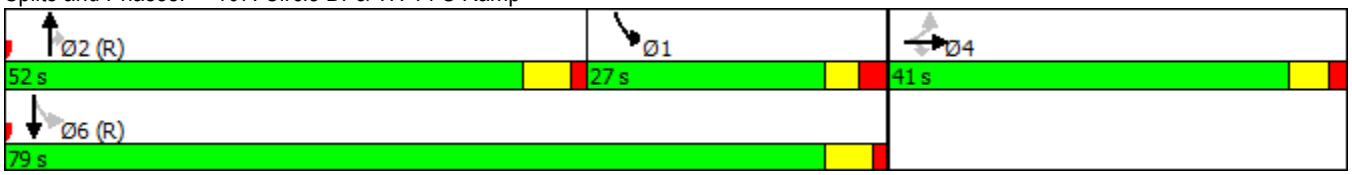
Timings
107: Circle Dr & TH 14 S Ramp

02/15/2021

Lane Group	EBT	EBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1	63	928	310	331	659
Future Volume (vph)	1	63	928	310	331	659
Turn Type	NA	Perm	NA	Perm	pm+pt	NA
Protected Phases	4		2		1	6
Permitted Phases		4		2	6	
Detector Phase	4	4	2	2	1 6	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	20.0	20.0	5.0	20.0
Minimum Split (s)	43.3	43.3	26.5	26.5	10.8	29.1
Total Split (s)	41.0	41.0	52.0	52.0	27.0	79.0
Total Split (%)	34.2%	34.2%	43.3%	43.3%	22.5%	65.8%
Yellow Time (s)	3.6	3.6	4.3	4.3	3.0	4.3
All-Red Time (s)	1.7	1.7	1.5	1.5	2.8	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.8	5.8	5.8	5.8
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	None	C-Max
Act Effct Green (s)	35.7	35.7	46.2	46.2	73.2	73.2
Actuated g/C Ratio	0.30	0.30	0.38	0.38	0.61	0.61
v/c Ratio	0.98	0.14	0.86	0.44	1.00	0.35
Control Delay	76.0	6.5	30.6	2.7	78.5	15.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	76.0	6.5	30.6	2.7	78.5	15.6
LOS	E	A	C	A	E	B
Approach Delay	67.5		23.6			36.6
Approach LOS	E		C			D

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 99 (83%), Referenced to phase 2:NBT and 6:SBTL, Start of 1st Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 36.6	Intersection LOS: D
Intersection Capacity Utilization 83.7%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 107: Circle Dr & TH 14 S Ramp



AM Peak opt timings

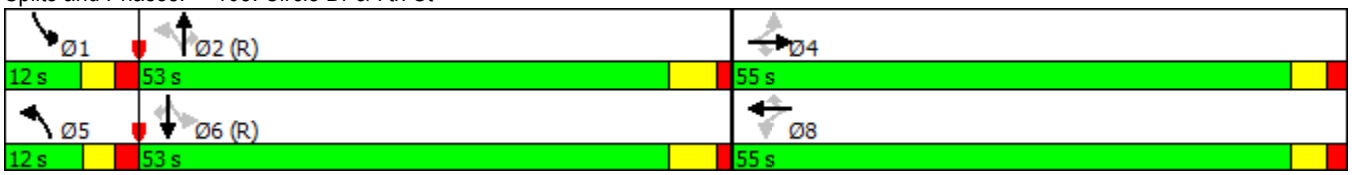
Timings
108: Circle Dr & 7th St

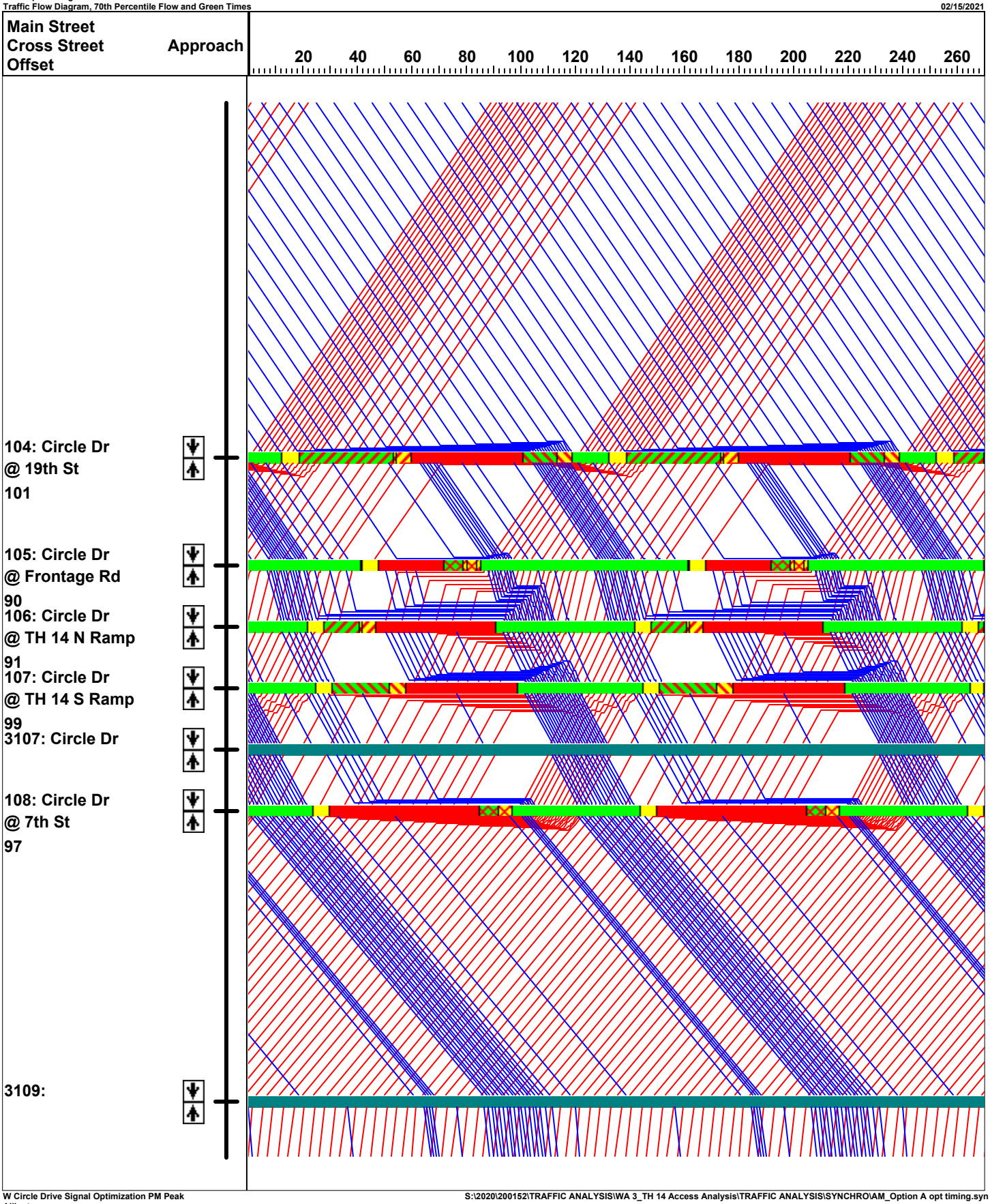
02/15/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	448	5	61	15	1	105	34	685	23	143	520	59
Future Volume (vph)	448	5	61	15	1	105	34	685	23	143	520	59
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	2 5	2	2	1 6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	5.0	20.0	20.0	5.0	20.0	20.0
Minimum Split (s)	38.2	38.2	38.2	38.2	38.2	38.2	10.2	28.8	28.8	10.2	28.8	28.8
Total Split (s)	55.0	55.0	55.0	55.0	55.0	55.0	12.0	53.0	53.0	12.0	53.0	53.0
Total Split (%)	45.8%	45.8%	45.8%	45.8%	45.8%	45.8%	10.0%	44.2%	44.2%	10.0%	44.2%	44.2%
Yellow Time (s)	3.2	3.2	3.2	3.2	3.2	3.2	3.0	4.3	4.3	3.0	4.3	4.3
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.1	1.5	1.5	2.2	1.5	1.5
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.2	5.2		5.2	5.2	5.1	5.8	5.8	5.2	5.8	5.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)		48.7	48.7		48.7	48.7	55.4	48.0	48.0	57.8	53.1	53.1
Actuated g/C Ratio		0.41	0.41		0.41	0.41	0.46	0.40	0.40	0.48	0.44	0.44
v/c Ratio		0.95	0.10		0.04	0.17	0.10	0.55	0.04	0.58	0.38	0.09
Control Delay		63.5	4.8		21.2	4.4	16.2	29.7	0.1	37.9	15.3	2.5
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		63.5	4.8		21.2	4.4	16.2	29.7	0.1	37.9	15.3	2.5
LOS		E	A		C	A	B	C	A	D	B	A
Approach Delay		56.5			6.6			28.2			18.7	
Approach LOS		E			A			C			B	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 97 (81%), Referenced to phase 2:NBTL and 6:SBTL, Start of 1st Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.95	
Intersection Signal Delay: 30.6	Intersection LOS: C
Intersection Capacity Utilization 73.4%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 108: Circle Dr & 7th St




Main Street
Cross Street
Approach
Offset
20
40
60
80
100
120
140
160
180
200
220
240
260
104: Circle Dr
@ 19th St
101
105: Circle Dr
@ Frontage Rd
90
106: Circle Dr
@ TH 14 N Ramp
91
107: Circle Dr
@ TH 14 S Ramp
99
3107: Circle Dr
108: Circle Dr
@ 7th St
97
3109:

Timings
104: Circle Dr & 19th St

PM Peak opt timings

02/15/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	89	256	401	57	20	220	686	234	89	804	18
Future Volume (vph)	37	89	256	401	57	20	220	686	234	89	804	18
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	20.0	20.0	7.0	20.0	20.0
Minimum Split (s)	16.0	22.0	22.0	16.0	49.8	49.8	12.5	49.5	49.5	12.6	27.5	27.5
Total Split (s)	20.0	22.0	22.0	32.0	34.0	34.0	32.0	54.0	54.0	22.0	44.0	44.0
Total Split (%)	15.4%	16.9%	16.9%	24.6%	26.2%	26.2%	24.6%	41.5%	41.5%	16.9%	33.8%	33.8%
Yellow Time (s)	3.2	3.9	3.9	3.2	3.9	3.9	3.2	5.0	5.0	3.2	5.0	5.0
All-Red Time (s)	2.6	1.9	1.9	2.6	1.9	1.9	2.3	1.5	1.5	2.4	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	5.5	6.5	6.5	5.6	6.5	6.5
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	8.0	13.0	13.0	21.9	29.4	29.4	26.5	58.5	58.5	12.9	45.0	45.0
Actuated g/C Ratio	0.06	0.10	0.10	0.17	0.23	0.23	0.20	0.45	0.45	0.10	0.35	0.35
v/c Ratio	0.19	0.49	0.67	0.73	0.07	0.04	0.65	0.44	0.29	0.54	0.64	0.03
Control Delay	59.6	63.8	15.0	59.3	39.2	0.1	36.2	11.8	1.6	67.0	39.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.6	63.8	15.0	59.3	39.2	0.1	36.2	11.8	1.6	67.0	39.8	0.1
LOS	E	E	B	E	D	A	D	B	A	E	D	A
Approach Delay		30.7			54.5			14.4			41.7	
Approach LOS		C			D			B			D	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 18 (14%), Referenced to phase 2:NBT and 6:SBT, Start of 1st Green	
Natural Cycle: 130	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 31.7	Intersection LOS: C
Intersection Capacity Utilization 66.9%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 104: Circle Dr & 19th St

PM Peak opt timings

Timings
105: Circle Dr & Frontage Rd

02/15/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	11	119	280	9	71	38	1043	114	42	1407	12
Future Volume (vph)	26	11	119	280	9	71	38	1043	114	42	1407	12
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	2 5	2	2	1 6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	5.0	20.0	20.0	5.0	20.0	20.0
Minimum Split (s)	21.5	21.5	21.5	42.4	42.4	42.4	10.5	27.0	27.0	10.5	26.5	26.5
Total Split (s)	45.0	45.0	45.0	45.0	45.0	45.0	12.0	73.0	73.0	12.0	73.0	73.0
Total Split (%)	34.6%	34.6%	34.6%	34.6%	34.6%	34.6%	9.2%	56.2%	56.2%	9.2%	56.2%	56.2%
Yellow Time (s)	3.9	3.9	3.9	3.9	3.9	3.9	3.0	5.0	5.0	3.0	4.3	4.3
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	2.0	1.5	1.5	1.8	1.5	1.5
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.4	5.4		5.4	5.4	5.0	6.5	6.5	4.8	5.8	5.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)		34.0	34.0		34.0	34.0	81.7	74.9	74.9	82.0	75.5	75.5
Actuated g/C Ratio		0.26	0.26		0.26	0.26	0.63	0.58	0.58	0.63	0.58	0.58
v/c Ratio		0.12	0.24		0.87	0.16	0.21	0.53	0.12	0.15	0.71	0.01
Control Delay		35.2	6.8		70.1	7.9	8.4	10.2	1.3	3.1	7.0	0.0
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.2	0.0	0.0	1.1	0.0
Total Delay		35.2	6.8		70.1	7.9	8.4	10.5	1.3	3.1	8.1	0.0
LOS		D	A		E	A	A	B	A	A	A	A
Approach Delay		13.6			57.9			9.5			7.9	
Approach LOS		B			E			A			A	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 8 (6%), Referenced to phase 2:NBTL and 6:SBTL, Start of 1st Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay: 14.4	Intersection LOS: B
Intersection Capacity Utilization 76.1%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 105: Circle Dr & Frontage Rd

Lane Group	WBT	WBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	33	259	226	936	1451	355
Future Volume (vph)	33	259	226	936	1451	355
Turn Type	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2 5	2	6	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	5.0	20.0	20.0	20.0
Minimum Split (s)	46.2	46.2	10.0	26.5	29.8	29.8
Total Split (s)	40.0	40.0	24.0	90.0	66.0	66.0
Total Split (%)	30.8%	30.8%	18.5%	69.2%	50.8%	50.8%
Yellow Time (s)	3.6	3.6	3.0	4.3	4.3	4.3
All-Red Time (s)	1.6	1.6	1.9	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.2	5.2	4.9	5.8	5.8	5.8
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	33.8	33.8	86.1	85.2	63.8	63.8
Actuated g/C Ratio	0.26	0.26	0.66	0.66	0.49	0.49
v/c Ratio	0.91	0.53	0.85	0.42	0.86	0.40
Control Delay	72.2	20.1	89.6	0.9	21.8	1.7
Queue Delay	0.0	0.0	0.0	0.1	7.0	0.9
Total Delay	72.2	20.1	89.6	1.0	28.8	2.7
LOS	E	C	F	A	C	A
Approach Delay	52.0			18.3	23.7	
Approach LOS	D			B	C	

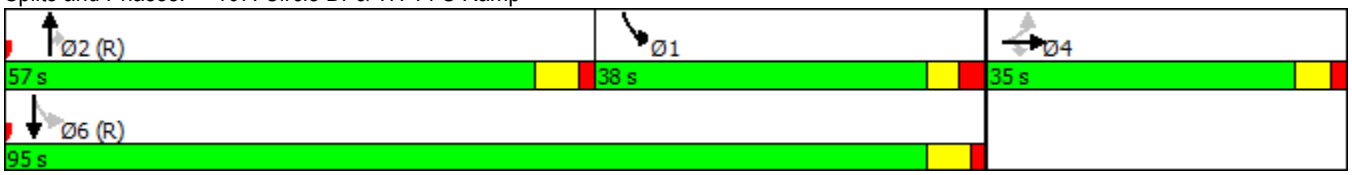
Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 124 (95%), Referenced to phase 2:NBTL and 6:SBT, Start of 1st Green	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 27.1	Intersection LOS: C
Intersection Capacity Utilization 88.8%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 106: Circle Dr & TH 14 N Ramp

Lane Group	EBT	EBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	2	63	943	221	467	1360
Future Volume (vph)	2	63	943	221	467	1360
Turn Type	NA	Perm	NA	Perm	pm+pt	NA
Protected Phases	4		2		1	6
Permitted Phases		4		2	6	
Detector Phase	4	4	2	2	1 6	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	20.0	20.0	5.0	20.0
Minimum Split (s)	43.3	43.3	26.5	26.5	10.8	29.1
Total Split (s)	35.0	35.0	57.0	57.0	38.0	95.0
Total Split (%)	26.9%	26.9%	43.8%	43.8%	29.2%	73.1%
Yellow Time (s)	3.6	3.6	4.3	4.3	3.0	4.3
All-Red Time (s)	1.7	1.7	1.5	1.5	2.8	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.8	5.8	5.8	5.8
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	None	C-Max
Act Effct Green (s)	23.0	23.0	57.9	57.9	95.9	95.9
Actuated g/C Ratio	0.18	0.18	0.45	0.45	0.74	0.74
v/c Ratio	0.72	0.19	0.69	0.29	0.86	0.54
Control Delay	63.5	8.8	30.9	3.4	39.3	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.5
Total Delay	63.5	8.8	30.9	3.4	39.3	4.4
LOS	E	A	C	A	D	A
Approach Delay	51.4		25.7			13.3
Approach LOS	D		C			B

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 21 (16%), Referenced to phase 2:NBT and 6:SBTL, Start of 1st Green	
Natural Cycle: 125	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 21.0	Intersection LOS: C
Intersection Capacity Utilization 88.8%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 107: Circle Dr & TH 14 S Ramp



PM Peak opt timings

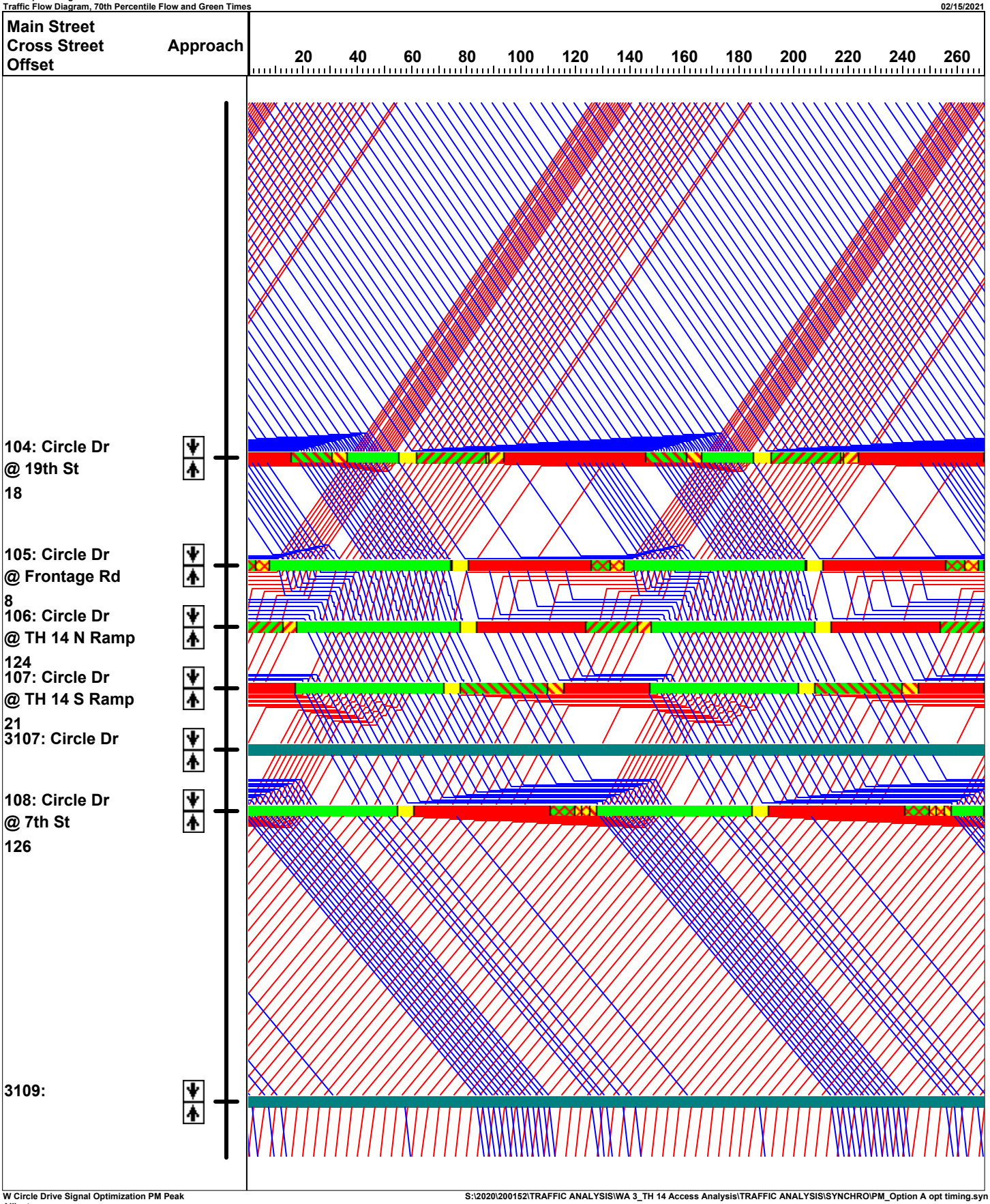
Timings
108: Circle Dr & 7th St

02/15/2021

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	344	14	47	28	11	152	70	668	23	127	906	390
Future Volume (vph)	344	14	47	28	11	152	70	668	23	127	906	390
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	2 5	2	2	1 6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	5.0	20.0	20.0	5.0	20.0	20.0
Minimum Split (s)	38.2	38.2	38.2	38.2	38.2	38.2	10.2	28.8	28.8	10.2	28.8	28.8
Total Split (s)	50.0	50.0	50.0	50.0	50.0	50.0	15.0	62.0	62.0	18.0	65.0	65.0
Total Split (%)	38.5%	38.5%	38.5%	38.5%	38.5%	38.5%	11.5%	47.7%	47.7%	13.8%	50.0%	50.0%
Yellow Time (s)	3.2	3.2	3.2	3.2	3.2	3.2	3.0	4.3	4.3	3.0	4.3	4.3
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.1	1.5	1.5	2.2	1.5	1.5
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.2	5.2		5.2	5.2	5.1	5.8	5.8	5.2	5.8	5.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)		41.0	41.0		41.0	41.0	71.5	62.5	62.5	76.4	67.0	67.0
Actuated g/C Ratio		0.32	0.32		0.32	0.32	0.55	0.48	0.48	0.59	0.52	0.52
v/c Ratio		0.89	0.09		0.11	0.26	0.23	0.40	0.03	0.31	0.51	0.40
Control Delay		66.2	3.9		30.6	5.5	13.7	23.7	0.1	20.9	33.5	11.2
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		66.2	3.9		30.6	5.5	13.7	23.7	0.1	20.9	33.5	11.2
LOS		E	A		C	A	B	C	A	C	C	B
Approach Delay		58.9			10.7			22.1			26.3	
Approach LOS		E			B			C			C	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 126 (97%), Referenced to phase 2:NBTL and 6:SBTL, Start of 1st Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 28.8	Intersection LOS: C
Intersection Capacity Utilization 69.4%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 108: Circle Dr & 7th St


Main Street
Cross Street
Approach
Offset
20
40
60
80
100
120
140
160
180
200
220
240
260
104: Circle Dr
@ 19th St
18
105: Circle Dr
@ Frontage Rd
8
106: Circle Dr
@ TH 14 N Ramp
124
107: Circle Dr
@ TH 14 S Ramp
21
3107: Circle Dr
108: Circle Dr
@ 7th St
126
3109: