McCook County

MASTER TRANSPORTATION PLAN

McCook County
Master Transportation Plan

South Dakota Department of Transportation
McCook County

HP 5510 19 P

September 2017

Prepared by: HR Green, Inc.

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Executive Summary

The purpose of the McCook County Master Transportation Plan is to examine the existing transportation network throughout McCook County and provide a framework by which McCook County will be able to prioritize, select, and implement improvements to the transportation network over the next 20+ years. It is intended to be a living document, serving as a road map to help guide elected and appointed officials, developers, and residents as McCook County continues to expand economic and residential opportunities for County residents. This plan provides the flexibility to react to changing conditions and shifts in the County's transportation needs as they arise. Ultimately, this Master Transportation Plan provides solutions to address existing and future transportation challenges while promoting a livable community that will enhance the economic and social well-being of McCook County residents.

At the onset of the study, the study team solicited stakeholder and public input to help identify eight transportation need categories through a review of the current and future transportation network. Five individual 'plans' were developed to address the identified needs, providing a systematic approach to the planning, prioritization, and implementation of future transportation projects. A Roadway Design, Analysis, and Policy Guidelines chapter was developed to supplement these plans and establish formal design and analysis guidelines for future projects and the evaluation of anticipated impacts.

McCook County Transportation Network Needs

- Bridge Condition
- Traffic
- Roadway Geometry
- Roadway Surfacing
- Multi-Modal Accommodations
- Growth Areas
- Drainage
- Railroad Crossings

The first plan, entitled the Major Roads Plan, establishes a prioritized framework for McCook County-jurisdiction highways. Through the identification of countywide priorities and assessment of network interdependence, ranging from Township roadways to State highways, this Major Roads Plan balances appropriate levels of mobility, access, and freight accommodations within the overarching regional transportation network. To convey these priorities and establish the long-term goals of a sustainable transportation network, McCook County highway categories were selected in terms of roadway surfacing type: Bituminous – Primary Truck Routes, Bituminous, and Gravel.

Bridges within McCook County pose a serious challenge to maintaining the existing transportation network. On one hand, bridges are a necessity to span water crossings and facilitate a connected transportation network. Residents have grown accustomed to the availability of crossing waterways throughout the County at nearly every section line road. On the other hand, bridges are expensive to replace, and complete replacement projects can quickly carve off a large portion of the County's annual transportation budget. The Bridge Plan describes existing conditions and identifies barriers within the network. It then builds upon the prioritization outlined in the Major Roads Plan to look at future-year costs of a comprehensive bridge plan through maintenance, preservation, rehabilitation, replacement and removal of existing structures. The Bridge Plan is geared towards the transferability of information into the Bridge Improvement Grant (BIG) fund provided by the South Dakota Department of Transportation.

McCook County Master Transportation Plan Components

1. Introduction and Purpose
2. Existing Conditions
3. Needs Assessment
4. Major Roads Plan
5. Bridge Plan
6. Roadway Preservation & Maintenance Plan
7. Bicycle and Pedestrian Plan
8. Roadway Design, Analysis, & Policy Guidelines
9. Transportation Funding
10. Project Implementation Plan
11. Conclusions and Recommendations

The Roadway Preservation and Maintenance Plan identifies typical preservation and maintenance activities for asphaltic concrete, blotter, and gravel-surfaced roadways within McCook County. A life cycle is developed for each roadway segment within the County, facilitating the development of various roadway needs scenarios. One important element of the Roadway Preservation and Maintenance Plan is the investigation of potential roadway surface conversions to more cost-effective solutions, such as the conversion of an existing asphaltic concrete roadway to a blotter or gravel surface, in light of future funding challenges.

A Bicycle and Pedestrian Plan introduces a framework for incorporating multi-modal accommodations into the transportation network. While recognizing the challenges in incorporating wide-scale multi-modal enhancements to a predominantly rural county, the plan does provide recommendations for multi-modal considerations in conjunction with future roadway projects as well as more focused projects in higher-density residential areas.

The Project Implementation Plan provides recommendations of feasible transportation projects that address McCook County's long-term transportation needs. Projects were categorized as either 'Core Implementation Elements to Maintain Existing Transportation Network', which includes roadway and bridge life-cycle based projects, or 'Transportation Network Enhancement Projects' that focus on enhancing the current network and supplementing the core implementation elements. The core implementation elements were structured in a 10-year planning outlay that includes major investments such as roadway resurfacing, chip seals, bridge replacement, and bridge preservation projects. The network enhancement projects are prioritized as high, medium, and low-priority for implementation as funding allows.

One of the more significant challenges to implementing the Master Transportation Plan is availability of transportation funding and the subsequent effect that has on the long-term sustainability of the current network. The Transportation Funding chapter ties everything together and quantifies three funding scenarios. The resources required to maintain the existing network as it is today was quantified in a 'Maintain Existing Network' scenario. Two additional scenarios were developed based on the Major Roads Plan to associate a cost with potential roadway surfacing modifications, not replacing select bridges when closure is required ("A"), or thickening bituminous-surfaced roadway base to improve long-term roadway performance ("B"). Annual costs were developed to provide a snapshot of need in Year 1 (2018, in 2017 dollars) and Year 20 (2037, in 2037 dollars to account for material and construction cost inflation). These costs are compared to the forecasted annual funding to help illustrate potential funding shortfalls in the future.

Transportation Needs Compared to Forecasted Transportation Funding
Details of each scenario discussed in Chapter 9

1. Introduction and Purpose

Background

McCook County is a predominantly rural county located in east-central South Dakota, approximately 25 miles west of Sioux Falls. Total land area is approximately 577 square miles, or 24- by 24-miles along the borders. Overall, the transportation network is a well-connected grid made up of US/State, County, Township, and municipal roadways. The County is blessed with a number of US and State highways traversing east/west and north/south through the County, essentially providing the backbone of the McCook County transportation network. Agriculture is the primary economic driver for McCook County. A reliable, well-connected network that can accommodate heavy loads and large equipment is important to agricultural operations, particularly for McCook County where the large transload grain terminals are located in adjacent counties.

McCook County has seen a general trend of decreasing population since the peak of around 10,300 County residents in 1930, though the decrease has generally stabilized since 1990 as shown in Table 1-1. Much of this decrease is attributed to the steady decrease in rural density, as generations continue moving to urban centers and technology allows agricultural operations to manage larger swaths of land with fewer people. These factors contribute to the challenges facing McCook County, particularly maintaining their roadway system that was constructed decades ago, in an era where the County's population was nearly double what it is today and agricultural-related trips were much shorter distances, with smaller equipment, and lighter loads.

Table 1-1: Existing McCook County Population Trends

	1980	1990	2000	2010	2016 (estimate)
Salem (county seat)	1,486	1,289	1,371	1,347	1,324
Bridgewater	653	533	607	492	475
Canistota	626	608	700	656	636
Montrose	396	420	460	472	463
Spencer	380	317	157	154	151
McCook County	6,444	5,688	5,832	5,618	5,625
South Dakota	690,768	696,004	754,844	814,180	865,454

Source: United States Census Bureau

Of late, the County has experienced a shift in population towards the southeast corner of the County around the Lake Vermillion area. Suburban and acreage development around Lake Vermillion and the East Fork Vermillion River Valley has become popular due to the abundant recreational opportunities, scenic rural setting, and the proximity to Sioux Falls via SD42. The resulting growth in traffic around the Lake Vermillion area is compounded by the seasonal, recreational traffic around the lake that annually brings over 100,000 visitors to the Lake Vermillion Recreation Area and surrounding recreational opportunities.

Like many counties throughout South Dakota, McCook County is feeling the constraints of maintaining their current system with relatively stagnant highway and bridge funding and continually increasing construction and material costs. Though additional funding and grant opportunities were established for counties in the 2015 Highway Funding Bill, maintaining the existing infrastructure to the level of service users have grown accustomed to is a daunting task.

Implementing network enhancements such as improved roadway capacity, safety, network connectivity and route continuity becomes even more difficult when the cost to maintain the existing transportation network exhausts available funding.

McCook County Master Transportation Plan Introduction

The Study Area for the McCook County Master Transportation Plan encompasses all of McCook County including the municipalities and townships of McCook County. The primary focus is the McCook County-jurisdiction highway system, but all roadways within the Study Area are included to provide a comprehensive view of the McCook County transportation network. Additionally, the Master Transportation Plan promotes a multi-modal approach to address issues and needs of all transportation users. The Study Area and associated roadways are illustrated in Figure 1-1.

Master Transportation Plan Purpose and Goals

The purpose of the study is to examine the McCook County transportation network from a multi-modal perspective and develop a series of prioritized solutions to address safety, infrastructure, and operations needs that will promote a livable community and enhance the economic and social well-being of McCook County residents.

This McCook County Master Transportation Plan is intended to be a living document that can be used as a blueprint or 'road map' to help guide elected and appointed officials, developers, and residents as McCook County continues to expand economic and residential opportunities over the next 20+ years.

Study Process

The McCook County Master Transportation Plan followed a three-phase study process over the course of a year, described in Table 1-2, beginning in the summer of 2016. Public and stakeholder involvement was an important element to the plan, beginning with the identification of issues and needs and commencing with the publication of the draft report for review and comment. Over the course of the three phases, individual components of the Master Transportation Plan were developed. The final phase was used to compile all elements of the Plan and prioritize projects for public and stakeholder review.

Table 1-2: Study Process

Phase 1 (Chapters 2 and 3)

- Inventory existing conditions
- Analyze existing and future conditions
- Identify issues, needs, and opportunities
- Initial public and stakeholder involvement opportunity with online transportation needs survey

Phase 2 (Chapters 4 through 9)

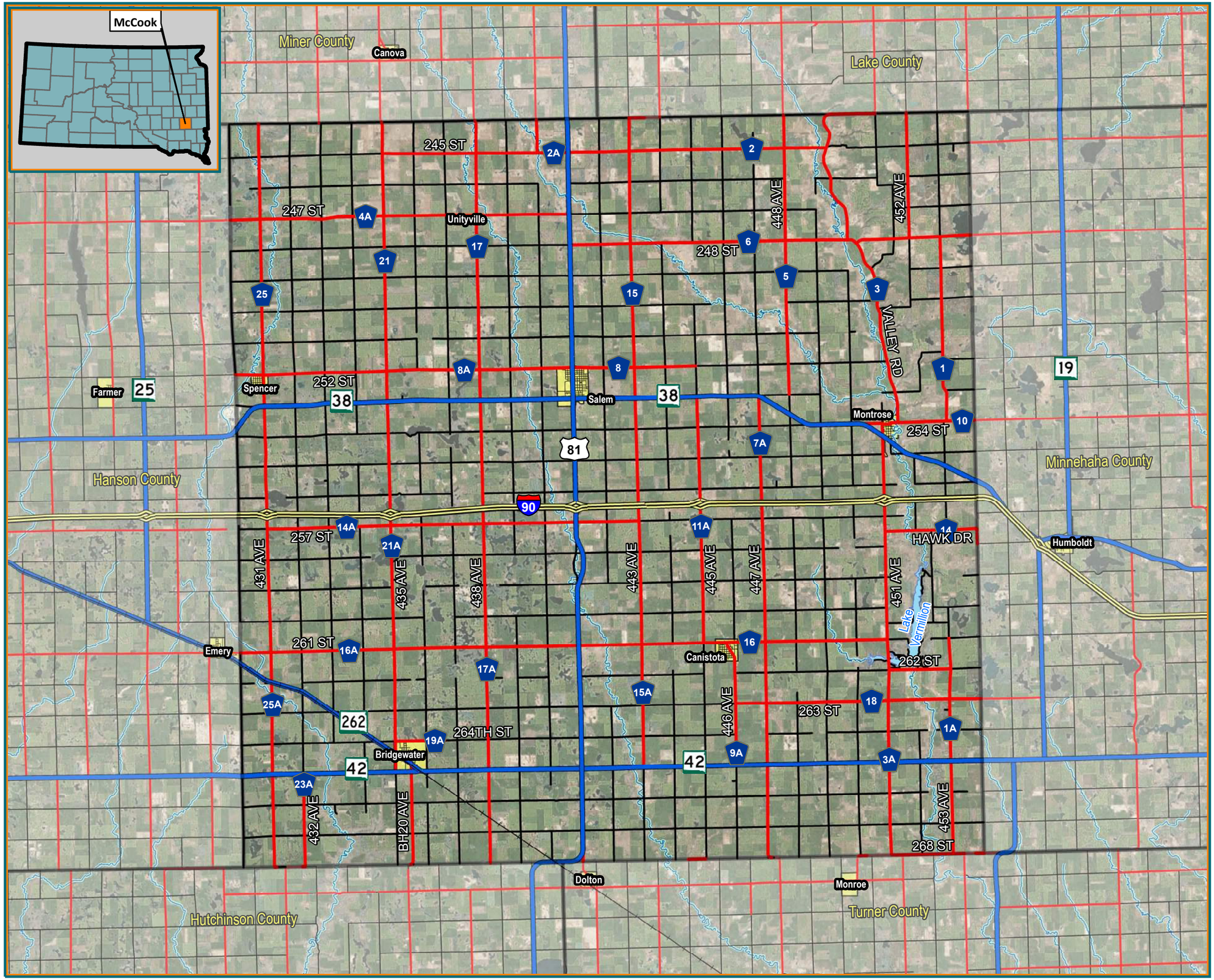
- Develop strategies and solutions to meet community values
- Evaluate potential options

Phase 3 (Chapters 10 and 11)

- Select improvement strategies
- Prioritize based on planned investments
- Publish plan
- Draft report public and stakeholder involvement opportunity

Study Guidance (Study Advisory Team)

A Study Advisory Team (SAT), comprised of South Dakota Department of Transportation (SDDOT) and McCook County staff and elected officials, was organized to help guide the development of the McCook County Master Transportation Plan. The SAT met several times throughout the study to provide input, feedback, and comments on study progress and materials developed for inclusion in the Master Transportation Plan. The SAT also provided available background data from which transportation system issues and needs were identified and evaluated. Ultimately, the SAT was instrumental in prioritizing study goals, objectives, and the implementation plan that is a culmination of the entire process.



MCCOOK COUNTY
MASTER TRANSPORTATION PLAN

FIGURE 1-1
STUDY AREA

- Interstate Highway
- State Highway
- County Road
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City

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1 inch = 3 miles

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2. Existing Conditions

Existing conditions for the McCook County transportation infrastructure were inventoried in order to identify and evaluate transportation-related needs and opportunities. This inventory included a review of the existing roadway network, traffic volumes and operations, crash history, non-motorized transportation facilities, transit service, airport and freight facilities. The following sections summarize the key findings of this review.

Roadway Network

McCook County has provided a well-managed transportation network that has served the traveling public for decades. However, typical of many rural counties throughout the United States, it is becoming more and more difficult to maintain and fund a high quality of service that the public has grown accustomed to over the years. McCook County faces challenges due in part to trucks and farm equipment becoming larger and hauling heavier loads, escalation of roadway material and construction costs, and historically flat funding. Modes of travel have continued to evolve as well, with an increase in freight traffic on the roads, more centralized transload facilities and consolidation of rail lines, and a gradual shift towards a desire for more non-motorized transportation opportunities.

Typical McCook County highway cross-section with gravel surfacing.

A vast majority of the McCook County roadways were designed decades ago based on different design standards and guidelines. When comparing the built environment to today's current design standards, the existing network exhibits many of these dated standards, such as lack of shoulders, steep side-slopes, limited sight distance, atypical intersection configuration, or designs that do not meet the respective design speed. Many of these roads were not originally designed to accommodate today's large agricultural equipment or heavy loads. Changes in land use also challenge the existing network. As recreational and rural development areas, such as the Lake Vermillion area, continue to extend outward into the rural countryside, there begins to be a blend of recreational and urbanized development with rural design features. What may have worked for low-volume, high-speed situations in the previous decades begins to become an issue as traffic volumes and turning conflicts increase.

Existing Infrastructure

McCook County's transportation network consists of over 1,150 miles of roadway across a well-connected grid network of US/State, County, Township, and Municipal roads. Approximately 284 of these miles are maintained under the jurisdiction of McCook County. Local roadways in McCook County are typically designated by a number ('streets' in east/west directions and 'avenues' in north/south directions). County-jurisdiction roadways are also given a County Highway (CH) designation with a number and letter(s) to help guide proximity of a respective segment

Typical McCook County highway cross-section with bituminous surfacing.

within the County (e.g. CH 4A). An overview of the roadway jurisdiction within McCook County is provided in Figure 2-1.

Approximately 164 of the 284 McCook County-jurisdiction road miles have a bituminous surface (asphaltic concrete or blotter). The County strives to maintain paved corridors at regular intervals throughout the County, building upon the US/State highway routes of Interstate 90 (I-90), United States Highway 81 (US81), South Dakota Highway 42 (SD42), 38 (SD38), 262 (SD262). These paved corridors provide inter-county connectivity as well as key connections to urban areas and I-90 interchanges. An overview of County and Township roadway surfacing is provided in Figure 2-2.

All east-west corridors and several north-south corridors within McCook County cross at least one river or stream. Each crossing location presents an opportunity for or potential barrier to network connectivity and route continuity. Whether a crossing is installed or removed, type of crossing, vehicle and load restrictions (width, height, and load), and the current condition of the crossing, all dictate functionality of the structure and roadway corridor. Ninety-eight bridges have been constructed throughout the County, 69 of which are maintained by McCook County (owned by either the County or a Township). The locations of these bridges are shown in Figure 2-2. There are also numerous culverts and smaller crossings that must be monitored and maintained to create a reliable roadway network.

Federal Functional Classification

Public roadways within McCook County are assigned a functional classification as part of the Federal Functional Classification approved by the Federal Highway Administration (FHWA). This classification is a network-wide balance of access and mobility to meet the goals and objectives of each roadway and is a standardized indication to the type of service each particular roadway provides to the user. FHWA's Highway Functional Classification: Concepts, Criteria and Procedures (2013) describe mobility and accessibility functions as follows:

- Roadway mobility function: Provides few opportunities for entry and exit; therefore, low travel friction from vehicle access/egress.
- Roadway accessibility function: Provides many opportunities for entry and exit, which creates potentially higher friction from vehicle access/egress.

In rural areas, the following hierarchy has been established across all jurisdictions, and the gradual reversal of mobility vs. access moving from Interstate highways to local roadways:

- Interstate: High mobility and low access
- Principal Arterial
- Minor Arterial
- Collector (Major or Minor)
- Local: Low mobility and high access

At the State highway level, the following classifications have been assigned within McCook County:

- I-90: Interstate
- US81: Other Principal Arterial
- SD42: Minor Arterial
- SD262: Minor Arterial
- SD38: Major Collector

McCook County roadways are designated one of three classifications, Major Collector, Minor Collector, or Local, as shown in Figure 2-3. Township roads are typically classified as Local.

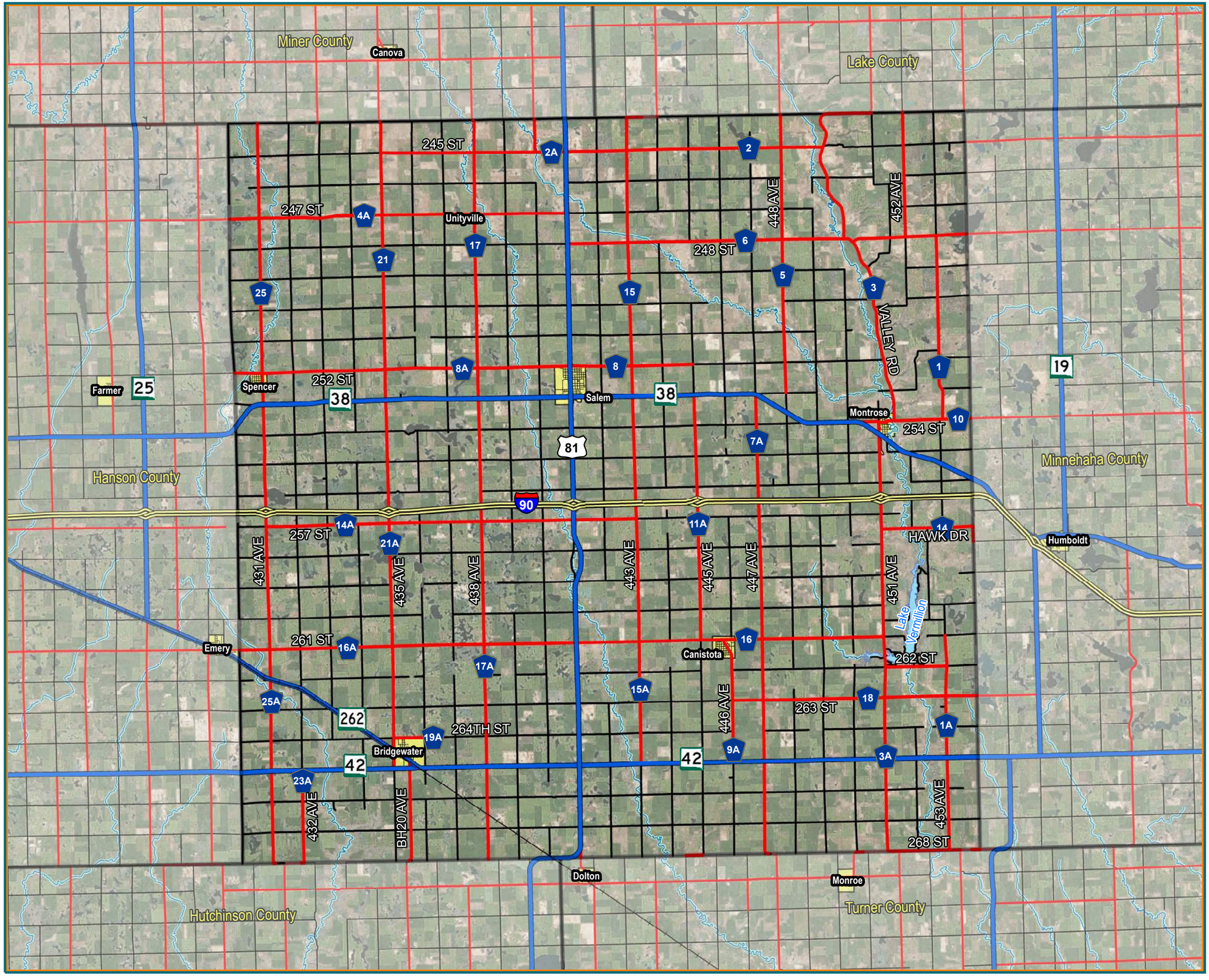

Figure 2-1
Existing Roadway Jurisdiction

- Interstate Highway
- State Highway
- County Road
- Township Road
- County Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City

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1 inch = 3 miles

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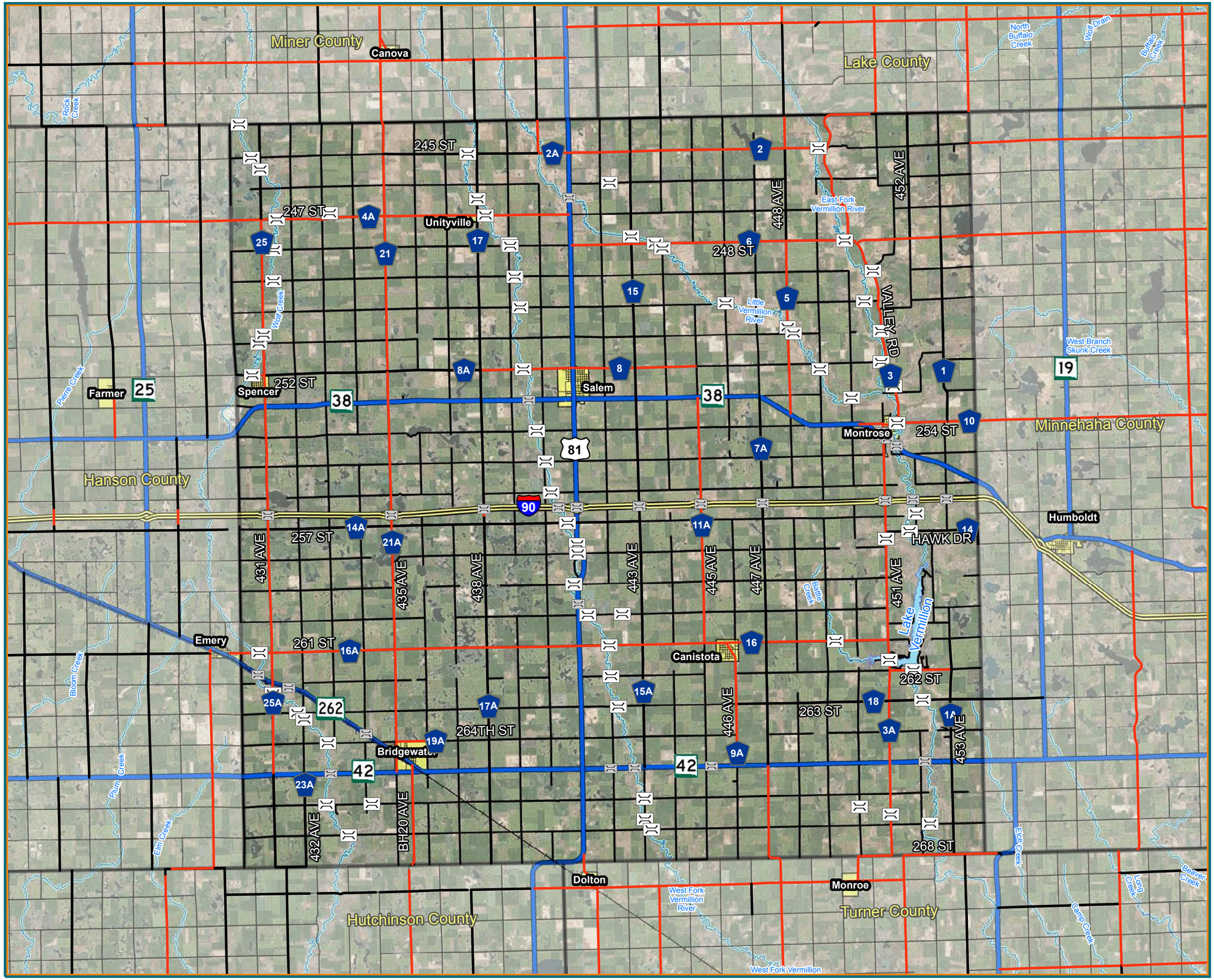

Figure 2-2 Existing Transportation Infrastructure

McCook County
MASTER TRANSPORTATION PLAN

Legend

- Interstate Highway
- State Highway
- Township Road
- Urban Road
- Railroad
- Lakes
- City
- Bridge (County) (69)
- Bridge (State) (29)
- Rivers/Streams

County Road Surface Type

- Gravel/Dirt
- Bituminous
- Concrete

McCook County Inspected Bridges (69)

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1 inch = 3 miles

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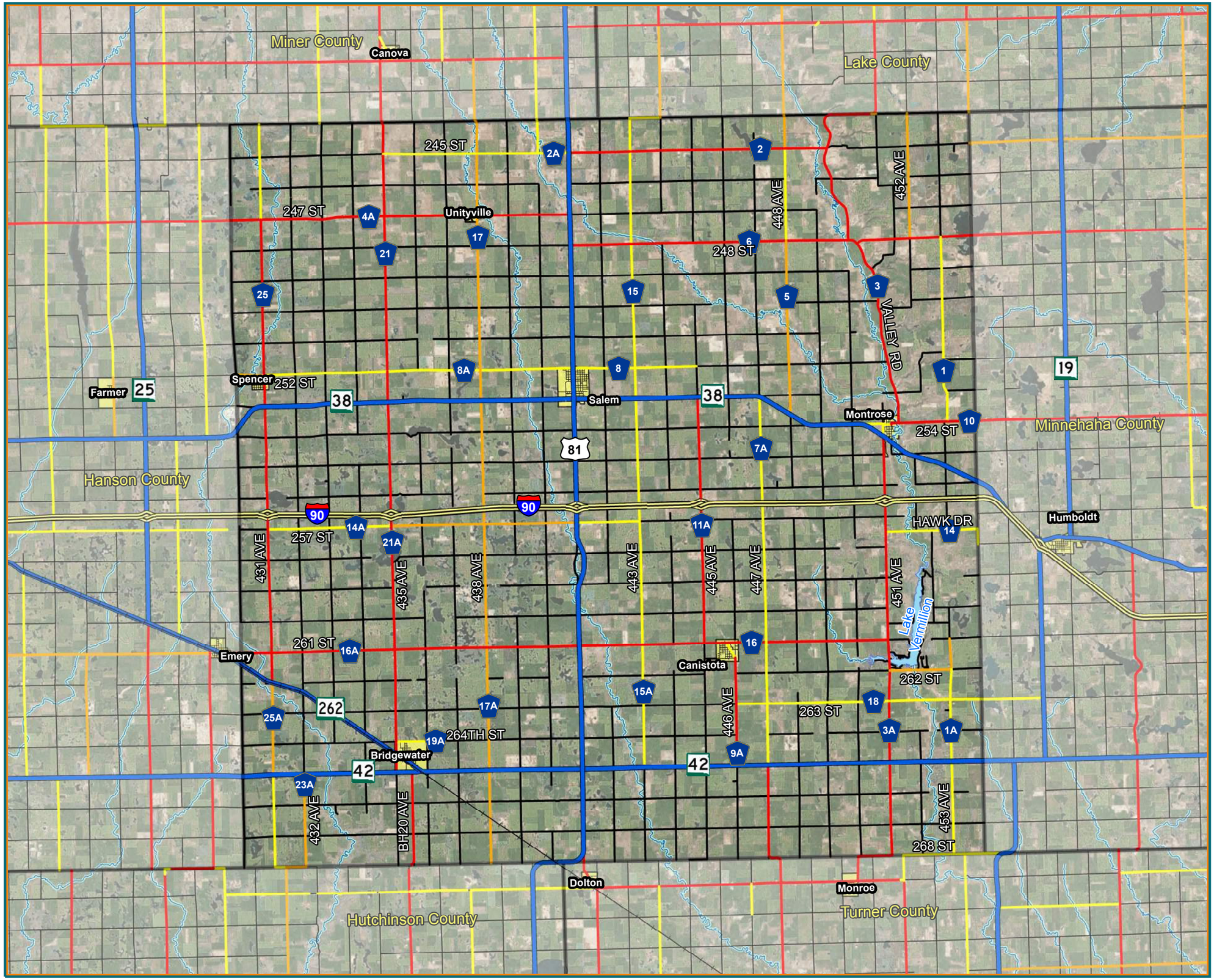

McCook County
MASTER TRANSPORTATION PLAN

Figure 2-3 Existing Federal Functional Classification

Legend

- Interstate Highway
- State Highway
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City

County Road Federal Functional Classification

- Rural Major Collector
- Rural Minor Collector
- Rural Local Roads

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0 1.5 3 Miles

1 inch = 3 miles

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Existing Roadway Safety Review

One method of assessing the performance of an existing roadway network is measuring traveler safety through a review of crash frequency and severity. The objectives are to identify trends or causal relationships at high crash frequency and severe crash locations. These trends can potentially lead to identifying countermeasures and improvements to mitigate crash issues. Historical crash data for the most recently available five-year period (2011-2015) was provided by the SDDOT. A total of 855 crashes were reported on County and State facilities within McCook County between 2011 and 2015. Countywide crash characteristics are summarized in Table 2-1. The crash locations throughout the County, categorized by crash severity, are spatially depicted in Figure 2-4. A figure focusing on fatal injury and incapacitating injury crashes is provided in Figure 2-5.

Table 2-1: McCook County Crash History (2011-2015)

Crash Severity	Total # Crashes
Fatal Injury	8
Incapacitating Injury	16
Non-Incapacitating Injury	49
Possible Injury	53
No Injury	354
Wild Animal Hit	374
Not Applicable	1
Total Crashes	855

Manner of Collision	Total # Crashes
Single vehicle	341
Rear-end	39
Angle	75
Vehicle-Animal	374
Sideswipe	25
Unknown	1

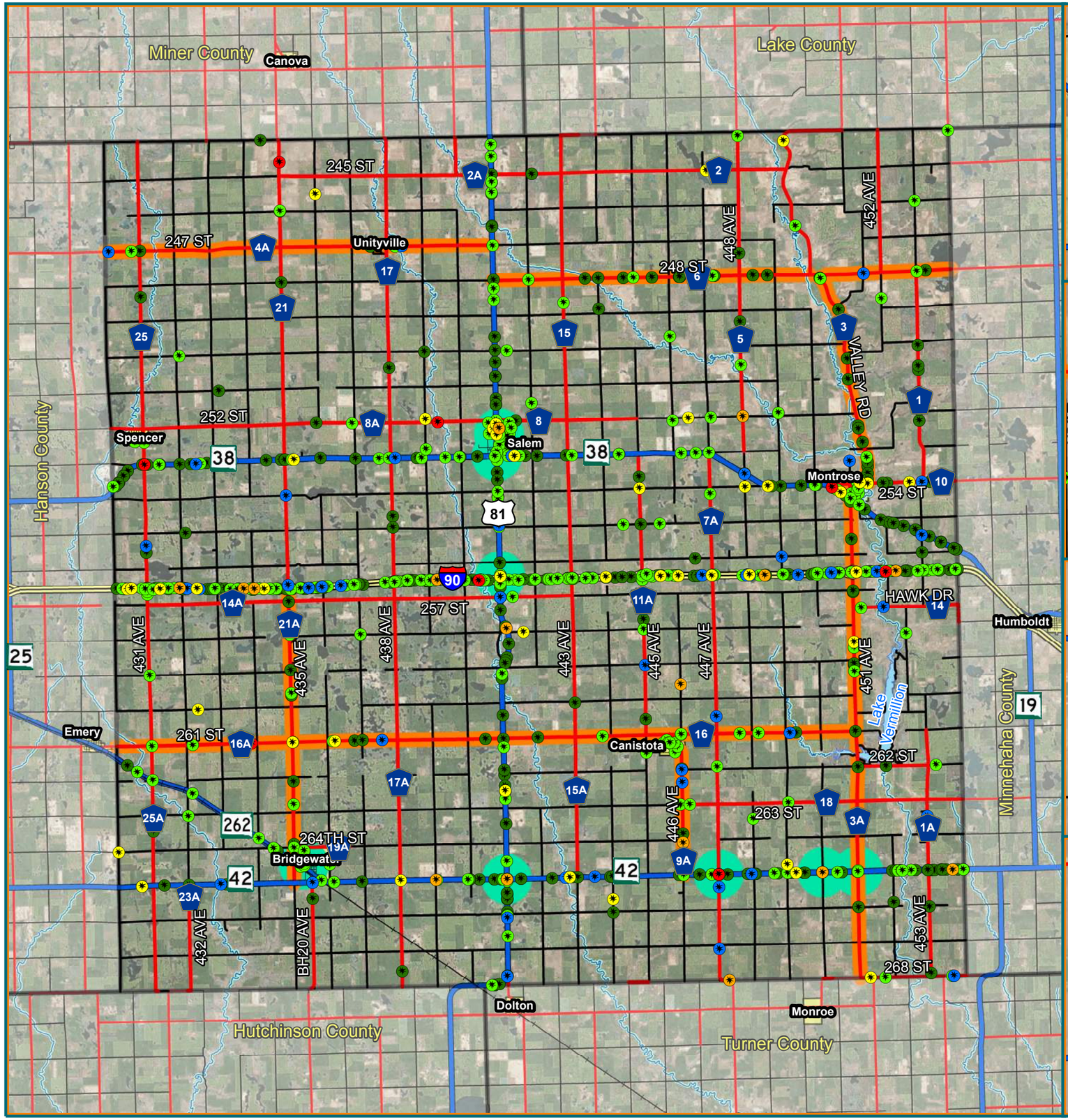
Month	Total # Crashes
January	73
February	55
March	54
April	45
May	52
June	86
July	60
August	49
September	58
October	80
November	147
December	96

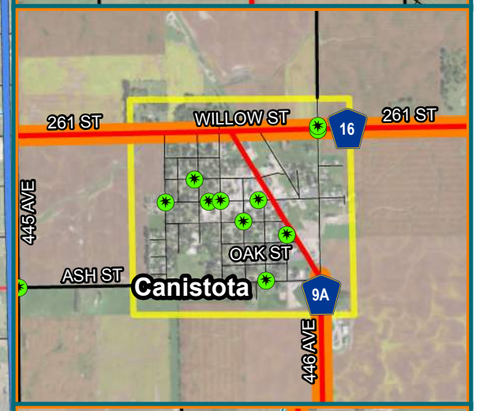
Pavement Condition	Total # Crashes
Dry	610
Frost	11
Ice	91
Sand, Mud, Dirt, Gravel	9
Slush	23
Snow	65
Wet	44
Unknown	1
Other	1

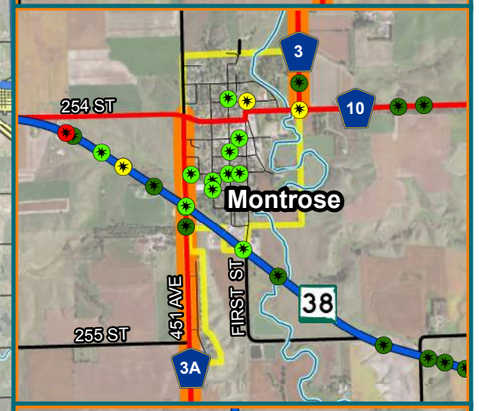
Light Condition	Total # Crashes
Dark – Lighted Roadway	16
Dark – Roadway Not Lighted	366
Dark – Unknown Roadway Lighting	1
Dawn	64
Daylight	369
Dusk	39

Source: SDDOT crash database of reported crashes occurring on McCook County, Township, and State of South Dakota roadways.

Note: Crash report coding may lead to discrepancies across various crash categories, particularly how vehicle-animal crashes are reported. Crash data reporting as obtained from the SDDOT has not been modified.







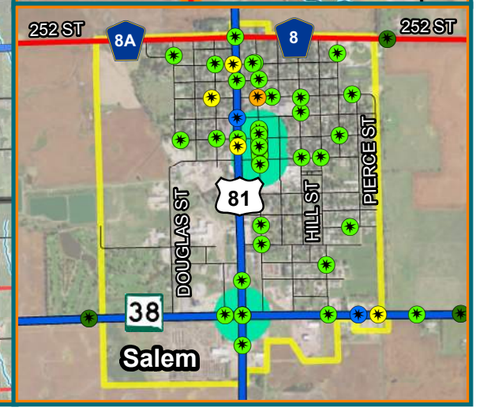


Figure 2-4
Crash History
(2011-2015)

Legend

- Interstate Highway
- State Highway
- County Road
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City
- Analysis Corridors
- Analysis Intersections (9)

Crash Severity

- Fatal injury (8)
- Incapacitating (16)
- Non-incapacitating (49)
- Possible (53)
- No injury (354)
- Wild Animal Hit (374)

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Crash Years: 2011-2015
Source: SDDOT

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1 inch = 3 miles

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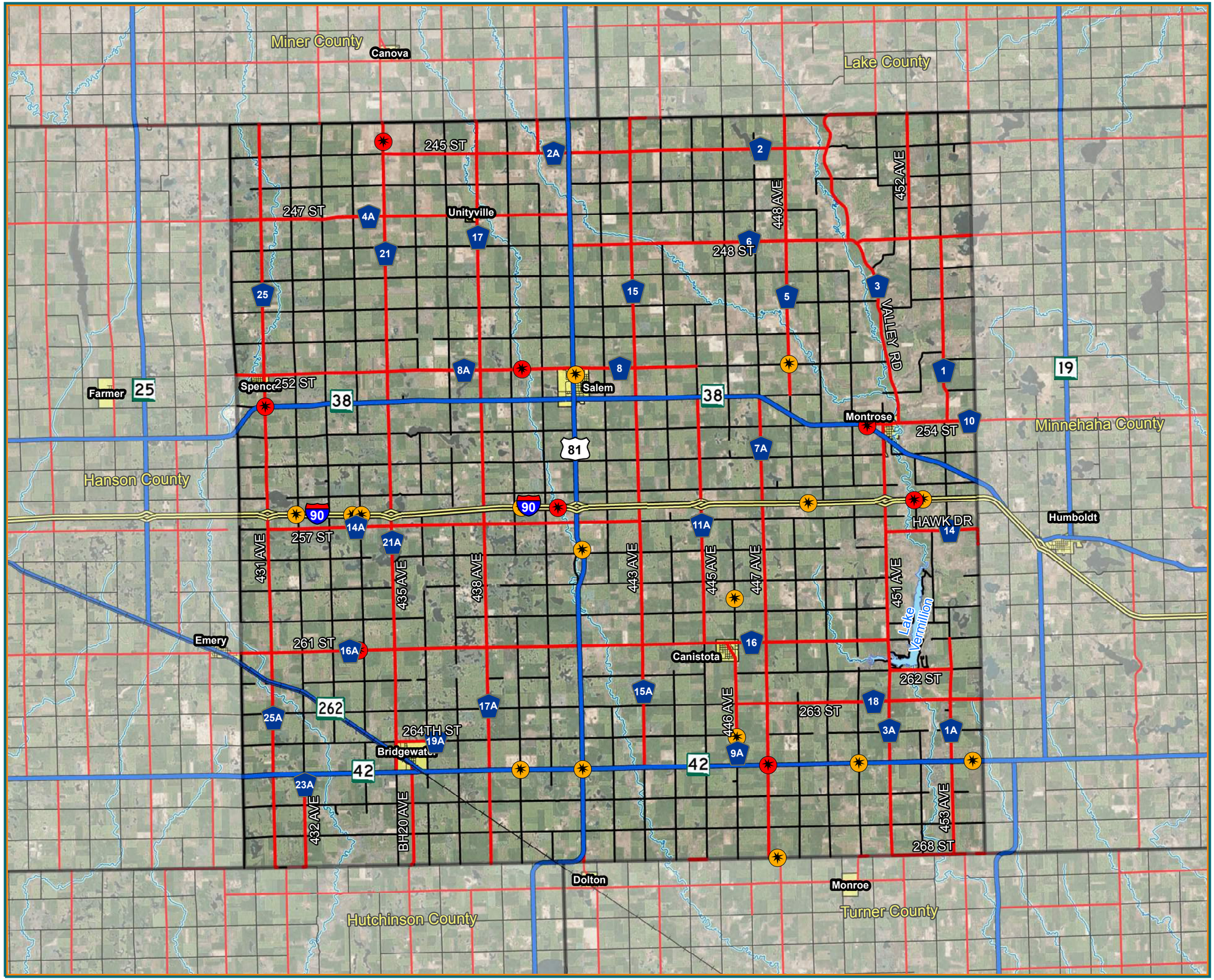

Figure 2-5
Severe Crashes (2011-2015)

Legend

- Interstate Highway
- State Highway
- County Road
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City

Crash Severity

- Fatal injury (8)
- Incapacitating (16)

Crash Years: 2011-2015
Source: SDDOT

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0 1.5 3 Miles

1 inch = 3 miles

HRGreen

Intersections

County intersections with the greatest number of crashes over the five-year period, across all roadway jurisdictions, are summarized in Table 2-2 and spatially identified in Figure 2-4. Three or more crashes were reported at nine intersections between 2011 and 2015. One intersection exhibited 10 reported crashes and a second 7 reported crashes.

Table 2-2: McCook County Crash History (2011-2015)

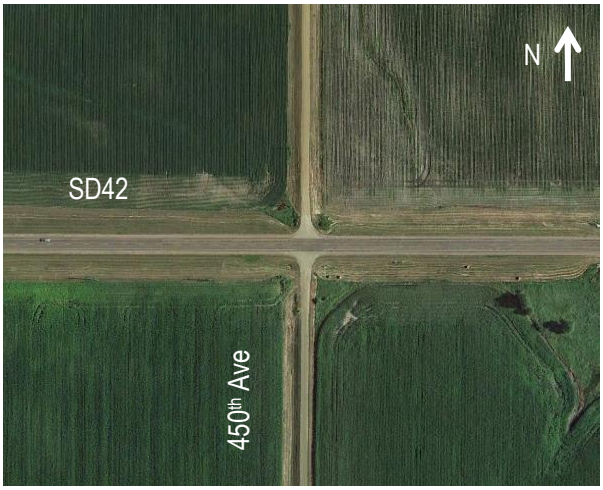
Intersection	Total # Crashes
447th Ave (CH 7A) and SD42	10
Main St and Vermont Ave (Salem)	7
US81 and I-90 WB Ramp Terminal	4
Main St and Norton Ave (Salem)	4
US81 and SD42	4
3rd St and Main Ave (Bridgewater)	3
450th Ave and SD42	3
451st Ave (CH 3A) and SD42	3
US81 and SD38	3

*McCook County-jurisdiction roadways in **bold***

Overall, 41 of the 855 reported crashes (5 percent) occurred at these nine intersections. The most frequent manner of collision was angle crashes (18), which is a common intersection-type crash type due to the presence of vehicle-vehicle conflicts. The second most frequent manner of collision involved a single vehicle crash that resulted in a variety of roadway departure events such as striking a fixed object, striking a parked vehicle, or entering a ditch. There were also several vehicle-animal crashes.

Three intersections included a McCook County-jurisdiction roadway. Additional details are provided for the McCook County-jurisdiction intersections in Table 2-3 and in the Traffic and Crash History Memorandum located in Appendix A. An intersection crash rate was calculated for the intersection of 447th Avenue (CH 7A) and SD42 using available daily traffic (ADT) volumes reflective of traffic conditions during the crash analysis period. The crash rate is expressed in terms of crashes per million entering vehicles (MEV).

Table 2-3: McCook County Intersection Crash History (2011-2015)

Intersection Crash Summary	Intersection Aerial
447th Ave (CH 7A) and SD42 ▪ 10 total crashes ▪ 1 fatality and 1 non-incapacitating injury ▪ 4 angle crashes ▪ 2 rear-end crashes ▪ Crash Rate: 1.54 crashes/MEV	
450th Ave and SD42 ▪ 3 total crashes ▪ 1 incapacitating injury crash ▪ 1 each: overturn/rollover, angle, vehicle-animal crash ▪ Icy pavement and speed factor in incapacitating crash	
451st Ave (CH 3A) and SD42 ▪ 3 total crashes ▪ No injury crashes ▪ 1 each: roadway departure, sideswipe, vehicle-animal crash	

Corridor Segments

Corridor crash rates were also developed to quantify crash frequency in relation to traffic volumes along select corridors within McCook County. Seven corridor segments were selected based on number of reported crashes and identified safety concerns. Segment limits were determined by natural break points in the roadway network (such as urban/rural transitions, major roadway intersections, and change in surface). Segmental crash rates are represented in terms of crashes per hundred million vehicle miles traveled (HMVMT) using the most recently available ADT for a respective roadway segment within the corridor study limits. The seven selected corridor segments are shown in Table 2-4 and spatially identified in.

Table 2-4: McCook County Corridor Crash History Summary (2011-2015)

Select North-South County Corridors		Length (miles)	Total # Crashes	Crash Rate (Crashes/HMVMT)
Roadway Corridor	Segment Limits			
435th Avenue (CH 21A)	264th St to 257th St	8	12	353
446th Avenue (CH 9A)	SD42 to 261st St	4	7	182
451st Avenue (CH 3A)	268th St to 257th St	14	17	168
Valley Road (CH 3)	254th St to 248th St	6	13	387

Select East-West County Corridors		Length (miles)	Total # Crashes	Crash Rate (Crashes/HMVMT)
Roadway Corridor	Segment Limits			
247st Street (CH 4A)	Hanson County Line to US 81	11	7	227
248th Street (CH 6)	US 81 to E County Line	13	18	632
261st Street (CH 16A-16)	Hanson County Line to 451st Ave	21	21	265

Overall, the majority of reported crashes on these seven corridors involved vehicle-animal crashes, both wild and domestic animals. There were also a number of run-off-road crashes, frequently exhibiting an overturn/rollover-type event. With regard to environmental conditions, crashes often occurred during the dusk-to-dawn timeframe and/or dry pavement conditions. The following, Table 2-5, is a summary of the critical crash factors at each of the seven roadway segments

Table 2-5: McCook County Corridor Crash History Details (2011-2015)

Roadway Corridor	Details
435th Avenue (CH 21A) 264th St to 257th St	▪ 12 total crashes ▪ 5 vehicle-animal crashes ▪ 3 run-off-the-road (2 exhibiting overturn/rollover events) ▪ 2 incapacitating injuries (overturn/rollover and angle crashes)
446th Avenue (CH 9A) SD42 to 261st St	▪ 7 total crashes ▪ 3 vehicle-animal crashes ▪ 2 run-off-the-road crashes (both exhibiting overturn/rollover events) ▪ Both overturn/rollover crashes included reported injuries
451st Avenue (CH 3A) 268th St to 257th St	▪ 17 total crashes ▪ 11 vehicle-animal crashes ▪ 3 run-off-the-road crashes ▪ 1 injury reported in vehicle-animal crash
Valley Road (CH 3) 254th St to 248th St	▪ 13 total crashes ▪ 11 vehicle animal crashes ▪ 9 crashes occurred within the first 2 miles north of 254th Street ▪ No reported injuries
247th Street (CH4A) Hanson County Line to US 81	▪ 7 total crashes ▪ 4 vehicle-animal crashes ▪ 2 run-off-the-road (both exhibiting overturn/rollover events)
248th Street (CH 6) US 81 to E County Line	▪ 18 total crashes ▪ 13 vehicle-animal crashes ▪ 3 run-off-the-road crashes (2 exhibiting overturn/rollover events) ▪ 13 of the 18 crashes occurred between dusk and dawn ▪ 1 possible injury in overturn/rollover crash ▪ Highest crash rate of selected corridors
261st Street (CH16A-16) Hanson County Line to 451st Ave	▪ 21 total crashes ▪ 9 vehicle animal crashes (only analyzed corridor with less than 50 percent vehicle-animal crashes) ▪ 11 run-off-the-road crashes (5 overturn/rollover and 6 striking a fixed object or ditch) ▪ 1 fatality in overturn/rollover crash ▪ 8 of the crashes occurred on a roadway surface that was not dry, contributing to many of the run-off-the-road crashes

Railroad Crossing Crash Summary

One rail line traverses across the southwestern corner of McCook County, currently owned and operated by the BNSF Railway Company (BNSF). The Federal Railroad Administration Office of Safety Analysis, part of the United States Department of Transportation (US DOT), maintains a national railroad crossing inventory. The inventory lists 18 at-grade crossings in McCook County, 2 private and 16 public, and are shown in Figure 2-2. These at-grade crossings are typically equipped with passive crossing control such as cross-bucks, but a few include an active warning system with flashing lights.

There are 18 at-grade crossings throughout McCook County. Many are along SD262 and feature passive control, similar to the BNSF crossing shown at 431st Avenue.

Train/vehicle exposure is a common measure of railroad crossing volume and is calculated as a function of average daily train volumes and the ADT volumes (i.e., daily train volumes multiplied by daily traffic volumes). Exposure is a tool that can help prioritize railroad crossing investments based on the risk of vehicle-train conflict. Table 2-6 lists the five railroad road crossings with the highest exposure volume in McCook County.

Through a review of the highway-rail crash summaries from the US DOT Grade Crossing Inventory, one vehicle-train crash has been reported in McCook County over the last 20 years (1996-2015) of available data. The crash occurred in 2003 at the 435th Avenue (Pine Avenue) crossing in Bridgewater. It was reported that the train hit a vehicle after the vehicle failed to stop and yield the right-of-way to the train with the driver of the vehicle sustaining injuries. The report is provided as part of the Traffic and Crash History Memorandum located in Appendix A.

Table 2-6: McCook County Corridor Crash History Details (2011-2015)

Roadway	Railroad Company/ Track Owner	Train/Vehicle Exposures	Crossing Control
SD Hwy 42	BNSF	2,535	Advance warning signs, cross-bucks, post-mounted flashing lights
BH20 Road (Walnut Avenue)	BNSF	565	Advance warning signs, cross-bucks, railroad crossing pavement markings
435th Avenue (Pine Avenue)	BNSF	295	Advance warning signs, cross-bucks, post-mounted flashing lights, railroad crossing pavement markings
431st Avenue (CH 25A)	BNSF	215	Advance warning signs, cross-bucks, stop-line pavement markings
438th Avenue (CH 17A)	BNSF	65	Advance warning signs, cross-bucks

Traffic Volumes Review

A review of existing traffic volumes, forecasted future-year traffic volumes, and operational constraints was conducted to evaluate existing and future conditions and identify potential needs facing the County over the next 20 years.

Traffic Volumes

The SDDOT provided the most recent, available traffic counts on County, Municipal, and State-jurisdiction roadways throughout McCook County. These volumes, represented by ADT counts, were collected between 2013 and 2015 through SDDOT traffic data collection programs.

A SDDOT-provided countywide growth factor[1] was used to mesh the various years of traffic counts and establish a consistent data set representative of 2016 Existing Conditions traffic volumes, presented in Figure 2-6. The same growth factor was then used to forecast traffic volumes representative of a 20-year planning horizon, referred as the 2037 Planning Year, to help identify potential future-year capacity constraints and considerations for future projects.

2037 Planning Year – Highway Volume-to-Capacity Evaluation

The ratio of volume-to-capacity provides a measure of planning-level traffic operations along a stretch of roadway and can help identify where roadway improvements may be needed. As a high-level planning analysis tool, a ratio of traffic volume to roadway capacity approaching or exceeding 1.0 is indicative of congested conditions with low speeds, significant delay, and unstable operations.

Planning level capacity for a specific route is determined by the number of lanes. As the number of lanes on a roadway increases, so does the roadway capacity. Table 2-7 summarizes the planning level capacity vehicles per day (VPD) based on number of lanes.

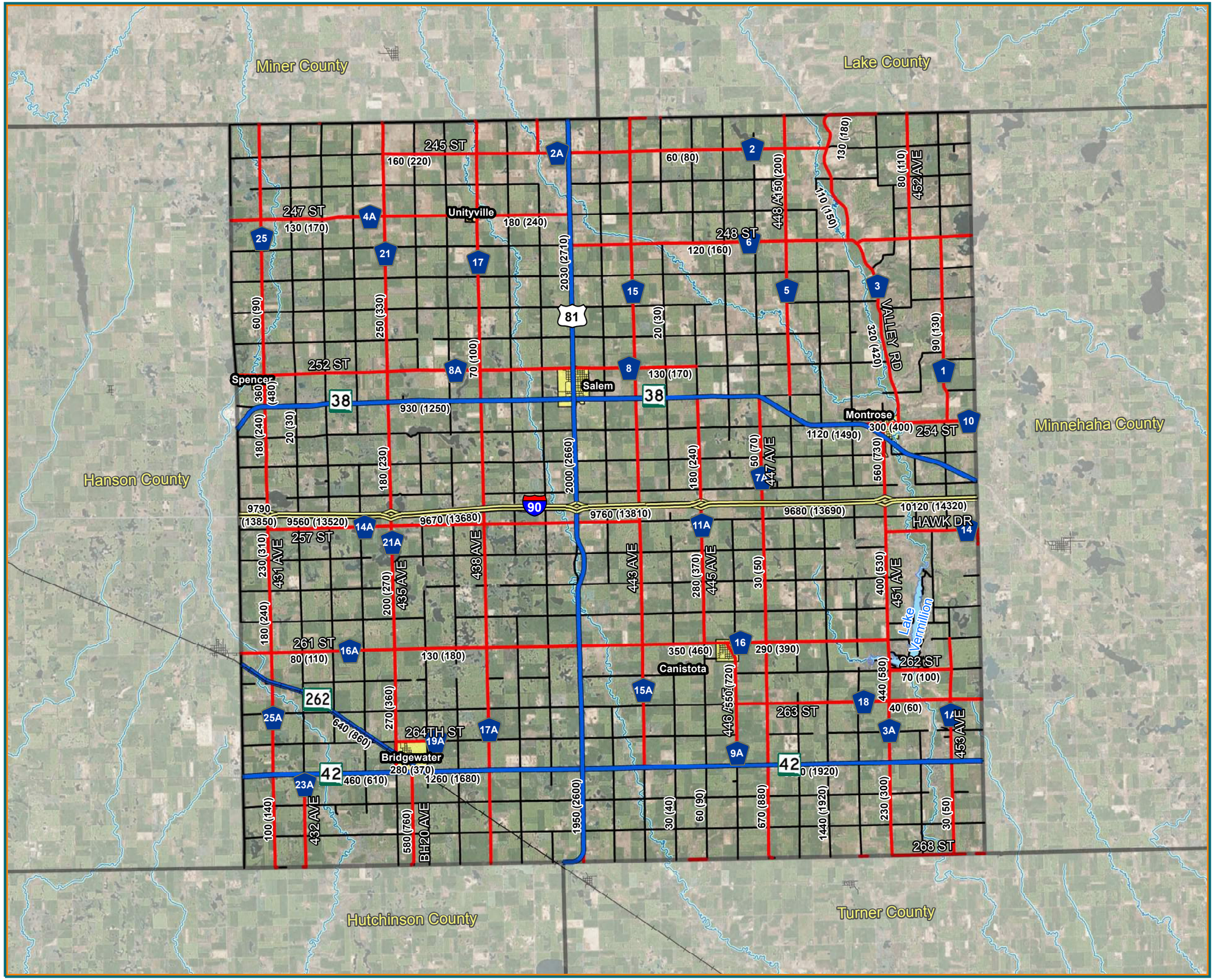
Table 2-7: Planning Level Traffic Capacity

Number of Lanes	Planning Level Capacity (VPD)
2	8,000
3	16,000
4	20,000
5	30,000

Adapted from SDDOT Road Design Manual

The resulting 2037 Planning Year volume-to-capacity results along McCook County-jurisdiction roadways are provided in Figure 2-7. Overall, all McCook County jurisdictional roadways are projected to exhibit a planning level capacity ratio of 'Below 60% Capacity,' (depicted by a green roadway segment) which is representative of acceptable operating conditions for a 2-lane rural highway.

[1] 20-year growth factor for McCook County was 1.5. Straight-line interpolation used to identify interim years. Additional information regarding traffic volume counts and growth rates can be found in Traffic and Crash History Memorandum located in Appendix A



McCook County Master Transportation Plan

Figure 2-6 Existing (2016) and Planning (2037) Year Traffic Volumes

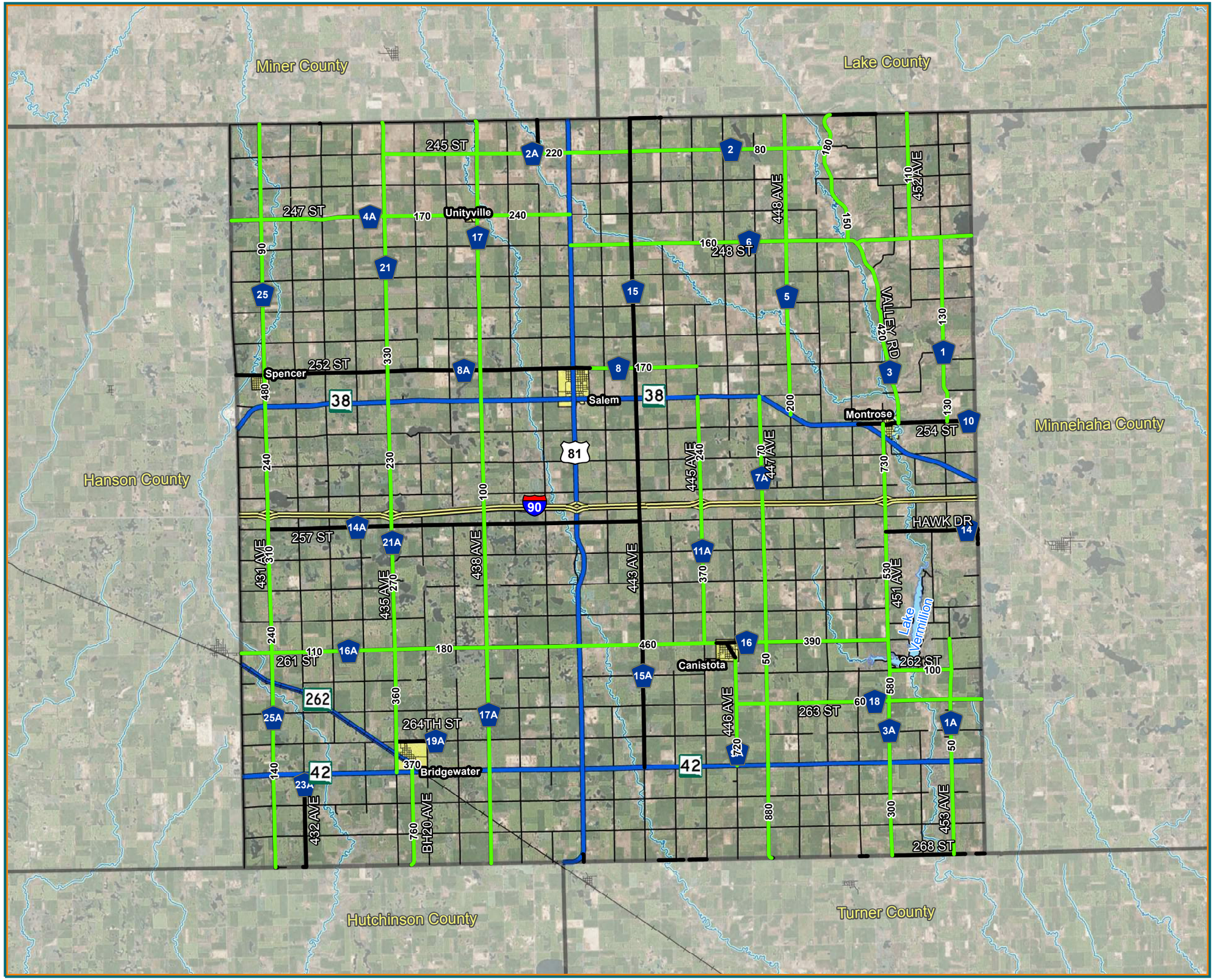


Figure 2-7
2037 Planning Year County-Jurisdiction Roadway Volume-to-Capacity

Legend

- Railroad
- Interstate Highway
- State Highway
- County Road (no count)
- Township Road
- Urban Road
- Rivers/Streams
- Lakes
- City

County Road Volume to Capacity Ratio

- Above Capacity Threshold (1.0+)
- Between 80% and 100% of Capacity (0.8 - 1.0)
- Between 60% and 80% of Capacity (0.6 - 0.8)
- Below 60% of Capacity (0.0 -0.6)

Average Dailty Traffic (ADT)

X,XXX 2037 Average Dailty Traffic (ADT)

HRGreen

Seasonal Traffic Considerations

Existing traffic within McCook County sees seasonal fluctuations due to the agricultural economy and recreational opportunities not reflected in the ADT-based traffic volumes. Each provides unique challenges to the transportation network and has a widespread impact across the region.

Agriculture is a year-round operation in McCook County due to the diversity of commodities raised throughout the County. The greatest peaks in agricultural-generated traffic are seen during the spring planting and fall harvest seasons. Large trucks and farm equipment are most noticeable to motorists and have an impact on traffic operations, safety, and the long-term condition of the roadways.

Lake Vermillion (451st Avenue Bridge)

Lake Vermillion Recreation Area draws around 100,000 visitors annually to partake in the recreational activities on and around the lake. Camping, fishing, and lake-related recreational opportunities in the summer months are the biggest draw, but fishing and hunting destinations on and around the lake also draw visitors year-round. Hunting and fishing also attracts visitors to areas throughout McCook County, particularly in the summer and fall months. Impacts to traffic operations and safety are most notable with recreational traffic due to the greater propensity of slow and turning traffic as well as large vehicles that include RVs and towed boats and campers.

Regional Connectivity and Route Continuity

Regional connectivity and route continuity are important aspects of transportation mobility in McCook County. Not only does the transportation network facilitate travel within the County, it is the gateway to efficiently transport goods, services, and people on a regional level through the interconnection of all roadway classifications and jurisdictions. Key elements of a well-connected transportation network with continuous, functional routes for local and regional travel include:

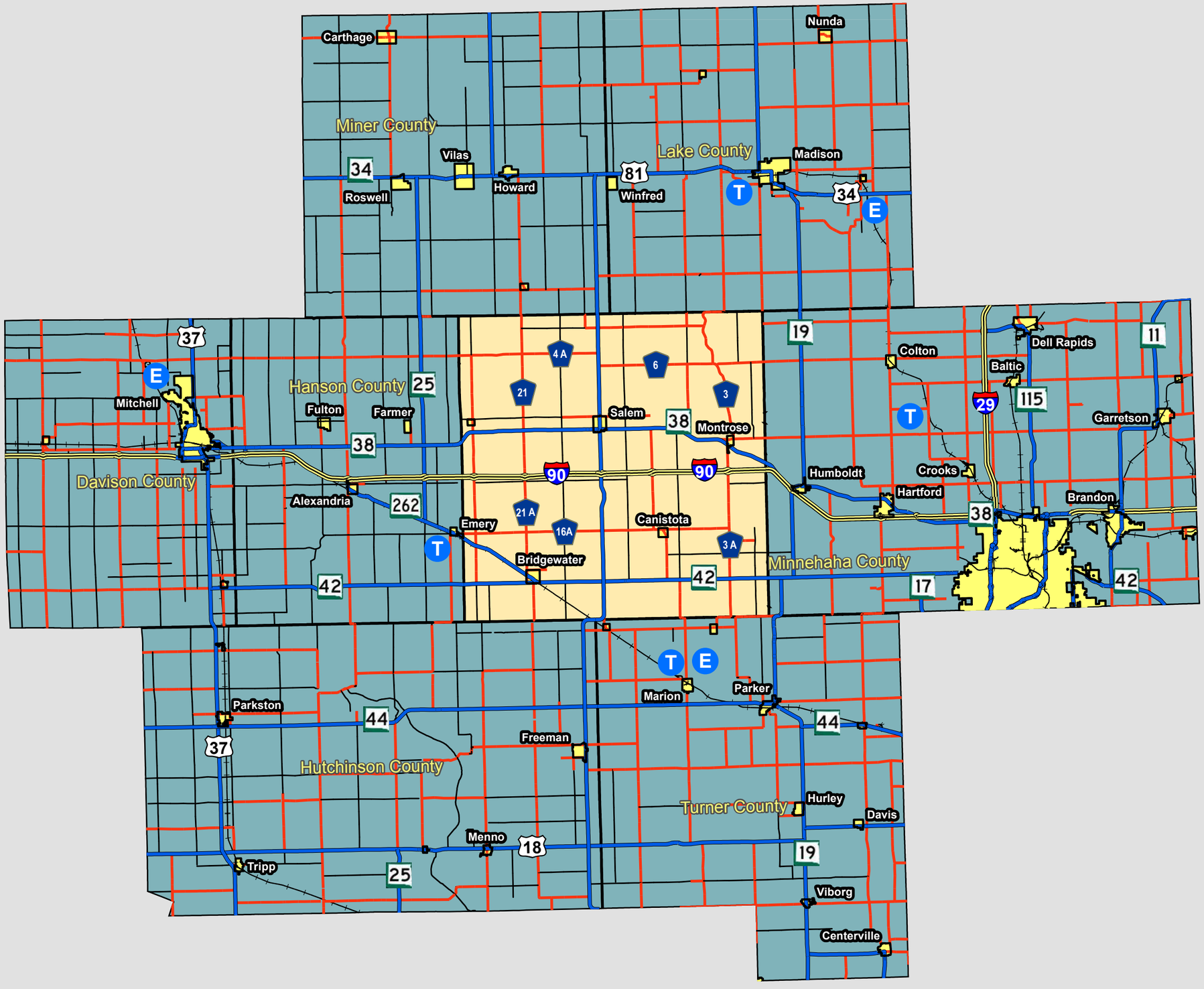
- Provide and maintain regional routes across the County, those that are continuous across multiple counties or key destinations.
- Provide connectivity to/from large scale agriculture elevators in surrounding counties.
- Provide connectivity to/from recreational areas within the County.
- Provide connectivity for farm-to-market routes and linking towns throughout the region.
- Provide efficient connections to higher function routes (state highways).
- Minimize out-of-the-way travel when traveling primary routes or key destinations
- Provide consistent roadway design throughout a primary route.

A snapshot of the current regional connectivity is provided in Figure 2-8, highlighted by US/State highway corridors and county bituminous-surfaced corridors through McCook County and into adjacent counties.

I-90 and US81 are the primary, high-speed routes across McCook County, connecting origins and destinations well beyond McCook County. SD38 and SD42 also extend east/west across the County and SD262 follows the BNSF line in the southwest corner. McCook County-jurisdiction highways supplement the US/State network and provide additional levels of connectivity to the local and regional grid network.

All large agricultural transload facilities in the area, identified in Figure 2-8, are currently located in the adjacent counties. Maintaining efficient connectivity to these facilities is very important to the agriculture economy of McCook County. Likewise, McCook County has a major recreational draw in Lake Vermillion that requires roads designed to accommodate the large recreational vehicles destined for the area.

The discussion of route connectivity and continuity lends itself to the establishment of route prioritization for future maintenance and reconstruction needs. Consideration to regional travel patterns, the interaction and interdependence of the County network with the US/State network, and efficient and safe multi-modal mobility is reflected in the development of the McCook County Major Roads Plan.



MCCOOK COUNTY
MASTER TRANSPORTATION PLAN

FIGURE 2-8 REGIONAL CONNECTIVITY

LEGEND

- Railroad
- Interstate Highway
- State Highway
- City

County Road

- Gravel/Dirt
- Bituminous
- T Grain Terminal
- E Ethanol Plant

N
W E
S

0 4.5 9 Miles

1 inch = 8 miles

HRGreen

Multi-Modal Characteristics Summary

Non-Motorized Transportation Network

A vast majority of the existing pedestrian and bicycle facilities are located within the County's five urban areas and the Lake Vermillion Recreational Area. In the urban areas, sidewalks and wide streets are the most common multi-modal features. In rural areas, bicycle and pedestrian accommodations are typically on the existing roadway, either within the travel lane or on the adjacent shoulder when applicable.

In 2015, students from the Landscape Architecture Program at South Dakota State University, in conjunction with the City of Salem and South Dakota Department of Health, provided Active Transportation Recommendations[2] for the City of Salem. The final report provided a series of multi-modal recommendations to encourage use of walking and bicycling as a mode of transportation throughout the community of Salem. Though the report recommendations are specific to a specific community, several are applicable to McCook County and are good considerations as urban areas grow outward into the rural countryside. Examples of these recommendations include:

- Integrating crosswalks along high volume roads
- Bike lane signage and education
- Sidewalk implementation and suggested routes

Public Transit

Public transit opportunities are currently limited to Bridgewater in McCook County where the Rural Office of Community Services provides an on-call service (curb-to-curb) for those that require a ride.

Air Transportation

There are currently no public airports in McCook County. The closest commercial airport is the Sioux Falls Regional Airport in Sioux Falls, approximately 40 miles from Salem.

Freight Transportation

Freight is primarily moved via truck within McCook County. Several local truck-train transload-type facilities that are of notable benefit to the McCook County economy are located in neighboring counties, including:

- Grain Terminal with Rail Access
  - Emery (Hanson County)
  - Marion (Turner County)
  - Lyons (Minnehaha County)
  - Madison (Lake County)
- Ethanol Plans with Rail Access
  - Loomis (Davison County)
  - Marion (Turner County)
  - Wentworth (Lake County)

[2] South Dakota State University Landscape Architecture. (2015). City *of Salem Active Transportation Recommendations*. Developed in coordination with City of Salem and South Dakota Department of Health. http://www.salemsd.com/vertical/sites/%7BD3202720-F104-455B-B0FC-EA46D49728AC%7D/uploads/Salem_Active_Transporation_Recommendations.pdf

Highway Freight

McCook County residents benefit from many opportunities for regional connectivity on state highways in both east/west and north/south directions. I-90 traverses east/west through the middle of the County and provides five full-access interchange locations:

- Exit: 353
  - 431st Avenue (CH 25A-25)
  - Connection to Spencer and Emery
- Exit 357
  - 435th Avenue (CH 21A-21)
  - Connection to Bridgewater
- Exit 364
  - US81
  - Connection to Salem
- Exit 368
  - 445th Avenue (CH 11A)
  - Connection to Canistota
- Exit 374
  - 451st Avenue
  - Connection to Montrose and Lake Vermillion area

In 2016, heavy vehicles traveled over 24.7 million miles[3] within McCook County with over half (14 million vehicle miles traveled, or VMT) of that occurring on the State highway system. I-90 accounts for nearly 11 million VMT alone. Rural local system mileage for heavy vehicles was nearly 4 million VMT, which was comparable to the State highway system VMT when I-90 travel was removed. This illustrates the importance of both State and County-maintained roadways in freight movement.

Rail Freight

The lone rail line in McCook County cuts diagonally across the southwest corner of the County through Bridgeport is part of a 100-mile BNSF owned-and-operated Mitchell to Canton to Sioux Falls route. Local transload facilities on this line are located in Emery and Marion. The primary commodities shipped via this rail line are agricultural products, thus train frequency is dictated by seasonal fluctuations due to harvest and regional demand.

Environment and Land Use

Similar to other Counties in the region, the McCook County transportation network is impacted by the natural and built environment within the County. Natural water features within McCook County provide natural barriers to connectivity that are overcome by constructing bridges and maintain a well-connected grid network. Rivers and streams generally flow from a north to south direction, with the primary waterways including Wolf Creek, West Fork Vermillion River, East Fork Vermillion River, and little Vermillion River. Additionally, depressions and marshes are scattered throughout the County and can pose challenges similar to those of a river.

West Fork Vermillion River

[3] 2016 Vehicle Miles Traveled (VMT) by County for Heavy Trucks. http://sddot.com/transportation/highways/traffic/Default.aspx

Flooding through these waterways is nearly an annual occurrence. Some years, roadway closures may be widespread and extend for several days while in other years, impacts may be minimal and sporadic. The well-connected grid network can typically accommodate travel throughout the County via alternate routes around the closed, overtopped roads. Figure 2-9 shows areas of flood impact during a 100-year or 500-year storm event.

Agriculture is the primary land use throughout McCook County, which poses challenges in both the design and maintenance of rural County highways. Large vehicles and heavy loads are common in today's operations, much larger than those in use when many of the County's roads and bridges were first constructed.

Long-standing urbanized areas are located in the five cities within McCook County, where population has typically remained stable or declined. Over the last few decades, the County has experienced a shift in population from northwest to southeast with the continual suburban/acreage development around the Lake Vermillion area. The County will likely face pressure to improve transportation facilities around the Lake Vermillion area as development continues and residents begin to request multi-modal accommodations that they are accustomed to experiencing in urban areas. Growth in accordance with McCook County planning and zoning ordinances will continue to be monitored and transportation needs will be evaluated during the land development process.

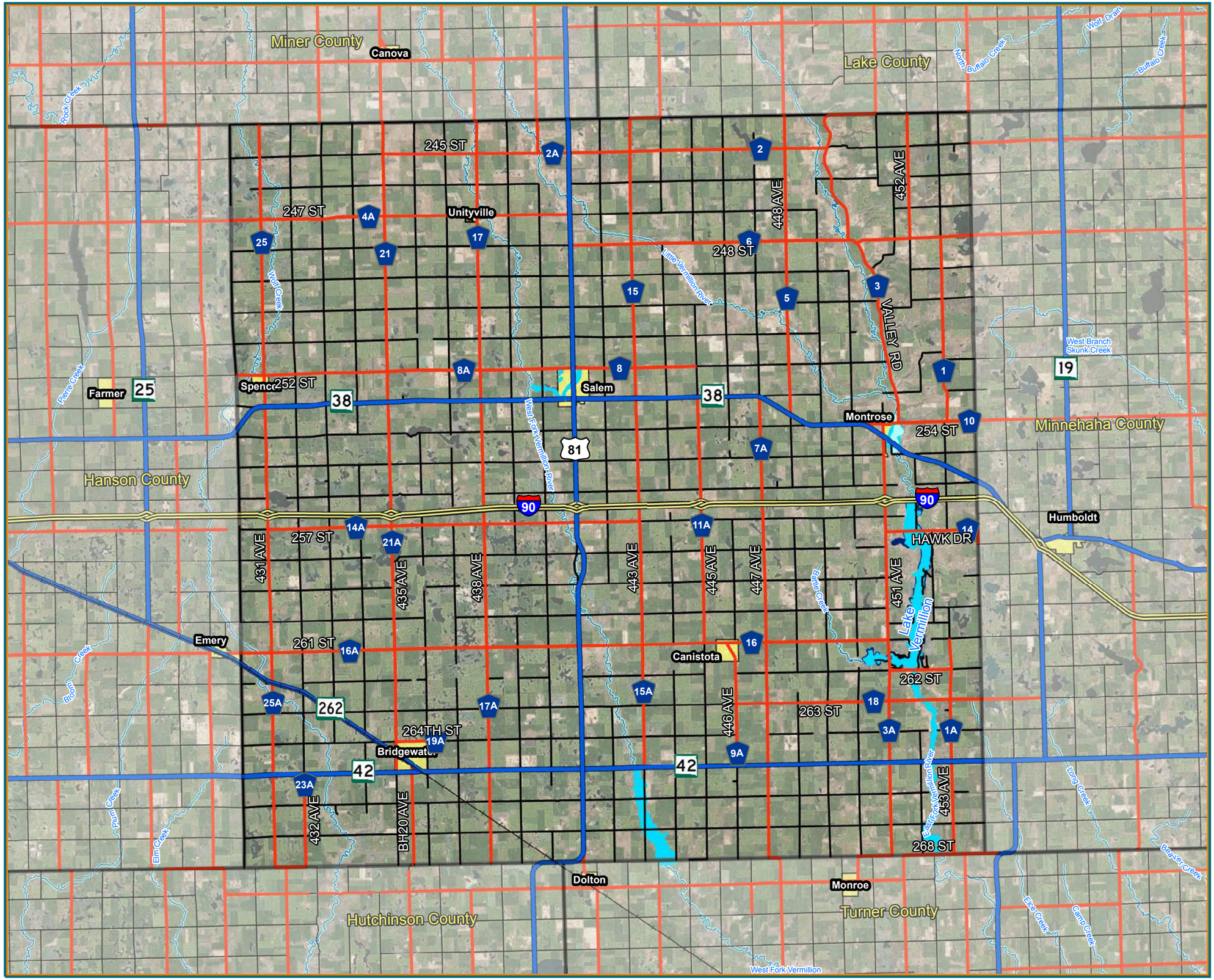


Figure 2-9 Flood Hazard Areas

Legend

- Interstate Highway
- State Highway
- County Road
- Township Road
- Railroad
- City
- Rivers/Streams

Flood Hazard Zones

- Floodway
- 100 Year Flood Zone
- 500 Year Flood Zone

N W E S

0 1.5 3 Miles

1 inch = 3 miles

HRGreen

3. Needs Assessment

The following section presents issues and needs identified by the study team, stakeholders, and the public to aid in the development of multi-modal transportation priorities and solutions for McCook County over the next 20+ years.

Public and Stakeholder Involvement

At the onset of the study, two project stakeholder meetings and a public information meeting were held in Salem on October 27, 2016 to request input on transportation issues and needs throughout McCook County. An online transportation survey was also developed as part of the initial outreach effort. A summary of the meeting information and submitted comments, which fed directly into the identification of transportation network needs in the following section, is provided in Appendix B.

Transportation Network Needs

Through a collaborative effort of the study team, stakeholders, and the public, a series of issues and needs were identified throughout McCook County for this Master Transportation Plan to address. Following the initial public and stakeholder involvement, the collective set of issues and needs were organized into eight categories:

- Bridge Condition
- Traffic
- Roadway Geometry
- Roadway Surfacing
- Multi-Modal
- Growth
- Drainage
- Railroad Crossings

These issues and needs are spatially depicted in Figure 3-1. Each category is summarized in the following sub-sections, expanding upon the issues and needs discussed at each of the identified locations.

Bridge Condition

Bridges identified as being structurally deficient or barriers to travel were identified on the transportation needs figure. As of the 2016 countywide bridge inspections, 15 bridges were identified as structurally deficient and 15 were weight restricted (posted for load). From a long-range perspective, over 24 bridges are currently more than 50 years old. In 10 years, if no bridges are replaced, another 10 will be more than 50 years old. In many instances, bridge closures and even restrictions in maximum loads allowed to cross a bridge create barriers and limit route functionality within the transportation network. Stakeholder input also noted the need to maintain or increase bridge widths, such as the 431st Avenue (CH 25) bridge over Wolf Creek just north of Spencer, to accommodate the large farm equipment used on today's operations.

The 448th Avenue (CH 5) bridge over the Little Vermillion River was constructed in 1940, is currently posted for load restriction, and has a sufficiency rating less than 60.

Countywide bridge conditions and long-term needs are discussed further in the Bridge Plan section of the McCook County Master Transportation Plan.

Traffic

Traffic issues and needs encompass a variety of conditions identified throughout McCook County, including increasing traffic volumes, intersection traffic control, and truck/large equipment mobility.

Increasing Corridor Volumes Due to Development

Recent and projected development surrounding Lake Vermillion is contributing to increased daily travel demand on 451st Avenue (CH 3A), 262nd Street (CH 16) and 453rd Avenue (CH 1A) between 261st Street and SD42. Many of the residents in the Lake Vermillion Area commute to/from Sioux Falls via SD42. While growth in traffic is not expected to reach a point where there would be congestion along the corridors, safety and the more frequent opportunities for vehicle conflict (exposure) becomes an increasing risk. On gravel roads, increased traffic volumes create considerably more maintenance needs due to washboarding and dust control. This effectively leads to a shift in resources to either: 1) provide a more frequent maintenance plan along the problematic segments of gravel road, or 2) consideration of a change to paved surfacing.

Increasing Corridor Volumes Due to Seasonal Demand

Lake Vermillion is a popular recreational destination year-round, particularly in the summer months. The Lake Vermillion Recreation Area annually attracts nearly 100,000 visitors alone. This leads to higher traffic demand on surrounding roadways, particularly 451st Avenue (CH 3A), and more turning vehicles into and out of driveways and intersections. The vehicle makeup of this seasonal traffic contains a large number of recreational vehicles, such as RVs and trucks pulling boats, which often drive at slower speeds than typical daily traffic and need longer gaps in traffic to complete turns into and out of driveways and intersections. A high percentage of seasonal traffic originates from the Sioux Falls metropolitan area and travels to Lake Vermillion via SD42.

Intersection Traffic Control

Two intersections were identified for possible changes to intersection traffic control:

- 261st Street (CH 16A) and 431st Avenue (CH 25A) – evaluate change from all-way stop-control to two-way stop control
    - Proposed improvement would stop traffic in northbound/southbound direction and provide a free through movement for the higher-volume east/west traffic
- 263rd Street (CH 18) and 447th Avenue (CH 7A) – evaluate change in two-way stop-control
    - Currently, northbound/southbound directions are stop-controlled
    - Proposed improvement would stop eastbound/westbound directions and provide free movement for northbound/southbound movements
    - Encourages use of 447th Avenue (CH 7A) as a connection between SD38 and the paved sections of 447th Avenue (CH 7A) south of SD42, continuing southward to Marion.

Truck Accommodations and Connectivity

Agriculture is the primary industry in McCook County, thus the roadways throughout the County experience notable heavy truck and large equipment travel demand. Efficient, well-maintained routes that can accommodate heavy loads frequently hauled by farmers are critical to the economy of McCook County. Destinations for agricultural and livestock commodities are typically outside of McCook County as there are no large grain handling facilities or other destinations within the County. Generally, these locations can be accessed via the State highway network.

Currently, all McCook County-owned and maintained asphalt roads are posted with an 80,000 lbs. Gross Vehicle Weight (GVW) year-round restriction to help maintain the long-term investment on these paved roads. During the spring months, a more restrictive posting is initiated that limits loads to 6 ton per axle on a countywide basis with the following exceptions (roads that maintain the 80,000 GVW through the spring):

- 446th Avenue (CH 9A) from Canistota south to SD42
- 261st Street (CH 16) from Canistota west to US81
- 431st Avenue (CH 25) from Spencer south to SD38
- 447th Avenue (CH 7A) from SD42 south to Turner County line

447th Avenue (CH 7A), south of SD42 to the Turner County border, has been identified as an important direct truck route between SD42 and the grain terminal and ethanol plant near Marion. This segment is currently not weight restricted like other McCook County-jurisdiction highways. McCook County has a perpetual maintenance agreement with Turner County whereby Turner County performs all maintenance on this roadway, and the road remains unposted for weight restrictions.

A need to maintain 'year-round' connections between state highways and municipalities was also identified for Spencer, Canistota, and Montrose. A 'year-round' road allows heavier loads, such as waste collection trucks, to access Canistota and Spencer during the spring when other County highways are posted at 6 ton/axle. Bridgewater and Salem are both accessible via state highways, thereby providing year-round access to those communities.

A 1.5-mile segment of 453rd Avenue between 254th Street and SD38 was identified as an unofficial truck bypass, or cut-off route, commonly used by trucks in order to avoid travel through Montrose. This 1.5-mile segment is currently within Township jurisdiction and has become expensive for them to maintain.

Roadway Geometry

This needs category represents safety-related issues and needs identified throughout the County, most of which are related to intersections and vehicle conflict locations.

Section Line Corrections

Section correction lines are present at both the northern and southern County boundaries. Because the original County and Township roadways were primarily built along the survey grid, a horizontal curve or set of offset intersections were needed to join section line roadways on either side of the "correction line" that guides the placement of section lines. This process has often introduced safety issues at these locations due to offset 'T' intersections, sharp horizontal curves, and unexpected breaks in a standard grid roadway network.

447th Avenue horizontal curves through section line correction at 268th Street.

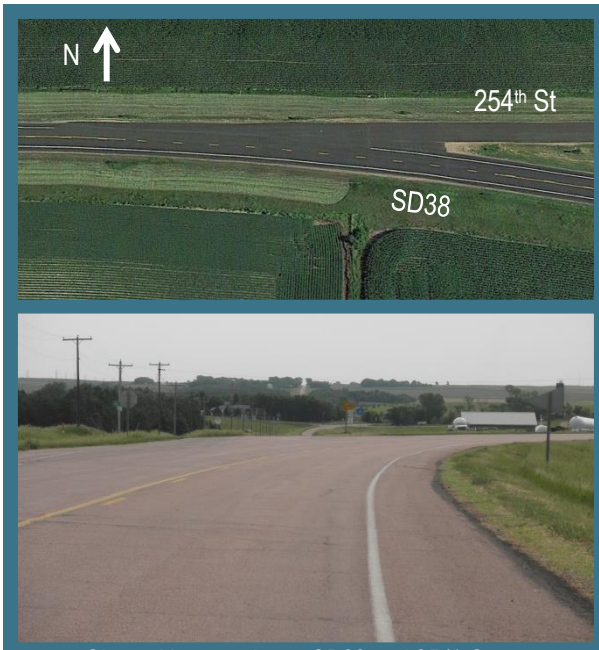
Two specific locations were identified as a need for the Master Transportation Plan, both of which are along the southern boundary:

- 447th Avenue (CH 7A) – Sharp horizontal curves with narrow shoulders make it difficult for trucks to travel side-by-side without encroaching into the opposing lane through the curves. The intersections on either side of the correction line are also skewed, which can present safety risks.
- BH20 Avenue (CH 21A) – Skewed intersections, similar to 447th Avenue intersections.

Skewed Intersections

Skewed intersections are common throughout both rural and urban networks; many are proliferations of dated design standards and accepted practice from when the roadways were constructed. The crash risks and safety implications for turning traffic that can lead to high-severity right-angle (broadside) type crashes at these locations were unknown at the time. Safety risks become magnified in areas with larger elderly populations that may have difficulty turning their head far enough to view oncoming traffic if the intersection is not at a 90 degree angle.

SD38 and SD262 have segments that traverse in a northwest to southeast (diagonal) alignment across the County grid network. This introduces multiple locations with skewed intersections that do not lineup at a 90-degree angle or appear to be a continuation of an east/west roadway (see inset for examples). For vehicles turning onto the highway, it can be difficult for a stopped motorist to see vehicles approaching on the highway due to orientation of their vehicle from the approaching roadway alignment. Several of these locations also exhibit intersections where there appears to be a straight continuation of the highway, in actuality the highway curves and a County road continuing straight. Motorists can become complacent and continue straight onto the intersecting road at high speeds, without recognizing oncoming, conflicting traffic on the highway, and create confusion for motorists stopped at the stop-sign of the minor street.



Skewed intersection at SD38 and 254th Street.
Top: aerial of intersection (Google Earth)
Bottom: Looking west along SD38 prior to horizontal curve or straight movement onto 254th Street.

The reported crashes between 2011 and 2015 do not present any historical crash trend that would indicate a safety issue, likely due to low volumes and few vehicle-vehicle conflicts. However, since current design guidance and crash research has established a high crash risk (often with high injury severity) correlated to these types of intersections, this need focuses on high-speed rural locations where vehicle-vehicle exposure is greater due to higher volumes on intersecting roadways.

Right-Of-Way and Roadway Surface Width

Another issue for McCook County that stems from the original construction of County roadways is the available right-of-way for the roadway and roadside ditches. There are still several McCook County-jurisdiction highway segments with 66 feet of right-of-way. The County has found that 100 feet of right-of-way width is desirable to maintain a 30-foot gravel roadway surface and roadside ditches. This has a back-end savings in terms of safety for motorist, reduces snow removal expenses, and gravel maintenance expenses. Due to increasing costs and frozen revenues, this program has been on hold but still remains a need for the County and will become a priority if funding becomes available. Remaining corridors with segments of 66-foot right-of-way are identified.

Vertical Curves and Grade

Terrain throughout McCook County is typically flat to gently rolling hills where vertical curvature presents little challenge to sight-distance and maintaining posted travel speeds. The primary exceptions to this; however, are along the larger river valleys such as the East Fork Vermillion River and West Fork Vermillion River where steep

bluffs are often located along both sides of the valley. One issue location was identified along 262nd Street (CH 16), just west of the East Fork Vermillion River with the following needs:

- A crest vertical curve with sight distance issues on the bluff,
- A steep grade down to the river valley, and
- An increase in pedestrian and bicycle traffic due to the surrounding recreational and residential development.

Roadway Surfacing

Six roadway segments were identified as candidates for bituminous to gravel surfacing conversion due to factors such as low or decreasing traffic volumes, duplicate parallel routes, or lack of connectivity to similar facilities. These factors contribute to a situation where maintaining low-volume bituminous roadways becomes cost-prohibitive and not an efficient use of County funds, warranting further evaluation for appropriate surfacing to meet the long-term needs and goals of the facility.

The 1-mile segment of 448th Avenue (CH 5), between Lake County and 245th Street, is a candidate location for bituminous to gravel surface conversion. Low traffic volumes, deteriorating pavement condition, and a gravel-surfaced roadway in Lake County are all considerations.

The roadway surfacing needs may also be applied in the other direction, with further consideration of converting gravel roadways to a bituminous-surfaced roadway. Increasing traffic volumes and surrounding development are often the impetus for gravel-to-bituminous surface conversion. As traffic volumes increase, gravel surfacing requires more frequent maintenance and resurfacing activities. Further, residential development often drives requests for paved surfacing to minimize dust and improve surface conditions during and after inclement weather.

Multi-Modal Facilities

The greatest bicycle and pedestrian demand is located around the municipalities and Lake Vermillion, with sporadic demand throughout the County in rural areas. Typically, these modes of travel are accommodated on sidewalks (in urban areas) or on the roadway (within travel lane or shoulder, if available, in rural areas). Recreational facilities, including trails, have been constructed within the Lake Vermillion Recreational Area.

Roadways with shoulders in McCook County are primarily the State highways: SD38 east of Salem, US81, and SD42. Most McCook County highways with paved surfacing do not have shoulders.

451st Avenue (CH 3-3A) between residential area south of SD38 and school north of SD38 (looking north towards school from residential area south of SD38).

A specific need for a shared-use path was identified along 451st Avenue (CH 3-3A) between a residential development on the south side of SD38 and the Montrose School District buildings north of SD38. Currently, 451st Avenue exhibits a 24-foot wide surface with no shoulders, so pedestrians walk either in the travel lane or in the grass/ditch alongside the roadway.

Growth Area

McCook County has seen recent growth around the Lake Vermillion area, with new residential developments and acreages surrounding the lake and heading southward along the East Fork Vermillion River valley. As part of this transition from rural to suburban/acreage land use, common needs or desires have or will likely arise to incorporate the conveniences of a more suburban transportation network, such as:

- Paved roadways
- Improved connectivity (multiple access routes to a location)
- Accommodation of increasing traffic volumes (traffic control, roadway geometrics, roadway surfacing)
- Access to existing and/or construction of new pedestrian/bicycle facilities
- More frequent maintenance of granular-surfaced roadways

Drainage

Two locations with drainage needs were identified by the study team. The first is located along 245th Street, approximately 1.5 miles east of US81. Overtopping at this location is frequent and can attain flow rate and depth to sweep vehicles off the roadway and push them out into the deeper waters downstream.

A second location is along the West Fork Vermillion River, from 266th Street to 268th Street. A recent project along 268th Street reconstructed the bridge and raised the roadway profile, resulting in a narrowed passage of floodwaters through this area that often results in higher flood elevations and a longer duration extending upstream through 266th Street. Two residences, one on 443rd Avenue between 266th Street and 267th Street, and a second along 267th Street have become an island during these flood events.

West Fork Vermillion River flood impact areas between 266th Street and 268th Street.
(Left: 267th Street looking east; Right: Intersection of 443rd Avenue and 266th Street)

Railroad Crossings

Improvement needs were identified at two railroad crossings, both along the BNSF line in the southwest corner of the County:

- BH2O Avenue spur crossing in Bridgewater: Removal of abandoned spur line to eliminate a track crossing
- 431st Avenue (CH 25A) crossing: Rough crossing in need of replacement

BH20 Avenue crossing of abandoned spur and BNSF main track in Bridgewater.

Needs Summary

The McCook County transportation network provides roadway users a well-connected network of roads that are in good condition. Like any transportation network, there are issues and needs to address to continue to maintain and improve user mobility, safety, and an acceptable level of service. Eight overarching needs were identified for the Master Transportation Plan to address. The following summarizes the approach to addressing each of these needs in the subsequent chapters of the Master Transportation Plan.

Bridge Condition

Planning for bridge needs is an important element to this Master Transportation Plan and critical to the transportation network. A closure or vehicle restriction in width, height, or weight disrupts network continuity and connectivity, essentially creating a barrier in the network. Bridge structures are expensive to replace; however, proactive preservation measures can help maximize the life of existing structures and adequate planning can help the County absorb the initial replacement costs. The Bridge Plan expands upon the initial assessment presented in this chapter to identify upcoming preservation opportunities and replacement needs. Each activity will be prioritized to maximize benefit of the road users while addressing long-term connectivity and continuity needs as identified in the Major Roads Plan.

Traffic

Overall, traffic volumes are low on McCook County-jurisdiction roadways; however, that does not mean the County is free of traffic-related challenges. Increasing volumes in the southeast corner of the county, seasonal traffic fluctuations, and the importance of maintaining quality truck routes for the local economy are all traffic-related needs facing the County. Intersection and roadway corridor projects are proposed to address increasing traffic volumes as part of the Implementation Plan. Each improvement will align with long-range priorities for connectivity and continuity in the Major Roads Plan. Tools for McCook County to monitor and assess future growth are provided in the Roadway Design, Analysis, & Policy Guidelines chapter.

Roadway Geometry

Because a vast majority of the County roadways were constructed decades ago using design standards current during that era, there are locations throughout the County that have been identified for potential improvement in line with today's speeds and design standards. Examples include curvature and skewed intersections along section line corrections, skewed intersections with State highways, roadway width, and vertical curvature creating sight-distance issues. A series of safety-related improvements to address roadway geometry needs are presented in the Implementation Plan. Many of these needs are related to the built environment and roadway design standards from several decades ago. The Roadway Design, Analysis, & Policy Guidelines chapter incorporates current design guidance and other design resources.

Roadway Surfacing

This need looks at the long-term viability of maintaining the existing surfacing given the costs and shifting travel patterns within McCook County. Several low-volume segments have been identified as candidates for conversion from a bituminous-surfaced roadway to a gravel-surfaced roadway at the time of major investment. Ultimately, proposed roadway-surfacing changes geared towards providing a sustainable transportation network in line with the Major Roads Plan are identified in the Roadway Preservation and Maintenance Plan and incorporated into the Implementation Plan.

Multi-Modal

Multi-modal needs consisted of two categories: Specific locations for sidewalks or a shared-use path and the overarching multi-modal demand typically representative of urban and recreational area. The recommended improvements will seek to balance the needs of both recreational and non-recreational facility users, while providing design standards that are adaptable to specific roadway needs. Recommendations will be geared towards opportunistic improvements in coordination with a facility's next major investment (e.g., shoulders will be a consideration on an identified bicycle route as part of the next major investment of that facility) and developing a framework for a safe and well-connected multi-modal network. The Bicycle and Pedestrian Plan will outline the long-range multi-modal goals for McCook County and projects will be incorporated into the Implementation Plan.

Growth Area

This identified need provides an overarching recognition of the challenges rural developments pose on the transportation network. Many of which are intertwined with several of the other established needs, and thus are contributing factors to many of the proposed projects, particularly in the southeast corner of McCook County around the Lake Vermillion area.

Drainage

Identified locations with drainage concerns stem from nearly annual flooding that occurs along the various waterways and low-lying areas throughout the County. Projects identified by the study team will incorporated into the Implementation Plan.

Railroad Crossings

Improvement projects to address the two identified BNSF crossing locations (431st Avenue (CH 25A) and BH2O Avenue) are incorporated into the Implementation Plan.

McCook County
MASTER TRANSPORTATION PLAN

Figure 3-1 Transportation Needs Assessment

Transportation Needs

Bridge Condition
- Structurally Deficient Bridge
- Bridge Posted for Weight Limit

Traffic
- Increasing Corridor Volumes Due to Development
- Increasing Corridor Volumes Due to Seasonal Demand
- Intersection Traffic Control
- Truck Accommodations and Connectivity

Roadway Geometry
- Section Line Corrections
- Skewed Intersections
- Right-of-Way and Roadway Surface Width
- Vertical Curves/Grade

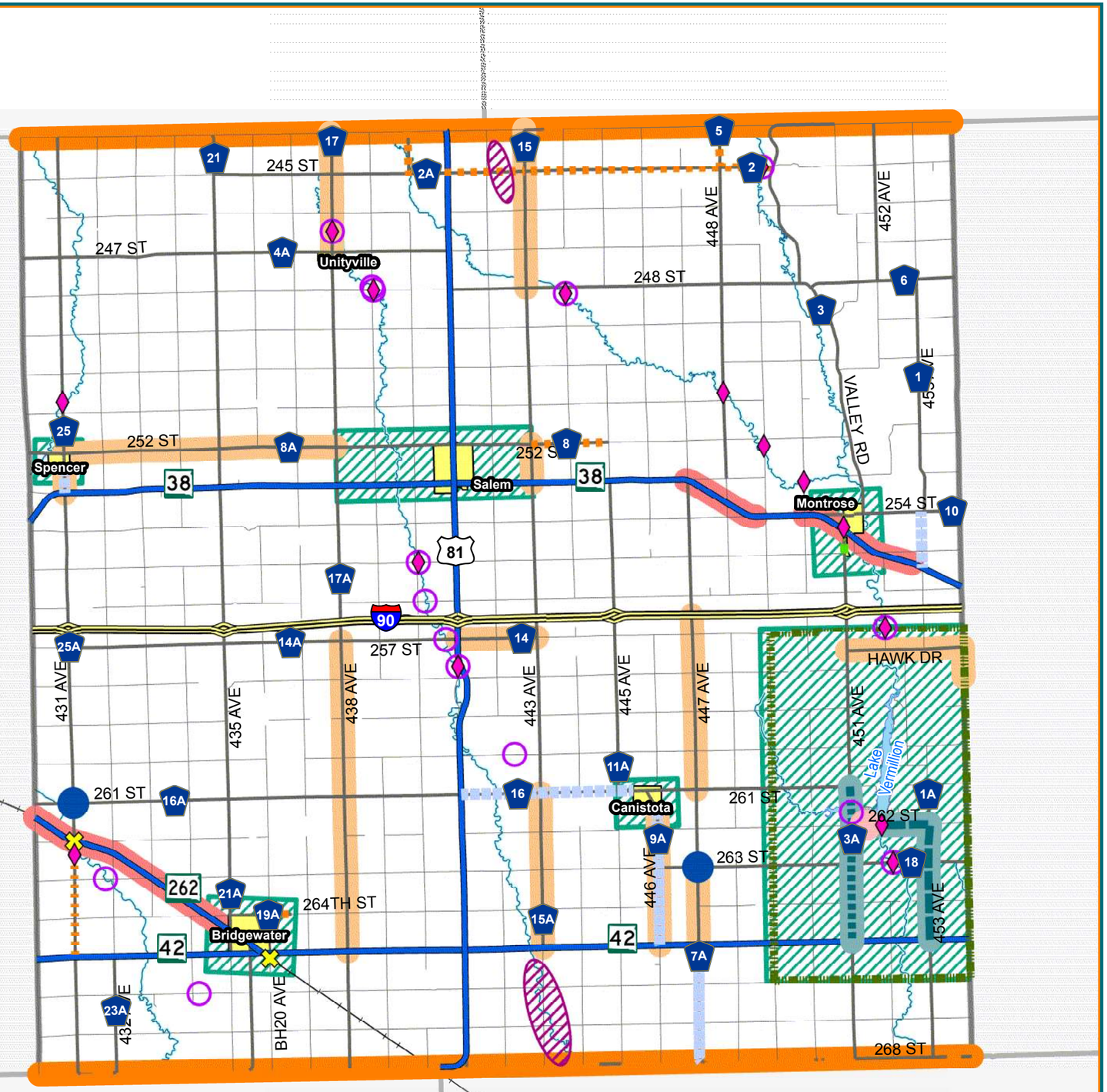
Roadway Surfacing
- Candidate Bituminous to Gravel Conversion Segments

Multi-Modal
- Sidewalk/Trail Corridors
- Urban and Recreational Area (Multi-modal facilities)

Growth
- Lake Vermillion Recreational Area

Drainage
- Flooding/Road Closures

Railroad Crossings
- Crossing Improvement Location



Legend
- Interstate Highway
- State Highway
- County Road
- Township Road
- Railroad
- Rivers/Streams
- Lakes
- City

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1 inch = 3 miles

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4. Major Roads Plan

The McCook County Major Roads Plan provides a prioritized framework for maintaining and improving McCook County highways over the next 20+ years. It was developed in partnership with McCook County, South Dakota Department of Transportation, and project stakeholders to provide a comprehensive approach to transportation mobility and safety planning throughout the County.

McCook County Roadway Network

The roadway network in McCook County is an interconnected network of highways and roads, primarily across the following jurisdictions:

- US/State highways (I-90, SD38, SD42, SD262, and US81)
- McCook County highways
- Township roads (16 townships)
- Urban roads (Bridgewater, Canistota, Montrose, Salem, and Spencer)
- Other (i.e. private and recreational roadways)

Each plays an important role in balancing appropriate levels of mobility and access, ranging from national mobility goals for the Interstate system to local access goals of Township roads. The interrelationships between each jurisdiction and the function each roadway provides are key elements to the Major Roads Plan.

US/State Highways

US/State-jurisdiction highways are the highest functioning roadways within McCook County and are intended to provide the highest level of speed, mobility, and heavy load accommodations while connecting the large activity centers across the region. These facilities are the focal point for regional connectivity and heavy load accommodations within the Major Roads Plan.

McCook County Highways

McCook County-jurisdiction highways provide varying levels of mobility and access depending on the goal and needs of each facility. These roadways may serve medium-to-long distance trips, connect smaller rural communities, carry intra-county traffic, and provide access to/from the US/State highway system. Travel speeds, traffic volumes, and roadway surfacing types are typically dependent on the facility's goals and needs.

Township Roads

Township-jurisdiction roadways provide access to adjacent land and connect to McCook County or US/State Highways. Low speeds, low traffic volumes, and short connections to higher-functioning roads or other destinations are characteristics of these facilities.

Urban Roads

Urban roads are those within urban areas and are typically owned and maintained by the respective municipality. These roads vary from providing high levels of mobility and less access to focusing on access and connectivity to higher-volume facilities. US/State highways and McCook County highways may also traverse through municipalities and often function as a higher-functioning route with controlled access, greater traffic capacity, and higher speeds through the community.

Other Roads

Other roads include private and recreational roadways that focus on access and provide a connection to a public roadway.

McCook County Major Roads Plan

The McCook County Major Roads Plan focuses on County-jurisdiction roadways and their appropriate levels of mobility, access, and freight accommodations within the overarching regional transportation network. To aid in the development of the Major Roads Plan, the following objectives and priorities were established:

1. Maintain and improve the overall transportation network, utilizing and building upon existing investments.
2. Maximize the benefits of the existing state highway network for intra-and inter-county trips.
3. Maintain and improve regional connectivity and route continuity of similar facilities.
4. Assign prioritization of parallel or duplicate routes.
5. Evaluate and understand route purpose and other transportation needs, such as:
    a. Existing truck routes, posted load limits, and farm-to-market connectivity.
    b. Mobility and land access relationships in recreational and transitioning rural areas.
    c. Connectivity of regional population centers, regional activity centers, and other traffic generators.
6. Provide appropriate roadway surfacing based on traffic demand.
7. Provide appropriate roadway jurisdiction based on traffic demand.
8. Provide 'all-season' access between each municipality and a State highway.
9. Provide route connectivity to transload grain terminals, ethanol plants, and other agricultural businesses in adjacent counties.

The backbone of the regional transportation network will continue to be the US/State highway network, providing the highest levels of vehicle, freight, and multi-modal mobility in the County. At the other end of the spectrum, Township and Urban roadways will continue to provide local access and important connections to higher-functioning roadways. McCook County-jurisdiction highways span between these bookends in the mobility and access relationship, with function and purpose highly dependent on characteristics and needs of each facility.

With consideration to the aforementioned priorities and objectives, the Major Roads Plan establishes County highway categories in terms of roadway surfacing as follows:

- Bituminous – Primary Truck Route
- Bituminous
- Gravel

The proposed Major Roads Plan is shown in Figure 4-1. Additional discussion on the Major Roads Plan development is provided in Appendix C.

McCook County Bituminous – Primary Truck Route

Bituminous – Primary Truck Routes represent priority truck connections between US/State highways, municipalities, and other destinations that require the accommodation of heavy loads, such as a grain handling facility, that do not have direct access to a US/State highway. These routes may serve as 'all season' routes that are not affected, or affected to a lesser degree, by seasonal load postings. Design guidance in the Roadway Design, Analysis & Policy Guidelines chapter identifies typical section features, such as shoulder width, that differentiate this type of facility from a Bituminous-category roadway.

Table 4-1: McCook County Bituminous – Primary Truck Route Facilities

Primary Truck Route Segment	From	To	Truck Route Connection
431st Avenue (CH 25)	Spencer	SD38	▪ Provides connectivity between Spencer and SD38
445th Avenue (CH 11A)	SD38	Canistota	▪ Provides connectivity between SD38, I-90 and Canistota ▪ Part of north/south route between SD38 and Turner County
446th Avenue (CH 9A)	Canistota	SD42	▪ Provides connectivity between Canistota and SD42 ▪ Part of north/south route between SD38 and Turner County
447th Avenue (CH 7A)	SD42	Turner County	▪ Provides connectivity between SD42 and grain terminal/ethanol plant north of Marion ▪ Part of north/south route between SD38 and Turner County

The primary truck route encompassing 445th Avenue and 446th Avenue between SD38 and SD42 is subject to revision based on future modifications to the 447th Avenue crossing of I-90. Statewide, many low-volume non-interchange crossings of I-90, similar to this crossing on 447th Avenue, are approaching a need for replacement. In each instance, the SDDOT will be evaluating the user costs vs. construction to determine whether the crossing is replaced or removed. McCook County has invested considerable time and funding to improve 447th Avenue as a heavy vehicle route between SD38 and SD42. While a paved north/south truck corridor between SD38 and SD42 would be beneficial, the importance of creating a new north/south primary truck route in this area is magnified if the 447th Avenue crossing of I-90 is removed and thus is a primary consideration for designating improvements along 445th Avenue and 446th Avenue.

McCook County Bituminous

Bituminous highways represent paved asphaltic concrete or blotter-surfaced roadways spaced across McCook County to supplement the US/State highway system and provide a higher level of mobility for longer-distance travel within the County and to adjacent Counties. These roadways are spaced in 4-6 mile increments with US/State highways to provide an overarching paved-surface grid network to meet route continuity and connectivity needs in the County.

The following tables present the proposed paved-surface grid network in McCook County, highlighting the complimentary relationship of US/State highways and County highways and the key corridor connections to facilitate countywide mobility and connectivity.

Table 4-2: East/West Bituminous Surface Corridors

East/West Paved Surface Corridor	From	To	Key Connections
247th Street (CH 4A)/ 248th Street (CH 6)	Hanson County	Minnehaha County	▪ Northern east/west corridor
SD38	Hanson County	Minnehaha County	▪ State highway ▪ Spencer, Salem, and Montrose
I-90	Hanson County	Minnehaha County	▪ Interstate highway ▪ 5 Exits in County
261st Street (CH 16A-16)	Hanson County	451st Avenue (CH 3A)*	▪ Emery, Canistota, Lake Vermillion
SD42	Hanson County	Minnehaha County	▪ State highway ▪ Bridgewater and SD262

**Paved cross-road intersection*

Table 4-3: North/South Bituminous Surface Corridors

North/South Paved Surface Corridor	From	To	Key Connections
431st Avenue (CH 25-25A)	247th Street (CH 4A)*	SD262*	▪ Spencer ▪ I-90 Interchange
435th Avenue (CH21-21A)/ BH20 Avenue (CH 21A)	Miner County	Hutchinson County	▪ Canova and Bridgewater ▪ I-90 Interchange
US81	Miner County	Hutchinson County	▪ Salem ▪ I-90 Interchange
445th/446th/447th/448th Avenue (CH 11A/9A/7A/5)	248th Street (CH 6)*	Turner County	▪ Series of paved segments between US81 and 451st Avenue ▪ Canistota and Marion ▪ I-90 Interchange
Valley Road (CH 3)/ 451st Avenue (CH 3A)	Lake County	Turner County	▪ Montrose and Lake Vermillion ▪ I-90 Interchange

**Paved cross-road intersection*

McCook County Gravel

Gravel roadways represent County-jurisdiction gravel roadways across McCook County. These roadways typically focus more on access and less on mobility, though they can also provide connectivity for longer trips within the County. Gravel corridors such as 447th Avenue between SD38 and SD42, serve as truck routes that can accommodate heavy loads not allowed on the bituminous roadways. These roadways also serve to fill gaps, supplement parallel routes, or provide extensions to the Bituminous-surfaced network on lower-volume segments.

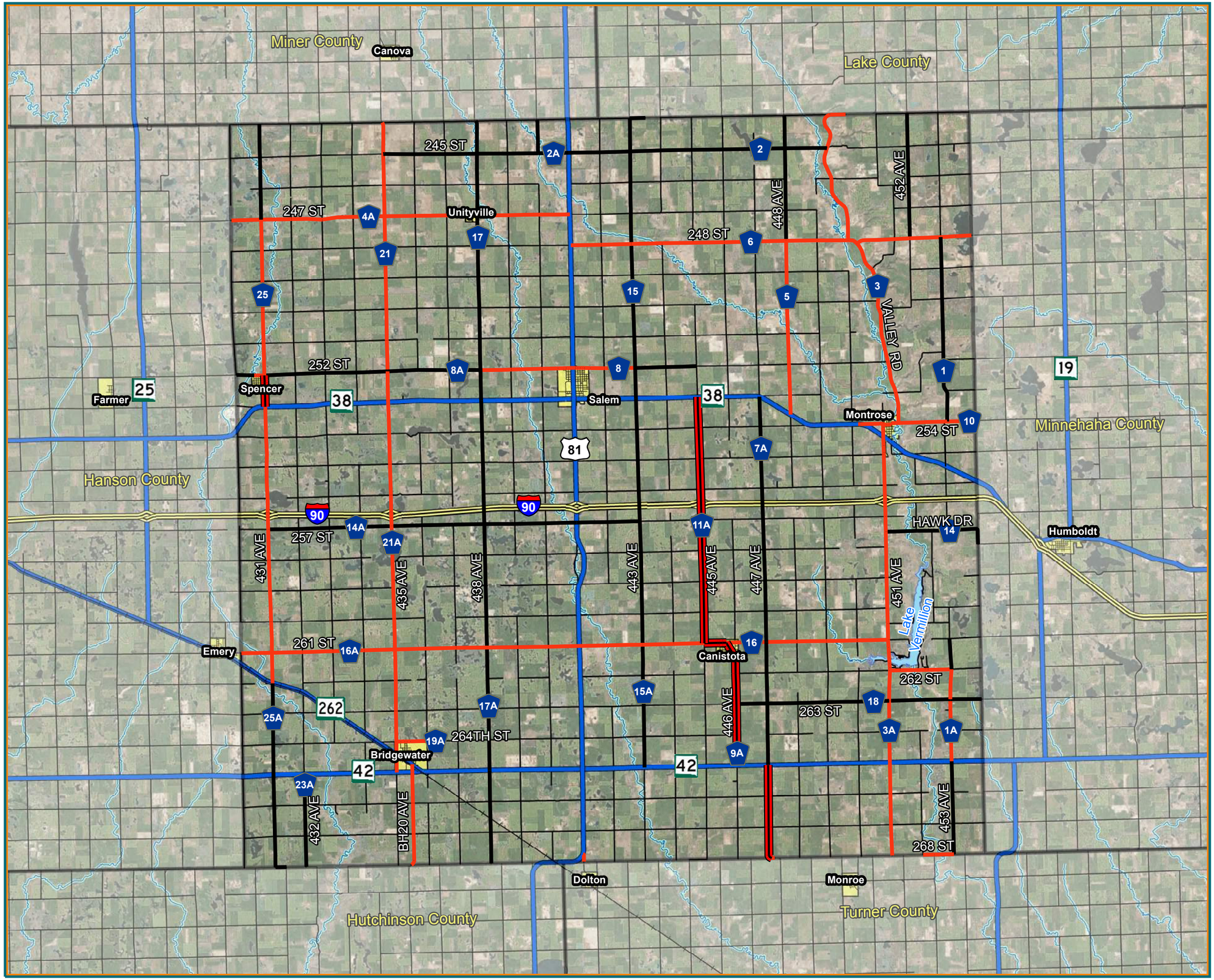
Jurisdictional Realignment

Traffic patterns, facility needs, and agency priorities change over time, and it is good practice to review the current jurisdictional alignment of roadways within the transportation network. This helps the transportation network, as a whole, operate efficiently and reduce the overall public cost of infrastructure, services, and maintenance of a roadway.

The Major Roads Plan includes two proposed modifications to current roadway jurisdiction, noted in Table 4-4 and Figure 4-2.

Table 4-4: Jurisdictional Realignment Segments

Route	From	To	Length (miles)	Transfer	Need
264th Street (CH 19A)	436th Avenue	0.5 miles west	0.5	County to Township	Low volumes, surface change
453rd Avenue	254th Street	SD38	1.5	Township to County	Truck connection between 254th Street and SD38 to bypass Montrose



MCCOOK COUNTY
MASTER TRANSPORTATION PLAN

FIGURE 4-1
MAJOR ROADS PLAN

LEGEND

- Interstate Highway
- State Highway
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City

McCook County Highways

- Bituminous - Primary Truck Route
- Bituminous
- Gravel

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1 inch = 3 miles

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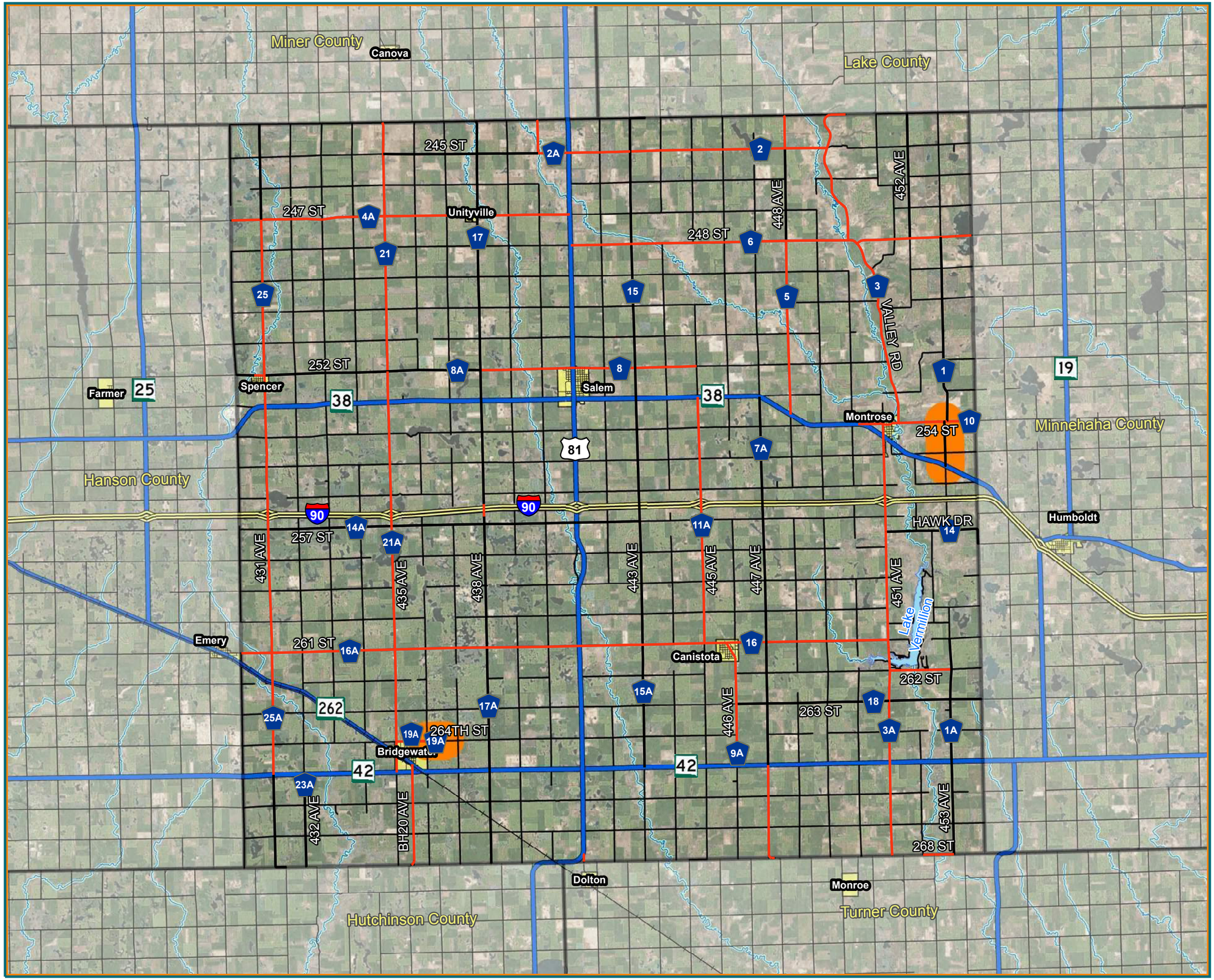
McCook County Master Transportation Plan

Figure 4-2 Proposed Jurisdictional Transfer



Legend

- Interstate Highway
- State Highway
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City
- Bituminous
- Gravel/Dirt
- Proposed Jurisdictional Transfer

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1 inch = 3 miles

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5. Bridge Plan

The Bridge Plan provides a review of current bridge conditions across McCook County, examines costs of bridge repair and replacement, and identifies a plan to help prioritize bridge improvements over the next 20+ years.

Existing Bridge Conditions

McCook County is currently responsible for maintaining 69 of the 98 bridges within the County and numerous other smaller culverts and drainage structures. The 69 bridges are part of a biennial bridge inspection that rates bridges on the current level of sufficiency based on National Bridge Inventory System standards. Sufficiency ratings, ranging on a scale from 0 to 100 percent, are used to indicate a measure of the bridge's ability to remain in service. A 100 indicates an "entirely sufficient bridge" and a 0 indicates an 'entirely insufficient or deficient bridge.[4] The 2016 biennial inspection indicated a McCook County-maintained bridge sufficiency average of 78 percent.

In addition to level of sufficiency, bridges are categorized as functionally obsolete, structurally deficient, or not deficient. Within McCook County, 15 of the 69 bridges maintained by the County are considered structurally deficient. As of the 2016 inspections, no existing McCook County-maintained bridges are considered functionally obsolete.

Functionally Obsolete

Bridges are considered functionally obsolete when the deck geometry, load carrying capacity (comparison of the original design load to the current State legal load), clearance, or approach roadway alignment no longer meet the usual criteria for the system of which it is an integral part. In general, functionally obsolete means that the bridge was built to standards that are not used today.

Structurally Deficient

Bridges are considered structurally deficient if significant load carrying elements are found to be in poor condition due to deterioration and/or damage, or the adequacy of the waterway opening provided by the bridge is determined to be extremely insufficient to the point of causing overtopping with intolerable traffic interruptions.

An overview of the 69 bridges maintained by McCook County, including sufficiency rating and status regarding being structurally deficient, is provided in Figure 5-1.

Priority Route Needs

Maintaining prioritized, continuous routes with similar vehicular and equipment accommodations, such as load, width and height, is an important part of countywide mobility. This is of particular importance to agricultural operations and freight transportation. When a bridge is no longer able to accommodate a certain vehicle load, width, or height, commiserate with the maximum accommodations of the roadway corridor, it becomes a barrier within the transportation network and necessitates a detour that can sometime lead to several additional miles of travel. It is important that the impacts of posting a bridge for restricted loads be considered in the long-range planning of major bridge rehabilitation or replacement as the function of a bridge is compromised if it is not serving the vehicular demand at the crossing.

Load posted (restricted) bridges throughout McCook County, as of the 2016 bridge inspections, are shown in Figure 5-2.

The Major Roads Plan outlines a McCook County priority of maintaining continuous routes that accommodate the accepted loads (within restrictions on the given roadway) along prioritized major corridors within the County. The

[4] *Bridge Preservation Guide: Maintaining a State of Good Repair Using Cost Effective Investment Strategies*, U.S. Department of Transportation, Federal Highway Administration, 2011.

Major Roads Plan establishes the following roadway hierarchy with regard to prioritization of bridge rehabilitation and replacement to maintain corridor continuity and connectivity:

1. Bituminous – Primary Truck Routes
2. Bituminous
3. Gravel
4. Township

Table 5-1 lists bridges on County-jurisdiction roadways that have one or more of the following characteristics that indicate a barrier or potential barrier to County mobility: A sufficiency rating less than 70, is structurally deficient, and/or posted for load restriction. Bridges on Bituminous – Primary Truck Routes were found to not exhibit any of the queried deficiencies.

Table 5-1: Existing Conditions Bridge Need Matrix

Current Surfacing (2017)	Bridge Number	Roadway	Waterway Crossing	Sufficiency Rating < 70	Structurally Deficient	Posted for Load
Bituminous	44010067	431st Avenue	Wolf Creek	X		X
	44010185	431st Avenue	Wolf Creek	X		X
	44180068	448th Avenue	Little Vermillion River	X		X
	44191010	245th Street	East Fork Vermillion River	X	X	X
	44210103	451st Avenue	Creek	X		X
	44210177	451st Avenue	East Vermillion Lake		X	
	44219180	262nd Street	East Fork Vermillion River	X		X
Gravel	44077010	245th Street	West Fork Vermillion River	X		
	44080025	438th Avenue	West Fork Vermillion River	X	X	X
	44107130	257th Street	West Fork Vermillion River		X	
	44221190	263rd Street	East Fork Vermillion River	X	X	X
Township	44018190	263rd Street	Wolf Creek	X	X	
	44042220	266th Street	Creek	X	X	
	44090039	439th Avenue	West Fork Vermillion River	X	X	
	44091040	248th Street	West Fork Vermillion River	X	X	X
	44101110	255th Street	West Fork Vermillion River	X	X	X
	44103120	256th Street	West Fork Vermillion River		X	
	44110137	441st Avenue	West Fork Vermillion River	X	X	X
	44124160	260th Street	Creek	X	X	
	44140043	444th Avenue	Little Vermillion River	X	X	X
	44190083	449th Avenue	Little Vermillion River			X
	44200093	450th Avenue	Little Vermillion River	X		X
	44220129	452nd Avenue	Creek	X	X	X

No bridges identified on Bituminous – Primary Truck Routes with reviewed needs criteria

Timber Pile Bridges

Bridges constructed with timber pile supported substructures bring a different set of challenges to maintain structures. McCook County has 25 structures with timber pile substructure.

Untreated timber piles and older treated timber piles are subject to biological decay from the inside out because older preservative treatments often did not penetrate the heartwood. Sections of pile subject to alternating wet and dry cycles are the most vulnerable and many failures occur just above or just below the mudline or splash zone. Since the outside of the pile dries more rapidly, deterioration is often not visible until the pile begins to fail. If several piles in the same bent are weakened, failure of a single pile can cause the entire bent to fail catastrophically as the other piles suddenly carry the additional load from the failed pile and eccentricity.

Timber pile abutments are subject to bending from retained embankment (the approach roadway) as well as axial compression from the bridge. Using older versions of AASHTO, the interaction of the stresses from these two types of loading was not accounted for in a conservative fashion.

Timber piles supporting heavy concrete superstructures on poured-in-place pile caps are also vulnerable to bending just below the pile cap caused by eccentric live loads – heavy truck loads being a good example. Timber pile caps are less likely to cause deterioration in the tops of the piles but the connection between the pile cap and the top of the pile may fail as soil pressure from the retained embankment is taken by the bridge superstructure.

The latest bridge inspection reports indicate that the timber piles supporting many of these structures are deteriorating at about the same rate, meaning that there is a greater risk of these needing replacement or high-cost rehabilitation at about the same time. However, it is difficult to discern the amount of section loss and subsequent repair options without coring these piles. Flexibility in accommodating rehabilitation and replacement for timber pile bridges is important until cores can be obtained.

Timber pile substructure at 266th Street bridge over West Fork Vermillion River

If piling is serviceable and any repairs are limited to around the water line, the structures may be candidates for injection of preservatives, fiberglass encasement, splicing, and/or spot repair of the existing timber piles. On smaller structures, McCook County Highway Department staff has been able to lift off existing bridge decks, repair the piling, and replace the existing deck onto the repaired substructure.[5] This has proven to be a cost-effective measure to lengthen the service life of smaller timber pile bridges.

[5] When the superstructure is removed, an additional repair opportunity is to drive additional piles prior to replacement of the bridge deck.

Industry planning-level guides for estimation benefit of the aforementioned timber pile treatments include:

- Preservatives: 10 years
- Encasement: 10-15 years
- Splicing with new pile section: 10-20 years

Flooding

Flooding is nearly an annual occurrence along waterways within McCook County. The well-maintained grid network typically provides many opportunities for detour routes that do not require extensive out-of-the-way travel when the County closes a road due to flooding and overtopping. However, there are problematic locations identified in the Needs Assessment chapter that warrant future improvements to help maintain residential access during flood conditions. On a case-by-case basis, this requires a multi-faceted approach that addresses issues at both the causal location as well as flood-impacted locations upstream.

- Realignment and/or profile raise of existing roadway
- Increase bridge or culvert capacity when bridge is reconstructed
- Construct overflow segment at causal location to help floodwaters dissipate quicker at upstream locations

Bridge Improvement Grant (BIG) Funding

The South Dakota Legislature created the Bridge Improvement Grant (BIG) fund that provides $7 million for local government bridge preservation and replacement. The fund is supplemented with an additional $2 million by the SDDOT until 2019 when it increases to $6 million.[6] Funding eligible activities and projects include, as of 2018, preliminary engineering (PE), preservation, major rehabilitation, and replacement projects.

As a statewide grant-based fund, the 2018 procedures establish criteria for two rankings, one for preliminary engineering and rehabilitation/replacement grants and second for preservation grants. These rankings are used to aid in the selection of bridges based on prioritized needs, impacts, and local contribution to funding the bridge project.

A summary of the PE and rehabilitation/replacement McCook County bridge rankings for Bridge Condition, User Impact, and Local Planning (wheel tax) criteria is provided in Appendix D and incorporated into the prioritization of bridge improvements.

BIG Preservation Ranking Criteria (2018)

1) User Impact
2) Cost Ratio
3) Wheel Tax
4) LPA Financial Commitment
5) Load Rating
6) Scour
7) Substructure Condition
8) Superstructure Condition
9) Culvert condition
10) Service Life
11) Quality of Project

BIG PE and Rehabilitation/Replacement Ranking Criteria (2018)

1) Bridge Condition (50 points maximum)
   a. Posting
   b. Substructure condition
   c. Superstructure condition
   d. Culvert condition
   e. Fracture critical
   f. Scour critical
   g. Sufficiency rating
2) User Impact (20 points maximum)
   a. Traffic volumes (ADT)
   b. Detour length
3) Local Planning (30 points maximum)
   a. County wheel tax
   b. Bid ready status
   c. Local agency commitment

[6] *Bridge Improvement Grant (BIG) Procedure 2018,* South Dakota Department of Transportation, Office of Local Government Assistance, June 29, 2018.

Bridge Plan Elements

The McCook County Bridge Plan incorporates a proactive and comprehensive approach to planning for and managing future bridge improvements in McCook County over the next 20+ years. The goal is to develop guidelines for a cost-effective process of managing existing and newly constructed bridges to maximize their performance and useful life, ultimately lowering the lifetime cost to the County. Bridge Plan conclusions are not intended to serve as Bridge Condition Reports or as a design or construction document, rather they provide guidance towards the planning of long-term investments and management of available resources.

The Bridge Plan is structured to function in line with the South Dakota BIG procedures, using similar terminology and approach. This will afford McCook County a systematic process of identifying bridge improvements and seamless integration towards BIG funding applications or funding the bridge activity 100 percent locally. Therefore, the Bridge Plan incorporates a simplified process of maintaining a bridge through its useful life, incorporating the following elements adapted from the SDDOT's Bridge Improvement Grant Procedure manual and FHWA's Bridge Preservation Guide:

- Routine Maintenance
- Bridge Preservation
- Bridge Rehabilitation
- Bridge Replacement

The following definitions of each activity are adapted from the SDDOT's Bridge Improvement Grant Procedure manual and FHWA's Bridge Preservation Guide, as noted. The relationship to BIG funding eligibility and notable requirements for each activity are included as well. Additional information can be found in the source documents.

Routine Maintenance (required for BIG major rehabilitation and replacement eligibility)

Routine maintenance includes smaller cyclical, often annual, maintenance activities for bridges in good to fair condition. The goal is to maintain and preserve bridge elements to help extend the useful life of the structure. Routine maintenance may also be in response to specific needs. Examples of routine maintenance items include:

- Vegetation removal
- Wash deicing chemicals and debris off bridge deck
- Wash bridge seats
- Remove debris from expansion joints
- Clear all deck drains
- Clean and prime exposed rebar
- Seal cracks in the deck including exposed keyways between precast elements

Bridge Preservation (BIG funding eligible)

Bridge preservation includes actions or strategies that prevent, delay, or reduce deterioration of bridges or bridge elements, restore the function of existing bridges, keep bridges in good condition and extend their life. Preservation actions may be preventative or condition-driven (*Source: FHWA Bridge Preservation Guide*). Examples of bridge preservation work identified in the SDDOT BIG Procedure manual include:

- Scour remediation (rip rap to fill scour holes and address potential scour)
- Steel repairs
- Expansion joint repair and/or replacement
- Cleaning and painting fascia beams and railing
- Replace railing

- Seal deck to minimize water intrusion (Asphalt on membrane, epoxy chip seal or apply a silane or siloxane sealer)
- Epoxy crack injection
- Concrete patching (deck, abutments, piers and wingwalls)
- Grind and hydrodemolition of deck clear cover and replacement with a latex modified concrete surface
- Remove wearing surface and replace with 2" of Latex Modified Concrete
- Jacket and or replace deteriorated timber piles. Repair timber abutment lagging and wingwalls

For BIG funding eligibility, minor repair, rehabilitation or preservation work must be valued greater than the set preservation financial minimum and extend the service life by at least 10 years.

Bridge Rehabilitation (BIG funding eligible)

Rehabilitation projects include major repair or rehabilitation work to restore the structural integrity of a bridge and restore any major defects (*Source: FHWA Bridge Preservation Guide*). A combination of preservation activities to several bridge components may also be categorized as rehabilitation work. Rehabilitation projects may include:

- Remove and replace super structure[7]
- Remove and replace deck, end diaphragms and bearings[7]
- Clean and paint the existing steel
- Remove and replace concrete deck beams (in kind or similar)
- Construct concrete bridge approach slabs

For BIG funding eligibility, work must be valued greater than the set rehabilitation financial minimum.

Bridge Replacement

Bridge replacement includes the total replacement of the bridge or culvert structure, including approach work required to connect the new bridge to the existing roadway.

Preliminary Engineering (BIG funding eligible)

Preliminary engineering includes items such as preliminary structure design, preservation/rehabilitation/replacement investigation studies, surveys, bridge hydrologic/hydraulic (H/H) studies, including type, location, and size recommendations (*Source: SDDOT BIG Procedure manual)*.

Potential Bridge Closures

Four major waterways traverse McCook County from north to south: Wolf Creek, West Fork Vermillion River, Little Vermillion River, and East Fork Vermillion River. As part of the established grid network, crossings are provided at nearly every mile of these waterways. Back when many of these bridges were constructed in the 1920's, 30's, and 40's, it was important to maintain crossings in 1-mile increments due to agricultural operations of that time. However, through advancements in agricultural equipment and other vehicles, maintaining a crossing at each mile section line is not nearly as important as it was 60 years ago. Further, as rural population density continues to decrease, volumes decrease as well on several of these bridges, and traveling an extra mile to a crossing is less of a concern.

With the number of bridges approaching a need for replacement, McCook County is taking a proactive look at each bridge to evaluate whether it is still warranted based on their long-range goals, priorities, and funding. The following criteria were used to help identify potential closure locations:

[7] Both items offer the opportunity to make the new deck fully composite with steel beams to obtain a higher live load capacity.

- **Redundant structures** – Locations where multiple bridges are within close proximity of each other, and the removal of a bridge would not have a significant impact to the road users. Typically, either a maintained crossing or a bituminous-surfaced route is available on the adjacent section line road.
- **Current bridge condition and type** – Current condition and bridge type were considered as to what may make sense to close from a fiscal standpoint. Current limitations in functionality such as width or weight restrictions are also considered.
- **Township roads** – The Major Roads Plan identifies a priority to maintain County-jurisdiction connectivity and continuity. At redundant structure locations, a County-jurisdiction road is often included in the bridge cluster to show the primary route bridge in relation to the potential closure. Per the Major Roads Plan, only the Township bridge(s) are being considered for closure.

Bridge clusters that met the aforementioned criteria are identified in Figure 5-3 and further described in Table 5-2. Bridges identified for future consideration to close involve passive closures. The bridge would remain open until closure is required due to bridge condition.

Table 5-2: Proposed Bridge Closures

Roadway	Roadway Jurisdiction	Structure Number	Waterway
248th Street	Township	44014040	Wolf Creek
248th Street	Township	44091040	West Fork Vermillion River
444th Avenue	Township	44140043	Little Vermillion River
449th Avenue – or – 450th Avenue	Township	4419008 – or – 44200093	Little Vermillion River
263rd Street	Township	44018190	Wolf Creek
441st Avenue	Township	44110137	West Fork Vermillion River

Future Needs Assessment

The 2016 McCook County-jurisdiction bridge inspection reports were reviewed to identify future needs and provide planning-level estimates of implementation timeframe and costs associated with each improvement in a bridge evaluation matrix (provided in Appendix E). Building upon the aforementioned Bridge Plan elements, preservation, replacement, and routine maintenance needs were categorized based on the following process.

- **Bridge Preservation** – Bridges were evaluated to identify candidate bridges for preservation activities eligible for BIG funding. This included bridges that were in a condition to where preservation activities could extend the service life by at least 10 years. Bridges that required replacement or bridges that were recently reconstructed were not typically candidates for preservation. Bridge candidates for preservation were only identified for a 10-year timeframe.

  Timber pile bridges were separated into their own preservation category and all included a cost estimate for jacketing of timber piles, in addition to any preservation needs. This category is highly dependent on findings from coring of each timber pile and the actual preservation need may be less than reported.

  Bridge preservation costs were based on a per-item basis with needs identified from the 2016 bridge inspection reports.

- **Bridge Replacement** – Bridges identified as needing replacement in the next 20 years were organized into two categories: Those anticipated for replacement in the next 10 years, and those that will likely need replacement in 11 to 20 years. A third category was introduced as a 'watch' category for bridges that appear to be trending towards needing replacement, based on historical inspection reports, in the 11 to 20 year timeframe. Bridge replacement costs are based on a cost per square foot of existing bridge deck basis and include preliminary engineering design costs.

- **Routine Maintenance** – Routine maintenance was applied on an annual cost per bridge basis. This approach assumes an average annual cost, where some years maintenance needs will be more and some years it will be less.

Two scenarios were developed to illustrate the benefits of closing candidate bridges instead of reconstruction:

1) **Bridge Funding Scenario with No Bridge Closures** – All existing bridges are reconstructed when bridge conditions necessitate replacement.
2) **Bridge Funding Scenario with Proposed Bridge Closures** – Candidate bridges for closure (Table 5-2) are closed in this scenario when bridge conditions necessitate replacement.

The estimated bridge preservation, replacement, and maintenance costs for each scenario are shown in Table 5-3 and Table 5-4.

Table 5-3: Bridge Funding Scenario with No Bridge Closures

	Preservation		Replacement			Maintenance
	Timber Pile Bridges 1-10 Years (2018 – 2027)	Other Bridges 1-10 Years (2018 – 2027)	1-10 Years (2018 – 2027)	11-20 Years (2028 – 2037)	Watch List	Annual Maintenance
No. of Structures	25	8	9	13	4	69
Total Cost – No Bridge Closures	$880,000	$230,000	$6,250,000	$6,400,000	$2,850,000	n/a
Annual Need	$88,000	$23,000	$625,000	$640,000	n/a	$50,000

McCook County-maintained bridges under inspection (69)
Replacement costs include preliminary engineering

Table 5-4: Bridge Funding Scenario with Proposed Bridge Closures

	Preservation		Replacement			Maintenance
	Timber Pile Bridges 1-10 Years (2018 – 2027)	Other Bridges 1-10 Years (2018 – 2027)	1-10 Years (2018 – 2027)	11-20 Years (2028 – 2037)	Watch List	Annual Maintenance
No. of Structures	24	8	7	10	4	64
Total Cost – with Bridge Closures	$850,000	$230,000	$5,150,000	$5,000,000	$2,850,000	n/a
Annual Need	$85,000	$23,000	$515,000	$500,000	n/a	$48,000

McCook County-maintained bridges under inspection (69) less those proposed for closure in next 20 years (5)
Replacement costs include preliminary engineering

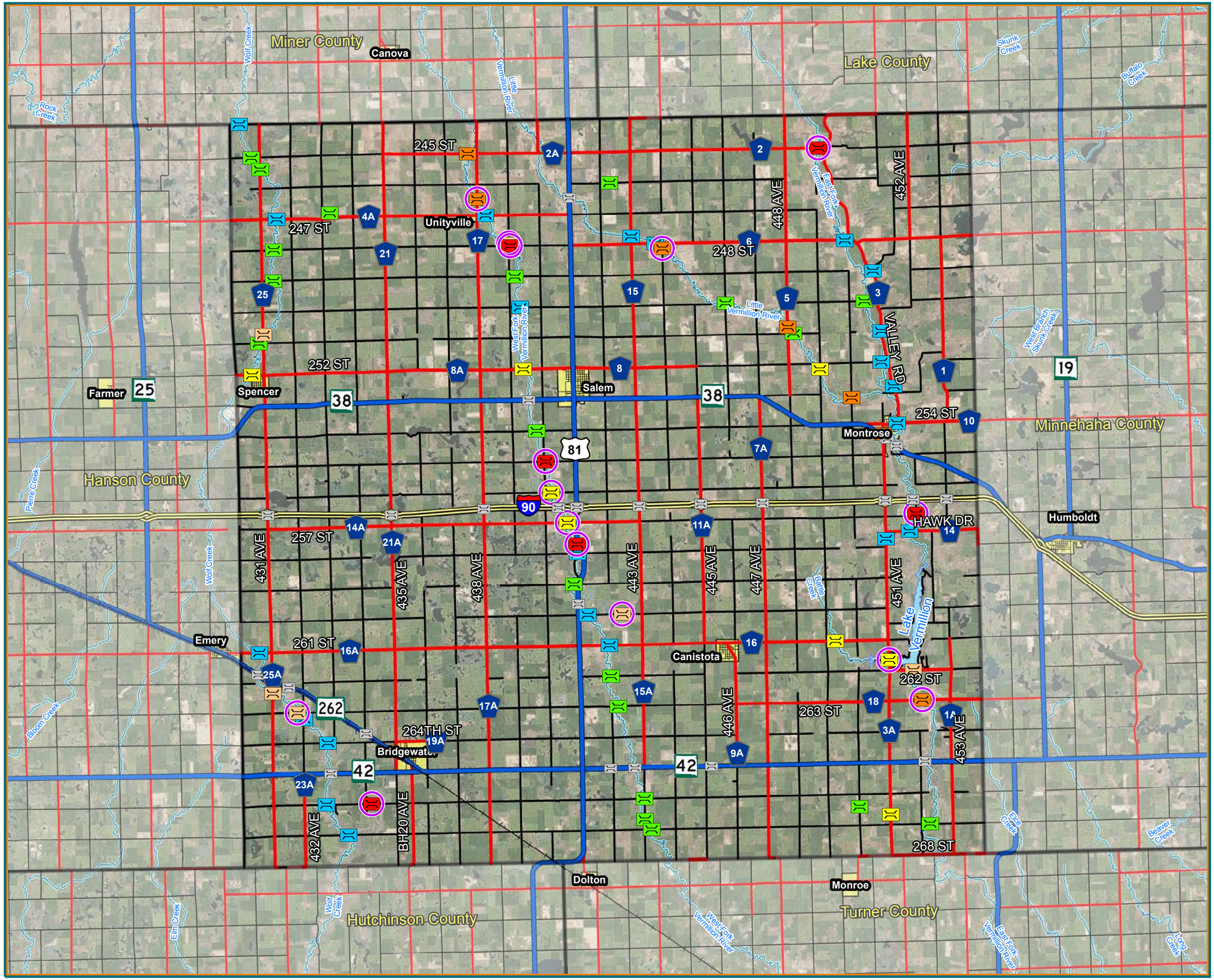


Figure 5-1
Bridge Sufficiency Rating/Status

Legend

- Interstate Highway
- State Highway
- County Road
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City
- Bridge (State) (29)

Sufficiency Rating

- 0 - 50 (6)
- 51 - 60 (7)
- 61 - 70 (6)
- 71 - 80 (8)
- 81 - 90 (20)
- 91 - 100 (22)

Bridge Status

- Structurally Deficient (15)

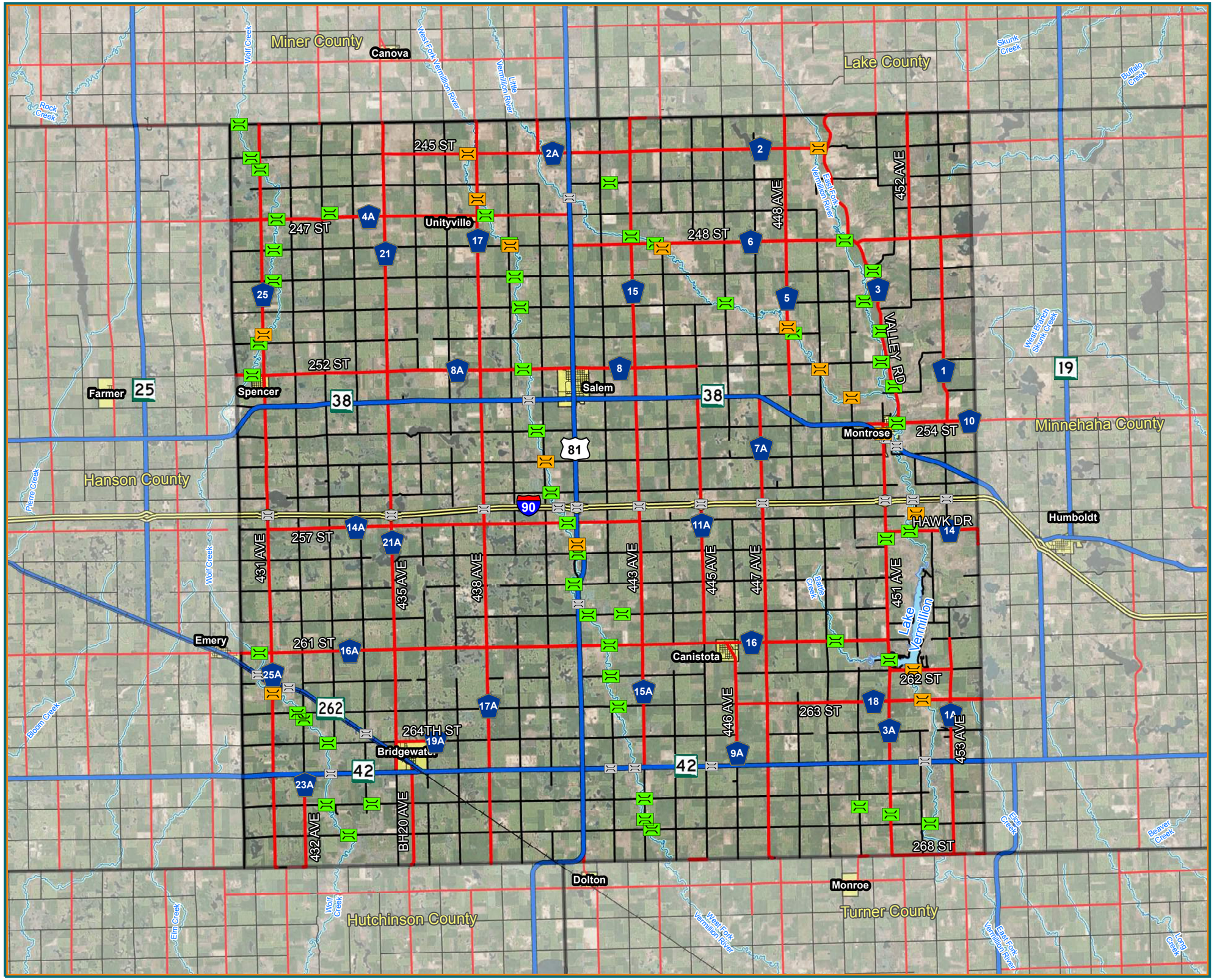
McCook County Inspected Bridges (69)

N
W E
S

0 1.5 3 Miles

1 inch = 3 miles

HRGreen



McCook County Master Transportation Plan

Figure 5-2
County & Township Bridge Weight Restrictions

Legend

- Interstate Highway
- State Highway
- County Road
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City
- Bridge (State) (29)

Bridge Weight Restrictions

- No Weight Restriction (53)
- Posted Load Restriction (16)

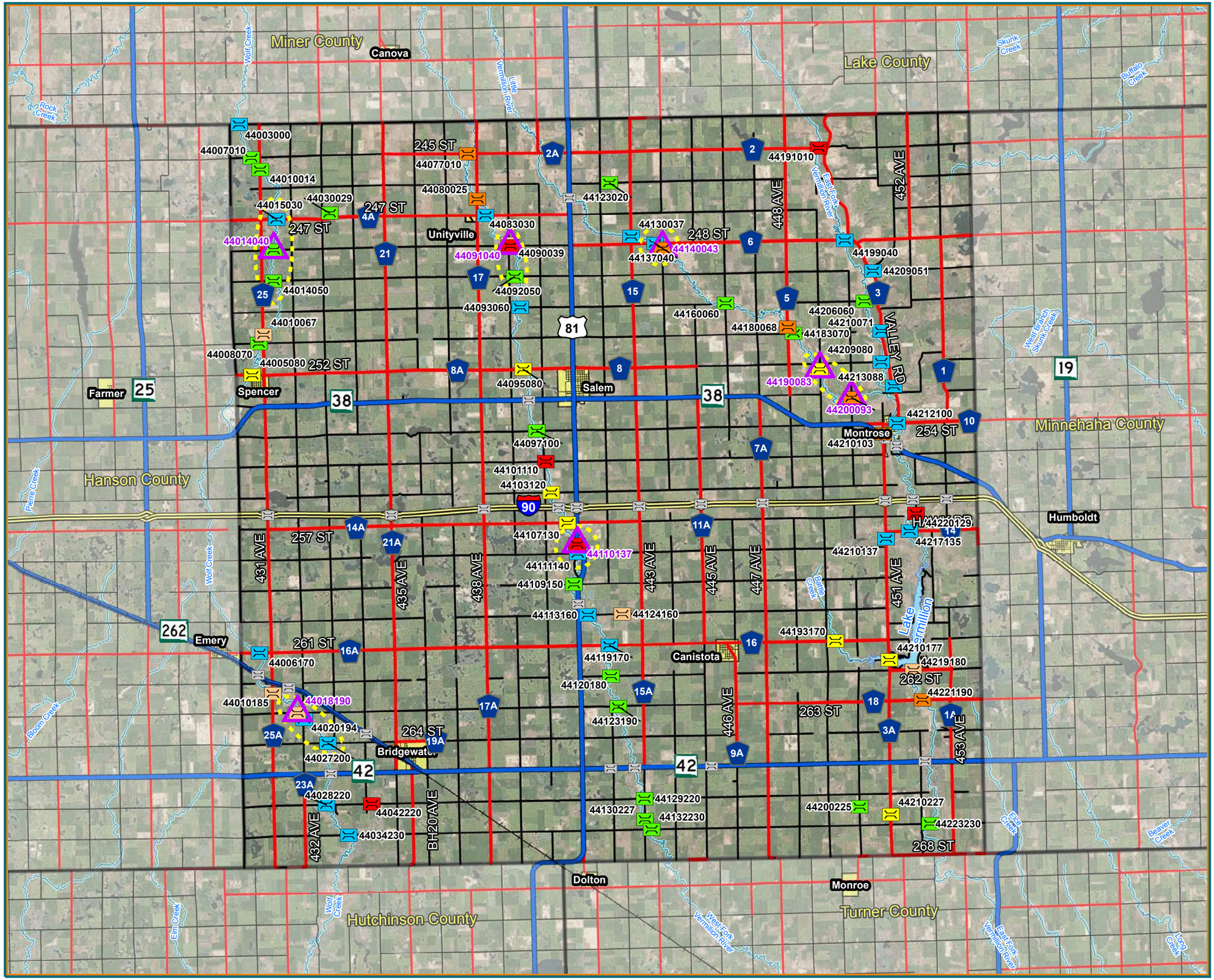
McCook County Inspected Bridges (69)

N
W E
S

0 1.5 3 Miles

1 inch = 3 miles

HRGreen



McCook County Master Transportation Plan

Figure 5-3 Candidate Bridges for Evaluation of Future Removal

- Interstate Highway
- State Highway
- County Road
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City
- Bridge (State) (29)

Bridge Sufficiency Rating

- 0 - 50 (6)
- 51 - 60 (7)
- 61 - 70 (6)
- 71 - 80 (8)
- 81 - 90 (20)
- 91 - 100 (22)

Bridge Closure

- Candidate for Future Removal* (5)
- Redundant Bridge Clusters

McCook County Inspected Bridges (69)

*Bridges identified for future consideration to close involve passive closures. The bridge would remain open until closure is required due to bridge condition.

N W E S

0 1.5 3 Miles

1 inch = 3 miles

HRGreen

6. Roadway Preservation & Maintenance Plan

The Roadway Preservation and Maintenance Plan provides typical preservation and maintenance activities for asphaltic concrete, blotter, and gravel-surfaced roadways within McCook County. This Plan illustrates the typical life cycle of these roadways, including typical preservation and maintenance activities, frequency, and costs applied to the identified needs of the system over the next 20+ years.

Roadway Preservation and Maintenance Planning

The Roadway Preservation and Maintenance Plan looks at the long-range aspect of incorporating new construction, reconstruction, preservation, and maintenance of roadways to help maximize the long term investment of the McCook County roadway network. This plan maps out the reconstruction, resurfacing, preservation and maintenance activities for each roadway segment, along with the respective frequency and estimated costs, throughout the anticipated design life of each asset. The output of this plan is directly translatable to the County's 5-year program and offers flexibility for the County to update as needed into the future.

A 'design life' is associated with each type of investment for planning and design purposes, representing the time from original construction to a state where reconstruction or replacement is needed. The realized design life can vary widely between separate segments consisting of the same element based on location-specific conditions such as traffic and truck volumes, roadway base thickness, subgrade conditions, environmental factors, and quality of construction and materials. The following lists planning-level design lives for various roadway elements assuming appropriate preservation and maintenance activities:

- Bridges and concrete culverts – 75 years
- Asphalt pavement – 20 years
- Concrete pavement – 40 years (jointed)
- Gravel surfacing – 8 years
- Signs – 15 years
- Pavement markings – 1 year for paint; 3 years (sprayable durable, grooved) to 7 years (plastic, grooved) for others

Planning-level preservation and maintenance activities are outlined in the following tables for asphaltic concrete, blotter, and gravel-surfaced roadways. The activities follow industry guidance and align with the standard practice for McCook County roadways. Activity frequencies are based upon industry guidance for recommended treatment under average conditions and McCook County experience. Unit costs reflect typical prices for contractor-performed work in McCook County, with consideration to historical costs from the SDDOT statewide averages and other local input.

Table 6-1: New Structural Surfacing or Surface Conversions

Activity	Frequency	Unit Cost
3" Asphaltic Concrete (AC) (structural resurfacing)	n/a	$200,000/mile
AC Base Improvements (Reclaim, add base, 3" AC)	n/a	$230,000/mile
AC to Gravel Conversion	n/a	$30,000/mile
Blotter to Gravel Conversion	n/a	$25,000/mile
AC to Blotter Conversion	n/a	$80,000/mile
Gravel to Blotter Conversion	n/a	$60,000/mile
Gravel/Blotter to AC Conversion (3" AC structural surfacing)	n/a	$200,000/mile

Table 6-2: Asphaltic Concrete Roadway Preservation and Maintenance Schedule

Activity	Frequency	Unit Cost
Chip Seal	6 years (year 3, 9, 15, 21*)	$20,000/mile
Crack Seal	6 years (same year as chip seal)	$3,000/mile
Mill 1.5" and Overlay 2"	20 years	$100,000/mile + structures
Mill 2" and Overlay 2"	20 years	$110,000/mile + structures
Mill 2" and Overlay 3"	20 years	$155,000/mile + structures
Pavement Markings	Annual	$1,000/mile (shared with SDDOT)
Patching/Annual Pavement Maintenance	Annual	$2,000/mile

**If overlay is not warranted, next chip seal would occur at year 21*

Table 6-3: Blotter Surfacing Preservation and Maintenance Schedule

Activity	Frequency	Unit Cost
Blotter Maintenance (chip seals)	6 years	$20,000/mile
Blotter Re-application	18 years	$60,000/mile

Table 6-4: Gravel Maintenance Schedule

Activity	Frequency	Unit Cost
Gravel Resurfacing – 3"	8 years	$20,000/mile
Blading	18 times/year	$900/mile
Spot Gravel/Annual Maintenance	Annual	$500/mile
Dust Control	1/year, as needed on select mile segments	$7,500/mile*

**$7,500/mile for year 1, $4,000/mile for year 2+*

Table 6-5: Miscellaneous Item Maintenance Schedule

Activity	Frequency	Unit Cost
Sign Maintenance	Annual	$115/mile
Sign Replacement	Assess at year 15 Blanket Replacement	$1,300,000*
General Maintenance**	Annual, as needed	$1,500/mile

**Blanket replacement full cost; McCook County has participated in the SDDOT Countywide Signing Program funded at 100%*

***General maintenance includes snow removal, mowing, and other internal activities*

A representative life cycle of asphaltic concrete overlays, blotter surfacing, and gravel roads are shown in Table 6-6. Asphaltic concrete overlay and blotter surfacing includes chip seal and crack seals. General and routine maintenance, such as spot patches, pavement markings, sign maintenance, and blading of gravel roads is not included.

Table 6-6: Life Cycle Costs for Various Surface Treatments ($/mile)

Treatment Type	Year 0-5	Year 6	Year 8	Year 10	Year 15	Year 18	Year 20	Year 30	Year 40
AC Overlay (20 Yr. Cycle)	$123,000	$123,000	$123,000	$146,000	$169,000	$169,000	$269,000	$315,000	$438,000
AC Overlay (30 Yr. Cycle)	$123,000	$123,000	$123,000	$146,000	$169,000	$169,000	$169,000	$315,000	$361,000
Blotter (18 Yr. Cycle)	$60,000	$83,000	$83,000	$83,000	$106,000	$166,000	$166,000	$212,000	$272,000
Gravel Resurfacing (8 Yr. Cycle)	$20,000	$20,000	$40,000	$40,000	$40,000	$60,000	$60,000	$80,000	$120,000
Major Investment Activity Legend	*Initial Activity*					*Blotter Reapplication*	*Year of Overlay*	*Year of Overlay*	*Year of Overlay*

Costs are in current dollars per mile; shown amount indicates costs incurred that year for activity plus all costs up to that year.
The "AC Overlay" activity in years 0-5 includes an initial 1.5" Mill and 2" Overlay in year 0 ($100,000) and then Chip/Crack Seal in year 3 ($23,000).

McCook County Road Condition Assessments

McCook County conducts an annual assessment of roadway surface conditions for all County-jurisdiction roadways using the methodology outlined in the Rural Road Condition Survey Guide[8]. This process provides a "standard approach to rating the observable condition of a pavement or gravel-surfaced road" to "uniformly and objectively compare pavement conditions" across the County network.

While the industry standard roadway life cycle, preservation, and maintenance activities are the basis for the Preservation and Maintenance Plan, annual roadway condition assessments allow McCook County to adjust their activities and meet the dynamic needs of individual roadway segments. This is a proactive step to address specific roadway segments that may be deteriorating quicker than anticipated while also not providing unnecessary and costly overlays to roadways that are performing exceptionally well and exceeding their expected design life.

[8] *Rural Road Condition Survey Guide*, Eres Consultants, Inc., SDDOT Office of Research, July 1995.

A summary of the roadway surfacing rating and evaluation criteria for typical McCook County flexible pavement (asphaltic concrete and blotter) and gravel roadways is provided in Table 6-7and Table 6-8. The rating is based on a 100 point scale. For more detailed information, refer to tables in the Rural Road Condition Survey Guide.

Results of the 2016 assessment are shown in Figure 6-1.

McCook County supplements their visual assessment with roadway cores to determine existing roadway surfacing thickness, such as asphaltic concrete or gravel surfacing, and base course thickness. Asphaltic concrete surfacing thickness provides a record of constructed surface thickness and helps aid in identification of resurfacing and preservation applications. Gravel surface thickness can indicate gravel loss and a need for more frequent resurfacing or blading. Conversely, cores may also indicate that less gravel is needed at the next resurfacing application.

Over the last couple of decades, McCook County has identified a trend in which asphaltic concrete roadways constructed with a base thickness of less than 9 inches typically perform worse than those constructed with a base greater than 9 inches. Asphaltic concrete roadways with a base less than 9 inches will typically exhibit a design life between major resurfacing projects of 15 to 20 years and require more frequent minor resurfacing, patching, and other spot repairs. Asphaltic concrete roadway segments with a base thickness greater than 9 inches can extend out towards 30 or more years between major resurfacing projects and require less effort to preserve and maintain the roadway.

A summary of asphaltic concrete roadway segments with base thickness less than 9 inches, as of 2016, is provided in Figure 6-2.

Table 6-7: Flexible Pavement Rating Summary

Rating Description	McCook County-Jurisdiction Total Miles (2016)	McCook County Segment Example
Excellent: 86-100 Pavement surface is in excellent condition, appears to be very smooth and is generally free of any distress.	**24 miles** *Example: CH 21A*	
Very Good: 71-85 Pavement surface is in very good condition, but surface deterioration is evident such as minor cracking, spalling, or faulting.	**54 miles** *Example: CH 6*	
Good: 56-70 Pavement surface is in good condition, but surface deterioration is more evident than the Very Good condition. Surface deterioration, cracks and depressions are evident.	**71 miles** *Example: CH 3A*	
Fair: 41-55 Pavement surface is in fair condition with more advanced pavement deterioration than that in Good condition. This is the ideal condition to consider a bituminous to gravel surface conversion.	**7 miles** *Example: CH 2*	
Poor: 26-40 Pavement surface is in poor condition with poor rideability. Severe cracking, potholes, and/or rutting is present.	**2 miles** *Example: CH 5*	
Very Poor to Failed: 0-25 Pavement surface is in very poor to failed condition with a severely cracked or disintegrated pavement surface.	**0 miles**	
2016 Countywide weighted average: 74		

Adapted from Rural Road Condition Survey Guide
Total mileage from 2016 ratings is approximate and does not include segments in process of reconstruction

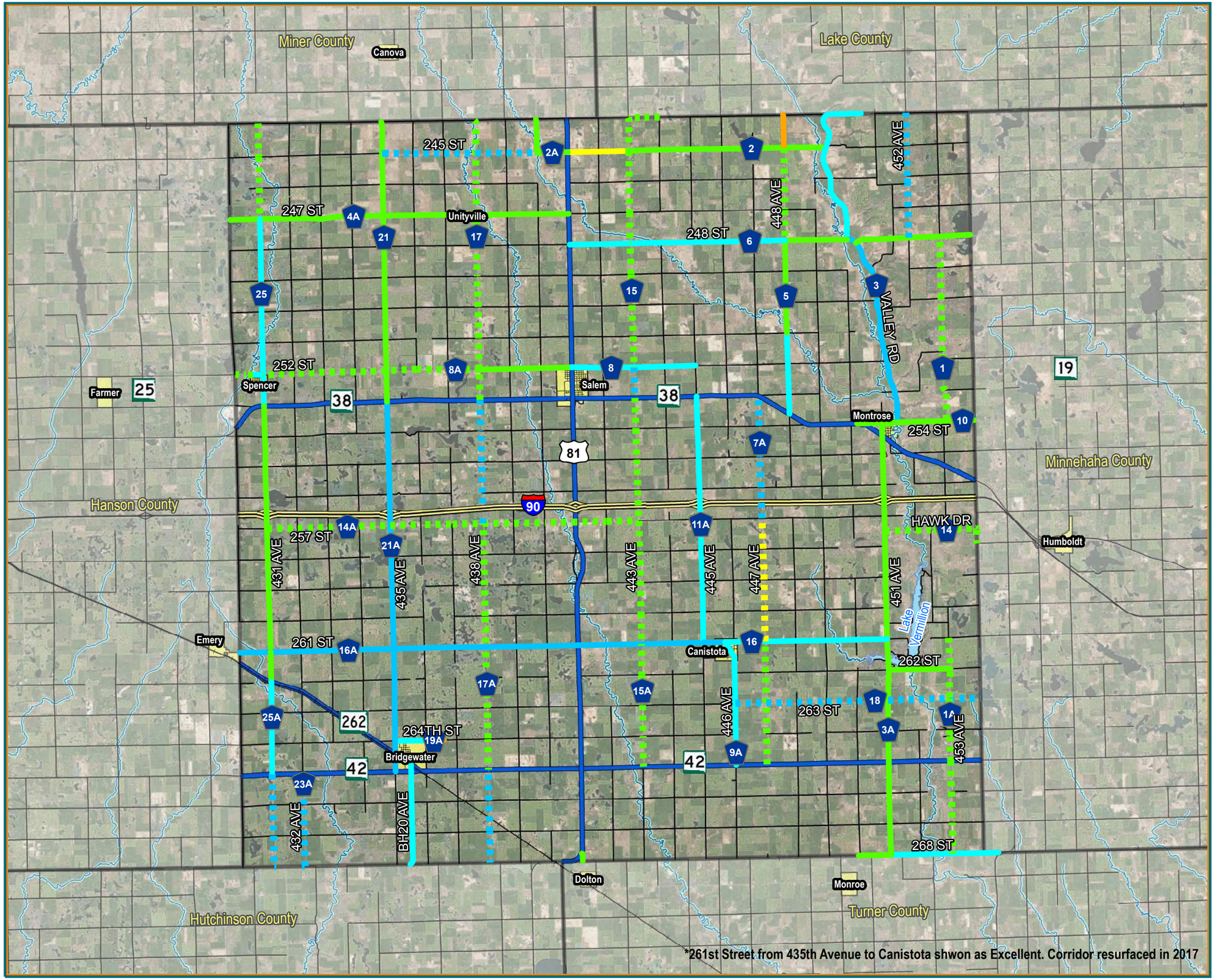
Table 6-8: Gravel Surfacing Rating Summary

Rating Description	McCook County-Jurisdiction Total Miles (2016)
Excellent: 81-100 Gravel surface is in excellent condition with very good rideability. Good gravel thickness and drainage, generally free of any distress.	**35 miles**
Good: 61-80 Adequate gravel thickness, good surface crown and drainage. Moderate loose gravel with slight washboarding and rutting.	**83.5 miles**
Fair: 41-60 Adequate gravel thickness and good surface crown with occasional potholes. Secondary ditches begin to develop along roadway. Moderate loose gravel, washboarding and rutting.	**4.5 miles**
Poor: 21-40 Slow travel speeds required. Minimal roadway crown with moderate potholes. Secondary ditches along over 50% of roadway. Severe loose gravel, washboarding, and rutting. Areas with little or no aggregate.	**0 miles**
Failed: 0-20 Travel on roadway is difficult. Minimal roadway crown with severe potholes. Deep secondary ditches along roadway and filled culverts. Severe washboarding and rutting. Many areas with little or no aggregate.	**0 miles**
2016 Countywide weighted average: 76	

Adapted from Rural Road Condition Survey Guide

McCook County Master Transportation Plan

Figure 6-1
2016 Roadway Surface Condition Rating



- Interstate Highway
- State Highway
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City

Surface Type

- Gravel
- Asphalt

Condition Rating

- Excellent
- Very Good
- Good
- Fair
- Poor
- Failed

N
W E
S

0 1.5 3 Miles

1 inch = 3 miles

HRGreen

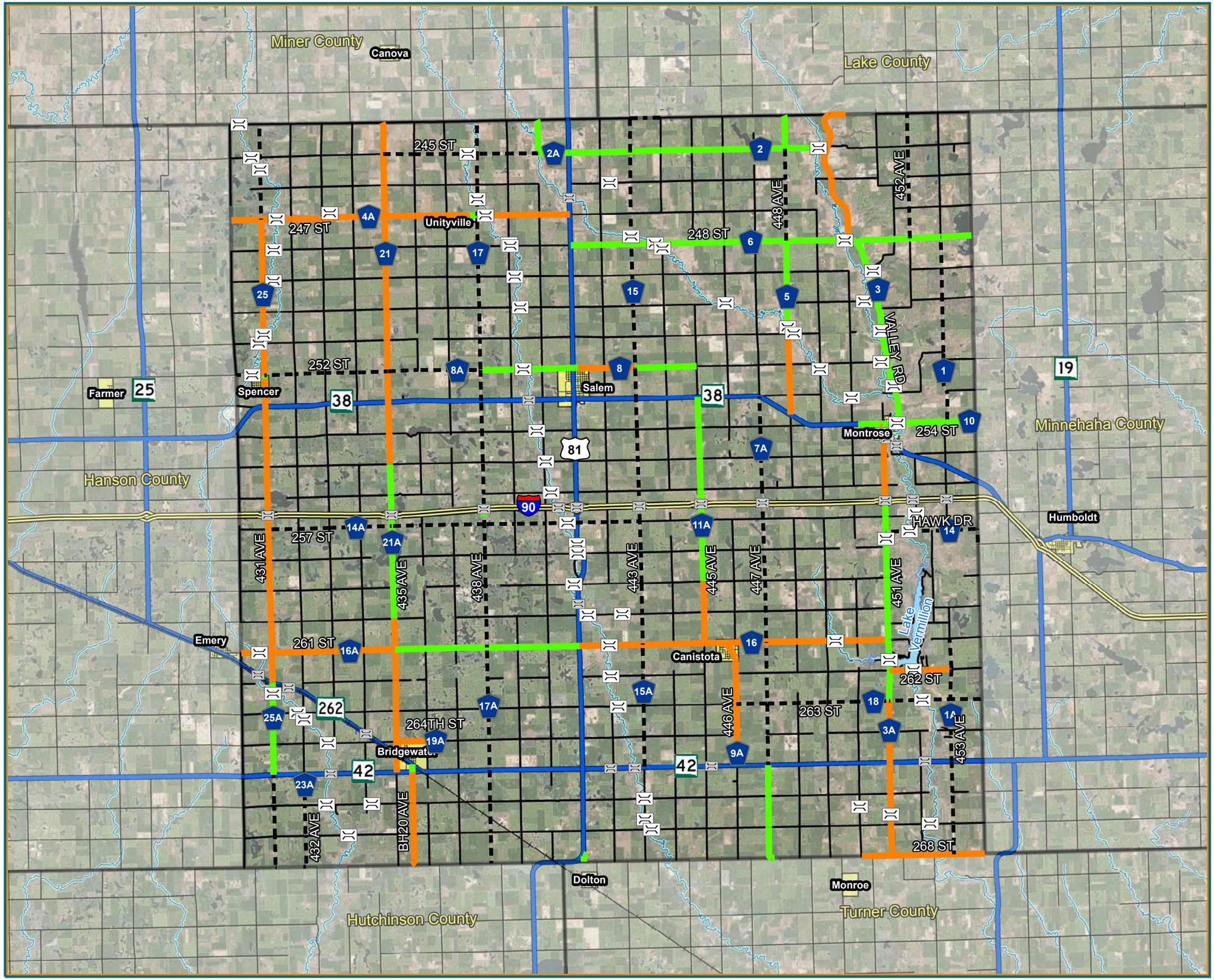


Figure 6-2
Existing Bituminous Roadway Base Thickness

Legend

- Interstate Highway
- State Highway
- Gravel County Roads
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City
- Bridge (County) (69)
- Bridge (State) (29)

County Road Base Thickness*

- At Least 9 Inch Base
- Less Than 9 Inch Base

*Based on roadway core samples, as of 2016. "Less Than 9 Inch Base" segments exhibit at least one core location between sections that indicated less than 9 inches of base thickness.

N
W E
S

0 1.5 3 Miles

1 inch = 3 miles

HRGreen

Roadway Life Cycle Preservation and Maintenance Needs

The McCook County-jurisdiction roadway network was reviewed from a life-cycle perspective to assess preservation and maintenance needs over the next 20+ years. The primary objectives are to optimize the dollars being spent by McCook County and maximize the design life of each investment. Pavements in good condition are in line for simple, routine maintenance or future preservation, while pavements trending towards poor condition are in need for overlay or reconstruction. The initial review of existing roadway surfacing, and potential surfacing changes as initially identified in the Major Roads Plan, establishes a baseline condition for the identification and evaluation of future reconstruction and preservation projects.

Roadway Preservation – Existing Conditions and Recent Activities

The life cycle of typical roadway designs were evaluated for McCook County, starting with asphaltic concrete and blotter roadways. For each bituminous segment, the following factors were considered to understand a segment's history, where it currently was on the respective life cycle, and help predict future performance:

- **Most recent resurfacing or significant investment:** Representative of the starting point, or baseline, of the current life cycle. Shown in Figure 6-3.
- **Most recent chip seal:** Identifies latest preservation-related investment
- **Base and surfacing depth from County roadway cores:** Contributes to estimation of performance over remaining service life by correlating historical performance of roadways with base thicknesses greater than or less than 9 inches.
- **Historical roadway surface condition ratings:** Contributes to estimation of performance over remaining service life. Ratings that are quickly trending downward indicate a major investment may be needed earlier than the initially expected service life while stable ratings may indicate a longer than anticipated service life.
- **Major Roads Plan truck routes and daily traffic:** Contributes to estimation of performance over remaining service life. Segments with high heavy vehicle volumes may degrade quicker than those with low heavy vehicle volumes.

The evaluation of gravel roadways incorporated a review of the following:

- **Base and surfacing depth from County roadway cores:** Provides indication of current gravel thickness and base condition.
- **Historical roadway surface condition ratings:** Provides indication of current gravel thickness and base condition. Historical trends help identify whether roadway has needed more frequent or less frequent resurfacing applications.
- **Major Roads Plan truck routes and daily traffic:** Roadway segments with low traffic volumes often experience less gravel loss and may not need as much gravel during a resurfacing as a higher-volume gravel road.

Evaluation of Potential Surface Changes to Existing Network

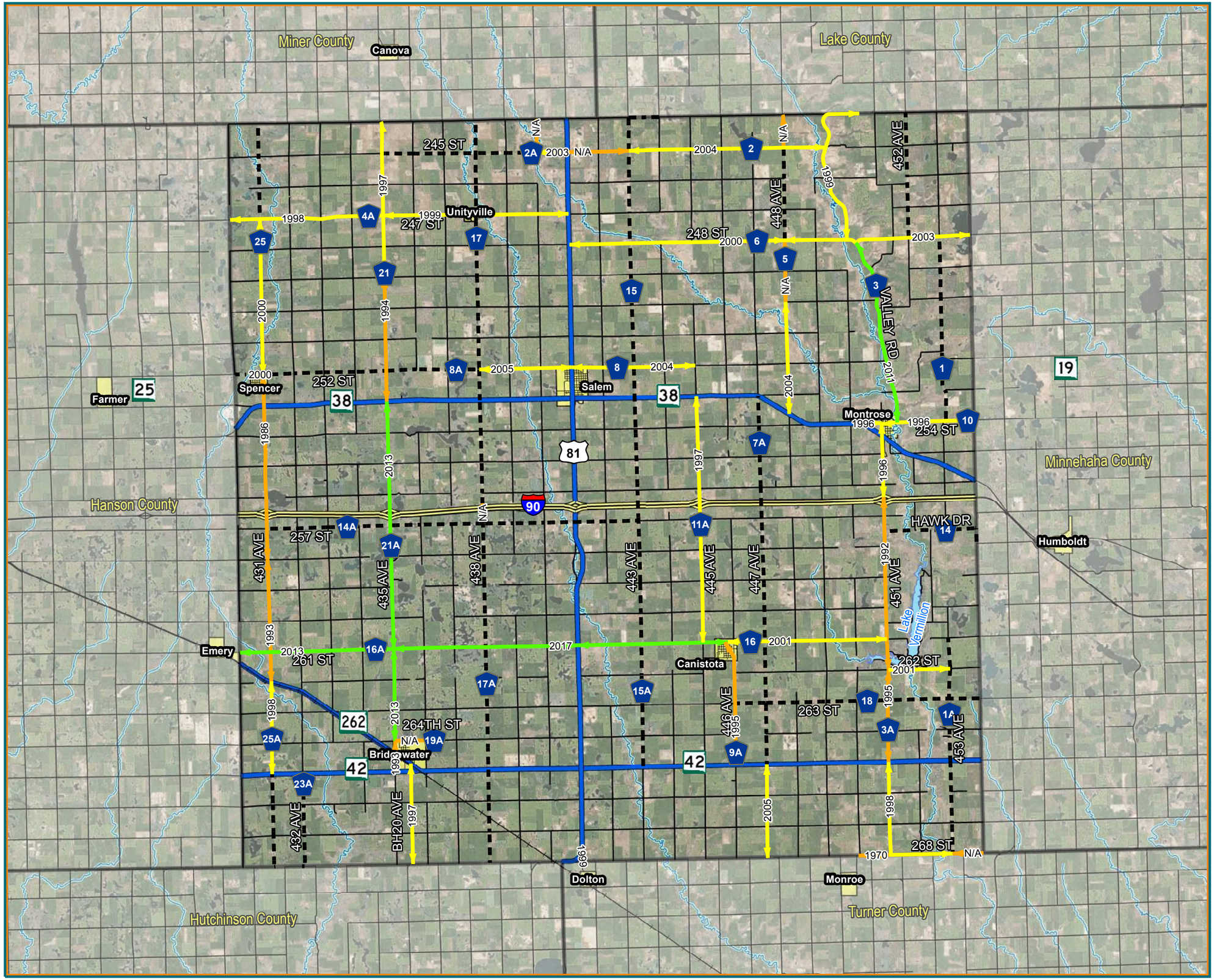
As noted in the Existing Conditions and Needs Assessment chapters of this Plan, multiple McCook County highway segments have been identified as candidates for evaluation of future modifications to roadway surfacing. Traffic volumes, proximity to parallel bituminous-surfaced routes and population density are primary drivers of the proposed changes. However, availability of funding and localized needs, such as destinations along the candidate segment, will also be taken into account in the future evaluation. The candidate segments are shown in Table 6-9 and Figure 6-4.

This process assumes a passive approach to any surface modification, meaning that the existing surfacing will remain in place until a major investment such as an asphalt overlay is required due to surface condition. At that time, the respective segment(s) will be evaluated to determine the appropriate surfacing investment.

For additional information regarding the evaluation process and criteria for selection of the appropriate roadway surfacing type, refer to the Roadway Design, Analysis, and Policy Guidelines chapter.

Table 6-9: Candidate Roadway Surface Change Segments

Route	From	To	Segment Length (miles)	Proposed Change	Considerations
245th Street (CH 2A-2) **440th Avenue (CH 2A)** **448th Avenue (CH 5)**	440th Avenue 244th Street 244th Street	Valley Road 245th Street 245th Street	9 1 1	AC to Gravel; consider blotter on select segments	▪ Low traffic volumes ▪ Proximity to paved parallel route (248th Street; 3 miles) ▪ Evaluate select segments for potential blotter surfacing
252nd Street (CH 8)	443rd Avenue	445th Avenue	2	AC to Gravel or Blotter	▪ Low traffic volumes ▪ Proximity to paved parallel route (SD38; 1 mile)
264th Street (CH 19A)	436th Avenue	437th Avenue	0.5	AC to Gravel or Blotter	▪ Low traffic volumes ▪ Proximity to paved parallel route (SD42; 1 mile)
431st Avenue (CH 25A)	SD262	SD42	3	AC to Gravel or Blotter	▪ Low traffic volumes
453rd Avenue (CH 1A)	262nd Street	SD42	3	Gravel to AC or Blotter	▪ Increasing traffic volumes and development around Lake Vermillion. ▪ Connection to SD42



McCook County Master Transportation Plan

Figure 6-3 Existing Pavement Life-Cycle

Legend

- Interstate Highway
- State Highway
- Gravel County Roads
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City

Most Recent Asphaltic Concrete Overlay

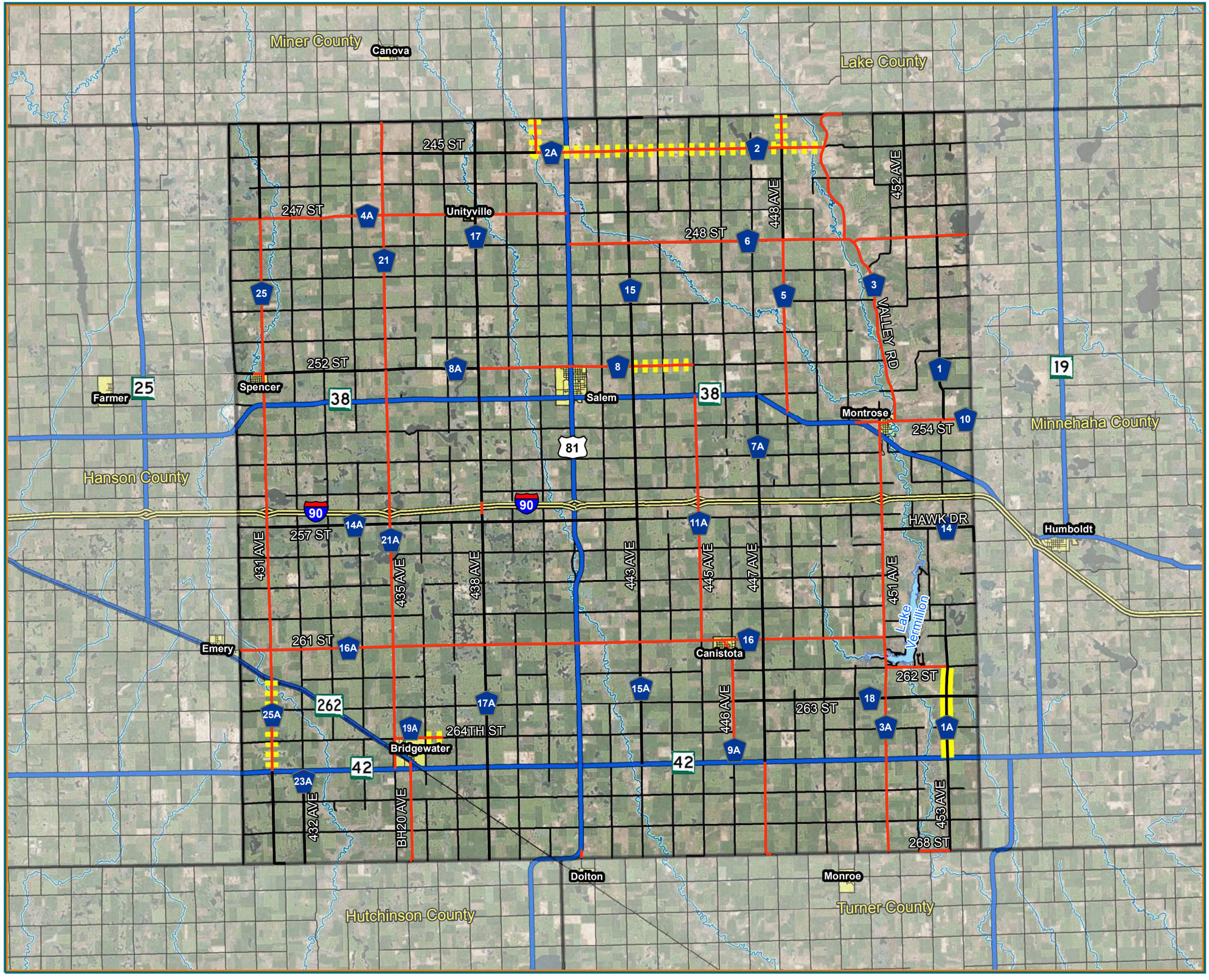
- 1995 and Prior
- 1996 - 2005
- 2006 - 2017

N
W E
S

0 1.5 3 Miles

1 inch = 3 miles

HRGreen



McCook County Master Transportation Plan

Figure 6-4
Highway Segments for Evaluation of Future Surfacing Modifications

Legend

- Interstate Highway
- State Highway
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City

County Roads

- Bituminous
- Gravel/Dirt

Segments for Evaluation of Future Surfacing Modifications

- Existing Bituminous
- Existing Gravel

*Highway segments identified for future evaluation of surfacing modifications involve a passive approach to any modification. The existing surfacing will remain in place until a major investment (such as an asphalt overlay) is required due to surface condition. At that time, the segment will be evaluated to determine the appropriate surfacing investment.

N W E S

0 1.5 3 Miles

1 inch = 3 miles

HRGreen

Roadway Preservation and Maintenance Evaluation

Preservation and maintenance scenarios were developed for the estimation of roadway preservation and maintenance based on different approaches to manage the County-jurisdiction transportation network over the next 20 years. Projected 20-, 40-, and 60-year costs were developed to provide an order of magnitude representation of costs over multiple life cycles for each scenario. A detailed outlay of the Life Cycle Cost analysis is presented in Appendix F.

The scenarios developed, based on short-term and long-term identified needs for the McCook County transportation network, are as follows:

Bituminous Roadways

- **Maintain Existing Network** – Reflects maintaining current system with standard 20-year life-cycle for all asphalt overlays.
- **Major Roads Plan Baseline Conditions** – Follows Major Roads Plan with standard 20-year life-cycle for all asphalt overlays.
- **Major Roads Plan with Base Thickness Considerations** – Follows Major Roads Plan with mix of 20 and 30-year life cycles depending on existing base thickness: 20-year life-cycle if base is less than 9 inches and 30-year life cycle if base is 9 inches or greater. No base improvements in this scenario.
- **Major Roads Plan with Base Improvements** – All roadway segments with less than 9 inches of base are reconstructed to meet or exceed 9-inch base. 30-year life cycle for all asphaltic concrete roadways.

Gravel Roadways

- **Maintain Existing Network** – Reflects maintaining current system with standard resurfacing plan (frequency and gravel depth).
- **Major Roads Plan Baseline Conditions** – Follows Major Roads Plan with standard resurfacing schedule (frequency and gravel depth).
- **Major Roads Plan with Traffic Volume Based Resurfacing** – Follows Major Roads Plan with standard resurfacing frequency. Amount of new gravel material varies by segment daily traffic volumes: segments with low volume (less than 100 vehicles per day) are resurfaced with half the standard gravel thickness (1.5 inches compared to 3 inches).

20-Year Preservation and Maintenance Cost Scenarios (2018-2037)

The estimated annual and total life-cycle costs for each of the preservation and maintenance scenarios are shown in Table 6-10 and Table 6-11. Totals representative of the entire McCook County-jurisdiction roadway network are provided in Table 6-12.

Table 6-10: 20-Year Preservation and Maintenance Scenario Costs (Bituminous Roadways)

	Cost Summary	Maintain Existing Network (2017 $)	Major Roads Plan Baseline Conditions (2017 $)	Major Roads Plan w/ Base Thickness Considerations (2017 $)	Major Roads Plan with Base Improvements (2017 $)
Construction (Overlays) and Chip Seals	Annualized	$1,340,000	$1,280,000	$1,250,000	$1,830,000
Patching/Pavement Maintenance	Annualized	$330,000	$310,000	$310,000	$310,000
Pavement Markings, Signs, and General Maintenance	Annualized	$290,000	$280,000	$280,000	$280,000
Bituminous Roadway Totals	**Annualized Cost**	**$1,960,000**	**$1,870,000**	**$1,840,000**	**$2,420,000**
	Total 20-Yr Cost	**$39,300,000**	**$37,400,000**	**$36,800,000**	**$48,500,000**

Table 6-11: 20-Year Preservation and Maintenance Scenario Costs (Gravel Roadways)

	Cost Summary	Maintain Existing Network (2017 $)	Major Roads Plan Baseline Conditions (2017 $)	Major Roads Plan w/ Traffic Volume Based Resurfacing (2017 $)
Gravel Resurfacing	Annualized	$300,000	$305,000	$230,000
Blading	Annualized	$110,000	$120,000	$120,000
Spot Gravel, Signs, and General Maintenance	Annualized	$285,000	$290,000	$290,000
Gravel Roadway Totals	**Annualized Cost**	**$695,000**	**$715,000**	**$640,000**
	Total 20-Yr Cost	**$13,900,000**	**$14,300,000**	**$12,800,000**

Table 6-12: 20-Year Preservation and Maintenance Scenario Costs Summary (Entire Network)

	Cost Summary	Maintain Existing Network (2017 $)	Major Roads Plan Scenarios* (2017 $)
Bituminous Roadways	Annualized	$1,960,000	$1,840,000 - $2,420,000
Gravel Roadways	Annualized	$690,000	$640,000 - $715,000
Preservation and Maintenance Totals	**Annualized Cost**	**$2,650,000**	**$2,480,000 - $3,135,000**
	Total 20-Yr Cost	**$53,100,000**	**$49,600,000 - $62,800,000**

** Range includes lowest-cost combination and highest-cost combination of bituminous and gravel Major Roads Plan scenarios.*

60-Year Preservation and Maintenance Cost Scenarios (2018-2077)

The Major Roads Plan with Base Improvements scenario was developed with long-range considerations in mind, that a greater investment up front would yield long-term savings by better roadway performance and extended service life. This scenario assumes that the segments identified in Figure 6-2 are reconstructed to provide a thicker base instead of a lower-cost overlay at the time of next major activity. For planning purposes, this would extend the next life cycle to 30 years instead of the 20 years assumed for segments with less than 9 inches of base. Therefore, the benefits of reduced overlay frequency do not begin to be realized until 40 or 60 years from the reconstruction activity.

Figure 6-5 extends the four bituminous scenarios out using current dollars to 2077, 60 years from the base year of this Plan. The initial investment is illustrated in the 2024 to 2042 timeframe, with the Major Roads Plan Base Improvement scenario tracking more expensive than the other three scenarios. By the end of the 60-year horizon, Base Improvement scenario costs are in line with the other Major Roads Plan-based scenarios. When accounting for increases in future-year construction costs (assumed 2 percent increase annually on a straight-line basis from 2017 dollars), the separation of total cost between the Major Roads Plan Base Improvements and Base Thickness Considerations scenarios is negligible and notably less than the other two scenarios as shown in Figure 6-6.

Figure 6-5: 60-Year Preservation and Maintenance Cost Scenarios (2018-2077)

	Bituminous - Major Roads Plan Baseline Conditions (20 yr LC)		Bituminous - Major Roads Plan with Base Improvements (30 yr LC)		Bituminous - Major Roads Plan with Base Thickness Consierations (No Base Improvements; 20 & 30 yr LC)		Bituminous - Maintain Existing Network (20 yr LC)		Gravel - Major Roads Plan Baseline Conditions	Gravel - Major Roads Plan with Traffic Volume Based Surfacing	Gravel - Maintain Existing Network
	40 Year (2017 $)	60 Year (2017 $)	40 Year (2017 $)	60 Year (2017 $)	40 Year (2017 $)	60 Year (2017 $)	40 Year (2017 $)	60 Year (2017 $)			
Construction Yearly Total	$50,419,705	$75,361,955	$58,917,455	$76,544,705	$48,654,555	$71,031,805	$54,051,050	$81,359,300	$13,082,000	$9,792,000	$12,208,000
Maintenance Yearly Total	$23,160,673	$34,458,678	$23,160,673	$34,458,678	$23,160,673	$34,458,678	$24,909,610	$37,364,415	$16,653,695	$16,653,695	$15,733,800
Construction & Maintenance Yearly Total	**$73,580,378**	**$109,820,633**	**$82,078,128**	**$111,003,383**	**$71,815,228**	**$105,490,483**	**$78,960,660**	**$118,723,715**	**$29,735,695**	**$26,445,695**	**$27,941,800**

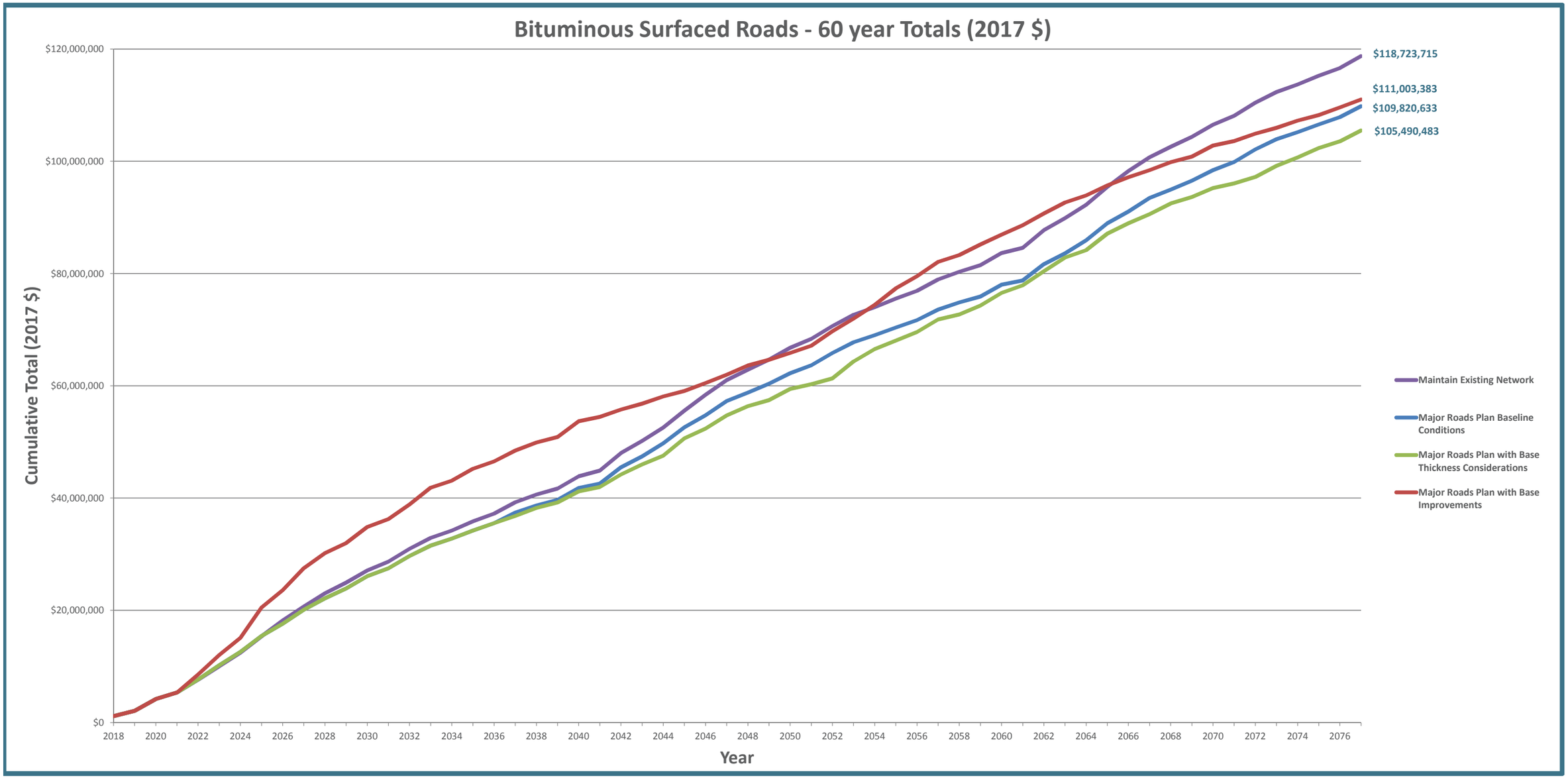
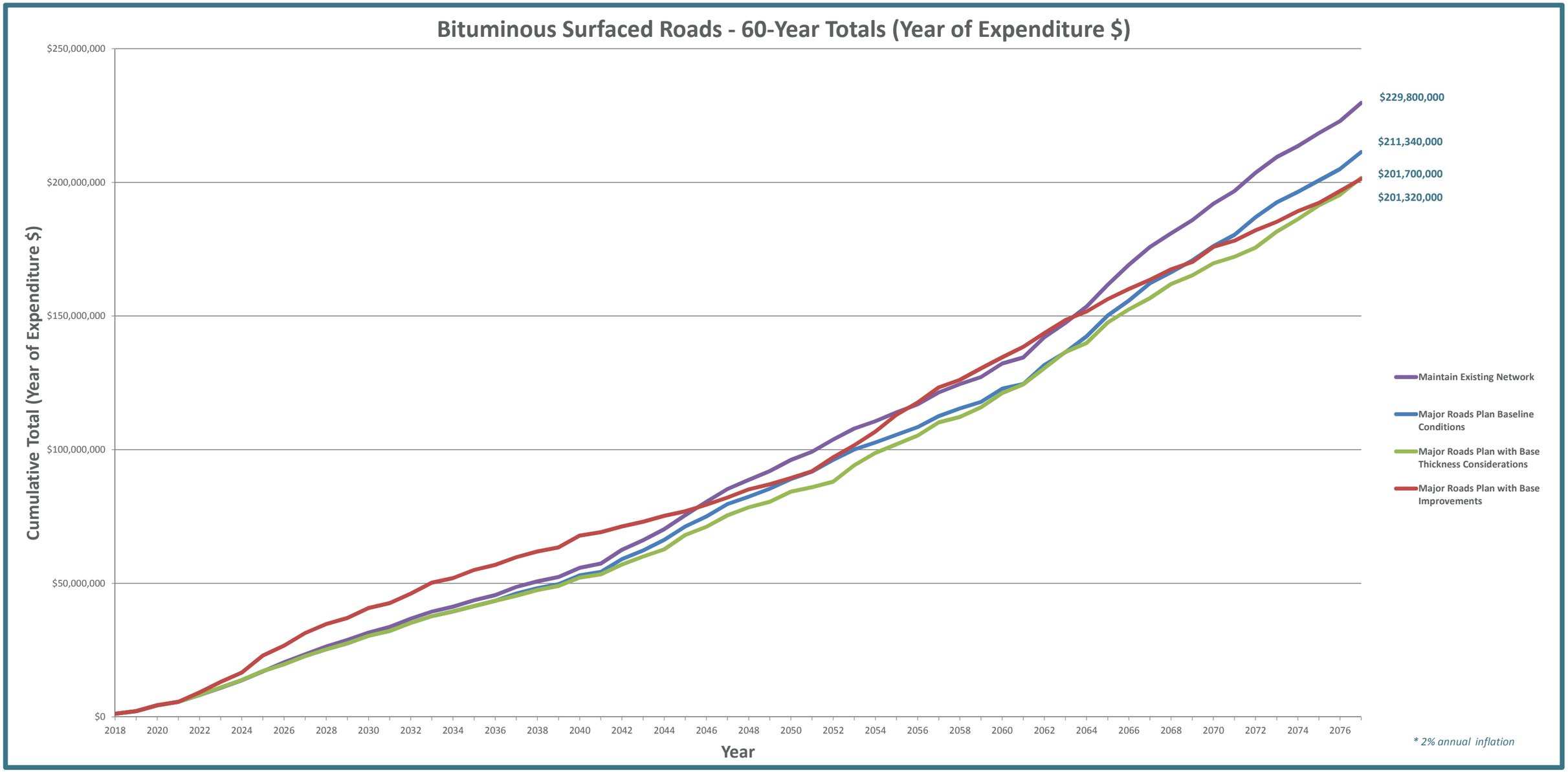


Figure 6-6: 60-Year Preservation and Maintenance Cost Scenarios with Year of Expenditure Dollars (2018-2077)



7. Bicycle and Pedestrian Plan

The Bicycle and Pedestrian Plan provides a framework for incorporating multi-modal accommodations into the transportation network.

Introduction

The McCook County Master Transportation Plan provides a comprehensive review and plan for countywide and regional transportation that includes motorized and non-motorized modes of travel. For non-motorized transportation travel, such as bicycling and walking, accommodations are most common to urbanized areas, shoulders on select US/State highways, and on the travel way of most County and Township roadways. This Plan identifies and prioritizes opportunities to improve multi-modal accommodations and address needs of the County while recognizing funding limitations and incorporating existing infrastructure.

Bicycle and Pedestrian Plan Objectives and Priorities

The Bicycle and Pedestrian Plan was developed to help guide McCook County in multi-modal transportation funding decisions for the next 20+ years. The following objectives and priorities were established for the development of this Plan:

1. Provide an interconnected system of paths, trails, roadway lanes and routes that are multi-purpose, accessible, convenient, and connected within and to/from locations of high multi-modal accessibility demand.
2. Identify opportunities to incorporate feasible multi-modal improvements into existing infrastructure and future projects.
3. Form mutually beneficial partnerships with and among the public, cities and townships, and private sector partners to expand and improve the accessibility of multi-modal services and facilities.

Key design elements of potential multi-modal facility improvements for McCook County include:

- Shoulders along rural County highways
  - Minimum of 4-foot rideable surface width (clear width)
  - May be a designated bicycle lane in urban areas
- Shared-Use Path separated from roadway for bicycles and pedestrians
  - 10-foot width to accommodate 2-way pedestrian and bicycle traffic
- Sidewalk in urbanized areas
  - 5-foot minimum width
- Shared roadway/existing travel way on low-volume facilities

Further design information for these facilities is included in the Roadway Design, Analysis, & Policy Guidelines chapter.

Bicycle and Pedestrian Plan

Desired multi-modal accommodations vary widely, from regional bicycle routes where riders are comfortable riding next to high-speed traffic to pedestrian access separated from the roadway. The Bicycle and Pedestrian Plan provides a systematic approach to implementing feasible multi-modal improvements throughout the County by evaluating existing and projected needs and identifying appropriate improvements.

With consideration to the aforementioned priorities and objectives, the Bicycle and Pedestrian Plan establishes a set of categories based on desired multi-modal accommodations to help guide future improvements.

- Rural Bicycle Routes
  - Primary Bicycle State Route with Paved Shoulder or Shared-Use Path
  - State Route with Limited Bicycle or Pedestrian Accommodations
  - Rural Bicycle Routes
  - County Route with Limited Bicycle or Pedestrian Accommodations
- Urban and Recreational Area Multi-Modal Facilities
- Proposed Projects

The proposed Bicycle and Pedestrian Plan is shown in Figure 7-1. Further discussion on the development of this plan is provided in Appendix G.

Rural Bicycle Routes

Rural bicycle routes have been identified to accommodate longer purpose-driven bicycle-trips, often regional or inter-city trips. Recreational bicyclists may also use these facilities, though there is a comfort level to riding alongside high-speed vehicles on shoulders or within the travel lane. Pedestrian accommodations on these routes would be on the same surface location as bicyclists.

Primary Bicycle Route with Paved Shoulder or Shared-Use Path

Primary bicycle routes for inter-city and regional bicycle travel, typically US/State routes or trails constructed on abandoned railroad lines that provide regional route connectivity and continuity. These routes include wide paved shoulders (minimum of 4-foot wide) that accommodate bicycles outside of the through travel lane. In McCook County, these facilities include US81, SD42, and SD38 as noted in Table 7-1.

Table 7-1: Primary Bicycle Route with Paved Shoulders

Primary Bicycle Route with Paved Shoulder	From	To	Current Rural Typical Cross-Section*
US81	Miner County	Hutchinson County	▪ Travel lane width: 12’ ▪ Paved Shoulder width: varies 8’ to 10’
SD42	Hanson County	Minnehaha County	▪ Travel lane width: 12’ ▪ Paved Shoulder width: varies 4’ to 6’
SD38	Salem (US81)	Minnehaha County	▪ Travel lane width: 12’ ▪ Paved Shoulder width: 4’

**May vary from noted ‘typical’ at certain locations within McCook County*

State Route with Limited Bicycle or Pedestrian Accommodations

This category identifies segments along the State system that currently exhibit a typical roadway section that lacks shoulders wide enough to accommodate bicycles completely outside of the travel lane. In many instances, these roadway sections include a 28-foot paved surface (12-foot lanes and 2-foot shoulder) and turf shoulders. The following segments in Table 7-2 are recommended for consideration of shoulders to improve multi-modal connectivity as part of the next resurfacing or improvement project.

Table 7-2: State Routes with Limited Bicycle or Pedestrian Accommodations

State Route	From	To	Current Typical Cross-Section*
SD38	Salem (US81)	Minnehaha County	▪ Travel lane width: 12' ▪ Paved Shoulder width: 2'
SD262	Bridgewater (SD42)	Hanson County	▪ Travel lane width: 12' ▪ Paved Shoulder width: 2'

Rural Bicycle Route w/Paved Shoulder or Shared-Use Path

McCook County-jurisdiction paved roadways identified as potential future shoulder or shared-use path connections between urbanized areas, recreational areas, and the Primary Bicycle State Route with Paved Shoulder or Trail facilities. Until improvements are in place, these segments exhibit similar characteristics as a 'Rural Bicycle Route'. Multi-modal improvements recommended for consideration along these routes, to be done in conjunction with future resurfacing or reconstruction activities are listed in Table 7-3.

Table 7-3: Rural Bicycle Routes with Paved Shoulders or Shared-Use Path

Rural Bicycle Route w/Paved Shoulders or Shared-Use Path	From	To	Length (miles)	Key Connections
261st Street (CH 16)	Canistota	Lake Vermillion (451st Avenue)	5	Connects Canistota to Lake Vermillion area
262nd Street (CH16)	451st Avenue	453rd Avenue	2	Connects 451st Avenue with residential development along 262nd Street
431st Avenue (CH 25)	Spencer	SD38	0.5	Connects Spencer with SD38
451st Avenue (CH 3A)	Montrose	Lake Vermillion	7	Connects Montrose with Lake Vermillion area
451st Avenue (CH 3A)	Lake Vermillion	SD42	4	Connects Lake Vermillion area with SD42 Primary Bicycle Route

Rural Bicycle Route

Remaining McCook County-jurisdiction paved roadways as identified in the Major Roads Plan. These highways typically exhibit narrow or no shoulders, low volumes, and traverse across flat to rolling terrain. Because of the low vehicular volumes, these roadways are conducive to shared right-of-way travel (bicyclist in travel lane, pedestrian on edge of travel lane[9]). These facilities could be considered for 'Rural Bicycle Route w/Paved Shoulder or Shared-Use Path' on a case-by-case basis.

County Route with Limited Bicycle or Pedestrian Accommodations

McCook County-jurisdiction roadways with gravel surfacing provide limited opportunities for bicycle mobility and may be difficult for pedestrian travel.

[9] Not the recommended situation, but difficult to address in all circumstances in rural areas.

Urban and Recreational Area Multi-Modal Facilities

Urban and Recreational Areas represent areas of higher multi-modal demand that may require a multi-faceted approach to provide facilities for a wide variety of users. The following areas have been identified in McCook County

- Lake Vermillion area
- Salem
- Montrose
- Canistota
- Bridgewater
- Spencer

The Lake Vermillion Recreation Area and surrounding development represents a concentrated area likely to see some of the largest demand for pedestrian and bicycle facilities from both seasonal recreation visitors and residents living around the lake.

Municipalities within the County also exhibit a concentrated demand for bicycle and pedestrian facilities. While much of this falls within the local City jurisdiction, developing urban fringe areas often do not have the multi-modal amenities and connectivity that are typically established in the cities.

Users of facilities in these areas will likely vary with regard to trip purpose, experience, and comfort level around vehicular traffic. Therefore, this Plan illustrates a multi-modal approach in Urban and Recreational Areas of incorporating off-street facilities, such as sidewalks or share-use paths, in addition to paved shoulders on designated bike routes as identified in the more rural areas. Connectivity and continuity of facilities with similar elements helps accommodate the variety of users expected in these areas and avoiding multi-modal barriers or 'islands' that lack internal connections to/from the areas where the demand originates.

Shared-use path projects that accommodate bicycle and pedestrian use away from the highway travelway have been identified to provide multi-modal connectivity. Due to the nature commensurate with the identified area, shared-use paths are the preferred improvement to remove users away from the roadway travelway; however, shoulders may be considered as a potential improvement.

Table 7-4: Urban and Recreational Area Bicycle and Pedestrian Improvements

Multi-Modal Improvement Route	From	To	Length *(Miles)*	Improvement	Key Connections
451st Avenue (Montrose)	Kluckholm Street	Lynn Avenue	0.45	Shared-Use Path	Connects residential area south of SD38 with school and Montrose
262nd Street (CH 16)	451st Avenue *(Sundal Drive)*	453rd Avenue *(Sunset Bluff Drive)*	2.0 *(0.8)*	Shared-Use Path or Shoulders	Connects residential areas on east and west side of lake *(Optional local road to local road connection along corridor)*
451st Avenue (CH 3A)	262nd Street *(Quail Drive)*	261st Street *(Lake Vermillion Rec Area)*	1.0 *(0.4)*	Shared-Use Path or Shoulders	Connects Lake Vermillion Recreation Area with surrounding residential areas *(Optional local road to local road connection along corridor)*

Implementation Considerations

The installation of countywide bicycle and pedestrian facilities is a prohibitively difficult and expensive undertaking if done within a short timeframe. Implementation of proposed bicycle and pedestrian improvements should be undertaken through an incremental process that leverages existing infrastructure and prioritizes improvements to enhance connectivity for non-motorized travel.

Improvements or new facilities identified in this Bicycle and Pedestrian Plan should be considered as opportunities arise. Many of these locations, particularly roadway segments identified for shoulders, have a companion roadway improvements project where multi-modal improvements could coincide with improvements to the roadway. The Plan also identifies long-term desires by the County that can be implemented through potential grants and land development projects. Regardless of funding source and location of the improvement, multi-modal facility maintenance requirements and responsibilities should be identified as part of the grant application process and/or preliminary design.

Design guidance for multi-modal accommodations is provided in the Roadway Design, Analysis, & Policy Guidelines chapter. Further discussion and guidance of bicycle and shared-use facilities is provided in the SDDOT Road Design Manual.

Illustrative rendering of potential shared-use path along 451st Avenue in Montrose

(Top: Looking south from SD38; Bottom: Looking south towards SD38)

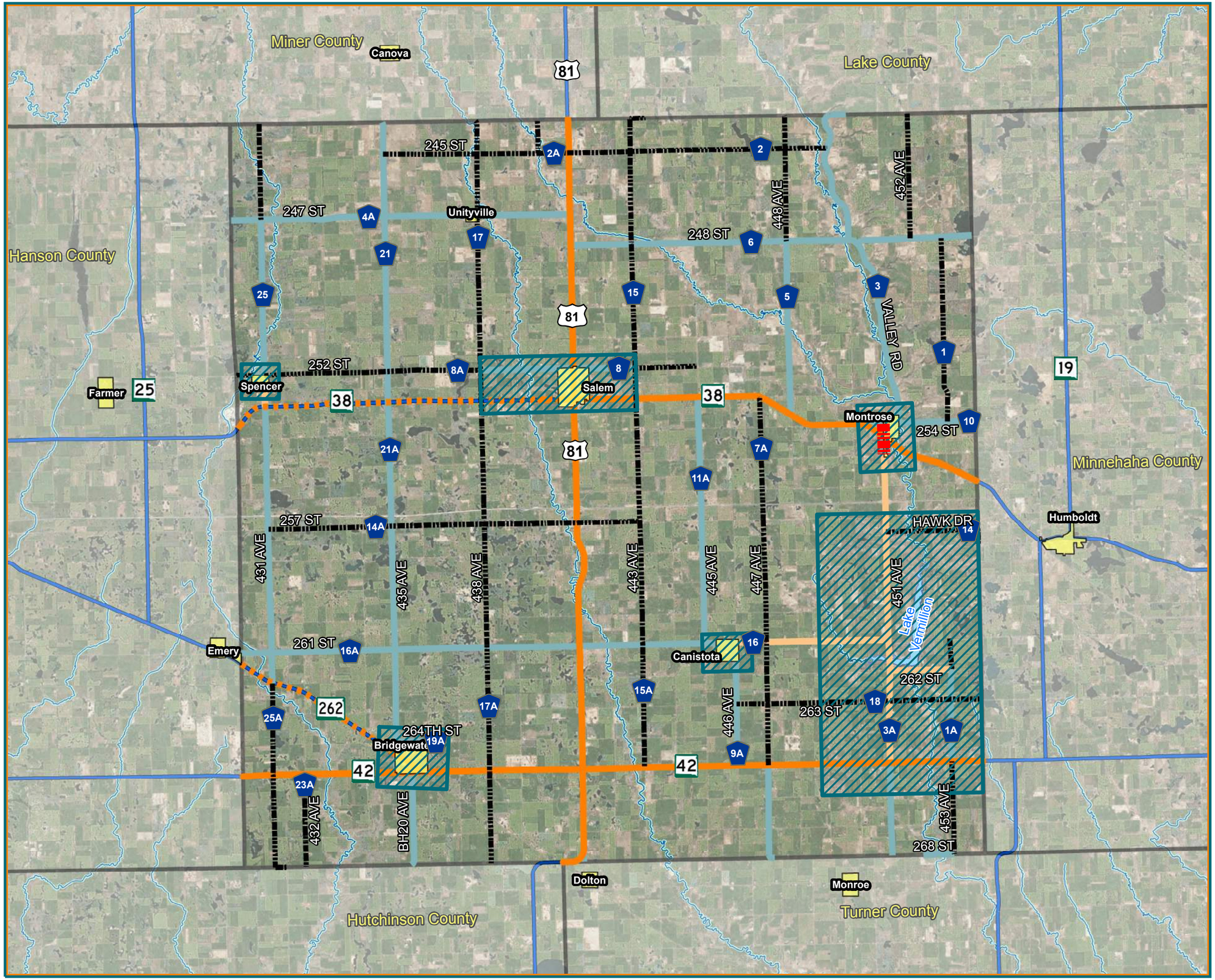


Figure 7-1 Bicycle and Pedestrian Plan

Legend

- Urban and Recreational Area (Multi-modal facilities)
- Proposed Sidewalks/Shared-Use Paths
- Primary Bicycle Route w/ Paved Shoulder or Shared-Use Path
- State Route with Limited Bicycle or Pedestrian Accommodations
- Rural Bicycle Route w/ Paved Shoulder or Shared-Use Path
- Rural Bicycle Route
- County Route With Limited Bicycle or Pedestrian Accommodations
- State Highway
- Rivers/Streams
- Lakes
- City

N
W E
S

0 1.5 3 Miles

1 inch = 3 miles

HRGreen

8. Roadway Design, Analysis, & Policy Guidelines

This section covers a range of roadway design guidance, traffic operational measures, and policy guidelines for McCook County. In many instances, this guidance supplements established design and operations manuals and policies, which are referenced throughout.

McCook County Roadway Design Guidelines

Typical Roadway Cross-Sections for New or Reconstructed Roadways

Typical roadway cross-sections were developed to supplement the Major Roads Plan and meet the long-term needs and objectives of new and reconstructed McCook County roadways. These cross-sections are based on the engineering design guidelines presented in the following documents[10]:

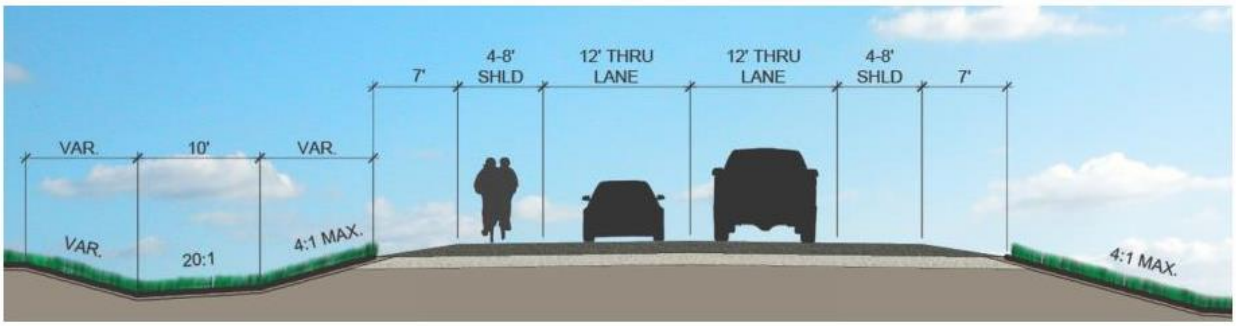
- American Association of State Highway and Transportation Officials (AASHTO) Policy on Geometric Design of Highways and Streets 6th Edition (2011)
- SDDOT Road Design Manual (February 2017 revision)
- SDDOT Local Roads Plan (2011 update)

The typical roadway cross-sections are defined in three categories by the Major Roads Plan: Bituminous – Primary Truck Route, Bituminous, and Gravel. Gravel roadways are further sub-divided into County Highways and County and Township Low Volume segments. Supplemental typical sections are also presented for Bituminous – County Highways on Bicycle Routes (as identified in the Bicycle and Pedestrian Plan), and an Urban Section for urban fringe areas and County roadways within City corporate limits. With respect to the Urban Section, McCook County participation is limited to a 28-foot surfacing width. Everything outside of the 28-foot width is the responsibility of the City.

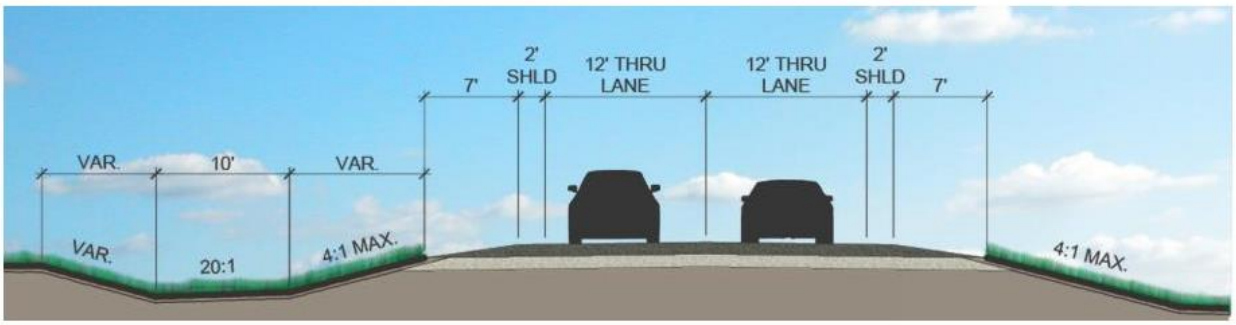
The SDDOT Local Roads Plan recommends that right-of-way (ROW) width should not be less than what is required for all elements of the design cross-section, utility accommodation, and appropriate border areas; including roadside ditches for drainage. McCook County requires a minimum of 100 feet of ROW width prior to roadway reconstruction.

[10] Design guidelines subject to change in future manual revisions. The proposed typical cross-sections are based on design guidelines current to publication of this Plan. The designer should use his or her professional judgment when determining the final roadway design. Each manual presents guidelines on roadway and roadside design as well as respective minimum design elements and criteria.

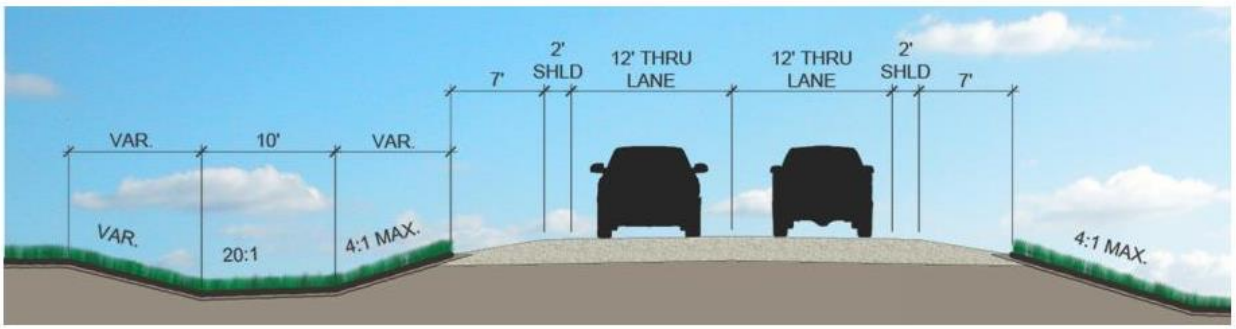
BITUMINOUS – PRIMARY COUNTY HIGHWAY TRUCK ROUTE



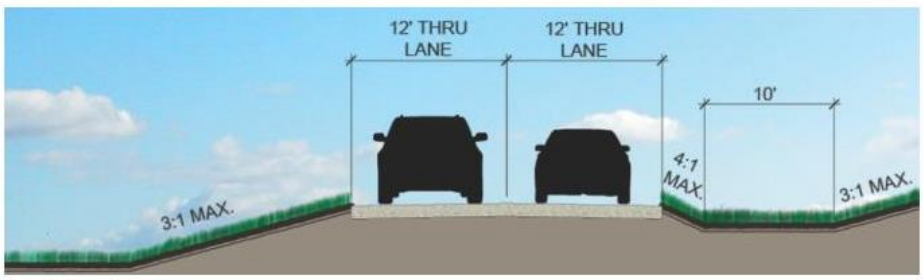
BITUMINOUS – COUNTY HIGHWAYS (28-FT. WIDTH TYPICAL)



GRAVEL – COUNTY HIGHWAYS



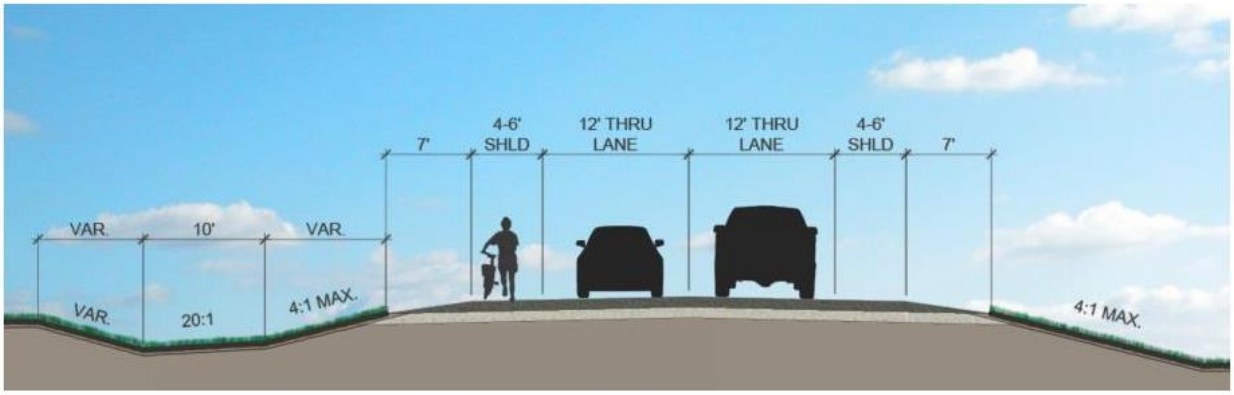
GRAVEL – COUNTY AND TOWNSHIP LOW VOLUME



*DITCH SIZE DEPENDENT ON DRAINAGE ANALYSIS AND EXISTING GRADE

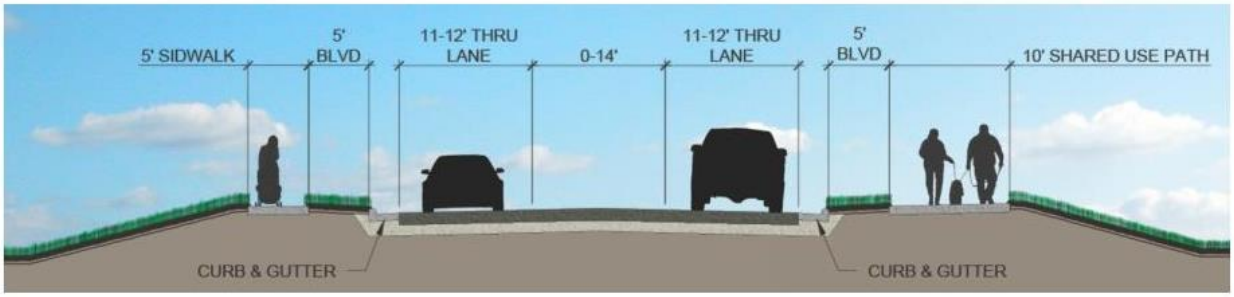
Figure 8-1: Typical Roadway Cross-Sections

BITUMINOUS – COUNTY HIGHWAYS ON BICYCLE ROUTES



URBAN SECTION

*URBAN FRINGE AREAS & WITHIN CITY LIMITS
*COUNTY PARTICIPATION LIMIT IS 28' SURFACING WIDTH



TYPICAL ROADWAY SURFACE CROSS-SLOPES

TRAVEL WAY***
- ASPHALT CONCRETE 2%
- OTHER ASPHALT SURFACING 2%
- GRAVEL 4%
- OTHER GRANULAR SURFACE 4%

SHOULDERS****
- PAVED 4%
- GRANULAR 4%

***Urban facilities may be increased to 3%

****See pedestrian/bicycle facilities for further discussion regarding shoulder treatments to accommodate pedestrians and bicyclists on shoulders.

TYPICAL SECTION NOTES

*Shoulder width may be adjusted based on design year traffic forecasts. Refer to latest version of South Dakota Department of Transportation Local Roads Plan for guidance.

Right-of-way (ROW) width varies by location. McCook County requires 100' ROW width prior to roadway reconstruction.

See pedestrian/bicycle facilities typical sections for incorporation of side paths or shared use paths.

Figure 8-1: Typical Roadway Cross-Sections (cont.)

Roadway Surfacing Standards

Roadway surface type is an important consideration to the functionality and life cycle of a roadway segment. McCook County has historically focused on bituminous-surfaced roadways and gravel surfaced roadways throughout the County. Recent exploratory blotter surfacing has been installed on a 3-mile segment of 448th Street with favorable results and is a feasible option for the County in the future. Key considerations to the appropriate scenarios for surfacing implementation and design are as follows.

Gravel Roadway Surfacing Design

Gravel roadways are typically used on the lowest volume roads in McCook County, focusing on local connectivity and access. Gravel roadways should be designed per guidance provided in the most current editions of the SDDOT Local Roads Plan, AASHTO's Guidelines for Geometric Design of Very Low-Volume Local Roadways, and South Dakota Local Transportation Assistance Program (SD LTAP) Gravel Roads Maintenance and Design Manual.

Generally, the thickness of the gravel surfacing depends on a design determination of equivalent single axle loads (ESAL), number of heavy trucks, quality of gravel available, and the existing soil or subgrade. AASHTO (Guide for Design of Pavement Structures, 1993) has developed a 10-step process for the design of gravel thickness, shown in Figure 8-2.

Figure 8-2: AASHTO Gravel Thickness Design Method Process

AASHTO Guide for Design of Pavement Structures (1993)

Two supplemental tables have been provided to incorporate select pieces of data required in the AASHTO method to recommend gravel-surfacing thickness. These methods do not incorporate all of the parameters in the AASHTO method and rely on assumptions to develop the recommended minimum gravel layer thickness.

Table 8-1: Recommended Gravel Thickness for New or Reconstructed Rural Roads – Based on Heavy Trucks and Subgrade Support Condition

Estimated Daily Number of Heavy Trucks	Subgrade Support Condition (Based on California Bearing Ratio [CBR])	Recommended Minimum Gravel Layer Thickness (in.)
0 to 5	Less than or equal to 3 percent	6.5
	3.1 percent to 10 percent	5.5
	Greater than 10 percent	4.5
5 to 10	Less than or equal to 3 percent	8.5
	3.1 percent to 10 percent	7.0
	Greater than 10 percent	5.5
10 to 25	Less than or equal to 3 percent	11.5
	3.1 percent to 10 percent	9.0
	Greater than 10 percent	7.0
25 to 50	Less than or equal to 3 percent	14.5
	3.1 percent to 10 percent	11.5
	Greater than 10 percent	8.5

Adapted from FHWA Gravel Roads Construction and Maintenance Guide (August 2015)

Table 8-2: Recommended Gravel Thickness for New or Reconstructed Rural Roads – Based on Equivalent Single Axle Loads and Subgrade Support Condition

18-kip Equivalent Single Axle Loads	Subgrade Support Condition	Recommended Minimum Gravel Layer Thickness (in.)
10,000 – 30,000	Very Poor	10
	Poor	9
	Fair	7
	Good	7
	Very Good	6
30,000 – 60,000	Very Poor	Higher type pavement design recommended
	Poor	Higher type pavement design recommended
	Fair	12
	Good	12
	Very Good	11
60,000 – 100,000	Very Poor	Higher type pavement design recommended
	Poor	Higher type pavement design recommended
	Fair	17
	Good	17
	Very Good	15

Aggregate Surfaced Road Design Catalog, AASHTO Guide for Design of Pavement Structures (1993). Based on U.S. Climatic Region III

Asphaltic Concrete Roadway Surfacing Design

Design of asphaltic concrete surfacing thickness should be based on the latest edition of AASHTO's Guide for Design of Pavement Structures and current SDDOT Standards. For low-volume roads that are to be surfaced with asphaltic concrete, the low volume road design method may be used based on AASHTO's Guidelines for Geometric Design of Very Low-Volume Local Roadways.

Recommended pavement thickness for asphaltic concrete and blotter surfacing on County highways is shown in Table 8-3. These recommended minimums apply as both a minimum design and basis for estimation of future project costs; however, are not intended to replace a pavement design analysis.

Table 8-3: Recommended Minimum Bituminous Surfacing Thickness for McCook County Highways

	Base	Surface
Asphaltic Concrete with Aggregate Base	10" Aggregate (minimum) 12" Aggregate (preferred)	3" AC (2 - 1.5" lifts)
Blotter with Aggregate Base	12" Aggregate	Blotter Surfacing

For new and reconstructed facilities.
Site conditions will dictate actual pavement thickness on project-by-project basis

Blotter (Asphalt Surface Treatment) Roadway Design

A blotter-surfaced roadway is an intermediate step between a gravel and paved-surface roadway where a surface treatment is placed on a granular base. A typical application consists of a layer of bituminous surface treatment less than one-inch thick with a top course of aggregate chips placed over a thick granular base. The bituminous surface treatment can significantly reduce dust, loose material, and washboard issues of a low-volume gravel road. A blotter surface may not be suitable for routes with high traffic volumes or notable truck volumes, as it provides minimal structural stability and may break down relatively quickly.

Selection of Roadway Surfacing Type

Several resources are available to provide guidance on how to select what surface type is best suited for a roadway segment. The 2015 revision of the FHWA Gravel Roads Construction and Maintenance Guide provides a 10-part answer to the question of "Should we pave this gravel road?" The SDDOT published a Local Road Surfacing Criteria study in 2004 that outlines recommendations for surfacing criteria for local roads. It also provides a detailed cost model to aid local agencies in selection of appropriate road surfacing criteria.

The following outlines a recommended process to determine appropriate surfacing for a given roadway segment using both quantitative and qualitative measures to consider the unique nature of individual roadway segments.

1. Identify Road Section Limits
    a. Project limits and logical termini
    b. Average Daily Traffic (ADT) and truck (large vehicle) volumes
    c. Integration and continuity with McCook County Major Roads Plan
2. Determine Design Alternatives
    a. Review segment issues, needs, and formulate objectives
    b. Identify design standards and improvements needed for each alternative due to a conversion
3. Determine Agency Costs
4. Determine User Costs

5. Summarize and Compare Total Costs
6. Evaluate Non-Economic Factors
    a. Growth rates and anticipated urbanized expansion
    b. Residential development and density
    c. Mail and bus routes
    d. Agriculture, industry, and truck traffic
    e. Political factors
    f. Public feedback

Design Guidance

Further guidance and best practices in roadway design is provided in the latest versions of following documents:

- A Policy on Geometric Design of Highways and Streets (AASHTO)
- SDDOT Road Design Manual
- SDDOT Local Roads Plan

Roadway Safety Improvements

A review of crash history throughout McCook County between 2011 and 2015 indicated that nearly 85 percent of the 855 reported crashes involved only a single vehicle (typically a roadway departure) or animal crashes. The other 15 percent involved a collision between at least two vehicles, which reflects the rural nature of the County and limited exposure of vehicle-vehicle conflicts. Overall, nearly 50 percent of the crashes were vehicle-animal crashes. Discernable trends were difficult to ascertain as the vehicle-animal crashes and roadway departure crashes tended to be scattered in a random nature across the County.

In February 2014, the SDDOT released the South Dakota Strategic Highway Safety Plan to provide a comprehensive, statewide approach to addressing roadway and roadside safety. The plan utilizes a data-driven, multi-year framework to reduce fatal and serious injury crashes. Seven safety emphasis areas were identified, regarding respective issues, goals, actions, and priority safety strategies:

- Roadway Departure
- Intersections
- Motorcycles
- Unbelted Vehicle Occupants
- Speeding-Related
- Drug- and Alcohol-Related
- Young Drivers

In an effort to reduce the fatal and serious injury crash rates, McCook County should continue to partner with the SDDOT and South Dakota Department of Public Safety to integrate safety improvement efforts with the process, guidelines, and strategies identified in the latest version of the South Dakota Strategic Highway Safety Plan. In collaboration with other local agencies, these partnerships will assist in providing a comprehensive approach to preventing and reducing the severity of crashes on all roadways throughout McCook County.

A network-wide, programmatic approach of continually improving roadway surface and roadside features is a proactive measure in helping reduce severity of random roadway departure crashes. This involves a combination of upgrading roadway segments to meet current design standards, spot safety improvements, or safety improvements integrated into larger maintenance, preservation, and reconstruction projects. Particular attention should be noted

along the SD42 corridor and around the Lake Vermillion Recreation Area as traffic volumes continue to increase due to recent and projected development.

Further guidance on safety strategies is available at the following:

- SDDOT Strategic Highway Safety Plan http://sddot.com
- FHWA Office of Safety http://safety.fhwa.dot.gov
  - FHWA Proven Safety Countermeasures http://safety.fhwa.dot.gov/provencountermeasures
  - FHWA Local and Rural Road Safety Program http://safety.fhwa.dot.gov/local_rural
- AASHTO Roadside Design Guide

Railroad Crossings Safety Improvements

Railroad crossings are primarily located in the southwest corner of the County along an existing BNSF line that parallels SD262 in a northwest to southeast diagonal direction. Sixteen public roadway-rail crossing intersections are currently noted within McCook County.

While only one vehicle-train crash has been reported in McCook County since 1996, conflicts at low volume crossings often entail random circumstances and causal factors. However, while there may not be a historical trend in crashes at a particular crossing (often due to this limited train-vehicle exposure), underlying safety issues may still be present that create risks for both the motorist and train.

It is recommended that continual improvements be applied to existing and any new crossings in the future based on the random-nature of these crashes. New proven safety measures and technology improvements are continuously evolving through research and implementation. One aspect of a continual railroad improvement program is identification of potential vehicle-train, pedestrian-train, and vehicle-vehicle conflict points. Consideration to vehicle-train crash causal factors as well general traffic operations and meeting driver expectancy should be accounted for in future designs and modifications of existing crossings. These considerations include such items as:

- Crossing geometrics: Intersection skew, sight distance, proximity to driveways, etc.
- Crossing control: Gates, flashing lights, cross-bucks, etc.
- Provide smooth crossings
- Remove rails from abandoned tracks at a crossing
- Pavement markings
- Pavement condition/crossing condition
- Excessive vehicle speeds
- Traffic signal preemption timing
- Detection of blocked crossings for emergency responders
- Pedestrian crossings

Traffic Control Warrants

The Manual on Uniform Traffic Control Devices (MUTCD) contains the basic principles that govern design and use of traffic control devices for public streets and highways. The MUTCD should be used to evaluate the design and proper traffic control device for each intersection and roadway, using the following guidelines (see MUTCD 2009 Edition for additional guidance).

An engineering study should be conducted to identify appropriate traffic control measures. The study incorporates factors to consider in the establishment of intersection control and includes:

- Vehicular, bicycle, and pedestrian traffic volumes on all approaches

- Number and angle of approaches
- Approach speeds
- Sight distance available on each approach
- Reported crash experience

Conditions have been established in the MUTCD to provide guidance on the use or consideration of YIELD and STOP signs. These conditions are specific to application and are based on the aforementioned factors when evaluating the establishment of intersection control.

In locations where dynamic means of traffic control may be desired, the following traffic signal warrants are analyzed to help in the analysis of whether to install a traffic signal.

Warrant 1: Eight-Hour Vehicular Volume
Warrant 2: Four-Hour Vehicular Volume
Warrant 3: Peak Hour
Warrant 4: Pedestrian volume
Warrant 5: School Crossing
Warrant 6: Coordinated Signal System
Warrant 7: Crash Experience
Warrant 8: Roadway Network
Warrant 9: Intersection Near a Grade Crossing

It should be noted that the MUTCD 2009 Edition states, "The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal". Further information on the traffic control signal needs studies, the standard, guidance, and options is provided in the latest edition of the MUTCD.

Turn Lane Warrants

Along highway segments with high traffic volumes or a relatively high volume of large turning vehicles, it is often advantageous to install turn lanes at unsignalized intersections to improve intersection operations and safety. The primary benefit is removing turning traffic from the through travel lane and reducing the risk of rear-end crashes. Removing turning traffic from the through lane also improves intersection operations by reducing the amount of delay a vehicle would experience if a turning vehicle slowing or waiting for a gap in traffic blocked the through lane.

The SDDOT Road Design Manual details considerations for the installation of a left- and right-turn lane at unsignalized intersections. These considerations are applicable at all types of roadway or driveway intersections and work hand-in-hand with established access management policies and County ordinances.

At unsignalized intersections, the following items are recommended for consideration in the determination of whether a left-turn lane is warranted:

- Traffic volume
    - Left-turn volume (vehicles per hour)
    - Opposing and advancing volume (in design hour)
- Crash history
- Special cases, when applicable
    - Railroad crossings
    - Geometric/Safety concerns
    - Presence of non-traversable medians

For the evaluation of right-turn lane warrants, the following items are recommended for consideration:

- Traffic volume
  - Left-turn volume (vehicles per hour)
  - Opposing and advancing volume (in design hour)
- Crash history
- Special cases, when applicable
  - Railroad crossings
  - Geometric/Safety concerns

At signalized intersections, it is typically advantageous to install a left-turn lane in terms of traffic operations and safety, while a right-turn lane is generally determined based on signal capacity needs or operational/safety improvements by removing turning vehicles from the through lane.

In all instances, access spacing and current roadway design standards apply to the design and installation of a turn lane. The design shall safely accommodate the necessary process of the turning movement and not create new safety issues. The process for application and assessment of turn-lane warrant criteria is outlined in detail within Chapter 15, Traffic, of the SDDOT Road Design Manual.

Traffic Analysis Guidelines

Traffic Operations Analysis Thresholds

It is recommended that McCook County establish minimum acceptable operational thresholds using methodology consistent with SDDOT guidelines in the analysis of existing or planning-year traffic conditions. The most current edition of the Highway Capacity Manual quality of service measures of highway facilities and intersections in relation to traffic demand is described through a Level of Service (LOS) rating.

The two most common operational measures applicable to McCook County include the assessment of rural/urban fringe two-lane highways and intersections. The Highway Capacity Manual 6th Edition (HCM6) calculates the estimated percent time spent following and average travel speed along an analysis-determined two-lane highway segment and relates it to LOS criteria. The HCM6 measures intersection operations in terms of control delay (average delay per vehicle) for signalized, two-way stop-controlled (TWSC), all-way stop-controlled (AWSC), and roundabout intersections. At signalized intersections, the LOS criteria are based on the overall average delay of the intersection. At stop-controlled and roundabout intersections, the operational threshold is based on the worst-case stop-controlled approach.

For traffic analysis and studies in McCook County, the recommended minimum operating conditions in existing conditions or a future planning condition is:

- Two-lane highway segments
  - LOS B
- Intersections
  - LOS B

Multi-modal analyses are also applicable to two-lane highway and intersection operational analyses. The latest version of the HCM provides guidance on how to assess bicycle and pedestrian LOS where applicable, helping an analyst or designer gauge multi-modal accommodations at a specific location. Bicycle and pedestrian LOS scores

are developed based on traveler perception models developed for the HCM. As multi-modal LOS guidelines for use in the analysis of alternatives is still being developed and continually refined, it is recommended that McCook County consult the latest guidance provided in the SDDOT Road Design Manual and HCM.

Traffic Impact Studies

A Traffic Impact Study (TIS) is a comprehensive analysis of before and after operational impacts to the surrounding roadway system due to additional traffic volume or shifts in travel patterns from new development of modified land use. The preparation of a TIS will assist McCook County in properly assessing these impacts and identifying improvements or other mitigation measures to continue to provide safe and efficient mobility throughout the County.

The need for a TIS is established by trip generation criteria, which is used to assess the magnitude of expected impacts to the surrounding roadway from a proposed new development or modified land use. This trip generation may be developed using trip generation rates from the latest version of the Institute of Transportation Engineers (ITE) Trip Generation Manual or from previous experience or traffic counts of similar facilities at the discretion of McCook County. Recommended peak hour or daily trip generation thresholds that prompt a TIS are as follows:

- Generate 100 or more added (new) vehicle peak hour trips to or from the site
- Generate 750 or more added (new) vehicle trips per day to or from the site
- When additional traffic volume generated by the improvement is expected to adversely impact County roadways, at the discretion of McCook County
- When construction traffic or post-construction traffic is expected to increase the number of large vehicles (trucks, farm equipment, construction equipment, etc.) which may adversely impact the condition of the existing roadway, at the discretion of McCook County
- When changes to access are expected to adversely impact operations on County roadways, at the discretion of McCook County

Examples of the type and size of development that would warrant a TIS are provided in Table 8-4. For development that has a seasonal peak, such as a grain-handling facility, the seasonal peak traffic generation shall be evaluated. Consideration for a study should also be made to evaluate high truck volumes into and out of the development regardless of total generated traffic volume.

Table 8-4: Approximate Development Size for Recommended Trip Generation Thresholds

Development Type (ITE trip generation code)	Development Size +100 Peak Hour Trips	Development Size +750 Daily Trips
Single Family Homes (210)	100 units	80 units
Apartments (220)	160 units	115 units
General Office (710)	64,000 sf	68,000 sf
Fast Food w/Drive Thru (934)	2,200 sf	1,500 sf
Light Industrial (110)	110,000 sf	108,000 sf

Based on ITE Trip Generation Manual
Reflects greatest generated volume of AM or PM peak hours
Square footage based on gross floor area

A TIS prepared for McCook County shall follow the process outlined by the latest edition of the SDDOT Road Design Manual or as approved by McCook County staff. The study shall provide McCook County with an assessment of the proposed development's impact on the local transportation network during and post-construction and propose improvements to mitigate those impacts. Recommended thresholds that prompt mitigation occur when LOS, 95th

percentile queue lengths, volume/capacity ratios, or other operational measures identified by McCook County fall outside of SDDOT Road Design Manual guidelines. Haul roads to/from the site and post-construction truck routes should be identified and evaluated for adequacy of existing route geometry and structural section. Mitigation measures shall be proposed to address truck route needs based on the anticipated truck volume.

Mitigation measures will be noted as conditions on McCook County permit applications or other directives issued by McCook County.

McCook County Access Management Guidelines

Access management is the process of providing safe, efficient ways of turning onto and off public roads and highways[11]. It entails the planning, design, and implementation of land use and transportation strategies in an effort to maintain a safe flow of traffic while accommodating the access needs of the adjacent development. Management of roadway access, in terms of cross-street spacing and driveway placement, is a critical means of preserving and enhancing a roadway's intended function aids efficient operation. Additionally, providing access management in some form – such as grade separated crossings, frontage and backage roads, or right-in/right-out access – reduces the number of vehicle conflict points and improves safety along the corridor.

Studies have demonstrated a direct relationship between the number of access points and the rate of crashes, showing a positive correlation between access density (access points per mile) and the frequency of crashes (crash rates).[12] Given this relationship, access management is an important roadway safety tool that can provide many benefits to the corridor, such as:

- Reduce crashes
- Preserve road capacity and postpone the need for roadway widening or other capital improvements
- Improve travel times for the delivery of goods and services
- Ease movement between destinations
- Support local economic development

Access Spacing and Corner Clearance

Access management guidelines provide a means to balance private property interests with the need for a safe and efficient transportation system. Standardized guidelines facilitate clear communications between the agencies and individuals involved (such as developers, agency staff, and landowners) throughout the access permitting process.

The following access spacing guidelines in Table 8-5 reflect policy that has been identified by the McCook County Commission for all County-jurisdiction highways, adapted to reflect highway designation in the Major Roads Plan. Additional access management guidance and information is provided in the SDDOT Road Design Manual.

[11] South Dakota DOT Roadway Design Manual, Chapter 17 – Access Management, pg. 17-2

[12] Safety Effectiveness of Highway Design Features, Volume I: Access Control (FHWA-RD-91-044), Federal Highway Administration, 1992.

Table 8-5: Approximate Development Size for Recommended Trip Generation Thresholds

McCook County Highway Major Roads Plan Designation*	Signal Spacing (miles)	Minimum Unsignalized Access Spacing (feet)*	Access Density	Apply for Exception?
Bituminous – Primary Truck Route	1/4	1,000 (full/partial)	3 accesses/ side/½ mile**	Yes
Bituminous	1/4	1,000 (full/partial)	3 accesses/ side/½ mile**	Yes
Gravel	N/A	1,000 (full/partial)	3 accesses/ side/½ mile**	Yes

*'Full' denotes a standard full-movement intersection. 'Partial' denotes a restricted movement intersection (i.e., right-in/right-out).
**Access locations do not count public cross-street, 3 accesses/side/½ mile are between the section line roads. Adopted from McCook County Highway Commission policy.

Another component of access management is maintaining adequate separation between private driveways and the nearest adjacent roadway intersection. This minimum separation is referred to as the 'minimum corner clearance' and defines the distance between the radius return point of the intersection and the first adjacent driveway. The minimum corner clearance concept accounts for a motorist's perception-reaction time of downstream conflicts, which is an integral component to stopping sight distance requirements in roadway design.

Minimum clearance between a cross-street and driveway also helps minimize private access breaks and conflict points within an intersection's functional area. The functional area of an intersection is representative of the area in which upstream and downstream maneuvers are influenced or impacted by activity within the intersection. This area includes intersection lane channelization and associated storage length and the taper/maneuver area for separate turn lanes. Overall, the functional area is considered much larger than the physical area of the intersection.

Maintaining desired corner clearance is of particular importance in developing rural and urban fringe areas, where the County can establish desired access management as the area develops.

Recommended minimum upstream corner clearance guidelines are provided in Table 8-6.

Table 8-6: McCook County Minimum Upstream Corner Clearance Guidelines

Speed (mph)	Corner Clearance (feet)
30	200
35	225
40	250
45	280
50	350
55	425

SDDOT Road Design Manual

Access Management Best Practices

Roadways in urban fringe (areas positioned for future development) and rural areas typically serve low-density land uses and usually have lower traffic volumes; therefore, should be treated differently than roadways in urban areas.

Access management in these areas should focus on increasing/maintaining safety (i.e., sight distance, number of conflict areas, and severity of crashes when vehicles run off the road) and minimizing operational/maintenance costs such as snow removal, resurfacing and drainage. Access management best practices for these areas should be cognizant of the potential future urbanization, and the impacts an access granted today will have on tomorrow. Industry best practices for access management and access consolidation in urban fringe and rural areas include the following:

Access Management Best Practices – Urban Fringe and Rural Areas

- Develop a formal policy that ensures an agency has processes in place to determine the need for and evaluate the use, location, spacing and design characteristics of the requested access points
- Encourage coordination of roadway access during the zoning and platting process
- Give access permits for a specific use
- Provide adequate spacing of access points
- Protect the functional area of intersections
- Ensure adequate sight distance at entrances
- Avoid offset or dogleg intersections and entrances
- Encourage development of turn lanes at entrances
- Consider consolidating access or relocating existing access
- Encourage good driveway and intersection design characteristics (i.e., driveway width and turning radii, corner clearance, approach grade, intersection alignment/skew, entrance in-slopes and culvert openings, sight triangles, clear zones, etc.)

Access Consolidation Guidelines

- Close driveways
- Create alternative access ways
- Create shared driveways
- Relocating entrances to side streets
- Promote cross access (access points direction across from each other)
- Turn restrictions from driveway
- Turn restrictions from roadway

Bicycle and Pedestrian Facility Design Guidelines

The Bicycle and Pedestrian Plan outlines long-term goals for multi-modal accessibility throughout the County. The following provides recommended design guidance in the development of bicycle and pedestrian facilities throughout McCook County in support of the Bicycle and Pedestrian Plan.

Shared-Use Path

A shared-use path is a designated facility for non-motorized travel separated from roadway traffic. Common locations of shared-use paths are parallel to a motor vehicle roadway near the right-of-way line or on a separate alignment such as on abandoned railroad grade or through recreational areas. When available space is constrained due to limited right-of-way, water crossings, or other situations that restrict the available width, a side path may be constructed adjacent to the roadway that is an extension of the shared-use path. Two typical cross-sections representative of a shared-use path are provided in Table 8-3:

- Shared-use path on independent alignment
- Shared-use path parallel to roadway

Recommended minimum shared-use path surfacing thickness is shown in Table 8-7.

Table 8-7: Recommended Minimum Shared-Use Path Surfacing Thickness

Surfacing Type	Base	Surfacing Thickness
Asphaltic Concrete with Aggregate Base	4" Aggregate	2.5"
Portland Cement Concrete with Aggregate Base	4" Aggregate	4" PCC (jointed)
Shoulder	-	Turf or Aggregate

Highway Shoulders

Highway shoulders of sufficient width and delineation provide travel ways for bicyclists and pedestrians along County highways in addition to providing motor vehicle safety and operational benefits. These facilities should be located along common bicycle routes throughout McCook County, particularly near urban, recreational, and other high multi-modal demand areas as identified in the Bicycle and Pedestrian Plan. A typical cross-section of a multi-modal shoulder is provided in Figure 8-3, tying into the appropriate roadway typical sections previously shown in Figure 8-1.

A minimum of four feet of smooth, rideable/walkable paved shoulder width should be provided for a multi-modal shoulder. The installation of rumble strips/stripes between the edge of travel lane and shoulder should incorporate the following:

- Shoulder width of 4 feet or less
  - 8-inch wide rumble stripes, placed on edge of travel lane
- Shoulder width of greater than 4 feet
  - 12-inch wide rumble strip, placed adjacent to edge of travel lane on shoulder

In all instances, rumble strips/stripes on bicycle routes should consist of a 60-foot cycle pattern of 48-feet of rumble strip/stripe and a 12-foot gap.

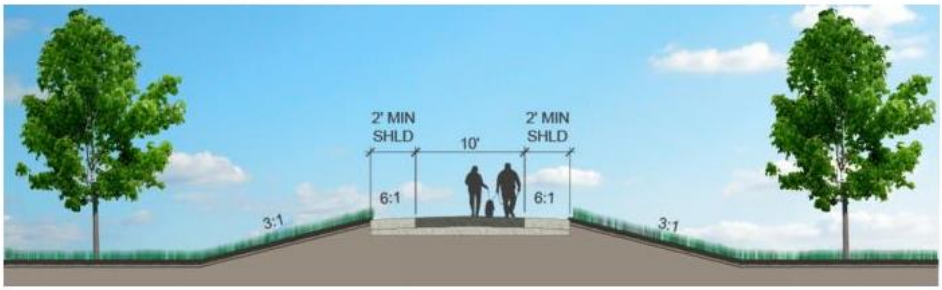
For locations of high pedestrian demand, shoulders should maintain less than a two percent cross-slope to meet accessibility requirements.

Bicycle and Pedestrian Facility Design Guidance

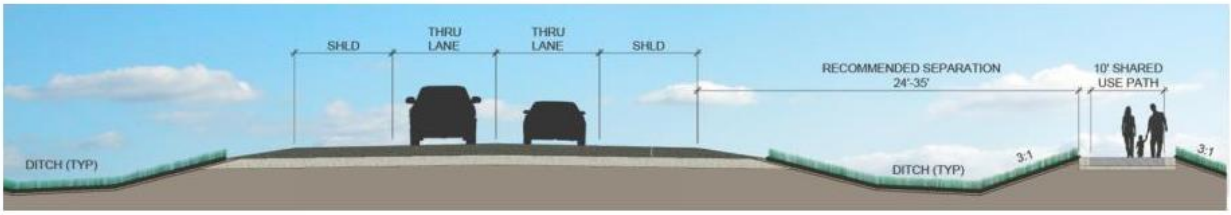
Further guidance and best practices in the design of shared-use paths and highway shoulder accommodations is provided in the latest versions of the following documents:

- A Policy on Geometric Design of Highways and Streets (AASHTO)
- Guide for Planning, Design, and Operation of Pedestrian Facilities (AASHTO)
- Guide for the Development of Bicycle Facilities (AASHTO)
- SDDOT Road Design Manual

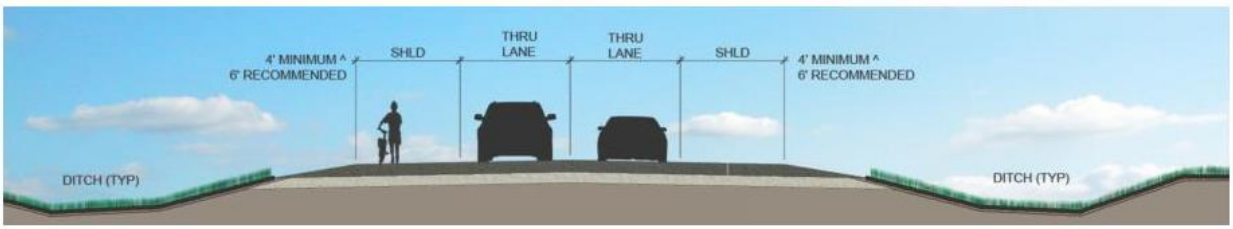
SHARED USE PATH



PARALLEL SHARED USE PATH



USE OF SHOULDERS



BICYCLE AND PEDESTRIAN TYPICAL SECTION NOTES

^ For sections with a 4' shoulder, use an 8" intermittent rumble stripe instead of rumble strip. For shoulders wider that 4', use a 12" intermittent rumble strip.

Intermittent rumble strip/stripes shall be a 60' cycle pattern, consisting of 48' rumble strip/stripe and a 12' gap.

See Roadway Typical Sections for typical roadway and ditch widths

TYPICAL CROSS-SLOPES

SHARED USE PATHS 2%
ROADWAY SHOULDERS..... 4%
ROADWAY SHOULDERS USED FOR PEDESTRIAN TRAFFIC 2%

Figure 8-3: Typical Multi-Modal Facility Cross-Sections

Policy and Operations Recommendations

It is recommended that many of the components within this section be integrated into McCook County's permit process, ordinances, and regulations where appropriate. The roadway design and analysis guidance helps outline expectations for the developer while also allowing the County gauge potential impacts from development and changes in access.

New of Modified Development

As part of the review and approval of new development and access to the County network, it is recommended that the following guidelines, as identified in this chapter, be incorporated into the Application for Entrance from a McCook County Highway, McCook County Building Permit Application, and Zoning Regulations for McCook County:

- Access Management
- Traffic Impact Studies
- Traffic Operations Analysis Thresholds
- Traffic Control Warrants
- Turn-Lane Warrants

Where development will include future public facilities, additional design guidance may also be included in the Zoning Regulations for McCook County, such as:

- Typical Section Information
- Minimum Roadway Surfacing Criteria
- Bicycle and Pedestrian Design Guidelines

Due to the likelihood that the vast majority of applications and requests are minor in nature, it is recommended that each requirement noted above have the option to be waived at the discretion of McCook County.

Change in Access

It is recommended that McCook County include criteria that require a property owner to file an application prior to making a notable modification to an existing access location, such as splitting, combining, or relocating driveways or widening for additional channelized lanes at a driveway approach. While these requests may or may not include additional traffic volumes from the requesting site, this recommended review process will allow the County to assess potential access-related impacts in relation to the long-term goals of the highway corridor and include the following:

- Develop additional guidance for a change in access/change in Application for Entrance From a McCook County Highway, noting a different process between a change in access/change in use and a new access
- Access Management
- Traffic Impact Studies
- Traffic Operations Analysis Thresholds
- Traffic Control Warrants
- Turn-Lane Warrants

Similar to the new or modified development guidelines recommendation, it is likely that the vast major of applications and requests will be minor in nature. Therefore, it is recommended that each requirement noted above have the option to be waived at the discretion of McCook County.

Continuous Activities

It is recommended that several activities entail a continuous approach to improving the transportation network within McCook County, including a periodic, systematic review of existing conditions and needs throughout the network. This allows for the planning and implementation of improvements in a timely manner, yet receptive to available resources and system-wide needs. Further, good needs assessment and planning practices allows for a series of improvements to be combined to a single project or smaller needs integrated into a larger preservation or reconstruction project. The following provides additional guidance to facilitate a continuous evaluation of needs, implementation, and monitoring of conditions throughout the network:

Access Management Implementation

Access management guidelines and practices should generally be implemented at the County and local levels (cities and townships with active land-use planning programs) as these agencies are typically involved at the planning stages of development proposals. However, effective access management requires mutual support and effective communication at all governmental levels. Therefore, it is important to consider how access management guidelines are implemented as part of City planning and development review procedures. The following are key considerations when implementing access management guidelines:

- Access management guidelines apply primarily to routes with a collector functional classification or above; however, the guidelines may also be used on some local roads.
- Access management guidelines should be used as long-term goals, not as absolute rules. Maintaining some flexibility is important in promoting access consolidation. Existing physical barriers or constraints need to be considered.

Implementation of access management practices in rural areas differs from urban areas. Access management efforts in urban areas typically focus on addressing mobility concerns while balancing access needs of local businesses and residents. In these areas, new access points should be minimized while existing access points are consolidated or reduced as development occurs. Developing areas include areas where roadways and services have already been improved to serve current and planned development.

Safety Improvements

Safety improvements are tied to many aspects within this chapter, from access management to roadway design. The review, assessment, and identification of potential improvements are an integral part of the daily maintenance and capital improvement projects on a well-functioning transportation network. It is recommended that McCook County continue to be proactive in addressing safety concerns on the County's transportation network. This includes a periodic, systematic review of facilities throughout the County, so that identified improvements can be planned and addressed as funding allows. This will also position the County to seek and apply for safety funding assistance through SDDOT and other agency safety programs. In addition to the periodic reviews, safety aspects of facilities should be reviewed during preservation and reconstruction activities to address issues as part of a larger project.

9. Transportation Funding

Existing conditions for the McCook County transportation infrastructure were inventoried in order to identify transportation related issues and opportunities. This inventory included a review of the existing roadway network, traffic volumes and operations, crash history, non-motorized transportation facilities, transit service, airport and freight facilities. The following sections summarize the key findings of this review.

Annual Funding Need

The McCook County Master Transportation Plan outlines current and future needs throughout the McCook County transportation network over the next 20+ years. Two annualized cost scenarios were developed to bring the various needs and transportation components together into a countywide needs assessment. Table 9-1 outlines the annual and 20-year funding need for these two scenarios in terms of 2017 dollars. The table also notes source chapters where the funding need elements were originally discussed within the Master Transportation Plan. The primary difference between Scenario A and Scenario B is that in Scenario B, all segments with a base less than 9 inches thick are reconstructed to provide a thicker base. In Scenario A, all segments are milled and overlaid regardless of base thickness.

Table 9-1: Annual Funding Needs over Next 20 Years (2017 Dollars)

	Maintain Existing Network (2017 $)	Needs Scenario A Estimated Annual Cost (2017 $)	Needs Scenario B Estimated Annual Cost (2017 $)
Bituminous Surfacing - Overlays and Chip Seals	$1,340,000	$1,250,000	$1,830,000
Bituminous Roadway Maintenance	$620,000	$590,000	$590,000
Gravel Resurfacing	$300,000	$230,000	$230,000
Gravel Roadway Maintenance	$395,000	$410,000	$410,000
Bridge Replacement Need	$625,000	$515,000	$515,000
Bridge Preservation Need	$111,000	$108,000	$108,000
Culvert Replacement	$100,000	$100,000	$100,000
Bridge Maintenance	$50,000	$48,000	$48,000
High Priority Projects	$15,000	$15,000	$15,000
Total (Year 1)	**$3,556,000**	**$3,266,000**	**$3,846,000**
Total 20-Year Need	**$71,120,000**	**$65,320,000**	**$76,920,000**
Needs based on the following scenarios from other chapters:			
Bituminous Road Pres. and Maint. Scenario:	▪ *Maintain Existing Network*	▪ *Major Roads Plan w/Base Thickness Considerations*	▪ *Major Roads Plan w/Base Improvements*
Gravel Road Pres. and Maint. Scenario:	▪ *Maintain Existing Network*	▪ *Major Roads Plan w/Traffic Volume Based Resurfacing*	▪ *Major Roads Plan w/Traffic Volume Based Resurfacing*
Bridge Needs Scenario:	▪ *Bridge Funding Scenario with No Bridge Closures*	▪ *Bridge Funding Scenario w/Proposed Bridge Closures*	▪ *Bridge Funding Scenario w/Proposed Bridge Closures*
High Priority Projects:	▪ *High Priority Intersection and Roadway Segment Projects*	▪ *High Priority Intersection and Roadway Segment Projects*	▪ *High Priority Intersection and Roadway Segment Projects*

Recognizing that transportation funding needs will continue to increase as construction costs increase, year of expenditure costs were estimated for year 2037 using a 2% annual inflation rate. As shown in Table 9-2, the estimated annual funding need to continue maintaining the network, per the potential scenarios, increases by nearly 50 percent by 2037.

Table 9-2: Funding Need in Year 2037 (YOE Dollars)

	Maintain Existing Network (2017 $)	Needs Scenario A Estimated Annual Cost (2037 $)	Needs Scenario B Estimated Annual Cost (2037 $)
Bituminous Surfacing Overlays and Chip Seals	$1,990,000	$1,860,000	$2,720,000
Bituminous Roadway Maintenance	$920,000	$880,000	$880,000
Gravel Resurfacing	$450,000	$340,000	$340,000
Gravel Roadway Maintenance	$590,000	$610,000	$610,000
Bridge Replacement Need	$930,000	$770,000	$770,000
Bridge Preservation Need	$160,000	$160,000	$160,000
Culvert Replacement	$150,000	$150,000	$150,000
Bridge Maintenance	$70,000	$70,000	$70,000
High Priority Projects	$20,000	$20,000	$20,000
2037 Total (Year 20)	**$5,280,000**	**$4,860,000**	**$5,720,000**
Total 20-Year Need (YOE) (2018 – 2037, with inflation)	**$88,130,000**	**$80,940,000**	**$95,320,000**

Historical Budget and Expenditures

McCook County has historically expended between $1.8 and $3.3 million annually from the McCook County Road and Bridge fund. A generalized overview of the three reported revenue accounts include:

- Highway, Roads, and Bridges: Includes all infrastructure construction, preservation, and maintenance costs; County operations costs such as personnel, equipment, buildings, and utilities.
- Intergovernmental Expenditures: County Wheel Tax disbursement to Townships.
- Debt Service: Payments for equipment purchases.

An overview of the fund expenditures from 2013 through 2016, as well as the 2017 budget, is provided in Table 9-3.

Table 9-3: McCook County Road and Bridge Fund Expenditures 2013 – 2016

Account Description	2013 Expenditures (YOE $)	2014 Expenditures (YOE $)	2015 Expenditures (YOE $)	2016 Expenditures (YOE $)	2017 Budget (YOE $)
Highways, Roads, and Bridges	$3,209,072	$2,128,488	$1,827,516	$1,813,159	$4,006,00
Intergovernmental Expenditures	$30,002	$30,152	$30,979	$31,817	$31,500
Debt Service	$41,424	$42,248	$42,248	$42,248	$42,249
Total Expenditures	**$3,280,498**	**$2,200,888**	**$1,900.743**	**$1,887,224**	**$4,079,749**

Source: South Dakota Department of Revenue and McCook County

McCook County typically maintains a Capital Outlay fund, established through resolution, to accumulate a portion of the budgeted funding from year to year that can be used on large infrastructure investments, such as asphalt overlays, roadway reconstruction, or new bridges. This process typically follows a 3 to 4-year cycle where funding is accumulated over 3 years and then expended in the fourth year, as shown in Table 9-4 between 2013 and 2017. The notably larger Road and Bridge fund expenditures in years 2013 and 2017 shown in Table 9-2 coincide with the depletion of the Capital Outlay fund in Table 9-4.

Table 9-4: McCook County Capital Outlay Appropriations 2013 – 2016

Account Description	2013 Expenditures (YOE $)	2014 Expenditures (YOE $)	2015 Expenditures (YOE $)	2016 Expenditures (YOE $)	2017 Budget (YOE $)
Capital Outlay Appropriation	$0	$375,000	$325,000	$300,000	$0
Accumulated Outlay Total	**Expended**	**$375,000**	**$700,000**	**$1,000,000**	**Expended**

Source: McCook County

County Road and Bridge Fund Revenue Sources

The primary annual sources of McCook County Road and Bridge funding are County General Funds, Motor Vehicle Licenses, Wheel Tax, and annual allocation of State funds. Additional funding sources are available to McCook County, but are typically competitive grant-based awards such as the Bridge Improvement Grant or emergency-based programs. The following provides a brief summary of the typical Road and Bridge funding sources.

County General Funds

McCook County provides an annual transfer of proper tax revenue from the General Fund to the County Road and Bridge Fund.

Motor Vehicle License Fees

Motor Vehicle License Fees are collected by McCook County. A portion is retained by the County and distributed amongst the County Road and Bridge Fund, Townships, and Municipalities. The remainder is sent to the State of South Dakota for distribution.

County Wheel Tax

McCook County currently assesses a wheel tax of $4.00 per wheel up to 4 wheels per vehicle for a maximum per vehicle total of $16.00. This tax is retained by McCook County and deposited into the Road and Bridge Fund. Revenues are distributed as follows within the County: 80 percent retained by McCook County, 10 percent to Townships and 10 percent to municipalities.

Annual Surface Transportation Program (STP) Funding

Prior to 2015, federal STP funds were allocated to all Counties in South Dakota through the SDDOT. Counties had the option to let funds accumulate until they could provide the required matching funds to implement a project, or they could exchange their STP funding with State funds on a 90:10 ratio. Beginning in 2015, the State of South Dakota has discontinued the accumulation element and now exchanges all Federal STP funding to be allocated to Counties with State funds at a 90:10 ratio. The State funds are allocated to the Counties in the form of a check to allow greater flexibility in roadway or bridge project implementation, including repair or maintenance.

Other Annual Revenue Sources

A series of other small annual funding sources and maintenance contracts round out the remaining annual revenue sources for the County Road and Bridge Fund. Small funding sources, typically less than $5,000 annually include items such as mobile home fees, motor fuel tax adjustments disbursed by the State of South Dakota, and licenses and permits. Maintenance contracts are typically with Townships or municipalities on an as-requested basis for County services.

State and Federal Grants

One-time funding mechanisms are available to local counties and municipalities through Federal and State funding programs, often in the form of grants. These grants often vary by highway funding bill, particularly on the Federal level, but may be available to help fund individual projects such as transportation alternatives (share-use paths, bicycle lanes, trails, etc.), emergency repairs, or economic development-driven projects.

Historical Summary

The following table summarizes McCook County Road and Bridge Fund revenue from 2013 through 2016 in terms of Year of Revenue (YOR).

Table 9-5: Yearly McCook County Road and Bridge Fund Revenue 2013 – 2016

Account Description	2013 Revenue (YOR $)	2014 Revenue (YOR $)	2015 Revenue (YOR $)	2016 Revenue (YOR $)
County Wheel Tax	$149,942	$150,823	$153,789	$159,195
Motor Vehicle License Fees	$632,895	$715,603	$746,766	$818,614
State/Federal Grants	$8,195	$160,458	-	-
Annual STP Payout/Swap	$130,324	-	$529,414	$152,177
Other	$250,694	$193,721	$116,433	$100,113
General Fund Transfer	$1,065,000	$1,060,000	$925,000	$800,000
Property Tax Limitation Opt-Out*	$300,000	$300,000	$300,000	$300,000
Total Road and Bridge Fund Revenue	**$2,537,050**	**$2,580,605**	**$2,771,402**	**$2,330,099**

Source: South Dakota Department of Revenue and McCook County

Up to $300,000 available from property tax limitation opt-out. Funding may be used for other needs outside of Highway Department as specified in resolution.

Future County Road and Bridge Fund Revenue Sources

The South Dakota Legislature adopted a Highway Funding Bill, known as Senate Bill 1, in early 2015 that provided a series of modifications to current funding sources and adds a property tax levy option for Counties and Townships. This bill was signed into law and the initial components became effective April 1, 2015.

Changes from the new law provide several benefits to Counties, including:

- 20 percent increase in Motor Vehicle License Fees
- Converts Federal STP funds to State funds; provides Counties more flexibility in use and now includes maintenance activities
- Establishes a Bridge Improvement Grant fund to help Counties address bridge infrastructure needs

The highway funding bill also provides opportunities for counties to raise additional revenue at the local level through increases in fees and taxes. The following is a summary of these options, the current level in McCook County, maximum allowed through the highway funding bill, and estimated additional revenue generated if implemented.

County Wheel Tax

- Existing: $4/wheel and maximum of $16/vehicle (4 wheels)
- Generates approximately $155,000 annually
- Allowed Increase: $5/wheel and maximum of $60/vehicle (12 wheels)
- McCook County would receive an additional 2 points on all BIG applications if the Wheel Tax is increased to $5/wheel (increase from 8 points to 10 points out of the available 10 points)
- *Estimated Annual Revenue Increase: $80,000 (increase/decrease based on number of wheels of licensed vehicles) for McCook County*

Property Tax Levy Option for Counties

- Existing: $300,000 annual opt-out of tax limitation
- Allowed Increase:
  - $1.20 per $1,000 of taxable property valuation if total taxable valuation of County is $1 billion or less
  - $0.90 per $1,000 of taxable property valuation if total taxable valuation of County is more than $1 billion and less than $2 billion
  - Townships: $0.50 per $1,000 of taxable property valuation
  - McCook County taxable valuation was $955,119,617 in 2016 and anticipated to cross $1 billion by 2018 based on recent trend.
- *Estimated Annual Revenue Increase: $900,000 at just over $1 billion taxable valuation (increase/decrease based on taxable valuation) for McCook County*

Projected benefit from increasing the County Wheel Tax and Property Tax Levy Option to the maximum amounts limited by the highway funding bill is shown in Table 9-6. It should be noted, that if the Property Tax Levy Option were implemented by the County, the Property Tax Limitation Opt-Out would be discontinued.

Table 9-6: Projected Benefit in Potential Increases in Revenue

Account Description	2016 Revenue (2016 $)	Estimated Additional Annual Revenue from Tax/Fee Increase (2017 $)	20-Year Benefit of Additional Revenue* (2018 – 2037)
County Wheel Tax	$159,195	+ $80,000	$1,723,800
Motor Vehicle License Fees	$818,614	-	-
State/Federal Grants	-	-	
Annual STP Payout	$152,177	-	-
Other	$100,113	-	-
Property Tax Levy		+ $900,000	$26,876,070
General Fund Transfer	$800,000	-	-
Property Tax Limitation Opt-Out	$300,000	- $300,000	- $6,000,000

Source: South Dakota Department of Revenue and McCook County

** 20-year benefit of additional revenue illustrates the total, forecasted revenue that would be generated between 2018 and 2037 by increases to the Wheel Tax and or implementation of the Property Tax Levy Option. Forecasts to 2037 are based on historical data and projected growth obtained from South Dakota Department of Revenue and McCook County.*

Transportation Needs and Available Funding

Local, state and federal funding was forecasted out over the next 20 years based on McCook County funding forecasts and historical data. For the baseline funding conditions, no additional funding from the 2015 Highway Funding Bill was incorporated. However, it was assumed that McCook County would be successful in being awarded BIG funding for preliminary engineering and bridge construction for one structure every other year, equating to 10 structures over the next 20 years. It was also assumed that McCook County would be awarded a small bridge preservation grant every other year and the SDDOT signing program would cover a blanket sign replacement in the next 20 years. A breakout of the 20-year funding projections is attached in Appendix H.

A comparative look at where the forecasted funding falls within the planning-level costs for the identified transportation network needs is provided in Table 9-7. Projected costs with and without an inflation factor are presented to illustrate the short-term and long-term comparison to forecasted funding. The costs are annualized based on an aggregate 20-year need, with the understanding that the anticipated costs each year may be above or below the shown annual costs. For example, replenishing the County's gravel stockpile for gravel roadways is typically done every three years and the County incurs a one-time cost at time of replenishment. In the annualized view of these costs below, that one-time cost is spread out across the three years serviced by the replenishment. Revenue is presented in a similar manner.

As shown, the forecasted funding representative of the baseline conditions is expected to be short in fully addressing the identified needs to both scenarios at some point over the next 20 years. However, the time when that would occur is highly dependent on the actual rate of material and construction cost inflation.

Table 9-7: Average Annual Transportation Funding Needs vs. Forecasted Revenue Comparison

		Maintain Existing	Needs Scenario A	Needs Scenario B
1-Year Need Totals Tables 9-1 and 9-2	**2018 Total (Year 1) (2017 $)**	$3,556,000	$3,266,000	$3,846,000
	2037 Total (Year 20) (YOE $)	$5,280,000	$4,860,000	$5,720,000
20-Year Need Totals Tables 9-1 and 9-2	**Total 20-Year Need (2017 $)**	$71,120,000	$65,320,000	$76,920,000
	Total 20-Year Need (YOE $)	$88,130,000	$80,940,000	$95,320,000
Forecasted Revenue – Baseline Conditions Appendix H	**Annual Funding Forecast (2017 $)**	$3,516,000		
	Total 20-Year Funding Forecast (2017 $)	$70,311,000		
Wheel Tax Increase to Maximum Amount Table 9-6	**Annual Funding Increase (2017 $)**	*+ $80,000*		
	Total 20-Year Funding Increase (2017 $)	*+$1,723,800*		
Implementation of Property Tax Levy (less current property tax opt-out) Table 9-6	**Annual Funding Increase (2017 $)**	*+ $600,000*		
	Total 20-Year Funding Increase (2017 $)	*+ $20,876,070*		

Other Potential Funding Sources

It is recommended that McCook County leverage alternative funding and agency assistance opportunities as feasible, such as Federal programs, grants, research, and multi- or cross-program opportunities. In many instances, these programs are competitive for award of funding; thus, the County should research and evaluate each program prior to submittal.

Administered through South Dakota Department of Transportation

- Bridge Improvement Grant (BIG) Fund
- Transportation Alternatives Program (TAP)
- Highway Safety Improvement Projects (HSIP), in conjunction with the South Dakota Strategic Highway Safety Plan
- State Planning and Research Program (programs for STP Recipients or Small Communities; for planning related activities)
- Transportation Economic Development Grants

Project and Funding/Effort Assistance

- South Dakota State University
- Southeast Technical Institute or Mitchell Technical Institute
- Local Transportation Assistance Program (LTAP)
- South Eastern Council of Governments
- Resource Directory – South Dakota Governor's Office of Economic Development

Multi-Modal and Other Funding Opportunities

- U.S. Department of Transportation (including Federal Highway Administration) Discretionary Programs
  - *Many of these were discontinued with the latest Federal funding bill, but something to consider in the future when new bills are approved*
- Federal Bicycle and Pedestrian Funding Opportunities
  - http://www.fhwa.dot.gov/environment/bicycle_pedestrian/funding/funding_opportunities.cfm
- Bicycle/Pedestrian Grants
  - Many are available, competitive, and fund projects at various levels
  - Example grant-based organization includes People for Bikes : http://www.peopleforbikes.org/

Loan Programs

- State Infrastructure Bank (SIB) Loans – 0 percent interest loans of federal funds for projects on federal-aid routes.
- State Highway Fund Loans (SHFL) – industrial or agricultural business-type projects on non-federal-aid routes for Counties and Class I cities.

10. Project Implementation Plan

The implementation plan was developed through a collaborative effort between McCook County, the South Dakota Department of Transportation, and public and stakeholder input. The goal of this implementation plan is to provide recommendations of feasible transportation projects that address McCook County's long-term transportation needs, supplementing the Major Roads Plan, Bridge Plan, Preservation and Maintenance Plan, and Bicycle and Pedestrian Plan. The actual implementation of these projects is highly dependent on the availability of financial resources.

Project Development

Through an assessment of the existing McCook County transportation network, future needs, available resources, and public and stakeholder input throughout the process, the McCook County Master Transportation Plan identifies seven overarching categories for transportation needs throughout the existing network, each often encompassing multiple specific needs. These eight categories are as follows:

- Bridge Condition
- Traffic
- Roadway Geometry
- Roadway Surfacing
- Multi-Modal Accommodations
- Growth Areas
- Drainage
- Railroad Crossings

The McCook County Master Transportation Plan was developed to provide a systematic means for establishing goals and objectives, evaluating existing and future-year conditions, and providing a prioritized set of projects for implementation through the following Plan elements:

- Major Roads Plan
- Bridge Plan
- Bicycle and Pedestrian Plan
- Roadway Preservation and Maintenance Plan
- Roadway Design, Analysis, and Policy Guidelines

Using this systematic approach towards project identification, evaluation, and selection, supplemented with public and stakeholder involvement throughout the process, a series of proposed projects were identified and prioritized for implementation over the next 20+ years.

Project Implementation

The McCook County Master Transportation Plan illustrates a two-part implementation plan:

1. Maintain the existing transportation network in line with the Major Roads Plan, Bridge Plan, and Roadway Preservation and Maintenance Plan
    a. Reflects the 'core' implementation elements to maintain a similar level of service on McCook County highways
2. Implement capital improvements to address additional needs and enhance the transportation network
    a. Reflects 'supplemental' planning elements such as intersection, roadway segment, and multi-modal facility improvements to enhance the existing transportation network

The implementation tables include planning level cost estimates based on current industry planning-level estimating procedures, combined with SDDOT and McCook County input on recent project costs and locality adjustments. Accompanying figures that depict many of the projects are provided in Figure 10-1, Figure 10-2, and Figure 10-3.

Core Implementation Elements to Maintain Existing Transportation Network

The core implementation elements look at maintaining a transportation network pursuant to the overarching goals and framework outlined in the Major Roads Plan. The hallmark of this approach is to apply proactive maintenance and preservation activities to extend the useful life of each roadway and bridge investment. When replacement or a significant investment is warranted, the plan identifies opportunities to evaluate alternatives with the long-term goal of providing a sustainable transportation network.

Roadways

The Roadway Preservation and Maintenance Plan structures projects geared towards preserving and maintaining McCook County-jurisdiction bituminous and gravel roadways over the next 20+ years. The following bituminous and gravel roadway 10-year project outlays identify anticipated roadway segment project needs while incorporating flexibility to implement roadway segment enhancement at the time of a major investment, such as roadway base improvement projects and widening projects.

Bituminous Roadway Segment Outlay (Table 10-1)

- 10-year timeframe (2018-2027) of overlays, chip seals, and surface conversion projects
- Two tracks are presented:
    - Major Roads Plan with Base Thickness Considerations Scenario (Table 10-1a)
    - Major Roads Plan with Base Improvements Scenario (Table 10-1b)
- The proposed overlay project or other improvement that aligns with the goals of the respective scenario is indicated in **Bold**.
- Optional improvement projects that should be evaluated when the identified segment is to be resurfaced are identified in *italics*. These serve as prompts for roadway segment enhancement projects, such as base improvements, shoulder construction, or ROW widening, as identified in Table 10-8 through Table 10-10.

Gravel Roadway Segment Outlay (Table 10-2)

- 10-year timeframe of gravel resurfacing projects
- Based on Major Roads Plan with Traffic Volume Based Resurfacing Scenario

Bridges

The Bridge Plan established existing and future needs of the bridges maintained by McCook County, serving as the baseline for identification of anticipated bridge replacement, rehabilitation, and preservation projects. The following bridge outlay tables outline anticipated bridge replacement projects in 0-10 years and 11-20 year timeframes and preservation projects over the next 10 years.

Bridge Outlay (Table 10-3 through Table 10-6)

- Bridge replacement projects (Table 10-3 through Table 10-5)
    - Lists of projected bridge replacement needs in two timeframes: 0-10 years (2017-2027) and 11-20 years (2028-2037)
    - Sorted by 2016 Bridge Improvement Grant ranking
    - 'Small Structure' bridge replacement projects

- Bridge preservation projects (Table 10-6)
    - List of identified potential preservation projects for the next 10 years
    - Categorized by timber pile structures and other bridges, or those that do not have a timber substructure

Transportation Network Enhancement Projects

The following transportation network enhancement projects are geared towards addressing the identified transportation issues and needs, focusing on enhancing the transportation network and supplementing the core implementation elements to maintain the existing network. These projects have been prioritized with respect to potential timeframe and viability of funding, based on the following definitions: High Priority (H), Medium Priority (M), and Low or Long-Term Priority (L). Companion conceptual layouts for many of these projects are provided in Appendix I.

Intersection Projects (A) (Table 10-7)

- Capital improvement projects to address identified transportation needs at a specific location or intersection.

Roadway Segment Projects (B, C, and D) (Table 10-8 through Table 10-10)

- Capital improvement projects to address identified transportation needs along specific roadway segments (Table 10-8).
- Roadway surfacing change projects (Table 10-9)
    - Proposed roadway surface conversion segments per the Major Roads Plan
    - Costs shown for conversion or maintain existing surfacing options

ROW Widening and Reconstruction projects (Table 10-10)

- Candidate segments for widening of ROW to 100 feet
- Segments with companion capital improvement projects that would necessitate ROW widening for implementation are identified

Multi-modal Network Enhancement Projects (E) (Table 10-11)

- Capital improvement projects to improve safety and mobility for pedestrians and bicyclists.
- Projects may coincide with projects developed as part of other needs, as noted.
- Multi-modal segment projects geared towards consideration and incorporation at the time of next major investment along the respective segment, as noted.

Table 10-1a: Bituminous Roadway Segment 10-Year Project Outlay (Major Roads Plan with Base Thickness Considerations Scenario)

Year	Route	From	To	Project Length (miles)	Planning Level Estimated Cost (2017 $)	Comments	Total Planned Cost (2017 $)	5-Year Cumulative Total (2017 $)
2018	**Countywide Chip Seal**	-	-	-	**$509,400**	**Chip Seal:** 19ABW, 21ASB, 04AB, 06WB, 09AB	**$509,400**	-
2019	**Countywide Chip Seal**	-	-	-	**$336,600**	**Chip Seal:** 25ANB, 05MB, 05SB, 06EB, 08AEB	**$336,600**	-
2020	**431st Avenue**	258th Street	SD38	5.0	**$737,333**	**Overlay**	**$1,479,500**	-
	431st Avenue	SD38	252nd Street	1.0	**$147,467** ($750,000)	**Overlay** *Approx.0.5 miles potential ROW widening & reconstruction w/ shoulders*		
	Countywide Chip Seal	-	-	-	**$594,700**	**Chip Seal:** 16WBW, 16AEB, 16AWB, 21B, 03SB		
2021	**Countywide Chip Seal**	-	-	-	**$534,600**	**Chip Seal:** 10B, 16WBE, 16EB, 25B 02EB, 03NB, 08AWB	**$534,600**	-
2022	**431st Avenue**	262nd Street	258th Street	4.0	**$400,000** *($940,000)*	**Overlay** *Approximately 4 miles potential base improvements*	**$1,721,955**	**$4,582,055**
	451st Avenue	SD42	254th Street	11.0	**$700,000** *($1,037,500)*	**Overlay;** Costs are for initial 7 of the 11 miles *Approximately 2.5 miles potential base improvements*		
	Countywide Chip Seal	-	-	-	**$448,500**	**Chip Seal:** 20B, 21ANB, 25ASB		
	264th Street	436th Avenue	0.5 Miles East	0.6	**$18,000** *($48,000 / $60,000)*	**Surface Conversion:** AC to gravel conversion (19ABE) *Convert to blotter / Maintain AC (Overlay)*		
	245th Street	US81	443rd Avenue	2.0	**$60,000** *($160,000 / $200,000)*	**Surface Conversion:** AC to gravel conversion (02WB) *Convert to blotter / Maintain AC (Overlay)*		
	440th Avenue	245th Street	244th Street	2.0	**$60,000** *($160,000 / $200,000)*	**Surface Conversion:** AC to gravel conversion (02AB) *Convert to blotter / Maintain AC (Overlay)*		
	448th Avenue	245th Street	244th Street	1.0	**$30,000** *($80,000 / $100,000)*	**Surface Conversion:** AC to gravel conversion (05NB) *Convert to blotter / Maintain AC (Overlay)*		
	453rd Avenue	265th Street	262nd Street	3.0	**$5,455**	**ROW:** ROW acquisition for gravel to bituminous surface conversion (01A)		
2023	**441st Avenue**	268th Street	US81	0.25	**$25,000**	**Overlay**	**$1,918,300**	**$5,990,955**
	264th Street	435th Avenue	436th Avenue	1.0	**$100,000** *($235,000)*	**Overlay** *Approximately 1 mile potential base improvements*		
	451st Avenue	SD42	254th Street	11.0	**$400,000** *($670,000)*	**Overlay;** Costs are for remaining 4 of the 11 miles *Approximately 2 miles potential base improvements*		
	451st Avenue	268th Street	SD42	4.0	**$400,000** *($940,000)*	**Overlay** *Approximately 4 miles potential base improvements*		
	453rd Avenue	265th Street	262nd Street	3.0	**$600,000** *($180,000 / $60,000)*	**Surface Conversion:** Gravel to AC conversion (01A) *Convert to blotter / Maintain Gravel (Overlay)*		
	Countywide Chip Seal	-	-	-	**$393,300**	**Chip Seal:** 11AB, 21ASB, 25B, 25ANB		
2024	**254th Street**	SD38	454th Avenue	3.8	**$380,000**	**Overlay**	**$1,766,000**	**$7,420,355**
	247th Street	430th Avenue	US81	11.0	**$500,000** *($1,175,000)*	**Overlay;** Costs are for initial 5 of the 11 miles *Approximately 5 miles potential base improvements*		
	248th Street	448th Avenue	454th Avenue	6.1	**$610,000**	**Overlay**		
	Countywide Chip Seal	-	-	-	**$276,000**	**Chip Seal:** 06WB, 08B, 08AEB		

Year	Route	From	To	Project Length (miles)	Planning Level Estimated Cost (2017 $)	Comments	Total Planned Cost (2017 $)	5-Year Cumulative Total (2017 $)
2025	**435th Avenue**	SD38	244th Street	9.0	**$900,000** *($2,115,000)*	**Overlay** *Approximately 9 miles potential base improvements*	**$2,235,800**	**$8,176,655**
	247th Street	430th Avenue	US81	11.0	**$600,000** *($1,410,000)*	**Overlay;** Costs are for remaining 6 of the 11 miles *Approximately 6 miles potential base improvements*		
	446th Avenue	SD42	261st Street	4.0	**$400,000** *($940,000)* *($6,000,000)*	**Overlay** *Approximately 4 miles potential base improvements* *Approx.0.5 miles potential ROW widening & reconstruction w/ shoulders*		
	Countywide Chip Seal	-	-	-	**$335,800**	**Chip Seal:** 16AWB, 25ANB, 05MB, 05SB		
2026	**261st Street**	446th Avenue	451st Avenue	5.0	**$500,000** *($1,175,000)*	**Overlay** *Approximately 5 miles potential base improvements*	**$1,522,150**	**$9,194,205**
	262nd Street	451st Avenue	453rd Avenue	2.0	**$200,000** *($470,000)*	**Overlay** *Approximately 2 miles potential base improvements*		
	Countywide Chip Seal	-	-	-	**$852,150**	**Chip Seal:** 155B, 16WBW, 16AEB, 19ABW, 03SB, 03ANB, 03ASB, 08AWB, 01A		
2027	**445th Avenue**	261st Street	SD38	8.0	**$800,000** *($1,070,000)* *($2,550,000)*	**Overlay** *Approximately 2 miles potential base improvements* *Shoulder widening (in addition to resurfacing costs)*	**$1,907,700**	**$9,379,950**
	BH2O Avenue	268th Street	SD42	3.1	**$310,000** *($728,500)*	**Overlay** *Approximately 3.1 miles potential base improvements*		
	449/450th Avenue	248th Street	244th Street	5.1	**$510,000** *($1,198,500)*	**Overlay** *Approximately 5.1 miles potential base improvements*		
	Countywide Chip Seal	-	-	-	**$227,700**	**Chip Seal:** 10B, 06EB		
	252nd Street	443rd Avenue	445th Avenue	2.0	**$60,000** *($160,000 / $200,000)*	**Surface Conversion:** AC to gravel conversion (08B) *Convert to blotter / Maintain AC (Overlay)*		

Outlay reflects Major Roads Plan with Base Thickness Considerations scenario

Legend		
$XXX,XXX	**Planned Scenario Improvements**	**Overlay:** Overlay improvement consists of 1.5” mill and 2” asphalt overlay
		Chip Seal: Countywide chip seal and crack seal on noted highways
		Surface Conversion or ROW: Surface conversion or ROW acquisition
($X,XXX,XXX)	*Optional Improvements*	*Base improvement option consists of rebuilding roadway, where needed, to 9 inches of base and resurfacing entire segment*
		ROW improvement option includes ROW widening and reconstruction w/shoulders

Table 10-1b: Bituminous Roadway Segment 10-Year Project Outlay (Major Roads Plan with Base Improvements Scenario)

Year	Route	From	To	Project Length (miles)	Planning Level Estimated Cost (2017 $)	Comments	Total Planned Cost (2017 $)	5-Year Cumulative Total (2017 $)
2018	**Countywide Chip Seal**	-	-	-	**$509,400**	**Chip Seal:** 19ABW, 21ASB, 04AB, 06WB, 09AB	**$509,400**	-
2019	**Countywide Chip Seal**	-	-	-	**$336,600**	**Chip Seal:** 25ANB, 05MB, 05SB, 06EB, 08AEB	**$336,600**	-
2020	**431st Avenue**	258th Street	SD38	5.0	**$737,333**	**Overlay**	**$1,479,500**	-
	431st Avenue	SD38	252nd Street	1.0	**$147,467** *($750,000)*	**Overlay** *Approx.0.5 miles potential ROW widening & reconstruction w/ shoulders*		
	Countywide Chip Seal	-	-	-	**$594,700**	**Chip Seal:** 16WBW, 16AEB, 16AWB, 21B, 03SB		
2021	**Countywide Chip Seal**	-	-	-	**$534,600**	**Chip Seal:** 10B, 16WBE, 16EB, 25B 02EB, 03NB, 08AWB	**$534,600**	-
2022	**431st Avenue**	262nd Street	258th Street	4.0	**$940,000** *($400,000)*	**Base Improvement:** Approximately 4 miles potential base improvements *Overlay*	**$2,599,455**	**$5,459,555**
	451st Avenue	SD42	254th Street	11.0	**$1,037,500** *($700,000)*	**Base Improvement:** Approximately 2.5 miles potential base improvements *Overlay*; Costs are for initial 7 of the 11 miles		
	Countywide Chip Seal	-	-	-	**$448,500**	**Chip Seal:** 20B, 21ANB, 25ASB		
	264th Street	436th Avenue	0.5 Miles East	0.6	**$18,000** *($48,000 / $60,000)*	**Surface Conversion:** AC to gravel conversion (19ABE) *Convert to blotter / Maintain AC (Overlay)*		
	245th Street	US 81	443rd Avenue	2.0	**$60,000** *($160,000 / $200,000)*	**Surface Conversion:** AC to gravel conversion (02WB) *Convert to blotter / Maintain AC (Overlay)*		
	440th Avenue	245th Street	244th Street	2.0	**$60,000** *($160,000 / $200,000)*	**Surface Conversion:** AC to gravel conversion (02AB) *Convert to blotter / Maintain AC (Overlay)*		
	448th Avenue	245th Street	244th Street	1.0	**$30,000** *($80,000 / $100,000)*	**Surface Conversion:** AC to gravel conversion (05NB) *Convert to blotter / Maintain AC (Overlay)*		
	453rd Avenue	265th Street	262nd Street	3.0	**$5,455**	ROW acquisition for gravel to bituminous surface conversion (01A)		
2023	**441st Avenue**	268th Street	US81	0.25	**$25,000**	**Overlay**	**$2,863,300**	**$7,813,455**
	264th Street	435th Avenue	436th Avenue	1.0	**$235,000** *($100,000)*	**Base Improvement:** Approximately 1 mile potential base improvements *Overlay*		
	451st Avenue	SD42	254th Street	11.0	**$670,000** *($400,000)*	**Base Improvement:** Approximately 2 miles potential base improvements *Overlay;* Costs are for remaining 4 of the 11 miles		
	451st Avenue	268th Street	SD42	4.0	**$940,000** *($400,000)*	**Base Improvement:** Approximately 4 miles potential base improvements *Overlay*		
	453rd Avenue	265th Street	262nd Street	3.0	**$600,000** *($180,000 / $60,000)*	**Surface Conversion:** Gravel to AC conversion (01A) *Convert to blotter / Maintain Gravel (Overlay)*		
	Countywide Chip Seal	-	-	-	**$393,300**	**Chip Seal:** 11AB, 21ASB, 25B, 25ANB		
2024	**254th Street**	SD38	454th Avenue	3.8	**$380,000**	**Overlay**	**$2,441,000**	**$9,917,855**
	247th Street	430th Avenue	US81	11.0	**$1,175,000** *($500,000)*	**Base Improvement:** Approximately 5 miles potential base improvements *Overlay;* Costs are for initial 5 of the 11 miles		
	248th Street	448th Avenue	454th Avenue	6.1	**$610,000**	**Overlay**		
	Countywide Chip Seal	-	-	-	**$276,000**	**Chip Seal:** 06WB, 08B, 08AEB		

Year	Route	From	To	Project Length (miles)	Planning Level Estimated Cost (2017 $)	Comments	Total Planned Cost (2017 $)	5-Year Cumulative Total (2017 $)
2025	**435th Avenue**	SD38	244th Street	9.0	**$2,115,000** *($900,000)*	**Base Improvement:** Approximately 9 miles potential base improvements *Overlay*	**$4,800,800**	**$13,239,155**
	247th Street	430th Avenue	US81	11.0	**$1,410,000** *($600,000)*	**Base Improvement:** Approximately 6 miles potential base improvements *Overlay;* Costs are for remaining 6 of the 11 miles		
	446th Avenue	SD42	261st Street	4.0	**$940,000** *($400,000)* *($6,000,000)*	**Base Improvement:** Approximately 4 miles potential base improvements *Overlay* *Approx.0.5 miles potential ROW widening & reconstruction w/ shoulders*		
	Countywide Chip Seal	-	-	-	**$335,800**	**Chip Seal:** 16AWB, 25ANB, 05MB, 05SB		
2026	**261st Street**	446th Avenue	451st Avenue	5.0	**$1,175,000** *($500,000)*	**Base Improvement:** Approximately 5 miles potential base improvements *Overlay*	**$2,497,150**	**$15,201,705**
	262nd Street	451st Avenue	453rd Avenue	2.0	**$470,000** *($200,000)*	**Base Improvement:** Approximately 2 miles potential base improvements *Overlay*		
	Countywide Chip Seal	-	-	-	**$852,150**	**Chip Seal:** 155B, 16WBW, 16AEB, 19ABW, 03SB, 03ANB, 03ASB, 08AWB, 01A		
2027	**445th Avenue**	261st Street	SD38	8.0	**$1,070,000** *($800,000)* *($2,550,000)*	**Base Improvement:** Approximately 2 miles potential base improvements *Overlay* *Shoulder widening (in addition to resurfacing costs)*	**$3,284,700**	**$15,886,950**
	BH2O Avenue	268th Street	SD42	3.1	**$728,500** *($310,000)*	**Base Improvement:** Approximately 3.1 miles potential base improvements *Overlay*		
	449/450th Avenue	248th Street	244th Street	5.1	**$1,198,500** *($510,000)*	**Base Improvement:** Approximately 5.1 miles potential base improvements *Overlay*		
	Countywide Chip Seal	-	-	-	**$227,700**	**Chip Seal:** 10B, 06EB		
	252nd Street	443rd Avenue	445th Avenue	2.0	**$60,000** *($160,000 / $200,000)*	**Surface Conversion:** AC to gravel conversion (08B) *Convert to blotter / Maintain AC (Overlay)*		

Outlay reflects Major Roads Plan with Base Thickness Considerations scenario

Legend		
$XXX,XXX	**Planned Scenario Improvements**	**Base Improvement:** consists of rebuilding roadway, where needed, to 9 inches of base and resurfacing entire segment
		Overlay: Overlay improvement consists of 1.5" mill and 2" asphalt overlay
		Chip Seal: Countywide chip seal and crack seal on noted highways
		Surface Conversion or ROW: Surface conversion or ROW acquisition
($X,XXX,XXX)	*Optional Improvements*	*Overlay option improvement consists of 1.5" mill and 2" asphalt overlay*
		ROW improvement option includes ROW widening and reconstruction w/shoulders

Table 10-2: Gravel Roadway Segment 10-Year Project Outlay (Major Roads Plan with Traffic Volume Based Resurfacing Scenario)

Year	Route	From	To	Total Length (miles)	Planning Level Estimated Cost (2017 $)	Comments	5-Year Cumulative Total (2017 $)
2018	Countywide Gravel Resurfacing	-	-	16	**$248,000**	14AG (4 miles), 14WG (2 miles), 15ASG (4 miles), 17ASG (3 miles)	-
2019	Countywide Gravel Resurfacing	-	-	16.5	**$330,000**	05G (3 miles), 08AEG (3 miles), 08AMG (2 miles), 08AWG (2.5 miles), 14AG (6 miles)	-
2020	Countywide Gravel Resurfacing	-	-	15.5	**$310,000**	01SG (6 miles), 02AG (5 miles), 07AMNG (4.5 miles)	-
2021	Countywide Gravel Resurfacing	-	-	11.5	**$230,000**	01AG (3 miles), 07AMSG (2 miles), 07ASG (2 miles), 15NG (4.5 miles)	-
2022	Countywide Gravel Resurfacing	-	-	18.5	**$200,000**	15ANG (8 miles), 17NG (3 miles), 17SG (6 miles), 01SG (1.5 miles)	**$1,318,000**
2023	Countywide Gravel Resurfacing	-	-	18.5	**$245,000**	14EG (3.5 miles), 15SG (1 mile), 18G (8 miles), 23AG (3 miles), 25G (3 miles)	**$1,315,000**
2024	Countywide Gravel Resurfacing	-	-	15	**$185,000**	07ANG (3.5 miles), 15MG (4 miles), 17ANG (4 miles), 25AG (3.5 miles)	**$1,170,000**
2025	Countywide Gravel Resurfacing	-	-	12	**$160,000**	01NG (4 miles), 17AMG (8 miles)	**$1,020,000**
2026	Countywide Gravel Resurfacing	-	-	19	**$310,000**	14AG (10 miles), 14WG (2 miles), 15ASG (4 miles), 17ASG (3 miles)	**$1,100,000**
2027	Countywide Gravel Resurfacing	-	-	11.5	**$220,000**	01AG (1 mile), 05G (3 miles), 08AEG (3 miles), 08AMG (2 miles), 08AWG (2.5 miles)	**$1,120,000**

Outlay reflects Major Roads Plan with Traffic Volume Based Resurfacing scenario

Table 10-3: Bridge Replacement Project Outlay (0-10 Year Timeframe)

BIG Ranking	Bridge #	Route	Waterway	Major Roads Plan Designation	Planning Level Estimated Replacement Cost (2017 $)	Deficiency	Comments
1	44091040	248th Street	West Fork Vermillion River	Township	Closure	SR, S, P	Proposed bridge closure
2	44010185	431st Avenue	Wolf Creek	Gravel	$1,520,000	SR, P	
4	44221190	263rd Street	East Fork Vermillion River	Gravel	*$475,000*	SR, S, P	*Programmed for 2018 replacement*
5	44110137	441st Avenue	West Fork Vermillion River	Township	Closure	SR, S, P	Proposed bridge closure
7	44219180	262nd Street	East Fork Vermillion River	**Bituminous**	$645,000	SR, P	Consider widening for bicycle and pedestrian accommodations
8	44191010	245th Street	East Fork Vermillion River	Gravel	*$424,000*	SR, S, P	*Programmed for 2019 replacement*
9	44210103	451st Avenue	creek	**Bituminous**	$546,000	SR, P	Consider widening for bicycle and pedestrian accommodations
10	44101110	255th Street	West Fork Vermillion River	Township	*$405,000*	SR, S, P	*Programmed for 2017 replacement*
12	44077010	245th Street	West Fork Vermillion River	Gravel	$543,000	SR	
14	44010067	431st Avenue	Wolf Creek	**Bituminous**	$520,000	SR, P	
17	44210177	451st Avenue	East Vermillion Lake	**Bituminous**	*$344,000*	S	*Deck rehabilitation programmed for 2018, reflected in cost*
22	44042220	266th Street	creek	Township	*$265,000*	SR, S	Programmed for 2017 replacement

Construction costs shown for 2017, 2018, and 2019 programmed bridges
SR = Sufficiency Rating < 70 S = Structurally Deficient P = Posted for Load

Table 10-4: Small Structure Replacement Project Outlay (0-10 Year Timeframe)

Project No.	Route	Between	Waterway	Major Roads Plan Designation	Planning Level Estimated Cost (2017 $)	Comments
Small Structure 1	245th Street	442nd and 443rd	creek	Gravel	*$400,000*	New structure may qualify for biennial inspection requirements, depending on length. Consider improvements in conjunction with next major activity (resurfacing or surface conversion)

Table 10-5: Bridge Replacement Project Outlay (11-20 Year Timeframe)

BIG Ranking	Bridge #	Route	Waterway	Major Roads Plan Designation	Planning Level Estimated Replacement Cost (2017 $)	Deficiency	Comments
3	44140043	444th Avenue	Little Vermillion River	Township	Closure	SR, S, P	*Pile cap preservation programmed for 2017/2018* Proposed bridge closure
11	44180068	448th Avenue	Little Vermillion River	**Bituminous**	$567,000	SR, P	
13	44200093	450th Avenue	Little Vermillion River	Township	$397,000	SR, P	Consider closure of this structure or 44190083
15	44080025	438th Avenue	West Fork Vermillion River	Gravel	$473,000	SR, S, P	
16	44190083	449th Avenue	Little Vermillion River	Township	$574,000	P	Consider closure of this structure or 44200093
20	44124160	260th Street	creek	Township	$373,000	SR, S	
23	44018190	263rd Street	Wolf Creek	Township	Closure	SR, S	Proposed bridge closure
24	44090039	439th Avenue	West Fork Vermillion River	Township	$420,000	SR, S	
25	44123020	246th Street	Little Vermillion River	Township	$448,000	-	
36	44129220	266th Street	West Fork Vermillion River	Township	$567,000	-	
38	44130227	443rd Avenue	West Fork Vermillion River	Township	$637,000	-	
42	44095080	252nd Street	West Fork Vermillion River	**Bituminous**	$493,000	-	
49	44005080	252nd Street	Wolf Creek	Gravel	$392,000	-	
Watch							
6	44220129	452nd Avenue	creek	Township	$501,000	SR, S, P	Watch list
17	44210177	451st Avenue	East Vermillion Lake	**Bituminous**	$1,428,000	S	Watch list
41	44193170	261st Street	Battle Creek	**Bituminous**	$443,000	-	Watch list
33	44103120	256th Street	West Fork Vermillion River	Township	$462,000	S	Watch list

Construction costs shown for 2017, 2018, and 2019 programmed bridges
SR = Sufficiency Rating < 70 S = Structurally Deficient P = Posted for Load

Table 10-6: Bridge Preservation Project Outlay (0-10 Year Timeframe)

BIG Ranking	Bridge #	Route	Waterway	Major Roads Plan Designation	Planning Level Estimated Preservation Cost (2017 $)		Deficiency	Comments
					Timber Pile Bridge Preservation	Other Bridge Preservation		
30	44007010	245th Street	Wolf Creek	Township	$37,000	-		
43	44008070	251st Street	Wolf Creek	Township	$49,000			
26	44010014	431st Avenue	Wolf Creek	Gravel	$30,000			
34	44014050	249th Street	Wolf Creek	Township	$38,000			
23	44018190	263rd Street	Wolf Creek	Gravel	$30,000			Replacement in 11-20 year timeframe; consider observation and replacement
29	44030029	433rd Avenue	creek	Township	$36,000			
12	44077010	245th Street	West Fork Vermillion River	Gravel	$20,000		SR	Replacement in 0--10 year timeframe; consider observation and replacement
15	44080025	438th Avenue	West Fork Vermillion River	Gravel		$12,000	SR, S, P	
24	44090039	439th Avenue	West Fork Vermillion River	Township	$51,000		SR, S, P	
40	44092050	249th Street	West Fork Vermillion River	Township	$38,000			
38	44097100	254th Street	West Fork Vermillion River	Township	$51,000			
33	44103120	256th Street	West Fork Vermillion River	Township		$39,000	S	
19	44107130	257th Street	West Fork Vermillion River	Gravel	$20,000		S	
39	44109150	259th Street	West Fork Vermillion River	Township	$49,000			
46	44120180	262nd Street	West Fork Vermillion River	Township	$49,000			
25	44123020	246th Street	Little Vermillion River	Township	$20,000			
35	44123190	263rd Street	West Fork Vermillion River	Gravel	$51,000			
20	44124160	260th Street	creek	Township		$8,000	SR, S	
36	44129220	266th Street	West Fork Vermillion River	Township	$20,000			
37	44130227	443rd Avenue	West Fork Vermillion River	Township	$20,000			
44	44132230	267th Street	West Fork Vermillion River	Township	$20,000			
3	44140043	444th Avenue	Little Vermillion River	Township	$35,000		SR, S, P	*Programmed for 2017/2018*
28	44160060	446th Avenue	Little Vermillion River	Township	$40,000			
10	44180068	448th Avenue	Little Vermillion River	**Bituminous**		$25,000	SR, P	
31	44183070	251st Street	Little Vermillion River	Township	$46,000			
16	44190083	449th Avenue	Little Vermillion River	Township		$49,000	P	
41	44193170	261st Street	Battle Creek	**Bituminous**	$29,000			
13	44200093	450th Avenue	Little Vermillion River	Township		$19,000	SR, P	
21	44206060	250th Street	East Fork Vermillion River	Township	$42,000			
17	44210177	451st Avenue	East Vermillion Lake	**Bituminous**		$18,000	S	
32	44210227	451st Avenue	creek	**Bituminous**	$36,000			
7	44219180	262nd Street	East Fork Vermillion River	**Bituminous**	$20,000		SR, P	Replacement in 0--10 year timeframe; consider observation and replacement
6	44220129	452nd Avenue	creek	Township		$57,000	SR, S, P	

Construction costs shown for 2017, 2018, and 2019 programmed bridges
SR = Sufficiency Rating < 70 S = Structurally Deficient P = Posted for Load

Table 10-7: Intersection Projects

Project No.	Intersection	Planning Level Estimated Cost (2017 $)	Priority	Need Addressed	Comments
A.1	261st Street & 431st Avenue	$1,500	H	Intersection Traffic Control	▪ Modification to intersection traffic control: change from all-way stop-control to two-way stop-control (north/south directions)
A.2	263rd Street & 447th Avenue	$2,500	H	Intersection Traffic Control	▪ Modification to direction of travel being stopped: two-way stop-control change from north/south traffic being stopped to east/west
A.3a*	254th Street & SD38 (east)	$7,500	H	Skewed Intersection	▪ Minor adjustment within existing pavement footprint on 254th Street to reduce skew and provide closer to 90 degree approach to SD38
A.4a*	254th Street & SD38 (west)	$7,500	H	Skewed Intersection	▪ Minor adjustment within existing pavement footprint on 254th Street to reduce skew and align approach vehicles closer to 90 degree approach to SD38
A.5*	453rd Avenue & 254th Street	$1,135,000	M	Truck Accommodations and Connectivity	▪ Realigns 453rd Avenue south of 254th Street to the east to create a single intersection and remove offset 'T' intersections ▪ 453rd Avenue corridor improvements from southern limit of intersection-related realignment southward to SD38: converts Township road to County highway with 100-foot ROW and County gravel highway standards
A.6*	451st Avenue & Lake Vermillion Recreation Area Entrance	$405,000	M	Increasing Corridor Volumes Due to Development and Seasonal Demand	▪ Remove turning vehicles from through travel lane by adding southbound left-turn lane and bypass lane and northbound right-turn lane ▪ See 451st Avenue roadway segment project for longer-range improvement through intersection
A.3b*	254th Street & SD38 (east)	$50,000	L	Skewed Intersection	▪ Realignment of 254th Street to intersection with SD38 at 90 degree angle
A.4b*	254th Street & SD38 (west)	$45,000	L	Skewed Intersection	▪ Realignment of 254th Street to intersection with SD38 at 90 degree angle
A.7*	451st Avenue & SD38	$380,000	L	Skewed Intersection	▪ Realigns 451st Street to remove skew ▪ May include shared-use path as part of this project (see multi-modal project list for more information)

** See Appendix I for conceptual design layout*

Table 10-8: Roadway Segment Projects

Project No.	Route	From	To	Project Length (miles)	Planning Level Estimated Cost (2017 $)	Priority	Need Addressed	Comments
B.1a*	**447th Avenue**	268th Street	268th Street	0.3	$70,000	H	Section Line Corrections; Truck Accommodations and Connectivity	▪ Shoulder widening through horizontal curves to make it easier for opposing direction trucks to pass through the curves at the same time
B.2	**268th Street**	443rd Avenue	444th Avenue	.05	$20,000	H	Drainage	▪ Construct overflow segment just west of structure 63033000, west of 444th Avenue to help alleviate flooding impact
B.3a*	**BH20 Road**	268th Street	268th Street	0.4	$40,000	M	Section Line Corrections; Skewed Intersections	▪ Shoulder widening through horizontal curves to make it easier for opposing direction trucks to pass through the curves at the same time ▪ Remove 2 intersection approaches
B.4*	**443rd Avenue**	266th Street	266th Street	A) 0.4 B) 0.8 C) 0.15	A) $755,000 B) $525,000 C) no County cost	M	Drainage	▪ Options A & B: Realign 443rd Avenue to the east and raise profile outside of typical flood area to minimize risk of flooding closing the roadway ▪ Option C: Realign driveway outside of flood area
B.5	**267th Street**	443rd Avenue	444th Avenue	.05	$20,000	M	Drainage	▪ Construct overflow segment just west of structure 44132230, east of 443rd Avenue to help alleviate flooding impact
B.6*	**262nd Street**	451st Avenue	453rd Avenue	0.4	$2,912,000	M	Vertical Curves/Grade	▪ Flatten hill to increase sight distance and decrease roadway grade
B.7	**431st Avenue**	Spencer	SD38	0.5	$750,000	M	Truck Accommodations and Connectivity; ROW and Roadway Surface Width	▪ Designated as Major Roads Plan Bituminous – Primary Truck Route ▪ Current ROW is 80' and would require reconstruction with wider ROW ▪ Project also noted in ROW Widening and Multi-Modal project lists
B.1b*	**447th Avenue**	268th Street	268th Street	0.75	$985,000	L	Section Line Corrections; Skewed Intersections; Truck Accommodations and Connectivity	▪ Reconstruct horizontal curves to higher design speed ▪ Reconstruct intersections with 268th Street to remove skewed intersections
B.3b*	**BH20 Road**	268th Street	268th Street	0.35	$475,000	L	Section Line Corrections; Skewed Intersections	▪ Realign 268th Street to remove skewed intersections ▪ Remove all other intersection approaches
B.8*	**451st Avenue**	262nd Street	Lake Vermillion Recreation Area Entrance	0.85	$545,000	L	Increasing Corridor Volumes Due to Development and Seasonal Demand; Growth Area	▪ Construct 3-lane segment with center left-turn lane at driveways and intersections to remove left-turning vehicles from through lane. Consider right-turn lanes at high-volume driveways and intersections. ▪ See 451st Avenue & Lake Vermillion Recreation Area Entrance intersection project for shorter-range improvement
B.9	**261st Street**	US81	Canistota	8.5	$2,550,000	L	Truck Accommodations and Connectivity	▪ Designated as Major Roads Plan Bituminous – Primary Truck Route ▪ Shoulder widening (in addition to any resurfacing project)
B.10	**446th Avenue**	Canistota	SD42	3.5	$6,000,000	L	Truck Accommodations and Connectivity; ROW and Roadway Surface Width	▪ Designated as Major Roads Plan Bituminous – Primary Truck Route ▪ Current ROW is 80' and would require reconstruction with wider ROW ▪ Project also noted in ROW Widening list

** See Appendix I for conceptual design layout*

Table 10-9: Roadway Segment Projects – Roadway Surfacing Conversions

Project No.	Route	From	To	Project Length (miles)	Planning Level Estimated Cost (2017 $)	Priority	Need Addressed	Comments
C.1	**245th Street**	440th Avenue	Valley Road	9	Convert to Gravel: $270,000 Convert to Blotter: $720,000 Maintain AC: $900,000	H	Roadway Surfacing	Proposed conversion to gravel surfacing
C.2	**252nd Street**	443rd Avenue	445th Avenue	2	Convert to Gravel: $60,000 Convert to Blotter: $160,000 Maintain AC: $200,000	H	Roadway Surfacing	Proposed conversion to gravel surfacing
C.3	**264th Street**	436th Avenue	437th Avenue	0.5	Convert to Gravel: $15,000 Convert to Blotter: $40,000 Maintain AC: $50,000	H	Roadway Surfacing	Proposed conversion to gravel surfacing
C.4	**431st Avenue**	SD262	SD42	3	Convert to Gravel: $90,000 Convert to Blotter: $240,000 Maintain AC: $300,000	H	Roadway Surfacing	Proposed conversion to gravel surfacing
C.5	**440th Avenue**	244th Street	245th Street	1	Convert to Gravel: $30,000 Convert to Blotter: $80,000 Maintain AC: $100,000	H	Roadway Surfacing	Proposed conversion to gravel surfacing
C.6	**448th Avenue**	244th Street	245th Street	1	Convert to Gravel: $30,000 Convert to Blotter: $80,000 Maintain AC: $100,000	H	Roadway Surfacing	Proposed conversion to gravel surfacing
C.7	**453rd Avenue**	262nd Street	SD42	3	Convert to AC: $600,000 Convert to Blotter: $180,000 Maintain Gravel: $60,000	H	Increasing Corridor Volumes Due to Development; Growth Area; ROW and Roadway Surface Width	Proposed conversion to asphaltic concrete surfacing with ROW widening

Table 10-10: Roadway Segment Projects – ROW Widening and Reconstruction

Project No.	Route	From	To	Project Length (miles)	Planning Level Estimated Cost (2017 $)	Priority	Need Addressed	Comments
D.1	**245th Street**	US81	443rd Avenue	2 miles	$1,440,000	M	ROW and Roadway Surface Width	Remaining segments along 245th Street to widen ROW to 100 feet and roadway surface to 30 feet (66-foot existing ROW)
D.2	**252nd Street**	435th Avenue	438th Avenue	3 miles	$2,160,000	M	ROW and Roadway Surface Width	Remaining segments along 252nd Street to widen ROW to 100 feet and roadway surface to 30 feet (66-foot existing ROW)
D.3	**Hawk Drive**	451st Avenue	258th Street	3.5 miles	$2,520,000	M	ROW and Roadway Surface Width	Remaining segments along Hawk Drive to widen ROW to 100 feet and roadway surface to 30 feet (66-foot existing ROW)
D.4	**257th Street**	US81	443rd Avenue	2 miles	$1,440,000	M	ROW and Roadway Surface Width	Remaining segments along 257th Street to widen ROW to 100 feet and roadway surface to 30 feet (66-foot existing ROW)
D.5	**431st Avenue**	Spencer	SD38	0.5 miles	See Roadway Segment Project List (#B.7)	M	ROW and Roadway Surface Width	Remaining segments along 431st Avenue to widen ROW to 100 feet and roadway surface to 30 feet (80-foot existing ROW)
D.6	**438th Avenue**	244th Street 257th Street	247th Street SD42	3 miles 8 miles	$2,160,000 $5,750,000	M	ROW and Roadway Surface Width	Remaining segments along 438th Avenue to widen ROW to 100 feet and roadway surface to 30 feet (66-foot existing ROW)
D.7	**446th Avenue**	261st Street	SD42	4 miles	See Roadway Segment Project List (#B.10)	M	ROW and Roadway Surface Width	Remaining segments along 446th Avenue to widen ROW to 100 feet and roadway surface to 30 feet (80-foot existing ROW)
D.8	**447th Avenue**	I-90 263rd Street	261st Street SD42	4.2 miles 2 miles	$3,020,000 $1,440,000	M	ROW and Roadway Surface Width	Remaining segments along 447th Avenue to widen ROW to 100 feet and roadway surface to 30 feet (66-foot existing ROW); Projects dependent on maintaining 447th Avenue crossing of I-90

Table 10-11: Multi-Modal Segment Projects

Project No.	Route	From	To	Project Length (miles)	Planning Level Estimated Cost (2017 $)		Priority	Bicycle and Pedestrian Plan Element	Comments
					Shared-Use Path	Add Shoulders			
E.1	**451st Avenue (Montrose)**	Kluckholm Street	Lynn Avenue	0.45	-	$205,000	H	Urban and Recreational Area	▪ Shared-use path along 451st Avenue to connect residential neighborhood south of SD38 with the school area north of SD38 ▪ May be constructed independently or in conjunction w/ Intersection Project #A.7 ▪ Tie into multi-modal accommodations of new structure (44210103)
E.2	**262nd Street**	451st Avenue *(Sundal Drive)*	453rd Avenue *(Sunset Bluff Drive)*	2.0 *(0.8)*	$900,000 *($360,000)*	$200,000 *($320,000)*	M	Urban and Recreational Area; Rural Bicycle Route w/Paved Shoulder or Shared-Use Path	▪ Provides multi-modal accommodations outside of travel lane ▪ *Alternate connection between Quail Drive to Sunset Bluff Drive shown in ( )* ▪ Does not include pedestrian structure over river ▪ Recommend to incorporate with Roadway Segment Project #B.6
E.3	**451st Avenue**	261st Street *(Lake Vermillion Recreation Area Entrance)*	262nd Street *(Quail Drive)*	1.0 *(0.4)*	$450,000 *($180,000)*	$400,000 *($160,000)*	M	Urban and Recreational Area; Rural Bicycle Route w/Paved Shoulder or Shared-Use Path	▪ Provides multi-modal accommodations outside of travel lane ▪ *Alternate connection between Quail Drive Lake Vermillion Recreation Area Entrance shown in ( )* ▪ Does not include modifications to pedestrian structure over river
E.4	**261st Street**	Canistota	451st Avenue	5.0	$2,250,000	$2,000,000	L	Rural Bicycle Route w/Paved Shoulder or Shared-Use Path	▪ Part of long-term connectivity goal to link developed areas and state highways with multi-modal facilities outside of the motor vehicle travel lane ▪ Links Canistota and Lake Vermillion Recreation Area ▪ Recommend to incorporate with any future roadway improvements
E.5	**451st Avenue**	262nd Street (Lake Vermillion Recreation Area)	SD42	3.0	$1,350,000	$1,200,000	L	Urban and Recreational Area; Rural Bicycle Route w/Paved Shoulder or Shared-Use Path	▪ Part of long-term connectivity goal to link developed areas and state highways with multi-modal facilities outside of the motor vehicle travel lane ▪ Recommend to incorporate with any future roadway improvements
E.6	**451st Avenue**	Lynn Avenue (Montrose)	261st Street (Lake Vermillion Recreation Area)	6.5	$2,925,000	$2,600,000	L	Urban and Recreational Area; Rural Bicycle Route w/Paved Shoulder or Shared-Use Path	▪ Part of long-term connectivity goal to link developed areas and state highways with multi-modal facilities outside of the motor vehicle travel lane ▪ Links Lake Vermillion Recreation Area and Montrose ▪ Recommend to incorporate with any future roadway improvement
E.7	**431st Avenue**	Spencer	SD38	0.5	$225,000	See Roadway Segment Project List (#B.7)	L	Rural Bicycle Route w/Paved Shoulder or Shared-Use Path	▪ Part of long-term connectivity goal to link developed areas and state highways with multi-modal facilities outside of the motor vehicle travel lane ▪ Recommend to incorporate with any future roadway improvements
E.8	**SD38**	431st Avenue	US81	10.0	$4,500,000	$4,000,000	L	Primary Bicycle Route w/Paved Shoulder or Shared-Use Path	▪ Identifies a need for a multi-modal connection between Spencer and Salem, outside of the through travel lanes on SD38 or gravel-surfaced roadways

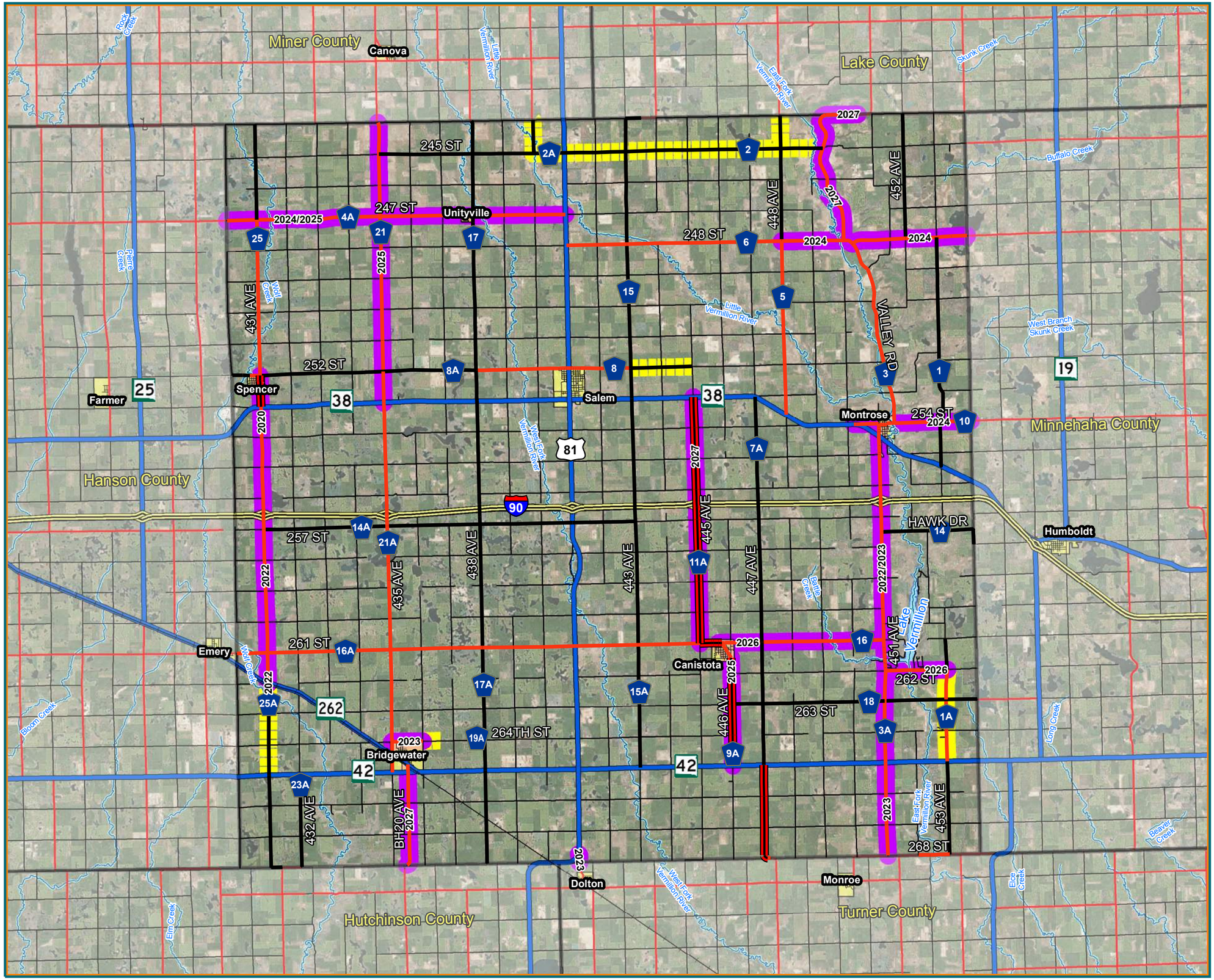


Figure 10-1
Bituminous Roadway Segment 10-Year Project Outlay (2018-2027)

Legend

- Interstate Highway
- State Highway
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City

McCook County Highways

- Bituminous - Primary Truck Route
- Bituminous
- Gravel
- Bituminous Overlay Project

Segments for Evaluation of Future Surfacing Modifications

- Existing Bituminous
- Existing Gravel

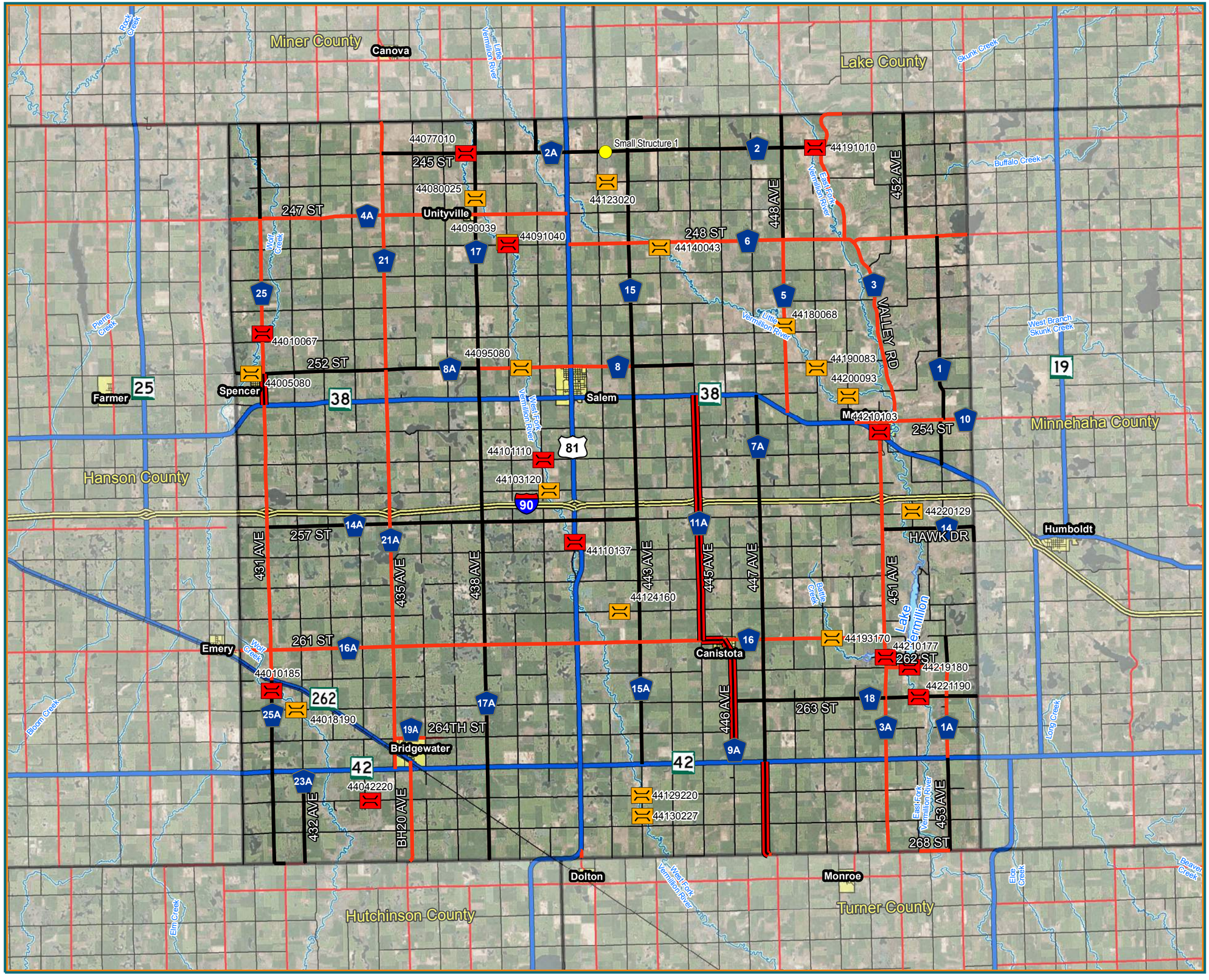
* Note: See companion tables for chip seal projects and optional segment improvements.

N / W / E / S

0 1.5 3 Miles

1 inch = 3 miles

HRGreen



MCCOOK COUNTY
MASTER TRANSPORTATION PLAN

FIGURE 10-2
BRIDGE REPLACEMENT PROJECT OUTLAY (2017 – 2037)

LEGEND

- Interstate Highway
- State Highway
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City

TruckRoute

- Bituminous - Primary Truck Route
- Bituminous
- Gravel

Bridge Projects*

- Small Structure/Culvert Replacement
- Replacement 0-10 Year Timeframe
- Replacement 11-20 Year Timeframe

* Note: see companion tables for supplemental notes and candidates for bridge preservation projects.

N
W E
S

0 1.5 3 Miles

1 inch = 3 miles

HRGreen

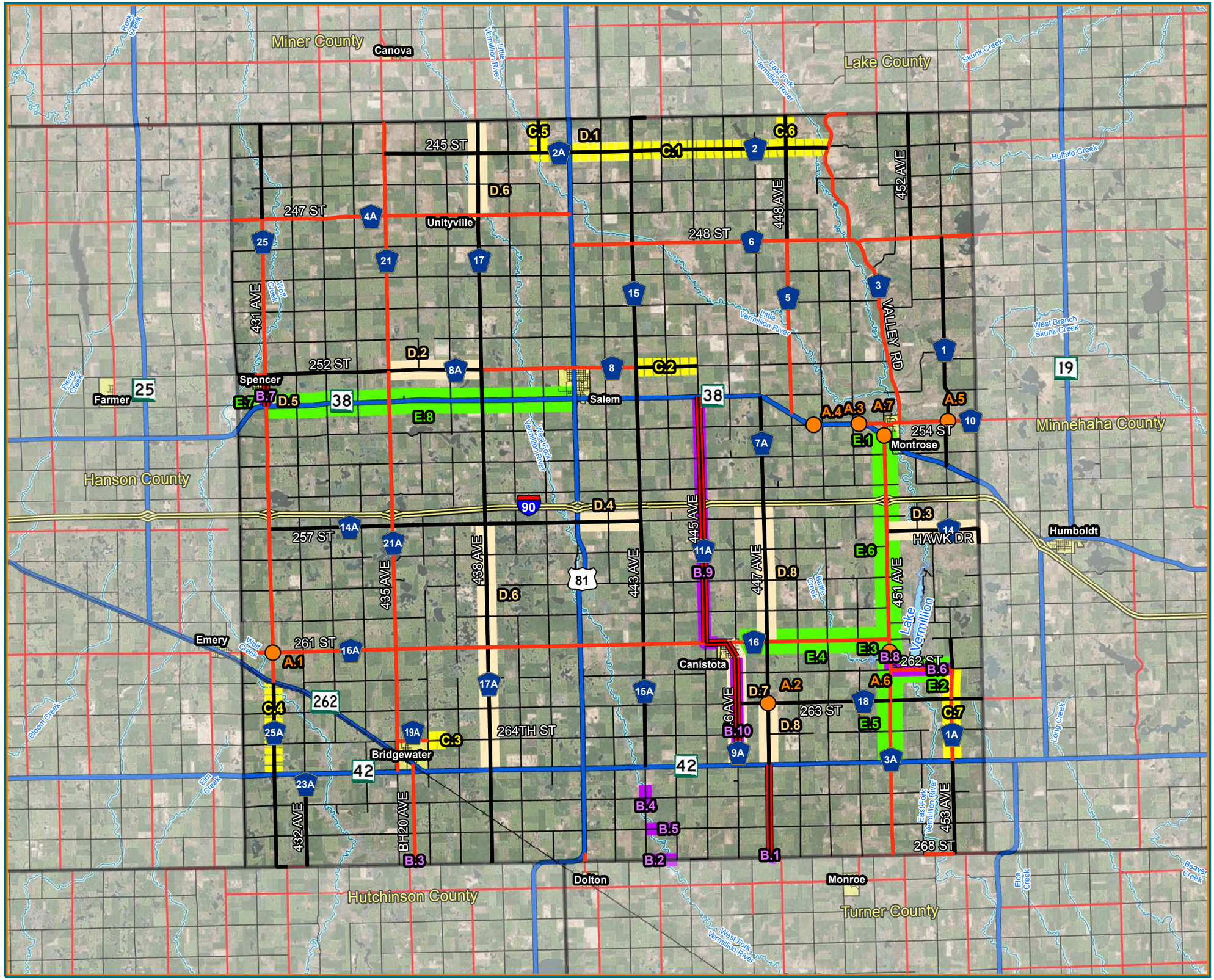


Figure 10-3
Transportation Network Enhancement Projects

- Interstate Highway
- State Highway
- Township Road
- Urban Road
- Railroad
- Rivers/Streams
- Lakes
- City
- Bituminous - Primary Truck Route
- Bituminous
- Gravel

Projects

- A. Intersection Projects
- B. Roadway Improvement Projects
- C. Evaluate Existing Bituminous Surfacing
- C. Evaluate Existing Gravel Surfacing
- D. ROW Widening and Reconstruction Projects
- E. Multi-Modal Projects

N W E S

0 1.5 3 Miles

1 inch = 3 miles

HRGreen

11. Conclusions and Recommendations

Conclusions

The McCook County Master Transportation Plan provides a comprehensive framework for guiding the maintenance, preservation, and enhancement of the County's transportation network over the next 20+ years. Beginning with an introduction of the background and challenges facing McCook County, the Master Transportation Plan provides a comprehensive, multi-modal illustration of the existing and future transportation needs before transitioning into strategies and solutions. In many respects, the Master Transportation Plan is structured to provide strategies to help McCook County maintain the existing network to a level the County residents have grown accustomed to and expect, yet offering the flexibility to provide network enhancements and adapt to changing conditions and needs well into the future.

In conjunction with the initial public and stakeholder involvement process, the SAT identified the following eight current and forecasted needs facing the McCook County transportation network:

- Bridge Condition
- Traffic
- Roadway Geometry
- Roadway Surfacing
- Multi-Modal Accommodations
- Growth Areas
- Drainage
- Railroad Crossings

To address these needs, a series of 'plans' were developed to provide a systematic approach to the planning, prioritization, and implementation of future transportation projects. These plans take the issues and needs identified at the onset of the study and provide the road map to implement recommended strategies and solutions for the next 20+ years:

- Major Roads Plan
- Bridge Plan
- Bicycle and Pedestrian Plan
- Roadway Preservation and Maintenance Plan
- Project Implementation Plan

The Roadway Design, Analysis, and Policy Guidelines chapter was developed to supplement the aforementioned plans and establish formal design and analysis guidelines for future projects and evaluation of impacts in McCook County. These guidelines support the long-term transportation network priorities and goals of McCook County

Public and stakeholder involvement has been an integral part of shaping the Master Transportation Plan, identifying several issues and needs throughout the County and providing recommendations for implementation. Through these discussions, the study team's initial inclinations regarding the importance of maintaining heavy load and large equipment route continuity and connectivity were validated. Transportation network safety and efficiency in mobility Providing a reliable network of priority routes to accommodate consistent vehicle width and weight safely is extremely important to the agricultural economy of McCook County and one of the main objectives of the Major Roads Plan. The County is fortunate to have a well-spaced network of US/State highway corridors that are considered the

backbone for freight and agricultural mobility within McCook County. County highways supplement this network by providing key state route connections and cross-county corridors at regular intervals. Because the large transload grain terminal and ethanol plant facilities are all in adjacent counties, priority route continuity and connectivity took on a reginal approach with consideration of the adjacent Counties' road network and high-demand routes within McCook County.

Maintaining a sustainable transportation network, while incorporating feasible mobility and safety improvements as opportunities arise, is one of the greatest challenges facing McCook County. County funding has been historically flat and proving difficult to keep up with increasing material and construction costs. An evaluation of identified needs vs. forecasted funding shows a shortfall of nearly $18 million over the next 20 years when inflation of material and construction costs is considered. The 2015 Highway Funding Bill provided a few automatic increases, greater flexibility with STP funding and opportunities for each County to generate additional local revenue. However, the greatest potential infusion of funding is from the local opportunities (wheel tax and property tax levy) that require local approval to implement each increase.

Given the challenges in maintaining the existing system as it is today, one of the hallmarks of the McCook County Master Transportation Plan is to provide a comprehensive strategy of maintenance, preservation, and major rehabilitation/replacement for roads and bridges in order maximize the design life of each investment. In addition, when that next major investment is needed, Master Transportation Plan incorporates several opportunities to either modify the existing network or implement a long-term investment geared towards a sustainable transportation network in line with priorities established in the Major Roads Plan. Candidate roadway segments for potential roadway surface modifications (gravel vs. bituminous), bridges for potential closure, jurisdictional transfers, and improvements to roadway typical section elements are all examples of potential modifications to the existing network. A scenario that incorporates these select bridge removals and roadway surface conversions to less costly surfacing materials reduces this shortfall to around $10 million.

In conclusion, the McCook County Master Transportation Plan provides the framework by which McCook County will be able to prioritize, select, and implement improvements to the transportation network over the next 20+ years. It also provides the flexibility to react to changing conditions and shifts in the County's transportation needs as well as opportunities to provide network enhancements and long-term investments as they arise. The Master Transportation Plan is an important step in working towards maintaining the sustainability of the County's transportation network into the future, in addition to recognizing the challenges facing the implementation of the long-range plan. Ultimately, the Master Transportation Plan provides solutions to address the existing and future issues and needs while promoting a livable community that will enhance the economic and social well-being of McCook County residents.

Recommendations

The following provides general recommendations of the implementation of the McCook County Master Transportation Plan, incorporating the evaluation of existing and future conditions, identification of issues and needs, recommended guidance and strategies included each specific plan, and public and stakeholder involvement throughout the study process:

1. Maintain and preserve the existing transportation system and infrastructure.
    a. Maximize the existing transportation infrastructure investment through proactive preservation and maintenance.
    b. Utilize the guidance within the Master Transportation Plan to assist in the identification, prioritization, and selection of projects, and allocation of funding.

c. When faced with major investment decisions, evaluate potential changes to roadway surfacing, closures of bridges, jurisdictional transfers, and roadway typical section elements based on systematic and long-term need-driven evaluation criteria.

2. Prioritize roadways to guide investment decisions.
    a. Promote the highest level of County-jurisdiction mobility in a systematic and sustainable manner that compliments and provides key connections to/from the US/State highway system.
        i. Facilitate reliable, efficient and safe intra- and inter-county travel.
        ii. Minimize or eliminate continuity barriers on priority routes.
    b. Utilize route prioritization guidance identified in the Major Roads Plan.
    c. Utilize bridge prioritization guidance identified in the Bridge Plan.

3. Continue to seek and evaluate new and additional funding opportunities for road and bridge projects.
    a. Investigate feasibility of implementing additional funding opportunities, partial or to the maximum amount, set forth in the 2015 Highway Funding Bill.
        i. Wheel Tax
        ii. Property Tax Levy
    b. Increase the Wheel Tax from $4/wheel to $5/wheel to gain an additional two points in the BIG rankings.
    c. Evaluate the potential for outside grants and assistance when applicable.
    d. Provide an annual summary for the public regarding what completed with the additional funding.

4. Provide a proactive, comprehensive approach to address current and future issues and needs throughout the County's transportation network.
    a. Facilitate a program that blends roadway preservation and maintenance of the existing infrastructure with capital improvement, reconstruction, capacity expansion, and multi-modal improvement projects based on the Master Transportation Plan.
    b. Continue the annual rural road conditions surveys.
    c. Consider the long-range series of improvement needs along a corridor to provide a systematic, planned approach to address issues and needs over the next 20+ years.
        i. In many instances, corridors have multiple, yet exclusive, identified needs. The County should plan to address these needs along the corridor in a systematic and cost-effective means.
    d. Begin planning for large, long-term projects well in advance to assess avenues of funding and coordination.
    e. Consider improvements to all modes of travel throughout the County during major preservation and maintenance activities as well as long-term capital improvement projects.

5. Maintain a Master Transportation Plan that is compatible with other planning documents and adaptable to address unforeseen needs and the evolving transportation network.
    a. The McCook County Master Transportation Plan is intended to be a living document, updated by McCook County as needed in the future.

b. Use the Master Transportation Plan to collaborate with additional multi-modal planning efforts within McCook County, local municipalities, SDDOT-jurisdiction roadway planning, and adjacent counties to promote route connectivity and continuity of a regional transportation network.
c. Incorporate guidance from the Master Transportation Plan into McCook County permits, ordinances, and future studies.

6. Incorporate roadway design and analysis guidance from the Master Transportation Plan into McCook County permits, ordinances, regulations, and future studies, including:
    a. McCook County Building Permit Application
    b. Application for Entrance from a McCook County Highway
    c. Zoning Regulations for McCook County

Appendix A - Traffic and Crash History Memorandum

Appendix B – McCook County Master Transportation Plan Public Involvement #1 and #2

Appendix C – Major Roads Plan Memorandum

Appendix D – McCook County BIG Ranking (2016)

Appendix E – Bridge Evaluation Matrix

Appendix F – McCook County Master Transportation Plan Life Cycle Cost Tables Memorandum

Appendix G – Bicycle and Pedestrian Plan Memorandum

Appendix H – McCook County Funding Forecast Table

Appendix I – Transportation Network Enhancement Project Layouts