MAPO
MANKATO/NORTH MANKATO
AREA PLANNING ORGANIZATION

Highway 169 Corridor Study

Purpose and Need Statement

Date: **August 12, 2020**

To: Charles Androsky, Transportation Planner, MAPO

From: Bob Rogers, SEH

Subject: Purpose and Need Statement
Highway 169 Corridor Study
Mankato/North Mankato Area Planning Organization (MAPO)

Table of Contents

Tables

Figures

I. What is Purpose and Need?

This corridor study purpose and need defines the transportation problems or deficiencies along Highway 169 from Highway 60 to Lake Street. The formation of the purpose and need is based upon existing conditions data and stakeholder input received early in the study process. The identification of needs helps build a common focus among stakeholders on the scope and timing of improvements through defining the "who, what, where, why, and when" of the transportation needs. This also provides project partners and stakeholders with direction on the need for additional analysis required in the next phase of the project development process.

The identified needs and opportunities within the study area will also serve as the cornerstone for developing evaluation criteria, which will be used to create and evaluate a full range of alternatives and design options that satisfy the specific project area needs.

Since any major future improvements along the Highway 169 corridor will likely seek federal funding, pertinent Federal Highway Administration (FHWA) transportation purpose and need guidance was used, in part, to help outline transportation needs (and other considerations) in the Highway 169 corridor study area. It is anticipated that standalone purpose and need statements will be required for each future action and that the corridor study needs documented in this corridor study will be utilized to the extent practicable.

A. Study Area Background

The study area is located in the cities of Mankato and North Mankato and includes unincorporated areas in Blue Earth and Nicollet Counties (**Figure 1**). The Highway 169 study limits extend from the Highway 60 intersection on the south to the Lake Street intersection on the north. This segment of Highway 169 is designated as a Principal Arterial, as it serves a critical role in the local and regional transportation system. Within the study area, Highway 169 is a four-lane principal arterial roadway with traffic volumes ranging between approximately 15,500 to over 32,000 daily trips.

Figure 1: Project Area

Highway 169 is an essential route and contributing element to the quality of life and economic vitality of the region by connecting residents and businesses to numerous communities, markets, and other transportation corridors. Beyond serving commuters and commercial freight movements in the study area, Highway 169 provides connections and access to several institutional and recreational facilities. Adjacent land uses vary widely among the three segments of the corridor study area. The northern segment includes a mix of commercial and industrial businesses along with residential developments to the south. The central segment provides freeway level access to the densely developed central business districts of both Mankato and North Mankato. The southern segment transitions from a higher density of mixed uses (commercial, industrial, residential) near the northern portion of this segment to a more scattered mixed use pattern with areas of open space and agricultural land use.

II. Purpose

The purpose of the Highway 169 Corridor Study is to identify context-sensitive transportation improvements along Highway 169 and the local supporting roadway system that will improve vehicle safety, maintain high levels of local and regional traffic operations and enhance pedestrian/bicycle movements and safety throughout the study corridor. Future corridor improvements should also address infrastructure conditions, foster economic growth, and be supported by local jurisdictions through the municipal consent process.

III. Highway 169 Corridor Study Area Needs

This section lists the study area needs that will be refined based on existing conditions data and future conditions analysis. The determination of primary needs, secondary needs, and additional considerations will be completed after review of the data/analysis and in consultation with the PMT.

Primary needs include the transportation problem(s) that have been substantiated and recognized by the project partners as priority issues to be solved. Primary needs lead to the initiation of specific improvements/project(s) that resolve current or future concerns. Secondary needs include other transportation problems or opportunities in the study area that may be able to be addressed, if feasible, at the same time that the primary needs are addressed. Additional considerations are other important factors that may have an influential effect on project decisions or project elements. Below is an assessment of US Highway 169 corridor needs and/or additional considerations. The determination of whether a need is considered primary and/or secondary will be determined on a project by project basis and at the scoping and preliminary design phase of project development.

A. Vehicle Mobility

Corridor Operations

Highway 169 is a four-lane divided section throughout the study area. Daily traffic volumes range between 15,500 to 32,000 trips and heavy commercial vehicle account for 8 to 15 percent of all traffic. The number of daily trips along the corridor falls within the capacity of the highway section

and is generally comparable to other non-metro (Twin Cities) four-lane facilities found throughout Minnesota. The percent of heavy commercial vehicles is slightly above average for similar highways.

The existing peak hour operations were analyzed using Synchro/SimTraffic software. Based on existing travel demand, there are no substantial operational issues related to corridor capacity. Analysis of 2040 No-Build corridor operation shows conditions remaining at acceptable levels. The 2040 forecast average travel speeds are expected to remain the same or decrease slightly over the existing conditions along Highway 169. The northern subarea experiences the biggest decrease in average speed with a 3-4 MPH reduction.

Intersection Operations

Existing Intersection Operations

An analysis of existing AM and PM peak hour intersection operations was conducted in Synchro/SimTraffic to understand delay and queuing issues at nineteen intersections located throughout the project area. Existing signal timing was provided by MnDOT and fleet mix percentages (passenger and heavy commercial vehicles) were obtained from previous traffic counts. The following intersections are signalized throughout the project area:

- Lind Street at Highway 169
- Webster Avenue at Highway 169
- Belgrade Avenue at southbound Highway 169 Ramps
- Belgrade Avenue at northbound Highway 169 Ramps
- Riverfront Drive at southbound Highway 169 Ramps

The average intersection delay is a volume-weighted average of delay experienced by all motorists entering the intersection on all intersection approaches. Intersections and each intersection approach are given a ranking from Level of Service (LOS) A through LOS F. LOS A indicates the best traffic operation, with vehicles experiencing minimal delays. LOS A through D are generally perceived to be acceptable to drivers. LOS E indicates that an intersection is operating at, or very near, its capacity and that travelers experience considerable delays. LOS F indicates an intersection where demand exceeds capacity resulting in substantial delays. **Table 1**, on the following page, shows the intersection delay as well as the maximum delay of all movements at each intersection.

Based on the results of the existing conditions operational analysis, all intersections operate with acceptable LOS C or better, which are commonly perceived as operating at acceptable levels. A LOS D is still considered acceptable, but is an indicator that an intersection is approaching capacity and that operational conditions are beginning to adversely impact traffic flows.

While the overall intersection delay is considered acceptable throughout the study area intersections, there are several approach movements operating with unacceptable operations (LOS E or F) during the peak hours. These approaches/movements are detailed below and shown in **Table 1**:

- Lake Street NW (north access) at Highway 169: westbound left turns operate with LOS E in the PM peak hour

- Eastbound Highway 14 Exit Ramp at Highway 169: eastbound left turn operates with LOS F in the PM peak hour
- Webster Avenue/Highway 169 signalized intersection: southbound left turn operates at LOS E for both AM and PM peaks
- CSAH 33 at Highway 169: northbound left turn operates at LOS F in both the AM and PM peaks
- Highway 60 at Highway 169: northbound left turn operates with LOS F in the PM peak hour.

Table 1 – Existing Traffic Operations Analysis Results

Intersection	A.M. Peak Hour					P.M. Peak Hour				
	Intersection		Maximum Movement			Intersection		Maximum Movement		
	Delay*	LOS	Mvmt	Delay*	LOS	Delay*	LOS	Mvmt	Delay*	LOS
Lake St NW (North Access) at TH 169	1	A	WBL	27	D	2	A	WBL	41	E
Lake St NW (South Access) at TH 169	1	A	NBL	6	A	1	A	NBL	9	A
WB TH 14 Entrance Ramp at TH 169	1	A	NBL	8	A	2	A	NBL	12	B
EB TH 14 Exit Ramp at TH 169	5	A	EBL	31	D	7	A	EBL	81	F
Lind St at TH 169	16	B	NBL	49	D	18	B	SBL	48	D
River Ln at TH 169	4	A	NBR	8	B	5	A	NBR	9	A
Webster Ave at TH 169	16	B	SBL	69	E	19	B	SBL	64	E
Monroe Ave at TH 169	5	A	EBR	13	B	4	A	EBR	10	B
Belgrade Ave at SB TH 169 Ramps	15	B	SBL	30	C	14	B	SBL	35	D
Belgrade Ave at NB TH 169 Ramps	3	A	NBL	18	B	7	A	NBL	21	B
Owatonna St at SB TH 169 Ramps	3	A	NBT	29	D	3	A	SBT	3	A
Riverfront Dr at SB TH 169 Ramps	23	C	SBL	33	C	21	C	SBL	34	C
Riverfront Dr at NB TH 169 Ramps	6	A	NBL	33	D	5	A	NBL	22	C
CSAH 69 (Hawley St) at TH 169	5	A	WBL	32	D	2	A	WBL	12	C
CSAH 33 at TH 169	3	A	NBL	50	F	21	C	NBL	423	F
TH 68 at TH 169	3	A	SBL	18	C	5	A	SBL	34	D
CSAH 69 (Gadwall Rd) at TH 169	2	A	SBL	16	C	3	A	SBL	26	D
CSAH 90 at TH 169	1	A	WBL	3	A	1	A	WBL	8	A
TH 60 at TH 169	6	A	NBL	28	D	7	A	NBL	145	F

*Delay in seconds per vehicle.

Several traffic queuing issues were also identified in the existing operational analysis. Specific details of each movement/intersection approach is contained in the *Highway 169 Corridor Study – Traffic Operations Evaluation Report.* Below is a summary of problematic queues:

- Lind Street: the maximum northbound queue blocks access to left and right turn lanes during both peak hours and the maximum westbound queues in the AM and PM peak hours extend beyond Lind Court
- Webster Avenue: the maximum eastbound queues in the both AM and PM peaks extends to and beyond the Range Street intersection resulting in operational impacts along Range Street and in some cases blocking driveway access to surrounding businesses. The maximum AM and PM westbound queues extend to River Drive resulting in delays for trips along River Drive
- Belgrade Avenue at Southbound Highway 169 Ramps: the maximum eastbound thru movement queue extends past Nicollet Avenue during both peak hours and the maximum westbound left queue extends beyond the turn lane during the PM peak
- Riverfront Drive at Southbound Highway 169 Ramps: during both the AM and PM peak hours the maximum southbound queues extend past Owatonna Street, however the queues do not extend onto Highway 169
- Riverfront Drive at Northbound 169 Ramps: the maximum westbound queues in AM peak extend through the intersection of Poplar Street and Riverfront Drive whereby impacting traffic operations at this intersections
- CSAH 33 at Highway 169: the maximum northbound queue in the PM peak hour extends approximately 850 feet causing traffic to back up through the Southbend Avenue intersection which is located only 200 feet from the CSAH 33 and Highway 169 intersection.

2040 No-Build Intersection Operations

An analysis of forecast AM and PM peak hour intersection operations was conducted in Synchro/SimTraffic for the same nineteen intersections located throughout the project area. As shown in **Table 2**, the 2040 No-Build operational analysis shows several deficiencies and unacceptable levels of service.

The results of the 2040 No-Build operational analysis indicates that most intersections are anticipated to continue to operate acceptably with LOS C or better except the following intersections which operate with LOS E or F:

- Eastbound Highway 14 Exit Ramp at Highway 169: Intersection operates with LOS D in the AM peak hour and LOS F during the PM peak hour
- Eastbound Highway 14 Exit Ramp at Highway 14: Queues from the eastbound Highway 14 Exit Ramp/Highway 169 intersection back up onto Highway 14 causing the exit ramp (which should be free flowing) to operate with LOS E in the PM peak
- CSAH 33 at Highway 169: The intersection operates at LOS F in the PM peak hour
- Highway 60 at Highway 169: The intersection operates at LOS D in the PM peak hour

Table 2 – 2040 No Build Traffic Operations Analysis Results										
Intersection	A.M. Peak Hour					P.M. Peak Hour				
	Intersection		Maximum Movement			Intersection		Maximum Movement		
	Delay*	LOS	Mvmt	Delay*	LOS	Delay*	LOS	Mvmt	Delay*	LOS
Lake St NW (North Access) at TH 169	2	A	EBL	37	E	4	A	EBL	81	F
Lake St NW (South Access) at TH 169	1	A	NBL	10	A	1	A	NBL	13	B
WB TH 14 Entrance Ramp at TH 169	2	A	NBL	15	B	2	A	NBL	18	C
EB TH 14 Exit Ramp at TH 169	25	D	EBL	204	F	87	F	EBL	926	F
EB TH 14 Exit Ramp at TH 14	1	A	NBR	2	C	43	E	NBR	297	F
Lind St at TH 169	20	C	NBL	52	D	24	C	NBL	51	D
River Ln at TH 169	6	A	NBR	10	B	7	A	WBR	12	B
Webster Ave at TH 169	19	B	SBL	62	E	21	C	SBL	61	E
Monroe Ave at TH 169	6	A	EBR	18	C	5	A	EBR	15	C
Belgrade Ave at SB TH 169 Ramps	17	B	SBL	29	C	16	B	SBL	39	D
Belgrade Ave at NB TH 169 Ramps	4	A	NBL	23	C	9	A	NBL	28	C
Owatonna St at SB TH 169 Ramps	4	A	NBT	23	C	3	A	SBT	3	A
Riverfront Dr at SB TH 169 Ramps	26	C	EBT	32	C	22	C	EBT	31	C
Riverfront Dr at NB TH 169 Ramps	9	A	NBL	46	E	8	A	NBL	33	D
CSAH 69 (Hawley St) at TH 169	16	C	WBL	129	F	2	A	WBL	18	C
CSAH 33 at TH 169	5	A	NBL	148	F	130	F	NBL	1385	F
TH 68 at TH 169	6	A	SBL	46	E	8	A	SBL	70	F
CSAH 69 (Gadwall Rd) at TH 169	3	A	SBL	23	C	3	A	SBL	36	E
CSAH 90 at TH 169	1	A	WBL	6	A	1	A	WBL	12	B
TH 60 at TH 169	7	A	NBL	57	F	25	D	NBL	1200	F

*Delay in seconds per vehicle.

Additionally, several intersection approaches/movements are expected to operate at LOS E or F and numerous problematic traffic queues have been identified under the 2040 No-Build condition. As shown in **Table 2**, eleven intersection approaches in the AM peak hour and nine in the PM peak hour will potentially experience unacceptable (LOS E/F) operating conditions. Specific details of the forecast operations and problematic queuing conditions at the study area intersections is contained in the *Highway 169 Corridor Study – Traffic Operations Evaluation Report*.

System Connectivity

StreetLight® Insight data was used to analyze the origin-destination of trips using the Highway 169 corridor in order to determine the type of trip (local vs. regional) and if there are similarities or differences in travel patterns among the three subareas. The analysis reviewed all vehicles using the highway as well as a separate review of just heavy commercial vehicles/haulers. The full results of the analysis can be found in the *Highway 169 Corridor Study – Origin-Destination Assessment for the Existing Conditions & No-Build Conditions Report*.

The StreetLight data indicates that the majority of vehicles passing through the Northern Subarea (62% all vehicles and 39% trucks) and Middle Subarea (69% all vehicles and 37% trucks) are local trips destined for locations within the Mankato and North Mankato. Approximately 43% of all vehicles and 30% of heavy commercial trucks passing through the Southern Subarea were shown to have local destinations in the Mankato and North Mankato area. These findings emphasize the need for safe and efficient connections between Highway 169 and the local arterial system in order to effectively serve the existing and future travel demands and patterns.

A more detailed review of trips with destinations in the Northern and Southern Subareas was also conducted. The main trends of the daily travel patterns are summarized below:

Northern Subarea:

- *All Vehicle Traffic* – 62% of all traffic passing through the northern subarea are destined for North Mankato and Mankato. The primary destinations of northbound Highway 169 traffic include Belgrade Avenue east of Highway 169 (29%), Highway 14 east of Highway 169 (21%) and through trips continuing north of Lake Street (22%). Similarly, the primary destinations of southbound Highway 169 traffic include Belgrade Avenue east of Highway 169 (16%), Highway 14 east of Highway 169 (14%), Highway 14 west of Highway 169 (14%), and through trips continuing south of Belgrade Avenue (35%).

- *Heavy Commercial Traffic* – 39% of all freight traffic passing through the northern subarea are destined for Blue Earth County and Nicollet County. The main destinations of northbound trucks on Highway 169 include Highway 14 east of Highway 169 (27%) and through trips continuing north of Lake Street (45%). Southbound truck destinations include Highway 14 east of Highway 169 (13%) and through trips continuing south of Belgrade Ave (57%).

This analysis indicates that most of the heavy commercial vehicle traffic in the northern subarea remains on Highways 169 and 14, with Belgrade Ave east of Highway 169 being another important destination for both northbound and southbound Highway 169 traffic.

Southern Subarea:

- *All Vehicle Traffic* – 43% of all traffic passing through the southern subarea are destined for North Mankato and Mankato. The majority of traffic remains on Highway 169 throughout the entire subarea (74%). The only other roadways with more than 2% of the traffic include Highway 60 west of Highway 169 (5%), CSAH 90 (5%), and CSAH 33 (6%). The southbound destinations differ slightly with the primary destinations being CSAH 69/Hawley Street (19%), CSAH 33 (10%), Highway 68 (10%), Highway 169 south of Highway 60 (9%), and Highway 60 west of Highway 169 (41%).

- *Heavy Commercial Traffic* – 30% of the freight traffic passing through the southern subarea are destine for North Mankato and Mankato. Most northbound traffic remains on Highway 169 throughout the entire subarea (76%), while 11% are destine west of Highway 60, 3% connect to CSAH 90, and 5% are destined to Highway 68. Most of the southbound trips end up along Highway 60 west of Highway 169 (83%) with other roadways having lesser of a draw with Highway 169 south of Highway 60 receiving 6%, Highway 68 attracting 3%, and approximately 4% destine to CSAH 69/Hawley Street.

This analysis indicates that most of the traffic remains on Highway 169 or Highway 60 throughout the southern subarea, but the all vehicle analysis showed that CSAH 69/Hawley St and CSAH 33 are also popular destinations for southbound Highway 169 traffic in addition to Highways 60 and 169.

B. Vehicle Safety

Vehicle safety is a primary need throughout the corridor study area. A safety assessment was completed to determine "hot spots" along Highway 169 where crash history data identifies safety concerns. The safety analysis included a review of five year (2015-2019) crash data at intersections, interchanges, and along the highway segments. In addition to vehicle crashes, the analysis also considered pedestrian and bicycle crashes. A complete summary of the safety assessment can be found in the *Highway 169 Corridor Study – Existing and Future Safety Evaluation Report.*

Intersection Crash Analysis

A crash analysis, utilizing five year crash data (2015-2019), was completed for fifteen intersections located throughout the study area. The following Highway 169 intersections or interchange ramp terminal intersections were included in the crash analysis:

- Lake Street NW Northern Access: at-grade intersection with side street stop control
- Lake Street NW Southern Access : at-grade intersection with side street stop control
- Lind Street: at-grade signalized intersection
- Webster Avenue: at-grade signalized intersection
- Belgrade Avenue at Southbound Ramps: signalized intersection
- Belgrade Avenue at Northbound Ramps: signalized intersection
- Riverfront Drive at Northbound Ramps: stop control for exit ramp
- Riverfront Drive at Southbound Ramps: signalized intersection
- Hawley Street/CSAH 69: at-grade intersection with side street stop/yield control
- Hemlock Road/CSAH 33: at-grade intersection with side street stop/yield control
- Highway 68: at-grade intersection with side street stop control
- Gadwall Road/CSAH 69: at-grade intersection with side street stop control
- Loren Drive: at-grade intersection with side street stop control
- Gadwall Road West /CSAH 69: at-grade intersection with side street stop control
- Highway 60: at-grade intersection with side street stop/yield control

The intersection crash analysis shows that three intersections have statistically significant safety concerns with critical index values greater than one (see **Table 3**). Another location of interest is the Hawley Street/CSAH 69 intersection, which has a critical index less than one but has a fatal and serious injury index of 1.07 for the five year reporting period.

Table 3 – Intersections with Safety Concerns						
Intersection	**Total Crashes**	**Severe Crashes (K + A)**	**Actual Crash Rate**	**Statewide Average**	**Critical Rate**	**Critical Index**
Lind Street at Highway 169[a]	70	1	1.45	0.45	0.71	**2.04**
Riverfront Dr. at NB Highway 169 Ramps[b]	19	0	0.49	0.18	0.37	**1.32**
Highway 68 at Highway 169[c]	17	2	0.38	0.18	0.36	**1.06**
[a] *located in Northern Subarea* [b] *located in Middle Subarea* [c] *located in Southern Subarea*						

While all three intersections demonstrate localized safety concerns, the Lind Street intersection is especially concerning with a crash rate over three times the statewide average for similar intersections and a critical index value of 2.04.

Interchange Crash Analysis

Safety conditions over the five year analysis period (2015-2019) at the Highway 14, Belgrade Avenue, Lookout Drive, Riverfront Drive, and Hawthorn Road/CSAH 90 interchanges were also evaluated. Since ramp merge areas are not considered a typical intersection type or highway segment, crashes within these interchange ramp areas were reviewed for crash trends.

Highway 169/Highway 14 Interchange

During the five year reporting period there were a total of 22 reported crashes at the interchange. The data indicates that most crashes resulted in property damage, however three minor injury and five possible injury crashes were reported. Additional crash information and trends can be found in the *Highway 169 Corridor Study – Existing and Future Safety Evaluation Report.*

Photo taken along Highway 14 WB exit ramp to NB Highway 169. *Source: Google Maps*

Belgrade Avenue Interchange

Three crashes were reported during the five-year study period. All of which were run off the road type crashes, one of which resulted in a "possible injury" crash.

Highway 169/Lookout Drive Interchange

From 2015 to 2019 there were 19 reported crashes at the Highway 169/Lookout Drive interchange. The location of the crashes and trends in crash types are summarized below.

- 11 crashes were along the northbound Highway 169 exit ramp to Lookout Drive
- 4 crashes were along the southbound Highway 169 exit ramp to Lookout Drive
- 2 crashes were along the entrance ramp to northbound Highway 169
- 2 crashes were long the entrance ramp to southbound Highway 169

Of the 19 reported crashes, 15 involved vehicles that ran off the road while traversing the ramps at this interchange. The majority of crashes (13 of 19) involved property damage only, 2 had possible injuries, and 4 involved minor injuries.

Riverfront Drive Interchange

During the five year reporting period there were a total of 11 reported crashes at the merge/diverge areas of the interchange. The data indicates that most crashes resulted in property damage, however one possible injury crash was reported.

Highway 169/Hawthorn Road (CSAH 90) Interchange

From 2015 to 2019 there were four reported crashes at the Hawthorn Road/CSAH 90 interchange. One of the crashes resulted in a fatality of a motorcycle that was merging onto northbound Highway 169 from westbound Hawthorn Road/CSAH 90 and collided with another vehicle. The other three crashes resulted in property damage only. Two of the property damage crashes involved vehicles attempting to turn left onto Hawthorn Road/CSAH 90 from southbound Highway 169 and the third involved a vehicle merging onto southbound Highway 169.

Segment Crash Analysis

A segment crash analysis for the three Highway 169 subareas/segments was completed using the five year crash data from 2015-2019. The limit of each subarea is described below:

- *Northern Subarea* – covers the portion of the study area from Lake Street on the north to the Veterans' Memorial Bridge/Belgrade Avenue on the south. This approximately 2 mile segment is a four-lane divided expressway with a speed limit of 50 mph
- *Middle Subarea* – runs from the Veterans' Memorial Bridge/Belgrade Avenue to the Blue Earth River crossing. This 2.3 mile segment is a four-lane freeway corridor with a speed limit of 50 mph
- *Southern Subarea* – covers the portion of the study area from the Blue Earth River crossing to southern study limit at Highway 60. This 4.4 mile segment is a four-lane expressway with speed limits ranging from 50 mph to 65 mph.

All three subareas were analyzed with and without intersection related crashes. The analysis shows that without the intersection related crashes included, none of the segments appear to have a

crash issue, but there is a high frequency of crashes spread out along each subarea. The most common crash type in all three subareas is run off the road crashes (54% in the northern subarea, 67% in the middle subarea, and 57% in the southern subarea).

An assessment was also completed that added in the intersection related crashes. This shows that the middle subarea operates with a critical index of 1.09, which indicates a safety concern. Also, the southern subarea has seven severe crashes and a fatal and serious injury critical index of 1.03. This indicates that the southern segment is operating above the normal range for fatal and serious injury crashes compared to similar roadway segments statewide.

Contributing Conditions

The physical characteristics of highways, interchanges, and intersections can contribute to safety issues. Below is a list of geometric conditions that may have contributed to past safety concerns.

- Westbound Highway 14 to northbound Highway 169 Exit Ramp – two reported crashes along the westbound Highway 14 exit ramp to northbound Highway 169 both involved a vehicle that crossed over the solid white lines along the ramp and northbound 169 travel lanes while attempting to get back onto westbound Highway 14 via the left turn from northbound Highway 169 to the westbound Highway 14 entrance ramp. The photo displayed on page 10 depicts this area. There is a sign along the exit ramp that shows this left turn movement prohibited and pavement striping is present restricting this movement, however these crashes indicate that the sign and paint prohibiting this movement might not be sufficient.

- Riverfront Drive at northbound Highway 169 Entrance Ramp – five rear end crashes have occurred as vehicles were turning right onto the northbound Highway 169 entrance ramp. Westbound right turns are required to yield to eastbound vehicles, but these crashes indicate that vehicles are not always anticipating the need to stop and yield to other traffic. With the right turn channelized and the non-signalized intersection, vehicles may be incorrectly assuming they have the right of way and therefore are not expecting the vehicle in front of them to stop for oncoming traffic.

- Highway 68 at Highway 169 – six right angle crashes have occurred involving vehicles attempting to turn left from Highway 68 onto northbound Highway 169 that were struck by a vehicle in the southbound direction along Highway 169. Several injuries and a fatality have resulted due in part to speeds of 65 mph along this portion of Highway 169 and the intersection sight distance for the left turn movement from TH 68 onto TH 169 being approximately 25 percent less than the recommended distance of 720 feet. This distance is not met for southbound Highway 169 traffic due to the vertical curvature of the roadway.

Another key component can be the inadequate spacing of access points, especially where heavy entering/exiting volumes exist, which can lead to considerable weaving problems and conflicts between faster moving thru trips and slower moving vehicle entering/exiting the highway. As shown in **Table 4,** the distance between access points in the study area rarely complies with the recommended spacing distances listed in MnDOT's Access Management Manual. Additional access information for the study area can be found in the *Highway 169 Corridor Study – Existing Conditions and No-Build Conditions Report*.

Table 4 – Spacing Between Highway 169 Corridor Study Access Points			
Spacing Between Primary Intersections			
Primary Intersections[1]	**Miles**	**Recommended Spacing (Miles)**	**Meets Spacing Recommendation**
Highway 14 to Webster Avenue	0.64	0.5	Yes
Webster Avenue to Belgrade Avenue	0.60	0.5	Yes
Belgrade Avenue to Lookout Drive	0.09	1	No
Lookout Drive to Riverfront Drive	0.13	1	No
Riverfront Drive to CSAH 69 (Hawley Street)	0.74	1	No
CSAH 69 (Hawley Street) to CSAH 33	0.57	1	No
CSAH 33 to Highway 68	0.68	1	No
Highway 68 to CSAH 90	1.2	1	Yes
CSAH 90 to Highway 60	1.4	1	Yes
Spacing Between Secondary Intersections[1]			
Secondary Intersection	**Miles**	**Recommended Spacing (Miles)**	**Meets Spacing Recommendation**
Lake Street (North) to Lake Street (South)	0.02	0.5	No
Lake Street (South) to Highway 14	0.16	0.5	No
Highway 14 to Lind Street	0.08	0.5	No
Lind Street to River Lane	0.14	0.25	No
River Lane to Webster Avenue	0.44	0.25	Yes
Webster Avenue to Monroe Avenue	0.45	0.25	Yes
Monroe Avenue to Belgrade Avenue	0.15	0.25	No
Riverfront Drive to Woodland Avenue	0.42	0.5	No
Woodland Avenue to CSAH 69 (Hawley Street)	0.32	0.5	No
CSAH 69 (Hawley Street) to Amos Owen Lane	0.19	0.5	No
Amos Owen Lane to CSAH 33	0.38	0.5	No
CSAH 33 to Bison Street	0.50	0.5	Yes
Bison Street to Highway 68	0.18	0.5	No
Highway 68 to 211th Lane	0.32	0.5	No
211th Lane to CSAH 69 (Gadwall Road)	0.14	0.5	No
CSAH 69 (Gadwall Road) to CSAH 120	0.47	0.5	No
CSAH 120 to CSAH 90	0.26	0.5	No
CSAH 90 to CSAH 117	0.10	0.5	No
CSAH 117 to Loren Drive	1.02	0.5	Yes
Loren Drive to CSAH 69 (Gadwall Road)	0.14	0.5	No
CSAH 69 (Gadwall Road) to Highway 60	0.14	0.5	No

A primary intersection refers to a junction between two major roads and a secondary access refers to a junction between a major road and a minor road or local street. Based on the definitions I categorized the intersections based on the functional classification. Since Lind St is classified as a local roadway I believe it should be considered a secondary intersection.

As shown in above, only 4 of the 9 primary intersections and 4 of the 21 secondary intersections along Highway 169 meet the recommended spacing distance. It should be noted that the 211th Lane and Loren Drive intersection are technically local roadways, but they only serve a few businesses and therefore could be classified as driveways; however, they were analyzed as secondary access points as they both provide full access to Highway 169.

C. Modal Interrelationships

Regional Freight Movements

A number of freight generating businesses/developments have been identified throughout the study corridor. According to 2019 traffic data, heavy commercial vehicles account for approximately 8 to 15 percent of all trips on Highway 169. The percentage of trucks has increased in the latest traffic counts by as much as five percent. This increase may in part be connected to recent capacity improvements along Highway 60 southwest of the study area.

Safe and reliable access to freight generating developments as well as efficient connections to the extensive county road network is important to the long term viability of these industries to deliver and receive goods to/from regional markets outside the study area. While existing access conditions appear to adequately serve freight operations, there are local circulation issues, intersection geometry constraints, and connectivity opportunities within all three corridor subareas that need to be considered in evaluating future improvements in order to ensure safe and efficient freight movements to current and future commercial, industrial, and manufacturing land uses. Below is a brief description of the important freight access points and routes within each subarea of the corridor study area:

- *North Subarea* – the Lake Street, Lind Street, Webster Street intersections and Belgrade Avenue interchange provide sufficient access for freight movements. Range Street (west) and North River Drive (east) serve as frontage/backage roads along Highway 169, allowing heavy commercial vehicles to efficiently access existing and future freight dependent developments. In several locations the existing geometrics (lane/shoulder widths, sight distance, lack of turn lanes, and turning radii) creates challenges for freight movements.

- *Middle Subarea* – the Riverfront Drive interchange provides access to several commercial and industrial/manufacturing nodes in this portion of the study area. Riverfront Drive, Poplar Street, Front Street, and Sibley Parkway are a few of the primary local roadways connecting freight movements to Highway 169 and other county roads. The presence of the railroad corridor, the Minnesota River and Blue Earth River have contributed to the challenge of creating efficient and direct connections between land uses. Intersection geometry, congestion, and traffic control also present a variety of constraints for freight movements in this subarea. Future improvements shall evaluate the effectiveness of removing these barriers/constraints that currently affect freight operations.

- *South Subarea* – the Hawley Street, County Road 33, Highway 68, and County Road 69 are the primary intersections that provide access for heavy commercial vehicles to larger freight generating businesses in the south subarea. Several other full and partial access points existing in this subarea that are used by freight traffic. All at-grade access points along a higher speed arterial roadway can present safety and mobility issues for slower

moving freight vehicles to enter and exit Highway 169. While right and left turn lanes exist at the major intersections, only the Highway 68 and County Road 33 intersections have acceleration lanes for heavy trucks to utilize while getting up to speed on Highway 169.

Walkability/Bikeability

Within the study area communities, there are many destinations for pedestrians and bicyclists to travel to/from. Facilities within the pedestrian network include sidewalks, multi-use (shared-use) trails, and pedestrian crossing infrastructure. Facilities within the bicycle network include on-street bikeways and off-street bikeways or multi-use trails. The communities of Mankato and North Mankato have robust park and public space networks, residential neighborhoods, and commercial/industrial nodes.

The area surrounding the Highway 169 corridor study area includes several existing local and regional pedestrian/bicycle facilities that provide non-motorized vehicles access to many local destinations. Complete descriptions of existing facilities and maps illustrating the existing and planned network of sidewalks and trails can be found in the *Highway 169 Corridor Study Existing Conditions Report*.

Listed below is a summary of pedestrian and bicycle facility needs within the study area. These system needs are further discussed and mapped in the *Highway 169 Corridor Study Existing Conditions Report.*

- *ADA Compliant Features* – several trails that cross Highway 169 are currently not ADA compliant. This is the case at Lind Street, Webster Avenue, Riverfront Drive, CSAH 69, and Highway 14

- *System Gaps/Barriers* – connectivity for pedestrian and bicycle movements is a need within the study area as higher speed highway corridors such as Highway 169 and waterways such as the Minnesota River and Blue Earth River can create barriers for non-motorized travelers to cross unless existing bridges are designed to accommodate these movements. Currently only the Belgrade Avenue Bridge over Highway 169, the Highway 169 (North Star Bridge) over the Minnesota River, and Highway 169 Blue Earth River Bridge have dedicated pedestrian/bicycle facilities.

  Several gaps and missing connections have been identified through planning studies completed by the municipalities within the Highway 169 corridor study area:

  - A key missing connection exists in the north subarea where trails exist along both the east and west sides of the Minnesota River, but no connection exists across the river. This limits access to surrounding recreational features, area destinations, and an efficient connection between the West River Trail and the Minnesota River Trail.

  - Highway 169 creates a barrier for pedestrian/bicycle crossing at the Hawley Street (CSAH 69) and Highway 169 intersection due to the need to connect the residential areas both north and south of the highway to local destinations and to the Minneopa Trail for access across the Blue Earth River Bridge. A striped crosswalk was removed from this location due to safety concerns; yet demand continues to exist for crossing the highway in this location.

- The trail on the Blue Earth River Bridge is the only east/west pedestrian and bicycle facility into West Mankato and to destinations such as Roosevelt Elementary School, West High School, and commercial/business developments. The next closest crossing is located approximately two miles downstream at the Hawthorn Road (CSAH 90) bridge across the Blue Earth River.

Pedestrian and Bicycle Crashes

A crash analysis showed there were four crashes involving a pedestrian or bicyclists over the last ten years (2010-2019) in the study area. While the frequency and severity of crashes involving these vulnerable modes of travel does not demonstrate a substantial safety concern

- Pedestrian Crashes – a serious injury crash was reported along Highway 169 between River Lane and Webster Avenue where a pedestrian was struck walking along the shoulder of Highway 169. A second pedestrian crash involved possible injuries and was reported at the Highway 169 and Webster Avenue intersection.
- Bicycle Crashes – two crashes involving bicyclists were reported in the study area. A non-injury crash was reported at the intersection of Riverfront Drive and the northbound Highway 169 ramp terminal intersection and a possible injury crash occurred at the intersection of Riverfront Drive and the southbound Highway 169 ramp terminal intersection.

D. Infrastructure Conditions

Bridge Conditions

Bridge conditions is a transportation need as three bridges in the Highway 169 corridor study area that have been planned for improvements/preservation work to be completed in 2027. The following bridges in the study area are included in the District 7 10-Year Capital Highway Investment Plan (Draft 2021-2030):

- Bridge No. 52012 – Northbound and southbound Highway 169 bridge over northbound Highway 169 exit ramp to Lookout Drive/Center Street
- Bridge No. 07029 – Northbound and southbound Highway 169 bridge over Riverfront Drive
- Bridge No. 9098 – Northbound and southbound Highway 169 bridge over Minnesota River, Union Pacific Railroad, and Sibley Parkway

Two additional bridges along Highway 169 have been recognized for future rehabilitation improvements, but not set timeframe for completion has been identified at this time:

- Bridge No. 52008 – Southbound Highway 169 exit ramp bridge to Lookout Drive (over Sherman Street/Highway 169 southbound entrance ramp)
- Bridge No. 52011 – Southbound Highway 169 exit ramp bridge to Lookout Drive (over northbound Highway 169 exit ramp to Lookout Drive/Center Street)

Table 5 shows the existing conditions of the five bridges identified for preservation/rehabilitation improvements.

Table 5: Highway 169 Corridor Study Bridges with Planned Improvements					
Bridge Characteristics	**Bridge 52008** SB Hwy 169 exit ramp to Lookout Drive (over Sherman St.)	**Bridge 52011** SB Hwy 169 exit to Lookout Dr. (over Hwy 169 exit to Lookout Dr/Center St)	**Bridge 52012** Hwy 169 exit ramp to Lookout Dr.	**Bridge 9098** NB/SB Hwy 169 over MN River, UP RR, Sibley Pkwy	**Bridge 07029** NB/SB Hwy 169 over Riverfront Dr
Year Built	1992	1992	1992	1960	1992
Inspection Date	July 2018	July 2018	August 2018	May 2018	August 2018
Vertical Clearance	No restrictions	No Restrictions	No restrictions	No restrictions	No restrictions
Deficient Status[1]	Adequate	Adequate	Adequate	Adequate	Adequate
Sufficiency Rating[2]	95.7	99.8	93.0	95.9	93.4
[1]Vertical clearances with no restrictions indicate bridges that meet new bridge construction standards: minimum 16'-4" vertical clearance for bridges carrying roadways over highways and 17'-4" for bridges carrying trails only over highways. [2]Sufficiency rating is a percentage scale of 0-100 (100% being entirely sufficient). Generally, to be eligible for bridge rehabilitation, a sufficiency rating of 80% or less is required, and to be eligible for bridge replacement, a sufficiency rating of 50% or less.					
NBI Condition Rating[4]					
Deck	7	8	7	6	6
Superstructure	7	7	8	6	7
Substructure	7	7	7	6	7
NBI Appraisal Rating[4]					
Structure Evaluation	7	7	7	6	7
Deck Geometry	6	6	9	9	9
Under-Clearances	4	6	4	5	6
Waterway Adequacy	NA	NA	NA	9	NA
Approach Alignment	8	8	8	8	8
[4]National Bridge Inventory (NBI) ratings range from 0 to 9, with 0 being a failed condition, and 9 being an excellent condition (such as newly constructed). NBI Condition and Appraisal Ratings with values of 4 or less are highlighted in yellow in the table. A value of "4" indicates a rating of "poor," and a value of "3" indicates a serious condition.					

Table Note: Data obtained from each bridge's 2018 Structural Inventory Report, the most recent available data, generated after the latest inspections in 2018. Additional information on ratings can be found in MnDOT's Bridge Inspection Manual.

Bridge Improvement Needs

The bridge improvements listed in the District 7 10-year Capital Highway Improvement Plan (CHIP) will be further scoped by MnDOT as projects are moved from the CHIP to the current 5-year State Transportation Improvement Program (STIP).

Highway 169 bridge improvements from approximately Riverfront Drive to Lake Street (2027 planned) include roadway and bridge rehabilitation, including major work on the Northstar Bridge. MnDOT has also indicated that within the next 10-15 years it is anticipated that Bridge 07023 (Highway 14 over Highway 169) and Bridge 07011 (Highway 14 over Minnesota River and UP Railroad) will likely require rehabilitation work. The corridor vision established as part of the Highway 169 Corridor Study and additional transportation needs of the region will be used to inform future investments.

Pavement Conditions

Pavement conditions are an important component for maintaining safe driving conditions. Segments where the pavement experiences fatigue/alligator cracking, potholes with patching, and transverse or longitudinal cracking can compromises the smoothness of the driving surface . This in turn can result in loss of vehicle control, a reduction in a driver's or bicyclist's ability to perform maneuvering tasks, and can increase the frequency of lost loads and debris on the roadway.

Pavement Indices

MnDOT uses four indices for reported pavement conditions. Each index describes a different aspect of pavement conditions and can be used to rank pavement sections and predict the need for future maintenance and rehabilitation. The MnDOT pavement condition indices are described in **Table 6**.

Table 6: Pavement Condition Indices

Index	Description	Rating Scale
Ride Quality Index (RQI)	MnDOT's ride, or smoothness, index. RQI reflects the "seat of the pants" feeling the average user experiences traveling down the roadway.	RQI ratings range from 0.0 to 5.0, with 0.0 being considered very poor and 5.0 being considered very good.
Pavement Surface Rating (SR)	MnDOT uses SR to describe pavement distress. Pavement distresses are visible defects on the pavement surface. These defects are symptoms that indicate problems of pavement deterioration.	SR ratings range from 0.0 to 4.0. A higher SR rating indicates a road in better condition. A road with no defects is rated at 4.0. A road in need of major repair or rehabilitation will have an SR rating of near or below 2.5.
Pavement Quality Index (PQI)	MnDOT uses PQI as an overall measure of pavement condition, taking into account both smoothness and cracking	PQI ratings range from 0.0 to 4.5. A higher PQI rating indicates a better overall condition of the roadway.
Remaining Service Life (RSL)	RSL is an estimate, in years, until the RQI will reach a value of 2.5, which is generally considered the end of a pavement's design life. Most pavements will need some type of major rehabilitation when the RQI has reached 2.5	RSL is considered "high" when the number of years until reaching an RQI of 2.5 is 12 or more years. RSL is considered "low" when the number of years until reaching an RQI of 2.5 is 0 to 3 years.

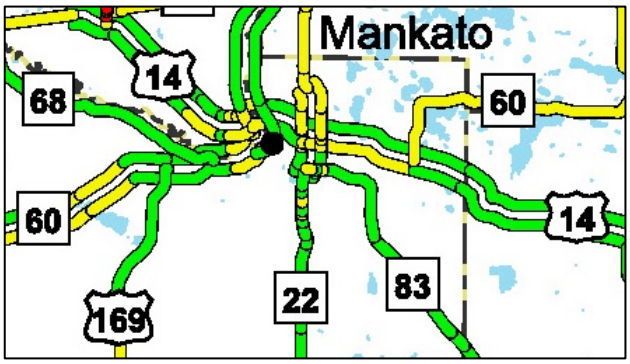
Every year, the MnDOT Pavement Management Unit collects pavement roughness and digital image data of all the highways on the entire state trunk highway system. From this information, pavement condition indices are calculated and mapped for each MnDOT district. The pavement conditions along the Highway 169 study corridor are briefly described below and illustrated in ***Figure 2***.

- The Ride Quality Index (RQI) along the study segment of Highway 169 ranges from fair (2.1 to 3.0) to good (3.1 to 5.0) conditions. The southbound lanes in the North and Middle Subareas are generally rates as "fair" and the South Subarea is rated "good". The northbound lanes of Highway 169 are rated as "good", with the exception of a portion of the Middle Subarea (see Figure 2). MnDOT's criterion for pavement preservation is generally an RQI between 2.5 to 3.0, depending on the type of roadway facility. As a result, there future pavement preservation needs anticipated in the study area.
- The Pavement Surface Rating (SR) is consistently good (2.5 to 4.0) throughout the study corridor.

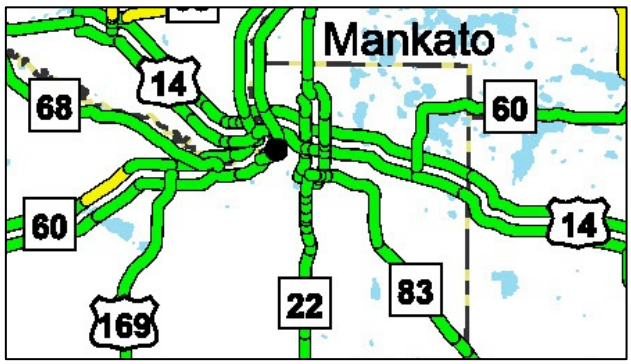
Figure 2: Highway 169 Study Corridor RQI and RSL
(Source: MnDOT Pavement Management Unit, 2019)

DEPARTMENT OF TRANSPORTATION

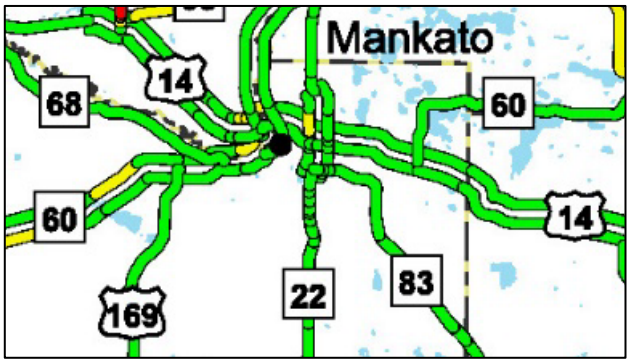
ATP 7
2019 Pavement Condition
Ride Quality Index (RQI)
- Poor (0.0 - 2.0)
- Fair (2.1 - 3.0)
- Good (3.1 - 5.0)



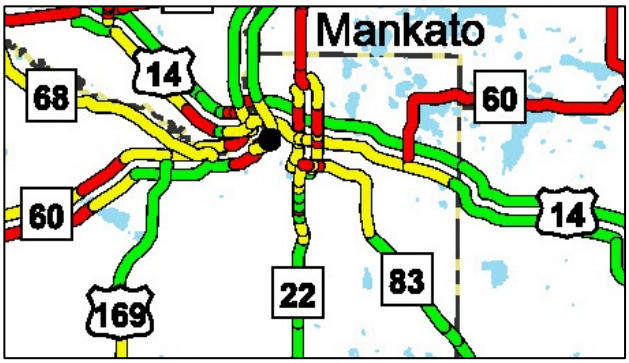
ATP 7
2019 Pavement Condition
Surface Rating (SR)
- Poor (0.0 - 1.6)
- Fair (1.7 - 2.4)
- Good (2.5 - 4.0)



ATP 7
2019 Pavement Condition
Pavement Quality Index (PQI)
- Poor (0.0 - 1.8)
- Fair (1.9 - 2.7)
- Good (2.8 - 4.5)



ATP 7
2019 Pavement Condition
Remaining Service Life (RSL)
- Low (0 - 3 years)
- Medium (4 - 11 years)
- High (12+ years)



- The Pavement Quality Index (PQI) is generally good (2.5 to 4.0) throughout the majority of the study corridor. A short segment along southbound Highway 169 through Mankato/North Mankato was categorized as "fair" (1.9 to 2.7).
- The northbound lanes of Highway 169 in the South Subarea received a "good" rating for Remaining Service Life (RSL), meaning the pavement has 12-plus years of life. Portions on both northbound and southbound Highway 169 through the Middle Subarea have Remaining Service Life (RSL) ratings as "poor", meaning the pavement has less than 3 years of remaining service and is in need of improvements. The other segments of Highway 169 in the study area received "fair" (4 to 11 years) ratings, which indicate improvements are not needed in the short term but should be monitored for deteriorating conditions.

Planned Pavement Improvements

Within the Highway 169 corridor study area there is one programmed pavement improvement/preservation project scheduled for 2024, which is listed in the District 7 10-Year Capital Highway Investment Plan (2019-2028).

A. Additional Considerations: Social, Economic, and Environmental Factors

This section is intended to provide a high level description of the existing conditions and potential SEE factors within the Highway 169 study area that will need to be considered as alternatives are developed and evaluated as part of the project development process. This section is not an in-depth analysis and the topics to be considered during future phases of project development will depending on the scope of planned projects and the type of funding being used, as a project may be required to undertake state and/or federal environmental review.

A more detailed inventory and assessment of the SEE factors associated with the study area can be found in the *"Highway 169 Environmental Screening Report" and the "Highway 169 Environmental Justice Analysis Report".*

An important social factor needing to be considered early in alternatives development is the presence of Environmental Justice (EJ) populations as all federal actions are required to comply with Executive Order 12898[1]. EJ populations are minority and/or low-income populations that are meaningfully greater than those of the general population. For EJ, "meaningfully greater" is defined as a minority or low-income population that is either 10 percent higher than the county average, or greater than 50 percent of the total geographic unit, or determined based on input from local officials or stakeholders.

Social

Based on a review of U.S. Census data – 2017 American Community Survey 5-year Estimates, there are minority and low-income EJ populations present in the corridor study area. Further determination will be needed on a project basis to determine if these populations have the potential to experience disproportional impacts as a result of a federal action or construction activity. Generally, permanent impacts of transportation projects are intended to improve the transportation corridor for all users. While future improvements to the Highway 169 corridor would

[1] https://www.archives.gov/files/federal-register/executive-orders/pdf/12898.pdf

unlikely disproportionately impact any of the identified environmental justice populations, a robust public/stakeholder engagement effort is strongly recommended in future stages of the project development process and prior to the evaluation of alternatives.

Stakeholder Support

In 2019, the Highway 169 Corridor Study Project Management Team (PMT) was formed, which consists of representatives from the cities, counties, MnDOT, and FHWA. The PMT is tasked with guiding the study process and serving as a conduit to their governing bodies and constituents. A goal of the PMT is to develop a unified vision for transportation priorities/recommendations that are locally accepted in order to pursue funding and future municipal consent.

Economic

Highway 169 is an important route for commuters, tourists, and commercial freight travel across southwestern Minnesota. As shown in the traffic analysis section, the corridor continues to grow in use and travel demand, which along with safe and efficient access to commerce destinations (retail shops, restaurants, entertainment, office, and manufacturing/industry) are key factors in the long-term vitality of the local and regional economies.

Traffic counts collected through MnDOT and StreetLight® data from 2019 indicate that heavy commercial truck volumes account for approximately 8 to 15 percent of all daily traffic using Highway 169. This percentage of traffic is greater than the statewide average of approximately 8 percent on the state trunk highway system. As part of the project development process, a Project Management Team (PMT) was formed that consists of representatives from the local units of government (Mankato Area Planning Organization, MnDOT-District 7 Mankato, Blue Earth County, Nicollet County and Cities of North Mankato and Mankato). These stakeholders have mentioned Highway 169 as a critical connection to deliver goods to local businesses and throughout the region and state. Concerns have been raised that the existing highway facility is limiting potential growth and the efficient movement of heavy freight traffic. Operational and safety benefits for freight operators can translate into real dollar savings for businesses that ship items via commercial trucking. By reducing freight shipping costs, a real efficiency benefit can accrue to the business shipping the product, and a potential cost savings can be realized by the receiving business. Shipping cost savings can lower the overall product cost for consumers, in turn making local businesses more competitive compared with their outside competition, and better able to expand to new markets.

In addition to the business expansion benefit related to shipping cost savings, highway improvements can extend the market area that businesses can serve, as well as the areas from which they can access customers and/or suppliers. By extending the distance range over which local businesses effectively compete with their regional or state competitors can provide opportunities for substantial market expansion and attraction of manufacturing and distribution industries. Trajectory

Investments in transportation-related improvements result in several types of economic impacts. The magnitude of the economic impact is most influenced by increased traffic speed and the relative change in travel time. Providing safe, reliable, and efficient travel along and across the

Highway 169 corridor will promote economic competitiveness and expand employment opportunities for the local and regional economies.

Environmental/Natural Resources

A large portion of the study area lies within the river valleys of the Minnesota River and Blue Earth River. Several other sensitive water features and wetlands are scattered throughout the study area, which may influence the location and type of future infrastructure improvements. The alternatives development and evaluation processes for future projects will need to conduct an in-depth review and consideration of these features, along with assessing right of way needs and potential impacts to existing flood control structures, future flood risks, impacts to unique vegetation, prime farmlands, cultural/historic resources, soil and groundwater contamination, and threatened/endangered species.