MAPO
MANKATO/NORTH MANKATO
AREA PLANNING ORGANIZATION

Highway 169 Corridor Study

Identification and Evaluation of Corridor Concepts

Date: September 29, 2021

To: Project Management Team

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Subject: Final Concept Development and Evaluation Memo

Highway 169 Corridor Study

Mankato/North Mankato Area Planning Organization (MAPO) and Minnesota Department of Transportation (MnDOT)

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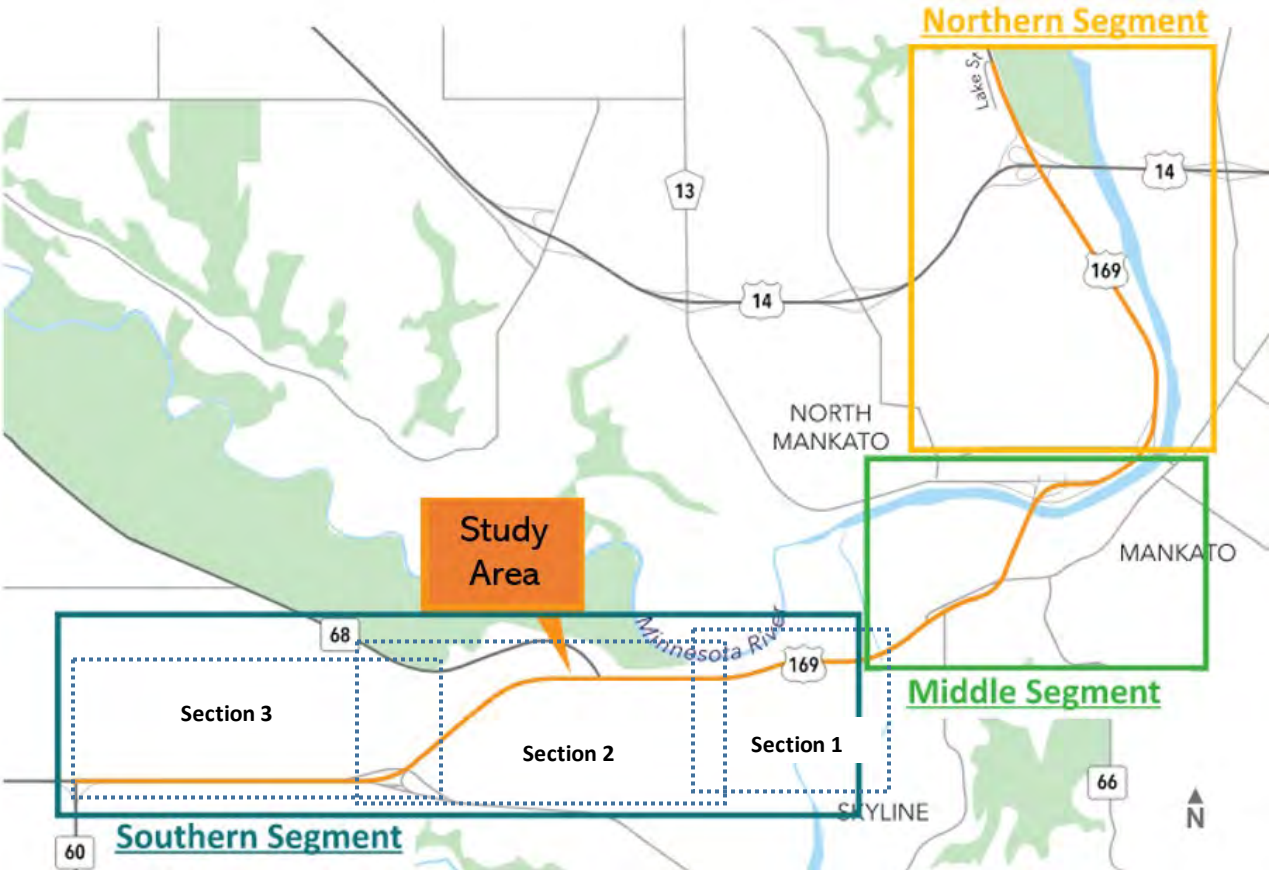
I. Introduction

Representatives from the Mankato/North Mankato Area Planning Organization (MAPO) and the Cities of North Mankato, Mankato, Blue Earth County, Nicollet County, and the Minnesota Department of Transportation (MnDOT) made up a Project Management Team (PMT) that developed improvement concepts on Highway 169, and the surrounding local network. The study area extents included Lake Street at the north and Highway 60 at the south as shown in **Figure 1**. For ease in describing key corridor/network needs, the study area was split into three subareas based on the unique context within each. The northern, middle, and southern subareas and for the same reasons the southern subarea was split into three sections. The subareas are also shown in **Figure 1**.

Figure 1. Study Extents and Subareas



Multiple improvement concepts were identified and evaluated based on the existing conditions analysis, purpose and need, and issues and needs identified through public, agency and stakeholder involvement. The memo describes and documents concepts evaluated for each subarea of Highway 169.

II. Initial Concepts List

The list below represents all concepts considered for each subarea. A discussion of concepts can also be seen in the Concept Traffic Operations Memorandum in **Appendix B.**

Northern Subarea

A. Signalized Green T intersection at eastbound Highway 14 exit ramp
B. Combine River Lane/Lind Street and maintain Webster Avenue
    i. Signalized intersection at River Lane/Lind Street and Webster Avenue
    ii. Roundabout intersections at River Lane/Lind Street and Webster Avenue
    iii. Signalized Reduced Conflict U-Turns (RCUTs) at River Lane/Lind Street and Webster Avenue
C. Combined intersection – Lind Street, River Lane, Webster Avenue
D. Highway 169/Highway 14 Interchange
    i. Full cloverleaf
    ii. Eliminate south loop with a signalized intersection
    iii. Eliminate south loop with a roundabout intersection
    iv. Diverging Diamond
    v. Roundabout ramp intersections
E. Local connection improvements
    i. Range Street remain open with modifications to lane striping/utilization
    ii. Range Street Right-In/Right-Out (RIRO) Intersection
    iii. Range Street cul-de-sac
    iv. Monroe Avenue – check sight distance and determine need for intersection
F. Pedestrian considerations
    i. Future trail connection across Highway 169 and Minnesota River using the existing Highway 14 bridge and including connections to Rex Macbeth Trail and the Minnesota River Trail
    ii. Possible new grade separated crossing north of Lind Street
    iii. Possible new grade separated crossing at Webster Avenue

Middle Subarea

A. Veteran's Memorial Bridge/Belgrade Avenue/Highway 169 Interchange
    i. Westbound lane reduction and pedestrian crossing improvements
    ii. Roundabout at western interchange ramp terminal

B. Riverfront Drive/Highway 169 Interchange

    i. Right Turn Lane Concept - Add channelized westbound right turn lane at northbound Highway 169 entrance ramp, tighten right turn, pedestrian crossing improvements, close local accesses off Riverfront Drive
    ii. Signalized Corridor Concept - Triple left from southbound Highway 169, additional eastbound through lane under the bridge which becomes a right turn lane at Poplar Street, additional entrance ramp lane for northbound Highway 169
    iii. Riverfront Drive West of Highway 169 Concept - Loop ramp from southbound Highway 169 eliminating access off Hubbell Avenue onto Riverfront Drive, roadway extension of

2nd Street from Owatonna Street to Hubbell Avenue and 3rd Street between Sibley Street and Hubbell Avenue, additional entrance ramp for northbound Highway 169

Southern Subarea

A. Section 1: Blue Earth River bridge to CSAH 33 (Hemlock Road)
   i. Concept A – Maintain 3/4 access at Hawley Street, restrict access at Amos Owen Lane and CSAH 33 by removing side street left turns (convert to RCUTs), install U turns between CSAH 33/McCauley Street and Amos Owen Lane/Hawley Street to accommodate lefts, potentially eliminate CSAH 33 access with new access south of Highway 68 or realign with Hemlock Road.
   ii. Concept B – eastbound right-in only at Hawley Street, restrict access at Amos Owen Lane and CSAH33 by removing side street left turns (convert to RCUT), install U turns between CSAH 33/Amos Owen Lane and Amos Owen Lane/Hawley Street to accommodate lefts, potentially eliminate CSAH 33 access with new access south of Highway 68 or realign with Hemlock Road.
   iii. Concept C – Full access signalized Green-T intersection at Hawley Street, restrict access at Amos Owen Lane by removing side street left turns (convert to RCUT), use U turn between CSAH 33/Amos Owen Lane to accommodate lefts, restrict access at CSAH 33 to RIRO
   iv. Concept D – Full access signalized Green-T intersection at CSAH 33, restrict access at Amos Owen Lane by removing side street left turns (convert to RCUT), install U turn between CSAH 33/Amos Owen Lane to accommodate lefts, restrict access at Hawley Street to RIRO
   v. Grade separated pedestrian crossings
      - Overpass at Hawley Street
      - Underpass at Blue Earth River Bridge

B. Section 2: Highway 68 to CSAH 90
   i. Concept A - Maintain existing access locations, construct High-T at Highway 68, restrict direct access to Highway 169 for businesses, restrict left turns at County Road 120 and CSAH 69, install U turn between County Road 120 and CSAH 69 to accommodate westbound left turn from T-943, close Bison Street access
   ii. Concept B1 – Construct High-T at Highway 68, consolidate access near CSAH 69 to provide better access spacing, construct connector roads to direct local traffic to new access location, close County Road 120 and Bison Street accesses
   iii. Concept B2 - Consolidate access between County Road 120 and CSAH 69 to provide better access spacing, construct connector roads to direct local traffic to new access location, close Bison Street access, reduce access at Highway 68 to RIRO
   iv. Concept C - Use RCUTs for County Road 120 and CSAH 69, add south leg to Highway 68 intersection, close Bison Street access

C. Section 3: CSAH 90 to 208th Lane
   i. Concept A - Close access at 208th Lane and Loren Drive, restrict northbound left turn at Highway 60/Highway 169 intersection, install U turns between Loren Drive/County Road 117 and west of Highway 60/Highway 169 intersection to accommodate lefts, reduce access at Gadwall Road to RIRO

ii. Concept B - Realign access at Gadwall Road to provide better access spacing, close access at 208th Lane, Loren Drive and County Road 117, construct connector road to connect County Road 117 with the new Gadwall Road access location

III. Early Concepts Screening

Table 1 below describes reasons for early dismissal of concepts that showed fatal flaws in comparison against the study's goals and objectives and purpose and need. The early screening process was conducted and documented by the PMT and shared with the public. The concepts dismissed below were not carried forward into the detailed concept evaluation. See the **Appendix D** for sketches of the dismissed concepts.

Table 1. Dismissed Concepts

Dismissed Concepts	Reason Dismissed*
Northern Subarea	
Signalized Green T at the eastbound Highway 14 exit ramp	• Early layout of this concept showed the northbound left turn lane to westbound Highway 14 located too close to the Highway 169 and eastbound Highway 14 exit ramp intersection. Specifically, the crossover between the eastbound left traffic from the eastbound Highway 14 exit ramp and the northbound left traffic at the westbound Highway 14 entrance ramp is a crash concern
Combined intersection – Lind Street, River Lane, Webster Avenue	• Concept is too impactful to existing businesses and future redevelopment areas and would require significant local road network reconfiguration
Southern Subarea	
Section 1 – Concept A: Maintain existing access, convert to RCUTs, modify geometry at Hawley Street to improve safety	• Operational issues – Westbound left turns at Hawley Street and at CSAH 33 operate with failing LOS
Section 1 – Concept B: Restrict access at Hawley Street, RCUTs at CSAH 33 and Amos Owen Lane	• Operational issues – Westbound left turns at CSAH 33 and westbound U-Turns at RCUTs operate with failing LOS

**The supporting traffic and safety analyses are documented in the Concept Traffic Operations Memo in Appendix B.*

IV. Detailed Evaluation of Concepts

Following the early screening process, concepts carried forward were run through an evaluation matrix. Each subarea evaluation matrix scored concepts on their ability to achieve study goals and concept scores were compared to the no-build and each other to determine which perform best. The northern and southern subarea evaluation matrices are included in **Appendix A**. Local system improvements and grade separated pedestrian crossing were also evaluated in the northern subarea. In addition, the southern subarea evaluated grade separated pedestrian crossings. Matrices for these can also be found on the following pages.

Study Goals and Objectives

Table 2 shows the study goals and objectives used for the detailed evaluation of concepts. Not all objectives were relevant to each subarea or evaluation of local system improvements. Refer to each subarea matrix in **Appendix A** for the objectives relevant to each subarea and concept.

Table 2. Study Goals and Objectives

Study Goals	Goal Objectives
Goal A: Preserve community connections and economic vitality.	• Maintain sustainable access for local trips into/out of Mankato and North Mankato • Maintain emergency access routes into/out of Mankato and North Mankato • Accommodate reasonable vehicle/truck access • Accommodate reasonable pedestrian/bicycle access • Enhance community identity
Goal B: Provide efficient and reliable mobility for all users.	• Provide acceptable system reliability serving existing and planned growth • Provide acceptable regional highway travel times while accommodating reliable local access • Provide acceptable side street delay • Improves side street delay over existing conditions • Understand and plan for freight needs • Meets access spacing guidelines • Improves access spacing guidelines over existing conditions • Provide a connected transportatio9n system that accommodates trips consistent with roadway functional classification • Perceived pedestrian/bicyclist level of comfort • Accommodate future transit plans and needs • Understand and plan for roadway expansion

Goal C: Safely accommodate all system users.	• Reduce crash and severity rates • Provide safe pedestrian and bicycle travel near and across roadways, to area schools, and to regional destinations.
Goal D: Provide infrastructure improvements that respect the environment.	• Avoid, minimize, and mitigate impacts to sensitive environmental resources • Avoid, minimize, and mitigate impacts to hazardous contaminated areas • Disproportionate impact to Environmental Justice (EJ) populations
Goal E: Develop a financially responsible implementation plan.	• Right-size improvements to address needs yet maximize use of existing infrastructure where possible • Develop fiscally responsible improvements (construction costs) • Develop fiscally responsible improvements (right-of-way and environmental impact costs) • Develop project phases that meet schedule and funding constraints and maximize opportunities • Develop a supported funding model to clearly identify agency responsibilities • Position partner agencies to seek federal and state grants for identified improvements to minimize partner costs
Goal F: Develop a plan supported by all agency partners.	• Supported by the Project Management Team (PMT)

Additional Concepts Dismissed

After further traffic analysis, it was determined that the concepts below have concerning operational issues and the PMT decided to dismiss each. **Table 3** on the next page provides more detail for early the additional concepts dismissed.

Table 3. Additional Concepts Dismissed

Dismissed Concepts	Reason Dismissed*
Northern Subarea	
Highway 169/Highway 14 Interchange - Eliminate north loop with a roundabout intersection	• Operational issues - Maximum queues along exit ramp are anticipated to extend onto mainline Highway 14 and delay for the exit ramp movements operates with failing LOS
Highway 169/Highway 14 Interchange - Eliminate south loop with a roundabout intersection	• Operational issues - Maximum queues along exit ramp are anticipated to extend onto mainline Highway 14 and delay for the exit ramp movements operates with failing LOS

**The supporting traffic and safety analyses are documented in the Concept Traffic Operations Memo in Appendix B.*

The Middle Subarea

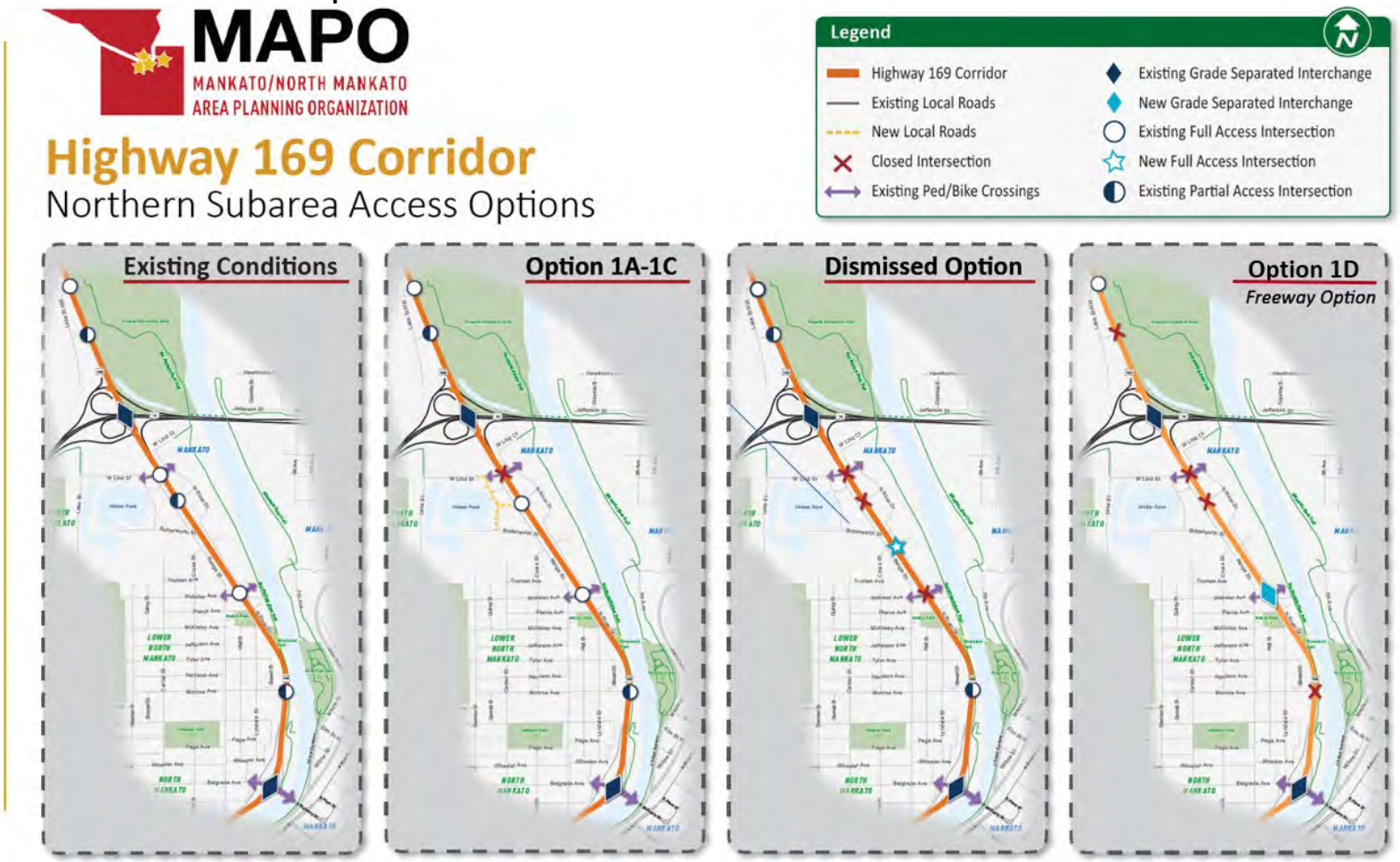
Concepts considered for the middle subarea included newly developed lower cost concepts and concepts identified in the previous Riverfront Drive and Belgrade Avenue Corridor Studies. In the early stage of the detailed concept evaluation, MnDOT announced the middle subarea would be best addressed through the scoping process of an upcoming Veterans Memorial Bridge project. MnDOT and the cities of Mankato and North Mankato will utilize the concepts developed for this subarea and engage in further analysis and public input to determine a preferred alternative for the upcoming project. For this reason, the middle subarea concepts were not carried through the detailed evaluation process. However, the PMT requested that concepts be documented for consideration in the upcoming MnDOT project scoping effort. See documented concepts in **Appendix C**.

V. Northern Subarea Evaluation

The following pages include images, descriptions, and summaries of scores for each concept. This also depicts how concepts were presented to the public. Full copies of the concept drawings can be seen on the MAPO website (www.mnmapo.org)

Figure 2 below provides a high-level overview for each Northern Subarea concept. Concepts 1A-1C all close Lind Street and relocate a full access intersection to North River Lane with either traffic signals, reduced conflict U-turns (RCUTS), or roundabouts. As discussed in Section III, Early Concept Screening, the study team looked at combining Lind Street, North River Lane, and Webster Avenue into one intersection but dismissed the idea because it was too impactful to businesses and properties to fit in the local road reconfigurations needed to support it. Concept 1D converts this section of Highway 169 into a freeway by completing the cloverleaf at the Highway 169/14 interchange and adding a grade separated interchange at Webster Avenue. Not shown in this graphic, but the study team also looked at other Highway 169/14 interchange improvements such as a ramp signal and a Diverging Diamond interchange. These other Highway 169/14 interchange improvements are shown on the follow pages and can be paired with a 1A-C concept.

Figure 2. Northern Subarea Access Concepts



Northern Subarea Concepts

No-Build Concept

With every transportation improvement study, a "no-build" concept is evaluated to justify the need for any improvement investments. The “no-build” or existing conditions concept is shown in **Figure 3**. This evaluation looks at what will happen over the next 20 years if no transportation improvements are made but the communities and region continue to grow as planned.

The “no-build” concept was evaluated against the study goals and given an overall score. The no-build scored very poorly with a negative score (-63 out of a possible 291 points) due to the many project goals it did not address. This justified to the study team that "doing nothing" is not a viable concept. The following is a high-level summary as to why. See the Traffic Operations Memo in **Appendix B** for more details.

- 2040 traffic projections show excessive delays at the eastbound Highway 14 ramp during peak traffic hours.
- Five of seven intersections are spaced closer than MnDOT access spacing guidelines recommend
- There were a high number of crashes, 159 total with two severe, between 2015 and 2019. With anticipated traffic growth this would worsen.
- Crashes at the Lind Street intersection are more than three times the normal range for similar intersections.
- Local business access is very important in this subarea and council resolutions reinforce this.
- There is a demand for pedestrian and bicycle access across Highway 169 to connect the existing trail systems at Lind Street and Webster Avenue.

Figure 3. Northern Subarea No-Build Concept

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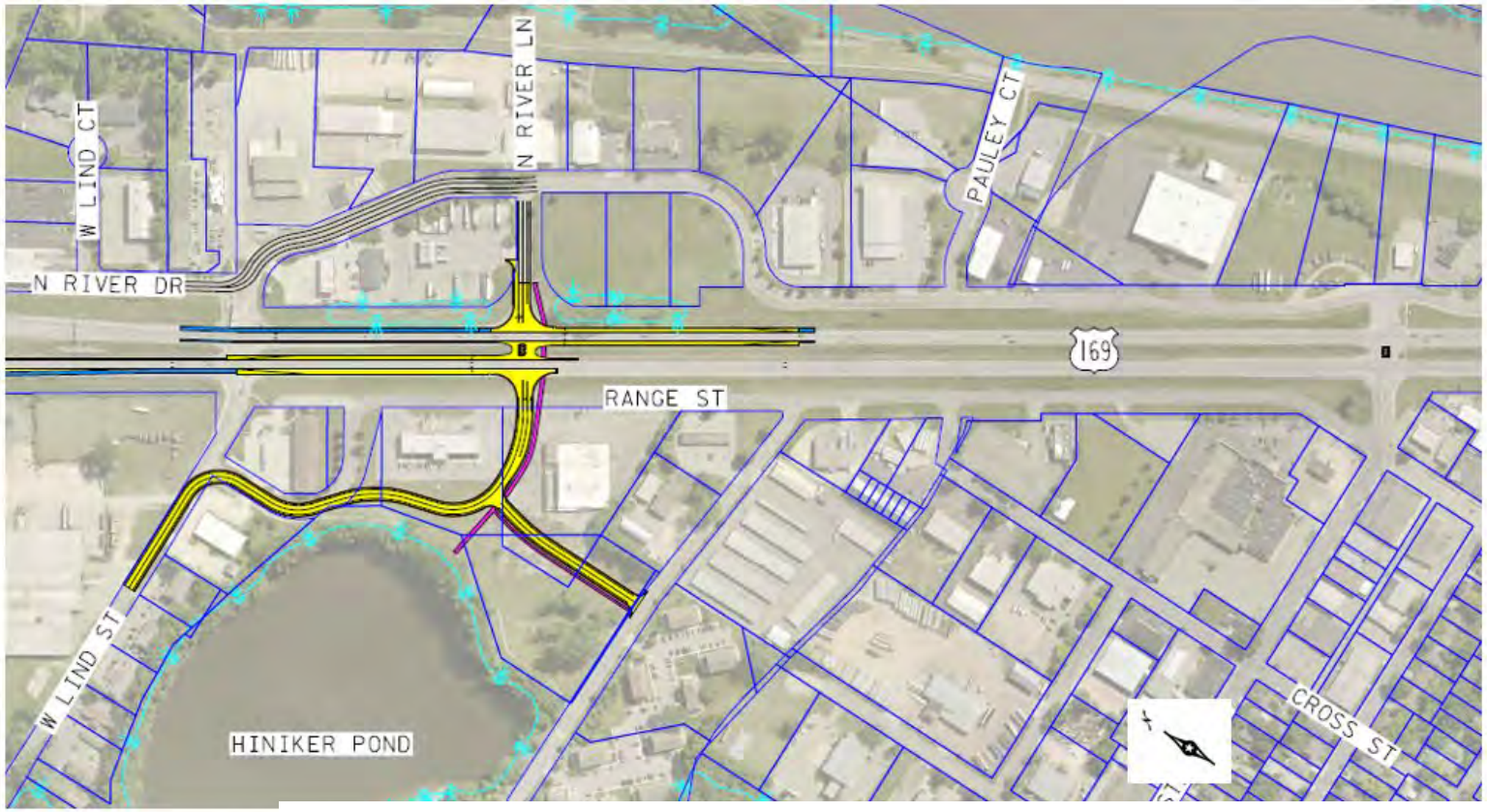
Northern Subarea Concepts

Concept 1A – Combine River Lane/Lind Street and Maintain Webster Avenue (Signals)



Summary of Evaluation:

Goal A: All movements are maintained at intersections accommodating reasonable access.

Goal B: Close access spacing to Highway 14 ramps. Average side street delay is increased from the no build scenario.

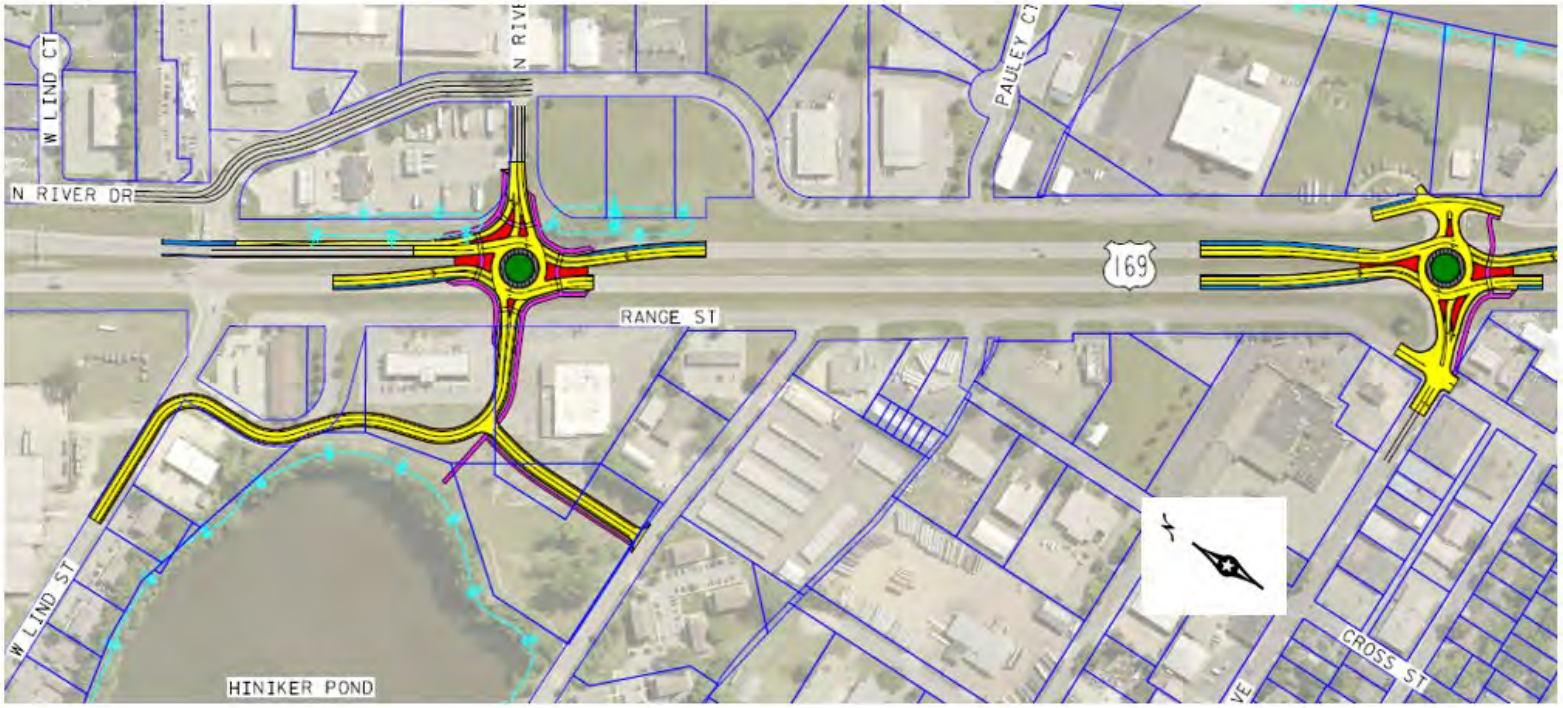
Goal C: Retaining traffic signal would not reduce crash/severity rates.

Goal D: New road alignment north of Hiniker Pond and Highway 14 ramp adjustments pose medium risk for impacts that will need to be studied with a future project. Based on environmental screening there are several hazardous waste areas south of the Highway 14 interchange, most south of Hiniker Pond.

Goal E: A fair fiscally responsible score is applied here because the concept's lack of addressing safety issues makes it less competitive for funding programs. Also, the cost estimate does not cover all partial property impacts or any easements necessary.

Northern Subarea Concepts

Concept 1B – Combine River Lane/Lind Street and Maintain Webster Avenue (Roundabouts)



CONCEPT EVALUATION

GOOD ++ | FAIR + | POOR -

Project Goals	Overall Score
Community connections & economic vitality	++
Mobility for all users	+
Safety for all users	++
Community & environmental impacts	+
Fiscally responsible $7.3M	++
Agency support	++

SCORE 202.5

Summary of Evaluation:

Goal A: All movements are maintained at intersections accommodating reasonable access. Median areas provide opportunity for aesthetics/monumentation.

Goal B: Close access spacing to Highway 14 ramps. Average side street delay is reduced from the no build scenario.

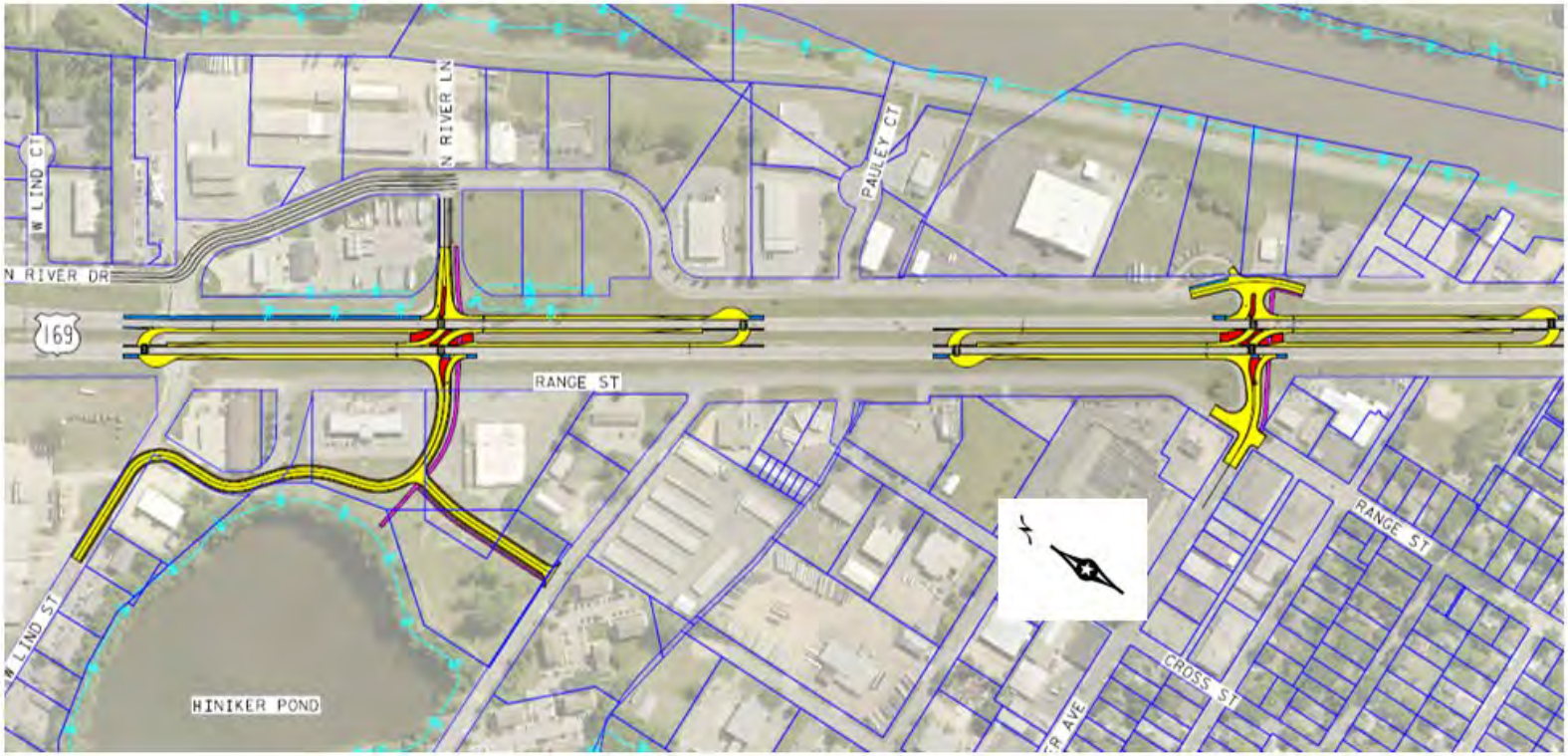
Goal C: Roundabouts reduce crash severity rates and pedestrian/vehicle conflict points.

Goal D: New road alignment north of Hiniker Pond and Highway 14 ramp adjustments pose medium risk for impacts that will need to be studied with a future project. Based on environmental screening there are several hazardous waste areas south of the Highway 14 interchange, most south of Hiniker Pond. Intersection improvements at both River Lane and Webster Avenue have larger disturbance footprint in this area.

Goal E: A good fiscally responsible score is applied here because the concept's ability to address safety issues makes it more competitive for funding programs. Also, the cost estimate does not cover all partial property impacts or any easements necessary.

Northern Subarea Concepts

Concept 1C – Combine River Lane/Lind Street and Maintain Webster Avenue (RCUTs)



CONCEPT EVALUATION

GOOD FAIR POOR

Project Goals	Overall Score
Community connections & economic vitality	-
Mobility for all users	+
Safety for all users	+
Community & environmental impacts	+
Fiscally responsible $8.6M	+
Agency support	+

SCORE 115

Summary of Evaluation:

Goal A: Sightline concerns with plantings in RCUT medians. Side street movements are restricted so reasonable access is not perceived as being accommodated.

Goal B: Close access spacing to Highway 14 ramps. Average side street delay is the same as the no build scenario.

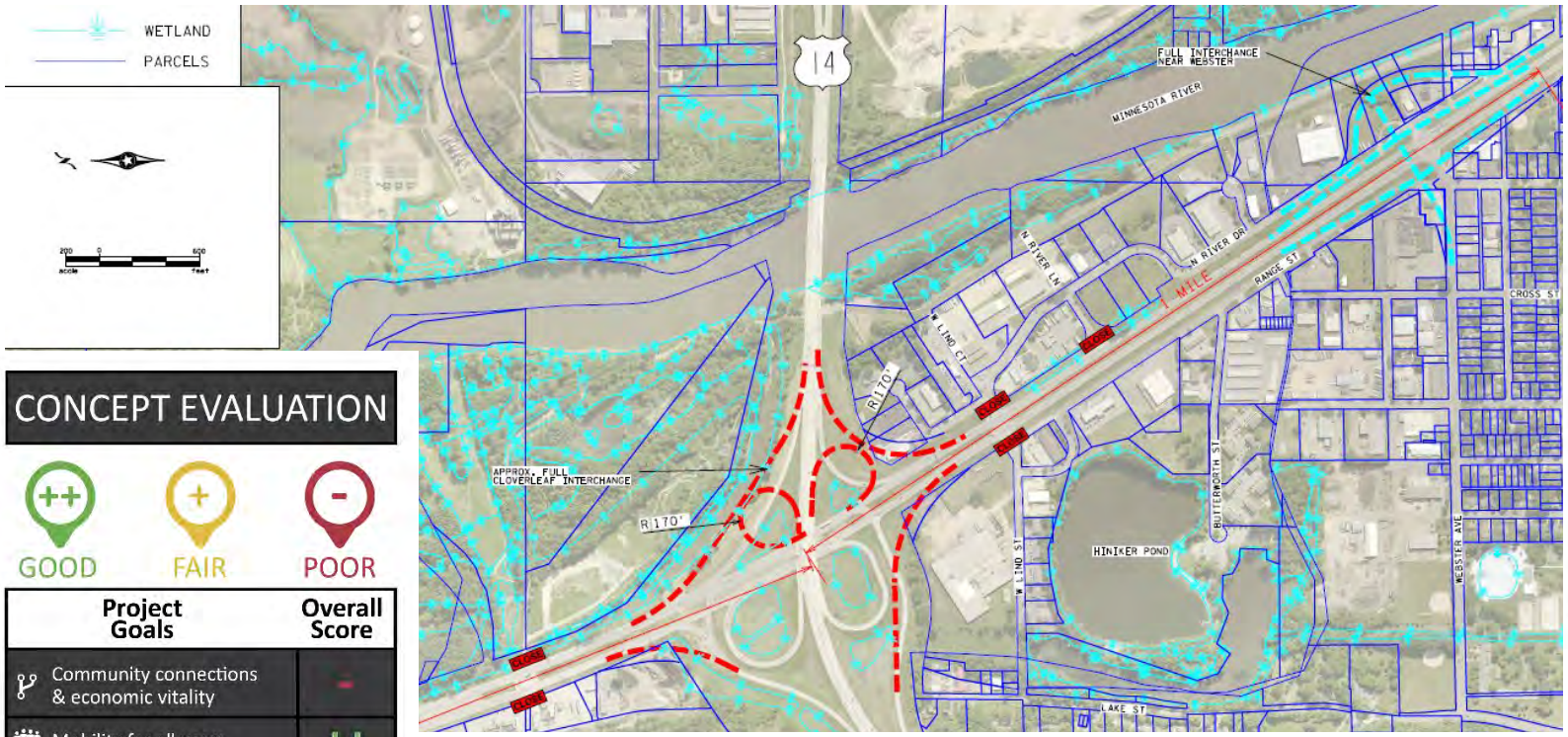
Goal C: RCUTs have been shown to reduce crash/severity rates. RCUTs are perceived as confusing for pedestrians and bicyclists.

Goal D: New road alignment north of Hiniker Pond and Highway 14 ramp adjustments pose medium risk for impacts that will need to be studied with a future project. Based on environmental screening there are several hazardous waste areas south of the Highway 14 interchange, most south of Hiniker Pond. Intersection improvements at both River Lane and Webster Avenue have larger disturbance footprint in this area.

Goal E: The cost estimate does not cover all partial property impacts or any easements necessary.

Northern Subarea Concepts

Concept 1D – Webster Ave Interchange and 2A – Highway 14/169 Interchange (Full Cloverleaf)



CONCEPT EVALUATION

GOOD ++ | FAIR + | POOR -

Project Goals	Overall Score
Community connections & economic vitality	-
Mobility for all users	++
Safety for all users	++
Community & environmental impacts	-
Fiscally responsible - $25M	-
Agency support	-

SCORE 156

CONCEPT EVALUATION

GOOD ++ | FAIR + | POOR -

Project Goals	Overall Score
Community connections & economic vitality	-
Mobility for all users	++
Safety for all users	-
Community & environmental impacts	-
Fiscally responsible - $13M	-
Agency support	+

SCORE 31.5

Summary of Evaluation:

Goal A: Freeway will result in increased travel time from Highway 14 to area around McDonalds and Lind Street. Large cloverleaf footprint provides limited opportunities for aesthetic improvements.

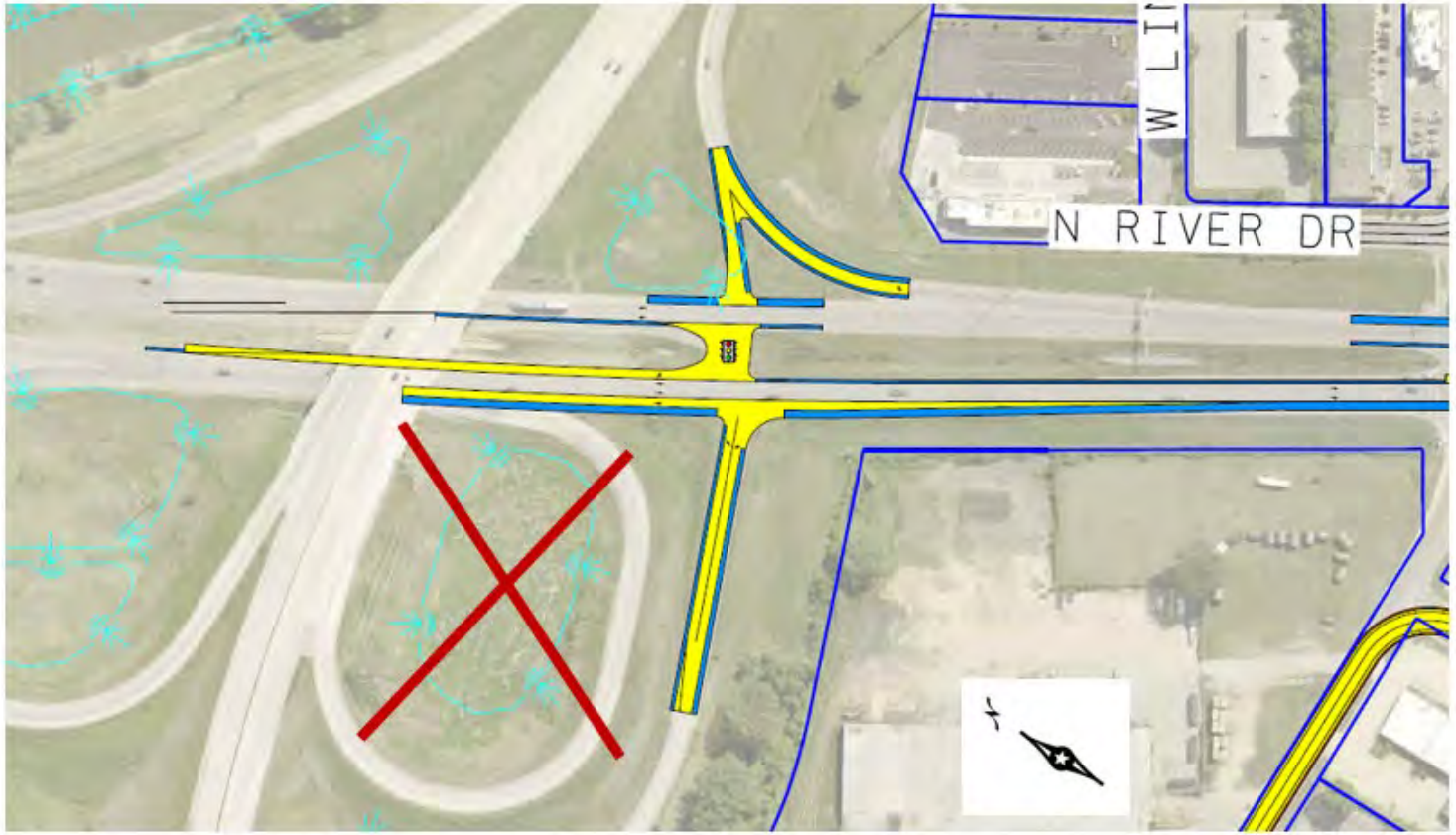
Goal C: Full cloverleaf introduces new weave areas.

Goal D: Highway 14 West to Highway 169 ramp would impact the existing wetland in the northeast quadrant. - Highway 169 North to Highway 14 East ramp would impact McDonald's building. - The full interchange configuration Concept 2A would warrant modifications to the Minnesota River levee that protects the City of Mankato and North Mankato from flood waters produced by the Minnesota River. Further coordination with FEMA will be required to understand the requirements associated with levee modifications or relocations associated with Concept 2A. - Based on environmental screening there are several hazardous waste areas south of the Highway 14 interchange, most south of Hiniker Pond. An interchange at Webster Avenue would have a larger disturbance footprint in this area. North Mankato Resolution No. No. R-19-0708-119 states at-grade access must be preserved at Webster Avenue. For this reason, this option would fail goal F, as it would not be supported by the PMT.

Goal E: The cost estimate does not cover all partial property impacts or any easements necessary.

Northern Subarea Concepts

Concept 2C – Highway 14/169 Interchange (Eliminate South Loop - Signal)



CONCEPT EVALUATION		
GOOD (++)	FAIR (+)	POOR (-)

Project Goals	Overall Score
Community connections & economic vitality	++
Mobility for all users	++
Safety for all users	+
Community & environmental impacts	++
Fiscally responsible - $2.5M	++
Agency support	++

SCORE 183

Summary of Evaluation:

Goal B: Average side street delay is significantly reduced from the no build scenario.

Goal C: Increase in total number of crashes anticipated with adding traffic signal.

Goal D: Alone poses low risk and further evaluation needed relative to what it is paired with for improvements to the south.

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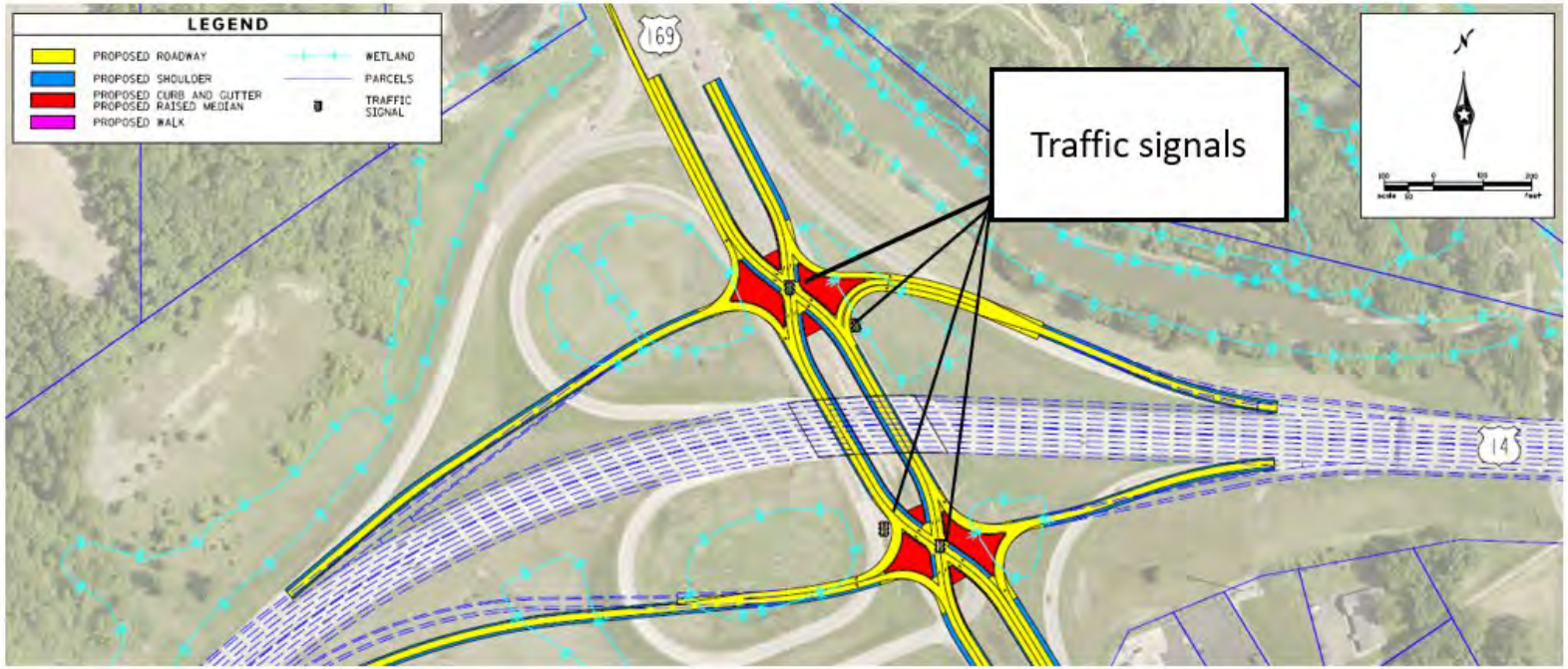
Northern Subarea Concepts

Concept 2D – Highway 14/169 Interchange (Diverging Diamond)



CONCEPT EVALUATION

GOOD (++) FAIR (+) POOR (-)

Project Goals	Overall Score
Community connections & economic vitality	++
Mobility for all users	++
Safety for all users	+
Community & environmental impacts	++
Fiscally responsible - $9M	++
Agency support	++

SCORE 193.5

Summary of Evaluation:

Goal A: Median areas provide opportunity for aesthetics/monumentation, but sightline concerns may limit this.

Goal B: Average side street delay is significantly reduced from the no build scenario.

Goal C: Increase in total number of crashes anticipated with adding traffic signals.

Goal D: Highway 14 West to Highway 169 ramp would impact the existing wetland and flood levee. Further coordination with FEMA will be required to understand the requirements associated with levee modifications or relocations.

Northern Subarea Local System Improvements

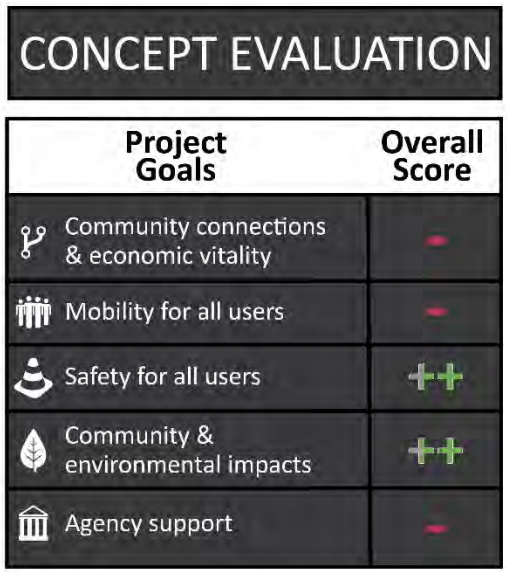
Concept L1 – Range Street Remains Open (No Change)

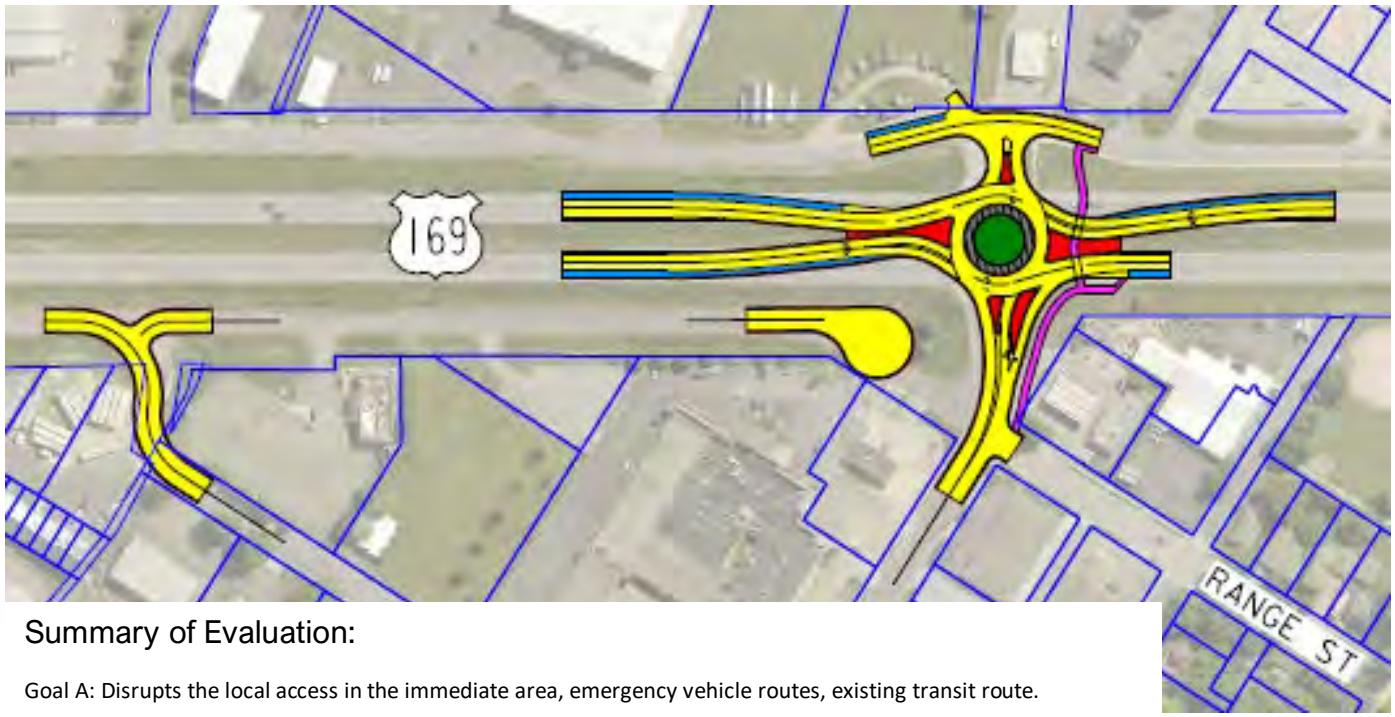
This concept would leave Range Street as it is today. The score is similar to Concept L4 on page 20. The main evaluation points include:

- Goal A: Maintains access for local trips and emergency routes (relative to Highway 169 improvement paired with).
- Goal C: Existing crash issues will continue (relative to Highway 169 improvement paired with).

Northern Subarea Local System Improvements

Concept L2 – Range Street Cul-de-sac





SCORE -24

Summary of Evaluation:

Goal A: Disrupts the local access in the immediate area, emergency vehicle routes, existing transit route.

Goal C: Crash reduction anticipated with reduced access.

Northern Subarea Local System Improvements

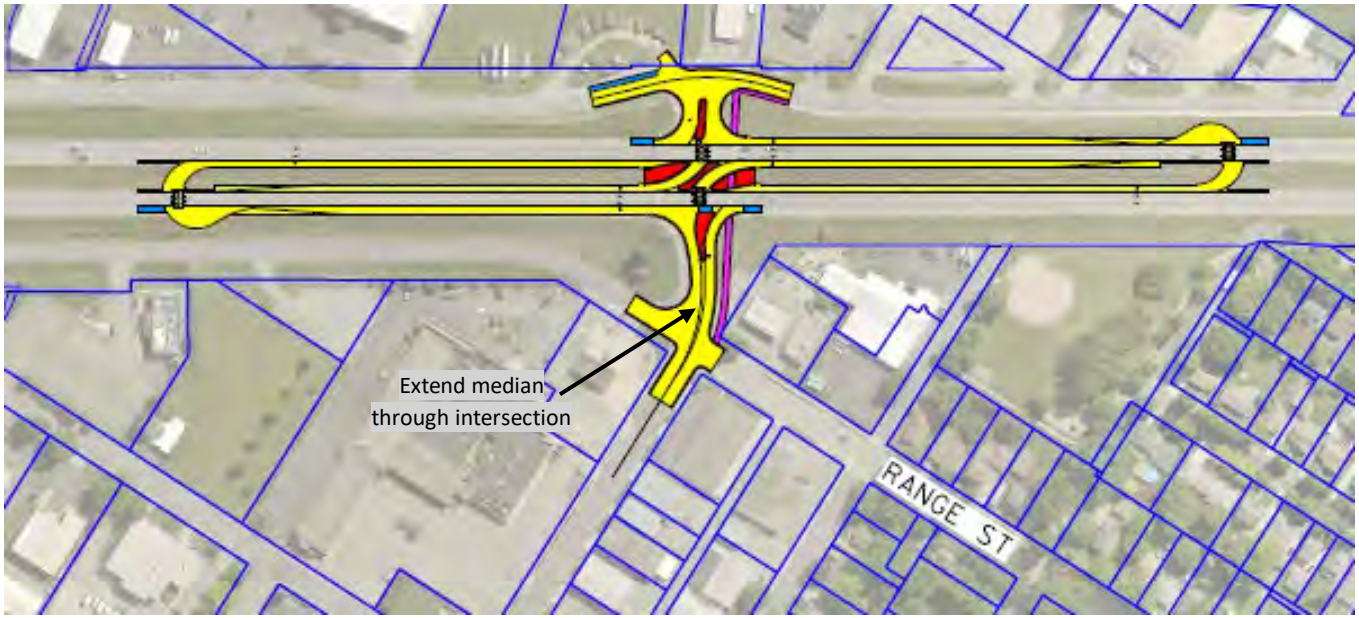
Concept L3 – Range Street Right-In/Right-Out

CONCEPT EVALUATION

GOOD (++) FAIR (+) POOR (-)

Project Goals	Overall Score
Community connections & economic vitality	++
Mobility for all users	+
Safety for all users	-
Community & environmental impacts	++
Agency support	++

SCORE 24



Summary of Evaluation:

Goal A: Limits local access in the immediate area and emergency vehicle routes.

Goal C: Crash reduction anticipated with reduced access.

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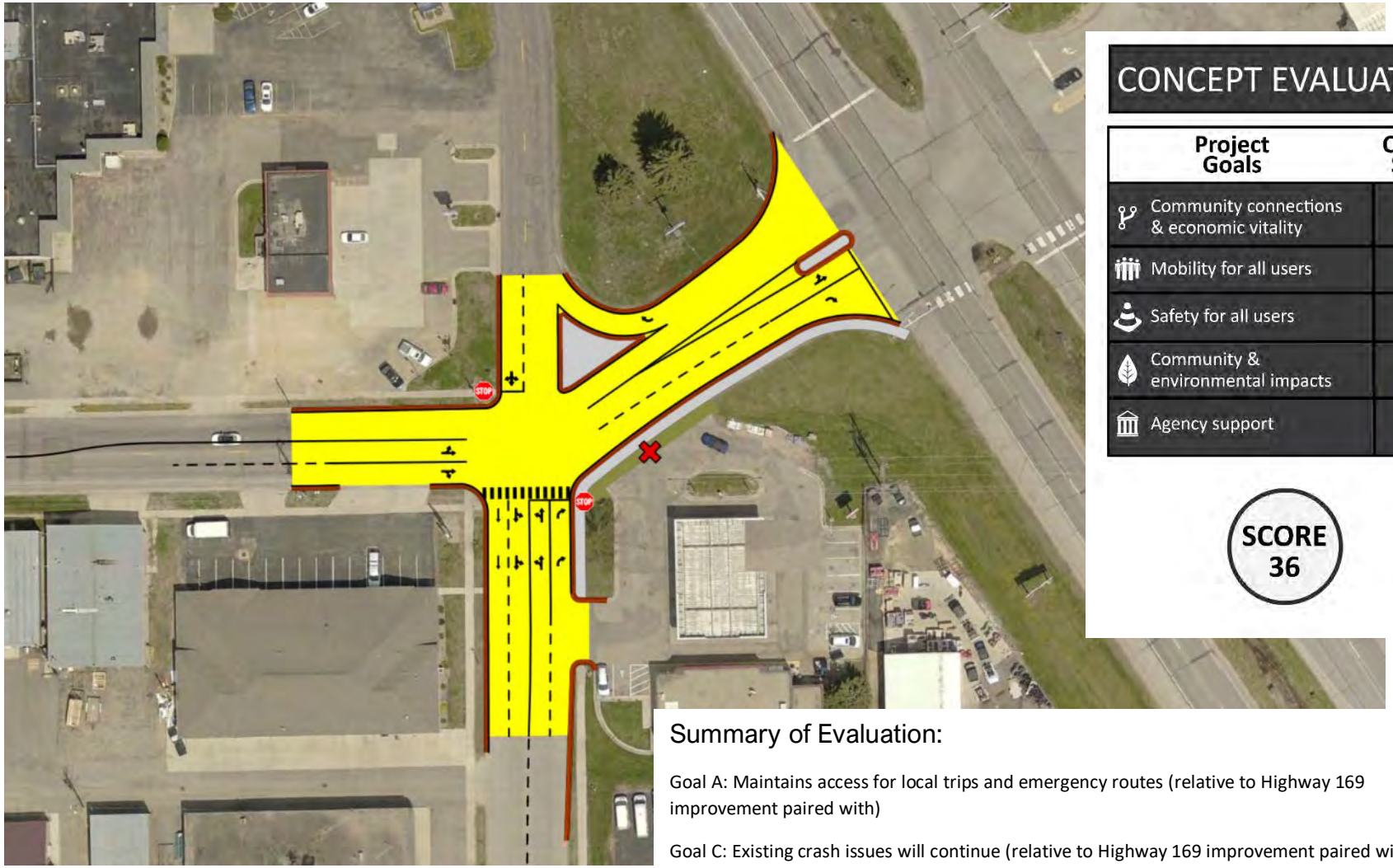
Northern Subarea Local System Improvements

Concept L4 – Range Street Modernization



CONCEPT EVALUATION	
Project Goals	**Overall Score**
Community connections & economic vitality	++
Mobility for all users	+
Safety for all users	-
Community & environmental impacts	++
Agency support	++

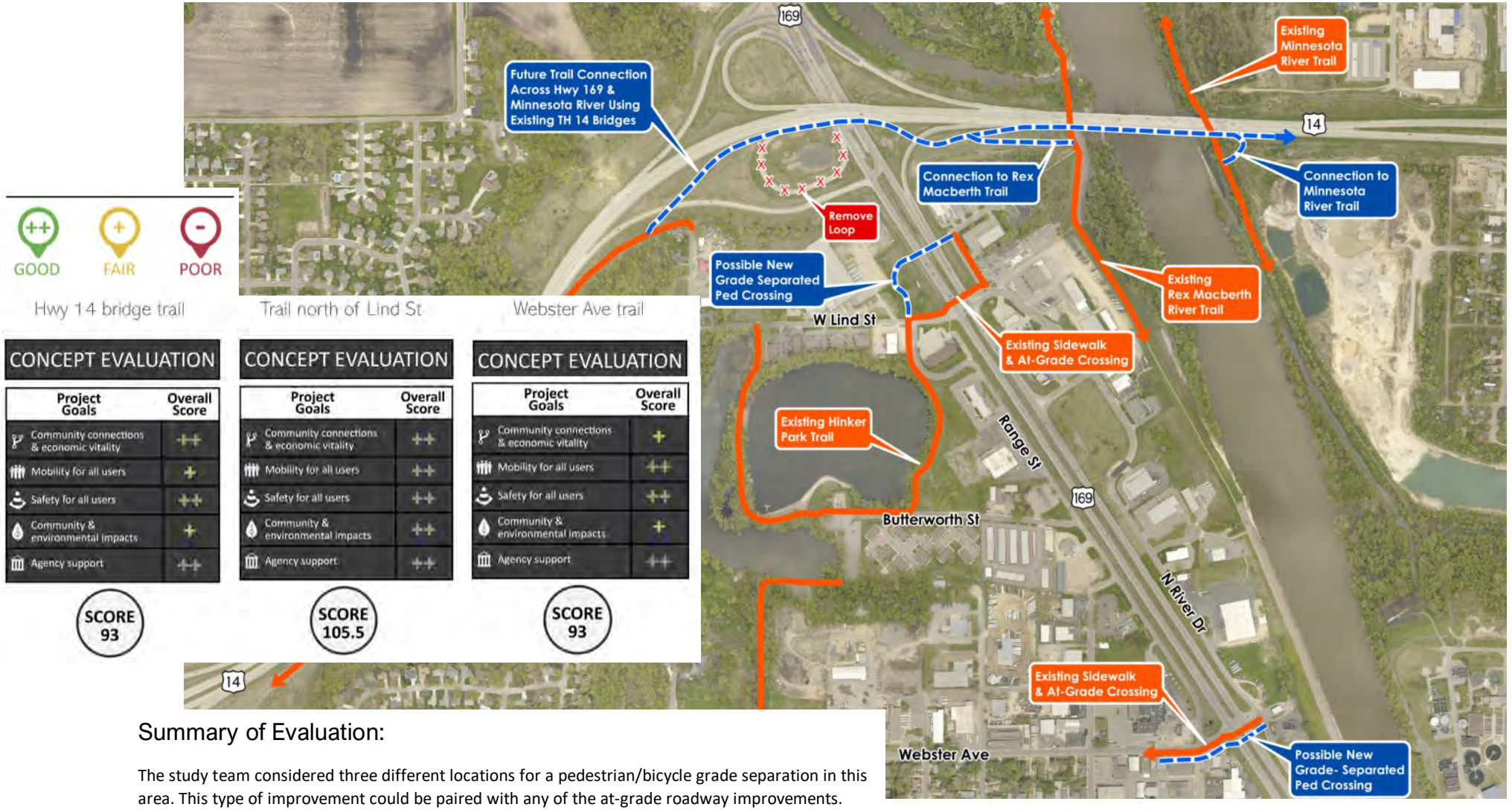
SCORE 36

Summary of Evaluation:

Goal A: Maintains access for local trips and emergency routes (relative to Highway 169 improvement paired with)

Goal C: Existing crash issues will continue (relative to Highway 169 improvement paired with)

Northern Subarea Grade Separated Crossings



Summary of Evaluation:

The study team considered three different locations for a pedestrian/bicycle grade separation in this area. This type of improvement could be paired with any of the at-grade roadway improvements. We considered a grade separation at Webster Avenue, Lind Street, and adjacent to Highway 14.

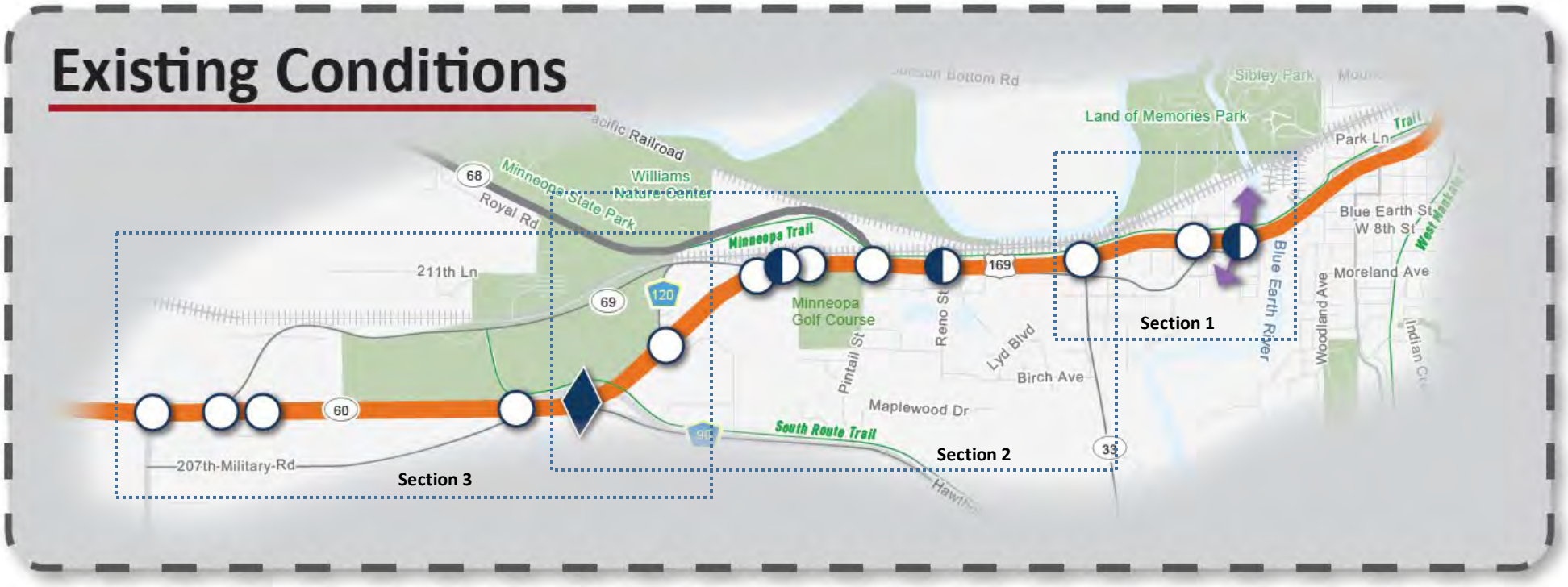
Both the Highway 14 bridge and Lind Street concepts scored the highest as they seemed to make the most natural connection between the Bluff Valley Trail and Rex MacBeth Trail for recreational users. These concepts also serve the pedestrian demand for access to convenience stores located east of Highway 169 and residential land uses west of Highway 169 near Lind Street.

VI. Southern Subarea Evaluated Concepts

The following pages include images, description, and summary of scores for each concept. This also depicts how concepts were presented to the public. Full copies of the concept drawings can be seen on the MAPO website (www.mnmapo.org)

As shown in **Figure 4**, for ease in describing key corridor/network needs the subarea area was split into three sections based on the unique context within each. The study team looked at several lower cost/high benefit solutions to address the existing and anticipated future needs based on current area planning documents. The study team also explored and evaluated future scenarios that are opportunity driven if unplanned growth in the area occurs.

Figure 4. Southern Subarea Existing Conditions and Sections



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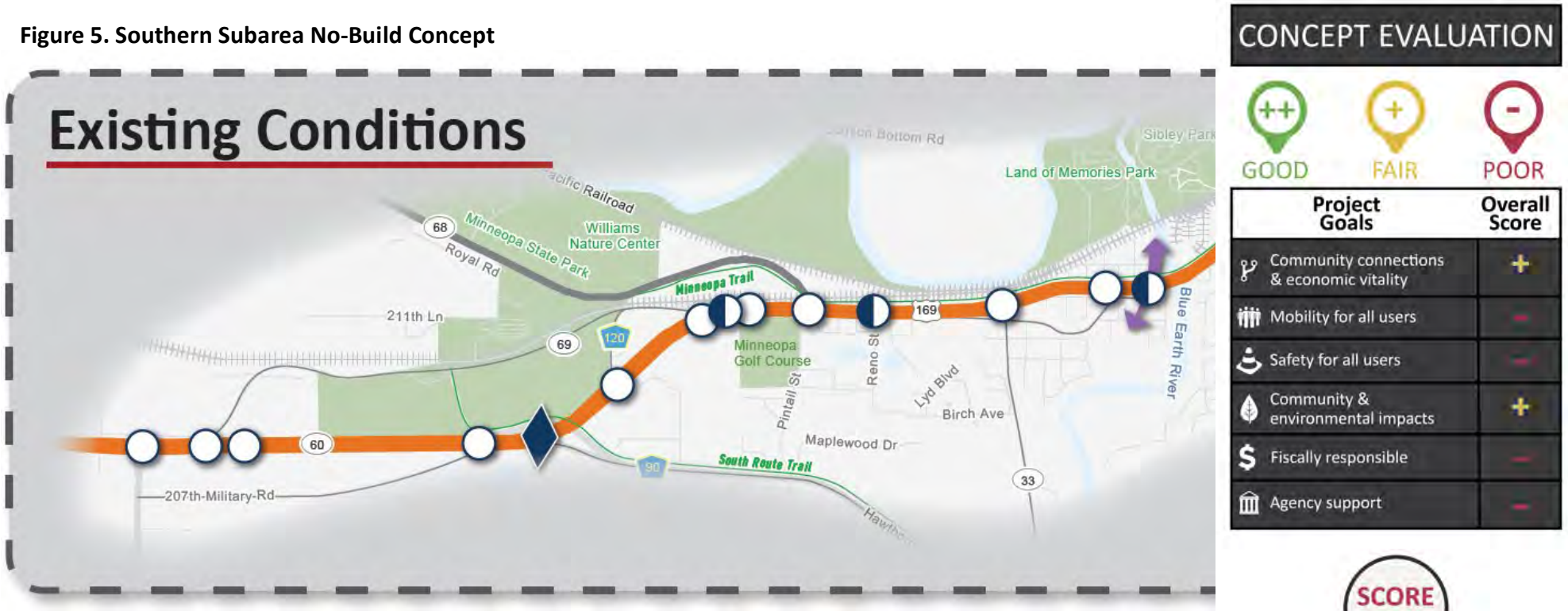
Southern Subarea Concepts

No-Build Concept

A southern subarea “no-build” concept was also evaluated against the study goals and given an overall score. The no-build concept is shown in **Figure 5**. The no-build scored very poorly with a negative score (-93 out of a possible 252 points) due to the many project goals it did not address. This justified to the study team that "doing nothing" is not a viable concept. The following is a high-level summary as to why. See the Traffic Operations Memo in **Appendix B** for more details.

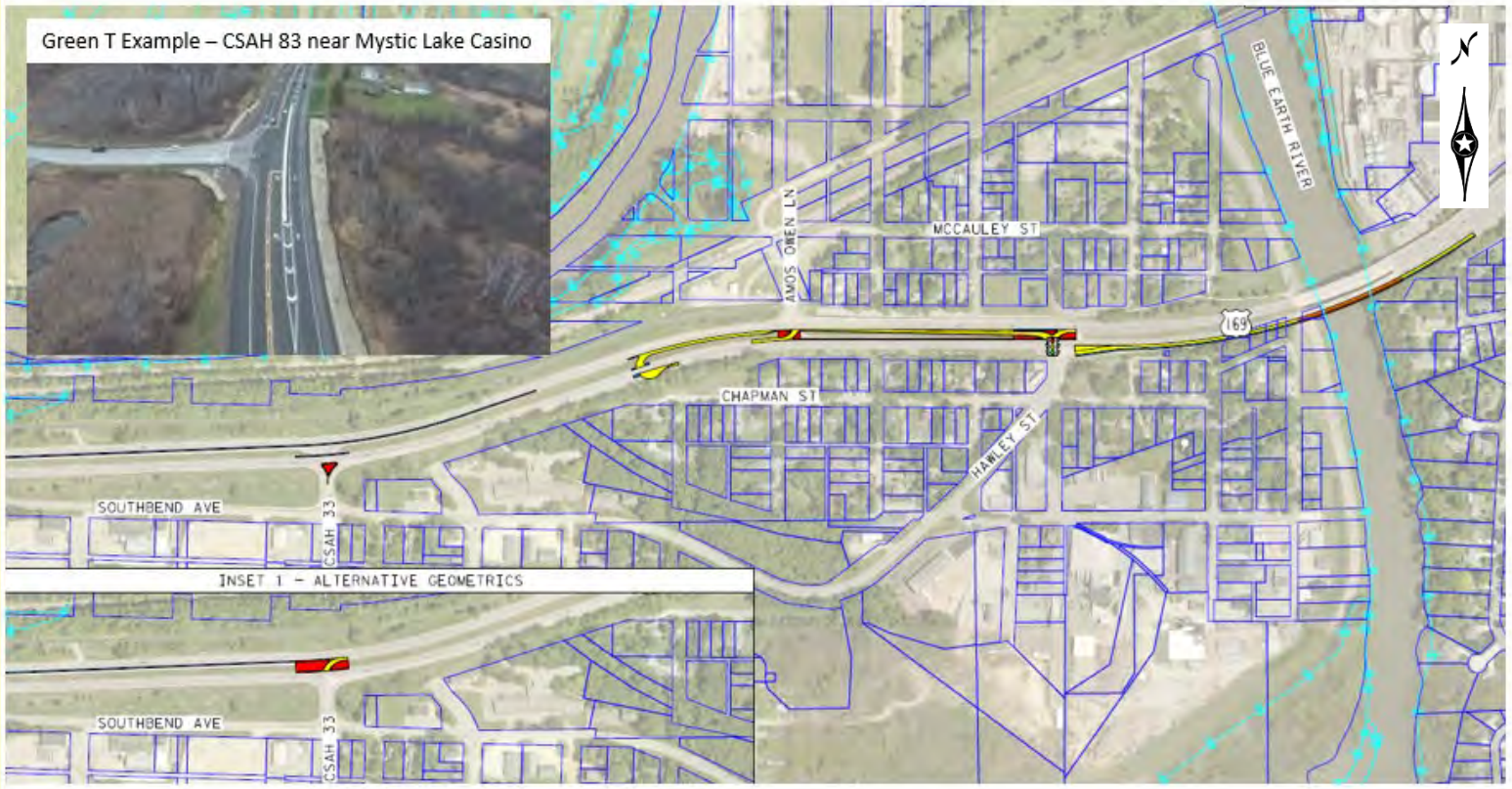
- 2040 traffic projections show back-ups particularly bad at WB left turn lane at Hwy 60, CSAH 69 (Hawley Street) and excessive delay at Highway 60 and CSAH 33 during the evening peak hours.
- Five of seven intersections are spaced closer than MnDOT access spacing guidelines allow
- There were a high number of crashes, 171 total with seven severe, between 2015 and 2019. Fatal crashes have occurred at CSAH 90, CSAH 69, Highway 68, and CSAH 69 (Hawley Street).
- There is a demand for pedestrian and bicycle access across Highway 169, at Hawley Street, to connect existing neighborhoods to a local convenience store.

Figure 5. Southern Subarea No-Build Concept



Southern Subarea Concepts

Section 1: Concept 1C



CONCEPT EVALUATION

	GOOD (++)	FAIR (+)	POOR (-)
Project Goals*			Overall Score
Community connections & economic vitality*			+
Mobility for all users*			++
Safety for all users			+
Community & environmental impacts			++
Fiscally responsible - $5.1M			++
Agency support			++

*With Pedestrian Bridge

SCORE 67.5

Summary of Evaluation:

Goal A: Limits CSAH 33 and Amos Owen Lane neighborhood access.

Goal B: Acceptable operations with all WBLs (Hawley Street and CSAH 33) at signalized Green T (Hawley Street). Does not address access spacing.

Goal C: Requires pedestrians to cross multiple lanes of traffic. Green-T would reduce severe crashes but increase rear end crashes with signal added along Highway 169.

Goal D: Low risk impact due to ability to construct improvements in existing right-of-way footprint.

Goal E: The cost estimate does not cover all partial property impacts or any easements necessary.

Southern Subarea Concepts

Section 1: Concept 1D

CONCEPT EVALUATION

	GOOD (++)	FAIR (+)	POOR (-)
Project Goals*			Overall Score
Community connections & economic vitality*	++		
Mobility for all users*	++		
Safety for all users		+	
Community & environmental impacts	++		
Fiscally responsible - $4.7M	++		
Agency support	++		

*With Pedestrian Bridge

SCORE 61.5

Summary of Evaluation:

Goal A: Limits Hawley Street and Amos Owen Lane neighborhood access.

Goal B: Acceptable operations with all WBLs (Hawley Street and CSAH 33) at signalized Green T (CSAH 33). Does not address access spacing.

Goal C: Requires pedestrians to cross multiple lanes of traffic. Green-T would reduce severe crashes but increase rear end crashes with signal added along Highway 169.

Goal D: Low risk impact due to ability to construct improvements in existing right-of-way footprint.

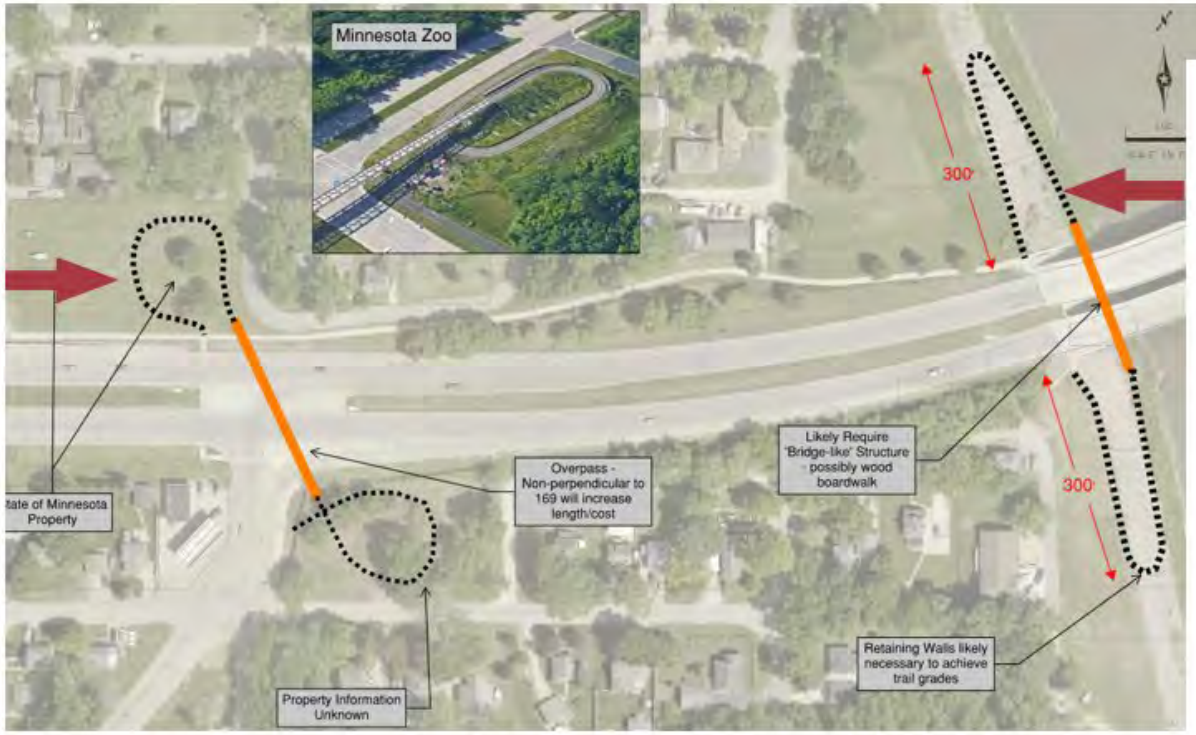
Goal E: The cost estimate does not cover all partial property impacts or any easements necessary.

CONCEPT EVALUATION

GOOD ++ FAIR + POOR -

Project Goals	Overall Score
Community connections & economic vitality	++
Mobility for all users	++
Safety for all users	++
Community & environmental impacts	++
Agency support	++

SCORE 102



CONCEPT EVALUATION

Project Goals	Overall Score
Community connections & economic vitality	-
Mobility for all users	++
Safety for all users	++
Community & environmental impacts	++
Agency support	+

SCORE 78

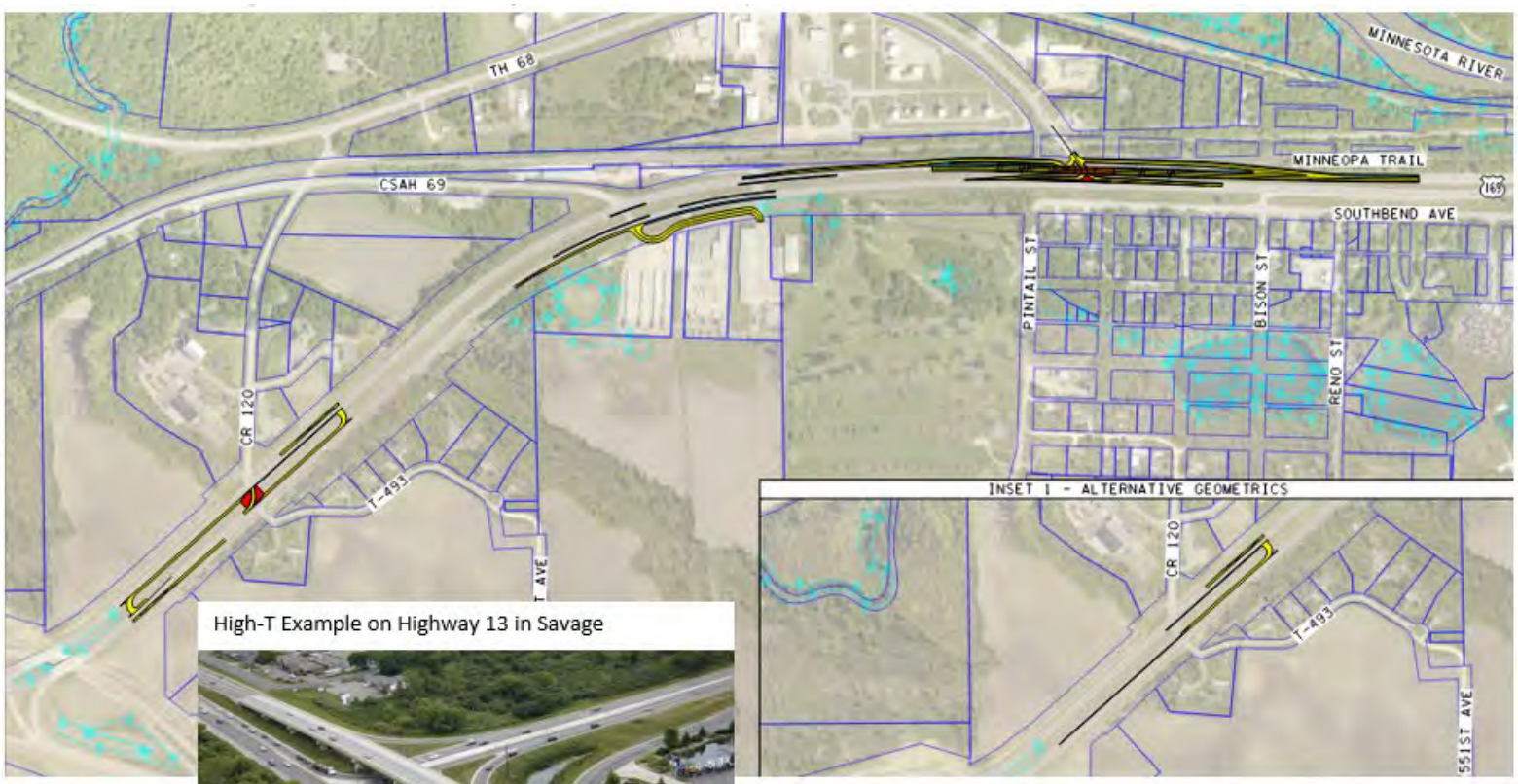
Summary of Evaluation:

Goal A: The concept near Hawley Street would best serve existing demand for people to walk and bike across Highway 169 to and from the Quick Mart at the southwest quadrant of the intersection.

Goal D: The Hawley Street option would go over 169. This shows the footprint needed for the bridge and ramps that are accessible for all abilities. This is utilizing state owned land on the north and undeveloped section on the south.

Southern Subarea Concepts

Section 2: Concept 2A



High-T Example on Highway 13 in Savage

CONCEPT EVALUATION

GOOD ++ FAIR + POOR -

Project Goals	Overall Score
Community connections & economic vitality	++
Mobility for all users	++
Safety for all users	++
Community & environmental impacts	++
Fiscally responsible- 22.2M	+
Agency support	++

SCORE 154.5

Summary of Evaluation:

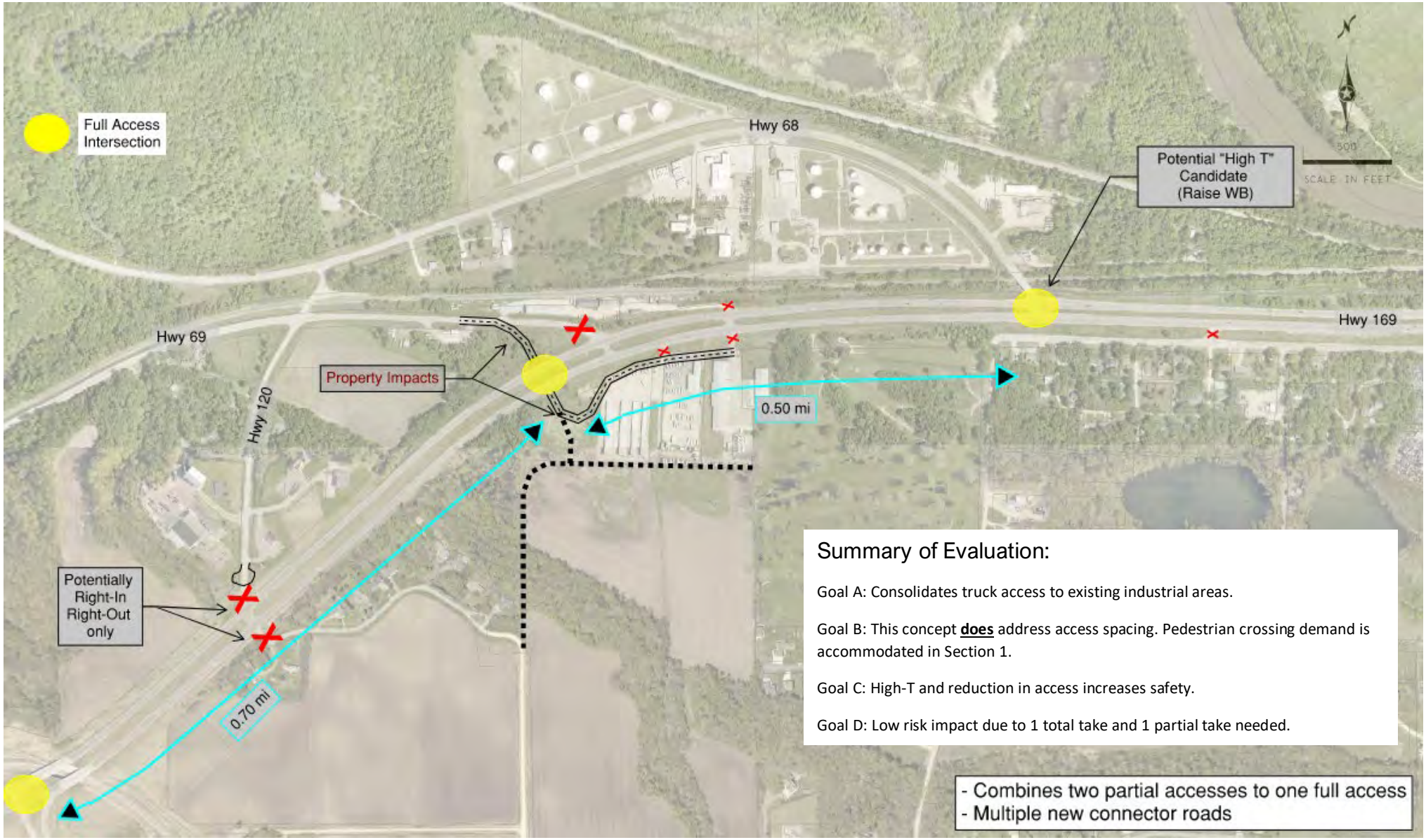
Goal A: Provides good local access.

Goal B: Does not meet access spacing guidelines. Pedestrian crossing demand is accommodated in Section 1.

Goal C: High-T and reduction in access increases safety.

Goal D: Low risk impact due to 1 partial take needed south of CSAH 69.

Goal E: The cost estimate does not cover all partial property impacts or any easements necessary.



Southern Subarea Concepts

Section 2: Concept 2B2 (Long-term and development driven)

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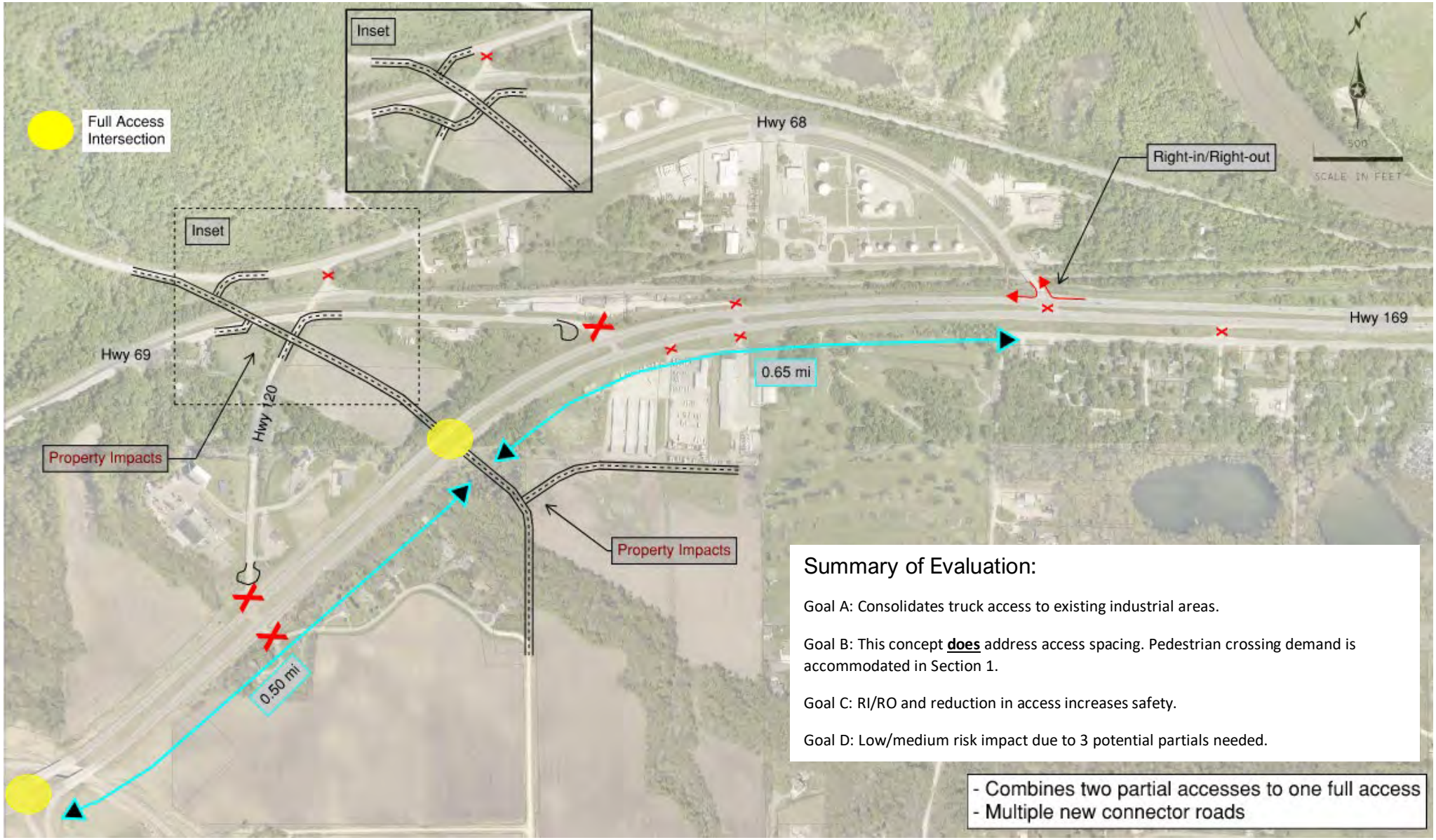
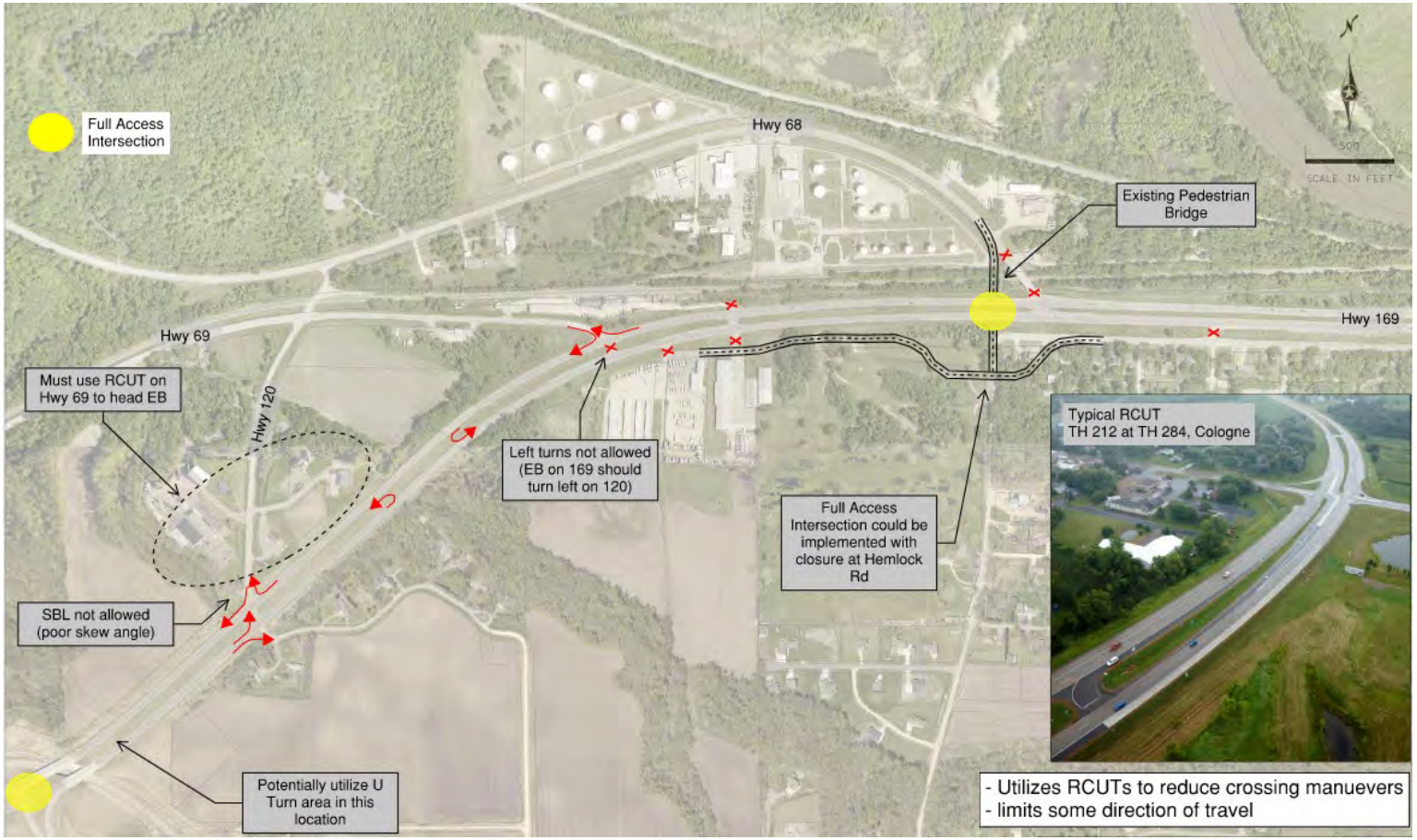

Inset
Full Access Intersection
Hwy 68
Right-in/Right-out
500
SCALE IN FEET
Inset
Hwy 169
Hwy 69
Hwy 120
0.65 mi
Property Impacts
Property Impacts
0.50 mi
Summary of Evaluation:
Goal A: Consolidates truck access to existing industrial areas.
Goal B: This concept does address access spacing. Pedestrian crossing demand is accommodated in Section 1.
Goal C: RI/RO and reduction in access increases safety.
Goal D: Low/medium risk impact due to 3 potential partials needed.
- Combines two partial accesses to one full access
- Multiple new connector roads

Southern Subarea Concepts

Section 2: Concept 2C



CONCEPT EVALUATION

GOOD ++ | FAIR + | POOR -

Project Goals	Overall Score
Community connections & economic vitality	+
Mobility for all users	++
Safety for all users	++
Community & environmental impacts	+
Fiscally responsible - $9M	+
Agency support	++

SCORE 126

Summary of Evaluation:

Goal A: RCUTs would increase travel time and result in consolidated truck access to existing industrial areas.

Goal B: Does not meet access spacing guidelines. Pedestrian crossing demand is accommodated in Section 1.

Goal C: RI/RO and reduction in access increases safety.

Goal D: Higher risk impact due to 3 total takes and 4 partial takes needed.

Goal E: The cost estimate does not cover all partial property impacts or any easements necessary.

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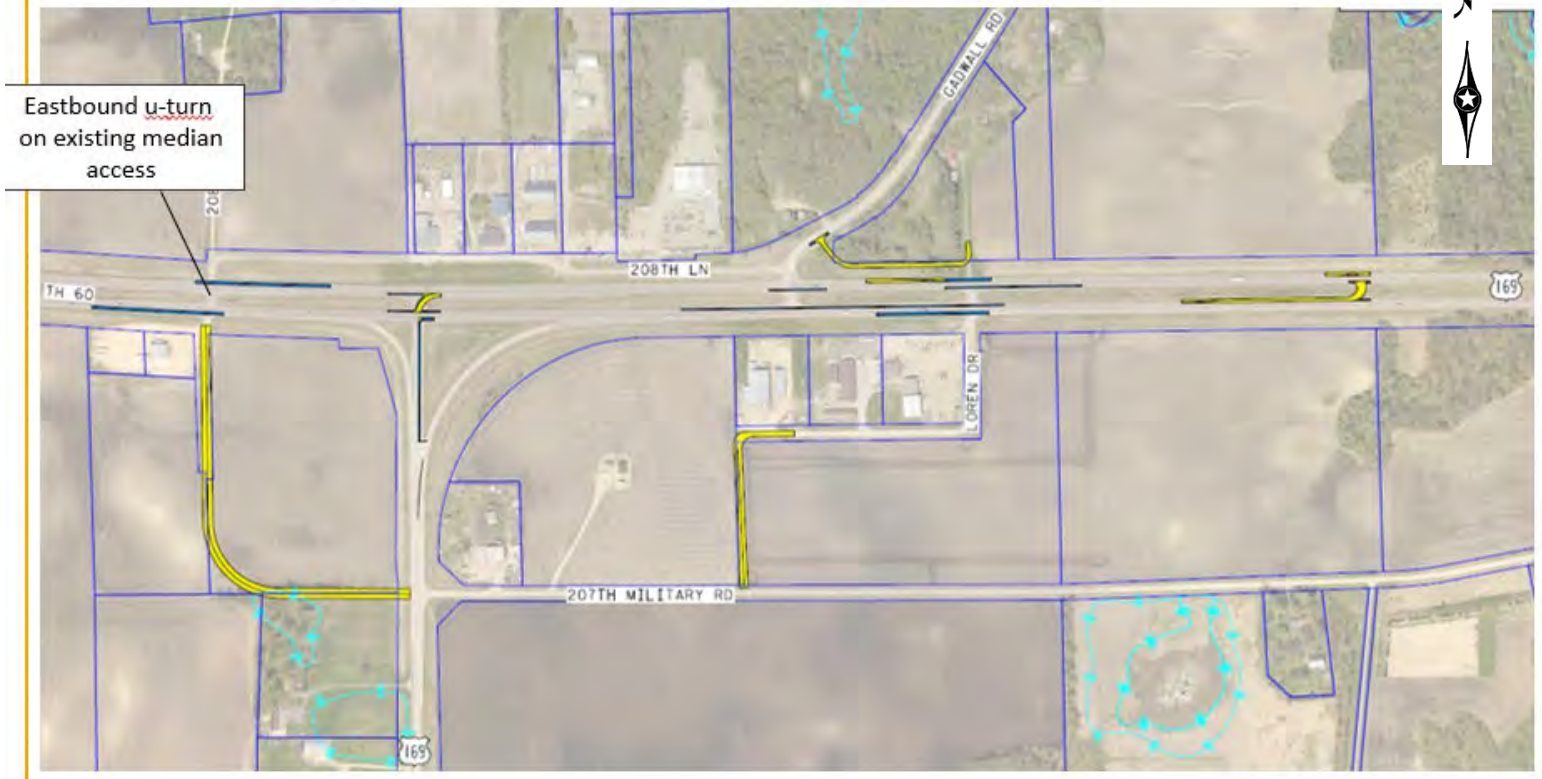
Southern Subarea Concepts

Section 3: Concept 3A



CONCEPT EVALUATION

GOOD FAIR POOR

Project Goals	Overall Score
Community connections & economic vitality	++
Mobility for all users	++
Safety for all users	++
Community & environmental impacts	+
Fiscally responsible - $1.9M	++
Agency support	++

SCORE 157.5

Summary of Evaluation:

Goal A: Good local access.

Goal B: Improves access spacing over existing conditions. Pedestrian access not a consideration in this section due to rural character.

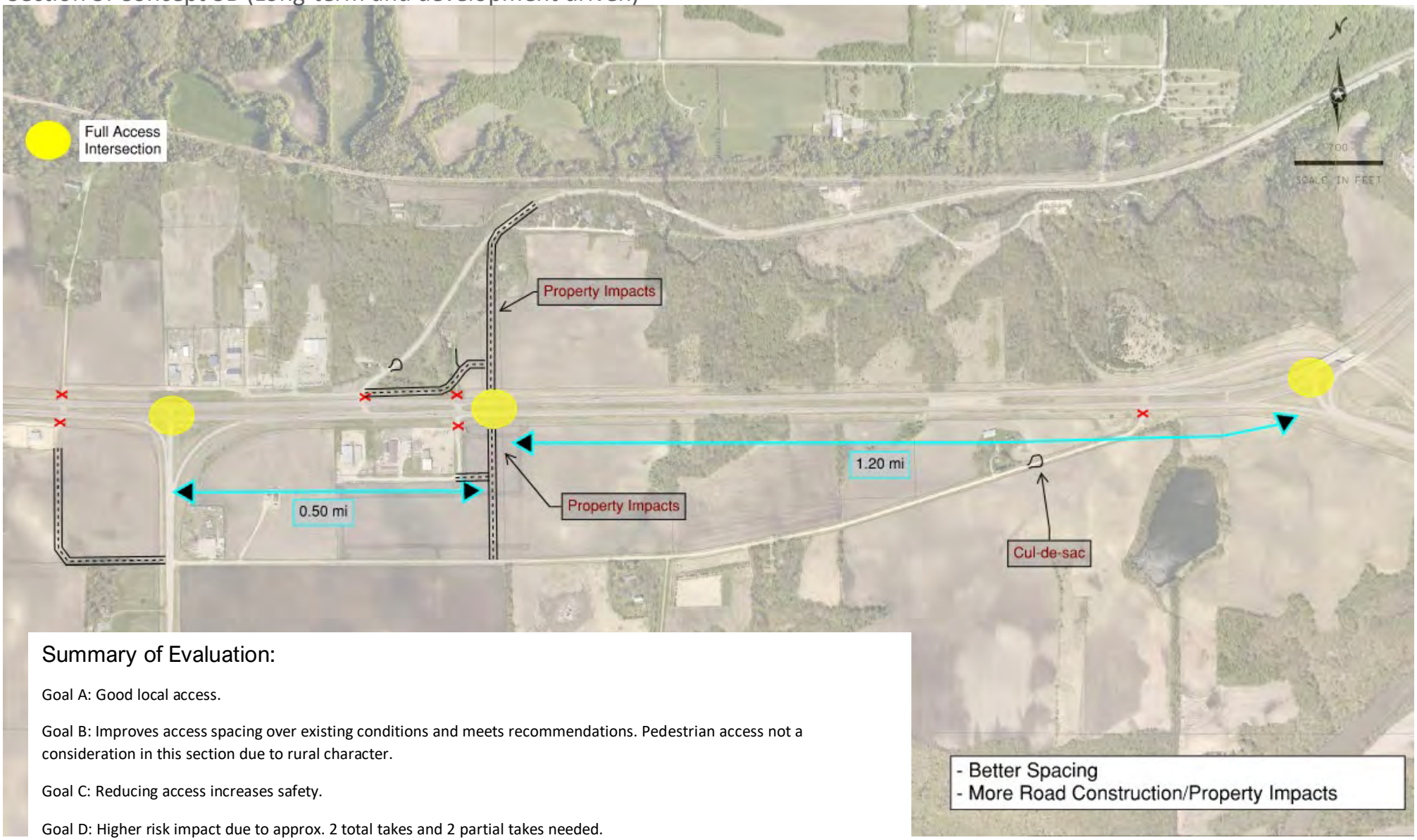
Goal C: Reducing access increases safety.

Goal D: Medium risk impact due to approx. 5 partial takes throughout the area.

Goal E: The cost estimate does not cover all partial property impacts or any easements necessary.

Southern Subarea Concepts

Section 3: Concept 3B (Long-term and development driven)



Summary of Evaluation:

Goal A: Good local access.

Goal B: Improves access spacing over existing conditions and meets recommendations. Pedestrian access not a consideration in this section due to rural character.

Goal C: Reducing access increases safety.

Goal D: Higher risk impact due to approx. 2 total takes and 2 partial takes needed.

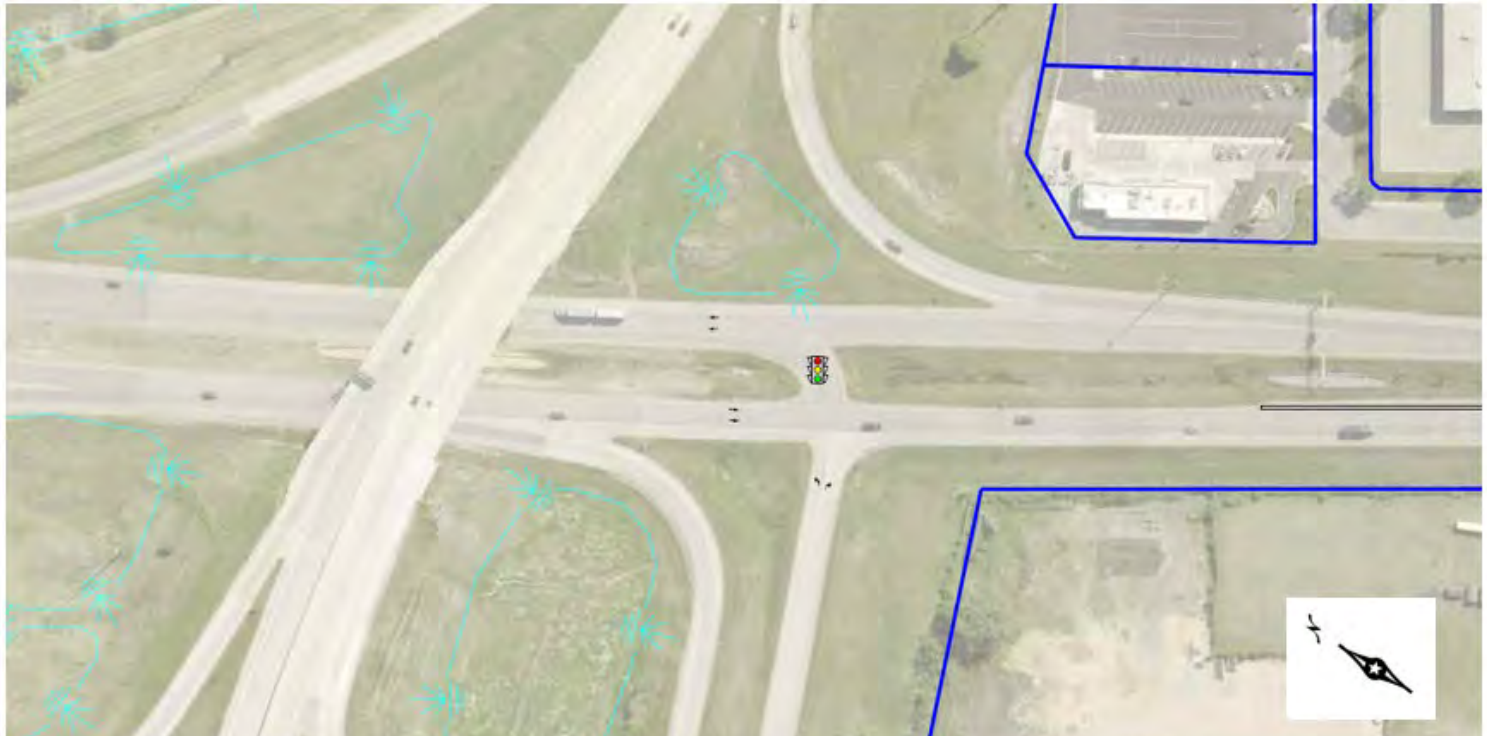
VII. Concept Updates

The following concept updates were made based on feedback at and following the July 2021 focus group meetings and public open house.

Northern Subarea

Concept 2C – Highway 14/169 Interchange (Eastbound Ramp Signal)

After further evaluation, Concept 2C was updated since a crash issue does not currently exist at the loop ramps. This update retains the southbound to eastbound loop ramp which keeps this a free-flowing movement and reduces the number of phases needed at the signalized intersection.



Summary of Evaluation:

Goal B: Average side street delay is significantly reduced from the no build scenario.

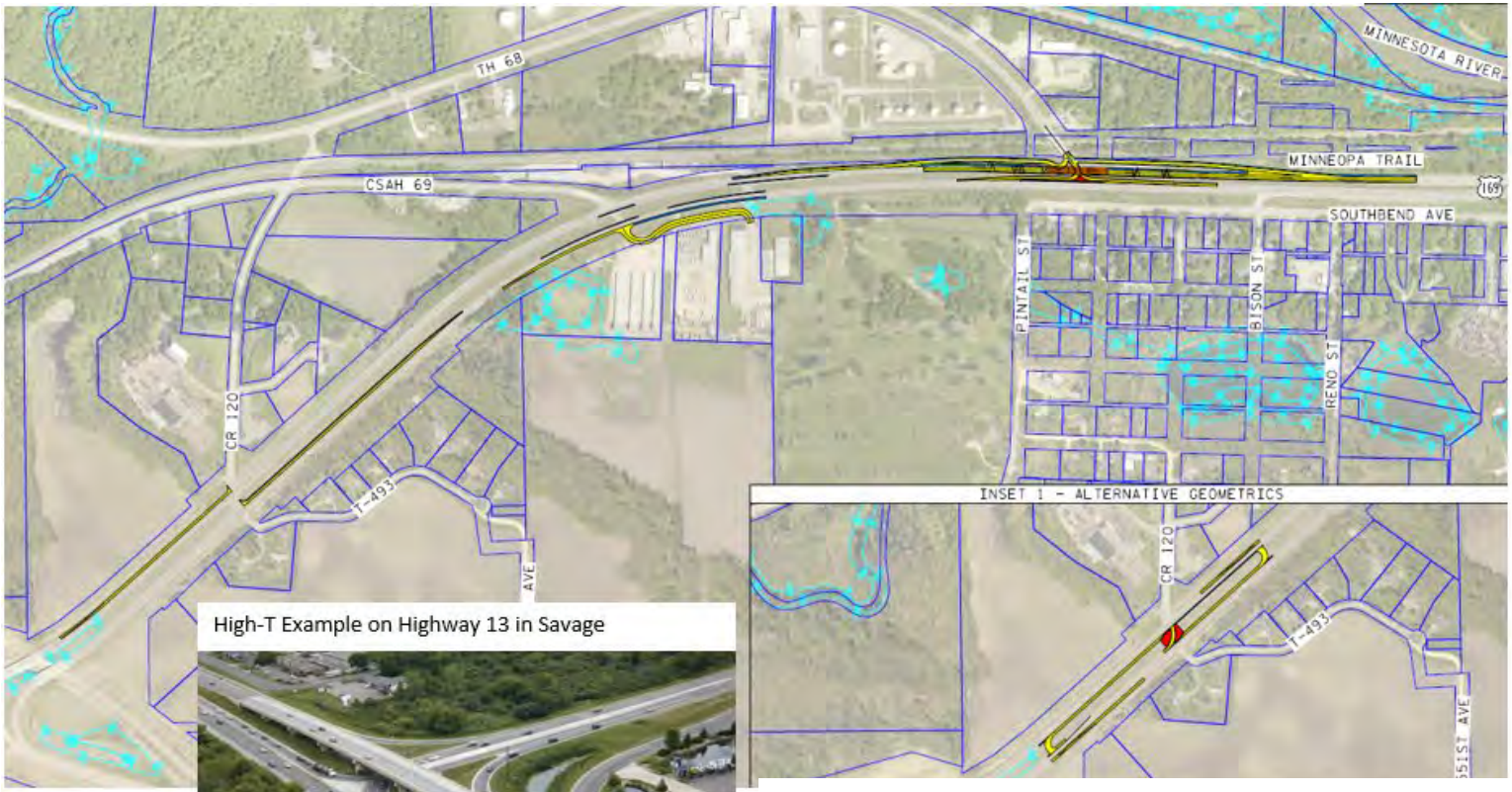
Goal C: Increase in total number of crashes anticipated with adding traffic signal.

Goal D: Alone poses low risk and further evaluation needed relative to what it is paired with for improvements to the south.

Southern Subarea

Concept 2A

This concept update addresses concerns the project team heard from the owner of Benco Electric Cooperative, a business located in the northeast quadrant of the County Road 120 and Highway 169 intersection, at the June 2021 focus group meetings. The Benco owner shared that their large trucks often struggle with movements on and off Highway 169 related to acceleration and deceleration necessary for merging into high-speed highway traffic. The Benco owner also shared that acceleration and deacceleration areas would also help with safety concerns of all their employees traveling to and from work around the same time.



High-T Example on Highway 13 in Savage

CONCEPT EVALUATION

GOOD ++ FAIR + POOR -

Project Goals	Overall Score
Community connections & economic vitality	++
Mobility for all users	++
Safety for all users	++
Community & environmental impacts	++
Fiscally responsible- 22.2M	+
Agency support	++

SCORE 154.5

Summary of Evaluation:

Goal A: Provides good local access.

Goal B: Does not meet access spacing guidelines. Pedestrian crossing demand is accommodated in Section 1.

Goal C: High-T and reduction in access increases safety.

Goal D: Low risk impact due to 1 partial take needed south of CSAH 69.

Goal E: The cost estimate does not cover all partial property impacts or any easements necessary.

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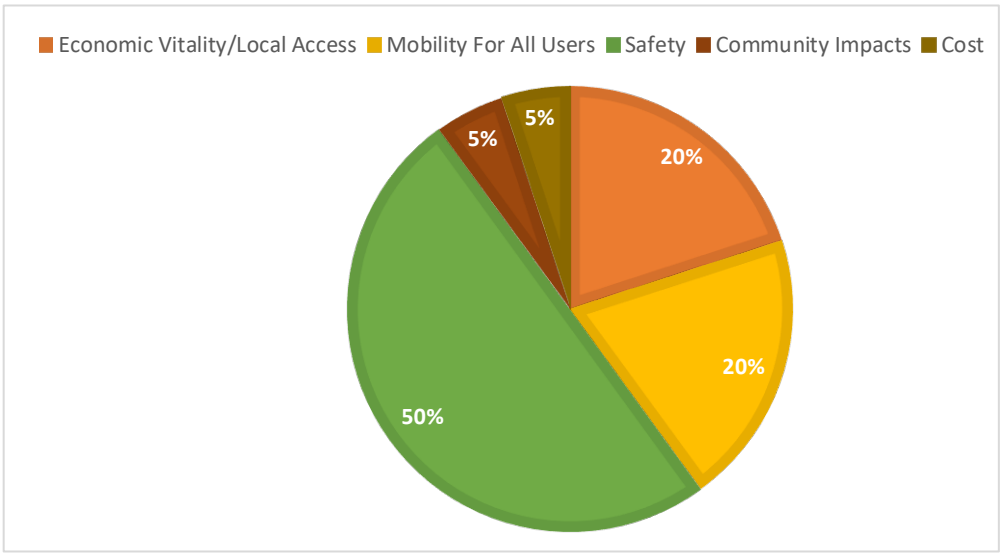
VIII. Final Concept Scoring

A score was determined for each concept to measure its overall benefit and how it compared to others. Each goal was broken down into objectives. The objectives vary by subarea and are shown in **Appendix A**. As shown on the matrices, concepts that did not meet the objective or presented a high risk was given -6 points, a minimally met objective or medium risk was given 3 points and met objective or low risk was given 9 points. The PMT then weighted the importance of each goal. Based on the goal weights shown in **Figure 6**, concept scoring relative to each goal was multiplied by its assigned weight.

Figure 6. Study Goal Weighting Breakdown



Based on the scores received for each concept, the study team conducted a planning-level Benefit Cost Analysis and graphed the results for the Northern and Southern Subareas. The Benefit Cost Analysis assumed infrastructure costs in 2022 dollars. The planning level costs including 20% contingency and 20% for design and construction engineering fees. Right of way costs were not included in the planning level benefit cost analysis shown below. See **Figures 7 – 11** on the following pages.

Figure 7. Northern Subarea Expressway Benefit Cost Analysis

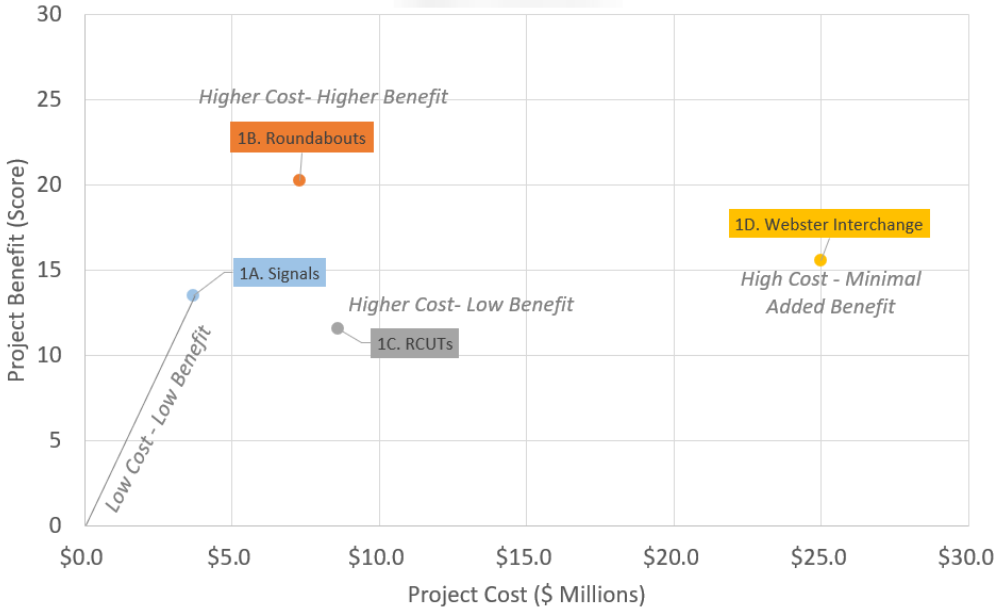


Figure 7 shows the benefit cost analysis for the concepts at Lind Street, River Lane and Webster Avenue in the Northern Subarea. This indicates that Concept 1B (Roundabouts) offers a high benefit, but at a higher cost than the Concept 1A (Signals). Concept 1A (Signals) and Concept 1C (RCUTs) have lower costs, but also offer a lower overall benefit. Concept 1D (Webster Interchange) has a much higher cost minimal added benefit compared to Concepts 1A and 1C.

Figure 8. Northern Subarea (Highway 14 Interchange) Benefit Cost Analysis

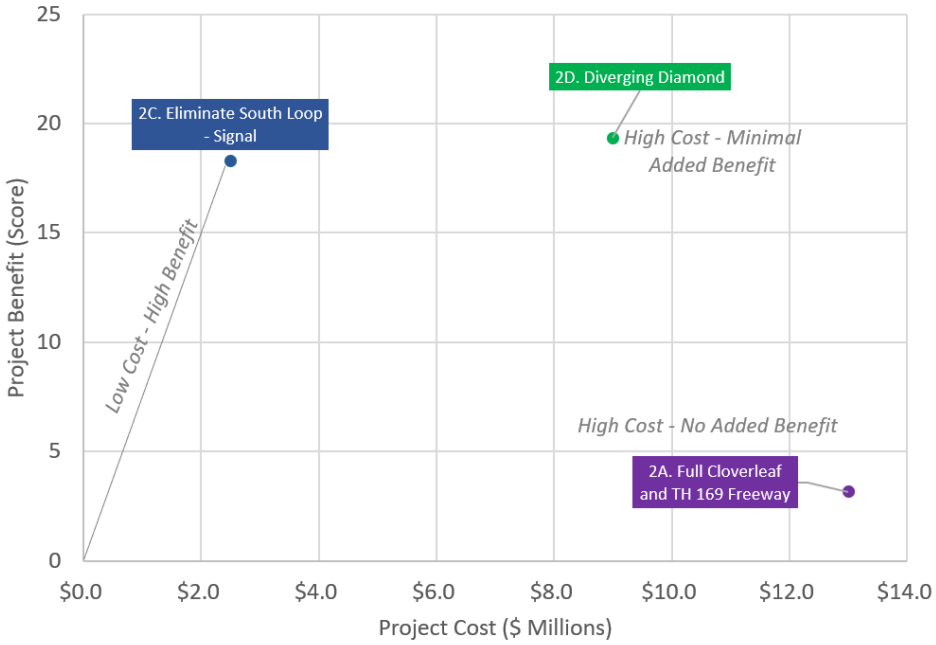


Figure 8 shows the benefit cost analysis for the Highway 14 interchange concepts in the Northern Subarea. This shows that Concept 2C (Eliminate South Loop - Signal) provides the best cost to benefit ratio. This concept has a high benefit at a low cost. Concept 2D (Diverging Diamond) has a higher cost but offers minimal additional benefit. Concept 2A (Full Cloverleaf and TH 169 Freeway) has a much higher cost but offers minimal benefit.

Figure 9. Southern Subarea – Section 1 Benefit Cost Analysis

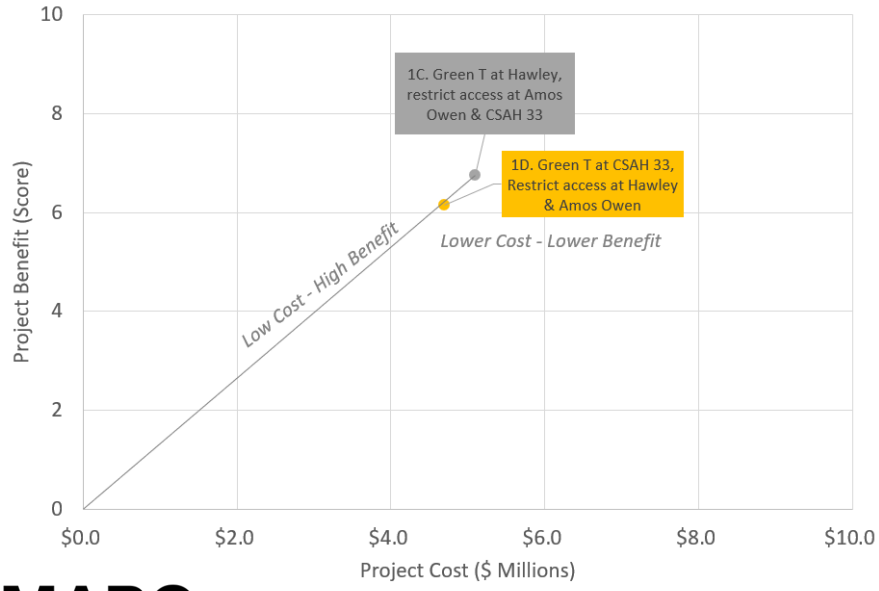


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Figure 9 shows the benefit cost analysis for the Section 1 concepts in the Southern Subarea. The shows that Concept 1C (Green T at Hawley Street) provides the best cost to benefit ratio. This concept has the highest benefit at a lower cost. Concept 1D (Green T at CSAH 33) has a lower cost, but also offers a lower overall benefit.

Figure 10. Southern Subarea – Section 2 Benefit Cost Analysis

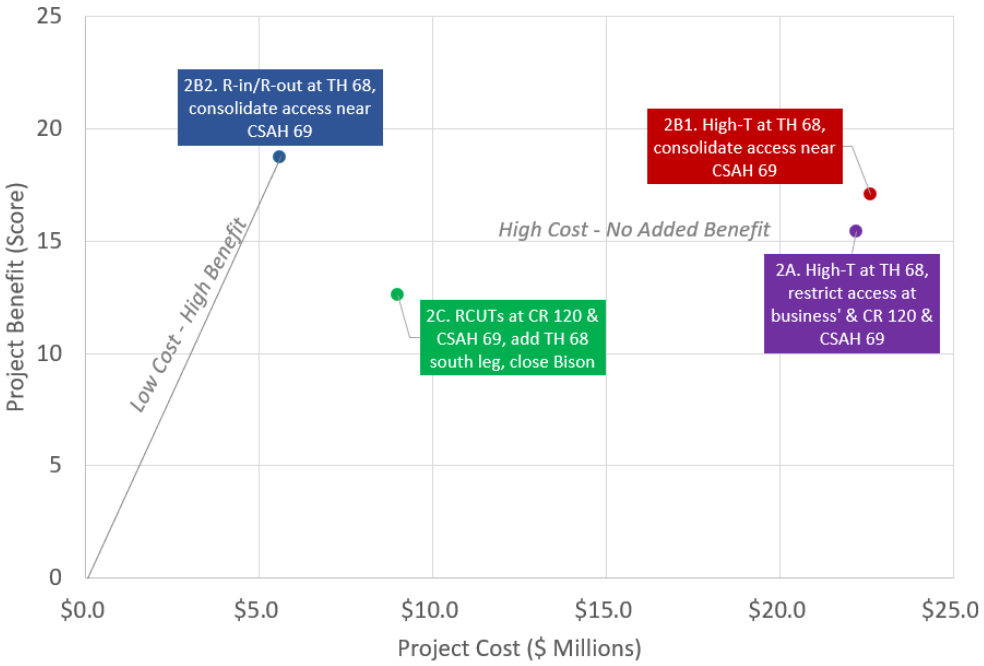

Figure 10 shows the benefit cost analysis for the Section 2 concepts in the Southern Subarea. The shows that Concept 2B2 provides the best cost to benefit ratio. This concept has the highest benefit and the lowest cost. Concepts 2A, 2B1, and 2C all have higher costs and offer a lower benefit.

Figure 11. Southern Subarea – Section 3 Benefit Cost Analysis

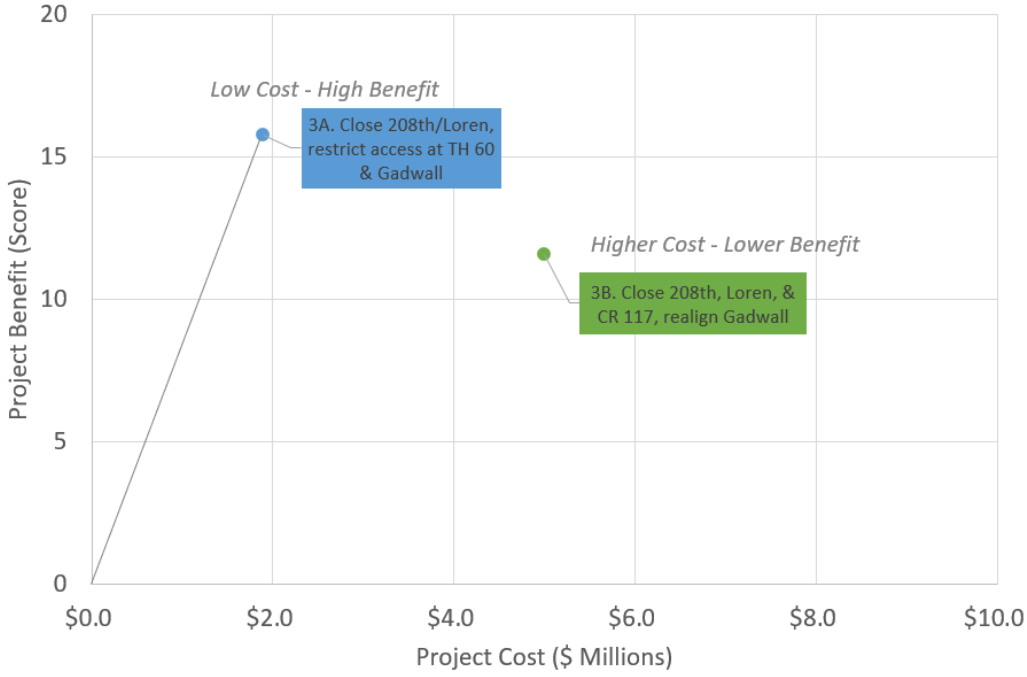

Figure 11 shows the benefit cost analysis for the Section 3 concepts in the Southern Subarea. The figure indicates that Concept 3A is the concept with the optimal cost to benefit ratio. This concept has the highest benefit at the lowest cost. Concept 3B has a higher cost and offers a lower benefit.

IX. Detailed Benefit Cost Analysis

A detailed benefit cost analysis was completed for the Northern Subarea concepts. The results of the benefit cost analysis are summarized below. For more information see the full documentation of the benefit cost analysis process in **Appendix F**. Safety and delay benefits were analyzed over a 20-year project lifespan and compared to the overall project cost to determine which concepts are anticipated to have a greater benefit than cost and which have benefits that do not offset the cost. The results of the benefit cost analysis are summarized in **Table 4** below for the Lind/River/Webster concepts and **Table 5** for the TH 14 Concepts. The total cost listed includes right of way acquisition for full take properties. Only concepts 1d and 2a were assumed to have full property takes based on the planning level concepts. The cost of acquiring the properties was assumed to be three times the current market value of the property. For concept 1d, six of the properties adjacent to the existing TH 169 and Webster Ave intersection were assumed to be acquired. For concept 2a, only one property was assumed to be acquired.

Table 4. Benefit-Cost for Lind/River/Webster Concepts

Concepts	Safety Benefit	Delay Benefit	Total Cost	B/C Ratio
Concept 1a. Signalized Expressway	$ -	$ (9,762,231)	$ 3,700,000	**-2.64**
Concept 1b. Roundabout Expressway	$ 386,419	$ 19,284,962	$ 7,300,000	**2.69**
Concept 1c. RCUT Expressway	$ 7,798,000	$ (16,013,057)	$ 8,600,000	**-0.96**
Concept 1d. Interchange at Webster	$ 14,711,915	$ 74,206,498	$ 29,431,000	**3.02**

Table 4 indicates that concepts 1b and 1d both have anticipated benefits that are higher than project costs. Since concepts 1a and 1c have benefit cost ratios less than one, the anticipated benefits do not offset the cost. Delay benefits for the concepts 1a and 1c were found to be negative as delay is increased overall with these options.

Table 5. Benefit-Cost for TH 14 Concepts

Concepts	Safety Benefit	Delay Benefit	Total Cost	B/C Ratio
Concept 2a. Full Cloverleaf Interchange (lower end)	$ 2,458,951	$ 91,765,194	$ 17,079,000	**5.52**
Concept 2a. Full Cloverleaf Interchange (higher end)	$ 2,458,951	$ 91,765,194	$ 26,079,000	**3.61**
Concept 2c. Eliminate South Loop - Signal	$ (11,782,418)	$ 52,640,901	$ 2,500,000	**16.34**
Concept 2d. Diverging Diamond	$ (3,886,305)	$ 49,628,565	$ 9,000,000	**5.08**
Concept 2f. Signalize EB TH 14 Exit Ramp	$ (1,279,631)	$ 82,151,540	$ 500,000	**161.74**

Table 5 indicates that all of the TH 14 concepts have anticipated benefits that are higher than the project costs. Safety benefits for the concepts 2c, 2d, and 2f were found to be negative as crashes are

anticipated to increase with these options. Concept 2f shows the highest benefit cost ratio as this concept offers a significant delay benefit at a low cost.

It should be noted for the freeway design (Concepts 1d and 2a), the full cost of these projects is likely underrepresented. The total right-of-way and relocation costs are difficult to predict at a planning-level without detailed designs. As noted above, only full property acquisitions are currently included in the cost calculation. Relocation costs are not included. In addition, both cities have identified additional potential costs due to business closures and reductions in tax base. These costs are also not factored in at this point. Because of these additional influences, it should be anticipated that the total project cost for these concepts will go up and the Benefit/Cost Ratios for each will be reduced.

X. Implementation Plan

The implementation plan is depicted in tables for the Northern and Southern Subareas in Appendix G. The separate subarea tables prioritize standalone projects to be strategically and incrementally implemented over the next fifteen or more years. Timing of projects is organized into short-term (0-5 years), mid-term (6-15 years), or projects that are opportunity driven or only necessary with increased development or rise in safety issues. The mid-term projects are meant to align with MnDOT's planned investments for 2027, particularly in the Northern Subarea. The overall implementation timeframes also coincide with the MAPO Long-Range Transportation Plan (LRTP) implementation timeframes for short-term (2021-2025) and Mid-Term 1 (2026-2030). The Highway 169 Corridor Study implementation plan does not have any projects that would align with the LRTP's Mid-Term 2 (2031-2035) or Long-Term (2036-2045). All remaining Highway 169 recommendations are shown in the Opportunity/Development/Safety Driven implementation category.

The detailed benefit cost analysis for the Northern Subarea determined that a freeway (full cloverleaf Concept 2D) is not needed for operations projected out to 2040. The signalized exit ramp (Concept 2f) showed comparable delay benefits at significantly less cost. The roundabout express way (Concept 1B) showed comparable benefits with significantly less cost to the Webster Avenue interchange (Concept 1D) out to 2040. The roundabout express way (Concept 1B) is also a concept supported by local agencies and the public including the freight generating businesses.

In summary, the freeway concepts are not included in the vision and implementation plan because of the lower-cost/high-benefit alternate solutions that are recommended.

XI. Next Steps

Additional design, studies and public input will be needed for each of the recommended improvement concepts to move forward. The purpose of the Highway 169 Corridor Study was to develop a long-term plan for improvements. The concepts developed as part of this study are high-level and will need additional refinement through preliminary and final design. Environmental review and permitting will also be required with exact requirements based on the scope of the project and the funding source. See **Appendix D** for environmental screening considerations and considerations for concept scores. Also see the Existing Conditions Report for more detail on the study environmental review.

The improvement concepts identified within this study and the projects prioritized as part of the implementation plan will help the Mankato Area Planning Organization (MAPO), MnDOT and the Cities of Mankato, North Mankato, Blue Earth County, and Nicollet County to continue to maintain a functioning yet safe principal arterial roadway.

Study partners must continue to work together to further plan, obtain funding, design, and implement the recommended improvement projects. All partners have an active role in implementing these improvements. All competitive funding sources should be considered. Agencies should also update their comprehensive and transportation plans to include these findings to better leverage funding sources.

Appendix A

SUBAREA EVALUATION MATRICES

Highway 169 Evaluation

Northern Subarea Concept Evaluation Summary

Does Not Meet Measure/ High Risk: -6 pts | Minimally Meets Measure/ Medium Risk: 3 pts | Meets Measure/ Low Risk: 6 pts

Goals	Objectives	No Build	Highway 169 Concepts								Notes
			1a	1b	1c	1d	2a	2b	2c	2d	2e	
			Signalized Expressway	RAB Expressway	RCUT Expressway	Freeway	Freeway	Spot Interchange - Expressway				
			Combined River Ln / Lind St and Webster Ave Remain Signalized	Combined River Ln / Lind St RA and Webster Ave Roundabouts	Combined River Ln / Lind St RCUT and Webster Ave RCUTs	Webster Ave Interchange	TH 14 Interchange Full Cloverleaf and TH 169 Freeway	TH 14 Interchange Eliminate South Loop - Roundabout	TH 14 Interchange Eliminate South Loop - Signal	TH 14 Interchange Diverging Diamond	TH 14 Interchange RA Ramp Intersections	
GOAL A: Preserve community connections and economic vitality.	Maintain sustainable access for local trips into/out of Mankato and North Mankato.	Baseline										Quantitative - travel time and network efficiency 2a Freeway will result in increased travel time from TH 14 to area around McDonalds and Lind Street
	Maintain emergency access routes into/out of Mankato and North Mankato.	Baseline										Qualitative - design, system connectivity, traffic calming impacts to response times
	Accommodate reasonable vehicle/truck access											Qualitative - Agency and public perception
	Accommodate reasonable ped/bike access						NA	NA	NA	NA	NA	Qualitative - Agency and public perception
	Enhance community identity.											Qualitative - median areas provide opportunity for aesthetics/monumentation. Traffic signals do not include median areas along side street approaches. Large cloverleaf footprint provides limited opportunities for aesthetic improvements. Sightline concerns with RCUT medians.
GOAL B: Provide efficient and reliable mobility for all users.	Provide acceptable system reliability serving existing and planned growth.											Quantitative - serves existing and forecasted ADT 2b does not improve problematic operations at the EB TH 14 exit ramp 2e causes excessive delay and queuing for WB TH 14 to SB TH 169 movement
	Provide acceptable regional highway travel times while accommodating reliable local access.	Baseline				Did not model this option	Did not model this option					Quantitative - average through trip travel time Green - adds <60 seconds Yellow - adds 60-120 seconds Red - adds 120+ seconds
	Provide acceptable side street delay	EBL/R (TH 14) operates with LOS F	Several movements operate with LOS E	EBL/T (Webster) and EBL/T (Lind/River) operate with LOS F	Several movements operate with LOS E	Did not model this option	Did not model this option	EBL/R (EB TH 14 Exit Ramp) operate with LOS F	EBL & SBL (EB TH 14 Exit Ramp) operate with LOS E		WBL/R & SBR (WB TH 14 Exit Ramp) and EBL/R (EB TH 14 Exit Ramp) operate with LOS F	Quantitative - side street LOS Green: All side street movements operate with LOS A - D Yellow: Side street movements operate with LOS E Red: Side street movements operate with LOS F
	Improves side street delay over existing conditions	Baseline	Average Side Street Delay: 50 seconds/vehicle (Lind/River and Webster)	Average Side Street Delay: 23 seconds/vehicle (Lind/River and Webster)	Average Side Street Delay: 35 seconds/vehicle (Lind/River and Webster)	Did not model this option	Did not model this option	Average Side Street Delay: 402 seconds/vehicle (EB TH 14 Exit Ramp)	Average Side Street Delay: 23 seconds/vehicle (EB TH 14 Exit Ramp)	Average Side Street Delay: 19 seconds/vehicle (EB and WB TH 14 Exit Ramps)	Average Side Street Delay: 115 seconds/vehicle (EB and WB TH 14 Exit Ramps)	Quantitative - Reduction in side street delay Green: Side street delay is reduced from the no build scenario Yellow: Side street delay remains the same as the no build scenario Red: Side street delay is increased from the no build scenario Baseline/2040 No Build Average Peak Hour Side Street Delay: Lind/River/Webster: 32 seconds/vehicle [comparison for 1a-1c] EB TH 14 Exit Ramp: 361 seconds/vehicle [comparison for 2b and 2c] EB and WB TH 14 Exit Ramps: 125 seconds/vehicle [comparison for 2d and 2e]
	Understand and plan for freight needs.											Qualitative - adequate access and truck turning movements to existing and planned industrial areas
	Meets access spacing guidelines.	Recommended spacing is only met from River Ln to Monroe Ave	0.22 miles between TH 14 and River/Lind	0.22 miles between TH 14 and River/Lind	0.08 miles between TH 14 and River/Lind NB U-Turn	0.41 miles between TH 14 and Webster Interchange	NA - Depends on pairing	NA - Depends on pairing	NA - Depends on pairing	NA - Depends on pairing	NA - Depends on pairing	Quantitative - meets access spacing guidelines. Recommended spacing is 0.5 mile from Lake St to Lind St (Subcategory A) and 0.25 mile from Lind St to Belgrade Ave (Subcategory B) according to the MnDOT Access Management Manual
	Improves access spacing over existing conditions						NA - Depends on pairing	NA - Depends on pairing	NA - Depends on pairing	NA - Depends on pairing	NA - Depends on pairing	Quantitative Green - improves access spacing Red - does not improve access spacing
	Provide a connected transportation system that accommodates trips consistent with roadway functional class.											Qualitative - are the right trips on the right roads per functional classification

	Perceived pedestrian/bicyclist level of comfort.						NA	NA	NA	NA	NA	Qualitative = Signalized intersections give pedestrian "WALK" indication, but traffic is traveling at a higher speed; Roundabout reduces traffic speed and pedestrian-vehicle conflict points but crossing relies on vehicles yielding to pedestrian; RCUT requires all red phase to accommodate pedestrians; An interchange would grade separate pedestrians from mainline TH 169 traffic
	Accommodate future transit plans and needs.											Qualitative
	Understand and plan for roadway expansion needs.											Qualitative - infrastructure can be built for future expansion
GOAL C: Safely accommodate all system users.	Reduce crash and severity rates.											Quantitative - Retaining traffic signal would not reduce crash/severity rates; 2x1 roundabouts would likely increase crashes but reduce crash severity; RCUTs have been shown to reduce crash/severity rates; Full cloverleaf introduces new weave areas; Signal (2c) would reduce angle crashes but likely increase rear end crashes; DDI would add signals likely increasing rear end crashes
	Provide safe pedestrian and bicycle travel near and across roadways, to area schools, and to regional destinations.	16	16	8*	14	Did not draw this concept	NA	NA	NA	NA	NA	Quantitative - number of vehicle-pedestrian conflict points. *Roundabout concept drawing shows pedestrian facilities on all legs of Lind/River intersection but conflict points were only counted for the crossing on the south leg as the other concepts assumed pedestrian facilities on south leg only (Webster and Lind/River).
GOAL D: Provide infrastructure improvements that respect the environment.*	Avoid, minimize, and mitigate impacts to historic properties.	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Quantitative - Will require future detailed analysis
	Avoid, minimize, and mitigate impacts to cultural resources.	Low Risk	Medium Risk	Medium Risk	Medium Risk	Low Risk	Medium Risk	Low Risk	Low Risk	Medium Risk	Medium Risk	Quantitative - New road alignment north of Hiniker Pond and TH 14 ramp adjustments pose medium risk for impacts that will need to be studied with a future project.
	Avoid, minimize, and mitigate impacts to the built environment.	0 takes	4 partial takes	4 partial takes	4 partial takes	6 total and 4 partial takes	1 total and 2 partial takes	0 takes	0 takes	0 takes	0 takes	Quantitative - TH 169 N to US 14 E ramp would impact McDonalds building
	Avoid, minimize, and mitigate impacts to sensitive environmental resources.	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	High Risk	Low Risk	Low Risk	Low Risk	Low Risk	Quantitative - The full interchange configuration Option 2A would warrant modifications to the Minnesota River flood control structure that protects the City of Mankato and North Mankato from flood waters produced by the Minnesota River. Further coordination with FEMA will be required to understand the requirements associated with levee modifications or relocations associated with Option 2A. - US 14 W to TH 169 ramp would impact the existing wetland in the NE quadrant.
	Avoid, minimize, and mitigate impacts to hazardous contaminated areas.	Low Risk	Medium Risk	High Risk	High Risk	High Risk	High Risk	Low Risk	Low Risk	Low Risk	Low Risk	Quantitative - Based on environmental screening there are several hazardous waste areas south of the TH 14 interchange, most south of Hiniker Pond
	Disproportionate impact to EJ populations	High Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	This is a two pronged analysis with a yes (red cell) or no (green cell) rating. 1) To have an EJ impact, there must first be an impact. In other words, a red cell somewhere else in this table. 2) If there is an impact, we need to determine if it will be "disproportionately high" on EJ communities. Because there are no EJ residences within close proximity in the northern sub area (they are east of the river) and because we have no data to lead us to believe that EJ populations use this area significantly more than other populations (i.e., travel to the corridor or drive through it), there is no reason to assume impacts would be disproportionately high.
GOAL E: Develop a financially responsible implementation plan.	Right-size improvements to address needs yet maximize use of existing infrastructure where possible.	Baseline										Quantitative - general project footprint, retaining walls, etc.
	Develop fiscally responsible improvements (construction cost)	Baseline	$ 3.7M	$ 7.3M	$ 8.6M	$$$ 25M	$$ 13M	$ 4.6M	$ 2.5M	$ 9M	$ 8.7M	Quantitative - high level construction project cost in 2023 dollars, contingency, engineering. Does not include R/W or environmental (levee recontsruction) $ = 1-10M, $$ = 10-20M, $$$ = 20M+
	Develop fiscally responsible improvements (Impact (ROW and Env) costs)	Baseline	Medium Risk	Medium Risk	Medium Risk	High Risk	High Risk	Low Risk	Low Risk	Low Risk	Low Risk	Alternatives 1a, 1b, 1c – involve the realignment of the Lind St./River Ln. intersection, a "Medium" risk. Alternative 1d – the Webster interchange alternative involves several parcel impacts resulting in a "High" risk rating. Alternative 2a – this alternative carries the same parcel impacts as Alt. 1d, and additional property and environmental impacts at the Hwy 14/169 interchange. Alternatives – 2b, 2c, 2d, 2e – all improvements maintained within existing ROW with no environmental concerns.
	Develop project phases that meet schedule and funding constraints and maximize opportunities.	Baseline										Qualitative - ability to be phased with MnDOT investment plans and agency funding availability
	Develop a supported funding model to clearly identify agency responsibilities.	Baseline										Qualitative - combination of funding competitiveness and agency support
	Position partner agencies to seek federal and state grants for identified improvements to minimize partner costs.	Baseline										Qualitative - Funding competitiveness based on concept ability to reduce/eliminate severe and fatal crashes, improve non-motorized safety and mobility, and gain agency/community support.
GOAL F: Develop a plan supported by all agency partners.	Supported by the PMT											Quantitative

***Assessment based on planning-level concepts and will require further review to verify actual impacts.**

Weighted Scores

Goal A	6	60	60	-12	-12	-24	48	42	48	48
Goal B	-66	66	72	60	120	96	0	90	96	18
Goal C	-15	-15	45	45	60	-30	15	15	15	15
Goal D	12	13.5	9	9	6	-1.5	18	18	16.5	16.5
Goal E	0	10.5	16.5	13.5	-18	-9	6	18	18	6
Preliminary Total Score	-63	135	202.5	115.5	156	31.5	87	183	193.5	103.5

Weighting Percent Per Goal
2
2
5
0.5
0.5

Highway 169 Evaluation

Northern Subarea Grade Separated Pedestrian Crossings

Does Not Meet Measure/ High Risk	-6 pts
Minimally Meets Measure/ Medium Risk	3 pts
Meets Measure/ Low Risk	6 pts

Goals	Objectives	No Build	Grade Separated Ped Crossings			Notes
			A	B	C	
			Across TH 169 & MN river using existing TH 14 bridges	Crossing north of Lind St	Crossing south side of Webster Ave	
GOAL A: Preserve community connections and economic vitality.	Provide convenient pedestrian and bicycle access to regional destinations.	Baseline				Qualitative - Webster Ave is more of a local destination than a regional destination in comparison to Lind Court and Lind Street destinations and connections to existing regional trails.
GOAL B: Provide efficient and reliable mobility for all users.	Perceived pedestrian/bicyclist level of comfort.					Quantitative - No Build gives pedestrian "WALK" indication, but traffic is traveling at a higher speed; Utilizing the existing TH 14 bridges will not completely separate peds/bikes from traffic like standalone ped bridges will.
GOAL C: Safely accommodate all system users.	Reduce crash and severity rates.					Quantitative
	Provide safe pedestrian and bicycle travel near and across Highway 169.	16	0	0	0	Quantitative - number of vehicle-pedestrian conflict points
GOAL D: Provide infrastructure improvements that respect the environment.*	Avoid, minimize, and mitigate impacts to historic properties.	Low Risk	Low Risk	Low Risk	Low Risk	Quantitative -Will require future detailed analysis.
	Avoid, minimize, and mitigate impacts to cultural resources.	Low Risk	Medium Risk	Low Risk	Low Risk	Quantitative - Will require future detailed analysis of grades and alignments. Trail connections needed with the TH 14 bridges connection could potentially disturb areas along the MN River.
	Avoid, minimize, and mitigate impacts to the built environment.	0 takes	0 takes	1 partial impact	1 partial impact	Quantitative - Will require future detailed analysis of grades and bridge type foot print. Built out environment could result in some partial property impacts.
	Avoid, minimize, and mitigate impacts to sensitive environmental resources.	Low Risk	Medium Risk	Low Risk	Low Risk	Quantitative - Will require future detailed analysis of grades and alignments. Trail connections needed with the TH 14 bridges connection could potentially disturb areas along the MN River.
	Avoid, minimize, and mitigate impacts to hazardous contaminated areas.	Low Risk	Low Risk	Low Risk	Medium Risk	Quantitative - Will require future detailed analysis. Based on environmental screening there are several hazardous waste areas south of the TH 14 interchange, most south of Hiniker Pond.
	Disproportionate impact to EJ populations	Low Risk	Low Risk	Low Risk	Low Risk	Quantitative - Low risk given consideration all proposed roadway concepts provide more safe and connected at grade crossings than existing conditions and a pedestrian bridge could be paired with any improvement concept.
GOAL E: Develop a financially responsible implementation plan.	Right-size improvements to address needs yet maximize use of existing infrastructure where possible.	Baseline				Quantitative - general project footprint, retaining walls, etc.
	Develop fiscally responsible improvements	Baseline	$$ 4M	$$ 4M	$$ 5M	Quantitative - high level project cost in 2023 dollars, contingency, engineering $ = 1-3M, $$ = 4-6M, $$$ = 6M+
	Develop project phases that meet schedule and funding constraints and maximize opportunities.	Baseline				Qualitative - ability to be phased with MnDOT investment plans and agency funding availability
	Develop a supported funding model to clearly identify agency responsibilities.	Baseline				Qualitative - combination of funding competitiveness and agency support
	Position partner agencies to seek federal and state grants for identified improvements to minimize partner costs.	Baseline				Qualitative - Funding competitiveness based on concept anticipated use, ability to reduce/eliminate severe and fatal crashes, improve non-motorized safety and mobility, and gain agency/community support.
GOAL F: Develop a plan supported by all agency partners.	Supported by the PMT					Quantitative

***Assessment based on planning-level concepts and will require further review to verify actual impacts.**

Highway 169 Evaluation

Northern Subarea Local System Evaluation Summary

Does Not Meet Measure/ High Risk	-6 pts
Minimally Meets Measure/ Medium Risk	3 pts
Meets Measure/ Low Risk	6 pts

Goals	Objectives	Local System Concepts				Notes
		L1	L2	L3	L4	
		Range St remains open (no change)	Range St Cul-de-Sac	Range St RIRO at Webster Ave	Range St Modernization	
GOAL A: Preserve community connections and economic vitality.	Maintain sustainable access for local trips into/out of Mankato and North Mankato.					Qualitative - design, system connectivity, and agency support
	Accommodate reasonable vehicle/truck access.					Qualitative - Agency and public perception
	Maintain emergency access routes into/out of Mankato and North Mankato.					Qualitative - design, system connectivity, traffic calming impacts to response times
GOAL B: Provide efficient and reliable mobility for all users.	Understand and plan for freight needs.					Qualitative - adequate access and truck turning movements to existing and planned industrial areas
	Meets access spacing guidelines.					Quantitative - meets access spacing guidelines, relative to Hwy 169 concepts paired with
	Accommodate future transit plans and needs.					Quantitative - Route 5 travels Range St to cross TH 169 at Belgrade Ave
GOAL C: Safely accommodate all system users.	Reduce crash and severity rates.					Quantitative - with L1 and L4 Webster Avenue will continue to see crash issues
GOAL D: Provide infrastructure improvements that respect the environment.*	Avoid, minimize, and mitigate impacts to historic properties.	Low Risk	Low Risk	Low Risk	Low Risk	Quantitative - Will require future detailed analysis. All options could likely be constructed within the footprint of the existing intersection.
	Avoid, minimize, and mitigate impacts to cultural resources.	Low Risk	Low Risk	Low Risk	Low Risk	Quantitative - Will require future detailed analysis. All options could likely be constructed within the footprint of the existing intersection.
	Avoid, minimize, and mitigate impacts to the built environment.	Low Risk	Low Risk	Low Risk	Low Risk	Quantitative - Will require future detailed analysis. All options could likely be constructed within the footprint of the existing intersection.
	Avoid, minimize, and mitigate impacts to sensitive environmental resources.	Low Risk	Low Risk	Low Risk	Low Risk	Quantitative - Will require future detailed analysis. All options could likely be constructed within the footprint of the existing intersection.
	Avoid, minimize, and mitigate impacts to hazardous contaminated areas.	Low Risk	Low Risk	Low Risk	Low Risk	Quantitative - Will require future detailed analysis. All options could likely be constructed within the footprint of the existing intersection.
	Disproportionate impact to EJ populations	Low Risk	Low Risk	Low Risk	Low Risk	Quantitative - Low risk given consideration that most options could be paired with any improvement concept.
GOAL F: Develop a plan supported by all agency partners.	Supported by the PMT					Quantitative

***Assessment based on planning-level concepts and will require further review to verify actual impacts.**

Highway 169 Evaluation

Southern Subarea Concept Evaluation Summary

Does Not Meet Measure/ High Risk: -6 pts | Minimally Meets Measure/ Medium Risk: 3 pts | Meets Measure/ Low Risk: 6 pts

Goals	Objectives	No Build	Highway 169 Concepts: 1a	1b	1c	1d	2a	2b1	2b2	2c	Local System Concepts: 3a	3b	Notes
			Restrict access @ Hawley & Amos Owen & CSAH 33	EB right only @ Hawley, restrict access @ Amos Owen & CSAH 33	Green T @ Hawley, restrict access @ Amos Owen & CSAH 33	Restrict access @ Hawley & Amos Owen, Green T @ CSAH 33	High-T at TH 68, restrict access @ business' & CR 120 & CSAH 69	High-T at TH 68 & consolidate access near CSAH 69	R-in/R-out at TH 68 & consolidate access near CSAH 69	RCUT's @ CR 120 & CSAH 69, add TH 68 south leg, close Bison	Close 208th/Loren, restrict access @ TH 60 & Gadwall	Close 208th & Loren & CR 117, realign Gadwall	
GOAL A: Preserve community connections and economic vitality.	Maintain sustainable access for local trips.												Quantitative - travel time and network efficiency
	Maintain emergency access routes.												Qualitative - design, system connectivity, traffic calming impacts to response times
	Accommodate reasonable vehicle/truck access												Qualitative - Agency and public perception Green: Minimal or no re-routing of trips Yellow: A few movements need to be re-routed Red: Several movements need to be re-routed
	Accommodate reasonable ped/bike access						NA	NA	NA	NA	NA	NA	Qualitative - Agency and public perception
	Enhance community identity.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Qualitative - median areas provide opportunity for aesthetics/monumentation
GOAL B: Provide efficient and reliable mobility for all users.	Provide acceptable system reliability serving existing and planned growth.		WBLs at CSAH 33 and Hawley operate with LOS F	WBL at CSAH 33 and U-Turns at RCUTs operate with LOS F	Operations are acceptable with all WBLs at Green T	Operations are acceptable with all WBLs at Green T		Did not model this option	Operations accpetable with signal at full movement access	Did not model this option		Did not model this option - But NBL at TH 60 operate with LOS F with existing control/full access	Quantitative - serves existing and forecasted ADT
	Provide acceptable regional highway travel times while accommodating reliable local access.	Baseline						Did not model this option		Did not model this option		Did not model this option	Quantitative - average through trip time Green - adds <60 seconds Yellow - adds 60-120 seconds Red - adds 120+ seconds
	Provide acceptable side street delay	Several movements operate with LOS F						Did not model this option		Did not model this option		Did not model this option - But NBL at TH 60 operate with LOS F with existing control/full access	Quantitative - side street LOS Green: All side street movements operate with LOS A - D Yellow: Side street movements operate with LOS E Red: Side street movements operate with LOS F
	Improves side street delay over existing conditions	Baseline	Average Side Street Delay: 2 seconds/vehicle	Average Side Street Delay: 2 seconds/vehicle	Average Side Street Delay: 4 seconds/vehicle	Average Side Street Delay: 5 seconds/vehicle	Average Side Street Delay: 6 seconds/vehicle	Did not model this option	Average Side Street Delay: 41 seconds/vehicle	Did not model this option	Average Side Street Delay: 2 seconds/vehicle	Did not model this option - Excessive side street delay anticipated with full access and stop control	Quantitative - Reduction in side street delay Green: Side street delay is reduced from the no build scenario Yellow: Side street delay remains the same as the no build scenario Red: Side street delay is increased from the no build scenario Baseline/2040 No Build Average Peak Hour Side Street Delay: Section 1: 327 seconds/vehicle Section 2: 51 seconds/vehicle Section 3: 102 seconds/vehicle
	Understand and plan for freight needs.												Qualitative - adequate access and truck turning movements to existing and planned industrial areas
	Meets access spacing guidelines.	Only met CSAH 33 to Bison St and CSAH 117 to Loren Dr	Alternative does not change access spacing	Alternative does not change access spacing	Alternative does not change access spacing	Alternative does not change access spacing	TH 68-CSAH 69 = 0.46 miles CSAH 69-CSAH 120 = 0.47 miles			Alternative does not change access spacing	CSAH 117 to CSAH 90 = 0.25 miles		Quantitative - meets access spacing guidelines. Recommended spacing is 0.5 mile according to the MnDOT Access Management Manual
	Improves access spacing over existing conditions												Quantitative Green - improves access spacing Red - does not improve access spacing
	Provide a connected transportation system that accommodates trips consistent with roadway functional class.												Quantitative - are the right trips on the right roads per functional classification
	Perceived pedestrian/bicyclist level of comfort						NA	NA	NA	NA	NA	NA	Qualitative - All concepts require pedestrians to cross multiple lanes of free flowing high speed traffic

	Accommodate future transit plans and needs.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Quantitative
	Understand and plan for roadway expansion needs.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Qualitative - infrastructure can be built for future expansion
GOAL C: Safely accommodate all system users.	Reduce crash and severity rates.												Quantitative - Reducing access would reduce crash rate and severity. Green-T would reduce severe crashes, but increase rear end crashes with a signal added along TH 169
	Provide safe pedestrian and bicycle travel near and across roadways, to area schools, and to regional destinations.	7	7	7	8	7	NA	NA	NA	NA	NA	NA	Quantitative - number of pedestrian conflict points
GOAL D: Provide infrastructure improvements that respect the environment.*	Avoid, minimize, and mitigate impacts to historic properties.	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Will require future detailed analysis
	Avoid, minimize, and mitigate impacts to cultural resources.	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Will require future detailed analysis
	Avoid, minimize, and mitigate impacts to the built environment.	0 takes	0 takes	0 takes	0 takes	0 takes	1 partial take	1 total and 1 partial take	3 partial takes	3 total and 4 partial takes	5 partial takes	2 total and 2 partial takes	For 2B1 a total take west of the Hwy 69 intersection is an undeveloped property. For 2c the total takes would impact existing residential properties.
	Avoid, minimize, and mitigate impacts to sensitive environmental resources.	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Will require future detailed analysis
	Avoid, minimize, and mitigate impacts to hazardous contaminated areas.	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Medium Risk	Medium Risk	Low Risk	Low Risk	Low Risk	To be considered for 2B1 and based on environmental screening there is a hazardous waste area near the Hwy 120 intersection.
	Disproportionate impact to EJ populations	High Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk	This is a two pronged analysis with a yes (red cell) or no (green cell) rating. 1) To have an EJ impact, there must first be an impact. In other words, a red cell somewhere else in this table. 2) If there is an impact, we need to determine if it will be "disproportionately high" on EJ communities. Because we have no data to lead us to believe that EJ populations use this area significantly more than other populations (i.e., travel to the corridor or drive through it), there is no reason to assume impacts would be disproportionately high.
	Right-size improvements to address needs yet maximize use of existing infrastructure where possible.												Quantitative - general project footprint, retaining walls, etc.
GOAL E: Develop a financially responsible implementation plan.	Develop fiscally responsible improvements (construction cost)	Baseline	$ 4M	$ 3.2M	$ 5.1M	$ 4.7M	$$$ 22.2M	$$$ 22.6M	$ 5.6M	$ 9M	$ 1.9M	$ 5M	Quantitative - high level project cost in 2023 dollars, contingency, engineering $ = 1-10M, $$ = 10-20M, $$$ = 20M+
	Develop fiscally responsible improvements (Impact (ROW and Env) costs)	Baseline	Low Risk	Low Risk	Low Risk	Low Risk	High Risk	High Risk	Medium Risk	High Risk	Medium Risk	Medium Risk	There is risk associated with the High T at CR 68 and the proximity of the railroad/trail bridge. For 2c the total takes would impact existing residential properties.
	Develop project phases that meet schedule and funding constraints and maximize opportunities.	Baseline											Qualitative - ability to be phased with agency investment plans and agency funding availability
	Develop a supported funding model to clearly identify agency responsibilities.	Baseline											Qualitative - combination of funding competitiveness and agency support
	Position partner agencies to seek federal and state grants for identified improvements to minimize partner costs.	Baseline											Qualitative - Funding competitiveness based on concept ability to reduce/eliminate severe and fatal crashes, improve non-motorized safety and mobility, and gain agency/community support.
GOAL F: Develop a plan supported by all agency partners.	Supported by the PMT	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Quantitative

***Assessment based on planning-level concepts and will require further review to verify actual impacts.**

Weighted Scores

											Weighting Percent Per Goal
Goal A	**24**	**0**	**-6**	**12**	**18**	**36**	**30**	**30**	**24**	**36**	**36**	2
Goal B	**-66**	**0**	**-18**	36	**24**	**72**	**96**	**96**	**48**	**60**	**24**	2
Goal C	**-60**	**0**	**0**	**-15**	**-15**	**30**	**30**	**30**	**30**	**30**	**30**	5
Goal D	**12**	**18**	**18**	**18**	**18**	**16.5**	**15**	**15**	**12**	**16.5**	**12**	0.5
Goal E	**-3**	**16.5**	**16.5**	**16.5**	**16.5**	**0**	**0**	**16.5**	**12**	**15**	**13.5**	0.5
Preliminary Total Score	**-93**	**34.5**	**10.5**	**67.5**	**61.5**	**154.5**	**171**	**187.5**	**126**	**157.5**	**115.5**	

Highway 169 Evaluation

Southern Subarea Grade Separated Ped Crossings

Does Not Meet Measure/ High Risk	-6 pts
Minimally Meets Measure/ Medium Risk	3 pts
Meets Measure/ Low Risk	6 pts

Goals	Objectives	No Build	Separated Ped Crossings		Notes
			A	B	
			Across TH 169 at Hawley Street	Across TH 169 just west of Blue Earth River	
GOAL A: Preserve community connections and economic vitality.	Provide convenient pedestrian and bicycle access to local and regional destinations.	Baseline			Qualitative - The Hawley Street location provides more direct access to the convenient store which is a popular local destination.
GOAL B: Provide efficient and reliable mobility for all users.	Perceived pedestrian/bicyclist level of comfort.				Quantitative - Both options provide complete separation between peds and bikes.
GOAL C: Safely accommodate all system users.	Reduce crash and severity rates.				Quantitative
	Provide safe pedestrian and bicycle travel near and across Highway 169.		0	0	Quantitative - number of vehicle-pedestrian conflict points
GOAL D: Provide infrastructure improvements that respect the environment.*	Avoid, minimize, and mitigate impacts to historic properties.	Low Risk	Low Risk	Low Risk	Quantitative -Will require future detailed analysis.
	Avoid, minimize, and mitigate impacts to cultural resources.	Low Risk	Low Risk	Low Risk	Quantitative - Will require future detailed analysis.
	Avoid, minimize, and mitigate impacts to the built environment.	0 takes	0 takes	0 takes	Quantitative
	Avoid, minimize, and mitigate impacts to sensitive environmental resources.	Low Risk	Low Risk	Low Risk	Quantitative - Will require future detailed analysis.
	Avoid, minimize, and mitigate impacts to hazardous contaminated areas.	Low Risk	Low Risk	Low Risk	Quantitative - Will require future detailed analysis.
	Disproportionate impact to EJ populations	High Risk	Low Risk	Low Risk	Quantitative - No Build is high risk given consideration that existing conditions and all proposed concepts do not provide safe pedestrian crossings of Hwy 169.
GOAL E: Develop a financially responsible implementation plan.	Right-size improvements to address needs yet maximize use of existing infrastructure where possible.	Baseline			Quantitative - general project footprint, retaining walls, etc.
	Develop fiscally responsible improvements (construction cost)	Baseline	$$ 5M	$$ 4M	Quantitative - high level project cost in 2023 dollars, contingency, engineering $ = 1-3M, $$ = 3-6M, $$$ = 6M+
	Develop project phases that meet schedule and funding constraints and maximize opportunities.	Baseline			Qualitative - ability to be phased with MnDOT investment plans and agency funding availability
	Develop a supported funding model to clearly identify agency responsibilities.	Baseline			Qualitative - combination of funding competitiveness and agency support
	Position partner agencies to seek federal and state grants for identified improvements to minimize partner costs.	Baseline			Qualitative - Funding competitiveness based on concept anticipated use, ability to reduce/eliminate severe and fatal crashes, improve non-motorized safety and mobility, and gain agency/community support.
GOAL F: Develop a plan supported by all agency partners.	Supported by the PMT	TBD	TBD	TBD	Quantitative

***Assessment based on planning-level concepts and will require further review to verify actual impacts.**

Appendix B

TRAFFIC ANALYIS MEMEORANDUM

MAPO
MANKATO/NORTH MANKATO
AREA PLANNING ORGANIZATION

Highway 169 Corridor Study

Concept Traffic Operations Evaluation

Date: August 25, 2021

To: Charles Androsky, Transportation Planner, MAPO

From: Scott McBride, PE, Project Manager, Bolton & Menk, Inc.

Kelsey Retherford, PE, Traffic Engineer, Bolton & Menk, Inc.

Subject: Concept Traffic Operations Evaluation

Highway 169 Corridor Study

Mankato/North Mankato Area Planning Organization (MAPO)

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Introduction

The Mankato/North Mankato Area Planning Organization (MAPO) in collaboration with the Cities of North Mankato, Mankato, Blue Earth County, Nicollet County, and the Minnesota Department of Transportation (MnDOT) are working to identify transportation improvements on Highway 169. This report summarizes the future traffic analysis of Highway 169 in the Northern Subarea from Lake St to the Veterans' Memorial Bridge and in the southern subarea from the Blue Earth River Crossing to Highway 60.

Northern Subarea

The northern subarea extends from Lake St to the Veterans' Memorial Bridge. This segment is a four-lane divided expressway withing the Cities of Mankato and North Mankato. This subarea has a large concentration of commercial, heavy industrial, light industrial, residential, and public/institutional land uses served by Lind St and Webster Ave connections to Highway 169.

Concepts

Throughout the northern subarea four overall options were derived with several sub options to analyze various traffic control. These options are described below:

- **Concept 1 – Spot Intersection Improvements**
  - Signalized Green-T at EB TH 14 Exit Ramp
  - Local system concepts
    - Range St remain Full Access (no change from existing)
    - Range St Cul-de-sac
    - Range St Right-In/Right-Out
    - Range St Modernization
- **Concept 2 – Access Relocation (Combine Lind St/River Ln)**
  - Signals at combined Lind St/River Ln and Webster Ave intersections
  - Roundabouts at combined Lind St/River Ln and Webster Ave intersections
  - Signalized RCUTs at combined Lind St/River Ln and Webster Ave intersections
- **Concept 3 – Combined Intersection (Lind St/River Ln/Webster Ave)**
  - At grade signal at combined Lind St/River Ln/Webster Ave intersection
  - Interchange at combined Lind St/River Ln/Webster Ave intersection
- **Concept 4 – TH 14 Interchange Improvements**
  - Full cloverleaf interchange
  - Eliminate South Loop
    - Roundabout at EB TH 14 Ramps
    - Signal at EB TH 14 Ramps
  - Eliminate Both Loops
    - Diverging Diamond
    - Roundabouts
  - Signalize EB TH 14 exit ramp at TH 169

Traffic Operations

A level of service (LOS) analysis of the 2040 peak hours was completed using the forecasted turning movement counts in Synchro/SimTraffic for the signalized/stop-controlled intersections and in Vissim for roundabouts. Traffic operations were not analyzed for the local system concepts at Range St. This is because traffic volumes were not collected at this intersection and it is outside the project limits. The four local system concepts were derived to show a full range of options at the intersection of Range St and Webster Ave as traffic queuing from the TH 169 and Webster Ave intersection extends beyond Range St during the peak hours. The operations for the Northern Subarea concepts analyzed are shown in **Tables 1** through **4** below.

Table 1. Concept 1 – 2040 Build Traffic Operations

Intersection	Traffic Control	A.M. Peak Hour						P.M. Peak Hour					
		Intersection		Maximum Movement				Intersection		Maximum Movement			
		Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)	Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)
EB TH 14 Exit Ramp at TH 169	Signalized Green T	12	B	EBL	45	D	300	9	A	EBL	49	D	300

*Delay in seconds per vehicle.

Table 1 shows the traffic operations with a signalized Green-T at the intersection of TH 169 and EB TH 14 exit ramp. This shows that the concept would operate well with the overall peak hours operating with LOS A or B and all movements operating with LOS D or better. However, the preliminary concept design of this concept showed that the northbound left turn lane for the WB TH 14 entrance ramp is located too close to the TH 169 at EB TH 14 exit ramp intersection. Specifically, the crossover between the eastbound left traffic from the EB TH 14 exit ramp and the northbound left traffic at the WB TH 14 entrance ramp is a crash concern and therefore this concept was dismissed from further evaluation. The detailed 2040 traffic operations are included in **Tables A1** and **A2** of **Appendix A** and a concept drawing of the concept is included in **Appendix B**.

Table 2. Concept 2 – 2040 Build Traffic Operations

Intersection	Traffic Control	A.M. Peak Hour						P.M. Peak Hour					
		Intersection		Maximum Movement				Intersection		Maximum Movement			
		Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)	Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)
Lind St/River Ln at TH 169	Signal	33	C	SBL	75	E	400	32	C	SBL	96	F	450
Webster Ave at TH 169		28	C	SBL	72	E	50	30	C	SBL	79	E	125
Lind St/River Ln at TH 169	Roundabout**	7	A	EBT	68	F	250	8	A	EBT	59	F	200
Webster Ave at TH 169		11	B	WBL	68	F	200	10	B	WBL/T	52	F	225
Lind St/River Ln NB U-Turn at TH 169	Signalized RCUTs	4	A	NBU	33	C	125	4	A	NBU	32	C	175
Lind St/River Ln at TH 169		17	B	NBL	47	D	50	30	C	SBL	76	E	500
Lind St/River Ln SB U-Turn at TH 169		5	A	SBU	73	E	200	4	A	SBU	63	E	150
Webster Ave NB U-Turn at TH 169		4	A	NBU	72	E	125	4	A	NBU	74	E	175
Webster Ave at TH 169		12	B	NBL	49	D	150	17	B	NBL	44	D	175
Webster Ave SB U-Turn at TH 169		10	B	SBU	39	D	300	7	A	SBU	27	C	300

*Delay in seconds per vehicle.
**Operational Analysis from Vissim

Table 2 shows the traffic operations with signals, roundabouts, and signalized RCUTs at the combined Lind St/River Ln intersection with TH 169 and the intersection of Webster Ave at TH 169. This shows that each concept is anticipated to operate with LOS C or better for the intersection overall during both peak hours. The roundabouts operate with the lowest intersection delay of the three traffic control concepts analyzed. The maximum movement delay is also lowest with the roundabouts, however, the LOS indicates some movements are anticipated to operate with LOS F. This is because the delay thresholds associated with LOS for a roundabout are based on a stop controlled intersection which have lower delay thresholds than a signalized

intersection. The signalized RCUTs analysis shows that all movements are anticipated to operate with LOS E or better. The signal analysis shows that the SBL during the AM peak at the combined Lind St/River Ln intersection is anticipated to operate with LOS F, but all other movements operate with LOS E or better. The detailed 2040 traffic operations are included in **Tables A3** through **A8** of **Appendix A** and concept drawings of the concepts which show lane configuration assumptions with each concept are included in **Appendix B**.

Table 3. Concept 3 – 2040 Build Traffic Operations

Intersection	Traffic Control	A.M. Peak Hour						P.M. Peak Hour					
		Intersection		Maximum Movement				Intersection		Maximum Movement			
		Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)	Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)
Signalized At Grade Intersection													
Lind St/River Ln/Webster Ave at TH 169	Signal	41	D	EBL	96	F	325	45	D	WBL	90	F	275
Interchange													
SB TH 169 Ramps	Roundabout	6	A	EBT	8	A	175	11	B	SBL/SBR	17	B	325
NB TH 169 Ramps		18	C	WBR	27	D	500	10	B	WBT	18	C	350

*Delay in seconds per vehicle.

Table 3 shows the traffic operations with an at grade signal or grade separated interchange at a combined Lind St/River Ln/Webster Ave intersection with TH 169. This shows that a signal would operate with LOS D overall, however, the maximum delay movement would operate with LOS F during both peak hours. All other movements are anticipated to operate with LOS E or better. This concept was analyzed with channelized left and right turn lanes on the northbound, southbound, and westbound approaches. A dual left turn lane and channelized right turn lane was assumed for the eastbound approach. This concept was not drawn as it was dismissed by the Project Management Team (PMT) due to concerns with the concept being too impactful to existing businesses and future redevelopment areas. The interchange option was assumed to have single lane roundabouts at the ramp terminals. This option operates well with all movements operating with LOS D or better during both peak hours. The detailed 2040 traffic operations are included in **Tables A9a** through **A10b** of **Appendix A.**

Table 4. Concept 4 – 2040 Build Traffic Operations

Intersection	Traffic Control	A.M. Peak Hour						P.M. Peak Hour					
		Intersection		Maximum Movement				Intersection		Maximum Movement			
		Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)	Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)
Full Cloverleaf Interchange													
TH 14 at TH 169		1	A	SBR	6	A	25	2	A	SBR	6	A	25
Eliminate South Loop													
EB TH 14 Ramps at TH 169	Roundabout**	63	F	EBR	435	F	4900	45	E	EBR	444	F	3225
EB TH 14 Ramps at TH 169	Signal	19	B	SBL	60	E	250	22	C	SBL	61	E	275
Eliminate Both Loops													
TH 14 at TH 169	Signal (Diverging Diamond)	5**	A	EBL/WBL	16	B	175/200	6**	A	WBL	17	B	225
WB TH 14 Ramps at TH 169	Roundabout***	17	C	SBR/WBL	25	D	475/425	78	F	WBR	273	F	1650
EB TH 14 Ramps at TH 169	Roundabout***	22	C	EBR	123	F	1900	10	A	EBR	52	F	450
Signalize EB TH 14 Exit Ramp													
EB TH 14 Ramps at TH 169	Signal	12	B	EBL	46	D	250	9	A	EBL	48	D	250

*Delay in seconds per vehicle.
**Overall Interchange Delay (average delay of all movements at the interchange)
***Operational Analysis from Vissim

Table 4 shows the traffic operations for the TH 14 interchange improvement concepts. **Table 4** shows how a full cloverleaf interchange would operation with the lowest amount of delay and all movements operate with LOS A during both peak hours. **Table 4** also shows how eliminating the south loop and making the EB TH 14

ramp at TH 169 intersection a roundabout operates with excessive delay and queuing. The eastbound exit ramp is approximately 1650 ft in length so the maximum queues are anticipated to extend onto mainline TH 14 with a roundabout. With a signal at this intersection the overall delay is LOS B or C during the peak hours. The maximum movement delay with a signal is LOS E and queuing is anticipated to be minimal. **Table 4** shows how roundabouts or a diverging diamond will operate with both loops eliminated. This indicates that roundabouts at both ramp terminals will operate with excessive delay and queuing. The diverging diamond, however, operates well with an average delay of only 5-6 seconds per vehicle during both peak hours and the maximum movement delay operates with LOS B during both peak hours. Finally, **Table 4** shows how signalizing the EB TH 14 exit ramp would operate with minimal delay for the intersection overall and would reduce the eastbound left at the exit ramp from LOS F under the no build scenario to LOS D during both peak hours. The detailed 2040 traffic operations are included in **Tables A11** through **A18** of **Appendix A** and concept drawings of the concepts are included in **Appendix B**.

Additional Traffic Analysis

Vissim Analysis

An additional operational analysis was completed in Vissim to confirm that a signal at the TH 14 interchange would operate acceptably with roundabouts at Lind St/River Ln and Webster Ave. The operations are summarized in **Table 5** below.

Table 5. Additional Vissim Analysis – 2040 Build Traffic Operations

Intersection	Traffic Control	A.M. Peak Hour						P.M. Peak Hour					
		Intersection		Maximum Movement				Intersection		Maximum Movement			
		Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)	Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)
EB TH 14 Exit Ramp at TH 169	Signal	18	B	SBL	66	E	350	17	B	SBL	62	E	325
Lind St/River Ln at TH 169	Roundabout	8	A	EBL	45	E	225	9	A	EBT	41	E	175
Webster Ave at TH 169		10	B	WBL	67	F	200	10	B	WBL	42	E	200

Table 5 indicates that a signal at the TH 14 exit ramp and TH 169 intersection is anticipated to operate acceptably with roundabouts at Lind St/River Ln and Webster Ave. In fact, the traffic operations indicate that a signal at TH 14 actually reduces the delay for the eastbound approach at Lind St/River Ln as the signal creates gaps in the southbound TH 169 mainline traffic instead of SB TH 169 being a free-flowing movement like it is today. The detailed 2040 traffic operations are included in **Tables A19** and **A20** of **Appendix A.**

Sensitivity Analysis

A sensitivity analysis was completed for the eastbound TH 14 exit ramp to see how operations are anticipated to worsen over time as volumes increase. The results are shown in **Table 6**.

Table 6. EB TH 14 Exit Ramp at TH 169 - Traffic Operations

Year	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)								Queue Lengths (ft)				Volumes		
				NBT		SBT		EBL		EBR		EBL		EBR		EBL	EBR	SBT
												Avg	Max	Avg	Max			
2020	AM	5	A	0	A	1	A	31	D	11	B	100	175	75	175	158	250	818
	PM	7	A	0	A	1	A	81	F	11	B	125	275	75	225	150	163	1068
2025	AM	8	A	1	A	1	A	61	F	13	B	125	325	100	300	168	272	863
	PM	12	B	0	A	1	A	143	F	27	D	175	400	150	625	158	175	1128
2030	AM	10	B	0	A	1	A	82	F	14	B	150	350	100	205	178	294	908
	PM	18	C	1	A	1	A	214	F	39	E	250	450	250	800	165	187	1188
2035	AM	29	D	0	A	1	A	239	F	47	E	300	450	375	925	187	315	953
	PM	50	F	1	A	1	A	502	F	219	F	375	475	800	1800	173	199	1248
2040	AM	25	D	0	A	1	A	204	F	39	E	300	475	275	800	196	336	998
	PM	87	F	1	A	1	A	926	F	538	F	450	475	1475	2025	180	210	1308

1. Delay in seconds per vehicle

This shows how the existing (2020) peak hour shows failing operations for the eastbound left turn during the PM peak hour and by 2025 both peak hours show failing LOS for the eastbound left turn. It should be noted that video footage of the intersection could not be obtained to verify the existing condition due to non-normal traffic patterns because of COVID-19 so it is unclear if this delay is experienced by drivers today. Traffic volumes should be monitored to determine when a signal is needed to mitigate the delay for the eastbound left turn.

Travel Time Analysis

A travel time analysis was completed during the 2040 AM and PM peak hours along northbound and southbound TH 169 to see how each option increases or decreases the travel time for mainline vehicles compared to the No Build scenario. The travel time was reported along the northern subarea between Lake St NW and Belgrade Ave for each concept. Each option was modeled only changing described improvement. All other intersections along the corridor were kept as the existing condition. **Table 7** shows the travel time for the 2040 No Build scenario and each of the northern subarea concepts. **Table 8** shows the change in travel time compared to the No Build scenario with the last row in **Table 8** showing the average change in travel time for both peak hours and both directions of travel.

Table 7. Travel Time from Lake St NW to Belgrade Ave

Peak Hour	Direction	No Build	Highway 169 Concepts								
			1a	1b	1c	1d & 2a	2b	2c	2d	2e	2f
			Combined River Ln / Lind St Signals	Combined River Ln / Lind St Roundabouts	Combined River Ln / Lind St RCUTs	TH 14 Interchange Full Cloverleaf and Webster Area Interchange	TH 14 Interchange Eliminate South Loop - Roundabout	TH 14 Interchange Eliminate South Loop - Signal	TH 14 Interchange Diverging Diamond	TH 14 Interchange Roundabout Ramp Intersections	TH 14 Interchange Signalize EB TH 14 Exit Ramp
AM	Northbound	220	223	180	217	151	254	234	248	265	222
	Southbound	212	253	230	196	187	216	252	229	305	220
PM	Northbound	234	223	185	254	153	274	251	258	285	234
	Southbound	214	239	228	249	188	219	239	230	330	220

Table 8. Change In Travel Time Compared to No Build from Lake St NW to Belgrade Ave

Peak Hour	Direction	No Build	Highway 169 Concepts								
			1a	1b	1c	1d & 2a	2b	2c	2d	2e	2f
			Combined River Ln / Lind St Signals	Combined River Ln / Lind St Roundabouts	Combined River Ln / Lind St RCUTs	TH 14 Interchange Full Cloverleaf and Webster Area Interchange	TH 14 Interchange Eliminate South Loop - Roundabout	TH 14 Interchange Eliminate South Loop - Signal	TH 14 Interchange Diverging Diamond	TH 14 Interchange Roundabout Ramp Intersections	TH 14 Interchange Signalize EB TH 14 Exit Ramp
AM	Northbound	Baseline	3	-40	-3	-69	34	14	28	45	2
	Southbound		41	18	-16	-25	5	40	18	93	8
PM	Northbound		-12	-49	20	-81	40	17	24	51	0
	Southbound		25	14	35	-26	5	25	16	116	6
Average Change in Travel Time		*Baseline*	*15*	*-14*	*9*	*-50*	*21*	*24*	*22*	*76*	*4*

The information shown in **Tables 7** and **8** indicate that Concepts 1a, 1c, 2b, 2c, 2d and 2f would minimally increase the average travel time for vehicles from the No Build scenario with the average travel time increasing by between 4 and 24 seconds. Concepts 1b and 1d/2a shows a decrease in travel time on average compared to the No Build scenario. For Concept 1b the northbound travel time shows an estimated 40 to 49 second reduction during the peak hours and the southbound travel time shows an estimated increase of only 14 to 18 seconds. For Concept 1d/2a the northbound travel time shows an estimated 25 to 26 second reduction and the southbound travel time shows an estimated 69 to 81 seconds reduction during the peak hours. Concept 2e, which analyzed roundabouts at the TH 14 ramp terminals shows the greatest increase in travel time with

an average increase in travel time of 76 seconds. The northbound travel time shows an estimated increase in travel time by 45 to 51 second during the peak hours and the southbound travel time shows an estimated increase of 93 to 116 seconds.

Southern Subarea

The southern subarea runs from the Blue Earth River crossing to Highway 60 within South Bend Township. This is a four-lane divided expressway corridor. This area includes primarily low density residential, park, and open space land uses directly adjacent to Highway 169, with some areas of commercial and light industrial.

The southern subarea was broken down into three sections for the concept analysis. These sections are outlined below:

- Section 1 extends from the Blue Earth River crossing to CSAH 33
- Section 2 extends from CSAH 33 to CSAH 90
- Section 3 extends from CSAH 90 to 208th Ln

Concepts

Throughout the southern subarea options were derived for each section. These options are described below:

- **Section 1 – Blue Earth River crossing through CSAH 33**
    - Concept 1A – RCUTs at Amos Owen Ln and CSAH 33
    - Concept 1B – Restrict access at Hawley St; RCUTs at Amos Owen Ln and CSAH 33
    - Concept 1C – Signalized Green T at Hawley St; restrict access at CSAH 33 and Amos Owen Ln
    - Concept 1D – Signalized Green T at CSAH 33; restrict access at Hawley St and Amos Owen Ln

- **Section 2 – CSAH 33 to CSAH 90**
    - Concept 2A – High-T at TH 68; restrict access at CR 120, CSAH 69, and businesses; close Bison St access
    - Concept 2B1 – High-T at TH 68; consolidate access near CSAH 69 to provide better access spacing; close Bison St access
    - Concept 2B2 – Right-In/Right-Out at TH 68; consolidate access between CR 120 and CSAH 69 to provide better access spacing; close Bison St access
    - Concept 2C – RCUTs at CR 120 and CSAH 69; add south leg to TH 68; close Bison St access
- **Section 3 – CSAH 90 to 208th Ln**
    - Concept 3A – RCUT at Gadwall Rd; restrict access at TH 60; close access at 208th Ln and Loren Dr
    - Concept 3B – Realign Gadwall Rd to provide better access spacing; close access at 208th Ln, Loren Dr, and CR 117

Traffic Operations

A level of service (LOS) analysis of the 2040 peak hours was completed using the forecasted turning movement counts in Synchro/SimTraffic. Detailed traffic operations were not completed for Concept 2B1, 2C, or 3B as these concepts were kept at higher level and are anticipated to operate similar to either the other concepts analyzed or the existing conditions. The operations for the Southern Subarea concepts analyzed are shown in **Tables 9** through **11** below.

Table 9. Section 1 Concepts – 2040 Build Traffic Operations

Concept	Intersection	A.M. Peak Hour						P.M. Peak Hour					
		Intersection		Maximum Movement				Intersection		Maximum Movement			
		Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)	Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)
1A	CSAH 69 (Hawley St) at TH 169	26	D	WBL	189	F	1675	3	A	WBL	32	D	75
	CSAH 33 at TH 169	5	A	WBL	33	D	300	10	B	WBL	119	F	450
	CSAH 33 at TH 169 EB U-Turn	2	A	EBY	26	D	50	3	A	EBU	21	C	75
1B (All WBL's from Hawley use U-Turn)	CSAH 69 (Hawley St) at TH 169	4	A	EBR	6	A	0	2	A	EBR	3	A	0
	CSAH 33 at TH 169	6	A	WBL	44	E	350	16	C	WBL	214	F	650
	CSAH 33 at TH 169 EB U-Turn	3	A	EBU	34	D	75	4	A	EBU	24	C	75
	CSAH 33 at TH 169 WB U-Turn	8	A	WBU	77	F	600	4	A	WBU	247	F	125
1B (Half WBL's from Hawley use U-Turn, Half use CSAH 33)	CSAH 69 (Hawley St) at TH 169	3	A	EBR	4	A	0	2	A	EBR	3	A	0
	CSAH 33 at TH 169	25	D	WBL	181	F	875	21	C	WBL	286	F	700
	CSAH 33 at TH 169 EB U-Turn	5	A	EBU	75	F	75	5	A	EBU	58	F	125
	CSAH 33 at TH 169 WB U-Turn	3	A	WBU	19	C	175	3	A	WBU	250	F	100
1C (WBL allowed at CSAH 33)	CSAH 69 (Hawley St) at TH 169	8	A	NBL	28	C	50	6	A	WBL	31	C	75
	CSAH 33 at TH 169	6	A	WBL	44	E	375	36	E	WBL	444	F	1000
1C (All WBLs at Green-T)	CSAH 69 (Hawley St) at TH 169	16	B	NBL	36	D	50	11	B	WBL	34	C	250
	CSAH 33 at TH 169	2	A	EBT	3	A	0	4	A	EBT	6	A	0
1D (All WBLs at Green-T)	CSAH 69 (Hawley St) at TH 169	2	A	EBR	5	A	0	4	A	EBR	7	A	0
	CSAH 33 at TH 169	21	C	WBL	43	D	550	15	B	WBL	44	D	275

*Delay in seconds per vehicle.

Table 9 shows the traffic operations for the Section 1 concepts. The Concept 1A operations indicate that the westbound left turn at Hawley St during the AM peak hour and at CSAH 33 during the PM peak hour operates with failing LOS (2-3 minutes of delay on average per vehicle). Additionally, the traffic queues for the westbound left at Hawley St during the AM peak hour are anticipated to extend 1675 ft. The channelized turn lane is only 350 ft so vehicles would block one of the through lanes along TH 169 with this option.

Concept 1B was analyzed two different ways. Concept 1B eliminates the westbound left turning movement at the intersection of Hawley St and TH 169 so the operations were analyzed first assuming all of the westbound lefts re-route via the U- turn along TH 169. Next Concept 1B was also analyzed assuming half of the westbound lefts re-route via the U- turn along TH 169 and the other half make the westbound left turn at CSAH 33. The operations for both options indicate that the westbound left and westbound U-turn are anticipated to operate with failing LOS and several longer queues during both peak hours.

Concept 1C was also analyzed two different ways. This concept proposes a signalized Green-T at Hawley St and eliminates the northbound left movement from CSAH 33 but keeps the westbound left turn at CSAH 33 open. The traffic operations indicate that if left open the westbound left at CSAH 33 would operate with failing LOS (over 7 minutes of delay per vehicle). Therefore, traffic operates were analyzed with CSAH 33 restricted to a right-in/right-out and all westbound left turners were re-routed via Hawley St. With all westbound lefts at Hawley St the operations are acceptable during both peak hours with the maximum movement delay of LOS D during the AM peak, LOS C during the PM peak, and minimal traffic queuing.

Concept 1D is similar to 1C, but proposes a signalized Green-T at CSAH 33 instead of Hawley St. With all westbound lefts assumed to occur at the CSAH 33 Green-T and Hawley St assumed to be restricted to right-in/right-out operations were found to be acceptable. The detailed 2040 traffic operations are included in **Tables A21** through **A32** of **Appendix C** and concept drawings of the concepts are included in **Appendix D**.

Table 10. Section 2 Concepts – 2040 Build Traffic Operations

Concept	Intersection	A.M. Peak Hour						P.M. Peak Hour					
		Intersection		Maximum Movement				Intersection		Maximum Movement			
		Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)	Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)
2A	TH 68 at TH 169	3	A	SBL	6	A	100	2	A	SBL	5	A	100
2B2 (Stop Controlled)	TH 68 at TH 169	2	A	SBR	7	A	75	3	A	SBR	7	A	50
	CSAH 69 at TH 169	40	E	SBL	351	F	1025	106	F	SBL	1115	F	2075
2B2 (Stop Controlled, Acceleration Lane)	TH 68 at TH 169	3	A	SBR	10	B	75	2	A	SBR	7	A	50
	CSAH 69 at TH 169	11	B	SBL	82	F	400	15	C	SBL	145	F	575
2B2 (Signalized)	TH 68 at TH 169	3	A	SBR	6	A	75	4	A	EBT	7	A	0
	CSAH 69 at TH 169	11	B	SBL	47	D	300	11	B	SBL	47	D	275

*Delay in seconds per vehicle.

Table 10 shows the traffic operations for the Section 2 Concepts. The operations for Concept 2A indicates that the High-T at the intersection of TH 68 and TH 169 operates well as a stop-controlled intersection with all movements operating with LOS A during both peak hours. Concept 2B2 analyzed the TH 68 at TH 169 intersection as a right-in/right-out and full access at the CSAH 69 and TH 169 intersection. Multiple traffic control options were analyzed for the intersection of CSAH 69 at TH 169. **Table 10** indicates that with stop control and no acceleration lanes the southbound left operates with excessive delay causing the peak hour overall to operate with LOS E during the AM peak hour and LOS F during the PM peak hour. An acceleration lane for the southbound left movement was also analyzed with stop control at the intersection of CSAH 69 and TH 169, however delay was still shown to be excessive for the southbound left turning movement. With a signal at CSAH 69 and TH 169 the operations are acceptable.

Although Concepts 2B1 and 2C were not modeled these options are anticipated to operate similar to Concepts 2A and 2B2. Concept 2B1 shows a High T at TH 68 and TH 169 which would operate similar to Concept 2A. Concept 2B1 also shows a full access intersection at CSAH 69 and TH 169 which would operate similar to Concept 2B2. Concept 2C shows a full access intersection at TH 68 and right-in/right-out at CSAH 69 which would operate similar to Concept 2B2.

The detailed 2040 traffic operations are included in **Tables A33** through **A40** of **Appendix C** and concept drawings of the concepts are included in **Appendix D**.

Table 11. Section 3 Concepts – 2040 Build Traffic Operations													
Concept	Intersection	A.M. Peak Hour						P.M. Peak Hour					
		Intersection		Maximum Movement				Intersection		Maximum Movement			
		Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)	Delay*	LOS	Mvmt	Delay*	LOS	Queue (ft)
3A	TH 60 at TH 169	5	A	WBL	11	B	150	8	A	WBL	68	F	375
	EB TH 169 U-Turn E of TH 60	5	A	EBU	12	B	50	4	A	EBU	23	C	75

*Delay in seconds per vehicle.

Table 11 shows the traffic operations for Section 3 with an RCUT at Gadwall Rd and restricted access at TH 60 (no northbound left turn). This indicates that the intersections overall operate well with LOS A during both peak hours. The westbound left turn at TH 60 operates with LOS F during the PM peak hour, but delay is minimal during the AM peak hour. Although Concept 3B was not modeled, this option keeps TH 60 at TH 169 full access. If left as a full access intersection the northbound left turn is anticipated to operate with excessive delay during the PM peak hour as shown in the 2040 No Build operations.

The detailed 2040 traffic operations are included in **Tables A41** and **A42** of **Appendix C** and concept drawings of the concepts are included in **Appendix D**.

Travel Time Analysis

A travel time analysis was also completed for the southern subarea concepts during the 2040 AM and PM peak hours along northbound and southbound TH 169 to see how each option increases or decreases the travel time for mainline vehicles compared to the No Build scenario. The travel time was reported along the southern subarea by section. The section 1 travel time was compared from Hawley St to CSAH 33, section 2 travel time was compared from CSAH 33 to CSAH 90, and section 3 travel time was compared from CSAH 90 to TH 60.

Table 12 shows the travel time for the 2040 No Build scenario and each of the southern subarea options in section 1. **Table 13** shows the change in travel time compared to the No Build scenario.

Table 12. Travel Time from Hawley St to CSAH 33						
Peak Hour	Direction	No Build - Section 1	Highway 169 Concepts			
			1a	1b	1c	1d
			RCUTs at Amos Owen Ln and CSAH 33	Restrict access at Hawley St; RCUTs at Amos Owen Ln and CSAH 33	Signalized Green T at Hawley St; restrict access at CSAH 33 and Amos Owen Ln	Signalized Green T at CSAH 33; restrict access at Hawley St and Amos Owen Ln
AM	Northbound	64	64	73	86	106
	Southbound	78	71	86	58	59
PM	Northbound	65	70	70	103	103
	Southbound	62	88	73	95	91

Table 13. Change In Travel Time Compared to No Build from Hawley St to CSAH 33						
Peak Hour	Direction	No Build - Section 1	Highway 169 Concepts			
			1a	1b	1c	1d
			RCUTs at Amos Owen Ln and CSAH 33	Restrict access at Hawley St; RCUTs at Amos Owen Ln and CSAH 33	Signalized Green T at Hawley St; restrict access at CSAH 33 and Amos Owen Ln	Signalized Green T at CSAH 33; restrict access at Hawley St and Amos Owen Ln
AM	Northbound	Baseline	0	9	22	42
	Southbound		-8	8	-20	-19
PM	Northbound		5	5	38	38
	Southbound		25	10	32	29
Average Change in Travel Time		*Baseline*	6	8	18	22

The information shown in **Tables 12** and **13** indicate that all of the concepts analyzed in section 1 of the southern subarea would minimally increase the average travel time for vehicles from the No Build scenario with the average travel time increasing by between 6 and 22 seconds.

Table 14 shows the travel time for the 2040 No Build scenario and each of the southern subarea options in section 2. **Table 15** shows the change in travel time compared to the No Build scenario.

Table 14. Travel Time from CSAH 33 to CSAH 90

Peak Hour	Direction	No Build - Section 2	Highway 169 Concepts			
			2a	2b1	2b2	2c
			High-T at TH 68; restrict access at CR 120, CSAH 69, and businesses; close Bison St access	High-T at TH 68; consolidate access near CSAH 69; close Bison St access	RIRO at TH 68; consolidate access between CR 120 and CSAH 69; close Bison St access	RCUTs at CR 120 and CSAH 69; add south leg to TH 68; close Bison St access
AM	Northbound	100	97	N/A - did not model this concept	105	N/A - did not model this concept
	Southbound	107	103		116	
PM	Northbound	106	97		114	
	Southbound	114	104		122	

Table 15. Change In Travel Time Compared to No Build from CSAH 33 to CSAH 90

Peak Hour	Direction	No Build - Section 2	Highway 169 Concepts			
			2a	2b1	2b2	2c
			High-T at TH 68; restrict access at CR 120, CSAH 69, and businesses; close Bison St access	High-T at TH 68; consolidate access near CSAH 69; close Bison St access	RIRO at TH 68; consolidate access between CR 120 and CSAH 69; close Bison St access	RCUTs at CR 120 and CSAH 69; add south leg to TH 68; close Bison St access
AM	Northbound	Baseline	-3	N/A - did not model this concept	5	N/A - did not model this concept
	Southbound		-4		9	
PM	Northbound		-9		8	
	Southbound		-10		8	
Average Change in Travel Time		*Baseline*	-7	*N/A - did not model this concept*	7	*N/A - did not model this concept*

The information shown in **Tables 14** and **15** indicate that Concept 2a is anticipated to decrease the travel time and Concept 2b2 is anticipated to minimally increase the travel time compared to the 2040 No Build scenario. Concept 2b1 and 2c were not modeled, however, due to the similarities in design to those modeled they are also estimated to minimally change the travel time from the 2040 No Build scenario.

Table 16 shows the travel time for the 2040 No Build scenario and the southern subarea options in section 3. **Table 17** shows the change in travel time compared to the No Build scenario.

Table 16. Travel Time from CSAH 33 to CSAH 90				
Peak Hour	Direction	No Build - Section 3	Local System Concepts	
			3a	3b
			RCUT at Gadwall Rd; restrict access at TH 60; close access at 208th Ln and Loren Dr	Realign Gadwall Rd; close access at 208th Ln, Loren Dr, and CR 117
AM	Northbound	121	155	N/A - did not model this concept
	Southbound	121	153	
PM	Northbound	127	111	
	Southbound	115	110	

Table 17. Change In Travel Time Compared to No Build				
Peak Hour	Direction	No Build - Section 3	Local System Concepts	
			3a	3b
			RCUT at Gadwall Rd; restrict access at TH 60; close access at 208th Ln and Loren Dr	Realign Gadwall Rd; close access at 208th Ln, Loren Dr, and CR 117
AM	Northbound	Baseline	34	N/A - did not model this concept
	Southbound		31	
PM	Northbound		-16	
	Southbound		-5	
Average Change in Travel Time		*Baseline*	11	*N/A - did not model this concept*

Tables 16 and **17** indicate that Concept 3a is anticipated to minimally increase the travel time compared to the 2040 No Build scenario. Concept 3b was not modeled, however, it is anticipated to operate similarly to Concept 3a assuming mainline TH 169 has the priority at each intersection.

Conclusion

This report summarizes the alterative traffic analysis of Highway 169 in the Northern Subarea from Lake St to the Veterans' Memorial Bridge and in the southern subarea from the Blue Earth River Crossing to Highway 60. Several concept designs were analyzed in both subareas. The concepts that operate acceptably are detailed below.

Northern Subarea

- Signals, roundabouts, or signalized RCUTs at a combined Lind St/River Ln and Webster Ave intersections were found to operate well.
- An interchange near Webster Ave that would combine Lind St, River Ln, and Webster Ave was found to operate well.
- At the TH 14/TH 169 interchange both a signalized intersection at the EB TH 14 ramps or a diverging diamond interchange were found to operate well.

Southern Subarea

- In Section 1 a signalized Green-T was found to operate well at either Hawley St or CSAH 33.
- In Section 2 both a High-T or a right-in/right-out were found to operate well at the TH 68 and TH 169 intersection.
- In Section 2 a full access intersection operates well if signalized.

- In Section 3 an RCUT at Gadwall Rd and restricting access at TH 60 was found to operate well.

The travel time analysis indicated that all concepts in the northern subarea except Concept 2e are anticipated to minimally change the travel time compared to the 2040 No Build scenario. In the southern subarea, all concepts were shown to have a minimal impact on travel time compared to the 2040 No Build scenario.

Appendix A: Northern Subarea Detailed Traffic Operations

Table A1: Northern Subarea - Concept 1 - Signalized Green-T - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)							
				NBT		SBT		EBL		EBR	
Hwy 169 & EB TH 14 Exit	AM	12	B	0	A	9	A	45	D	23	C
Signalized Intersection	PM	9	A	1	A	7	A	49	D	26	C

1. Delay in seconds per vehicle

Table A2: Northern Subarea - Concept 1 - Signalized Green-T - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)							
		EBL		EBR		NBT		SBT	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max
Hwy 169 & EB TH 14 Exit	AM	150	300	150	325	-	-	125	325
Signalized Intersection	PM	150	300	100	275	-	-	150	325

Table A3: Northern Subarea - Concept 2 - Access Relocation (Combined River Ln/Lind St) - Signalized Intersections - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)																					
				NBL		NBT		NBR		SBL		SBT		SBR		EBL		EBT		EBR		WBL		WBT		WBR	
Hwy 169 & Lind St/River Ln	AM	33	C	39	D	30	C	18	B	75	E	29	C	7	A	43	D	43	D	14	B	50	D	63	E	52	D
Signalized Intersection	PM	32	C	56	E	25	C	15	B	96	F	23	C	7	A	50	D	52	D	18	B	66	E	57	E	62	E
Hwy 169 & Webster Ave	AM	28	C	61	E	19	B	6	A	72	E	30	C	19	B	49	D	50	D	21	C	36	D	37	D	12	B
Signalized Intersection	PM	30	C	75	E	22	C	6	A	79	E	27	C	19	B	55	E	67	E	27	C	38	D	36	D	16	B

1. Delay in seconds per vehicle

Table A4: Northern Subarea - Concept 2 - Access Relocation (Combined River Ln/Lind St) - Signalized Intersections - 2040 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
Hwy 169 & Lind St/River Ln	AM	75	175	75	175	25	75	200	575	200	575	200	325	25	50	250	725	75	400	150	400	300	550	25	325
Signalized Intersection	PM	75	175	75	175	25	75	225	700	225	700	225	325	25	100	225	500	50	200	200	450	250	525	25	225
Hwy 169 & Webster Ave	AM	250	525	250	525	75	175	25	100	25	100	25	75	100	175	200	475	25	125	25	50	175	500	75	350
Signalized Intersection	PM	275	550	275	550	100	175	50	175	50	175	25	100	125	250	250	425	25	50	50	125	200	425	75	250

Table A5: Northern Subarea - Concept 2 - Access Relocation (Combined River Ln/Lind St) - Roundabouts - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)																							
				NBL		NBT		NBR		SBL		SBT		SBR		EBL		EBT		EBR		WBL		WBT		WBR	
Hwy 169 & Lind St/River Ln	AM	7	A	7	A	6	A	6	A	7	A	5	A	5	A	67	F	68	F	46	E	13	B	16	C	2	A
Roundabout	PM	8	A	9	A	8	A	8	A	10	B	6	A	6	A	56	F	59	F	37	E	19	C	14	B	2	A
Hwy 169 & Webster Ave	AM	11	B	16	C	11	B	11	B	5	A	4	A	5	A	34	D	6	A	16	C	68	F	40	E	41	E
Roundabout	PM	10	B	11	B	7	A	6	A	6	A	5	A	5	A	29	D	46	E	16	C	52	F	52	F	39	E

1. Delay in seconds per vehicle

Table A6: Northern Subarea - Concept 2 - Access Relocation (Combined River Ln/Lind St) - Roundabouts - 2040 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
Hwy 169 & Lind St/River Ln	AM	50	250	50	250	50	250	25	100	25	100	0	0	25	325	25	325	25	325	25	250	25	250	25	250
Roundabout	PM	50	200	50	200	50	200	25	150	25	150	0	0	50	400	50	400	50	400	25	350	25	350	25	350
Hwy 169 & Webster Ave	AM	100	500	100	500	100	500	25	200	25	200	25	200	50	400	50	400	50	400	25	225	25	225	25	225
Roundabout	PM	100	600	100	600	100	600	25	225	25	225	25	225	50	350	50	350	50	350	25	275	25	275	25	275

Table A7: Northern Subarea - Concept 2 - Access Relocation (Combined River Ln/Lind St) - Signalized RCUTs - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)																			
				NBU		NBL		NBT		NBR		SBU		SBL		SBT		SBR		EBR		WBR	
Hwy 169 & Lind St/River Ln	AM	17	B	-		47	D	19	B	8	A	-		45	D	9	A	3	A	16	B	35	D
Signalized Intersection	PM	30	C	-		61	E	28	C	10	B	-		76	E	21	C	6	A	22	C	67	E
Hwy 169 & Webster Ave	AM	12	B	-		49	D	10	B	5	A	-		45	D	7	A	5	A	27	C	16	B
Signalized Intersection	PM	17	B	-		44	D	14	B	6	A	-		43	D	19	B	11	B	21	C	17	B
Hwy 169 & Lind/River North U-Turn	AM	4	A	33	C	-		4	A	-		-		-		3	A	-		-		-	
Signalized Intersection	PM	4	A	32	C	-		3	A	-		-		-		2	A	-		-		-	
Hwy 169 & Lind/River South U-Turn	AM	5	A	-		-		2	A	-		73	E	-		4	A	-		-		-	
Signalized Intersection	PM	4	A	-		-		2	A	-		63	E	-		3	A	-		-		-	
Hwy 169 & Webster North U-Turn	AM	4	A	72	E	-		5	A	-		-		-		1	A	-		-		-	
Signalized Intersection	PM	4	A	74	E	-		3	A	-		-		-		1	A	-		-		-	
Hwy 169 & Webster South U-Turn	AM	10	B	-		-		10	B	-		39	D	-		4	A	-		-		-	
Signalized Intersection	PM	7	A	-		-		7	A	-		27	C	-		3	A	-		-		-	

1. Delay in seconds per vehicle

Table A8: Northern Subarea - Concept 2 - Access Relocation (Combined River Ln/Lind St) - Signalized RCUTs - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)																			
		EBR		WBR		NBU		NBL		NBT		NBR		SBU		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Hwy 169 & Lind St/River Ln	AM	50	150	200	525	-	-	25	50	175	475	75	250	-	-	100	250	100	275	25	150
Signalized Intersection	PM	50	225	350	650	-	-	25	75	375	750	100	500	-	-	200	500	275	675	50	400
Hwy 169 & Webster Ave	AM	175	375	25	125	-	-	75	150	125	275	25	50	-	-	25	75	75	200	50	100
Signalized Intersection	PM	150	325	50	125	-	-	100	175	150	350	25	50	-	-	25	100	200	400	100	175
Hwy 169 & Lind/River North U-Turn	AM	-	-	-	-	50	125	-	-	25	200	-	-	-	-	-	-	50	125	-	-
Signalized Intersection	PM	-	-	-	-	75	175	-	-	-	-	-	-	-	-	-	-	75	175	-	-
Hwy 169 & Lind/River South U-Turn	AM	-	-	-	-	-	-	-	-	50	175	-	-	100	200	-	-	-	-	-	-
Signalized Intersection	PM	-	-	-	-	-	-	-	-	50	175	-	-	100	150	-	-	25	100	-	-
Hwy 169 & Webster North U-Turn	AM	-	-	-	-	50	125	-	-	0	25	-	-	-	-	-	-	25	50	-	-
Signalized Intersection	PM	-	-	-	-	75	175	-	-	25	50	-	-	-	-	-	-	50	200	-	-
Hwy 169 & Webster South U-Turn	AM	-	-	-	-	-	-	-	-	100	225	-	-	175	300	-	-	-	-	-	-
Signalized Intersection	PM	-	-	-	-	-	-	-	-	125	225	-	-	175	300	-	-	25	75	-	-

Table A9a: Northern Subarea - Concept 3 - Combined River Ln/Lind St/Webster Ave (At Grade Signal) - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)																					
				NBL		NBT		NBR		SBL		SBT		SBR		EBL		EBT		EBR		WBL		WBT		WBR	
Hwy 169 & Lind St/River Ln/Webster Ave	AM	41	D	69	E	36	D	11	B	68	E	32	C	9	A	96	F	40	D	23	C	63	E	49	D	42	D
Signalized Intersection	PM	45	D	62	E	53	D	15	B	69	E	37	D	13	B	75	E	33	C	18	B	90	F	57	E	34	C

1. Delay in seconds per vehicle

Table A10a: Northern Subarea - Concept 3 - Combined River Ln/Lind St/Webster Ave (At Grade Signal) - 2040 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
Hwy 169 & Lind St/River Ln/Webster Ave	AM	225	325	200	625	75	275	100	200	75	450	200	425	100	300	275	475	75	275	150	275	250	425	75	150
Signalized Intersection	PM	200	325	75	475	75	325	125	275	75	500	225	425	150	425	400	725	150	500	200	425	275	450	100	300

Table A9b: Northern Subarea - Concept 3 - Combined River Ln/Lind St/Webster Ave (Interchange) - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)																					
				NBL		NBT		NBR		SBL		SBT		SBR		EBL		EBT		EBR		WBL		WBT		WBR	
SB TH 169 Ramps	AM	6	A	-		-		-		6	A	-		6	A	-		8	A	6	A	4	A	5	A	-	
Roundabout	PM	11	B	-		-		-		17	C	-		17	C	-		8	A	7	A	4	A	5	A	-	
NB TH 169 Ramps	AM	18	C	22	C	-		21	C	-		-		-		10	B	10	A	-		-		27	D	25	D
Roundabout	PM	10	B	8	A	-		9	A	-		-		-		6	A	7	A	-		-		18	C	15	C

1. Delay in seconds per vehicle

Table A10b: Northern Subarea - Concept 3 - Combined River Ln/Lind St/Webster Ave (Interchange) - 2040 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
SB TH 169 Ramps	AM	-		75	175	75	175	25	25	25	25	-		-		-		-		50	175	-		50	175
Roundabout	PM	-		75	200	75	200	25	75	25	75	-		-		-		-		125	325	-		125	325
NB TH 169 Ramps	AM	75	275	75	275	-		-		150	500	150	500	125	375	-		125	375	-		-		-	
Roundabout	PM	50	175	50	175	-		-		125	350	125	350	75	175	-		75	175	-		-		-	

Table A11: Northern Subarea - Concept 4 - Full Cloverleaf Interchange- 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)																			
				NBL	NBT		NBR		SBL	SBT		SBR		EBL	EBT		EBR		WBL	WBT		WBR	
SB TH 169 at WB TH 14 Ent & NB TH 169 at WB TH 14 Exit	AM	0	A	-	0	A	-		-	0	A	1	A	-	-		-		-	-		1	A
Stop Controlled	PM	0	A	-	0	A	-		-	0	A	2	A	-	-		-		-	-		0	A
SB TH 169 at WB TH 14 Exit Ramp & NB TH 169 at WB TH 14 Ent	AM	0	A	-	0	A	0	A	-	0	A	-		-	-		1	A	-	-		-	
Stop Controlled	PM	1	A	-	0	A	0	A	-	0	A	-		-	-		1	A	-	-		-	
SB TH 169 at EB TH 14 Ent &NB TH 169 at EB TH 14 Exit	AM	1	A	-	0	A	-		-	1	A	1	A	-	-		-		-	-		0	A
Stop Controlled	PM	1	A	-	0	A	-		-	1	A	1	A	-	-		-		-	-		0	A
EB TH 14 Exit & Hwy 169	AM	0	A	-	0	A	-		-	0	A	-		-	0	A	1	A	-	-		-	
Stop Controlled	PM	0	A	-	0	A	-		-	0	A	-		-	0	A	0	A	-	-		-	
NB TH 169 & EB TH 14 Ent	AM	1	A	-	1	A	1	A	-	1	A	-		-	-		-		-	-		-	
Stop Controlled	PM	1	A	-	1	A	1	A	-	0	A	-		-	-		-		-	-		-	
TH 14 & EB TH 14 Exit	AM	2	A	-	4	A	3	A	-	0	A	-		-	-		-		-	-		-	
Stop Controlled	PM	2	A	-	5	A	4	A	-	0	A	-		-	-		-		-	-		-	
TH 14 & WB TH 14 Ent	AM	2	A	-	-		-		-	-		6	A	-	1	A	-		-	2	A	-	
Stop Controlled	PM	2	A	-	-		-		-	-		6	A	-	1	A	-		-	3	A	-	
TH 14 at WB TH 14 Exit (to SB TH 169) & TH 14 at EB TH 14 Ent (from SB TH 169)	AM	1	A	-	-		0	A	-	-		-		-	2	A	-		-	1	A	1	A
Stop Controlled	PM	2	A	-	-		0	A	-	-		-		-	2	A	-		-	2	A	1	A
TH 14 at WB TH 14 Ent (from NB TH 169) & TH 14 at EB TH 14 Exit (to NB TH 169)	AM	1	A	-	-		-		-	-		0	A	-	1	A	0	A	-	2	A	-	
Stop Controlled	PM	3	A	-	-		-		-	-		0	A	-	1	A	0	A	-	4	A	-	
TH 14 & WB TH 14 Exit	AM	2	A	-	1	A	1	A	-	-		-		-	2	A	-		-	1	A	1	A
Stop Controlled	PM	3	A	-	1	A	1	A	-	-		-		-	3	A	-		-	4	A	1	A

1. Delay in seconds per vehicle

Table A12: Northern Subarea - Concept 4 - Full Cloverleaf Interchange - 2040 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
SB TH 169 at WB TH 14 Ent & NB TH 169 at WB TH 14 Exit	AM	-		-		-		-		-		0	0	-		0	0	-		-		0	0	0	0
Stop Controlled	PM	-		-		-		-		-		0	0	-		0	0	-		-		0	0	0	0
SB TH 169 at WB TH 14 Exit Ramp & NB TH 169 at WB TH 14 Ent	AM	-		-		0	0	-		-		-		-		0	0	0	0	-		0	0	-	
Stop Controlled	PM	-		-		0	0	-		-		-		-		0	0	0	0	-		0	0	-	
SB TH 169 at EB TH 14 Ent &NB TH 169 at EB TH 14 Exit	AM	-		-		-		-		-		0	0	-		0	0	-		-		0	0	0	0
Stop Controlled	PM	-		-		-		-		-		0	0	-		0	0	-		-		0	0	0	0
EB TH 14 Exit & Hwy 169	AM	-		0	0	0	0	-		-		-		-		0	0	-		-		0	0	-	
Stop Controlled	PM	-		0	0	0	0	-		-		-		-		0	0	-		-		0	0	-	
NB TH 169 & EB TH 14 Ent	AM	-		-		-		-		-		-		-		0	0	0	0	-		0	25	-	
Stop Controlled	PM	-		-		-		-		-		-		-		0	0	0	0	-		0	0	-	
TH 14 & EB TH 14 Exit	AM	-		-		-		-		-		-		-		0	0	0	0	-		0	0	-	
Stop Controlled	PM	-		-		-		-		-		-		-		0	0	0	0	-		0	25	-	
TH 14 & WB TH 14 Ent	AM	-		0	0	-		-		0	0	-		-		-		-		-		-		0	25
Stop Controlled	PM	-		0	0	-		-		0	0	-		-		-		-		-		-		0	25
TH 14 at WB TH 14 Exit (to SB TH 169) & TH 14 at EB TH 14 Ent (from SB TH 169)	AM	-		0	0	-		-		0	0	0	0	-		-		0	0	-		-		-	
Stop Controlled	PM	-		0	0	-		-		0	0	0	0	-		-		0	0	-		-		-	
TH 14 at WB TH 14 Ent (from NB TH 169) & TH 14 at EB TH 14 Exit (to NB TH 169)	AM	-		0	0	0	0	-		0	0	-		-		-		-		-		-		0	0
Stop Controlled	PM	-		0	0	0	0	-		0	0	-		-		-		-		-		-		0	0
TH 14 & WB TH 14 Exit	AM	-		0	25	-		-		0	0	0	0	-		0	0	0	25	-		-		-	
Stop Controlled	PM	-		0	50	-		-		0	0	0	0	-		0	0	0	0	-		-		-	

Table A13a: Northern Subarea - Concept 4 - Eliminate South Loop (Roundabout) - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)											
				NBT		NBR		SBL		SBT		EBL		EBR	
Hwy 169 & EB TH 14 Ramps	AM	63	F	7	A	5	A	3	A	3	A	330	F	435	F
Roundabout	PM	45	E	10	B	4	A	4	A	4	A	371	F	444	F

1. Delay in seconds per vehicle

Table A14a: Northern Subarea - Concept 4 - Eliminate South Loop (Roundabout) - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)											
		EBL		EBR		NBT		NBR		SBL		SBT	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Hwy 169 & EB TH 14 Ramps	AM	975	2225	2350	4900	25	350	25	250	0	50	0	50
Roundabout	PM	975	3075	1500	3225	50	325	25	200	0	125	0	125

Table A13b: Northern Subarea - Concept 4 - Eliminate South Loop (Signal) - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)											
				NBT		NBR		SBL		SBT		EBL		EBR	
Hwy 169 & EB TH 14 Ramps	AM	19	B	18	B	13	B	60	E	10	B	47	D	26	C
Signalized Intersection	PM	22	C	27	C	18	B	61	E	8	A	57	E	24	C

1. Delay in seconds per vehicle

Table A14b: Northern Subarea - Concept 4 - Eliminate South Loop (Signal) - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)											
		EBL		EBR		NBT		NBR		SBL		SBT	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Hwy 169 & EB TH 14 Ramps	AM	150	275	150	375	150	325	50	375	150	250	150	300
Signalized Intersection	PM	150	300	100	250	275	525	150	500	150	275	150	350

Table A15a: Northern Subarea - Concept 4 - Diverging Diamond - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)																			
				NBL		NBT		NBR		SBL		SBT		SBR		EBL		EBT		EBR		WBL		WBT		WBR	
TH 169 Crossover (North)	AM	8	A	-		8	A	-		-		14	B	1	A	-		-		-		-		-		-	
Signalized Intersection	PM	9	A	-		5	A	-		-		15	B	0	A	-		-		-		-		-		-	
WBL TH 14 Exit Ramp at SB TH 169	AM	8	A	-		-		-		-		2	A	-		-		-		-		16	B	-		-	
Signalized Intersection	PM	10	B	-		-		-		-		3	A	-		-		-		-		17	B	-		-	
TH 169 Crossover (South)	AM	10	B	-		13	B	-		-		8	A	-		-		-		-		-		-		-	
Signalized Intersection	PM	11	B	-		14	B	-		-		9	A	-		-		-		-		-		-		-	
EBL TH 14 Exit Ramp at NB TH 169	AM	5	A	-		2	A	-		-		-		-		16	B	-		-		-		-		-	
Signalized Intersection	PM	4	A	-		2	A	-		-		-		-		13	B	-		-		-		-		-	
WBR TH 14 Exit Ramp at NB TH 169	AM	4	A	-		1	A	-		-		-		-		-		-		-		-		-		10	B
Stop Controlled	PM	4	A	-		2	A	-		-		-		-		-		-		-		-		-		12	B
WB TH 14 Exit (WBL/WBR Split)	AM	1	A	-		-		-		-		-		-		-		-		-		1	A	-		0	A
Stop Controlled	PM	4	A	-		-		-		-		-		-		-		-		-		5	A	-		1	A
WB TH 14 Entrance (SBR/NBL Merge)	AM	2	A	-		-		-		-		-		-		-		-		-		-		0	A	2	A
Stop Controlled	PM	1	A	-		-		-		-		-		-		-		-		-		-		0	A	1	A
NB Hwy 169 at NBT/NBR Split	AM	2	A	-		2	A	3	A	-		-		-		-		-		-		-		-		-	
Stop Controlled	PM	5	A	-		7	A	3	A	-		-		-		-		-		-		-		-		-	
EBR TH 14 Exit Ramp at SB TH 169	AM	4	A	-		-		-		-		2	A	-		-		-		12	B	-		-		-	
Signalized Intersection	PM	3	A	-		-		-		-		2	A	-		-		-		12	B	-		-		-	
EB TH 14 Entrance (NBR/SBL Merge)	AM	4	A	-		-		-		-		-		-		-		1	A	4	A	-		-		-	
Stop Controlled	PM	3	A	-		-		-		-		-		-		-		2	A	4	A	-		-		-	
SB TH 169 at EB TH 14 Entrance Ramp	AM	4	A	-		-		-		3	A	4	A	-		-		-		-		-		-		-	
Stop Controlled	PM	8	A	-		-		-		8	A	8	A	-		-		-		-		-		-		-	
NB TH 169 at WB TH 14 Entrance Ramp	AM	2	A	3	A	1	A	-		-		-		-		-		-		-		-		-		-	
Stop Controlled	PM	2	A	3	A	2	A	-		-		-		-		-		-		-		-		-		-	
EB TH 14 Exit (EBL/EBR Split)	AM	1	A	-		-		-		-		-		-		1	A	-		1	A	-		-		-	
Stop Controlled	PM	1	A	-		-		-		-		-		-		2	A	-		1	A	-		-		-	

1. Delay in seconds per vehicle

Table A16a: Northern Subarea - Concept 4 - Diverging Diamond - 2040 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
TH 169 Crossover (North)	AM	-		-		-		-		-		-		-		100	175	-		-		125	200	0	0
Signalized Intersection	PM	-		-		-		-		-		-		-		50	150	-		-		150	225	0	0
WBL TH 14 Exit Ramp at SB TH 169	AM	-		-		-		125	200	-		-		-		-		-		-		0	25	-	
Signalized Intersection	PM	-		-		-		175	225	-		-		-		-		-		-		0	25	-	
TH 169 Crossover (South)	AM	-		-		-		-		-		-		-		150	175	-		-		125	125	-	
Signalized Intersection	PM	-		-		-		-		-		-		-		175	200	-		-		125	150	-	
EBL TH 14 Exit Ramp at NB TH 169	AM	100	175	-		-		-		-		-		-		0	25	-		-		-		-	
Signalized Intersection	PM	75	150	-		-		-		-		-		-		0	25	-		-		-		-	
WBR TH 14 Exit Ramp at NB TH 169	AM	-		-		-		-		-		75	150	-		0	25	-		-		-		-	
Stop Controlled	PM	-		-		-		-		-		75	150	-		0	25	-		-		-		-	
WB TH 14 Exit (WBL/WBR Split)	AM	-		-		-		25	75	-		0	0	-		-		-		-		-		-	
Stop Controlled	PM	-		-		-		25	150	-		0	0	-		-		-		-		-		-	
WB TH 14 Entrance (SBR/NBL Merge)	AM	-		-		-		-		0	50	50	150	-		-		-		-		-		-	
Stop Controlled	PM	-		-		-		-		0	25	25	75	-		-		-		-		-		-	
NB Hwy 169 at NBT/NBR Split	AM	-		-		-		-		-		-		-		25	100	0	25	-		-		-	
Stop Controlled	PM	-		-		-		-		-		-		-		50	150	0	0	-		-		-	
EBR TH 14 Exit Ramp at SB TH 169	AM	-		-		100	200	-		-		-		-		-		-		-		0	25	-	
Signalized Intersection	PM	-		-		75	175	-		-		-		-		-		-		-		0	25	-	
EB TH 14 Entrance (NBR/SBL Merge)	AM	-		0	0	75	175	-		-		-		-		-		-		-		-		-	
Stop Controlled	PM	-		0	50	75	150	-		-		-		-		-		-		-		-		-	
SB TH 169 at EB TH 14 Entrance Ramp	AM	-		-		-		-		-		-		-		-		-		50	200	75	200	-	
Stop Controlled	PM	-		-		-		-		-		-		-		-		-		100	250	100	250	-	
NB TH 169 at WB TH 14 Entrance Ramp	AM	-		-		-		-		-		-		0	0	0	25	-		-		-		-	
Stop Controlled	PM	-		-		-		-		-		-		0	25	0	25	-		-		-		-	
EB TH 14 Exit (EBL/EBR Split)	AM	0	25	-		0	25	-		-		-		-		-		-		-		-		-	
Stop Controlled	PM	0	0	-		0	0	-		-		-		-		-		-		-		-		-	

Table A15b: Northern Subarea - Concept 4 - Eliminate Both Loops (Roundabout) - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)																	
				NBL		NBT		NBR		SBL		SBT		SBR		EBL		EBR		WBL		WBR	
Hwy 169 & WB TH 14 Ramps	AM	17	C	8	A	3	A	-		-		24	C	25	D	-		-		25	D	21	C
Roundabout	PM	78	F	8	A	4	A	-		-		42	E	49	E	-		-		201	F	273	F
Hwy 169 & EB TH 14 Ramps	AM	22	C	-		7	A	5	A	3	A	2	A	-		84	F	123	F	-		-	
Roundabout	PM	10	B	-		9	A	4	A	4	A	3	A	-		36	E	52	F	-		-	

1. Delay in seconds per vehicle

Table A16b: Northern Subarea - Concept 4 - Eliminate Both Loops (Roundabout) - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)																			
		EBL		EBR		WBL		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
Hwy 169 & WB TH 14 Ramps	AM	-		-		50	425	25	250	25	150	25	150	-		-		75	475	75	475
Roundabout	PM	-		-		675	1600	625	1650	0	100	0	75	-		-		150	550	150	550
Hwy 169 & EB TH 14 Ramps	AM	50	575	525	1900	-		-		-		25	350	25	250	0	125	0	125	-	
Roundabout	PM	25	200	75	450	-		-		-		25	300	25	200	0	125	0	125	-	

Table A17: Northern Subarea - Concept 4 - Signalize EB TH 14 Exit Ramp - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)																			
				NBL		NBT		NBR		SBL		SBT		SBR		EBL		EBT		EBR		WBL		WBT	WBR
Hwy 169 & EB TH 14 Ramps	AM	12	B	-		5	A	-		-		6	A	-		46	D	-		20	C	-		-	-
Signalized Intersection	PM	9	A	-		4	A	-		-		5	A	-		48	D	-		19	B	-		-	-

1. Delay in seconds per vehicle

Table A18: Northern Subarea - Concept 4 - Signalize EB TH 14 Exit Ramp - 2040 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
Hwy 169 & EB TH 14 Ramps	AM	150	250	-	-	125	300	-	-	-	-	-	-	-	-	100	225	-	-	-	-	125	250	-	-
Signalized Intersection	PM	125	250	-	-	100	200	-	-	-	-	-	-	-	-	125	275	-	-	-	-	125	250	-	-

Table A19: Detailed Vissim Analysis - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)																							
				NBL		NBT		NBR		SBL		SBT		SBR		EBL		EBT		EBR		WBL		WBT		WBR	
Hwy 169 & EB TH 14 Ramps	AM	18	B	-		20	C	4	A	66	E	10	B	-		48	D	-		32	C	-		-		-	
Signalized Intersection	PM	17	B	-		18	B	5	A	62	E	7	A	-		61	E	-		37	D	-		-		-	
Hwy 169 & Lind St/River Ln	AM	8	A	7	A	5	A	6	A	12	B	8	A	8	A	45	E	40	E	31	D	15	C	19	C	2	A
Roundabout	PM	9	A	10	B	8	A	8	A	13	B	10	B	9	A	37	E	41	E	29	D	19	C	15	C	2	A
Hwy 169 & Webster Ave	AM	10	B	16	C	11	B	11	B	5	A	5	A	5	A	24	C	6	A	11	B	67	F	31	D	41	E
Roundabout	PM	10	B	11	B	7	A	6	A	7	A	6	A	6	A	26	D	33	D	13	B	42	E	39	E	27	D

1. Delay in seconds per vehicle

Table A20: Detailed Vissim Analysis - 2040 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
Hwy 169 & EB TH 14 Ramps	AM	75	325	-	-	75	450	-	-	-	-	-	-	-	-	50	325	25	375	75	350	50	350	-	-
Signalized Intersection	PM	75	325	-	-	50	275	-	-	-	-	-	-	-	-	75	425	25	425	75	325	25	300	-	-
Hwy 169 & Lind St/River Ln	AM	25	225	25	225	25	225	25	125	25	125	0	0	25	300	25	300	25	300	25	425	25	425	25	425
Roundabout	PM	25	175	25	175	25	175	25	150	25	150	0	0	50	425	50	425	50	425	25	425	25	425	25	425
Hwy 169 & Webster Ave	AM	50	425	50	425	50	425	25	200	25	200	25	200	50	375	50	375	50	375	25	275	25	275	25	275
Roundabout	PM	75	550	75	550	75	550	25	200	25	200	25	200	50	325	50	325	50	325	25	300	25	300	25	300

Appendix B: Northern Subarea Concept Drawings

LEGEND

- PROPOSED ROADWAY
- PROPOSED SHOULDER
- PROPOSED CURB AND GUTTER
- PROPOSED RAISED MEDIAN
- PROPOSED WALK
- WETLAND
- PARCELS
- TRAFFIC SIGNAL

100 0 100 200
scale 50 feet

W LIND CT

N RIVER DR

169

14

W LIND ST

HINIKER POND

SEH
PHONE: (651)490-2000
3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110

SEH PROJECT NO. 154596

DATE: 3/4/2021

US 169 CORRIDOR STUDY

US 14 SOUTH RAMP GREEN T

2:22:20 PM
3/4/2021
shotchkin
X:\AE\B\BOLTM\154596\4-prelim-dsgn-rpts\43-prelim-dsgn\Figures\Plansheets\CP154596_fig1.dgn

LEGEND

- PROPOSED ROADWAY
- PROPOSED SHOULDER
- PROPOSED CURB AND GUTTER
- PROPOSED RAISED MEDIAN
- PROPOSED WALK
- WETLAND
- PARCELS
- TRAFFIC SIGNAL

INSET 1 - SOUTH RAMP ALTERNATIVE GEOMETRICS

200 0 200 400
scale 100 feet

MINNESOTA RIVER

W LIND CT

N RIVER LN

PAULEY CT

N RIVER DR

169

RANGE ST

W LIND ST

14

HINIKER POND

WEBSTER AVE

CROSS ST

RANGE ST

SEH
PHONE: (651)490-2000
3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110

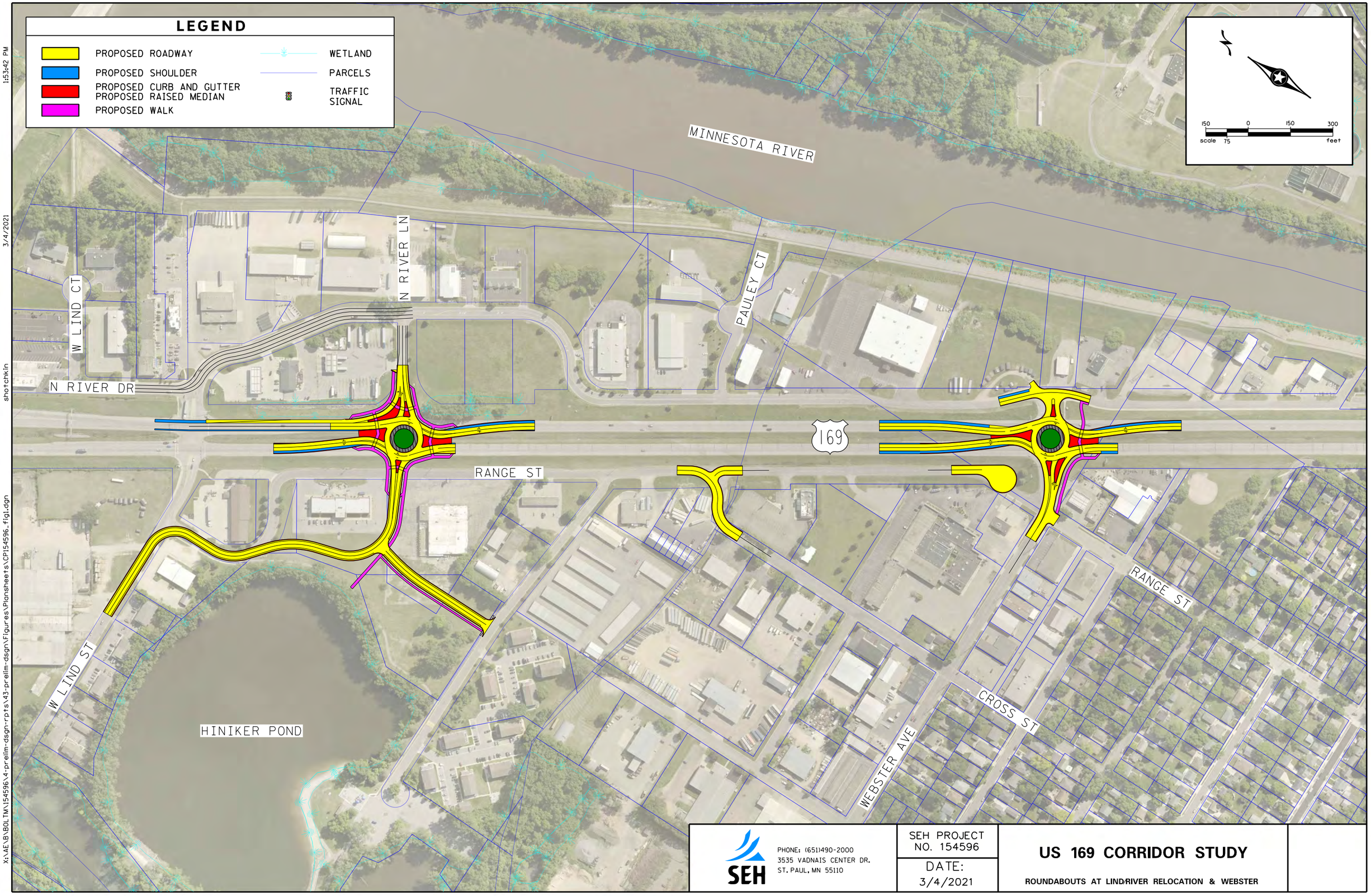
SEH PROJECT NO. 154596

DATE: 7/29/2021

US 169 CORRIDOR STUDY

TRADITIONAL SIGNAL AT US 14 SOUTH RAMP, LIND/RIVER RELOCATION & WEBSTER

1:56:11 PM
7/29/2021
shotchkin
X:\AE\B\BOLTM\154596\4-prelim-dsgn-rpts\43-prelim-dsgn\Figures\Plansheets\CP154596_fig1.dgn



SEH
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ROUNDABOUTS AT LIND/RIVER RELOCATION & WEBSTER

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LEGEND

- PROPOSED ROADWAY
- PROPOSED SHOULDER
- PROPOSED CURB AND GUTTER
- PROPOSED RAISED MEDIAN
- PROPOSED WALK
- WETLAND
- PARCELS
- TRAFFIC SIGNAL

150 0 150 300
scale 75 feet

MINNESOTA RIVER
N RIVER LN
PAULEY CT
W LIND CT
N RIVER DR
169
RANGE ST
W LIND ST
HINIKER POND
WEBSTER AVE
CROSS ST
RANGE ST

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RCUT AT LIND/RIVER RELOCATION & WEBSTER

LEGEND

WETLAND

PARCELS

200 0 600

scale feet

14

169

FULL INTERCHANGE NEAR WEBSTER

MINNESOTA RIVER

N RIVER LN

N RIVER DR

W LIND CT

RANGE ST

1 MILE

CLOSE

CROSS ST

R 170'

APPROX. FULL CLOVERLEAF INTERCHANGE

BUTTERWORTH ST

W LIND ST

HINIKER POND

WEBSTER AVE

LAKE ST NW

LAKE ST

COVENTRY LN

SEH

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FUTURE FREEWAY CONDITION

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LEGEND

- PROPOSED ROADWAY
- PROPOSED SHOULDER
- PROPOSED CURB AND GUTTER
- PROPOSED RAISED MEDIAN
- PROPOSED WALK
- WETLAND
- PARCELS
- TRAFFIC SIGNAL

N

100 0 100 200
scale 50 feet

169

14

W LIND CT

N RIVER DR

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DIVERGING DIAMOND INTERCHANGE

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LEGEND

- PROPOSED ROADWAY
- PROPOSED SHOULDER
- PROPOSED CURB AND GUTTER
- PROPOSED RAISED MEDIAN
- PROPOSED WALK
- WETLAND
- PARCELS
- TRAFFIC SIGNAL

N

100 0 100 200
scale 50 feet

169

14

W LIND CT

N RIVER DR

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ROUNDABOUT INTERCHANGE

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Appendix C: Southern Subarea Detailed Traffic Operations

Table A21: Southern Subarea Section 1 - Concept 1A- 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)											
				NBR		EBU		EBT		EBR		WBL		WBT	
CSAH 69 (Hawley St) & Hwy 169	AM	26	D	1	A	-		2	A	3	A	189	F	16	C
Stop Controlled	PM	3	A	1	A	-		2	A	3	A	32	D	4	A
CSAH 33 & Hwy 169	AM	5	A	2	A	-		3	A	1	A	33	D	1	A
Stop Controlled	PM	10	B	2	A	-		4	A	1	A	119	F	2	A
Hwy 169 & CSAH 33 EB U-Turn	AM	2	A	-		26	D	2	A	-		-		1	A
Stop Controlled	PM	3	A	-		21	C	4	A	-		-		1	A

1. Delay in seconds per vehicle

Table A22: Southern Subarea Section 1 - Concept 1A - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)											
		EBU		EBT		EBR		WBL		WBT		NBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
CSAH 69 (Hawley St) & Hwy 169	AM	-	-	-	-	25	75	325	1675	375	1675	-	-
Stop Controlled	PM	-	-	-	-	25	25	25	75	-	-	-	-
CSAH 33 & Hwy 169	AM	-	-	-	-	0	25	125	300	25	75	-	-
Stop Controlled	PM	-	-	-	-	25	25	225	450	50	200	-	-
Hwy 169 & CSAH 33 EB U-Turn	AM	25	50	-	-	-	-	-	-	-	-	-	-
Stop Controlled	PM	50	75	25	200	-	-	-	-	-	-	-	-

Table A23: Southern Subarea Section 1 - Concept 1B (All WBLs from Hawley use U-Turn) - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)													
				NBR		EBU		EBT		EBR		WBU		WBL		WBT	
CSAH 69 (Hawley St) & Hwy 169	AM	4	A	-		-		3	A	6	A	-		-		4	A
Stop Controlled	PM	2	A	-		-		2	A	3	A	-		-		2	A
CSAH 33 & Hwy 169	AM	6	A	2	A	-		3	A	1	A	-		44	E	1	A
Stop Controlled	PM	16	C	2	A	-		4	A	1	A	-		214	F	2	A
Hwy 169 & CSAH 33 EB U-Turn	AM	3	A	-		34	D	5	A	-		-		-		0	A
Stop Controlled	PM	4	A	-		24	C	6	A	-		-		-		0	A
Hwy 169 & Hawley St WB U-Turn	AM	8	A	-		-		1	A	-		77	F	-		2	A
Stop Controlled	PM	4	A	-		-		0	A	-		247	F	-		5	A

1. Delay in seconds per vehicle

Table A24: Southern Subarea Section 1 - Concept 1B (All WBLs from Hawley use U-Turn) - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Movement Delay (sec/veh)													
		NBR		EBU		EBT		EBR		WBU		WBL		WBT	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
CSAH 69 (Hawley St) & Hwy 169	AM	-		-	-	-		-		-		-		-	
Stop Controlled	PM	-		-	-	-		-		-		-		-	
CSAH 33 & Hwy 169	AM	-		-	-	-		0	25	-		150	350	25	100
Stop Controlled	PM	-		-	-	-		25	50	-		350	650	150	525
Hwy 169 & CSAH 33 EB U-Turn	AM	-		25	75	-		-		-		-		-	-
Stop Controlled	PM	-		50	75	-		-		-		-		0	25
Hwy 169 & Hawley St WB U-Turn	AM	-		-	-	25	50	-		200	600	-		25	350
Stop Controlled	PM	-		-	-	-	-	-		50	125	-		-	-

Table A25: Southern Subarea Section 1 - Concept 1B (Half WBLs from Hawley use U-Turn, Half use CSAH 33) - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)											
				NBR		EBU		EBT		EBR		WBU		WBL		WBT	
CSAH 69 (Hawley St) & Hwy 169	AM	3	A	-		-		2	A	4	A	-		-		4	A
Stop Controlled	PM	2	A	-		-		2	A	3	A	-		-		2	A
CSAH 33 & Hwy 169	AM	25	D	2	A	-		4	A	1	A	-		181	F	3	A
Stop Controlled	PM	21	C	3	A	-		5	A	2	A	-		286	F	3	A
Hwy 169 & CSAH 33 EB U-Turn	AM	5	A	-		75	F	5	A	-		-		-		4	A
Stop Controlled	PM	5	A	-		58	F	6	A	-		-		-		2	A
Hwy 169 & Hawley St WB U-Turn	AM	3	A	-		-		1	A	-		19	C	-		4	A
Stop Controlled	PM	4	A	-		-		0	A	-		250	F	-		6	A

1. Delay in seconds per vehicle

Table A26: Southern Subarea Section 1 - Concept 1B (Half WBLs from Hawley use U-Turn, Half use CSAH 33) - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Movement Delay (sec/veh)													
		NBR		EBU		EBT		EBR		WBU		WBL		WBT	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
CSAH 69 (Hawley St) & Hwy 169	AM	-		-	-	-		-		-		-		-	
Stop Controlled	PM	-		-	-	-		-		-		-		-	
CSAH 33 & Hwy 169	AM	-		-	-	-		-		-		500	875	300	875
Stop Controlled	PM	-		-	-	-		-		-		450	700	275	700
Hwy 169 & CSAH 33 EB U-Turn	AM	-		25	75	-		-		-		-		50	150
Stop Controlled	PM	-		50	125	-		-		-		-		25	75
Hwy 169 & Hawley St WB U-Turn	AM	-		-	-	25	50	-		75	175	-		50	175
Stop Controlled	PM	-		-	-	-	-	-		50	100	-		-	-

Table A27: Southern Subarea Section 1 - Concept 1C (WBL allowed at CSAH 33) - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)											
				NBL		NBR		EBT		EBR		WBL		WBT	
CSAH 69 (Hawley St) & Hwy 169	AM	8	A	28	C	1	A	13	B	7	A	27	C	2	A
Signalized Intersection	PM	6	A	22	C	2	A	8	A	4	A	31	C	5	A
CSAH 33 & Hwy 169	AM	6	A	-		2	A	3	A	1	A	44	E	1	A
Stop Controlled	PM	36	E	-		1	A	6	A	2	A	444	F	5	A

1. Delay in seconds per vehicle

Table A28: Southern Subarea Section 1 - Concept 1C (WBL allowed at CSAH 33) - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)											
		NBL		NBR		EBT		EBR		WBL		WBT	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
CSAH 69 (Hawley St) & Hwy 169	AM	25	50	-	-	125	250	75	175	125	250	-	-
Signalized Intersection	PM	25	75	-	-	100	200	50	100	25	75	-	-
CSAH 33 & Hwy 169	AM	-	-	-	-	-	-	0	25	150	375	25	100
Stop Controlled	PM	-	-	-	-	0	25	0	25	575	1000	475	1000

Table A29: Southern Subarea Section 1 - Concept 1C (All WBLs at Green-T) - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)											
				NBL		NBR		EBT		EBR		WBL		WBT	
CSAH 69 (Hawley St) & Hwy 169	AM	16	b	36	D	1	A	24	C	15	B	34	C	2	A
Signalized Intersection	PM	11	B	33	C	2	A	15	B	7	A	34	C	6	A
CSAH 33 & Hwy 169	AM	2	A	-		2	A	3	A	1	A	-		1	A
Stop Controlled	PM	4	A	-		1	A	6	A	2	A	-		2	A

1. Delay in seconds per vehicle

Table A30: Southern Subarea Section 1 - Concept 1C (All WBLs at Green-T) - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)											
		NBL		NBR		EBT		EBR		WBL		WBT	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
CSAH 69 (Hawley St) & Hwy 169	AM	25	50	-	-	200	400	100	300	250	450	25	175
Signalized Intersection	PM	25	100	-	-	175	325	75	150	125	250	-	-
CSAH 33 & Hwy 169	AM	-	-	-	-	-	-	-	-	-	-	-	-
Stop Controlled	PM	-	-	-	-	-	-	-	-	-	-	-	-

Table A31: Section 1 - Alternative 1D (All WBLs at Green-T) - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)											
				NBL		NBR		EBT		EBR		WBL		WBT	
CSAH 69 (Hawley St) & Hwy 169	AM	2	A	-		1	A	3	A	5	A	-		2	A
Stop Controlled	PM	4	A	-		1	A	5	A	7	A	-		4	A
CSAH 33 & Hwy 169	AM	21	C	39	D	2	A	37	D	14	B	43	D	1	A
Signalized Intersection	PM	15	B	40	D	2	A	24	C	7	A	44	D	2	A

1. Delay in seconds per vehicle

Table A32: Section 1 - Alternative 1D (All WBLs at Green-T) - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)											
		NBL		NBR		EBT		EBR		WBL		WBT	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
CSAH 69 (Hawley St) & Hwy 169	AM	-	-	-	-	-	-	-	-	-	-	-	-
Stop Controlled	PM	-	-	-	-	-	-	-	-	-	-	-	-
CSAH 33 & Hwy 169	AM	25	50	-	-	250	500	25	150	300	550	25	150
Signalized Intersection	PM	50	125	-	-	225	375	25	50	150	275	-	-

Table A33: Southern Subarea Section 2 - Concept 2A - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)					
				SBL		EBL		EBT	
Hwy 68 & Hwy 169	AM	3	A	6	A	2	A	2	A
Stop Controlled	PM	2	A	5	A	1	A	1	A

1. Delay in seconds per vehicle

Table A34: Southern Subarea Section 2 - Concept 2A - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths (ft)					
		SBL		EBL		EBT	
		Avg	Max	Avg	Max	Avg	Max
Hwy 68 & Hwy 169	AM	50	100	-	-	-	-
Stop Controlled	PM	50	100	-	-	-	-

Table A35: Southern Subarea Section 2 - Concept 2B2 (Stop Controlled) - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)											
				SBL		SBR		EBL		EBT		WBT		WBR	
Hwy 169 & Hwy 68	AM	2	A	-		7	A	-		3	A	1	A	0	A
Stop Controlled	PM	3	A	-		7	A	-		4	A	1	A	1	A
Hwy 169 & CSAH 69 (Gadwall Rd)	AM	40	E	351	F	160	F	11	B	3	A	3	A	2	A
Stop Controlled	PM	106	F	1115	F	1014	F	12	B	3	A	3	A	2	A

1. Delay in seconds per vehicle

Table A36: Southern Subarea Section 2 - Concept 2B2 (Stop Controlled) - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Movement Delay (sec/veh)											
		SBL		SBR		EBL		EBT		WBT		WBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Hwy 169 & Hwy 68	AM	-	-	25	75	-	-	-	-	-	-	-	-
Stop Controlled	PM	-	-	25	50	-	-	-	-	-	-	-	-
Hwy 169 & CSAH 69 (Gadwall Rd)	AM	525	1025	50	325	25	50	-	-	-	-	-	-
Stop Controlled	PM	1625	2075	75	400	25	75	-	-	-	-	0	25

Table A37: Southern Subarea Section 2 - Concept 2B2 (Stop Controlled, Acceleration Lane) - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)											
				SBL		SBR		EBL		EBT		WBT		WBR	
Hwy 169 & Hwy 68	AM	3	A	-		10	B	-		2	A	4	A	0	A
Stop Controlled	PM	2	A	-		7	A	-		3	A	1	A	1	A
Hwy 169 & CSAH 69 (Gadwall Rd)	AM	11	B	82	F	11	B	12	B	5	A	1	A	1	A
Stop Controlled	PM	15	C	145	F	25	D	14	B	3	A	1	A	0	A

1. Delay in seconds per vehicle

Table A38: Southern Subarea Section 2 - Concept 2B2 (Stop Controlled, Acceleration Lane) - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Movement Delay (sec/veh)											
		SBL		SBR		EBL		EBT		WBT		WBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Hwy 169 & TH 68	AM	-	-	25	75	-	-	-	-	-	-	-	-
Stop Controlled	PM	-	-	25	50	-	-	-	-	-	-	-	-
Hwy 169 & CSAH 69 (Gadwall Rd)	AM	175	400	25	175	25	50	-	-	-	-	-	-
Stop Controlled	PM	275	575	25	400	25	75	-	-	-	-	-	-

Table A39: Southern Subarea Section 2 - Concept 2B2 (Signalized) - 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)											
				SBL		SBR		EBL		EBT		WBT		WBR	
Hwy 169 & Hwy 68	AM	3	A	-		6	A	-		4	A	1	A	0	A
Stop Controlled	PM	4	A	-		6	A	-		7	A	1	A	1	A
Hwy 169 & CSAH 69 (Gadwall Rd)	AM	11	B	47	D	11	B	25	C	6	A	7	A	3	A
Signalized Intersection	PM	11	B	47	D	8	A	25	C	7	A	7	A	4	A

1. Delay in seconds per vehicle

Table A40: Southern Subarea Section 2 - Concept 2B2 (Signalized) - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Movement Delay (sec/veh)											
		SBL		SBR		EBL		EBT		WBT		WBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Hwy 169 & Hwy 68	AM	-	-	25	75	-	-	-	-	-	-	-	-
Stop Controlled	PM	-	-	25	50	-	-	-	-	-	-	-	-
Hwy 169 & CSAH 69 (Gadwall Rd)	AM	150	300	25	50	25	50	50	200	75	200	25	50
Signalized Intersection	PM	150	275	25	25	25	75	75	225	75	200	25	50

Table A41: Southern Subarea Section 3 - Concept 3A- 2040 Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay (1.)		Movement Delay (sec/veh)											
				NBR		EBU		EBT		EBR		WBL		WBT	
Hwy 169 & Hwy 60	AM	5	A	2	A	-		2	A	2	A	11	B	7	A
Stop Controlled	PM	8	A	2	A	-		3	A	5	A	68	F	3	A
Hwy 169 EBU-Turn East of Hwy 60	AM	5	A	-		12	B	7	A	-		-		4	A
Stop Controlled	PM	4	A	-		23	C	5	A	-		-		3	A

1. Delay in seconds per vehicle

Table A42: Southern Subarea Section 3 - Concept 3A - 2040 Peak Hour Queues By Movement

Intersection	Peak Hour	Movement Delay (sec/veh)											
		NBR		EBU		EBT		EBR		WBL		WBT	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
Hwy 169 & Hwy 60	AM	-	-	-	-	-	-	-	-	50	150	-	-
Stop Controlled	PM	-	-	-	-	-	-	-	-	150	375	25	75
Hwy 169 EBU-Turn East of Hwy 60	AM	-	-	25	50	0	25	-	-	-	-	-	-
Stop Controlled	PM	-	-	25	75	-	-	-	-	-	-	-	-

Appendix D: Southern Subarea Concept Drawings

TH 169 - Southern Sub Area
Segment 1
Access Alternative 1A

U-turn area options if sight lines are a concern

Could move to align with 33 (Hemlock)

0.70 mi to Hwy 68

Consider elimination in conjunction with new access south of Hwy 68

Restricted Crossing

Same as existing (Does not allow NB to WB movement)

Hwy 169

Blue Earth River

N

400

SCALE IN FEET

BOLTON & MENK

HWY 169 CORRIDOR STUDY

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michaelna

TH 169 - Southern Sub Area
Segment 1
Access Alternative 1B

U-turn area options if sight lines are a concern

Could move to align with 33 (Hemlock)

0.70 mi to Hwy 68

Restricted Crossing

Eliminate Entering Hwy 169 at this location

Consider elimination in conjunction with new access south of Hwy 68

Hwy 169

Blue Earth River

N

400

SCALE IN FEET

BOLTON & MENK

HWY 169 CORRIDOR STUDY

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michaelna

LEGEND

- PROPOSED ROADWAY
- PROPOSED SHOULDER
- PROPOSED CURB AND GUTTER
- PROPOSED RAISED MEDIAN
- PROPOSED WALK
- WETLAND
- PARCELS
- TRAFFIC SIGNAL

N

200 0 200 400
scale 100 feet

MINNESOTA RIVER
AMOS OWEN LN
MCCAULEY ST
BLUE EARTH RIVER
169
CHAPMAN ST
HAWLEY ST
SOUTHBEND AVE
CSAH 33

INSET 1 - ALTERNATIVE GEOMETRICS

SOUTHBEND AVE
CSAH 33

SEH
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ST. PAUL, MN 55110

SEH PROJECT NO. 154596

DATE: 6/1/2021

US 169 CORRIDOR STUDY
SOUTH SUBAREA – SECTION 1

GREEN T AT HAWLEY ST

FIGURE No. # 1

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LEGEND

- PROPOSED ROADWAY
- PROPOSED SHOULDER
- PROPOSED CURB AND GUTTER
- PROPOSED RAISED MEDIAN
- PROPOSED WALK
- WETLAND
- PARCELS
- TRAFFIC SIGNAL

N

scale 100 0 200 400 feet

MINNESOTA RIVER

AMOS OWEN LN

MCCAULEY ST

BLUE EARTH RIVER

169

CHAPMAN ST

HAWLEY ST

SOUTHBEND AVE

CSAH 33

INSET 2 - ALTERNATIVE GEOMETRICS

AMOS OWEN LN

MCCAULEY ST

CHAPMAN ST

SEH

PHONE: (651)490-2000
3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110

SEH PROJECT NO. 154596

DATE: 6/1/2021

US 169 CORRIDOR STUDY SOUTH SUBAREA – SECTION 1

GREEN T AT CSAH 33
AND MUT AT AMOS OWEN LN

FIGURE No. # 2

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LEGEND

- PROPOSED ROADWAY
- PROPOSED SHOULDER
- PROPOSED CURB AND GUTTER
- PROPOSED RAISED MEDIAN
- PROPOSED WALK
- WETLAND
- PARCELS
- TRAFFIC SIGNAL

N

200 0 500
scale feet

TH 68
MINNESOTA RIVER
CSAH 69
MINNEOPA TRAIL
169
SOUTHBEND AVE
PINTAIL ST
BISON ST
RENO ST
CR 120
T-493
551ST AVE

INSET 1 - ALTERNATIVE GEOMETRICS

SEH
PHONE: (651)490-2000
3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110

SEH PROJECT NO. 154596

DATE: 6/1/2021

US 169 CORRIDOR STUDY
SOUTH SUBAREA – SECTION 2

HIGH T AT TH 68, RT IN /RT OUT AT CSAH 69
AND RCUT AT CSAH 120

FIGURE No. # 1

TH 169 - Southern Sub Area
Segment 2
Access Alternative 2B1

Full Access Intersection

Hwy 68

Potential "High T" Candidate (Raise WB)

500
SCALE IN FEET

Hwy 69

Hwy 120

Property Impacts

Hwy 169

0.50 mi

Potentially Right-In Right-Out only

0.70 mi

Hwy 90

- Combines two partial accesses to one full access
- Multiple new connector roads

BOLTON & MENK

HWY 169 CORRIDOR STUDY

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michaelma

TH 169 - Southern Sub Area
Segment 2
Access Alternative 2B2

Full Access Intersection

Inset

Inset

Hwy 68

Right-in/Right-out

500
SCALE IN FEET

Hwy 169

Hwy 69

Hwy 120

0.65 mi

Property Impacts

Property Impacts

0.50 mi

Hwy 90

- Combines two partial accesses to one full access
- Multiple new connector roads

BOLTON & MENK

HWY 169 CORRIDOR STUDY

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TH 169 - Southern Sub Area
Segment 2
Access Alternative 2C

Full Access Intersection

Hwy 68

Existing Pedestrian Bridge

Hwy 169

Hwy 69

Must use RCUT on Hwy 69 to head EB

Hwy 120

Left turns not allowed (EB on 169 should turn left on 120)

Full Access Intersection could be implemented with closure at Hemlock Rd

SBL not allowed (poor skew angle)

Potentially utilize U Turn area in this location

Hwy 90

Typical RCUT
TH 212 at TH 284, Cologne

- Utilizes RCUTs to reduce crossing manuevers
- limits some direction of travel

N

500

SCALE IN FEET

BOLTON & MENK

HWY 169 CORRIDOR STUDY

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LEGEND

- PROPOSED ROADWAY
- PROPOSED SHOULDER
- PROPOSED CURB AND GUTTER
- PROPOSED RAISED MEDIAN
- PROPOSED WALK
- WETLAND
- PARCELS
- TRAFFIC SIGNAL

N

200 0 200 400
scale 100 feet

208TH LN

GADWALL RD

TH 60

169

LOREN DR

207TH MILITARY RD

169

SEH PHONE: (651)490-2000 3535 VADNAIS CENTER DR. ST. PAUL, MN 55110	SEH PROJECT NO. 154596 DATE: 6/1/2021	**US 169 CORRIDOR STUDY** **SOUTH SUBAREA – SECTION 3** RCUT AT US 169 ALONG WITH LOCAL ACCESS CONSOLIDATION	**FIGURE No. # 1**

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TH 169 - Southern Sub Area
Segment 3
Access Alternative 3B

Full Access Intersection

Property Impacts

0.50 mi

Property Impacts

1.20 mi

Cul-de-sac

- Better Spacing
- More Road Construction/Property Impacts

N

700

SCALE IN FEET

BOLTON & MENK

HWY 169 CORRIDOR STUDY

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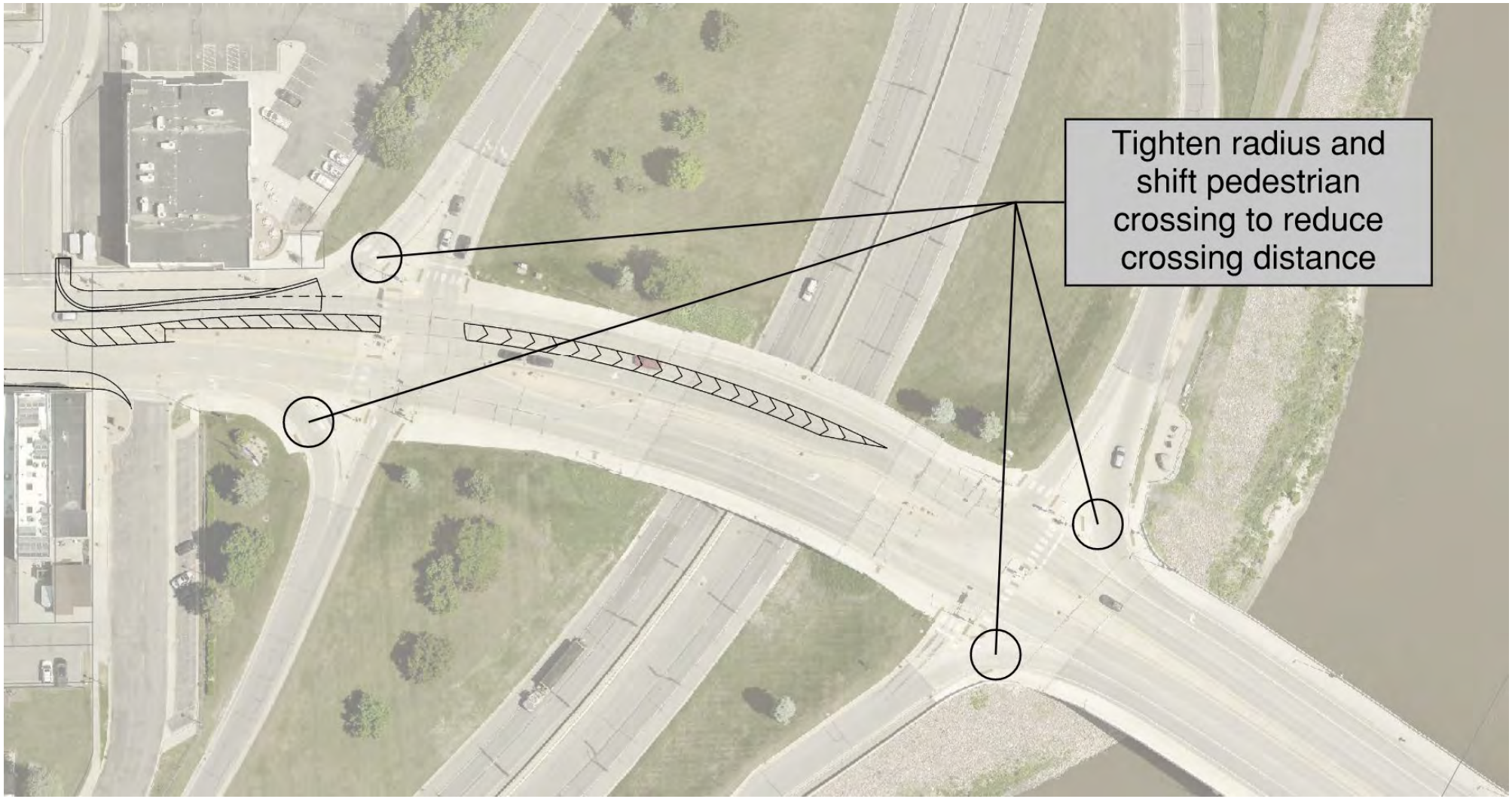
Appendix C

MIDDLE SUBAREA CONCEPTS

Middle Subarea Concepts

Belgrade Avenue – Westbound Lane Reduction and Pedestrian Crossing Improvements



Pros:
- Improves pedestrian crossings
- Traffic operates well
- Improves traffic flow into potential reduced section west of Highway 169

Cons:
- Cost to construct improvement

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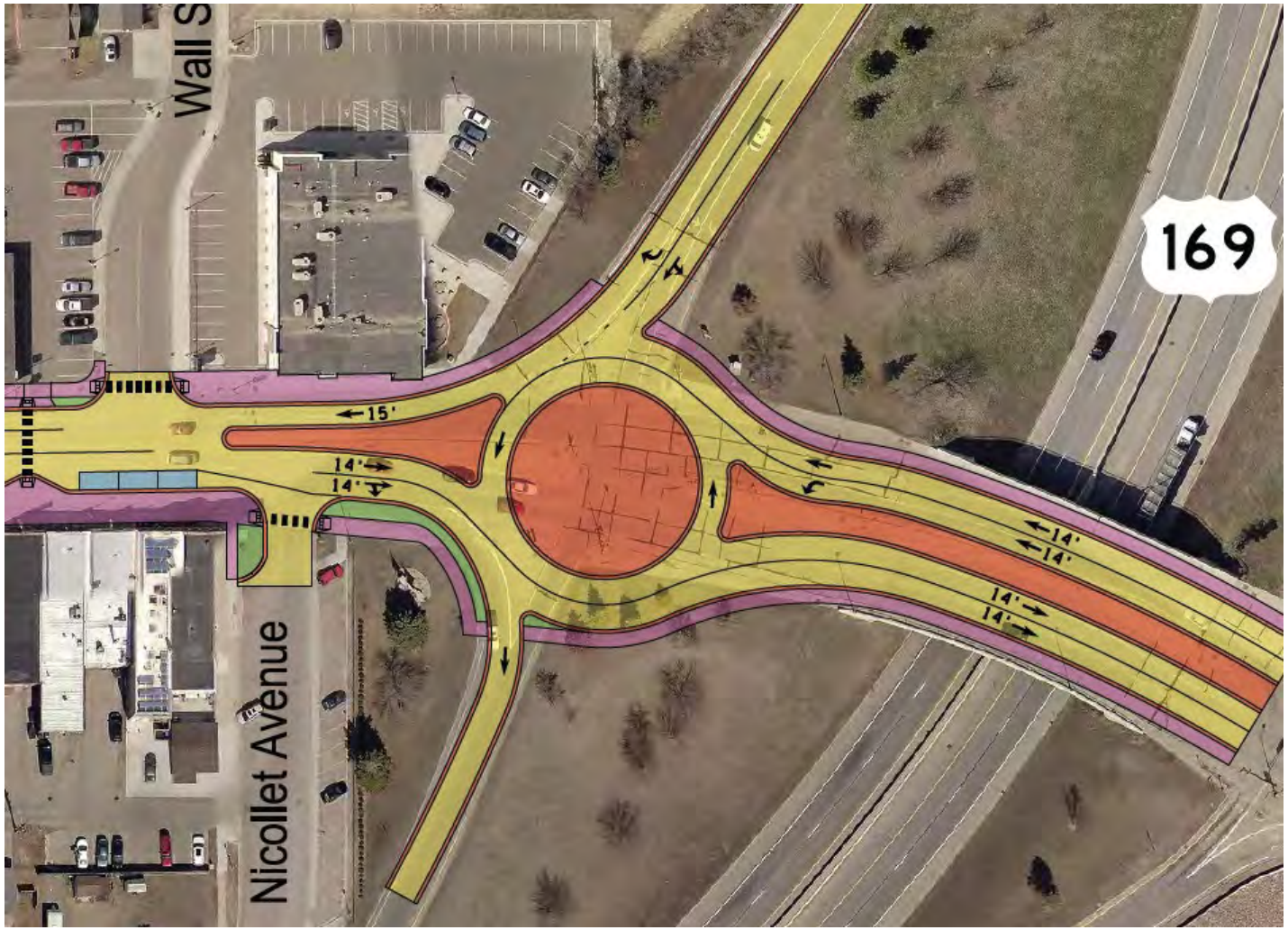
Middle Subarea Concepts

Belgrade Avenue – Roundabout

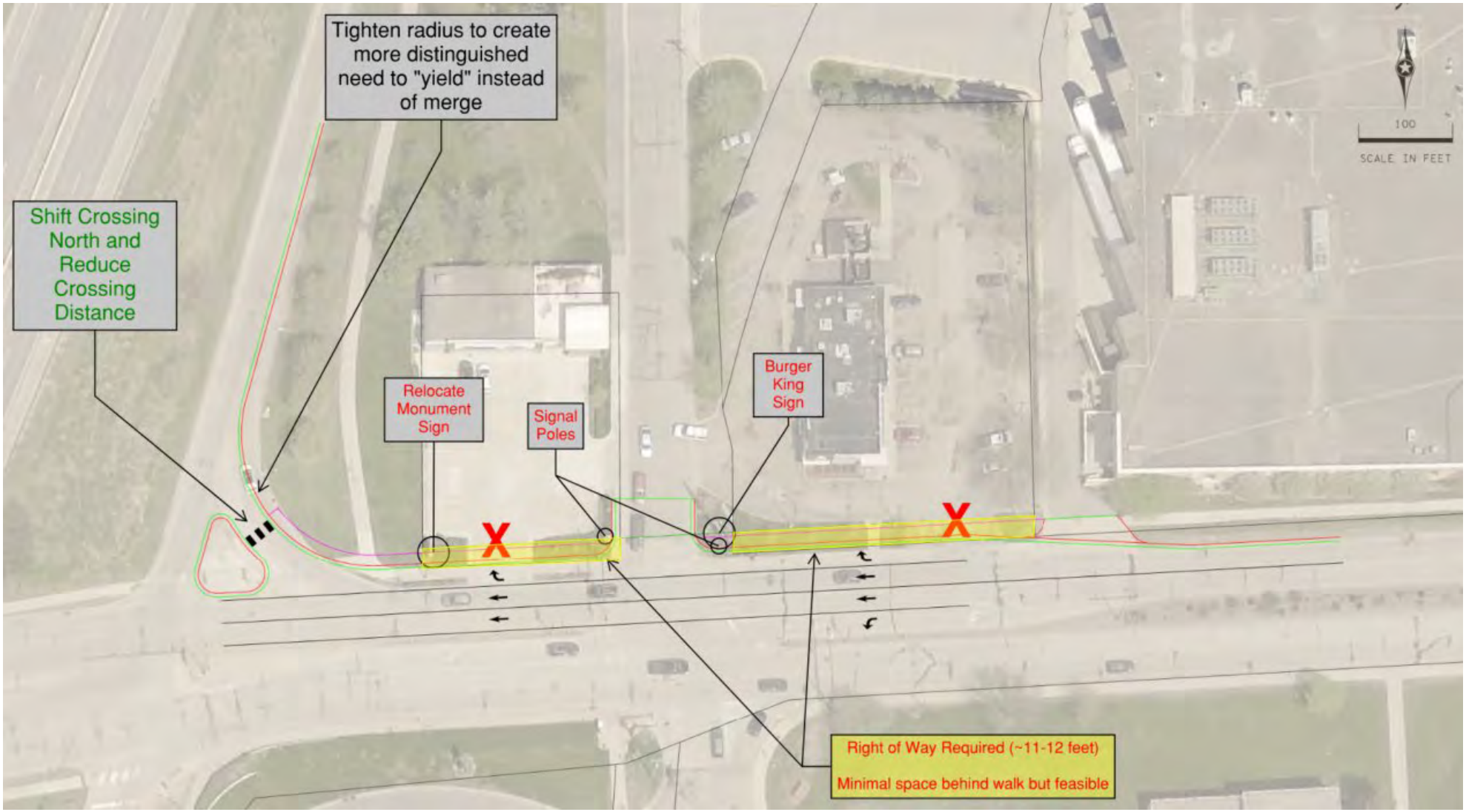


Pros:
- Improves pedestrian crossings
- Traffic operates well
- Improves traffic flow into potential reduced section west of Highway 169

Cons:
- Cost to construct improvement

Middle Subarea Concepts

Riverfront Drive - Right Turn Lane Concept



Pros:
- Improves pedestrian crossing
- Enforces need for WBR traffic to yield
- Adds channelized WBR turn lane
- Reduces WB rear end crashes
- Reduces access along Riverfront Drive

Cons:
- Increases WBR delay (drivers assume free movement under existing conditions)
- Right of way required
- Unlikely business supportive with reduced access

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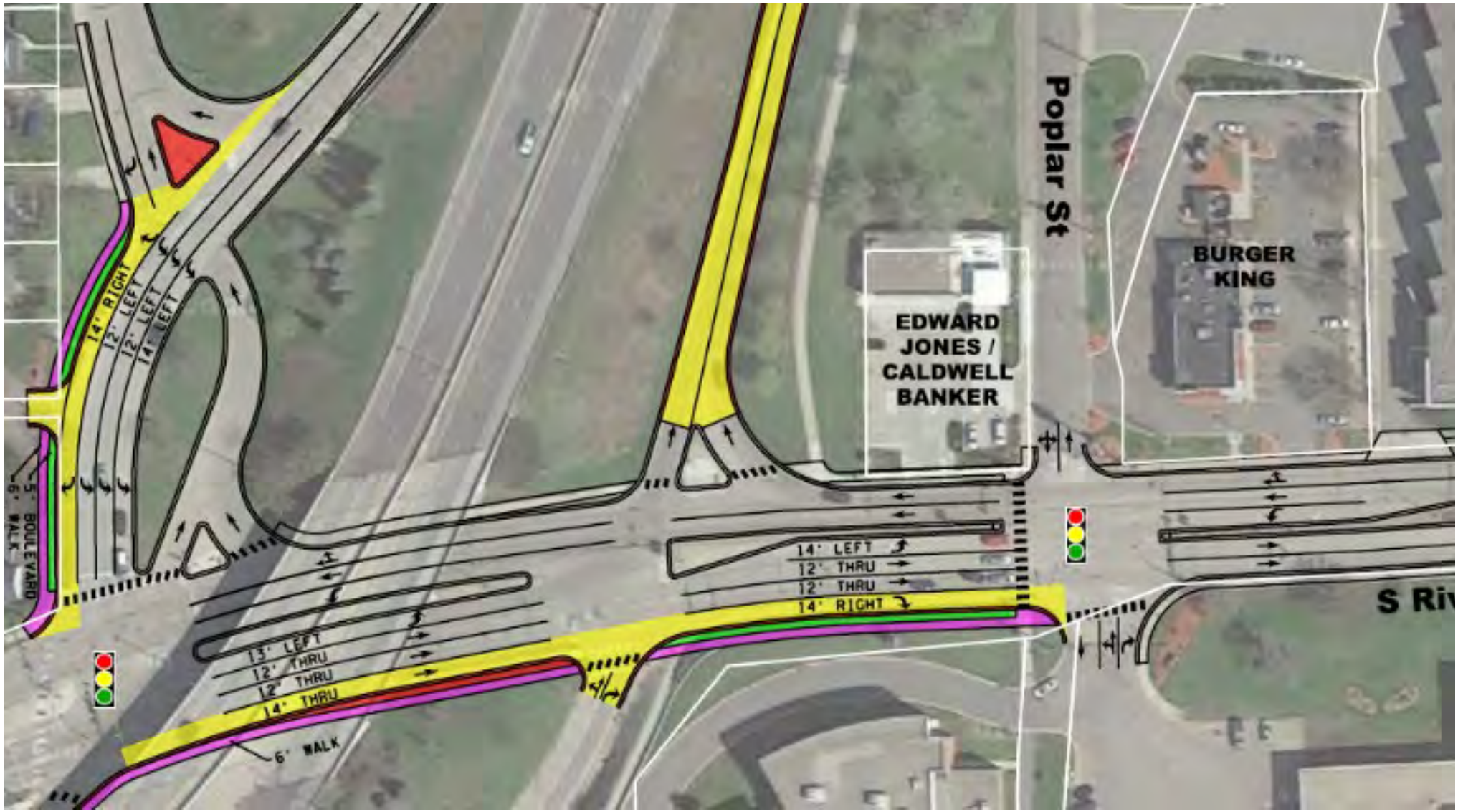
Middle Subarea Concepts

Riverfront Drive - Signalized Corridor Concept



Pros:

- Improves traffic operations with triple SBL and additional lane along northbound ramp
- Full access is maintained at all intersections (at ramps and to the east)

Cons:

- Potential property acquisition
- Potential bridge abutment work to accommodate third lane (or elimination of sidewalk)
- Unfamiliar drivers may not use proper lane and end of weaving/slowing down traffic flow
- Uncertainty of drivers utilizing all three SBL turn lanes as intended

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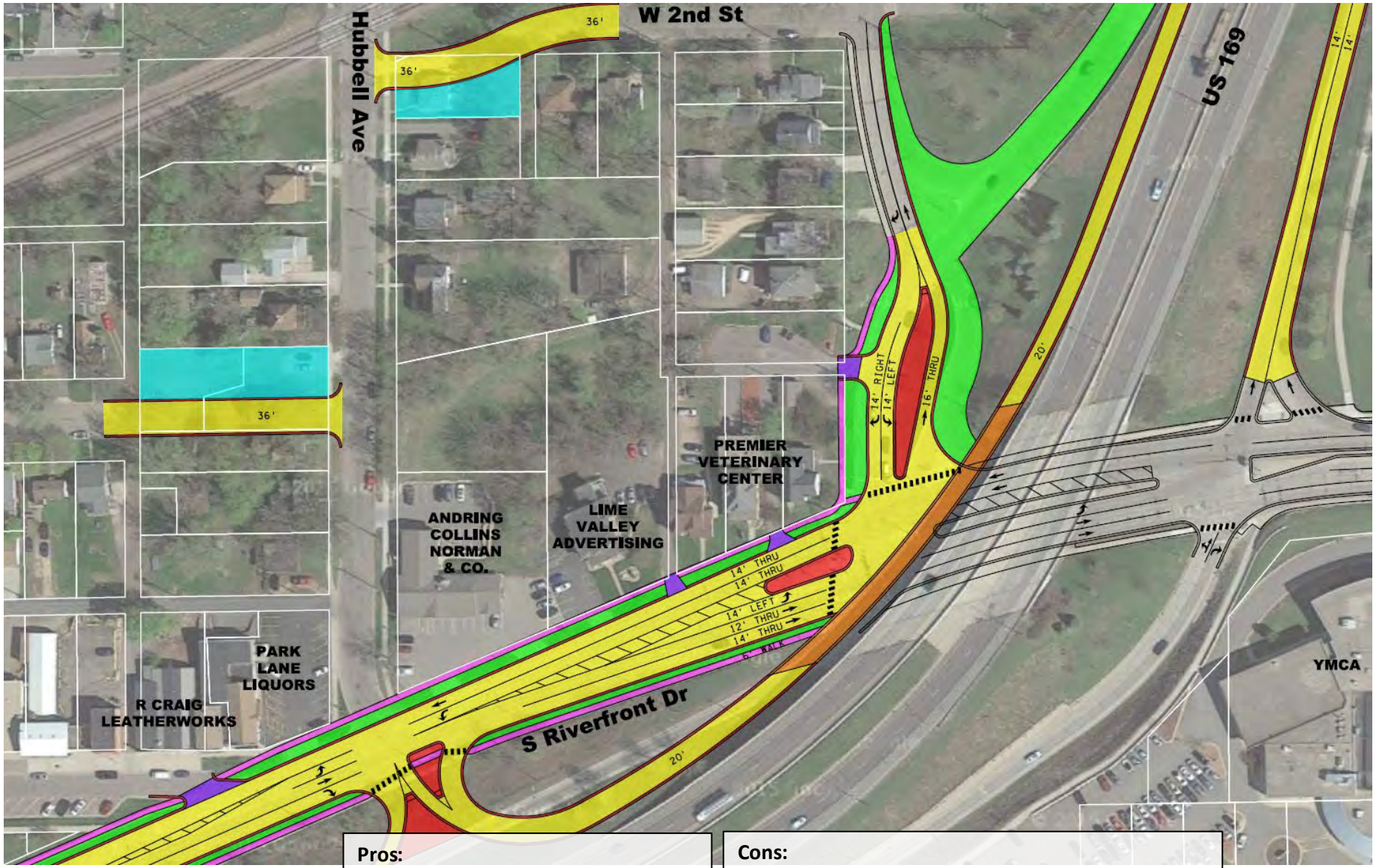
Middle Subarea Concepts

Riverfront Drive - Riverfront Drive West of Highway 169 Concept



Pros:

- Improves traffic operations with existing heavy SBL now an NBR
- Access points east of Highway 169 along Riverfront Drive could remain in place as is

Cons:

- Design challenges with bringing loop ramp down to Riverfront Drive (need to elevate Riverfront Drive)
- $$$
- Lose Hubbell Avenue connection to Riverfront Drive (need additional local connections for circulation)

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Appendix D

ENVIRONMENTAL IMPACT SUMMARY

Environmental Impact Summary
Highway 169 Corridor Study

Social, Economic or Environmental Topic	Considerations	Existing Conditions	Concept (Negative) Scoring Considerations**
Water Resources	Effects to water resources. Wetlands that may be impacted by partial or complete filling, excavation or drainage, or severance of water supply (see Figure 1)	• The study area falls within the Mankato Watershed of the Minnesota River Basin. The Minnesota and Blue Earth Rivers are identified as impaired streams near the study area. • The study area falls within the Mankato Watershed of the Minnesota River Basin. The Minnesota and Blue Earth Rivers are identified as Public Waters Inventory (PWI) watercourses near the study area over which the MnDNR Waters has regulatory jurisdiction. • There are many small unnamed ponds in the areas surrounding the two rivers. And many of the areas surrounding the rivers and ponds are designated wetlands, either freshwater emergent or freshwater forested. • Other major water features include Hiniker Pond which lies to the west of Highway 169 to the southwest of the Highway 169/Highway 14 interchange.	<u>Northern Subarea:</u> Concept 1A-1C New road alignment north of Hiniker Pond and Highway 14 ramp adjustments pose medium risk for impacts that will need to be studied with a future project. Concept 2A - Highway 14 West to Highway 169 ramp would impact the existing wetland in the northeast quadrant. Highway 14 pedestrian bridge trail concept - Trail connections needed with the TH 14 bridges connection could potentially disturb areas along the MN River.
Floodplains	Development encroachments on the 100-year floodplain (see Figure 2)	• The Corridor falls within the 100- year and 500-year floodplain of the Minnesota River in several sections throughout the study area. • A large portion of the northern subarea is within the 500-year floodplain and small segments of the middle and southern subareas run through the 100-year floodplain (See Figure 2).	<u>Northern Subarea:</u> Concept 2A - The full interchange configuration would warrant modifications to the Minnesota River levee that protects the City of Mankato and North Mankato from flood waters produced by the Minnesota River. Further coordination with FEMA will be required to understand the requirements associated with levee modifications or relocations. Concept 2D - Highway 14 West to Highway 169 ramp would impact the existing wetland and flood levee. Further coordination with FEMA will be required to understand the requirements associated with levee modifications or relocations.
Surface Water Drainage/Water Quality	Effects of drainage modifications. Run-off effects to protected lakes and watercourses	Drainage infrastructure alterations and impervious surface additions may affect the bodies of water. To be considered in future environmental review.*	
Wildlife, Threatened and Endangered Species	• Unique habitats • Widened section • Federal and state listed threatened and endangered species	• MnDNR Natural Heritage Information System (NHIS) data suggests threatened, endangered, and rare species do not exist within the immediate study area. However, species have been identified within close proximity along the shore of the Minnesota River near the Veteran's Memorial Bridge. These locations are separated from the study area by a concrete levee wall and roughly 200 feet of land and the species are aquatic. It is unlikely that roadway alternatives could effect these species. • GIS Data delineating MNDNR, Division of Wildlife Management Areas (WMA) show WMA's are non-existent within the study area.	
Fisheries	• Trout streams • Fish migrations • Spawning runs • Unique habitats	There are no designated trout streams within the study area.	
Vegetation	• Native plant communities • Landscape vegetation • Functional vegetation • High value vegetation • Hazard trees	• The study area is dominated by developed industrial, commercial, and agricultural uses with altered vegetation. • Most of the native plants communities exist in the southern subarea and the Minneopa State Park is directly adjacent the study area here too. In the northern subarea, the Kiwanis Recreation Area is within close proximity to the corridor. • To be considered in future environmental review.*	
Contaminated Properties	Disturbance of contaminated properties may increase project cost (see Figure 3)	• Known history of contamination in the study area. MPCA "What's in My Neighborhood?" sites that are located within 150 feet of the corridor were selected as relevant and can be seen in Figure 3. • More detailed investigations may be recommended for properties with existing/past land uses that may have used hazardous/chemical waste. To be considered in a future environmental review.*	<u>Northern Subarea:</u> Concept 1A-1C Based on environmental screening there are several hazardous waste areas south of the Highway 14 interchange, most south of Hiniker Pond. Concept 1B - Intersection improvements at both River Lane and Webster Avenue have larger disturbance footprint in this area. Concept 2A - An interchange at Webster Avenue would have a larger disturbance footprint in this area. Webster Avenue grade separated pedestrian concept could result in a large disturbance area. <u>Southern Subarea:</u> Concept 2B1 and 2B2 - could disturb hazardous areas near the Highway 120 intersection.
Parks and Recreation Areas (Section 4f/6f Resources)	• Parks and recreation areas • Land and Water Conservation (LAWCON) funds • Wildlife & waterfowl refuges • Historic sites • Landscapes • Highways • Bridges • Buildings & districts • Wildlife management areas • School playgrounds • Fairgrounds • Public multiple-use land holdings • Public golf courses • Archaeological sites • Wild & scenic rivers • Recreational bikeways and trails (see Figure 4)	• The following properties may qualify as Section 4f and are adjacent to the corridor: -Parks • Bluff Park • Kiwanis Recreation Area • Hiniker Park • Riverview Park • Reconciliation Park • Land of Memories Park • Minneopa State Park • The following are LAWCON (Section 6f) properties and are adjacent to the corridor: - Trails • The Minnesota River Trail • The North Star Bridge Trail • The Rex Macbeth River Trail • The West Mankato Trail • Bluff Valley Trail • Hiniker Park Trail • The Kiwanis Mountain Bike Trail • Any impacts to parks and recreational areas to be considered in a future environmental review*	

Environmental Impact Summary
Highway 169 Corridor Study

Social, Economic or Environmental Topic	Considerations	Existing Conditions	Concept (Negative) Scoring Considerations**
Social and Community	• Hospitals • Schools • Libraries • Churches • Government buildings • Post offices	• The following are located within or in close proximity to the study corridor • New Creation World Outreach Church • Mankato West High School • Hillcrest Rehabilitation Center • North Mankato United States Postal Service	
Cultural Resources	Buildings that exceed 50 years in age, archaeological sites, and Traditional Cultural Properties.	• Cultural and Historic properties will need to be reviewed when specific projects are identified for this corridor. Even though there are no designated tribal lands in this area, the confluence of the Blue Earth and Minnesota Rivers has cultural significance for the Dakota people.	<u>Northern Subarea:</u> Highway 14 pedestrian bridge trail concept - Connections needed could potentially disturb areas along the MN River.
Pedestrian & Bicycle Facilities	Bicycle and pedestrian safety	• Sidewalk and trail connections exist along Highway 169 and intersecting roadways in many areas throughout the study area but safe crossings of Highway 169 lack throughout. See 6f resources listed above. • To be considered in future environmental review.*	
Environmental Justice	Disproportionate effects to low-income or minority populations (see Figures 5 and 6)	• There are two block groups above 23 percent minority populations within the study area (Figure 4). Due to the significantly greater minority population compared to the general population than the counties, both of these block groups can be considered environmental justice populations. • There are 11 block groups above 26 percent low-income populations that fall within the project area (Figure 5). The block groups range between 26 percent and 70 percent of populations that have low incomes. Due to the significantly greater low-income concentrations compared to the general population than the counties, all 11 block groups can be considered environmental justice populations.	<u>Southern Subarea:</u> Grade separated pedestrian trail concepts - No Build is high risk given consideration that existing conditions and all proposed concepts do not provide safe pedestrian crossings of Highway 169. Generally for the entire study area, no data suggests that EJ populations use this area significantly more than other populations (i.e., travel to the corridor or drive through it), so there is no reason to assume impacts would be disproportionately high.
Air Quality	• Impacts to air quality • Mobile source air toxins	The need for an air quality analysis, conformity determination, or Mobile Source Air Toxics analysis will be determined once individual improvement projects are identified.*	
Traffic Noise	• Comply with federal noise criteria and Minnesota Noise Standards • Identify sensitive noise receptors	The need for a noise analysis will be determined once individual improvement projects are identified.*	
Construction Noise	• Comply with federal noise criteria and Minnesota Noise Standards • Identify sensitive noise receptors	Construction noise will be further considered in a future environmental review as projects are implemented.* City ordinances can regulate the daytime hours of construction activities in order to minimize potential impacts to adjacent areas.	
Utilities	Impacts to utilities may incur additional project costs.	• To be considered in future environmental review.*	
Erosion	• Erosional effects • Water pollution	To be considered in a future environmental review.*	
Right of Way and Relocation	Effects of right of way acquisition	Additional right-of-way may need to be acquired for future improvement projects. Temporary easements and changes to local roadway and property access points are also likely. Any impacts resulting from right-of-way acquisition, relocation or access changes will be identified in a future environmental review.*	<u>Northern Subarea:</u> Concept 2A - Highway 169 North to Highway 14 East ramp would impact McDonald's building. Grade separated pedestrian concepts north of Lind Street and on the south side of Webster Avenue will require future detailed analysis of grades and bridge type foot print. Built out environment could result in some partial property impacts. <u>Southern Subarea:</u> Concept 2B2 - three partial acquisitions anticipated. Concept 2C - three total acquisitions and four partials anticipated. Concept 3A - five partial acquisitions anticipated. Concept 3B - two total acquisitions and two partials anticipated.
Visual Quality	• Scenic intrusion • Bridges • Lighting • Railings • Grading, Trails • Walls • Fencing • Vegetation Modifications	The proposed project is not anticipated to result in adverse visual impacts.	
Farmland and Soils	• Minimization of effects to agricultural land • Properties of soils • Suitability for roadway construction	• Soil suitability of farmland impacts will be addressed in a future environmental review.*	

*Additional study considerations will be pursued when improvements are identified.
**If a concept is not mentioned it poses low risk for negative impacts.

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Figure 1: Water Resources

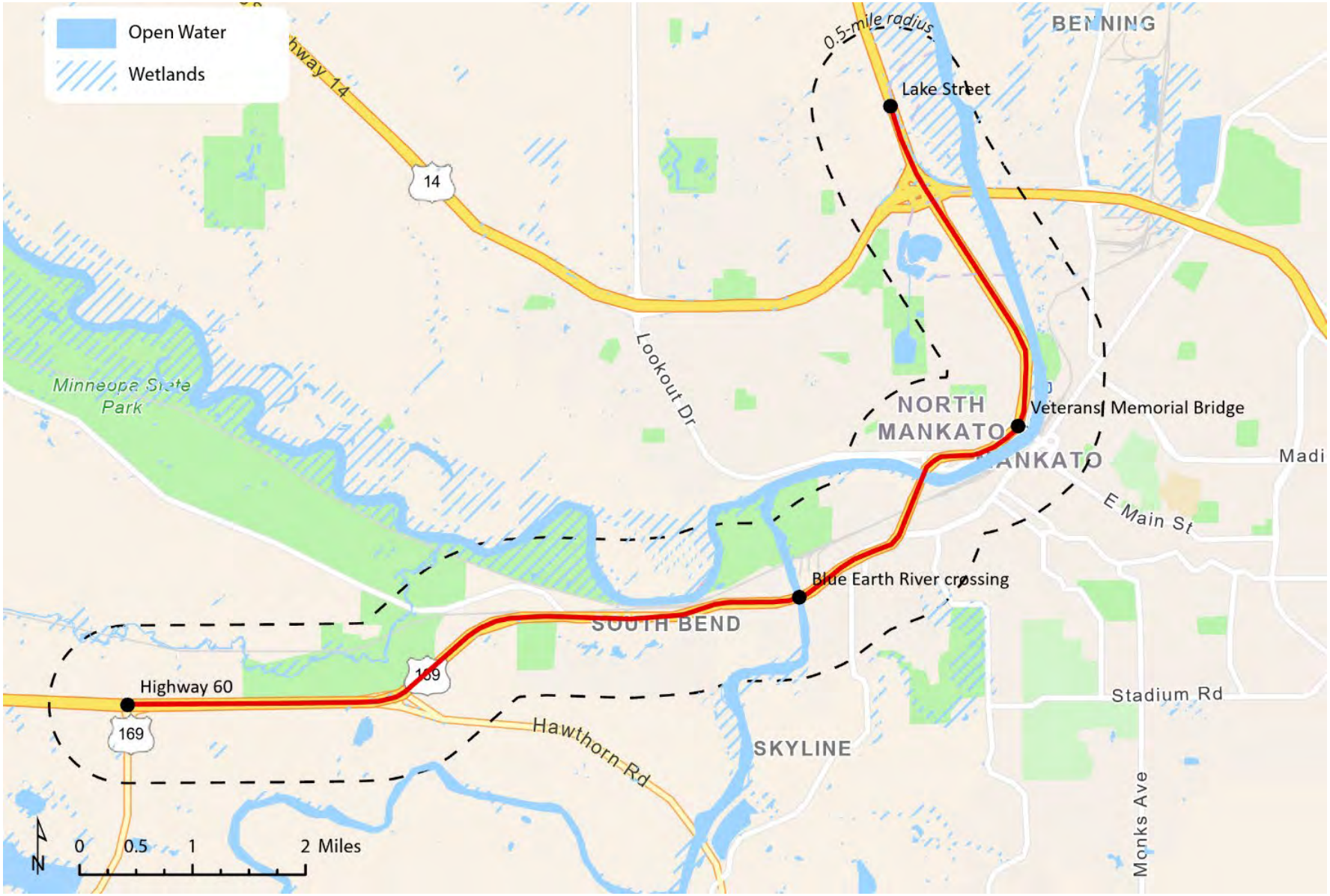


Figure 2: Flood Plains

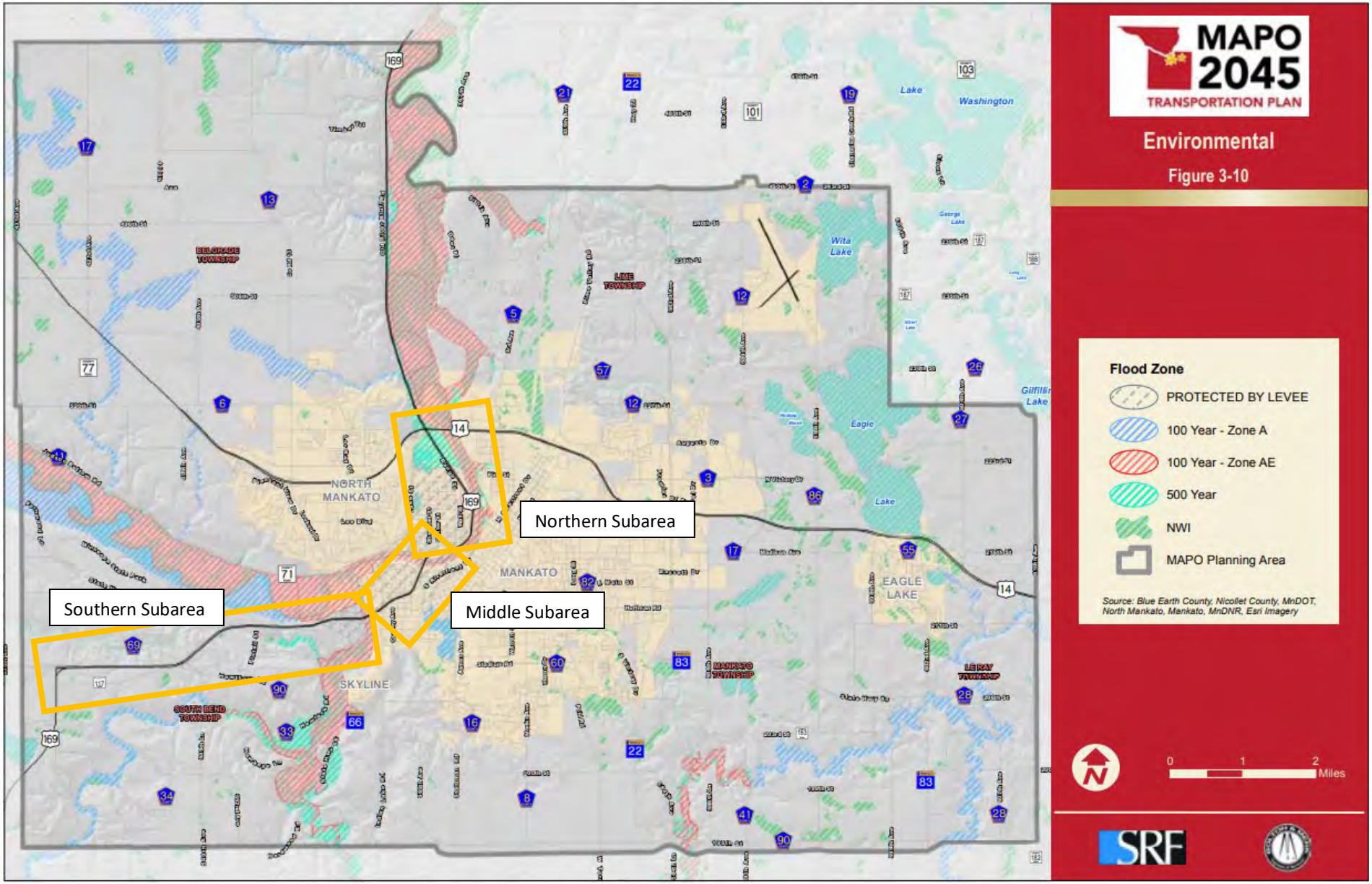


Figure 3: Potentially Contaminated Sites

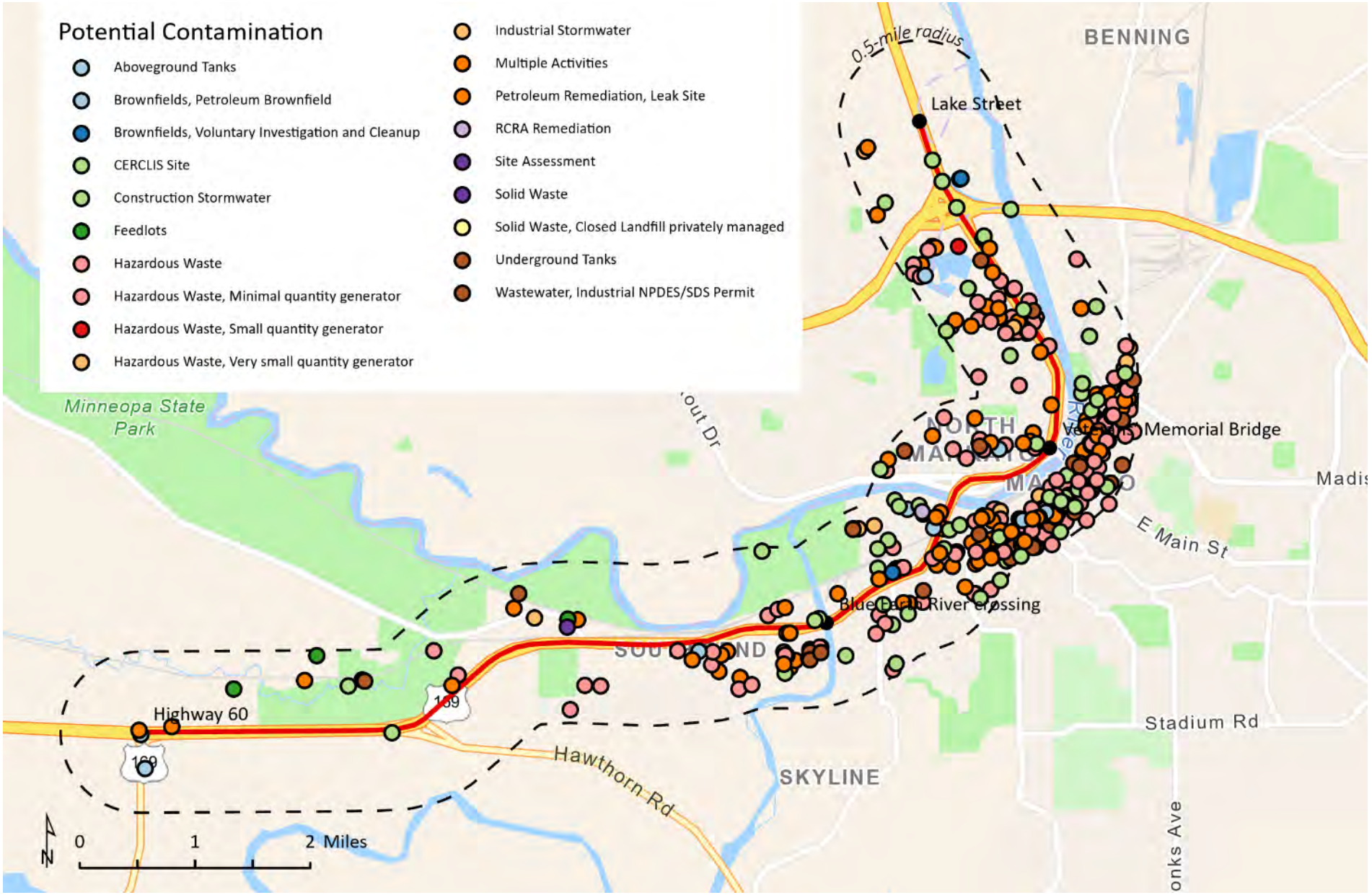


Figure 4: Existing Land Use

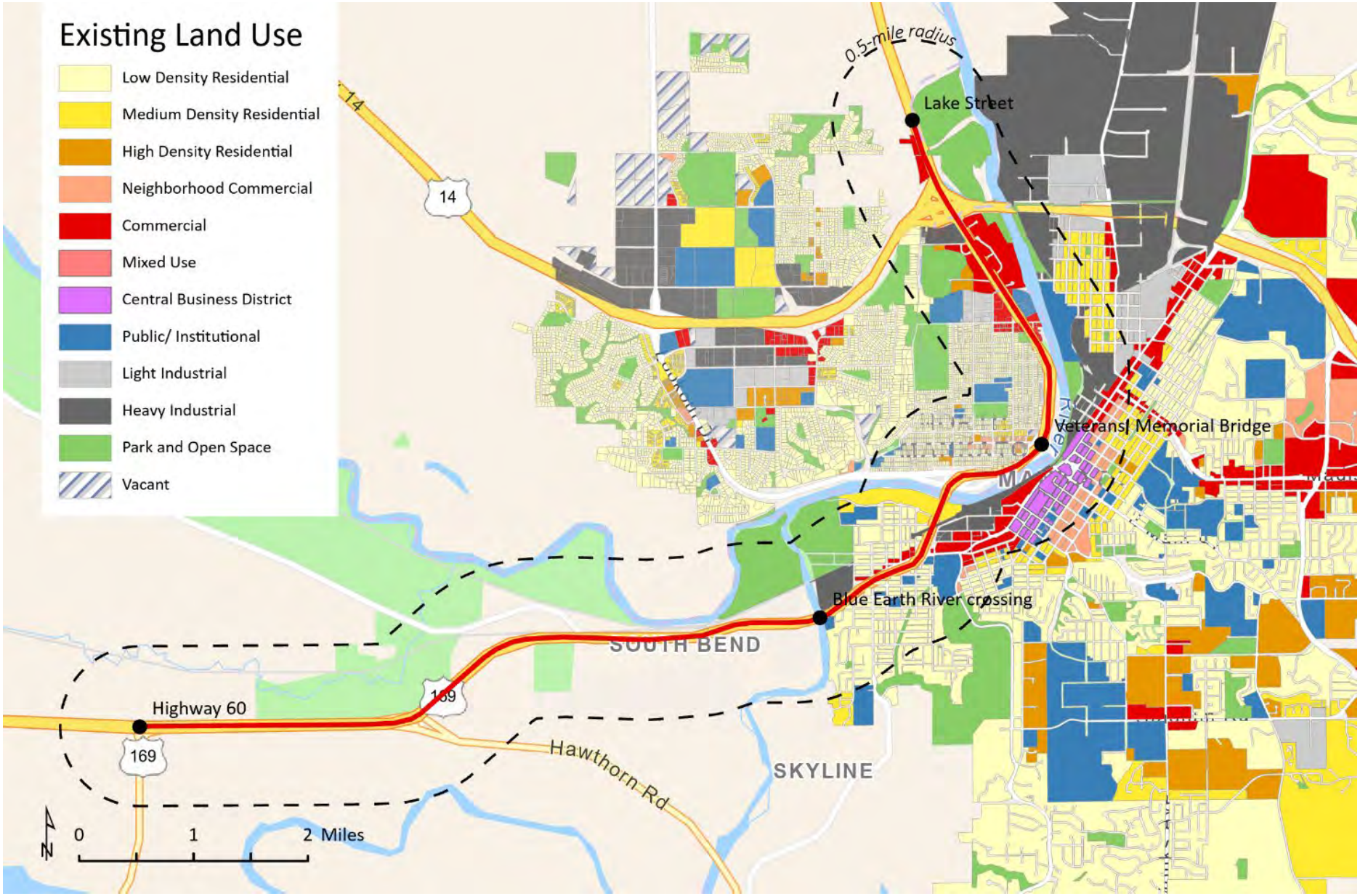


Figure 5: Percent Minority Individuals by Block Group

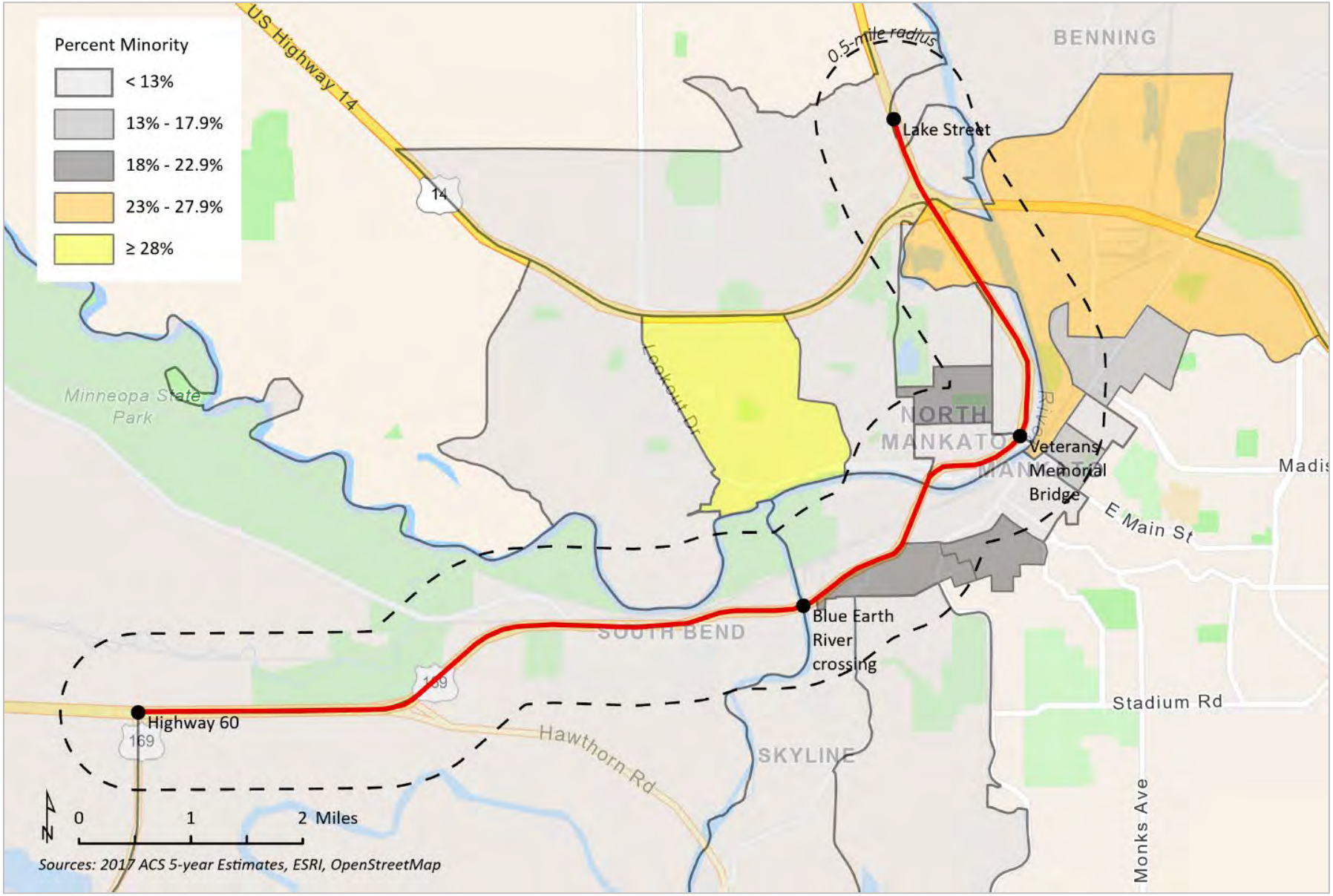
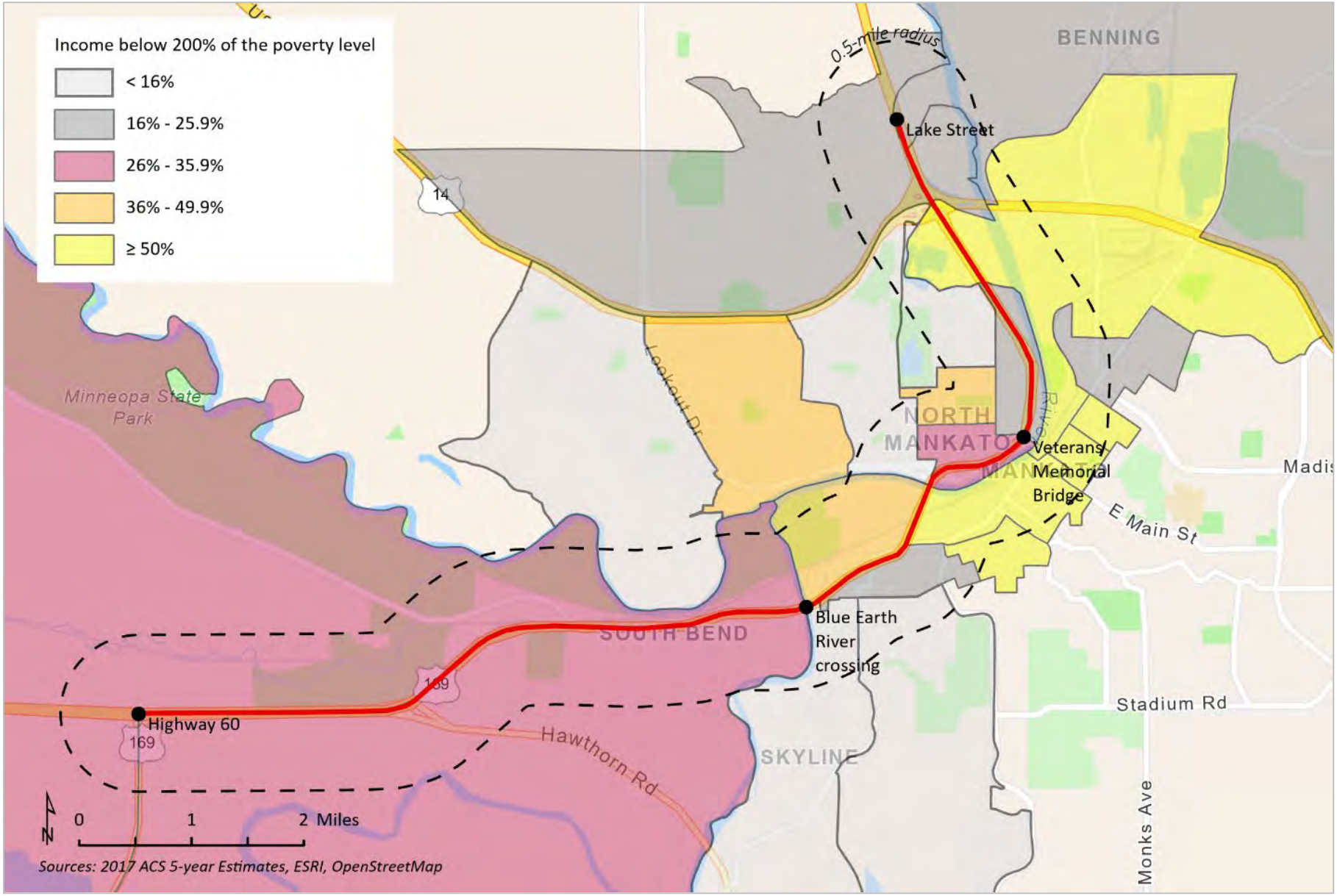


Figure 6: Percent Low-Income Individuals by Block Group

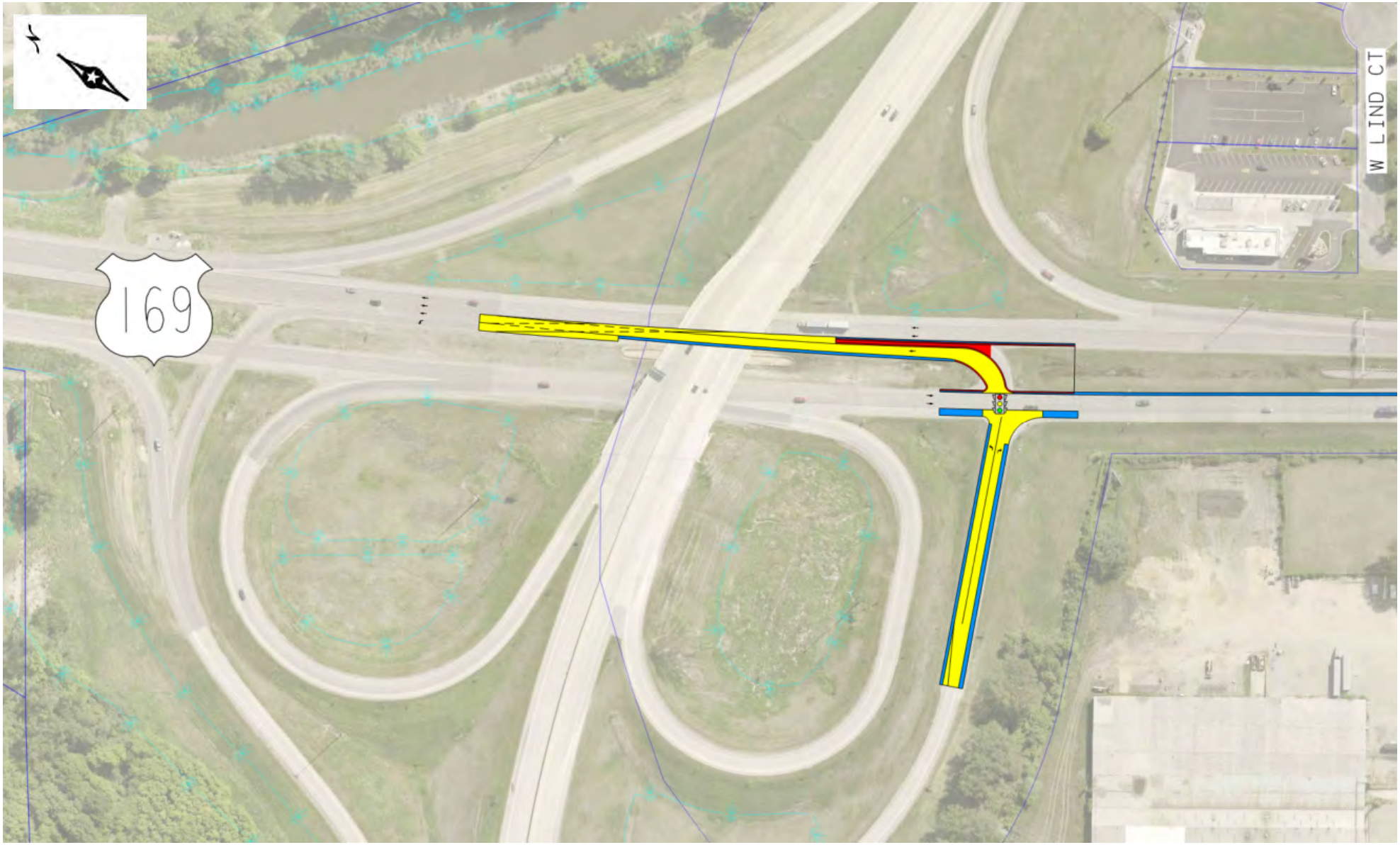


Appendix E

DISMISSED CONCEPTS

Northern Subarea – Dismissed Concepts

Signalized Green T at Eastbound TH 14 Exit Ramp



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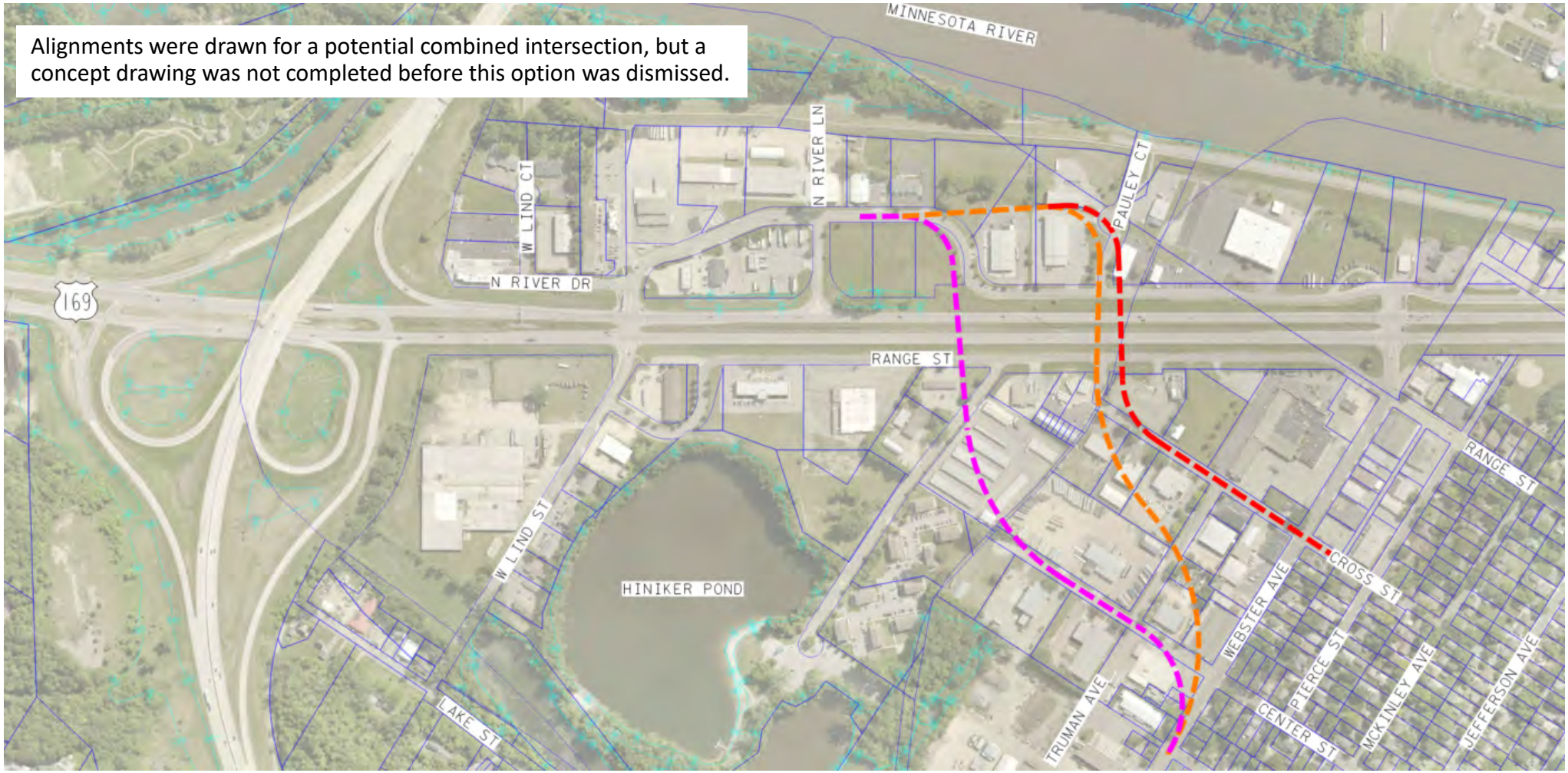
Northern Subarea – Dismissed Concepts

Combined Intersection – Lind Street, River Lane, Webster Avenue



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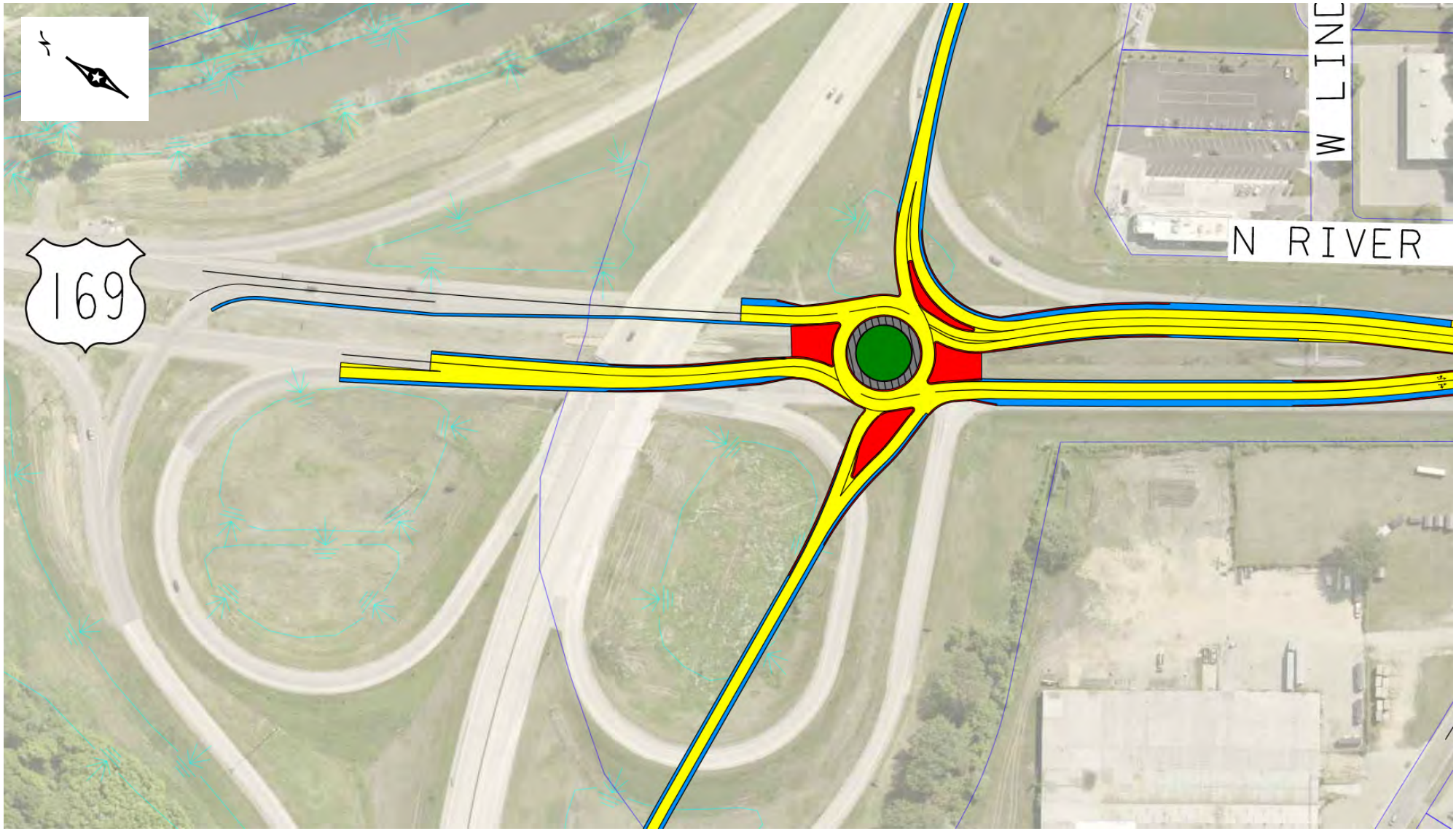
Northern Subarea – Dismissed Concepts

Option 2B – TH 14 Interchange (Eliminate South Loop – Roundabout)



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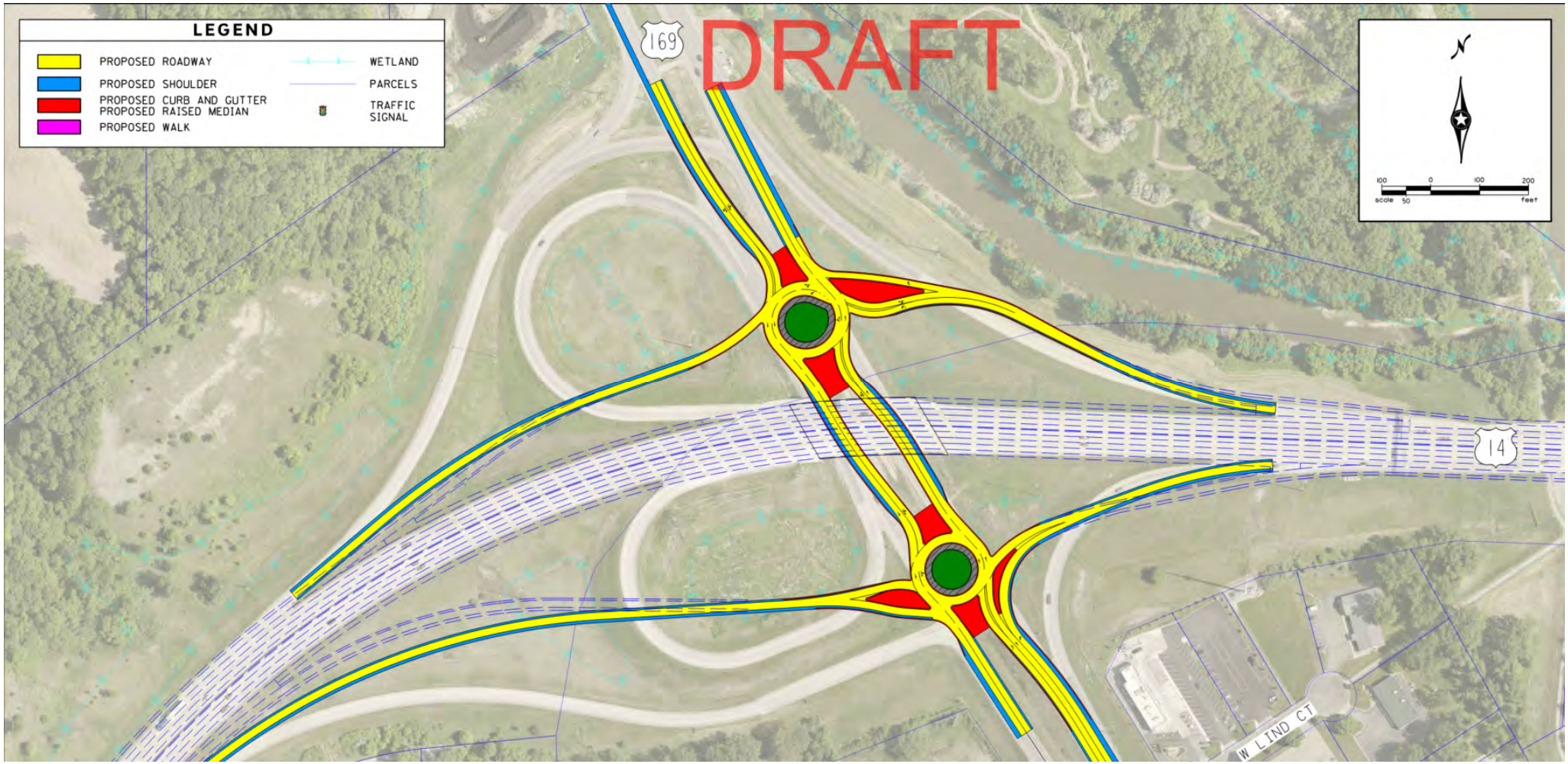
Northern Subarea – Dismissed Concepts

Option 2E – TH 14 Interchange (Roundabout Ramp Intersections)



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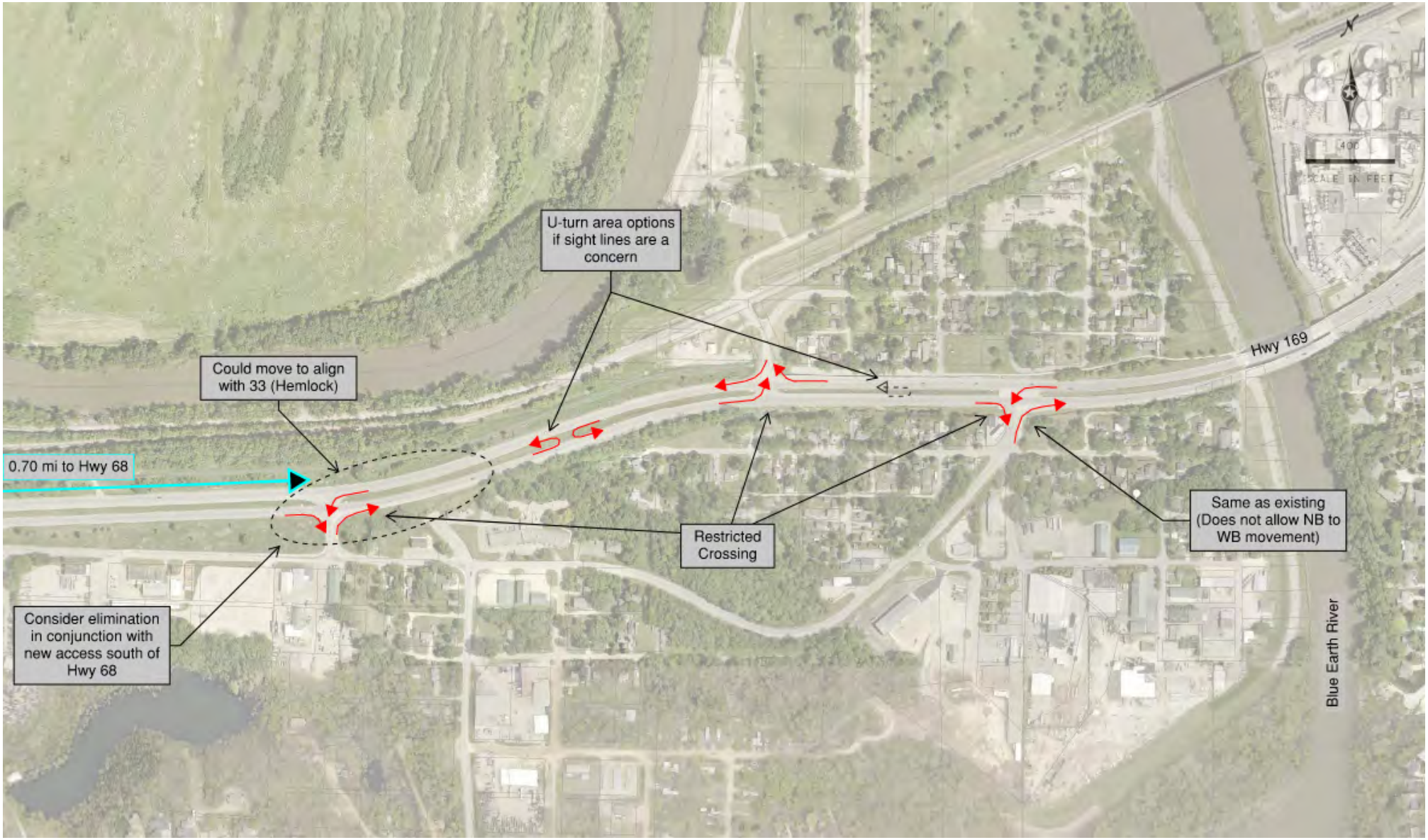
Southern Subarea – Dismissed Concepts

Section 1: Alternative 1A



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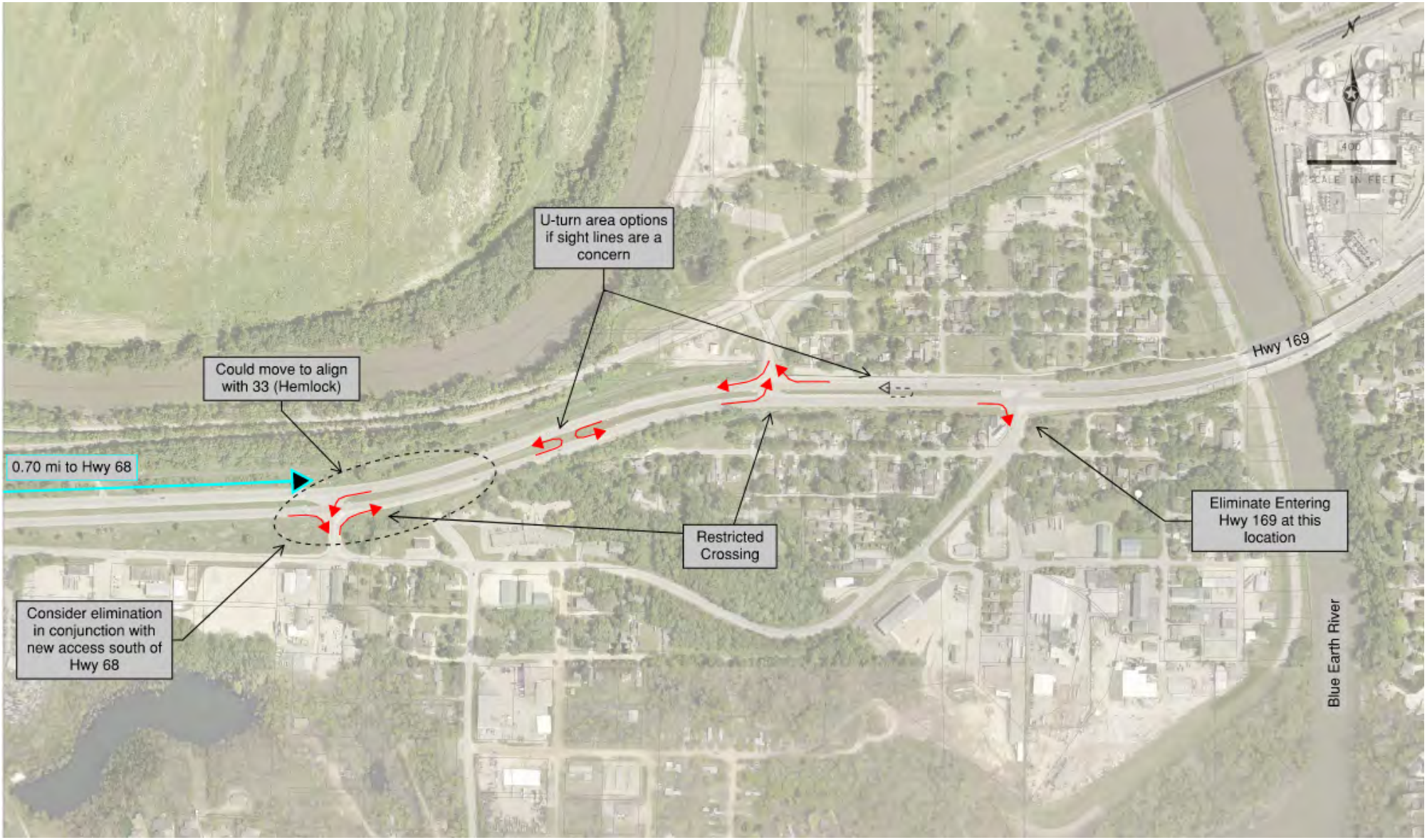
Southern Subarea – Dismissed Concepts

Section 1: Alternative 1B



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Appendix F

BENEFIT COST ANALYSIS MEMORANDUM

MAPO
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AREA PLANNING ORGANIZATION

Highway 169 Corridor Study

Benefit Cost Analysis

Date: August 25, 2021

To: Charles Androsky, Transportation Planner, MAPO

Ronda Allis, PE, MnDOT

From: Scott McBride, PE, Project Manager, Bolton & Menk, Inc.

Kelsey Retherford, PE, Traffic Engineer, Bolton & Menk, Inc.

Subject: Benefit Cost Analysis

Highway 169 Corridor Study

Mankato/North Mankato Area Planning Organization (MAPO)

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Introduction

The Mankato/North Mankato Area Planning Organization (MAPO) in collaboration with the Cities of North Mankato, Mankato, Blue Earth County, Nicollet County, and the Minnesota Department of Transportation (MnDOT) are working to identify transportation improvements on Highway 169. This report summarizes the detailed benefit cost analysis of the Northern Subarea concepts.

Concepts

A benefit cost analysis was completed for the following concepts:

- **Concept 1a – Signalized Expressway:** Signals at combined Lind St/River Ln and Webster Ave intersections
- **Concept 1b – Roundabout Expressway:** Roundabouts at combined Lind St/River Ln and Webster Ave intersections
- **Concept 1c – RCUT Expressway:** Signalized RCUTs (Restricted Crossing U-Turn)at combined Lind St/River Ln and Webster Ave intersections
- **Concept 1d – Freeway:** Interchange at Webster Ave and TH 169, close Lind St/River Ln access
- **Concept 2a – Freeway:** Full cloverleaf interchange at TH 169/TH 14
- **Concept 2c – Spot Interchange Improvements - Expressway:** Eliminate South to East loop and signalize TH 169 at EB TH 14 Ramps
- **Concept 2d – Spot Interchange Improvements - Expressway:** Convert TH 14 at TH 169 to a Diverging Diamond interchange
- **Concept 2f – Spot Interchange Improvements - Expressway:** Signalize TH 169 at EB TH 14 Exit Ramp

Concept drawings are included in the **Appendix**.

Safety Benefit

Lind St/River Ln/Webster Ave Concepts

Crash reduction factors for the alternatives were taken from the Highway Safety Manual, CMF Clearinghouse, and MnDOT technical memos. The reduction factors were used in combination with the standard HSIP Benefit-Cost Calculation worksheets to generate benefits associated with crash reductions. A traffic growth rate of 1.2% was determined comparing the existing and future peak hour turning movement volumes. Additionally, a discount rate of 1.0% and a project lifespan of 20 years was assumed based on MnDOT Benefit-Cost Analysis and HSIP guidance. Crash data from the last 5 years at Lind St, River Ln, and Webster Ave were analyzed for Concepts 1a-1d.

The crash reductions assumed for each concept are described below.

- **Concept 1a – Signalized Expressway:** No crash reduction was assumed since this option does not change the intersection of TH 169 at Webster Ave and only combines Lind St/River Ln traffic at signal which is similar to the existing condition.

- **Concept 1b – Roundabout Expressway:** Crash reductions (and increases) were taken from Table 15 of "A Study of the Traffic Safety at Roundabouts in Minnesota (2017)" which shows percent increase/decreases in crashes by severity for 2x1 roundabouts statewide.
- **Concept 1c – RCUT Expressway:** Crash reductions were taken from the 2017 MnDOT Study of the Traffic Safety at Reduced Conflict Intersections and the MnDOT Tech Memo: Restricted Crossing U-Turn - Design and Implementation Guidance. The reports show a crash reduction of 77% for angle crashes and a 35% reduction for all other crashes.
- **Concept 1d – Freeway (Interchange at Webster):** Crash reductions for converting an at grade intersection into a grade separated interchange was taken from the Highway Safety Manual. The HSM shows a 57% reduction in injury crashes and a 42% reduction in all other crashes. Additionally, CMFs for converting an intersection to a roundabout were applied. CMF ID 9157 was applied to all injury crashes (44% reduction) and CMF ID 10084 was applied to all property damage only crashes (36% reduction)

The present value safety benefits are shown in **Table 1** for the Concepts 1a-1d. The HSIP Benefit-Cost Calculation worksheets used to determine the present value cost of crashes are included in the **Appendix**.

Table 1. Safety Benefits for Lind/River/Webster Concepts

Concepts	Safety Benefit
Concept 1a. Signalized Expressway	$ -
Concept 1b. Roundabout Expressway	$ 386,419
Concept 1c. RCUT Expressway	$ 7,798,000
Concept 1d. Interchange at Webster	$ 14,711,915

TH 14 Interchange Concepts

Applicable crash reduction factors were not available for all of the TH 14 interchange concepts. Therefore, a new approach was used to determine the safety benefit with each concept. First, the conflict points with each concept were analyzed and compared to the existing condition. The following table shows the conflict points and change in conflict points from the existing condition.

Table 2. TH 14 Concept Conflict Points

Concepts	Conflict Points	Change in Conflict Points
No Build/Existing Condition	4 crossing, 8 diverging, 8 merging	N/A
Concept 2a. Full Cloverleaf Interchange	0 crossing, 8 diverging, 8 merging	4 less crossing
Concept 2c. Eliminate South Loop - Signal	6 crossing, 8 diverging, 9 merging	2 more crossing, 1 more merging
Concept 2d. Diverging Diamond	9 crossing, 8 diverging, 9 merging	5 more crossing, 1 more merging
Concept 2f. Signalize EB TH 14 Exit Ramp	4 crossing, 8 diverging, 8 merging	No change

The change in crossing conflict points was used to determine the increase or decrease in angle crashes and the change in merging/diverging conflict points were used to determine the increase or decrease in sideswipe crashes anticipated. The increase/decrease in angle and sideswipe crashes with concept are listed below.

- **Concept 2a – Freeway (Full Cloverleaf):** With 50% fewer crossing conflict points, concept 2a was assumed to have a 50% reduction in angle crashes at the TH 14 interchange.
- **Concept 2c – Spot Interchange Improvements – Expressway (Eliminate South Loop – Signalize):** With 150% more crossing conflict points, concept 2c was assumed to have a 150% increase in angle crashes

at the TH 14 interchange. With 113% more merging conflict points, concept 2c was assumed to have a 113% increase in sideswipe crashes at the TH 14 interchange.

- **Concept 2d – Spot Interchange Improvements – Expressway (Diverging Diamond):** With 225% more crossing conflict points, concept 2d was assumed to have a 225% increase in angle crashes at the TH 14 interchange. With 113% more merging conflict points, concept 2d was assumed to have a 113% increase in sideswipe crashes at the TH 14 interchange.
- **Concept 2f – Spot Interchange Improvements – Expressway (Signalize EB TH 14 Exit Ramp):** With no change in conflict points from the existing scenario, no change in angle or sideswipe crashes were assumed.

The percent reduction/increase was used in combination with the standard HSIP Benefit-Cost Calculation worksheets to generate benefits associated with crash reductions. A traffic growth rate of 1.2% was determined comparing the existing and future peak hour turning movement volumes. Additionally, a discount rate of 1.0% and a project lifespan of 20 years was assumed based on MnDOT Benefit-Cost Analysis and HSIP guidance. Crash data from the last 5 years at the TH 14/TH 149 interchange were analyzed.

The safety benefit due to anticipated changes in angle and sideswipe crashes is shown in **Table 3** below. Values in parenthesis indicate a negative safety benefit (increase in crashes).

Table 3. Safety Benefits (Angle and Sideswipe Crashes) for TH 14 Concepts

Concepts	Safety Benefit
Concept 2a. Full Cloverleaf Interchange	$ 2,458,951
Concept 2c. Eliminate South Loop - Signal	$ (7,516,981)
Concept 2d. Diverging Diamond	$ (1,220,407)
Concept 2f. Signalize EB TH 14 Exit Ramp	$ -

The existing TH 14/TH 169 interchange design results in very few rear end crashes (two in the last five years along the eastbound TH 14 exit ramp, and one along the WB TH 14 to SB TH 169 weave area), therefore, crash data at TH 169 and Lind St was used as a comparison. In order to estimate the increase in rear end crashes with the signalized concepts average 2040 AM/PM mainline delay was compared to 2040 AM/PM mainline delay at Lind St under the no build condition. The average 2040 AM/PM mainline delay with each concept and percent decrease in delay is shown in **Table 4** below. Since all of the concepts show less mainline delay than currently at Lind St, less rear end crashes are anticipated with each of the concepts than are at Lind St today.

Table 4. Average Mainline TH 169 2040 Peak Hour Delay

Concepts	Average Delay (seconds/vehicle)	Percent Decrease in Delay
No Build/Existing Condition (Lind St)	20	N/A
Concept 2c. Eliminate South Loop - Signal	8	60%
Concept 2d. Diverging Diamond	5	75%
Concept 2f. Signalize EB TH 14 Exit Ramp	2.5	88%

To determine the cost of the increase in rear end crashes anticipated with each concept first the present value of rear end crashes at Lind St was calculated. This cost was found to be $10,663,593. Next the cost of rear end crashes reduced with each concept was calculated based on the percent decrease anticipated in delay since delay was assumed to be directly correlated to the number of rear end crashes. Finally, the cost of the rear end crashes that remaining with each option was determined by subtracting the cost of the reduction in rear end crashes from the cost of rear end crashes at Lind St.

HSIP Benefit-Cost Calculation worksheets were used to determine the present value cost of crashes and are included in the **Appendix**.

The safety benefit due to anticipated increase in rear end crashes is shown in **Table 5**.

Table 5. Safety Benefits (Rear End Crashes) for TH 14 Concepts

Concepts	Safety Benefit
Concept 2a. Full Cloverleaf Interchange	$ -
Concept 2c. Eliminate South Loop - Signal	$ (4,265,437)
Concept 2d. Diverging Diamond	$ (2,665,898)
Concept 2f. Signalize EB TH 14 Exit Ramp	$ (1,279,631)

The overall total safety benefit with each option is shown in **Table 6** below.

Table 6. Total Safety Benefits for TH 14 Concepts

Concepts	Safety Benefit
Concept 2a. Full Cloverleaf Interchange	$ 2,458,951
Concept 2c. Eliminate South Loop - Signal	$ (11,782,418)
Concept 2d. Diverging Diamond	$ (3,886,305)
Concept 2f. Signalize EB TH 14 Exit Ramp	$ (1,279,631)

Delay Benefit

Existing and forecasting turning movement counts were used to model peak hour conditions with each concept. Total network delay in hours was determined in Synchro/SimTraffic for the AM and PM peak hours for each concept to determine the delay benefits. Concept 1d was modeled assuming single lane roundabouts at the interchange ramp terminals.

Tables 7 and **8** shows the 2020 and 2040 total network delay for each concept.

Table 7. Total Peak Hour Network Delay for the Lind/River/Webster Concepts

Concepts	2020 Network Delay (Hours)		2040 Network Delay (Hours)	
	AM Peak	PM Peak	AM Peak	PM Peak
No Build/Existing Condition	27.2	34.3	44.3	57.1
Concept 1a. Signalized Expressway	32.5	42.4	47.3	59.6
Concept 1b. Roundabout Expressway	15.3	17.9	39.6	52.1
Concept 1c. RCUT Expressway	26.8	44.0	47.6	70.9
Concept 1d. Interchange at Webster	4.5	6.3	12.8	14.2

Table 8. Total Peak Hour Network Delay for the TH 14 Concepts

Concepts	2020 Network Delay (Hours)		2040 Network Delay (Hours)	
	AM Peak	PM Peak	AM Peak	PM Peak
No Build/Existing Condition	10.3	14.8	70.8	105.3
Concept 2a. Full Cloverleaf Interchange	9.0	13.2	17.1	28.9
Concept 2c. Eliminate South Loop - Signal	22.0	27.6	36.7	48.1
Concept 2d. Diverging Diamond	25.6	29.7	36.6	48.9
Concept 2f. Signalize EB TH 14 Exit Ramp	12.6	16.7	22.6	32.7

Table 7 indicates that concepts 1b and 1d would lower the total network delay compared to the existing condition during the 2020 and 2040 peak hours, where concepts 1a and 1c would increase network delay compared to the no build scenario. **Table 8** indicates that all TH 14 concepts except concept 2a would increase total network delay compared to the existing condition during the 2020 peak hour. However, during the 2040 peak hours the no build scenario delay is anticipated to be significantly worse so by 2040 all concepts are assumed to operate with less delay than the no build scenario.

The AM peak hour was assumed to account for 8% of the daily total and the PM peak hour was assumed to account for 10% of the daily total. Therefore, the total daily delay was estimated using the following equation.

$$\boldsymbol{Total\ Daily\ Delay} = \frac{\boldsymbol{AM\ Network\ Delay} + \boldsymbol{PM\ Network\ Delay}}{(\mathbf{0.08}+\mathbf{0.10})}$$

Auto delay and truck delay values were computed using the truck percentage (6.6%). The 6.6% truck percentage was estimated from the most recent heavy commercial count along TH 169 south of TH 14. The following values of travel time savings per person-hour were taken from Table A.1 of MnDOTs recommended standard values for use in cost effectiveness and benefit-cost analysis:

- $20.30 for autos
- $33.00 for trucks

Benefits from the reduction of delay were computed for the various concepts by comparing the total delay values for the concepts to the no build scenario. The total benefit over the 20-year analysis period can be determined using the 2020 and 2040 benefits. Assuming the delay benefits increased over the analysis period with a discount rate of 1.0%, the following formula was used to convert to a present value total delay benefit:

$$\boldsymbol{Total\ Delay\ Benefit} =$$

$$(\mathbf{2020}\ \boldsymbol{Benefit}) + \mathbf{17.2} * (\mathbf{2020}\ \boldsymbol{Benefit}) + \mathbf{150} * \frac{(\mathbf{2040}\ \boldsymbol{Benefit} - \mathbf{2020}\ \boldsymbol{Benefit})}{\mathbf{19}}$$

The formula was developed by assuming a uniform series of the 2020 benefit over the 20-year analysis period with the addition of a uniform gradient benefit (the additional benefit gained every year until the full 2040 benefit is reached). See **Tables 9** and **10** for the total delay benefits for each concept.

Table 9. Delay Benefits for Lind/River/Webster Concepts

Concepts	Delay Benefit
Concept 1a. Signalized Expressway	$ (9,762,231)
Concept 1b. Roundabout Expressway	$ 19,284,962
Concept 1c. RCUT Expressway	$ (16,013,057)
Concept 1d. Interchange at Webster	$ 74,206,498

Table 10. Delay Benefits for TH 14 Concepts

Concepts	Delay Benefit
Concept 2a. Full Cloverleaf Interchange	$ 91,765,194
Concept 2c. Eliminate South Loop - Signal	$ 52,640,901
Concept 2d. Diverging Diamond	$ 49,628,565
Concept 2f. Signalize EB TH 14 Exit Ramp	$ 82,151,540

Delay benefits for the concepts 1a and 1c were found to be negative as delay is increased overall with these options.

Project Cost

Planning level cost estimates were calculated for each alternative. The cost estimates shown are in 2022 dollars and include 20% contingency and 20% for design and construction engineering fees. The cost of right of way was included only for concepts that require full property takes as concepts drawings were completed at a planning level and exact property impacts is unknown. Only concepts 1d and 2a were assumed to have full property takes based on the planning level concepts. The cost of acquiring the properties was assumed to be three times the current market value of the property. For concept 1d, six of the properties adjacent to the existing TH 169 and Webster Ave intersection were assumed to be acquired. For concept 2a, only one property was assumed to be acquired. The impacted properties can be seen on the concept figure for concept 2a and 1d in **Appendix B**. The construction and right of way acquisition costs are shown in **Table 11** below. A lower and higher end cost is shown for concept 2a. The lower end cost assumes the interchange remains within the flood zone (which is the existing condition). The higher end cost raises TH 169 and the TH 14 interchange to eliminate the flood zone issue so that TH 169 does not need to be closed and sand bagged when the Mississippi River water levels get too high.

Table 11. Concept Cost Estimates

Concepts	Construction Cost	ROW Cost	Total Cost
Concept 1a. Signalized Expressway	$ 6,200,000	$ -	$ 6,200,000
Concept 1b. Roundabout Expressway	$ 7,300,000	$ -	$ 7,300,000
Concept 1c. RCUT Expressway	$ 8,600,000	$ -	$ 8,600,000
Concept 1d. Interchange at Webster	$ 25,000,000	$ 4,430,700	$ 29,431,000
Concept 2a. Full Cloverleaf Interchange (lower end)	$ 14,000,000	$ 3,078,300	$ 17,079,000
Concept 2a. Full Cloverleaf Interchange (higher end)	$ 23,000,000	$ 3,078,300	$ 26,079,000
Concept 2c. Eliminate South Loop - Signal	$ 2,500,000	$ -	$ 2,500,000
Concept 2d. Diverging Diamond	$ 9,000,000	$ -	$ 9,000,000
Concept 2f. Signalize EB TH 14 Exit Ramp	$ 500,000	$ -	$ 500,000

Cost Benefit Summary

The present value of both safety and delay benefits are summarized in **Tables 12** and **13** along with concept-level cost estimates and the benefit to cost ratio. A ratio greater than one indicates the project cost is less than the anticipated benefit from the investment. A ratio lower than one, or a negative ratio, indicates the anticipated benefit does not offset the cost.

Table 12. Benefit-Cost for Lind/River/Webster Concepts

Concepts	Safety Benefit	Delay Benefit	Total Cost	B/C Ratio
Concept 1a. Signalized Expressway	$ -	$ (9,762,231)	$ 3,700,000	**-2.64**
Concept 1b. Roundabout Expressway	$ 386,419	$ 19,284,962	$ 7,300,000	**2.69**
Concept 1c. RCUT Expressway	$ 7,798,000	$ (16,013,057)	$ 8,600,000	**-0.96**
Concept 1d. Interchange at Webster	$ 14,711,915	$ 74,206,498	$ 29,431,000	**3.02**

Table 12 indicates that concepts 1b and 1d both have anticipated benefits that are higher than project costs. Since concepts 1a and 1c have benefit cost ratios less than one, the anticipated benefits do not offset the cost.

Table 13. Benefit-Cost for TH 14 Concepts

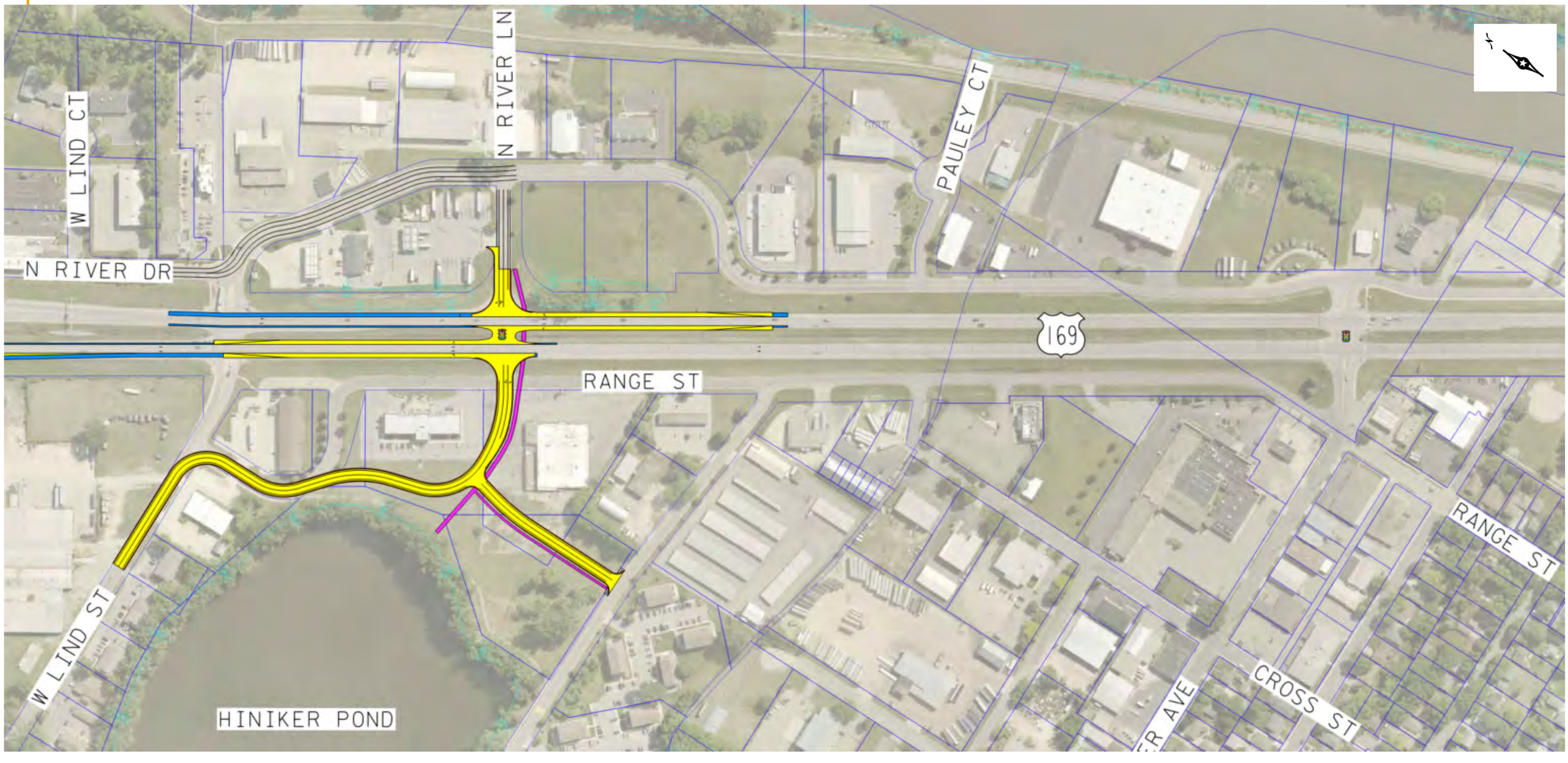
Concepts	Safety Benefit	Delay Benefit	Total Cost	B/C Ratio
Concept 2a. Full Cloverleaf Interchange (lower end)	$ 2,458,951	$ 91,765,194	$ 17,079,000	**5.52**
Concept 2a. Full Cloverleaf Interchange (higher end)	$ 2,458,951	$ 91,765,194	$ 26,079,000	**3.61**
Concept 2c. Eliminate South Loop - Signal	$ (11,782,418)	$ 52,640,901	$ 2,500,000	**16.34**
Concept 2d. Diverging Diamond	$ (3,886,305)	$ 49,628,565	$ 9,000,000	**5.08**
Concept 2f. Signalize EB TH 14 Exit Ramp	$ (1,279,631)	$ 82,151,540	$ 500,000	**161.74**

Table 13 indicates that all of the TH 14 concepts have anticipated benefits that are higher than the project costs.

Appendix

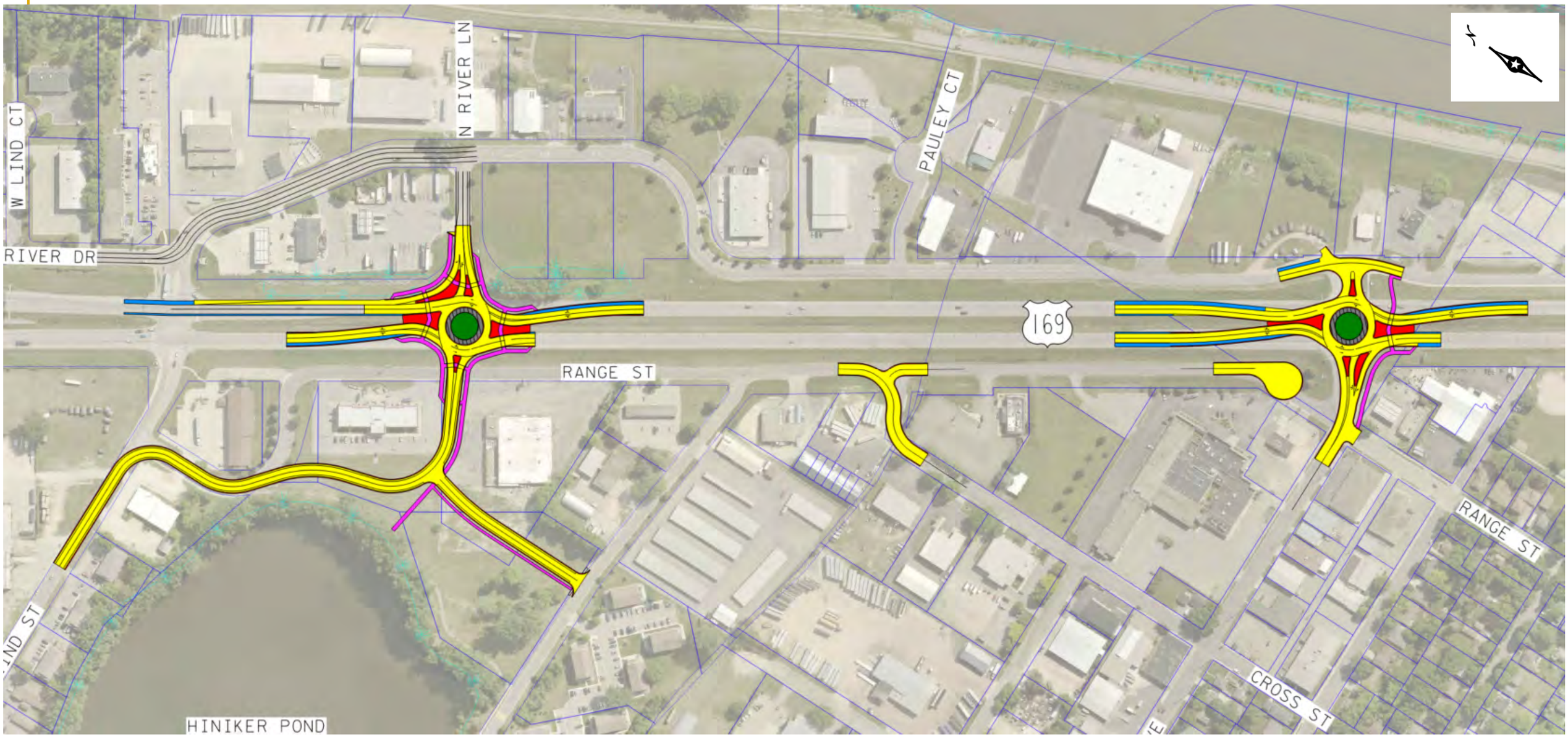
Northern Subarea – N River Ln and Webster Ave

Concept 1A – N River Ln and Webster Ave: Traffic Signal



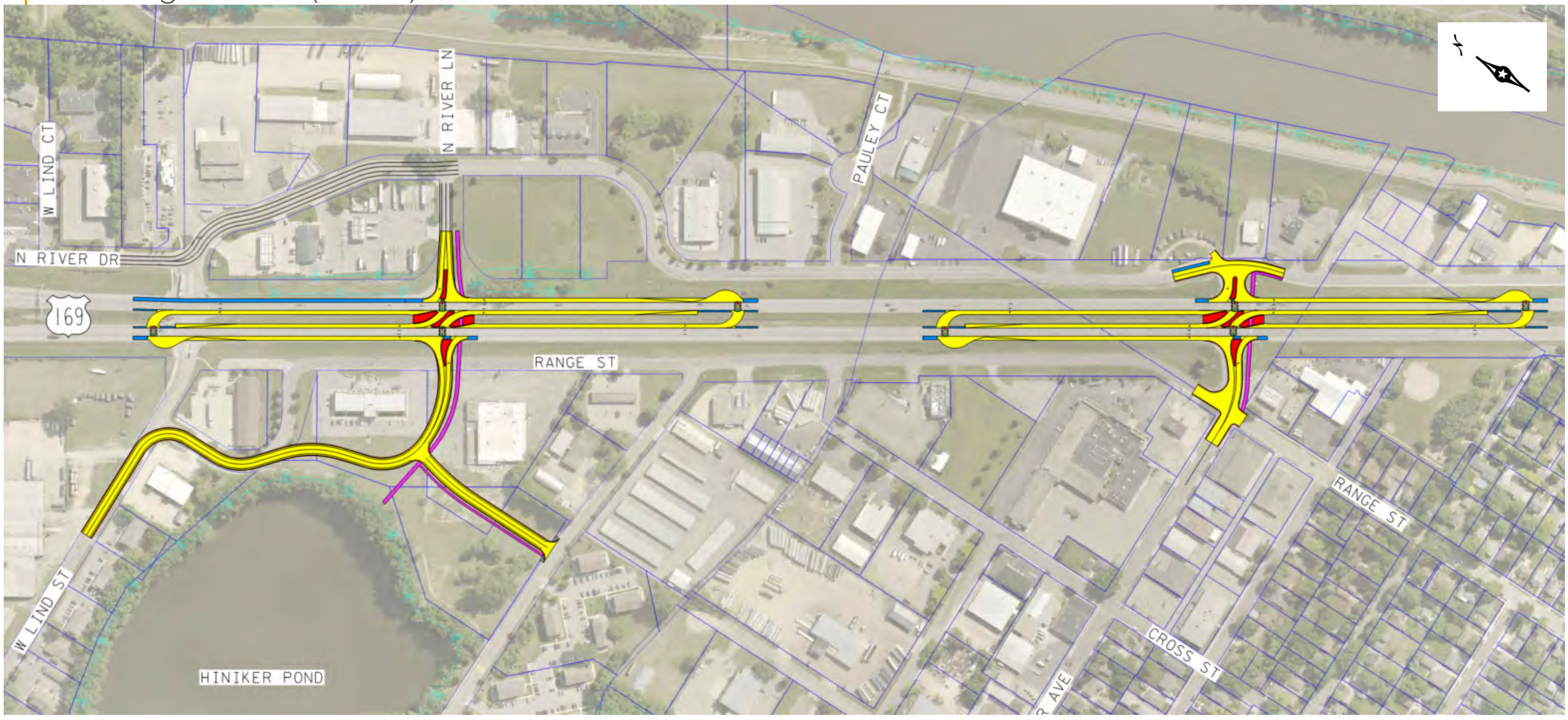
Northern Subarea – N River Ln and Webster Ave

Concept 1B – N River Ln and Webster Ave: Roundabouts



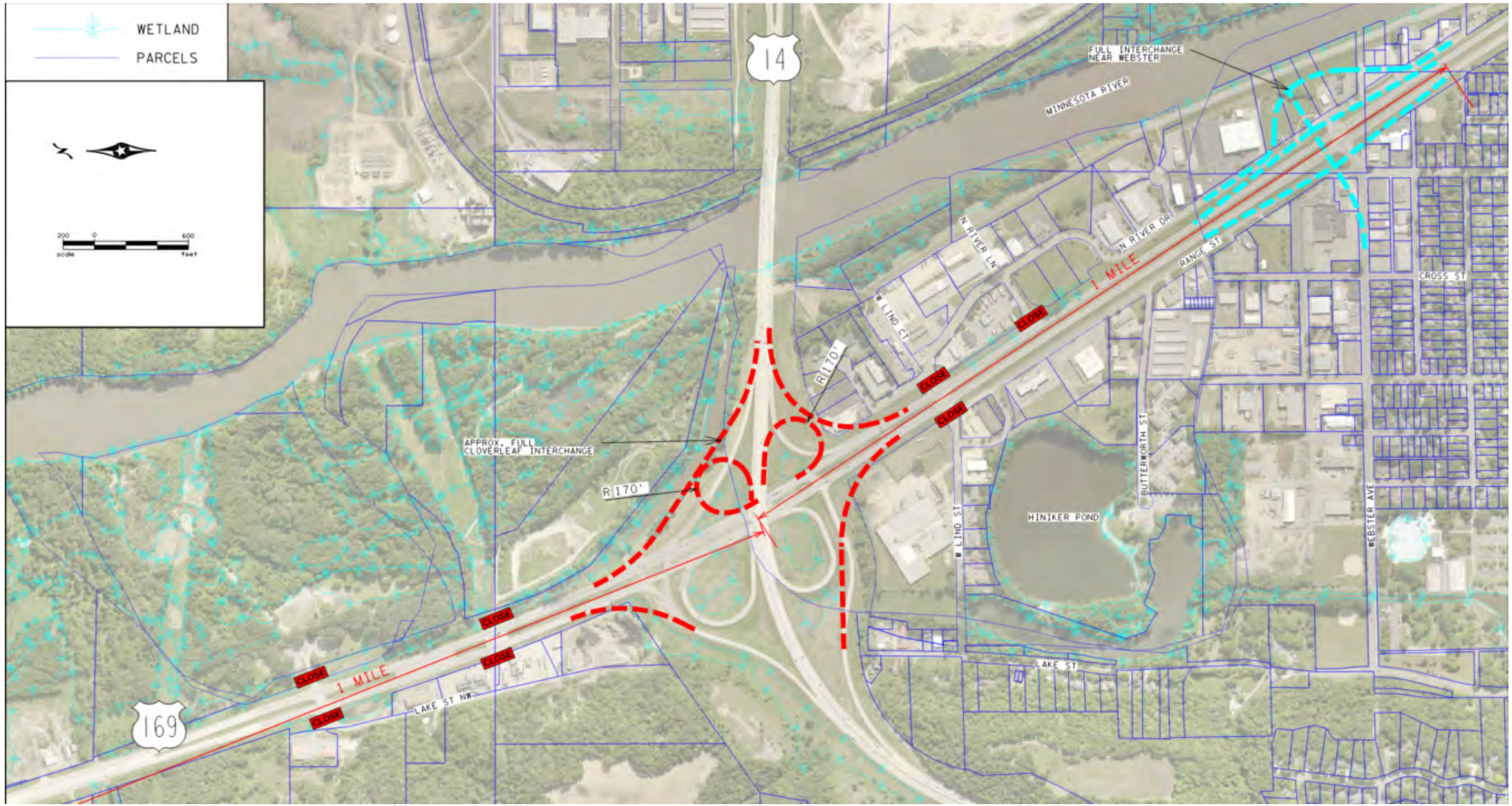
Northern Subarea – N River Ln and Webster Ave

Concept 1C – N River Ln and Webster Ave: Restricted Crossing U-Turn (RCUT) Intersections



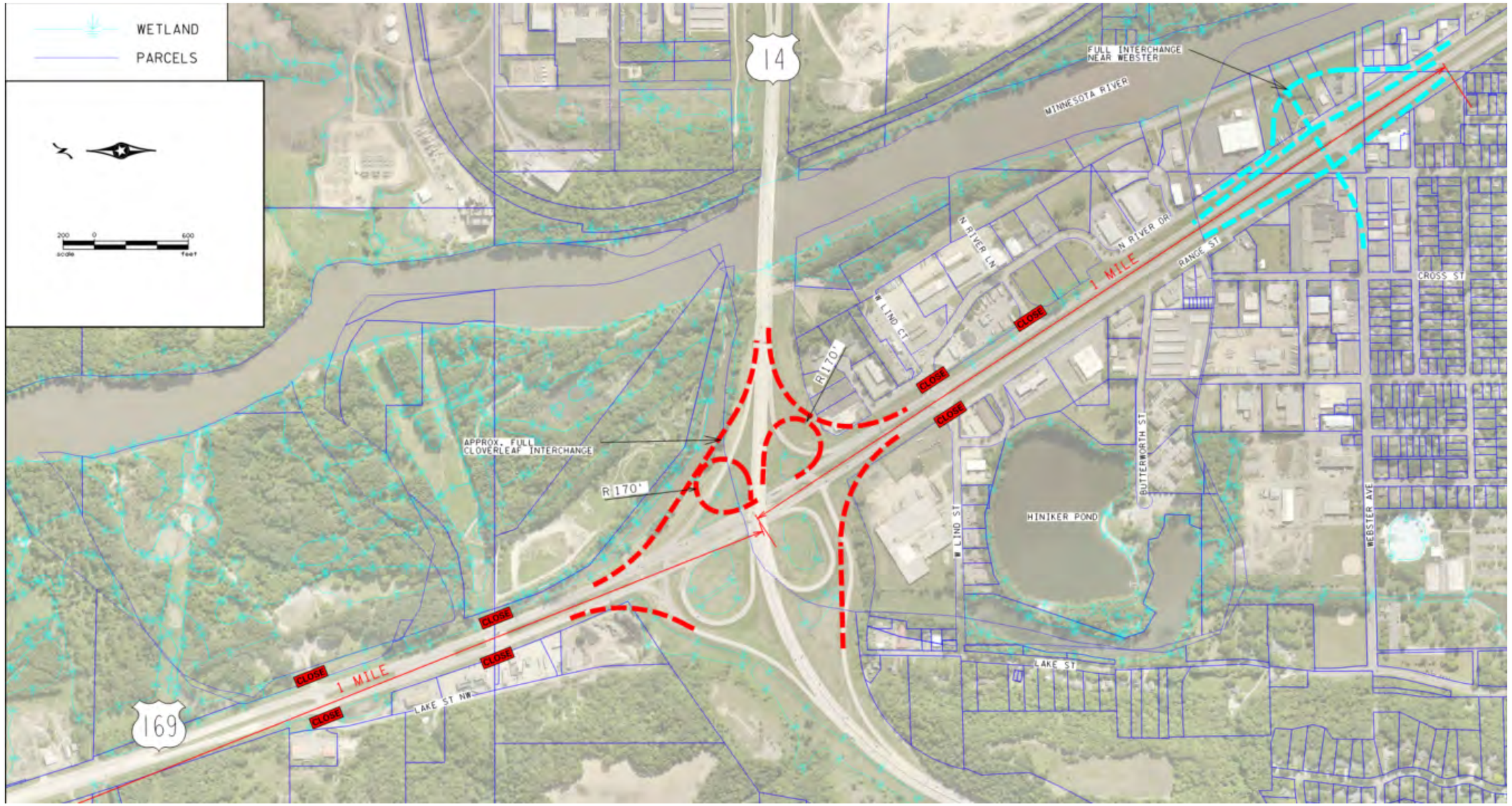
Northern Subarea – Freeway Option

Concept 1D – Hwy 169/14 Cloverleaf and Webster Ave Interchange



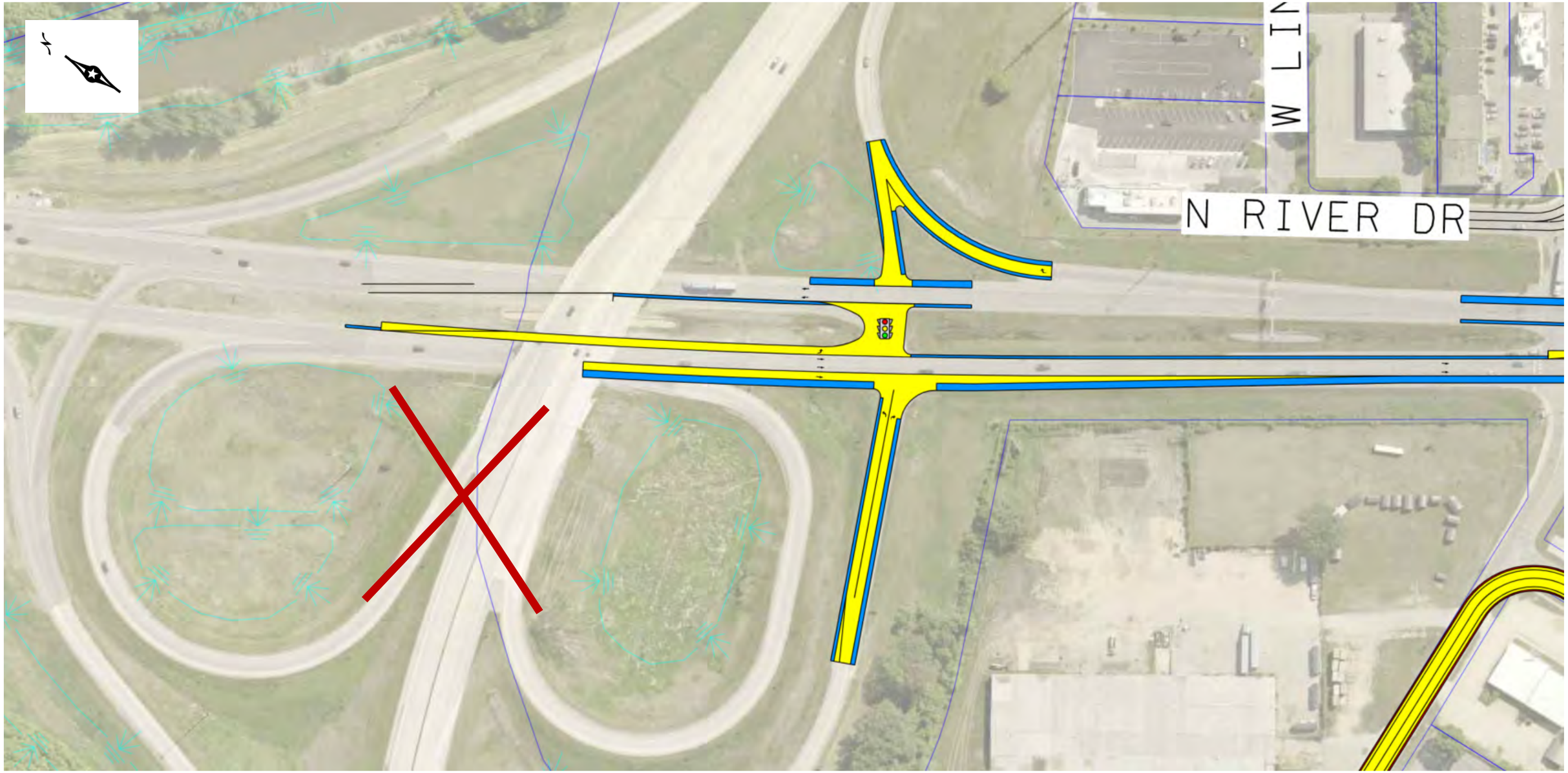
Northern Subarea – Hwy 14 Interchange

Concept 2A: Full Cloverleaf



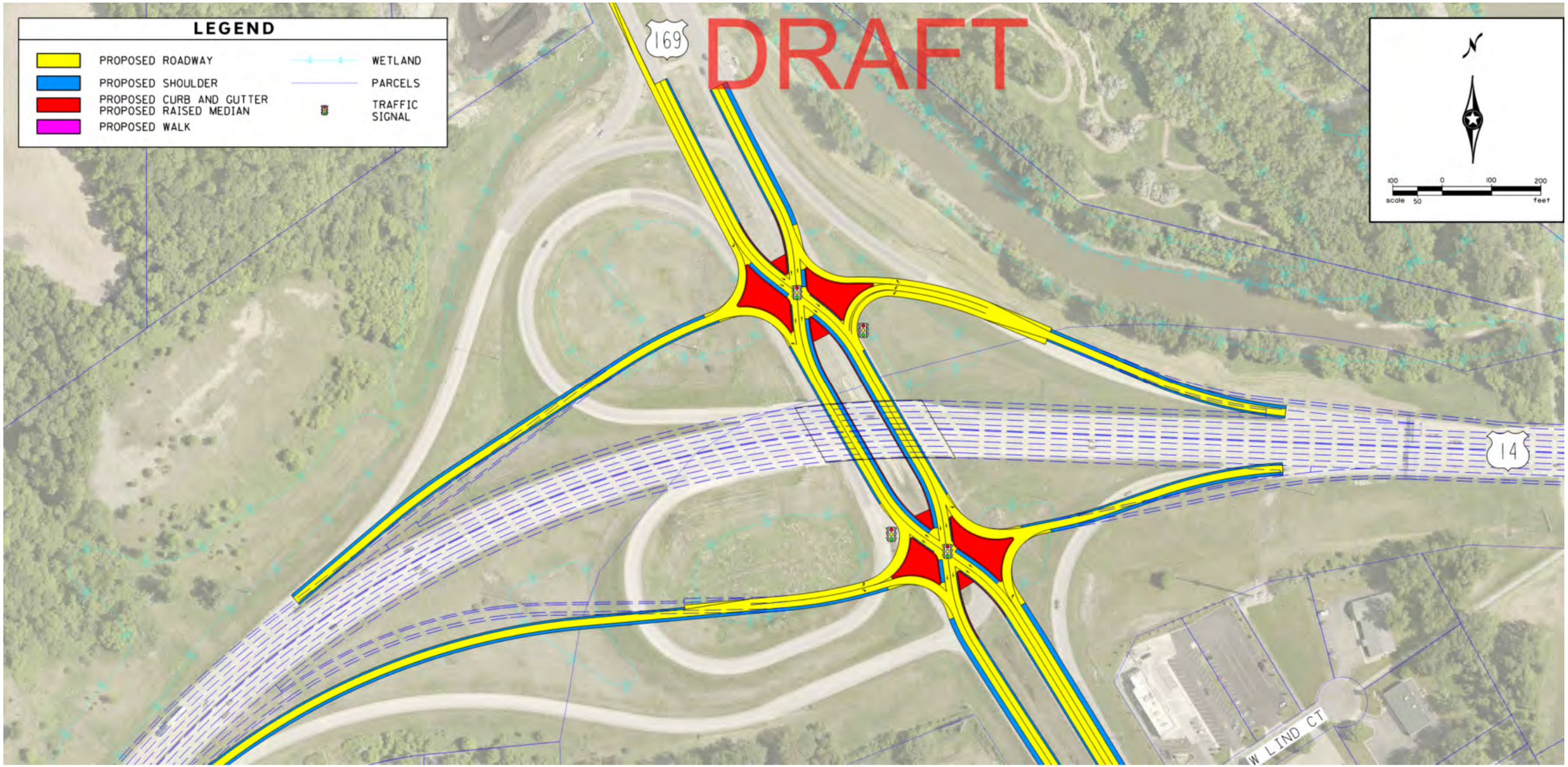
Northern Subarea – Hwy 14 Interchange

Concept 2C: Eliminate South Loop and Add Traffic Signal



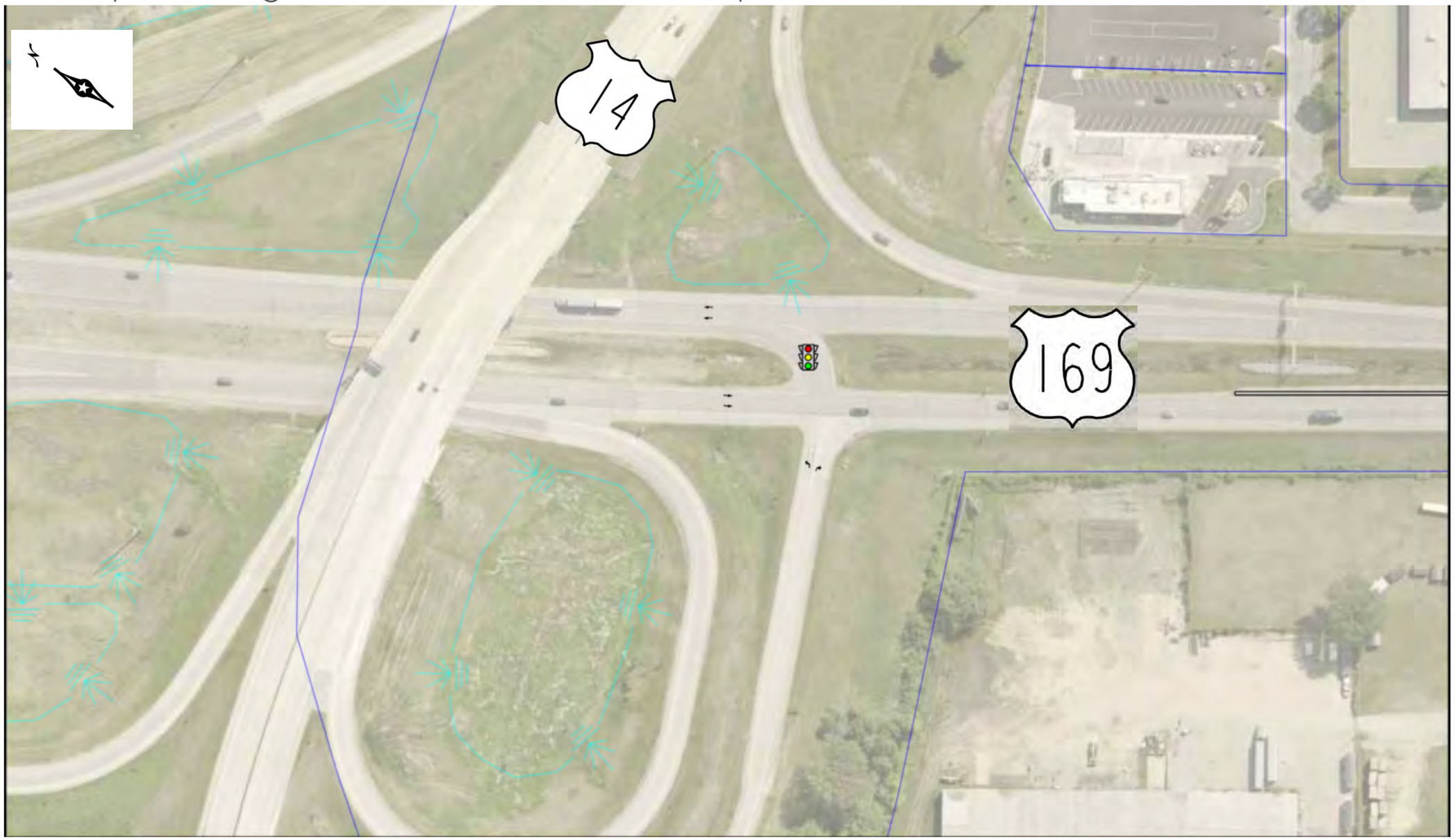
Northern Subarea – Hwy 14 Interchange

Concept 2D: Diverging Diamond



Northern Subarea – Hwy 14 Interchange

Concept 2F: Signalize EB TH 14 Exit Ramp at TH 169



CRASH MODIFICATION FACTORS CLEARINGHOUSE

CMF / CRF Details

CMF ID: 9157

Convert intersection to roundabout

Description:

Prior Condition: ***No Prior Condition(s)***

Category: Intersection geometry

Study: ***Road safety effects of roundabouts: A meta-analysis*****, Elvik, R., 2017**

Star Quality Rating:	★★★★★ [View score details]

Crash Modification Factor (CMF)	
Value:	0.56
Adjusted Standard Error:	
Unadjusted Standard Error:	0.043

Crash Reduction Factor (CRF)	
Value:	44 *(This value indicates a **decrease** in crashes)*
Adjusted Standard Error:	
Unadjusted Standard Error:	4.34

Applicability

Crash Type:	All
Crash Severity:	A (serious injury),B (minor injury),C (possible injury)
Roadway Types:	Not specified
Number of Lanes:	
Road Division Type:	
Speed Limit:	
Area Type:	Not specified
Traffic Volume:	
Time of Day:	Not specified

If countermeasure is intersection-based

Intersection Type:	Not specified
Intersection Geometry:	Not specified
Traffic Control:	
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

Development Details

Date Range of Data Used:	1975 to 2014
Municipality:	
State:	No state(s) chosen.
Country:	Multiple countries

Type of Methodology Used:	10
Sample Size Used:	

Other Details

Included in Highway Safety Manual?	No
Date Added to Clearinghouse:	Jan-17-2018
Comments:	Includes single and double lane roundabouts

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CMF / CRF Details

CMF ID: 10084

Conversion of intersection to roundabout

Description: Conversion of stop- and signal-controlled intersections into roundabouts

Prior Condition: Intersections without roundabouts

Category: Intersection geometry

Study: *Safety Evaluation of Roundabouts in Georgia*, Gbologah et al., 2019

Star Quality Rating:	★★★☆☆ [View score details]

Crash Modification Factor (CMF)	
Value:	0.642
Adjusted Standard Error:	
Unadjusted Standard Error:	

Crash Reduction Factor (CRF)	
Value:	35.8 *(This value indicates a **decrease** in crashes)*
Adjusted Standard Error:	

Unadjusted Standard Error:	

Applicability

Crash Type:	All
Crash Severity:	All
Roadway Types:	Not specified
Number of Lanes:	
Road Division Type:	Undivided
Speed Limit:	
Area Type:	All
Traffic Volume:	
Time of Day:	All

If countermeasure is intersection-based

Intersection Type:	Roadway/roadway (not interchange related)
Intersection Geometry:	4-leg
Traffic Control:	Not specified
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

Development Details

Date Range of Data Used:	2007 to 2014
Municipality:	
State:	GA

Country:	United States
Type of Methodology Used:	2
Sample Size Used:	

Other Details

Included in Highway Safety Manual?	No
Date Added to Clearinghouse:	Jul-26-2019
Comments:	Applies to the conversion of a four-leg intersection to a single-lane roundabout. CMF analysis omits roundabout locations with less than four average observed crashes per year in before period as one sample, roundabout locations with just a single data-year of crashes in before or after period, and roundabout locations with zero observed crashes in the before period.

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Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	Intersections of TH 169/Lind St/River Ln and TH 169/Webster Ave				

B. Project Description

Proposed Work	Install Roundabouts		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

	Fatal (K) Crashes	**Reference**	A Study of the Traffic Safety at Roundabouts in Minnesota (2017)
	Serious Injury (A) Crashes		
0.64	**Moderate Injury (B) Crashes**	**Crash Type**	All
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	**All**	**< optional 2nd CMF >**
K crashes		
A crashes		
B crashes	8	
C crashes		
PDO crashes		

F. Benefit-Cost Calculation

$2,465,255	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce 1 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	2.88	0.58	$120,960
C crashes	0.00	0.00	$0
PDO crashes	0.00	0.00	$0
			$120,960

H. Amortized Benefit

Total = $2,465,255

Year	Crash Benefits	Present Value
2025	$120,960	$120,960
2026	$122,412	$121,200
2027	$123,880	$121,440
2028	$125,367	$121,680
2029	$126,871	$121,921
2030	$128,394	$122,162
2031	$129,935	$122,404
2032	$131,494	$122,647
2033	$133,072	$122,890
2034	$134,669	$123,133
2035	$136,285	$123,377
2036	$137,920	$123,621
2037	$139,575	$123,866
2038	$141,250	$124,111
2039	$142,945	$124,357
2040	$144,660	$124,603
2041	$146,396	$124,850
2042	$148,153	$125,097
2043	$149,931	$125,345
2044	$151,730	$125,593
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	Intersections of TH 169/Lind St/River Ln and TH 169/Webster Ave				

B. Project Description

Proposed Work	Install Roundabouts		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

	Fatal (K) Crashes	**Reference**	A Study of the Traffic Safety at Roundabouts in Minnesota (2017)
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	All
0.90	**Possible Injury (C) Crashes**		
	Property Damage Only Crashes		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	**All**	**< optional 2nd CMF >**
K crashes		
A crashes		
B crashes		
C crashes	15	
PDO crashes		

F. Benefit-Cost Calculation

$672,565	**Benefit (present value)**
$0	**Cost**

B/C Ratio = N/A

Proposed project expected to reduce 1 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	0.00	0.00	$0
C crashes	1.50	0.30	$33,000
PDO crashes	0.00	0.00	$0
			$33,000

H. Amortized Benefit

Year	Crash Benefits	Present Value
2025	$33,000	$33,000
2026	$33,396	$33,065
2027	$33,797	$33,131
2028	$34,202	$33,196
2029	$34,613	$33,262
2030	$35,028	$33,328
2031	$35,448	$33,394
2032	$35,874	$33,460
2033	$36,304	$33,526
2034	$36,740	$33,593
2035	$37,181	$33,659
2036	$37,627	$33,726
2037	$38,079	$33,793
2038	$38,535	$33,860
2039	$38,998	$33,927
2040	$39,466	$33,994
2041	$39,939	$34,061
2042	$40,419	$34,129
2043	$40,904	$34,196
2044	$41,395	$34,264
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Total = $672,565

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	Intersections of TH 169/Lind St/River Ln and TH 169/Webster Ave				

B. Project Description

Proposed Work	Install Roundabouts		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

	Fatal (K) Crashes	**Reference**	A Study of the Traffic Safety at Roundabouts in Minnesota (2017)
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	All
	Possible Injury (C) Crashes		
1.75	**Property Damage Only Crashes**		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	**All**	**< optional 2nd CMF >**
K crashes	0	
A crashes	0	
B crashes	0	
C crashes	0	
PDO crashes	75	

F. Benefit-Cost Calculation

-$2,751,401	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce -12 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	0.00	0.00	$0
C crashes	0.00	0.00	$0
PDO crashes	-56.25	-11.25	-$135,000
			-$135,000

H. Amortized Benefit

Total = -$2,751,401

Year	Crash Benefits	Present Value
2025	-$135,000	-$135,000
2026	-$136,620	-$135,267
2027	-$138,259	-$135,535
2028	-$139,919	-$135,804
2029	-$141,598	-$136,072
2030	-$143,297	-$136,342
2031	-$145,016	-$136,612
2032	-$146,757	-$136,882
2033	-$148,518	-$137,153
2034	-$150,300	-$137,425
2035	-$152,103	-$137,697
2036	-$153,929	-$137,970
2037	-$155,776	-$138,243
2038	-$157,645	-$138,517
2039	-$159,537	-$138,791
2040	-$161,451	-$139,066
2041	-$163,389	-$139,341
2042	-$165,349	-$139,617
2043	-$167,334	-$139,894
2044	-$169,342	-$140,171
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	Intersections of TH 169/Lind St/River Ln and TH 169/Webster Ave				

B. Project Description

Proposed Work	Install Restricted Crossing U-Turn		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

0.23	**Fatal (K) Crashes**	**Reference**	2017 MnDOT Study of the Traffic Safety at Reduced Conflict Intersections
0.23	**Serious Injury (A) Crashes**		
0.23	**Moderate Injury (B) Crashes**	**Crash Type**	Angle
0.23	**Possible Injury (C) Crashes**		
0.23	**Property Damage Only Crashes**		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	Angle	< optional 2nd CMF >
K crashes	0	
A crashes	0	
B crashes	1	
C crashes	2	
PDO crashes	10	

F. Benefit-Cost Calculation

$1,694,000	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce 3 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.2%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	0.77	0.15	$32,340
C crashes	1.54	0.31	$33,880
PDO crashes	7.70	1.54	$18,480
			$84,700

H. Amortized Benefit

Year	Crash Benefits	Present Value
2025	$84,700	$84,700
2026	$85,716	$84,700
2027	$86,745	$84,700
2028	$87,786	$84,700
2029	$88,839	$84,700
2030	$89,905	$84,700
2031	$90,984	$84,700
2032	$92,076	$84,700
2033	$93,181	$84,700
2034	$94,299	$84,700
2035	$95,431	$84,700
2036	$96,576	$84,700
2037	$97,735	$84,700
2038	$98,908	$84,700
2039	$100,095	$84,700
2040	$101,296	$84,700
2041	$102,511	$84,700
2042	$103,741	$84,700
2043	$104,986	$84,700
2044	$106,246	$84,700
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Total = $1,694,000

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	Intersections of TH 169/Lind St/River Ln and TH 169/Webster Ave				

B. Project Description

Proposed Work	Install Restricted Crossing U-Turn		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

0.65	**Fatal (K) Crashes**	**Reference**	MnDOT Tech Memo: Restricted Crossing U-Turn - Design and Implementation Guidance
0.65	**Serious Injury (A) Crashes**		
0.65	**Moderate Injury (B) Crashes**	**Crash Type**	All
0.65	**Possible Injury (C) Crashes**		
0.65	**Property Damage Only Crashes**		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	**All**	**< optional 2nd CMF >**
K crashes	0	
A crashes	1	
B crashes	7	
C crashes	13	
PDO crashes	65	

F. Benefit-Cost Calculation

$6,104,000	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce 7 crashes annually, 1 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.2%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.35	0.07	$47,600
B crashes	2.45	0.49	$102,900
C crashes	4.55	0.91	$100,100
PDO crashes	22.75	4.55	$54,600
			$305,200

H. Amortized Benefit

Year	Crash Benefits	Present Value
2025	$305,200	$305,200
2026	$308,862	$305,200
2027	$312,569	$305,200
2028	$316,320	$305,200
2029	$320,115	$305,200
2030	$323,957	$305,200
2031	$327,844	$305,200
2032	$331,778	$305,200
2033	$335,760	$305,200
2034	$339,789	$305,200
2035	$343,866	$305,200
2036	$347,993	$305,200
2037	$352,169	$305,200
2038	$356,395	$305,200
2039	$360,671	$305,200
2040	$364,999	$305,200
2041	$369,379	$305,200
2042	$373,812	$305,200
2043	$378,298	$305,200
2044	$382,837	$305,200
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Total = $6,104,000

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	Intersections of TH 169/Lind St/River Ln and TH 169/Webster Ave				

B. Project Description

Proposed Work	Install Grade Separated Interchage with Roundabouts		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

0.24	**Fatal (K) Crashes**	**Reference**	Highway Safety Manual and CMF ID 9157
0.24	**Serious Injury (A) Crashes**		
0.24	**Moderate Injury (B) Crashes**	**Crash Type**	All Injury Crashes
0.24	**Possible Injury (C) Crashes**		
	Property Damage Only Crashes		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	All Injury Crashes	< optional 2nd CMF >
K crashes	0	
A crashes	1	
B crashes	8	
C crashes	15	
PDO crashes	0	

F. Benefit-Cost Calculation

$12,409,396	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce 4 crashes annually, 1 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.76	0.15	$103,251
B crashes	6.07	1.21	$255,091
C crashes	11.39	2.28	$250,536
PDO crashes	0.00	0.00	$0
			$608,878

H. Amortized Benefit

Total = $12,409,396

Year	Crash Benefits	Present Value
2025	$608,878	$608,878
2026	$616,185	$610,084
2027	$623,579	$611,292
2028	$631,062	$612,503
2029	$638,635	$613,716
2030	$646,298	$614,931
2031	$654,054	$616,149
2032	$661,903	$617,369
2033	$669,846	$618,591
2034	$677,884	$619,816
2035	$686,018	$621,043
2036	$694,251	$622,273
2037	$702,582	$623,505
2038	$711,012	$624,740
2039	$719,545	$625,977
2040	$728,179	$627,217
2041	$736,917	$628,459
2042	$745,760	$629,703
2043	$754,709	$630,950
2044	$763,766	$632,200
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	Intersections of TH 169/Lind St/River Ln and TH 169/Webster Ave				

B. Project Description

Proposed Work	Install Grade Separated Interchage with Roundabouts		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

	Fatal (K) Crashes	**Reference**	Highway Safety Manual and CMF ID 10084
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	All
	Possible Injury (C) Crashes		
0.37	**Property Damage Only Crashes**		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	**All**	**< optional 2nd CMF >**
K crashes	0	
A crashes	0	
B crashes	0	
C crashes	0	
PDO crashes	75	

F. Benefit-Cost Calculation

$2,302,519	**Benefit (present value)**
$0	**Cost**

B/C Ratio = N/A

Proposed project expected to reduce 10 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	0.00	0.00	$0
C crashes	0.00	0.00	$0
PDO crashes	47.07	9.41	$112,975
			$112,975

H. Amortized Benefit

Year	Crash Benefits	Present Value
2025	$112,975	$112,975
2026	$114,331	$113,199
2027	$115,703	$113,423
2028	$117,091	$113,648
2029	$118,496	$113,873
2030	$119,918	$114,098
2031	$121,357	$114,324
2032	$122,814	$114,551
2033	$124,287	$114,777
2034	$125,779	$115,005
2035	$127,288	$115,232
2036	$128,816	$115,461
2037	$130,361	$115,689
2038	$131,926	$115,918
2039	$133,509	$116,148
2040	$135,111	$116,378
2041	$136,732	$116,608
2042	$138,373	$116,839
2043	$140,034	$117,071
2044	$141,714	$117,302
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Total = $2,302,519

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	TH 169 - TH 14 Interchange				

B. Project Description

Proposed Work	Convert to Full Cloverleaf Interchange		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

0.50	**Fatal (K) Crashes**	**Reference**	Based on change in crossing conflict points
0.50	**Serious Injury (A) Crashes**		
0.50	**Moderate Injury (B) Crashes**	**Crash Type**	Angle
0.50	**Possible Injury (C) Crashes**		
0.50	**Property Damage Only Crashes**		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	Angle	< optional 2nd CMF >
K crashes	0	
A crashes	0	
B crashes	3	
C crashes	5	
PDO crashes	3	

F. Benefit-Cost Calculation

$2,468,951	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce 2 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	1.50	0.30	$63,000
C crashes	2.50	0.50	$55,000
PDO crashes	1.50	0.30	$3,600
			$121,600

H. Amortized Benefit

Year	Crash Benefits	Present Value
2025	$121,600	$121,600
2026	$123,011	$121,793
2027	$124,437	$121,986
2028	$125,881	$122,179
2029	$127,341	$122,372
2030	$128,818	$122,566
2031	$130,313	$122,760
2032	$131,824	$122,955
2033	$133,353	$123,150
2034	$134,900	$123,345
2035	$136,465	$123,540
2036	$138,048	$123,736
2037	$139,650	$123,932
2038	$141,269	$124,128
2039	$142,908	$124,325
2040	$144,566	$124,522
2041	$146,243	$124,719
2042	$147,939	$124,917
2043	$149,655	$125,114
2044	$151,391	$125,313
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Total = $2,468,951

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	TH 169 - TH 14 Interchange				

B. Project Description

Proposed Work	Install Traffic Signal at EB TH 14 Ramp and TH 169, Eliminate SB to EB Loop Ramp		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

2.50	**Fatal (K) Crashes**	**Reference**	Based on change in crossing conflict points
2.50	**Serious Injury (A) Crashes**		
2.50	**Moderate Injury (B) Crashes**	**Crash Type**	Angle
2.50	**Possible Injury (C) Crashes**		
2.50	**Property Damage Only Crashes**		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	Angle	< optional 2nd CMF >
K crashes	0	
A crashes	0	
B crashes	3	
C crashes	5	
PDO crashes	3	

F. Benefit-Cost Calculation

-$7,406,852	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce -4 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	-4.50	-0.90	-$189,000
C crashes	-7.50	-1.50	-$165,000
PDO crashes	-4.50	-0.90	-$10,800
			-$364,800

H. Amortized Benefit

Year	Crash Benefits	Present Value
2025	-$364,800	-$364,800
2026	-$369,032	-$365,378
2027	-$373,312	-$365,957
2028	-$377,643	-$366,536
2029	-$382,024	-$367,117
2030	-$386,455	-$367,699
2031	-$390,938	-$368,281
2032	-$395,473	-$368,865
2033	-$400,060	-$369,449
2034	-$404,701	-$370,034
2035	-$409,395	-$370,620
2036	-$414,144	-$371,208
2037	-$418,949	-$371,796
2038	-$423,808	-$372,385
2039	-$428,725	-$372,974
2040	-$433,698	-$373,565
2041	-$438,729	-$374,157
2042	-$443,818	-$374,750
2043	-$448,966	-$375,343
2044	-$454,174	-$375,938
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Total = -$7,406,852

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	TH 169 - TH 14 Interchange				

B. Project Description

Proposed Work	Install Traffic Signal at EB TH 14 Ramp and TH 169, Eliminate SB to EB Loop Ramp		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

2.13	**Fatal (K) Crashes**	**Reference**	Based on change in merging conflict points
2.13	**Serious Injury (A) Crashes**		
2.13	**Moderate Injury (B) Crashes**	**Crash Type**	Sideswipe
2.13	**Possible Injury (C) Crashes**		
2.13	**Property Damage Only Crashes**		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	**Sideswipe**	**< optional 2nd CMF >**
K crashes	0	
A crashes	0	
B crashes	0	
C crashes	0	
PDO crashes	2	

F. Benefit-Cost Calculation

-$110,129	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce -1 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	0.00	0.00	$0
C crashes	0.00	0.00	$0
PDO crashes	-2.26	-0.45	-$5,424
			-$5,424

H. Amortized Benefit

Year	Crash Benefits	Present Value
2025	-$5,424	-$5,424
2026	-$5,487	-$5,433
2027	-$5,551	-$5,441
2028	-$5,615	-$5,450
2029	-$5,680	-$5,458
2030	-$5,746	-$5,467
2031	-$5,813	-$5,476
2032	-$5,880	-$5,484
2033	-$5,948	-$5,493
2034	-$6,017	-$5,502
2035	-$6,087	-$5,511
2036	-$6,158	-$5,519
2037	-$6,229	-$5,528
2038	-$6,301	-$5,537
2039	-$6,374	-$5,546
2040	-$6,448	-$5,554
2041	-$6,523	-$5,563
2042	-$6,599	-$5,572
2043	-$6,675	-$5,581
2044	-$6,753	-$5,590
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Total = -$110,129

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	TH 169 - TH 14 Interchange				

B. Project Description

Proposed Work	Convert to Diverging Diamond Interchange		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

3.25	**Fatal (K) Crashes**	**Reference**	Based on change in crossing conflict points
3.25	**Serious Injury (A) Crashes**		
3.25	**Moderate Injury (B) Crashes**	**Crash Type**	Angle
3.25	**Possible Injury (C) Crashes**		
3.25	**Property Damage Only Crashes**		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	Angle	< optional 2nd CMF >
K crashes	0	
A crashes	0	
B crashes	3	
C crashes	5	
PDO crashes	3	

F. Benefit-Cost Calculation

-$11,110,278	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce -5 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	-6.75	-1.35	-$283,500
C crashes	-11.25	-2.25	-$247,500
PDO crashes	-6.75	-1.35	-$16,200
			-$547,200

H. Amortized Benefit

Year	Crash Benefits	Present Value
2025	-$547,200	-$547,200
2026	-$553,548	-$548,067
2027	-$559,969	-$548,935
2028	-$566,464	-$549,805
2029	-$573,035	-$550,676
2030	-$579,683	-$551,548
2031	-$586,407	-$552,422
2032	-$593,209	-$553,297
2033	-$600,090	-$554,173
2034	-$607,051	-$555,051
2035	-$614,093	-$555,931
2036	-$621,217	-$556,811
2037	-$628,423	-$557,693
2038	-$635,713	-$558,577
2039	-$643,087	-$559,462
2040	-$650,547	-$560,348
2041	-$658,093	-$561,236
2042	-$665,727	-$562,125
2043	-$673,449	-$563,015
2044	-$681,261	-$563,907
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Total = -$11,110,278

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	TH 169 - TH 14 Interchange				

B. Project Description

Proposed Work	Convert to Diverging Diamond Interchange		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

2.13	**Fatal (K) Crashes**	**Reference**	Based on change in merging conflict points
2.13	**Serious Injury (A) Crashes**		
2.13	**Moderate Injury (B) Crashes**	**Crash Type**	Sideswipe
2.13	**Possible Injury (C) Crashes**		
2.13	**Property Damage Only Crashes**		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	**Sideswipe**	**< optional 2nd CMF >**
K crashes	0	
A crashes	0	
B crashes	0	
C crashes	0	
PDO crashes	2	

F. Benefit-Cost Calculation

-$110,129	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce -1 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	0.00	0.00	$0
C crashes	0.00	0.00	$0
PDO crashes	-2.26	-0.45	-$5,424
			-$5,424

H. Amortized Benefit

Total = -$110,129

Year	Crash Benefits	Present Value
2025	-$5,424	-$5,424
2026	-$5,487	-$5,433
2027	-$5,551	-$5,441
2028	-$5,615	-$5,450
2029	-$5,680	-$5,458
2030	-$5,746	-$5,467
2031	-$5,813	-$5,476
2032	-$5,880	-$5,484
2033	-$5,948	-$5,493
2034	-$6,017	-$5,502
2035	-$6,087	-$5,511
2036	-$6,158	-$5,519
2037	-$6,229	-$5,528
2038	-$6,301	-$5,537
2039	-$6,374	-$5,546
2040	-$6,448	-$5,554
2041	-$6,523	-$5,563
2042	-$6,599	-$5,572
2043	-$6,675	-$5,581
2044	-$6,753	-$5,590
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	TH 169 at Lind St				

B. Project Description

Proposed Work	N/A - Rear End Crashes at Lind for Comparison		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

0.00	**Fatal (K) Crashes**	**Reference**	Based on change in mainline delay (comparing Lind to TH 14)
0.00	**Serious Injury (A) Crashes**		
0.00	**Moderate Injury (B) Crashes**	**Crash Type**	Rear End
0.00	**Possible Injury (C) Crashes**		
0.00	**Property Damage Only Crashes**		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT (Rear End Crashes at Lind)			

Crash Severity	Rear End	< optional 2nd CMF >
K crashes	0	
A crashes	0	
B crashes	4	
C crashes	11	
PDO crashes	48	

F. Benefit-Cost Calculation

$10,663,593	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce 13 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	4.00	0.80	$168,000
C crashes	11.00	2.20	$242,000
PDO crashes	48.00	9.60	$115,200
			$525,200

H. Amortized Benefit

Year	Crash Benefits	Present Value
2025	$525,200	$525,200
2026	$531,292	$526,032
2027	$537,455	$526,865
2028	$543,690	$527,700
2029	$549,997	$528,536
2030	$556,377	$529,373
2031	$562,831	$530,212
2032	$569,359	$531,052
2033	$575,964	$531,893
2034	$582,645	$532,736
2035	$589,404	$533,580
2036	$596,241	$534,425
2037	$603,157	$535,271
2038	$610,154	$536,119
2039	$617,232	$536,969
2040	$624,392	$537,819
2041	$631,635	$538,671
2042	$638,961	$539,525
2043	$646,373	$540,379
2044	$653,871	$541,235
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Total = $10,663,593

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	TH 169 - TH 14 Interchange				

B. Project Description

Proposed Work	Install Traffic Signal at EB TH 14 Ramp and TH 169, Eliminate SB to EB Loop Ramp		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

0.40	**Fatal (K) Crashes**	**Reference**	Based on change in mainline delay (comparing Lind to TH 14)
0.40	**Serious Injury (A) Crashes**		
0.40	**Moderate Injury (B) Crashes**	**Crash Type**	Rear End
0.40	**Possible Injury (C) Crashes**		
0.40	**Property Damage Only Crashes**		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	**Rear End**	**< optional 2nd CMF >**
K crashes	0	
A crashes	0	
B crashes	4	
C crashes	11	
PDO crashes	48	

F. Benefit-Cost Calculation

$6,398,156	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce 8 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	2.40	0.48	$100,800
C crashes	6.60	1.32	$145,200
PDO crashes	28.80	5.76	$69,120
			$315,120

H. Amortized Benefit

Year	Crash Benefits	Present Value
2025	$315,120	$315,120
2026	$318,775	$315,619
2027	$322,473	$316,119
2028	$326,214	$316,620
2029	$329,998	$317,122
2030	$333,826	$317,624
2031	$337,698	$318,127
2032	$341,616	$318,631
2033	$345,578	$319,136
2034	$349,587	$319,641
2035	$353,642	$320,148
2036	$357,745	$320,655
2037	$361,894	$321,163
2038	$366,092	$321,672
2039	$370,339	$322,181
2040	$374,635	$322,692
2041	$378,981	$323,203
2042	$383,377	$323,715
2043	$387,824	$324,228
2044	$392,323	$324,741
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Total = $6,398,156

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	TH 169 - TH 14 Interchange				

B. Project Description

Proposed Work	Convert to Diverging Diamond Interchange		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

0.25	**Fatal (K) Crashes**	**Reference**	Based on change in mainline delay (comparing Lind to TH 14)
0.25	**Serious Injury (A) Crashes**		
0.25	**Moderate Injury (B) Crashes**	**Crash Type**	Rear End
0.25	**Possible Injury (C) Crashes**		
0.25	**Property Damage Only Crashes**		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT (Rear End Crashes at Lind)			

Crash Severity	**Rear End**	**< optional 2nd CMF >**
K crashes	0	
A crashes	0	
B crashes	4	
C crashes	11	
PDO crashes	48	

F. Benefit-Cost Calculation

$7,997,695	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce 10 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	3.00	0.60	$126,000
C crashes	8.25	1.65	$181,500
PDO crashes	36.00	7.20	$86,400
			$393,900

H. Amortized Benefit

Year	Crash Benefits	Present Value
2025	$393,900	$393,900
2026	$398,469	$394,524
2027	$403,091	$395,149
2028	$407,767	$395,775
2029	$412,497	$396,402
2030	$417,282	$397,030
2031	$422,123	$397,659
2032	$427,020	$398,289
2033	$431,973	$398,920
2034	$436,984	$399,552
2035	$442,053	$400,185
2036	$447,181	$400,819
2037	$452,368	$401,454
2038	$457,615	$402,090
2039	$462,924	$402,727
2040	$468,294	$403,365
2041	$473,726	$404,004
2042	$479,221	$404,644
2043	$484,780	$405,285
2044	$490,404	$405,927
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Total = $7,997,695

Traffic Safety Benefit-Cost Calculation

Highway Safety Improvement Program (HSIP) Reactive Project

DEPARTMENT OF TRANSPORTATION

A. Roadway Description

Route	TH 169	**District**	7	**County**	Nicollet
Begin RP		**End RP**		**Miles**	
Location	TH 169 - TH 14 Interchange				

B. Project Description

Proposed Work	Install Traffic Signal at EB TH 14 Ramp and TH 169		
Project Cost*		**Installation Year**	2025
Project Service Life	20 years	**Traffic Growth Factor**	1.2%

** exclude Right of Way from Project Cost*

C. Crash Modification Factor

0.12	**Fatal (K) Crashes**	**Reference**	Based on change in mainline delay (comparing Lind to TH 14)
0.12	**Serious Injury (A) Crashes**		
0.12	**Moderate Injury (B) Crashes**	**Crash Type**	Rear End
0.12	**Possible Injury (C) Crashes**		
0.12	**Property Damage Only Crashes**		www.CMFclearinghouse.org

D. Crash Modification Factor (optional second CMF)

	Fatal (K) Crashes	**Reference**	
	Serious Injury (A) Crashes		
	Moderate Injury (B) Crashes	**Crash Type**	
	Possible Injury (C) Crashes		
	Property Damage Only Crashes		www.CMFclearinghouse.org

E. Crash Data

Begin Date	1/1/2015	**End Date**	12/31/2019	5 years
Data Source	MnDOT			

Crash Severity	**Rear End**	**< optional 2nd CMF >**
K crashes	0	
A crashes	0	
B crashes	4	
C crashes	11	
PDO crashes	48	

F. Benefit-Cost Calculation

$9,383,962	**Benefit (present value)**	**B/C Ratio = N/A**
$0	**Cost**	

Proposed project expected to reduce 12 crashes annually, 0 of which involving fatality or serious injury.

F. Analysis Assumptions

Crash Severity	Crash Cost
K crashes	$1,360,000
A crashes	$680,000
B crashes	$210,000
C crashes	$110,000
PDO crashes	$12,000

Link: mndot.gov/planning/program/appendix_a.html

Real Discount Rate	1.0%
Traffic Growth Rate	1.2%
Project Service Life	20 years

G. Annual Benefit

Crash Severity	Crash Reduction	Annual Reduction	Annual Benefit
K crashes	0.00	0.00	$0
A crashes	0.00	0.00	$0
B crashes	3.52	0.70	$147,840
C crashes	9.68	1.94	$212,960
PDO crashes	42.24	8.45	$101,376
			$462,176

H. Amortized Benefit

Year	Crash Benefits	Present Value
2025	$462,176	$462,176
2026	$467,537	$462,908
2027	$472,961	$463,641
2028	$478,447	$464,376
2029	$483,997	$465,112
2030	$489,611	$465,848
2031	$495,291	$466,586
2032	$501,036	$467,326
2033	$506,848	$468,066
2034	$512,728	$468,807
2035	$518,675	$469,550
2036	$524,692	$470,294
2037	$530,778	$471,039
2038	$536,935	$471,785
2039	$543,164	$472,532
2040	$549,465	$473,281
2041	$555,838	$474,031
2042	$562,286	$474,782
2043	$568,809	$475,534
2044	$575,407	$476,287
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0
0	$0	$0

Total = $9,383,962

Appendix G

IMPLEMENTATION PLAN

MAPO Highway 169 Corridor Study

Northern Subarea Implementation Plan

Priority*	Timeframe	Section	Project Name or #	Project Description	Estimated 2022 Cost** and (Anticipated Build Year Cost)	Benefit Cost Ratio	Lead Agency	Cost Participation	Likely Funding Sources	Potential Competitive Funding Sources	Comments
Short-Term 0 to 5 Years	2021 - 2025	Highway 14 interchange	Eastbound Ramp Signal	A standalone traditional signal system at the eastbound Highway 14 exit ramp.	$500,000	161.74	MnDOT	City of Mankato, City of North Mankato	TH, LOCAL	LPP, HSIP	Can be constructed as an independent standalone project to improve operations at the eastbound Highway 14 exit ramp intersection.
				Subtotal	***$500,000***						
Mid-term 6 to 15 Years	2026 - 2030	North River Lane to Webster Avenue	North River Lane and Webster Avenue Roundabouts or Signals	Includes closure of the Lind Street intersection with a new full access intersection (roundabout or signal) at North River Lane and reconstruction of the Webster Avenue intersection to either a roundabout or signal control. Closure of Lind Street and the new full access intersection at North River Lane will require a new local connection on the east side of Hiniker Pond from Lind Street to Butterworth Street and connecting to the North River Lane intersection with Highway 169.	$3.7-7.3M ($4.7-9.3M in 2027 $)	Roundabouts: 2.69 Signals: -2.64	MnDOT	City of Mankato, City of North Mankato	TH, LOCAL	HSIP, LPP, LRIP,COC, MNHFP TED/TEDI, State Bonding Bill	The concept allows for further evaluation of a signal or roundabout control at each intersection. Either intersection control can be paired with the Eastbound Ramp Signal project or a future Highway 14/169 Diverging Diamond interchange. Should be planned to be paired with MnDOT planned investments for 2027.
		Webster Avenue intersection	Webster Avenue Intersection Modernization	Range Street remains open with modifications to lane striping/utilization on Webster Avenue and Range Street at the intersection. Would include closure of the Speedway driveway access to Webster Avenue.	$450,000	-	City of North Mankato	NA	LOCAL	LPP, HSIP	To be paired with the North River Lane and Webster Avenue Roundabouts or Signal project. While improvements to operations may occur this concept does not address safety issues to a degree that would make it competitive for funding.
		Highway 14 interchange to Lind Street	Grade Separated Pedestrian Crossings of Highway 169	Public support and evaluation scoring was strongest for the grade separated pedestrian crossing just north of the current Lind Street intersection because the surrounding amenities create pedestrian demand to cross near that location. However agency feedback recognized the benefit of utilizing the existing Highway 14 bridge.	$4M ($5.9M in 2030 $)	-	MnDOT	City of Mankato, City of North Mankato	TH, LOCAL	LPP, TAP	If paired with a larger roadway reconstruction project the cost of a pedestrian grade separation could be included in a RAISE or INFRA request. More competitive funding options are available if paired with larger roadway project.
				Subtotal	*$8.2-15.7M*						
Opportunity / Development / Safety Driven	Illustrative	Highway 14 interchange	Diverging Diamond Interchange	Reconstruction of the existing Highway 14/169 partial cloverleaf interchange into a diverging diamond interchange with signalized ramp intersections.	$9M	5.08	MnDOT	City of Mankato, City of North Mankato	TH, LOCAL	RAISE, INFRA, COC, MNHFP TED, State Bonding Bill	Only needed with increased development and crash issues associated with the weaving created by the existing cloverleaf ramps. Could be paired with roundabouts or signals at North River Lane and Webster Ave.
		Webster Avenue	Grade Separated Pedestrian Crossings of Highway 169	Agency feedback recognized that a grade separated crossing could also be beneficial at Webster Avenue.	$5M	-	City of North Mankato	City of Mankato, MnDOT	TH, LOCAL	LPP, TAP	Should consider pedestrian improvements considered in 2025 Veterans Memorial Bridge project. If paired with a larger roadway reconstruction project the cost of a pedestrian grade separation could be included in a RAISE or INFRA request. More competitive funding options are available if paired with larger roadway project.

*Timing of all projects dependent upon funding availability.

** All estimated costs are for individual improvements only and don't capture the full right-of-way and easement costs

FUNDING KEY

COC Corridors of Commerce Funds (State)

CO County State Aid Highway, County Sales Tax, Wheelage, or Other County Funds

HSIP Highway Safety Improvement Program Funds (Federal)

LOCAL City Funding MSAS or Township

LPP Local Partnership Program Funds (State)

LRIP Local Road Improvement Program Funds (State)

MHFP Minnesota Highway Freight Program Funds (State)

PRIV Private Funding / Development (Private)

SRTS Safe Routes to School

TAP Transportation Alternatives Program (Federal)

STP Surface Transportation Program Funds (Federal)

TE Transportation Enhancement Funds (Federal)

TED/I Transportation Economic Development (State)

TH Trunk Highway Funds (State)

RAISE Rebuilding American Infrastructure with Sustainability and Equity (Federal)

INFRA Infrastructure for Rebuilding America (Federal)

TRLF Transportation Revolving Loan Fund (Federal)

TBACK Turnback Funds (State)

MAPO Highway 169 Corridor Study

Southern Subarea Implementation Plan

Priority*	Timeframe	Section	Project Name or #	Project Description	Estimated 2022 Cost** and (Anticipated Build Year Cost)	Lead Agency***	Cost Participation	Likely Funding Sources	Potential Competitive Funding Sources	Comments
Short-Term 0 to 5 Years	2021 - 2025	1 - Blue Earth River to County Highway 33	1D	Reduced conflict intersection at Amos Owen Lane with southbound to eastbound left removed and replaced with U-turn to the west of the intersection. Hawley Street is right-in/right-out. OR Full R-cut intersection at Amos Owen Lane with Hawley Street remaining open as it is today. Green T with traffic signal, at County Highway 33, for eastbound and all left turning traffic (northbound to westbound left and westbound to southbound left).	$2.2M	MnDOT	South Bend Township, Blue Earth County, City of Mankato (with orderly annexation)	TH, LOCAL, CSAH, CO	LPP, HSIP, MNHFP, TED	The Amos Owen Lane and County Highway 33 improvements need to be paired together for full safety benefits. The Green T at County Highway 33 is necessary, prior to closure of Hawley Street, to provide for the displaced left turns onto and off of Hwy 169.
		Hawley Street Pedestrian Bridge	Hawley Street Pedestrian Bridge	Pedestrian overpass across Highway 169/Hawley Street intersection with touchdowns at northwest to southeast quadrants, utilizing State of MN property (NW quadrant) and an undeveloped property (SW quadrant).	$5M	MnDOT	South Bend Township, Blue Earth County, City of Mankato (with orderly annexation)	TH, LOCAL, CO	DNR, TAP, LPP	High level project cost in 2023 dollars including engineering and contingency estimates. Does not include right-of-way costs for the parcel on the SE quadrant.
		2 - County Highway 33 to County Highway 90	2A	County Road 120 acceleration lanes.	$660,000	MnDOT	South Bend Township, Blue Earth County, City of Mankato (with orderly annexation)	TH, LOCAL, CO	LPP, HSIP	Can be constructed independently as an interim improvement prior to a Highway 68 High-T
				Subtotal	*$7.9M*					
Mid-term 6 to 15 Years	2026 - 2030	2 - County Road 33 to County Highway 90	2A	High T at Highway 68. County Highway 69 median closure and new local street connection to close multiple driveways on Highway 169. Convert County Road 120 to R-cut.	$22.2M ($32.8M in 2030 $)	MnDOT	South Bend Township, Blue Earth County, City of Mankato (with orderly annexation)	TH, LOCAL, CO	HSIP, COC, TED,/TEDI State Bonding Bill	High T to be paired with larger Highway 68 reconstruction project, serving as a capacity building project to be completed prior to the project, and provide a detour for future Highway 14 construction. Alternatively, the project could be modified slightly and paired with 1C instead of 1D and allow for a full median at County Highway 33. Construction will not impact the existing Minneopa Trail Pedestrian Bridge. County Highway 69 improvements remove all left turns so they must occur after the Highway 68 High T which can replace those movements within this area.
		3- County Road 90 to 133th Lane	3A	208th Lane and Loren Drive access closures with new local road connections. Reduced conflict intersection at Highway 60 at Highway 169 with northbound to westbound removed and replaced with U-turn to the east of the intersection	$1.9M ($2.8M in 2030 $)	MnDOT	South Bend Township, Blue Earth County, City of Mankato (with orderly annexation)	TH, LOCAL, CO	LPP, HSIP	208th Lane and Loren Drive access closures must happen simultaneously or previous to the Highway 60 and Gadwall Road R-cut.
				Subtotal	*$24.1-35.6M*					
Opportunity / Development / Safety Driven	Illustrative	1 - Blue Earth River to County Highway 33	1D	Acceleration lane from Hawley Street to eastbound Highway 169	$2.5M	MnDOT	TBD	TH	TBD	Time with a Blue Earth River Crossing bridge project.
		2 - County Highway 33 to County Highway 90	2C	Highway 68 realignment with Highway 169 and extension of Southbend Ave (Highway 69). Includes local driveway and median closures between Highway 68 and Highway 69.	$9M	TBD	TBD	TH, LOCAL, CO	TBD	Could be warranted if new industrial, commercial, or residential developments occur. Current local plans do not show planned development that would require these improvements.
		3- County Highway 90 to 133th Lane	3B	Full access intersection at Highway 60 and 169 with access closure at 208th Lane and new local road access. Realignment and extension of Gadwall Road to a new full access intersection with Highway 169 east of the current intersection. Includes cul-de-sac of County Road 117 and new local road connections for existing industrial properties.	$5M	TBD	TBD	TH, LOCAL, CO	TBD	Could be warranted if new industrial, commercial, or residential developments occur. Current local plans do not show planned development that would require these improvements.

Timing of all projects dependent upon funding availability.

*** All estimated costs are for individual improvements only and don't capture the full right-of-way and easement costs*

**** Southern Subarea not currently in the MnDot Capital Highway Investment Plan (CHIP)*

FUNDING KEY

COC Corridors of Commerce Funds (State)

CO County State Aid Highway, County Sales Tax, Wheelage, or Other County Funds

HSIP Highway Safety Improvement Program Funds (Federal)

LOCAL City Funding MSAS or Township

LPP Local Partnership Program Funds (State)

LRIP Local Road Improvement Program Funds (State)

MHFP Minnesota Highway Freight Program Funds (State)

PRIV Private Funding / Development (Private)

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TAP Transportation Alternatives Program (Federal)

STP Surface Transportation Program Funds (Federal)

TE Transportation Enhancement Funds (Federal)

TED/I Transportation Economic Development (State)

TH Trunk Highway Funds (State)

RAISE Rebuilding American Infrastructure with Sustainability and Equity (Federal)

TRLF Transportation Revolving Loan Fund (Federal)

TBACK Turnback Funds (State)