

# Appendix G: Future Conditions Traffic Analysis Memorandum



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## MEMORANDUM

**Date:** April 10, 2017  
**To:** Paul Vogel  
**From:** Ross B. Tillman, P.E.  
Kelsey E. Retherford, E.I.T.  
**Subject:** Future Traffic Analysis  
Riverfront Drive Corridor Study  
Mankato/North Mankato Area Planning Organization  
Project No.: T42.111867

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### Introduction

The Mankato/North Mankato Area Planning Organization in cooperation with the City of Mankato have requested a corridor study along Riverfront Drive from TH 14 to Woodland Avenue. Riverfront Drive is located along the western edge of the City of Mankato. This memorandum provides a summary of the future conditions and potential solutions.

### Traffic Forecasting

Future traffic volumes for 2041 (25-yr forecast) were developed using historical data and the Mankato/North Mankato Area Planning Organization (MAPO) 2045 Long Range Transportation Plan while recognizing population growth trends in the area, which are likely to affect traffic volumes.

The historical growth rates (1997-2013) along Riverfront Drive were all calculated to be between 0.2 and 0.9 percent. An analysis was also completed using only the last 10 years of data but, the growth rates were all found to be negative. The MAPO 2045 Long Range Transportation Plan indicated future growth rates to be between 0.9 and 1.65 percent. Population growth trends have been between 0.5 percent per year and 1.5 percent per year on average depending on which time period is analyzed.

Traffic growth was compared using trend lines from various data sources and a 1% straight line growth value. These graphics are shown in **Figures 1** through **4** in **Appendix A**. In general, the 1% line falls within a similar range of the 2045 Long Range Transportation Plan and the full-history trend and would appear to provide a reasonable growth rate for the corridor. This assumption is meant to be all encompassing of background growth as well as spot redevelopment in areas nearby.

The historical growth rates for side streets with data available were also calculated. Data was available from 1997 to 2013 for the side streets, leading to historical growth rates ranging from -2.9 to 3 percent. The MAPO 2045 Long Range Transportation Plan had analysis at Cherry Street, Main Street and Madison Avenue east of Riverfront Drive. The growth rates were found to be between 1 and 1.9 percent in the Transportation Plan, however using the historical data growth rates at these intersections were between -2.9 and -0.5%. The historical side street data includes periods of time when streets were converted from one-way to two-way traffic and the reconstruction of 2<sup>nd</sup> Street and Mulberry Street

occurred. These major circulation changes result in data patterns with no natural trends and essentially provide meaningless data.

Although the majority of analyzed side streets along the corridor are fully developed, they provide connectivity to other parts of the city that may experience development and growth. For this reason, a 1% per year growth rate was also applied to these approaches recognizing the potential for future growth in other areas and also the need to feed and receive a certain amount of traffic from Riverfront Drive.

Parallel routes to Riverfront Drive were also analyzed for spare capacity. TH 169 was projected to have 27,000 vehicles per day in 2045 as part of the Long Range Transportation Plan which is well under capacity for a 4-lane freeway. 2<sup>nd</sup> Street currently carries between 8,100 and 10,900 vehicles per day downtown, which if using the same growth rate as Riverfront Drive will also be under capacity in 2041.

### Future Operations Analysis

A level of service (LOS) analysis of the peak hours was completed using the forecasted turning movement counts in SimTraffic. **Tables 1 through 4** show the results of the 2041 no build traffic analysis for Segments 1 through 4, respectively.

#### Segment 1 – Woodland Avenue to Sibley Parkway

**Table 1 - 2041 Existing Geometry (No Build) Traffic Operations Analysis**

Intersection	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft)
Riverfront Dr & Woodland Ave <i>Stop Controlled</i>	AM	2	A	7	A	NBT	NBL/T/R	25	100
	PM	3	A	7	A	SBT	SBL/T/R	50	50
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	6	A	41	E	NBT	WBL/T	75	200
	PM	7	A	32	D	NBL	WBL/T	75	175
SB TH 169 Ramp/Owatonna St & Riverfront Dr <i>Signalized Intersection</i>	AM	49	D	75	E	SBL	SBL/T	575	950
	PM	32	C	56	E	SBT	SBL/T	275	650
NB TH 169 Ramp & Riverfront Dr <i>Stop Controlled</i>	AM	62	F	1949	F	NBL	NBR	725	1275
	PM	24	C	127	F	NBR	NBR	375	1000
Mankato West HS/Poplar St & Riverfront Dr <i>Signalized Intersection</i>	AM	79	E	351	F	WBR	WBT/R	600	800
	PM	50	D	162	F	NBT	WBT/R	575	800
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	89	F	320	F	NBL	NBL	800	1300
	PM	44	D	156	F	NBT	NBL/T	425	500
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	75	E	182	F	WBT	WBT	300	775
	PM	15	B	41	D	NBL	WBT	125	400

\*Delay in seconds per vehicle

\*\*Maximum delay and LOS on any approach and/or movement

\*\*\*Limiting Movement is the highest delay movement.

#### AM Peak Hour

- Intersection delay has failing LOS at the intersections of Riverfront Drive with the NB TH 169 Ramp and Stoltzman Road.
- The limiting movement operates with LOS F at the following intersections:
  - TH 169 North Ramp at Riverfront Drive
  - Poplar Street-West Mankato High School at Riverfront Drive

- Stoltzman Road at Riverfront Drive
- Marshall Street at Riverfront Drive

**PM Peak Hour**

- Intersection delay is acceptable with LOS D or better at all of the intersections.
- The limiting movement operates with LOS F at the following intersections:
  - TH 169 North Ramp at Riverfront Drive
  - Poplar Street-West Mankato High School at Riverfront Drive
  - Stoltzman Road at Riverfront Drive

**Tables B1 and B2 in Appendix B** show the delay and queue lengths for each movement at all of the intersections in Segment 1.

**Segment 2 –Sibley Parkway to Veterans Memorial Bridge**

**Table 2 - 2041 Existing Geometry (No Build) Traffic Operations Analysis**

Intersection	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft)
Riverfront Dr & Sibley Pkwy <i>Signalized Intersection</i>	AM	38	D	84	F	WBR	WBT	175	825
	PM	5	A	41	D	EBL	WBT	50	150
Riverfront Dr & Poplar St/Warren St <i>Signalized Intersection</i>	AM	14	B	32	C	WBL	NBT/R	100	275
	PM	18	B	31	C	EBL	SBT/R	150	350
Riverfront Dr & Minnesota St/Cherry St <i>Signalized Intersection</i>	AM	11	B	32	C	WBT	SBT	75	325
	PM	19	B	56	E	SBL	WBL/T	175	350
Riverfront Dr & Main St <i>Signalized Intersection</i>	AM	8	A	26	C	WBL	NBT	50	150
	PM	13	B	31	C	EBL	NBT	100	250

\*Delay in seconds per vehicle  
 \*\*Maximum delay and LOS on any approach and/or movement  
 \*\*\*Limiting Movement is the highest delay movement.

**AM Peak Hour**

- Intersection delay is acceptable with LOS D or better at all of the intersections.
- The limiting movement operates with LOS F at the intersection of Sibley Parkway and Riverfront Drive.

**PM Peak Hour**

- Intersection delay is acceptable with LOS A or B at all of the intersections.
- The limiting movement operates with LOS E at the intersections of Minnesota Street-Cherry St and Riverfront Drive

**Tables B3 and B4 in Appendix B** show the delay and queue lengths for each movement at all of the intersections in Segment 2.

**Segment 3 –Veterans Memorial Bridge to Madison Avenue**

**Table 3 - 2041 Existing Geometry (No Build) Traffic Operations Analysis**

Intersection	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft)
Riverfront Dr & Plum St <i>Signalized Intersection</i>	AM	4	A	23	C	WBL	NBT	50	175
	PM	5	A	28	C	WBL	NBT	50	175
Riverfront Dr & Elm St <i>Signalized Intersection</i>	AM	4	A	11	B	WBL	NBL/T	50	125
	PM	6	A	22	C	EBL	SBL/T	75	225
Riverfront Dr & Madison Ave <i>Signalized Intersection</i>	AM	12	B	24	C	WBL	NBT/R	125	300
	PM	17	B	49	D	WBT	NBT/R	200	425

\*Delay in seconds per vehicle  
 \*\*Maximum delay and LOS on any approach and/or movement  
 \*\*\*Limiting Movement is the highest delay movement.

**AM Peak Hour**

- Intersection delay is acceptable with LOS A or B at all of the intersections.
- The limiting movement is acceptable with LOS C or better at all of the intersections.

**PM Peak Hour**

- Intersection delay is acceptable with LOS A or B at all of the intersections.
- The limiting movement is acceptable with LOS D or better at all of the intersections.

Tables B5 and B6 in Appendix B show the delay and queue lengths for each movement at all of the intersections in Segment 3.

**Segment 4 –Madison Avenue to TH 14**

**Table 4 - 2041 Existing Geometry (No Build) Traffic Operations Analysis**

Intersection	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft)
Riverfront Dr & 3rd Ave/Lafayette St <i>Stop Controlled</i>	AM	5	A	57	F	EBL	EBR	75	225
	PM	6	A	48	E	EBT	EBR	100	275
Riverfront Dr & May St <i>Stop Controlled</i>	AM	1	A	16	C	WBL	WBL/R	25	75
	PM	3	A	23	C	WBL	WBL/R	50	100
Riverfront Dr & TH 14 EB Ramp <i>Stop Controlled</i>	AM	5	A	22	C	EBL	EBR	100	250
	PM	6	A	39	E	EBL	EBL	125	325
Riverfront Dr & TH 14 WB Ramp <i>Stop Controlled</i>	AM	28	D	197	F	WBL	WBL/T	325	1025
	PM	56	F	374	F	WBL	WBL/T	650	1725

\*Delay in seconds per vehicle  
 \*\*Maximum delay and LOS on any approach and/or movement  
 \*\*\*Limiting Movement is the highest delay movement.

**AM Peak Hour**

- Intersection delay is acceptable with LOS D or better at all of the intersections.

- The limiting movement operates with LOS F at the following intersections:
  - 3<sup>rd</sup> Avenue/Lafayette Street at Riverfront Drive
  - TH 14 Westbound Ramp at Riverfront Drive

#### *PM Peak Hour*

- Intersection delay and the limiting movement have failing LOS at the intersection of the TH 14 Westbound Ramp and Riverfront Drive.
- The intersection delay is LOS A for all other intersections.
- The limiting movement is LOS E at 3<sup>rd</sup> Avenue/Lafayette Street and the TH 14 Eastbound Ramp.
- The limiting movement is LOS C at May Street.

**Tables B7 and B8 in Appendix B** show the delay and queue lengths for each movement at all of the intersections in Segment 4.

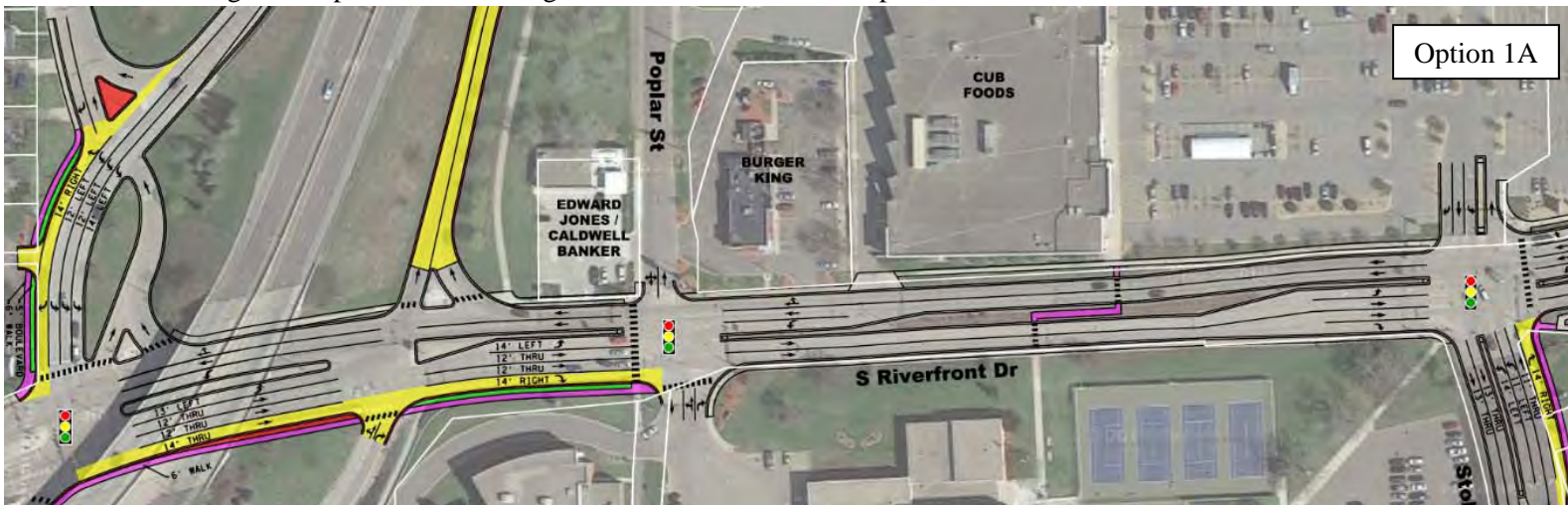
### **Alternative Concepts**

#### ***Segment 1 – Woodland Avenue to Sibley Parkway***

There were six alternatives analyzed for Segment 1. These options are detailed below with snapshots of each.

#### **Option 1: Traditional Signalized Corridor with Capacity and Pedestrian Enhancements**

Option 1A - Triple left turn from southbound TH 169, additional on ramp lane for northbound TH 169, Poplar Street remains signalized, turn lane additional and signal phasing improvement at Stoltzman Road, and signalized pedestrian crossings at Stoltzman Road and Poplar Street.

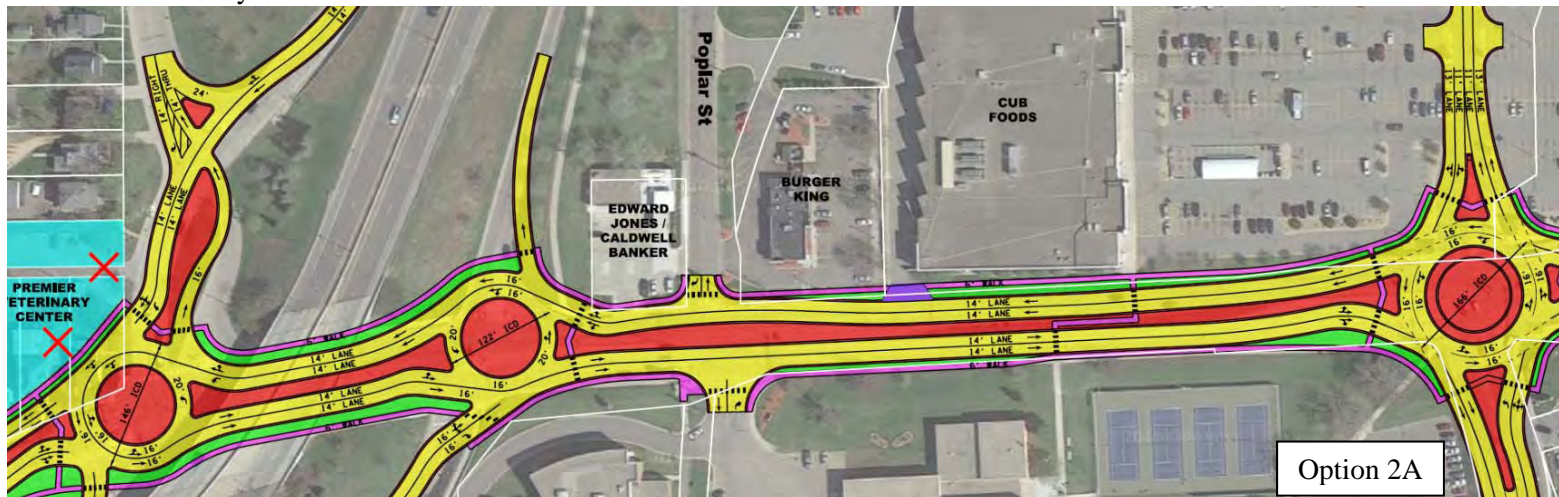


Option 1B – No changes to the Southbound TH 169 Ramp, additional on ramp lane for northbound TH 169, partial signalization at Poplar Street with all left turns removed except the westbound left into Mankato West High School, turn lane additional and signal phasing improvement at Stoltzman Road, roadway expansion at Stoltzman Road through Cub Foods parking lot from Riverfront Drive to Sibley Parkway, and signalized pedestrian crossings at Stoltzman Road and Poplar Street.

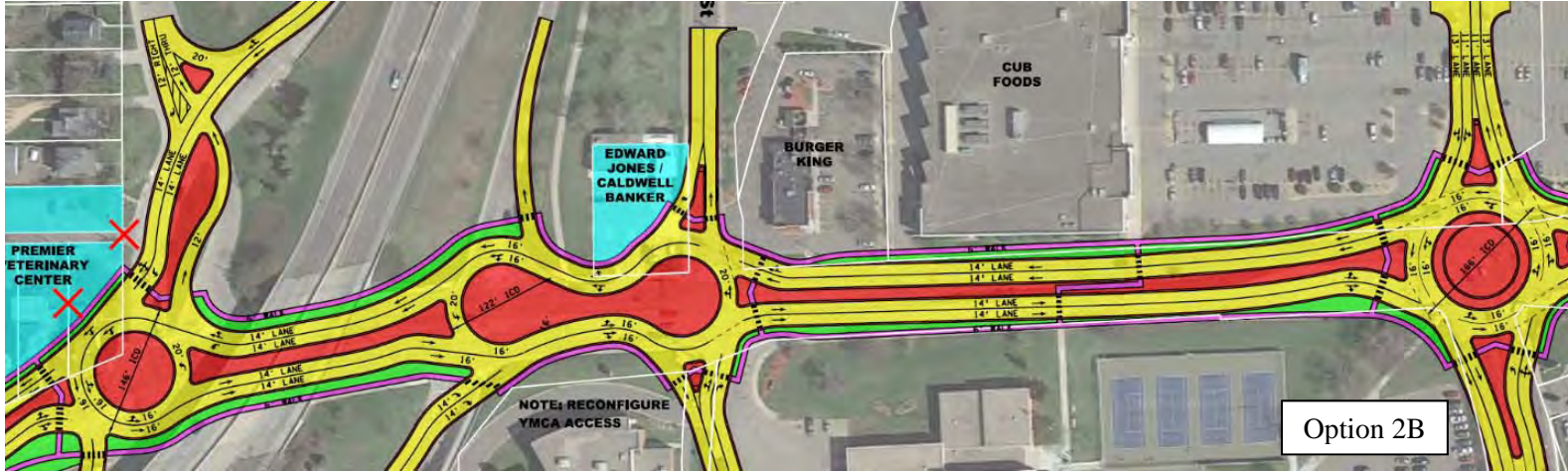


### Option 2: Roundabout Corridor with Access and Pedestrian Enhancements

Option 2A - Roundabouts at TH 169 Ramps and Stoltzman Road, right-in/right-out at Poplar Street, and roadway expansion at Stoltzman Road through Cub Foods parking lot from Riverfront Drive to Sibley Parkway.

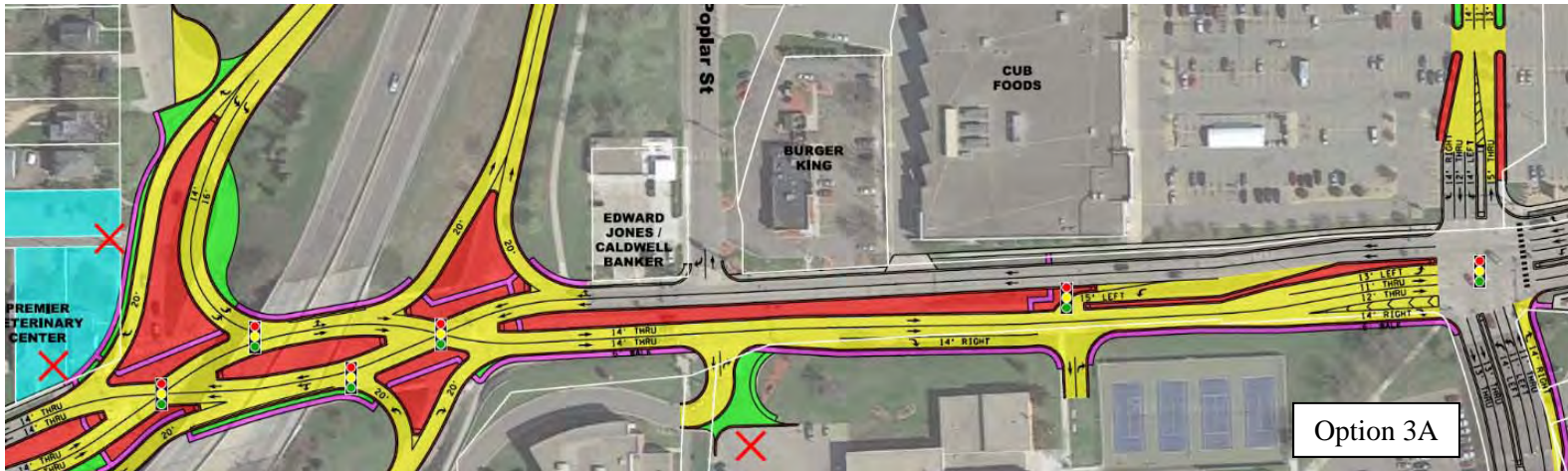


Option 2B - Roundabouts at the Southbound TH 169 Ramp and Stoltzman Road, combined tear drop roundabout at the Northbound TH 169 Ramp and Poplar Street, and roadway expansion at Stoltzman Road through Cub Foods parking lot from Riverfront Drive to Sibley Parkway.



### Option 3: Interchange Modifications with Signal at Stoltzman Road

Option 3A - Diverging diamond at TH 169 Ramps, right-in/right-out at Poplar Street, additional on ramp lane for northbound TH 169, Mankato West High School entrance road shifted east and partially signalized, roadway extension at Stoltzman Road through Cub Foods parking lot from Riverfront Drive to Sibley Parkway, and turn lane additional and signal phasing improvement at Stoltzman Road.





Option 3B - Loop ramp from southbound TH 169 eliminating access of Hubbell Avenue onto Riverfront Road, roadway extension of 2<sup>nd</sup> Street from Owatonna Street to Hubbell Avenue and 3<sup>rd</sup> Street between Sibley Street and Hubbell Avenue, additional on ramp lane for northbound TH 169, and turn lane additional and signal phasing improvement at Stoltzman Road.

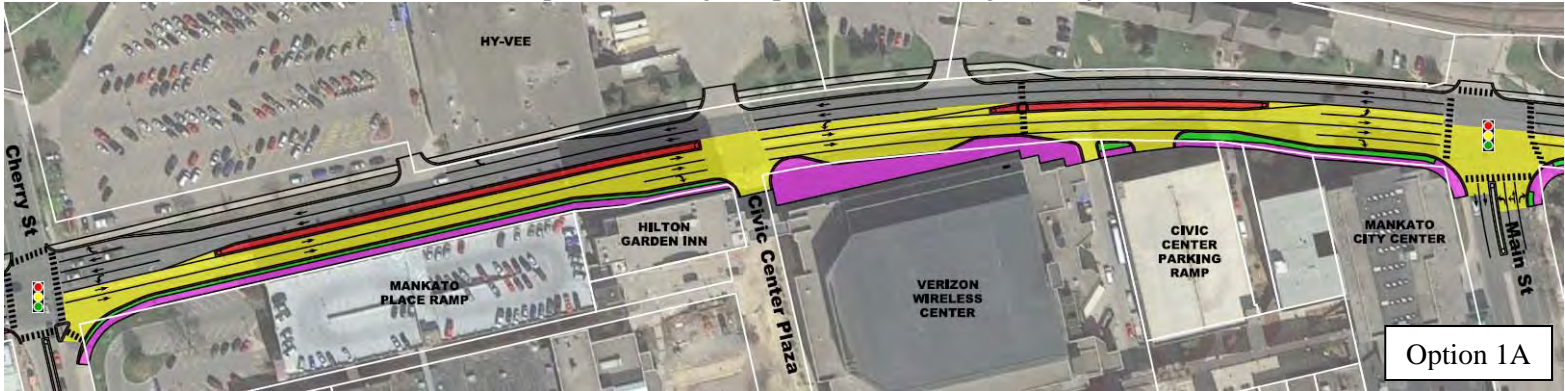


### ***Segment 2 – Sibley Parkway to Veterans Memorial Bridge***

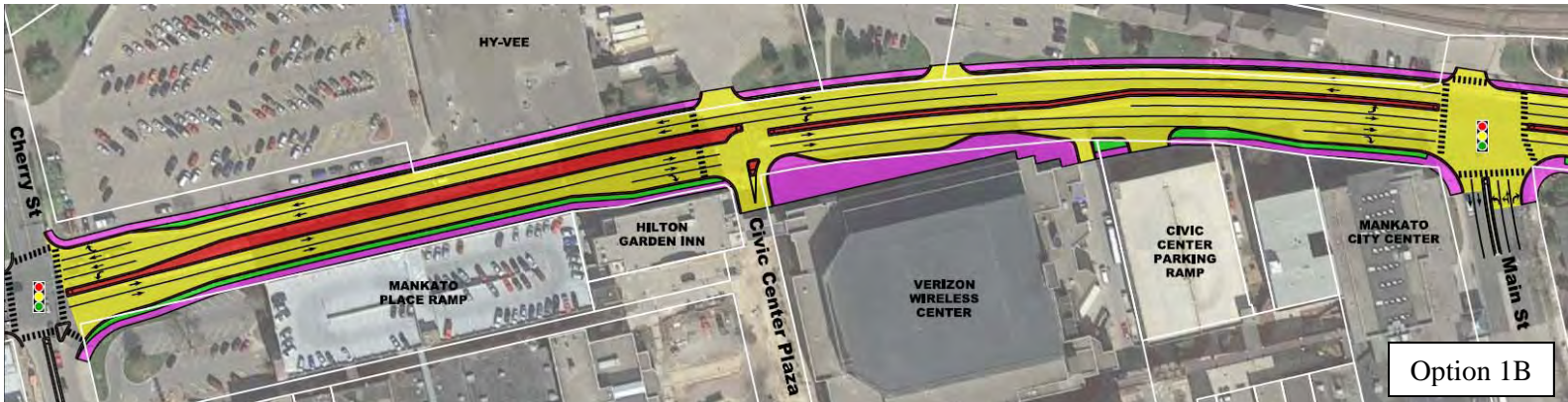
There were three alternatives analyzed for Segment 2. These options are detailed below with snapshots of each.

#### **Option 1: Four Lane Roadway with Spot Safety and Pedestrian Enhancements**

Option 1A - The median is narrowed by eight feet to allow for a sidewalk on the east side of Riverfront Drive, west curb line remains in place, and at-grade pedestrian crossings are adjusted.

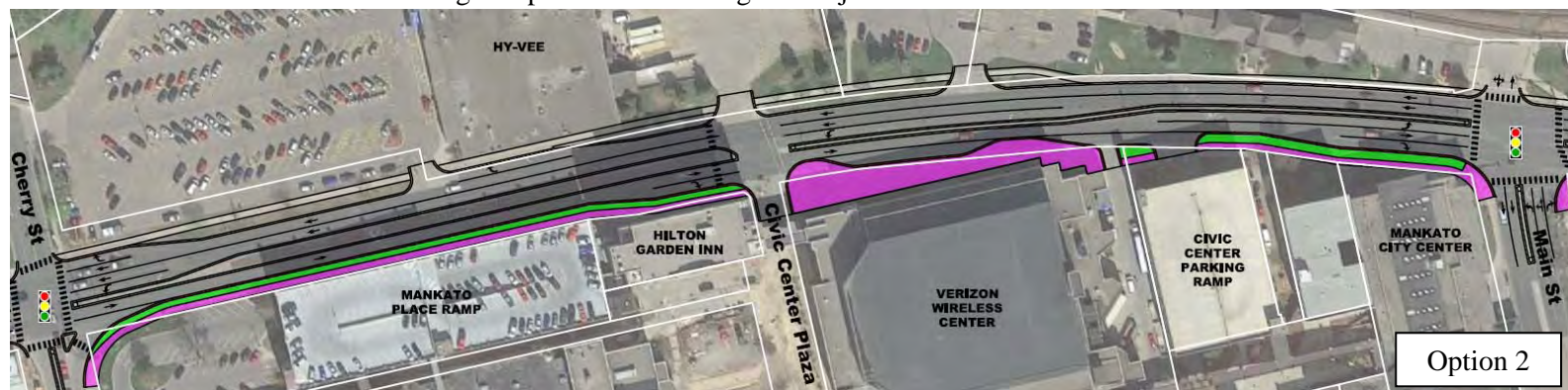


Option 1B - The west curb line between Cherry Street and Plum Street is shifted further west to provide a sidewalk on east side of Riverfront Drive.



#### **Option 2: Three Lane Roadway with Spot Safety and Pedestrian Enhancements**

Northbound through lane is removed starting 50 feet north of Cherry Street to provide a sidewalk on the east side and at-grade pedestrian crossings are adjusted.



### ***Segment 3 – Veterans Memorial Bridge to Madison Avenue***

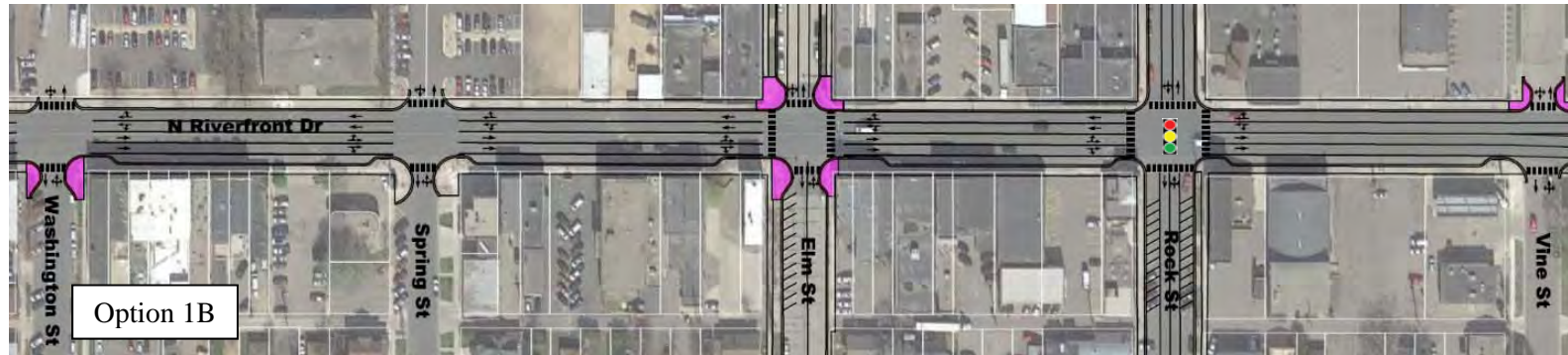
There were eight alternatives analyzed for Segment 3. These options are detailed below with snapshots of each.

#### **Option 1: Four Lane Roadway with Spot Safety and Pedestrian Enhancements**

Option 1A - Primary vehicle intersections at Plum Street & Elm Street and enhanced pedestrian corridor on Rock Street. Add bump-outs at Washington Street, Rock Street, and Vine Street.

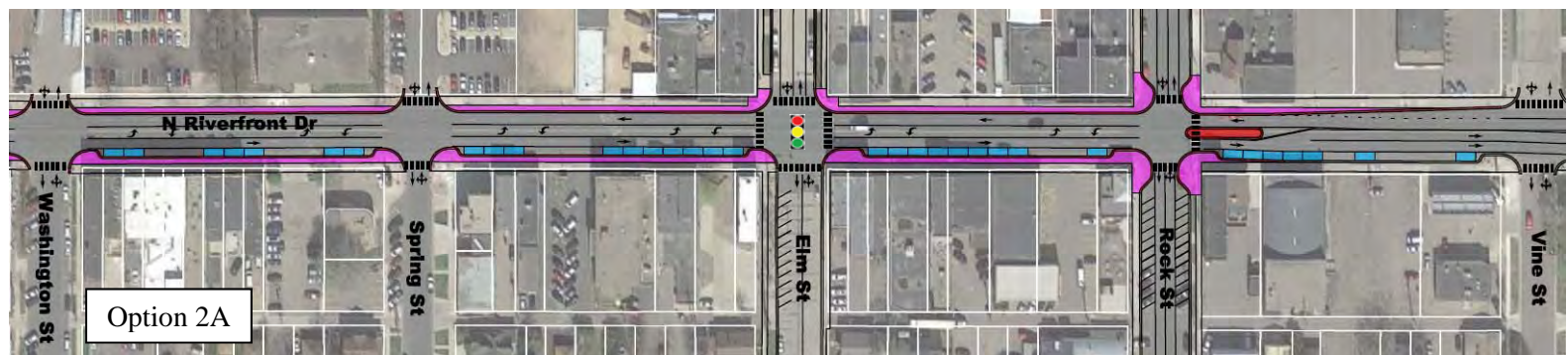


Option 1B - Primary vehicle intersections at Plum Street & Rock Street and enhanced pedestrian corridor on Elm Street.

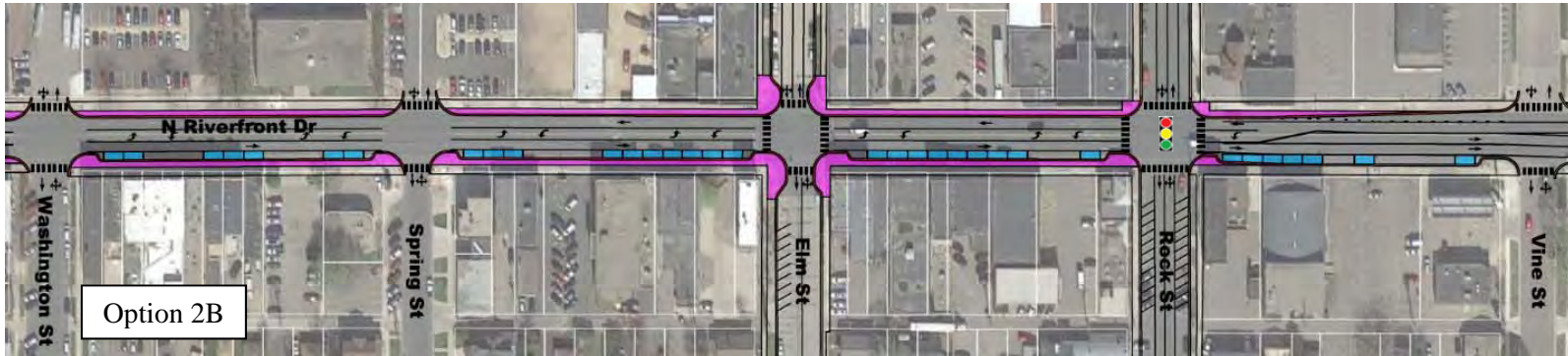


#### **Option 2: Three Lane Roadway with Parking on South Side, Spot Safety and Pedestrian Enhancements**

Option 2A - Primary vehicle intersections at Plum Street & Elm Street and enhanced pedestrian corridor on Rock Street.

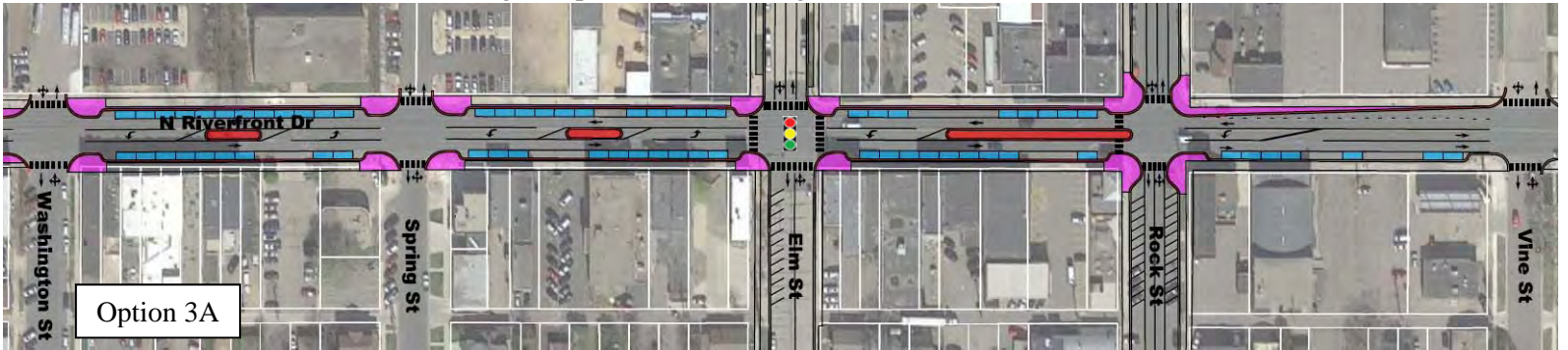


Option 2B - Primary vehicle intersections at Plum Street & Rock Street and enhanced pedestrian corridor on Elm Street.

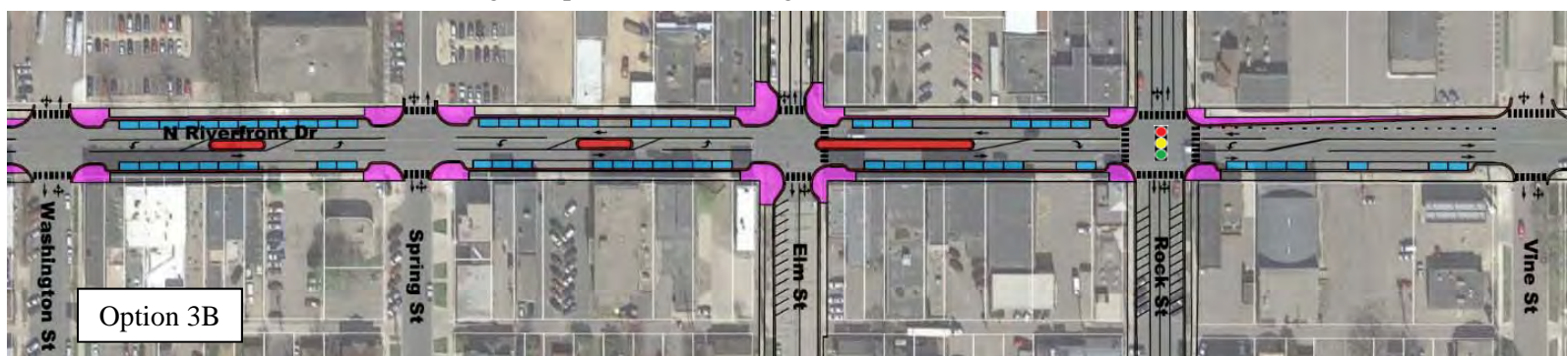


**Option 3: Three Lane Roadway with Parking on Both Sides, Left Turn Lanes between Washington Street and Rock Street, Spot Safety and Pedestrian Enhancements**

Option 3A - Primary vehicle intersections at Plum Street & Elm Street, enhanced pedestrian corridor on Rock Street and median refuge for pedestrians crossing Riverfront Drive.

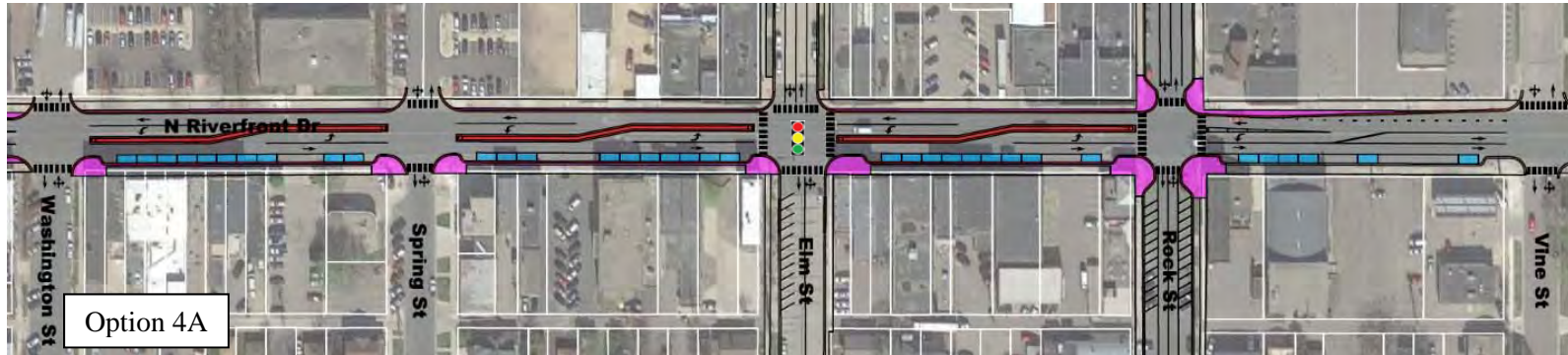


Option 3B - Primary vehicle intersections at Plum Street & Rock Street, enhanced pedestrian corridor on Elm Street and median refuge for pedestrians crossing Riverfront Drive.

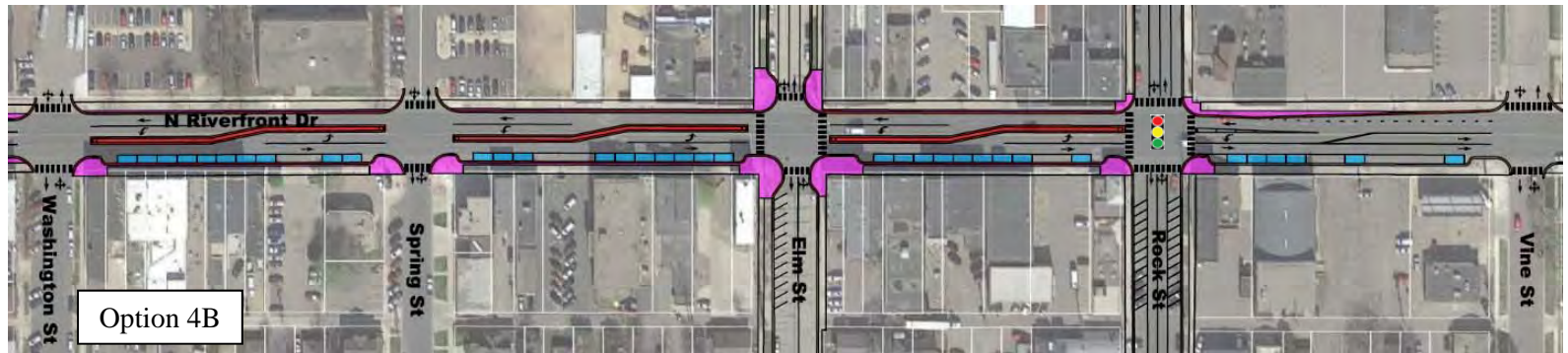


### **Option 4: Three Lane Roadway with Parking on South Side, Medians and Left Turn Lanes between Washington Street and Rock Street, Spot Safety and Pedestrian Enhancements**

Option 4A - Primary vehicle intersections at Plum Street & Elm Street and enhanced pedestrian corridor on Rock Street.



Option 4B - Primary vehicle intersections at Plum Street & Rock Street and enhanced pedestrian corridor on Elm Street.



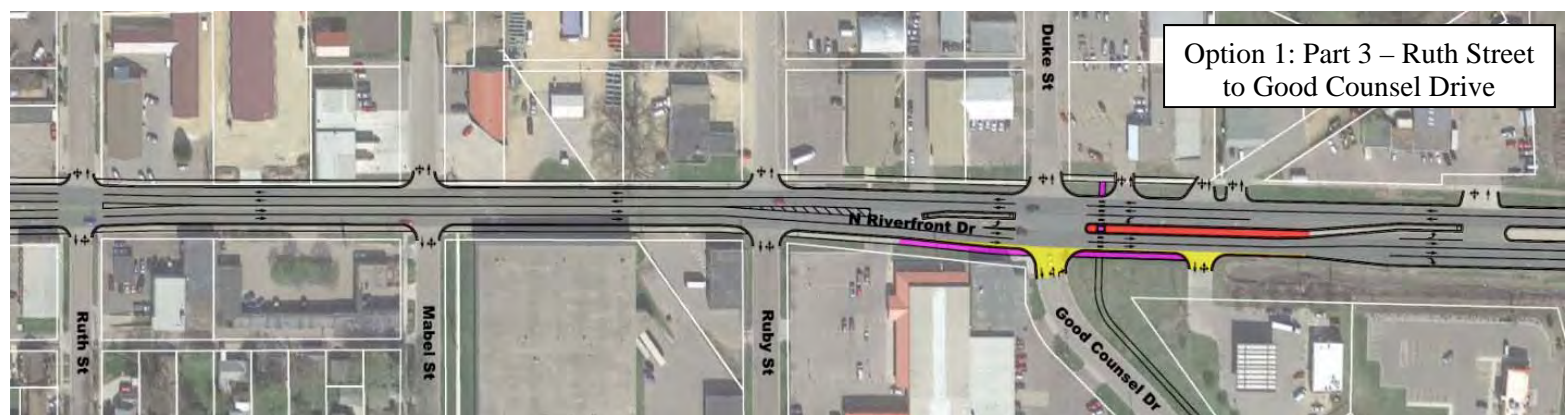
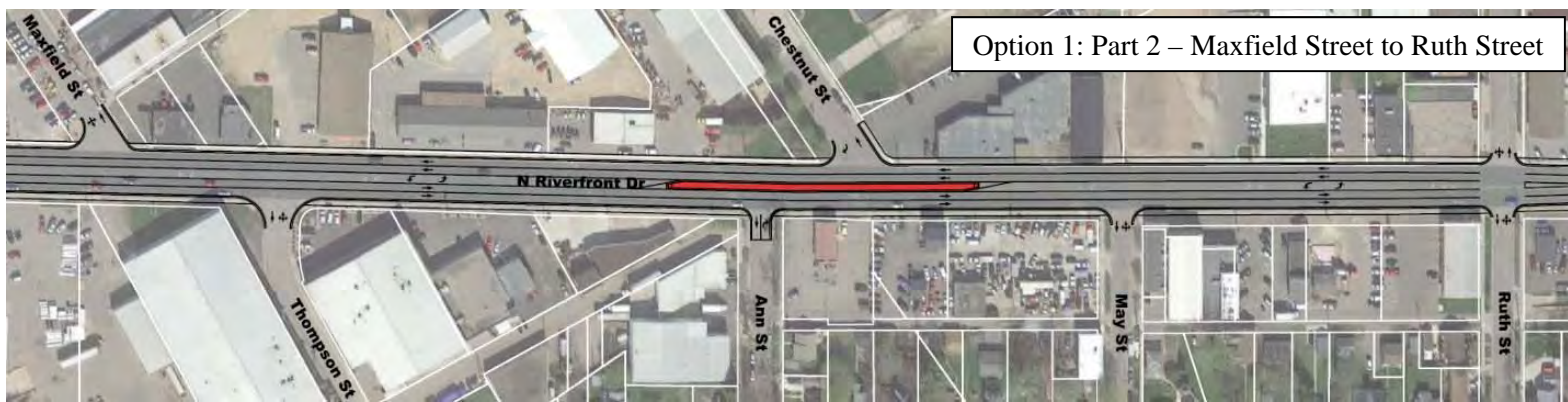
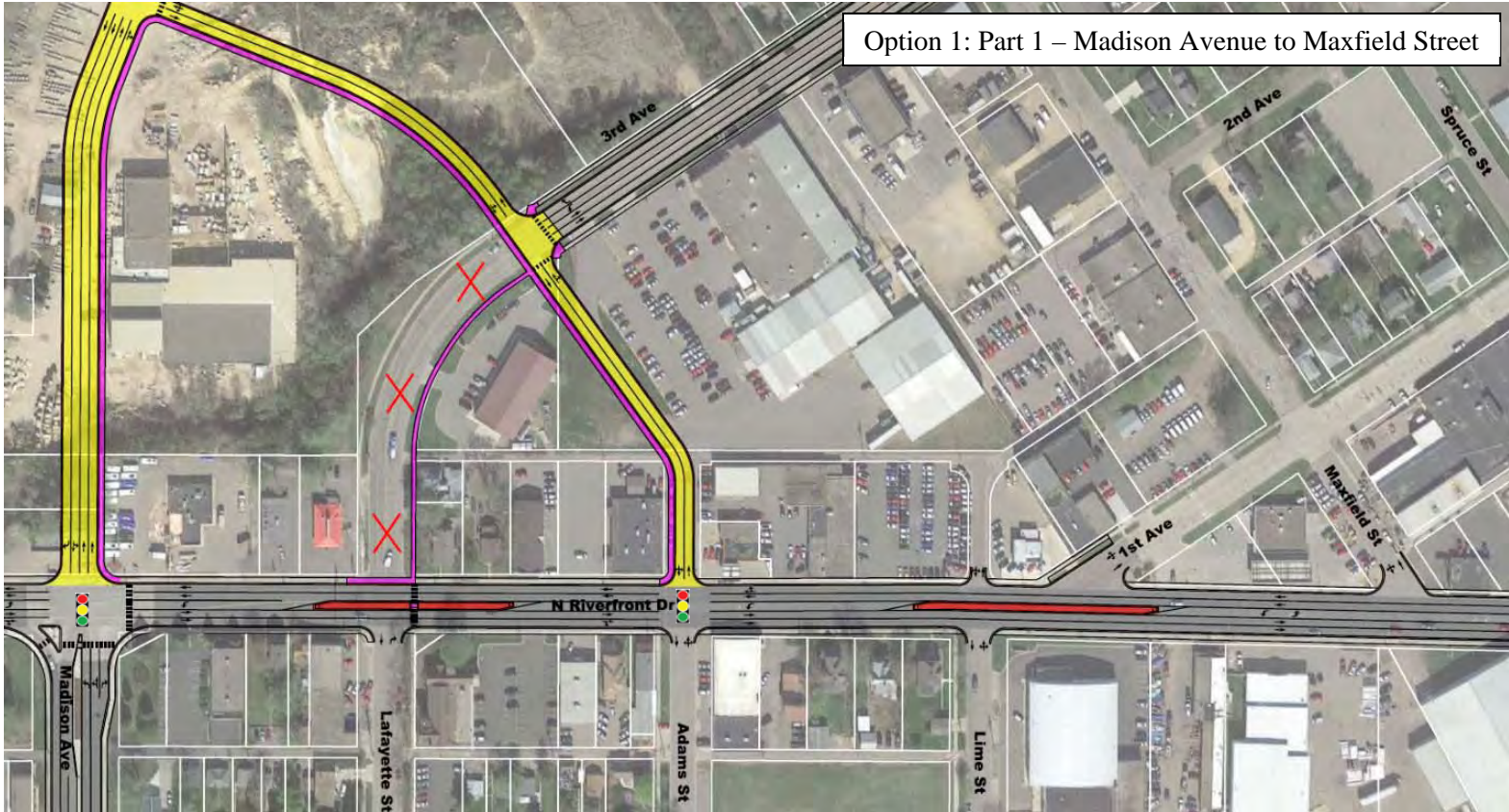
### ***Segment 4 –Madison Avenue to Good Council Drive***

For analysis purposes TH 14 was analyzed separately as its own segment and Segment 4 was analyzed from Madison Avenue to Good Council Drive. There were three alternatives analyzed for Segment 4. These options are detailed below with snapshots of each.

### **Option 1: Primary Vehicle Intersections at Madison Avenue, Adams Street, May Street, and Good Council Drive**

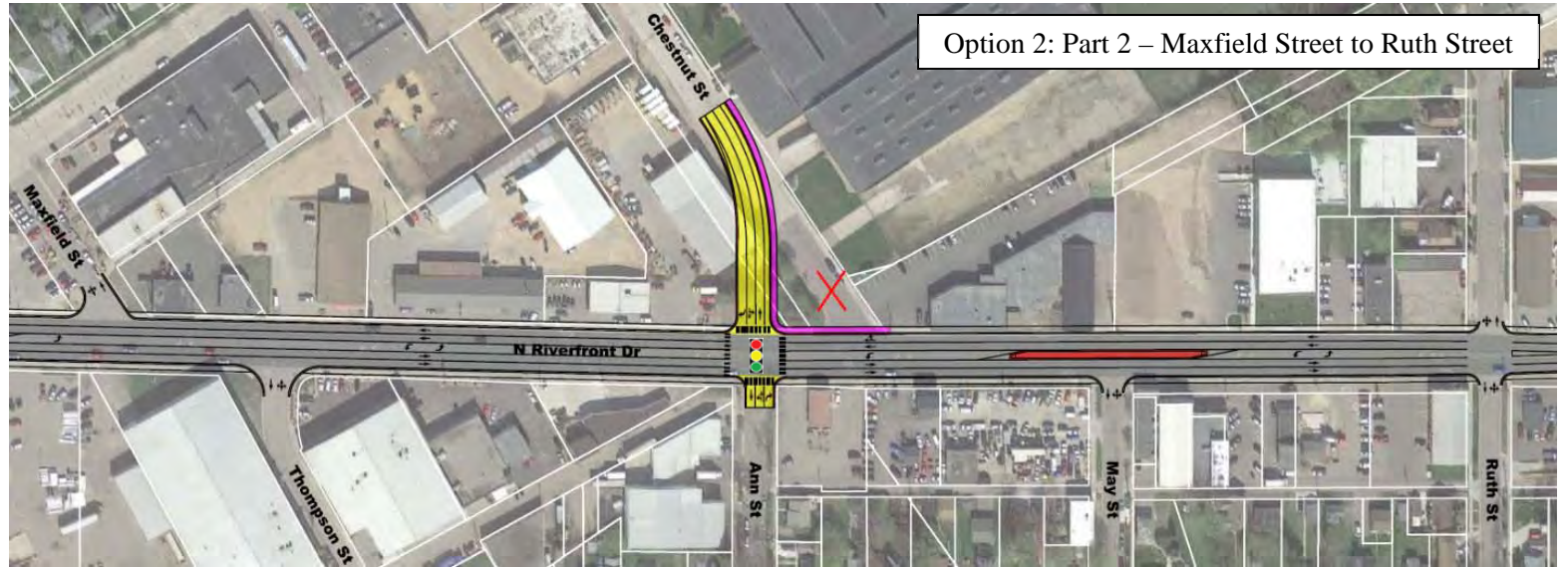
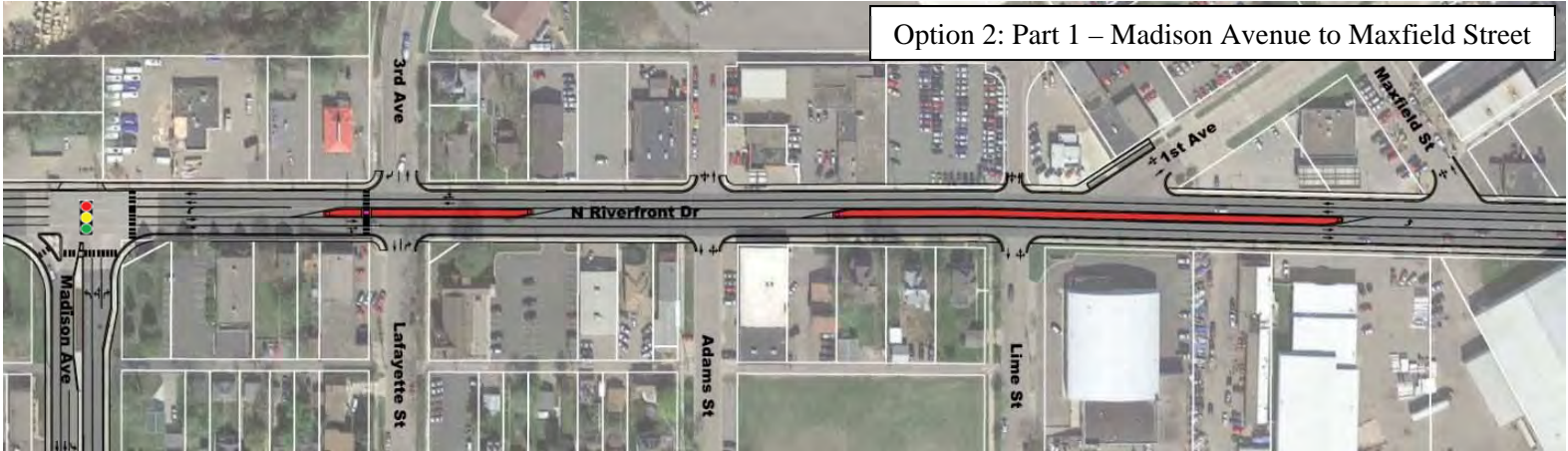
3<sup>rd</sup> Avenue is closed at Riverfront Drive, Madison Avenue is extended into current mining property and Adams Street is extended to the Madison Avenue extension. 3<sup>rd</sup> Avenue ties into Adams Street extension. Secondary intersections are converted to right-in/right-out. Pedestrian crossings at 3<sup>rd</sup> Avenue/Lafayette Street and Good Council Drive.

**Option 1:**



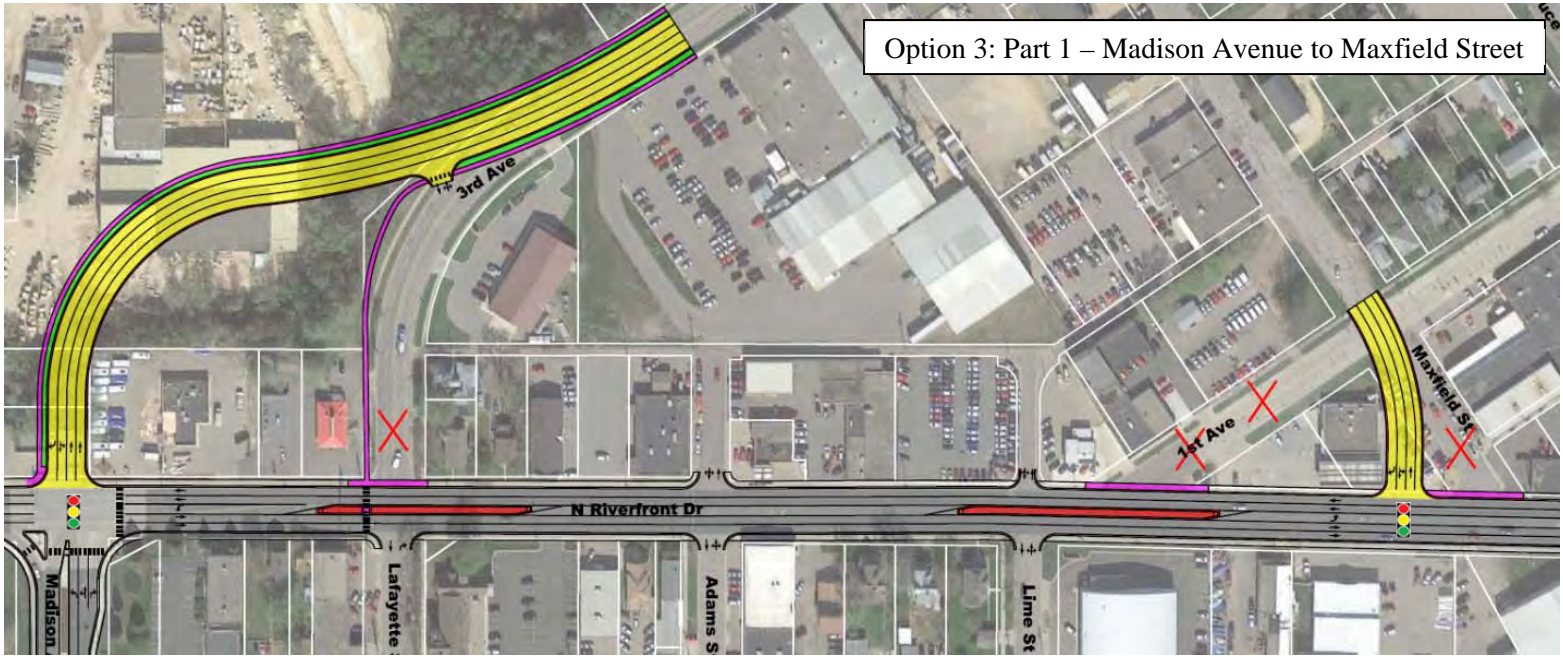
### Option 2: Primary Vehicle Intersections at Madison Avenue, Chestnut Street/Ann Street, and Good Council Drive

3<sup>rd</sup> Avenue is converted to right-in/right-out. Chestnut Street is realigned and tied into Ann Street. Secondary intersections are converted to right-in/right-out. Pedestrian crossings at 3<sup>rd</sup> Avenue/Lafayette Street and Good Council Drive.



### Option 3: Primary Vehicle Intersections at Madison Avenue, Maxfield Street, May Street, and Good Council Drive, realignment of 3rd Avenue to Madison Avenue Extension

3<sup>rd</sup> Avenue is realigned to tie into Madison Avenue, Maxfield Street is realigned to eliminate skewed intersection and May Street is upgraded as a primary intersection. Pedestrian crossings at 3<sup>rd</sup> Avenue/Lafayette Street and Good Council Drive.



Option 3: Part 1 – Madison Avenue to Maxfield Street



Option 3: Part 2 – Maxfield Street to Ruth Street



Option 3: Part 3 – Ruth Street to Good Counsel Drive

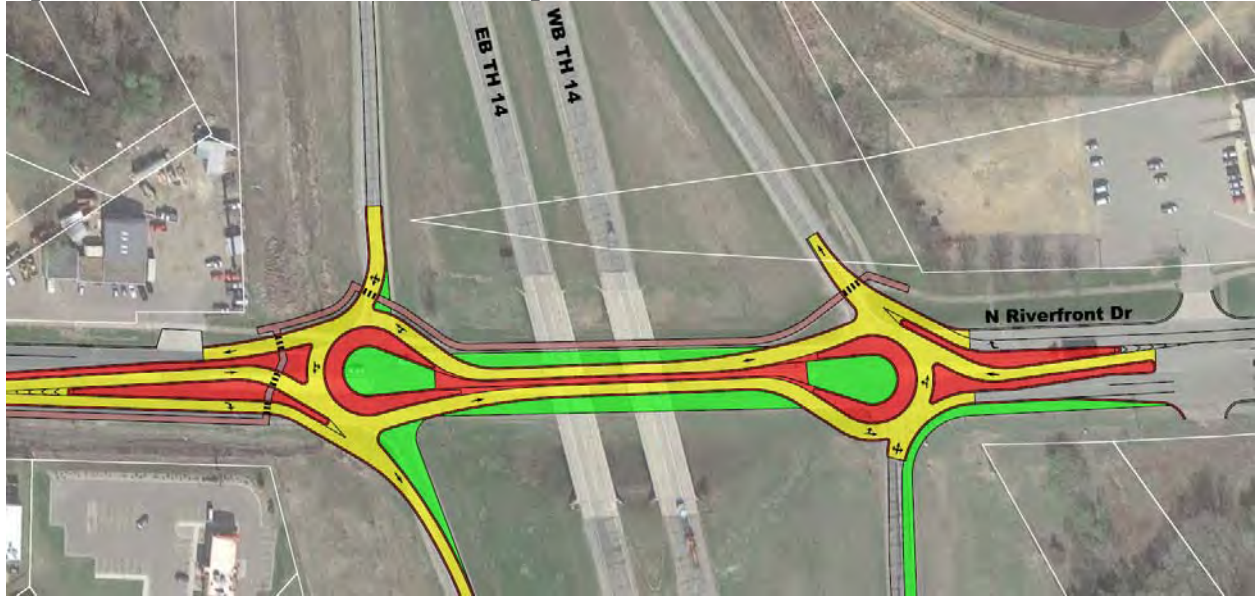


Additionally with each of the Segment 4 options there would be the option to keep the existing five lane section as shown in the snapshots, reduce the roadway to a three lane section with a center turn lane throughout the corridor or reduce the roadway to a two lane section with a median.

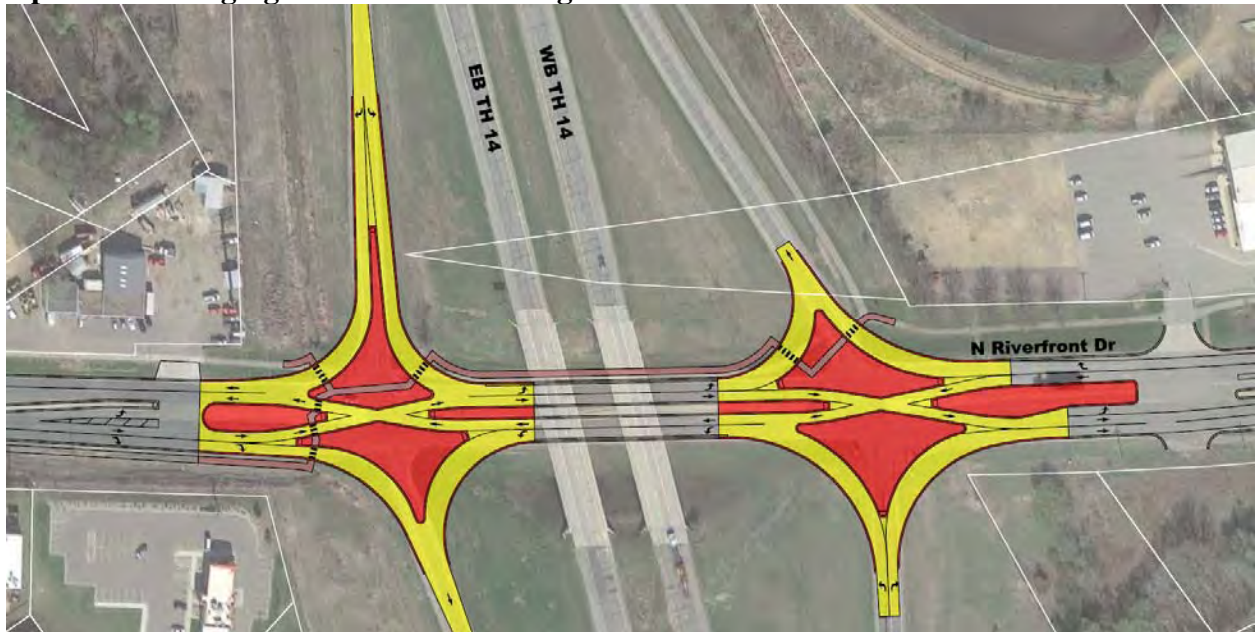
**Segment 5 – TH 14 Ramps**

There were two alternatives analyzed for Segment 5. These options are detailed below with snapshots of each.

**Option 1: Roundabouts at TH 14 Ramps**



**Option 2: Diverging Diamond Interchange at TH 14**



## Alternative Operations Analysis

A traffic operational analysis was completed using the forecasted turning movement counts in SimTraffic for each option. **Tables 5** through **9** show the results of the 2041 no build traffic analysis compared to each option considered along each segment.

### Segment 1 – Woodland Avenue to Sibley Parkway

**Table 5. Segment 1 Traffic Operations Analysis**

Performance Measure		No Build		Traditional Signalized Corridor				Roundabout Corridor				Interchange Modifications			
				Option 1A - Triple Lefts		Option 1B - Double Lefts		Option 2A - Three Roundabouts		Option 2B - Four Roundabout		Option 3A - Diverging Diamond		Option 3B - Loop Ramp	
Vehicle Delay on Riverfront (sec/veh)	AM	44	D	11	B	13	B	9	A	12	B	6	A	10	A
	PM	31	C	16	B	23	C	19	B	14	B	9	A	19	B
Vehicle Delay on Side Streets (sec/veh)	AM	102	F	24	C	33	C	28	C	14	B	21	C	19	B
	PM	66	E	34	C	41	D	57	E	27	C	29	C	33	C
Segment Delay (veh-hr)	AM	230		57		71		55		50		60		51	
	PM	177		90		125		127		79		96		108	
Net Change in Eastbound Travel Time (minutes)	AM	4.2 (baseline)		-1.7		-1.5		-1.8		-1.7		-1.4		-1.5	
	PM	3.2 (baseline)		-0.2		+0.3		-0.4		-0.7		-0.2		+0.4	
Net Change in Westbound Travel Time (minutes)	AM	13 (baseline)		-10.7		-10.7		-10.8		-10.6		-10.3		-10.6	
	PM	4.4 (baseline)		-1.6		-0.8		+0.9		-1.5		-0.8		-1.2	
Intersection Capacity Utilization		0.92		0.9		0.94		1.34		1.37		0.85		0.92	
Maximum Volume to Capacity Ratio		0.95		0.95		0.91		1.75		1.52		0.88		0.99	

**Table 5** shows that vehicle delay and segment delay is decreased overall for each option analyzed compared to the 2041 no build analysis. Travel time is increased by less than one minute during the PM peak hour for eastbound traffic in Options 1B and 3B and westbound in Option 2A and decreased for all other options. The intersection capacity utilization and maximum volume to capacity ratio is greater than one for the roundabout corridor options, but less than one for all other options.

**Tables C1 – C12** in **Appendix C** show the detailed delay and queue lengths for each option at all of the intersections in Segment 1.

**Segment 2 – Sibley Parkway to Veterans Memorial Bridge**

**Table 6. Segment 2 Traffic Operations Analysis**

Performance Measure		No Build		Option 1A - 4 Lane Narrow Median		Option 1B - 4 Lane Shifted Roadway		Option 2 - 3 Lane	
Vehicle Delay on Riverfront (sec/veh)	AM	14	B	14	B	14	B	13	B
	PM	13	B	13	B	13	B	19	B
Vehicle Delay on Side Streets (sec/veh)	AM	14	B	14	B	14	B	28	C
	PM	18	B	18	B	18	B	32	C
Maximum Queue (ft)									
Poplar St/Warren St	AM	NBT	275	NBT	275	NBT	275	NBT	650
	PM	NBT	275	NBT	275	NBT	275	NBT	625
Minnesota St/Cherry St	AM	NBT	225	NBT	225	NBT	225	NBT	375
	PM	NBT	300	NBT	300	NBT	300	NBT	375
Main St	AM	NBT	150	NBT	150	NBT	150	NBT	475
	PM	NBT	250	NBT	250	NBT	250	NBT	775
Intersection Capacity Utilization		0.79		0.79		0.79		0.89	
Maximum Volume to Capacity Ratio		0.83		0.83		0.83		0.82	

**Table 6** shows that operations are acceptable and the same as the existing no build analysis for Option 1A and Option 1B as no geometric changes were made at the intersections. With Option 2 vehicle delay increases, but remains acceptable at LOS C or better during both peak hours. Northbound queuing is problematic during the PM peak hours, however most vehicles do not wait more than one cycle. Delay is acceptable with LOS C or better at Minnesota Street/Cherry Street and Main Street and LOS D at Poplar Street/Warren Street. The intersection capacity utilization and maximum volume to capacity ratio is less than one for all options.

**Tables C13 – C14** in **Appendix C** show the detailed delay and queue lengths at all of the intersections in Segment 2 for Option 2.

**Segment 3 – Veterans Memorial Bridge to Madison Avenue**

**Table 7. Segment 3 Traffic Operations Analysis**

Performance Measure		No Build		Four Lane				Three Lane - Parking Both Sides				Three Lane - Parking Both Sides & Left Turn Lanes				Three Lane - Parking South Side, Full Medians & Left Turn Lanes			
				Option 1A Elm Primary Intersection		Option 1B Rock Primary Intersection		Option 2A Elm Primary Intersection		Option 2B Rock Primary Intersection		Option 3A Elm Primary Intersection		Option 3B Rock Primary Intersection		Option 4A Elm Primary Intersection		Option 4B Rock Primary Intersection	
Vehicle Delay on Riverfront (sec/veh)	AM	7	A	7	A	7	A	9	A	8	A	9	A	8	A	9	A	8	A
	PM	10	A	10	A	10	A	15	B	15	B	15	B	15	B	15	B	15	B
Vehicle Delay on Side Streets (sec/veh)	AM	14	B	14	B	14	B	20	C	20	B	20	C	20	B	20	C	20	B
	PM	18	B	18	B	18	B	30	C	30	C	30	C	30	C	30	C	30	C
Intersection Capacity Utilization		0.74		0.74		0.74		0.81		0.82		0.81		0.82		0.81		0.82	
Maximum Volume to Capacity Ratio		0.78		0.78		0.78		1.05		1.05		1.05		1.05		1.05		1.05	

**Table 7** shows that vehicle delay is acceptable for all options with LOS C or better. The intersection capacity utilization is less than one for all options. The maximum volume to capacity ratio is greater than one for the three lane options and less than one for the four lane option.

**Tables C15 and C16 in Appendix C** show the detailed delay and queue lengths at all of the intersections in the three lane options with Elm Street as a primary intersection. **Tables C17 and C18 in Appendix C** show the detailed delay and queue lengths at all of the intersections in the three lane options with Rock Street as a primary intersection.

Madison Avenue at Riverfront Drive was also analyzed as a roundabout to determine if the three lane section could begin north of Madison Avenue however the volumes were too high in this area for a single lane roundabout to function with acceptable delay.

Additionally, analysis was completed to determine if the free northbound right turn could be eliminated at Plum Street. The movement delay was found to be 4.5 seconds with the free right and 4.7 seconds without the free right so it is recommended that the free right be removed to improve pedestrian safety.

***Segment 4 – Madison Avenue to Good Council Drive***

Traffic operations were not analyzed for the alternatives discussed along Segment 4. Due to the lower traffic volumes it was assumed that operations would be comparable between all of the options. Instead these options were analyzed with the goals of how to provide efficient vehicle and freight mobility and access, safety for all users, infrastructure improvements compatible with the historic and natural environment and how to enhance the community identity. Details on how each option is able to meet these goals is described in the Final Study Report.

***Segment 5 – TH 14 Ramps***

**Table 9. Segment 5 Traffic Operations Analysis**

Performance Measure		No Build		Option 1 - Roundabouts		Option 2 - Diverging Diamond	
Vehicle Delay on Riverfront (sec/veh)	AM	2	A	23	C	6	A
	PM	2	A	16	C	9	A
Vehicle Delay on Ramps (sec/veh)	AM	99	F	20	C	5	A
	PM	193	F	20	C	5	A
Intersection Capacity Utilization		0.54		1.12		0.73	
Maximum Volume to Capacity Ratio		3.01		0.99		0.78	

**Table 9** shows that with roundabouts at both ramps in Option 1 the vehicle delay on Riverfront Drive increases, but remains acceptable at LOS C. With the diverging diamond in Option 2 the vehicle delay on Riverfront Drive remains LOS A. The vehicle delay on the ramps is significantly less for both options compared to 2041 no build analysis. The intersection capacity utilization is greater than one for Option 1 and remains less than one for Option 2. The maximum volume to capacity ratio is greatly reduced and less than one for both options.

# Appendix A: Traffic Forecasting

Figure 1. Traffic Growth at Riverfront Drive West of Stoltzman Road

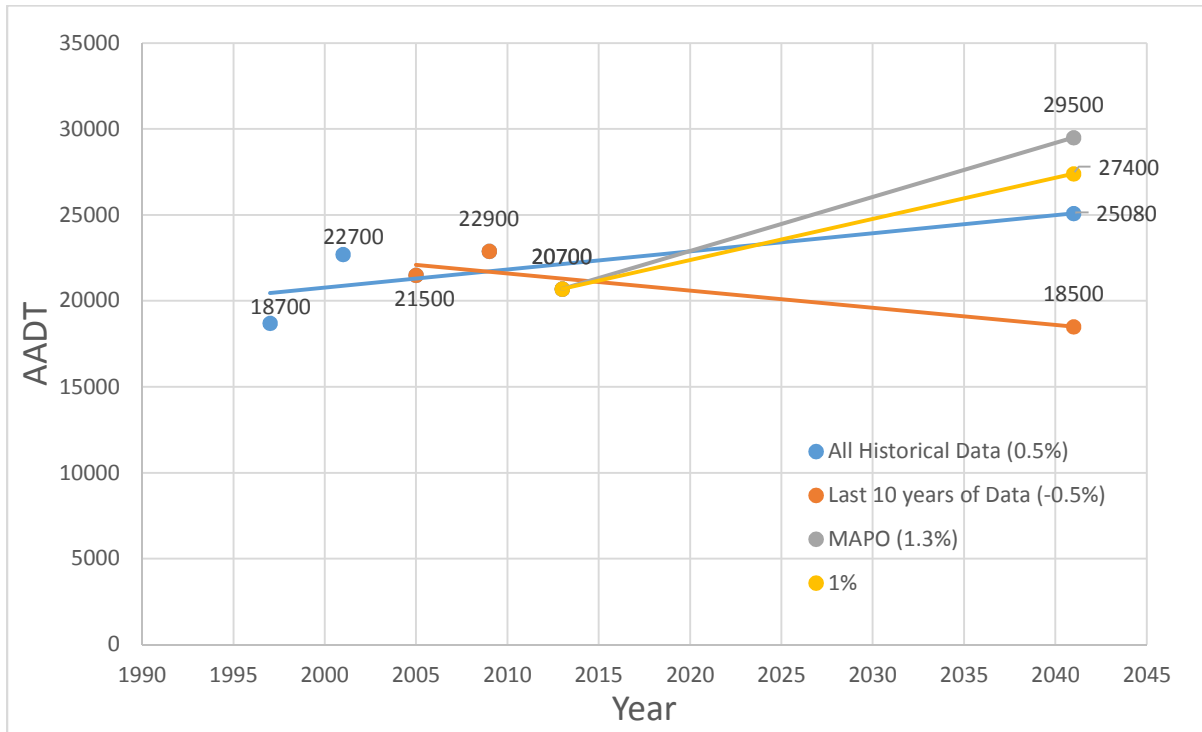


Figure 2. Traffic Growth at Riverfront Drive South of Minnesota Street-Cherry Street

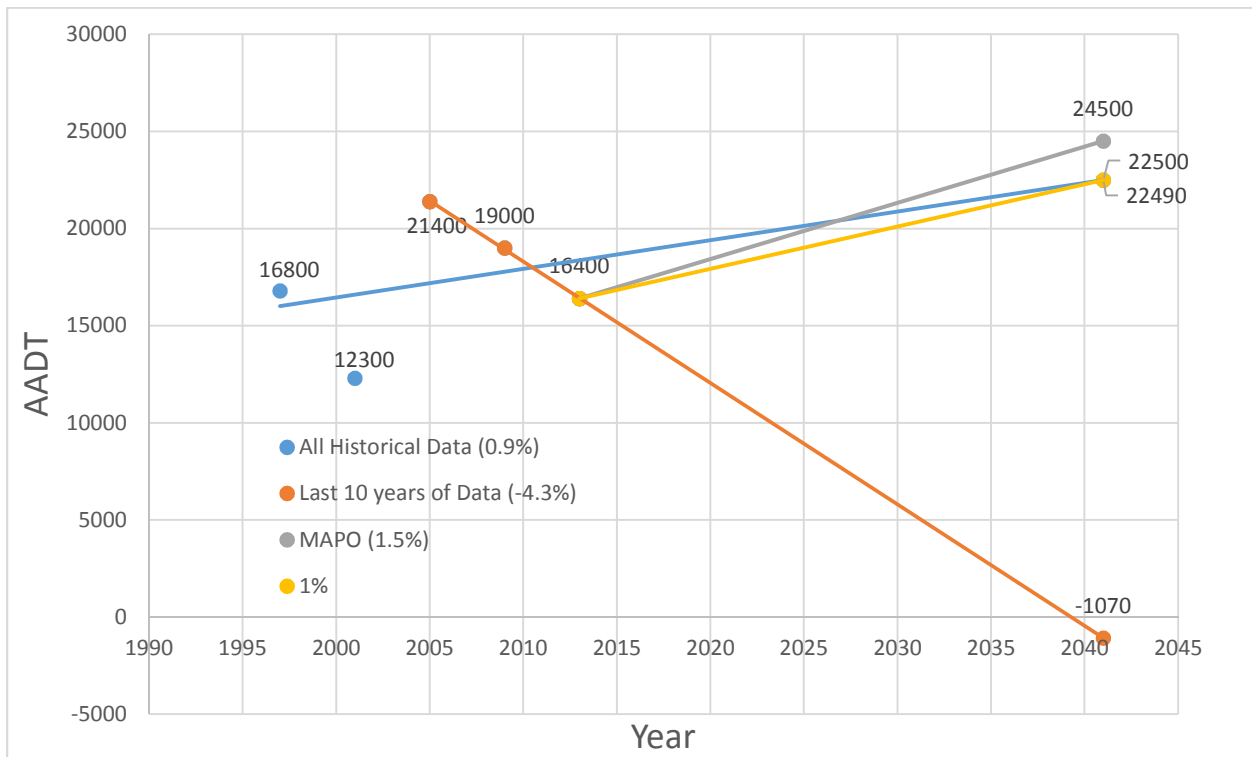


Figure 3. Traffic Growth at Riverfront Drive South of Lafayette Street-3<sup>rd</sup> Avenue

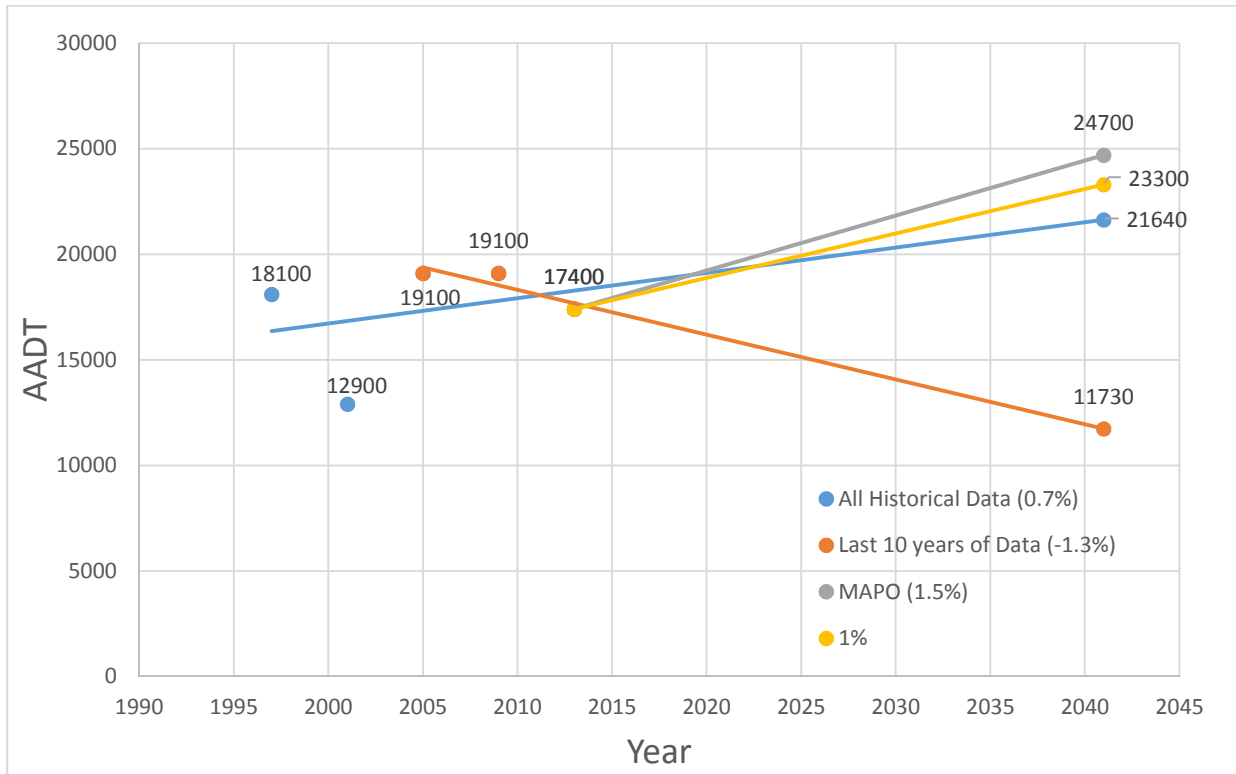
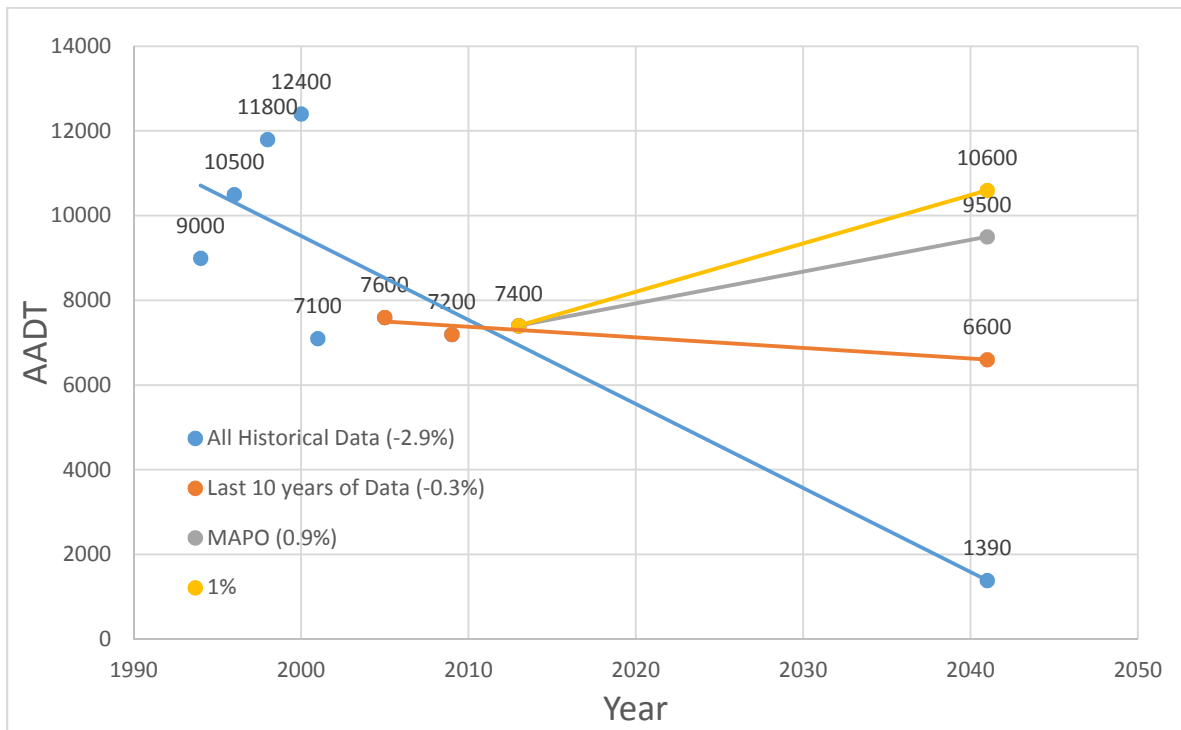


Figure 4. Traffic Growth at Riverfront Drive North of TH 14 Westbound Ramp



# Appendix B: 2041 No Build Traffic Operational Analysis



**Table B1: 2041 Segment 1 Existing Geometry Traffic Operations Analysis - Riverfront Drive Corridor Study**

Intersection	Peak Hour	Intersection Delay*- LOS		Movement Delay (sec/veh)																							
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
Riverfront Dr & Woodland Ave <i>Stop Controlled</i>	AM	2	A	-	0	A	0	A	2	A	1	A	1	A	6	A	7	A	2	A	5	A	7	A	-		
	PM	3	A	2	A	0	A	0	A	3	A	1	A	1	A	6	A	7	A	2	A	5	A	7	A	3	A
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	6	A	-	4	A	4	A	9	A	2	A	2	A	33	D	41	E	4	A	16	C	15	C	7	A	
	PM	7	A	7	A	4	A	4	A	9	A	2	A	2	A	32	D	27	D	2	A	25	D	19	C	8	A
SB TH 169 Ramp/Owatonna St & Riverfront Dr <i>Signalized Intersection</i>	AM	49	D	14	B	34	C	-	22	C	17	B	2	A	-	-	-	-	-	75	E	-	-	41	D		
	PM	32	C	8	A	43	D	33	C	26	C	16	B	3	A	-	-	-	-	43	D	56	E	16	B		
NB TH 169 Ramp & Riverfront Dr <i>Stop Controlled</i>	AM	62	F	7	A	14	B	-	-	14	B	37	E	1949	F	514	F	748	F	-	-	-	-	-	-		
	PM	24	C	24	C	6	A	-	-	5	A	17	C	-	-	77	F	127	F	-	-	-	-	-	-		
Mankato West HS/Poplar St & Riverfront Dr <i>Signalized Intersection</i>	AM	79	E	11	B	19	B	22	C	59	E	156	F	351	F	261	F	253	F	153	F	78	E	86	F	111	F
	PM	50	D	22	C	18	B	19	B	62	E	69	E	103	F	134	F	162	F	65	E	73	E	60	E	60	E
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	89	F	16	B	16	B	12	B	19	B	83	F	16	B	320	F	268	F	69	E	16	B	26	C	44	D
	PM	44	D	46	D	32	C	15	B	42	D	39	D	10	B	117	F	156	F	19	B	26	C	37	D	24	C
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	75	E	-	7	A	4	A	128	F	182	F	-	-	176	F	-	-	1	A	-	-	-	-	-		
	PM	15	B	-	7	A	4	A	23	C	18	B	-	-	41	D	-	-	1	A	-	-	-	-	-		

\*Delay in seconds per vehicle

\*\*Maximum delay and LOS on any approach and/or movement

\*\*\*Limiting Movement is the highest delay movement.

**Table B2: 2041 Segment 1 Existing Geometry Peak Hour Queues By Movement**

Intersection	Peak Hour	Queue Lengths																							
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Riverfront Dr & Woodland Ave <i>Stop Controlled</i>	AM	0	25	0	25	0	25	25	50	25	50	-	-	25	100	25	100	25	100	25	50	25	50	25	50
	PM	0	25	0	25	0	25	25	50	25	50	-	-	25	25	25	25	25	25	50	50	50	50	50	50
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	25	75	25	75	25	75	75	200	75	200	25	75	50	125	50	125	-	-	25	50	25	50	25	50
	PM	25	50	25	50	25	50	75	175	75	175	25	25	25	75	25	75	-	-	25	75	25	75	25	75
SB TH 169 Ramp/Owatonna St & Riverfront Dr <i>Signalized Intersection</i>	AM	25	25	200	350	200	350	75	150	25	125	25	125	-	-	-	-	-	-	575	950	-	-	175	300
	PM	0	25	150	300	150	300	200	275	75	150	75	150	-	-	-	-	-	-	275	650	-	-	125	300
NB TH 169 Ramp & Riverfront Dr <i>Stop Controlled</i>	AM	75	250	200	300	-	-	-	-	200	250	175	200	25	150	25	150	725	1275	-	-	-	-	-	-
	PM	100	250	100	275	-	-	-	-	250	275	200	225	25	100	25	100	375	1000	-	-	-	-	-	-
Mankato West HS/Poplar St & Riverfront Dr <i>Signalized Intersection</i>	AM	50	150	200	225	200	225	75	200	600	800	600	800	350	525	350	525	100	150	150	375	150	375	150	375
	PM	75	225	225	250	225	250	125	250	575	800	575	800	225	500	225	500	100	150	200	450	200	450	200	450
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	25	75	100	200	100	200	50	150	175	275	25	175	800	1300	-	-	725	1300	25	75	-	-	25	100
	PM	125	225	150	300	125	225	150	250	200	300	100	200	425	500	-	-	325	475	75	125	-	-	100	125
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	-	-	75	175	50	125	50	175	300	775	-	-	150	525	-	-	-	-	-	-	-	-	-	-
	PM	-	-	75	250	50	150	50	175	125	400	-	-	125	250	-	-	0	25	-	-	-	-	-	-

**Table B3: 2041 Segment 2 Existing Geometry Traffic Operations Analysis - Riverfront Drive Corridor Study**

Intersection	Peak Hour	Intersection Delay*- LOS		Movement Delay (sec/veh)																							
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
Riverfront Dr & Sibley Pkwy <i>Signalized Intersection</i>	AM	38	D	39	D	3	A	-	-	74	E	84	F	-	-	-	-	-	33	C	-	-	48	D			
	PM	5	A	41	D	4	A	-	-	5	A	4	A	-	-	-	-	-	26	C	-	-	7	A			
Riverfront Dr & Poplar St/Warren St <i>Signalized Intersection</i>	AM	14	B	30	C	26	C	21	C	32	C	24	C	10	B	10	B	10	B	9	A	19	B	12	B	11	B
	PM	18	B	31	C	30	C	22	C	29	C	25	C	11	B	28	C	15	B	13	B	24	C	15	B	12	B
Riverfront Dr & Minnesota St/Cherry St <i>Signalized Intersection</i>	AM	11	B	28	C	30	C	13	B	30	C	32	C	2	A	10	B	6	A	4	A	22	C	10	B	6	A
	PM	19	B	25	C	20	C	11	B	30	C	29	C	3	A	27	C	13	B	10	B	56	E	18	B	9	A
Riverfront Dr & Main St <i>Signalized Intersection</i>	AM	8	A	26	C	-	-	-	-	26	C	-	-	7	A	6	A	8	A	5	A	15	B	5	A	5	A
	PM	13	B	31	C	-	-	8	A	26	C	18	B	9	A	17	B	13	B	9	A	23	C	9	A	-	-

\*Delay in seconds per vehicle

\*\*Maximum delay and LOS on any approach and/or movement

\*\*\*Limiting Movement is the highest delay movement.

**Table B4: 2041 Segment 2 Existing Geometry Peak Hour Queues By Movement**

Intersection	Peak Hour	Queue Lengths																							
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Riverfront Dr & Sibley Pkwy <i>Signalized Intersection</i>	AM	25	50	25	125	-	-	-	-	175	825	25	150	-	-	-	-	-	-	25	75	-	-	25	50
	PM	25	75	50	125	-	-	-	-	50	150	25	50	-	-	-	-	-	-	50	100	-	-	25	50
Riverfront Dr & Poplar St/Warren St <i>Signalized Intersection</i>	AM	75	200	75	200	75	200	50	125	50	150	50	150	25	100	100	275	100	275	50	150	75	275	75	275
	PM	125	250	125	250	125	250	75	175	75	150	75	150	50	150	125	275	125	275	75	225	150	350	150	350
Riverfront Dr & Minnesota St/Cherry St <i>Signalized Intersection</i>	AM	50	100	25	100	25	100	100	225	100	225	25	75	25	50	75	200	75	200	50	100	75	325	25	75
	PM	75	125	50	150	50	150	175	350	175	350	50	125	50	150	125	300	125	300	75	225	150	325	50	175
Riverfront Dr & Main St <i>Signalized Intersection</i>	AM	25	25	25	25	25	25	75	150	75	150	50	125	25	50	50	150	25	50	25	100	50	125	50	125
	PM	25	75	25	75	25	75	100	175	100	175	50	100	25	50	100	250	50	175	50	125	75	200	75	200

**Table B5: 2041 Segment 3 Existing Geometry Traffic Operations Analysis - Riverfront Drive Corridor Study**

Intersection	Peak Hour	Intersection Delay*- LOS		Movement Delay (sec/veh)																						
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR
Riverfront Dr & Plum St <i>Signalized Intersection</i>	AM	4	A	-	-	-	-	23	C	-	7	A	15	B	5	A	3	A	8	A	3	A	3	A		
	PM	5	A	10	B	-	-	28	C	-	9	A	-	-	5	A	5	A	13	B	3	A	-	-		
Riverfront Dr & Elm St <i>Signalized Intersection</i>	AM	4	A	10	B	6	A	4	A	11	B	-	6	A	10	B	4	A	2	A	6	A	3	A	3	A
	PM	6	A	22	C	21	C	9	A	18	B	-	7	A	14	B	6	A	5	A	16	B	6	A	4	A
Riverfront Dr & Madison Ave <i>Signalized Intersection</i>	AM	12	B	-	-	-	-	24	C	-	-	10	B	-	-	14	B	8	A	22	C	6	A	-	-	
	PM	17	B	-	-	-	-	26	C	49	D	12	B	-	-	25	C	14	B	22	C	8	A	9	A	

\*Delay in seconds per vehicle

\*\*Maximum delay and LOS on any approach and/or movement

\*\*\*Limiting Movement is the highest delay movement.

**Table B6: 2041 Segment 3 Existing Geometry Peak Hour Queues By Movement**

Intersection	Peak Hour	Queue Lengths																							
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Riverfront Dr & Plum St <i>Signalized Intersection</i>	AM	-	-	-	-	-	-	25	50	25	50	50	75	25	25	50	175	25	25	25	75	25	75	25	75
	PM	25	25	25	25	25	25	25	75	25	75	50	75	-	-	50	175	25	50	50	125	25	100	25	100
Riverfront Dr & Elm St <i>Signalized Intersection</i>	AM	25	50	25	50	25	50	25	50	25	50	-	-	50	125	50	125	50	125	25	125	25	125	-	-
	PM	50	125	50	125	50	125	25	50	25	50	-	-	75	175	75	175	75	175	75	225	75	225	-	-
Riverfront Dr & Madison Ave <i>Signalized Intersection</i>	AM	-	-	-	-	-	-	75	125	25	150	75	150	-	-	125	300	125	300	75	200	75	225	75	225
	PM	-	-	-	-	-	-	125	200	100	200	100	175	-	-	200	425	200	425	100	200	75	175	75	175

**Table B7: 2041 Segment 4 Existing Geometry Traffic Operations Analysis - Riverfront Drive Corridor Study**

Intersection	Peak Hour	Intersection Delay*- LOS		Movement Delay (sec/veh)																						
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR
Riverfront Dr & 3rd Ave/Lafayette St <i>Stop Controlled</i>	AM	5	A	57	F	25	D	15	C	-	45	E	12	B	10	B	2	A	2	A	8	A	3	A	2	A
	PM	6	A	48	E	48	E	17	C	-	-	6	A	9	A	3	A	3	A	3	A	8	A	3	A	1
Riverfront Dr & May St <i>Stop Controlled</i>	AM	1	A	-	-	-	-	16	C	-	-	6	A	-	-	2	A	2	A	3	A	0	A	-	-	-
	PM	3	A	-	-	-	-	23	C	-	-	11	B	-	-	3	A	3	A	6	A	0	A	-	-	-
Riverfront Dr & TH 14 EB Ramp <i>Stop Controlled</i>	AM	5	A	22	C	-	-	13	B	-	-	-	-	-	1	A	2	A	5	A	1	A	-	-	-	-
	PM	6	A	39	E	-	-	7	A	-	-	-	-	-	2	A	3	A	12	B	1	A	-	-	-	-
Riverfront Dr & TH 14 WB Ramp <i>Stop Controlled</i>	AM	28	D	-	-	-	-	197	F	-	80	F	11	B	1	A	-	-	-	-	1	A	1	A	1	A
	PM	56	F	-	-	-	-	374	F	-	242	F	6	A	1	A	-	-	-	-	1	A	1	A	1	A

\*Delay in seconds per vehicle

\*\*Maximum delay and LOS on any approach and/or movement

\*\*\*Limiting Movement is the highest delay movement.

**Table B8: 2041 Segment 4 Existing Geometry Peak Hour Queues By Movement**

Intersection	Peak Hour	Queue Lengths																							
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Riverfront Dr & 3rd Ave/Lafayette St <i>Stop Controlled</i>	AM	25	50	-	-	75	225	50	75	50	75	-	-	75	150	25	25	25	25	25	75	25	25	25	25
	PM	25	50	-	-	100	275	25	50	25	50	-	-	75	150	-	-	-	-	25	50	-	-	-	-
Riverfront Dr & May St <i>Stop Controlled</i>	AM	-	-	-	-	-	-	25	75	-	-	25	75	-	-	-	-	-	-	25	50	-	-	-	-
	PM	-	-	-	-	-	-	50	100	-	-	50	100	-	-	0	25	0	25	25	50	-	-	-	-
Riverfront Dr & TH 14 EB Ramp <i>Stop Controlled</i>	AM	75	225	-	-	100	250	-	-	-	-	-	-	-	-	-	0	25	25	75	-	-	-	-	-
	PM	125	325	-	-	75	200	-	-	-	-	-	-	-	-	-	25	25	25	75	-	-	-	-	-
Riverfront Dr & TH 14 WB Ramp <i>Stop Controlled</i>	AM	-	-	-	-	-	-	325	1025	325	1025	100	350	50	175	-	-	-	-	-	-	-	0	25	-
	PM	-	-	-	-	-	-	650	1725	650	1725	150	350	50	175	-	-	-	-	-	-	-	25	25	-

# Appendix C: 2041 Alternative Traffic Operational Analysis

**Table C1: 2041 Segment 1 - Option 1A Traffic Operations Analysis**

Intersection	Peak Hour	Intersection Delay* - LOS		Movement Delay (sec/veh)																							
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
Riverfront Dr & Woodland Ave <i>Stop Controlled</i>	AM	2	A	-	0	A	0	A	2	A	1	A	1	A	6	A	8	A	2	A	6	A	6	A	-		
	PM	3	A	3	A	1	A	0	A	3	A	1	A	1	A	6	A	8	A	2	A	6	A	7	A	2	A
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	9	A	-	5	A	4	A	11	B	2	A	1	A	68	F	66	F	7	A	24	C	17	C	11	B	
	PM	8	A	5	A	4	A	4	A	11	B	2	A	2	A	38	E	29	D	2	A	32	D	26	D	13	B
Riverfront Dr & SB TH 169 Ramps/Owatonna St <i>Signalized Intersection</i>	AM	27	C	13	B	31	C	-	24	C	12	B	2	A	-	-	-	-	-	-	33	C	-	-	13	B	
	PM	32	C	34	C	46	D	41	D	29	C	15	B	3	A	-	-	-	-	-	42	D	43	D	12	B	
Riverfront Dr & NB TH 169 Ramps <i>Stop Controlled</i>	AM	6	A	9	A	3	A	-	-	2	A	3	A	84	F	23	C	36	E	-	-	-	-	-	-		
	PM	12	B	24	C	4	A	-	-	4	A	4	A	-	-	48	E	64	F	-	-	-	-	-	-		
Mankato West HS/Poplar St & Riverfront Dr <i>Signalized Intersection</i>	AM	22	C	18	B	14	B	6	A	54	D	16	B	16	B	62	E	59	E	41	D	32	C	28	C	21	C
	PM	25	C	29	C	14	B	3	A	58	E	23	C	21	C	62	E	63	E	28	C	54	D	46	D	42	D
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	16	B	16	B	17	B	17	B	16	B	12	B	3	A	22	C	19	B	9	A	18	B	27	C	8	A
	PM	28	C	42	D	29	C	16	B	36	D	27	C	7	A	36	D	38	D	11	B	34	C	49	D	20	C
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	5	A	-	5	A	3	A	14	B	4	A	-	-	13	B	-	-	1	A	-	-	-	-	-		
	PM	11	B	-	6	A	3	A	22	C	9	A	-	-	41	D	-	-	1	A	-	-	-	-	-		

\*Delay in seconds per vehicle

**Table C2: 2041 Segment 1 - Option 1A Peak Hour Queues By Movement**

Intersection	Peak Hour	Queue Lengths (ft)																							
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Riverfront Dr & Woodland Ave <i>Stop Controlled</i>	AM	0	25	0	25	0	25	25	50	25	50	-	-	25	50	25	50	25	50	25	50	25	50	25	50
	PM	0	25	0	25	0	25	25	50	25	50	-	-	25	25	25	25	25	25	50	75	50	75	50	75
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	25	50	25	50	25	50	75	200	75	200	75	200	75	200	75	200	25	50	25	50	25	50	25	50
	PM	25	50	25	50	25	50	100	300	100	300	100	300	25	75	25	75	-	-	25	100	25	100	25	100
Riverfront Dr & SB TH 169 Ramps/Owatonna St <i>Signalized Intersection</i>	AM	25	75	200	375	200	375	100	200	25	100	25	100	-	-	-	-	-	-	150	500	150	500	75	275
	PM	25	25	175	275	175	275	200	300	75	150	75	150	-	-	-	-	-	-	175	550	175	550	100	275
Riverfront Dr & NB TH 169 Ramps <i>Stop Controlled</i>	AM	75	225	50	175	-	-	-	25	150	25	125	25	25	25	25	100	275	-	-	-	-	-	-	
	PM	100	225	25	200	-	-	-	50	250	25	200	25	25	25	25	225	700	-	-	-	-	-	-	
Mankato West HS/Poplar St & Riverfront Dr <i>Signalized Intersection</i>	AM	50	150	175	250	100	200	125	275	175	400	175	400	225	625	225	625	100	150	75	175	75	175	75	175
	PM	75	175	175	250	50	100	125	250	275	500	275	500	150	475	150	475	75	150	175	350	175	350	175	350
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	50	125	125	450	150	225	50	125	75	175	25	100	125	250	50	225	75	175	-	-	-	-	25	75
	PM	125	225	125	300	125	225	150	250	175	275	75	200	175	275	100	375	75	150	-	-	-	-	75	125
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	-	-	50	125	50	100	25	75	50	125	-	-	-	-	-	-	-	-	-	-	-	-	-	
	PM	-	-	75	200	50	150	50	150	100	275	-	-	-	-	-	-	-	-	-	-	-	-	-	

Table C3: 2041 Segment 1 - Option 1B Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay* - LOS	Movement Delay (sec/veh)																									
			EBU		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
Riverfront Dr & Woodland Ave <i>Stop Controlled</i>	AM	2   A	-	-	0	A	0	A	3	A	1	A	1	A	6	A	8	A	2	A	5	A	7	A	-	-		
	PM	3   A	-	2	A	0	A	3	A	1	A	1	A	7	A	8	A	2	A	6	A	7	A	4	A			
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	7   A	-	-	4	A	4	A	9	A	2	A	1	A	43	E	46	E	5	A	19	C	17	C	11	B		
	PM	7   A	-	8	A	4	A	4	A	10	B	2	A	1	A	29	D	24	C	2	A	25	D	23	C	11	B	
Riverfront Dr & SB TH 169 Ramps/Owatonna St <i>Signalized Intersection</i>	AM	42   D	-	16	B	33	C	22	C	26	C	7	A	2	A	-	-	-	-	64	E	-	-	34	C			
	PM	34   C	-	19	B	44	D	16	B	31	C	13	B	4	A	-	-	-	-	46	D	-	-	16	B			
Riverfront Dr & NB TH 169 Ramps <i>Signalized Intersection</i>	AM	11   B	-	9	A	13	B	-	-	7	A	3	A	23	C	66	E	28	C	-	-	-	-	-	-			
	PM	14   B	-	16	B	11	B	-	-	14	B	4	A	44	D	42	D	35	D	-	-	-	-	-	-			
Mankato West HS/Poplar St & Riverfront Dr <i>Signalized Intersection</i>	AM	16   B	-	-	16	B	9	A	23	C	6	A	5	A	-	-	-	-	39	D	-	-	55	E				
	PM	22   C	-	-	14	B	5	A	38	D	15	B	18	B	-	-	-	-	65	E	-	-	51	D				
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	21   C	28	C	30	C	17	B	14	B	20	C	25	C	5	A	33	C	22	C	9	A	41	D	42	D	14	B
	PM	42   D	97	F	80	F	33	C	14	B	38	D	55	E	18	B	70	E	38	D	9	A	54	D	50	D	24	C
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	6   A	-	-	3	A	2	A	11	B	4	A	-	-	37	D	-	-	1	A	-	-	-	-	-	-		
	PM	21   C	-	-	14	B	6	A	37	D	48	D	-	-	85	F	-	-	1	A	-	-	-	-	-	-		

\*Delay in seconds per vehicle

Table C4: 2041 Segment 1 - Option 1B Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)																							
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Riverfront Dr & Woodland Ave <i>Stop Controlled</i>	AM	-	-	-	-	-	-	25	50	25	50	25	50	25	75	25	75	25	75	25	50	25	50	25	50
	PM	25	75	25	75	25	75	25	75	25	75	25	75	25	50	25	50	25	50	25	75	25	75	25	75
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	25	75	25	75	25	75	75	175	75	175	75	175	50	200	50	200	25	50	25	50	25	50	25	50
	PM	25	50	25	50	25	50	75	250	75	250	75	250	25	75	25	75	-	-	25	100	25	100	25	100
Riverfront Dr & SB TH 169 Ramps/Owatonna St <i>Signalized Intersection</i>	AM	25	25	175	325	175	325	75	150	25	75	25	75	-	-	-	-	-	550	950	550	950	175	300	
	PM	0	25	150	250	150	250	225	275	50	150	50	150	-	-	-	-	-	300	775	300	775	125	300	
Riverfront Dr & NB TH 169 Ramps <i>Signalized Intersection</i>	AM	100	225	175	300	-	-	-	50	175	25	175	25	50	25	50	100	225	-	-	-	-	-	-	
	PM	100	200	150	275	-	-	-	125	275	50	225	25	50	25	50	150	400	-	-	-	-	-	-	
Mankato West HS/Poplar St & Riverfront Dr <i>Signalized Intersection</i>	AM	-	-	175	250	125	200	100	225	75	175	75	175	-	-	-	250	525	-	-	-	-	75	175	
	PM	-	-	175	275	75	225	100	225	250	550	250	550	-	-	-	225	500	-	-	-	-	175	300	
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	150	250	125	500	125	225	75	150	125	250	25	100	175	275	50	425	75	175	25	75	25	75	25	75
	PM	225	250	275	825	125	225	175	250	225	325	175	200	225	275	225	700	75	225	100	125	150	350	100	125
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	-	-	50	100	25	75	25	75	25	125	-	-	75	150	-	-	-	-	-	-	-	-	-	-
	PM	-	-	125	200	75	200	75	200	275	700	-	-	175	375	-	-	0	25	-	-	-	-	-	-

Table C5: 2041 Segment 1 - Option 2A Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay* - LOS		Movement Delay (sec/veh)																									
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR			
Riverfront Dr & Woodland Ave <i>Stop Controlled</i>	AM	2	A	-	1	A	0	A	2	A	1	A	1	A	6	A	8	A	2	A	5	A	7	A	-	-			
	PM	2	A	3	A	0	A	0	A	3	A	1	A	0	A	6	A	8	A	2	A	6	A	8	A	3	A		
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	7	A	-	4	A	4	A	8	A	1	A	1	A	39	E	47	E	6	A	20	C	14	B	4	A			
	PM	6	A	5	A	4	A	4	A	6	A	1	A	1	A	32	D	26	D	2	A	30	D	33	D	12	B		
Mankato West HS/Poplar St & Riverfront Dr <i>Signalized Intersection</i>	AM	34	D	-	3	A	2	A	-	-	5	A	2	A	-	-	-	-	124	F	-	-	-	-	78	F			
	PM	37	E	-	4	A	3	A	-	-	13	B	9	A	-	-	-	-	115	F	-	-	-	-	321	F			
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	5	A	-	4	A	2	A	13	B	4	A	-	-	13	B	-	-	1	A	-	-	-	-	-	-			
	PM	57	E	-	8	A	4	A	22	C	9	A	-	-	51	D	-	-	1	A	-	-	-	-	-	-			
				EBL/T		EBT/R		WBL		WBT/R		NBL		NBT		NBR		SBL		SBT/R									
Riverfront Dr & SB TH 169 Ramps/Owatonna St <i>Signalized Intersection</i>	AM	14	B	23	C	22	C	-	4	A	4	A	-	-	-	-	-	-	-	-	13	B	10	B	-	-			
	PM	20	C	18	C	17	C	-	5	A	5	A	-	-	-	-	-	-	-	-	40	E	22	C	-	-			
				EBL/T		EBT		WBL/L/T		WBR		NBL/T/R		NBR															
Riverfront Dr & NB TH 169 Ramps <i>Signalized Intersection</i>	AM	12	B	9	A	10	B	-	8	A	16	C	-	-	20	C	18	C	-	-	-	-	-	-	-	-			
	PM	12	B	7	A	8	A	-	15	C	14	B	-	-	16	C	15	C	-	-	-	-	-	-	-	-			
				EBU/L/T		EBT/R		WBL/T		WBT/R		NBL		NBL/T/R				SBL/T		SBT/R									
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	15	C	13	B	15	C	-	11	B	11	B	-	-	25	D	17	C	-	-	9	A	8	A	-	-			
	PM	50	E	43	E	55	F	-	60	F	64	F	-	-	56	F	29	D	-	-	36	E	31	D	-	-			

\*Delay in seconds per vehicle

Table C6: 2041 Segment 1 - Option 2A Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)																									
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR			
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max		
Riverfront Dr & Woodland Ave <i>Stop Controlled</i>	AM	25	25	25	25	25	25	25	50	25	50	25	50	25	50	25	50	25	50	25	50	25	50	25	50		
	PM	25	25	25	25	25	25	25	50	25	50	25	50	25	50	25	50	25	50	50	75	50	75	50	75		
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	25	50	25	50	25	50	75	175	75	175	25	50	50	350	50	350	25	150	25	50	25	50	25	50		
	PM	25	50	25	50	25	50	50	150	50	150	0	25	25	50	25	50	25	50	25	100	25	100	25	100		
Mankato West HS/Poplar St & Riverfront Dr <i>Signalized Intersection</i>	AM	-	-	25	175	25	175	-	-	25	175	25	125	-	-	-	-	350	525	-	-	-	-	125	300		
	PM	-	-	50	150	50	200	-	-	75	350	100	400	-	-	-	-	200	500	-	-	-	-	550	650		
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	-	-	75	150	25	75	25	75	25	125	-	-	50	100	-	-	0	0	-	-	-	-	-	-		
	PM	-	-	75	150	50	75	100	200	350	775	-	-	125	250	-	-	0	0	-	-	-	-	-	-		
				EBL/T		EBT/R		WBL		WBT/R		NBL		NBT		NBR		SBL		SBT/R							
Riverfront Dr & SB TH 169 Ramps/Owatonna St <i>Signalized Intersection</i>	AM	-	125	-	125	-	-	-	0	-	0	-	-	-	-	-	-	-	-	100	-	75	-	-	-		
	PM	-	75	-	75	-	-	-	25	-	25	-	-	-	-	-	-	-	-	275	-	150	-	-	-		
				EBL/T		EBT		WBL/L/T		WBR		NBL/T/R		NBR													
Riverfront Dr & NB TH 169 Ramps <i>Signalized Intersection</i>	AM	-	100	-	125	-	-	-	50	-	150	-	-	-	25	-	25	-	-	-	-	-	-	-	-		
	PM	-	50	-	75	-	-	-	150	-	200	-	-	-	50	-	50	-	-	-	-	-	-	-	-		
				EBU/L/T		EBT/R		WBL/T		WBT/R		NBL		NBL/T/R				SBL/T		SBT/R							
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	-	125	-	175	-	-	-	50	-	50	-	-	-	150	-	100	-	-	0	-	0	-	-	-		
	PM	-	350	-	425	-	-	-	325	-	375	-	-	-	250	-	150	-	-	125	-	125	-	-	-		



Table C7: 2041 Segment 1 - Option 2A Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay* - LOS		Movement Delay (sec/veh)																							
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
Riverfront Dr & Woodland Ave <i>Stop Controlled</i>	AM	2	A	-	1	A	0	A	2	A	1	A	1	A	6	A	8	A	2	A	5	A	7	A	-	-	
	PM	2	A	3	A	0	A	0	A	3	A	1	A	0	A	6	A	8	A	2	A	6	A	8	A	3	A
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	7	A	-	4	A	4	A	8	A	1	A	1	A	39	E	47	E	6	A	20	C	14	B	4	A	
	PM	6	A	5	A	4	A	4	A	6	A	1	A	1	A	32	D	26	D	2	A	30	D	33	D	12	B
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	5	A	-	4	A	2	A	13	B	4	A	-	-	13	B	-	-	1	A	-	-	-	-	-	-	
	PM	57	E	-	8	A	4	A	22	C	9	A	-	-	51	D	-	-	1	A	-	-	-	-	-	-	
				EBL/T		EBT/R		WBL		WBT/R										SBL		SBT/R					
Riverfront Dr & SB TH 169 Ramps/Owatonna St <i>Roundabout</i>	AM	14	B	23	C	22	C	-	4	A	4	A	-	-	-	-	-	-	-	-	13	B	10	B	-	-	
	PM	20	C	18	C	17	C	-	5	A	5	A	-	-	-	-	-	-	-	-	40	E	22	C	-	-	
				EBL/T		EBT/R		WBL/T		WBT/R		WBR		NBL/T		NBR											
Riverfront Dr & NB TH 169 Ramps <i>Roundabout</i>	AM	13	B	12	B	15	C	-	6	A	-	-	15	C	26	D	-	-	22	C	-	-	-	-	-	-	
	PM	12	B	8	A	9	A	-	12	B	-	-	13	B	20	C	-	-	18	C	-	-	-	-	-	-	
				EBL/T		EBT/R		WBL/T		WBT/R				NBL		NBL/T/R								SBR			
Mankato West HS/Poplar St & Riverfront Dr <i>Roundabout</i>	AM	16	C	11	B	14	B	-	16	C	19	C	-	31	D	20	C	-	-	-	-	-	-	16	C		
	PM	18	C	9	A	11	B	-	17	C	23	C	-	23	C	13	B	-	-	-	-	-	-	55	F		
				EBL/T		EBT/R		WBL/T		WBT/R				NBL		NBL/T/R				SBL/T		SBT/R					
Riverfront Dr & Stoltzman Rd <i>Roundabout</i>	AM	11	B	9	A	9	A	-	9	A	9	A	-	16	C	12	B	-	-	8	A	7	A	-	-		
	PM	27	D	19	C	21	C	-	34	D	37	E	-	29	D	19	C	-	-	30	D	26	D	-	-		

\*Delay in seconds per vehicle

\*\*Maximum delay and LOS on any approach and/or movement

\*\*\*Limiting Movement is the highest delay movement.

Table C8: 2041 Segment 1 - Option 2A Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)																									
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR			
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max		
Riverfront Dr & Woodland Ave <i>Stop Controlled</i>	AM	25	25	25	25	25	25	25	50	25	50	25	50	25	50	25	50	25	50	25	50	25	50	25	50		
	PM	25	25	25	25	25	25	25	50	25	50	25	50	25	50	25	50	25	50	50	75	50	75	50	75		
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	25	50	25	50	25	50	75	175	75	175	25	50	50	350	50	350	25	150	25	50	25	50	25	50		
	PM	25	50	25	50	25	50	50	150	50	150	0	25	25	50	25	50	25	50	25	100	25	100	25	100		
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	-	-	75	150	25	75	25	75	25	125	-	-	50	100	-	0	0	-	-	-	-	-	-	-		
	PM	-	-	75	150	50	75	100	200	350	775	-	-	125	250	-	0	0	-	-	-	-	-	-	-		
		EBL/T		EBT/R		WBL		WBT/R						NBL		NBL/T/R		SBL		SBT/R							
Riverfront Dr & SB TH 169 Ramps/Owatonna St <i>Signalized Intersection</i>	AM	-	125	-	125	-	-	0	-	0	-	-	-	-	-	-	-	-	100	-	75	-	-	-	-		
	PM	-	75	-	75	-	-	25	-	25	-	-	-	-	-	-	-	-	275	-	150	-	-	-	-		
		EBL/T		EBT		WBL/T		WBR				NBL/T/R		NBR													
Riverfront Dr & NB TH 169 Ramps <i>Signalized Intersection</i>	AM	-	125	-	175	-	-	50	-	225	-	-	50	-	50	-	-	-	-	-	-	-	-	-	-		
	PM	-	75	-	75	-	-	150	-	175	-	-	50	-	50	-	-	-	-	-	-	-	-	-	-		
		EBL/T		EBT/R		WBL/T		WBT/R				NBL		NBL/T/R				SBL/T		SBT/R							
Mankato West HS/Poplar St & Riverfront Dr <i>Roundabout</i>	AM	-	150	-	200	-	-	100	-	150	-	-	100	-	75	-	-	-	-	-	-	-	-	-	50		
	PM	-	100	-	125	-	-	150	-	225	-	-	50	-	25	-	-	-	-	-	-	-	-	-	175		
		EBL/T		EBT/R		WBL/T		WBT/R				NBL		NBL/T/R				SBL/T		SBT/R							
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	-	75	-	75	-	-	25	-	50	-	-	100	-	75	-	-	0	-	0	-	-	-	-	-		
	PM	-	150	-	200	-	-	225	-	275	-	-	175	-	100	-	-	100	-	100	-	100	-	-	-		

Table C9: 2041 Segment 1 - Option 3A Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay*- LOS		Movement Delay (sec/veh)																									
				EBU		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
SB TH 169 Intersection (Crossover) <i>Signalized Intersection</i>	AM	15	B	-	-	16	B	2	A	-	10	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	PM	13	B	-	-	17	B	3	A	-	8	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SB TH 169 Intersection SBL off Ramp <i>Signalized Intersection</i>	AM	14	B	-	-	3	A	-	-	-	-	-	-	-	-	-	-	-	-	22	C	-	-	-	-				
	PM	13	B	-	-	3	A	-	-	-	-	-	-	-	-	-	-	-	-	19	B	-	-	-	-				
NB TH 169 Intersection (Crossover) <i>Signalized Intersection</i>	AM	7	A	-	-	7	A	-	-	10	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	PM	9	A	-	-	9	A	-	-	9	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SB TH 169 Intersection WBL onto Ramp	AM	1	A	-	-	-	-	-	2	A	1	A	-	-	-	-	-	-	-	-	-	-	-	-	-				
	PM	2	A	-	-	-	-	-	2	A	1	A	-	-	-	-	-	-	-	-	-	-	-	-	-				
SB TH 169 SBR off Ramp	AM	2	A	-	-	-	-	-	-	2	A	-	-	-	-	-	-	-	-	-	-	-	-	2	A				
	PM	2	A	-	-	-	-	-	-	2	A	-	-	-	-	-	-	-	-	-	-	-	-	2	A				
SB TH 169 Intersection (Off Ramp)	AM	9	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	A	-	-	6	A				
	PM	3	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	A	-	-	2	A				
SB TH 169 Intersection (On Ramp)	AM	0	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	A	1	A				
	PM	0	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	A	7	A				
NB TH 169 Intersection WBR onto Ramp	AM	1	A	-	-	-	-	-	-	2	A	1	A	-	-	-	-	-	-	-	-	-	-	-	-				
	PM	2	A	-	-	-	-	-	-	4	A	1	A	-	-	-	-	-	-	-	-	-	-	-	-				
NB TH 169 Intersection NBR off Ramp	AM	3	A	-	-	2	A	-	-	-	-	-	-	-	-	-	-	9	A	-	-	-	-	-	-				
	PM	4	A	-	-	2	A	-	-	-	-	-	-	-	-	-	-	11	B	-	-	-	-	-	-				
NB TH 169 Intersection (On Ramp)	AM	1	A	-	-	-	-	-	-	-	2	A	-	1	A	-	-	-	-	-	-	-	-	-	-				
	PM	1	A	-	-	-	-	-	-	-	-	1	A	-	0	A	-	-	-	-	-	-	-	-	-				
NB TH 169 Intersection EBL onto Ramp	AM	8	A	-	1	A	11	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	PM	12	B	-	1	A	14	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
NB TH 169 Intersection NBL off Ramp <i>Signalized Intersection</i>	AM	2	A	-	-	-	-	-	-	2	A	-	32	C	-	-	-	-	-	-	-	-	-	-	-				
	PM	2	A	-	-	-	-	-	-	2	A	-	19	B	-	-	-	-	-	-	-	-	-	-	-				
NB TH 169 NBR off Ramp	AM	1	A	-	-	-	-	-	-	-	-	-	-	1	A	1	A	-	-	-	-	-	-	-	-				
	PM	1	A	-	-	-	-	-	-	-	-	-	-	1	A	1	A	-	-	-	-	-	-	-	-				
Riverfront Dr & Poplar St <i>Stop Controlled</i>	AM	2	A	-	-	1	A	-	-	1	A	0	A	-	-	-	-	-	-	-	-	-	-	15	C				
	PM	14	B	-	-	0	A	-	-	2	A	1	A	-	-	-	-	-	-	-	-	-	-	185	F				
Mankato West HS & Riverfront Dr <i>Signalized Intersection</i>	AM	9	A	-	-	10	A	6	A	16	C	1	A	-	-	-	27	D	-	-	-	-	-	-	-				
	PM	9	A	-	-	7	A	3	A	18	C	2	A	-	-	-	53	F	-	-	-	-	-	-	-				
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	19	B	22	C	22	C	15	B	8	A	19	B	20	C	5	A	37	D	28	C	11	B	49	D	48	D	15	B
	PM	38	D	45	D	53	D	31	C	11	B	47	D	54	D	18	B	51	D	30	C	10	B	55	E	50	D	25	C
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	7	A	-	-	5	A	3	A	15	B	3	A	-	-	47	D	-	1	A	-	-	-	-	-	-			
	PM	26	C	-	-	8	A	4	A	26	C	18	B	-	-	174	F	-	3	A	-	-	-	-	-	-			
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	29	D	-	0	A	2	A	1	A	7	A	0	A	0	A	77	F	79	F	64	F	17	C	10	A	5	A	
	PM	9	A	-	3	A	1	A	1	A	6	A	1	A	0	A	35	E	48	E	21	C	28	D	20	C	9	A	

\*Delay in seconds per vehicle

**Table C10: 2041 Segment 1 - Option 3A Peak Hour Queues By Movement**

Intersection	Peak Hour	Queue Lengths (ft)																									
		EBU		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
SB TH 169 Intersection (Crossover) <i>Signalized Intersection</i>	AM	-	-	-	-	125	250	0	25	-	-	25	75	-	-	-	-	-	-	-	-	-	-	-	-	-	
	PM	-	-	-	-	100	200	0	25	-	-	50	100	-	-	-	-	-	-	-	-	-	-	-	-	-	
SB TH 169 Intersection SBL off Ramp <i>Signalized Intersection</i>	AM	-	-	-	-	25	75	-	-	-	-	-	-	-	-	-	-	-	-	-	200	250	-	-	-	-	
	PM	-	-	-	-	25	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	175	250	-	-	-	-
NB TH 169 Intersection (Crossover) <i>Signalized Intersection</i>	AM	-	-	-	-	75	100	-	-	-	-	75	100	-	-	-	-	-	-	-	-	-	-	-	-	-	
	PM	-	-	-	-	75	100	-	-	-	-	100	125	-	-	-	-	-	-	-	-	-	-	-	-	-	
SB TH 169 Intersection WBL onto Ramp	AM	-	-	-	-	-	-	-	0	0	0	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	PM	-	-	-	-	-	-	-	0	50	0	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SB TH 169 SBR off Ramp	AM	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	25	75	
	PM	-	-	-	-	-	-	-	-	-	0	25	-	-	-	-	-	-	-	-	-	-	-	-	50	100	
SB TH 169 Intersection (Off Ramp)	AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	500	-	-	25	200	
	PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	150	-	-	0	50	
SB TH 169 Intersection (On Ramp)	AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	25	25	
	PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	25	25	
NB TH 169 Intersection WBR onto Ramp	AM	-	-	-	-	-	-	-	-	-	25	125	0	0	-	-	-	-	-	-	-	-	-	-	-	-	
	PM	-	-	-	-	-	-	-	-	-	75	150	0	0	-	-	-	-	-	-	-	-	-	-	-	-	
NB TH 169 Intersection NBR off Ramp	AM	-	-	-	-	25	75	-	-	-	-	-	-	-	-	-	-	-	-	75	150	-	-	-	-	-	
	PM	-	-	-	-	25	50	-	-	-	-	-	-	-	-	-	-	-	-	125	250	-	-	-	-	-	
NB TH 169 Intersection (On Ramp)	AM	-	-	-	-	-	-	-	-	-	-	0	25	-	-	25	50	-	-	-	-	-	-	-	-	-	
	PM	-	-	-	-	-	-	-	-	-	-	0	0	-	-	0	0	-	-	-	-	-	-	-	-	-	
NB TH 169 Intersection EBL onto Ramp	AM	-	0	0	200	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	PM	-	0	0	200	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
NB TH 169 Intersection NBL off Ramp <i>Signalized Intersection</i>	AM	-	-	-	-	-	-	-	-	0	0	-	-	0	25	-	-	-	-	-	-	-	-	-	-	-	
	PM	-	-	-	-	-	-	-	-	0	25	-	-	25	50	-	-	-	-	-	-	-	-	-	-	-	
NB TH 169 NBR off Ramp	AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	-	-	-	-	-	-	-	
	PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	25	75	-	-	-	-	-	-	-	
Riverfront Dr & Poplar St <i>Stop Controlled</i>	AM	-	-	-	-	25	125	-	-	-	0	25	0	25	-	-	-	-	-	-	-	-	-	-	50	125	
	PM	-	-	-	-	25	100	-	-	-	0	50	0	50	-	-	-	-	-	-	-	-	-	-	325	550	
Mankato West HS & Riverfront Dr <i>Signalized Intersection</i>	AM	-	-	-	-	150	275	100	250	75	225	25	100	-	-	-	-	-	175	500	-	-	-	-	-	-	
	PM	-	-	-	-	125	325	50	250	75	150	0	50	-	-	-	-	-	175	625	-	-	-	-	-	-	
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	125	250	125	250	100	375	100	225	50	100	100	225	25	125	200	275	75	450	100	225	25	75	25	100	25	75
	PM	200	250	200	250	225	425	125	225	175	250	200	300	150	200	200	275	175	550	75	250	100	175	150	325	102	175
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	-	-	-	-	75	200	25	125	25	75	50	125	-	-	75	175	-	-	0	25	-	-	-	-	-	
	PM	-	-	-	-	100	225	50	200	50	175	175	350	-	-	250	550	-	-	25	225	-	-	-	-	-	
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	-	-	25	50	25	50	25	50	50	175	0	0	0	0	300	525	300	525	300	525	25	50	25	50	25	50
	PM	-	-	0	50	0	50	0	50	75	200	0	0	0	0	100	325	100	325	100	325	25	75	25	75	25	75

Table C11: 2041 Segment 1 - Option 3B Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay* - LOS		Movement Delay (sec/veh)																							
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
Riverfront Dr & Woodland Ave <i>Stop Controlled</i>	AM	2	A	-	1	A	0	A	3	A	1	A	1	A	6	A	8	A	2	A	6	A	7	A	-	-	
	PM	3	A	2	A	0	A	0	A	3	A	1	A	1	A	6	A	7	A	2	A	6	A	7	A	2	A
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	8	A	-	6	A	5	A	11	B	1	A	0	A	35	E	43	E	7	A	21	C	16	C	10	B	
	PM	7	A	5	A	4	A	4	A	9	A	2	A	1	A	26	D	24	C	2	A	23	C	27	D	9	A
Riverfront Dr & TH 169 SB Ramp <i>Signalized Intersection</i>	AM	19	B	-	20	C	8	A	25	C	3	A	-	-	50	D	-	-	13	B	-	-	-	-	-	-	
	PM	32	C	-	49	D	8	A	57	E	24	C	-	-	36	D	-	-	7	A	-	-	-	-	-	-	
Riverfront Dr & Owatonna St <i>Stop Controlled</i>	AM	4	A	6	A	5	A	-	-	1	A	3	A	-	-	-	-	-	-	18	C	-	-	4	A		
	PM	10	B	31	D	7	A	-	-	7	A	3	A	-	-	-	-	-	-	159	F	-	-	10	B		
Riverfront Dr & NB TH 169 Ramps <i>Signalized Intersection</i>	AM	3	A	9	A	0	A	-	-	4	A	4	A	33	C	18	B	5	A	-	-	-	-	-	-		
	PM	19	B	22	C	16	B	-	-	12	B	4	A	66	E	21	C	72	E	-	-	-	-	-	-		
Riverfront Dr & Mankato West HS/Poplar St <i>Signalized Intersection</i>	AM	21	C	17	B	19	B	16	B	61	E	14	B	13	B	35	D	34	C	16	B	35	D	33	C	19	B
	PM	31	C	36	D	17	B	17	B	59	E	29	C	31	C	92	F	91	F	42	D	59	E	61	E	48	D
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	18	B	17	B	17	B	10	B	16	B	12	B	3	A	33	C	29	C	10	B	31	C	42	D	9	A
	PM	29	C	41	D	32	C	15	B	35	D	31	C	10	B	37	D	36	D	11	B	31	C	50	D	23	C
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	6	A	-	4	A	2	A	9	A	3	A	-	-	35	D	-	-	1	A	-	-	-	-	-	-	
	PM	12	B	-	8	A	4	A	18	B	10	B	-	-	45	D	-	-	1	A	-	-	-	-	-	-	

\*Delay in seconds per vehicle

Table C12: 2041 Segment 1 - Option 3B Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)																							
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Riverfront Dr & Woodland Ave <i>Stop Controlled</i>	AM	0	25	0	25	0	25	-	-	-	-	-	-	25	75	25	75	25	75	25	50	25	50	25	50
	PM	0	25	0	25	0	25	-	-	-	-	-	-	25	50	25	50	25	50	25	50	25	50	25	50
Riverfront Dr & Sibley St <i>Stop Controlled</i>	AM	25	125	25	125	25	125	75	275	25	25	25	25	75	325	75	325	25	125	25	75	25	75	25	75
	PM	25	50	25	50	25	50	100	300	25	25	25	25	25	75	25	75	-	-	25	75	25	75	25	75
Riverfront Dr & TH 169 SB Ramp <i>Signalized Intersection</i>	AM	-	-	225	475	100	550	100	175	-	-	-	-	-	-	-	-	75	550	-	-	-	-	-	-
	PM	-	-	300	425	75	375	325	500	-	-	-	-	-	-	-	-	50	300	-	-	-	-	-	-
Riverfront Dr & Owatonna St <i>Stop Controlled</i>	AM	0	25	25	250	-	-	-	-	25	75	25	75	-	-	-	-	-	-	50	100	-	-	25	50
	PM	25	25	25	375	-	-	-	-	25	75	25	75	-	-	-	-	-	-	50	175	-	-	25	100
Riverfront Dr & NB TH 169 Ramps <i>Signalized Intersection</i>	AM	100	225	-	-	-	-	-	50	225	25	200	25	25	25	25	25	50	75	-	-	-	-	-	-
	PM	100	225	175	375	-	-	-	125	250	50	200	25	100	25	100	250	900	-	-	-	-	-	-	-
Riverfront Dr & Mankato West HS/Poplar St <i>Signalized Intersection</i>	AM	50	125	175	225	175	225	125	250	175	450	175	450	150	400	150	400	100	150	75	200	75	200	75	200
	PM	75	200	225	250	225	250	125	250	350	600	350	600	175	500	175	500	100	150	175	375	175	375	175	375
Riverfront Dr & Stoltzman Rd <i>Signalized Intersection</i>	AM	25	75	100	200	100	200	50	125	75	175	25	50	175	275	75	425	75	200	25	75	25	125	25	75
	PM	125	250	125	325	125	225	150	250	200	275	125	200	200	275	100	350	75	175	75	125	150	325	100	125
Riverfront Dr & Marshall St <i>Signalized Intersection</i>	AM	-	-	75	200	25	75	25	75	25	125	-	-	75	150	-	-	0	25	-	-	-	-	-	-
	PM	-	-	100	250	50	175	50	150	125	300	-	-	125	250	-	-	0	25	-	-	-	-	-	-

Table C13: 2041 Segment 2 - Option 2 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay* - LOS		Movement Delay (sec/veh)																							
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
Riverfront Dr & Sibley Pkwy <i>Signalized Intersection</i>	AM	2	A	24	C	1	A	-	-	-	-	2	A	3	A	-	-	-	-	25	C	-	-	5	A		
	PM	5	A	39	D	3	A	-	-	-	-	5	A	5	A	-	-	-	-	24	C	-	-	7	A		
Riverfront Dr & Poplar St/Warren St <i>Signalized Intersection</i>	AM	26	C	41	D	44	D	18	B	33	C	41	D	14	B	34	C	37	D	19	B	26	C	8	A	7	A
	PM	30	C	54	D	46	D	29	C	34	C	44	D	22	C	46	D	49	D	19	B	31	C	17	B	15	B
Riverfront Dr & Minnesota St/Cherry St <i>Signalized Intersection</i>	AM	15	B	41	D	36	D	14	B	40	D	45	D	2	A	15	B	14	B	3	A	46	D	5	A	2	A
	PM	21	C	31	C	22	C	15	B	37	D	35	D	2	A	33	C	28	C	4	A	38	D	15	B	7	A
Riverfront Dr & Main St <i>Signalized Intersection</i>	AM	14	B	36	D	-	-	-	-	29	C	-	-	16	B	11	B	16	B	8	A	28	C	6	A	2	A
	PM	23	C	61	E	-	-	9	A	46	D	57	E	34	C	23	C	30	C	15	B	36	D	9	A	-	-

\*Delay in seconds per vehicle

Table C14: 2041 Segment 2 - Option 2 Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)																							
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Riverfront Dr & Sibley Pkwy <i>Signalized Intersection</i>	AM	25	50	25	125	-	-	-	-	25	100	25	50	-	-	-	-	-	-	25	75	-	-	25	50
	PM	25	75	50	125	-	-	-	-	50	150	25	50	-	-	-	-	-	-	50	100	-	-	25	50
Riverfront Dr & Poplar St/Warren St <i>Signalized Intersection</i>	AM	50	125	50	125	50	125	50	125	50	200	50	200	50	225	275	650	225	625	50	125	75	200	75	200
	PM	75	200	100	200	100	200	100	175	100	225	100	225	75	250	300	625	250	600	100	225	200	350	200	350
Riverfront Dr & Minnesota St/Cherry St <i>Signalized Intersection</i>	AM	50	125	50	100	50	100	125	275	125	275	25	25	25	150	225	375	50	300	50	100	75	175	25	75
	PM	75	150	50	125	50	125	200	350	200	350	25	50	75	200	300	375	75	325	75	100	175	200	25	100
Riverfront Dr & Main St <i>Signalized Intersection</i>	AM	25	25	25	25	25	25	75	175	-	-	75	150	25	50	200	475	50	350	50	125	50	100	50	100
	PM	25	75	25	75	25	75	150	225	-	-	75	175	25	225	375	775	125	400	50	150	75	225	75	225

Table C15: 2041 Segment 3 - Options 2A, 3A and 4A Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay* - LOS		Movement Delay (sec/veh)																							
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
Riverfront Dr & Plum St <i>Signalized Intersection</i>	AM	10	B	-	-	-	-	30	C	-	-	17	B	11	B	12	B	6	A	17	B	5	A	3	A		
	PM	13	B	41	D	-	-	-	38	D	-	-	23	C	-	-	16	B	10	B	27	C	8	A	-		
Riverfront Dr & Elm St <i>Signalized Intersection</i>	AM	6	A	24	C	34	C	9	A	25	C	-	-	11	B	14	B	7	A	7	A	22	C	3	A	3	A
	PM	10	B	47	D	53	D	27	C	49	D	39	D	26	C	38	D	10	B	9	A	29	C	7	A	6	A
Riverfront Dr & Madison Ave <i>Signalized Intersection</i>	AM	14	B	39	D	47	D	6	A	40	D	37	D	9	A	15	B	11	B	5	A	13	B	12	B	4	A
	PM	24	C	60	E	57	E	8	A	44	D	38	D	10	B	22	C	24	C	12	B	23	C	24	C	5	A

\*Delay in seconds per vehicle

Table C16: 2041 Segment 3 - Options 2A, 3A and 4A Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)																							
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Riverfront Dr & Plum St <i>Signalized Intersection</i>	AM	-	-	-	-	-	-	25	50	25	50	50	125	25	25	150	500	25	250	50	100	50	175	50	175
	PM	25	50	25	50	25	50	25	75	25	75	50	100	-	-	200	575	50	300	75	150	75	200	75	200
Riverfront Dr & Elm St <i>Signalized Intersection</i>	AM	25	75	25	75	25	75	25	50	25	50	25	50	25	50	75	225	75	225	25	50	50	175	50	175
	PM	50	125	50	125	50	125	50	75	50	75	50	75	25	50	100	325	100	325	25	75	125	325	125	325
Riverfront Dr & Madison Ave <i>Signalized Intersection</i>	AM	50	125	50	125	50	125	100	175	-	-	75	175	75	175	100	275	100	275	50	175	50	225	50	225
	PM	75	175	75	175	75	125	200	325	-	-	100	175	75	275	200	375	200	375	75	150	125	300	125	300

Table C17: 2041 Segment 3 - Options 2B, 3B and 4B Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay* - LOS		Movement Delay (sec/veh)																							
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
Riverfront Dr & Plum St <i>Signalized Intersection</i>	AM	9	A	-	-	-	-	35	D	-	-	17	B	6	A	11	B	6	A	18	B	5	A	4	A		
	PM	14	B	38	D	-	-	41	D	-	-	22	C	-	-	16	B	10	B	28	C	8	A	-	-		
Riverfront Dr & Rock St <i>Signalized Intersection</i>	AM	6	A	20	C	20	C	11	B	27	C	-	-	13	B	16	B	8	A	9	A	20	C	2	A	2	A
	PM	9	A	51	D	45	D	33	C	53	D	41	D	22	C	37	D	12	B	10	B	31	C	4	A	2	A
Riverfront Dr & Madison Ave <i>Signalized Intersection</i>	AM	14	B	44	D	48	D	6	A	41	D	36	D	8	A	14	B	10	B	5	A	14	B	12	B	4	A
	PM	24	C	73	E	59	E	8	A	43	D	37	D	11	B	24	C	24	C	14	B	25	C	24	C	9	A

\*Delay in seconds per vehicle

Table C18: 2041 Segment 3 - Options 2B, 3B and 4B Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)																							
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Riverfront Dr & Plum St <i>Signalized Intersection</i>	AM	-	-	-	-	-	-	25	50	25	50	50	125	0	25	125	425	25	125	50	100	50	150	50	150
	PM	25	50	25	50	25	50	25	75	25	75	50	100	-	-	225	600	25	300	75	175	75	225	75	225
Riverfront Dr & Rock St <i>Signalized Intersection</i>	AM	25	75	25	75	25	75	25	75	25	75	25	75	25	50	75	200	75	200	25	50	75	200	75	200
	PM	50	125	50	125	50	125	50	100	50	100	50	100	25	50	100	300	100	300	25	100	125	250	125	250
Riverfront Dr & Madison Ave <i>Signalized Intersection</i>	AM	50	150	50	150	50	125	100	200	75	175	75	175	75	175	100	225	100	225	50	125	100	225	50	200
	PM	75	150	75	150	75	150	175	350	150	325	75	175	100	300	225	425	225	425	75	150	175	325	125	275

Table C19: 2041 Segment 5 - Option 1 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay* - LOS		Movement Delay (sec/veh)											
				EBL/T/R		NBT		NBR		SBL/T					
Riverfront Dr & TH 14 EB Ramp <i>Roundabout</i>	AM	14	B	28	D	-	9	A	7	A	11	B	-		
	PM	14	B	17	C	-	20	C	9	A	8	A	-		
							WBL/T/R		NBL/T		SBT		SBR		
Riverfront Dr & TH 14 WB Ramp <i>Roundabout</i>	AM	13	B	-		13	B	9	A			20	C	9	A
	PM	17	C	-		14	B	21	C			10	B	7	A

\*Delay in seconds per vehicle

Table C20: 2041 Segment 5 - Option 1 Peak Hour Queues By Movement

Intersection	Peak Hour	Maximum Queue Lengths (ft)									
		EBL/T/R		NBT	NBR	SBL/T					
Riverfront Dr & TH 14 EB Ramp <i>Roundabout</i>	AM	200	-	75	25	100	-				
	PM	125	-	200	50	50	-				
				WBL/T/R		NBL/T		SBT		SBR	
Riverfront Dr & TH 14 WB Ramp <i>Roundabout</i>	AM	-	50	75	-	150	25				
	PM	-	50	250	-	50	25				



Table C21: 2041 Segment 5 - Option 2 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay* - LOS		Movement Delay (sec/veh)																				
				EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR									
EB TH 14 Intersection (Crossover) <i>Signalized Intersection</i>	AM	13	B	-	-	-	-	-	-	-	-	-	-	-	-	15	B	6	A	-	-	16	B	-
	PM	17	B	-	-	-	-	-	-	-	-	-	-	-	-	16	B	7	A	-	-	28	C	-
EB TH 14 Intersection SBL off Ramp <i>Signalized Intersection</i>	AM	6	A	19	B	-	-	-	-	-	-	-	-	-	2	A	-	-	-	-	-	-	-	-
	PM	6	A	18	B	-	-	-	-	-	-	-	-	-	2	A	-	-	-	-	-	-	-	-
WB TH 14 Intersection (Crossover) <i>Signalized Intersection</i>	AM	11	B	-	-	-	-	-	-	-	-	-	-	-	10	A	-	-	-	-	-	12	B	-
	PM	11	B	-	-	-	-	-	-	-	-	-	-	-	8	A	-	-	-	-	-	17	B	-
EB TH 14 Intersection WBL onto Ramp	AM	3	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	A	3	A	-	-
	PM	7	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	A	7	A	-	-	-
EB TH 14 SBR off Ramp	AM	4	A	-	-	7	A	-	-	-	-	-	-	-	-	-	-	-	-	-	3	A	-	-
	PM	3	A	-	-	6	A	-	-	-	-	-	-	-	-	-	-	-	-	-	1	A	-	-
EB TH 14 Intersection (Off Ramp)	AM	0	A	0	A	-	-	0	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PM	1	A	0	A	-	-	1	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB TH 14 Intersection (On Ramp)	AM	3	A	-	0	A	4	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PM	4	A	-	0	A	4	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB TH 14 Intersection WBR onto Ramp	AM	2	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	A	1	A
	PM	1	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	A	0	A
WB TH 14 Intersection NBR off Ramp	AM	3	A	-	-	-	-	-	-	1	A	-	-	10	B	-	-	-	-	-	-	-	-	-
	PM	2	A	-	-	-	-	-	-	1	A	-	-	14	B	-	-	-	-	-	-	-	-	-
WB TH 14 Intersection (On Ramp)	AM	2	A	-	-	-	-	-	1	A	3	A	-	-	-	-	-	-	-	-	-	-	-	-
	PM	2	A	-	-	-	-	-	0	A	5	A	-	-	-	-	-	-	-	-	-	-	-	-
WB TH 14 Intersection EBL onto Ramp	AM	2	A	-	-	-	-	-	-	-	-	1	A	2	A	-	-	-	-	-	-	-	-	-
	PM	3	A	-	-	-	-	-	-	-	-	1	A	5	A	-	-	-	-	-	-	-	-	-
WB TH 14 Intersection NBL off Ramp <i>Signalized Intersection</i>	AM	8	A	-	-	-	-	23	C	-	-	-	-	-	-	-	-	-	-	-	2	A	-	-
	PM	11	B	-	-	-	-	19	B	-	-	-	-	-	-	-	-	-	-	-	4	A	-	-
WB TH 14 NBR off Ramp	AM	1	A	-	-	-	-	0	A	-	0	A	-	-	-	-	-	-	-	-	-	-	-	-
	PM	1	A	-	-	-	-	1	A	-	0	A	-	-	-	-	-	-	-	-	-	-	-	-

\*Delay in seconds per vehicle



# Appendix H: Evaluation Matrices



Evaluation Matrix  
Riverfront Drive Corridor Study  
February 2017



Segment 2 - Sibley Parkway to Veteran's Memorial Bridge				4-Lane with Spot Safety and Pedestrian Enhancements				3-Lane with Spot Safety and Pedestrian				
Goal	Objectives	Performance Measure	No Build	Option 1A Narrow Median	Option 1B Hyvee Expansion	Option 2A Lane Reduction	Notes					
Goal A: Provide efficient vehicle and freight mobility and access.	Address peak hour back-ups at Warren St, Cherry St, & Main St.	Vehicle Delay on Riverfront	AM 14 B	14 B	14 B	14 B	14 B	14 B	14 B	14 B		
		PM 13 B	13 B	13 B	13 B	13 B	24 C					
		Maximum Queue										
		•Poplar St/Warren St	AM NBT 275	NBT 275	NBT 275	NBT 275	NBT 275	NBT 800				
		PM NBT 275	NBT 275	NBT 275	NBT 275	NBT 275	NBT 950					
		•Minnesota St/Cherry St	AM NBT 225	NBT 225	NBT 225	NBT 225	NBT 225	NBT 375				
		PM NBT 300	NBT 300	NBT 300	NBT 300	NBT 300	NBT 375					
		•Main St	AM NBT 150	NBT 150	NBT 150	NBT 150	NBT 150	NBT 500				
		PM NBT 250	NBT 250	NBT 250	NBT 250	NBT 250	NBT 800					
		Score	9	9	9	7						
	Provide reasonable and responsible access.	Vehicle Delay on Side Streets	AM 14 B	14 B	14 B	14 B	28 C					
		PM 18 B	18 B	18 B	18 B	34 C						
		Number of Access Points on Riverfront by Type:										
		•Full Access	6	6	5	5						
		•3/4 Access	0	0	1	1						
•Right-In/Right-Outs		0	0	0	0							
•Roundabouts	0	0	0	0								
Provides reasonable access to existing businesses	Good	Good	Fair	Fair								
Score	8	8	9	7								
Ensure freight mobility and access.	Accommodates Truck Staging Needs	Yes	Yes	Yes	Yes	Not a Determining Factor						
Score												
Goal A Score (100 Points Total)		85	85	90	70							
Goal B: Safely accommodate all users.	Study opportunities to address travel speeds above the posted speed limits.	Roadway design provides traffic calming effect	N/A	No	No	Yes*	*Reduction to one northbound lane may encourage slower speeds.					
		Score	1	1	1	7						
		Goal B Score (100 Points Total)	10	10	10	70						
Goal C: Support an inviting and safe pedestrian environment both along and across Riverfront Drive	Provide safe pedestrian crossings near Warren, Cherry, Hy-Vee and the Civic Center.	Provides Pedestrian Refuge at Primary Crossings										
		•Warren Street	Yes - 7'	Yes - 7'	Yes - 7'	Yes - 7'						
		•Cherry Street	Yes - 7'	No	Yes - 7'	Yes - 7'						
		•Civic Center Drive	Yes - 15'	Yes - 7'	No - 4'	No - 4'						
		•Mid-Block to Civic Center Front Door	Yes	No	No	Yes*	*Need to relocate refuge crossing to the north. Would not line up with Civic Center front door.					
		•Main Street	Yes - 7'	No	No - 4'	No - 4'						
		Distance to Cross at Riverfront Drive (ft)										
		•Warren Street	71	61	61	61						
		•Cherry Street	83	80*	85	80	*Single stage crossing (no refuge)					
		•Civic Center	65	61	69*	57*	*Single stage crossing (no refuge)					
	•Main Street	80	74*	79*	71*	*Single stage crossing (no refuge)						
	Score	8	4	4	6							
	Improve Walkability along and across the corridor.	Provides Pedestrian facilities in missing areas:										
		•Between Main and Walnut	Yes - <5'	Yes - 8' W, 6' Blvd	Yes - 8' W, 6' Blvd	Yes - 8' W, 10' Blvd	Not a Differentiator					
		•Between Civic Center Dr and Cherry St	No	Yes - 8' W, 4' Blvd	Yes - 8' W, 6' Blvd	Yes - 8' W, 7' Blvd						
Number of Lanes to Cross in a Single Stage		Min Max	Min Max	Min Max	Min Max							
•Warren Street		2 3	2 3	2 3	2 3							
•Cherry Street		2 4	6 6	2 4	2 4							
•Civic Center	2 3	5 5	2 3	1 3								
•Main Street	2 4	6 6	2 4	1 3								
Pedestrian LOS Score for Segment												
•Cherry to Civic Center Plaza (South Side)	N/A	C	C	D	Factors effecting results include number of adjacent thru-lanes, proportion of sidewalk adjacent to buildings, sidewalk width, etc.							
Score	2	6	8	9								
Goal C Score (100 Points Total)		50	50	60	75							
Goal D: Support bicycle connections across Riverfront Drive to designated parallel bike routes and	Accommodate on-street bicycle connections	Accommodates facilities at Cherry Street	Yes	Yes	Yes	Yes	No changes affect on-street bicycle facilities on Cherry Street across Riverfront Drive.					
		Score										
		Goal D Score (100 Points Total)										
Goal E: Supports future land use and redevelopment plans.	Supports future land use	Supports Hy-Vee Redevelopment Plans					Unknown until we meet with Hy-Vee					
		Impacts to Developable Space on Hy-Vee Property	N/A	No	Yes*	No	*Road ROW encroaches onto the Hy-Vee property pushing sidewalks further onto the property.					
		Score										
Goal E Score (100 Points Total)		0	0	0	0							
Goal F: Provide infrastructure improvements compatible with the historic and natural environment.	Avoid property impacts and impacts to historic/cultural and natural resources.	Number of Partial Acquisitions	0	0	1	0						
		Risk of Impacts to Historic/Cultural Resources	N/A	Low	High*	Low	*Option 1B encroaches on the Union Depot Property. The Union Depot is listed on the National Registry of Historic Places.					
		Risk of Impacts to Natural Resources	N/A	Low	Low	Low	There is no potential for impacts to natural resources					
	Score	10	10	4	10							
	Minimize Cost.	Estimated Cost	-	\$1,175,000	\$2,135,000	\$450,000						
Score	10	5	3	8								
Goal F Score (100 Points Total)		100	75	35	90							
Goal G: Enhance Community Identity	Enhance Community Identity. Minimize Long Term Maintenance Costs.	Provides space for streetscape elements.	Fair	Poor	Poor	Poor	Medians reduced in all build options.					
		Level of long-term maintenance costs.	Medium	Low	Low	Low						
		Score	7	5	5	5						
Goal G Score (100 Points Total)		70	50	50	50							

Evaluation Matrix  
Riverfront Drive Corridor Study  
February 2017



Segment 3 - Veteran's Memorial Bridge to Madison Avenue			4-Lane with Spot Safety and Pedestrian Enhancements				3-Lane with Spot Safety and Pedestrian Enhancements				3-Lane with Medians and Parking both Sides				3-Lane Medians and turn lanes				Notes				
Goal	Objectives	Performance Measure	No Build		Option 1A Primary Int. Plum & Elm		Option 1B Primary Int. Plum & Rock		Option 2A Primary Int. Plum & Elm		Option 2B Primary Int. Plum & Rock		Option 3A Primary Int. Plum & Elm		Option 3B Primary Int. Plum & Rock		Option 4A Primary Int. Plum & Elm			Option 4B Primary Int. Plum & Rock			
Goal A: Provide efficient vehicle and freight mobility and access.	Provide adequate mobility on Riverfront Drive.	Vehicle Delay on Riverfront Drive	AM	7	A	7	A	7	A	8	A	8	A	8	A	8	A	8	A	8	A		
			PM	10	A	10	A	10	A	15	B	16	B	15	B	16	B	15	B	16	B	16	B
		Score		10		10		10		9		9		9		9		9		9		9	
	Provide reasonable and responsible access.	Vehicle Delay on Side Streets	AM	14	B	14	B	14	B	19	B	19	B	19	B	19	B	19	B	19	B	19	B
			PM	18	B	18	B	18	B	29	C	30	C	29	C	30	C	29	C	30	C	30	C
		Maintains Left Turn Access to Businesses/Parking	Yes		Yes		Yes		Yes		Yes		Yes		No		No		No		No		No
		Number of Left Turn Access to Businesses/Parking	North	17		17		17		17		17		16		16		14		14		14	
		South	19		19		19		19		19		16		16		14		14		14		
		Score		10		10		10		9		9		8		8		7		7		7	
	Ensure freight mobility and access.	Accommodates Truck Staging Needs																					
Maintains trucks ability to stage on Riverfront Dr.*		Yes		Yes		Yes		No		No		No		No		No		No		No		No	
Score			10		10		10		8		8		8		8		8		8		8		
	Goal A Score (100 Points Total)		100		100		100		87		87		83		83		80		80		80		

Performance Measure	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Crash Rate Reduction (Cumulative)	-	-	0%	0%	47%	47%	47%	47%	47%	47%	47%	47%	47%	47%	47%	47%	47%	47%
Minimizes parallel parking maneuvers conflicting with thru traffic	Good	Good	Good	Good	Fair	Fair	Poor	Poor	Fair	Fair								
Roadway design provides traffic calming effect	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reduced Number of Lanes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bumpouts into Riverfront/Medians	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Score	1	1	1	1	6	6	10	10	8	8	8	8	8	8	8	8	8	8
Goal B Score (100 Points Total)	20	20	20	20	75	75	85	85	85	85	85	85	85	85	85	85	85	85

Goal B: Safely accommodate all users (vehicles, freight, transit, pedestrians, bicycles)	Study opportunities to address crash issues.	Crash Rate Reduction (Cumulative)	-	0%	0%	47%	47%	47%	47%	47%	47%	47%	47%	47%	47%	47%	47%	47%	
		Minimizes parallel parking maneuvers conflicting with thru traffic	Good	Good	Good	Fair	Fair	Poor	Poor	Fair	Fair								
	Study opportunities to address travel speeds above the posted speed limits.	Roadway design provides traffic calming effect	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		Reduced Number of Lanes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		Bumpouts into Riverfront/Medians	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
		Score	1	1	1	1	6	6	10	10	8	8	8	8	8	8	8	8	8
		Goal B Score (100 Points Total)	20	20	20	20	75	75	85	85	85	85	85	85	85	85	85	85	85

Goal C: Support an inviting and safe pedestrian environment both along and across Riverfront Drive	Accommodates pedestrian crossings at Rock Street or other alternative for events and between public parking lots on both sides of Riverfront.	Provides Pedestrian Refuge at Primary Crossings	No	No	No	No	No	No	Yes - 13'	Yes - 13'	No - 4'	No - 4'										
		Number of Lanes to Cross in a Single Stage (West/East)																				
		•Rock Street	4	4	4	4	3	3	3	3	3	3	3									
		•Elm Street	4	4	4	4	3	3	3	3	3	3	3									
		•Plum Street	5	5-6	5-6	5-6	3-4	3-4	3-4	3-4	3-4	3-4	3-4									
		Crossing Distance - Decreased (Y/N) / New Distance (ft)																				
		•Rock Street	N/A	50	No	50	No	50	Yes	38	Yes	38	Yes	38	Yes	38	Yes	38	Yes	46	Yes	46
		•Elm Street	N/A	50	No	50	No	50	Yes	38	Yes	38	Yes	38	Yes	38	Yes	38	Yes	46	Yes	46
		•Plum Street	N/A	55	No	75	No	75	Yes	50	Yes	50	Yes	50	Yes	50	Yes	50	Yes	50	Yes	50
		Width of Sidewalks	10'	10'	10'	10'	16'	16'	11-12'	11-12'	12'	12'	12'	12'								
Pedestrian LOS Score for Segment	South	North	South	North	South	North	South	North	South	North	South	North	South	North	South	North	South	North				
•Elm to Rock	C	C	C	C	C	C	D	D	D	D	D	C	D	C	B	C	B	C				
Unsignalized Crossing LOS: Elm/Rock																						
Crosswalk Markings and Signage Only:																						
•Level of Service (A-F)	F	F	F	F	F	F	F	E	E	F	F	F										
Rectangular Rapid Flashing Beacon:																						
•Level of Service (A-F)	A	A	A	A	B	B	A	A	A	A	A	A										
Score	4	4	4	4	8	8	9	9	7	7	7	7										
Assess need for additional on-street parking and accessibility to available off-street public parking areas.	Provides On-Street Parking:																					
•One / Both Sides	One	One	One	One	One	One	Both	Both	One	One	One											
•Number of On-Street Parking Spaces	35	35	35	35	35	35	66	65	35	35	35											
Maintains full access to public parking lots	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No											
Score	8	8	8	8	8	8	9	9	8	8	8											
Goal C Score (100 Points Total)	60	60	60	60	80	80	90	90	75	75	75											

Goal D: Support bicycle connections across Riverfront Drive to designated parallel bike routes and regional trails.	Accommodate future on-street bicycle facility crossing at Elm Street or other alternatives.	Accommodates future on-street bicycle crossing at Elm Street	Poor	Fair	Poor	Good	Fair	Good	Fair	Good	Fair	Options with a signal at Elm rated higher along with those with fewer traffic lanes to cross.
		Score	3	6	3	9	6	9	6	9	6	
	Goal D Score (100 Points Total)	30	60	30	90	60	90	60	90	60		

Goal E: Supports future land use and redevelopment	Support Old Town redevelopment strategies.	Supports Redevelopment Plans	Poor	Fair	Fair	Good	Good	Good	Good	Good	Good	Not a differentiator
		Impacts to Developable Space	No	No	No	No	No	No	No	No	No	No Impacts to Developable Space.
		Score	1	6	6	9	9	9	9	9	9	
	Goal E Score (100 Points Total)	10	60	60	90	90	90	90	90	90		

Goal F: Provide infrastructure improvements compatible with the historic and natural environment.	Avoid property impacts and impacts to historic/cultural properties in Old Town and Zonta Gardens.	Number of Acquisitions (full-partial)	None	None	None	None	None	None	None	None	None	No Impacts to Properties. Proposed Construction is within ROW.	
		Risk of Impacts to Historic/Cultural Resources	Low	Low	Low	Low	Low	Low	Low	Low	Low	No Impacts to Historical/Cultural Resources. Proposed Construction is within ROW.	
		Risk of Impacts to Natural Resources	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	No Impacts to Natural Resources. Proposed Construction is within ROW.
		Score											Not a differentiator
		Estimated Cost	-	\$325,000	\$575,000	\$550,000	\$800,000	\$550,000	\$800,000	\$525,000	\$775,000		
Score	10	8	7	7	5	7	5	7	5				
	Goal F Score (100 Points Total)	100	80	70	70	50	70	50	70	50			

Goal G: Enhance Community Identity	Support Identity of Old Town District	Provides Additional Space for Streetscape Elements.	Poor	Poor	Poor	Good	Good	Good	Good	Fair	Fair	A rating of good was given if there was additional sidewalk space, medians and bumpouts for streetscape amenities.
		Accommodates Events/Public Gathering Spaces	Poor	Poor	Poor	Good	Good	Fair	Fair	Fair	Fair	
		Level of community familiarity/acceptance	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Level of long-term maintenance costs.	Low	Low	Low	Low	Low	Medium	Medium	Medium	Medium	
		Score	3	3	3	10	10	8	8	7	7	
	Goal G Score (100 Points Total)	30	30	30	100	100	80	80	70	70		

Evaluation Matrix  
Riverfront Drive Corridor Study  
February 2017



Segment 4 - Madison Avenue to Good Council Drive																																				
Goal	Objectives	Performance Measure	No Build	Option 1 3rd Ave Realigned to Adams Street								Option 2 3rd Ave RI/RO, Realigned Chestnut St								Option 3 Madison Ave/3rd Ave Connection								Notes								
Goal A: Provide efficient vehicle and freight mobility and access.	Provide reasonable and responsible access.	<b>Number of Access Points on Riverfront by Type:</b>																																		
		Full Access	14	9								9								9																
		Right-in/Right-Out	0	6								6								5																
	Provides reasonable access to existing businesses	Good	Fair - some full accesses converted to right-in / right-out access								Fair - some full accesses converted to right-in / right-out access								Fair - some full accesses converted to right-in / right-out access																	
	Score	5	8								7								8																	
	Ensure freight mobility and access & consider network connectivity options between Madison/3rd Ave	Accommodates truck movements from 3rd Ave to Riverfront Dr	Good	Fair - relocation to Adams St or Madison Ave								Poor - shift to Maxfield or Chestnut for full access								Good - closest to today's movements																
Score	10	8								5								10																		
Goal A Score (100 Points Total)			75	80								60								90																
Goal B: Safely accommodate all users (vehicles, freight, transit, pedestrians, bicycles)	Provides Pedestrian Crossing Opportunities, Particularly Near Schools.	Riverfront Crossing at Lafayette St / 3rd Ave	No Build	Option 1 (On Layout)								Option 2 (On Layout)								Option 3 (On Layout)																
		Improves Pedestrian Crossings	N/A	Yes								Yes								Yes																
		Provides Pedestrian Refuge	No	9' Median								13' Median								15' Median																
		Number of Lanes to Cross in a Single Stage	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max	Min Max							
		Distance to Cross Riverfront (Per Stage) (ft)	61 61	24 24	24 24	24 24	15 15	17 17	17 17	24 24	24 24	15 15	17 17	17 17	24 24	24 24	15 15	17 17	17 17	24 24	24 24	15 15	17 17	17 17	24 24	24 24	15 15	17 17								
	Score	1	7								8								9																	
	Ensure Compatibility with Transit Development Plan	Accommodates bus transit access on designated routes	Yes	No - Right-in / right-out (medians) access will reroute transit route 3 entering Riverfront from Lime St.								No - Right-in / right-out (medians) access will reroute transit route 3 entering Riverfront from Lime St.								No - Right-in / right-out (medians) access will reroute transit route 3 entering Riverfront from Lime St.								Bus route 3 traverses from Madison Avenue to Lime St.								
	Score	10	7								7								7																	
	Study opportunities to address vehicles traveling above posted speed limits.	Roadway design provides traffic calming effect	Poor	Poor								Fair								Good																
	Score	1	2								6								9																	
Goal B Score (100 Points Total)			40	53								70								83																
Goal F: Provide infrastructure improvements compatible with the historic and natural environment.	Avoid impacts to property and historic/natural resources.	Number of Acquisitions (full-partial)	0	2 full - 4 partial								1 full								3 full - 1 partial																
	Minimize Costs	Parcel Acquisition Costs (Sum)	N/A	\$140,000								\$600,000								\$670,000																
	Score	10	6								6								4								3									
Goal F Score (100 Points Total)			100	60								60								40								30								
Goal G: Enhance Community Identity	Enhance the community /corridor identity in ways compatible with	Provide additional space for streetscape elements.	No	9' Median, No Blvd								13' Median, No Blvd								13' Median, 9' Blvd								13' Median, 6' Blvd								
		Level of long-term maintenance costs.	Low	Medium								Medium								Medium								Medium								
	Score	2	6								8								10								9									
Goal G Score (100 Points Total)			20	60								80								100								90								

Evaluation Matrix  
Riverfront Drive Corridor Study  
January 2016

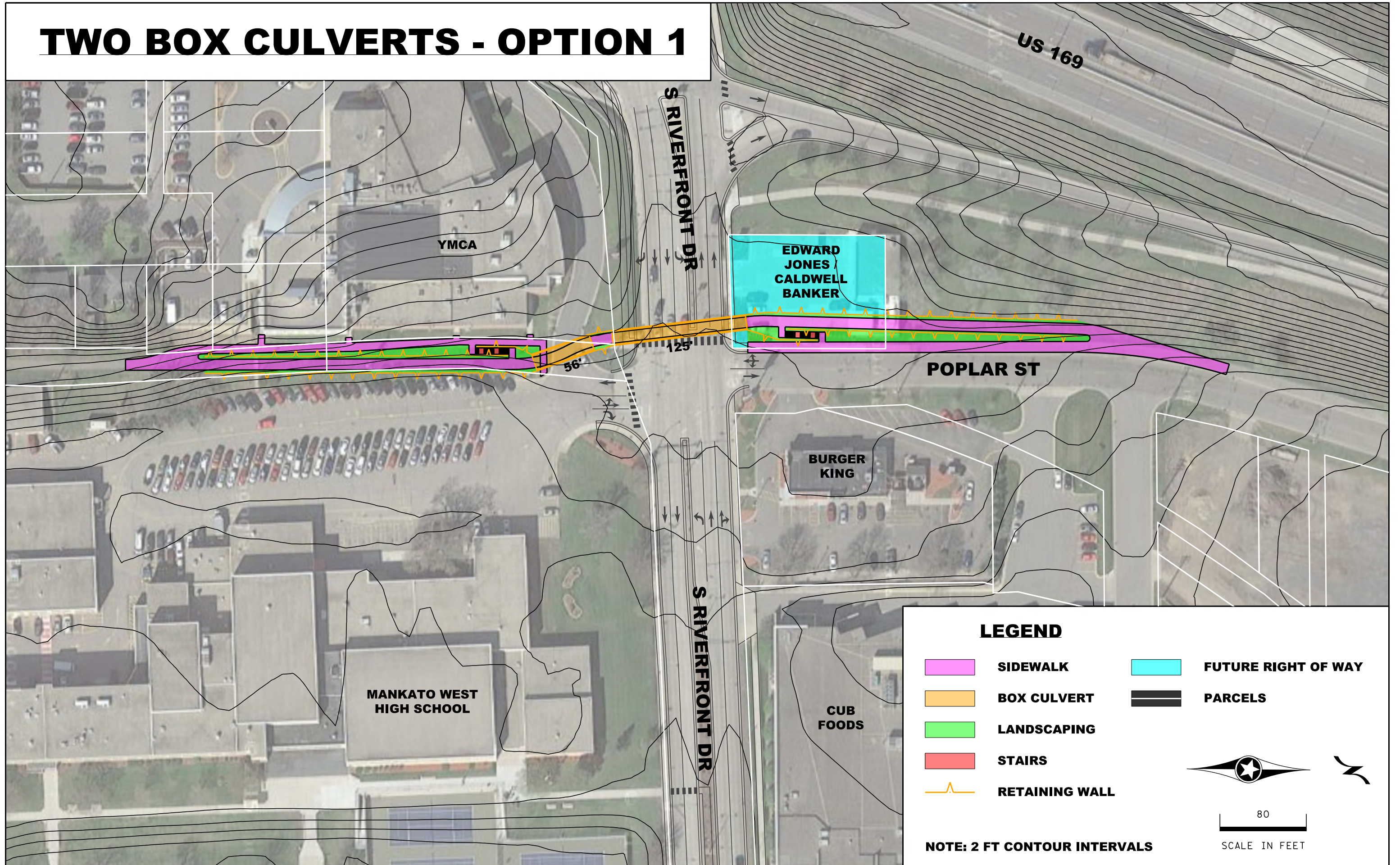


Segment 5 - Highway 14 Interchange				Hwy 14 Intersection Options						
Goal	Objectives	Performance Measure	No Build	Option 1 - Roundabouts		Option 2 - Diverging Diamond		Notes		
Goal A: Provide efficient vehicle and freight mobility and access.	Address peak hour backups at Highway 14 ramp intersections.	Vehicle Delay on Riverfront	AM	2	A	23	C	6	A	
			PM	2	A	16	C	9	A	
		Vehicle Delay on Ramps	AM	99	F	20	C	5	A	
			PM	193	F	20	C	5	A	
	Score			1		9		10		
	Ensure mobility and reliability on Riverfront Drive and to Highway	Maximum Intersection Capacity Utilization		0.54		1.01		0.73		
			Maximum Volume to Capacity Ratio		3.01		0.99		0.78	
	Score			1		6		10		
	Provide reasonable and responsible access.	Number of Access Points on Riverfront by Type:								
		Full Access			3		3		3	
		3/4 Access			0		0		0	
		Right-In/Right-Outs			0		0		0	
Roundabouts			0		0		0			
Score									Not a differentiator for this segment.	
Ensure freight mobility and access.	Accommodates Truck Staging Needs			N/A		N/A		N/A	Not a differentiator for this segment.	
Score									Not a differentiator for this segment.	
Goal A Score (100 Points Total)			10		75		100			
Goal B: Safely accommodate all users.	Study opportunities to address crash issues.	Crash Rate Reduction (Cumulative)		-		67%		57%		
		Vehicle to vehicle conflict points		32		7		12		
		Vehicle to pedestrian conflict points		4		6		7		
	Score			1		9		8		
	Study opportunities to address vehicles traveling above posted speed limits.	Roadway design provides traffic calming effect		No		Yes		Yes		
			Score	1		10		9		
Goal B Score (100 Points Total)			10		95		85			
Goal C: Provide an inviting and safe pedestrian environment both along and across Riverfront Drive.	Provide safe pedestrian crossings particularly near schools.	Number of lanes to cross in single stage:							A single stage of crossing is the distance pedestrians need to cross to access the other side of the roadway or pedestrian refuge such as central median. All lanes were included if intersection is signal controlled.	
		Good Counsel Drive			2-3		2-3			2-3
		TH 14 EB			2-3		1			1
		Distance to cross Riverfront Drive:								
		Good Counsel Drive			72'		72'			72'
		TH14 EB			83'		3 Stage - 16', 22', 18'			4 Stage - 16', 16', 16', 26'
		Sidewalk width								
		North/South side at Good Counsel Drive			6'		6'			6'
		North/South side at TH 14 WB			8'		8'			8'
		Boulevard Width Under Bridge			N/A		18'			5'
Score			1		9		8	Provides buffer from traffic.		
Goal C Score (100 Points Total)			10		90		80			
Goal D: Support bicycle connections across Riverfront Drive to designated parallel bike routes and	Accommodate future trail crossing to Minnesota River Trail.	Accommodates bicycles at primary crossings:								
		To Minnesota River Trail			No		Yes		Yes	
		Score								
Goal D Score (100 Points Total)										
Goal E: Supports future land use and redevelopment plans.	Supports future land use	Consistent with future land use plans			Yes		Yes		Yes	Not a differentiator for this segment.
		Score								
Goal E Score (100 Points Total)										
Goal F: Provide infrastructure improvements compatible with community and the historic and natural environment.	Avoid impacts to historic properties and natural resources.	Number of Acquisitions (full-partial)			0		0		0	
		Risk of Impacts to Historic/Cultural Resources			None		None		None	
		Risk of Impacts to Natural Resources			None		None		None	
	Score									Not a differentiator for this segment.
	Minimize Cost.		Estimated Cost		-		\$1,300,000		\$1,600,000	
	Score			10		8		7		
	Enhance Community Identity.	Provides space for additional streetscape elements.		No		Yes		Yes		Roundabouts are familiar and accepted in community. Diverging diamond is a new concept.  2 signal systems with diverging diamond option.
	Level of Community Familiarity/Acceptance	Level of community familiarity/acceptance.		N/A		High		Low		
	Minimize long term maintenance costs.	Level of long-term maintenance costs.		N/A		Low		High		
	Score			1		10		7		
Goal F Score (100 Points Total)			55		90		70			










# Appendix I: Grade Separated Pedestrian Crossings at the West Mankato Trail

# TWO BOX CULVERTS - OPTION 1



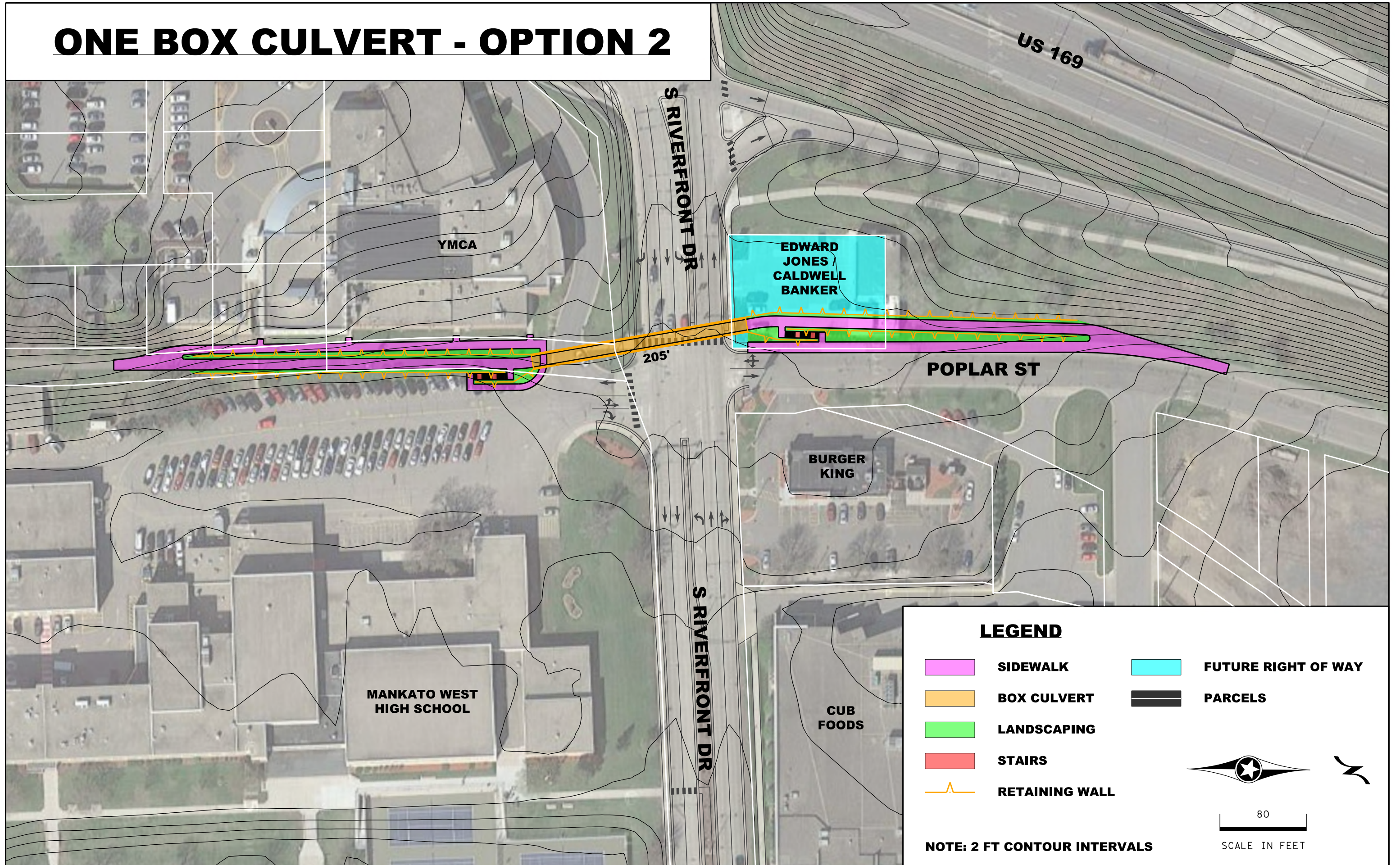
## LEGEND

- |   |                       |   |                            |
|---|-----------------------|---|----------------------------|
|  | <b>SIDEWALK</b>       |  | <b>FUTURE RIGHT OF WAY</b> |
|  | <b>BOX CULVERT</b>    |  | <b>PARCELS</b>             |
|  | <b>LANDSCAPING</b>    |   |                            |
|  | <b>STAIRS</b>         |   |                            |
|  | <b>RETAINING WALL</b> |   |                            |








**NOTE: 2 FT CONTOUR INTERVALS**

80  
SCALE IN FEET

# ONE BOX CULVERT - OPTION 2



## LEGEND

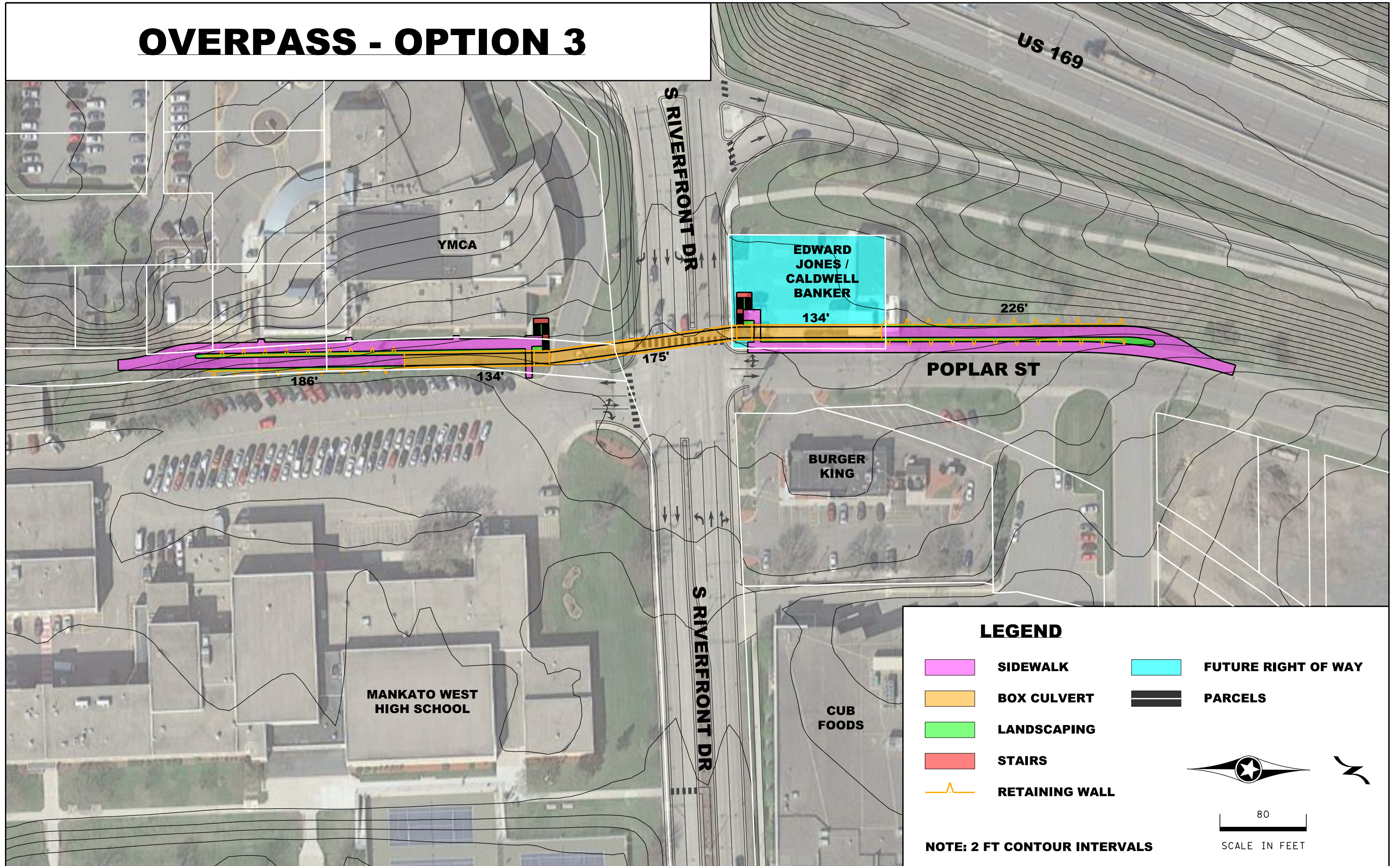
- |   |                       |   |                            |
|---|-----------------------|---|----------------------------|
|  | <b>SIDEWALK</b>       |  | <b>FUTURE RIGHT OF WAY</b> |
|  | <b>BOX CULVERT</b>    |  | <b>PARCELS</b>             |
|  | <b>LANDSCAPING</b>    |   |                            |
|  | <b>STAIRS</b>         |   |                            |
|  | <b>RETAINING WALL</b> |   |                            |

**NOTE: 2 FT CONTOUR INTERVALS**








80

SCALE IN FEET

# OVERPASS - OPTION 3



## LEGEND

- |   |                       |   |                            |
|---|-----------------------|---|----------------------------|
|  | <b>SIDEWALK</b>       |  | <b>FUTURE RIGHT OF WAY</b> |
|  | <b>BOX CULVERT</b>    |  | <b>PARCELS</b>             |
|  | <b>LANDSCAPING</b>    |   |                            |
|  | <b>STAIRS</b>         |   |                            |
|  | <b>RETAINING WALL</b> |   |                            |

NOTE: 2 FT CONTOUR INTERVALS

80

SCALE IN FEET

# Appendix J: Implementation Table with Public Prioritization Results

# Implementation Priorities – Input from April 20, 2017 Open House

Priority*	Segment/ Project #	Project Description	Estimated Cost**	Comments	Public Input on Timeframe Priorities	
Short-term 0 to 5 Years	1A OR 1B	Triple Lefts at TH 169 South Ramp, Add Right Turn Lane on Riverfront to YMCA/School, Two-Stage Pedestrian Crossing (School to Cub Foods), Add Right Turn Lane on Stoltzman	\$700,000 - \$1.0M	Could choose Either 1A OR 1B. Need to further investigate the feasibility of adding a 3rd lane under the TH 169 bridge with Option 1A. Requires coordination with MnDOT and Blue Earth County.	Yellow circles	
	Cub Foods New Public Street	Establish a public street connection from Riverfront Drive to Linder Ave through the Cub Foods parking lot drive lane	\$175,000	Requires close coordination with property owner.	Red circles	
	2	Lane alignment modifications to the Riverfront Drive intersections with Warren Street and Cherry Street	\$40,000	Opportunity to study needs at the Warren/Poplar St intersection with Riverfront Drive further during the 2017-2018 Warren Street studies.	Yellow circles	
	2	Installation of protected lefts on Warren Street/Poplar Street and Southbound Riverfront Drive at Cherry Street	\$35,500	Opportunity to study needs at the Warren/Poplar St intersection with Riverfront Drive further during the 2017-2018 Warren Street studies.	Yellow circles	
	2, 3	Test a 3-Lane on Riverfront Drive from Cherry Street to Vine Street Test 2nd Street enhancements (bump-outs, marked crosswalks, etc.) at same time as Riverfront Drive	\$55,000 - \$65,000	Estimated cost is to test a 3-lane. The lower cost represents using paint and the upper range for using removable tape striping. Testing 2nd St enhancements would be an additional \$900 per bump-out and \$900 per crosswalk.	Yellow and Red circles	
	3	Add wayfinding for public parking locations and public spaces.	\$6,000	\$500 per sign	Yellow circles	
	5	Construct roundabout at TH 14 North Ramp	\$750,000	Requires coordination with MnDOT and Blue Earth County	Yellow and Red circles	
	<b>Subtotal</b>			<b>\$2.0 - \$2.5M</b>		
	Mid-term 6 to 15 Years	2-1A OR 2-2	4-Lane narrow median to add sidewalk on east side of Riverfront Drive 3-lanes to add sidewalk on east side of Riverfront Drive.	\$1.2M OR \$450,000	3-lane in Segment 2 would need to be paired with 3-lane in Segment 3. Both options maintain full access at Civic Center Plaza/back parking lot to Hy-Vee.	Blue and Yellow circles
All Segment 3 Options		Remove free-right at Plum Street	\$60,000		Red and Blue circles	
3-1 OR 3-2, 3-2B, 3-3, 3-4		4-Lane with Pedestrian Flasher (RRFB) at Rock St or Elm St (wherever traffic signal is not present) One of 3-Lane Options (if comfortable after 3-Lane test period)	\$300,000 - \$800,000	These costs include removing the free right at Plum. Consider an overhead RRFB system if a 4-lane is maintained on Riverfront Drive. A ground mounted RRFB system could be considered with a 3-lane.	Blue and Red circles	
<b>Subtotal</b>			<b>\$750,000 - \$2.0M</b>			
Opportunity / Development / Safety Driven		All Segment 1 Options	Extend a public street the proposed Cub Food public street extension at Linder Ave to Sibley Parkway	\$300,000	Development driven with former City Public Works site	Blue and Red circles
	All Segment 1 Options	Grade Separated Trail Crossing near Poplar Street	\$1- \$1.5M	Reevaluate need after short-term improvements to Segment 1 of Riverfront Drive are implemented.	Blue and Red circles	
	1-2A	Roundabouts at TH 169 Ramp intersections with Riverfront Drive and Stoltzman Road.	\$5M	Will require right-of-way acquisition and coordination with adjacent property owners	Blue and Red circles	
	1-2B	Roundabout at TH 169 South Ramp and Stoltzman Road. Six-legged roundabout with 169 North Ramp and Poplar Street.	\$6.5M	Not supported by YMCA or School	Blue and Red circles	
	1-3A	Diverging Diamond at TH 169; right-in/right-out at Poplar St/YMCA and School access	\$4.5M	Not supported by YMCA or School	Blue and Red circles	
	1-3B	Add a loop ramp to the TH 169 interchange; raise Riverfront Drive to accommodate.	\$4.5M	Will require additional city street network enhancements.	Blue and Red circles	
	2-1B	4-Lane Shift West	\$2.2M	Feasible only if Hy-Vee decides to expand on a new building footprint. Allows wide center median to remain.	Blue and Red circles	
	4	Median on Riverfront Drive at Adams Street with trail extension to 3rd Avenue	TBD	Trail extension addresses need identified in Safe Routes to School Plan.	Blue and Red circles	
	4	3rd Avenue/Madison - 3rd Avenue Realignment to 4th Leg of Madison Ave/Riverfront Dr intersection	TBD	Development driven in conjunction with Coughlan Mine redevelopment	Blue and Red circles	
	4	3rd Avenue/Madison - 3rd Avenue T-intersection at extended Madison Ave	TBD	Development driven in conjunction with Coughlan Mine redevelopment	Blue and Red circles	
	4	3rd Avenue/Madison - 3rd Avenue T-intersection to Adams Street extension	TBD	Development driven in conjunction with Coughlan Mine redevelopment. This option not supported by Blue Earth County.	Blue and Red circles	
4	3rd Avenue/Madison - Median at 3rd Avenue	TBD	Development driven in conjunction with Coughlan Mine redevelopment. This option not supported by Blue Earth County.	Blue and Red circles		
4	Madison Ave to Good Counsel Drive; Reevaluate - with of the street, number of lanes, access to Riverfront, and primary intersection locations	TBD	Consider when infrastructure improvements are needed, land use changes or as opportunities arise with individual business/property owners.	Blue and Red circles		
5	Construct roundabout at TH 14 South Ramp	\$750,000	Consider when operational and/or safety need is present	Blue and Red circles		

\*Timing of all projects dependent upon funding availability.

\*\* All estimated costs are for individual improvements only. Costs do not account for any reconstruction needs of Riverfront Drive.