Bismarck-Mandan

Metropolitan Transportation Plan

January 2020

ARRIVE 2045
Bismarck-Mandan MPO
Metropolitan Transportation Plan

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SUMMARY

Arrive 2045 is the long-range transportation plan (LRTP), now known as the metropolitan transportation plan (MTP), for the Bismarck-Mandan Metropolitan Planning Organization (BMMPO) area, which includes the City of Bismarck, the City of Mandan, City of LIncoln, Burleigh County, and Morton County. Arrive 2045 is designed to help realize BMMPO's adopted outcomes to meet current and future transportation needs and to gauge the success of these efforts with established performance measures. Arrive 2045 will guide the development of multimodal transportation systems throughout the Bismarck-Mandan metropolitan area for the next 25 years. It will be used to prioritize most of transportation spending throughout this period, and as such, it is vitally important that the plan reflect the choices and desires of the Bismarck-Mandan metropolitan area's residents, workers, and visitors. Since transportation has a broad impact on society, long-range transportation planning must consider concerns, such as impact upon the environment, land use, and economic development, in addition to traditional transportation-related issues, such as mobility and safety.

In accordance with Federal law, metropolitan transportation plans are updated every five years to accommodate the changing needs of the area and to reflect changes in the socio-economic composition of the area, as well as changes in local transportation policy. The last MTP for the Bismarck-Mandan metropolitan area was adopted in 2015. While 2045 extends beyond what can be accurately predicted, a long-range plan's value lies in comprehensively assessing the region's current transportation system and charting a course of action for coming years. It presents an opportunity to step back and take a big-picture look at current conditions, challenges, and possible solutions. Arrive 2045 creates a vision that assists in guiding future decisions toward the goal of a safe and efficient transportation system to meet the area's current and future needs.

Arrive 2045 must also consider all modes of transportation; streets and highways, transit, bicycle and pedestrian, air, rail and water, as well as freight movement within and through the Bismarck-Mandan metropolitan area. The Plan must be maintained so local jurisdictions can receive Federal funding for transportation improvements within the Bismarck-Mandan metropolitan area.

Arrive 2045 must present a reasonable expectation of revenue to fund the improvements identified to meet the transportation needs of the Bismarck-Mandan metropolitan area now and in the future. It must be a fiscally-constrained document. Fiscally-constrained, simply stated, is that the expense of accomplishing the projects identified in the Plan does not exceed what the Bismarck-Mandan metropolitan area can reasonably expect to receive in revenues.

Federal Requirements

Arrive 2045 is an integral part of the BMMPO's "continuing, cooperative, and comprehensive" planning process as stipulated by Federal law. This process was established by the Federal government with the intent of fostering better management, operation, and development of the surface transportation system. This Plan is also compliant with the national goals set forth in Fixing America's Surface Transportation (FAST) Act, the current Federal transportation program. Arrive 2045 adheres to all requirements stipulated in the FAST Act.

Plan Development Process

The planning process for the development of Arrive 2045 consisted of six phases:

- Identify the baseline and future conditions which assessed historic growth and development, analyzed the region's transportation system, and evaluated existing issues and needs.
- Create a transportation vision, goals, and objectives to guide the development.
- Establish a fiscal constraint.
- Evaluate options and alternatives that will address the region's transportation issues and needs and help meet the overall transportation vision for Bismarck-Mandan.
- Prioritize projects based on the fiscal constraint and time line for implementation.
- Plan review and approval by the Bismarck-Mandan MPO's Policy Board.

The six phases were part of the overall process, as shown on the next page.

THE PROCESS

ARRIVE 2045
bismarck mandan
Metropolitan Transportation Plan

PUBLIC ENGAGEMENT

The development of Arrive 2045 was conducted with a pro-active public involvement process. BMMPO staff also worked cooperatively with decision-makers of its member jurisdictions, the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the North Dakota Department of Transportation (NDDOT), and the public to execute a continuous, cooperative, and comprehensive planning process and develop the highest quality public investment plans for our changing society.

Steering Committee

A steering committee was established to provide technical direction and guidance of the Metropolitan Transportation Plan (MTP) development. Representation on the committee included:

- City of Bismarck
- City of Mandan
- City of Lincoln
- Burleigh Bounty
- Morton County
- Bismarck International Airport
- Bismarck Public Schools
- Bismarck Police Department
- Bismarck Rural Fire Department
- North Dakota Department of Transportation

There were ten Steering Committee meetings held throughout the development of the MTP.

Information and Marketing

Project Website

Arrive2045.com was the website established for the MTP to serve as the primary warehouse for all project documents and information as well as a forum to submit public comment. The website included:

- A home page with the most recent project updates and links for new information and to provide comment.
- An about page with a general overview, a frequently asked questions section, the schedule, and project partners.
- A documents page with all documents and newsletters produced during the MTP.
- A contact page with an email submission form and other relevant contact information.

Social Media

Facebook was used to keep the community engaged throughout the MTP development. Facebook posts were published as appropriate throughout the process, with key stakeholders sharing the posts as they were able.

Throughout the study process, there were more than 25 Facebook posts that were viewed by more than 900 different users.

Public Input Meetings

PIM #1: Arrive 2045 Futures Summit

On October 9th and 10th, 2018, the Bismarck-Mandan MPO held the first round of public engagement for the Bismarck – Mandan Metropolitan Transportation Plan (MTP). These were advertised as the Arrive 2045 Futures Summit meetings. The first round included three meetings located across the MPO Planning area. At each meeting there was a brief presentation on the issues identified through the technical analysis; small group prioritization exercise for goals, performance areas, and emerging issues; and a table top exercise to identify future transportation improvements to the transportation network.

PIM#2: Options & Alternatives

A second round of public input was deployed at the midway point of developing Arrive 2045. The second round of public input meetings was structured to provide the public and key stakeholder an opportunity to provide input on the universe of projects which had been developed and evaluated.

Meeting participants were provided with a list and map of identified projects being contemplated for inclusion in Arrive 2045. Each project was identified with a relative technical score that had been previously identified by the project Study Committee. Participants were asked to provide a ranking of their top three projects; and then to provide a general listing of the seven other projects they felt were high priority needs for Arrive 2045.

A total of three input meetings were held the week of July 9, 2019. Each meeting was opened with a short background presentation the Arrive 2045 and provided content and guidance to participants on what input was needed from them at this point in the planning process.

PIM #3: Draft Plan Review

To be completed after the third public input meeting.

VISION, GOALS, OBJECTIVES & PERFORMANCE MEASURES

Transportation Vision

The future of the transportation system in the Bismarck-Mandan metropolitan area will be driven by the vision, goals, objectives, and performance measures developed for Arrive 2045. The vision for Arrive 2045 has been developed as follows:

Arrive 2045 is focused on **preserving** the transportation infrastructure of the Bismarck-Mandan MPO Area. The development of new **funding strategies** will be critical. Future investments in system preservation must be balanced against thoughtful implementation of **new infrastructure** which serve to **expand transportation capacity**. Arrive 2045 establishes a set of **regional priorities** to **balance public expectations** for improved **regional mobility**. Arrive 2045 recognizes the future contains many opportunities to channel **technology** to influence transportation mobility.

Arrive 2045 Goals, Objectives & Performance Measures

The goals developed for Arrive 2045 reflect guidance from MAP-21 planning factors, MAP-21 and FAST Act National Performance Goals, the NDDOT statewide transportation plan, and input from project stakeholders and community outreach. The figure below depicts how the performance measure areas are set as part of MAP-21 and the FAST Act and the requirements for which measures and targets are to be set for NDDOT's Statewide Transportation Plan and the MPO's MTP – Arrive 2045.

Again, the graphic is inclusive of the required performance measure areas. Additional performance measures and desired target trendlines have been set by the MPO as part of Arrive 2045 that pertain specifically to the MPO's system.

Federal Performance Measure Categories	Required for NDDOT Statewide Transportation Plan	Required for MPO MTP – Arrive 2045	Arrive 2045 Additional Local Performance Measures
Pavement Condition [1]	✓	✓	✓
Performance [1]	✓	✓	✓
Bridge Condition [2]	✓	✓	✓
Safety – Fatalities & Serious Injury [3]	✓	✓	✓
Traffic Congestion [5]	✓	Optional	✓
On-road Mobile Source Emissions [5]	✓	Optional	Not Included
Freight Movement [4]	✓	✓	Not Included

Roadways "Required" for the Federal Performance Categories:

(1) Required for Interstate and Non-Interstate NHS Roadways; (2) Required for all NHS Roadways; (3) Required for all Public Roadways; (4) Required for Interstate System Roadways; (5) Required Roadways Not Specified

ARRIVE 2045 GOAL 1:

Safety & Security

Goal 1 incorporates the following goals, performance measures, and planning factors:

- National Performance Goal for safety
- National Performance Measure for Safety - Fatalities and Serious Injuries
- MAP-21 Planning Factors to increase the safety of the transportation system for motorized and non-motorized users and to increase the security of the transportation system for motorized and non-motorized users.

All transportation improvements should be developed with safety of the traveling public in mind. Safety should be considered when developing transportation projects for all modes of motorized and non-motorized transportation. These improvements should consider reducing both the severity and overall number of crashes.

Security of the transportation system includes ensuring users of the transportation system are protected from natural or human disaster (ie flooding, acts of terrorism). Security measures for transportation system users are often considered for public transit riders and non-motorized users of the trail systems. Security of our transportation system also considers the mobility of our emergency service vehicles.

Performance Measures
Existing Metrics and Targets:

State System Federal Requirements

Safety Performance Measure	NDDOT 5-Year Average (2013 - 2017)	2019 NDDOT 5-Year Average Target
Number of Motorized Fatalities	120.0	108.3
[a]Rate of Fatalities per 100 million VMT	1.2	1.106
Number of Motorized Serious Injuries	458.6	413.9
[a]Rate of Serious Injuries per 100 million VMT	4.59	4.23
Number of Non-Motorized Fatalities and Non-Motorized Serious Injuries	36.2	33.4

[a] *The MPO will adapt current NDDOT targets for rate calculated goals*

Local MPO System Optional Requirements

Safety Performance Measure	MPO 5-Year Average (2013 - 2017)
Number of Motorized Fatalities	4.6
Rate of Fatalities per 100 million VMT	0.642
Number of Motorized Serious Injuries	33.6
Rate of Serious Injuries per 100 million VMT	4.687
Number of Non-Motorized Fatalities and Non-Motorized Serious Injuries	5.2

Desired Target:

Reduction in crashes

How will we achieve the goal?
Objectives:

- **1A**: Reduce the incidence of all motor vehicle and non-motor vehicle (pedestrian and cyclist) crashes, with an emphasis on serious injury and fatal crashes. This may include implementing improvements that are both proven Crash Reduction Measures at locations with an existing crash history or at locations without an existing crash history as a proactive improvement (SMO)
- **1B**: Provide a safe and secure environment for transit system riders (PBO)
- **1C**: Enhance transportation security and reliability by developing strategies to address critical transportation assets identified that will facilitate the rapid movement of first responders and support incident management during times of emergency (SMO)
- **1D**: Support North Dakota's State Highway Safety Plan (SHSP) "Vision Zero" as a goal to move toward zero fatal resultant crashes (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

ARRIVE 2045 GOAL 2:

Infrastructure Condition

Goal 2 incorporates the following goals, performance measures, and planning factors:

- National Performance Goals for the infrastructure condition of pavements and bridges.
- National Performance Measure Categories of bridge condition and pavement condition
- MAP-21 Planning Factors to emphasize the preservation of the existing transportation system and to promote efficient system management and operations.

As our transportation system ages, maintenance of our existing system is continuously needed to ensure that the condition of our pavements, bridges, bicycle and pedestrian facilities, transit facilities, and any other components of our existing transportation system are maintained and repaired to serve our traveling public. The challenges with maintaining our existing transportation system typically revolve around funding. The cost of transportation maintenance is continuously rising and there is often a competition between maintenance and operations costs of our existing system versus new facilities.

Performance Measures

Existing Metrics and Targets:

State System Federal Requirements

Pavement Conditions Measures and Targets

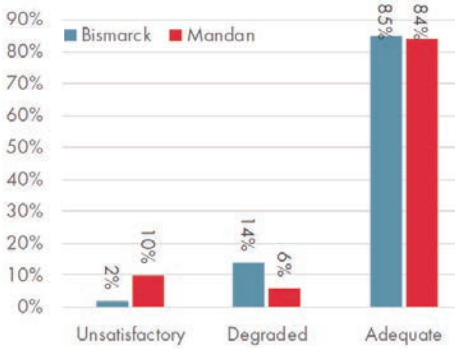
NDDOT Conditions Performance Measure	Existing Condition	Target Condition
Interstate Good	80.2%	75.6%
Interstate Poor	0.1%	3%
Non-Interstate Good	62.8%	58.3%
Non-Interstate Poor	0.3%	3%

Bridge Conditions Measures

Conditions Performance Measure	Structures Good	Structures Poor
Target Condition (NDDOT)	60%	4%
Existing Condition (NDDOT)	64.44%	3.67%

Local MPO System Optional Requirements

Pavement Conditions Measures



Desired Target:

Decrease Percent of Unsatisfactory/ Degraded Pavement

Bridge Conditions Measures

Structures Good:
77.8%

Structures Poor:
5.6%

Desired Target:

Maintain Bridges

How will we achieve the goal?

Objectives:

- **2A**: Maintain pavement quality and bridges at acceptable levels (SMO)
- **2B**: Maintain street signage and visibility (SMO)
- **2C**: Maintain the current bicycle & pedestrian system (SMO)
- **2D**: Maintain transit fleet, equipment, and facilities in a state of good repair as identified within the Transit Development Plan (TDP) (SMO)
- **2E**: Maintain traffic signals, lighting, and other transportation ITS assets at acceptable levels (SMO)
- **2F**: All MPO participating jurisdictions should cost participate in the data collection of pavement system condition on a 5-year cycle (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

ARRIVE 2045 GOAL 3:

Congestion Reduction

Goal 3 incorporates the following goals, performance measures, and planning factors:

- National Performance Goals for congestion reduction and system reliability
- National Performance Measure Categories of traffic congestion and freight movement.
- MAP-21 Planning Factor to enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.

Mobility and connectivity of the transportation system allows users to move from one place to another in a direct route with reduced travel times and reduced delays. Connectivity allows people to make decisions based on traffic conditions, access, and desired trip destinations. Connectivity is not only about a direct route from an origin to a destination, it should also allow users to choose multiple transportation modes and to interchange between the modes in a safe and efficient manner.

Performance Measures

Existing Metrics and Targets:

Local MPO System Optional Requirements

Vehicle Miles Traveled (VMT) Per Capita

County	Population [a]	2017 Annual VMT [b]	Resultant Annual VMT per Capita [c]
Burleigh	95,273	739,236,000	7,800
Morton	31,095	446,409,000	14,500

[a] *Data Source: American Community Survey (ACS) 2018 Population Estimates*
[b] *Data Source: 2017 NDDOT Annual Traffic Report per County*
[c] *Rounded to the nearest 500 miles*

Desired Target:

Reduction of VMT per Capita

Vehicle Hours Traveled (VHT) Per Capita

MPO Population [c]	VHT [d]	VHT per Capita
100,306	47,100	0.47 hours 28.2 minutes

[c] *Data Source: Bismarck Mandan MPO Monitoring Report - US Census, 2010*
[d] *Data Source: 2015 Travel Demand Model*

Desired Target:

Reduction of VHT per Capita

How will we achieve the goal?

Objectives:

- **3A**: Implement projects and programs that will reduce travel delays on corridors that have an existing or proposed Level of Service (LOS) D or worse, to a LOS C or better after the improvement is made (SMO)
- **3B**: Provide and maintain corridors functionally classified as minor arterials and above that facilitate longer-distance travel within the region (SMO)
- **3C**: Improve the continuity of the multimodal systems for pedestrians, cyclists, or transit riders; through improved network connections and reduction of system gaps (SMO)
- **3D**: Support future development that would result in reduced motor vehicle trips (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

ARRIVE 2045 GOAL 4:

System Reliability for Freight Movement and Economic Vitality

Goal 4 incorporates the following goals, performance measures, and planning factors:

- National Performance Goals for system reliability and freight movement and economic vitality.
- National Performance Measure Category of Freight Movement
- MAP-21 Planning Factors to support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency; enhance the integration and connectivity of the transportation system, across and between modes, for people and freight; and increase accessibility and mobility of people and freight.

A transportation system that provides good access for all modes of transportation can promote future development and employment opportunities which will in return stimulate the region's local economy.

A well connected and efficient transportation system that facilitates the movement of goods between freight modes and facilitates the movement of goods and freight to commercial and industrial centers can lower the cost of doing business. This can both support existing business and attract new business to support and enhance the local economy.

Performance Measures

Existing Metrics and Targets:

State System Federal Requirements

System Performance for the Interstate and Non-Interstate NHS

Conditions Performance Measure	Travel Time Reliability Non-Interstate National Highway System (NHS)	Travel Time Reliability Interstate	Freight Reliability Index
Target Condition	85%	85%	3.0
Existing Condition (NDDOT - 2017)	91.6%	99.4%	1.15

Local MPO System Optional Requirements

There is not an MPO desired performance measure or target for this goal.

How will we achieve the goal?

Objectives:

- **4A**: Enhance the efficient and safe movement of freight and goods including investments in congestion reduction and safety improvements on the critical urban freight corridors and other designated freight corridors (SMO)
- **4B**: Support transportation investments as identified in the most recent Bismarck-Mandan MPO Regional Freight Study (PBO)
- **4C**: Promote transportation investments that enhance the local economy (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

ARRIVE 2045 GOAL 5:

Alternative Transportation Modes to Automobile Travel

Goal 5 incorporates the following goals, performance measures, and planning factors:

- National Performance Goals for congestion reduction, system reliability and environmental sustainability.
- National Performance Measure Categories of traffic congestion and on-road mobile source emissions.
- MAP-21 Planning Factors to increase accessibility and mobility of people and freight; protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns; and enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.

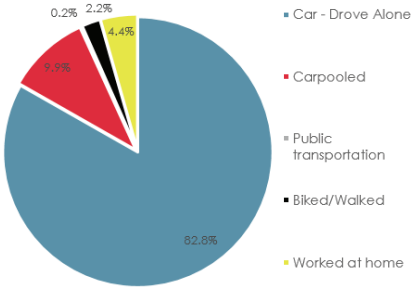
More people are choosing to use alternate modes of transportation to live a healthier lifestyle, reduce their environmental footprint, or spend less money out of their budget on transportation costs. Also, due to various social justice issues, certain portions of the population also are dependent on public transportation or non-motorized transportation. Regardless of the reason, it is important to provide a well-balanced transportation system that supports modes other than a single occupancy motor vehicle. This includes supporting alternative modes of transportation for users of all ages and all abilities.

Performance Measures

Existing Metrics and Targets:

Local MPO System Optional Requirements

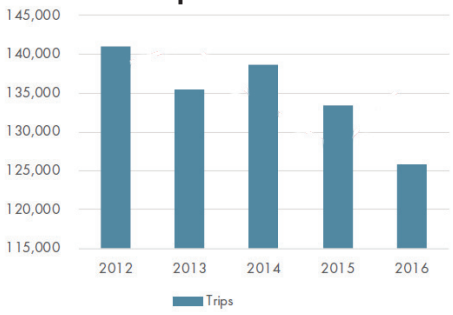
Mode Share



Desired Target:

Decrease single vehicle use

CAT Ridership



Desired Target:

Increase fixed route transit ridership

Miles of Facilities

Facility Type	Miles	
	Bismarck	Mandan
Multi-use Trails	52 miles	18 miles
Bicycle Lanes	4 miles	0 miles
Shared-Use Routes	5 miles	0 miles

Desired Target:

Increase miles of bicycle facilities

How will we achieve the goal?

Objectives:

- **5A**: Consider coordination with transit agencies to improve transit route efficiency, system productivity, and community awareness by implementing transportation investments that support the transit system (PBO)
- **5B**: Improve transit and rideshare opportunities for travelers commuting into Bismarck-Mandan from outside the urban area (PBO)
- **5C**: Improve bicycle and pedestrian system accessibility and connectivity opportunities while maintaining safety by implementing transportation investments identified in the most recent Bismarck-Mandan MPO Bicycle and Pedestrian Plan (SMO)
- **5D**: Improve the awareness and safety of bicycling, and educate both bicyclists and motorists on rules and responsibilities (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

ARRIVE 2045 GOAL 6:

Environmental Sustainability

Goal 6 incorporates the following goals, performance measures, and planning factors:

- National Performance Goal for environmental sustainability.
- National Performance Measure Category for on-road mobile source emissions.
- MAP-21 Planning Factor to promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns.

Air quality is affected by mobile source emissions resulting from vehicle miles traveled (VMT). Air quality impacts can be reduced through roadway improvements that reduce VMT or provide for transportation modes other than single occupancy vehicles. New and expanded transportation facilities can also negatively impact the environment such as impacting wetlands, historical and cultural resources, existing neighborhoods or properties, and many other potential environmental impacts.

Performance Measures

Existing Metrics and Targets:

Local MPO System Optional Requirements

The performance measures and targets for reduction in VMT/Capita and VHT/Capita as identified in Goal 3 Congestion Reduction, will also support environmental sustainability through reduced on-road mobile source emissions. Please see Goal 3 Congestion Reduction for the performance measures, current system performance, and targets.

How will we achieve the goal?

Objectives:

- **6A**: Minimize the transportation system's impacts on the natural and built environment (PBO)
- **6B**: Ensure that projects located within Environmental Justice (EJ) areas have no negative impacts or have identified mitigation measures (PBO)
- **6C**: Promote transportation investments that support infill, mixed use development patterns (PBO)
- **6D**: Provide transportation infrastructure design guidance that fits within the context of the built environment (PBO)
- **6E**: Plan for and address multimodal transportation system impacts/sufficiency when planning new developments (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

ARRIVE 2045 GOAL 7:

Reduced Project Delivery

Goal 7 incorporates the following goals, performance measures, and planning factors:

- National Performance Goals for reduced project delivery delay.
- MAP-21 Planning Factors to support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency; promote efficient system management and operation; and emphasize the preservation of the existing transportation system.

A well developed MTP will consider fiscal constraint and develop, prioritize, and program projects to ensure they are within the means of each jurisdiction's transportation budget. This first includes consideration of maintenance and operation costs of the existing transportation system.

Secondly, lower cost alternatives should be considered to improve the performance of the transportation system before more expensive projects such as extending and widening the system are considered.

Performance Measures

Existing Metrics and Targets:

Local MPO System Optional Requirements

There is currently no data available for this performance measure. The MPO, when able, will commit to collecting these data following the completion of this plan. Baseline data will be available in 2020.

Possible Performance Measures:

- Track the number of projects that are delivered on time (as scheduled).

Possible Desired Target:

Reduction of the number of delayed projects

How will we achieve the goal?

Objectives:

- **7A**: Identify Non-Federal funding opportunities (public or private) to support transportation needs to fund entire projects or greater than the required Federal project match (PBO)
- **7B**: Leverage the existing transportation system by emphasizing low-cost, high impact solutions that may include incremental system improvements, system preservation, and technology applications to achieve congestion in lieu of more expensive projects such as roadway widening (SMO)
- **7C**: Develop policies to support consistent application of development-related improvement requirements and streamlined project development (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

EXISTING SYSTEM PERFORMANCE

The Existing System Performance analysis evaluated the current conditions for all modes of transportation and was used to identify issues and opportunities for investment over the life of Arrive 2045.

Traffic Operations

The travel demand model provides level of service for the functionally classified roadways. Areas of existing concern based on deficient LOS include many of the metro's most heavily traveled arterial roadways:

- Washington Street
- State Street
- I-94
- Divide Avenue
- Bismarck Expressway
- Centennial Road
- 19th Street N
- 7th Street
- 3rd Street (Mandan)
- Memorial Highway
- Downtown Bismarck and Mandan (various streets)

Asset Management

Highways, roads, and bridges are an integral part of the community. These assets keep the economy moving, connect to daily destinations, and provide access in case of an emergency. Asset managemt is defined as a strategic and systematic process of operating, maintaining, and improving physical assets based on engineering and economic analysis. For Arrive 2045 asset management includes pavement conditions and bridge structures.

- Pavement Conditions
  - 75.6 percent of the Interstate in the MPO area is in good condition and 3 percent in poor condition.
  - 58.3 percent of the Non-Interstate National Highway System in the MPO area is in good condition and 3 percent in poor condition.
  - 85 percent of Bismarck's roadways have an adequate pavement condition and 2 percent in unsatisfactory condition.
  - 84 percent of Mandan's roadways have an adequate pavement condition and 10 percent in unsatisfactory condition.
- Bridge Conditions
  - 70 percent of bridge structures in the MPO area are in good condition and just 2 percent in poor condition.

Roadway Safety

The last five years of crash data was analyzed to understand roadway safety patterns and high crash locations. During this timeframe there were 15,039 motorized vehicle and 238 non-motorized crashes. This includes 23 fatal crashes, of which six occurred at intersections, and 186 serious injury crashes.

Bismarck has 17 of 50 high crash urban locations across North Dakota. Mandan, Lincoln, Burleigh, and Morton County had none.

Other Highlights

- Vehicle miles traveled (the sum of the length of each trip driven by every person on the transportation network) has grown faster in Burleigh County than in Morton County, likely associated with larger population growth and suburban style development.
- Vehicle hours traveled (the sum of the travel time for each trip driven by every person on the tranpsortation network) increased 21 percent between 2010 and 2015.
- Passenger trips on Capital Area Transit's fixed routes have declined nearly 11 percent between 2012 and 2016 and about eight percent on the paratransit and demand response service. The Transit Development Plan was recently completed and outlined a variety of potential service improvements and funding mechanisms.
- The Cities of Bismarck and Mandan have 516 miles of bicycle and pedestrian facilities. The 2017 Bicycle and Pedestrian Plan identified priority routes and intersections to improve walking and biking in the Bismarck-Mandan metro.

GROWTH, TRENDS, AND FORECASTS

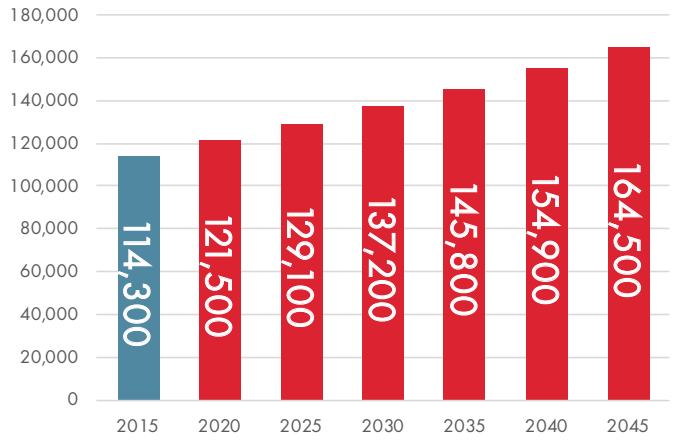
Demographic Trends

Population, household, and employment growth in the Bismarck-Mandan metro area are directly related to the demands placed on the transportation network. As more people and jobs are located in the region, there are more commuting and freight trips. This section includes a review of the population, household, and employment forecasts developed for the Bismarck-Mandan metro area as part of the Bismarck-Mandan Model Review and Socio-Economic Update Study.

Population Growth

The Bismarck-Mandan metro area population has historically grown at a rate of 1.2 percent per year (1985 to 2015), however more recent trends have shown a more significant growth rate, around 2.4 percent per year (2010 to 2015). Recently, the 2045 socioeconomic forecasts were approved using the historic growth rate around 1.2 percent per year, on average, resulting in more than 50,000 new people by 2045, for an expected population of 164,500.

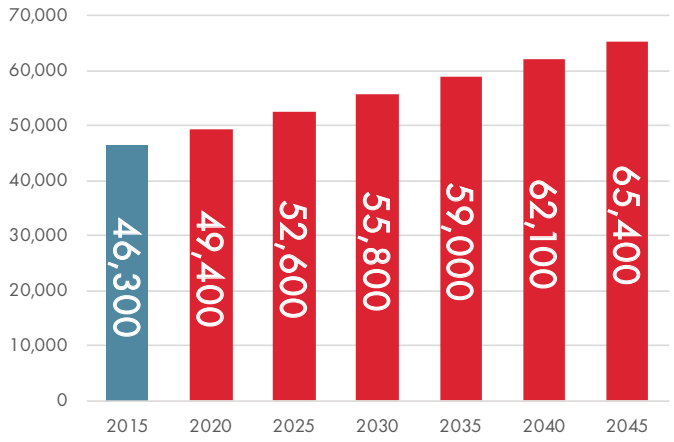
Current and Projected Population



Household Growth

The population growth forecasted through 2045 is allocated to new households based on household size, which reflects a variety of factors, including age and housing type (single-family/multi-family). Household size has declined since the 1970s (3.37) to 2005 (2.39), but has recently stabilized. The demographic forecasts expects a slight increase in household size through 2045. This results in around 65,400 total households in the Bismarck-Mandan metro area by 2045, an increase of more than 19,000 new households. This forecasts is lower (10.5 percent) than previous 25-year forecasts.

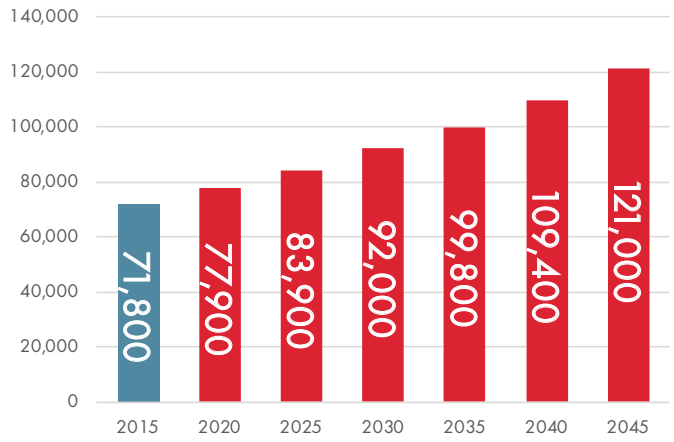
Current and Projected Households



Employment Growth

Employment growth in the Bismarck-Mandan metro area is expected to grow around 1.8 percent per year through 2045, resulting in more than 49,000 new jobs, for a total of 121,000 jobs. This forecast is slightly lower (2.6 percent) than previous 25-year forecasts, likely associated with the uncertainty surrounding energy development in western North Dakota.

Current and Projected Employment



Current and Forecasted Change in Socioeconomic Data

	2015	2020	2025	2030	2035	2040	2045	2015-2045 Percent Change
Metro Population	114,300	121,500	129,100	137,200	145,800	154,900	164,500	43.9%
Metro Households	46,300	49,400	52,600	55,800	59,000	62,100	65,400	41.3%
Metro Jobs	71,800	77,900	83,900	92,000	99,800	109,400	121,000	68.5%

FUTURE SYSTEM PERFORMANCE

The 2020 to 2045 Bismarck-Mandan Metropolitan Transportation Plan uses a year 2045 planning horizon to provide a 25-year time period after plan adoption for prioritizing regional transportation improvements. This chapter provides a performance assessment of the future transportation system.

2030 Future Network Performance

By 2030, the Bismarck-Mandan metro area will add nearly 10,000 households and 20,000 jobs. Even with this anticipated growth, the network will continue to operate effectively through most of the metro, however, there are some areas of growing congestion. Vehicle hours traveled (VHT) by all vehicles on the network will increase 30.3 percent, while vehicle miles traveled (VMT) by all vehicles on the network will increase 28.5 percent. VHT growing at a faster rate than VMT indicates increasing congestion, however mild through 2030.

The 2030 LOS is shown in below. Many of the metro's most heavily traveled arterial roadways will continue to see growing congestion, especially in the northeast.

2030 Model Outputs

	2015	2030	2015-2030 Percent Change
VHT	28,605	37,265	30.3%
VMT	1,753,850	2,253,430	28.5%
% of Links Over Capacity	1.2%	5.1%	322.3%

2045 Future Network Performance

From 2030 to 2045, the Bismarck-Mandan metro area will add another 10,000 households and 29,000 jobs. This anticipated growth begins to overload the network, with many of the functionally classified roadways over capacity. VHT increases far outpace VMT increases, indicating significant congestion on the network. The percent of roadway links over capacity increases more than 10 times when compared to 2015. Many of the metro's most heavily traveled arterial roadways will continue to see growing congestion.

2045 Model Outputs

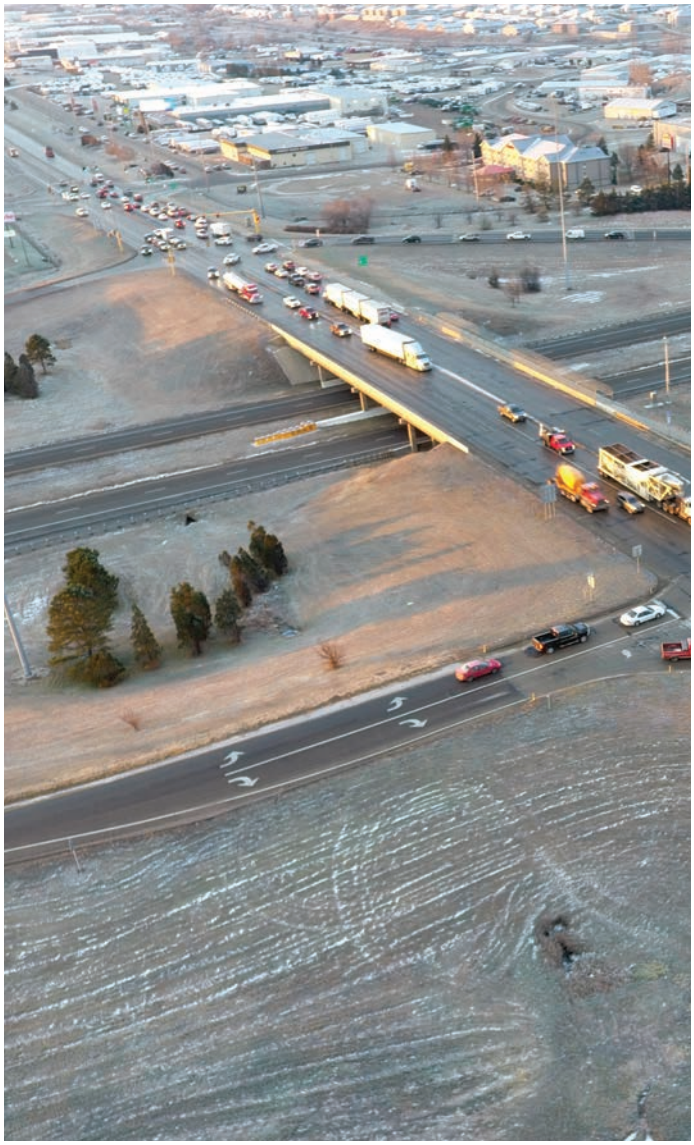
	2015	2045	2015-2045 Percent Change
VHT	28,605	55,650	94.5%
VMT	1,753,850	2,932,685	67.2%
% of Links Over Capacity	1.2%	13.6%	1,033.3%

ALTERNATIVE ANALYSIS

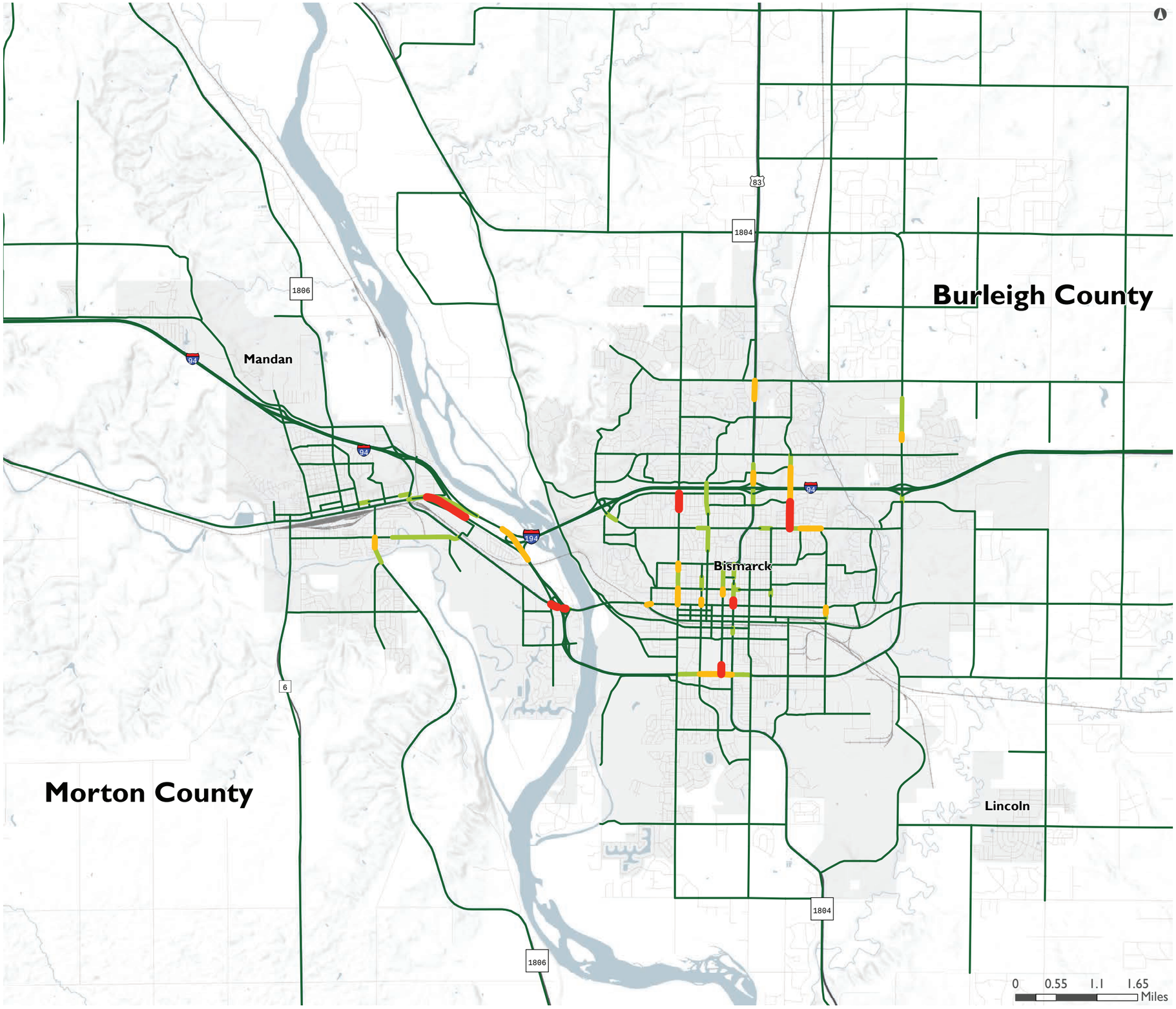
The alternatives analysis for Arrive 2045 was a multi-phased approach to assist in the identification of projects that should be evaluated and prioritized through 2045. This process included the following analyses:

- The Macro-Level Analysis evaluated large project concepts that would potentially address some of the most significant transportation issues, like new river crossings, interchanges, and other major connections.
- The Interstate Analysis completed a more detailed evaluation of the I-94 and I-194 mainline and existing interchanges.
- Smart Mobility workshop evaluated the impacts connected and autonomous vehicles and technology solutions could have on the transportation network.
- Project Evaluation and Prioritization scored and ranked the universe of projects included in this MTP.

Growing Traffic Demands Along Centennial Road



Level of Service 2015



Level of Service

- LOS F
- LOS E
- LOS D
- LOS A-C

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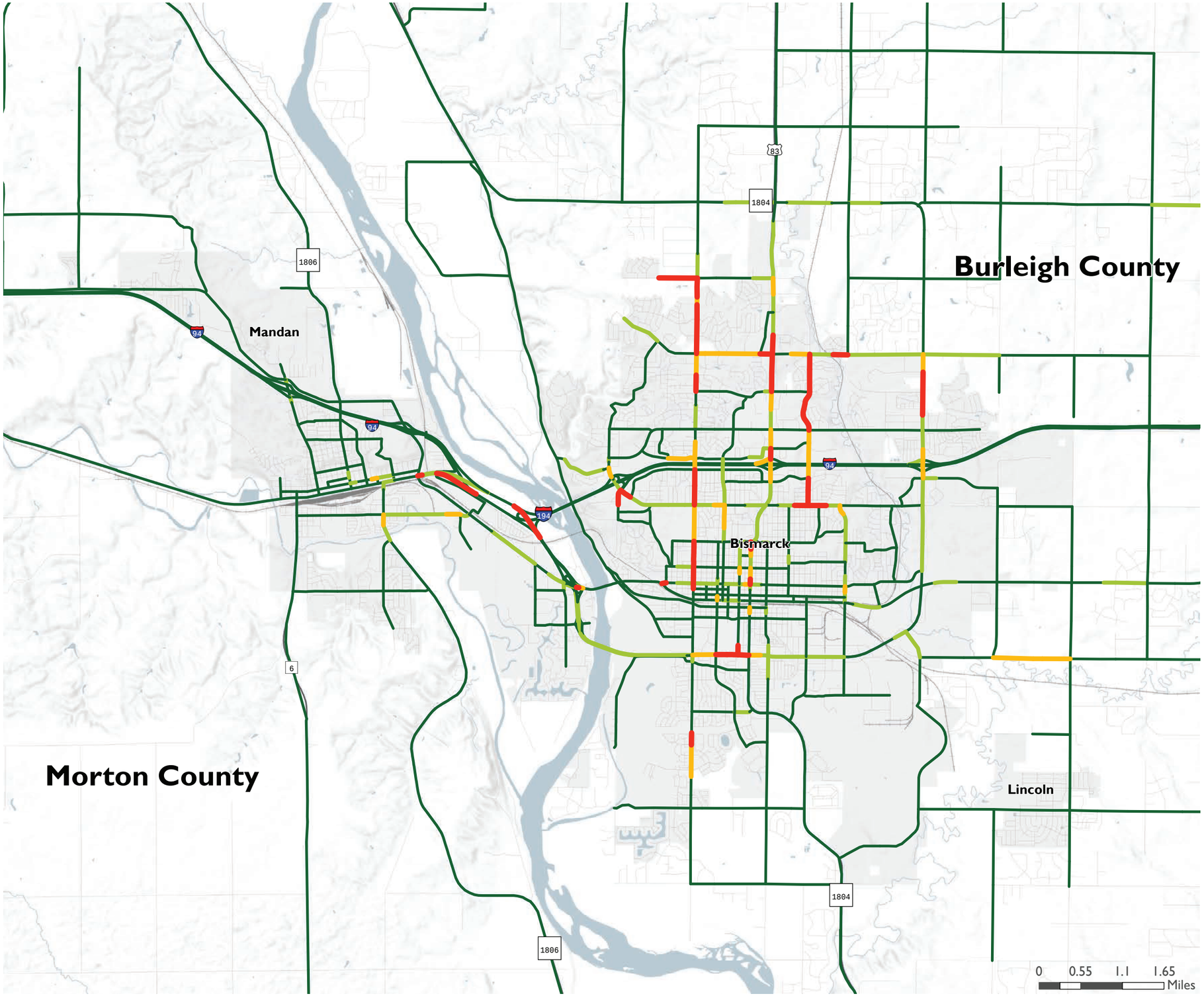

Level of Service 2030

LOS 2030

- F
- E
- D
- A-C

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Level of Service 2045

LOS 2045

- F
- E
- D
- A-C

Burleigh County

Morton County

Mandan

Bismarck

Lincoln

1804

1806

83

94

194

6

0 0.55 1.1 1.65 Miles

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FISCALLY CONSTRAINED PLAN

Development of the Fiscal Constraint

Development of the project list for Arrive 2045 must be based on an established fiscal constraint agreed to between the Bismarck-Mandan MPO and NDDOT. Development of a fiscal constraint can be based on a variety of scenarios and data points regarding transportation funding programs. Five potential scenarios were evaluated based on historical spending and future programmed funds from the current Transportation Improvement Programs. These trends were extrapolated to 2045 and allocated to the different funding programs, including Urban Roads, Regional Roads, Interstate, Safety, and Transportation Alternatives. The scenario selected was reduced by expected preservation and maintenance costs and operations costs to ensure the fiscal constraint is sufficient to manage the existing transportation network before expansion projects were considered. The table below shows the funding available across all project areas and across the short-term (2024-2031), mid-term (2032-2038), and long-term (2039-2045).

Prioritization of Projects

To determine which projects would be selected given limited funds and in what time period the project would be proposed, all projects were prioritized through a three-step process including

- Technical project evaluation based on the project goals and evaluation criteria. A composite score was calculated for each project based on the goal score times the goal weight which was developed as part of the public involvement process.
- Public involvement during the second round of public meetings where the public could select their top priorities.
- Steering Committee review of technical needs and construction feasibility.

Year	Urban	Regional	Interstate	Safety (State)	Safety (Urban)	TA + RTP
Base Year	**$3,936,368**	**$4,581,824**	**$5,120,750**	**$699,713**	**$651,250**	**$233,750**
2024	$4,172,550	$428,524	$3,321,051	$741,695	$690,325	$247,775
2025	$4,235,138	$399,247	$3,318,193	$752,821	$700,680	$251,492
2026	$4,298,666	$366,977	$3,313,186	$764,113	$711,190	$255,264
2027	$4,363,145	$331,568	$3,305,912	$775,575	$721,858	$259,093
2028	$4,428,593	$292,866	$3,296,250	$787,208	$732,686	$262,979
2029	$4,495,022	$250,712	$3,284,073	$799,016	$743,676	$266,924
2030	$4,562,447	$204,939	$3,269,248	$811,002	$754,831	$270,928
2031	$4,630,884	$155,372	$3,251,638	$823,167	$766,154	$274,992
Subtotal	**$29,967,507**	**$2,430,206**	**$26,359,550**	**$6,254,597**	**$5,821,400**	**$2,089,447**
2032	$4,700,347	$1,976,831	$3,231,098	$835,514	$777,646	$279,117
2033	$4,770,852	$1,919,128	$3,207,477	$848,047	$789,311	$283,303
2034	$4,842,415	$1,857,064	$3,087,523	$848,047	$789,311	$283,303
2035	$4,915,051	$1,790,436	$3,055,866	$860,768	$801,150	$287,553
2036	$4,988,777	$1,719,029	$2,926,125	$860,768	$801,150	$287,553
2037	$5,063,608	$1,642,620	$2,885,684	$873,679	$813,168	$291,866
2038	$5,139,563	$1,560,977	$2,745,356	$873,679	$813,168	$291,866
Subtotal	**$28,298,190**	**$12,466,086**	**$21,139,129**	**$6,000,502**	**$5,584,903**	**$2,004,562**
2039	$5,216,656	$1,473,859	$2,695,322	$886,784	$825,365	$296,244
2040	$5,294,906	$1,381,012	$2,640,890	$900,086	$837,746	$300,688
2041	$5,374,329	$1,282,174	$2,581,847	$913,587	$850,312	$305,198
2042	$5,454,944	$1,177,072	$2,517,971	$927,291	$863,066	$309,776
2043	$5,536,769	$1,065,420	$2,449,034	$941,201	$876,012	$314,423
2044	$5,619,820	$946,920	$2,374,794	$955,319	$889,153	$319,139
2045	$5,704,117	$821,264	$2,295,002	$969,648	$902,490	$323,926
Subtotal	**$30,144,852**	**$8,147,721**	**$17,554,860**	**$6,493,916**	**$6,044,144**	**$2,169,395**
Total	**$88,410,549**	**$23,044,013**	**$65,053,539**	**$18,749,015**	**$17,450,447**	**$6,263,404**

Fiscally Constrained Project List

Projects are assigned a time period based on their relative need. So, even if a project could be funded in a later phase, it is kept in the phase at which it is needed and would be listed as "illustrative" which allows for a better representation of unmet funding needs.

Short-Range Projects

The most significant time period and project list is the short-range list, which reflects projects from which to choose for developing the next five TIPs until Arrive 2045 is updated in 2025. Projects with a yellow fill are recommended for inclusion in the constrained plan and would reflect the MPO's prioritized list.

Based on the identification of short range projects, below reflects the financial analysis for the years 2024 to 2031 of Arrive 2045, with a summary of the revenue programs below.

- Urban Program
  - Requires $16M to $19M in Bismarck sales tax to balance program.
  - All Bismarck projects are sales tax eligible; sales tax benefit to the urban system is not fully shown in MTP financial analysis.
- Regional Program
  - Program is balanced; however, P&M revenues needed to support low cost improvements on State Street.
  - Assumes constraint of low cost improvements on State Street while high cost improvements on State Street remain illustrative.
- Interstate Program
  - Generally balanced, includes reconstruction of Exit 161.

Mid Range Projects

Projects with a yellow fill are recommended for inclusion in the constrained plan. Unlike the short-range project lists, there is no Urban Program priority. These projects can be prioritized as necessary.

Mid-Range Financial Analysis

Based on the identification of mid-range range projects, below reflects the financial analysis for the years 2032 to 2038 of Arrive 2045, with a summary of the revenue programs below.

- Urban Program
  - Program slightly out of balance, likely balanced with use of Bismarck Sales Tax.
- Regional Program
  - Program is balanced; however, requires use of P&M revenue to support program.
  - Assumes constraint of low cost improvements on State Street but high cost improvements on State Street remain illustrative.
- Interstate Program
  - Requires more capacity investment to support reconstruction of Exit 159; program still balanced.

Long-Range Projects

Projects with a yellow fill are recommended for inclusion in the constrained plan and can be prioritized as necessary.

Based on the identification of long-range range projects, below reflects the financial analysis for the years 2039 to 2045 of Arrive 2045, with a summary of the revenue programs below.

- Urban Program
  - Program balanced.
- Regional Program
  - Program is balanced; however, requires use of P&M revenue to support program.
  - Assumes constraint of low cost improvements on State Street while high cost improvements on State Street remain illustrative.
- Interstate Program
  - No capacity programmed in long range (e.g. 66th Street Interchange not included in constrained MTP).

Fiscally Constrained Projects and Future Network Performance

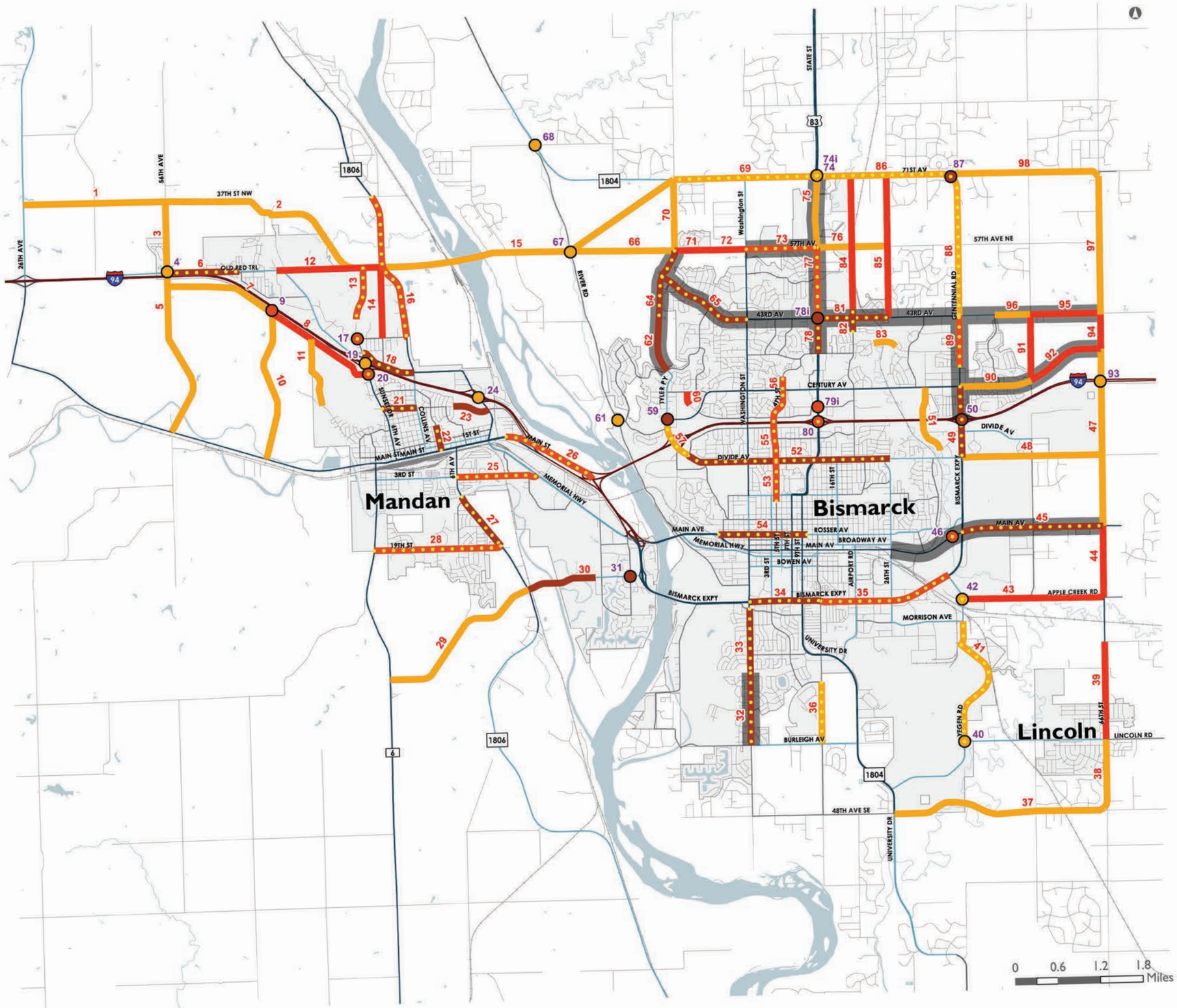
Projects that were cost constrained in the short-, mid-, and long-term were applied to the travel demand model. The prioritized and constrained projects reduce congestion, when compared to the 2030 and 2045 networks without these projects, but increase vehicle miles traveled.

2030 Fiscally Constrained Projects Model Outputs

	2015	2030	2015-2030 Percent Change
VHT	28,605	37,415	30.8%
VMT	1,753,850	2,489,035	41.9%
% of Links Over Capacity	1.2%	2.8%	133.3%

2045 Fiscally Constrained Projects Model Outputs

	2015	2045	2015-2045 Percent Change
VHT	28,605	49,235	72.1%
VMT	1,753,850	3,291,190	87.7%
% of Links Over Capacity	1.2%	7.6%	533.3%



Project Phasing

- Short Range Projects
- Mid Range Projects
- Long Range Projects
- Short Range Projects for Constrained Plan
- Mid Range Projects for Constrained Plan
- Long Range Projects for Constrained Plan
- Bismarck Sales Tax Eligible Corridors

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Short-Range Project List

ID	Location	Termini	Termini	Description	Phase	Cost	Year of Expenditure [YOE]	Program	Urban Program Priority
6	Old Red Trail	56th Avenue	40th Avenue NW	Reconstruct as 3-lane urban section.	Short	$8,400,000	$9,826,812	Urban	2
18	Old Red Trail	Sunset Drive	ND1806 / Collins Avenue	Restripe for 3-lane urban section.	Short	$39,500	$46,209	Safety	
21	Division Street	Sunset Drive	ND 1806 / Collins Avenue	Reconstruction.	Short	$2,500,000	$2,924,646	Urban	5
22	3rd Avenue NE	Main Street	5th Street	Reconstruction.	Short	$2,500,000	$2,924,646	Urban (P&M)	7
23	Division Street	8th Avenue E	Mandan Avenue	Construct as 2-lane urban section.	Short	$2,880,000	$3,369,193	Urban	
27	Highway 1806	19th Street	Heart River Bridge	Add turn lanes and signals at 8th Avenue and 19th Street.	Short	$1,750,000	$2,047,252	Regional (P&M)	
30	McKenzie Road	Highway 1806	39th Avenue E	Construct as 2-lane rural section. Include new bridge across Heart River. Add signals at McKenzie Drive/ Bismarck Expressway ramps and at McKenzie Drive/40th Avenue.	Short	$15,650,000	$18,308,286	Urban	
31	McKenzie Road	46th Avenue SE		Intersection capacity improvement.	Short	$2,500,000	$2,924,646	Urban	
32	Washington Street	Burleigh Avenue	Drainage Channel	Reconstruct as 3-lane urban arterial.	Short	$8,720,000	$10,201,167	Urban	3
33	Washington Street	Drainage Channel	Denver Avenue	Turn lane improvements including restripe south of Reno Avenue as 3-lane section.	Short	$39,000	$45,624	Safety	
34	Bismarck Expressway	Washington Street	12th Street	Safety improvements.	Short	$5,000,000	$5,849,293	Safety	
45	Main Avenue	Bismarck Expressway	66th Street	Widen from 2-lane to 3-lane section (including intersection improvement at 52nd Street).	Short	$10,020,000	$11,721,983	Urban	6
49	Bismarck Expressway / Centennial Road	Divide Avenue	Century Avenue	Widen from 5-lane to 6-lane section.	Short	$3,960,000	$4,632,640	Mix	
50	Bismarck Expressway / Centennial Road	I-94		Interchange reconstruction.	Short	$25,000,000	$29,246,464	Interstate	
52	Divide Avenue	Turnpike Avenue	26th Street	Restripe as 3-lane urban section.	Short	$143,500	$167,875	Safety	
54	Rosser Avenue	Main Avenue	10th Street	Restripe as 3-lane urban section.	Short	$62,000	$72,531	Safety	
59	Century Avenue	Tyler Parkway		Intersection capacity improvement.	Short	$2,500,000	$2,924,646	Urban	
62	Tyler Parkway	Valley Drive	43rd Avenue	Construct as 2-lane urban section.	Short	$4,260,000	$4,983,597	Urban	
64	Tyler Parkway	43rd Avenue	57th Avenue	Overlay existing roadway to 2-lane rural section.	Short	$500,000	$584,929	Urban	8
65	Ash Coulee Drive	Tyler Parkway	Washington Street	Widen from 2-lane to 3-lane urban section.	Short	$5,240,000	$6,130,059	Urban	4
78	State Street	Calgary Avenue	43rd Avenue	At grade improvements: Calgary Avenue and 43rd Avenue; widening to 6-lane urban section from Calgary Avenue through 43rd Ave intersection.	Short	$15,185,000	$17,764,302	Regional	
78i	State Street	43rd Avenue		Grade separation.	Short	$30,000,000	$35,095,757	Regional	
81	43rd Avenue	State Street	26th Street	Construct 3-lane or 5-lane urban section.	Short	$10,000,000	$11,698,586	Urban	1
82	19th Street	North Valley Loop/Yucca Avenue	43rd Avenue	Reconstruct as 3-lane urban section.	Short	$1,380,000	$1,614,405	Urban	1
87	71st Avenue	Centennial Road		Intersection capacity improvement.	Short	$2,500,000	$2,924,646	Safety	
TBD	State Street	Calgary Avenue	43rd Avenue	Shared use path.	Short	$1,000,000	$1,169,859	Regional	

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Mid-Range Project List

ID	Location	Termini	Termini	Description	Phase	Cost	Year of Expenditure [YOE]	Program
8	Boundary Road	32nd Avenue	Sunset Drive	Construct as 3-lane urban section.	Mid	$12,640,000	$20,237,047	Urban
9	32nd Avenue	I-94		Grade separation.	Mid	$15,000,000	$24,015,483	Urban
12	38th Street NW	Old Red Trail	Collins Avenue / ND 1806	Construct as 2-lane urban section.	Mid	$8,700,000	$13,928,980	Urban
13	Sunset Drive	Middle School	38th Street	Construct as 2-lane urban section.	Mid	$4,500,000	$7,204,645	Urban
14	8th Avenue NW	27th Street	38th Street	Construct as 2-lane urban section.	Mid	$6,000,000	$9,606,193	Urban
16	ND 1806	Old Red Trail	37th Street	Intersection capacity improvement, add turn lanes at key intersections. (Assume minor intersection improvements to match new 37th St section)	Mid	$2,711,000	$4,340,398	Regional (P&M)
17	27th Street N / Sunset Drive Intersection	Sunset Drive		Intersection capacity improvement.	Mid	$2,500,000	$4,002,581	Safety
20	Boundary Road	Sunset Drive		Signalize and stripe turn lanes on all approaches.	Mid	$350,000	$560,361	Safety
25	3rd Street	6th Avenue / ND1806	Memorial Highway	Restripe to include turn lanes or restripe to 3-lane section with center turn lane and no parking.	Mid	$57,000	$91,259	Safety
26	I-94	I-194		Additional westbound lane from I-94/I-194 to Main St/Exit 155.	Mid	$6,000,000	$9,606,193	Interstate
28	19th Street SE	ND 6	ND1806	Reconstruct as 3-lane urban section.	Mid	$14,400,000	$23,054,864	Urban
35	Bismarck Expressway	12th Street	Yegen Road	Implement 3/4 access control at 5 intersections and add right turn at Airport Road.	Mid	$500,000	$800,516	Regional (P&M)
39	66th Street	Lincoln Road	Northgate Drive	Widen from 2-lane to 3-section.	Mid	$5,480,000	$8,773,657	Urban
43	Apple Creek Road	Yegen Road	66th Street	Intersection capacity improvements at all intersections.	Mid	$5,000,000	$8,005,161	Urban
44	66th Street	Apple Creek	Highway 10/ Old Main Avenue	Widen from 2-lane to 3-section.	Mid	$4,040,000	$6,468,170	Urban
46	Main Avenue	Hay Creek Crossing		Structural replacement.	Mid	$500,000	$800,516	Regional (P&M)
53	4th Street	Boulevard Avenue	Divide Avenue	4th Street signal timing Improvements, stripe turn lanes at key intersections, potential new signal at Turnpike.	Mid	$278,500	$445,887	Safety
55	4th Street	Divide Avenue	Century Avenue	4th Street signal timing Improvements, stripe turn lanes at key intersections, potential new signal at Turnpike.	Mid	$303,000	$485,113	Safety
56	4th Street	Century Avenue	Montreal Street	4th Street signal timing Improvements, stripe turn lanes at key intersections, potential new signal at Turnpike.	Mid	$275,000	$440,284	Safety
60	Interstate Avenue	Country West Road	Country West Road	Construct as 2-lane urban section.	Mid	$1,140,000	$1,825,177	Urban
71	57th Avenue	Tyler Parkway	Crested Butte Road	Construct as 3-lane rural section.	Mid	$3,150,000	$5,043,251	Urban
72	57th Avenue	Crested Butte Road	Washington Street	Construct as 3-lane rural section.	Mid	$3,710,000	$5,939,830	Urban
73	57th Avenue	Washington Street	State Street	Construct as 3-lane rural section.	Mid	$7,000,000	$11,207,226	Urban
77	State Street	43rd Avenue	57th Avenue	Widen to 6-lanes from N of 43rd through 57th; intersection improvement at 57th.	Mid	$11,350,000	$18,171,716	Regional
79i	State Street	Interstate Boulevard		Grade separation.	Mid	$23,000,000	$36,823,741	Regional
80	State Street	I-94		Interchange reconstruction.	Mid	$21,000,000	$33,621,677	Interstate
84	19th Street	Skyline Boulevard	71st Avenue	Construct as 3-lane urban section.	Mid	$15,040,000	$24,079,525	Urban
85	26th Street	43rd Avenue	71st Avenue	Construct as 3-lane rural section.	Mid	$16,000,000	$25,616,515	Urban
89	Centennial Road	Jericho Road	43rd Avenue	Widen from 3-lane to 5-lane urban section.	Mid	$2,800,000	$4,482,890	Urban
91	52nd Street	Century Avenue	43rd Avenue	Reconstruct as 3-lane rural section.	Mid	$7,440,000	$11,911,680	Urban
92	Century Avenue	52nd Street	66th Street	Construct 3-lane urban section.	Mid	$9,040,000	$14,473,331	Urban
94	66th Street	Century Avenue	43rd Avenue	Reconstruct as 3-lane urban section.	Mid	$4,190,000	$6,708,325	Urban
95	43rd Avenue	52nd Street	66th Street	Widen from 2-lane to 3-lane or 5-lane urban section.	Mid	$8,000,000	$12,808,258	Urban

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Long-Range Project List

ID	Location	Termini	Termini	Description	Phase	Cost	Year of Expenditure [YOE]	Program
1	37th Street NW	ND 25	56th Avenue	Construct 2-lane urban section.	Long	$12,060,000	$24,431,347	
2	37th Street NW	56th Avenue	ND 1806	Construct 3-lane urban section.	Long	$27,920,000	$56,560,797	
3	56th Avenue	Old Red Trail	37th Street	Reconstruct as 3-lane urban section .	Long	$8,000,000	$16,206,532	Urban
4	56th Avenue NW	I-94		New interchange.	Long	$25,000,000	$50,645,413	Interstate
5	56th Avenue NW	I-94 Business Loop (Main Street)	Old Red Trail	Construct as 3-lane urban section.	Long	$19,280,000	$39,057,742	Urban
7	Boundary Road	56th Avenue / I-94 Interchange	32nd Avenue	Construct as 3-lane urban section.	Long	$13,200,000	$26,740,778	Urban
10	32nd Avenue W	I-94 Business Loop (Main Street)	Boundary Road (Future)	Construct as 2-lane urban section.	Long	$12,660,000	$25,646,837	Urban
11	31st Street	Lohstreter Road	Boundary Road (Future)	Construct as 2-lane urban section.	Long	$5,940,000	$12,033,350	Urban
15	Northern Bridge Corridor	38th Street (Mandan)	River Road	Construct as 2-lane rural section. Include new bridge across Heart River. Add signals at McKenzie Drive / Bismarck Expressway ramps and at McKenzie Drive / 40th Avenue.	Long	$62,450,000	$126,512,241	
19	Sunset Drive	I-94		Interchange reconstruction.	Long	$25,000,000	$50,645,413	Interstate
24	Mandan Avenue	I-94		Interchange reconstruction.	Long	$25,000,000	$50,645,413	Interstate
29	McKenzie Road	ND 6	ND 1806	Construct as 2-lane rural section.	Long	$12,550,000	$25,423,997	Urban
36	12th Street	Burleigh Avenue	Santa Fe Avenue	Add turn lanes at Santa Fe Avenue and Burleigh Avenue.	Long	$1,000,000	$2,025,817	Safety
37	48th Avenue S	University Drive	66th Street	Construct 2-lane rural section and structure improvements at Apple Creek crossing.	Long	$19,800,000	$40,111,167	Urban
38	66th Street	48th Avenue S	Lincoln Road	Reconstruct as 2-lane urban section.	Long	$5,880,000	$11,911,801	Urban
40	Lincoln Road	Yegen Road / Airway Avenue		Intersection capacity improvement.	Long	$2,500,000	$5,064,541	Safety
41	Yegen Road	Lincoln Road	Morrison Avenue	Add 6 new turn lanes in key locations.	Long	$1,500,000	$3,038,725	Safety
42	Apple Creek Road	Yegen Road		Intersection capacity improvement.	Long	$2,500,000	$5,064,541	Safety
47	66th Street	Highway 10 / Old Main Avenue	Century Avenue	Construct as 3-lane urban section (tied with project for interchange with I-94 at 66th Street).	Long	$19,920,000	$40,354,265	Urban
48	Divide Avenue	Bismarck Expressway	66th Street	Reconstruct as 3-lane urban section.	Long	$15,200,000	$30,792,411	Urban
51	Hamilton Street / Channel	Divide Avenue	Century Avenue	Construct as 2-lane urban section with grade separation.	Long	$20,940,000	$42,420,598	Urban
57	Tyler Parkway	Schafer Road	Burnt Board Drive	Intersection capacity improvement. Add turn lanes and include safety improvements.	Long	$750,000	$1,519,362	Urban
61	Burnt Boat Drive	River Road		Intersection capacity improvement.	Long	$2,500,000	$5,064,541	Urban
66	57th Avenue	River Road	Tyler Parkway	Construct as 3-lane rural section.	Long	$10,220,000	$20,703,845	Urban
67	Burnt Creek Loop South (57th Avenue)	River Road		Intersection capacity improvement.	Long	$2,500,000	$5,064,541	Urban
68	Burnt Creek Loop North / River Road	ND 1804		Intersection capacity improvement.	Long	$2,500,000	$5,064,541	Regional
69	71st Avenue/ ND 1804	15th Street/Tyler Parkway	State Street	Widen from 2-lane to 4-lane section.	Long	$10,150,000	$20,562,038	Regional
70	Tyler Parkway	57th Avenue	ND 1804 / 71st Avenue	Construct as 3-lane urban section.	Long	$7,920,000	$16,044,467	Urban
74	71st Street	State Street		Intersection capacity improvement.	Long	$2,200,000	$4,456,796	Regional
74i	71st Street	State Street		Grade separation.	Long	$25,000,000	$50,645,413	Regional
75	State Street	57th Avenue	71st Avenue	Widen to 6-lanes from 57th Avenue to ND 1804/ 71st Avenue.	Long	$12,600,000	$25,525,288	Regional
76	57th Avenue	State Street	26th Street	Construct 3-lane urban section.	Long	$7,680,000	$15,558,271	Urban
83	Calgary Avenue	DMVW Railroad	Haycreek Road	Construct 2-lane urban section across DMVW RR with grade separation.	Long	$36,980,000	$74,914,695	Urban
86	71st Avenue	State Street	Centennial Road	Widen from 2-lane to 3-lane rural section.	Long	$7,280,000	$14,747,944	Urban
88	Centennial Road	43rd Avenue	71st Avenue	Widen from 2-lane to 3-lane rural section.	Long	$7,960,000	$16,125,499	Urban
90	Century Avenue	Centennial Road	52nd Street	Reconstruct as 5-lane urban section.	Long	$10,875,000	$22,030,755	Urban
93	I-94	66th Street		New interchange.	Long	$25,000,000	$50,645,413	Interstate
96	43rd Avenue	Roosevelt Drive	52nd Street	Widen from 2-lane to 3-lane urban section.	Long	$1,960,000	$3,970,600	Urban
97	66th Street	43rd Avenue	71st Avenue	Reconstruct/New Construct as a 3-lane urban section.	Long	$15,600,000	$31,602,738	Urban
98	71st Avenue	Centennial Road	66th Street	Reconstruct as a 3-lane urban section.	Long	$16,160,000	$32,737,195	Urban

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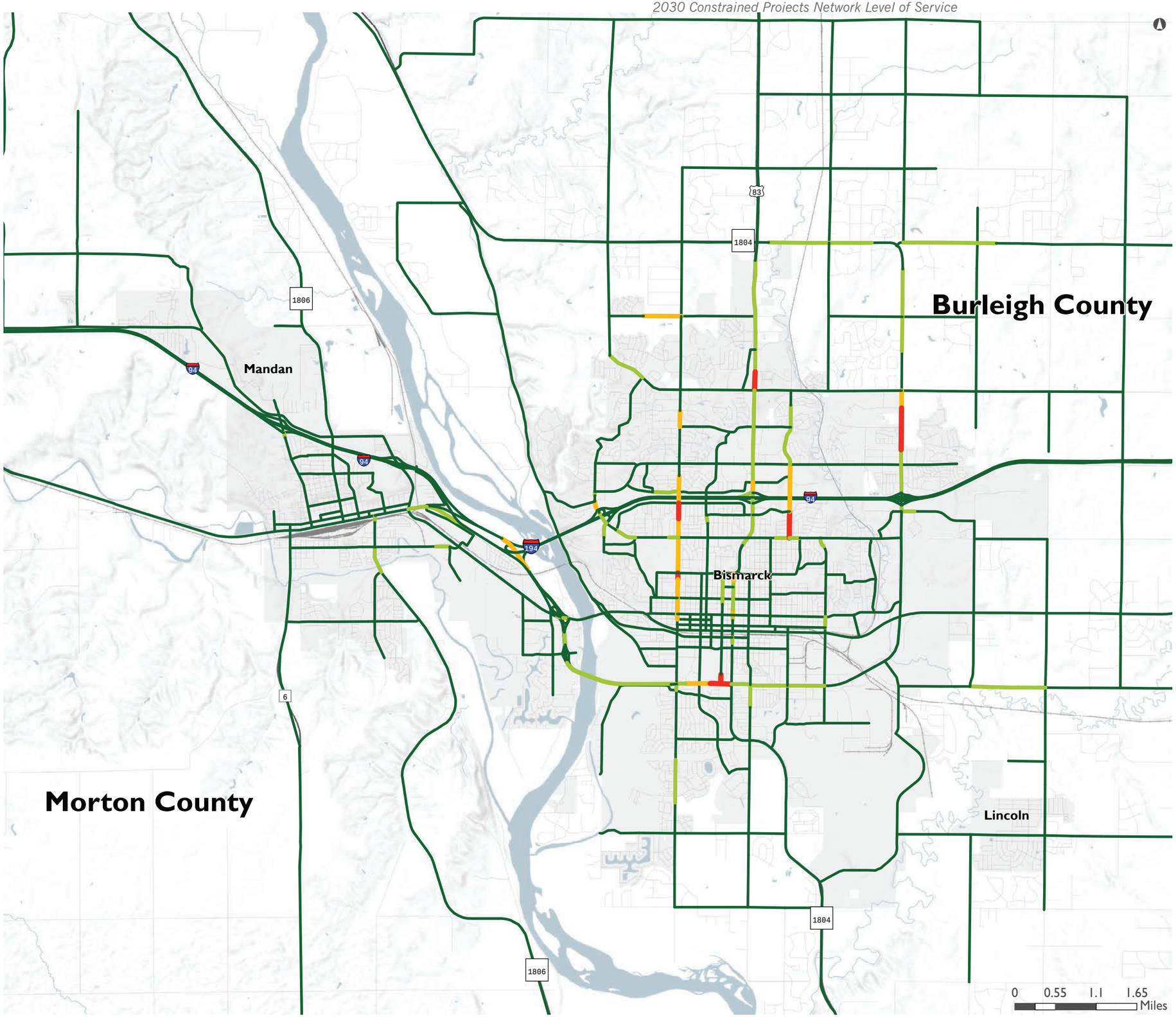
2030 Constrained Projects Network Level of Service



Level of Service 2030

LOS 2030

- F
- E
- D
- A-C

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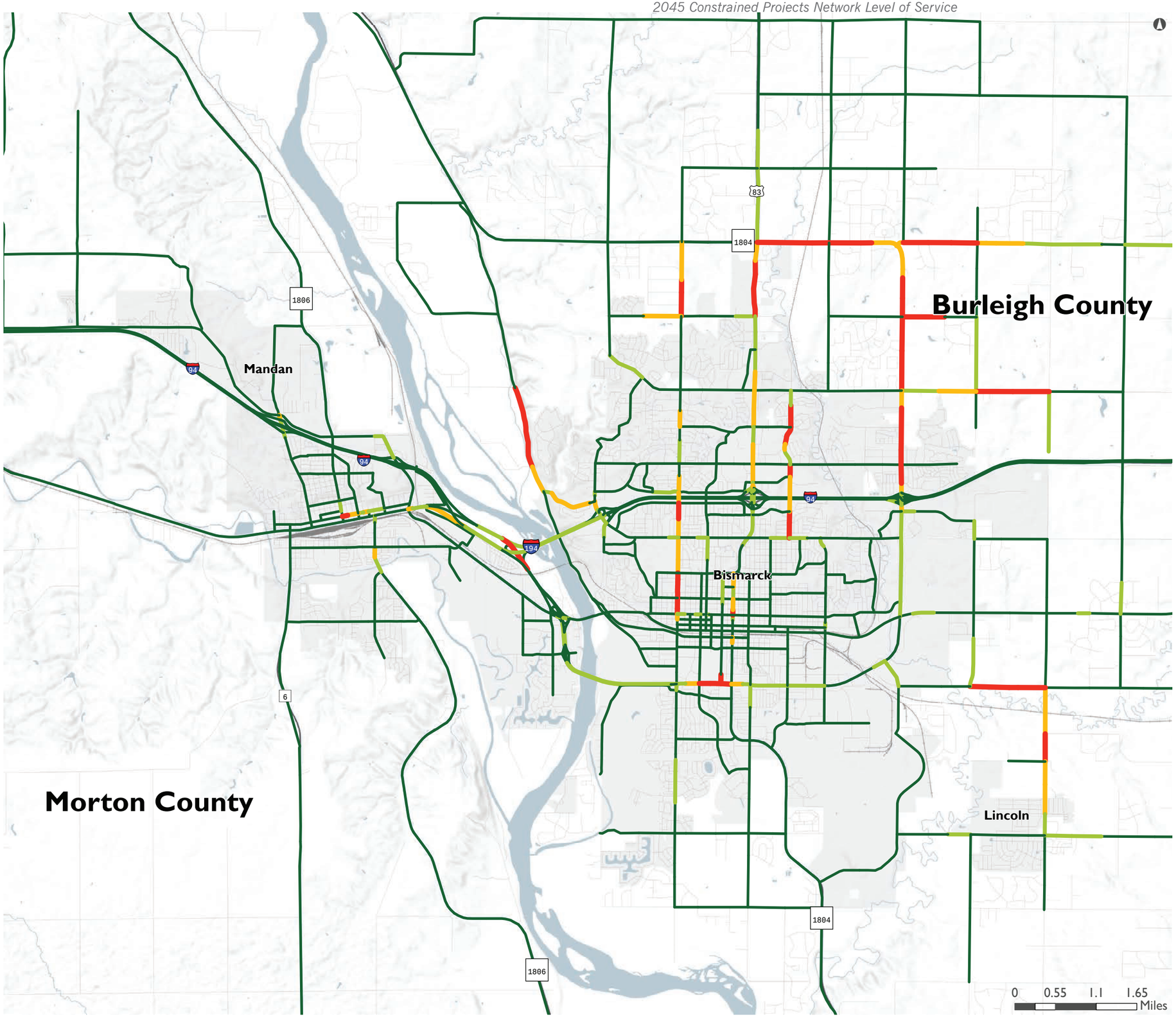
2045 Constrained Projects Network Level of Service



Level of Service 2045

LOS 2045

- F
- E
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- A-C

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Chapter 1
Introduction

ARRIVE 2045
Bismarck-Mandan MPO
Metropolitan Transportation Plan

INTRODUCTION

Metropolitan Planning Organization

The Bismarck-Mandan Metropolitan Planning Organization (MPO) provides a forum for public officials, citizens, and other interested groups to establish policies and plans for effectively addressing various metropolitan transportation issues. The MPO is comprised of five jurisdictions including the City of Bismarck, City of Mandan, City of Lincoln, Burleigh County, and Morton County. The MTP applies to all areas within the MPO planning area, as illustrated in Figure 1.1.

Federal law requires that every urbanized area with a population of 50,000 or more people must be represented by an MPO, which carries out the metropolitan transportation planning process for the urbanized area and surrounding areas. The MPO is the Bismarck-Mandan urbanized area's forum for regional transportation planning process, which helps shape an integrated and multimodal metropolitan transportation system. The MPO is composed of two main committees:

- The Technical Advisory Committee (TAC) is comprised of planning, engineering, and administrative staff from the member jurisdictions, the public transportation provider, North Dakota Department of Transportation, Federal Highway Administration, and an individual representing freight interests. The TAC provides professional assessment and recommendations for the MPO's Policy Board.
- The Policy Board is a five member board comprised of the mayors of Bismarck, Lincoln, and Mandan, and a commissioner from Burleigh County and Morton County. The Policy Board is the decision-making body of the MPO.

Metropolitan Transportation Plan

Arrive 2045 is the long-range transportation plan (LRTP), now known as the metropolitan transportation plan (MTP), for the BMMPO area. Arrive 2045 is designed to help realize BMMPO's adopted outcomes to meet current and future transportation needs and to gauge the success of these efforts with established performance measures. Arrive 2045 will guide the development of multimodal transportation systems throughout the Bismarck-Mandan metropolitan area for the next 25 years. It will be used to prioritize most of transportation spending throughout this period, and as such, it is vitally important that the plan reflect the choices and desires of the Bismarck-Mandan metropolitan area's residents, workers, and visitors. Since transportation has a broad impact on society, long-range transportation planning must consider concerns, such as impact upon the environment, land use, and economic development, in addition to traditional transportation-related issues, such as mobility and safety.

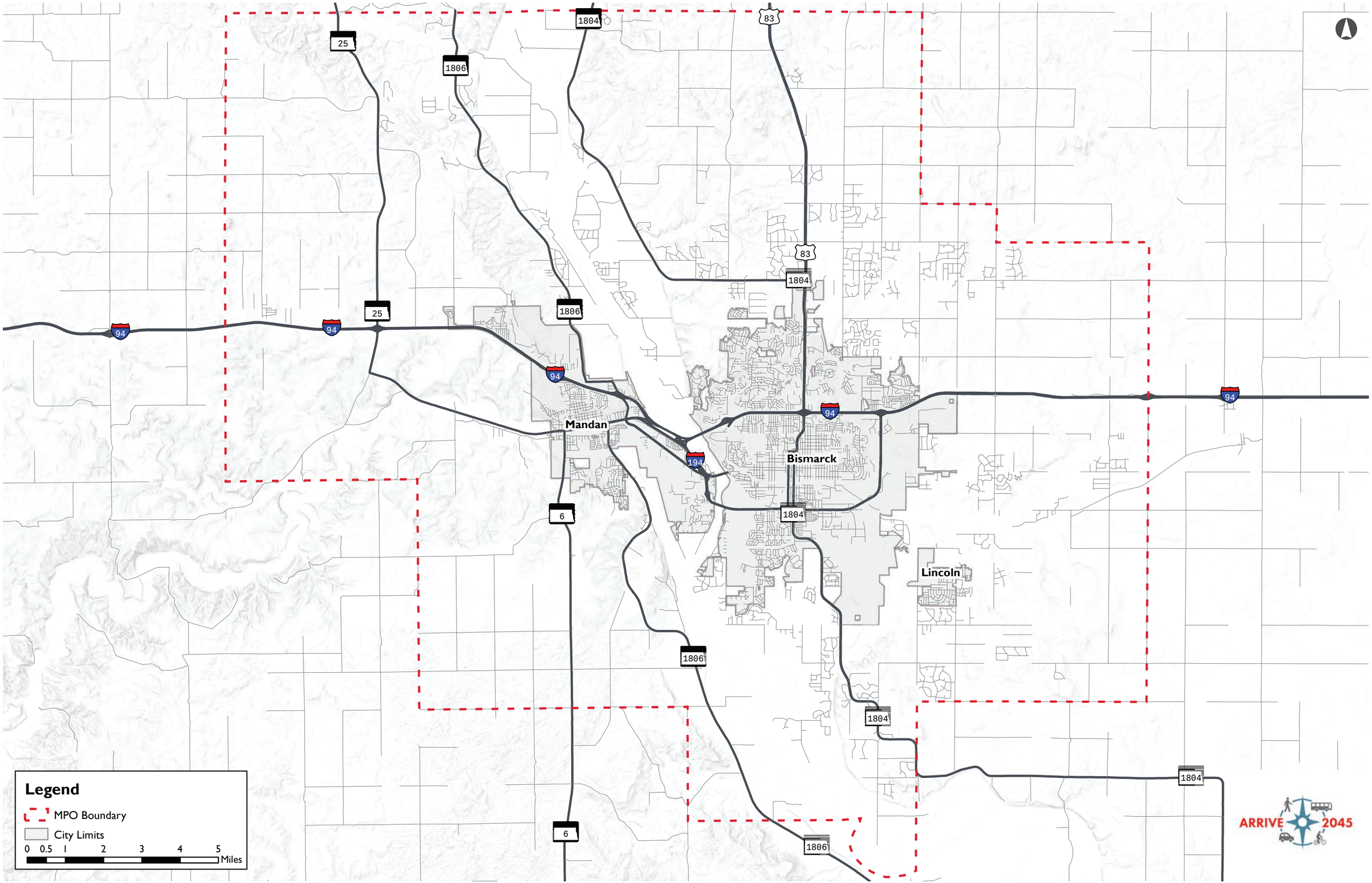
In accordance with Federal law, metropolitan transportation plans are updated every five years to accommodate the changing needs of the area and to reflect changes in the socio-economic composition of the area, as well as changes in local transportation policy. The last MTP for the Bismarck-Mandan metropolitan area was adopted in 2015. While 2045 extends beyond what can be accurately predicted, a long-range plan's value lies in comprehensively assessing the region's current transportation system and charting a course of action for coming years. It presents an opportunity to step back and take a big-picture look at current conditions, challenges, and possible solutions. Arrive 2045 creates a vision that assists in guiding future decisions toward the goal of a safe and efficient transportation system to meet the area's current and future needs.

Arrive 2045 must also consider all modes of transportation; streets and highways, transit, bicycle and pedestrian, air, rail and water, as well as freight movement within and through the Bismarck-Mandan metropolitan area. The Plan must be maintained so local jurisdictions can receive Federal funding for transportation improvements within the Bismarck-Mandan metropolitan area.

Arrive 2045 must present a reasonable expectation of revenue to fund the improvements identified to meet the transportation needs of the Bismarck-Mandan metropolitan area now and in the future. It must be a fiscally-constrained document. Fiscally-constrained, simply stated, is that the expense of accomplishing the projects identified in the Plan does not exceed what the Bismarck-Mandan metropolitan area can reasonably expect to receive in revenues.

The development of Arrive 2045 was conducted with a pro-active public involvement process. Information was provided to the public via newsletters, direct mailings, and public meetings, with input received from the public via public workshops held throughout the planning process. BMMPO staff also worked cooperatively with decision-makers of its member jurisdictions, the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the North Dakota Department of Transportation (NDDOT), and the public. BMMPO's goal is to execute a continuous, cooperative, and comprehensive planning process to develop the highest quality public investment plans for our changing society.

Figure 1.1: MPO Area



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Federal Requirements

Arrive 2045 is an integral part of the BMMPO's "continuing, cooperative, and comprehensive" planning process as stipulated by Federal law. This process was established by the Federal government with the intent of fostering better management, operation, and development of the surface transportation system. This Plan is also compliant with the national goals set forth in Fixing America's Surface Transportation (FAST) Act, the current Federal transportation program. Arrive 2045 adheres to all requirements stipulated in the FAST Act.

The FAST Act was signed into law on December 4, 2015. The FAST Act continued a streamlined and performance-based surface transportation program that was built on many of the highway, transit, bicycle, and pedestrian programs established in previous legislation, specifically, MAP-21. The FAST Act authorizes the federal surface transportation programs for highways, highway safety, and transit. It provides the rules, regulations, and planning practices and guidance for metropolitan and statewide transportation planning. It also presents eight planning factors that need to be addressed in Arrive 2045.

The eight planning factors are:

1. Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.
2. Increase the safety of the transportation system for motorized and non-motorized users.
3. Increase the security of the transportation system for motorized and non-motorized users.
4. Increase the accessibility and mobility of people and for freight.
5. Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns.
6. Enhance the integration and connectivity of the transportation system, across and between modes, people, and freight.
7. Promote efficient system management and operation.
8. Emphasize the preservation of the existing transportation system.

Plan Development Process

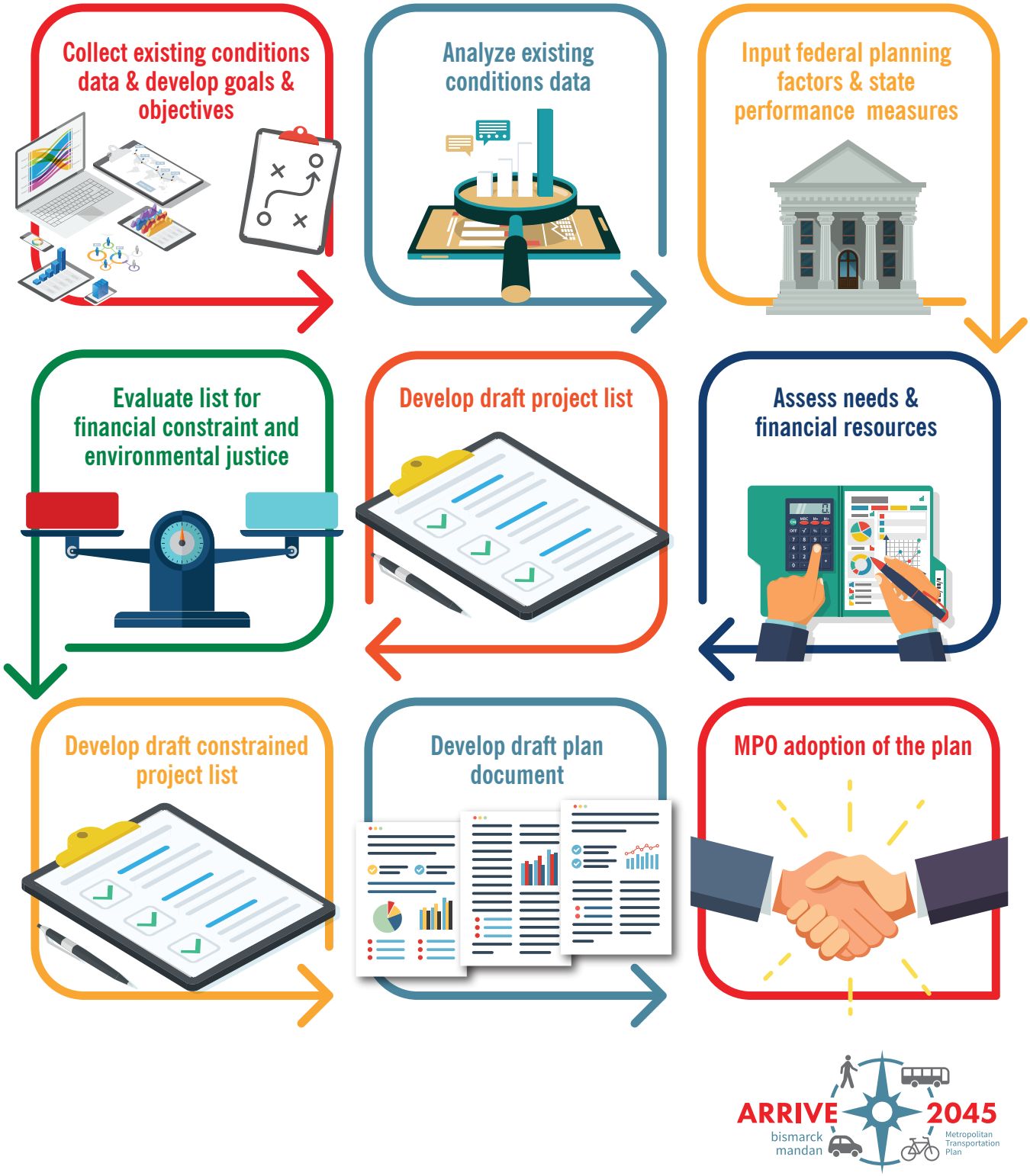
The planning process for the development of Arrive 2045 consisted of six phases:

- Identify the baseline and future conditions which assessed historic growth and development, analyzed the region's transportation system, and evaluated existing issues and needs.
- Create a transportation vision, goals, and objectives to guide the development.
- Establish a fiscal constraint.
- Evaluate options and alternatives that will address the region's transportation issues and needs and help meet the overall transportation vision for Bismarck-Mandan.
- Prioritize projects based on the fiscal constraint and time line for implementation.
- Plan review and approval by the Bismarck-Mandan MPO's Policy Board.

The six phases were part of the overall process, as shown in Figure 1.2.

Figure 1.2: Arrive 2045 Development Process

THE PROCESS



Chapter 2

Vision, Goals, Objectives, & Performance Measures

ARRIVE 2045
Bismarck-Mandan MPO
Metropolitan Transportation Plan

VISION, GOALS, OBJECTIVES & PERFORMANCE MEASURES

Transportation Vision

The future of the transportation system in the Bismarck-Mandan metropolitan area will be driven by the vision, goals, objectives, and performance measures developed for Arrive 2045. The vision for Arrive 2045 has been developed as follows:

Arrive 2045 is focused on **preserving** the transportation infrastructure of the Bismarck-Mandan MPO Area. The development of new **funding strategies** will be critical. Future investments in system preservation must be balanced against thoughtful implementation of **new infrastructure** which serve to **expand transportation capacity**. Arrive 2045 establishes a set of **regional priorities** to **balance public expectations** for improved **regional mobility**. Arrive 2045 recognizes the future contains many opportunities to channel **technology** to influence transportation mobility.

Federal and State Transportation Legislation and Planning

The Moving Ahead for Progress in the 21st Century Act, MAP-21, is a funding and authorization to govern United States federal surface transportation spending. It was signed into law on July 6, 2012.

The Federally-defined scope of the metropolitan transportation planning process is that "The metropolitan transportation planning process shall be continuous, cooperative, and comprehensive, and provide for consideration and implementation of projects, strategies, and services that will address the MAP-21 planning factors.

Map 21 Planning Factors

- Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.
- Increase the safety of the transportation system for motorized and non-motorized users.
- Increase the security of the transportation system for motorized and non-motorized users.
- Increase accessibility and mobility of people and freight.
- Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns.
- Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.
- Promote efficient system management and operation.
- Emphasize the preservation of the existing transportation system.

A key feature of MAP-21 was the establishment of a performance and outcome-based program. The objective of this performance and outcome-based program is for States and MPOs to invest resources in projects that, collectively, will make progress toward the achievement of the national goals.

The Fixing America's Surface Transportation (FAST) Act governs United States federal surface transportation spending currently. It was signed into law on December 4, 2015. The FAST Act continues MAP-21's overall performance management approach, within which States invest resources in projects that collectively will make progress toward national goals. The FAST Act makes no changes to the performance management provisions established by MAP-21, with a few minor exceptions. The main change applicable to the State DOTs and MPOs was to adjust the timeframe in which the metropolitan planning organizations (MPOs) must make progress toward meeting their performance targets.

Developing a Performance-Based Transportation Plan

"What is a performance-based transportation plan?" To understand what it means to have a performance-based transportation plan, the six elements that make a performance-based plan are defined within the entire performance management process:

Develop Goals and Objectives

Arrive 2045 is developed upon the seven key national performance goals as defined under MAP-21. The seven, MAP-21 national performance-based goals are further defined below:

Table 2.1: National Transportation Performance Goals

Goal Area	National Goal
Safety	To achieve significant reduction in traffic fatalities and serious injuries on all public roads.
Infrastructure Condition	To maintain the highway infrastructure asset system in a state of good repair.
Congestion Reduction	To achieve significant reduction in congestion on the National Highway System.
System Reliability	To improve the efficiency of the surface transportation system.
Freight Movement and Economic Vitality	To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.
Environmental Sustainability	To enhance the performance of the transportation system while protecting and enhancing the natural environment.
Reduce Project Delivery Delays	To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.

Additionally, the FAST Act requires that the planning process consider projects and strategies to improve the resilience and reliability of the transportation system, stormwater mitigation, and enhance travel and tourism.

Objectives are strategies that can be implemented to meet the planning goals. Arrive 2045 developed multiple objectives to respond to each one of the transportation planning goals. Historically, objectives have been used when evaluating projects to determine whether a proposed project will help to meet the transportation planning goals and in kind the performance targets for the transportation system. Two kinds of objectives for Arrive 2045 were developed: Policy Based Objectives (PBO) – used to guide decision making – and Scoring Metric Objectives (SMO) – used to score and evaluate potential projects.

Performance Measures

Performance measures are specified areas in which Arrive 2045 will measure the performance of the transportation system. Historically, all MTPs include analysis and reporting on the existing and forecast year conditions of the transportation system. A performance-based transportation plan will continue this but will ensure that it includes specifically measuring the performance of the transportation system. The performance measure areas listed in Figure 2.2 and include the minimum requirements for State DOTs and MPOs to include within their long-range transportation plans per MAP-21 and the FAST Act. Most of the Federally required performance measure areas currently only apply to the National Highway System (NHS).

Performance measures will measure the existing performance of the transportation system and will assist in identifying its needs as projects are developed as part of Arrive 2045 and evaluated over time. The measured existing performance of the BMMPO transportation system is including within Chapter 4: Existing System Performance Report for Arrive 2045.

Setting Performance Targets

Targets are typically the first step in a cycle of using performance measures. Targets make a specific commitment to working to achieve a level of performance for our transportation system. As an example, throughout 2018, the BMMPO consented to support performance targets established by the North Dakota Department of Transportation (NDDOT) for a series of performance measures outlined by the FAST Act. These are required Performance Targets. Through Arrive 2045, the BMMPO has the autonomy to voluntarily establish additional performance targets which are non-binding. These non-binding performance targets establish a desired trend line within specific areas of the local transportation system. They demonstrate to the public a desired trend line for the performance of various system attributes not otherwise required by the FAST Act.

The BMMPO will continue to measure the performance of their transportation system either annually as part of their annual monitoring report or every five years with the update of Arrive 2045. This will provide a continuous evaluation of how the BMMPO's transportation system is performing with respect to both required and voluntary performance targets.

Allocate Resources

Resource allocation is the next step in the performance-based cycle and should be inclusive of both budgets and staff time. Resource allocation should consider tradeoffs across program areas and potential performance outcomes.

Measure, Evaluate, and Report Results

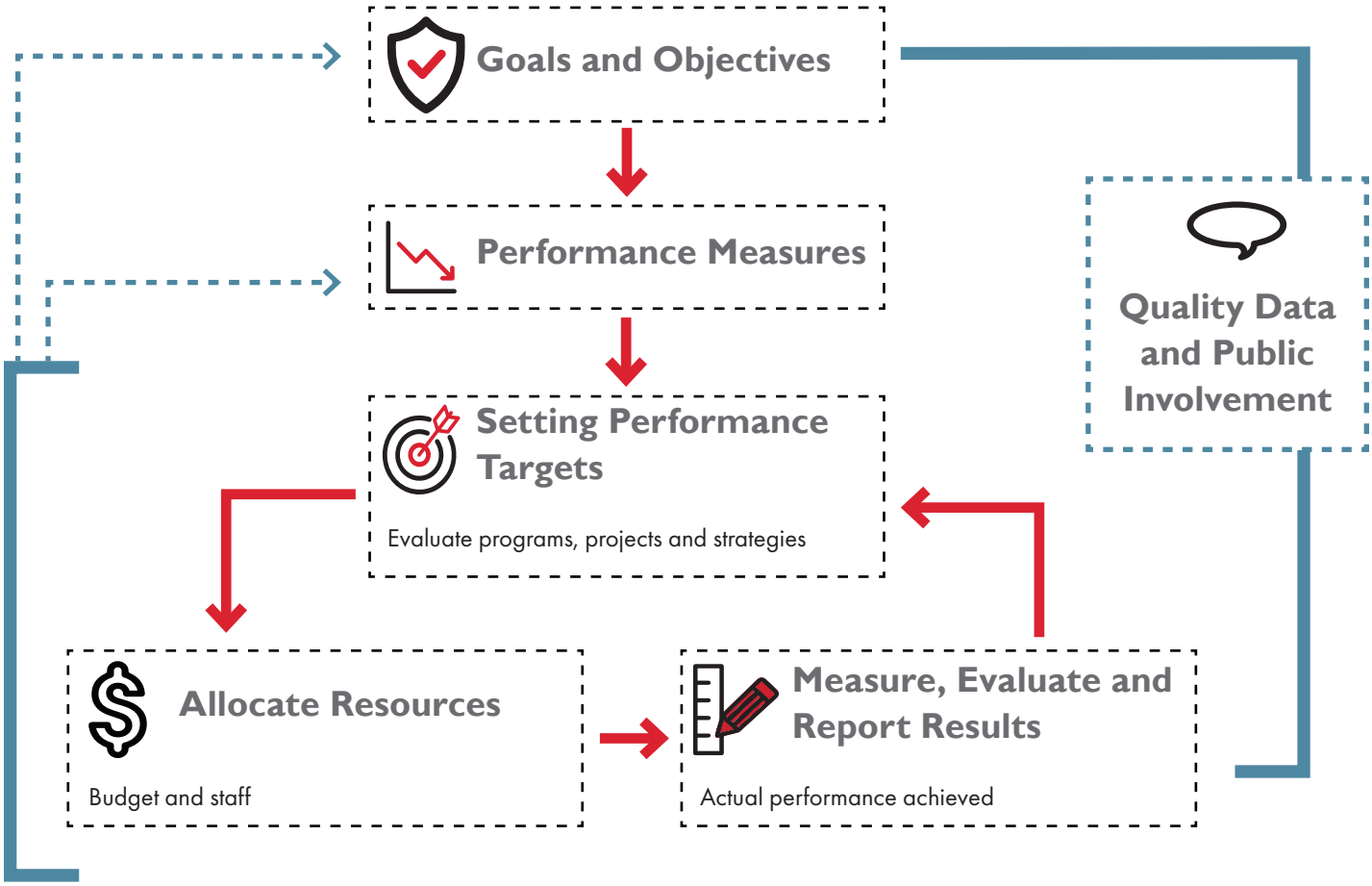
Reporting and evaluation typically follow resource allocation. This step is critical to ensure transparency of the performance management approach, by providing insight into the progress an agency is making toward its targets and goals. This is an opportunity to identify what is working and what is not working and how the performance management process can be updated.

Quality Data and Public Involvement

The entire performance management process is fed by quality data and public involvement, and is set up as a regular, reoccurring process. The public involvement portion of this element is reflective of the community values of the region and is based on input received by project stakeholders and the general public.

A prioritized list of projects to be programmed for implementation are the final product of Arrive 2045. It is important to understand how the key elements of the performance-based MTP are cyclical in nature as shown in Figure 2.1 In summary, it begins by evaluating the performance of the transportation system to identify needs and ends by evaluating the performance of the transportation system to determine how prioritized projects and transportation investments met performance goals and targets. This cycle occurs every five years with the update of the MTP, so the BMMPO can evaluate how transportation projects met the goals and performance targets. If goals and performance targets are not being met or if they change, the BMMPO can then adjust their strategies to prioritize projects to better meet targets.

Figure 2.1: Transportation Performance Management Framework



Arrive 2045 Goals, Objectives & Performance Measures

The goals developed for Arrive 2045 reflect guidance from MAP-21 planning factors, MAP-21 and FAST Act National Performance Goals, the NDDOT statewide transportation plan, and input from project stakeholders and community outreach. Figure 2.2 below depicts how the performance measure areas are set as part of MAP-21 and the FAST Act and the requirements for which measures and targets are to be set for NDDOT's Statewide Transportation Plan and the MPO's MTP – Arrive 2045.

Again, the graphic is inclusive of the required performance measure areas. Additional performance measures and desired target trendlines have been set by the MPO as part of Arrive 2045 that pertain specifically to the MPO's system.

Figure 2.2: Performance Measure Categories included in Various Plans

Federal Performance Measure Categories	Required for NDDOT Statewide Transportation Plan	Required for MPO MTP – Arrive 2045	Arrive 2045 Additional Local Performance Measures
Pavement Condition [1]	✓	✓	✓
Performance [1]	✓	✓	✓
Bridge Condition [2]	✓	✓	✓
Safety – Fatalities & Serious Injury [3]	✓	✓	✓
Traffic Congestion [5]	✓	Optional	✓
On-road Mobile Source Emissions [5]	✓	Optional	Not Included
Freight Movement [4]	✓	✓	Not Included

Roadways "Required" for the Federal Performance Categories:

(1) Required for Interstate and Non-Interstate NHS Roadways

(2) Required for all NHS Roadways

(3) Required for all Public Roadways

(4) Required for Interstate System Roadways

(5) Required Roadways Not Specified

ARRIVE 2045 GOAL 1:

Safety & Security

Goal 1 incorporates the following goals, performance measures, and planning factors:

- National Performance Goal for safety
- National Performance Measure for Safety - Fatalities and Serious Injuries
- MAP-21 Planning Factors to increase the safety of the transportation system for motorized and non-motorized users and to increase the security of the transportation system for motorized and non-motorized users.

All transportation improvements should be developed with safety of the traveling public in mind. Safety should be considered when developing transportation projects for all modes of motorized and non-motorized transportation. These improvements should consider reducing both the severity and overall number of crashes.

Security of the transportation system includes ensuring users of the transportation system are protected from natural or human disaster (ie flooding, acts of terrorism). Security measures for transportation system users are often considered for public transit riders and non-motorized users of the trail systems. Security of our transportation system also considers the mobility of our emergency service vehicles.

Performance Measures
Existing Metrics and Targets:

State System Federal Requirements

Safety Performance Measure	NDDOT 5-Year Average (2013 - 2017)	2019 NDDOT 5-Year Average Target
Number of Motorized Fatalities	120.0	108.3
[a]Rate of Fatalities per 100 million VMT	1.2	1.106
Number of Motorized Serious Injuries	458.6	413.9
[a]Rate of Serious Injuries per 100 million VMT	4.59	4.23
Number of Non-Motorized Fatalities and Non-Motorized Serious Injuries	36.2	33.4

[a] *The MPO will adapt current NDDOT targets for rate calculated goals*

Local MPO System Optional Requirements

Safety Performance Measure	MPO 5-Year Average (2013 - 2017)
Number of Motorized Fatalities	4.6
Rate of Fatalities per 100 million VMT	0.642
Number of Motorized Serious Injuries	33.6
Rate of Serious Injuries per 100 million VMT	4.687
Number of Non-Motorized Fatalities and Non-Motorized Serious Injuries	5.2

Desired Target:

Reduction in crashes

How will we achieve the goal?
Objectives:

- **1A**: Reduce the incidence of all motor vehicle and non-motor vehicle (pedestrian and cyclist) crashes, with an emphasis on serious injury and fatal crashes. This may include implementing improvements that are both proven Crash Reduction Measures at locations with an existing crash history or at locations without an existing crash history as a proactive improvement (SMO)
- **1B**: Provide a safe and secure environment for transit system riders (PBO)
- **1C**: Enhance transportation security and reliability by developing strategies to address critical transportation assets identified that will facilitate the rapid movement of first responders and support incident management during times of emergency (SMO)
- **1D**: Support North Dakota's State Highway Safety Plan (SHSP) "Vision Zero" as a goal to move toward zero fatal resultant crashes (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

ARRIVE 2045 GOAL 2:

Infrastructure Condition

Goal 2 incorporates the following goals, performance measures, and planning factors:

- National Performance Goals for the infrastructure condition of pavements and bridges.
- National Performance Measure Categories of bridge condition and pavement condition
- MAP-21 Planning Factors to emphasize the preservation of the existing transportation system and to promote efficient system management and operations.

As our transportation system ages, maintenance of our existing system is continuously needed to ensure that the condition of our pavements, bridges, bicycle and pedestrian facilities, transit facilities, and any other components of our existing transportation system are maintained and repaired to serve our traveling public. The challenges with maintaining our existing transportation system typically revolve around funding. The cost of transportation maintenance is continuously rising and there is often a competition between maintenance and operations costs of our existing system versus new facilities.

Performance Measures

Existing Metrics and Targets:

State System Federal Requirements

Pavement Conditions Measures and Targets

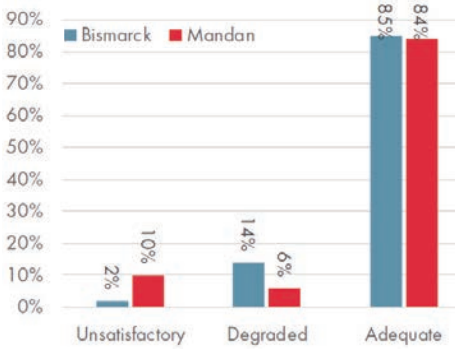
NDDOT Conditions Performance Measure	Existing Condition	Target Condition
Interstate Good	80.2%	75.6%
Interstate Poor	0.1%	3%
Non-Interstate Good	62.8%	58.3%
Non-Interstate Poor	0.3%	3%

Bridge Conditions Measures

Conditions Performance Measure	Structures Good	Structures Poor
Target Condition (NDDOT)	60%	4%
Existing Condition (NDDOT)	64.44%	3.67%

Local MPO System Optional Requirements

Pavement Conditions Measures



Desired Target:

Decrease Percent of Unsatisfactory/ Degraded Pavement

Bridge Conditions Measures

Structures Good:
77.8%

Structures Poor:
5.6%

Desired Target:

Maintain Bridges

How will we achieve the goal?

Objectives:

- **2A**: Maintain pavement quality and bridges at acceptable levels (SMO)
- **2B**: Maintain street signage and visibility (SMO)
- **2C**: Maintain the current bicycle & pedestrian system (SMO)
- **2D**: Maintain transit fleet, equipment, and facilities in a state of good repair as identified within the Transit Development Plan (TDP) (SMO)
- **2E**: Maintain traffic signals, lighting, and other transportation ITS assets at acceptable levels (SMO)
- **2F**: All MPO participating jurisdictions should cost participate in the data collection of pavement system condition on a 5-year cycle (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

ARRIVE 2045 GOAL 3:

Congestion Reduction

Goal 3 incorporates the following goals, performance measures, and planning factors:

- National Performance Goals for congestion reduction and system reliability
- National Performance Measure Categories of traffic congestion and freight movement.
- MAP-21 Planning Factor to enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.

Mobility and connectivity of the transportation system allows users to move from one place to another in a direct route with reduced travel times and reduced delays. Connectivity allows people to make decisions based on traffic conditions, access, and desired trip destinations. Connectivity is not only about a direct route from an origin to a destination, it should also allow users to choose multiple transportation modes and to interchange between the modes in a safe and efficient manner.

Performance Measures

Existing Metrics and Targets:

Local MPO System Optional Requirements

Vehicle Miles Traveled (VMT) Per Capita

County	Population [a]	2017 Annual VMT [b]	Resultant Annual VMT per Capita [c]
Burleigh	95,273	739,236,000	7,800
Morton	31,095	446,409,000	14,500

[a] *Data Source: American Community Survey (ACS) 2018 Population Estimates*
[b] *Data Source: 2017 NDDOT Annual Traffic Report per County*
[c] *Rounded to the nearest 500 miles*

Desired Target:

Reduction of VMT per Capita

Vehicle Hours Traveled (VHT) Per Capita

MPO Population [c]	VHT [d]	VHT per Capita
100,306	47,100	0.47 hours 28.2 minutes

[c] *Data Source: Bismarck Mandan MPO Monitoring Report - US Census, 2010*
[d] *Data Source: 2015 Travel Demand Model*

Desired Target:

Reduction of VHT per Capita

How will we achieve the goal?

Objectives:

- **3A**: Implement projects and programs that will reduce travel delays on corridors that have an existing or proposed Level of Service (LOS) D or worse, to a LOS C or better after the improvement is made (SMO)
- **3B**: Provide and maintain corridors functionally classified as minor arterials and above that facilitate longer-distance travel within the region (SMO)
- **3C**: Improve the continuity of the multimodal systems for pedestrians, cyclists, or transit riders; through improved network connections and reduction of system gaps (SMO)
- **3D**: Support future development that would result in reduced motor vehicle trips (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

ARRIVE 2045 GOAL 4:

System Reliability for Freight Movement and Economic Vitality

Goal 4 incorporates the following goals, performance measures, and planning factors:

- National Performance Goals for system reliability and freight movement and economic vitality.
- National Performance Measure Category of Freight Movement
- MAP-21 Planning Factors to support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency; enhance the integration and connectivity of the transportation system, across and between modes, for people and freight; and increase accessibility and mobility of people and freight.

A transportation system that provides good access for all modes of transportation can promote future development and employment opportunities which will in return stimulate the region's local economy.

A well connected and efficient transportation system that facilitates the movement of goods between freight modes and facilitates the movement of goods and freight to commercial and industrial centers can lower the cost of doing business. This can both support existing business and attract new business to support and enhance the local economy.

Performance Measures

Existing Metrics and Targets:

State System Federal Requirements

System Performance for the Interstate and Non-Interstate NHS

Conditions Performance Measure	Travel Time Reliability Non-Interstate National Highway System (NHS)	Travel Time Reliability Interstate	Freight Reliability Index
Target Condition	85%	85%	3.0
Existing Condition (NDDOT - 2017)	91.6%	99.4%	1.15

Local MPO System Optional Requirements

There is not an MPO desired performance measure or target for this goal.

How will we achieve the goal?

Objectives:

- **4A**: Enhance the efficient and safe movement of freight and goods including investments in congestion reduction and safety improvements on the critical urban freight corridors and other designated freight corridors (SMO)
- **4B**: Support transportation investments as identified in the most recent Bismarck-Mandan MPO Regional Freight Study (PBO)
- **4C**: Promote transportation investments that enhance the local economy (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

ARRIVE 2045 GOAL 5:

Alternative Transportation Modes to Automobile Travel

Goal 5 incorporates the following goals, performance measures, and planning factors:

- National Performance Goals for congestion reduction, system reliability and environmental sustainability.
- National Performance Measure Categories of traffic congestion and on-road mobile source emissions.
- MAP-21 Planning Factors to increase accessibility and mobility of people and freight; protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns; and enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.

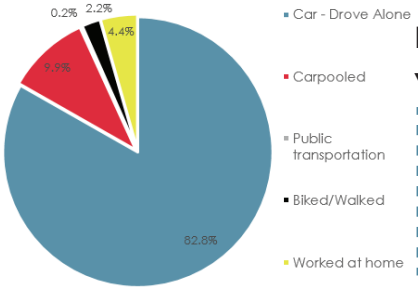
More people are choosing to use alternate modes of transportation to live a healthier lifestyle, reduce their environmental footprint, or spend less money out of their budget on transportation costs. Also, due to various social justice issues, certain portions of the population also are dependent on public transportation or non-motorized transportation. Regardless of the reason, it is important to provide a well-balanced transportation system that supports modes other than a single occupancy motor vehicle. This includes supporting alternative modes of transportation for users of all ages and all abilities.

Performance Measures

Existing Metrics and Targets:

Local MPO System Optional Requirements

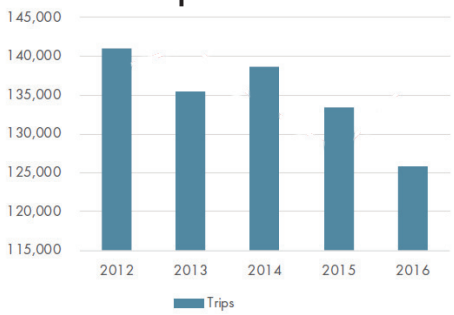
Mode Share



Desired Target:

Decrease single vehicle use

CAT Ridership



Desired Target:

Increase fixed route transit ridership

Miles of Facilities

Facility Type	Miles	
	Bismarck	Mandan
Multi-use Trails	52 miles	18 miles
Bicycle Lanes	4 miles	0 miles
Shared-Use Routes	5 miles	0 miles

Desired Target:

Increase miles of bicycle facilities

How will we achieve the goal?

Objectives:

- **5A**: Consider coordination with transit agencies to improve transit route efficiency, system productivity, and community awareness by implementing transportation investments that support the transit system (PBO)
- **5B**: Improve transit and rideshare opportunities for travelers commuting into Bismarck-Mandan from outside the urban area (PBO)
- **5C**: Improve bicycle and pedestrian system accessibility and connectivity opportunities while maintaining safety by implementing transportation investments identified in the most recent Bismarck-Mandan MPO Bicycle and Pedestrian Plan (SMO)
- **5D**: Improve the awareness and safety of bicycling, and educate both bicyclists and motorists on rules and responsibilities (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

ARRIVE 2045 GOAL 6:

Environmental Sustainability

Goal 6 incorporates the following goals, performance measures, and planning factors:

- National Performance Goal for environmental sustainability.
- National Performance Measure Category for on-road mobile source emissions.
- MAP-21 Planning Factor to promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns.

Air quality is affected by mobile source emissions resulting from vehicle miles traveled (VMT). Air quality impacts can be reduced through roadway improvements that reduce VMT or provide for transportation modes other than single occupancy vehicles. New and expanded transportation facilities can also negatively impact the environment such as impacting wetlands, historical and cultural resources, existing neighborhoods or properties, and many other potential environmental impacts.

Performance Measures

Existing Metrics and Targets:

Local MPO System Optional Requirements

The performance measures and targets for reduction in VMT/Capita and VHT/Capita as identified in Goal 3 Congestion Reduction, will also support environmental sustainability through reduced on-road mobile source emissions. Please see Goal 3 Congestion Reduction for the performance measures, current system performance, and targets.

How will we achieve the goal?

Objectives:

- **6A**: Minimize the transportation system's impacts on the natural and built environment (PBO)
- **6B**: Ensure that projects located within Environmental Justice (EJ) areas have no negative impacts or have identified mitigation measures (PBO)
- **6C**: Promote transportation investments that support infill, mixed use development patterns (PBO)
- **6D**: Provide transportation infrastructure design guidance that fits within the context of the built environment (PBO)
- **6E**: Plan for and address multimodal transportation system impacts/sufficiency when planning new developments (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

ARRIVE 2045 GOAL 7:

Reduced Project Delivery

Goal 7 incorporates the following goals, performance measures, and planning factors:

- National Performance Goals for reduced project delivery delay.
- MAP-21 Planning Factors to support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency; promote efficient system management and operation; and emphasize the preservation of the existing transportation system.

A well developed MTP will consider fiscal constraint and develop, prioritize, and program projects to ensure they are within the means of each jurisdiction's transportation budget. This first includes consideration of maintenance and operation costs of the existing transportation system.

Secondly, lower cost alternatives should be considered to improve the performance of the transportation system before more expensive projects such as extending and widening the system are considered.

Performance Measures

Existing Metrics and Targets:

Local MPO System Optional Requirements

There is currently no data available for this performance measure. The MPO, when able, will commit to collecting these data following the completion of this plan. Baseline data will be available in 2020.

Possible Performance Measures:

- Track the number of projects that are delivered on time (as scheduled).

Possible Desired Target:

Reduction of the number of delayed projects

How will we achieve the goal?

Objectives:

- **7A**: Identify Non-Federal funding opportunities (public or private) to support transportation needs to fund entire projects or greater than the required Federal project match (PBO)
- **7B**: Leverage the existing transportation system by emphasizing low-cost, high impact solutions that may include incremental system improvements, system preservation, and technology applications to achieve congestion in lieu of more expensive projects such as roadway widening (SMO)
- **7C**: Develop policies to support consistent application of development-related improvement requirements and streamlined project development (PBO)

SMO: Scoring Metric Objective | PBO: Policy Based Objective

Evaluating Projects Based on Prioritization of Goals and Performance Measures

Historically, the MPO has utilized the goals and their supporting objectives to evaluate projects when selecting projects for Federal Aid funding programs. This is a good methodology to evaluate competitive projects within an MPO area. The goals and supporting objectives are broken down in the table below, identifying which Federal Aid funding source each objective should be applied to during the evaluation process. Only the scoring metric objectives (SMOs) are included within the table below.

Performance Goals and performance measurement areas were prioritized throughout the entire community outreach and public involvement process—through project stakeholders and partners, during community-wide surveys and at the first round of public involvement meetings. The results of the prioritized goals and performance measure areas are included in the table below.

The goals and corresponding objectives under each goal area will be multiplied by the prioritization weight that was developed based on the community outreach and public involvement process. The number one goal ranking received a maximum of 5 prioritization weight points and each subsequent goal is based on the percentage of votes received as compared to the #1 Goal Priority Ranking.

Federal Aid Funding

Table 2.2: Goals for Federal Aid Funding Sources

Arrive 2045 Goals and Objectives	FEDERAL AID FUNDING SOURCE CATEGORIES			
	Urban & Regional Projects	Highway Safety Improvement Program (HSIP)	Transportation Alternatives (TA)	Transit
Goal 1: Safety & Security	1A, 1C	1A	1A	
Goal 2: Infrastructure Condition	2A, 2B*, 2C*	2B	2B, 2C, 2E	2D
Goal 3: Congestion Reduction	3A, 3B, 3C			
Goal 4: System Reliability for Freight Movement & Economic Vitality	4A	4A		
Goal 5: Alternative Transportation Modes to Automobile Travel	5C		5C	
Goal 6: Environmental Sustainability				
Goal 7: Reduced Project Delays	7B	7B		

**Objectives noted were not scored during the development of the MTP because the project scopes were not advanced enough to determine if points would be awarded for these Scoring Metric Objectives (SMOs). Further consideration should be given to these SMOs during the annual project solicitation and selection process.*

Prioritized Goal Results

Table 2.3: Prioritized Goals

Arrive 2045 Goals and Objectives	Total Votes	Goal Ranking	Prioritization Weight
Goal 1: Safety & Security	87	#2	4.5
Goal 2: Infrastructure Condition	96	#1	5
Goal 3: Congestion Reduction	70	#3	3.6
Goal 4: System Reliability for Freight Movement & Economic Vitality	44	#4	2.3
Goal 5: Alternative Transportation Modes to Automobile Travel	41	#6	2.1
Goal 6: Environmental Sustainability	43	#5	2.2
Goal 7: Reduced Project Delays	23	#7	1.2

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Chapter 3

Public Engagement

ARRIVE 2045
Bismarck-Mandan MPO
Metropolitan Transportation Plan

PUBLIC ENGAGEMENT

Steering Committee

A steering committee was established to provide technical direction and guidance of the Metropolitan Transportation Plan (MTP) development. Representation on the committee included:

- City of Bismarck
- City of Mandan
- City of Lincoln
- Burleigh Bounty
- Morton County
- Bismarck International Airport
- Bismarck Public Schools
- Bismarck Police Department
- Bismarck Rural Fire Department
- North Dakota Department of Transportation

There were XXXXX Steering Committee meetings held throughout the development of the MTP.

Information and Marketing

Project Website

Arrive2045.com was the website established for the MTP to serve as the primary warehouse for all project documents and information as well as a forum to submit public comment. The website included:

- A home page with the most recent project updates and links for new information and to provide comment.
- An about page with a general overview, a frequently asked questions section, the schedule, and project partners.
- A documents page with all documents and newsletters produced during the MTP.
- A contact page with an email submission form and other relevant contact information.

Social Media

Facebook was used to keep the community engaged throughout the MTP development. Facebook posts were published as appropriate throughout the process, with key stakeholders sharing the posts as they were able.

Throughout the study process, there were more than XXXXX Facebook posts that were viewed more than XXXXX times by more than 900 different users.

Figure 3.1: Steering Committee Members Prioritizing Goals and Objectives

Figure 3.2: Home Page from Arrive2045.com

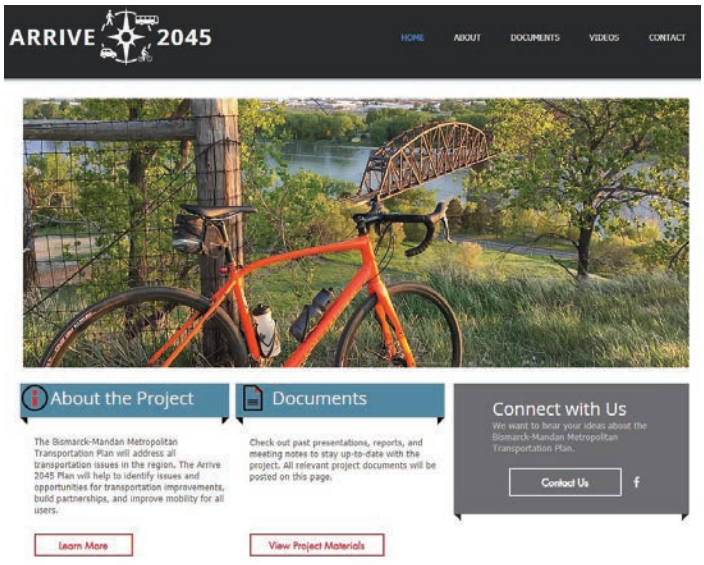
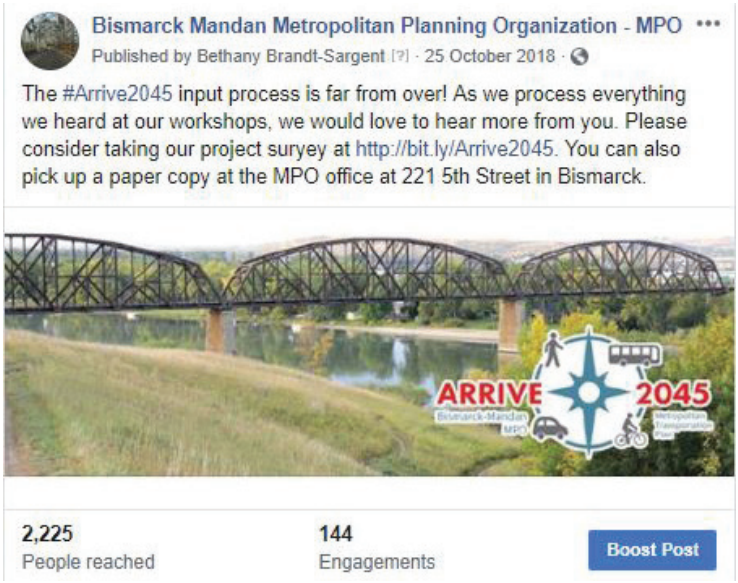


Figure 3.3: Example Social Media Post



Other Marketing

The MTP used more traditional marketing methods to notify the public of opportunities to comment as well, including newsletters mailed and emailed to the MPO's interested parties list, newspaper ads, notifications through community groups, and public television.

Public Input Meetings

The public input meetings are summarized below. More details are included in APPENDIX X.

PIM #1: Arrive 2045 Futures Summit

On October 9th and 10th, 2018, the Bismarck-Mandan MPO held the first round of public engagement for the Bismarck – Mandan Metropolitan Transportation Plan (MTP). These were advertised as the Arrive 2045 Futures Summit meetings. The first round included three meetings located across the MPO Planning area:

- Lincoln City Hall on October 9th
- Bismarck State College on October 10th
- Mandan City Hall on October 10th

At each meeting there were three activities:

- Brief presentation on the issues identified through the technical analysis.
- Small group prioritization exercise for goals, performance areas, and emerging issues.
- A table top exercise to identify future transportation improvements to the transportation network.

Futures Summit Prioritization Exercise

Goals

Arrive 2045 will be a performance-based transportation plan and will be built upon a range of goals established for the transportation system. The public was asked to vote among a range of goal areas. Meeting participants were able to distribute (or weight) up to 7 votes among all goal areas or place more emphasis on those goal areas they felt were most important.

Infrastructure condition, safety, and congestion were the most important goals identified by the public. The public prioritized the goals Infrastructure (23.7 percent), Safety (21.0 percent), and Congestion (17.4 percent).

Performance Areas

Arrive 2045 will target investments to improve the performance of the Bismarck-Mandan Metropolitan Area's transportation system. To help understand priorities for future investment, the public was asked to choose among a range of system performance areas. Each meeting participant was able to allocate up to 5 votes among various performance areas. Participants were given the ability to weight their votes based on the relative importance of each performance area.

Pavement conditions were by far the highest priority for the public (40 percent). The remaining four performance areas received between twelve and nineteen percent of selections.

Figure 3.4: Public Input Meeting #1 Prioritizing Goals, Objectives, and Performance Areas

Emerging Issues

Arrive 2045 will focus on addressing a range of issue areas facing the Bismarck-Mandan Metropolitan area. To help add clarity to a preexisting list of issues, the public was given the ability to select among a range of issue areas. Meeting participants were given nine votes to allocate among a range of issue areas, and each participant weighted their votes based on the importance of each issue.

Of the emerging issues, preservation and management were a top focus area (19.0 percent), followed by funding (15.9 percent), and growth and development (14.6 percent).

Future Summit Investment Maps

As part of the first round of public input meetings, participants were given an opportunity to allocate projected future transportation resources to address existing and future transportation conditions in the Bismarck-Mandan area. As part of a table top exercise, meeting participants worked as a group to allocate projected available funding for the Bismarck-Mandan MPO Area. Projects were identified for three tiers of systems: 1) Interstate projects, 2) Regional/State projects, and 3) Local/Urban projects. Available revenue types for each component of the Bismarck-Mandan transportation system had been previously consented to for use in the meetings by the project Steering Committee.

Project types and costs were developed in advance so that meeting participants were only required to select among a range of possible improvements. Project costs and project types are generalized to ensure the ability of the public to easily work within the parameters of the exercise. Meeting participants were guided in their choices by an available set of system performance data showing existing and projected conditions from throughout the MPO planning area. Each table was led by a local technical facilitator who was able to assist with answering questions and ensuring participants were able to appropriately complete the meeting exercise.

Figure 3.5: Public Input Meeting #1 Investment Maps

PIM#2: Options & Alternatives

A second round of public input was deployed at the midway point of developing Arrive 2045. The second round of public input meetings was structured to provide the public and key stakeholder an opportunity to provide input on the universe of projects which had been developed and evaluated.

Meeting participants were provided with a list and map of identified projects being contemplated for inclusion in Arrive 2045. Each project was identified with a relative technical score that had been previously identified by the project Study Committee. Participants were asked to provide a ranking of their top three (3) projects; and then to provide a general listing of the seven other projects they felt were high priority needs for Arrive 2045.

A total of three input meetings were held the week of July 9, 2019. Each meeting was opened with a short background presentation the Arrive 2045 and provided content and guidance to participants on what input was needed from them at this point in the planning process.

Meetings were held as follows:

- Lincoln City Hall – July 9th from 6:00 to 8:00 pm;
- Bismarck State College – July 10th from 9:00 to 11:00 am;
- Mandan City Hall – July 10th from 6:00 to 8:00 pm.

Over 40 total individuals attended the 2nd round of public input meetings. A total of 30 public participants provided completed project tally sheets. Tally sheets were summarized, and a general summary of projects identified by the public was developed. Public identified priorities were used as a factor in assisting with developing a final set of prioritized projects for Arrive 2045.

PIM #3: Final Plan

Transportation Survey

As part of the first round of public input meetings a survey was marketed to the public. There were nearly 140 participants in the initial survey released by the Bismarck-Mandan MPO. To ensure the survey was geographically and demographically weighting, a random sample of households was developed. Postcards were then distributed proportionally across Bismarck, Mandan, Lincoln, and the rural areas of Morton and Burleigh counties notifying households of the survey. The full results of this survey can be found in the Public Engagement Appendix.

- **Perceptions of Current Transportation Issues.** The public rated current transportation issues in the Bismarck-Mandan area from Very Satisfied (5) to Very Dissatisfied (1). The issues survey respondents were most dissatisfied with were north-south travel (2.75) and traffic flow at peak times (2.72). The issue which survey respondents were most satisfied with were traffic flow at non-peak times (4.14), maintenance of I-94 (3.95), and ease of traveling between Bismarck and Lincoln (3.84).
- **Which Three Items are the Most Important To Address?** Peak hour traffic congestion received support from 59 percent of survey respondents, north-south travel received 48 percent, maintenance of current roads received 43 percent and traffic safety received 40 percent.
- **How Would You Rate the Bismarck-Mandan Area Roadway and Street System?** Nearly 52 percent rated the Bismarck-Mandan area roadway and street system as either excellent or good. Forty percent rated as average. Only 9 percent rated the system as poor.
- **How Do You Feel Peak Hour Congestion in the Bismarck-Mandan Area Compares to Cities of the Same Size?** More than 61 percent of survey respondents felt peak-hour congestion in Bismarck-Mandan is better or about the same as cities of the same size. Nearly 35 percent felt it was worse.
- **Which of the Following Transportation Goals Should be Most Important to the Bismarck-Mandan Area?** Safety, system integration, maintenance and limiting/reducing congestion were the goals that scored highest based on surveys received. Limiting impacts, supporting economic development, and system security scored lowest.
- **How Supportive Are You of Providing Additional Funding for the Following Transportation Issues?** Of the responses received, most were supportive of increasing funding for better roadway maintenance but not to widen roadways.
- **Which of the Following Sources of Funding Would You Most Support?** Of the responses received, most supported new land developments paying for related transportation improvement needs and least supported the use of tolls and congestion fees.

Chapter 4

Existing System Performance

September 2018

ARRIVE 2045
Bismarck-Mandan MPO
Metropolitan Transportation Plan

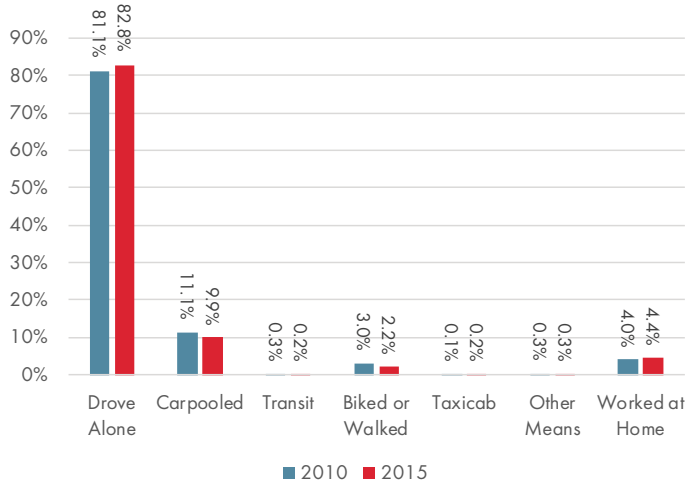
EXISTING SYSTEM PERFORMANCE

The assessment of existing system performance includes all modes of transportation: personal automobile, bicycle, pedestrian, transit, truck freight, rail, and air.

Travel Mode Trends

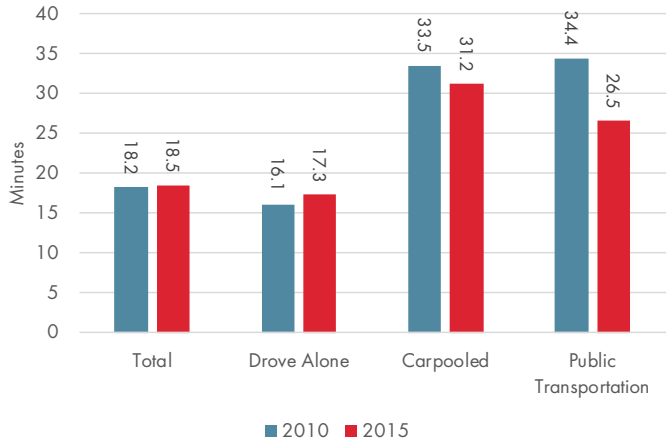
In the Bismarck-Mandan area, like most of North Dakota, the predominate mode for commuting is the personal automobile – nearly 93 percent of people use a personal automobile to travel to work. This mode preference has increased slightly since 2010 (92.1 percent to 92.6 percent). The use of carpooling has declined in that time, as have the use of public transportation, bicycling, and walking; more people are using taxis and working at home.

Figure 4.1: Travel Mode Trends



Since 2010, the median travel time to work has increased nearly 8 percent. It peaked in 2013 but has since slightly declined. Public transit commute times have declined 16 percent and are now faster, on average, than carpooling. For 90 percent of people who walk to work, their travel time to work is less than 20 minutes.

Figure 4.2: Average Travel Time to Work by Mode (Excludes Biking and Walking)

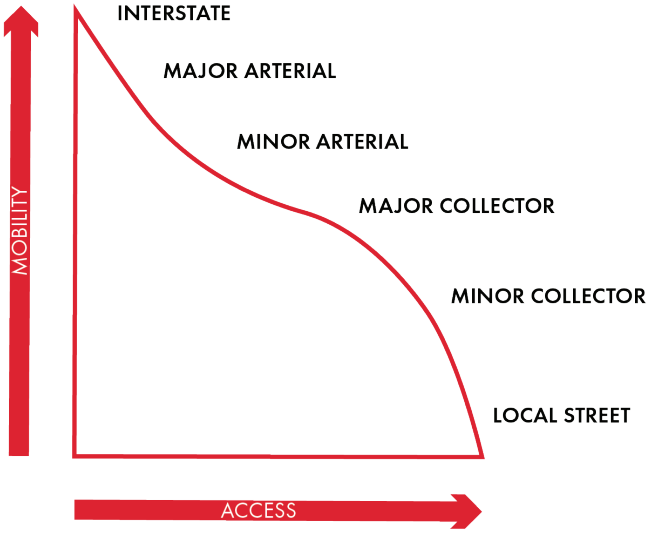


Roadway System

Functional Classification

The Bismarck-Mandan roadway system is illustrated in Figure 4.4. The roadway system is defined by its functional classification, depicted in Figure 4.3, a set of guidelines that groups streets and highways by their intended function ranging from high mobility and low access, like an interstate, to low mobility and high access, like a local street. Typically, travelers use a combination of arterial, collector, and local streets for their trips.

Figure 4.3: Functional Class Relationships



The total miles of Federally-classified roads within the metropolitan planning area are shown in Table 4.1. Roadways that have a functional class are generally eligible for federal transportation funding. The Bismarck-Mandan metro area is within the recommended ranges for the local and collector systems, but is slightly under the recommended range for arterials. This may put additional traffic stress on local and collector roadways, which are often important connections for bicycle and pedestrian traffic.

Table 4.1: Functionally Classified Roadway Mileage

Functional System	Roadway Miles	Percent of Total Network	Recommended Range
Local	903.4	72.9%	65 to 80%
Collector	92.4	7.5%	5 to 10%
Minor Arterial	81.2	6.6%	15 to 25%
Principal Arterial	99.7	8.0%	
Interstate	62.1	5.0%	NA
Total	1,238.8	100.0%	

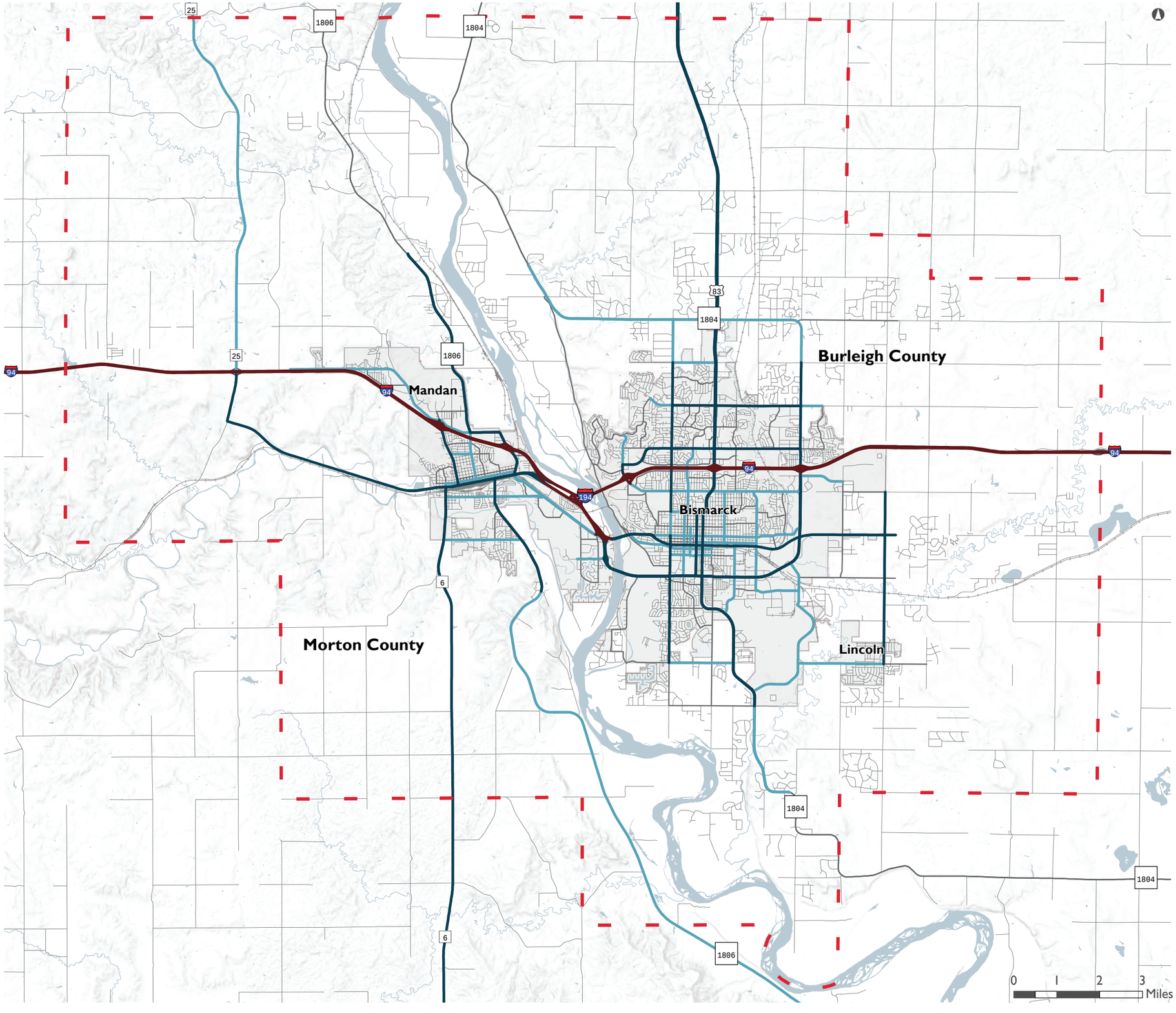


Figure 4.4: Functional Class

Functional Class

Metropolitan Planning Organization Boundary

Boundary

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector

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Metropolitan Transportation Plan

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Regional Travel Patterns

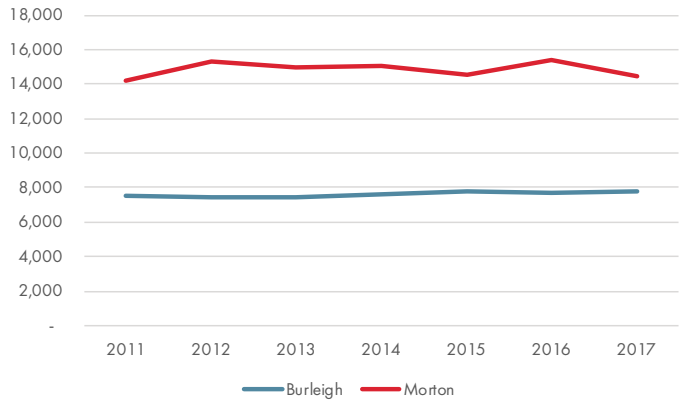
There are multiple measures of effectiveness for the regional transportation network and mobility: vehicle miles traveled, vehicle hours traveled, and level of service.

Vehicle Miles Traveled

Vehicle miles traveled represents the sum of the length of each trip driven by every person on the transportation network over the course of a year. NDDOT and the MPO track vehicle miles traveled for each county, including Burleigh and Morton county. To mitigate the impacts a growing population has on total vehicle miles traveled, VMT is normalized for population.

Historically, Morton County's per capita VMT is nearly twice Burleigh County's per capita VMT at around 14,500 in 2017 compared to 7,800, respectively. However, since 2011 per capita VMT in Burleigh County has grown faster than per capita VMT in Morton County. This is likely associated with larger population growth and suburban style development in Bismarck.

Figure 4.5: Vehicle Miles Traveled per Capita



Vehicle Hours Traveled

Vehicle hours traveled (VHT) represents the product of the number of vehicles in the system times the hours they travel over the course of a year. This data is not available at the County level, but is available from the MPO's travel demand model which includes portions of Burleigh and Morton County. A travel demand model is a computer model that uses socioeconomic demographic data to generate, distribute, and assign trips to a transportation network. More detail on travel demand modeling is available in Chapter 6 Future System Performance.

The 2015 travel demand model estimated more than 47,100 vehicle hours traveled, a 21 percent increase over the 2010 travel demand model estimate (38,790 vehicle hours traveled). Some of this increased travel time can be attributed to additional vehicles on the network, but the travel demand model indicates shorter trip times (10.9 percent) and trip length (12.7 percent) as well as slower trip speeds (2.0 percent). This indicates growing congestion in the metro.

Figure 4.6: Congestion on Main Street in Mandan

Traffic Operations

At the regional level, traffic operations is an evaluation of the ratio between travel demand and roadway capacity, known as the volume to capacity ratio (V/C ratio). Travel capacity is estimated using roadway characteristics like number of lanes, posted speeds, and intersection control. Travel demand represents the daily traffic volumes on the roadway, either as collected or through the calibrated travel demand model.

The V/C ratio is used to assign a level of service (LOS), which is a letter grade used to describe traffic operations. LOS "A" represents no delays and LOS "F" represents gridlocked travel. More details on traffic operations and the LOS description is shown in Figure 4.7. The V/C ratios and their corresponding LOS is shown in Table 4.2. Based on NDDOT and MPO standards, LOS "D" or better is considered acceptable, while LOS "E" and "F" are considered deficient.

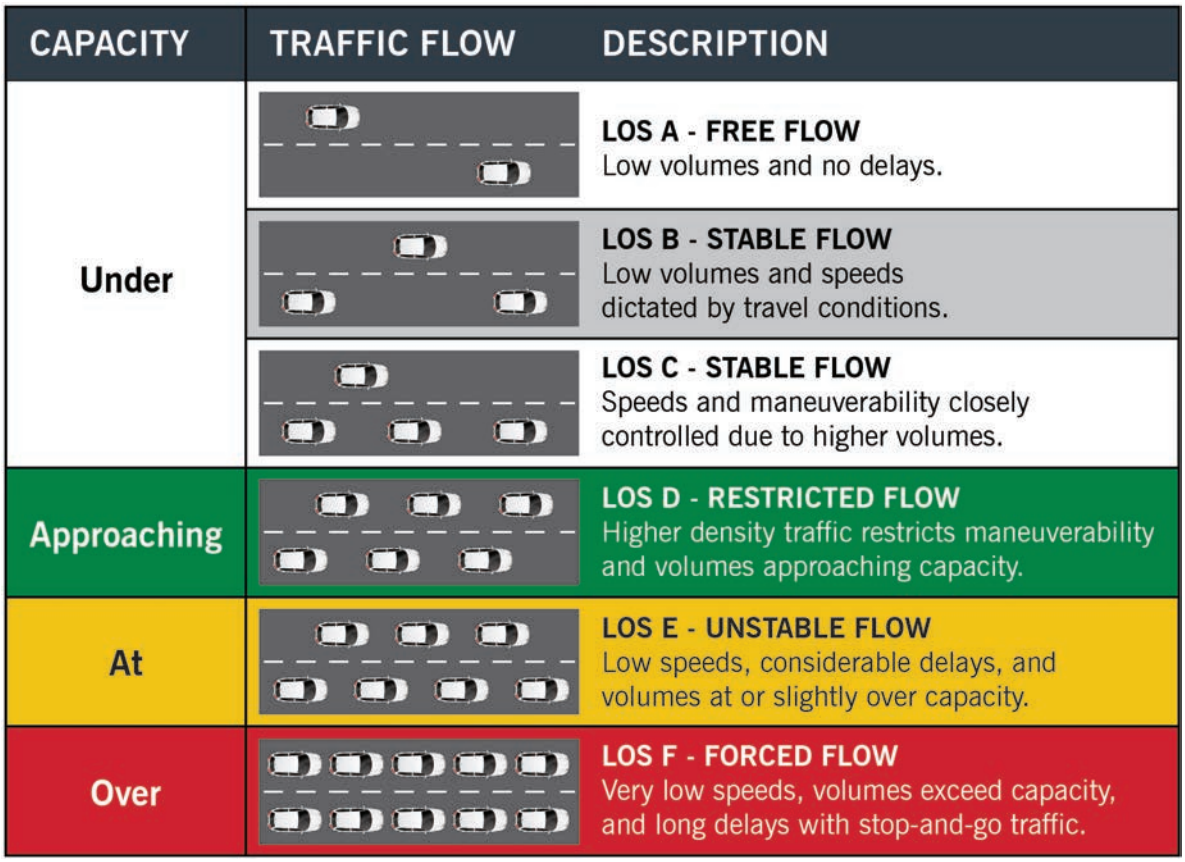
Table 4.2: V/C Ratios and Level of Service

LOS	V/C Ratio Ranges
A	< 0.5
B	0.5 to 0.6
C	0.6 to 0.7
D	0.7 to 0.8
E	0.8 to 0.9
F	> 0.9

The travel demand model provides V/C ratios for the functionally classified roadways. The level of service for the Bismarck-Mandan area is shown in Figure 4.8. Areas of existing concern based on deficient LOS include many of the metro's most heavily traveled arterial roadways:

- Washington Street
- State Street
- I-94
- Divide Avenue
- Bismarck Expressway
- Centennial Road
- 19th Street N
- 7th Street
- 3rd Street (Mandan)
- Memorial Highway
- Downtown Bismarck and Mandan (various streets)

Figure 4.7: Level of Service Descriptions



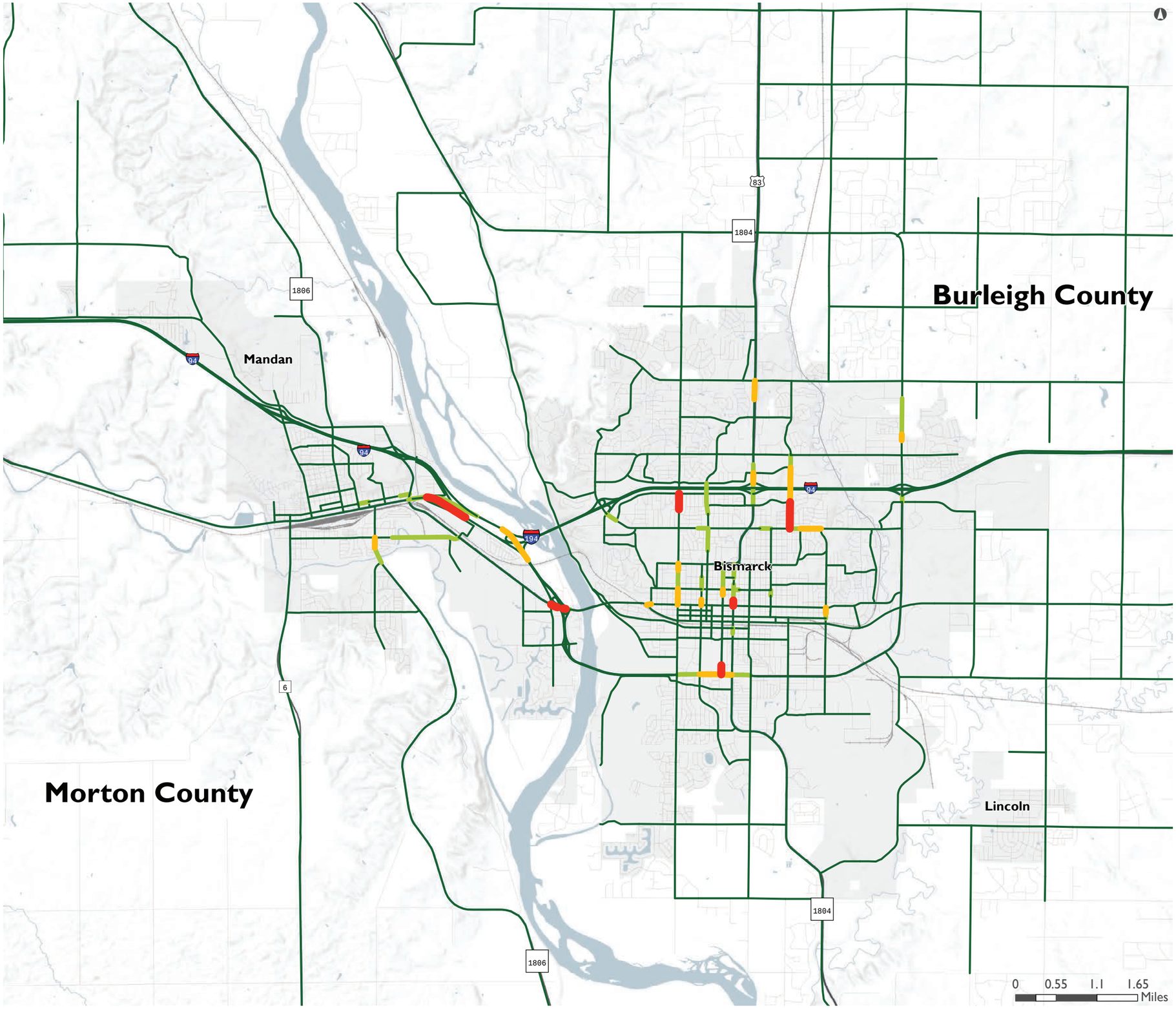


Figure 4.8: Level of Service 2015

Level of Service 2015

Level of Service

- LOS F
- LOS E
- LOS D
- LOS A-C

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Metropolitan Transportation Plan

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Asset Management

Highways, roads, and bridges are an integral part of the community. These assets keep the economy moving, connect to daily destinations, and provide access in case of an emergency. Managing the roadway infrastructure is a two-step process, which begins with maintaining the existing infrastructure and then managing that infrastructure to accommodate future needs and growth.

Asset managemt is defined as a strategic and systematic process of operating, maintaining, and improving physical assets based on engineering and economic analysis. A good asset management plan is based upon quality information which will achieve and sustain a desired state of good repair over the life cycle of the asset.

Transportation agencies are responsible for building and maintaining the roads and bridges within each of their jurisdictions. State owned versus locally owned roadways have differing levels of asset management plans, schedules, and data availability.

Pavement Condition Assessment

State Owned Roadway Pavement Management

The NDDOT evaluates roadways on the state system through their asset management plan by using the International Roughness Index (IRI). The IRI provides a quantitative measurement of pavement smoothness and is a cumulative deviation from a smooth surface in inches per mile. Ranges of IRI values can be used to classify the general condition of a roadway as listed in Table 4.3.

Table 4.3: International Roughness Index (IRI) and General Roadway Conditions

International Roughness Index (IRI)	Roadway Condition
≤ 60	Excellent
61 – 99	Good
100 – 145	Fair
> 145	Poor

Figure 4.10 shows the pavement conditions of the state-owned roadways. The data shown was collected in 2017. Table 4.4 lists the segments of roadway which received a poor rating on all the National Highway System (NHS) and Non-NHS roadways maintained by the NDDOT. Many of these locations have projects programmed in the 2019-2022 Transportation Improvement Program (TIP).

Table 4.4: State Owned Roadway Locations with a Poor IRI Rating

Route ID	NDDOT Highway	Highway Direction	Location	IRI Value	Initial Construction Year	Latest Construction Year	Programmed in TIP
267	94	W	In Mandan on Main Avenue from the Heart River Bridge to Twin Cities Drive	148	1996	1996	Yes 2019
266	94	E	In Mandan on Main Avenue from ND 6 to ND 1806	153	1996	1996	Yes 2019
9	83	N	In Bismarck on 9th Street from Rosser Avenue to Boulevard Avenue	155	1950	2009	No
260	83	S	In Bismarck on State Street from I-94 Bridge to approximately 600 feet south of Calgary Avenue	156	2003	2012	No
266	94	E	In Mandan on Main Avenue from the Heart River Bridge to ND 6	161	2008	2008	Yes 2022
271	1806	N	In Mandan on Fort McKeen Road from 15th Street SE to the Heart River Bridge	164	1997	1997	No
265	83	N	In Bismarck on State Street from I-94 Bridge to approximately 600 feet south of Calgary Avenue	166	2003	2012	No
271	1806	N	In Mandan from Main Street to I-94	189	2008	2008	No
10	1804	S	In Bismarck on 7th Street from Bismarck Expressway to Boulevard Avenue	193	1950	2009	Portion 2022
9	1804	N	In Bismarck on 9th Street from Bismarck Expressway to Rosser Avenue	195	1950	2009	Portion 2022
239	6	N	In Mandan from the Heart River Bridge to Main Street	219	1991	2017	No
293	1804	S	In Bismarck on University Avenue from approximately 700 feet north of 12th Street to Bismarck Expressway	223	2005	2005	Portion 2022

Pavement Condition Performance Measures and Targets

Table 4.5 below compares the pavement conditions on the current system with the targets set by the NDDOT. When setting targets, the FHWA only reviews the roadways on the National Highway System (NHS). This includes interstate and non-interstate NHS routes (principal arterials).

Table 4.5: Interstates and Non-Interstate Pavement Conditions

	Pavement Condition in MPO Area	NDDOT Target
Interstate Good	75.6%	80.2%
Interstate Poor	3%	0.1%
Non-Interstate NHS Good	58.3%	62.8%
Non-Interstate NHS Poor	3%	0.3%

Locally Owned Roadway Pavement Management

Pavement condition data for locally owned roadways is not collected on a regular schedule; however, PCI data from the City of Bismarck and the Upper Great Plains Transportation Institute (UGPTI) for Mandan's roadways was available for the years 2016 through 2018 and is shown in Figure 4.11.

The Pavement Condition Index (PCI) is a numerical ranking system of a pavement's condition based on a scale of 0 to 100 where 0 is the worst possible condition and 100 is the best. Surface cracks, construction deficiencies, surface weathering, and environmental issues are examples of different types of pavement distress.

The PCI ranges used to determine adequate, degraded, and unsatisfactory pavement assessment criteria is listed below in Table 4.6.

Table 4.6: PCI Range for Pavement Condition Assessment

Pavement Condition	PCI Value
Adequate	71 - 100
Degraded	56 - 70
Unsatisfactory	0 - 55

The PCI data obtained shows the majority of the roads in both cities are in adequate condition. Figure 4.9 shows the percentage of roads in these categories within both Bismarck and Mandan. PCI rating by functional classification for Bismarck and Mandan is shown in Table 4.7

Figure 4.9: PCI Assessment for Bismarck and Mandan

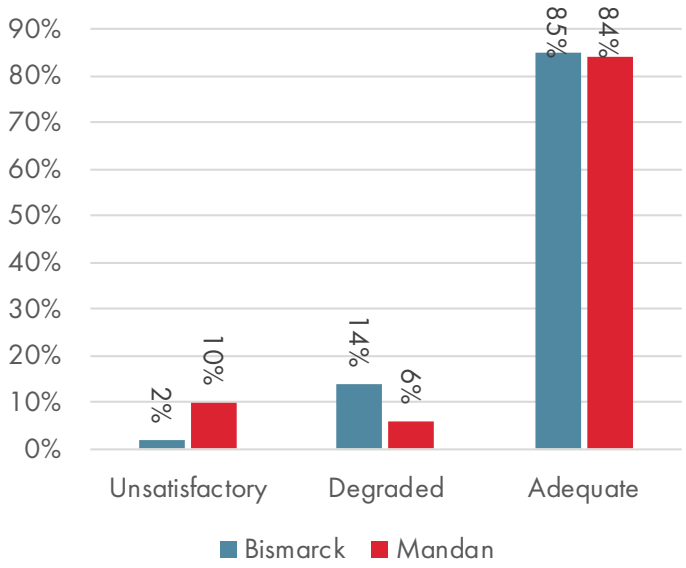
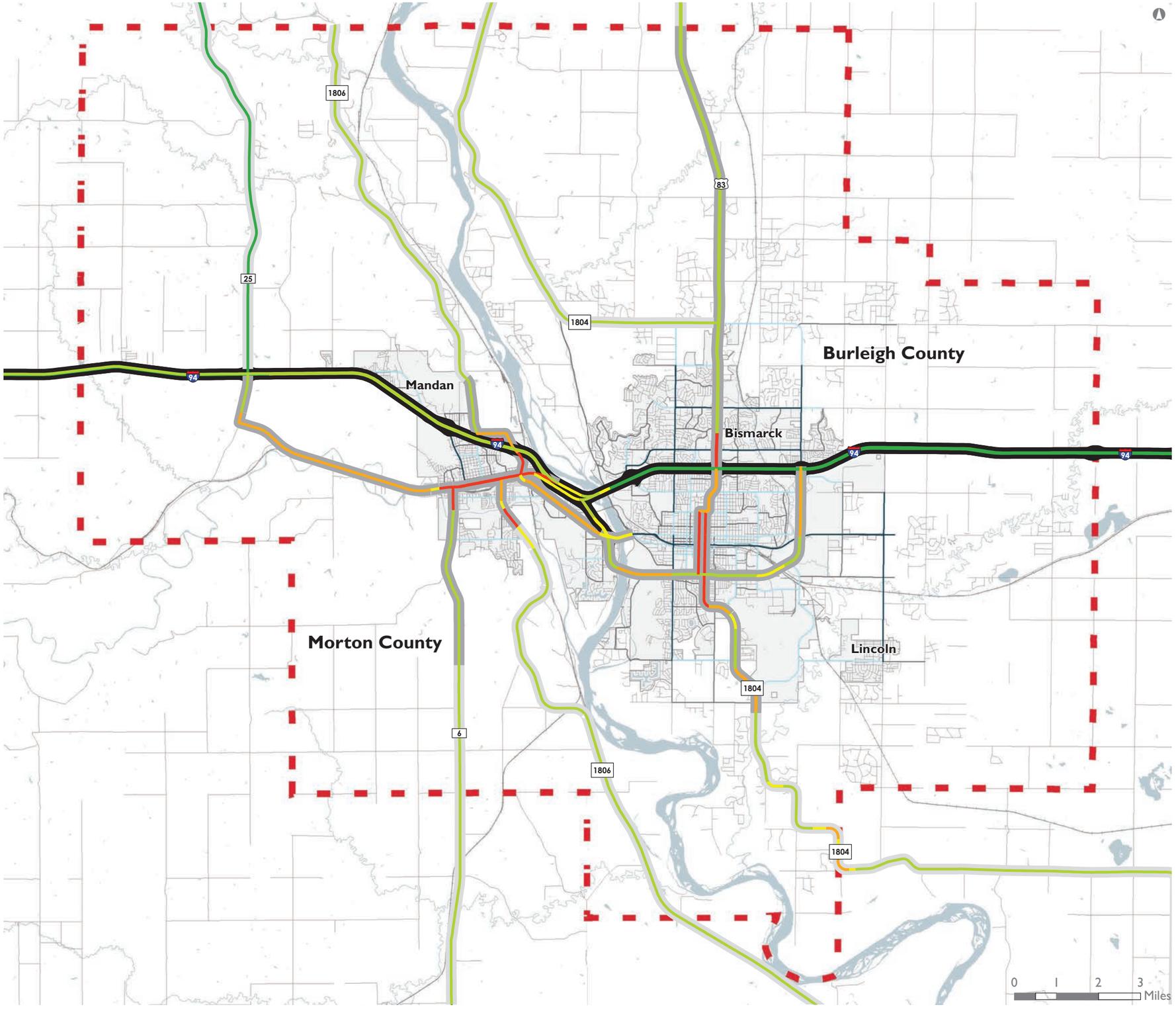


Table 4.7: PCI Ratings for Functionally Classified Roadways in Bismarck and Mandan

Functional Classification	PCI Rating	Bismarck		Mandan	
		Centerline Miles	Percent	Centerline Miles	Percent
Collector	Adequate	38.50	84.0%	8.57	83.7
	Degraded	6.40	14.0%	0.86	8.4
	Unsatisfactory	0.95	2.1%	0.81	7.9
Minor Arterial	Adequate	27.19	81.8%	9.10	79.5
	Degraded	5.32	16.0%	0.60	5.3
	Unsatisfactory	0.72	2.2%	1.74	15.2
Principal Arterial	Adequate	42.26	87.3%	1.58	100.0
	Degraded	5.87	12.1%	-	-
	Unsatisfactory	0.26	0.5%	-	-

Figure 4.10: State Owned Roads IRI

State Owned Roads International Roughness Index (IRI) Rating 2017



IRI Rating
- Excellent
- Good
- Fair
- Poor
- No Data

NHS Classification
- Interstate
- Principal Arterial
- State Non-NHS

Metropolitan Planning Organization Boundary
- Boundary

Roadway by Functional Classification
- Interstate
- Principal Arterial
- Minor Arterial
- Collector

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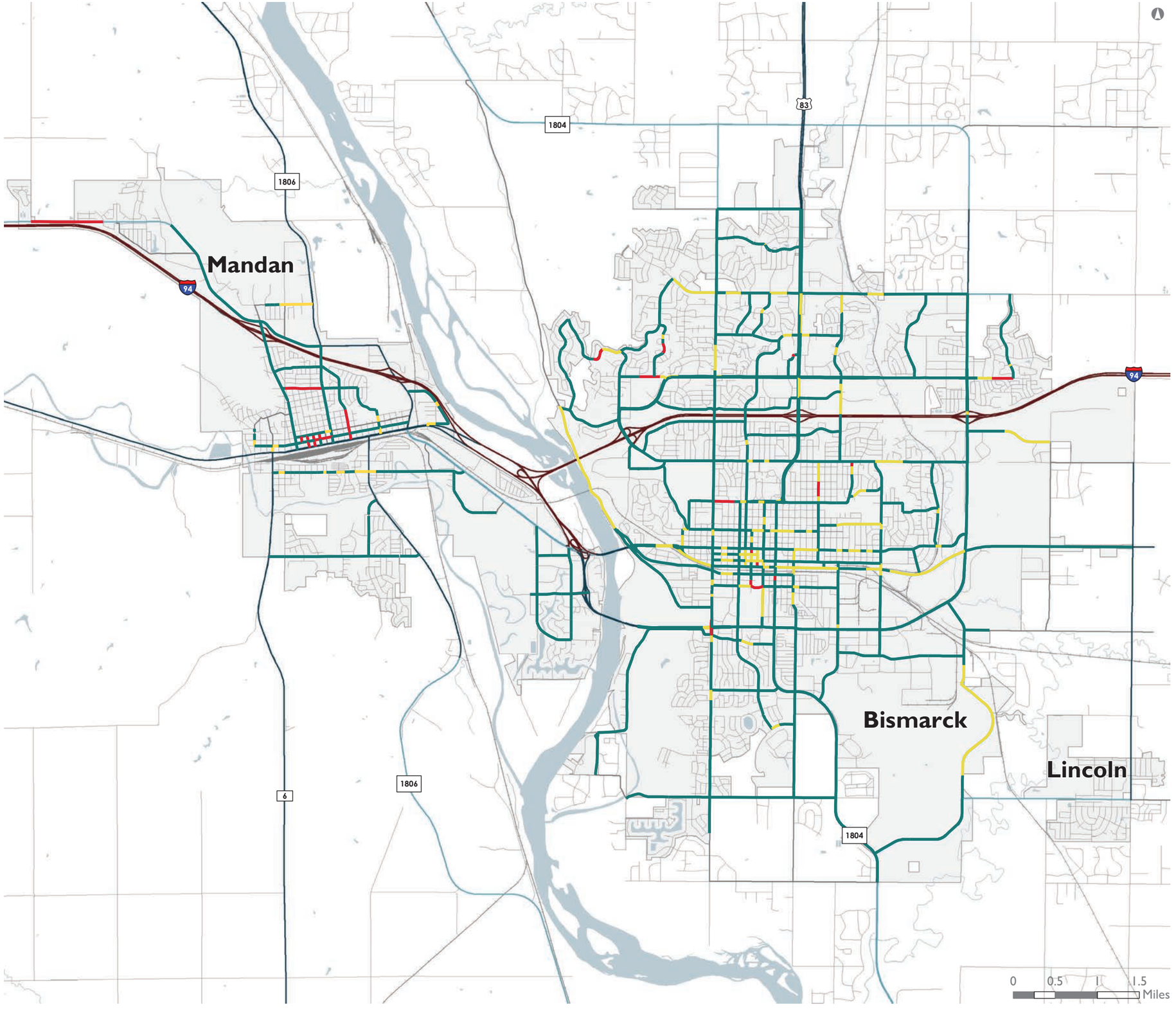
Figure 4.11: Pavement Conditions Index

Pavement Conditions Index (PCI) Rating 2016 - 2018



PCI Rating

- Adequate
- Degraded
- Unsatisfactory

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector

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Bridge Structure Assessment

The Federal Highway Administration (FHWA) compiles data on bridge structures within the United States in the National Bridge Inventory (NBI) database. Bridge structures include traditional bridges as well as culverts. The NBI completes a structural evaluation of bridge structures based on multiple factors such as geometric data, bridge components, average daily traffic, rating results, etc. A composite of these measurements, known as a Sufficiency Rating, is a scale between 0 and 100 and is intended to indicate the ability of a structure to remain in service. An entirely deficient structure is rated a 0 while an entirely sufficient structure is rated 100. A low Sufficiency Rating may be due to structural defects, narrow lanes, low vertical clearance, or other possible issues.

The NBI also classifies insufficient structures as either structurally deficient or functionally obsolete. Structurally deficient indicates the presence of structural defects such as: one or more of a structure's main components has been rated in poor condition, the load carrying capacity has been surpassed, or water frequently overflows the deck and impedes traffic. Functionally obsolete means the structure does not meet current design standards due to physical limitations such as lane width or clearance and cannot adequately meet traffic demands. Neither classification is intended to classify the structure as unsafe. However, safety is more of a concern for structurally deficient classified structures because it means the structure has a significant defect. In contrast, functionally obsolete, only implies the structure is not suitable for its current use. The existing structures located within the Bismarck-Mandan metropolitan area are mapped in Figure 4.13 and insufficient structures are shown with their corresponding structure number.

Structurally Deficient Structures

According to NBI data from 2017 there are 92 structures within the MPO boundary. Eight of these structures have an insufficient rating, two (2.2 percent) are identified as structurally deficient and six (6.5 percent) are identified as functionally obsolete. Table 4.8 on the following page identifies the bridges with an insufficient rating.

Since the 2015-2040 Bismarck-Mandan Long Range Transportation Plan (LRTP) was completed in 2015, structure number 8118340 (30th Avenue NE in Burleigh County) was added to the structurally deficient list and structure number 94164527 (80th Street bridge over I-94 in Burleigh County) was removed. Structure number 94922121 (I-94 Business Route over Washington Street North) in Bismarck has also been categorized as functionally obsolete since the 2015 LRTP was finalized.

Structure Condition

The FHWA classifies bridge structures as being in good, fair, and poor condition by reviewing the condition ratings for the deck, superstructure, substructure, and culvert. If the lowest rating is greater than or equal to seven, the bridge is classified as good; if it is less than or equal to four, the classification is poor.

According to the NBI database, there are 64 structures in good condition (69.6 percent), 26 in fair condition (28.3 percent), and two in poor condition (2.2 percent). The bridge structure condition by jurisdiction is shown in Table 4.9.

Table 4.8: Bridges Rated Insufficient in National Bridge Inventory

Structurally Deficient Bridge Structures				
Structure Number	Location	Functional Class	Owner	Sufficiency Rating
8118340	On 30th Avenue NE 1.6 miles east of 106th Street NE	Local (Rural)	Burleigh County	25.5
30153040	On 33 ½ Street west of Highway 25	Local (Rural)	Morton County	64.0
Functionally Obsolete Bridge Structures				
Structure Number	Location	Functional Class	Owner	Sufficiency Rating
0094156069 R	I-194 and I-94 at East Midway Interchange in Mandan	Principal Arterial – Interstate (Urban)	NDDOT	87.0
94922121	On I-94 Business Route over Washington Street North in Bismarck	Other Principal Arterial (Urban)	NDDOT	94.3
8107290	On 15th Street NW approximately ¾ miles south of 110th Avenue North	Local (Rural)	Burleigh County	87.8
30150050	On 35th Street SW 3 miles west of Highway 25	Local (Rural)	Morton County	57.3
0094152329 L	On I-94 over Sunset Drive in Mandan	Principal Arterial – Interstate (Urban)	NDDOT	79.0
0094152329R	On I-94 over Sunset Drive in Mandan	Principal Arterial – Interstate (Urban)	NDDOT	79.0

Table 4.9: Bridge Structure Conditions by Jurisdiction

Owner	Total Structures	Good Condition	Fair Condition	Poor Condition
NDDOT	56	36	20	0
Burleigh County	15	12	2	1
Morton County	9	5	3	1
City of Bismarck	9	8	1	0
City of Mandan	3	3	0	0
Total Bridges	92	64	26	2

Structure Condition Performance Measures and Targets

Table 4.10 shows the existing NDDOT owned bridge structure conditions in the MPO area and the NDDOT established bridge structure condition performance target. The MPO is slightly lower than the Good Condition target at 64.3 percent (compared to 64.4 percent) but has no bridges in Poor Condition in the MPO area.

Table 4.10: Bridge Conditions Performance Targets

% of Structures in	Existing NDDOT Bridge Condition in MPO Area	Existing NDDOT Target
Good Condition	64.3%	64.4%
Poor Condition	0.0%	3.7%

Figure 4.12: Memorial Bridge Over the Missouri River

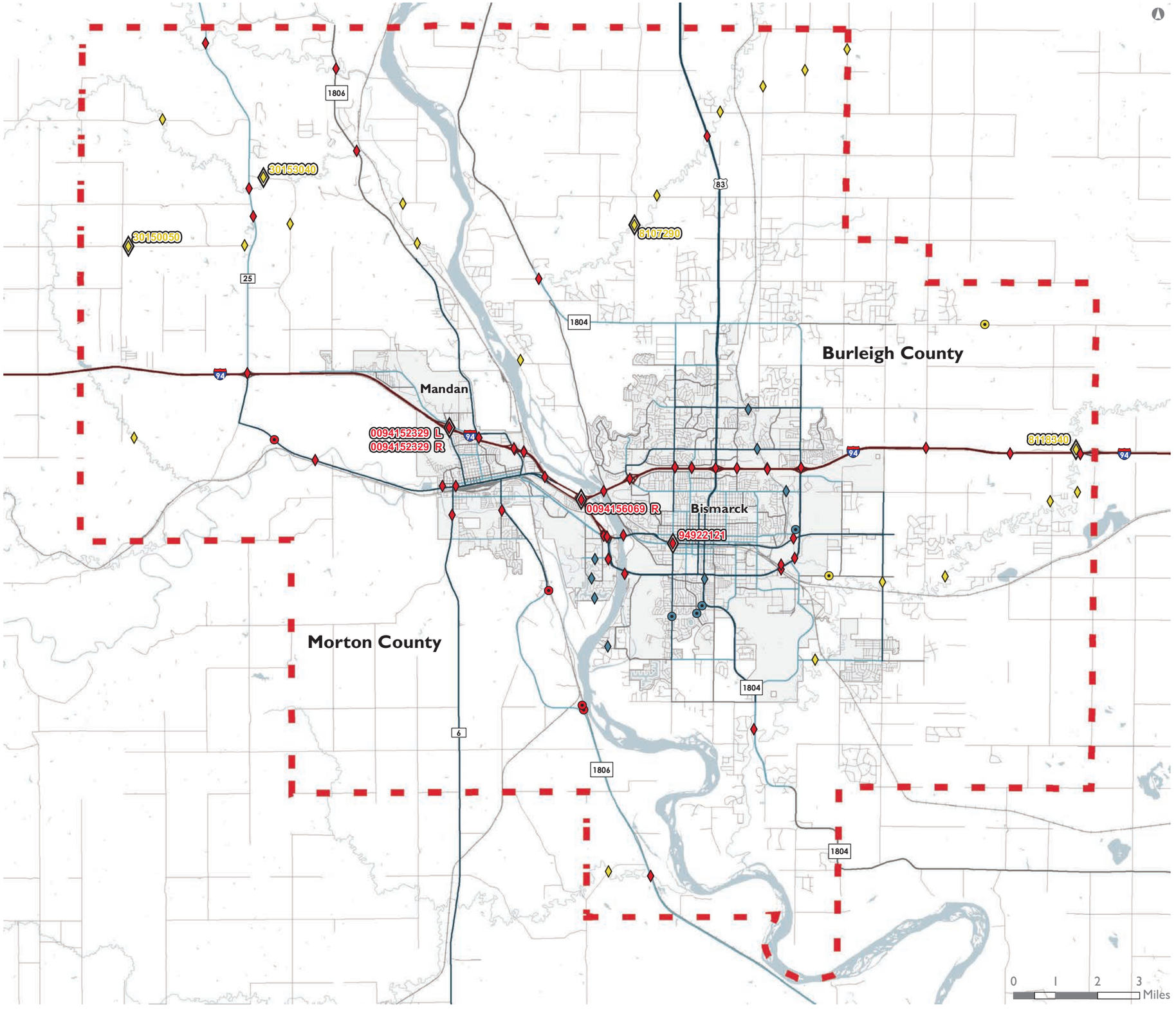

Figure 4.13: Bridges in MPO Boundary

Bridges in MPO Boundary

Bridges in MPO

Culvert Bridge

- State Highway Agency
- County Highway Agency
- City or Municipal Highway Agency
- Insufficient Bridge

Metropolitan Planning Organization Boundary

- Boundary

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector

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Roadway Safety

Consideration for safety is the number one concern for transportation agencies throughout the country. Safety improvements come in many forms including safety policies, programs, laws, education, technology, and engineering solutions. Performing a general safety analysis of the Bismarck Mandan MPO is the first step in identifying areas where further study might be warranted.

Existing Crash Summary

The last five years of crash data for the Bismarck Mandan MPO area was requested from the NDDOT from a period of January 2013 through December 2017. During this timeframe there were a total of 15,039 motorized vehicle and 238 non-motorized vehicle crashes. This includes 23 fatal crashes, of which six occurred at intersections. Table 4.11 shows a summary of total crashes and serious injury crashes within the MPO Boundary. Figure 4.14 further breaks down both motorized and non-motorized crashes by surface condition, crash type, crash facility, and crash year.

Table 4.11: Crash Summary for Motorized Crashes in MPO Boundary, 2013 - 2017

Crash Type	MPO Total	Fatal Crashes	Serious Injury Crashes
Total Reported Crashes	15,277	23	186
Motorized Vehicle Crashes	15,039	22 13 U/9 R	164 116 U/48 R
Non-Motorized Vehicle Crashes	238	1 1 U/0 R	22 21 U/1 R

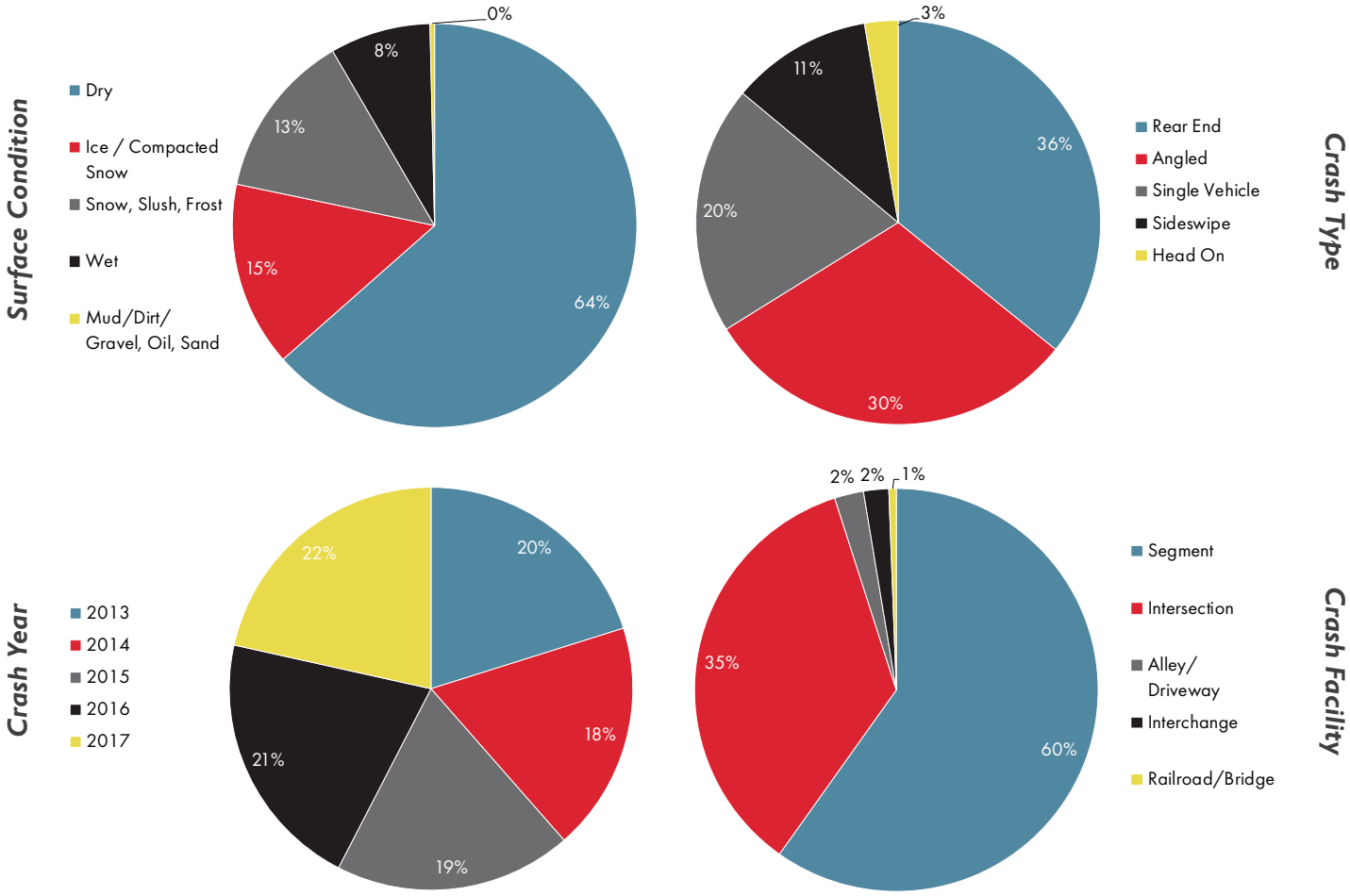
U = Urban, R = Rural

The number of crashes within the Bismarck Mandan MPO boundary has not changed significantly throughout the five-year period studied. Figure 4.17 shows all the serious vehicle crashes (fatal and incapacitating injury crashes) within the MPO area during the study period.

Intersection Crash Assessment

Based on the five-year crash data provided by the NDDOT an intersection crash assessment was completed. First, the intersections with the highest number of crashes were identified. Second, these intersections were further evaluated based on frequency, crash type, and severity.

Figure 4.14: Crash Attribute Summary



Intersection Crash Frequency

Crash rates were calculated in terms of crashes per 100-million vehicle miles traveled using the most recent average daily traffic (ADT) counts available at each intersection. Table 4.12 identifies the intersections with the highest number of crashes in both Bismarck and Mandan. If available, crash rates were compared to the rates calculated in the 2015 MTP.

Of the nineteen intersections listed, nine were also identified in the 2015 LRTP as being high crash frequency intersections. Where a comparison could be completed, crash rates significantly dropped since the 2015 MTP. No specific intersection modifications can be identified; however, the data shows a significant decrease in overall crashes coupled with higher daily traffic and a three year review period (instead of five), resulting in a lower crash rate.

The Highway Safety Improvement Program (HSIP) is a Federal-aid program aimed at achieving a significant reduction in fatalities and serious injuries on all public roads. As part of HSIP, NDDOT releases a rolling three-year report summarizing high crash locations on the rural and urban systems within North Dakota. The 2015-2017 HSIP analysis was released in late 2018 and outlines 25 high crash rural intersection locations and 50 high crash urban intersection locations. Of these, Burleigh and Morton counties had zero, Lincoln had zero, Mandan had zero, and Bismarck had 17 high crash locations. Table 4.12 identifies which of these intersections were also classified as high crash locations in this analysis.

Figure 4.18 and Figure 4.19 show the number of crashes by intersection broken out within the city limits and the greater rural area of the MPO.

Intersection Severity

Analyzing the severity of crashes is another tool used to determine if further study is warranted at an intersection. In the high crash intersections studied, zero fatalities and eight incapacitating injury crashes occurred between 2013 and 2017. Severe injury crashes accounted for one percent of the total crashes at these high crash intersections. Table 4.12 further breaks down the number of severe crashes by intersection.

Table 4.12: Highest Crash Frequency Intersections, 2013 - 2017

Bismarck	Number of Crashes	Crash Rate (Crashes per MEV)	2015 LRTP Crash Rate (Crashes per MEV)	Serious Injury Crashes	Percent of Crashes with Serious Injuries
Century Ave & State Street	104	1.12	2.14	0	0%
E Main Ave & 9th Street	70	1.42	1.87	2	3%
E Main Ave & 7th Street	60	1.12	1.85	1	2%
E Main Ave & 3rd Street	58	1.41	2.60	0	0%
E Capitol Ave & State Street	56	0.80	2.17	0	0%
Century Avenue & 4th Street	51	1.36	N/A	0	0%
Bismarck Expressway & 9th Street	51	0.74	N/A	2	4%
Bismarck Expressway & Washington Street	51	0.66	1.63	0	0%
E Divide & State Street	47	0.66	1.74	0	0%
Interstate Ave & State Street	46	0.51	1.54	1	2%
Mandan	**Number of Crashes**	**Crash Rate (Crashes per MEV)**	**2015 LRTP Crash Rate (Crashes per MEV)**	**Serious Injury Crashes***	**Percent of Crashes with Serious Injuries**
Main Street & Memorial Highway	45	0.83	N/A	0	0%
Main Street & 6th Ave SE	43	0.91	N/A	1	2%
Memorial Highway & 46th Ave SE	39	1.02	2.09	1	3%
3rd Street SE & 6th Ave SE	32	1.03	N/A	0	0%
Old Red Trail & Sunset Drive	31	0.95	N/A	0	0%
Burlington Street SE & 6th Ave SE	19	0.80	N/A	0	0%
NB Bismarck Expressway to EB Memorial Highway Ramp	15	0.68	N/A	0	0%
Main Street & 10th Ave NW	14	0.85	N/A	0	0%
I-94 WB to Sunset Dr Ramp	12	0.33	N/A	0	0%

Red text indicates intersection was identified in 2015-2017 crash analysis in the HSIP.

Intersection Crash Types

Crash types are categorized as angled, sideswipe, head-on, rear-end, and single vehicle collision. Crash types at intersections are an important metric because they give insight into potential issues leading to a crash. If a specific type of crash is predominant at an intersection, a countermeasure can be evaluated to help mitigate the risk. Table 4.13 identifies the percentage of each crash type per high crash volume intersection in Bismarck and Mandan.

The highest crash type for Bismarck was angled (55 percent) followed by rear end (28 percent). The highest crash type for Mandan was rear end (44 percent) followed by angled (37 percent).

Table 4.13: Crash Type at Highest Crash Frequency Intersections, 2013 - 2017

Bismarck	Rear End Crashes	Angled Crashes[a]	Sideswipe Crashes[b]	Head on Crashes	Single Vehicle Crashes
Century Ave & State Street	38%	48%	7%	4%	4%
E Main Ave & 9th Street	9%	79%	10%	1%	1%
E Main Ave & 7th Street	13%	42%	33%	3%	8%
E Main Ave & 3rd Street	19%	62%	5%	7%	7%
E Capitol Ave & State Street	29%	64%	4%	2%	2%
Century Avenue & 4th Street	16%	71%	0%	12%	2%
Bismarck Expressway & 9th Street	31%	59%	2%	0%	8%
Bismarck Expressway & Washington Street	45%	31%	14%	0%	10%
E Divide & State Street	62%	23%	2%	4%	9%
Interstate Ave & State Street	28%	63%	7%	2%	0%
Mandan	**Rear End Crashes**	**Angled Crashes[a]**	**Sideswipe Crashes[b]**	**Head on Crashes**	**Single Vehicle Crashes**
Main Street & Memorial Highway	64%	27%	0%	2%	7%
Main Street & 6th Ave SE	58%	28%	2%	7%	5%
Memorial Highway & 46th Ave SE	38%	41%	3%	13%	5%
3rd Street SE & 6th Ave SE	13%	50%	16%	9%	13%
Old Red Trail & Sunset Drive	52%	29%	3%	16%	0%
Burlington Street SE & 6th Ave SE	16%	74%	0%	11%	0%
NB Bismarck Expressway to EB Memorial Highway Ramp	80%	13%	0%	0%	7%
Main Street & 10th Ave NW	43%	21%	0%	29%	7%
I-94 WB to Sunset Dr Ramp	8%	75%	8%	0%	8%

[a] *includes Angle Not Specific, Angle Opposite Direction, Angle Same Direction, Right Angle*
[b] *includes Sideswipe Opposite Direction and Sideswipe Same Direction*

Bicycle and Pedestrian Crashes

Non-motorized crash severity by year is shown in Figure 4.15 for pedestrian involved crashes and Figure 4.16 for bicycle involved crashes. There was one fatal non-motorized pedestrian crash which occurred at Main Avenue and 24th Street North and 16 incapacitating injury crashes. Figure 4.20 maps all severe non-motorized crashes within the MPO Boundary between 2013 and 2017.

Figure 4.15: Pedestrian Crashes by Severity Level, 2013-2017

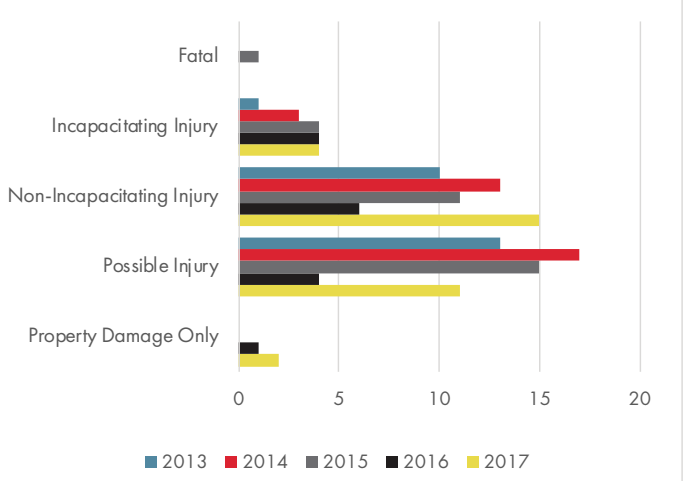
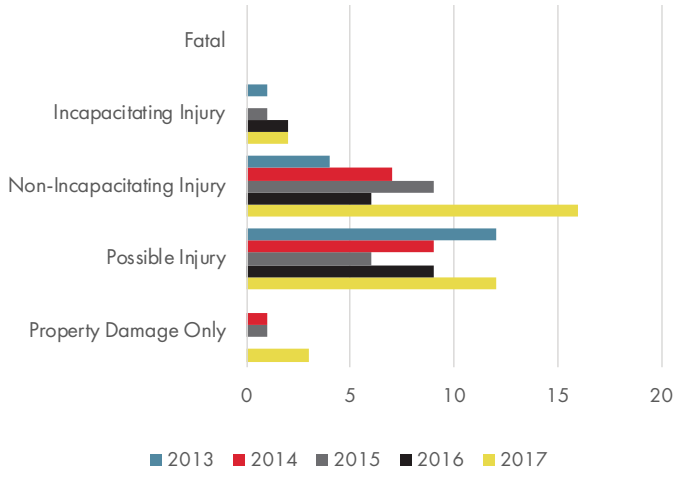


Figure 4.16: Bicycle Crashes by Severity Level, 2013-2017



Safety Performance Measures and Targets

The FHWA defines Safety Performance Management (Safety PM) as a strategic approach that uses system information to make investment and policy decisions to achieve national performance goals. The five performance measures, as five-year rolling averages, include:

- Number of Fatalities
- Rate of Fatalities per 100 million Vehicle Miles Traveled (VMT)
- Number of Serious Injuries
- Rate of Serious Injuries per 100 million VMT
- Number of Non-motorized Fatalities and Non-motorized Serious Injuries

State DOTs are required to set their own annual safety performance targets in their Highway Safety Improvement Program (HSIP). In general, NDDOT's goal is to reduce crashes by one percent. Table 4.14 shows the current NDDOT targets for the five safety performance measures. NDDOT sets targets for the number of motorized fatalities, number of motorized serious injuries, number of non-motorized fatalities and serious injuries. These numbers are for the entire state and are therefore not comparable to the smaller area of the MPO boundary.

The remaining two performance measures are calculated using vehicle miles traveled (VMT), which is the amount of travel for all vehicles in a geographic region over a given period of time.

Table 4.14: Safety Performance Measures and Targets

Safety Performance Measure	NDDOT 5-Year Average Target
Number of Motorized Fatalities	138.0
[a]Rate of Fatalities per 100 million VMT	1.366
Number of Motorized Serious Injuries	516.0
[a]Rate of Serious Injuries per 100 million VMT	5.088
Number of Non-Motorized Fatalities and Non-Motorized Serious Injuries*	34.8

[a] The MPO will adapt current NDDOT targets for rate calculated goals

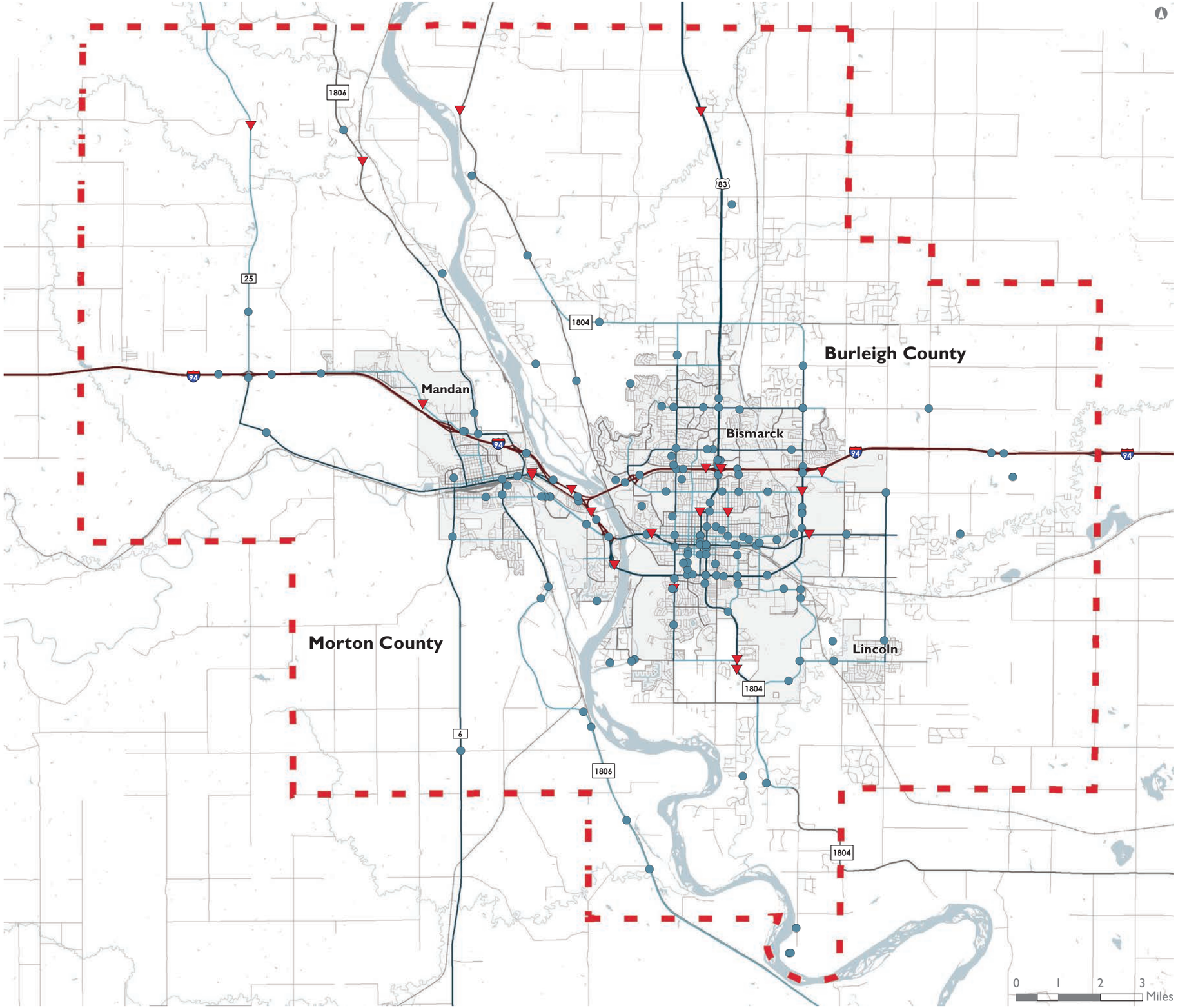


Figure 4.17: Serious Vehicular Crashes

Serious Vehicular Crashes 2013 - 2017

Serious Vehicular Crashes

- Fatal Crashes
- Incapacitating Injury Crashes

Metropolitan Planning Organization Boundary

- Boundary

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector

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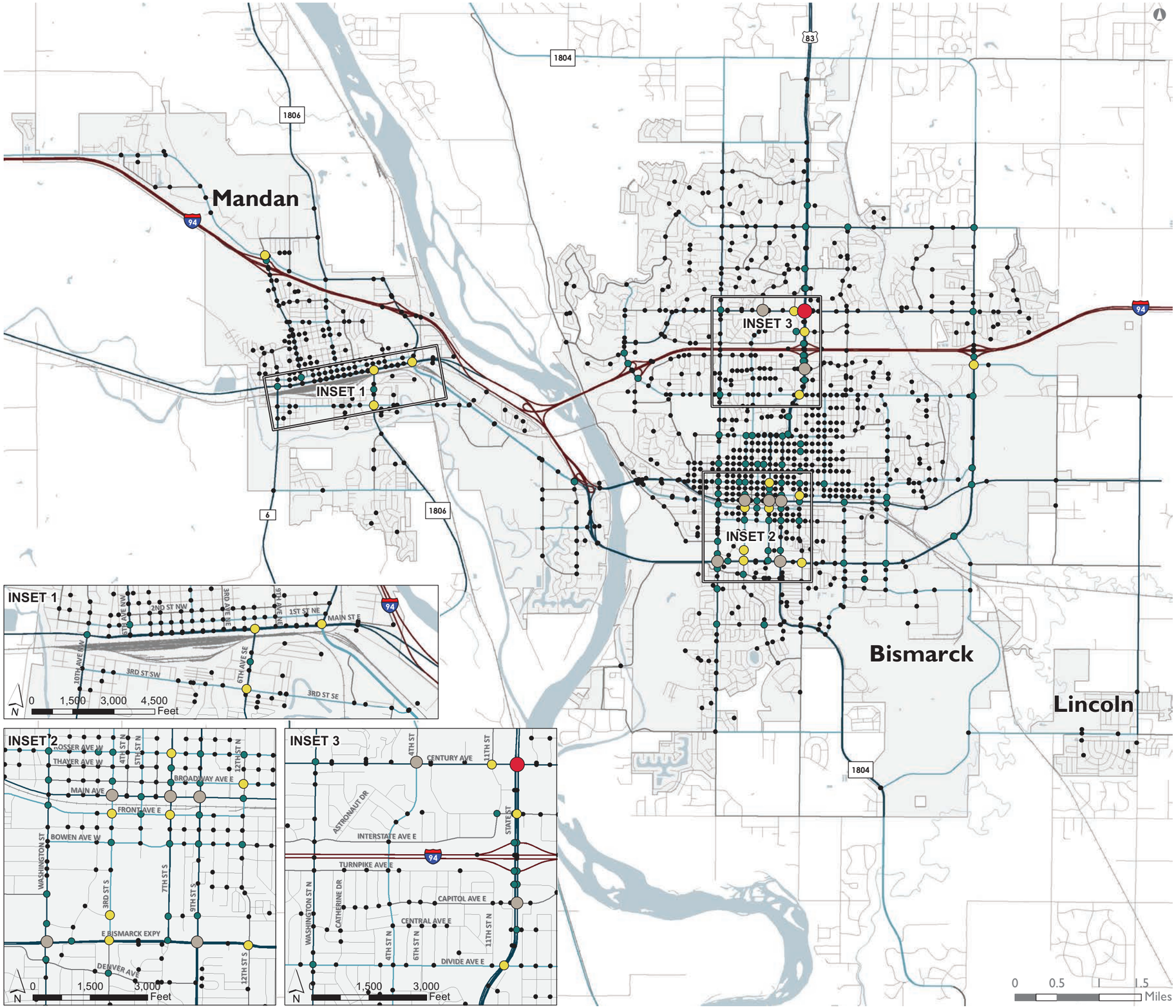
Figure 4.18: Urban Intersection Crashes

Urban Intersection Crashes 2013 - 2017



Crash Count

- 70+
- 51 - 70
- 31 - 50
- 11 - 30
- 1 - 10

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector

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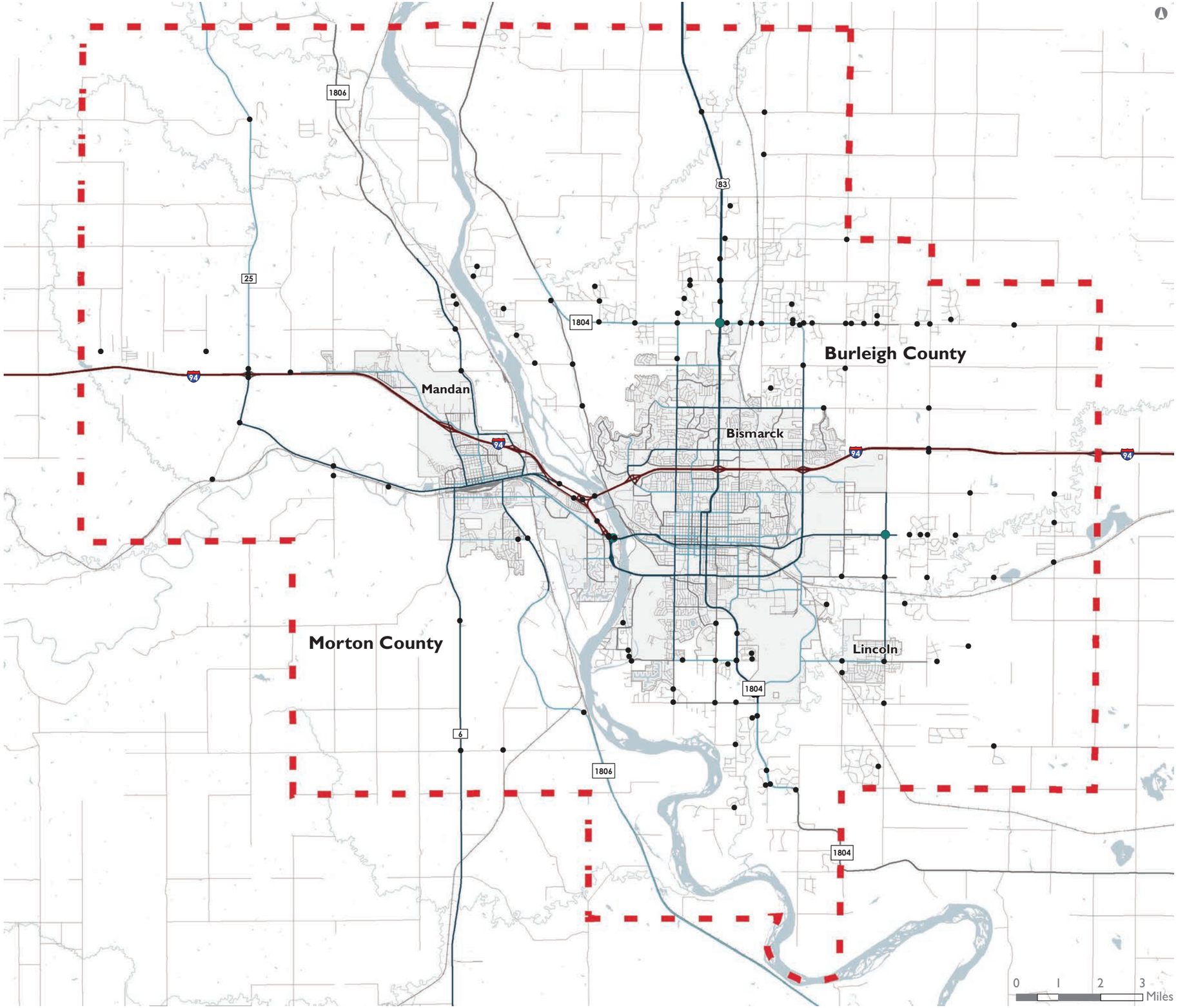
Figure 4.19: Rural Intersection Crashes

Rural Intersection Crashes 2013 - 2017



Crash Counts

- 11 - 15
- 1 - 10

Metropolitan Planning Organization Boundary

- Boundary

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector

Note: Crashes inside city limits are mapped on map titled "City Limit Intersection Crashes 2013-2017".

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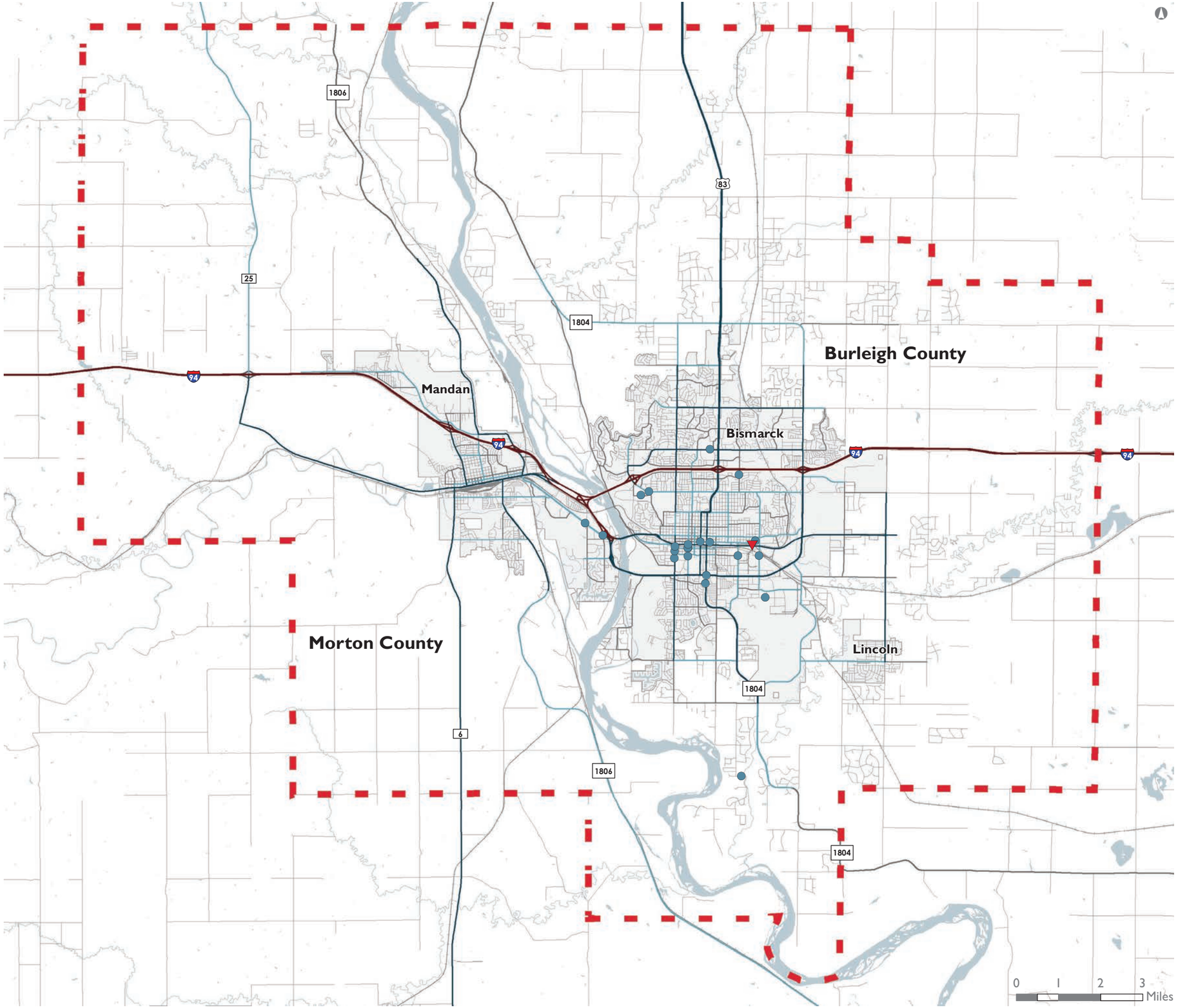
Figure 4.20: Serious Non-Motorized Crashes

Serious Non-Motorized Crashes 2013 - 2017



Serious Non-Motorized Crashes

- Fatal Crashes
- Incapacitating Injury Crashes

Metropolitan Planning Organization Boundary

- Boundary

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector

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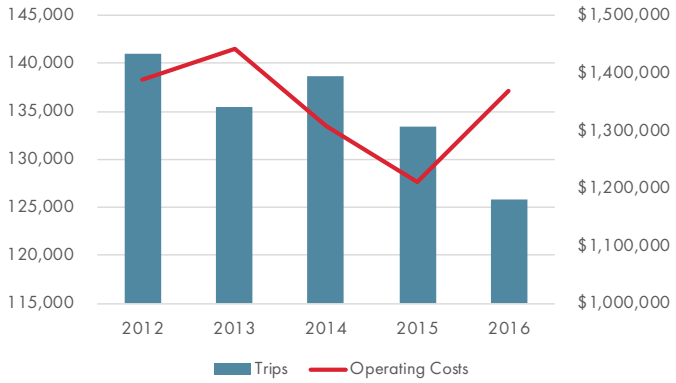
Regional Transit System

Public transit service in the Bismarck-Mandan metropolitan area is provided by the Bis-Man Transit Board. Fixed route service is provided through Capital Area Transit (CAT) and paratransit/ demand response is provided through Bis-Man Transit. The City of Bismarck has contracted these services through the Board since the service was first offered in 1990. Fixed route service was first offered in 2004.

Transit service and investment is guided through planning efforts in the Transit Development Plan (TDP), which was adopted in April 2019. Below is a summary of the transit existing conditions from the current update efforts.

Figure 4.21: Annual CAT Ridership and Operating Costs



Fixed Route Service

CAT operates six fixed routes, providing more than 125,000 trips each year since 2012. Routes are shown in Figure 4.25. Four routes primarily operate in Bismarck and two routes primarily operate in Mandan. These routes operate six days per week with service generally between 6:30 AM and 7 PM on weekdays and 8 AM to 7 PM on Saturdays. Fixed route ridership on CAT has declined 11 percent since 2012, while operating costs have declined just 1.4 percent in the same time period, as shown in Figure 4.21.

Revenue hours (number of hours transit service is available) has declined by less than one percent since 2012, yet passengers per revenue hour has declined by 10 percent. Revenue miles (the number of miles required for transit service) has increased more than one percent since 2012, yet passengers per revenue mile has decreased nearly 12 percent. Table 4.15 shows selected service indicators from the Existing Conditions Report of the upcoming TDP.

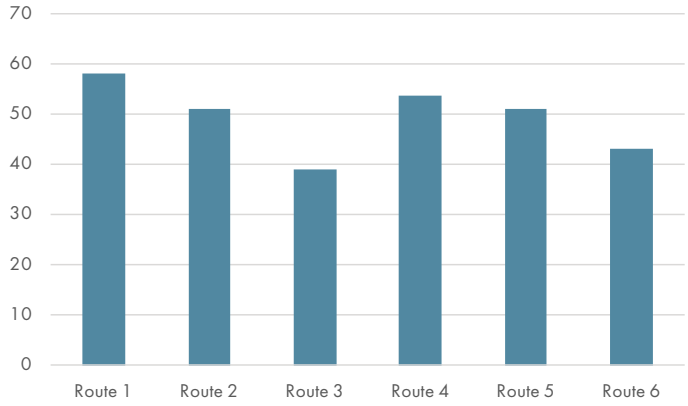
Table 4.15: Fixed Route Transit Service Indicators

Service Indicator	2012	2016	Percent Change
Passenger Trips	141,067	125,760	-10.9%
Operating Costs	$1.39 M	$1.37 M	-1.4%
Passengers per Revenue Hour	7.1	6.4	-10.0%
Passengers per Revenue Mile	0.5	0.4	-11.9%
Cost per Passenger	$9.85	$10.89	10.6%
Cost per Revenue Hour	$70.21	$69.87	-0.5%
Farebox Recovery Ratio	5.8%	5.5%	-5.5%

Figure 4.22:Passenger Boarding CAT Bus

Excluding Route 4, each route operates on one-hour frequencies. Route 4 operates on a two-hour frequency. Route 1 is the most productive route, providing an average 58 rides per day (weekday and Saturday); it serves Cashwise Foods, library, Capitol Building, and Gateway Mall. Route 3 has the lowest average daily ridership at 39 trips per day (weekday and Saturday); it serves Cashwise Foods, the airport, United Tribes Technical College, and the University of Mary. Ridership by routes are shown in Figure 4.23.

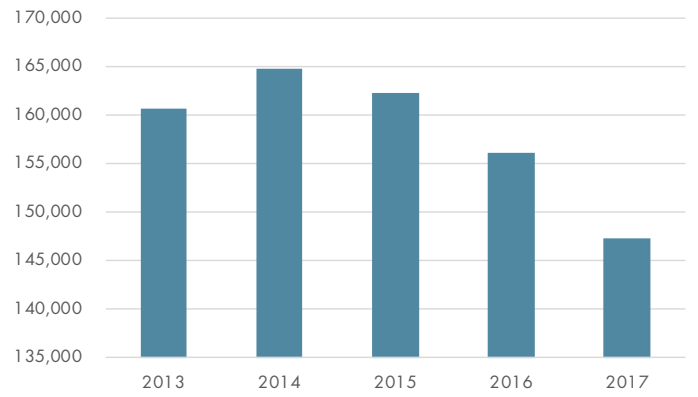
Figure 4.23: 2016 Average Daily CAT Ridership by Route



Paratransit Service

Bis-Man Transit operates the paratransit and demand response service for the Bismarck-Mandan area. In 2016, Bis-Man paratransit provided 19 percent more rides than CAT fixed route service. Ridership on this service has also declined since 2013, by about eight percent. Annual ridership is shown in Figure 4.24.

Figure 4.24: Annual Bis-Man Paratransit Ridership



Transit Assets

Transit assets include administrative offices, bus shelters, and maintenance facilities, and vehicles. These must be maintained in a state of good repair and require investments over time.

CAT owns 15 shelters across Bismarck and Mandan for its fixed route service. These shelters are placed at high ridership locations. Shelter locations in Bismarck include the two Walmarts, Gateway Mall, Arrowhead Plaza, Bismarck State College, West Central Human Services, McDonalds (Burnt Boat Drive), High Rise on Bowen Avenue, United Tribes Technical College, 7th Street near CHI. Shelter locations in Mandan include Liberty Heights, Mandan Brave Center, Dan's Supermarket, 8th Avenue near Ft. Lincoln school, and 1st Street NE.

There are 31 vehicles available for transit service in the Bismarck-Mandan metro area ranging from light-duty vans to heavy-duty large buses. Nine are dedicated for fixed route service and 22 for paratransit service. A summary of the fleet and its condition is shown in Table 4.16.

Table 4.16: Transit Vehicles Age and Condition

Service Type	ID	Year	Category	Condition
Fixed Route	401	2004	HD Small Bus	Adequate
Fixed Route	402	2004	HD Small Bus	Good
Fixed Route	403	2004	HD Small Bus	Decommissioned
Fixed Route	601	2006	HD Small Bus	Good
Fixed Route	602	2006	HD Small Bus	Good
Fixed Route	1001	2010	HD Small Bus	Good
Fixed Route	1002	2010	HD Small Bus	Good
Fixed Route	1003	2010	HD Small Bus	Good
Fixed Route	1501	2015	HD Large Bus	Excellent
Fixed Route	1502	2015	HD Large Bus	Excellent
Paratransit	38	2010	MD Bus	Good
Paratransit	44	2009	MD Bus	Good
Paratransit	47	2009	MD Bus	Good
Paratransit	48	2009	MD Bus	Good
Paratransit	49	2009	MD Bus	Good
Paratransit	53	2012	MD Bus	Good
Paratransit	54	2012	MD Bus	Good
Paratransit	55	2012	MD Bus	Good
Paratransit	31	2001	MD Bus	Good
Paratransit	1701	2017	MD Bus	Excellent
Paratransit	1702	2017	MD Bus	Excellent
Paratransit	1703	2017	MD Bus	Excellent
Paratransit	1704	2017	MD Bus	Excellent
Paratransit	62	2012	LD Van/Bus	Excellent
Paratransit	63	2012	LD Van/Bus	Excellent
Paratransit	1801	2018	MD Bus	Excellent
Paratransit	1802	2018	MD Bus	Excellent
Paratransit	1803	2018	MD Bus	Excellent
Paratransit	1804	2018	MD Bus	Excellent
Paratransit	1901	2018	MD Bus	Excellent
Paratransit	1902	2018	MD Bus	Excellent

LD = Light Duty MD = Medium Duty HD = Heavy Duty

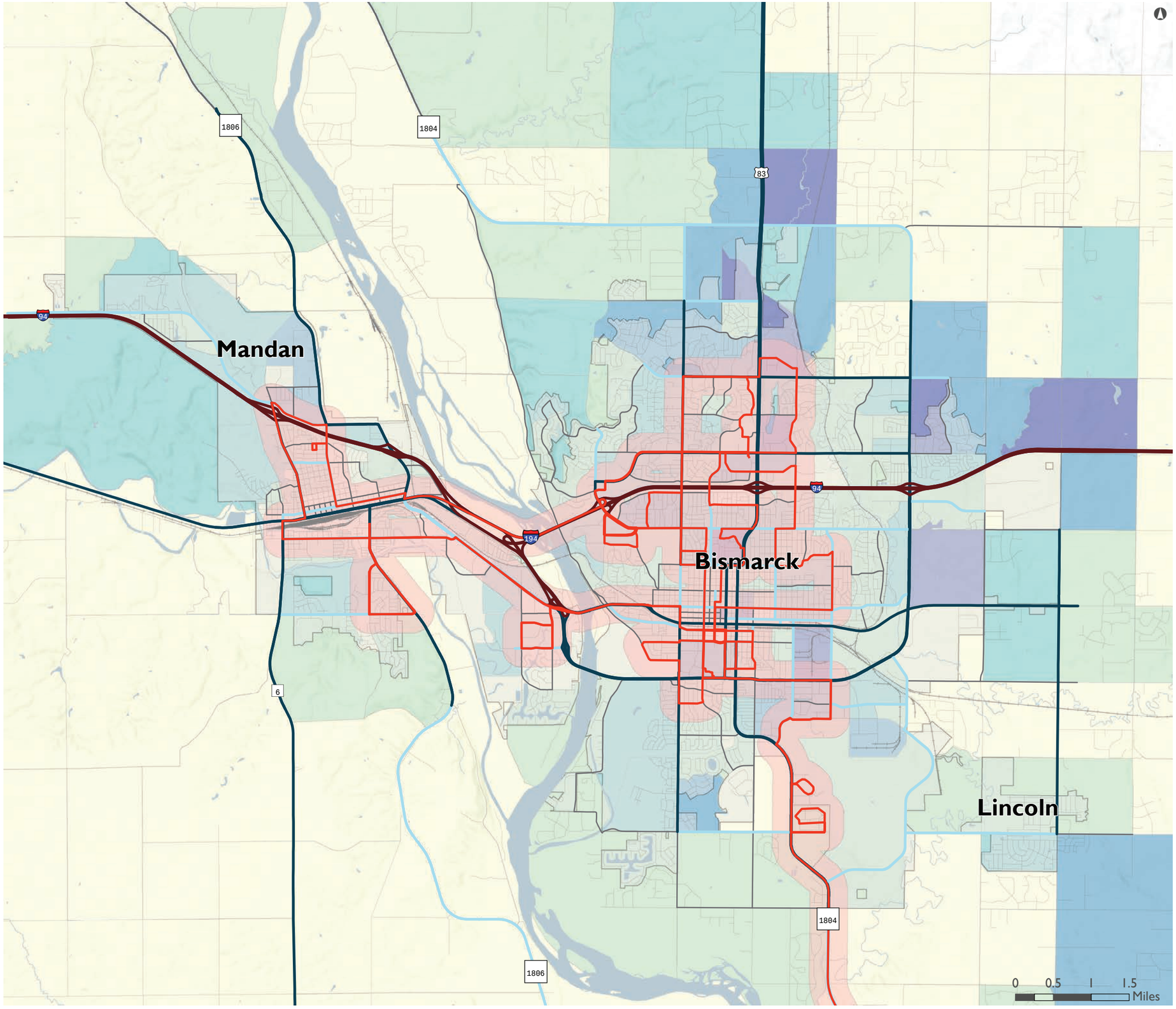


Figure 4.25: Transit Routes

Transit Routes

Bis-Man Transit Routes 2017

Transit Routes 1/4 Mile Buffer

2045 TAZ Data

Additional Households + Jobs

- 0 - 250
- 250 - 750
- 750 - 1,250
- 1,250 - 2,500
- 2,500+

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Transit Needs

The transit service operating costs have been exceeding the revenue in part because of reduced revenues and increased operating costs. In response to this, the capital reserves have been used to finance services and capital improvements. This has led to an annual $500,000 negative balance that is not sustainable, and as such, the transit service needs to make changes else the fund revenue will be exhausted in 2020.

Service Changes Dependent on Funding

The Bis-Man Transit Development Plan recommended two alternatives depending on the level of funding that becomes available to the transit service. The first was to reduce services if no funding increase is feasible or if an increase in funding is likely where to spend the funding to increase the level of service.

Service Reduction

While the level of service may need to be reduced due to costs, it does come with the risk of losing federal funding, making it less competitive for the Small Transit Intensive Cities Program. If service was to be reduced, the plan recommended that it target the following reduction options.

- Convert Purple and Brown routes to 120 minute frequency. This would save $235,000 in annual operations costs but result in a projected 40 percent reduction in ridership on these routes.
- Eliminate the age qualifier for paratransit (currently 70 years of age)x. This would save $196,000 in annual operations cost by moving more people to fixed route service.
- Reduce paratransit hours. This would save more than $100,000 annually.

Service Enhancements

If additional revenue is secured, the TDP recommended service level enhancements through expanded transit coverage, service hours, and frequency.

Expanded transit coverage would be accomplished through flex routes, providing improved service to areas with higher density and low-income populations with a curb-to-curb service and designated checkpoints. The proposed flex routes are shown in Figure 4.26 and Figure 4.27.

The current service operates six days per week between 6:30 AM to 7 PM on weekdays and 8 AM to 7 PM on Saturdays. Paratransit service operates 6:30 AM to midnight Sunday through Saturday. The current service hours do not provide travel options for persons working retail or second shift jobs. Expanded service hours on weekdays and Sunday service would expand job access and mobility.

Figure 4.26: Mandan Flex Route

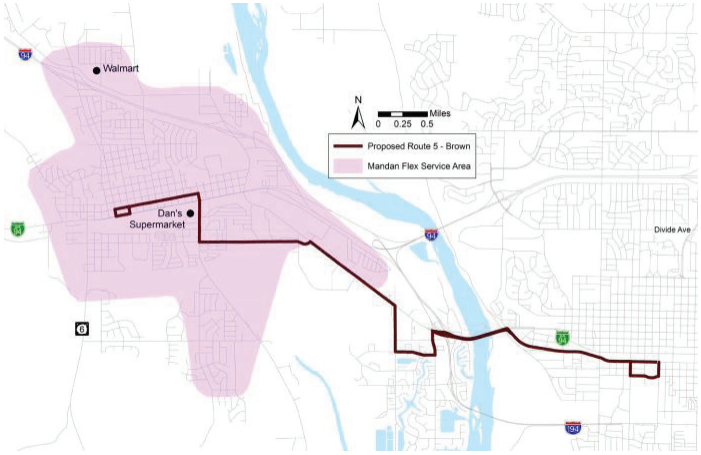
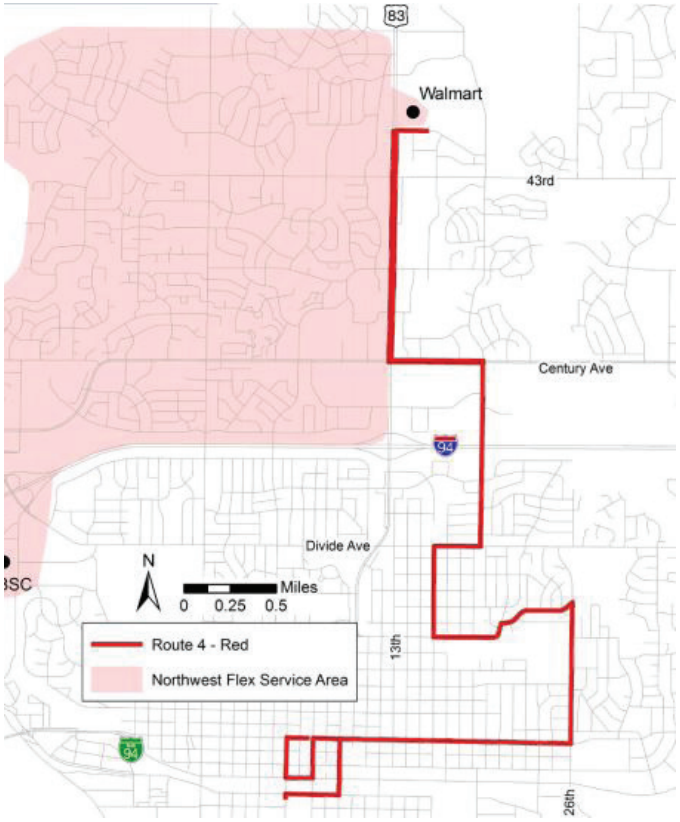


Figure 4.27: Mandan Flex Route



Improving frequency route reduce the amount of time between routes. Currently, most routes run on a one-hour headway, with Route 4 using a two-hour headway. These headways are inconvenient. The TDP recommended improving the Blue and Black routes to 30-minute frequency on weekdays and upgrade the Red route to a 60-minute frequency on weekdays.

Transit Service Facilities

Providing amenities at transfer and high demand stop locations is essential. These include amenities such as bus pads, benches, and shelters. Currently, the transit service owns 15 shelters across Bismarck and Mandan for its fixed routes. Providing and maintaining these service facilities is vital for a successful transit system, and the transit service will need to provide future transit facilities if it will add new routes and have increased ridership.

The current transfer hub along Front Avenue does not provide the waiting areas and well-designed transfer location that would provide for the convenience and comfort that would increase the level of service. It has been recommended in the 2012 Transit Development Plan, the 2013 Downtown Bismarck Subarea Plan, and the 2019 Transit Development Plan that the there is a need for a downtown transit center. This multimodal center would provide multiple benefits to transit riders such as access to fixed routes, taxi-hailing locations, and access to multimodal trails. This, however, is a long term project.

Capital Improvements

The transit service currently has 31 vehicles available which range from light-duty vans to large heavy-duty buses. Of the buses, nine of them are dedicated to the fixed service while the remaining 22 provide service for the paratransit route. To operate effectively, transit services require bus fleets and spares available to maintain a consistent level of service. It is ideal for buses to replaced when approximately twelve years of age. As the buses age, they begin to face increasing maintenance costs and have an increased number of road failures and service disruptions. Not only do the older buses cost more to maintain they also cause dissatisfaction for the customers utilizing the service as they have routes more frequently disrupted due to failures. The TDP estimated the total capital costs between 2020 and 2025 would approach $5.5 million.

Figure 4.28: Downtown Transit Center Concept from Downtown Bismarck Subarea Plan

A 12 Bus Bays (40')
B Center Platform & Building
C CAT/Bis-Man Parking
D Taxi
E Rail Trail
F Rail Trail Ramp
G Stair to Underpass

Bicycle and Pedestrian System

Bicycling and walking are important for recreation and transportation in the Bismarck-Mandan region for residents and visitors alike. The region was awarded a Bronze Level "Bicycle Friendly Community" designation from the League of American Cyclists in 2016. This designation reflects the community's strong network of multi-use trails, presence of community organizations that actively advocate for cycling and provide public education outreach, and inclusion of bicycling facilities in the 2015 Bismarck Mandan MPO Long Range Transportation Plan.

Since the 2015 Bismarck-Mandan MPO MTP, awareness of bicycling and walking options has continued to grow. In 2017, the Bismarck-Mandan MPO and its partners developed a bicycle and pedestrian plan to support engineering, education, encouragement, enforcement, and evaluation efforts to continue to advance bicycling and walking as safe, comfortable, and reliable modes of transportation in cities of Bismarck and Mandan. The plan included five goals for improving the bicycle and pedestrian network in the region:

- Network Use: Increase the number of bicycling and walking trips made by people in Bismarck and Mandan.
- Connectivity: Develop a connected network of bicycling and walking routes throughout both communities in partnership with local, regional, and state partners. Connect bicycling and walking routes to community destinations and other transportation systems, including transit.
- Safety and Comfort: Build and maintain safe and comfortable bicycling and walking facilities for people of all ages and abilities. Support driving, walking, and bicycling behaviors that increase the safety of people who walk and bicycle.
- Maintenance: Protect the public's investment in the bicycling and walking system over the long-term and ensure system accessibility all year round.
- Planning: As new commercial and residential projects are planned, integrate bicycle and pedestrian facilities with project designs during the development review process.

This Metropolitan Transportation Plan includes a summary of research and analysis developed for the Bicycle and Pedestrian Plan and moves the planning process for these modes forward.

Figure 4.29: Biking Near the Missouri River

Figure 4.30: Mandan Millennium Trail

Figure 4.31: Walking Along the Missouri River

Existing Facilities

The Cities of Bismarck and Mandan are home to 516 miles of bicycle and pedestrian facilities, including sidewalks, multi-use trails, and on-street bicycle facilities. Other infrastructure investments to support bicycling and walking include bicycle racks and trail kiosks throughout both communities. Existing facilities are summarized in Table 4.17 and illustrated in Figure 4.32 (from the 2017 Bicycle and Pedestrian Plan).

Table 4.17: Existing Facility Types

Facility Type	Description	Miles
SIDEWALKS 	Sidewalks are located on most streets in Bismarck and Mandan and are typically located on both sides of the street once a property is developed.	Bismarck: 437 miles Mandan: No data
MULTI-USE TRAILS 	These trails are separated from the roadway and used for bicycling, walking, running, or other non-motorized activities. There are multi-use trails in both Bismarck and Mandan. Many of these trails continue past city limits into Morton County and Burleigh County.	Bismarck: 52 miles Mandan: 18 miles
BICYCLE LANES 	Some roads in Bismarck include dedicated bicycle lanes, which are between 4 and 6 feet wide and marked with paint.	Bismarck: 4 miles Mandan: 0 miles
SHARED-USE ROUTES 	Some residential and collector roads in Bismarck are marked with Share the Road signs and/or street markings to encourage motorists to make space for bicyclists.	Bismarck: 5 miles Mandan: 0 miles
BIKE RACKS 	The Bismarck-Mandan MPO conducted a recent count of bicycle racks in the two cities. This plan includes a description and map of known locations of these racks.	136 Total Racks
Total	516 Miles of Pedestrian and Bicycle Facilities 136 Bike Racks	

Bike Rack Locations and Community Destinations

The Bicycle and Pedestrian Plan identified community destinations and bicycle parking opportunities, with the goal of understanding if bike racks were available at popular destinations. Figure 4.32 illustrates known locations of bike racks in Bismarck and Mandan. This figure also shows community destinations that typically generate bicycling and walking trips, such as schools, employment centers, and civic facilities. This data was collected via crowd-sourcing by the Bismarck-Mandan MPO as part of the 2016 League of American Cyclists Bicycle Friendly Community application.

In total, the 136 bike racks provide 1,913 spaces for bike parking in the two communities. An estimated ten percent or less of these bike racks conform to the American Pedestrian and Bicycle Professional (APBP) guidelines for secure bike racks. All bike parking in the two cities are racks. In May 2017, one indoor bike parking facility was added in a downtown parking garage, on 6th Street and East Thayer Avenue, and it conforms to APBP guidelines (bike corral). Additional bike parking facilities that were not identified by the Bismarck-Mandan MPO as part of the planning process may exist.

System Gaps

Numerous gaps in bicycle and pedestrian facilities exist across the cities of Bismarck and Mandan. The 2015 Long Range Transportation Plan identified a possible future network, which was incorporated into the 2017 Bicycle and Pedestrian Plan. The new connections identified as part of the Bicycle and Pedestrian Plan were determined by several factors. First, an extensive effort was undertaken to gather public input. Through a series of data gathering opportunities - wikimap survey, Survey Monkey, website comments, and dotmocracy voting and feedback during public open houses - new potential connections were identified. These routes were based on existing bike routes, routes the public would like to ride in the future, and barriers that would have an impact on safety, equity, accessibility, mobility, and demand. The prioritized routes based on this effort is shown in Figure 4.33.

The full network was then evaluated to identify ten routes and ten intersections in Bismarck and five routes and five intersections Mandan where improvements should be prioritized. From there, steering committee members identified a total of five critical routes and intersections in the region that should be the focus for implementation over the next five years. The plan identified different opportunities and constraints for the following routes and intersections:

Priority Routes

- Bismarck Priority Route #1: South Washington Street
- Bismarck Priority Route #2: North 4th Street & Dominion Street
- Bismarck Priority Route #3: 12th Street
- Mandan Priority Route #1: 6th Avenue SE
- Mandan Priority Route #2: 3rd Street SE and SW

Priority Intersections

- Bismarck Priority Intersection #1: South Washington Street & Bismarck Expressway
- Bismarck Priority Intersection #2: East Divide Avenue & State Street
- Bismarck Priority Intersection #3: I-94 South Ramp & State Street
- Mandan Priority Intersection #1: East Main Street & East Mandan Avenue
- Mandan Priority Intersection #2: 3rd Street SE & 6th Avenue SE

These prioritized routes are shown in Figure 4.34. Because the Bicycle and Pedestrian Plan was not an in-depth engineering study, further preliminary and detailed engineering will need to be completed with the development of each route as part of the final implementation.

Bicycle Level of Traffic Stress

Bicycle level of traffic stress (BLOTS) is a rating given to a road segment or crossing indicating the traffic stress it imposes on a cyclist. BLOTS is a comparable metric to the vehicular level of service and reflects the desirability of a route for different types of cyclists.

BLOTS on a segment typically includes pavement condition and facility width, buffer type and width, number of travel lanes, general land use, functional class, and daily traffic.

BLOTS at a crossing typically includes the functional class, traffic lanes and posted speed, ADT, median refuge, lighting, and traffic control.

Traffic stress ranges from 1 to 4:

- Level of Traffic Stress 1: Strong separation from all except low speed, low traffic volume. Simple crossings. Suitable for children.
- Level of Traffic Stress 2: Except in low speed/low volume traffic situations, cyclists have their own place to ride that keeps them from having to interact with traffic except at formal crossings. Along higher speed and multilane traffic, there is physical separation. Most adults can tolerate this level of traffic stress.
- Level of Traffic Stress 3: Involves interaction with moderate speed or multilane traffic, or close proximity to higher speed traffic. Appropriate for confident cyclists.
- Level of Traffic Stress 4: Involves interaction with higher speed traffic or close proximity to high speed traffic. Appropriate for the most experienced cyclists.

Figure 4.35 shows the bicycle traffic stress for selected routes in the Bismarck-Mandan metro area.

Pedestrian Level of Traffic Stress

Pedestrian level of traffic stress (PLOTS) follows a similar methodology to BLOTS - a rating given to a road segment or crossing indicating the traffic stress it imposes on a pedestrian. PLOTS too is a comparable metric to the vehicular level of service and reflects the desirability of a route for different types of pedestrians.

PLOTS on a segment typically includes sidewalk condition and width, buffer type and width, the presence and width of bike lanes or parking, number of traffic lanes and posted speed, lighting, and general land use.

PLOTS at a crossing typically includes the functional class of the roadway, traffic lanes and posted speed, ADT, sidewalk ramps, median refuge, lighting, and traffic control.

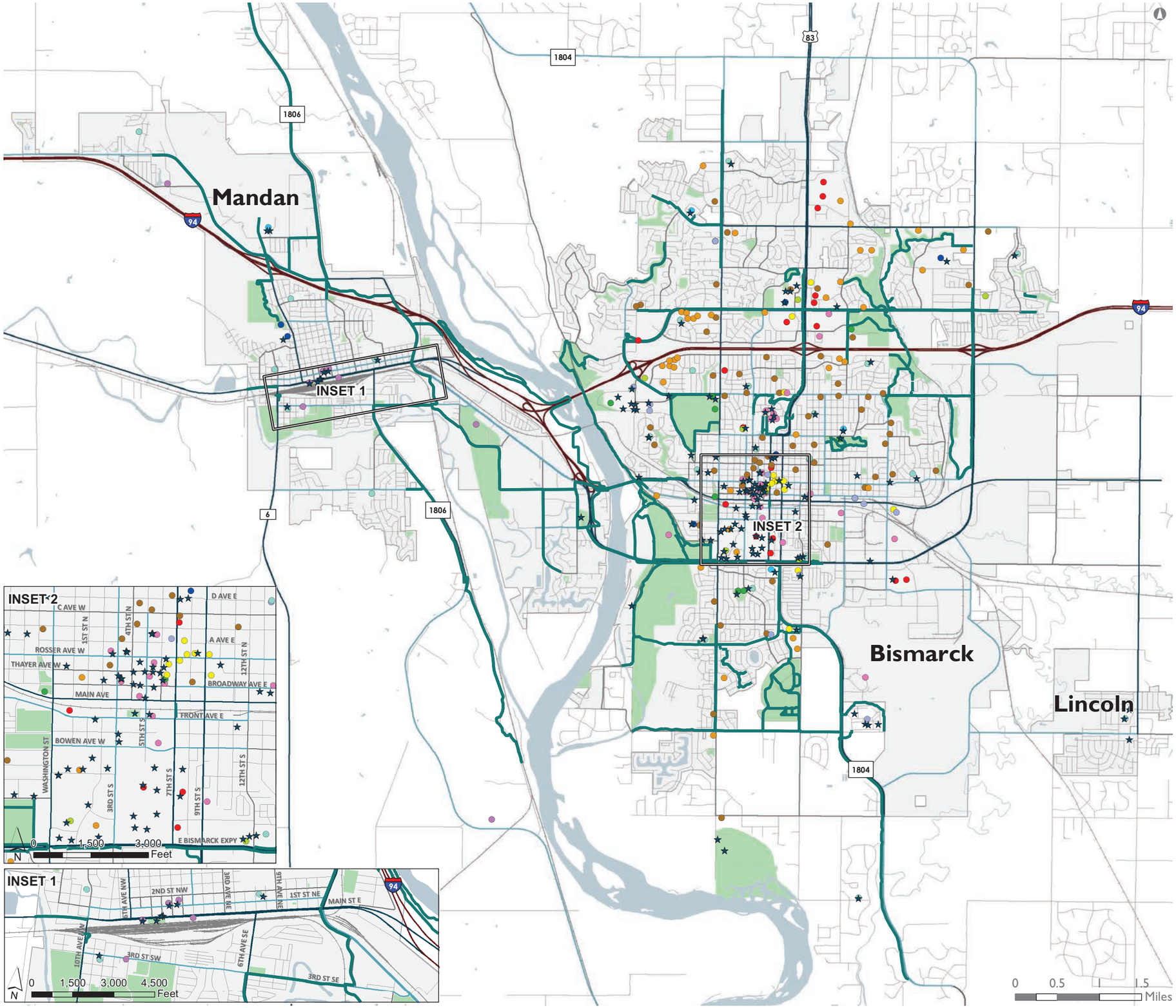
Traffic stress ranges from 1 to 4:

- Level of Traffic Stress 1: Little to no traffic stress and requires little attention to vehicular traffic. Simple crossings. Suitable for children, groups of people, and people with mobility devices. Typically along low volume and low speed roads with buffer between pedestrian space and roadway.
- Level of Traffic Stress 2: Little traffic stress with good sidewalk conditions. May be along roadways with higher speeds and volumes. More care is needed at crossings and it may not be appropriate for young children.
- Level of Traffic Stress 3: Moderate stress that would make a user feel uncomfortable, but safe. Includes higher speed roadways with smaller buffers and may be impassable for a person using mobility devices.
- Level of Traffic Stress 4: High traffic stress would lead few users to select this facility. Traffic speeds are moderate to high with limited pedestrian facilities or buffer. There may not be any facilities here at all. Users will likely only select this route when no other route is present.

Figure 4.36 shows the pedestrian traffic stress for selected routes in the Bismarck-Mandan metro area.

Figure 4.32: Community Destinations

Community Destinations Bismarck-Mandan Bicycle and Pedestrian Plan



Bicycle Facilities

- ★ Existing Bike Racks

Community Destinations

- Elementary School
- Middle School
- High School
- College/Other Schools
- Apartments/Condos
- Churches
- Healthcare Facilities
- Civic Services
- Major Commercial
- Food Market
- Recreation Facilities

- Existing Multi-Use Trails
- Existing Parks

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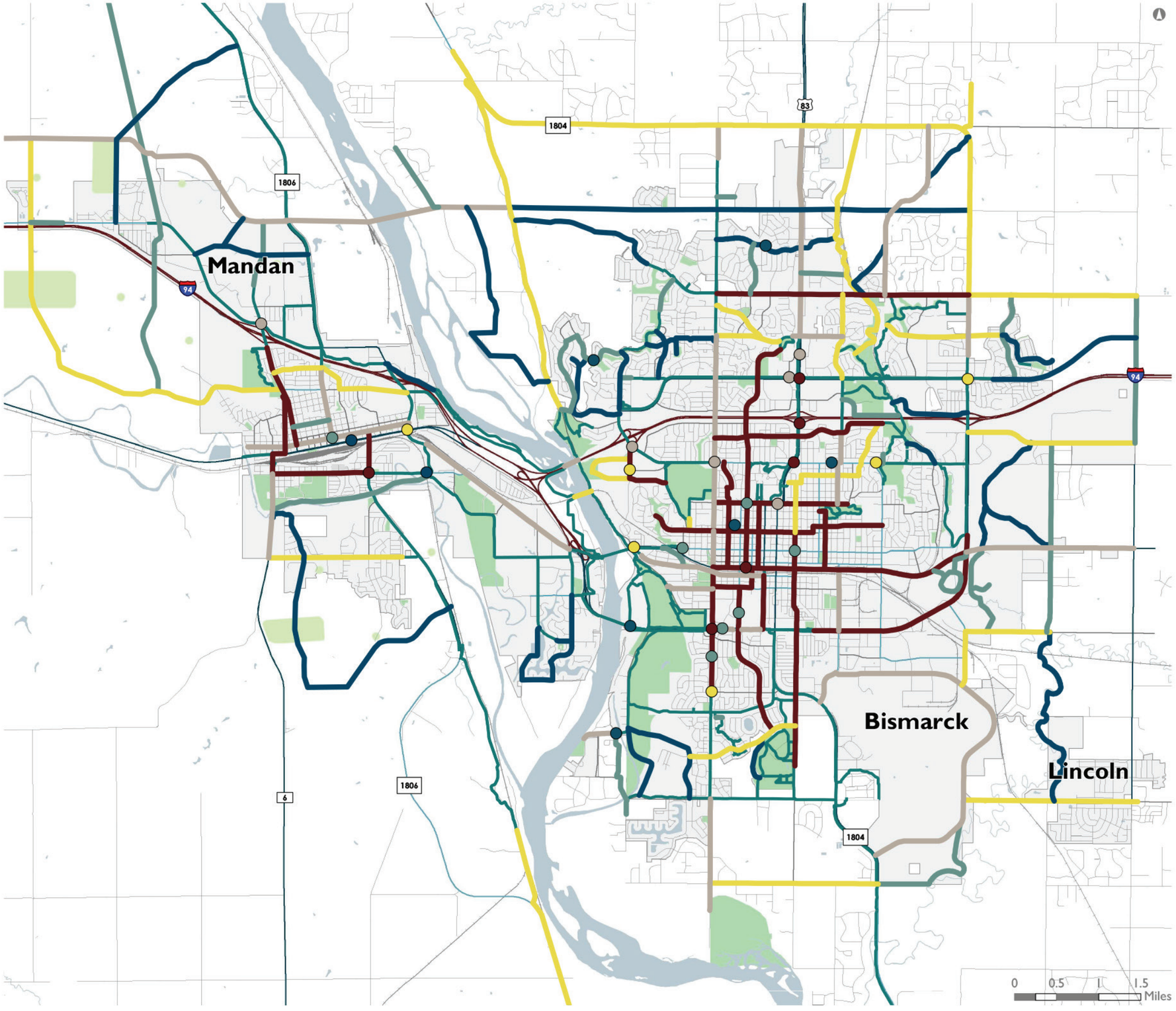
Figure 4.33: Intersection and Connection Analysis Scoring

Intersection and Connection Analysis Scoring Bismarck-Mandan Bicycle and Pedestrian Plan



Intersection Scoring
- Top 20%
- Top 40%
- Mid 20%
- Lower 40%
- Lower 20%

Connection Scoring
- Top 20%
- Top 40%
- Mid 20%
- Lower 40%
- Lower 20%

Bicycle Facilities
- Existing Multi-Use Trails
- Existing Parks
- Planned Parks

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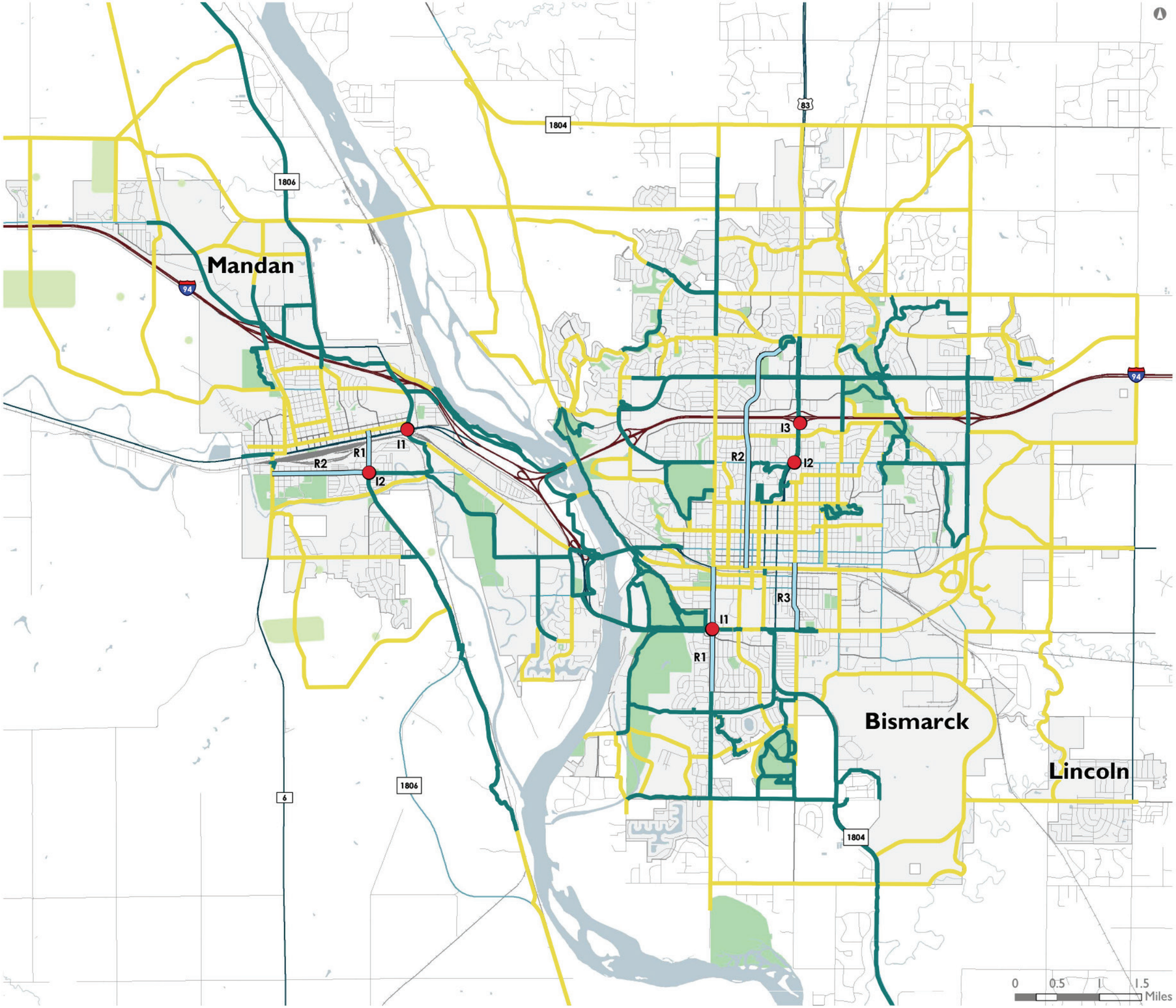
Figure 4.34: Steering Committee Recommended Routes and Intersections

Steering Committee Recommended Routes and Intersections Bismarck-Mandan Bicycle and Pedestrian Plan



Steering Committee Recommended Priority Intersections

Steering Committee Recommended Priority Route Segments

Bicycle Facilities

- Existing Multi-Use Trails
- Overall Network Routes
- Existing Parks
- Planned Parks

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Figure 4.35: Bicycle Level of Traffic Stress

Bicycle Level of Traffic Stress

Traffic Stress

- 4
- 3
- 2
- 1

Mandan
Bismarck
Lincoln
1804
1806
83
94
194
6
0 0.5 1 1.5 Miles

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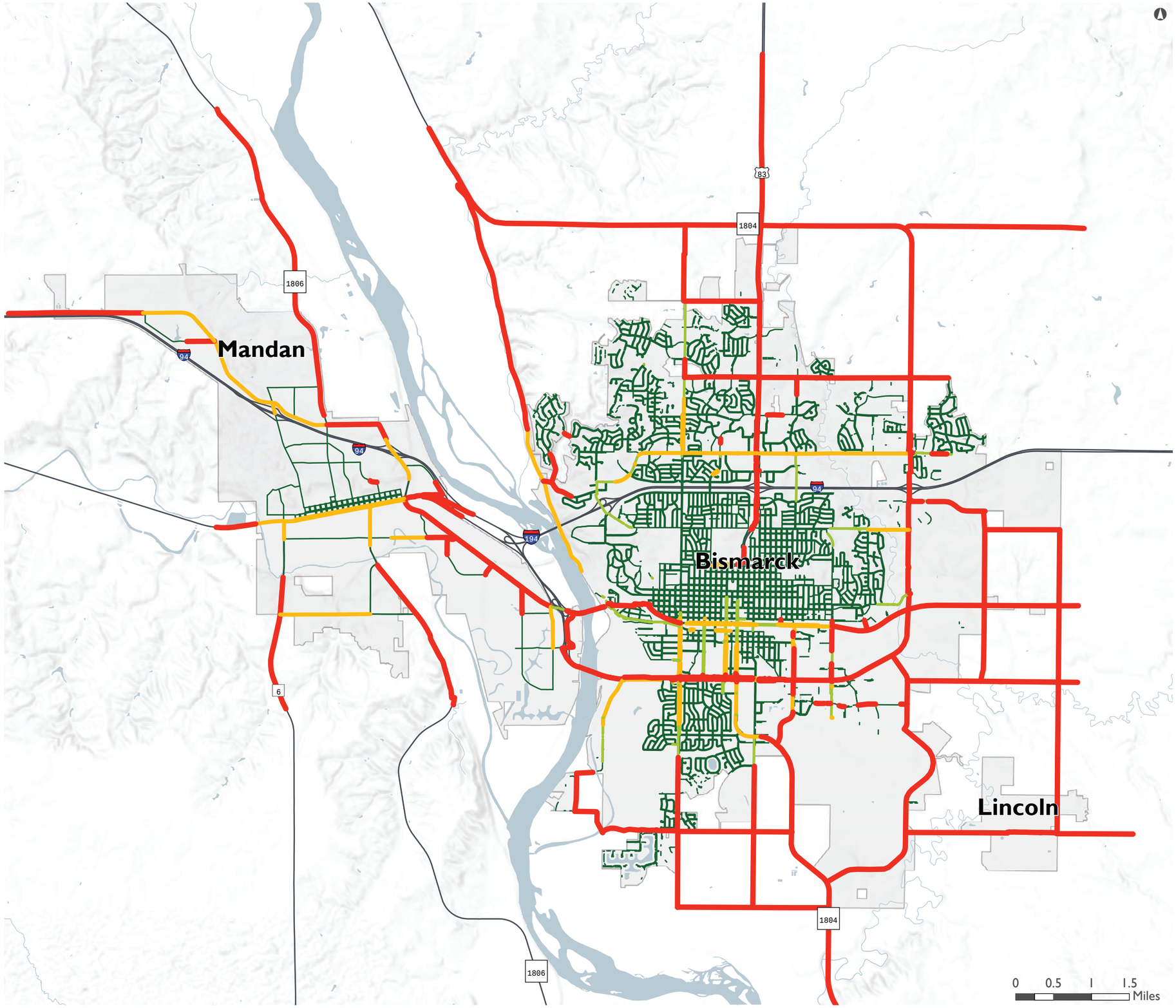
Figure 4.36: Pedestrian Level of Traffic Stress

Pedestrian Level of Traffic Stress



Traffic Stress

- 4
- 3
- 2
- 1

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Freight Systems

The safe and efficient movement of freight through the Bismarck-Mandan metropolitan area is essential for the economic vitality of the region. The regional economy and business community rely on direct freight linkages to the wider economy to maintain and enhance the local economy. The Metropolitan Transportation Plan (MTP) includes an element that focuses on specific freight issues but this element of the MTP can help further refine freight system needs and reduce conflicts between the freight system and other transportation network users.

Freight Network

Truck freight relies on a set of key network links to move through and around the Bismarck-Mandan metro including I-94, US 83, and three North Dakota State Highways, ND 6, ND 1804, and ND 1806. Local truck routes on the city and county networks connect these key freight networks to the metro area's largest industrial generators. The key freight network is shown in Figure 4.38.

Highway Freight Network

The highway system is the backbone of an efficient and effective freight network. This includes:

- **I-94**: runs east-west across the state connecting Montana and Minnesota. Its termini are Billings, MT and Port Huron, MI.
- **US 83**: runs north-south connecting Canada to Mexico.
- **ND 6**: runs north-south connecting South Dakota Highway 64 to the I-94 Business Loop in downtown Mandan.
- **ND 1804**: runs northwest-southeast connecting South Dakota to Montana along the east side of the Missouri River.
- **ND 1806**: a northwest-southeast highway connecting South Dakota to the Morton County border along the west side of the Missouri River.

Other Freight Corridors

There are multiple other formally designated routes that are critical to supporting movement in the nation, state, and region:

- **Critical Rural Freight Corridors (CRFC) and Critical Urban Freight Corridors (CUFC)**: provide important regional and last mile connections within the overall National Highway Freight Network.
- **Strategic Highway Network (STRAHNET)**: developed by the Department of Defense to identify roadways critical to the nation's defense. STRAHNET in Bismarck includes I-94 and US 83.
- **State Strategic Freight System**: corridors designated by the State of North Dakota as necessary to sustain the state's economy and expand competitiveness.

Local Truck Routes

On city and county truck routes, load restrictions are often in place to protect the roadway during the spring thaw. Mandan does not have officially designated truck routes. Restrictions can create challenges for truck freight, resulting in more trucks using the roadway with lighter loads and increasing conflicts with other roadway users or delaying shipments which may impact operations.

Figure 4.37: US 83/ND 1804 Interchange with I-94

Freight Generators

The Freight Study used American Trucking Research Institute (ATRI) data and Census Block Groups to identify areas of high truck activity, typically commercial and industrial areas. These areas are shown in Figure 4.38.

The major freight generators in the metro area include

- **Bobcat/Doosan Company**: this location manufactures Bobcat equipment attachments. It relies on the Bismarck Freeway, South 26th Street, I-94, and the Dakota, Missouri Valley and Western (DMVW) railroad to receive supplies and ship products.
- **Cloverdale Foods**: premium pork and beef product producer. It relies on Old Red Trail/ND 10 and Sunset Drive to access I-94.
- **M&W Beef Packers**: supplier of beef products. It relies on ND 1806 to access the regional marketplace.
- **Northern Plains Commerce Center (NPCC)**: industrial park with direct access to I-94 and railway access through DMVW. Includes a transload facility which handles bulk and dimensional cargo.

Rail

The Bismarck-Mandan metro areas is served by two railways: Burlington Northern Santa Fe (BNSF) and Dakota, Missouri Valley and Western Railroad (DMVW). While railroads are privately owned, their interaction with the overall transportation network is important, especially within the realm of freight movement and vehicular and non-motorized safety and mobility on at-grade crossings. At-grade crossings are locations where train-vehicle interactions can conflict and create safety concerns and cause travel delays.

Table 4.18: Rail Activity Summary

	BNSF	DMVW
Trains per Day	4-22	1
Miles of Track	57.5	17.9
At-Grade Crossings	42	21
Grade Separated Crossings	19	2

Railway Summaries

BNSF

The BNSF railways are essential for the energy and industrial sectors in the Bismarck-Mandan metro area. The BNSF railway carries between four and 22 trains per day, on average, depending on the railroad subdivision. The coal fired power plants north of Mandan rely on the railway for coal shipments from Wyoming. BNSF has a transloading facility in the Bismarck area which supports the energy sector. This transloading facility typically transfers from pipeline to rail. BNSF also intends to construct a new rail bridge over the Missouri River to the north of the existing rail bridge; construction is anticipated to begin in the next few years. Additionally, BNSF has future plans to develop a rail-served industrial park in Mandan. This project has no timeline, but could have significant impacts to both freight truck and rail activity in the Bismarck-Mandan metro area.

DMVW

The DMVW railroad serves the agriculture, energy, and biofuel industries. The DMVW railway serves one train per day, on average. They are a regional railroad with service in North Dakota, South Dakota, and Montana. They maintain a fleet of 24 locomotives. Much of their trackage has weight and speed restrictions that limit the long-term productivity of the route.

Railroad Crossings

There are 84 railroad crossings in the Bismarck-Mandan metro area. Most are at-grade crossings (75 percent). The remaining 25 percent are grade separated crossings, where the train tracks pass over (overpass) or under (underpass) the road.

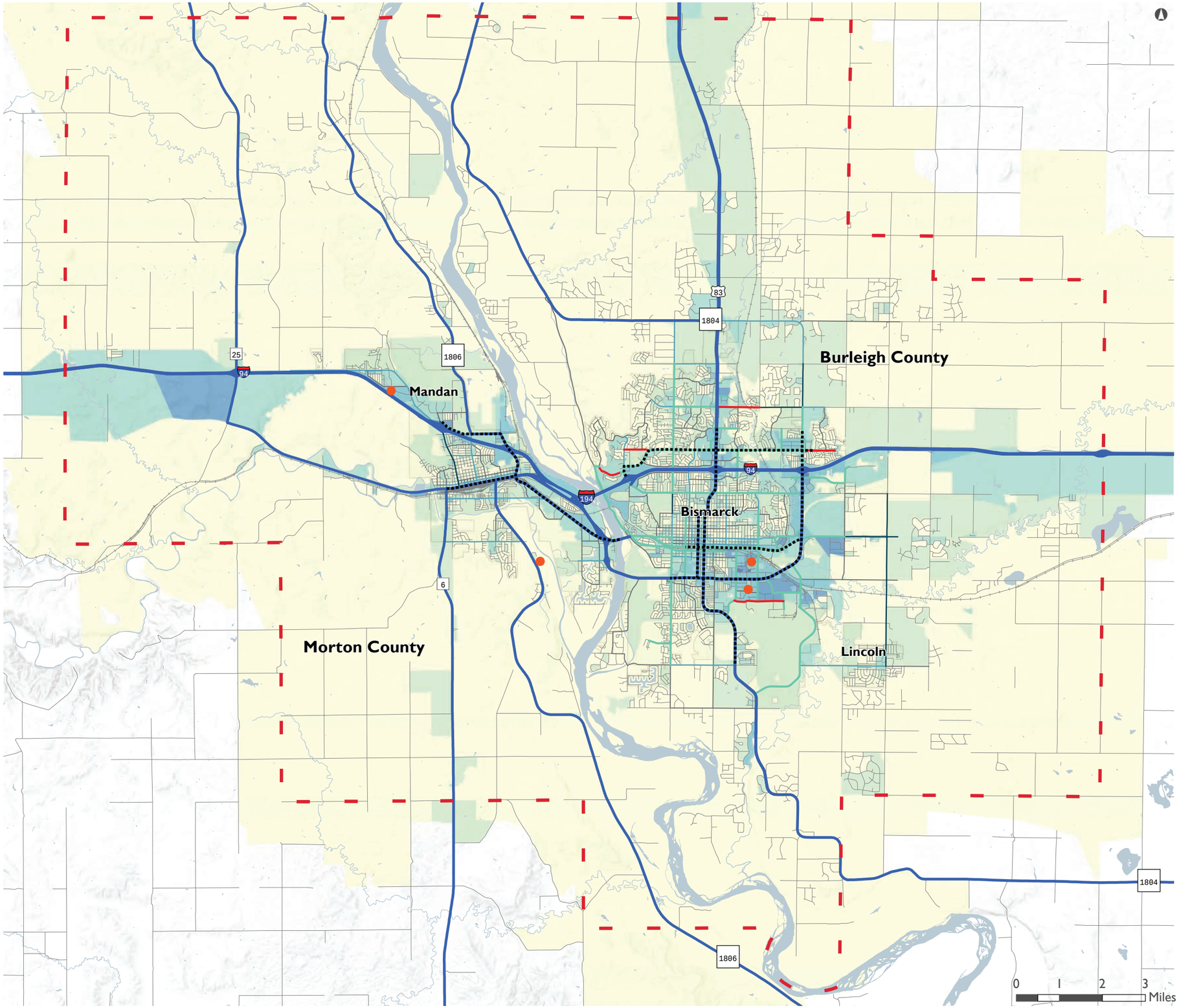
The Federal Highway Administration (FHWA) developed eleven criteria to determine when highway-rail grade crossings should be considered for grade separation or otherwise eliminated across the railroad right of way. After reviewing the eleven guidelines, it was determined that the only potential criteria that could be met is guideline (viii) for crossing exposure. This guideline notes that if the crossing exposure (the product of the number of trains per day and AADT) exceeds one million in urban areas or 250,000 in rural areas, then the highway-rail at-grade crossing should be considered for grade separation or elimination. Analysis of each highway-rail at-grade crossing within the Bismarck-Mandan metro area found that none of the existing crossings met the exposure criteria. The three highway-rail at grade crossings with the highest exposures in the area are shown in the Table 4.19. However, because they do not meet the threshold for crossing exposures within an urban area of one million, they are not recommended for grade separation, under existing traffic conditions.

Table 4.19: Highest Rail Crossing Exposure Locations

USDOT Crossing	Location	Crossing Exposure
087675T	Bismarck - 3rd Street	243,900
087660D	Bismarck - 26th Street	158,700
087665M	Bismarck - 19th Street	152,200

Figure 4.38: Truck Routes

Truck Routes



- Major Freight Generators
- Critical Urban Freight Corridors

Metropolitan Planning Organization Boundary

- Boundary
- State and Federal Truck Routes

Bismarck Local Routes

- Designated Truck Route
- 6-ton Limit

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Railroads

Truck Pings per Square Meter

- 0.00000 - 0.00004
- 0.00005 - 0.00043
- 0.00044 - 0.00433
- 0.00434 - 0.04333
- 0.04334 - 0.43338

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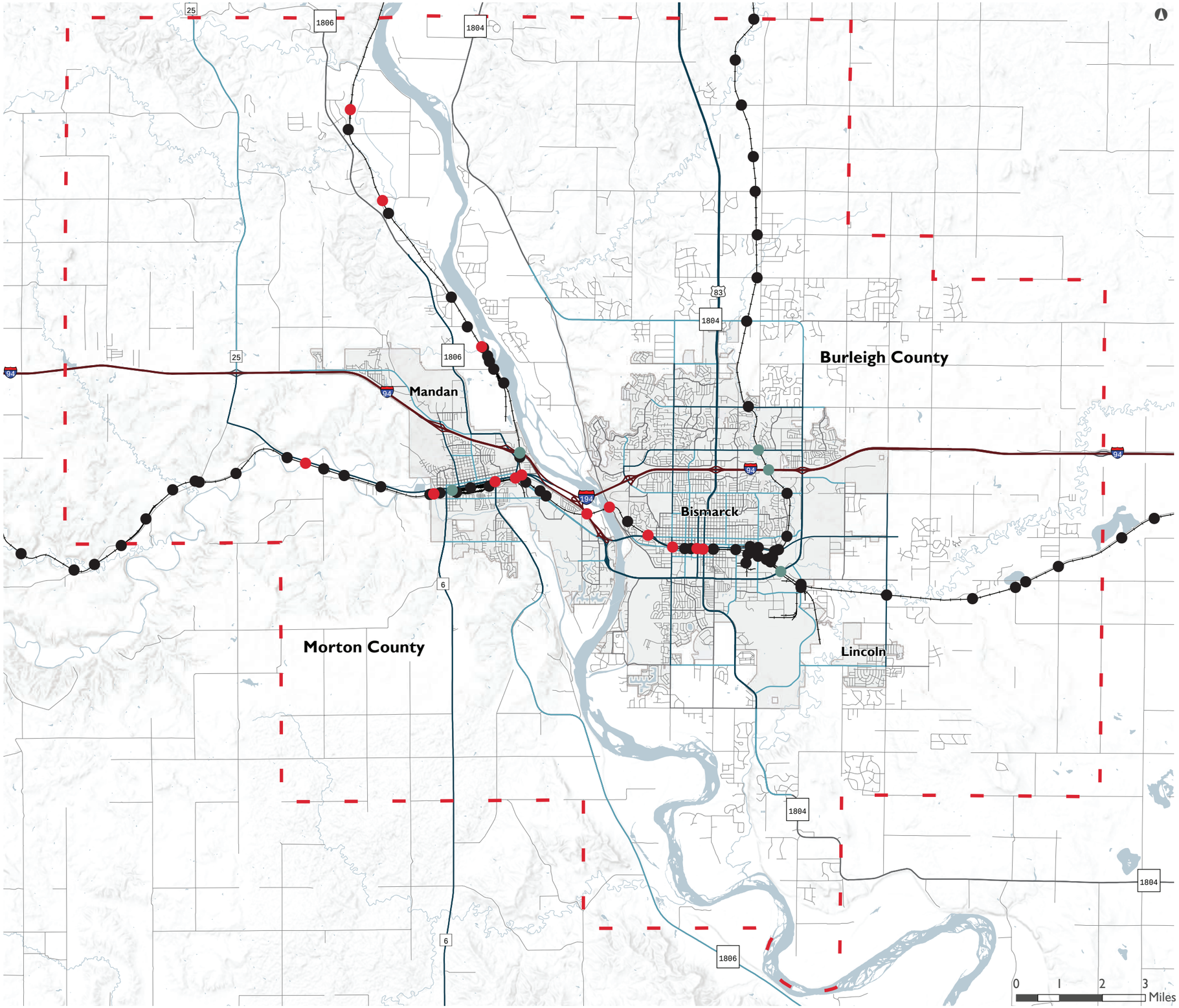
Figure 4.39: Rail Crossings

Rail Crossings



RailCrossings

- RR Over Grade
- RR Under Grade
- RR at Grade

Metropolitan Planning Organization Boundary

- Boundary

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Railroads

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Air Transportation

The Bismarck-Mandan metropolitan area is served by the Bismarck Municipal Airport and Mandan Municipal Airport. Only the Bismarck Municipal Airport provides scheduled commercial service.

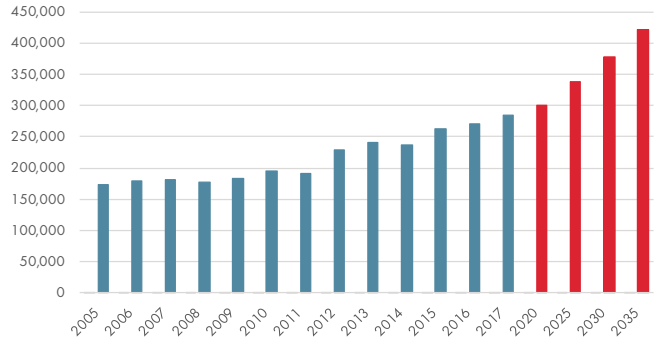
Mandan Municipal Airport

The Mandan Municipal Airport is located south of Mandan along ND 6 and County Road 138. It is a general aviation airport with 32 aircraft based at the airfield averaging 22 operations per day. Operations include local general aviation, transient general aviation, military, and air taxi.

Bismarck Municipal Airport

The Bismarck Municipal Airport (BIS) is located south of the East Bismarck Expressway on ND 1804/University Drive. American Airlines, Delta, United, Frontier Airlines (added in 2015), and Allegiant (added in 2004) provide regularly scheduled commercial flights. These airlines provided flights to nearly 284,000 people in 2017, the highest number of boardings ever recorded at the Bismarck Municipal Airport. The recently completed airport master plan expects boardings to continue to grow around two percent per year through 2035.

Figure 4.40: Annual Enplanements at BIS



The top 9 destinations for passengers boarding and arriving at the Bismarck Municipal Airport are shown in Table 4.20. These locations are 47.5 percent of annual passenger trips taken to and from the airport.

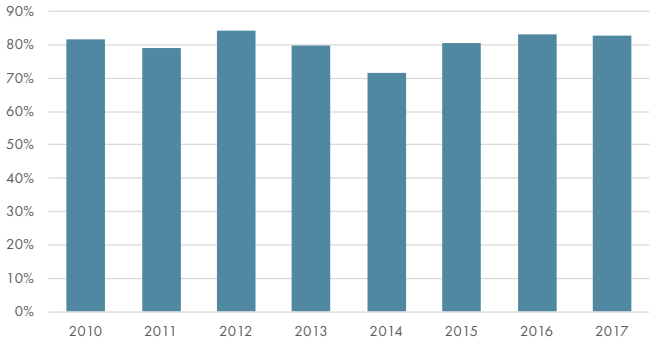
Table 4.20: Top Origins and Destinations for BIS

Origin/Destination	Percent of Total BIS Passengers
Las Vegas, NV	10.2%
Phoenix, AZ	9.8%
Denver, CO	8.1%
Orlando, FL	5.3%
Minneapolis, MN	4.9%
Dallas, TX	3.1%
Seattle, WA	2.1%
Chicago, IL	2.1%
Washington, DC	1.8%

On-Time Performance

From 2010 to 2017, the Bismarck Municipal Airport has averaged 80.6 percent on-time operations, this is comparable to the on-time arrival performance of all US airports (79.7 percent) in the same time frame. An aircraft is considered delayed when it arrived 15 or more minutes after the schedule. The most significant drivers of delay are air carrier delay, national aviation system delay, and the delayed arrival of the aircraft.

Figure 4.41: Annual On-Time Performance



Cargo

The Bismarck Municipal Airport also provides scheduled and on-demand air cargo services. In 2015, total landed weight of air cargo at this airport was 7.9 million pounds, a 36.2 percent increase over 2014. The forecasts included in the airport master plan expect air cargo to continue to grow around 0.5 percent annually through 2035.

Figure 4.42: Annual Landed Cargo (Millions of Pounds)

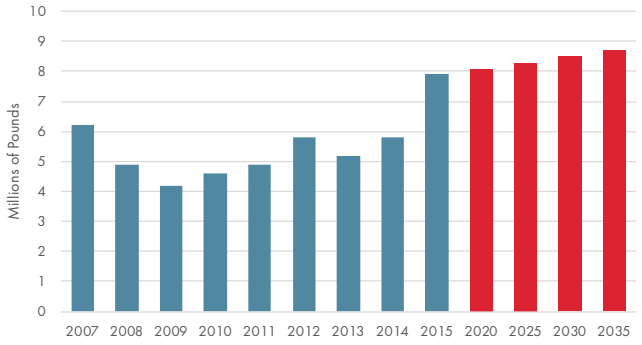
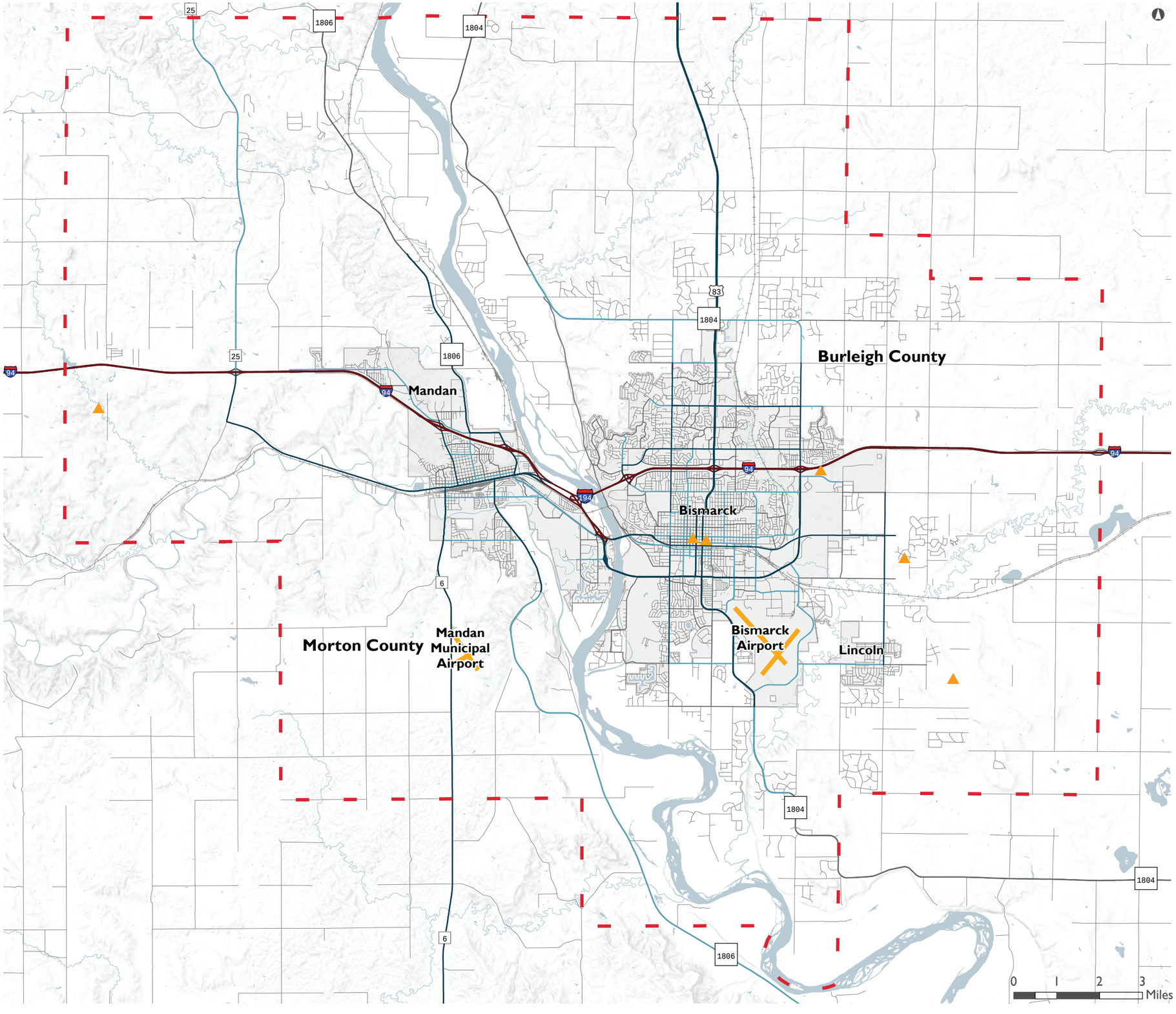


Figure 4.43: Aerial Image of BIS Airport

Figure 4.44: Airports

Airports



- Other Airports and Helipads
- Major Airport Runways

Metropolitan Planning Organization Boundary

- Boundary

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Railroads

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Environmental

When developing transportation projects, consideration of environmental constraints is necessary. These constraints may include sensitive environmental resource areas (cultural, wetlands and protected waters, threatened and endangered species) and environmental justice. These constraints will be used to screen alternatives that are identified through this project.

Sensitive Environmental Areas

Sensitive environmental areas that could potentially be affected by projects developed in this plan are discussed here. However, projects will require additional environmental analysis during the project development stage prior to implementation.

Archaeological and Historic Resources

Archaeological and historic resources might include historical buildings, like the Bismarck Tribune Building or the Burleigh County Courthouse; or Native American villages or burial grounds. The National Historic Preservation Act protects these resources and requires transportation projects to undergo additional analysis to ensure they do not disturb or do harm to these resources. This analysis would likely include a Class I literature review, which reviews documentation completed for previous transportation projects and a Class III field review, which is a systematic detailed field inspection done by or under the direction of professional historians, archaeologists, and other specialists as appropriate.

Wetlands and Water Resources

Impacts to wetlands and waters of the U.S. will also be considered as transportation projects move from the earliest phases of planning to construction. As a low lying area, there are many areas that could potentially be impacted by transportation projects including the Missouri River, streams, wetlands, and floodplains. Wetland delineation and coordination with the United States Corps of Engineers will be necessary to mitigate impacts.

Threatened and Endangered Species

Transportation projects must also consider the impacts to threatened and endangered species and their critical habitats. The Missouri River and the adjacent floodplains has been listed by the U.S. Fish and Wildlife Service as critical habitat for piping plover. Impacts to grass and prairie habitat in the area could affect the black-footed ferret. The northern-long eared bat often occupies bridges and box culverts, so simple replacements also require coordination to ensure impacts are mitigated.

Section 4(f) and Section 6(f) Resources

Section 4(f) of the Department of Transportation Act (DOT Act) of 1966 included a special provision which is intended to protect publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites. The Liberty Memorial Bridge and the trail along the west side of Sertoma Riverside Park are examples for 4(f) properties in Bismarck.

Section 6(f) of the Land and Water Conservation Act protects state and locally sponsored projects that were funded as part of the Land and Water Conservation Fund. Fort Abraham Lincoln State Park in Mandan would be one example of a Section 6(f) property.

Environmental Justice

Executive Order 12898 of 1994 introduced environmental justice (EJ) in the transportation planning process to ensure federal actions and funding of potential improvements to the transportation network do not have disproportionately high and adverse impacts on low-income or minority populations. The EJ principles are

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority and low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

EJ areas are identified in Figure 4.47 and Figure 4.48.

Figure 4.45: Missouri River

ITS

Intelligent transportation systems (ITS) is an operational system of transportation technologies that, when combined, improve the safety, efficiency, reliability, and cost effectiveness of the transportation system. ITS is a wide-ranging set of technologies but its implementation typically impacts vehicular efficiency and safety.

ITS remains a relatively new aspect of the transportation infrastructure and its deployment has been limited in small urban areas like Bismarck-Mandan. However, there are many ITS examples currently deployed around the world. Some include traffic signal improvements like loop detectors, cameras, and fiber optic interconnect; traveler information systems like 511 and dynamic message signs; ramp metering; global positioning systems (GPS); driver assistance systems; and smart phone applications. In the future, ITS is likely to include connected and autonomous vehicles for freight, personal use, and public transit, enhanced emergency response, and real-time data analytics.

The Bismarck-Mandan Metropolitan Planning Organization maintains a Regional Intelligent Transportation Systems Architecture to guide the implementation of ITS within the Bismarck-Mandan metro area, as well as coordinate the funding, deployment, information sharing, and operations of ITS systems. It includes five major components: traffic and travel management; maintenance and construction management; emergency management; advanced data management; and transit management. This document is a living one and the MPO has established an update cycle; it was most recently updated in 2014.

In 2017 the City of Bismarck completed a signal system assessment and city-wide fiber interconnect study. The outcome of this study pointed towards opportunities to improve transportation and community safety through upgrades to the existing city of Bismarck and NDDOT signal systems. The study also highlighted opportunities to improve interconnection of Bismarck and NDDOT facilities through existing signal related fiber systems. As part of this study, transportation technology was cataloged and is shown in Figure 4.49.

Security

Security of the transportation network is a critical part of this Metropolitan Transportation Plan. In fact, the SAFETEA-LU transportation authorization has required that MPOs incorporate security into their long range transportation plans since 2005. Security planning is essential because it helps the Bismarck Mandan MPO prepare and respond to natural- and human-caused events that affect the transportation system.

The US Department of Homeland Security (DHS) was formed in response to the attacks on September 11, 2001 and prepares for and addresses security threats of all types across the country. Protecting the national transportation network is an important component of DHS' work. Every five years, DHS issues a Transportation Systems Sector-Specific Plan (TSSSP). The 2015 Plan addresses the resilience of transportation infrastructure, as a critical component of national infrastructure.

Goals from the 2015 TSSSP include:

- Goal 1: Manage the security risks to the physical, human, and cyber elements of critical transportation infrastructure.
- Goal 2: Employ the Sector's response, recovery, and coordination capabilities to support whole community resilience.
- Goal 3: Implement processes for effective collaboration to share mission-essential information across sectors, jurisdictions, and disciplines, as well as between public and private stakeholders.
- Goal 4: Enhance the all-hazards preparedness and resilience of the global transportation system to safeguard U.S. national interests.

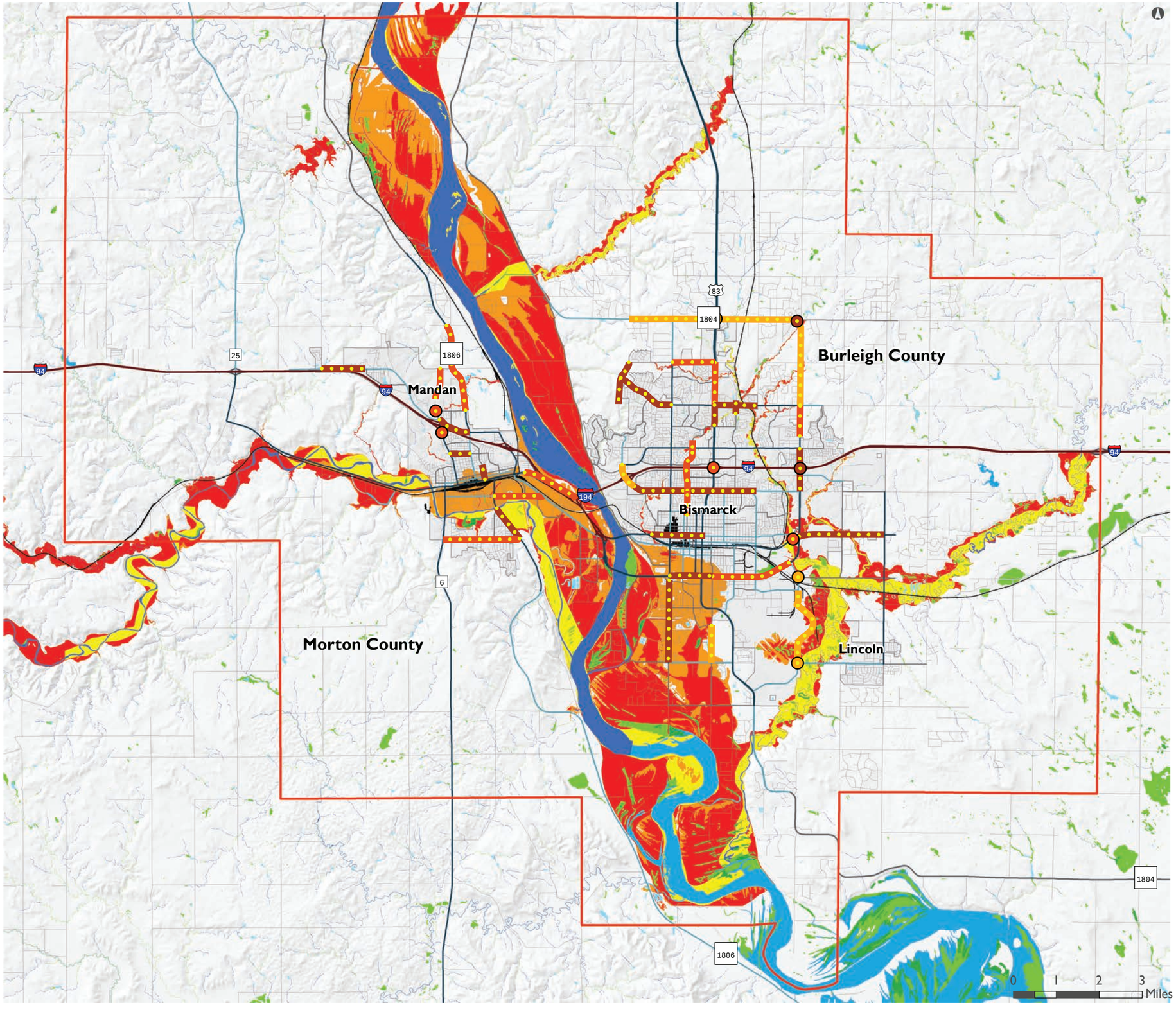
The federal government implements these goals through a risk management framework, identifying priority infrastructure to protect.

Recognizing the importance of transportation security, the Bismarck Mandan MPO has undertaken several activities to improve security of their local system.

- **Coordination and Collaboration with Emergency Responders.** The MPO works closely with emergency responders in the region including:
  - The participation of emergency responders on the LRTP committee and other MPO study committees/efforts as applicable.
  - The inclusion of sections regarding emergency responders in the January 2014 Regional ITS Plan.
- **Identification of Critical Assets.** The MPO has identified critical transportation infrastructure assets including:
  - Missouri River bridge crossings (roadway and rail bridges).
  - I-94 interchanges.
  - Transit facilities.
  - The transportation network as it provides access to key security facilities such as utility plants, the State capitol, and hospitals.
- **Continue to Coordinate with State and Federal Agencies**. The MPO will continue to collaborate with local, state, and federal agencies with concerns to natural disaster preparedness, mitigation, response, and recovery activities.

Figure 4.46: Environmental Areas

Environmental Areas



- Short Range Projects for Constrained Plan
- Mid Range Projects for Constrained Plan
- Long Range Projects for Constrained Plan

Metropolitan Planning Organization Boundary

- Boundary

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Railroads
- Historic Districts

Wetlands

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Flood Zone

- Floodway
- 100-Year Floodplain
- 500-Year Floodplain

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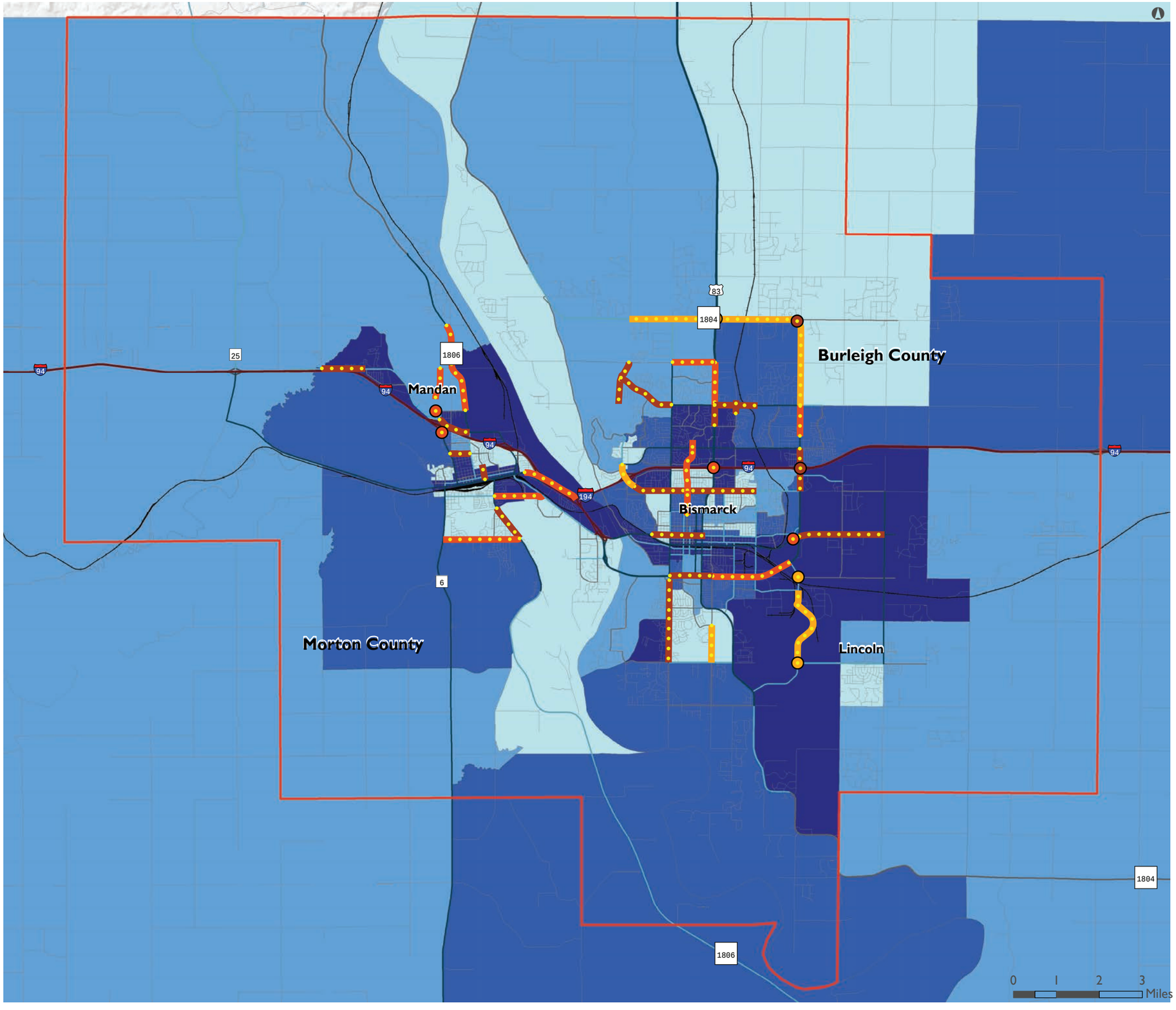
Figure 4.47: Environmental Justice Minority Areas

Environmental Justice Minority Areas



Short Range Projects for Constrained Plan

Mid Range Projects for Constrained Plan

Long Range Projects for Constrained Plan

Roadway by Functional Classification

Interstate

Principal Arterial

Minor Arterial

Collector

Railroads

Metropolitan Planning Organization Boundary

Boundary

Minority Areas

0% - 3%

3.1% - 5%

5.1% - 10%

10.1% +

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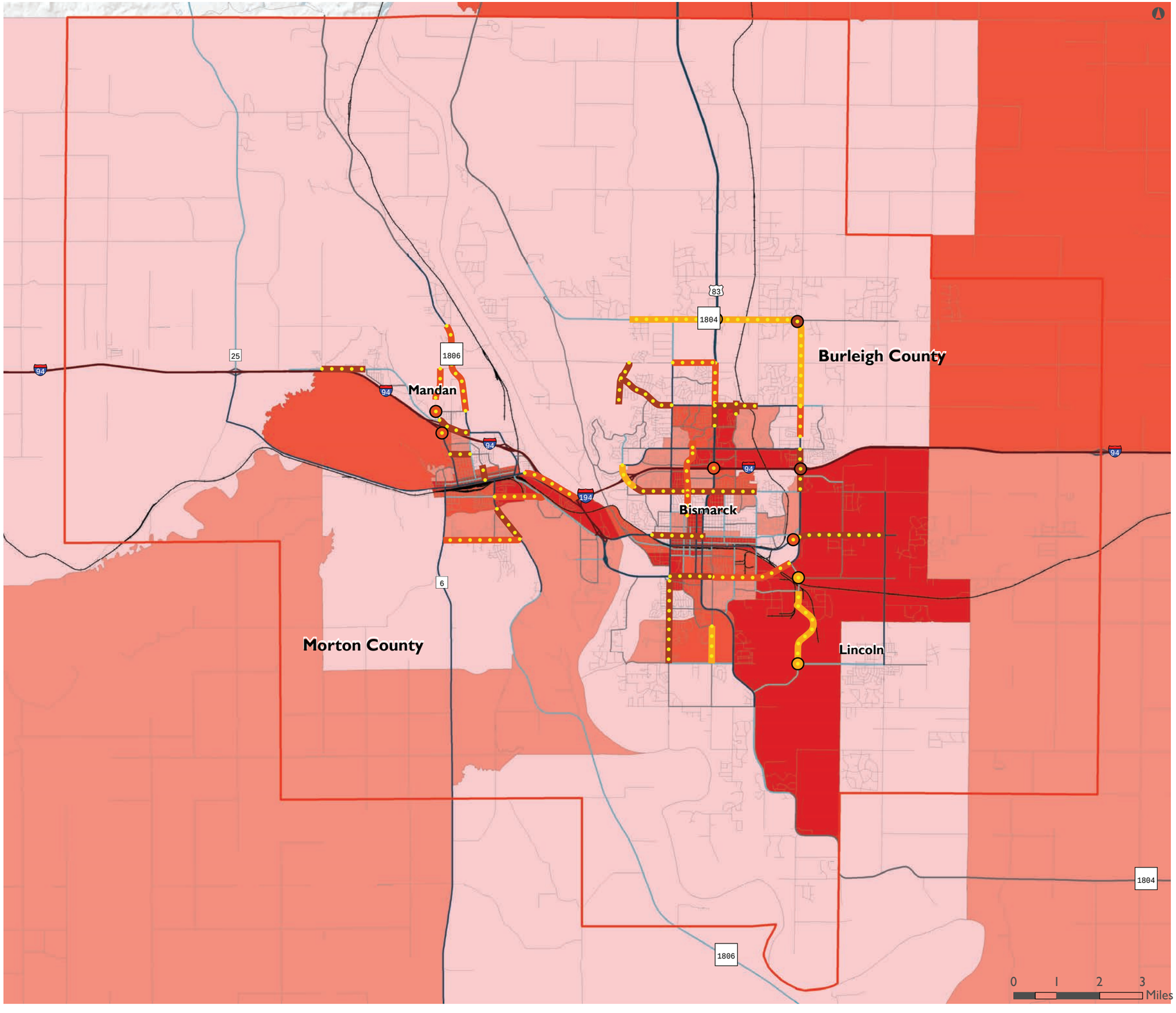
Figure 4.48: Environmental Justice Poverty Areas

Environmental Justice Minority Areas



- Short Range Projects for Constrained Plan
- Mid Range Projects for Constrained Plan
- Long Range Projects for Constrained Plan

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector
- Railroads

Metropolitan Planning Organization Boundary

- Boundary

Poverty Areas

- 0% - 5%
- 5.1% - 10%
- 10.1% - 15%
- 15.1% +

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Figure 4.49: Transportation Technology

Transportation Technology

- Existing Controller Cabinet/Traffic Signal
- NDDOT Fiber
- Bismarck Fiber Optic Wire

Functional Class

- Interstate
- Principal Arterial
- Minor Arterial
- Collector

Mandan
Bismarck
Lincoln
1806
1804
83
94
194
6
0 0.5 1 1.5 Miles

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Chapter 5

Growth, Trends, and Forecasts

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GROWTH, TRENDS, AND FORECASTS

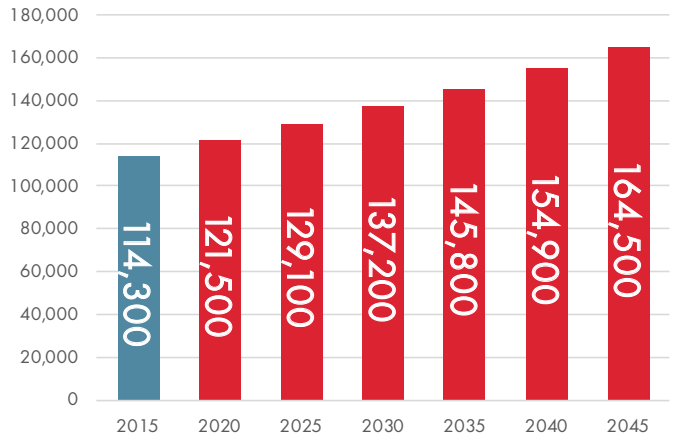
Demographic Trends

Population, household, and employment growth in the Bismarck-Mandan metro area are directly related to the demands placed on the transportation network. As more people and jobs are located in the region, there are more commuting and freight trips. This section includes a review of the population, household, and employment forecasts developed for the Bismarck-Mandan metro area as part of the Bismarck-Mandan Model Review and Socio-Economic Update Study.

Population Growth

The Bismarck-Mandan metro area population has historically grown at a rate of 1.2 percent per year (1985 to 2015), however more recent trends have shown a more significant growth rate, around 2.4 percent per year (2010 to 2015). Recently, the 2045 socioeconomic forecasts were approved using the historic growth rate around 1.2 percent per year, on average, resulting in more than 50,000 new people by 2045, for an expected population of 164,500.

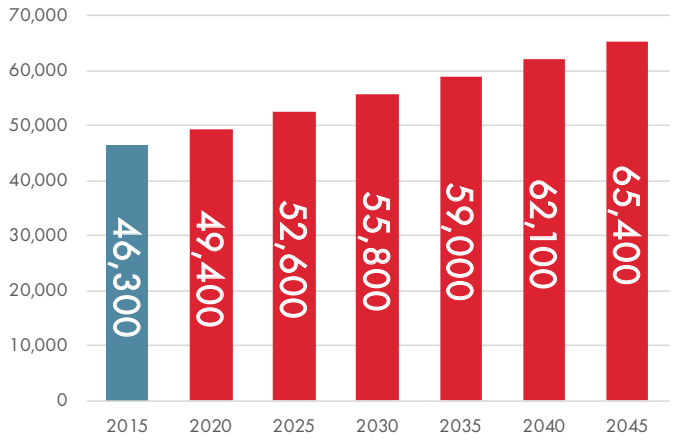
Figure 5.1: Current and Projected Population



Household Growth

The population growth forecasted through 2045 is allocated to new households based on household size, which reflects a variety of factors, including age and housing type (single-family/multi-family). Household size has declined since the 1970s (3.37) to 2005 (2.39), but has recently stabilized. The demographic forecasts expects a slight increase in household size through 2045. This results in around 65,400 total households in the Bismarck-Mandan metro area by 2045, an increase of more than 19,000 new households. This forecasts is lower (10.5 percent) than previous 25-year forecasts.

Figure 5.2: Current and Projected Households



Employment Growth

Employment growth in the Bismarck-Mandan metro area is expected to grow around 1.8 percent per year through 2045, resulting in more than 49,000 new jobs, for a total of 121,000 jobs. This forecast is slightly lower (2.6 percent) than previous 25-year forecasts, likely associated with the uncertainty surrounding energy development in western North Dakota.

Figure 5.3: Current and Projected Employment

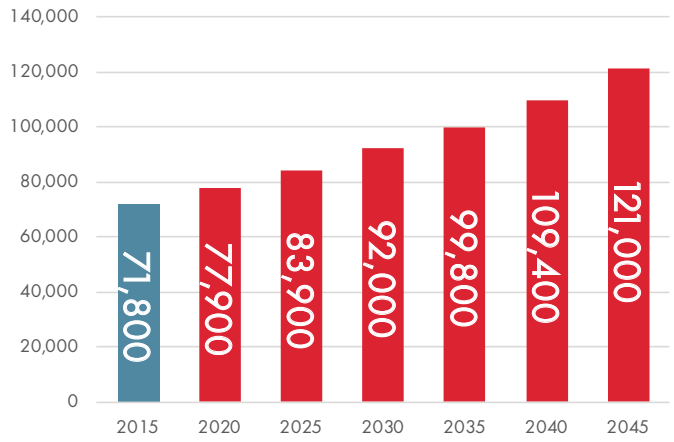


Table 5.1: Current and Forecasted Change in Socioeconomic Data

	2015	2020	2025	2030	2035	2040	2045	2015-2045 Percent Change
Metro Population	114,300	121,500	129,100	137,200	145,800	154,900	164,500	43.9%
Metro Households	46,300	49,400	52,600	55,800	59,000	62,100	65,400	41.3%
Metro Jobs	71,800	77,900	83,900	92,000	99,800	109,400	121,000	68.5%

Existing and Future Land Use

The Bismarck-Mandan Model Review and Socio-Economic Update Study identified representative land-use for residential, commercial, and industrial properties across the metro. This analysis resulted in multi-family and single-family typical housing units per acre and commercial and industrial typical jobs per acre. These typical densities are used to understand how much land will be required to accommodate the future household and employment growth through 2045.

With the demographic forecasts approved and the land use densities determined, the future growth in the Bismarck-Mandan metro area was geographically allocated to traffic analysis zones (TAZs). TAZs are small units of geography used for travel demand modeling. The size of a TAZ can vary; they are typically very small in dense downtown areas and typically very large in growth and rural areas. TAZ boundaries typically follow major streets and roadways, political boundaries, and geographical boundaries (rivers). TAZs are typically drawn to ensure land uses are similar, keeping residential neighborhoods separate from commercial and industrial developments.

The MPO worked with the member units of government (City of Bismarck, City of Mandan, City of Lincoln, Burleigh County, Morton County) to allocate their share of the metro area household and employment growth to the TAZs within their jurisdiction.

Summary of Growth Areas

Throughout the Bismarck-Mandan metro, new jobs and household growth is concentrated along the outskirts of the city, with a few areas of infill development.

In Bismarck, State Street/US 83 is a major commercial corridor currently, and that trend is expected to continue with more than 20,000 new jobs within one mile of the corridor through 2045. The future Century Avenue corridor, east of Centennial Road, is also an expected future commercial corridor, with more than 14,000 new jobs surrounding that corridor through 2045. Major pockets of residential growth are scattered across the city.

In Mandan, the future commercial and industrial areas are concentrated in the northwest along I-94, with more than 4,500 new jobs expected through 2045. The largest residential growth areas are also along the northern edge of the city, with more than 2,100 new households expected through 2045.

In Lincoln, growth areas are expected to be predominately residential, with more than 3,000 new households by 2045 and more than 500 new jobs by 2045.

Figure 5.4: New Residential Development along Old Red Trail in Mandan

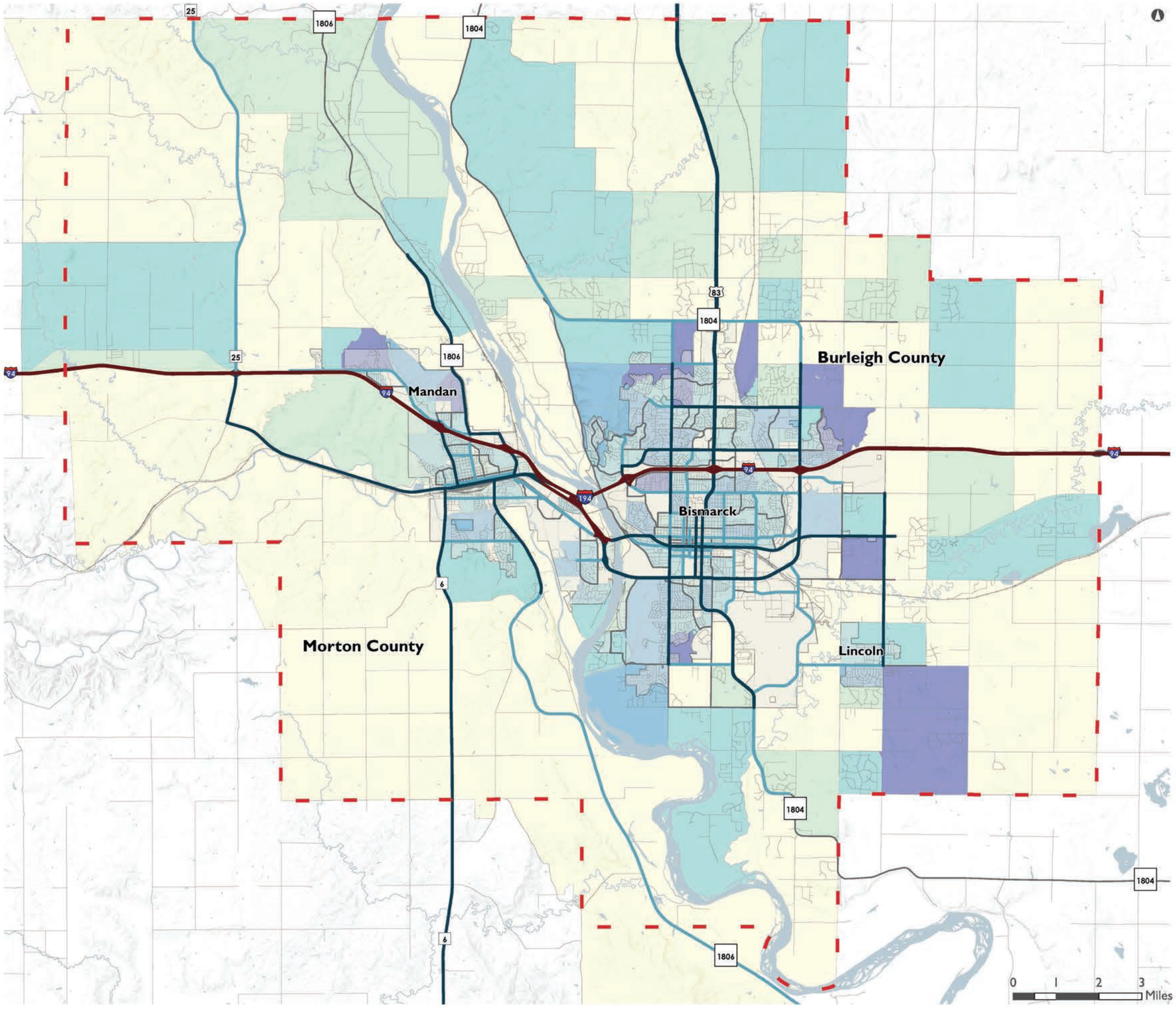


Figure 5.5: Forecasted Growth in Households by Traffic Analysis Zones, 2015-2045

2045 Household Growth

Metropolitan Planning Organization Boundary

Boundary

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector

2045 TAZ Data

Additional Households

- 0 - 100
- 101 - 200
- 201 - 500
- 501 - 1000
- 1001 - 1564

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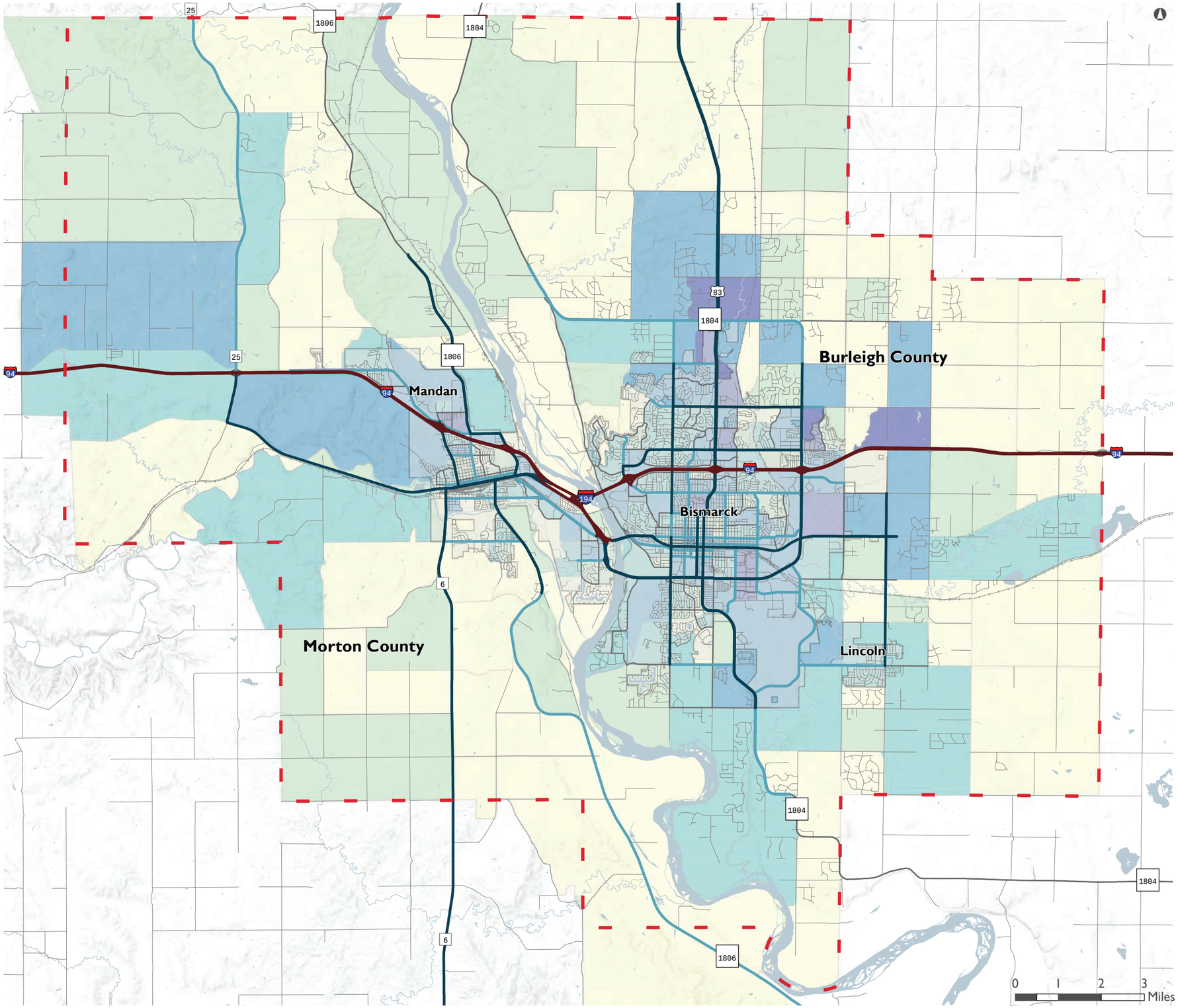

Figure 5.6: Forecasted Growth in Employment by Traffic Analysis Zone, 2015 - 2045

2045 Jobs Growth

Metropolitan Planning Organization Boundary

Boundary

Roadway by Functional Classification

- Interstate
- Principal Arterial
- Minor Arterial
- Collector

2045 TAZ Data

Additional Jobs

- 0 - 10
- 11 - 50
- 51 - 250
- 251 - 1500
- 1501 +

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Chapter 6
Future System Performance

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FUTURE SYSTEM PERFORMANCE

The 2020 to 2045 Bismarck-Mandan Metropolitan Transportation Plan uses a year 2045 planning horizon to provide a 25-year time period after plan adoption for prioritizing regional transportation improvements. This chapter provides a performance assessment of the future transportation system.

Introduction to Travel Demand Modeling

The travel demand model is a computer model used to estimate travel behavior and demand for a specific time frame, based on a number of assumptions. The model process begins with the development of the travel network. This includes characteristics of roads, bridges, and intersections. The model then estimates the 24-hour travel demand for each roadway using the four-step modeling process.

- **Step 1: Trip Generation** – how many trips are generated? In this step, the model estimates the number of trips that are produced in each Traffic Analysis Zone based on its residential and employment characteristics.
- **Step 2: Trip Distribution** – where do trips go? In this step, the model matches origins and destinations. These trips can occur between the same zone, adjacent, or non-continuous zones.
- **Step 3: Mode Choice** – how do people get there? This step typically is used to determine how people elect to travel to their destination, whether its by car, walk, bike, or bus, based on a variety of trip factors (purpose, travel time, travel cost, availability or transit). Because nearly everyone in the Bismarck-Mandan metropolitan area travels by personal automobile, this step is omitted.
- **Step 4: Trip Assignment –** what routes do people take to get there? The final step of travel demand modeling is to assign trips to roadways.

Once the four-step model process is completed, it is validated and calibrated to match existing data collected on the roadway network. This completes the 2015 base travel demand model. The model is then updated with future demographic information (population, households, and employment data) and any transportation projects with identified funding to develop the 2030 and 2045 existing network travel demand models. Ultimately, the model will be updated to include all transportation projects identified in this fiscally constrained Metropolitan Transportation Plan. This provides the most accurate estimate of future travel conditions on the Bismarck-Mandan road network.

2030 Future Network Performance

By 2030, the Bismarck-Mandan metro area will add nearly 10,000 households and 20,000 jobs. Even with this anticipated growth, the network will continue to operate effectively through most of the metro, however, there are some areas of growing congestion. Vehicle hours traveled (VHT) by all vehicles on the network will increase 30.3 percent, while vehicle miles traveled (VMT) by all vehicles on the network will increase 28.5 percent. VHT growing at a faster rate than VMT indicates increasing congestion, however mild through 2030.

The travel demand model outputs volume to capacity ratios (V/C ratios) based on forecasted travel volumes and a roadway's vehicular capacity based on a variety of characteristics including speed and number of lanes. The V/C ratio is used to assign a level of service (LOS), which is a letter grade used to describe traffic operations. LOS "A" represents no delays and LOS "F" represents gridlocked travel. The V/C ratios and their corresponding LOS is shown in Table 6.1. Based on NDDOT and MPO standards, LOS "D" or better is considered acceptable, while LOS "E" and "F" are considered deficient.

Table 6.1: V/C Ratios and Level of Service

LOS	V/C Ratio Ranges
A	< 0.5
B	0.5 to 0.6
C	0.6 to 0.7
D	0.7 to 0.8
E	0.8 to 0.9
F	> 0.9

The 2030 LOS is shown in Figure 6.1. Many of the metro's most heavily traveled arterial roadways will continue to see growing congestion, especially in the northeast.

Table 6.2: 2030 Model Outputs

	2015	2030	2015-2030 Percent Change
VHT	28,605	37,265	30.3%
VMT	1,753,850	2,253,430	28.5%
% of Links Over Capacity	1.2%	5.1%	322.3%

2045 Future Network Performance

From 2030 to 2045, the Bismarck-Mandan metro area will add another 10,000 households and 29,000 jobs. This anticipated growth begins to overload the network, with many of the functionally classified roadways over capacity. VHT increases far outpace VMT increases, indicating significant congestion on the network. The percent of roadway links over capacity increases more than 10 times when compared to 2015.

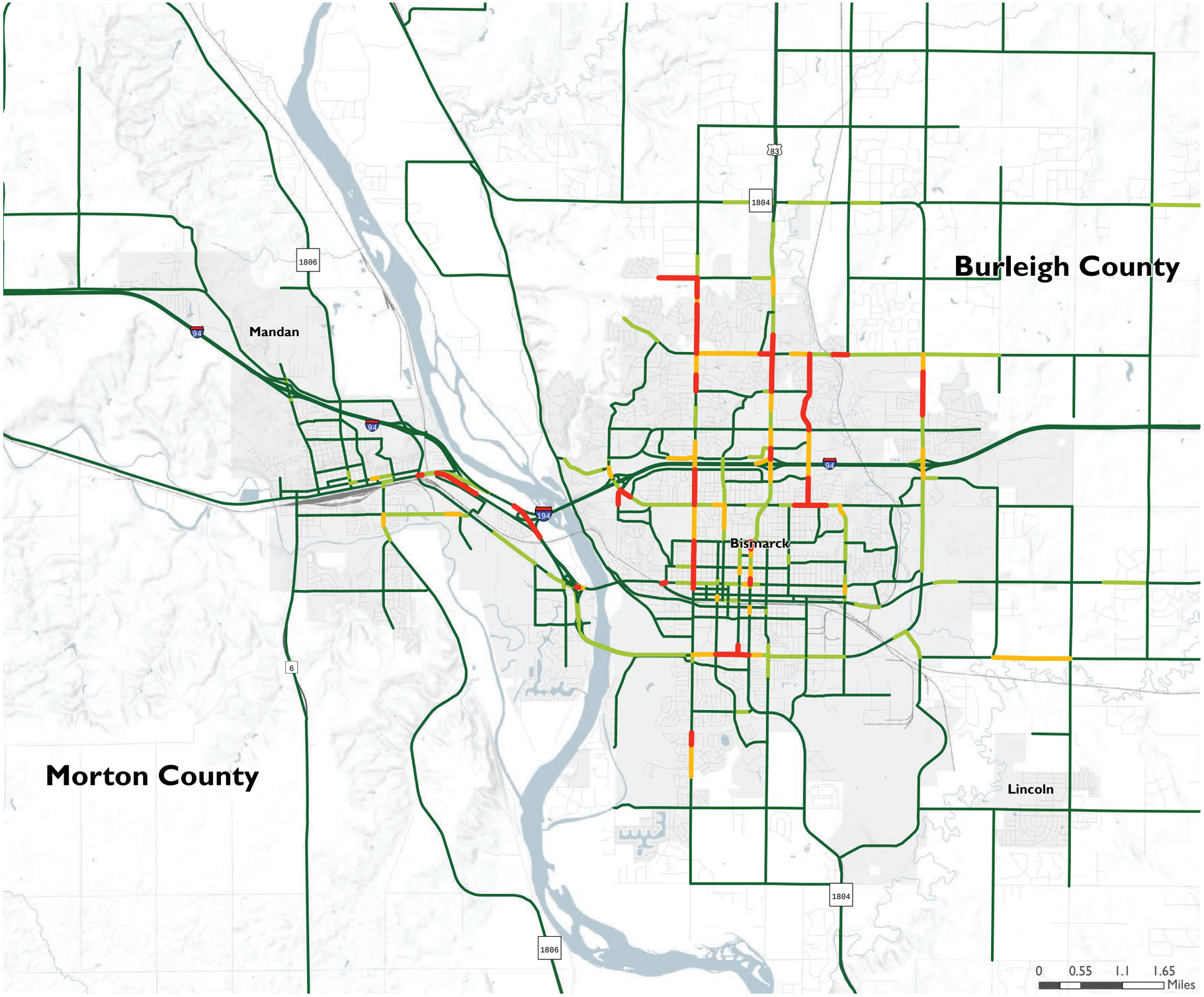
The 2045 LOS is shown in Figure 6.2. Many of the metro's most heavily traveled arterial roadways will continue to see growing congestion.

Table 6.3: 2045 Model Outputs

	2015	2045	2015-2045 Percent Change
VHT	28,605	55,650	94.5%
VMT	1,753,850	2,932,685	67.2%
% of Links Over Capacity	1.2%	13.6%	1,033.3%

Figure 6.1: Level of Service 2030

Level of Service 2030



LOS 2030

- F
- E
- D
- A-C

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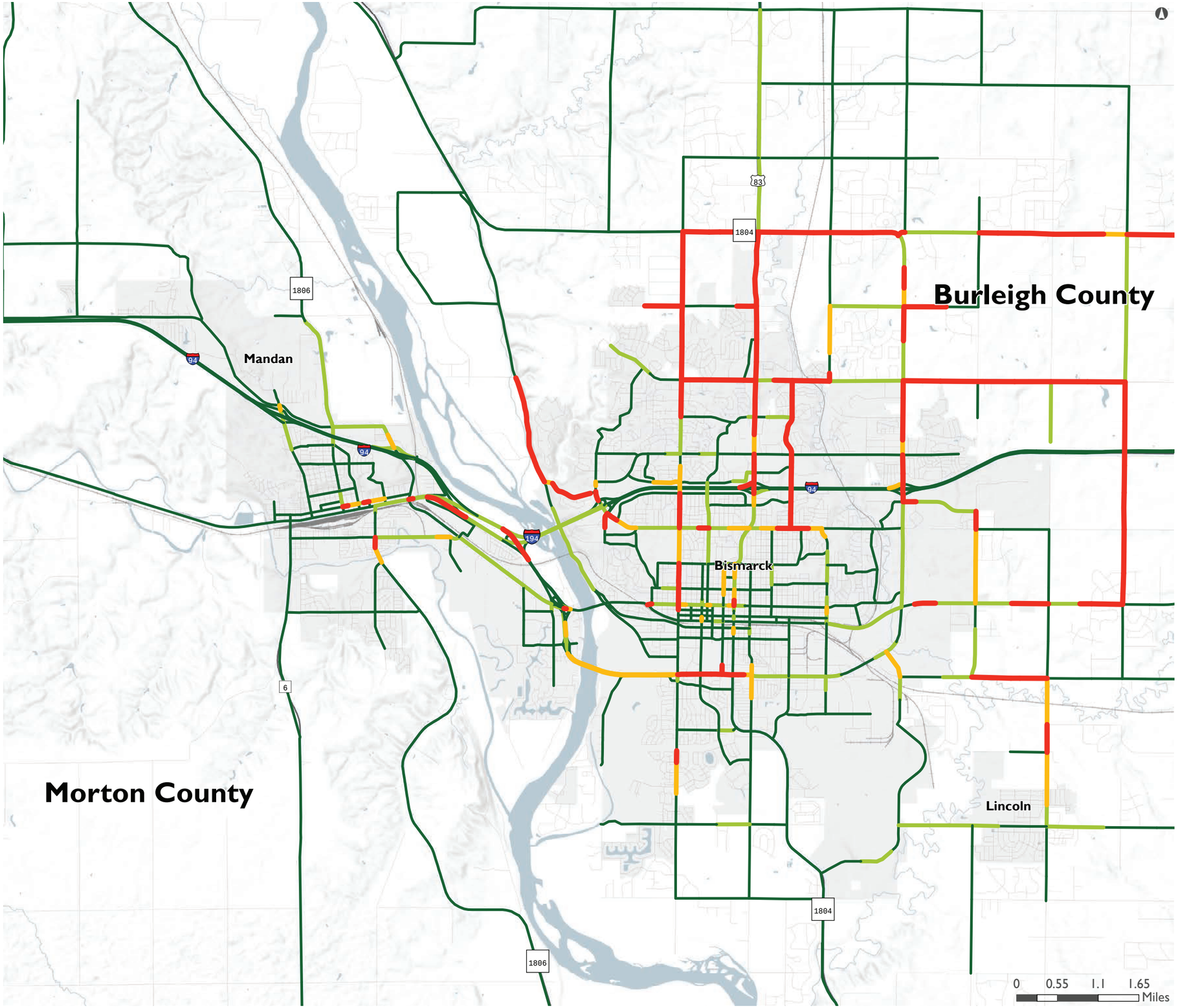
Figure 6.2: Level of Service 2045

Level of Service 2045



LOS 2045

- F
- E
- D
- A-C

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