

# FINAL REPORT



## Corridor Study

Bismarck-Mandan Metropolitan Planning Organization



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# Bismarck-Mandan MPO I-94 Corridor Study



## Final Report

**Prepared by:**

**Bismarck-Mandan Metropolitan Planning Organization**

**In Association with:**



**and Project Partners:**

**City of Bismarck, City of Mandan, Burleigh County, Morton County, NDDOT, and FHWA**

# Acknowledgements

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Appendix A – Technical Memorandum #1: Corridor Needs Assessment

Appendix B – Technical Memorandum #2: Purpose and Need Statement

Appendix C – Technical Memorandum #3:  
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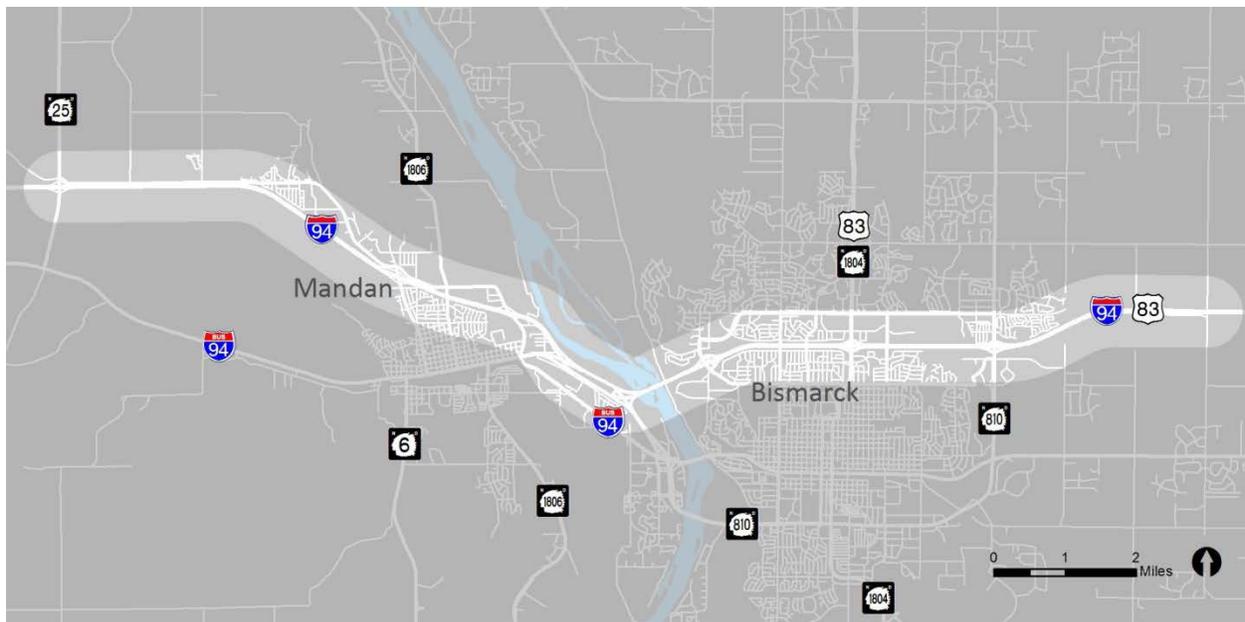


# Chapter A: Introduction

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## 1. STUDY OBJECTIVES AND WORK TASKS

The purpose of the Bismarck-Mandan I-94 Corridor Study is to identify and address current and future transportation issues along approximately 17 miles of I-94 from ND Highway 25 (in Morton County) on the west to 80th Street NE (in Burleigh County) on the east side of the study area, including its accessible crossroads. This corridor has experienced increasing traffic volumes in the past few years. This growth is the result of both local traffic growth, as well as the growth in regional trips heading to and from western North Dakota related to the oil boom.



*I-94 Corridor Study Area / Limits*

The I-94 Corridor Study began in October 2012 as a cooperative effort between the following agencies:

- Bismarck-Mandan Metropolitan Planning Organization
- City of Bismarck
- City of Mandan
- Burleigh County
- Morton County
- North Dakota Department of Transportation
- Federal Highway Administration



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These stakeholders make up a Project Steering Committee (PSC) that has guided the study process throughout the duration of the project. With the assistance of SRF Consulting Group, some of the activities that have taken place as part of the I-94 Corridor Study include:

- Assessment of existing conditions and future conditions
- Development of year 2040 traffic conditions
- Preparation of a purpose and need statement and vision for the study area
- Development of planning-level corridor improvement alternatives
- Evaluation of the planning-level alternatives
- Identification of alternatives to carry forward for future environmental documentation
- Development of an implementation plan

Throughout the study process, the consultant team developed four Technical Memorandums at key milestones to document the substantive assessment, analysis, evaluation, and general process. This allowed the project to make clear concise decisions throughout, and then move along to the next phase of the project – having clearly documented the decisions made by the PSC.

The Final Report document summarizes these technical memorandums and connects them with additional information compiled between key tasks. The four Technical Memorandums are Corridor Needs Assessment (TM #1); Purpose and Need Statement (TM #2); Alternatives Development, Evaluation, and Options to Carry Forward (TM #3); and Implementation Plan (TM #4). Each of these technical memorandums are attached as appendices to this document. Additional detail beyond the summary is provided in the technical memorandums.



## Chapter B: Corridor Needs Assessment

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**This chapter summarizes the detailed analysis and findings contained in Technical Memorandum #1: Corridor Needs Assessment (included as Appendix A). The reader should refer to the Technical Memorandum for additional explanation and detail, when necessary.**

The needs assessment is a comprehensive analysis of the existing and forecast conditions along the I-94 corridor from North Dakota (ND) Highway 25 in Mandan to 80th Street NE in Bismarck and each of the intersecting access roadways between these two end points. The assessment draws upon data collected along the corridor, review of existing planning documents, input received from the Project Steering Committee (PSC), and forecast traffic conditions. The following areas are analyzed in this assessment:

1. Corridor Access
2. Vehicle Crashes
3. Bicycle and Pedestrian Facilities and Gaps
4. Existing Truck and Transit Routes
5. Existing Corridor Geometry
6. Pavements, Bridges, Utilities
7. Land Use Review/Refinement/Best Practices
8. Cultural and Natural Resources
9. Environmental Justice
10. Traffic Operations

### 1. CORRIDOR ACCESS

Access plays a critical role in how roadway facilities operate. A high frequency of access points along a given segment of roadway can reduce capacity and adversely affect operations and safety. Based on their varying functional classifications and jurisdictions, intersecting roadway segments along the I-94 corridor were reviewed within approximately one-half mile of each I-94 interchange to determine the frequency of existing access points, relative to the existing guidance or local access standard. The following intersecting corridors were reviewed for access considerations during this study:

1. ND Highway 25 (NDDOT)
2. Sunset Drive NW (Mandan)
3. Mandan Avenue (Mandan)
4. Tyler Parkway/Divide Avenue (Bismarck)
5. State Street (Bismarck/NDDOT)
6. Centennial Road (Bismarck/NDDOT)

NDDOT’s design manual chapter, Driveways and Access Management (2009), includes a minimum public and private access point spacing guideline of 400 to 600 feet (the equivalent of 9 to 13 access points per mile) for urban regional highways such as US Highway 83.

In addition to this NDDOT urban roadway standard, local access standards were reviewed in order to analyze both public street and private driveway access guidelines within the Cities of Bismarck and Mandan. The City of Bismarck’s Access Management Policy was referenced for the corridors within Bismarck. Since the City of Mandan does not have a locally adopted access management policy, the Bismarck Access Management Policy was also used to evaluate access along roadways in both



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Bismarck and Mandan. The access analysis and review determined that access management along the north-south corridors is mostly non-compliant with access spacing guidance (Sunset Drive, Mandan Avenue, Tyler Parkway, State Street). Further, the north-south crossroads do not adhere to Transportation Research Board (TRB) guidance relative to access spacing immediately adjacent to freeway interchange areas (ranging from 750 feet to one-half mile spacing).

## 2. CRASH HISTORY

A crash analysis was performed for key intersections within 1/2 mile of the I-94 corridor and key segments along I-94, based on data obtained from the North Dakota Department of Transportation's (NDDOT) crash database for the three-year time period of January 2009 to December 2011. This review included crashes involving vehicles only and vehicle-pedestrian/bicyclist. Review of the various crash types indicates that 57 percent of the crashes located near the key intersections were rear-end crashes. These types of crashes are typical along corridors with a high number of signalized intersections.

Similar to the intersection crashes, rear-end crashes were also a frequent crash type along the roadway segments, representing more than 25 percent of the total crashes. The majority of the rear-end crashes (40 percent) occurred on the segment between the Bismarck Expressway interchange and the Tyler Parkway/Divide Avenue interchange (21 out of 52), and the segment between the Tyler Parkway/Divide Avenue interchange and the State Street interchange (17 of 43).

### Critical Rate Analysis

In addition to reviewing the specific types of crashes that occurred within the study area, the overall intersection and segment crash rates were calculated to determine where the highest crash rates are occurring. The calculated overall intersection or segment crash rates were compared to typical crash rates with similar characteristics. NDDOT does not publish crash rates by type of roadway or traffic control. Therefore, average crash rates, by type of roadway and traffic control, were referenced from sources published by the Minnesota Department of Transportation (MnDOT) for 2009 to 2011. MnDOT crash rates were used due to like type facilities within the MnDOT system of roads, and similarities to community characteristics by District.

As part of the Statewide Safety Program the NDDOT reviews the entire state highway system on a yearly basis with varying analyses – one of which is the Critical Rate Analysis. The Concept of “Critical Crash Rate” suggests that any sample or category of intersections or roadway corridors can be divided into three basic parts<sup>1</sup>:

- Locations with a crash rate below the average will be eliminated from further review.
- Locations with a crash rate above the average, but below the critical rate are locations where there is a very high probability (90-95%) that the higher than average crash rate is due to the random nature of crashes.
- Locations with a crash rate above the critical rate will be reviewed because there is a high probability (90-95%) that conditions at the site are contributing to the higher crash rate

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<sup>1</sup> NDDOT Statewide Safety Program, I-06.05 Statewide Safety Program, Revised 3/11/14



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Review of the intersection crash rates throughout the project study area indicate that 21 of the 33 intersections studied have a crash rate higher than typical for intersections with similar characteristics. However, this does not immediately indicate an issue exists. Therefore, the critical crash rates were calculated to determine the statistical significance of the above average crash rates. There are 13 intersections with higher crash rates than the calculated critical crash rate. This indicates that there is a high probability (90-95%) that conditions at the site are contributing to the higher crash rate.

Review of the segment crash rates indicate that six of the nine segments have a crash rate higher than typical for segments with similar characteristics. Similar to the intersection crash rates, a higher than typical crash rate does not necessarily indicate a crash problem. Therefore, critical crash rates were also calculated to determine the statistical significance of the above average segment crash rates. All six of these segments also had higher crash rates than the critical crash rates.

In addition to the crash rates, crash severity rates were calculated for the key intersections within the study area. The crash severity rate takes into account the number of crashes that occurred over a three-year period, the amount of vehicle exposure, and the level of crash severity of each crash (Fatal; Injury Category A, B, or C; and Property Damage). It was determined that the 21 of the 33 intersections had severity rates higher than typical for like type intersections; none of the segment severity rates were greater than typical for like type facilities.

### **3. BICYCLE AND PEDESTRIAN FACILITIES AND GAPS**

#### **Existing Facilities**

As noted in the 2010-2035 Bismarck-Mandan Long Range Transportation Plan (LRTP), the Bismarck-Mandan region has over 65 miles of shared use paths that serve recreation and transportation purposes. In addition to the shared use paths in the City of Mandan and the City of Bismarck, both cities also maintain an extensive sidewalk system for pedestrian use.

#### **Planned Future Facilities**

There are a number of planned future bicycle and pedestrian facilities throughout the area. While the MPO is unable to program a majority of these planned projects, the LRTP states that the MPO seeks to focus its future efforts on providing on-street bicycle facilities, whether they are dedicated lanes or facilities designed for shared use by motor vehicles and bicyclists.

#### **Identified Network Gaps**

A review of existing and planned facilities in the corridor study area was conducted to identify additional bicycle and pedestrian system gaps for consideration to develop a more complete network. A total of 10 pedestrian and bicycle facility gaps were identified. The location of each gap and the rationale for expanding facilities to close these gaps is summarized in the full Technical Memorandum included in Appendix A.



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## 4. EXISTING TRUCK AND TRANSIT ROUTES

The I-94 corridor and a majority of the north-south crossroads play a significant role in the movement of goods and services between the cities of Bismarck and Mandan and throughout the region. This serves to underscore the importance for these roads to operate efficiently not only today but into the future.

Bis-Man Transit operates the Capital Area Transit (CAT), with seven routes within the study corridor and major crossroads. The weekday frequency of service ranges from 30 minutes within Bismarck and 120 minutes between Bismarck and Mandan. Bis-Man Transit also coordinates and operates paratransit service in the region. These various routes use the I-94 corridor as a critical link between Bismarck and Mandan; again, highlighting the importance of the I-94 bridge crossing.

## 5. EXISTING CORRIDOR GEOMETRY

The purpose of the corridor geometry review is to document the existing geometry and compare it to applicable design standards. For this study, the American Association of State Highway and Transportation Officials (AASHTO) publication, “A Policy on Geometric Design of Highways and Streets,” (POLICY) was used as the design standard reference. The following geometric elements were examined:

- Horizontal Geometry
- Vertical Geometry
- Design Speed
- Bridge Clearance
- Entrance/Exit Ramp Geometry
- Access Spacing at Interchanges

The quantitative representation of these geometric elements was reviewed and is summarized in worksheets included with the full Technical Memorandum #1 included in Appendix A. A qualitative analysis was also performed to address areas of concern that may not show a clear geometric deficiency. Some deficient qualitative elements are: interchange skew angle, sightlines, back-to-back curvature, mainline left exits, and access crowding.

## 6. PAVEMENTS, BRIDGES, UTILITIES

### Pavements

Data regarding the pavement and bridge conditions was obtained from NDDOT. In addition, readily available utility data was obtained (e.g., Bismarck lighting data and high voltage power structures). Pavements are rated on a 0-100 value basis, or Pavement Condition Index (PCI); this is a numerical assessment method that evaluates pavements based on severity of distress as follows:

- Adequate =  $PCI > 70$
- Degraded =  $55 < PCI < 70$
- Unsatisfactory =  $PCI < 55$



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The majority of the pavements within the project study area in Bismarck are in adequate condition; there are three locations worth noting:

- Tyler Parkway, southbound, between Burnt Boat Road and Schafer Street, rated degraded
- Divide Avenue, bidirectional, between Lilac Lane and Channel Drive, rated unsatisfactory
- State Street, southbound, between I-94 North Ramp and Interchange Avenue, rated unsatisfactory

The majority of the pavements within the project study area in Mandan are in adequate condition, except for Sunset Avenue. This roadway is rated “degraded condition” between Old Red Trail and Boundary Road.

## **Bridges**

All bridges along I-94, both overpass and underpass bridges with crossroads were reviewed with respect to their bridge sufficiency ratings based on NDDOT Bridge Inventory – Structure Inventory and Appraisal data. The following attributes were reviewed to determine bridge sufficiency, including the deck surface:

- Deck Condition
- Superstructure Condition
- Substructure Condition
- Structure Condition
- Underclearance: Vertical & Horizontal

The bridge sufficiency is a cumulative measure given the ratings of the contributing attributes. A sufficiency rating of “obsolete” does not necessarily indicate that the structure requires replacement. The deficiency that results in the “obsolete” rating could be mitigated (i.e., guardrail installed to mitigate side clearance issue). Attributes rated as “poor” or worse were recommended for correction. Four of the 21 bridges reviewed were identified as having attributes rated “poor” or worse. See Technical Memorandum #1 for additional information.

## **Utilities**

Early coordination with various resource agencies included reaching out to the US Department of Energy – Western Area Power Administration (WAPA). In addition, existing street light basemap data was provided by the MPO for the City of Bismarck; similar data is not available for the City of Mandan. WAPA owns and operates two high voltage transmission lines that cross I-94 just west of Centennial Road in Bismarck. In addition, WAPA owns a parcel of land and communication site located near the intersection of I-94 and 66th Street in Bismarck.

As alternatives are developed and considered at various locations potential impacts to these facilities will be evaluated and documented. Once alternatives are developed they will be reviewed again by WAPA to determine potential impacts, changes, and costs.



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The street lighting data indicates that Bismarck has a comprehensive lighting network, with each I-94 interchange lit as well. Any geometric modifications to the roadway may potentially impact street lighting.

## **7. LAND USE REVIEW/REFINEMENT/BEST PRACTICES**

A key element of the I-94 Corridor Study is the review of future land use and assessment of recent and ongoing planning efforts of each of the four jurisdictions within the corridor study area. This review and assessment was completed to provide an interpretation of the land use practices, potential refinement (if any), and recommendations on best practices with respect to land use development planning.

The Bismarck-Mandan Metropolitan Planning Organization (MPO) sponsored the Regional Future Land Use Plan, which was completed in 2007. That study documented existing land uses and established maps of future land uses for vacant and developing areas. The future land use maps were prepared with the assistance of local planning staff to be consistent with an orderly growth pattern for the Bismarck-Mandan area.

### **Land Use Review with Local Stakeholders**

Each member jurisdiction of the Bismarck-Mandan MPO adopted the 2007 Regional Future Land Use Plan as an official document. The future land use maps within the plan are used by local planners to compare new proposals to the future plan as a routine step of planning staff reviews. If the character of a proposed development is inconsistent with the future land use plan, it does not mean that development will be prohibited; it does mean that adequate justification must be provided. If the justification is deemed reasonable by the governing bodies of each jurisdiction, the future land use plan can be amended to incorporate the change.

SRF met with the planning staffs of Morton County and the City of Mandan, and the City of Bismarck and Burleigh County. The purpose of these meetings was to obtain input on issues related to land use and development activities within the I-94 Corridor Study area. The main objectives were:

- Determine the validity and effectiveness of the future land use maps from the 2007 plan
- Determine if changes were needed
- Determine if developments constructed since 2007 were in accordance with the future land use plan
- Identify amendments to proposed / constructed developments



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Morton County and Mandan indicated that the future land uses established in the 2007 Plan are still valid and functional. No developments have occurred that are inconsistent with the plan. Burleigh County in cooperation with the City of Bismarck Community Development Department indicated that development within the study corridor had been consistent with the future land use plan and that the 2007 plan meets their expectations.

## **Land Use at the Sunset Interchange**

The area adjacent to the Sunset Interchange (I-94 Exit #152) is currently experiencing a high rate of development. New developments are either being built or are planned north and south of the freeway. The cumulative effect of these new developments will result in a significant increase in traffic generation. The I-94 Corridor Study coordinated closely with the concurrent North Mandan Subarea Study to assess these impacts. This dynamic pocket of growth is noteworthy and must be acknowledged as a significant increase in land use density with resulting traffic impacts to the Sunset interchange. The North Mandan Subarea Study documents in detail the land use impacts in this area and the subsequent transportation infrastructure needs that result (refer to its study documentation for more detail). Significant effort was put into reviewing potential access at Collins Avenue and I-94, and potential improvements west of Sunset Drive to provide access relief with new connections to or over/under I-94 at approximately 30th Avenue NW.

## **Best practices and recommended considerations**

The full Technical Memorandum #1 in Appendix A includes a discussion of best practices and recommended considerations for land use review. This discussion specifically covers the plan review process, the impacts of traffic noise on adjacent land uses, particularly those land uses adjacent to freeways, and other considerations for new development and redevelopment.

## **8. CULTURAL AND NATURAL RESOURCES**

Archaeological, cultural, and natural resources near the I-94 corridor and its accessible crossroads were identified through data provided by various resource agencies. Additional analysis and identification of sites will be completed as part of future environmental documentation beyond this study. This may include discovery of new sites that were not identified in any of the resources included as part of the I-94 Corridor Study documentation.

There are a number of resources located within the defined project study boundary; however, based on preliminary review of the data, there is no known potential for impacts within the project study area. This includes both environmental damage and impacts to archeological and Native American religious sites on lands held in trust by the Bureau of Indian Affairs, Great Plains Region. In addition, there are no known flood plain or wetland impacts anticipated within the project study area based on data received from the National Flood Hazard Layer [NFHL] database and the North Dakota State Water Commission.



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## 9. ENVIRONMENTAL JUSTICE

An environmental justice review was performed according to Title VI of the Civil Rights Act of 1964 and 1994's Executive Order 12898. In an effort to comply with Executive Order 12898, data from the 2007-2011 American Community Survey block group level and 2010 Census block level was used to identify the concentrations of low-income and minority populations along the I-94 corridor and its crossroads with direct access, respectively, in an effort to limit disproportionate impacts to these communities.

Based on a preliminary review, zero blocks fall within the race criteria to be considered a predominantly minority block near corridor areas that have the potential to be impacted by potential alternatives. Further, based on a preliminary review, the area north of I-94 between US 83 (State Street) and Centennial Road falls within these income criteria to be considered a predominantly low-income block group.

## 10. TRAFFIC OPERATIONS

I-94's Grant Marsh Bridge is one of only three river crossings in the Bismarck-Mandan area, with a convergence of traffic at existing system interchanges through this area. This convergence of traffic attempting to cross the river using this bridge is but one issue that has resulted in peak hour deficiencies at interchange intersections along the I-94 corridor.

A traffic operations analysis was conducted to determine how the I-94 corridor and intersecting north-south crossroads currently operate, to identify the future capacity, access, and safety needs, and to recommend potential improvements where necessary; existing and future year 2040 a.m. and p.m. peak hour conditions were reviewed.

17 miles of I-94 and 32 key intersections along crossroads were examined. Peak hour turning movement counts were collected at each of the key intersections during the week of October 23, 2012. In addition, 24-hour average daily traffic counts were collected on the State Street and Bismarck Expressway/Centennial Road interstate ramps during the same time period.

### Existing Conditions

#### FREEWAY OPERATIONS

Existing traffic operations for freeway facilities in the study area were evaluated using a CORSIM simulation model. The CORSIM model was prepared using existing intersection geometrics, traffic control, and traffic volumes collected in October 2012. Other adjustments and inputs to the model included vehicle fleet characteristics and corridor roadway grades.

Results from the existing operations model show no locations along the freeway system in the study area that have unacceptable levels of service. All segments were observed to operate at LOS B and above during the a.m. and p.m. peak hours under existing conditions.



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## CROSSROAD INTERSECTION OPERATIONS

A review of the existing conditions was completed to determine if any operational or geometric issues currently exist along the various north-south intersecting corridors. An operations analysis was conducted for the a.m. and p.m. peak hours at the key intersections to determine how traffic currently operates in the study area. Signalized intersections were analyzed using the Synchro/SimTraffic software, while unsignalized intersections were analyzed using a combination of Synchro/SimTraffic software and the HCM.

Results of the existing operations analysis indicate that all key intersections currently operate at an acceptable overall LOS C or better during the a.m. and p.m. peak hour, with existing traffic controls and geometric layout; except for the intersection of State Street/Divide Avenue during the p.m. peak hour. This intersection currently operates with an overall intersection LOS D (approaching capacity). There are a number of individual traffic movements at the various intersections that operate with a LOS D or worse (LOS E-F). Most of the traffic movements that operate with lower LOS are at side-street stop intersections, where the side-street delay in general is greater.

There were a number of queuing issues observed along the north-south corridors during the a.m. and p.m. peak hours. The queuing issues are characterized in three ways; queues between 250 – 300 feet are of concern and should be monitored; queues between 300 – 400 feet are approaching significance; queues greater than 400 feet are already significant.

## **Year 2040 Conditions**

Future area traffic growth is expected to impact the corridor operations. To determine the extent of the impacts and recommend potential improvements, as necessary, a future operations analysis was completed. The following information details the future operations of the corridor.

### TRAFFIC FORECASTS

#### BASE CONDITIONS

Existing traffic volumes were reviewed to establish the year 2012 baseline conditions throughout the study area. Data sources referenced in this process include North Dakota DOT traffic count maps, as well as turning movement and road tube counts collected by SRF.

#### YEAR 2040 NO BUILD

Year 2040 traffic forecasts were developed using results prepared by the Advanced Traffic Analysis Center (ATAC) for no build conditions. The year 2040 no build conditions equate to the existing plus committed future roadway network. The “committed” term refers to roadway improvements that are programmed in the Bismarck-Mandan MPO Transportation Improvement Program (TIP).

ATAC prepared daily model results utilizing the Bismarck-Mandan Metropolitan Planning Organization’s travel demand model. Daily model volumes were recorded and an adjustment and balancing process was applied to generate preliminary forecasts. The year 2040 freeway forecasts were verified using a traffic forecast reasonableness check process.



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## FREEWAY OPERATIONS

The CORSIM models developed for existing conditions were updated with year 2040 no build traffic volumes to evaluate future conditions. No other changes were made to the highway network characteristics. Due to the high traffic growth projected for year 2040, the model was not capable of simulating traffic conditions reasonably and no meaningful results were produced by the models.

The year 2040 traffic operations were therefore reevaluated by applying minor revisions to the highway network to ensure reasonable simulation results. The results of this evaluation continued to show congestion along some freeway segments in the study area under year 2040 no build conditions.

### A.M. PEAK HOUR

- I-94 eastbound experiences queues of approximately 3,000 feet upstream of Bismarck Expressway/ Centennial Drive due to backups from the eastbound ramp intersection (area operates with a LOS D)

### P.M. PEAK HOUR

- I-94 eastbound experiences occasional queues upstream of the State Street exit due to backups from the eastbound ramp intersection (area operates with a LOS C).
- I-94 eastbound experiences queues of approximately 9,000 feet upstream of Centennial Drive/Bismarck Expressway due to backups from the eastbound ramp intersection (area operates with a LOS F)
- Highway 810 (I-194) northbound experiences congestion due to the lane drop from two lanes to one lane upstream of the entrance to I-94 westbound (area operates with a LOS F)

## CROSSROAD INTERSECTION OPERATIONS

Results of this year 2040 no build improved operations analysis indicate that numerous key intersections will operate with an unacceptable overall LOS E/F during the a.m. and p.m. peak hour. Many others will operate with a LOS that is approaching capacity, or LOS D; while some will operate acceptably with LOS A-C. As can be expected many of the individual traffic movements operate poorly with lower LOS. The queues observed under existing conditions degrade further. These queues now impact adjacent intersections resulting in additional congestion and system failure.



## Chapter C: Purpose and Need Statement

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**This chapter summarizes the detailed process and findings contained in Technical Memorandum #2: Purpose and Need Statement (included as Appendix B). The reader should refer to the Technical Memorandum for additional explanation and detail, when necessary.**

The preparation of a Purpose and Need Statement (PNS) is an essential step in defining a potential project and providing guidance for future analysis. Defining the scope and depth of the issues and the reasons for a project provides a focus to guide stakeholders, officials and the public in sorting through various alternatives. The PNS can also help build consensus among various stakeholder groups, business people, landowners, modal interests, each of which are likely to view the corridor from a different perspective. Finally, the PNS can help select a recommended alternative(s) for more detailed analysis in a future environmental document.

### **1. PURPOSE OF THE PROPOSED PROJECT**

The purpose of the proposed project(s) is to address current and future transportation issues identified within the study boundaries along I-94 and its accessible crossroads. Such issues may pertain to system deficiencies (traffic operations-vehicle delay, traffic operations-intersection-queues, roadway design), safety (access and crash), capacity constraints (deficient roadway geometry and right-of-way (ROW)), and system linkage (north-south system connectivity and mobility). Improvements should operate to provide Bismarck and Mandan with a safe and efficient transportation system that can serve them today and into the year 2040 horizon.

### **2. NEED FOR THE PROJECT**

The need for the transportation improvements and the relationship to regional transportation need is based on the analyses completed as part of this study. The Project Steering Committee (PSC) has reviewed the needs assessment analyses and determined sufficient need was identified to justify continuation of this corridor study process and warrants development of future system improvement concepts.

It was determined that future corridor planning and improvements should address the following critical needs and considerations:

- 1. System deficiencies**
- 2. Safety**
- 3. Capacity/mobility**
- 4. System linkage**



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5. Modal relationships
6. *Social or economic goals*
7. *Other environmental factors*

Those identified with bold text indicate primary needs; others identified are considered secondary supporting needs (i.e., opportunities for other system improvements within the project study area that may be able to be addressed, if feasible, concurrent with addressing the primary needs). Additional important considerations are identified in italics. The long-term transportation needs are summarized in the matrices included in the full Technical Memorandum #2 included in Appendix B.



## Chapter D: Alternatives Development, Evaluations, and Options to Carry Forward

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**This chapter summarizes the detailed analysis and findings contained in Technical Memorandum #3: Alternatives Development, Evaluation, and Options to Carry Forward (included as Appendix C). The reader should refer to the Technical Memorandum for additional explanation and detail, when necessary.**

The purpose of this study is to identify, evaluate, and recommend future I-94 interchange and corridor alternatives to carry forward for further analysis in future environmental documentation. To accomplish this task, the study's goals, objects, and purpose and need statement were considered when developing the initial alternatives. In order to satisfy the project's goal of providing a safe and efficient transportation system, a range of conceptual alternatives were developed that serve Bismarck, Mandan, Burleigh, and Morton Counties and NDDOT through the year 2040 planning horizon.

### **1. ALTERNATIVE DEVELOPMENT PROCESS**

The development process was multifaceted using a range of inputs, including technical data, public comments, the purpose and need statement, and direction from the Project Steering Committee (PSC). The study team then facilitated a PSC meeting at which the committee members discussed initial corridor alternatives for I-94 and its crossroads. This meeting was a brainstorming session meant to consider virtually all potential options.

The preliminary alternatives were no more than line drawings on an aerial map, or figurative concepts of interchange alternatives that could be applied at the respective locations being discussed. Further concept development did not occur until later stages of the process.

### **2. STAGE 1 PRELIMINARY SCREENING**

Based on the study process, alternatives reviewed and developed in coordination with project stakeholders were identified to achieve acceptable operations within the functional interchange area. These alternatives were identified addressing issues related to system deficiencies, safety, capacity constraints, system connectivity, and regional mobility.

To further develop and evaluate the alternatives for each of the seven identified locations along the I-94 corridor, a preliminary screening evaluation was conducted. High-level evaluation criteria were considered for each alternative at this preliminary stage. These criteria focused the screening process efforts in order to identify satisfactory alternatives to be analyzed further in the Purpose and Need Evaluation.



# FINAL

## Evaluation Criteria

The preliminary screening of each alternative considered evaluation criteria from the following perspectives:

1. Social: Evaluates the impacts and benefits related to surrounding landowners, right-of-way acquisitions, access, and movements throughout the corridor.
2. Environmental: Considers impacts on the potential consequences associated with the physical and/or social environment.
3. Engineering: Focuses on the feasibility of each alternative as it relates to the design and construction.

## Screening Process

The qualitative preliminary screening process evaluated and organized alternatives into three categories:

1. Eliminate the alternative from consideration.
2. Maintain the alternative for further evaluation in this study.
3. Carry the alternative forward to a more detailed environmental review evaluation.

## Alternatives Evaluated

A preliminary evaluation matrix was created to show the comprehensive set of alternatives evaluated against each evaluation criteria in order to formulate recommendations. The evaluation matrix and preliminary alternative concept line drawings are included in the full Technical Memorandum #3 included in Appendix C.

## 3. STAGE 2 FORMAL EVALUATION

### Concept Evaluation Guidelines and Criteria

The foundation for the concept evaluation was the purpose and need statement. Evaluation factors were developed based on these guiding principles (i.e., System Deficiencies, Safety, Capacity Mobility, Modal Relationships, and System Linkage). The formal evaluation matrix shows the direct relationship between the purpose and need factors and the measurable criteria used to evaluate the concepts. In addition, other non-purpose and need related factors (Other Environmental Factors) were established by the PSC to be used in the evaluation process. The evaluation criteria included a number of factors from the following categories:

- System Deficiencies
- Safety
- System Linkage
- Modal Relationships
- Social or Economic Goals
- Other Environmental Factors



# FINAL

## Concept Evaluation Scoring

The concepts were evaluated based on a quantitative estimate of each alternative's ability to address the evaluation factors. Each concept was assigned a rating relative to its ability to meet the criteria. The rating system was as follows:

5	Good; meets criteria well
4	Acceptable; but relatively less desirable than 5
3	Neutral; marginally meets criteria
2	Less desirable; considers criteria
1	Poor; fails to meet criteria

The ranking and reasoning for each score is presented in a detailed evaluation matrix included in the full Technical Memorandum #3 included in Appendix C.

## 4. ALTERNATIVES TO BE CARRIED FORWARD

As part of the evaluation process, alternatives were identified in each of the seven locations on the I-94 corridor to be compared against the no build alternative in a future environmental documentation stage of the project development process. The discussion of whether or not the no build alternative met the project's purpose and need was merely meant to serve as the beginning of the framework used to support the need for improvements in the corridor. Furthermore, where multiple alternatives were considered, the PSC selected a singular alternative that it felt best fit the needs of that location. While others may be carried forward for consideration during the future environmental stage of the project, this singular alternative is the initial recommendation of the guiding committee of this study. During a future environmental stage, the alternatives that were not eliminated in this evaluation process will be compared to the no build alternative. Moving forward from the evaluation process the north-south crossroad improvements, without direct functional impacts, will also be re-incorporated into the selected build alternative for each segment and evaluated as a composite build alternative in the next stage of the project development process.

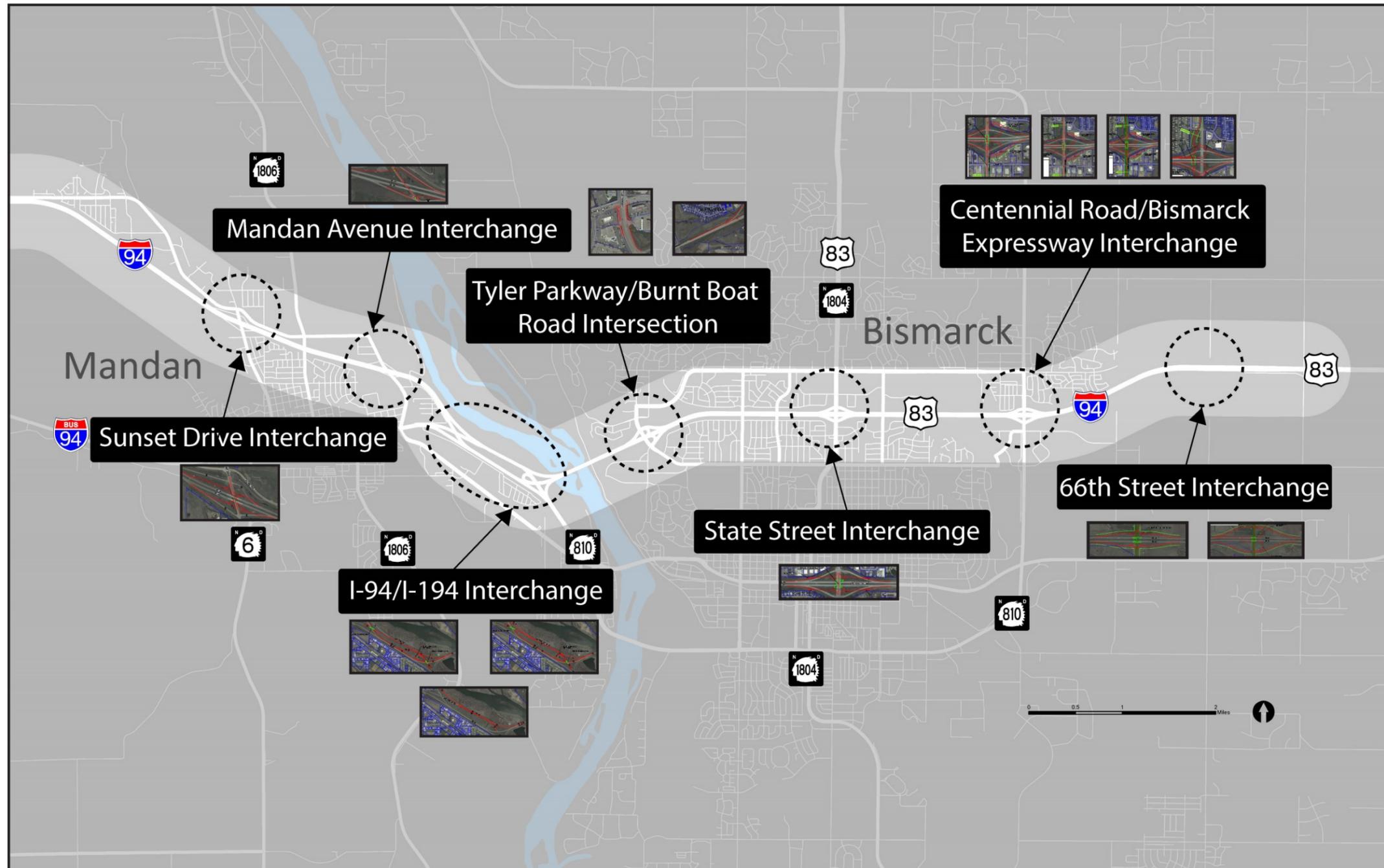
A number of alternatives for the I-94 corridor are recommended, including recommendations for the following locations:

- Sunset Drive Interchange
- Mandan Avenue Interchange
- I-94 / I-194 Interchange
- Tyler Parkway / Burnt Boat Road
- State Street Interchange Area
- Centennial Road / Bismarck Expressway Interchange / I-94 Interchange
- 66th Street Interchange

The figure on the following page provides an overview of the corridor concepts for each location.



**194 CORRIDOR CONCEPTS OVERVIEW**



# FINAL

There are a number of other improvements that were identified as well that will improve operations along the I-94 corridor; however, these improvements are not significant reconstruction improvements but rather corridor deficiencies that were identified based on our review. These improvements are included due to the low cost/high benefit they provide the I-94 corridor. They are as follows:

- Partial reconstruction of the westbound I-94 entrance ramp at Tyler Parkway and lengthen the loop acceleration lane (note this improvement is more significant; a refined concept drawing is included for this improvement – Concept H in Appendix D)
- Restripe the tapers for the eastbound I-94 entrance ramp and exit loop at Tyler Parkway
- Restripe the westbound I-94 entrance ramp taper at State Street
- Restripe the westbound I-94 entrance ramp taper at Sunset Drive
- Restripe the westbound I-94 entrance ramp taper at Mandan Avenue



## Chapter E: Implementation Plan

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**This chapter summarizes the detailed analysis and findings contained in Technical Memorandum #4: Implementation Plan (included as Appendix D). The reader should refer to the Technical Memorandum for additional explanation and detail, when necessary.**

The purpose of the implementation plan is to provide a clear systematic blueprint that outlines the vision of the I-94 Corridor Study over time with a series of projects. This plan coordinates not only improvements that were identified based upon safety or operational need as part of this study, but also scheduled NDDOT (STIP 2014-2017) and MPO (TIP 2014-2017) infrastructure investments and projects identified in the MPO's long-range transportation plan. The implementation plan was developed with consideration of the following key components:

- When the operational improvement is needed based on traffic analysis and future forecasted traffic volumes (years 2025 and 2040)
- Minimizing impacts to the traveling public by avoiding multi-year impacts to the same roadway and providing additional capacity to parallel corridors
- Reducing overall investment dollars by combining infrastructure replacement/maintenance with improvement projects

The first step in the process was developing a list of projects, including currently programmed improvements as well as projects identified as part of the I-94 Corridor study and potential projects identified in the 2035 LRTP. These projects were then broken up into three phases in order to meet the criteria listed above.

### **1. PROJECTS FOR IMPLEMENTATION**

#### **Programmed Projects (TIP and STIP)**

Planned and programmed improvements along and near the I-94 corridor are currently scheduled for the years 2014 through 2017. These projects were identified from NDDOT's STIP project list and the MPO's TIP project list. The current NDDOT STIP and MPO TIP extend through the year 2017 and it is assumed that further construction of the improvements identified through the I-94 Corridor Study will take place at that time. Therefore, the identified improvements are assumed to be in place when remaining elements of the I-94 Corridor Study are implemented.



# FINAL

## **I-94 Study Projects**

Based on the study process and evaluation, projects were identified to address issues related to system deficiencies, safety, capacity constraints, system connectivity, and regional mobility. Projects were developed in order to satisfy the project's goal of providing a safe and efficient transportation system that serves Bismarck and Mandan through the year 2040 planning horizon. These projects were reviewed and developed in coordination with project stakeholders and shared with the public as a part of the study's public involvement process.

## **Potential LRTP Projects (2010-2035)**

The last component of the project identification process for the implementation plan was to review and incorporate projects identified as part of the MPO's 2010 Long-Range Transportation Plan. A subset of the LRTP's projects was included as part of the implementation plan, due to their location and potential construction impacts to the previously identified projects. In addition to summarizing projects from the LRTP that are associated with the I-94 corridor, localized improvements were identified to reduce congestion and improve safety. This subset of improvements identified supporting local system improvements that are needed to accommodate the proposed interchange at I-94 and 66th Street.

## **2. PROJECT SEQUENCING**

Recognizing that projects will be implemented in phases as a part of the implementation plan, a series of smaller stages were nested within each phase to further refine the sequencing of projects through the year 2040 planning horizon. The result is a series of eleven stages (A-K) spread throughout the three phases. The three phases are Phase 1 (2014-2017), Phase 2 (2018-2025), and Phase 3 (2026-2040). The figures on the following pages provide an overview of the project identification, phasing, and subsequent staging recommendations made as part of the I-94 Corridor Study.

## **3. ADDITIONAL CONSIDERATIONS**

The project sequencing process identified how projects will be implemented in phases as part of the implementation plan using a series of smaller stages. However, some projects may take multiple years to construct, starting in one stage and ending in another.

Projects developed and sequenced as part of the implementation plan did not consider the fiscal constraints that may limit the implementation of the identified projects. Fiscal constraints may influence how quickly projects can be constructed and limit the time and scope of each project.

This plan accounts for projects near the I-94 corridor and does not include other preservation, operational or safety needs. The need for other projects within the Bismarck and Mandan area may influence available funds for the projects identified as part of the implementation plan.

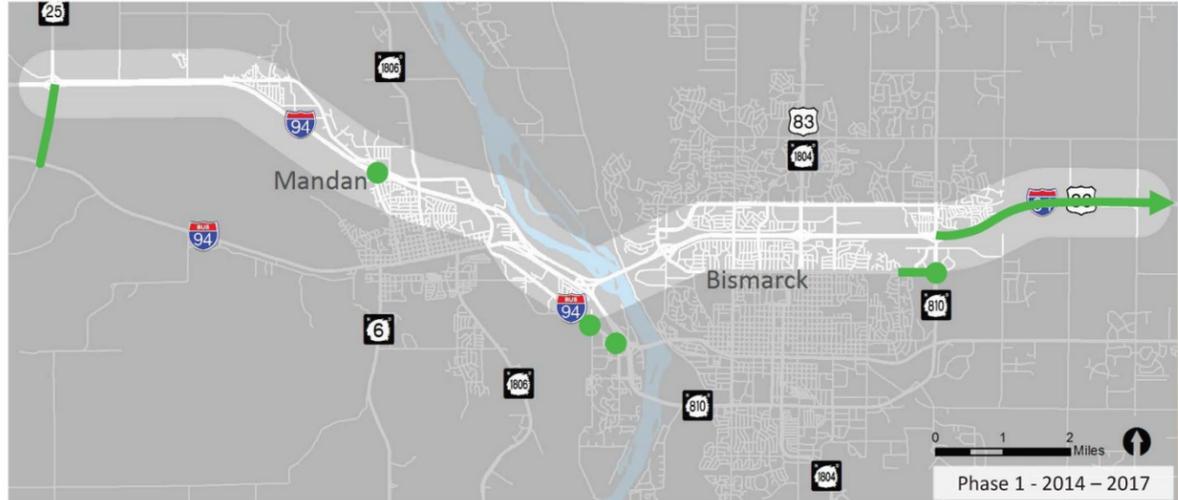


**194 CORRIDOR IMPLEMENTATION PHASE 1 (2014-2017)**



**STAGE A**

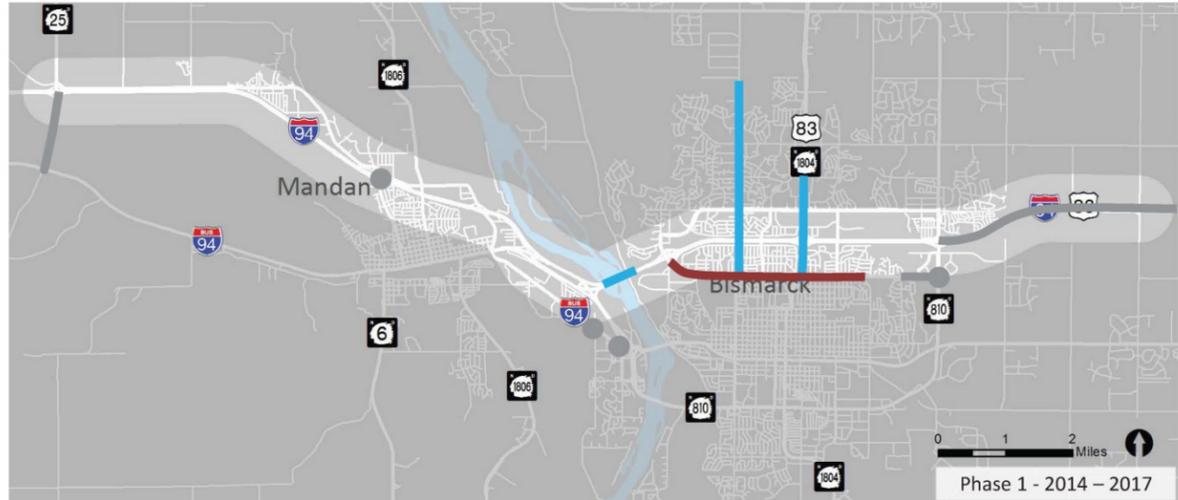
- 2014 STIP/TIP Projects Only**
- Eastbound and westbound I-94 mill and overlay from Bismarck Expressway/Centennial Road to north of Sterling (2014 STIP/TIP)
  - Addition of a turn lane at the I-94/Sunset Drive interchange (2014 STIP/TIP)
  - Business I-94 reconstruction from I-94 to Old Highway 10 (2014 STIP/TIP)
  - Divide Avenue reconstruction from Volk Drive to Bismarck Expressway (2014 STIP/TIP)
  - Addition of a southbound right-turn lane at Divide Avenue and Bismarck Expressway (2014 STIP/TIP)
  - Installation of traffic signals at the intersections of Memorial Highway/40th Avenue and Memorial Highway/46th Avenue (these two projects may occur in 2015) (2014 STIP/TIP)



**STAGE B**

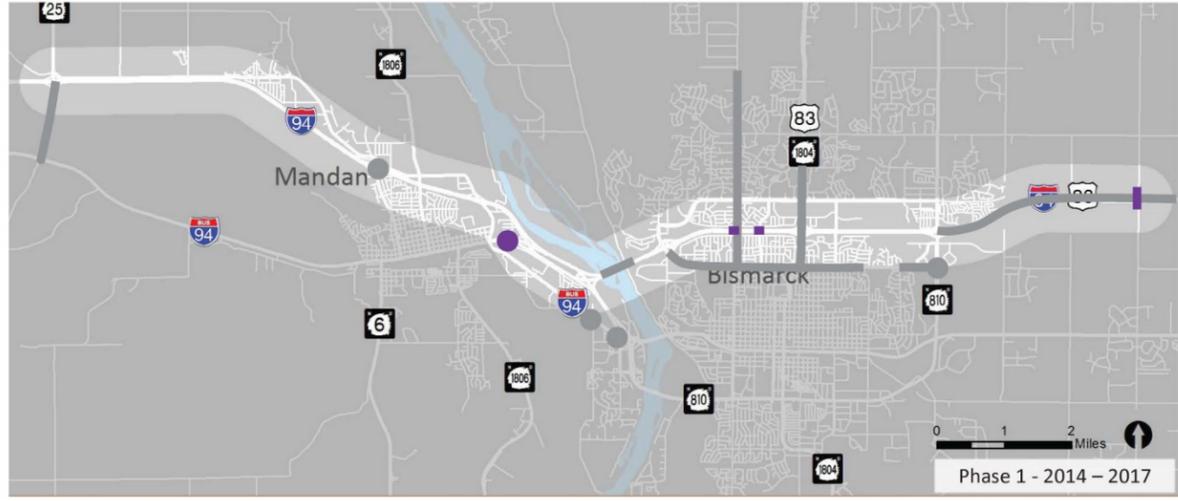
- 2015 STIP/TIP Projects**
- Addition of turn lanes on State Street from Divide Avenue to Calgary Avenue (2015 STIP/TIP)
  - Reconstruct Washington Street to a five-lane section from Divide Avenue to 57th Avenue (2015 STIP/TIP)
  - Repair and paint the I-94 Bridge over the Missouri River (2015 STIP/TIP)

- Potential LRTP Project**
- Restripe Divide Avenue to a three-lane roadway from I-94 to 26th Street (LRTP)



**STAGE C**

- 2016 STIP/TIP Projects Only**
- Replace the eastbound and westbound I-94 bridge decks over Washington Street and 4th Street (2016 STIP/TIP)
  - Traffic signal improvement at the intersection of Main Street and Twin City Drive (2016 STIP/TIP)
  - Replace the 80th Street Bridge over I-94 (2016 STIP/TIP)



**STAGE D**

- 2017 Projects**
- Eastbound and westbound I-94 concrete pavement repair and structural overlay from the Missouri River Bridge and Bismarck Expressway/Centennial Road (2017 STIP/TIP)

- I-94 Study Projects**
- Partial reconstruction of the westbound I-94 entrance ramp at Tyler Parkway and lengthen the loop acceleration lane (I-94 Study)
  - Restripe the tapers for the eastbound I-94 entrance ramp and exit loop at Tyler Parkway (I-94 Study)
  - Restripe the westbound I-94 entrance ramp taper at State Street (I-94 Study)



**194 CORRIDOR IMPLEMENTATION PHASE 2 (2018-2025)**



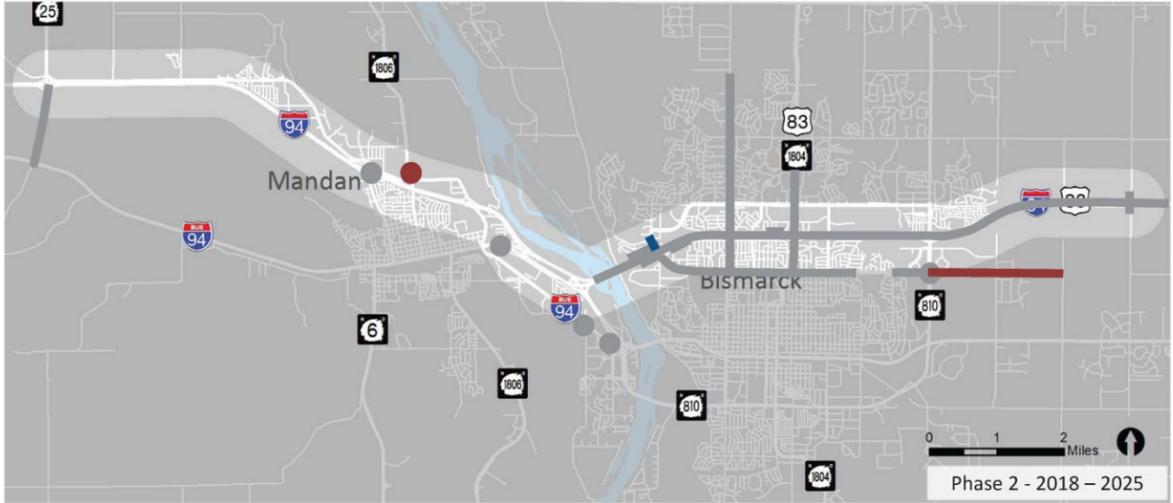
**STAGE E**

**I-94 Study Projects**

- Turn lane improvements at the intersection of Tyler Parkway and Burnt Boat Road (I-94 Study)

**Potential LRTP Projects**

- Improve and signalize the intersection of Collins Avenue/Old Red Trail (LRTP)
- Extend and improve East Divide Avenue from Bismarck Expressway to 66th Street (LRTP)



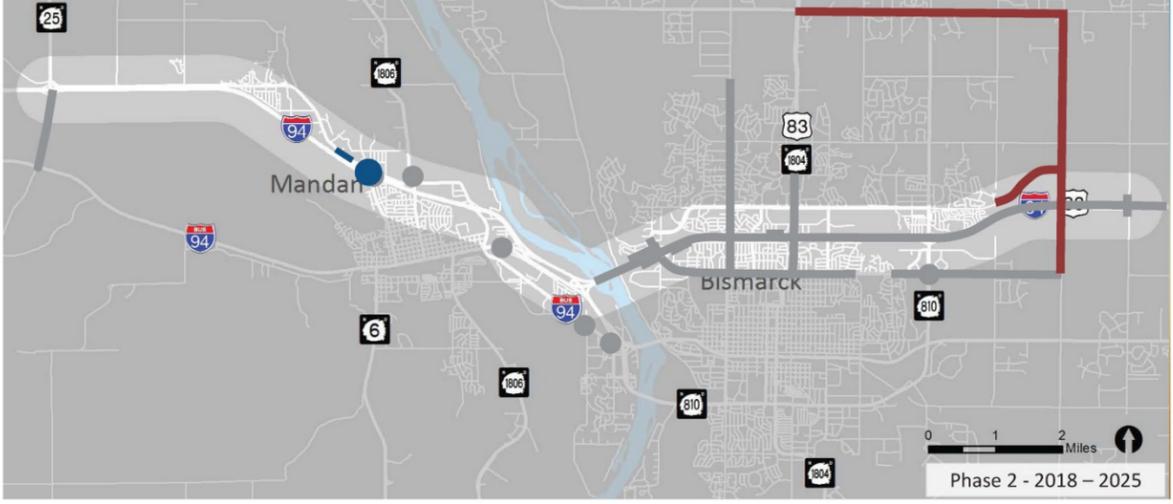
**STAGE F**

**I-94 Study Projects**

- Reconstruct the I-94 and Sunset Drive interchange (I-94 Study)
- Restripe the westbound I-94 entrance ramp taper at Sunset Drive (I-94 Study)

**Potential LRTP Projects**

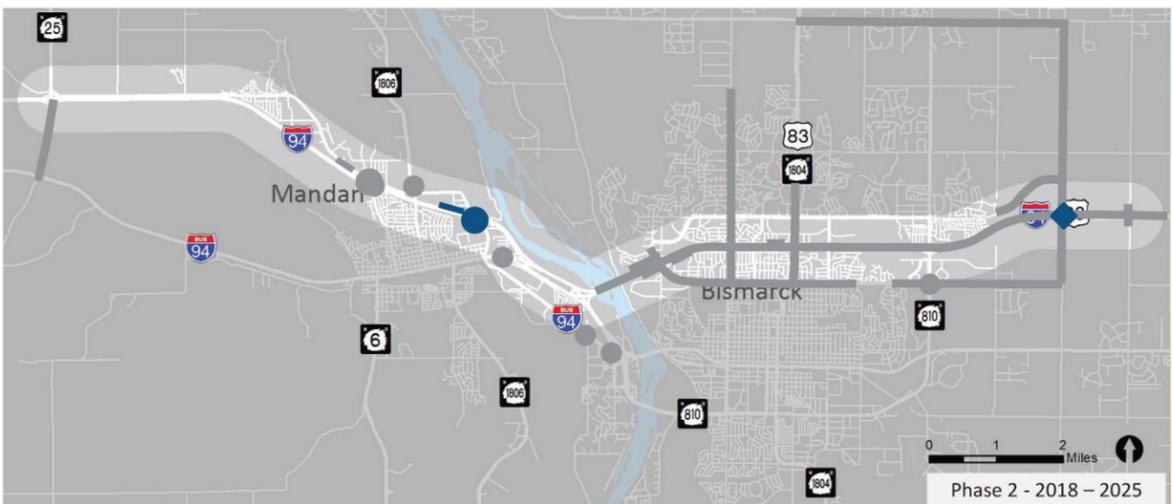
- Construct 66th Street from East Divide Avenue to 71st Street (LRTP)
- Extend Century Avenue to 66th Street (LRTP)
- Reconstruct and widen 71st Avenue from Highway 1804 to 66th Street (LRTP)



**STAGE G**

**I-94 Study Projects**

- Reconstruct the I-94 and Mandan Avenue interchange (I-94 Study)
- Restripe the westbound I-94 entrance ramp taper at Mandan Avenue (I-94 Study)
- Construct a new interchange at I-94 and 66th Street (I-94 Study)



**194 CORRIDOR IMPLEMENTATION PHASE 3 (2026-2040)**



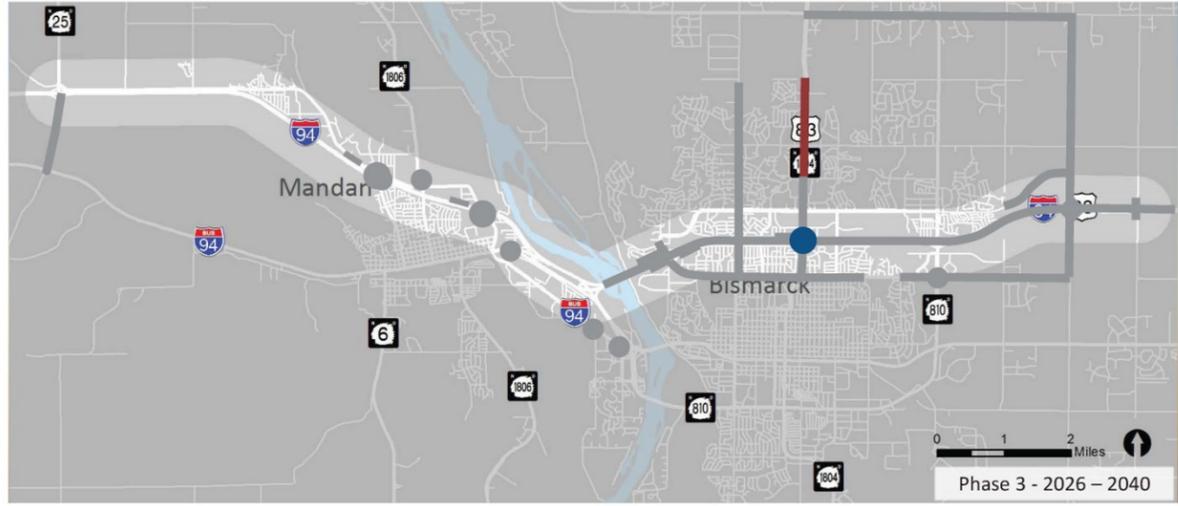
**STAGE H**

**I-94 Study Projects**

- Reconstruct the interchange at I-94 and State Street (I-94 Study)

**Potential LRTP Projects**

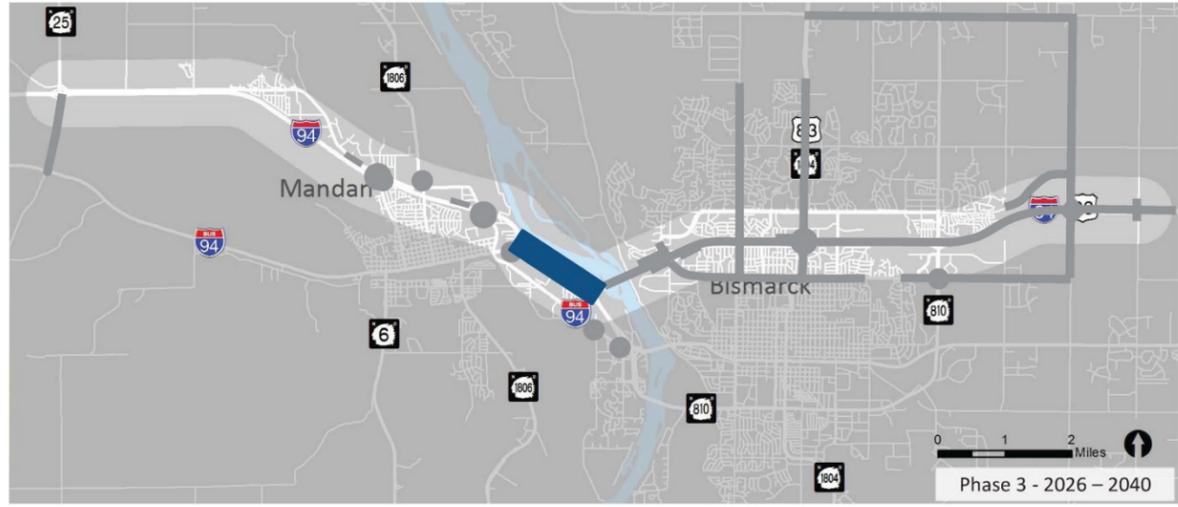
- Reconstruct and widen State Street from Calgary Avenue to 57th Avenue (LRTP)



**STAGE I**

**I-94 Study Projects**

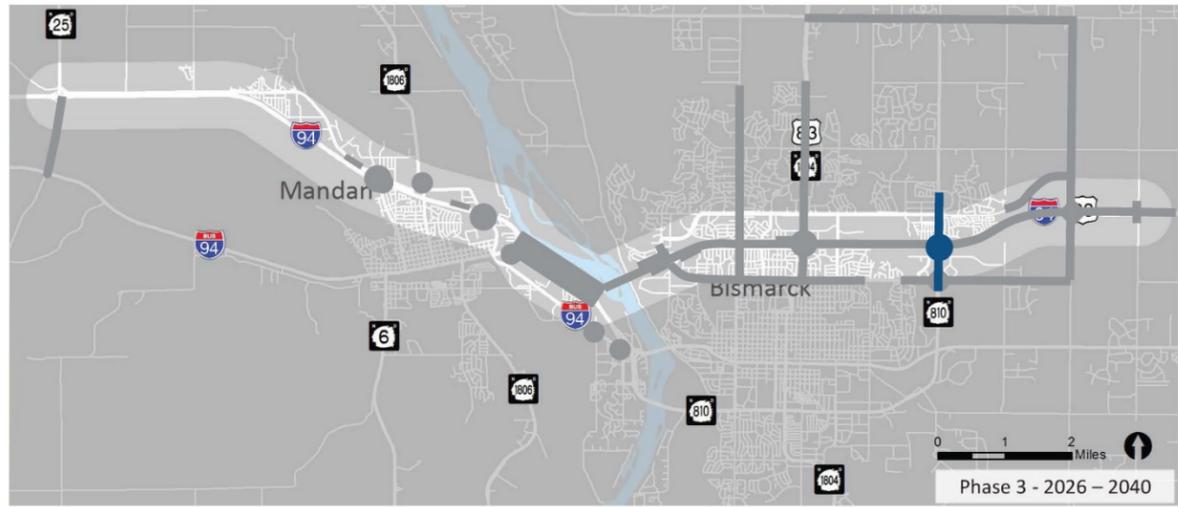
- Reconstruct I-94 between Main Street and I-194 (I-94 Study)



**STAGE J**

**I-94 Study Projects**

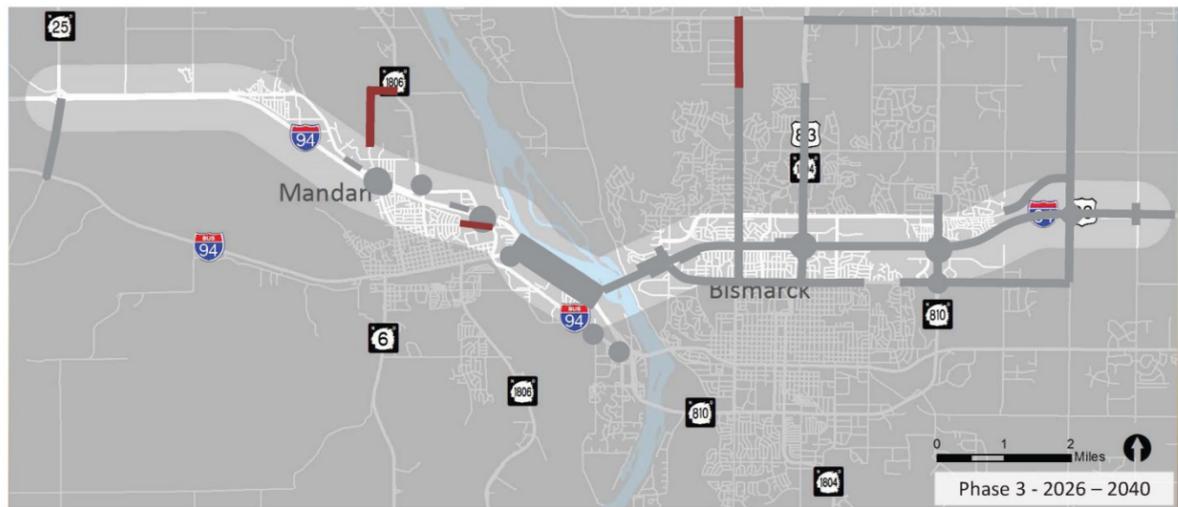
- Reconstruct the I-94 and Bismarck Expressway/Centennial Road interchange (I-94 Study)
- Reconstruct Bismarck Expressway/Centennial Road from Divide Avenue to Jericho Road (I-94 Study)



**STAGE K**

**Potential LRTP Projects**

- Extend Sunset Drive to Highway 1806 (LRTP)
- Widen Washington Street to a three-lane section from 57th Avenue to 71st Avenue (LRTP)
- Extend Division Street to Mandan Avenue (LRTP)



# FINAL

## 4. PROJECT COSTS

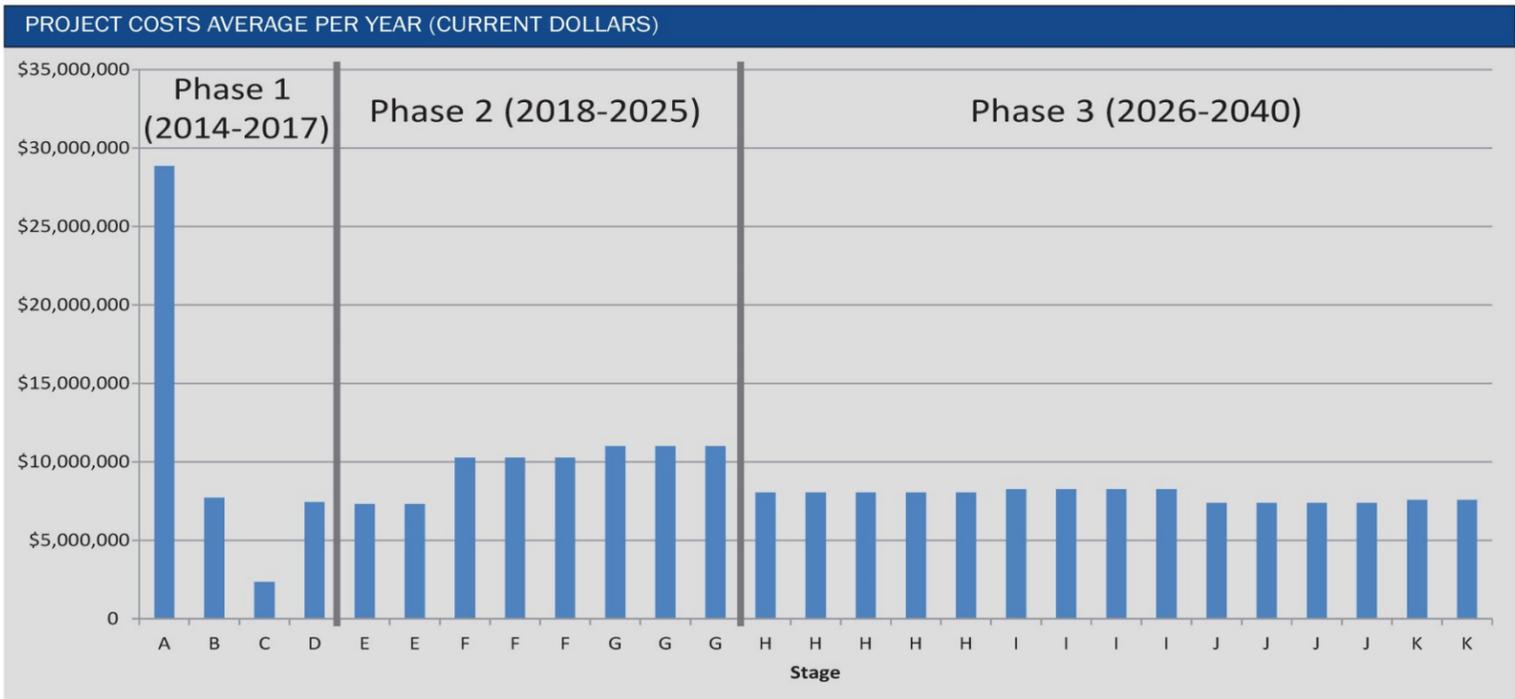
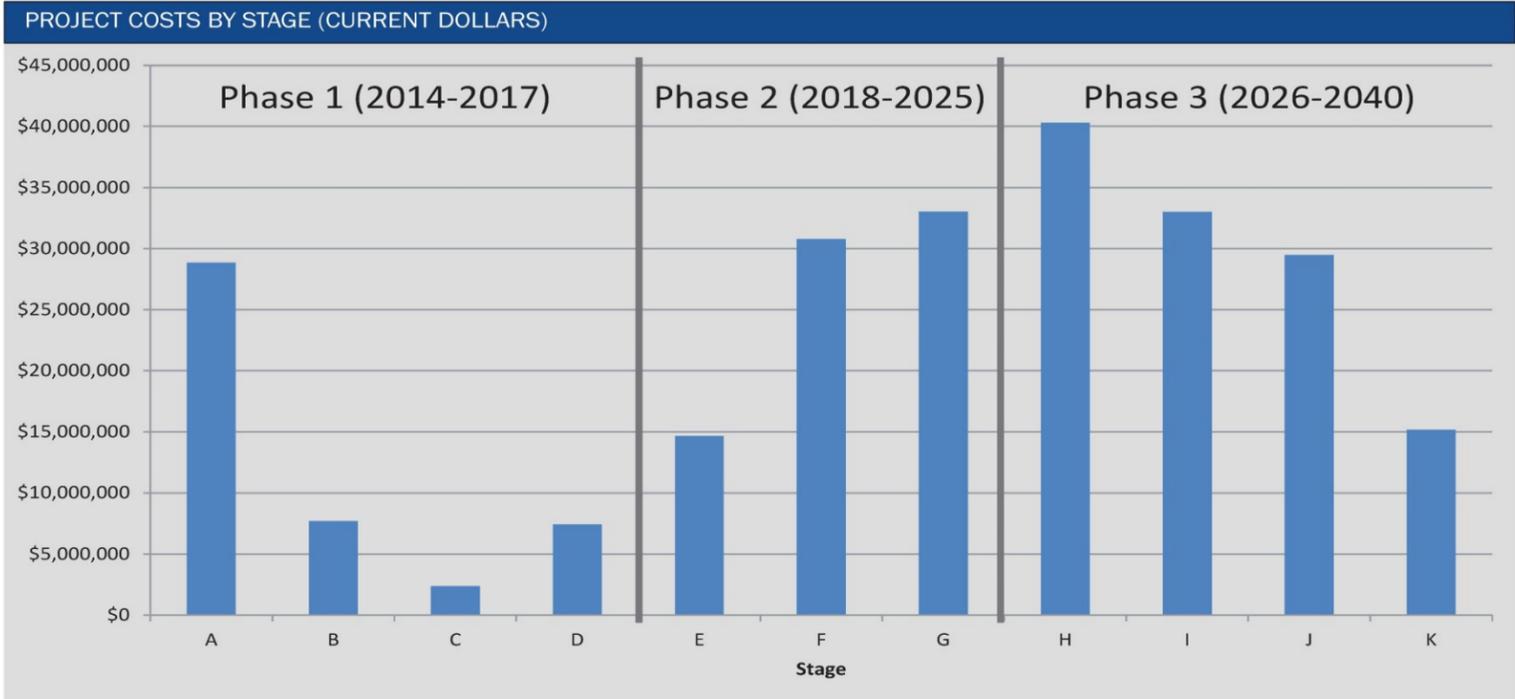
Project costs for the identified roadway improvements were developed in order to assess the investments needed to provide a safe and efficient transportation system that serves Bismarck and Mandan through the year 2040 planning horizon. Developing project costs for the study's implementation plan helps guide future corridor investments that meet the project's goals and are within the fiscal constraints of the MPO.

The total cost to implement the improvements identified as part of this plan was estimated at \$243 million dollars (2013 costs). Costs for each individual project were compiled from the NDDOT STIP, MPO TIP, and the MPO's LRTP (factored from 2009 to 2013). Costs for projects developed specifically from this plan were developed using planning-level construction cost estimates.

The figure on the following page illustrates the anticipated investments needed for each stage of construction, while also illustrating the potential annual expenditures needed to complete the implementation plan.



**194 IMPLEMENTATION PLAN COST SUMMARY** 



# Chapter F: Stakeholder and Public Involvement

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As part of the I-94 Corridor Study, the stakeholder and public involvement effort helped promote effective decision-making by fostering a cooperative spirit among local, metropolitan, and state partners, as well as review agencies and key stakeholders. Some of the key public involvement activities included:

1. Project Steering Committee (PSC) meetings
2. Public input meetings
3. Project website
4. Project Facebook page
5. Presentations
  - o NDDOT Management
  - o City and County Commissions
6. Early environmental coordination

## 1. PROJECT STEERING COMMITTEE (PSC) MEETINGS

The PSC was composed of technical staff from the varying local stakeholders comprised of Bismarck, Mandan, Burleigh County, Morton County, FHWA, and the NDDOT. The PSC met nine times during the study process to provide input and help guide the study process. Members of the PSC include:

Steve Saunders	Bis-Man MPO	Mike Aubol	Morton County
Rachel Drewlow	Bis-Man MPO	Daniel Nairn	Morton County
Michael Johnson	NDDOT	Marcus Hall	Burleigh County
Kevin Levi	NDDOT	Mark Berg	City of Bismarck
Shawn Kuntz	NDDOT	Kim Fettig	City of Mandan
Chad Orn	NDDOT	Justin Froseth	City of Mandan
Chris Holzer	NDDOT	Bob Decker	City of Mandan
Ben Ehreth	NDDOT (Formerly Bis-Man MPO)	Stephanie Hickman	FHWA
Kyle Kirchmeier	North Dakota Highway Patrol	Gary Goff	FHWA



# FINAL

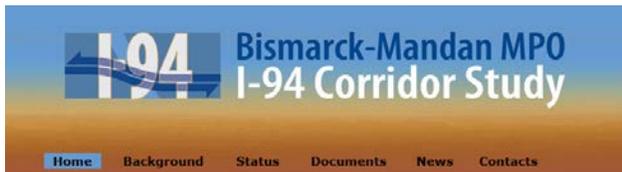
## 2. PUBLIC INPUT MEETINGS

The project team held three public input meetings to inform the general public about the study process, gather input on needed corridor improvements, and to review the study's findings. Meeting announcements were distributed through a variety of channels, including the Bismarck Tribune, Mandan News, Bismarck-Mandan MPO web postings, the project website, and the project Facebook page. A newsletter was sent out to abutting businesses along the north-south crossroads as part of the third public input meeting. The newsletter was a targeted effort to engage the businesses in these areas.

Comment cards were available at the public input meetings. In addition, participants were encouraged to contact the Bismarck-Mandan MPO with any questions or input related to the study. Comments obtained from the public input meetings can be found in Appendix E.

## 3. PROJECT WEBSITE AND FACEBOOK PAGES

The project website and Facebook pages were ways to publicize public input meetings and provide an on-demand depository of project information. The Facebook page was intended to engage the public and project stakeholders in an innovative manner, relative to traditional methods. Public meeting handouts, project deliverables, and other pertinent information were also posted on the project website for stakeholders to access at any time during the study process.



Welcome to the I-94 Corridor Study website. The goal of this study is to identify and address current and future transportation issues along approximately 17 miles of I-94 from ND Highway 25 in Mandan to 80th St NE in Bismarck and its crossing roadways. The I-94 Corridor Study came about due to increasing traffic volumes along this stretch of roadway. At the end of the study in August 2014, the study team will provide recommendations for improvements to I-94 and its interchanges/cross streets.

Your input is important to the success of this study. There will be three public open houses, the last of which is scheduled for June of 2014, and a meeting to adopt the study in late 2014. The exact dates and times of the meetings will be posted on this website and the project Facebook page. Check back to this website often to receive project updates and "like" our Facebook page to keep up to date with project happenings. We look forward to hearing your ideas regarding the long-term future of the I-94 corridor.

*Screenshot of Project Website*



*Screenshot of Project Facebook Page*

## 4. PRESENTATIONS

The Study Team presented the project to NDDOT Management in Bismarck to gather input and buy-in on the process and findings. Feedback from this meeting was incorporated into the study process prior to the implementation plan phase.

Further, the project was presented to the respective City and County Commissions for approval of the final project documentation.



# FINAL

## **5. EARLY ENVIRONMENTAL COORDINATION**

The study team initiated early environmental coordination with local, state, and federal agencies regarding the corridor study. A letter requesting agency review of the project was mailed to 64 local, state, and federal agencies in February 2013 and March 2014. This letter follows the format provided by NDDOT that is typically used as part of their environmental process. This effort was completed to inform the respective agencies regarding the preliminary corridor alternative evaluation process, especially in terms of the assessment of potential environmental impacts. Agency responses received were considered in the alternative evaluation process. The agency responses received from this coordination effort inform future agency coordination and environmental documentation that will be undertaken during future steps of the project development process. The Bismarck-Mandan MPO retains copies of the agency responses received, which are available for public review.



FINAL

# Appendix A – Technical Memorandum #1: Corridor Needs Assessment

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**FINAL REPORT**



# Bismarck-Mandan MPO I-94 Corridor Study



## Technical Memorandum #1 Corridor Needs Assessment

*FINAL*

**Prepared by:**

**Bismarck-Mandan Metropolitan Planning Organization**

**In Association with:**



**and Project Partners:**

**City of Bismarck, City of Mandan, Burleigh County, Morton County, NDDOT, and FHWA**

April 2013

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# FINAL

## Corridor Needs Assessment

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This needs assessment is a comprehensive analysis of the existing and forecasted conditions along the I-94 corridor from North Dakota (ND) Highway 25 in Mandan to 80th Street NE in Bismarck and each of the intersecting access roadways between these two end points. The assessment draws upon data collected along the corridor, review of existing planning documents, input received from the Project Steering Committee (PSC), and forecast traffic conditions. The following areas are analyzed in this assessment:

1. Corridor Access
2. Vehicle Crashes
3. Bicycle and Pedestrian Facilities and Gaps
4. Existing Truck and Transit Routes
5. Existing Corridor Geometry
6. Pavements, Bridges, Utilities
7. Land Use Review/Refinement/Best Practices
8. Cultural and Natural Resources
9. Environmental Justice
10. Traffic Operations

### 1. CORRIDOR ACCESS

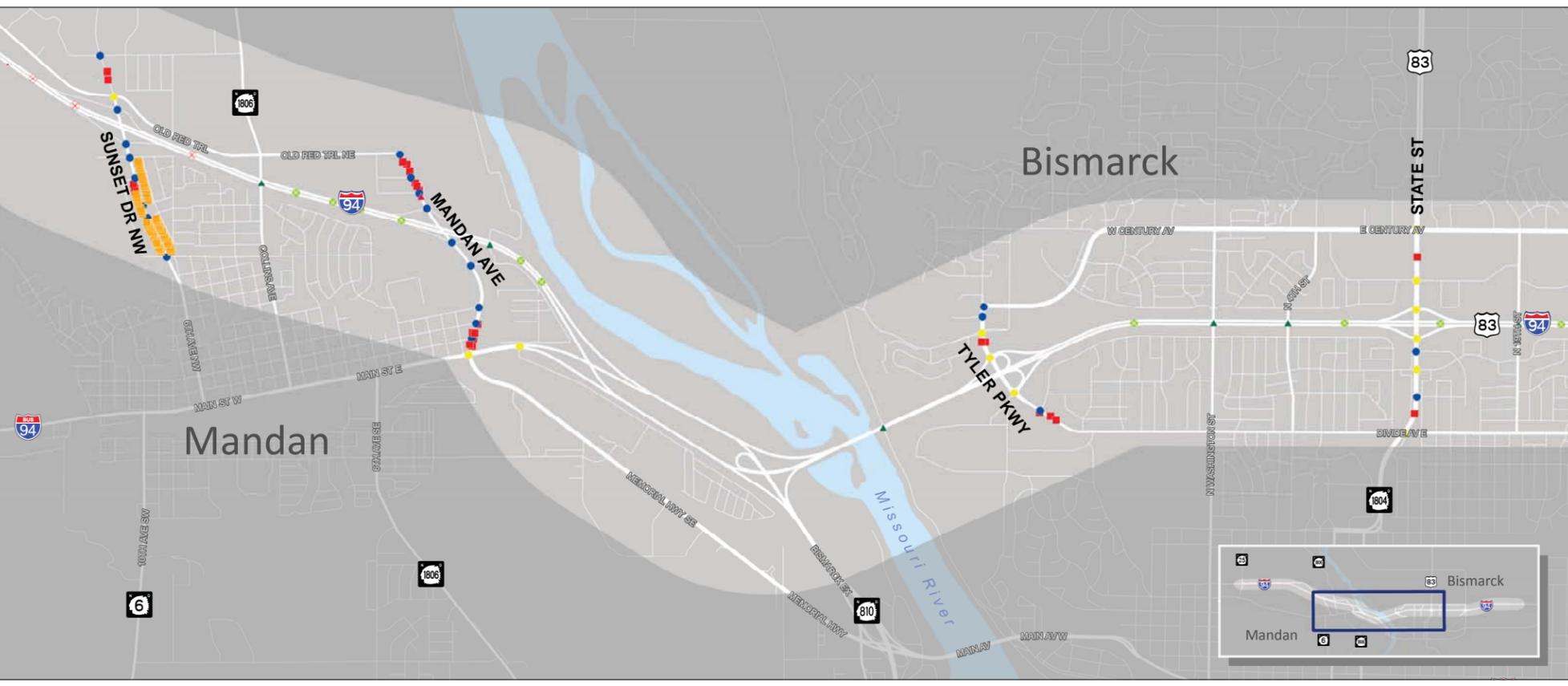
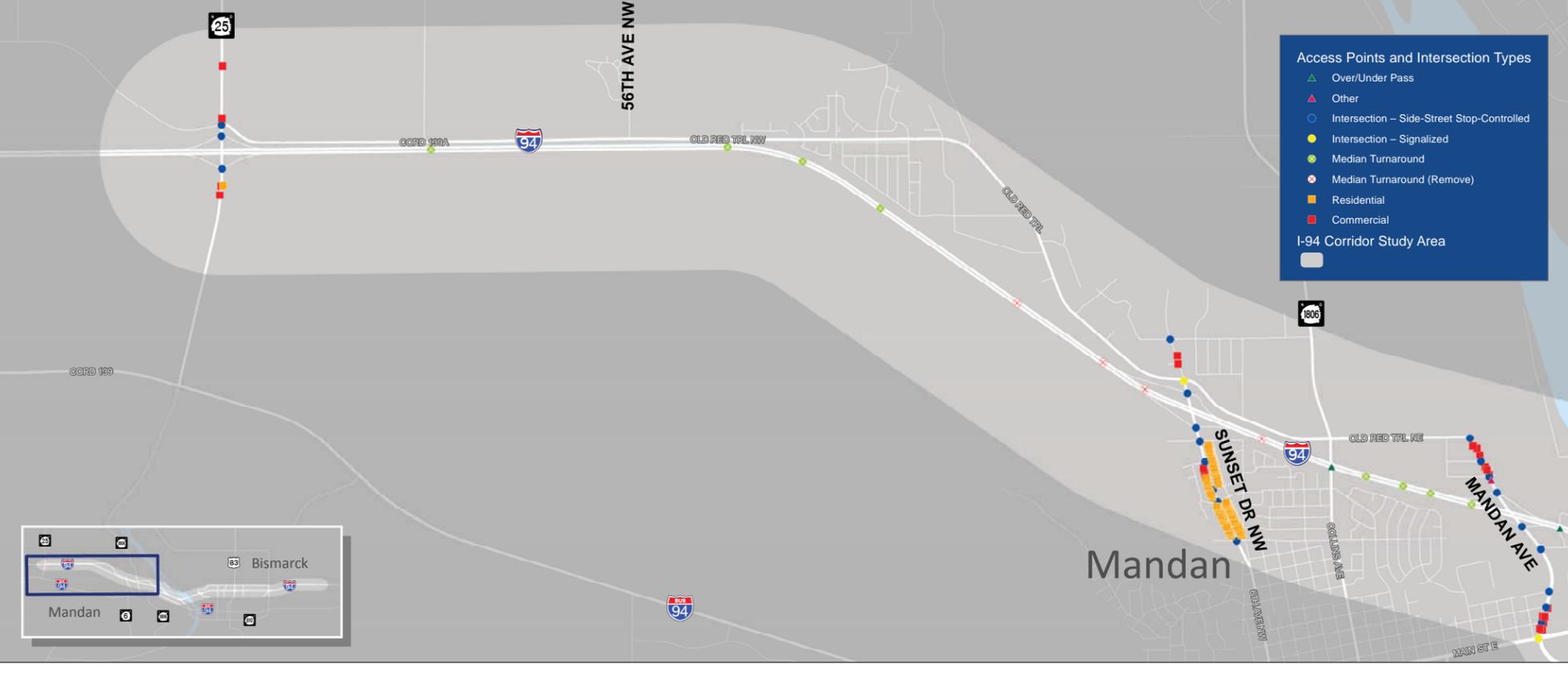
Access plays a critical role in how roadway facilities operate. A high frequency of access points along a given segment of roadway can reduce capacity and adversely affect operations and safety. Based on their varying functional classifications and jurisdictions, intersecting roadway segments along the I-94 corridor were reviewed within approximately one-half mile of each I-94 interchange to determine the frequency of existing access points, relative to the existing guidance or local access standard. Figure 1 and Table 1 present the results of the access inventory for the 17 miles of I-94 and the following intersecting corridors:

1. ND Highway 25 (NDDOT)
2. Sunset Drive NW (Mandan)
3. Mandan Avenue (Mandan)
4. Tyler Parkway/Divide Avenue (Bismarck)
5. State Street (Bismarck/NDDOT)
6. Centennial Road (Bismarck/NDDOT)

The following information describes and explains the access guidance used for the different roadway segments. NDDOT's design manual chapter, Driveways and Access Management (2009), includes a minimum public and private access point spacing guideline of 400 to 600 feet (the equivalent of 9 to 13 access points per mile) for urban regional highways such as US Highway 83.

In addition to this NDDOT urban roadway standard, local access standards were reviewed in order to analyze both public street and private driveway access guidelines within the Cities of Bismarck and Mandan. The City of Bismarck's Access Management Policy was referenced for the corridors within Bismarck. Since the City of Mandan does not have a locally adopted access management policy, the Bismarck Access Management Policy was also used to evaluate access along roadways in both Bismarck and Mandan. The City of Bismarck's Access Management Policy includes a minimum spacing of 300 to 1,320 feet (the equivalent of four to 18 access points per mile) for public and private access points on Minor Arterials and 600 to 1,320 feet (the equivalent of four to nine access points per mile) for public and private access points on Principal Arterials.





# FINAL

**Table 1: Existing Public/Private Access Compared to Access Standards \***

Roadway Segment	Limits	Functional Class	# of Access	Standard for Access Point Min. Spacing (Private and Public)	Existing Conditions for Access Points (Private and Public)	Existing Access is...
ND Highway 25	County Road (CR) 139 to 0.35 miles north of I-94 Ramps	Principal Arterial	10	4-9 access/mile	6 access/mile	Within standard
Sunset Dr NW	Division St NW to I-94 I-94 to 27th St NW	Principal Arterial	50	4-9 access/mile	48 access/mile	5x > standard
Mandan Ave	E Main St to Old Red Trail	Principal Arterial	21	4-9 access/mile	19 access/mile	2x > standard
Tyler Pkwy/ Divide Ave	W Turnpike Ave to W Century Ave	Principal Arterial	7	4-9 access/mile	15 access/mile	1x > standard
	W Turnpike Ave to Schafer St	Minor Arterial	2	4-18 access/mile	13 access/mile	Within standard
State St	E Divide Ave to E Century Ave	Principal Arterial	10	4-9 access/mile	10 access/mile	1x > standard
Centennial Rd	Commerce Dr to Century Ave	Principal Arterial	7	4-9 access/mile	7 access/mile	Within standard

\* NDDOT's design manual chapter, Driveways and Access Management (2009)  
Bismarck Access Management Policy

NDDOT also recognizes the need to restrict access immediately adjacent to freeway interchange areas. The Transportation Research Board (TRB) Access Management Manual provides guidance regarding access in these areas. It is recommended that partial access (right-in/right-out), directional access (left-in/right-in/right-out) and full access intersections maintain reasonable distances on multilane roadways in order to avoid weaving. The existing intersecting north-south roads with I-94 do not adhere to this guidance (ranging from 750 feet to one-half mile spacing).



# FINAL

## 2. CRASH HISTORY

A crash analysis was performed for key intersections within 1/2 mile of the I-94 corridor and key segments along I-94, based on data obtained from the North Dakota Department of Transportation's (NDDOT) crash database for the three-year time period of January 2009 to December 2011. This review included crashes involving vehicles only and vehicle-pedestrian/bicyclist. Table 2 and Figure 2 summarize the 826 reported crashes that occurred at the key intersections (seven of which involved pedestrians/bicyclists). Review of the various crash types indicates that 57 percent of the crashes located near the key intersections were rear-end crashes. These types of crashes are typical along corridors with a high number of signalized intersections.

**Table 2: Summary of Intersection Crash Types**

Key Intersections	Angle	Rear End	Side-Swipe	Head On	Rear to Side	Other	Total
Hwy 25 & I-94 (South Ramps)	0	1	0	0	0	0	1
Hwy 25 & I-94 (North Ramps)	2	0	0	0	0	0	2
Hwy 25 & County Road (CR) 139	0	1	0	0	0	0	1
Sunset Dr & Boundary Rd	3	3	0	0	0	0	6
Sunset Dr & I-94 (South Ramps)	1	4	0	1	0	0	6
Sunset Dr & I-94 (North Ramps)	1	1	0	0	0	0	2
Sunset Dr & 27th St	0	0	0	0	0	0	0
Sunset Dr & Old Red Tr	3	2	2	0	0	1	8
Mandan Ave & Division St	0	0	0	0	0	0	0
Mandan Ave & I-94 (South Ramps)	0	1	0	0	0	0	1
Mandan Ave & I-94 (North Ramps)	0	3	0	0	0	2	5
Mandan Ave & Old Red Tr	0	0	0	0	0	0	0
Divide Ave & Turnpike Ave	1	4	0	0	0	2	7
Divide Ave & I-94 (South Ramps)	15	67	3	0	0	0	85
Tyler Pkwy & I-94 (North Ramps)	2	27	1	0	0	1	31
Tyler Pkwy & Burnt Boat Rd	14	20	3	0	0	1	38
Tyler Pkwy & Century Ave	5	1	1	0	0	6	13
State St & Divide Ave	8	53	3	0	0	0	64
State St & Restaurant/ Business Access	3	1	1	0	0	0	5
State St & Spaulding Ave	7	3	4	0	0	0	14
State St & Capitol Ave	29	38	3	1	0	2	73
State St & Interchange Ave	18	23	4	0	0	1	46
State St & I-94 (South Ramps)	11	27	9	1	0	3	51
State St & I-94 (North Ramps)	9	31	7	0	0	2	49
State St & Gateway Ave	28	40	4	0	0	3	75
State St & K-Mart/Mall Access	0	0	0	0	0	0	0
State St & Century Ave	37	54	6	1	0	6	104



# FINAL

**Table 2: Summary of Intersection Crash Types (continued)**

Key Intersections	Angle	Rear End	Side-Swipe	Head On	Rear to Side	Other	Total
Bismarck Expy & Commerce Dr	0	0	0	0	0	0	0
Bismarck Expy & Miriam Ave	10	29	3	1	0	1	44
Centennial Rd & I-94 (South Ramps)	6	22	1	0	0	2	31
Centennial Rd & I-94 (North Ramps)	7	5	2	1	0	2	17
Centennial Rd & Trenton Dr	8	4	2	1	0	0	15
Centennial Rd & Century Ave	7	6	2	0	1	1	17
<b>Intersection Crash Type Subtotal:</b>	<b>238</b>	<b>474</b>	<b>63</b>	<b>10</b>	<b>1</b>	<b>40</b>	<b>826</b>

Table 3 summarizes the crashes that occurred along the I-94 corridor for the same three-year period. These crashes are also presented in Figure 2. Similar to the intersection crashes, rear-end crashes were also a frequent crash type along the roadway segments, representing more than 25 percent of the total crashes. The majority of the rear-end crashes (40 percent) occurred on the segment between the Bismarck Expressway interchange and the Tyler Parkway/Divide Avenue interchange (21 out of 52), and the segment between the Tyler Parkway/Divide Avenue interchange and the State Street interchange (17 of 43).

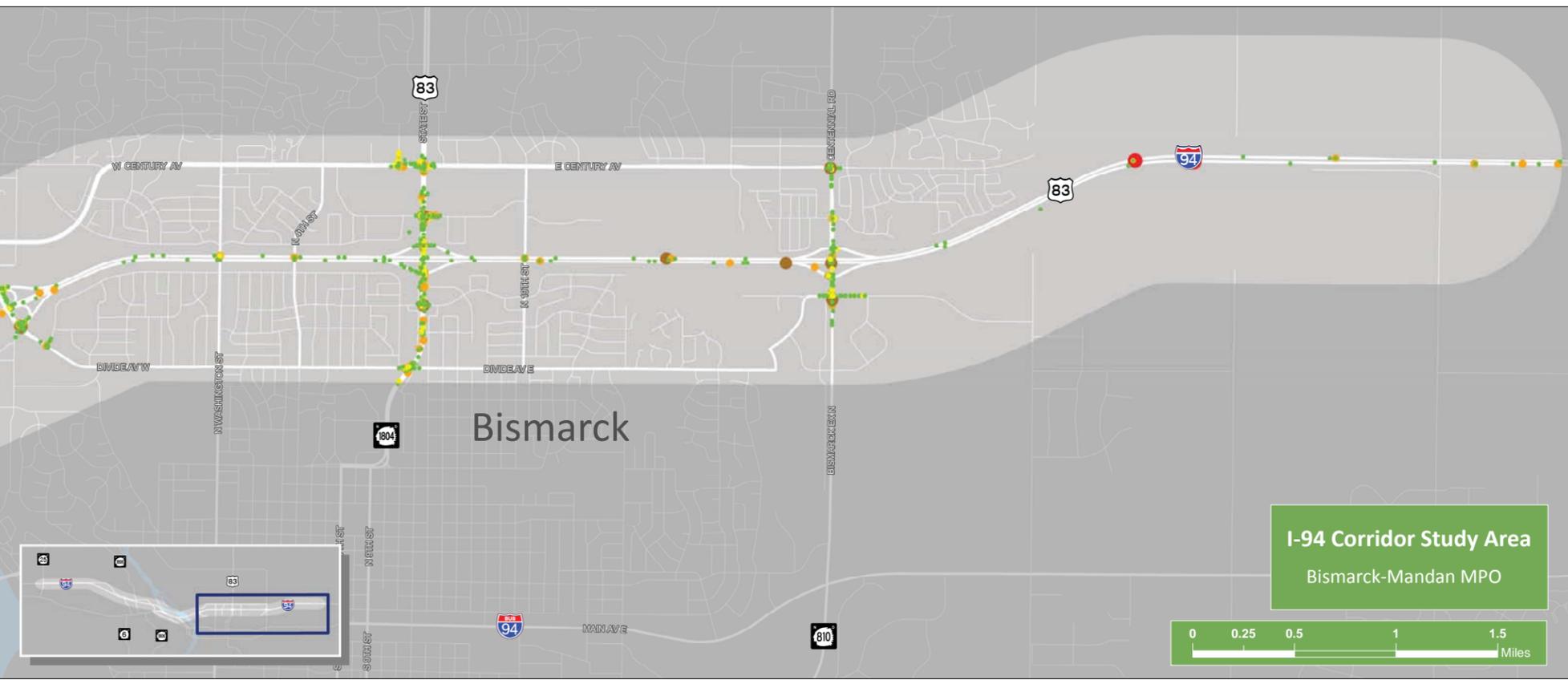
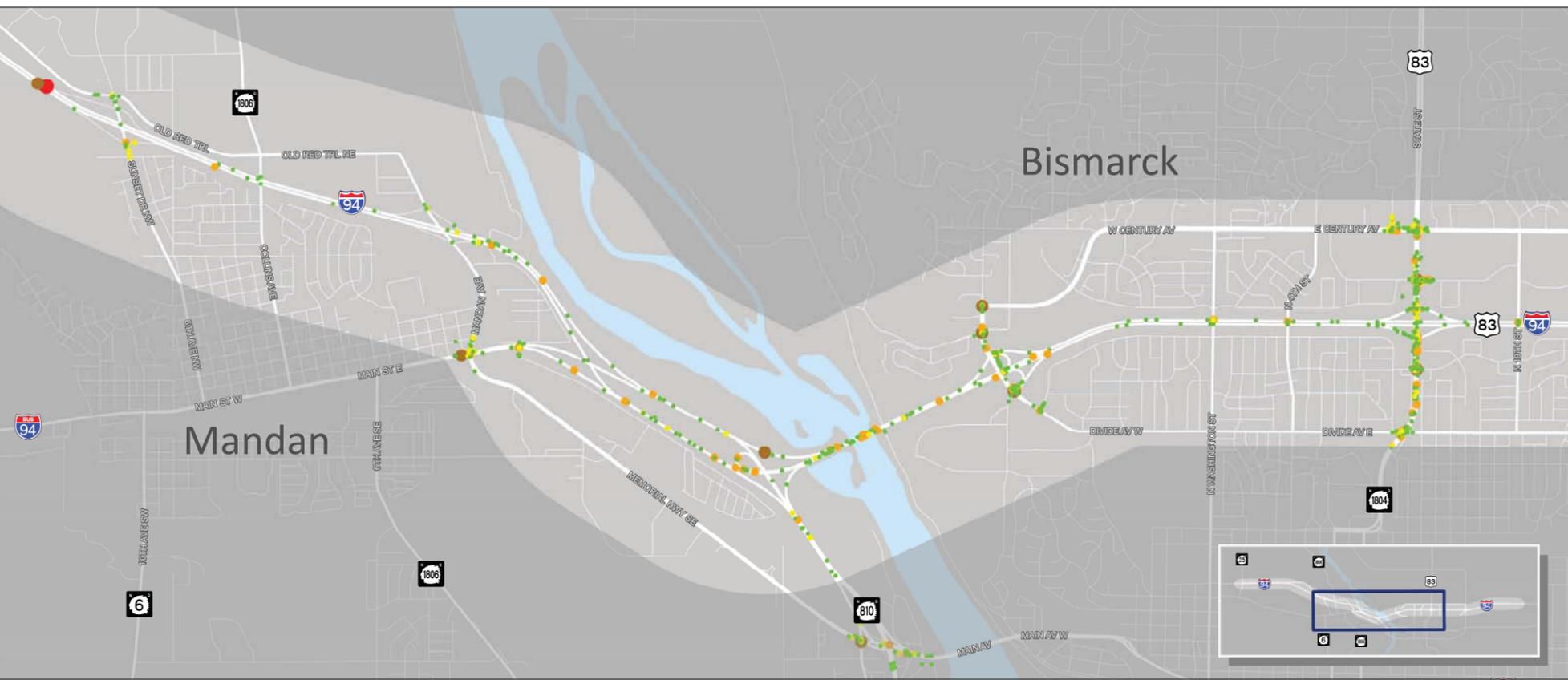
Many of the crashes along the I-94 corridor were coded as “other” crashes. This category of crashes includes all other categories of single and multi-vehicle crashes that do not fall under the other crash categories. This may include, but is not limited to, non-collision events such as cargo loss and run-off road incidents (property damage only).

**Table 3: Summary of Segment Crash Types**

Corridor Segments	Angle	Rear End	Side-Swipe	Head On	Rear to Side	Other	Total
I-94 from 1.42 miles west of Hwy 25 to Hwy 25	0	0	2	0	0	4	6
I-94 from Hwy 25 to Sunset Dr	2	4	1	0	0	23	30
I-94 from Sunset Dr to Mandan Ave	0	4	1	0	0	7	12
I-94 from Mandan Ave to Main St	0	5	2	0	0	15	22
I-94 from Main St to Bismarck Expy	1	11	11	0	0	12	35
I-94 from W Bismarck Expy to Tyler Pkwy/Divide Ave	0	21	8	0	0	25	54
I-94 from Tyler Pkwy/Divide Ave to State St	0	17	2	0	0	24	43
I-94 from State St to Centennial Rd/Bismarck Expy	3	8	0	0	0	24	35
I-94 from Centennial Rd/ E Bismarck Expy to 158th St	1	8	4	1	0	52	66
<b>Segment Crash Type Subtotal:</b>	<b>7</b>	<b>78</b>	<b>31</b>	<b>1</b>	<b>0</b>	<b>186</b>	<b>303</b>



# 194 Vehicle Crash Data – Figure 2



# FINAL

In addition to reviewing the specific types of crashes that occurred within the study area, the overall intersection and segment crash rates were calculated. The calculated overall intersection or segment crash rates were compared to typical crash rates with similar characteristics. NDDOT does not publish crash rates by type of roadway or traffic control. Therefore, average crash rates, by type of roadway and traffic control, were referenced from sources published by the Minnesota Department of Transportation (MnDOT) for 2009 to 2011. MnDOT crash rates were used due to like type facilities within the MnDOT system of roads, and similarities to community characteristics by District.

Table 4 summarizes the corresponding crash rates that were calculated for the key intersections within the study area. Results indicate that there are 21 intersections that have a crash rate higher than typical for intersections with similar characteristics. However, a higher than typical crash rate does not necessarily indicate a significant crash problem. Therefore, the critical crash rates were calculated to determine the statistical significance of the above average crash rates. If the calculated crash rate is below the critical crash rate, crashes that occurred are typically due to the random nature of crashes and not due to a geometric design or traffic control deficiency. As shown in Table 4, there are 13 intersections with higher crash rates than the calculated critical crash rate. This indicates that there is a significant crash issue at these locations and mitigation should be considered.

**Table 4: Summary of Intersection Crash Rates**

Key Intersections	Crashes	Calculated Crash Rate	Typical Crash Rate*	Critical Crash Rate
Hwy 25 & I-94 (South Ramps)	1	0.27	0.4	1.07
Hwy 25 & I-94 (North Ramps)	2	0.39	0.4	0.96
Hwy 25 & CR 139	1	0.29	0.4	1.11
Sunset Dr & Boundary Rd	6	0.48	0.3	0.60
Sunset Dr & I-94 (South Ramps)	6	0.59	0.3	0.63
Sunset Dr & I-94 (North Ramps)	2	0.13	0.3	0.56
Sunset Dr & 27th St	0	0.00	0.3	0.82
Sunset Dr & Old Red Tr	8	0.50	0.7	1.08
Mandan Ave & Division St	0	0.00	0.3	0.84
Mandan Ave & I-94 (South Ramps)	1	0.19	0.3	0.79
Mandan Ave & I-94 (North Ramps)	5	0.66	0.3	0.69
Mandan Ave & Old Red Tr	0	0.00	0.3	0.63
Divide Ave & Turnpike Ave	7	0.46	0.3	0.56
Divide Ave & I-94 (South Ramps) **	85	<b>3.33</b>	0.7	<b>0.99</b>
Tyler Pkwy & I-94 (North Ramps) **	31	<b>1.12</b>	0.7	<b>0.98</b>
Tyler Pkwy & Burnt Boat Rd **	38	<b>1.39</b>	0.7	<b>0.98</b>
Tyler Pkwy & Century Ave	13	<b>0.87</b>	0.3	<b>0.57</b>
State St & Divide Ave	64	<b>1.77</b>	0.7	<b>0.94</b>
State St & Restaurant/Business Access	5	0.17	0.3	0.48
State St & Spaulding Ave	14	0.46	0.3	0.48



# FINAL

**Table 4: Summary of Intersection Crash Rates (continued)**

Key Intersections	Crashes	Calculated Crash Rate	Typical Crash Rate*	Critical Crash Rate
State St & Capitol Ave	73	<b>2.18</b>	0.7	<b>0.95</b>
State St & Interchange Ave	46	<b>1.59</b>	0.3	<b>0.48</b>
State St & I-94 (South Ramps)	51	<b>1.06</b>	0.7	<b>0.91</b>
State St & I-94 (North Ramps)	49	<b>1.12</b>	0.7	<b>0.92</b>
State St & Gateway Ave	75	<b>1.63</b>	0.7	<b>0.91</b>
State St & K-Mart/Mall Access	0	0.00	0.3	0.48
State St & Century Ave	104	<b>2.23</b>	0.7	<b>0.91</b>
Bismarck Expy & Commerce Dr	0	0.00	0.7	1.01
Bismarck Expy & Miriam Ave	44	<b>1.56</b>	0.7	<b>0.98</b>
Centennial Rd & I-94 (South Ramps)	31	<b>1.30</b>	0.7	<b>1.00</b>
Centennial Rd & I-94 (North Ramps)	17	0.85	0.7	1.03
Centennial Rd & Trenton Dr	15	0.66	0.7	1.01
Centennial Rd & Century Ave	17	0.83	0.7	1.03

\* Typical crash rates published by MnDOT (2009-2011)

\*\* These three intersections along Tyler Pkwy/Divide Ave were reconstructed in 2012. The calculated crash rates presented here are based on crashes that occurred before these improvements were in place (crash data 2009-2011)

Table 5 summarizes the corresponding crash rates that were calculated for the segments along the I-94 corridor. Results indicate that there are six segments that have a crash rate higher than typical for segments with similar characteristics. Similar to the intersection crash rates, a higher than typical crash rate does not necessarily indicate a significant crash problem. Therefore, critical crash rates were also calculated to determine the statistical significance of the above average segment crash rates. As shown in Table 5, all six segments had higher crash rates than the critical crash rates, which indicates that there is a significant crash issue along these segments and mitigation should be considered.

**Table 5: Summary of Segment Crash Rates**

Segments	Crashes	Calculated Crash Rate	Typical Crash Rate*	Critical Crash Rate
I-94 from 1.42 miles west of Hwy 25 to Hwy 25	6	0.38	0.5	0.82
I-94 from Hwy 25 to Sunset Dr	30	0.41	0.5	0.64
I-94 from Sunset Dr to Mandan Ave	12	0.40	0.5	0.73
I-94 from Mandan Ave to Main St	22	<b>0.87</b>	0.5	<b>0.75</b>
I-94 from Main St to Bismarck Expy	35	<b>0.86</b>	0.5	<b>0.70</b>
I-94 from Bismarck Expy to Tyler Pkwy/Divide Ave	54	<b>1.90</b>	0.5	<b>0.74</b>
I-94 from Tyler Pkwy/Divide Ave to State St	43	<b>0.77</b>	0.5	<b>0.66</b>
I-94 from State St to Centennial Rd/Bismarck Expy	35	<b>1.10</b>	0.5	<b>0.72</b>
I-94 from Centennial Rd/Bismarck Expy to 158th St	66	<b>0.83</b>	0.5	<b>0.64</b>

\* Typical crash rates published by MnDOT (2009-2011)



# FINAL

Finally, a crash severity rate was calculated for the key intersections within the study area. The crash severity rate takes into account the number of crashes that occurred over a three-year period, the amount of vehicle exposure, and the level of crash severity of each crash (Fatal; Injury Category A, B, or C; and Property Damage). Results of the crash severity analysis, shown in Table 6, indicate that 21 key intersections had a crash severity rate higher than typical for intersections with similar characteristics.

**Table 6: Summary of Intersection Crash Severity Rates**

Key Intersections	Crashes	Calculated Severity Rate	Typical Severity Rate*
Hwy 25 & I-94 (South Ramps)	1	0.32	0.60
Hwy 25 & I-94 (North Ramps)	2	0.47	0.60
Hwy 25 & CR 139	1	0.35	0.60
Sunset Dr & Boundary Rd	6	0.87	0.50
Sunset Dr & I-94 (South Ramps)	6	1.06	0.50
Sunset Dr & I-94 (North Ramps)	2	0.15	0.50
Sunset Dr & 27th St	0	0.00	0.50
Sunset Dr & Old Red Tr	8	0.68	1.00
Mandan Ave & Division St	0	0.00	0.50
Mandan Ave & I-94 (South Ramps)	1	0.23	0.50
Mandan Ave & I-94 (North Ramps)	5	0.95	0.50
Mandan Ave & Old Red Tr	0	0.00	0.50
Divide Ave & Turnpike Ave	7	0.70	0.50
Divide Ave & I-94 (South Ramps) **	85	5.59	1.00
Tyler Pkwy & I-94 (North Ramps) **	31	1.60	1.00
Tyler Pkwy & Burnt Boat Rd **	38	2.15	1.00
Tyler Pkwy & Century Ave	13	1.36	0.50
State St & Divide Ave	64	2.72	1.00
State St & Restaurant/Business Access	5	0.28	0.50
State St & Spaulding Ave	14	0.63	0.50
State St & Capitol Ave	73	3.91	1.00
State St & Interchange Ave	46	2.32	0.50
State St & I-94 (South Ramps)	51	1.54	1.00
State St & I-94 (North Ramps)	49	1.89	1.00
State St & Gateway Ave	75	2.66	1.00
State St & K-Mart/Mall Access	0	0.00	0.50
State St & Century Ave	104	3.57	1.00
Bismarck Expy & Commerce Dr	0	0.00	1.00
Bismarck Expy & Miriam Ave	44	2.46	1.00
Centennial Rd & I-94 (South Ramps)	31	1.81	1.00
Centennial Rd & I-94 (North Ramps)	17	1.08	1.00
Centennial Rd & Trenton Dr	15	1.01	1.00
Centennial Rd & Century Ave	17	1.41	1.00

\* Typical crash rates published by MnDOT (2009-2011)

\*\* These three intersections along Tyler Pkwy/Divide Ave were reconstructed in 2012. The calculated severity rates presented here are based on crashes that occurred before these improvements were in place (crash data 2009-2011)



# FINAL

The crash severity rate calculations for the corridor segments are included in Table 7. Results of the crash severity analysis indicate that there are no segments with a crash severity rate higher than typical for segments with similar characteristics.

**Table 7: Summary of Segment Crash Severity Rates**

<b>Segments</b>	<b>Crashes</b>	<b>Calculated Severity Rate</b>	<b>Typical Severity Rate*</b>
I-94 from 1.42 miles west of Hwy 25 to Hwy 25	6	0.00	0.7
I-94 from Hwy 25 to Sunset Dr	30	0.07	0.7
I-94 from Sunset Dr to Mandan Ave	12	0.00	0.7
I-94 from Mandan Ave to Main St	22	0.00	0.7
I-94 from Main St to Bismarck Expy	35	0.00	0.7
I-94 from Bismarck Expy to Tyler Pkwy/Divide Ave	54	0.00	0.7
I-94 from Tyler Pkwy/Divide Ave to State St	43	0.00	0.7
I-94 from State St to Centennial Rd/Bismarck Expy	35	0.00	0.7
I-94 from Centennial Rd/Bismarck Expy to 158th St	66	0.19	0.7

\* Typical crash rates published by MnDOT (2009-2011)



# FINAL

## 3. BICYCLE AND PEDESTRIAN FACILITIES

### EXISTING FACILITIES

As noted in the 2010-2035 Bismarck-Mandan Long Range Transportation Plan (LRTP), the Bismarck-Mandan region has over 65 miles of shared use paths that serve recreation and transportation purposes. Existing shared use paths in the study corridor are displayed in Figure 3. In addition to the shared use paths in the City of Mandan and the City of Bismarck, both cities also maintain an extensive sidewalk system for pedestrian use.

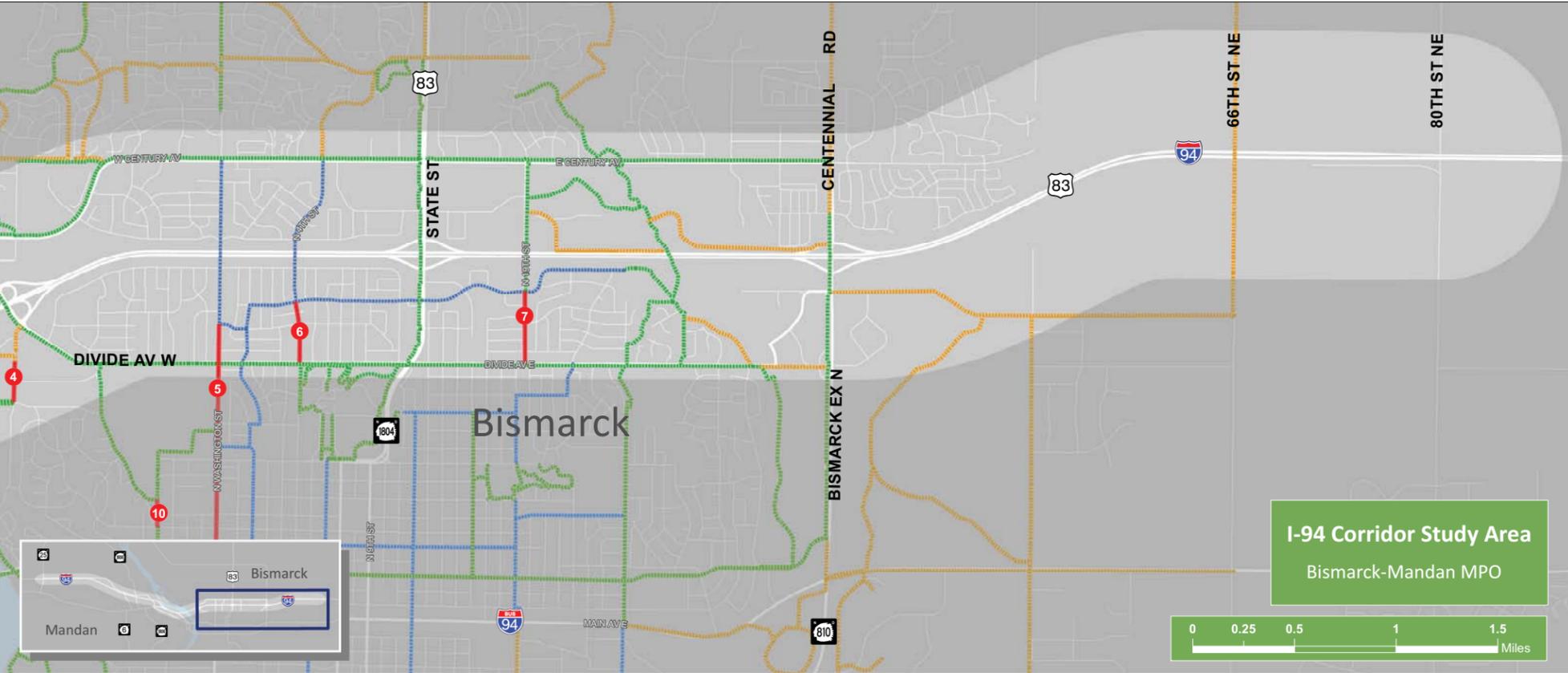
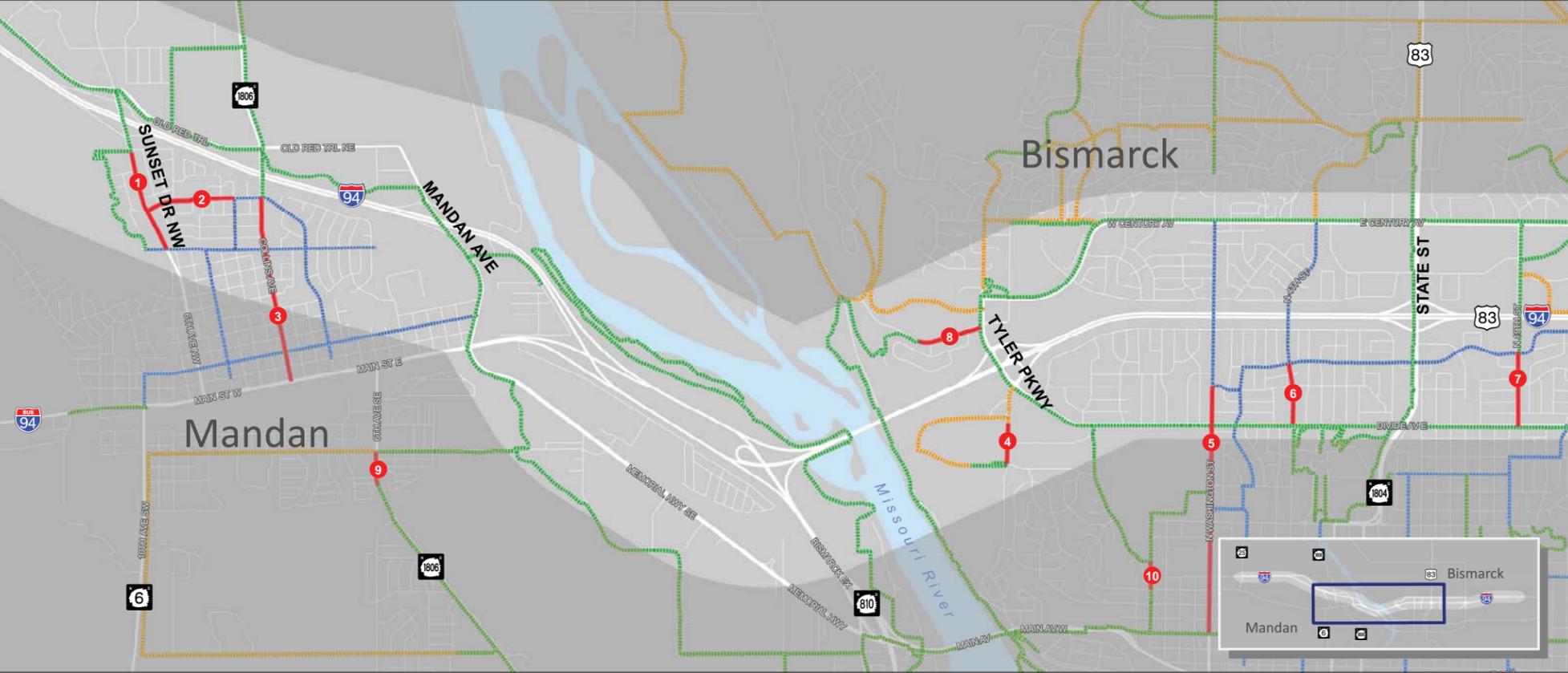
### PLANNED FUTURE FACILITIES

Planned future bicycle and pedestrian facilities are displayed on Figure 3, as designated by the Bismarck-Mandan MPO. While the MPO is unable to program a majority of these planned projects, the LRTP states that the MPO seeks to focus its future efforts on providing on-street bicycle facilities, whether they are dedicated lanes or facilities designed for shared use by motor vehicles and bicyclists.

### IDENTIFIED NETWORK GAPS

A review of existing and planned facilities in the corridor study area was conducted to identify additional bicycle and pedestrian system gaps for consideration to develop a more complete network. Figure 3 displays the existing and planned bicycle and pedestrian facilities in the study area, as well as the facility gaps identified through this review. The numbers assigned to the gaps displayed on Figure 3 correspond to the numbers on the left hand side of Table 8. Due to the extensive nature of existing sidewalks within both cities, most proposed gaps would be best suited for shared use paths or on-street bicycle facilities. Rationale for the additional facilities is also addressed in Table 8.

# 194 Bicycle/Pedestrian Facilities and Gaps – Figure 3



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**Table 8: Identified Bicycle and Pedestrian Facility Gaps**

#	Identified Gap	Termini	Rationale for Future Facility
1	Sunset Dr (Mandan)	Division St NW to Boundary Rd NW	<ul style="list-style-type: none"> <li>• Extends the existing north-south crossing of I-94 south to Kindred Hospital Central Dakotas, Lions Park, Mandan High School, and toward downtown business district</li> <li>• Connects to existing north-south shared use trails and proposed east-west facilities</li> <li>• Combined with LRTP proposed on-street bicycle facilities, creates a desirable loop route with existing facilities</li> <li>• There are relatively significant topography challenges with this section of roadway / trail</li> </ul>
2	14th St NW (Mandan)	Sunset Dr to 2nd Ave NW	<ul style="list-style-type: none"> <li>• Fills an east-west facility gap across Mandan</li> <li>• Creates connectivity between existing and proposed facilities on Sunset Dr and Collins Ave</li> <li>• Provides additional access to Kindred Hospital Central Dakotas, Lewis and Clark Elementary, Eagles Park, and the surrounding residential and commercial areas</li> <li>• There are relatively significant topography challenges with this section of roadway / trail</li> </ul>
3	Collins Ave (Mandan)	Main St to 14th St NW	<ul style="list-style-type: none"> <li>• Provides connection to Eagles Park</li> <li>• Complements proposed east-west non-motorized facilities</li> <li>• Increases potential for improved future connectivity to downtown business district</li> </ul>
4	Schafer St (Bismarck)	Canary Ave to Edwards Ave	<ul style="list-style-type: none"> <li>• Fills gap in planned and existing facilities surrounding Bismarck State College to serve efficient local circulation</li> <li>• Fills gap between planned facilities encircling the western half of campus and existing facilities on Tyler Pkwy/Divide Ave and Edwards Ave (critical north-south connection across I-94)</li> <li>• Increases opportunity for future connection to trail adjacent to the Missouri River</li> </ul>
5	N Washington St (Bismarck)	Main Ave to W Central Ave	<ul style="list-style-type: none"> <li>• Increases access to Missouri Valley YMCA site, network access to Bismarck High School</li> <li>• Connects to and joins existing and proposed facilities on N Washington St, Divide Ave, Main St</li> <li>• Facilitates additional river crossing, when combined with proposed LRTP facility on Main St, and connection to riverfront trail system</li> </ul>



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#	Identified Gap	Termini	Rationale for Future Facility
6	N 4th St (Bismarck)	E Divide Ave to E Capitol Ave	<ul style="list-style-type: none"> <li>Increases access to ND State Capitol grounds/state government offices</li> <li>Improves non-motorized connectivity to Bismarck High School</li> <li>Combined with LRTP proposed facility, provides north-south connectivity over I-94 for increased access to commercial/retail area surrounding State Street</li> <li>Provides additional access to Jaycee Centennial Park and surrounding residential neighborhoods</li> </ul>
7	N 19th St (Bismarck)	E Divide Ave to E Capitol Ave	<ul style="list-style-type: none"> <li>Provides north-south connectivity for increased access to commercial/retail area surrounding State Street</li> <li>Improves non-motorized connections to Bismarck High School for northeast Bismarck</li> <li>Facilitates additional connectivity to extensive surrounding planned facilities</li> </ul>
8	Burnt Boat Rd	Tyler Pkwy to east of Broadview Ln	<ul style="list-style-type: none"> <li>Fills gap remaining to Tyler Pkwy</li> </ul>
9	1806	8th Ave to 3rd St	<ul style="list-style-type: none"> <li>Fills gap remaining to 3rd St</li> </ul>
10	Ward Rd/Griffin St	W Ave C to north existing trail	<ul style="list-style-type: none"> <li>Completes trail connection north-south along Griffin St</li> </ul>



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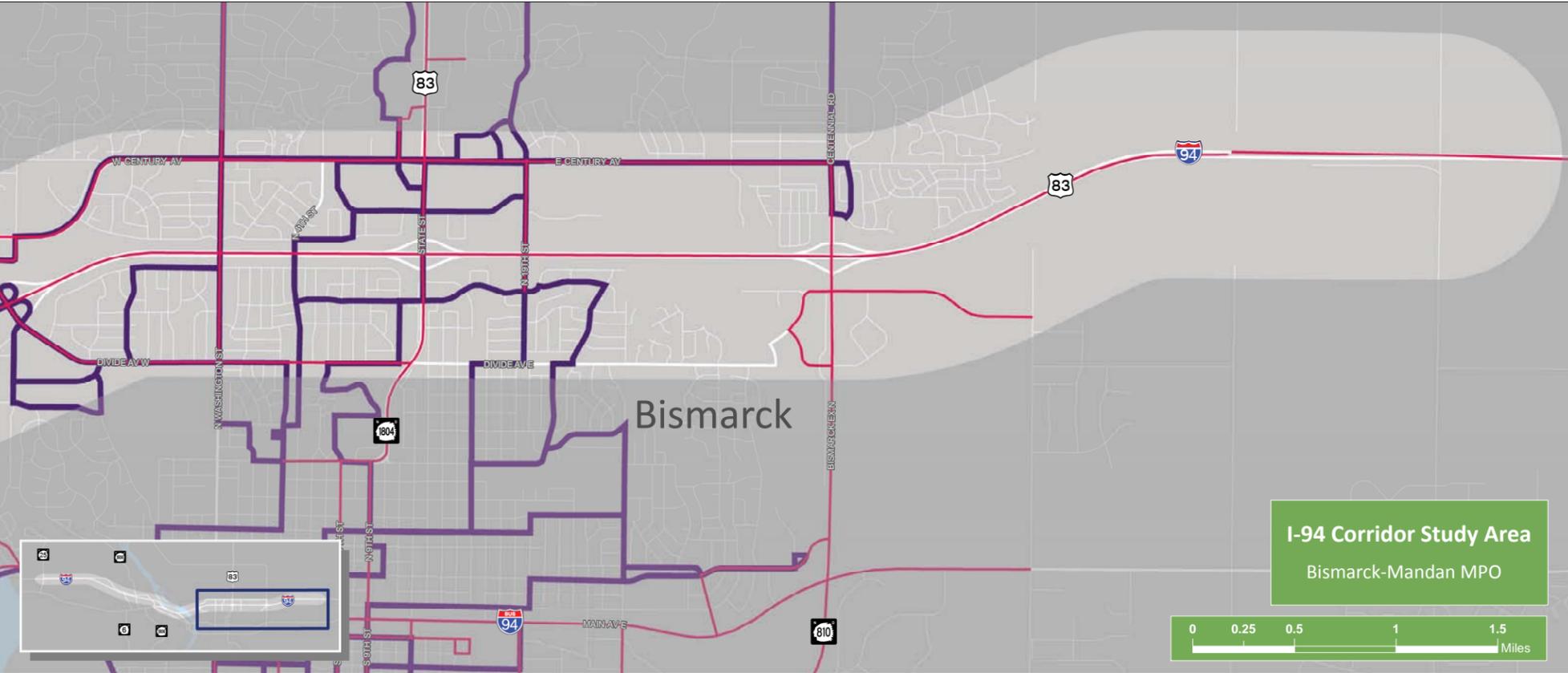
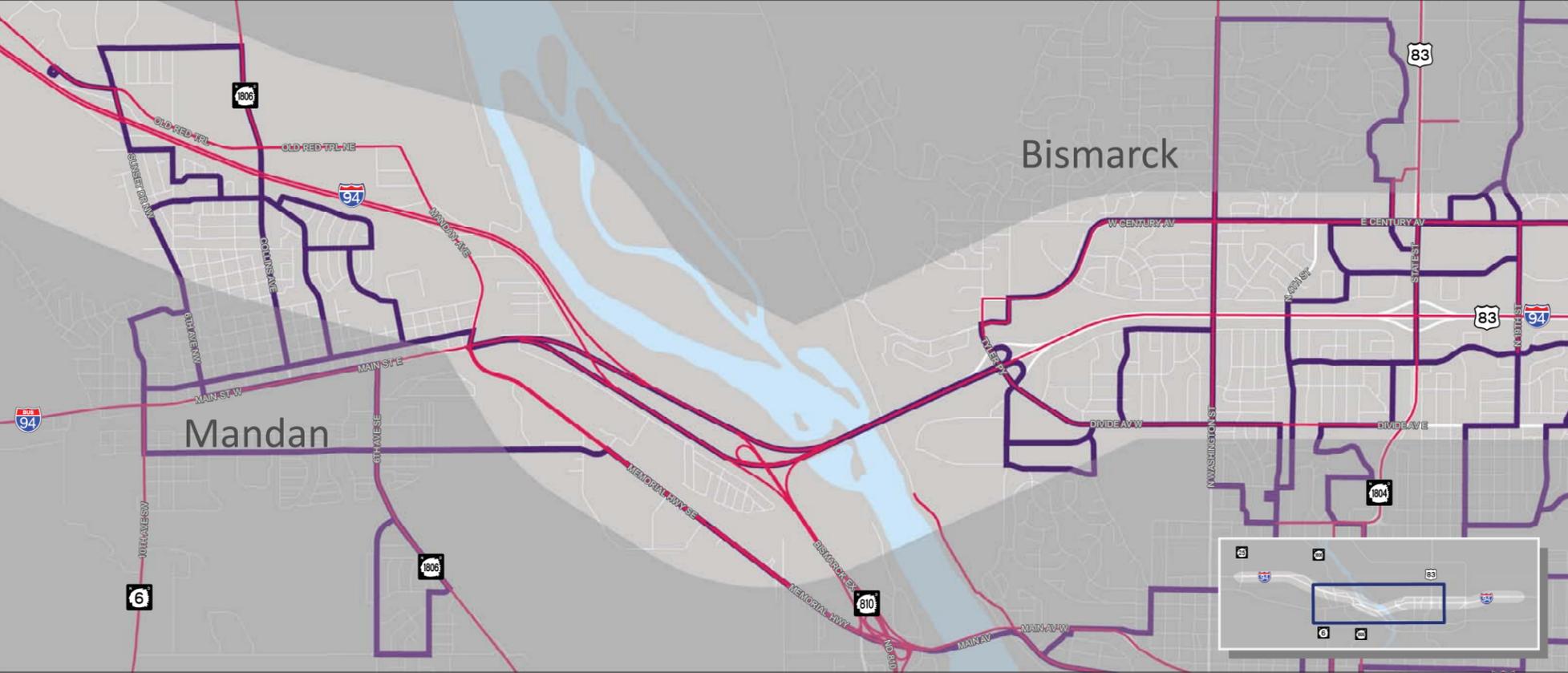
## **4. EXISTING TRUCK AND TRANSIT ROUTES**

The I-94 corridor and a majority of the north-south crossroads play a significant role in the movement of goods and services between the cities of Bismarck and Mandan and throughout the region. This serves to underscore the importance for these roads to operate efficiently not only today but into the future.

Bis-Man Transit operates the Capital Area Transit (CAT), with seven routes within the study corridor and major crossroads. The weekday frequency of service ranges from 30 minutes within Bismarck and 120 minutes between Bismarck and Mandan. Bis-Man Transit also coordinates and operates paratransit service in the region. These various routes use the I-94 corridor as a critical link between Bismarck and Mandan; again, highlighting the importance of the I-94 bridge crossing.

Figure 4 displays the local truck and transit routes within and through the project study area.





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## 5. EXISTING CORRIDOR GEOMETRY

The purpose of this corridor geometry review is to document the existing geometry and compare it to applicable design standards. For this study, the American Association of State Highway and Transportation Officials (AASHTO) publication, “A Policy on Geometric Design of Highways and Streets,” (POLICY) was used as the design standard reference. The following geometric elements were examined:

- Horizontal Geometry
- Vertical Geometry
- Design Speed
- Bridge Clearance
- Entrance/Exit Ramp Geometry
- Access Spacing at Interchanges

The quantitative representation of these geometric elements is summarized in the attached worksheet. Certain areas are color coded to indicate information on ramp-related entries.

- Red indicates a deficiency
- Yellow indicates a value outside the normal range (but not deficient)
- Orange indicates a value that is the result of an assumption

A qualitative analysis was also performed to address areas of concern where the above elements may not show a clear geometric deficiency.

### Quantitative Elements

#### HORIZONTAL GEOMETRY

Horizontal geometry was investigated as it is a fundamental element of design speed. To approximate existing horizontal geometry, alignments were developed for roadways based solely on aerial imagery. For mainline I-94, all horizontal curves were documented; for roadways crossing I-94, only the critical radius was provided, as that would be the limiting factor in design speed at the interchange. Once the alignment geometry was obtained, it was compared to the POLICY to determine an associated design speed based on an assumed maximum superelevation.

#### VERTICAL GEOMETRY

Vertical geometry was investigated as it is a fundamental element of design speed. Although the NDDOT Design Manual Chapter I-06.03 Design Guidelines states that vertical curvature for sag curves should be designed from passenger comfort consideration, the following documentation references AASHTO’s recommended design selection of headlight sight distance. SRF’s GIS department provided 2-0’ contours of surface information. With this information, existing profiles were created by best fitting the existing groundline surface. The critical vertical curve for each roadway (the curve with lowest design speed) dictated the associated design speed for each roadway segment as documented in the attached worksheet.



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## DESIGN SPEED

If the posted speed limit exceeded the lowest critical design speed between the horizontal and vertical curves, the roadway segment was listed as “Design Speed Exceeded.” Otherwise the roadway segment was listed as “OK.”

## BRIDGE CLEARANCE

This geometric element was obtained from Structure Inventory and Appraisal Sheet documentation provided by the NDDOT. For each interchange with an overpass/underpass, Minimum Vertical Clearance was documented. If two structures are located at one crossing, the minimum value is referenced.

## ENTRANCE/EXIT RAMP GEOMETRY

This geometric element relies heavily on the superelevation rate present on the ramp. Since this information was not known (and assumed superelevation rates provided an unusable range of results), only some of the critical ramp geometry was provided while other key elements were not. Parallel and tapered ramp designs are described in the POLICY; both types of ramp design have their own typical elements as described on the attached worksheet and in the POLICY. Deficiencies are indicated for elements not related to the ramp superelevation.

## ACCESS SPACING AT INTERCHANGES

While this information was already discussed herein, it is presented in the attached worksheet again relative to the I-94 corridor offset.

## **Qualitative Elements**

Some deficient qualitative elements are: interchange skew angle, sightlines, back-to-back curvature, mainline left exits, and access crowding. These items are also addressed qualitatively as a separate tab in the attached worksheet.



ROADWAY	TYPE	ROADWAYS	POSTED SPEEDS	HORIZONTAL GEOMETRY				VERTICAL GEOMETRY				DICTATING DESIGN SPEED	POSTED SPEED VS. DESIGN SPEED	BRIDGE CLEARANCE	TAPER DESIGN (G) (H)	TAPER RATE	TAPER LENGTH	ACCEL / DECEL LENGTH (J)	ACCESS SPACING / MINIMUM RECOMMENDED (K)		INTERCHANGE SPACING (M)	
				(A) MINIMUM LOCAL RADIUS	RURAL OR URBAN	ASSOC. DESIGN SPEED (B) (C)		(D) (L) LIMITING MIN.		K VALUE	ASSOC. DESIGN SPEED (F)								NORTH	SOUTH		
						2.1%	6.0%	CREST	SAG													
I-94 EB	MAINLINE	W. LIMIT - HWY 25	75	TANGENT		NA	NA		1200	816	80	80	OK									
I-94 WB	MAINLINE	W. LIMIT - HWY 25	75	TANGENT		NA	NA		800	582	80	80	OK									
HWY 25 (OVER 94)	INTERCHANGE	HWY 25	45	5000	rural	45	80		120	85	45	45	OK	16' - 11"								
		EB EXIT		1449										TAP	42:1	505	100	850	410 / 1320			
		EB ENTRANCE		1279										TAP	50:1	604	400			22600		
		WB EXIT		1387										TAP	34:1	418	130	230 / 1320	850	22390		
WB ENTRANCE		1468											TAP	52:1	630	440						
I-94 EB	MAINLINE	HWY 25 - SPEED CHANGE	75	5658	rural		80		1200	305	70	70	DESIGN SPEED EXCEEDED									
I-94 WB	MAINLINE	HWY 25 - SPEED CHANGE	75	5742	rural		80		1200	303	70	70	DESIGN SPEED EXCEEDED									
SCENIC LOOKOUT		EXIT RAMP	NA	1515	rural									NA	TAP	19:1	240	35				
		ENTRANCE RAMP	NA	435	rural										NA	PAR	25:1	300	600			
I-94 EB	MAINLINE	SPEED CHANGE - SUNSET	60	5542	rural		80		1200	305	70	70	OK									
I-94 WB	MAINLINE	SPEED CHANGE - SUNSET	60	5458	rural		80		1200	303	70	70	OK									
SUNSET DR. (UNDER 94)	INTERCHANGE	SUNSET	25	TANGENT	NA	NA	NA		250		35	35	OK	14' - 4"								
		EB EXIT		2100											PAR	NA	NA	420	970	300 / 660	22600	
		EB ENTRANCE		1568											PAR	31:1	377	395			5310	
		WB EXIT		1391											TAP	41:1	502	155	350 / 1320	970	4815	
WB ENTRANCE		1381												TAP	38:1	450	440			22390		
I-94 EB	MAINLINE	SUNSET - MANDAN	60	7542	rural		80		800	615	80	80	OK									
I-94 WB	MAINLINE	SUNSET - MANDAN	60	7458	rural		80		800	607	80	80	OK									
MANDAN AVE (UNDER 94)	INTERCHANGE	MANDAN	35	950	low speed urban	40		350			35	35	OK	16' - 9"								
		EB EXIT		3750	rural	40	80															
		EB ENTRANCE		1735												TAP	34:1	400	125	925	775 / 1320	5310
		WB EXIT		1462												PAR	NA	947	75			4570
		WB ENTRANCE		1438												TAP	42:1	511	245	350 / 1320	925	5590
I-94 EB	MAINLINE	MANDAN - DIVIDE	60	2825	rural		75		700	378	75	75	OK									
I-94 WB	MAINLINE	MANDAN - DIVIDE	60	2900	rural		75		700	420	80	75	OK									
I-94 EB	MAINLINE	MANDAN - DIVIDE	60	2350	rural		70		700	378	75	70	OK									
I-94 WB	MAINLINE	MANDAN - DIVIDE	60	7300	rural		80		700	420	80	80	OK									
I-94 EB	MAINLINE	MANDAN - DIVIDE	60	2300	rural		70		700	378	75	70	OK									
I-94 WB	MAINLINE	MANDAN - DIVIDE	60	2300	rural		70		700	420	80	70	OK									
E. MAIN ST	ENTRANCE RAMP	RAMP MAIN ST. TO I-94 EB	40	1820	rural		65		500	418	80	65	OK	NA	PAR	60:1	730	2110	NA	NA	3130	
E. MAIN ST	ENTR. LANE DROP	RAMP MAIN ST. TO I-94 EB	40	NA	rural		-						NA	NA	142:1	1715	NA	NA	NA	NA		
E. MAIN ST (OVER 94)	EXIT RAMP	RAMP I-94 WB TO MAIN ST.	40	3270	rural		80		400	155	60	60	OK	16'-3"	NA	NA	NA	2070	NA	NA	5590	
I-94 EB	RT EXIT	RAMP 94E TO EXPR S.	55	2285	rural		70						OK	NA	NA	NA	NA	NA	NA	NA	3000	
I-94 WB	LT EXIT/SPIRAL RAMP	RAMP 94W TO EXPR S.	25	SEE NOTE (E)	rural	25	25						OK	16' - 7"	NA	NA	NA	770/1780	NA	NA	2620	
BISM-EXPR NB	RIGHT EXIT	EXPR. TO I-94 EB	40	716	rural		45						OK	TAP	43:1	526	430	NA	NA	4370		
BISM-EXPR	MAINLINE	NB EXPR LANE DROP	55	2306	rural		70						OK	NA	NA	650	NA	NA	NA	2150		

ROADWAY	TYPE	ROADWAYS	POSTED SPEEDS	HORIZONTAL GEOMETRY				VERTICAL GEOMETRY				DICTATING DESIGN SPEED	POSTED SPEED VS. DESIGN SPEED	BRIDGE CLEARANCE	TAPER DESIGN (G) (H)	TAPER RATE	TAPER LENGTH	ACCEL / DECEL LENGTH (J)	ACCESS SPACING / MINIMUM RECOMMENDED		NOTES	
				(A) MINIMUM LOCAL RADIUS	RURAL OR URBAN	ASSOC. DESIGN SPEED (B) (C)		LIMITING MIN. (D)		K VALUE	ASSOC. DESIGN SPEED (F)								NORTH	SOUTH		
						2.1%	6.0%	CREST	SAG													
TYLER/DIVIDE (OVER 94)	INTERCHANGE	TYLER/DIVIDE	35	1100	low speed urban	45		700			70	45	OK	16' - 8"								
		EB EXIT		200											PAR	15:1	185	485				4040
		EB ENTRANCE		1476											TAP	44:1	530	497	1140	800 / 660		6870
		WB EXIT		1376											TAP	44:1	530	150	650 / 1320	1140		6940
		WB ENTRANCE		102/200												PAR	19:1	237	700			
I-94 EB	MAINLINE	DIVIDE - STATE	60	3800	rural	80		800		477	80	80	OK									
I-94 WB	MAINLINE	DIVIDE - STATE	60	3900	rural	80		1000		545	80	80	OK									
STATE ST (OVER 94)	INTERCHANGE	STATE ST	40	TANGENT	NA	NA	NA	650			60	60	OK	16' - 8"								
		EB EXIT		1365											TAP	39:1	470	85	730	360 / 1320		6870
		EB ENTRANCE		1601											TAP	48:1	580	410				6780
		WB EXIT		1587											TAP	35:1	426	180	750 / 1320	730		6780
		WB ENTRANCE		1366											TAP	35:1	428	530				6940
I-94 EB	MAINLINE	STATE - CENTENNIAL	60	TANGENT	rural	NA	NA	1200		475	80	80	OK									
I-94 WB	MAINLINE	STATE - CENTENNIAL	60	TANGENT	rural	NA	NA	1700		671	80	80	OK									
I-94 EB	MAINLINE		75	TANGENT	rural	NA	NA		500	154	60	60	DESIGN SPEED EXCEEDED									
I-94 WB	MAINLINE		75	TANGENT	rural	NA	NA	500		323	75	75	OK									
CENTENNIAL RD (OVER 94)	INTERCHANGE	CENTENNIAL	40	TANGENT	NA	NA	NA	1000			70	70	OK	17' - 0"								
		EB EXIT		1400											TAP	45:1	543	140	770	480 / 1320		6780
		EB ENTRANCE		1322											TAP	46:1	560	760				
		WB EXIT		1230											TAP	51:1	619	0	770 / 1320	770		
		WB ENTRANCE		1420											TAP	44:1	530	500				6780
I-94 EB	MAINLINE	CENTENNIAL - E. LIMIT	75	7693	rural	80		800		285	70	70	DESIGN SPEED EXCEEDED									
I-94 WB	MAINLINE	CENTENNIAL - E. LIMIT	75	7777	rural	80		900		304	70	70	DESIGN SPEED EXCEEDED									

ALL REFERENCES TO "A POLICY" REFER TO THE 6TH EDITION (2011) OF AASHTO'S A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS.

- (A) ALIGNMENT GEOMETRY WAS DERIVED FROM BEST FITTING AERIAL IMAGERY. ACTUAL ALIGNMENT RADII MAY VARY AND AFFECT SPECIFIED DESIGN SPEED.
- (B) RURAL DESIGN SPEEDS REFERENCE "A POLICY" TABLE 3-9, 'MINIMUM RADII FOR DESIGN SUPERELEVATION RATES, DESIGN SPEEDS AND  $e_{max} = 6\%$ ' (PG 3-45).
- (C) LOW SPEED URBAN DESIGN SPEEDS REFERENCE "A POLICY" TABLE 3-13b 'MINIMUM RADII AND DESIGN SUPERELEVATION RATES FOR LOW SPEED URBAN STREETS' (PG 3-55), WITH AN ASSUMED WORST CASE SCENARIO NORMAL CROWN OF -2.1%.
- (D) VERTICAL GEOMETRY WAS DERIVED FROM BEST FITTING PROFILES TO EXISTING GROUNDLINE (2' CONTOURS). ACTUAL PROFILES MAY VARY AND AFFECT SPECIFIED DESIGN SPEED.
- (E) SEE DESIGN CALCULATIONS FOR DESIGN SPEED DETERMINATIONS.
- (F) DESIGN SPEEDS REFERENCE "A POLICY" TABLES 3-34 AND 3-36 FOR CREST AND SAG VERTICAL CURVES, RESPECTIVELY (PG 3-155, 3-161).
- (G) "A POLICY" SHOWS ENTRANCES WITH TAPER DESIGN RANGE FROM 50:1 - 70:1 (10-107), AND STATES EXITS WITH TAPER DESIGN RANGE FROM 10:1 - 30:1 (10-112, (DIVERGENCE OF 2-5 DEGREES))
- (H) "A POLICY" SHOWS ENTRANCES WITH PARALLEL DESIGN REQUIRE A MIN TAPER OF 300', AND STATES EXITS WITH PARALLEL DESIGN REQUIRE A MIN TAPER OF 250'
- (I) ACCELERATION / DECELERATION LENGTHS WERE NOT COMPARED TO A DESIGN STANDARD AS THE LENGTHS ARE HEAVILY DEPENDENT ON THE SUPERELEVATION OF EACH RAMP - AN UNKNOWN VALUE.
- (K) ACCESS SPACING WAS BASED ON THE "CITY OF BISMARCK ACCESS CONTROL POLICY" TABLE AND THE "ROADWAY FUNCTION CLASS" LAYOUT PROVIDED IN DOCUMENTATION.
- (L) ONLY CRITICAL VERTICAL CURVES (LIMITING DESIGN SPEED) ARE SHOWN FOR EACH ROADWAY SEGMENT.
- (M) LENGTHS PROVIDED ARE APPROXIMATIONS TO BEGIN / END OF TAPER POINTS. TYPICALLY, ENTRANCE RAMP VALUES ARE TO THE NEXT RAMP IN THE DIRECTION OF TRAFFIC FLOW; EXIT RAMP VALUES ARE TO THE NEXT RAMP IN THE DIRECTION OPPOSITE TRAFFIC FLOW.

ROADWAY	TYPE	ROADWAYS	POTENTIAL ISSUES
HWY 25 (OVER 94)	INTERCHANGE	HWY 25 EB EXIT EB ENTRANCE WB EXIT WB ENTRANCE	STANDARD DIAMOND: NO APPARENT SIGHTLINE OR GEOMETRIC ISSUES
SCENIC LOOKOUT		EXIT RAMP ENTRANCE RAMP	EXIT AND ENTRANCE RAMPS HAVE VERY SHORT ACCELERATION AND DECELERATION LENGTHS.
SUNSET DR. (UNDER 94)	INTERCHANGE	SUNSET EB EXIT EB ENTRANCE WB EXIT WB ENTRANCE	SKEW ANGLE OF SUNSET CREATES ISSUES FOR EB AND WB 94 EXIT RAMPS AT INTERSECTION, BACK-TO-BACK CURVATURE ON 94 WB EXIT RAMP
MANDAN AVE (UNDER 94)	INTERCHANGE	MANDAN EB EXIT EB ENTRANCE WB EXIT WB ENTRANCE	SKEW ANGLE OF MANDAN CREATES ISSUES FOR EB AND WB94 EXIT RAMPS AT INTERSECTION, 94 EXIT RAMPS LEFT TURNS ONTO MANDAN CROSS THROUGH ONCOMING TRAFFIC AT UNDEFINED INTERSECTIONS, SIGHTLINES UNDER 94 BRIDGE
E. MAIN ST	ENTRANCE RAMP	RAMP MAIN ST. TO I-94 EB	
E. MAIN ST	ENTR. LANE DROP	RAMP MAIN ST. TO I-94 EB	
E. MAIN ST (OVER 94)	LT EXIT RAMP	RAMP I-94 WB TO MAIN ST.	I-94 WB TO MAIN ST E. - LEFT EXIT
I-94 EB	RT EXIT	RAMP 94E TO EXPR S.	
I-94 WB	LT EXIT/SPIRAL RAMP	RAMP 94W TO EXPR S.	I-94 WB TO BISMARCK EXPRESSWAY SB - LEFT EXIT
BISM-EXPR NB	RIGHT EXIT	EXPR. TO 1-94 EB	
BISM-EXPR	MAINLINE	NB EXPR LANE DROP	
TYLER/DIVIDE (OVER 94)	INTERCHANGE	TYLER/DIVIDE EB EXIT EB ENTRANCE WB EXIT WB ENTRANCE	TYLER IS CROWDED WITH ACCESS POINTS AND COMMERCIAL DRIVES, TYLER TO WB 94 RAMP LOOKS VERY TIGHT INITIALLY, 94 EB TO DIVIDE RAMP TERMINATES FACING A STREET,
STATE ST (OVER 94)	INTERCHANGE	STATE ST EB EXIT EB ENTRANCE WB EXIT WB ENTRANCE	INTERSECTION CROWDING SOUTH OF I-94
CENTENNIAL RD (OVER 94)	INTERCHANGE	CENTENNIAL EB EXIT EB ENTRANCE WB EXIT WB ENTRANCE	INTERSECTION CROWDING SOUTH OF I-94

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## 6. PAVEMENTS, BRIDGES, UTILITIES

### Pavements

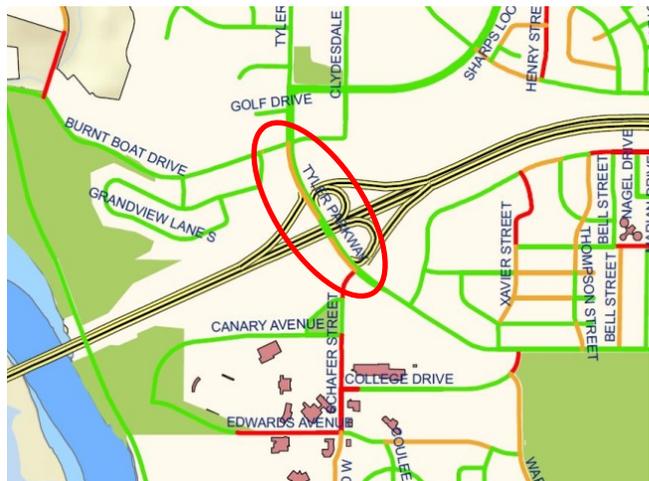
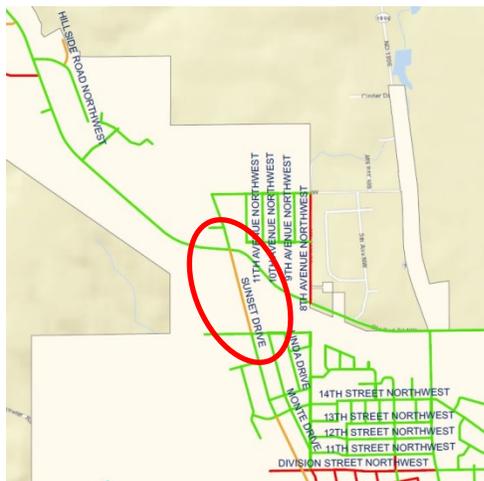
As part of the needs assessment and existing conditions review data regarding the pavement and bridge conditions was obtained from NDDOT. In addition, readily available utility data was obtained (i.e., Bismarck lighting data and high voltage power structures, etc.). Pavements are rated on a 0-100 value basis, or Pavement Condition Index (PCI); this is a numerical assessment method that evaluates pavements based on severity of distress as follows:

- Adequate =  $PCI > 70$
- Degraded =  $55 < PCI < 70$
- Unsatisfactory =  $PCI < 55$

The majority of the pavements within the project study area in Bismarck are in adequate condition; there are three locations worth noting:

- Tyler Parkway, southbound, between Burnt Boat Road and Schafer Street, rated degraded
- Divide Avenue, bidirectional, between Lilac Lane and Channel Drive, rated unsatisfactory
- State Street, southbound, between I-94 North Ramp and Interchange Avenue, rated unsatisfactory

The majority of the pavements within the project study area in Mandan are in adequate condition, except for Sunset Avenue. This roadway is rated “degraded condition” between Old Red Trail and Boundary Road. See Figure collage below provided by the Bismarck-Mandan MPO, 2012 Pavement Condition Index, performed by Dynatest.



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## Bridges

All bridges along I-94, both overpass and underpass bridges, with crossroads were reviewed with respect to their bridge sufficiency ratings based on NDDOT Bridge Inventory – Structure Inventory and Appraisal data. The following attributes were reviewed to determine bridge sufficiency, including the deck surface:

- Deck Condition
- Superstructure Condition
- Substructure Condition
- Structure Condition
- Underclearance Vertical & Horizontal

The bridge sufficiency is a cumulative measure given the ratings of the contributing attributes. The sufficiency rating of “obsolete” does not necessarily indicate that the structure requires replacement. The deficiency that results in the “obsolete” rating could be mitigated (i.e., guardrail installed to mitigate side clearance issue).

Table 9 presents the results of this review.



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**Table 9: Bridge Sufficiency Rating Data**

Location	Deck	Superstructure	Substructure	Structure	Underclear.	Sufficiency
ND 25	Good	Very Good	Good	> minimum	= minimum	Sufficient
Sunset-1	Very Good	Good	Good	> minimum	<b>Intolerable</b> <sup>(1)</sup>	<b>Obsolete</b>
Sunset-2	Very Good	Good	Very Good	> minimum	<b>Intolerable</b> <sup>(1)</sup>	<b>Obsolete</b>
Collins-1	Good	Satisfactory	Satisfactory	= minimum	> tolerable	Sufficient
Collins-2	Good	Good	Satisfactory	= minimum	> tolerable	Sufficient
Mandan-1	<b>Fair</b>	Satisfactory	<b>Fair</b>	> minimum	tolerable	Sufficient
Mandan-2	<b>Fair</b>	Good	<b>Fair</b>	> minimum	tolerable	Sufficient
E Main	Very Good	Very Good	Good	> minimum	> tolerable	Sufficient
BismExpr	Good	Satisfactory	Satisfactory	= minimum	<b>Intolerable</b> <sup>(2)</sup>	<b>Obsolete</b>
MO River <sup>(3)</sup>	Very Good	Very Good	Good	> minimum	= minimum	Sufficient
Tyler	Good	Very Good	Very Good	> minimum	= minimum	Sufficient
Washington-1	Satisfactory	Good	Good	> minimum	> minimum	Sufficient
Washington-2	Satisfactory	Good	Good	> minimum	> minimum	Sufficient
4th-1	<b>Fair</b>	Good	Good	> minimum	> minimum	Sufficient
4th-1	Good	Good	Good	> minimum	> minimum	Sufficient
State	Good	Good	Good	> minimum	= minimum	Sufficient
19th	Good	Good	Good	> minimum	= minimum	Sufficient
CP Railway-1	Very Good	Very Good	Very Good	> minimum	= minimum	Sufficient
CP Railway-2	Good	Very Good	Very Good	> minimum	> minimum	Sufficient
Centennial	Good	Excellent	Good	> minimum	= minimum	Sufficient
80th	Satisfactory	<b>Poor</b> <sup>(4)</sup>	Satisfactory	tolerable	> tolerable	<b>Deficient</b>

<sup>(1)</sup> Intolerable rated underclearance is recommended for correction – shown with grey shading

<sup>(2)</sup> This intolerable rating is due to I-94's clearance only being 16' 7". This seems acceptable being greater than 16' 6"

<sup>(3)</sup> This bridge structure is identified as fracture critical

<sup>(4)</sup> The superstructure is listed as poor with only satisfactory deck pavement and substructure

## Utilities

Early coordination with various resource agencies included reaching out to the US Department of Energy – Western Area Power Administration (WAPA). In addition, existing street light basemap data was provided by the MPO for the City of Bismarck; similar data is not available for the City of Mandan. WAPA owns and operates two high voltage transmission lines that cross I-94 just west of Centennial Road in Bismarck. In addition, WAPA owns a parcel of land and communication site located near the intersection of I-94 and 66th Street in Bismarck – specifically located in the NW1/4 of Section 29, T.139N, R.79W.

As alternatives are developed and considered at various locations, potential impacts to these facilities will be evaluated and documented. Once alternatives are developed they will be reviewed again by WAPA to determine potential impacts, changes, and costs.

The street lighting data indicates that Bismarck has a comprehensive lighting network, with each I-94 interchange lit as well. Any geometric modifications to the roadway may potentially impact street lighting.



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## 7. LAND USE REVIEW/REFINEMENT/BEST PRACTICES

A key element of the I-94 Corridor Study is the review of future land use and assessment of recent and ongoing planning efforts of each of the four jurisdictions within the corridor study area. This review and assessment is offered as our interpretation of the land use practices, potential refinement (if any) and recommendations on best practices with respect to land use development planning.

### Land Use Relationship

Land use has a direct correlation to traffic patterns and volumes. To maintain pace with growth, an analysis of the density and arrangement of land uses can determine future transportation infrastructure needs.

The Bismarck-Mandan Metropolitan Planning Organization (MPO) sponsored the Regional Future Land Use Plan which was completed in 2007. That study documented existing land uses and established maps of future land uses for vacant and developing areas. The future land use maps were prepared with the assistance of local planning staff to be consistent with an orderly growth pattern for the Bismarck-Mandan area.

### Land Use Review with Local Stakeholders

Each member jurisdiction of the Bismarck-Mandan MPO adopted the 2007 Regional Future Land Use Plan as an official document. The future land use maps within the plan are used by local planners to compare new proposals to the future plan as a routine step of planning staff reviews. If the character of a proposed development is inconsistent with the future land use plan, it does not mean that development will be prohibited. It does mean that adequate justification must be provided. If the justification is deemed reasonable by the governing bodies of each jurisdiction, the future land use plan can be amended to incorporate the change.

SRF met with the planning staffs of Morton County and the City of Mandan, and the City of Bismarck and Burleigh County. The purpose of these meetings was to obtain input on issues related to land use and development activities within the I-94 Corridor Study area. The main objectives were:

- Determine the validity and effectiveness of the future land use maps from the 2007 plan
- Determine if changes were needed
- Determine if developments constructed since 2007 were in accordance with the future land use plan
- Identify amendments to proposed / constructed developments

### MORTON COUNTY

Morton County indicated that the future land uses established in the 2007 Plan are still valid and functional. No developments have occurred that are inconsistent with the plan. The Morton County zoning jurisdiction boundary coincides with the west boundary of I-94 Corridor Study area at ND Highway 25. No new development has occurred and none is currently proposed in the proximity of the ND Highway 25 Interchange (I-94 Exit 147).



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## THE CITY OF MANDAN

The City of Mandan did not indicate that any changes were needed to the 2007 future land use map and no developments had occurred that were inconsistent with the future plan. A new development had been recently proposed for the southwest quadrant of the Sunset Avenue Interchange. That proposal was for a residential development, which is consistent with the land use established by the future land use plan.

## THE CITY OF BISMARCK AND BURLEIGH COUNTY

Burleigh County in cooperation with the City of Bismarck Community Development Department indicated that development within the study corridor had been consistent with the future land use plan and that the 2007 plan meets their expectations.

In discussing future needs related to land use along the I-94 corridor, it was noted that the big-box retailers of Pinehurst Mall (located along the north side of I-94, east of Tyler Parkway) had inadvertently created a sound barrier with the construction of their stores; the tall walls that face I-94 function to shield the residential neighborhoods north of Pinehurst Mall from traffic noise generated by I-94; however, the City does not feel they are aesthetically pleasing. Local municipalities could develop ordinances that require developments to incorporate screening and other means to address similar building façade issues or resultant views, with materials used to create an entry way corridor with an overlay zoning district.

### **Land Use at the Sunset Interchange**

The Sunset Interchange location (I-94 Exit #152) is currently experiencing a higher rate of development immediately adjacent. New developments are either being built or are planned north and south of the freeway. Southwest of the interchange, along the south side of I-94, a proposed plat was submitted to the City of Mandan in December of 2012 for a residential development. A detailed layout of the site has not been provided to date. This is consistent with the future land use guidance for this area, which designates this location for residential development. Access to and from this location will be via Boundary Road that connects to Sunset Avenue immediately south of the interchange.

Northeast of the interchange, along Old Red Trail, is the location of a new Wal-Mart store. Other recent and current developments in this area include the new Mandan Middle School and a motel that will be built west of the school. Additional adjacent commercial development is expected to emerge. See Figure 5 below for reference.



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**Figure 5: Sunset Drive Interchange Area Development**



The cumulative effect of these new developments will result in a significant increase in traffic generation. The I-94 Corridor Study is in close coordination with the concurrent North Mandan Subarea Study to assess these impacts. This dynamic pocket of growth is noteworthy and must be acknowledged as a significant increase in land use density with resulting traffic impacts to the Sunset interchange.

## **Best Practices and Recommended Considerations**

### REVIEW PROCESS

It is important for the planning staff to remain vigilant in comparing proposed developments to the future land use maps that were adopted in the 2007 Regional Future Land Use Plan. As a blueprint for orderly development, the future land use plan provides an arrangement of land uses that promote compatibility of adjacent uses. In addition, the future land use plan provides security and stability to the community by eliminating the guesswork that would arise in the absence of such a plan. Existing residents do not have to wonder what might develop next door to them because the plan offers reasonable expectations. Developers also appreciate a future land use plan because it defines how an area is expected to evolve.

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Although local planning departments will, from time to time, experience turnover of staff, the future land use plan will allow continuity through its existence as an officially adopted document. Awareness of the plan and following formal amendment procedures when changes are needed will help maintain uniform and consistent linkages with transportation infrastructure improvement plans.

## **New Development and Redevelopment Considerations**

### TRAFFIC NOISE

As growth continues, new facilities are constructed and traffic volumes increase. An impact associated with increased traffic is increased traffic noise. There are several locations within the Bismarck-Mandan I-94 Corridor Study area where existing residential neighborhoods are located adjacent to the freeway as shown on the existing land use map below (yellow is residential):

**Figure 6: Representative Land Use Map – Residential Adjacent to Freeway**



Residential land uses adjacent to freeways are common for most population centers and typically does not pose a big concern for buyers of these existing homes (buyer understanding). Traffic noise is an existing and expected condition of the environment and residents are accustomed to the sound of traffic. To prevent unnecessarily loud and random noises that are noticeable, Bismarck and Mandan both prohibit the use of compression releases (jake brakes) within the urbanized areas of the community.

In extreme situations with very high traffic volumes, sound walls can be used along urban freeways to protect residential neighborhoods from excessive levels of traffic noise. Although landscape trees and various buffering exist at some adjacent residential locations in the Bismarck-Mandan I-94 Corridor, plant materials are only so effective in buffering sound. The most effective sound barriers are solid structures that also block the line of sight between the source of the sound and the receptor.

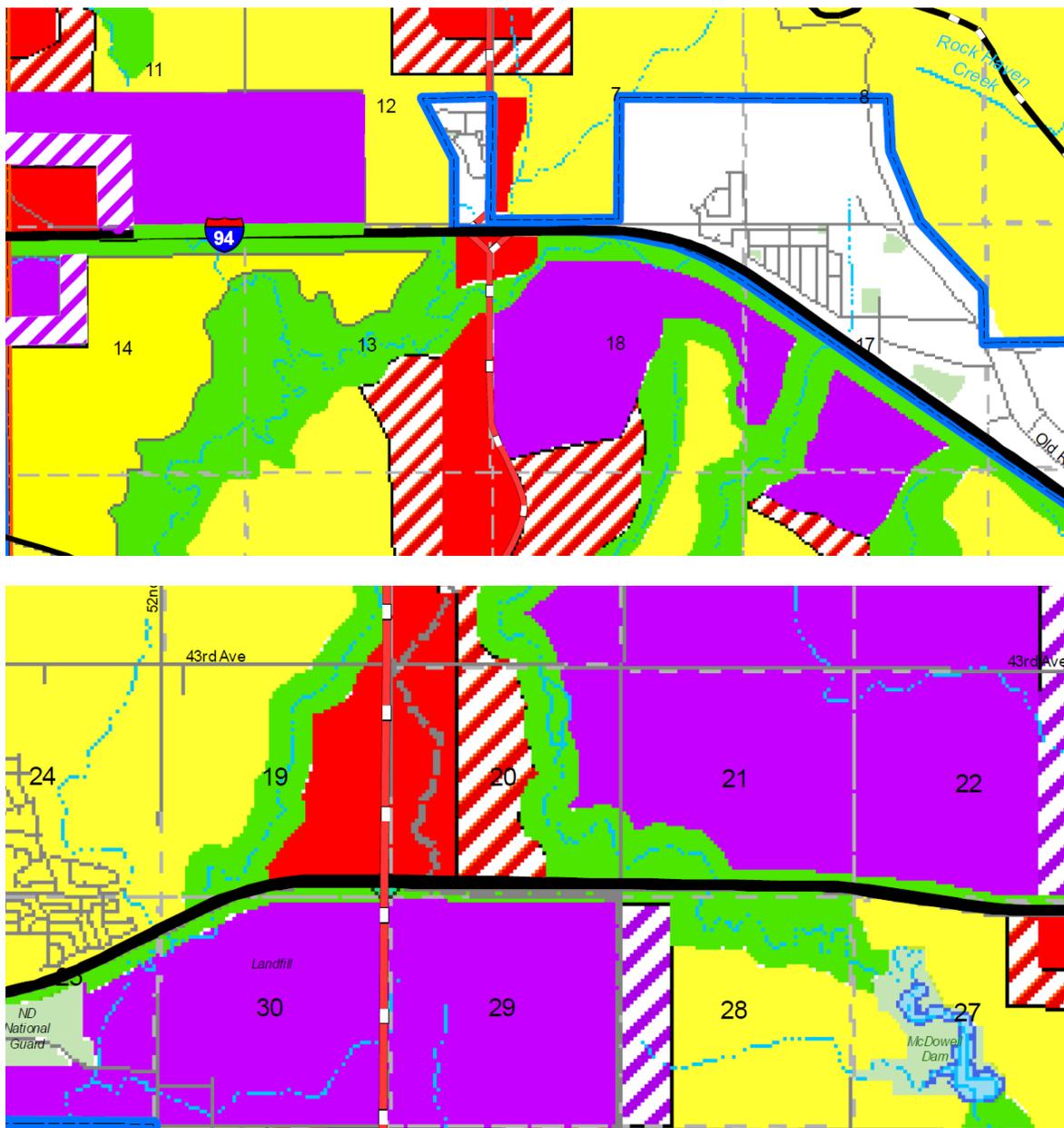


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As mentioned earlier, big-box retail stores adjacent to the freeway serve this function, but the entire corridor cannot be expected to be lined with commercial and industrial land uses. The development pattern is established and it is unlikely that existing residential neighborhoods will be redeveloped into less sound-sensitive uses.

The 2007 future land use plan maps show a buffer of “Parks/Open Space/Greenways” along many segments of the I-94 corridor (see Figure 7 and the green shaded areas). Landscape buffers function more effectively as aesthetic buffers to commercial and industrial uses (as viewed from the freeway) than they function as sound barriers to adjacent properties.

**Figure 7: Park / Green Space Buffers**



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Where there are opportunities to utilize less sound-sensitive land uses adjacent to a freeway, consideration should be given. One such area exists along the north edge of Section 27 at the bottom right corner of the above map where residential (yellow) land use is shown for this currently undeveloped area adjacent to the freeway. Avoidance of incompatibilities like this is the best way to avoid costly sound mitigation efforts in the future.

There is also a component of potential collaboration on the part of the NDDOT and local jurisdictions to resolve issues like noise mitigation. The SDDOT is working toward a public/private partnership in which SDDOT works with local jurisdictions to develop noise overlay districts where local jurisdictions regulate through zoning and/or subdivision to abate existing and future noise impacts. This may include noise buffers, building orientation, building with increased insulation, etc. A similar collaborative could be successful with the NDDOT and local jurisdictions.

## IDENTIFICATION AND ASSESSMENT OF TRANSPORTATION IMPROVEMENTS

Another recommended practice associated with new developments and redevelopment of areas is to require developers to conduct traffic studies around interchanges, at the initial or conceptual phase. This is not an unreasonable expectation because the proposed development will impact traffic flows. A traffic study will consider the cumulative effect and interactions with existing developments nearby and then identify design solutions. The need for corresponding improvements will be determined, such as the optimum location of access points and whether turn lanes and traffic control is needed. It is not unreasonable to require developers to fund those improvements needed to handle the traffic generated by their development.



# FINAL

## 8. CULTURAL AND NATURAL RESOURCES

Preliminary archaeological, cultural and natural resources near the I-94 corridor and its accessible crossroads were identified through data provided by various resource agencies. These preliminary resources are displayed on Figure 8. Additional analysis and identification of sites will be completed as part of future environmental documentation beyond this current process. This may include discovery of new sites that were not previously identified in any of the above-mentioned resources.

There are a number of resources located within the defined project study boundary; however, based on preliminary review of the data, there is no known potential for impacts within the project study area. This includes both environmental damage and impacts to archeological and Native American religious sites on lands held in trust by the Bureau of Indian Affairs, Great Plains Region. In addition, there are no known flood plain or wetland impacts anticipated within the project study area based on data received from the National Flood Hazard Layer [NFHL] database and the North Dakota State Water Commission (see Figure 9).

The identification and proper consideration of these sites is necessary to ensure that impacts to known or previously identified archaeological, cultural and natural resources are minimized as part of the evaluation of the corridor alternatives. Furthermore, the alternatives selected for implementation must be in compliance with the following legislation:

1. Department of Transportation Act of 1966, Section 4(f), which pertains to the preservation of all publically-owned public parks, waterfowl and wildlife refuges, and all historic areas (49 U.S.C. 303; 23 U.S.C. 138)
2. Land and Water Conservation Fund Act of 1965, Public Law 88-578 Title 16, United States Code, Section 6(f)(3), which contains strong provisions to protect Federal investments and the quality of assisted resources. The law is firm but flexible.
3. Archaeological Resources Protection Act of 1979, which applies to archaeological resources on tribal lands and non-tribal lands under Federal jurisdiction

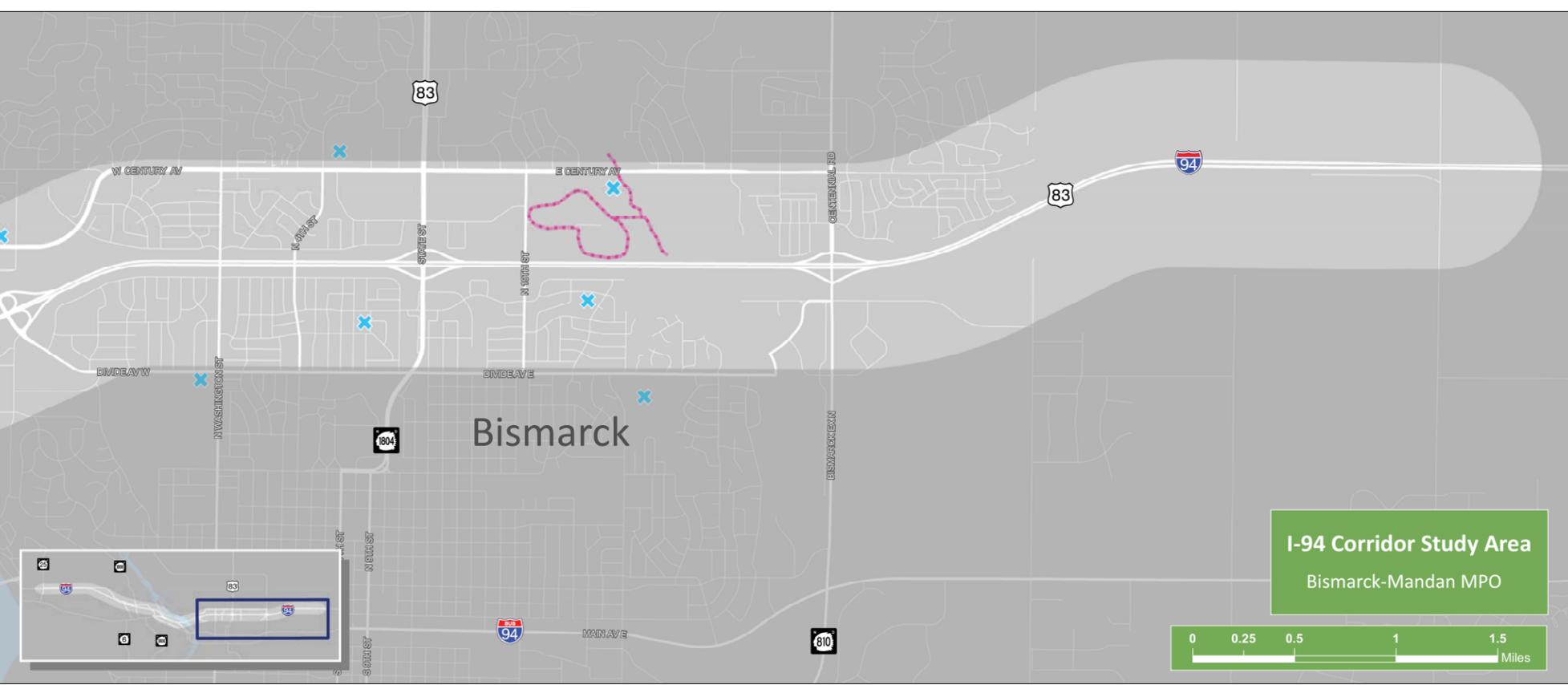
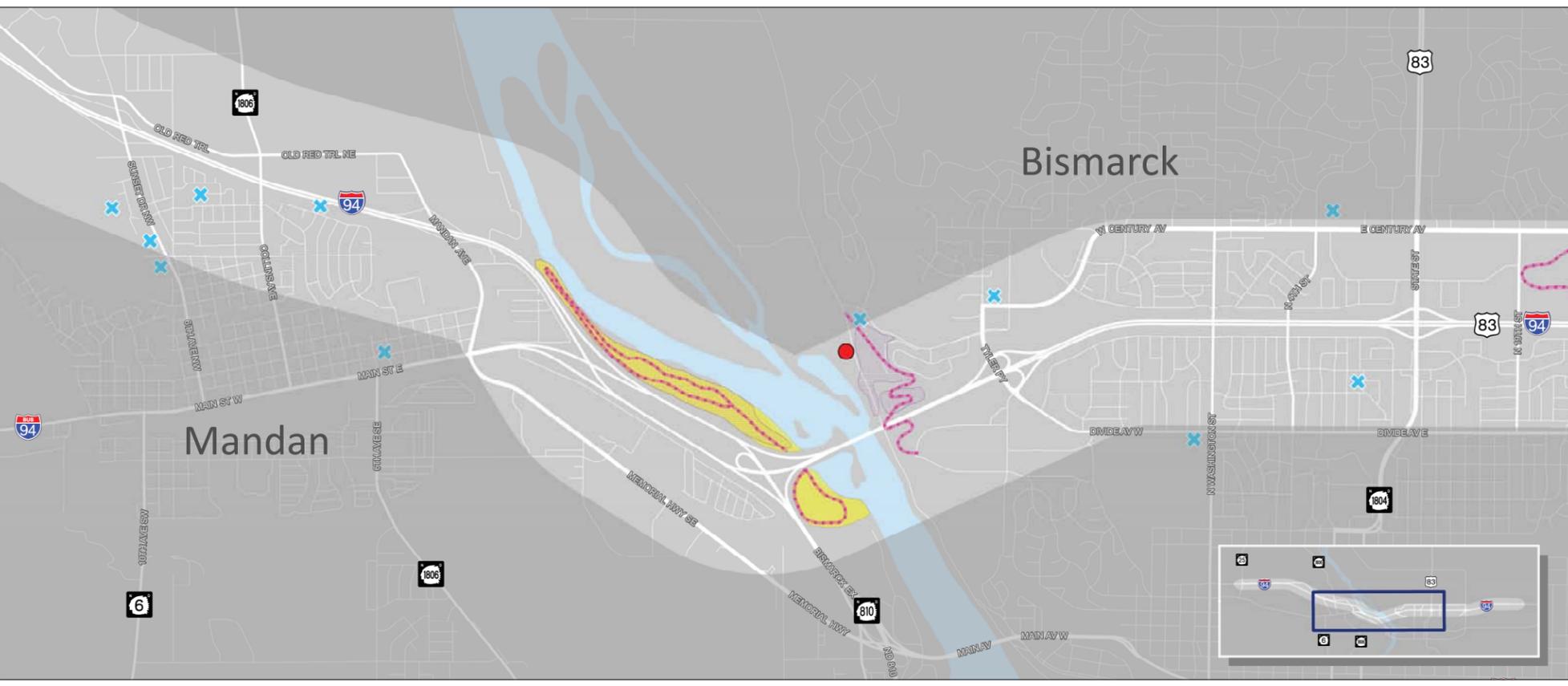




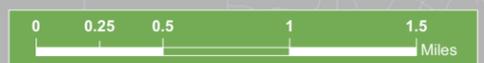
**Significant Areas and Sites**

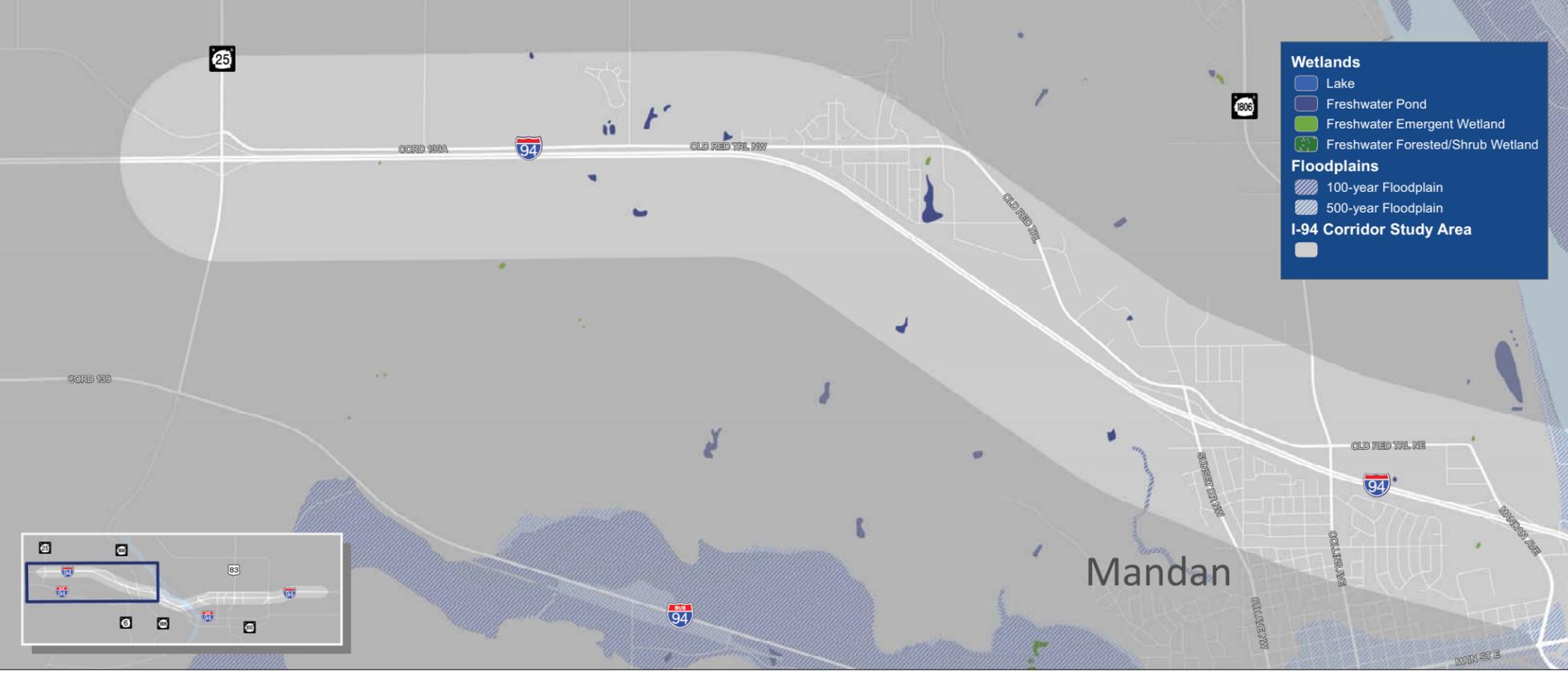
- Animal Species of Concern
- ▲ Significant Ecological Community
- ✕ Land & Water Conservation Fund Project (Section 6f)
- ND Parks & Recreation - Recreational Trail
- Significant Ecological Community
- ND Park & Recreation Boundaries
- I-94 Corridor Study Area

Source: ND Parks & Recreation Dept. March 2013



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO





**Wetlands**

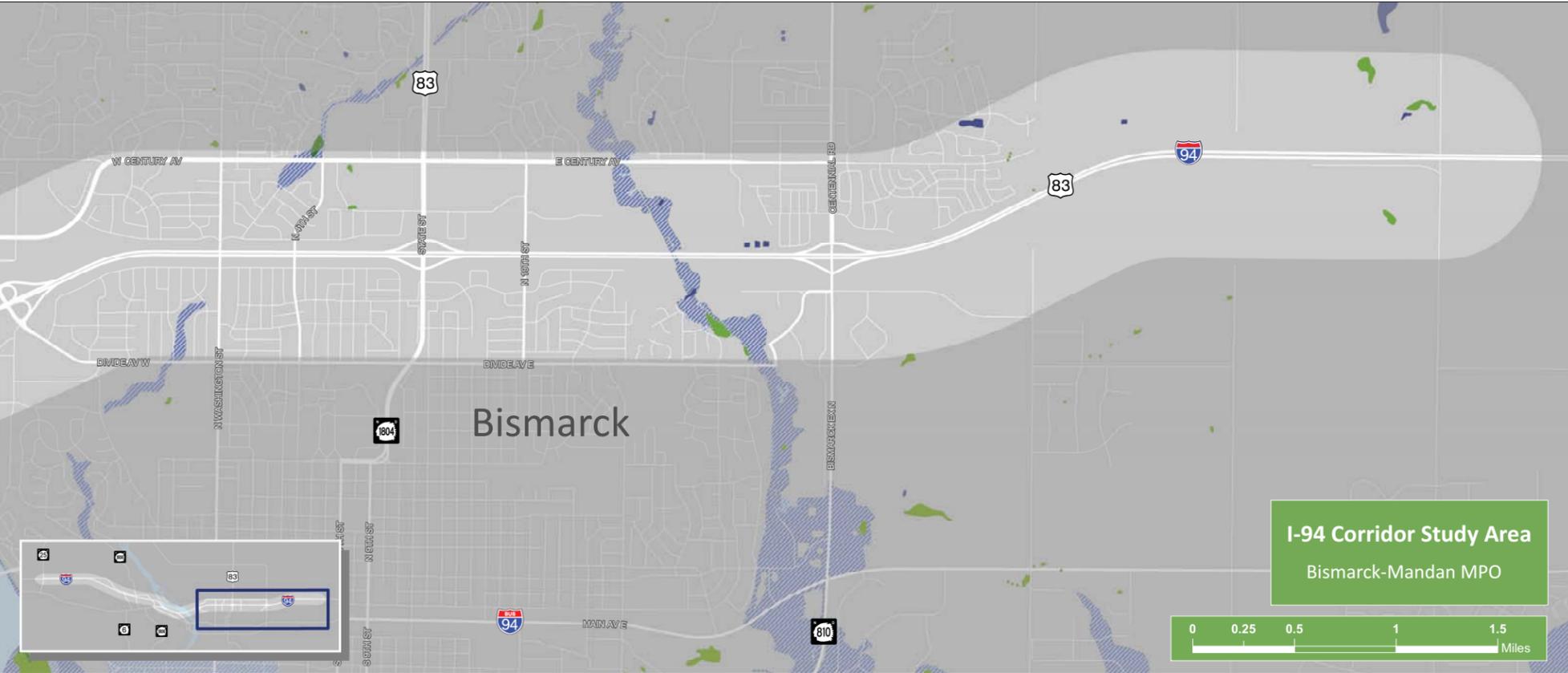
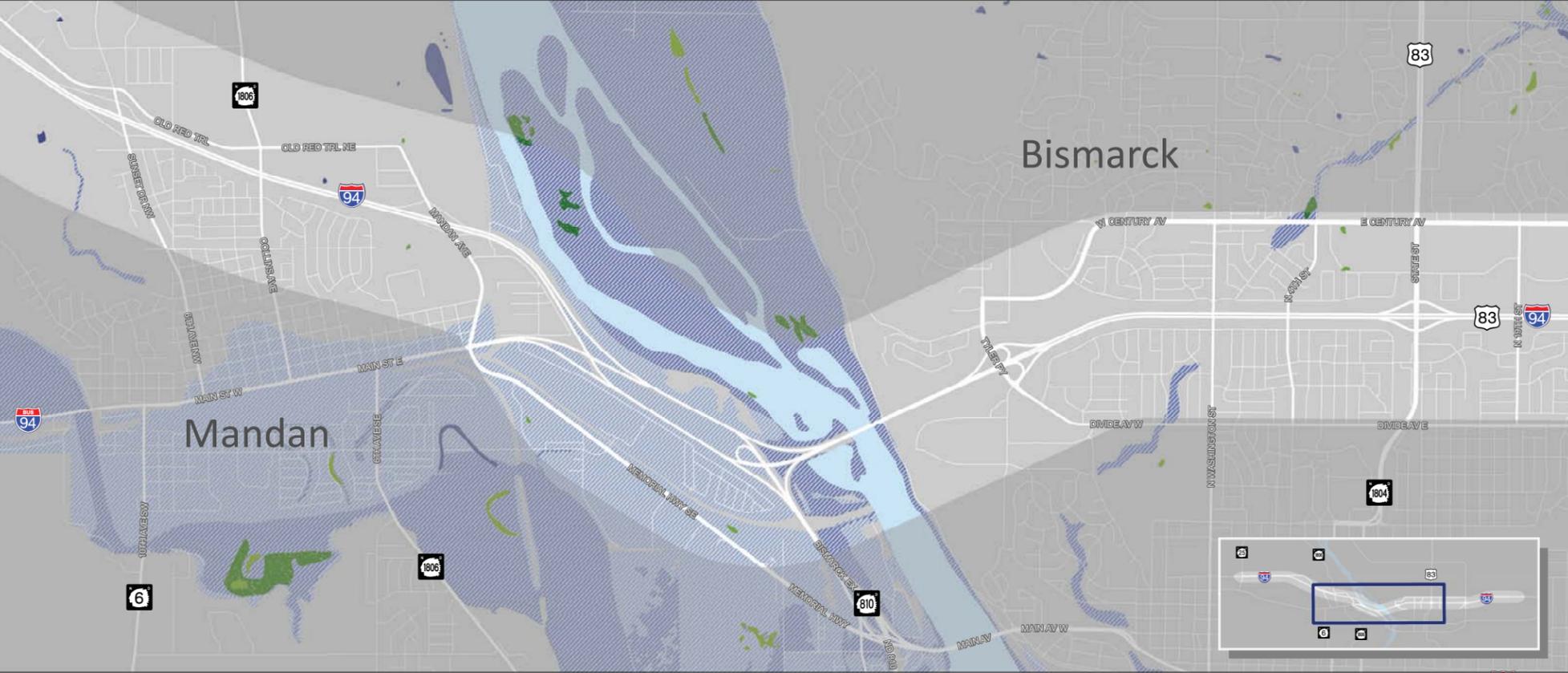
- Lake
- Freshwater Pond
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland

**Floodplains**

- 100-year Floodplain
- 500-year Floodplain

**I-94 Corridor Study Area**

- 



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO



# FINAL

## 9. ENVIRONMENTAL JUSTICE

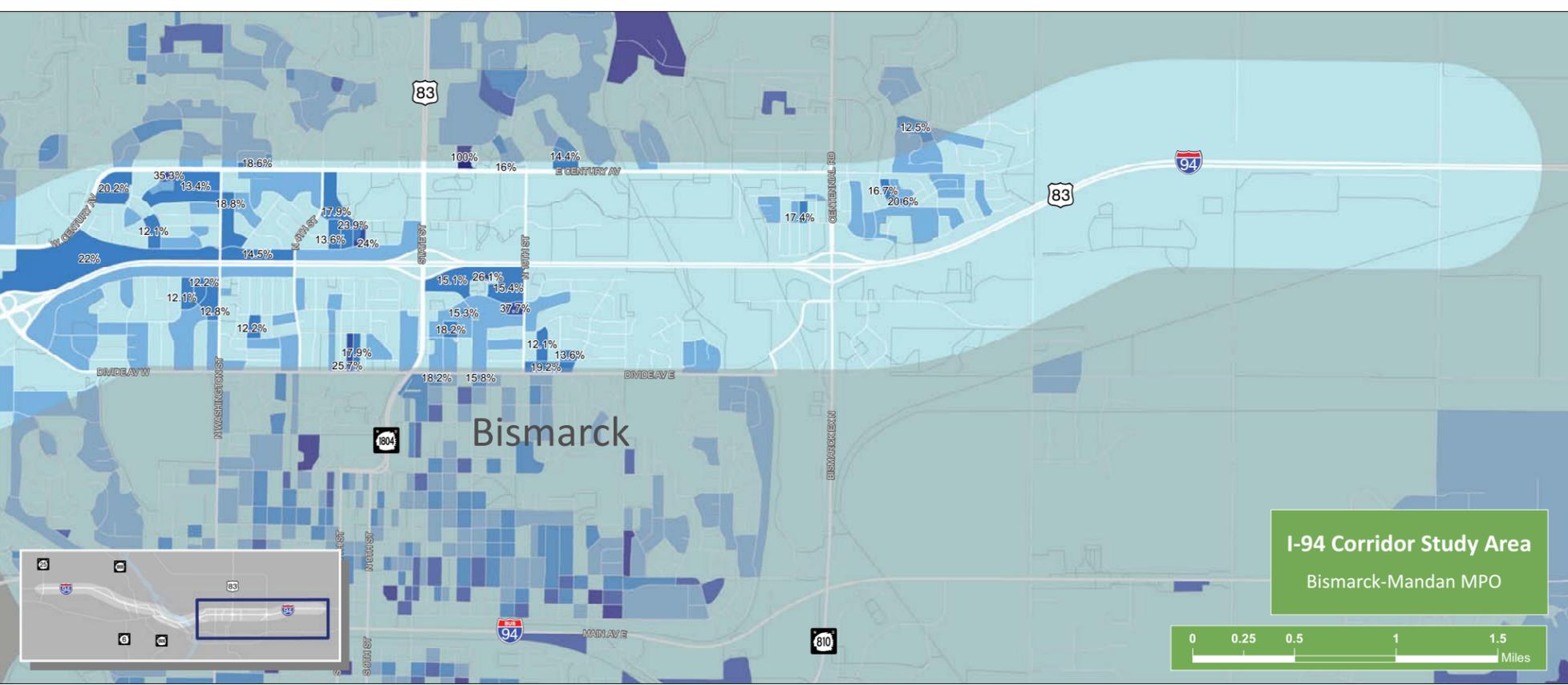
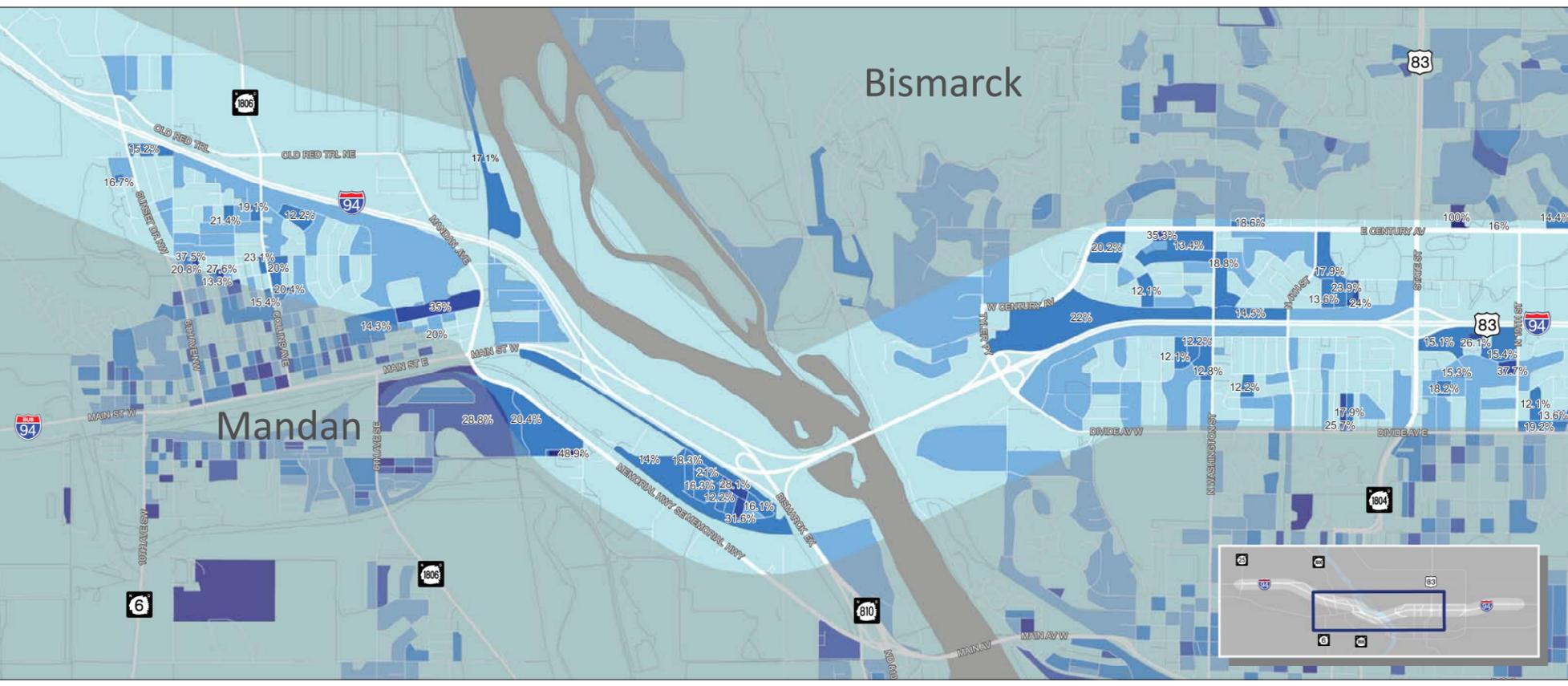
Title VI of the Civil Rights Act of 1964 prohibits discrimination on the basis of race, color, or national origin in programs receiving federal financial assistance. Title VI states that “no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.” In 1994, President Clinton issued Executive Order 12898, which states that each federal agency “shall make achieving environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.”

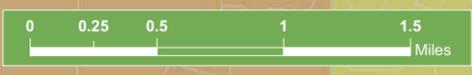
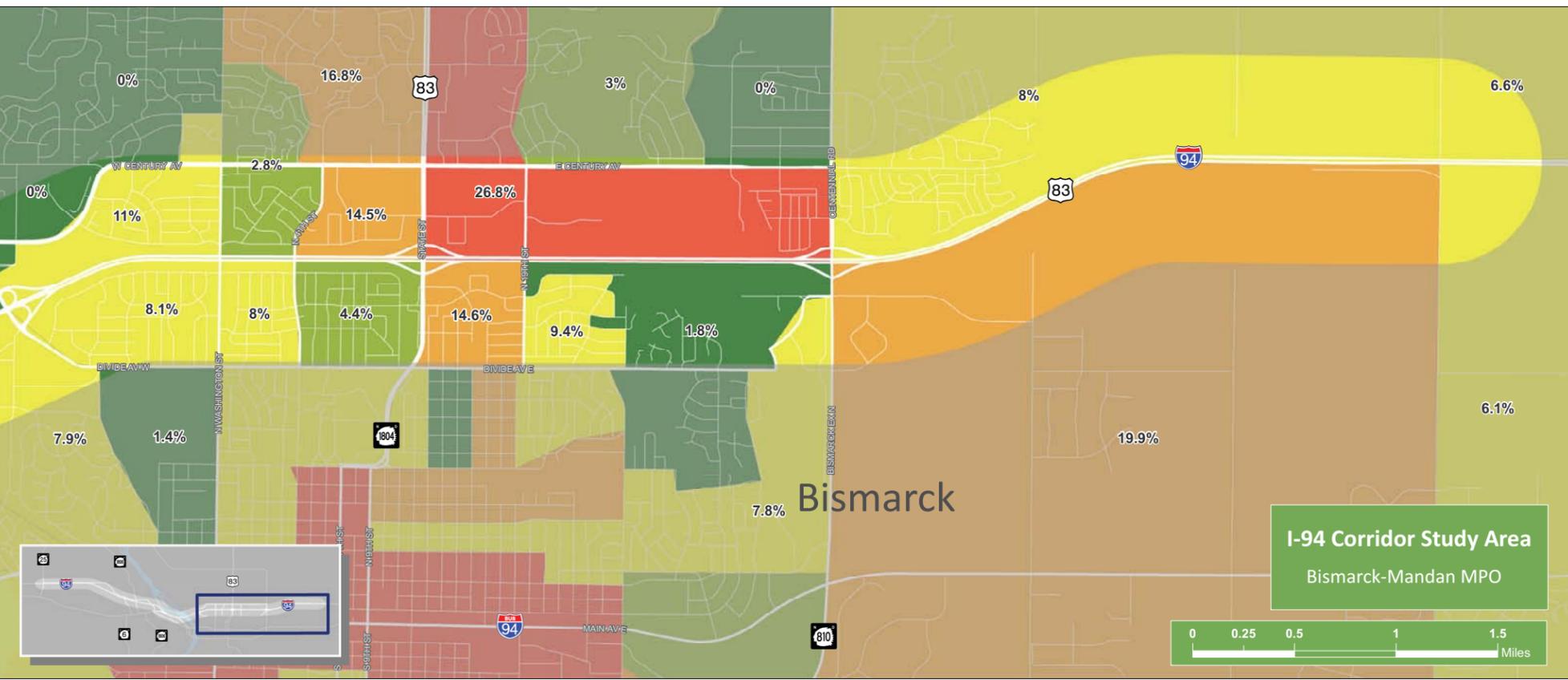
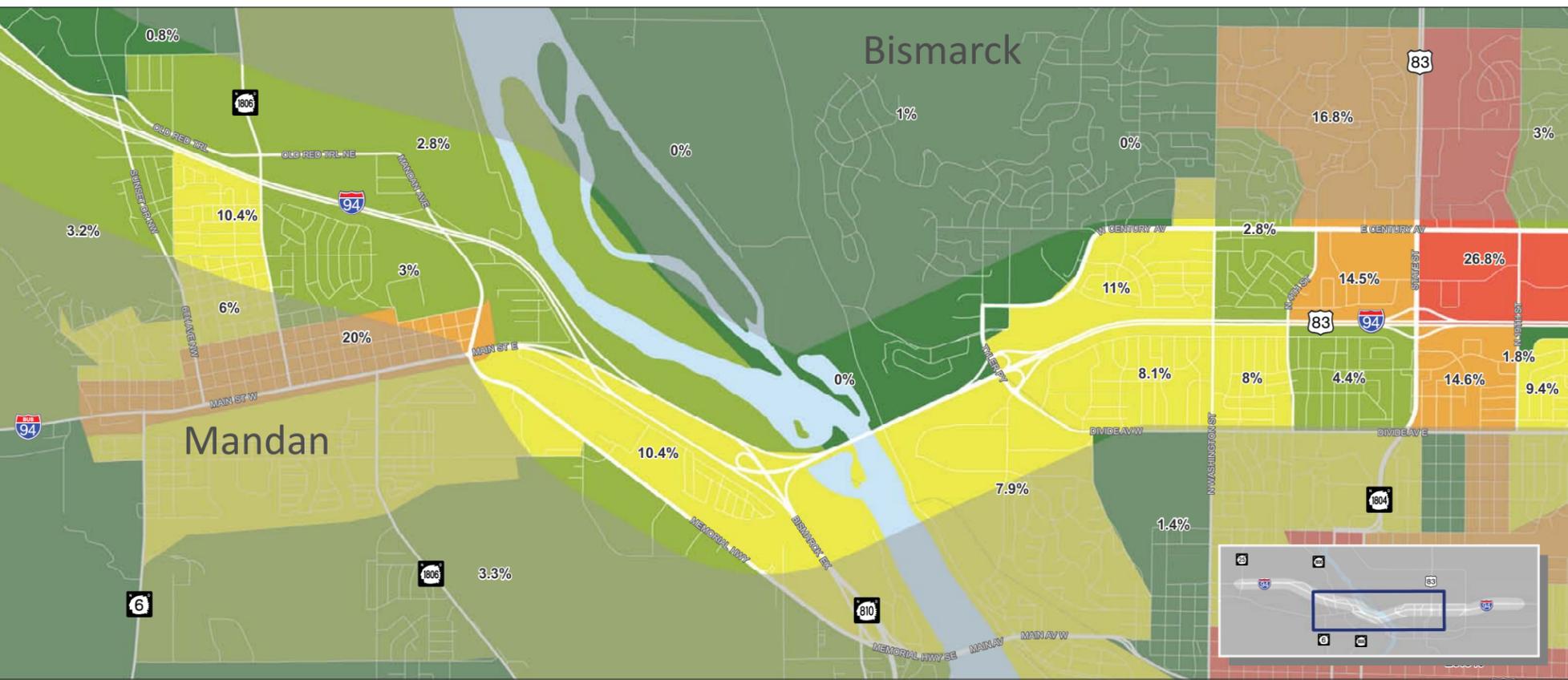
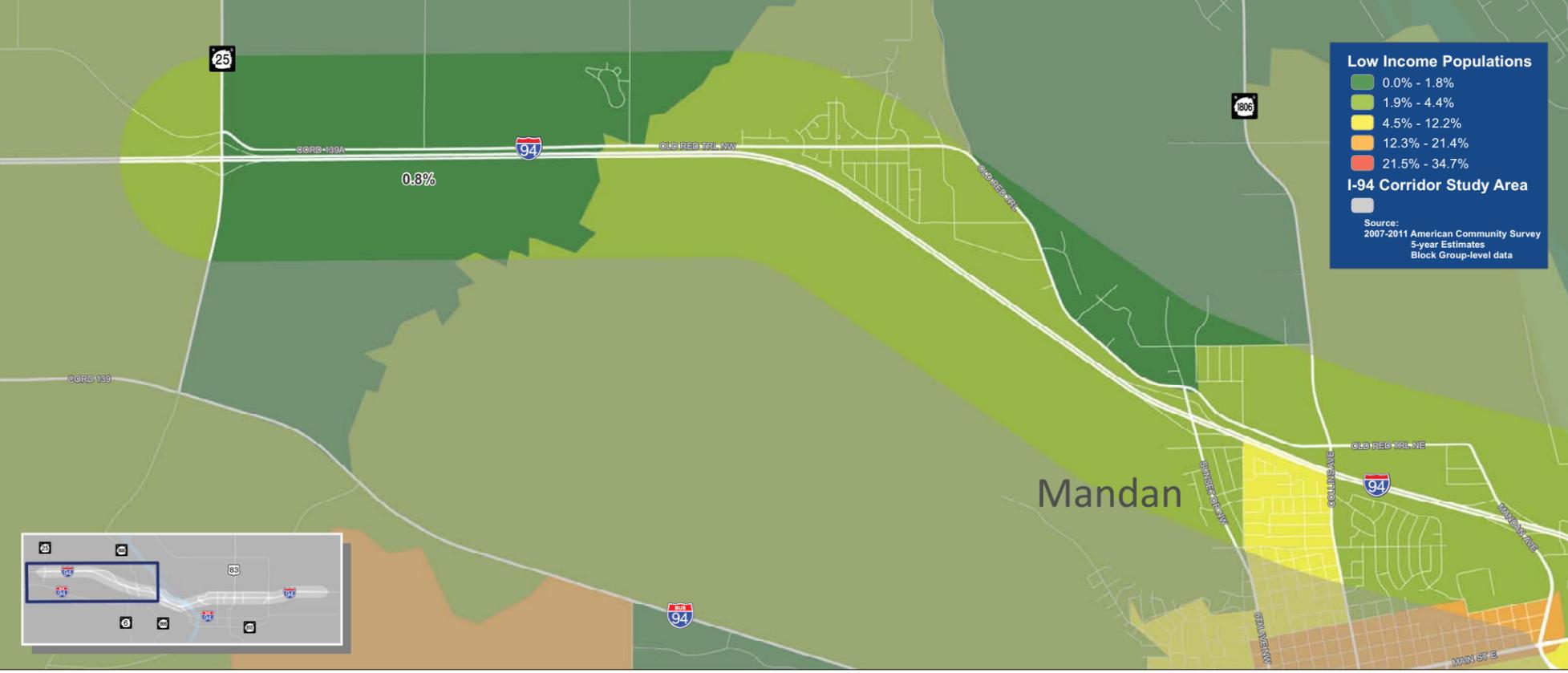
In an effort to comply with Executive Order 12898, data from the 2007-2011 American Community Survey block group level and 2010 Census block level was used to identify the concentrations of low-income and minority populations along the corridor, respectively, in an effort to limit disproportionate impacts to these communities.

Minority population concentrations were determined from the 2010 Census block-level data in which 25 percent or more of the total population self-reported a race other than “single-race white.” Based on our preliminary review zero blocks fall within these race criteria to be considered a predominantly minority block near corridor areas that have the potential to be impacted by potential alternatives (see Figure 10).

Low income population concentrations were determined from 2007-2011 block group-level data in which 25 percent or more of the total population was below 125 percent of the U.S. Department of Health and Human Services poverty threshold. Based on our preliminary review the area north of I-94 between US 83 (State Street) and Centennial Road falls within these income criteria to be considered a predominantly low-income block group (see Figure 11).







# FINAL

## 10. TRAFFIC OPERATIONS

I-94's Grant Marsh Bridge is one of only three river crossings in the Bismarck-Mandan area, with a convergence of traffic at existing system interchanges through this area. This convergence of traffic attempting to cross the river using this bridge is but one issue that has resulted in peak hour deficiencies at interchange intersections along the I-94 corridor.

A traffic operations analysis was conducted to determine how the I-94 corridor and intersecting north-south crossroads currently operate, to identify the future capacity, access, and safety needs, and to recommend potential improvements where necessary; existing and future year 2040 a.m. and p.m. peak hour conditions were reviewed.

17 miles of I-94 and 32 key intersections along crossroads were examined. The following key intersections were included:

1. ND Highway 25/South Ramp
2. State St/Century Ave
3. ND Highway 25/North Ramp
4. State St/K-Mart/Mall Access
5. ND Highway 25/Co Rd 139A
6. State St/Interstate Ave
7. Sunset Dr/27th St \*
8. State St/North Ramps
9. Sunset Dr/Old Red Trail \*
10. State St/South Ramps
11. Sunset Dr/North Ramps \*
12. State St/Interchange Ave
13. Sunset Dr/South Ramps \*
14. State St/Capitol Ave
15. Sunset Dr/Boundary Rd
16. State St/Spaulding Ave
17. Mandan Ave/North Ramps\*
18. State St/Restaurant/DQ/Bank Access
19. Mandan Ave/South Ramps\*
20. State St/Divide Ave
21. Mandan Ave/Division St
22. Bismarck Expy/Centennial Rd/Commerce Dr
23. Tyler Parkway/Divide Ave/Century Ave
24. Bismarck Expy/Centennial Rd/Miriam Ave
25. Tyler Parkway/Divide Ave/Burnt Boat Dr
26. Bismarck Expy/Centennial Rd/South Ramps
27. Tyler Parkway/Divide Ave/North Ramps
28. Bismarck Expy/Centennial Rd/North Ramps
29. Tyler Parkway/Divide Ave/South Ramps/Schafer St
30. Centennial Rd/Trenton Dr
31. Tyler Parkway/Divide Ave/Turnpike Ave
32. Centennial Rd/Century Ave

\* Intersection is also included in the North Mandan Subarea Study

Peak hour turning movement counts were collected at each of the key intersections listed above during the week of October 23, 2012. In addition, 24-hour average daily traffic counts were collected on the State Street and Bismarck Expressway/Centennial Road interstate ramps during the same time period. The resultant existing condition turning movement counts are provided in Appendix A.



# FINAL

## Existing Conditions

### FREEWAY OPERATIONS

Existing traffic operations for freeway facilities in the study area were evaluated using a CORSIM simulation model. CORSIM is a micro-simulation model used to evaluate freeway capacity and access configurations. The limits of the model include the I-94 corridor from ND Highway 25 in Mandan to 80th St NE in Bismarck. It also includes the intersections of freeway entrance and exit ramps and their crossroads, including the immediate adjacent intersections.

The CORSIM model was prepared using existing intersection geometrics, traffic control, and traffic volumes collected in October 2012. Other adjustments and inputs to the model include vehicle fleet characteristics and corridor roadway grades. Vehicle fleet data was measured by reviewing video files of traffic along I-94 to establish medium and heavy vehicle percentages. Roadway grades along I-94 were also input to ensure that vehicle operating characteristics were properly accounted for in the model.

Results of the operations modeling were reported for the a.m. and p.m. peak hours. Based on the traffic volumes along I-94 and at interchanges in the study area, the a.m. peak hour was determined to occur from 7:15 a.m. to 8:15 a.m. and the p.m. peak hour to occur from 4:45 p.m. to 5:45 p.m. Freeway performance is reported based on traffic density, which is expressed in units of vehicles per mile per lane (vpmpl). Traffic densities are grouped into level of service (LOS) categories from LOS A (free flow) to LOS F (highly congested). The NDDOT considers level of service C and above to be acceptable. Level of service ranges are shown in Table 10.

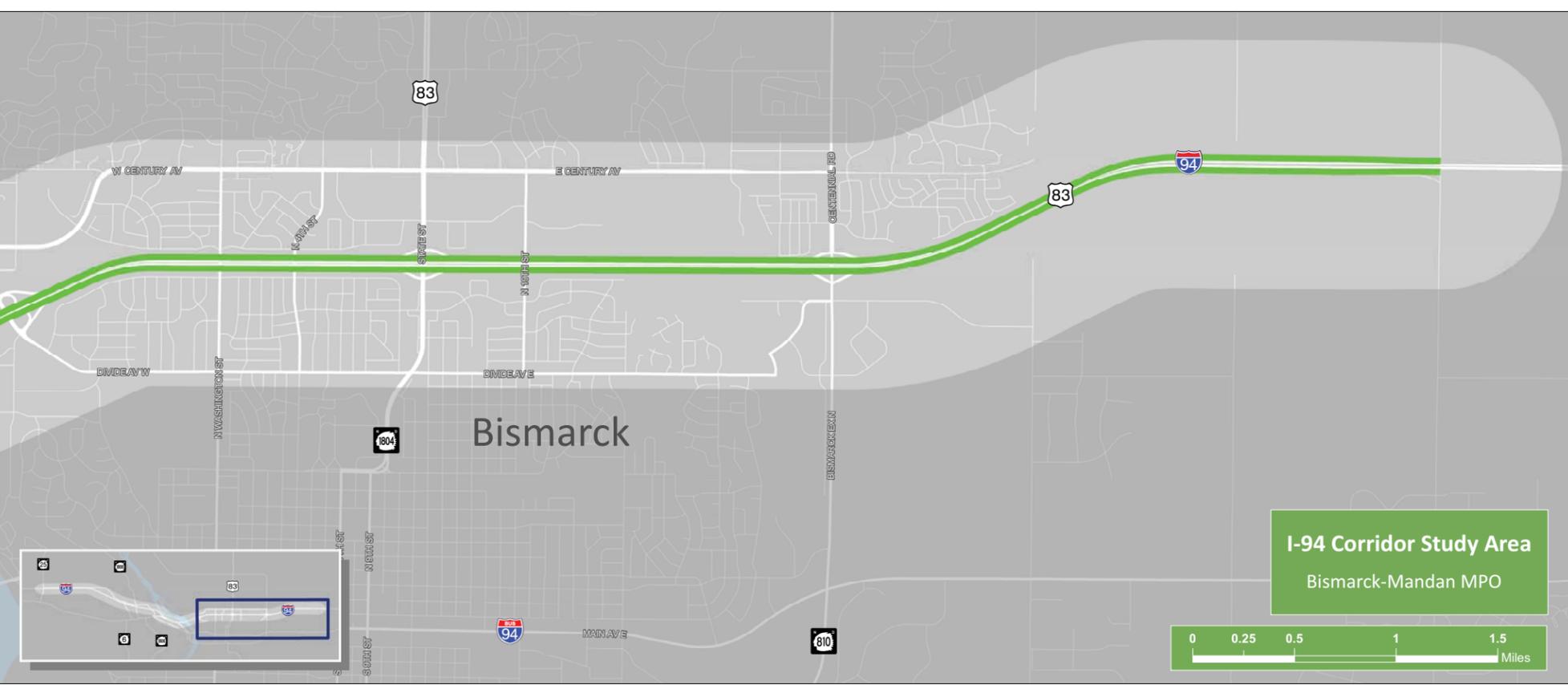
**Table 10: Freeway Level of Service Density Ranges \***

LOS Designation	Freeway Density (vpmpl)
A	0 to 10
B	10 to 20
C	20 to 28
D	28 to 35
E	35 to 43
F	43 and above

\* HCM 2010 – Freeway Facilities

Results from the existing operations model show no locations along the freeway system in the study area that have unacceptable levels of service. All segments were observed to operate at LOS B and above during the a.m. and p.m. peak hours under existing conditions. Figure 12 presents the acceptable freeway level of service for existing conditions graphically.





# FINAL

## CROSSROAD INTERSECTION OPERATIONS

A review of the existing conditions was completed to determine if any operational or geometric issues currently exist along the various north-south intersecting corridors. To determine the existing capacity at each intersection, a.m. and p.m. peak hour turning movement counts were reviewed.

An operations analysis was conducted for the a.m. and p.m. peak hours at the key intersections to determine how traffic currently operates in the study area. Signalized intersections were analyzed using the Synchro/SimTraffic software, while unsignalized intersections were analyzed using a combination of Synchro/SimTraffic software and the HCM. It should be noted that where unsignalized intersections are in close proximity to signalized intersections, the signalized intersections have a significant impact on the overall operations of the unsignalized intersections. To account for this situation, Synchro/SimTraffic results were reported for the unsignalized intersections as well as the signalized.

Capacity analysis results identify a Level of Service (LOS) which indicates the quality of traffic flow through an intersection. Intersections are given a ranking from LOS A through LOS F. The LOS results are based on average delay per vehicle. The delay threshold values are shown in Table 10. LOS A indicates the best traffic operation, with vehicles experiencing minimal delays. LOS F indicates an intersection where demand exceeds capacity, or a breakdown of traffic flow. LOS A through C is generally considered acceptable by drivers in the Bismarck-Mandan area. For purposes of this analysis LOS A through C is considered under capacity, LOS D is considered approaching capacity and LOS E-F is considered over capacity.

**Table 11: Level of Service Criteria for Signalized and Unsignalized Intersections \***

LOS Designation	Signalized Intersection Average Delay/Vehicle (seconds)	Unsignalized Intersection Average Delay/Vehicle (seconds)
A	< 10	< 10
B	10-20	10-15
C	20-35	15-25
D	35-55	25-35
E	55-80	35-50
F	80 <	50 <

\* HCM 2010 – Interrupted Flow Chapters

For side-street stop controlled intersections, special emphasis is given to providing an estimate for the LOS of the minor approach. The traffic operations at an unsignalized intersection with side-street stop control can be described in two ways. First, consideration is given to the overall intersection LOS. This takes into account the total number of vehicles entering the intersection and the capability of the intersection to support those volumes. Second, it is important to consider the delay on the minor approach. Since the mainline does not have to stop, the majority of delay is attributed to the side-street approaches.



# FINAL

Results of the existing operations analysis indicate that all key intersections currently operate at an acceptable overall LOS C or better during the a.m. and p.m. peak hour, with existing traffic controls and geometric layout; except for the intersection of State Street/Divide Avenue during the p.m. peak hour. This intersection currently operates with an overall intersection LOS D (approaching capacity). There are a number of individual traffic movements at the various intersections that operate with a LOS D or worse (LOS E-F). Most of the traffic movements that operate with lower LOS are at side-street stop intersections, where the side-street delay in general is greater. Tables 12-15 on the following pages provide the a.m. and p.m. LOS results, respectively.

There were a number of queuing issues observed along the north-south corridors during the a.m. and p.m. peak hours. The queuing issues are characterized in three ways; queues between 250 – 300 feet are of concern and should be monitored; queues between 300 – 400 feet are approaching significance; queues greater than 400 feet are already significant. The following notes summarize the operations analysis findings. All queues are graphically depicted for the a.m. and p.m. peaks in Appendix B. Tables 16 and 17 present the a.m. and p.m. peak hour 95th percentile queues that are of significance.



# FINAL

**Table 12: Existing A.M. Peak Hour LOS Results - 1**

**Bis-Man I-94 Corridor Study  
Traffic Operations Results**

**Existing Conditions  
AM Peak Hour**

**3/1/2013  
Page 1 of 2**

**105: TH 25 & EB I-94 On Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	5.4		2.4	3.5						1.4	0.8	1.2	2.8	1.4		2.2	2.0
Level of Service	A		A	A						A	A	A	A	A		A	A

**110: TH 25 & WB I-94 Off Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					6.2		3.0	4.7	2.9	0.5		2.0		0.3	0.2	0.3	1.6
Level of Service					A		A	A	A	A		A		A	A	A	A

**115: TH 25 & CR 139A**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)		5.9	2.9	3.0	4.5	5.7	2.6	4.0	1.9	0.3	0.2	0.4	2.3	0.7	0.0	0.8	1.6
Level of Service		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

**205: Sunset Dr & Boundary Rd**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	11.1		5.0	9.0	15.3	16.8	7.9	9.2	3.5	1.6	1.0	1.6	4.1	1.1	0.5	1.5	2.8
Level of Service	B		A	A	C	C	A	A	A	A	A	A	A	A	A	A	A

**210: Sunset Dr & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	46.9		4.0	17.2						2.5	1.5	2.0	15.8	1.4		8.7	6.3
Level of Service	E		A	C						A	A	A	C	A		A	A

**215: Sunset Dr & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					44.3		3.7	15.6	21.9	1.2		5.3		4.6	4.6	4.6	7.6
Level of Service					E		A	C	C	A		A		A	A	A	A

**220: Sunset Dr & Old Red Trail**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	18.2	19.5	4.7	6.2	21.7	20.2	3.0	18.5	21.7	9.4	1.4	16.9	0.0	26.0	2.2	23.7	13.6
Level of Service	B	B	A	A	C	C	A	B	C	A	A	B	A	C	A	C	B

**225: Sunset Dr**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)			1.5	1.5	5.1		3.5	5.0		1.4	1.9	1.7	1.1	0.1		0.6	3.2
Level of Service			A	A	A		A	A		A	A	A	A	A		A	A

**305: Mandan Ave & Missouri Dr**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					5.7		2.6	4.2		0.5	0.3	0.5	2.6	0.5		0.7	0.9
Level of Service					A		A	A		A	A	A	A	A		A	A

**310: Mandan Ave & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	10.1		3.9	4.3						1.2	0.5	0.9	4.3	1.4		3.6	3.0
Level of Service	B		A	A						A	A	A	A	A		A	A

**315: Mandan Ave & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					4.5		3.6	3.6	3.2	0.8		2.0		0.9	0.7	0.9	1.8
Level of Service					A		A	A	A	A		A		A	A	A	A

**505: Divide Ave & Commercial Driveway/Turnpike Ave**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	18.6		4.5	6.5	15.5	15.7	4.1	5.5	3.9	1.1	0.6	1.5	4.6	2.5	2.0	2.9	2.9
Level of Service	C		A	A	C	C	A	A	A	A	A	A	A	A	A	A	A

**510: Divide Ave & Schafer St/EB I-94 Ramps**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	40.6	46.9	5.5	37.9	33.4	42.2	3.1	18.8	13.1	10.4	2.6	9.4	12.3	9.4	6.1	8.6	13.0
Level of Service	D	D	A	D	C	D	A	B	B	B	A	A	B	A	A	A	B

**515: Divide Ave & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					31.1		1.5	20.7		6.7	4.2	6.2		7.0	4.3	6.1	8.0
Level of Service					C		A	C		A	A	A		A	A	A	A

**520: Divide Ave & Burnt Boat Rd**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	23.8	31.9	40.1	37.0	33.0	44.6	6.2	32.3	24.2	8.9	6.0	13.6	15.8	27.6	23.3	26.9	25.0
Level of Service	C	C	D	D	C	D	A	C	C	A	A	B	B	C	C	C	C

**525: Divide Ave & Century Ave**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					0.8		0.6	0.8		12.6	3.4	5.9	9.7	12.3		12.1	6.3
Level of Service					A		A	A		B	A	A	A	B		B	A



# FINAL

**Table 13: Existing A.M. Peak Hour LOS Results - 2**

**Bis-Man I-94 Corridor Study  
Traffic Operations Results**

**Existing Conditions  
AM Peak Hour**

**3/1/2013  
Page 2 of 2**

**605: State St & Divide Ave**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	39.0	30.8	2.3	24.6	42.3	27.1	3.0	26.5	41.5	21.8	13.4	23.9	52.7	19.0	18.4	21.9	23.5
Level of Service	D	C	A	C	D	C	A	C	D	C	B	C	D	B	B	C	C

**610: State St & Business Access/DQ Access**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	39.0		21.2	23.9					14.2	4.0	2.6	4.1	4.9	1.2	0.4	1.2	2.3
Level of Service	E		C	C					B	A	A	A	A	A	A	A	A

**615: State St & Spalding Ave**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	0.0	34.2	8.4	11.9	18.0		6.2	8.5	11.3	0.6	0.4	0.7	5.4	2.9	2.9	3.0	2.4
Level of Service	A	D	A	B	C		A	A	B	A	A	A	A	A	A	A	A

**620: State St & Capitol Ave**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	45.2	28.2	19.0	33.2	43.4	29.0	16.4	31.4	53.1	13.2	8.9	14.4	51.9	9.0	6.7	10.3	16.1
Level of Service	D	C	B	C	D	C	B	C	D	B	A	B	D	A	A	B	B

**625: State St & Interchange Ave**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	84.1	94.4	40.8	61.8	31.4	31.0	11.0	12.8	18.7	3.4	2.2	3.6	11.8	2.8	2.1	3.1	4.7
Level of Service	F	F	E	F	D	D	B	B	C	A	A	A	B	A	A	A	A

**630: State St & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	40.4		27.5	35.6						18.1	3.1	16.5	46.0	12.5		15.0	20.6
Level of Service	D		C	D						B	A	B	D	B		B	C

**635: State St & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					39.1		19.7	32.6	51.7	6.5		15.2		23.8	11.8	21.5	20.1
Level of Service					D		B	C	D	A		B		C	B	C	C

**640: State St & Interstate Ave**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	24.9	39.1	13.7	23.6	31.8	28.2	6.6	27.3	42.4	10.7	5.7	12.8	41.9	10.0	2.8	11.6	14.5
Level of Service	C	D	B	C	C	C	A	C	D	B	A	B	D	B	A	B	B

**645: State St & Business Acces/K-Mart Access**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)			1.1	1.1			1.0	1.0	15.4	2.5	2.4	3.0	14.5	3.6	2.4	4.1	3.6
Level of Service			A	A			A	A	C	A	A	A	B	A	A	A	A

**650: State St & Century Ave**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	23.7	30.4	9.7	24.6	25.7	23.2	6.1	23.4	34.7	35.6	16.2	30.7	63.5	24.7	8.2	30.8	28.4
Level of Service	C	C	A	C	C	C	A	C	C	D	B	C	E	C	A	C	C

**705: Bismarck Expy & Commerce Dr/Revere Dr**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	28.5	33.3	11.1	22.2	31.8	25.3	5.8	14.6	18.5	4.7	2.9	6.0	13.2	7.8	7.9	7.9	7.7
Level of Service	C	C	B	C	C	C	A	B	B	A	A	A	B	A	A	A	A

**710: Bismarck Expy & Divide Ave**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	42.4	32.2	17.1	35.7	40.2	30.5	1.1	13.9	29.3	12.3	6.1	11.7	15.4	9.4	6.7	9.8	12.8
Level of Service	D	C	B	D	D	C	A	B	C	B	A	B	B	A	A	A	B

**715: Bismarck Expy & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	27.0		28.8	28.3						12.4	5.0	11.2	31.0	15.4		16.1	17.0
Level of Service	C		C	C						B	A	B	C	B		B	B

**720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					41.7		6.0	36.6	24.8	4.4		11.3		11.8	10.2	11.3	12.2
Level of Service					D		A	D	C	A		B		B	B	B	B

**725: Centennial Rd & Trenton Ave**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	33.0	29.6	12.8	14.3	29.4		17.5	26.2	14.9	9.4	6.5	9.2	20.8	23.8	20.7	23.6	18.8
Level of Service	C	C	B	B	C		B	C	B	A	A	A	C	C	C	C	B

**730: Centennial Rd & Century Ave**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	39.9	34.4	11.8	19.1	37.9	23.8	3.7	31.9	49.2	11.9	4.0	25.7	49.7	25.1	6.7	23.5	25.8
Level of Service	D	C	B	B	D	C	A	C	D	B	A	C	D	C	A	C	C



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**Table 14: Existing P.M. Peak Hour LOS Results - 1**

**Bis-Man I-94 Corridor Study  
Traffic Operations Results**

**Existing Conditions  
PM Peak Hour**

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**105: TH 25 & EB I-94 On Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	4.2		2.4	2.7						1.5	1.4	1.4	2.5	1.1		1.7	1.7
Level of Service	A		A	A						A	A	A	A	A		A	A

**110: TH 25 & WB I-94 Off Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					5.9		4.1	4.6	2.6	0.9		1.5		0.3	0.2	0.3	2.5
Level of Service					A		A	A	A	A		A		A	A	A	A

**115: TH 25 & CR 139A**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)			2.9	2.9	7.4	7.5	2.8	5.7	2.0	0.6	0.3	0.9	2.0	0.6	0.0	0.7	1.3
Level of Service			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

**205: Sunset Dr & Boundary Rd**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	11.7	19.3	3.8	10.0	10.0	11.6	5.7	6.5	3.4	1.4	0.8	1.4	3.7	1.0	0.6	1.5	2.6
Level of Service	B	C	A	B	B	B	A	A	A	A	A	A	A	A	A	A	A

**210: Sunset Dr & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	30.2		8.9	16.3						1.5	1.0	1.3	8.0	1.4		5.0	4.4
Level of Service	D		A	C						A	A	A	A	A		A	A

**215: Sunset Dr & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					31.4		2.8	16.7	31.9	0.9		2.9		4.5	4.8	4.5	5.6
Level of Service					D		A	C	D	A		A		A	A	A	A

**220: Sunset Dr & Old Red Trail**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	17.6	17.6	6.6	7.7	21.4	15.3	1.8	16.5	20.6	9.0	1.1	17.7	29.8	28.4	1.6	27.4	13.0
Level of Service	B	B	A	A	C	B	A	B	C	A	A	B	C	C	A	C	B

**225: Sunset Dr**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)			1.9	1.9	4.1			4.2	3.1	0.0	1.1	1.3		0.0		0.0	2.7
Level of Service			A	A	A			A	A	A	A	A		A		A	A

**305: Mandan Ave & Missouri Dr**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					5.7		2.4	4.0		0.3	0.2	0.3	2.5	0.4		0.8	0.8
Level of Service					A		A	A		A	A	A	A	A		A	A

**310: Mandan Ave & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	7.2		3.4	4.0						0.7	0.4	0.6	4.0	1.1		3.0	2.4
Level of Service	A		A	A						A	A	A	A	A		A	A

**315: Mandan Ave & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					5.9		4.6	4.6	2.7	1.3		2.0		0.7	0.0	0.7	2.4
Level of Service					A		A	A	A	A		A		A	A	A	A

**505: Divide Ave & Commercial Driveway/Turnpike Ave**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	25.9	35.3	7.7	12.2	47.2	0.0	5.3	12.5	4.0	2.1	1.1	2.0	9.1	2.3	2.1	4.6	5.1
Level of Service	D	E	A	B	E	A	A	B	A	A	A	A	A	A	A	A	A

**510: Divide Ave & Schafer St/EB I-94 Ramps**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	34.7	40.2	6.2	29.0	54.9	46.2	5.4	20.1	13.0	14.6		14.4	15.9	12.2	3.7	10.5	16.9
Level of Service	C	D	A	C	D	D	A	C	B	B		B	B	B	A	B	B

**515: Divide Ave & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					34.9		2.2	17.4		8.2	5.0	7.8		4.9	3.8	4.4	7.5
Level of Service					C		A	B		A	A	A		A	A	A	A

**520: Divide Ave & Burnt Boat Rd**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	26.3	39.0	33.3	32.2	36.7	39.4	16.2	36.0	33.6	17.3	19.3	21.2	28.3	37.0	38.4	37.0	28.7
Level of Service	C	D	C	C	D	D	B	D	C	B	B	C	C	D	D	D	C

**525: Divide Ave & Century Ave**

Approach	EB			WB				NB				SB			All		
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					1.2		1.2	1.2		30.6	5.3	13.6	15.9	12.7		13.1	9.0
Level of Service					A		A	A		D	A	B	C	B		B	A



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**Table 15: Existing P.M. Peak Hour LOS Results – 2**

**Bis-Man I-94 Corridor Study  
Traffic Operations Results**

**Existing Conditions  
PM Peak Hour**

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**605: State St & Divide Ave**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	58.7	41.8	3.6	41.8	50.2	43.9	6.5	33.8	50.3	32.3	27.9	33.3	75.5	34.4	26.4	41.5	36.7
Level of Service	E	D	A	D	D	D	A	C	D	C	C	C	E	C	C	D	D

**610: State St & Business Access/DQ Access**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	44.5		10.6	16.7			17.9	17.9	18.1	6.1	5.5	6.3	18.5	0.8	0.4	1.0	4.4
Level of Service	E		B	C			C	C	C	A	A	A	C	A	A	A	A

**615: State St & Spalding Ave**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	28.8	51.2	8.6	19.8	37.1	55.7	16.2	19.3	12.1	1.5	1.1	1.5	26.8	2.6	3.1	4.0	3.0
Level of Service	D	F	A	C	E	F	C	C	B	A	A	A	D	A	A	A	A

**620: State St & Capitol Ave**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	51.9	29.4	16.9	38.8	42.1	31.6	20.4	31.8	48.6	16.5	20.4	17.5	73.8	12.6	11.2	17.0	20.7
Level of Service	D	C	B	D	D	C	C	C	D	B	C	B	E	B	B	B	C

**625: State St & Interchange Ave**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	107.8		37.7	57.8	329.9		234.9	246.1	12.3	3.8	2.9	3.8	30.9	2.3	1.5	4.7	14.0
Level of Service	F		E	F	F		F	F	B	A	A	A	D	A	A	A	B

**630: State St & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	50.8		33.6	44.9						19.6	3.8	18.2	44.9	13.2		16.9	22.9
Level of Service	D		C	D						B	A	B	D	B		B	C

**635: State St & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					46.0		28.4	36.4	59.6	5.8		12.2		22.3	20.2	21.6	17.4
Level of Service					D		C	D	E	A		B		C	C	C	B

**640: State St & Interstate Ave**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	25.4	46.6	18.7	28.7	33.4	32.0	13.3	28.7	48.4	21.6	7.2	24.0	45.3	39.6	14.1	38.9	29.4
Level of Service	C	D	B	C	C	C	B	C	D	C	A	C	D	D	B	D	C

**645: State St & Business Acces/K-Mart Access**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)			2.6	2.6			2.4	2.4	25.1	4.5	4.7	5.3	17.9	3.6	3.1	4.6	4.9
Level of Service			A	A			A	A	D	A	A	A	C	A	A	A	A

**650: State St & Century Ave**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	31.5	47.4	12.6	38.1	54.4	35.0	11.8	38.6	66.9	17.9	15.4	25.9	53.9	25.5	8.5	27.4	30.5
Level of Service	C	D	B	D	D	D	B	D	E	B	B	C	D	C	A	C	C

**705: Bismarck Expy & Commerce Dr/Revere Dr**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	35.5	41.8	8.8	24.9	36.2	29.2	11.4	26.8	14.7	7.7	6.2	7.8	16.1	6.9	7.1	7.1	9.3
Level of Service	D	D	A	C	D	C	B	C	B	A	A	A	B	A	A	A	A

**710: Bismarck Expy & Divide Ave**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	49.5	29.4	16.8	41.7	36.6	30.2	1.6	12.2	34.2	31.4	15.9	30.2	41.9	11.7	6.7	16.5	24.1
Level of Service	D	C	B	D	D	C	A	B	C	C	B	C	D	B	A	B	C

**715: Bismarck Expy & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	33.8		29.7	31.7						17.7	7.6	16.4	94.7	12.2		16.9	19.6
Level of Service	C		C	C						B	A	B	F	B		B	B

**720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					40.0		16.1	33.2	21.1	6.2		9.4		10.0	6.9	9.4	10.9
Level of Service					D		B	C	C	A		A		B	A	A	B

**725: Centennial Rd & Trenton Ave**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	30.5	31.1	9.9	13.8	33.0	67.5	24.1	30.0	14.2	18.8	17.9	18.4	22.5	20.7	15.2	20.6	19.7
Level of Service	C	C	A	B	C	E	C	C	B	B	B	B	C	C	B	C	B

**730: Centennial Rd & Century Ave**

Approach	EB			WB			NB			SB			All				
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	39.9	30.1	9.1	19.7	39.2	30.1	8.6	32.8	48.9	22.6	10.1	24.5	46.4	24.7	5.4	24.5	24.3
Level of Service	D	C	A	B	D	C	A	C	D	C	B	C	D	C	A	C	C



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**Table 16: Existing A.M. Peak Hour Queue Results**

Intersection: 520: Divide Ave & Burnt Boat Rd												
Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	L	TR	L	T	TR	L	T	TR
95th Queue (ft)	67	63	321	24	107	47	150	70	108	20	206	298
Link Distance (ft)		1004	1004			625		605	605		591	591
Intersection: 630: State St & EB I-94 Off Ramp/EB I-94 On Ramp												
Movement	EB	EB	EB	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	L	LTR	R	T	T	T	R	L	T	T	T	T
95th Queue (ft)	293	387	303	258	159	183	58	159	230	243	258	
Link Distance (ft)		1026		278	278	278	278		698	698	698	
Intersection: 635: State St & WB I-94 On Ramp/WB I-94 Off Ramp												
Movement	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served		L LTR	R	L	T	T	T	T	T	T	T	R
95th Queue (ft)	149	184	107	335	158	88	172	258	253	251	146	
Link Distance (ft)		1370			698	698	698	651	651	651		
Intersection: 715: Bismarck Expy & EB I-94 Off Ramp/EB I-94 On Ramp												
Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB	SB	SB	SB
Directions Served	LT	R	R	T	T	R	L	T	T			
95th Queue (ft)	151	204	183	226	168	87	95	276	290			
Link Distance (ft)	1086			405	405	405		721	721			
Intersection: 725: Centennial Rd & Trenton Ave												
Movement	EB	WB	NB	NB	NB	SB	SB	SB	SB	SB	SB	SB
Directions Served	LTR	LTR	L	T	TR	L	T	TR				
95th Queue (ft)	112	195	57	141	147	51	323	363				
Link Distance (ft)	789	696		697	697		1222	1222				

**Table 17: Existing P.M. Peak Hour Queue Results**

Intersection: 520: Divide Ave & Burnt Boat Rd												
Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	L	TR	L	T	TR	L	T	TR
95th Queue (ft)	92	93	222	123	195	85	196	207	275	47	268	415
Link Distance (ft)		1004	1004			625		605	605		591	591
Intersection: 605: State St & Divide Ave												
Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	TR	L	T
95th Queue (ft)	169	197	179	140	212	226	147	295	277	304	298	198
Link Distance (ft)		497	497		584			1333	1333	1333		421
Intersection: 605: State St & Divide Ave												
Movement	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB
Directions Served	T	TR										
95th Queue (ft)	212	245										
Link Distance (ft)	421	421										
Intersection: 620: State St & Capitol Ave												
Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	T	TR	L	T	T	TR
95th Queue (ft)	197	201	136	165	81	246	251	300	150	172	175	201
Link Distance (ft)		631		768		651	651	651		403	403	403

	250'-300' Noticeable Queue
	301'-400' Emerging Queue
	+400' Significant Queue



# FINAL

**Table 17: Existing P.M. Peak Hour Queue Results – continued...**

Intersection: 625: State St & Interchange Ave												
Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB		
Directions Served	LTR	LTR	L	T	T	TR	L	T	T	TR		
95th Queue (ft)	76	593	27	77	46	55	133	84	5	11		
Link Distance (ft)	791	748		403	403	403		278	278	278		
Intersection: 630: State St & EB I-94 Off Ramp/EB I-94 On Ramp												
Movement	EB	EB	EB	NB	NB	NB	NB	SB	SB	SB	SB	
Directions Served	L	LTR	R	T	T	T	R	L	T	T	T	
95th Queue (ft)	308	371	303	307	284	288	75	169	244	199	211	
Link Distance (ft)		1026		278	278	278	278		698	698	698	
Intersection: 635: State St & WB I-94 On Ramp/WB I-94 Off Ramp												
Movement	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB	
Directions Served	L	LTR	R	L	T	T	T	T	T	T	R	
95th Queue (ft)	93	138	73	285	125	99	140	305	229	213	315	
Link Distance (ft)		1370			698	698	698	651	651	651		
Intersection: 640: State St & Interstate Ave												
Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Directions Served	L	T	R	L	T	R	L	L	T	T	T	R
95th Queue (ft)	86	164	159	245	170	85	155	167	281	294	339	95
Link Distance (ft)		728	728		810				651	651	651	
Intersection: 640: State St & Interstate Ave												
Movement	SB	SB	SB	SB	SB	SB						
Directions Served	L	L	T	T	T	R						
95th Queue (ft)	45	87	271	290	376	195						
Link Distance (ft)			539	539	539							
Intersection: 650: State St & Century Ave												
Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	R	L	T	T	R	L	L	T	T
95th Queue (ft)	118	210	205	105	267	329	274	73	172	180	162	192
Link Distance (ft)		1517	1517			1354	1354				600	600
Intersection: 710: Bismarck Expy & Divide Ave												
Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	T	R	L	T	TR
95th Queue (ft)	238	249	102	93	39	47	396	411	270	289	244	227
Link Distance (ft)		1100		888	888		1871	1871			405	405
Intersection: 715: Bismarck Expy & EB I-94 Off Ramp/EB I-94 On Ramp												
Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB			
Directions Served	LT	R	R	T	T	R	L	T	T			
95th Queue (ft)	289	259	209	363	409	252	125	223	232			
Link Distance (ft)	1086			405	405	405		721	721			
Intersection: 725: Centennial Rd & Trenton Ave												
Movement	EB	WB	NB	NB	NB	SB	SB	SB				
Directions Served	LTR	LTR	L	T	TR	L	T	TR				
95th Queue (ft)	85	166	73	319	354	53	237	251				
Link Distance (ft)	789	696		697	697		1222	1222				

	250'-300' Noticeable Queue
	301'-400' Emerging Queue
	+400' Significant Queue



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## Year 2040 Conditions

Future area traffic growth is expected to impact the corridor operations. To determine the extent of the impacts and recommend potential improvements, as necessary, a future operations analysis was completed. The following information details the future operations of the corridor.

### TRAFFIC FORECASTS

#### BASE CONDITIONS

Existing traffic volumes were reviewed to establish the year 2012 baseline conditions throughout the study area. Data sources referenced in this process include North Dakota DOT traffic count maps as well as turning movement and road tube counts collected by SRF. Daily traffic volumes provided on the year 2012 NDDOT traffic count maps for Bismarck and Mandan were considered reference points for the system. Other daily volumes, such as minor roadways and driveways, were imputed from nearby volumes and recent counts performed by SRF. Existing daily volumes are shown in Figure 13.

#### Year 2040 No Build

Year 2040 traffic forecasts were developed using results prepared by the Advanced Traffic Analysis Center (ATAC) for no build conditions. The year 2040 no build conditions equate to the existing plus committed future roadway network. The “committed” term refers to roadway improvements that are programmed in the Bismarck-Mandan MPO Transportation Improvement Program (TIP). It should be noted that this network condition also includes another assumed roadway improvement based on discussions with staff; the extension of Sunset Drive north of its current termination point near 27th Street (Mandan Middle School).

ATAC prepared daily model results utilizing the Bismarck-Mandan Metropolitan Planning Organization’s travel demand model. Daily model volumes were recorded and an adjustment and balancing process was applied to generate preliminary forecasts. The methods used in this process were based on the guidelines presented in *NCHRP 255: Highway Traffic Data for Urbanized Area Project Planning and Design*, a widely referenced document for travel demand forecast preparation.

The projected traffic growth at each location in the study area was also compared to historical changes shown on NDDOT traffic count maps. In some cases, an additional adjustment was applied to reflect observed growth trends. The final year 2040 traffic forecasts are shown in Figure 9. The following observations summarize the findings of the 2040 no build forecasts:

- Traffic along I-94 is expected to nearly double between year 2012 and 2040 throughout the study area.
- Traffic on roadways surrounding interchanges north and west of Mandan (ND Highway 25, Sunset Drive, and Mandan Avenue) is expected to increase two to three times current volumes by year 2040, with annual growth rates of 2.5 to 6 percent.





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- Traffic at interchanges near established areas (Main Street and Bismarck Expressway in Mandan, Tyler Parkway/Divide Avenue in Bismarck) is expected to have slightly lower growth rates of 1.5 to 2.5 percent per year
- Traffic volumes on State Street are also expected to grow by 1.5 to 2 percent annually. North of I-94 this results in daily volumes at or exceeding the capacity of a six-lane roadway.
- Traffic on Bismarck Expressway/Centennial Road near I-94 is expected to grow rapidly, at annual rates of up to six percent. Year 2040 traffic demand along this roadway is around 40,000 vpd and would be expected to exceed the daily capacity of the existing four-lane roadway.

Daily traffic volumes were used to prepare peak hour freeway volumes and turning movements within the study area. These peak hour forecasts will be utilized in the traffic operations analysis performed to evaluate year 2040 no build conditions. Daily and peak hour freeway volumes along the I-94 mainline and at interchange ramps are provided in a table in Appendix C. Peak hour turning movements were developed by applying the growth factors identified for the daily forecasts to the existing turning movement counts. The year 2040 no build turning movement forecasts are provided in Appendix D.

The year 2040 freeway forecasts were verified using a traffic forecast reasonableness check process. This process specifies four guidelines that are typically expected to be met for future traffic forecasts.

- Volumes entering the study area must not exceed the capacity of the roadway. This would indicate that an upstream bottleneck exists and the specified vehicle throughput would not be possible.
- The peak hour percent of daily traffic typically decreases in the future. As roadways approach capacity and land uses become more varied, traffic volumes spread more evenly throughout the day.
- The directional distribution of peak hour traffic typically decreases in the future. As peak travel directions approach capacity and land uses become more varied, directionality becomes more balanced.
- Daily traffic growth should be higher than peak hour traffic growth. As volume-to-capacity ratios increase, less of the peak period demand can be served in the peak hour.

Tables prepared to document these reasonableness checks are provided in Appendix E. All of the guidelines were met for forecasts along I-94 under year 2040 no build conditions.

## FREEWAY OPERATIONS

The CORSIM models developed for existing conditions were updated with year 2040 no build traffic volumes to evaluate future conditions. No other changes were made to the highway network characteristics. Due to the high traffic growth projected for year 2040, the model was not capable of simulating traffic conditions reasonably and no meaningful results were produced by the models.



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The year 2040 traffic operations were therefore reevaluated by applying minor revisions to the highway network to ensure reasonable simulation results. The specific changes applied include:

- Traffic signals were assumed on Sunset Drive at the I-94 eastbound and westbound ramp intersections and at the Boundary Road intersection
- Traffic signals were assumed on Mandan Avenue at the I-94 eastbound and westbound ramp intersections

The results of this evaluation continued to show congestion along some freeway segments in the study area under year 2040 no build conditions.

## A.M. PEAK HOUR

- I-94 eastbound experiences queues of approximately 3,000 feet upstream of Bismarck Expressway/Centennial Drive due to backups from the eastbound ramp intersection (area operates with a LOS D)

The congestion along I-94 eastbound to the west of Bismarck Expressway/Centennial Drive is due to traffic from the eastbound exit ramp queuing back from the intersection with Bismarck Expressway/Centennial Drive onto the freeway. This causes congestion to develop on the mainline and resultant queuing.

## P.M. PEAK HOUR

- I-94 eastbound experiences occasional queues upstream of the State Street exit due to backups from the eastbound ramp intersection (area operates with a LOS C)
- I-94 eastbound experiences queues of approximately 9,000 feet upstream of Centennial Drive/Bismarck Expressway due to backups from the eastbound ramp intersection (area operates with a LOS F)
- Highway 810 (I-194) northbound experiences congestion due to the lane drop from two lanes to one lane upstream of the entrance to I-94 westbound (area operates with a LOS F)

The queuing along I-94 eastbound to the west of State Street is due to traffic from the eastbound exit ramp queuing back from the intersection with State Street onto the freeway. These backups occur occasionally and do not affect the peak hour level of service.

The congestion along I-94 eastbound to the west of Bismarck Expressway/Centennial Drive is due to traffic from the eastbound exit ramp queuing back from the intersection with Bismarck Expressway/Centennial Drive onto the freeway. This causes congestion to develop on the mainline and extend nearly to the State Street interchange.



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The congestion along Highway 810 (I-194) northbound to the south of I-94 is due to the lane drop after the exit to eastbound I-94. The volume on this segment is approximately 2,100 vph. While this volume is within the hourly capacity of a one-lane segment, vehicles merging near the lane drop results in slow speeds and poor level of service. Figure 14 and Figure 15 provide a graphical representation of the year 2040 freeway conditions.

It should be noted that the minor revisions to the highway network improved the freeway operations near the Sunset Drive and Mandan Avenue interchange areas. Without these improvements queues would extend from the local arterial system at Sunset Drive and Mandan Avenue back onto I-94 with significant queues and congestion.

## CROSSROAD INTERSECTION OPERATIONS

Signal timing for all signalized intersections was optimized for the year 2040 no build analysis. Traffic controls and geometric layout were assumed to remain the same as existing conditions, except where committed improvements have been identified in the Bismarck-Mandan MPO TIP (i.e., State Street turn lane improvements and access modification(s), and Divide Avenue extension to Bismarck Expressway).

Due to the significant traffic growth in the area the year 2040 no build operations model could not accommodate the traffic inputs. Significant queues and intersection failure occurred at numerous points along each corridor during the a.m. and p.m. peak hours, with the exception of ND Highway 25. This corridor continues to operate acceptably into the future with the current traffic controls and geometric layout during both peak hours.

In an attempt to allow traffic to circulate within the model and observe potential future condition operations, minor improvements were made to the system. The specific changes applied include:

- Traffic signals were assumed on Sunset Drive at the I-94 eastbound and westbound ramp intersections
- Dual southbound left-turn lanes were assumed on Sunset Drive
- A traffic signal was assumed on Mandan Avenue at the I-94 eastbound ramp intersection
- A traffic signal was assumed on Tyler Parkway/Divide Avenue at Century Avenue
- Turn lanes were extended on the I-94 eastbound off ramps at State Street and Bismarck Expressway/Centennial Road

Results of this year 2040 no build improved operations analysis indicate that numerous key intersections will operate with an unacceptable overall LOS E/F during the a.m. and p.m. peak hour. Many others will operate with a LOS that is approaching capacity, or LOS D; while some will operate acceptably with LOS A-C. As can be expected many of the individual traffic movements operate poorly with lower LOS. Tables 18-21 on the following pages provide the a.m. and p.m. LOS results, respectively, for this condition.





# I-94 Year 2040 No Build Freeway LOS [PM Peak] – Figure 15

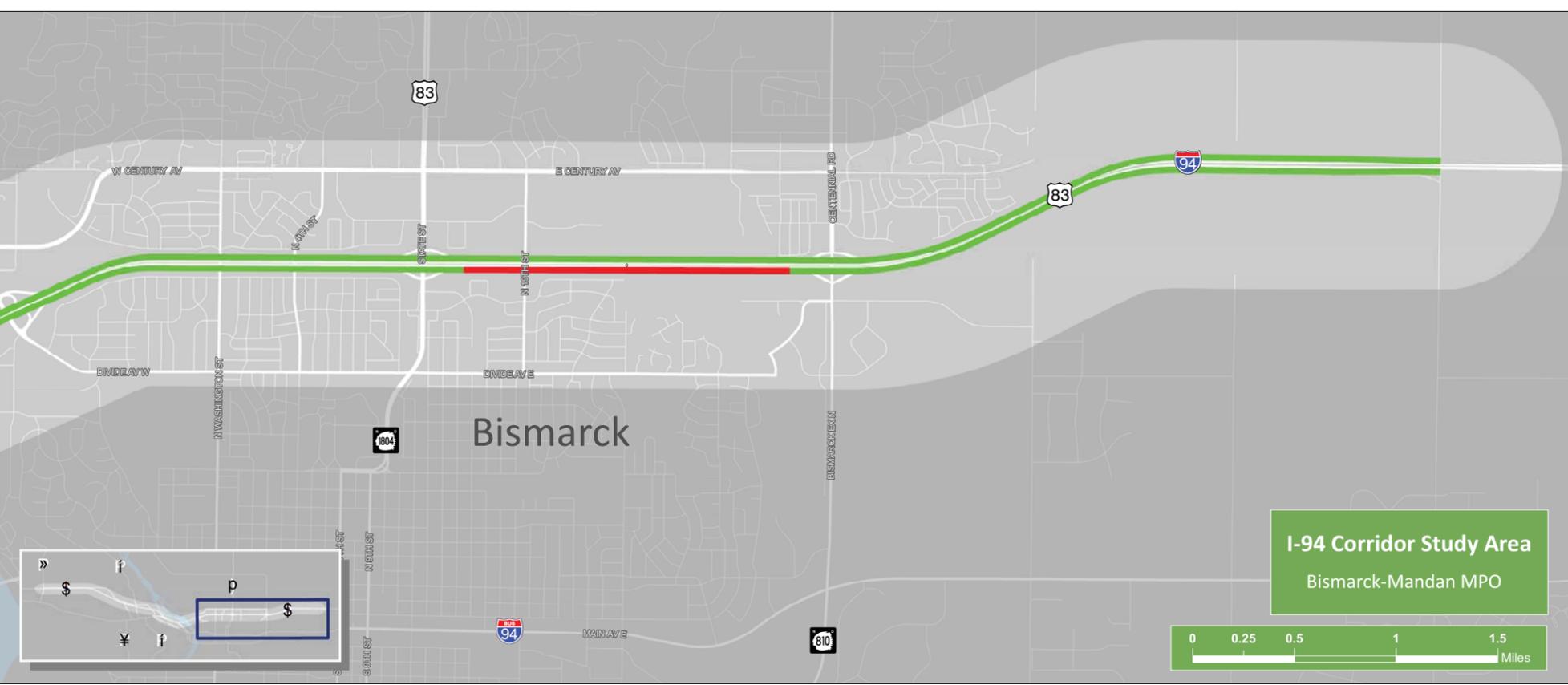


**Level Of Service**

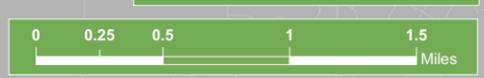
- LOS A - C
- LOS D
- LOS E - F

**I-94 Corridor Study Area**

\* LOS results obtained from CORSIM freeway modeling.



I-94 Corridor Study Area  
Bismarck-Mandan MPO



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**Table 18: 2040 A.M. Peak Hour LOS Results - 1**

**Bis-Man I-94 Corridor Study  
Traffic Operations Results**

**2040 No Build Improvement Conditions  
AM Peak Hour**

**3/1/2013  
Page 1 of 2**

**105: TH 25 & EB I-94 On Ramp**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	11.3		2.9	7.3						2.2	1.6	2.0	4.1	3.4		3.9	3.6
Level of Service	B		A	A						A	A	A	A	A		A	A

**110: TH 25 & WB I-94 Off Ramp**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					11.0		5.1	7.1	5.1	1.5		2.8		0.8	0.5	0.8	2.7
Level of Service					B		A	A	A	A		A		A	A	A	A

**115: TH 25 & CR 139A**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	8.2	11.2	6.6	7.2	8.7	8.8	4.1	8.0	2.7	1.0	0.4	1.1	3.4	1.8	0.9	1.9	4.2
Level of Service	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

**205: Sunset Dr & Boundary Rd**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	598.6	348.8	592.9	575.1	897.7	702.6	848.6	835.0	105.5	101.3	95.4	100.9	12.5	7.3	5.9	7.9	160.3
Level of Service	F	F	F	F	F	F	F	F	F	F	F	F	B	A	A	A	F

**210: Sunset Dr & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	264.1		131.2	217.0						48.0	43.1	45.8	52.0	6.3		30.8	62.0
Level of Service	F		F	F						E	E	E	F	A		D	F

**215: Sunset Dr & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					69.1		10.7	26.7	571.7	70.7		160.4		16.4	9.0	15.1	48.8
Level of Service					F		B	D	F	F		F		C	A	C	E

**220: Sunset Dr & Old Red Trail**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	39.7	38.6	113.8	98.7	41.8	35.8	14.3	31.9	49.6	16.7	7.5	32.4	42.7	43.0	11.7	39.5	55.3
Level of Service	D	D	F	F	D	D	B	C	D	B	A	C	D	D	B	D	E

**225: Sunset Dr**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)			4.5	4.5	22.0		21.2	22.0		3.6	3.2	3.5	4.9	0.8		0.8	5.7
Level of Service			A	A	C		C	C		A	A	A	A	A		A	A

**305: Mandan Ave & Missouri Dr**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					8.5		3.6	6.4		0.6	0.5	0.6	3.4	1.0		1.2	1.5
Level of Service					A		A	A		A	A	A	A	A		A	A

**310: Mandan Ave & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	42.0		5.4	22.5						4.9	2.4	3.7	42.2	12.3		34.2	25.1
Level of Service	E		A	C						A	A	A	E	B		D	D

**315: Mandan Ave & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					22.3		8.1	9.8	10.9	2.5		4.2		3.2	2.3	3.1	5.1
Level of Service					C		A	A	B	A		A		A	A	A	A

**505: Divide Ave & Commercial Driveway/Turnpike Ave**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	36.2	36.3	15.9	29.8	42.4	37.9	6.0	14.1	8.9	1.8	1.0	2.6	6.6	4.9	4.7	5.2	6.4
Level of Service	E	E	C	D	E	E	A	B	A	A	A	A	A	A	A	A	A

**510: Divide Ave & Schafer St/EB I-94 Ramps**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	60.8	56.6	8.8	52.6	76.1	60.3	7.1	33.1	18.4	17.3	5.6	15.3	15.0	15.7	9.0	13.4	22.8
Level of Service	E	E	A	D	E	E	A	C	B	B	A	B	B	B	A	B	C

**515: Divide Ave & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					28.8		2.0	17.0		11.0	4.9	10.0		9.0	5.4	7.6	9.7
Level of Service					C		A	B		B	A	B		A	A	A	A

**520: Divide Ave & Burnt Boat Rd**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	48.7	44.1	73.3	64.2	101.8	52.8	30.8	86.7	61.7	12.9	12.3	27.5	27.5	62.2	80.6	63.7	53.0
Level of Service	D	D	E	E	F	D	C	F	E	B	B	C	C	E	F	E	D

**525: Divide Ave & Century Ave**

Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					179.8		228.6	181.4		20.5	4.4	8.0	21.0	16.3		16.9	73.7
Level of Service					F		F	F		C	A	A	C	C		C	F



# FINAL

**Table 19: 2040 A.M. Peak Hour LOS Results - 2**

**Bis-Man I-94 Corridor Study  
Traffic Operations Results**

**2040 No Build Improvement Conditions  
AM Peak Hour**

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605: State St & Divide Ave																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	52.2	45.9	2.8	36.9	64.6	51.7	10.1	44.0	56.8	27.9	3.6	29.5	68.4	14.2	2.5	19.9	28.6
Level of Service	D	D	A	D	E	D	B	D	E	C	A	C	E	B	A	B	C

610: State St & Business Access/DQ Access																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	49.7	60.4	40.6	45.9	46.0	79.2	21.7	52.5	12.0	4.7	5.2	4.8	11.0	1.7	1.0	1.8	3.9
Level of Service	E	F	E	E	E	F	C	F	B	A	A	A	B	A	A	A	A

615: State St & Spalding Ave																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	118.0	140.8	49.1	86.1	78.1	138.8	41.1	50.4	10.8	0.7	0.7	0.8	7.5	2.9	3.1	3.0	4.2
Level of Service	F	F	E	F	F	F	E	F	B	A	A	A	A	A	A	A	A

620: State St & Capitol Ave																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	48.6	32.0	21.7	38.0	43.3	31.6	20.0	33.2	64.9	35.2	10.4	35.5	82.7	13.1	4.5	20.4	28.2
Level of Service	D	C	C	D	D	C	C	C	E	D	B	D	F	B	A	C	C

625: State St & Interchange Ave																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)			15.7	16.1			24.5	24.5		5.2	2.8	5.2		2.4	1.9	2.3	4.4
Level of Service			C	C			C	C		A	A	A		A	A	A	A

630: State St & EB I-94 Off Ramp/EB I-94 On Ramp																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	56.7		42.5	52.7						24.5	3.8	22.3	72.9	8.7		16.3	28.1
Level of Service	E		D	D						C	A	C	E	A		B	C

635: State St & WB I-94 On Ramp/WB I-94 Off Ramp																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)				59.8			37.8	49.0	19.6	7.3		9.4		11.4	17.6	13.2	15.3
Level of Service				E			D	D	B	A		A		B	B	B	B

640: State St & Interstate Ave																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	39.1	45.4	28.9	35.4	42.2	47.9	19.7	38.1	73.2	11.0	4.2	17.7	53.9	22.2	18.4	23.2	22.5
Level of Service	D	D	C	D	D	D	B	D	E	B	A	B	D	C	B	C	C

645: State St & Business Access/K-Mart Access																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)			3.0	3.0			2.6	2.6	57.6	6.2	4.0	7.9	42.2	6.7	6.7	8.3	8.0
Level of Service			A	A			A	A	F	A	A	A	E	A	A	A	A

650: State St & Century Ave																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	57.1	119.4	50.3	100.2	67.7	46.6	17.2	49.9	293.6	42.5	36.2	78.2	120.3	46.3	26.7	59.2	68.8
Level of Service	E	F	D	F	E	D	B	D	F	D	D	E	F	D	C	E	E

705: Bismarck Expy & Commerce Dr/Revere Dr																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	83.6	72.2	36.5	63.9	65.3	50.7	25.1	48.0	29.9	9.2	6.1	12.1	18.3	15.1	15.0	15.1	18.4
Level of Service	F	E	D	E	E	D	C	D	C	A	A	B	B	B	B	B	B

710: Bismarck Expy & Divide Ave																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	65.4	57.1	43.3	58.2	104.5	50.0	3.8	24.5	47.6	40.1	25.3	39.2	66.0	13.1	7.8	22.4	31.6
Level of Service	E	E	D	E	F	D	A	C	D	D	C	D	E	B	A	C	C

715: Bismarck Expy & EB I-94 Off Ramp/EB I-94 On Ramp																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	228.7		110.6	166.1						15.1	8.9	14.3	663.8	37.1		83.9	70.5
Level of Service	F		F	F						B	A	B	F	D		F	E

720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					521.8		294.7	452.8	64.2	7.4		19.7		112.6	69.0	100.7	68.6
Level of Service					F		F	F	E	A		B		F	E	F	E

725: Centennial Rd & Trenton Ave																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	125.6	216.2	122.4	126.0	155.1	221.7	148.9	154.5	33.0	16.6	13.7	17.1	179.3	199.3	195.9	198.6	103.9
Level of Service	F	F	F	F	F	F	F	F	C	B	B	B	F	F	F	F	F

730: Centennial Rd & Century Ave																	
Approach	EB				WB				NB				SB				All
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	83.5	58.8	177.4	117.6	696.7	80.4	42.7	355.7	319.6	43.0	17.8	117.5	341.8	416.7	418.5	415.8	244.3
Level of Service	F	E	F	F	F	F	D	F	F	D	B	F	F	F	F	F	F



# FINAL

**Table 20: 2040 P.M. Peak Hour LOS Results - 1**

**Bis-Man I-94 Corridor Study  
Traffic Operations Results**

**2040 No Build Improvement Conditions  
PM Peak Hour**

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**105: TH 25 & EB I-94 On Ramp**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	9.3		3.9	5.8						2.9	2.3	2.7	3.7	2.2		3.0	3.3
Level of Service	A		A	A						A	A	A	A	A		A	A

**110: TH 25 & WB I-94 Off Ramp**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					11.6		8.2	8.9	3.5	1.6		1.9		0.7	0.5	0.6	4.7
Level of Service					B		A	A	A	A		A		A	A	A	A

**115: TH 25 & CR 139A**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	8.6	13.4	4.2	5.5	12.8	11.6	5.5	10.8	2.7	1.7	0.8	1.9	4.1	1.6	1.1	2.1	3.3
Level of Service	A	B	A	A	B	B	A	B	A	A	A	A	A	A	A	A	A

**205: Sunset Dr & Boundary Rd**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	592.2	471.7	585.0	566.1	674.1	690.9	699.3	698.6	91.4	89.6	89.7	89.5	12.5	7.6	7.2	8.6	149.4
Level of Service	F	F	F	F	F	F	F	F	F	F	F	F	B	A	A	A	F

**210: Sunset Dr & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	367.2		163.9	282.3						57.5	53.8	56.1	37.7	7.5		24.4	70.6
Level of Service	F		F	F						F	F	F	E	A		C	F

**215: Sunset Dr & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					70.0		9.7	30.4	841.1	83.3		183.0		7.9	5.6	7.4	49.0
Level of Service					F		A	D	F	F		F		A	A	A	E

**220: Sunset Dr & Old Red Trail**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	58.4	60.0	195.6	172.6	24.8	22.7	6.2	21.5	68.5	23.5	8.0	48.3	93.8	72.7	26.5	70.4	101.0
Level of Service	E	E	F	F	C	C	A	C	E	C	A	D	F	E	C	E	F

**225: Sunset Dr**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	10.0	12.8	6.5	9.7	10.8			10.8	7.2	3.2	2.5	3.1	5.0	1.1	2.4	1.1	3.0
Level of Service	B	B	A	A	B			B	A	A	A	A	A	A	A	A	A

**305: Mandan Ave & Missouri Dr**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					9.4		3.6	6.8		0.8	0.5	0.7	3.6	1.1		1.5	1.7
Level of Service					A		A	A		A	A	A	A	A		A	A

**310: Mandan Ave & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	26.5		4.3	15.0						4.4	2.6	4.0	18.3	4.0		13.5	11.1
Level of Service	D		A	C						A	A	A	C	A		B	B

**315: Mandan Ave & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					26.4		24.9	25.0	9.1	3.2		4.9		3.1	2.3	3.0	11.8
Level of Service					D		C	D	A	A		A		A	A	A	B

**505: Divide Ave & Commercial Driveway/Turnpike Ave**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	226.3	191.6	164.8		259.4	208.2	28.0		5.0	2.9	1.8		16.3	4.6	3.7		
Level of Service	F	F	F		F	F	D		A	A	A		C	A	A		

**510: Divide Ave & Schafer St/EB I-94 Ramps**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	62.3	60.4	9.3		179.3	109.6	54.5		23.6	22.7	9.4		26.8	17.9	6.0		
Level of Service	E	E	A		F	F	D		C	C	A		C	B	A		

**515: Divide Ave & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					58.5		41.9			47.6	13.9			7.2	4.5		28.7
Level of Service					E		D			D	B			A	A		C

**520: Divide Ave & Burnt Boat Rd**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)	193.4	145.2	33.7		226.6	115.2	83.8		108.6	51.1	66.7		56.3	76.7	99.5		
Level of Service	F	F	C		F	F	F		F	D	E		E	E	F		

**525: Divide Ave & Century Ave**

Approach	EB				WB				NB				SB			All	
Movement	EBL	EBT	EBR	Total	WBL	WBT	WBR	Total	NBL	NBT	NBR	Total	SBL	SBT	SBR	Total	Total
Delay/Vehicle (s)					358.0		334.7			23.6	6.2		23.6	16.6			136.8
Level of Service					F		F			C	A		C	C			F



# FINAL

**Table 21: 2040 P.M. Peak Hour LOS Results – 2**

**Bis-Man I-94 Corridor Study  
Traffic Operations Results**

**2040 No Build Improvement Conditions  
PM Peak Hour**

**3/1/2013  
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**605: State St & Divide Ave**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)	76.8	59.7	9.4		61.6	86.9	26.9		67.2	36.3	8.4		79.5	26.9	4.2		Total
Level of Service	E	E	A		E	F	C		E	D	A		E	C	A		

**610: State St & Business Access/DQ Access**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)	249.9	250.3	151.5		92.0	60.0	27.1		15.3	6.9	4.5		24.5	1.1	0.7		Total
Level of Service	F	F	F		F	F	D		C	A	A		C	A	A		

**615: State St & Spalding Ave**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)	130.6	88.9	59.6		165.3	216.7	120.7		14.8	2.1	1.1		30.5	3.2	3.3		Total
Level of Service	F	F	F		F	F	F		B	A	A		D	A	A		

**620: State St & Capitol Ave**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)	88.9	46.7	32.0		65.4	41.6	30.6		80.8	30.2	10.5		98.6	25.8	6.1		Total
Level of Service	F	D	C		E	D	C		F	C	B		F	C	A		

**625: State St & Interchange Ave**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)			16.3				80.4		51.1	14.4	3.6		78.0	19.8	1.8		20.7
Level of Service			C				F		F	B	A		F	C	A		C

**630: State St & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)	186.2		154.2							25.7	6.6		155.6	77.0			75.5
Level of Service	F		F							C	A		F	E			E

**635: State St & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)					118.8		87.4		42.4	12.2			71.0	25.1			37.8
Level of Service					F		F		D	B			E	C			D

**640: State St & Interstate Ave**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)	355.9	175.4	65.5		286.3	198.5	388.2		74.1	43.4	9.7		98.5	70.4	45.1		Total
Level of Service	F	F	E		F	F	F		E	D	A		F	E	D		

**645: State St & Business Access/K-Mart Access**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)			38.0				29.2		125.8	27.2	5.2		99.3	42.3	70.8		37.4
Level of Service			E				D		F	D	A		F	E	F		E

**650: State St & Century Ave**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)	283.4	311.1	222.4		271.4	90.8	54.8		419.9	40.5	33.4		393.3	183.8	223.8		Total
Level of Service	F	F	F		F	F	D		F	D	C		F	F	F		

**705: Bismarck Expy & Commerce Dr/Revere Dr**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)	649.5	714.3	473.9		49.5	126.0	108.9		364.5	417.3	409.6		16.5	23.6	19.4		Total
Level of Service	F	F	F		D	F	F		F	F	F		B	C	B		

**710: Bismarck Expy & Divide Ave**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)	64.0	48.4	34.5		52.2	43.8	17.2		229.9	251.7	248.2		111.9	25.6	11.9		Total
Level of Service	E	D	C		D	D	B		F	F	F		F	C	B		

**715: Bismarck Expy & EB I-94 Off Ramp/EB I-94 On Ramp**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)	220.9		108.4							22.7	11.0		1734.0	101.9			88.5
Level of Service	F		F							C	B		F	F			F

**720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)					1468.8		1125.9		13.1	8.2			771.7	186.9			125.8
Level of Service					F		F		B	A			F	F			F

**725: Centennial Rd & Trenton Ave**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)	1672.9	1315.7	1192.2		1472.2	2715.2	1463.8		15.8	25.9	25.2		809.6	1319.4	1663.4		Total
Level of Service	F	F	F		F	F	F		B	C	C		F	F	F		

**730: Centennial Rd & Century Ave**

Approach	EB			Total	WB			Total	NB			Total	SB			Total	All
Movement	EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR		Total
Delay/Vehicle (s)	103.2	88.3	1412.7		2149.1	74.8	27.6		123.8	30.5	13.8		1265.2	1467.3	1089.7		Total
Level of Service	F	F	F		F	E	C		F	C	B		F	F	F		



# FINAL

The queues observed under existing conditions degrade further. These queues now impact adjacent intersections resulting in additional congestion and system failure. The areas with queues approaching significance and those already significant are presented graphically for the a.m. and p.m. peaks in Appendix F. Tables 22 and 23 present the a.m. and p.m. peak hour 95th percentile queues.



# FINAL

**Table 22: Year 2040 A.M. Peak Hour Queue Results**

Intersection: 205: Sunset Dr & Boundary Rd												
Movement	EB	WB	NB	SB								
Directions Served	LTR	LTR	LTR	LTR								
95th Queue (ft)	669	1414	1338	301								
Link Distance (ft)	951	1094	1263	289								
Intersection: 210: Sunset Dr & EB I-94 Off Ramp/EB I-94 On Ramp												
Movement	EB	EB	NB	SB	SB	SB						
Directions Served	L	TR	TR	L	L	T						
95th Queue (ft)	362	1149	350	261	275	198						
Link Distance (ft)		1062	289			838						
Intersection: 215: Sunset Dr & WB I-94 On Ramp/WB I-94 Off Ramp												
Movement	WB	WB	WB	NB	NB	SB	SB					
Directions Served	L	R	R	L	T	T	R					
95th Queue (ft)	274	145	131	437	1052	274	453					
Link Distance (ft)		885			838	258	258					
Intersection: 220: Sunset Dr & Old Red Trail												
Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB		
Directions Served	LT	R	LT	TR	L	L	TR	L	T	R		
95th Queue (ft)	454	1276	173	115	251	262	308	132	509	211		
Link Distance (ft)	1395	1395	1191	1191	258	258	258		1007			
Intersection: 310: Mandan Ave & EB I-94 Off Ramp/EB I-94 On Ramp												
Movement	EB	EB	NB	SB	SB							
Directions Served	L	TR	TR	L	T							
95th Queue (ft)	112	85	76	376	673							
Link Distance (ft)		1138	759		1058							
Intersection: 510: Divide Ave & Schafer St/EB I-94 Ramps												
Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	L	T	R	L	T	R	R	L	T	TR	L
95th Queue (ft)	88	132	88	34	288	346	182	101	51	154	220	110
Link Distance (ft)			1036			1165				728	728	
Intersection: 520: Divide Ave & Burnt Boat Rd												
Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	
Directions Served	L	T	R	L	TR	L	T	TR	L	T	TR	
95th Queue (ft)	181	179	648	238	287	111	392	126	249	88	769	709
Link Distance (ft)		1004	1004		625		605	605		591	591	
Intersection: 525: Divide Ave & Century Ave												
Movement	WB	WB	WB	NB	SB	SB	SB					
Directions Served	L	L	R	T	L	T	T					
95th Queue (ft)	1321	1336	361	157	80	129	180					
Link Distance (ft)	1224	1224		591		1326	1326					
Intersection: 605: State St & Divide Ave												
Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	L	T	TR	L	L	T	TR	L	T	T	T
95th Queue (ft)	62	86	170	169	127	201	318	303	122	227	188	163
Link Distance (ft)			494	494			582			1325	1325	1325
Intersection: 605: State St & Divide Ave												
Movement	SB	SB	SB	SB	SB							
Directions Served	L	T	T	T	R							
95th Queue (ft)	235	169	182	201	1							
Link Distance (ft)		414	414	414								

	250'-300' Noticeable Queue
	301'-400' Emerging Queue
	+400' Significant Queue



# FINAL

**Table 22: Year 2040 A.M. Peak Hour Queue Results – cont...**

Intersection: 620: State St & Capitol Ave												
Movement	EB	EB	WB	WB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	T	T	R	L	T	T
95th Queue (ft)	247	227	222	208	192	357	293	316	107	288	204	167
Link Distance (ft)	618		754		650		650				403	
Intersection: 620: State St & Capitol Ave												
Movement	SB	SB										
Directions Served	T	R										
95th Queue (ft)	197	75										
Link Distance (ft)	403											
Intersection: 630: State St & EB I-94 Off Ramp/EB I-94 On Ramp												
Movement	EB	EB	EB	NB	NB	NB	NB	SB	SB	SB	SB	
Directions Served	L	LTR	R	T	T	T	R	L	T	T	T	T
95th Queue (ft)	475	670	488	322	234	193	66	283	134	138	179	
Link Distance (ft)	1026			278	278	278	278	698		698	698	
Intersection: 635: State St & WB I-94 On Ramp/WB I-94 Off Ramp												
Movement	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB	
Directions Served	L	LTR	R	L	T	T	T	T	T	T	R	
95th Queue (ft)	219	259	216	218	137	156	187	139	114	148	192	
Link Distance (ft)	1370			698		698	698	651	651	651		
Intersection: 640: State St & Interstate Ave												
Movement	SB	SB	SB	SB	SB	SB						
Directions Served	L	L	T	T	T	R						
95th Queue (ft)	64	88	234	309	483	182						
Link Distance (ft)	539			539	539							
Intersection: 650: State St & Century Ave												
Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
95th Queue (ft)	43	456	752	741	460	220	311	387	380	231	395	528
Link Distance (ft)			1517	1517			1354	1354				
Intersection: 650: State St & Century Ave												
Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB	SB		
Directions Served	T	T	T	R	L	L	T	T	T	R		
95th Queue (ft)	586	429	409	280	282	381	925	826	558	350		
Link Distance (ft)	600	600	600			1334		1334	1334			
Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr												
Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB		
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR		
95th Queue (ft)	227	351	83	72	175	229	240	39	287	313		
Link Distance (ft)	845		970		3125		3125	1871		1871		
Intersection: 710: Bismarck Expy & Divide Ave												
Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served		L TR	L	T	R	L	T	T	R	L	T	TR
95th Queue (ft)	205	283	270	105	163	152	554	579	277	415	407	359
Link Distance (ft)	1100		888		888	1871		1871			405	405

	250'-300' Noticeable Queue
	301'-400' Emerging Queue
	+400' Significant Queue



# FINAL

**Table 22: Year 2040 A.M. Peak Hour Queue Results – cont...**

Intersection: 715: Bismarck Expy & EB I-94 Off Ramp/EB I-94 On Ramp									
Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	R	T	T	R	L	T	T
95th Queue (ft)	1429	963	361	357	456	335	513	946	641
Link Distance (ft)	1086			405	405	405	721		721

Intersection: 720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp								
Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	T	T	T	R
95th Queue (ft)	1250	184	501	681	460	891	886	144
Link Distance (ft)	1262			721	721	697	697	

Intersection: 725: Centennial Rd & Trenton Ave								
Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LTR	L	T	TR	L	T	TR
95th Queue (ft)	533	539	116	301	325	340	1576	1555
Link Distance (ft)	789	696	697		697	1222		1222

Intersection: 730: Centennial Rd & Century Ave												
Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
95th Queue (ft)	146	169	723	1063	387	421	454	1399	1598	165	292	349
Link Distance (ft)	1243			1243	1214				1214			

Intersection: 730: Centennial Rd & Century Ave								
Movement	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	R
95th Queue (ft)	1238	1179	222	34	327	1880	1882	320
Link Distance (ft)	1222	1222	1741			1741		

**Table 23: Year 2040 P.M. Peak Hour Queue Results**

Intersection: 205: Sunset Dr & Boundary Rd				
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
95th Queue (ft)	929	1348	1216	269
Link Distance (ft)	951	1094	1263	289

Intersection: 210: Sunset Dr & EB I-94 Off Ramp/EB I-94 On Ramp						
Movement	EB	EB	NB	SB	SB	SB
Directions Served	L	TR	TR	L	L	T
95th Queue (ft)	353	1312	340	305	322	242
Link Distance (ft)	1062		289	838		

Intersection: 215: Sunset Dr & WB I-94 On Ramp/WB I-94 Off Ramp							
Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	R	R	L	T	T	R
95th Queue (ft)	181	106	59	440	1157	194	138
Link Distance (ft)	885			838	258	258	

Intersection: 220: Sunset Dr & Old Red Trail										
Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	TR	L	L	TR	L	T	R
95th Queue (ft)	1730	1533	163	121	281	285	258	190	710	194
Link Distance (ft)	1395	1395	1191	1191	258	258	258	1007		

Intersection: 315: Mandan Ave & WB I-94 On Ramp/WB I-94 Off Ramp				
Movement	WB	WB	NB	SB
Directions Served	L	TR	L	TR
95th Queue (ft)	192	431	65	12
Link Distance (ft)	1355		1543	



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**Table 23: Year 2040 P.M. Peak Hour Queue Results – cont...**

Intersection: 505: Divide Ave & Commercial Driveway/Turnpike Ave													
Movement	EB	WB	WB	NB	NB	SB	SB						
Directions Served	LTR	LT	R	L	TR	L	TR						
95th Queue (ft)	329	435	123	24	27	161	70						
Link Distance (ft)	682	688				766	728	728					
Intersection: 510: Divide Ave & Schafer St/EB I-94 Ramps													
Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB	
Directions Served	L	L	T	R	L	T	R	R	L	T	TR	L	
95th Queue (ft)	200	192	114	57	410	1415	367	271	74	233	269	175	
Link Distance (ft)	1036			1165					728	728			
Intersection: 510: Divide Ave & Schafer St/EB I-94 Ramps													
Movement	SB	SB	SB										
Directions Served	T	T	R										
95th Queue (ft)	187	259	102										
Link Distance (ft)	1038	1038											
Intersection: 515: Divide Ave & WB I-94 On Ramp/WB I-94 Off Ramp													
Movement	WB	WB	NB	NB	NB	SB	SB						
Directions Served	L	R	T	T	R	T	T						
95th Queue (ft)	494	317	949	978	557	154	166						
Link Distance (ft)	1253	1038		1038	605		605						
Intersection: 520: Divide Ave & Burnt Boat Rd													
Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	
Directions Served	L	T	R	L	L	TR	L	T	TR	L	T	TR	
95th Queue (ft)	230	983	363	409	470	847	682	794	819	127	763	630	
Link Distance (ft)	1004		1004	625			605	605	591		591		
Intersection: 525: Divide Ave & Century Ave													
Movement	WB	WB	WB	NB	SB	SB	SB						
Directions Served	L	L	R	T	L	T	T						
95th Queue (ft)	1388	1385	541	275	63	95	137						
Link Distance (ft)	1224	1224	591		1326		1326						
Intersection: 605: State St & Divide Ave													
Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB	
Directions Served	L	L	T	TR	L	L	T	TR	L	T	T	T	
95th Queue (ft)	124	155	248	256	83	225	364	359	199	349	321	314	
Link Distance (ft)	494			494	582			1325		1325	1325		
Intersection: 605: State St & Divide Ave													
Movement	NB	SB	SB	SB	SB								
Directions Served	R	L	T	T	T								
95th Queue (ft)	201	386	377	238	250								
Link Distance (ft)	414		414	414									
Intersection: 615: State St & Spalding Ave													
Movement	EB	WB	NB	NB	NB	SB	SB						
Directions Served	LTR	LTR	L	T	R	L	T						
95th Queue (ft)	116	343	24	0	13	131	68						
Link Distance (ft)	716	760	384			650							
Intersection: 620: State St & Capitol Ave													
Movement	EB	EB	WB	WB	NB	NB	NB	NB	NB	SB	SB	SB	
Directions Served	L	TR	L	TR	L	T	T	T	R	L	T	T	
95th Queue (ft)	329	487	255	298	235	486	449	444	341	239	325	246	
Link Distance (ft)	618		754		650		650	650	403		403		
Intersection: 620: State St & Capitol Ave													
Movement	SB	SB											
Directions Served	T	R											
95th Queue (ft)	256	71											



# FINAL

**Table 23: Year 2040 P.M. Peak Hour Queue Results – cont...**

Intersection: 625: State St & Interchange Ave											
Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB	
Directions Served	R	R	LT	T	T	R	LT	T	T	R	
95th Queue (ft)	39	329	437	335	258	7	305	399	282	76	
Link Distance (ft)	777	750	403	403	403		278	278	278		
Intersection: 630: State St & EB I-94 Off Ramp/EB I-94 On Ramp											
Movement	EB	EB	EB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LTR	R	T	T	T	R	L	T	T	T
95th Queue (ft)	440	1054	571	332	312	312	108	756	748	887	732
Link Distance (ft)		1026		278	278	278	278		698	698	698
Intersection: 635: State St & WB I-94 On Ramp/WB I-94 Off Ramp											
Movement	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LTR	R	L	T	T	T	T	T	T	R
95th Queue (ft)	211	296	287	393	458	433	311	777	777	631	395
Link Distance (ft)		1370			698	698	698	651	651	651	
Intersection: 640: State St & Interstate Ave											
Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB
Directions Served	L	T	R	L	T	R	L	L	T	T	R
95th Queue (ft)	259	780	359	47	940	343	255	540	687	679	302
Link Distance (ft)		728	728		810				651	651	651
Intersection: 640: State St & Interstate Ave											
Movement	SB	SB	SB	SB	SB	SB					
Directions Served	L	L	T	T	T	R					
95th Queue (ft)	63	331	655	659	666	252					
Link Distance (ft)			539	539	539						
Intersection: 645: State St & Business Acces/K-Mart Access											
Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB	
Directions Served	R	R	L	T	T	TR	L	T	T	TR	
95th Queue (ft)	135	244	287	740	357	189	318	712	759	832	
Link Distance (ft)	663	555		539	539	539		600	600	600	
Intersection: 650: State St & Century Ave											
Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L
95th Queue (ft)	226	624	1842	1842	477	387	497	1298	1202	291	589
Link Distance (ft)			1517	1517				1354	1354		
Intersection: 650: State St & Century Ave											
Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB	SB	
Directions Served	T	T	T	R	L	L	T	T	T	R	
95th Queue (ft)	769	670	699	355	259	330	1675	1705	1694	356	
Link Distance (ft)	600	600	600				1334	1334	1334		
Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr											
Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR	
95th Queue (ft)	214	911	172	362	684	3959	3946	29	248	287	
Link Distance (ft)		845		970		3125	3125		1871	1871	
Intersection: 710: Bismarck Expy & Divide Ave											
Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	TR	L	T	R	L	T	T	R	L	T
95th Queue (ft)	274	391	149	120	466	374	1895	1896	338	332	298
Link Distance (ft)		1100		888	888		1871	1871		405	405

	250'-300' Noticeable Queue
	301'-400' Emerging Queue
	+400' Significant Queue



# FINAL

**Table 23: Year 2040 P.M. Peak Hour Queue Results – cont...**

Intersection: 715: Bismarck Expy & EB I-94 Off Ramp/EB I-94 On Ramp												
Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB			
Directions Served	LT	R	R	T	T	R	L	T	T			
95th Queue (ft)	1130	1000	279	455	522	646	429	780	291			
Link Distance (ft)	1086			405	405	405	721		721			
Intersection: 720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp												
Movement	WB	WB	NB	NB	NB	SB	SB	SB				
Directions Served	LT	R	L	T	T	T	T	R				
95th Queue (ft)	1669	257	300	165	178	710	718	79				
Link Distance (ft)	1262			721	721	697	697					
Intersection: 725: Centennial Rd & Trenton Ave												
Movement	EB	WB	NB	NB	NB	SB	SB	SB				
Directions Served	LTR	LTR	L	T	TR	L	T	TR				
95th Queue (ft)	1026	888	94	598	614	160	1499	1496				
Link Distance (ft)	789	696		697	697		1222	1222				
Intersection: 730: Centennial Rd & Century Ave												
Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
95th Queue (ft)	199	262	1069	1555	322	395	492	1646	1628	87	259	315
Link Distance (ft)			1243		1243			1214	1214			
Intersection: 730: Centennial Rd & Century Ave												
Movement	NB	NB	NB	SB	SB	SB	SB	SB				
Directions Served	T	T	R	L	L	T	T	R				
95th Queue (ft)	373	365	193	45	148	2363	2392	164				
Link Distance (ft)	1222	1222				1741	1741					

	250'-300' Noticeable Queue
	301'-400' Emerging Queue
	+400' Significant Queue

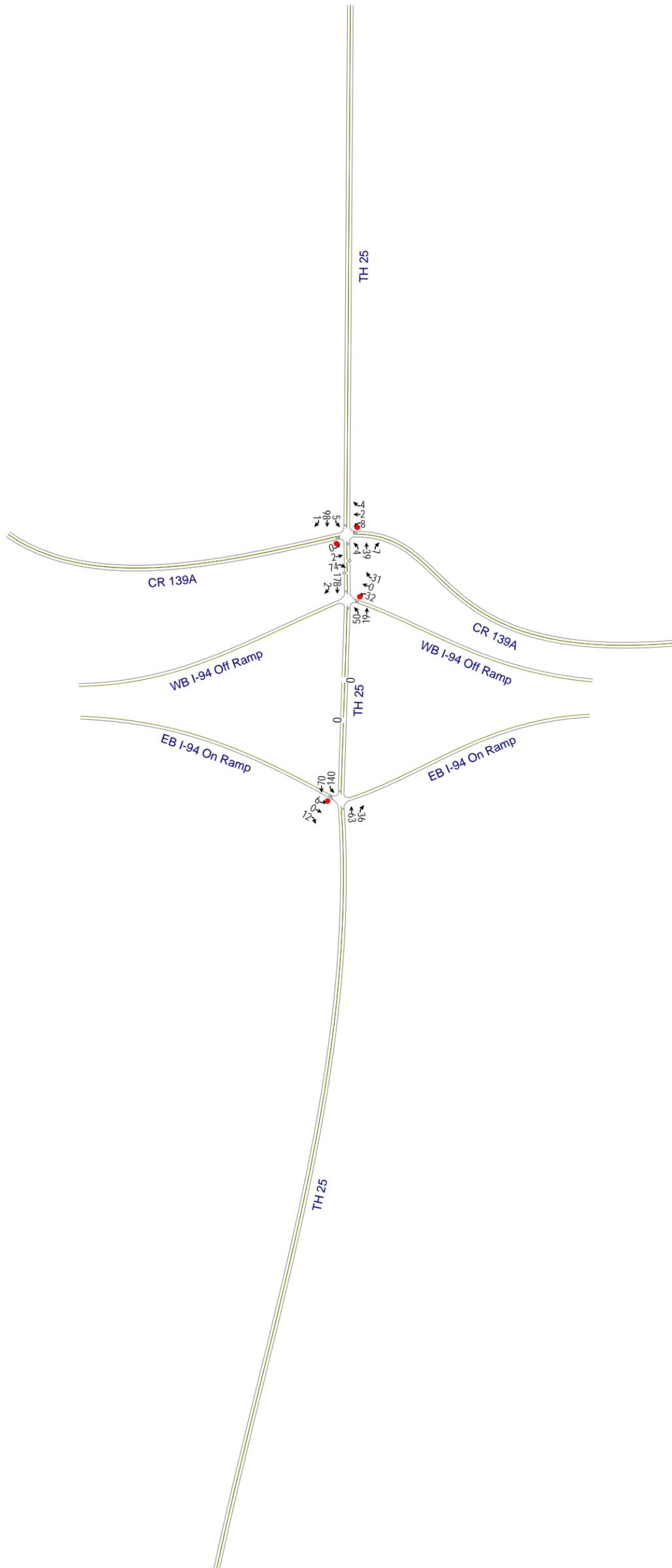


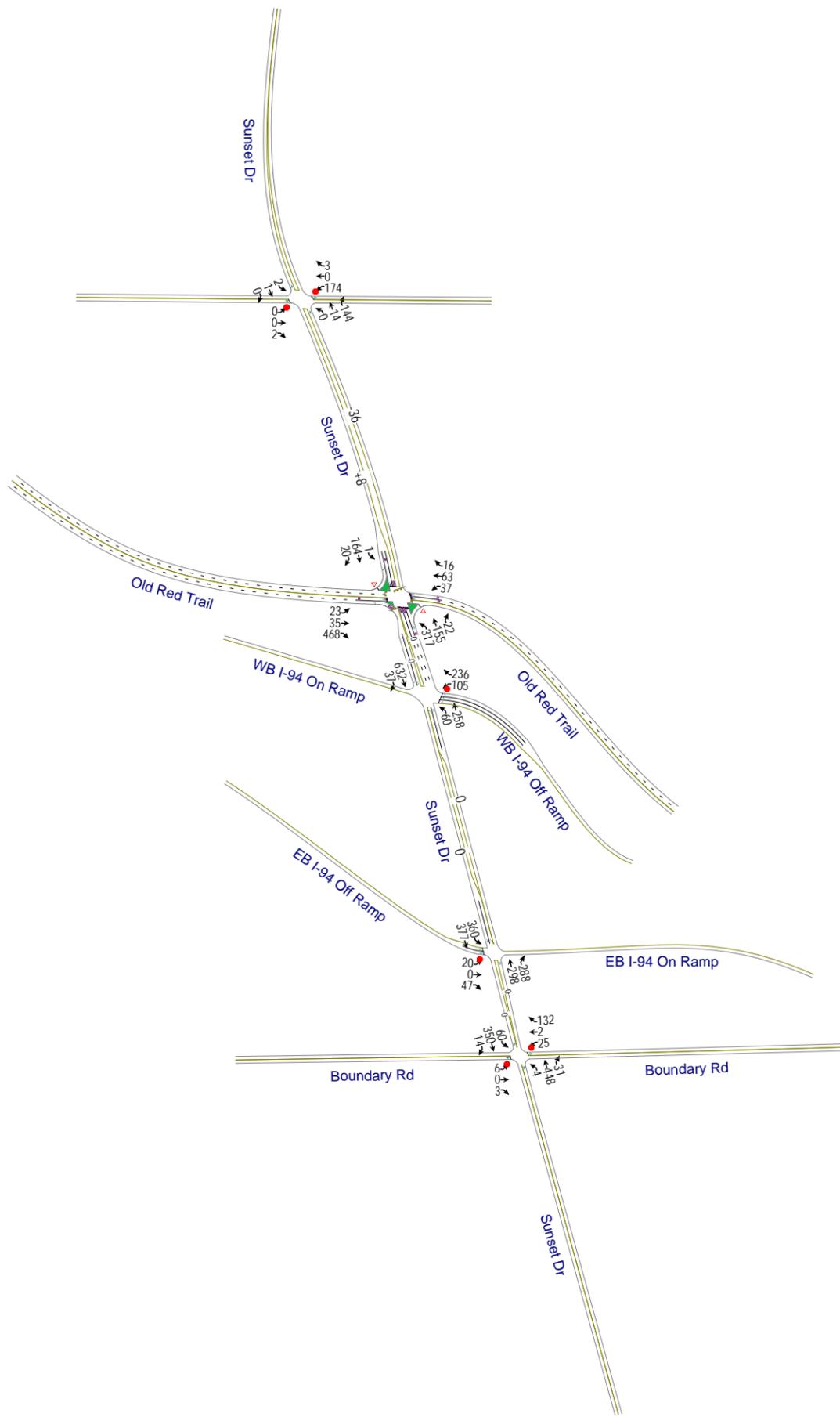
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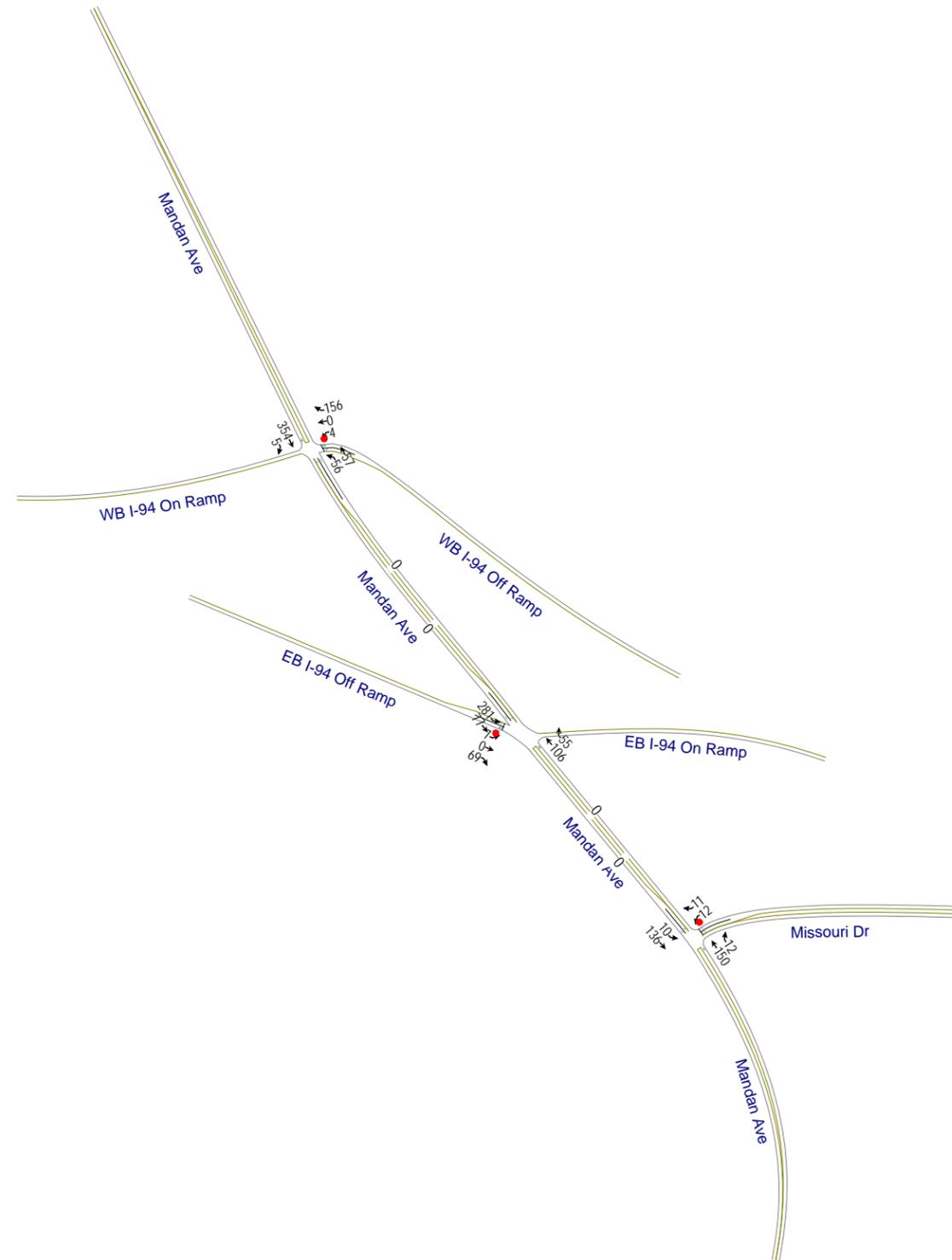
# Appendix A – Existing Turning Movement Counts

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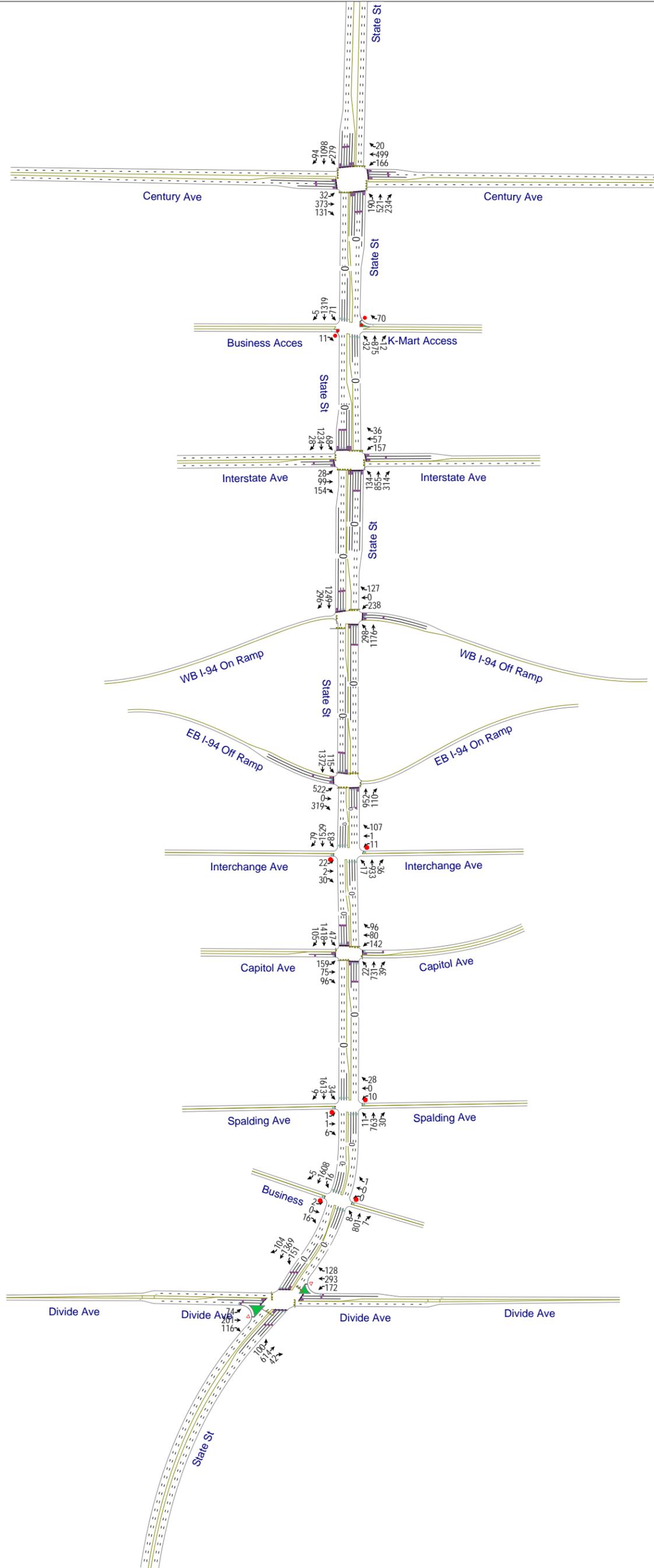


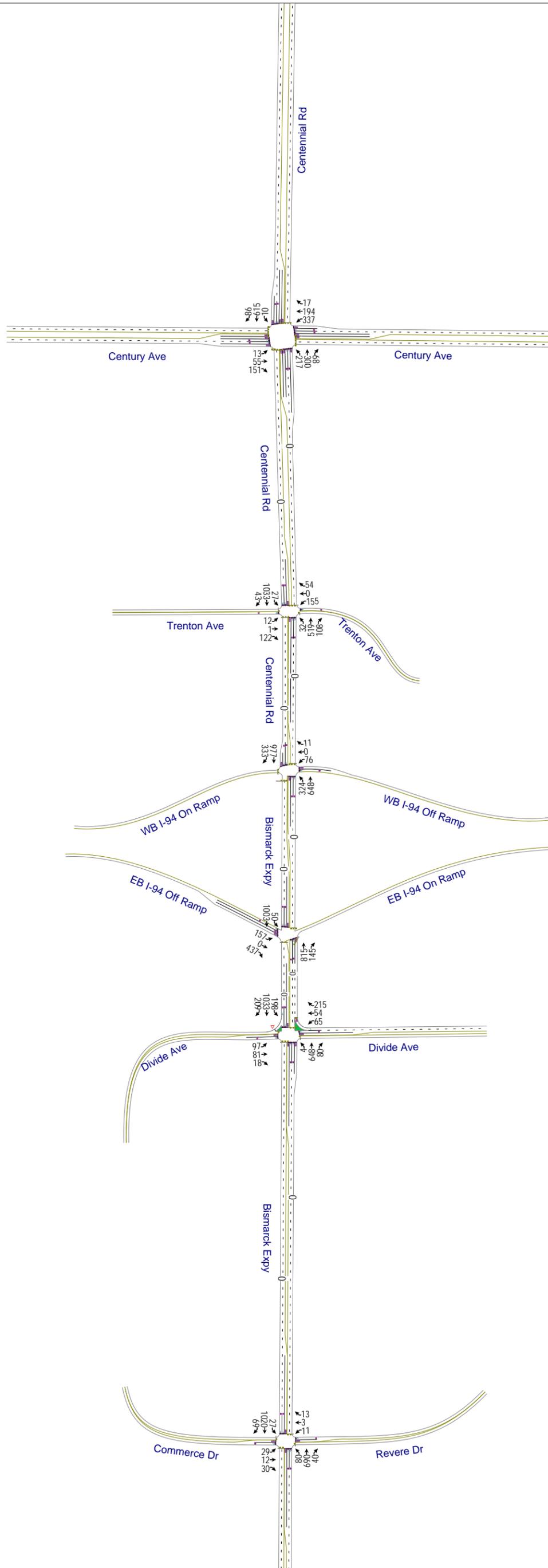


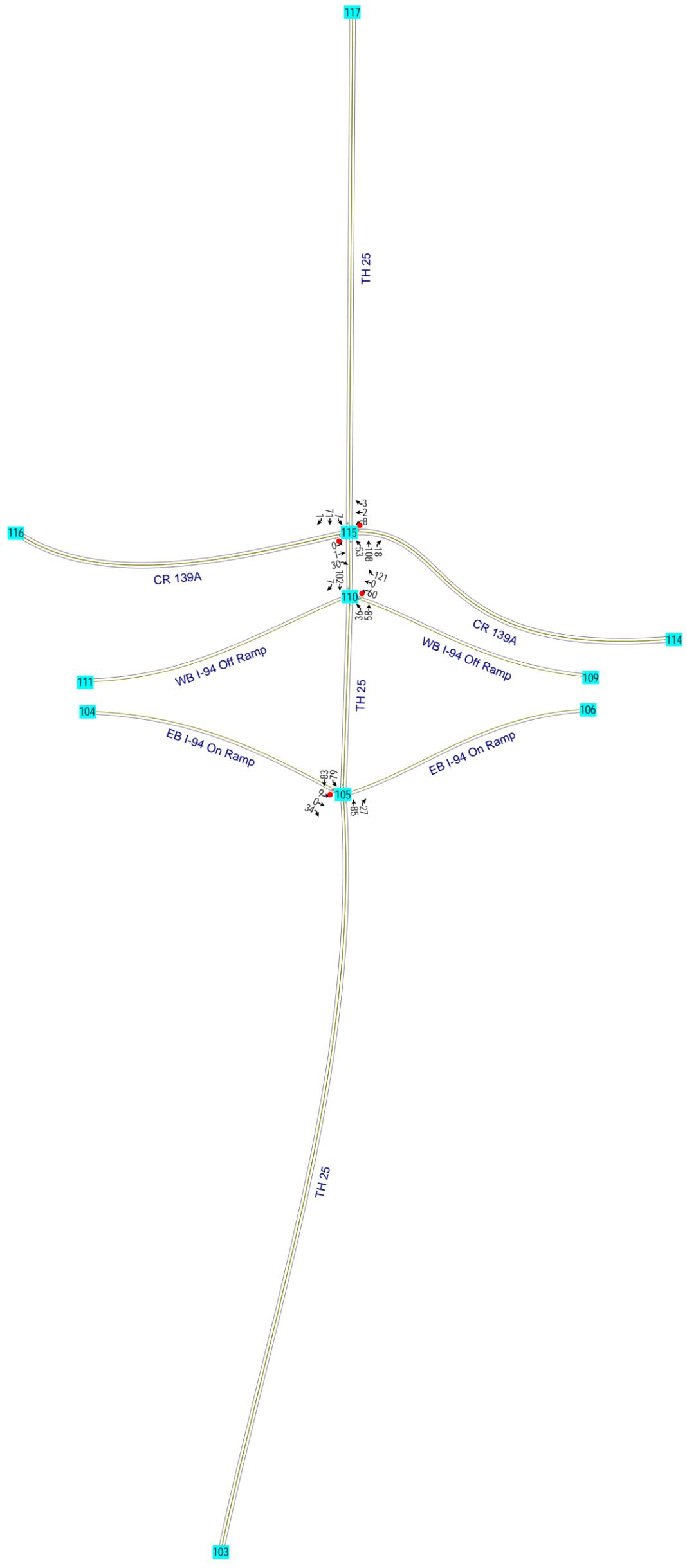


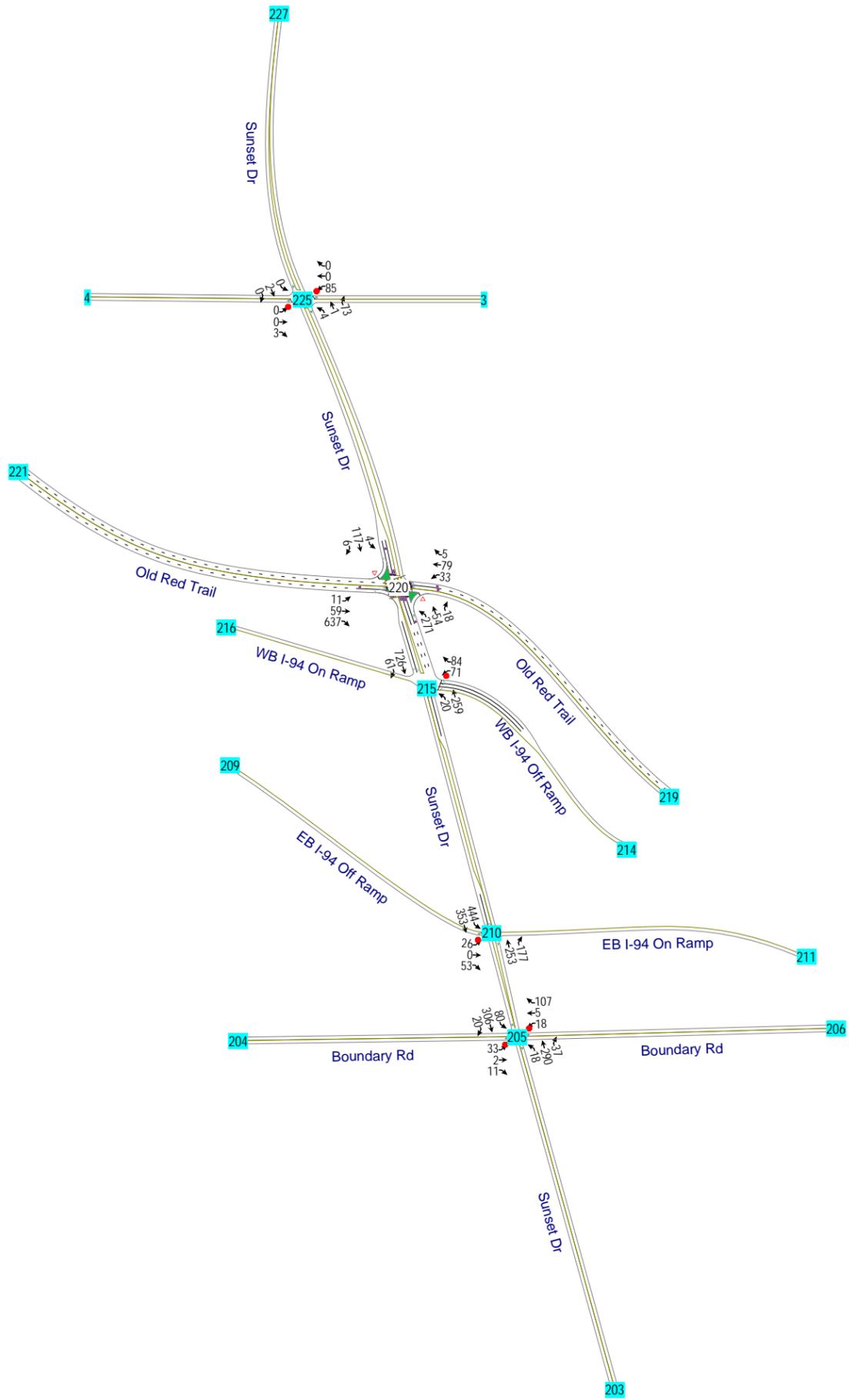


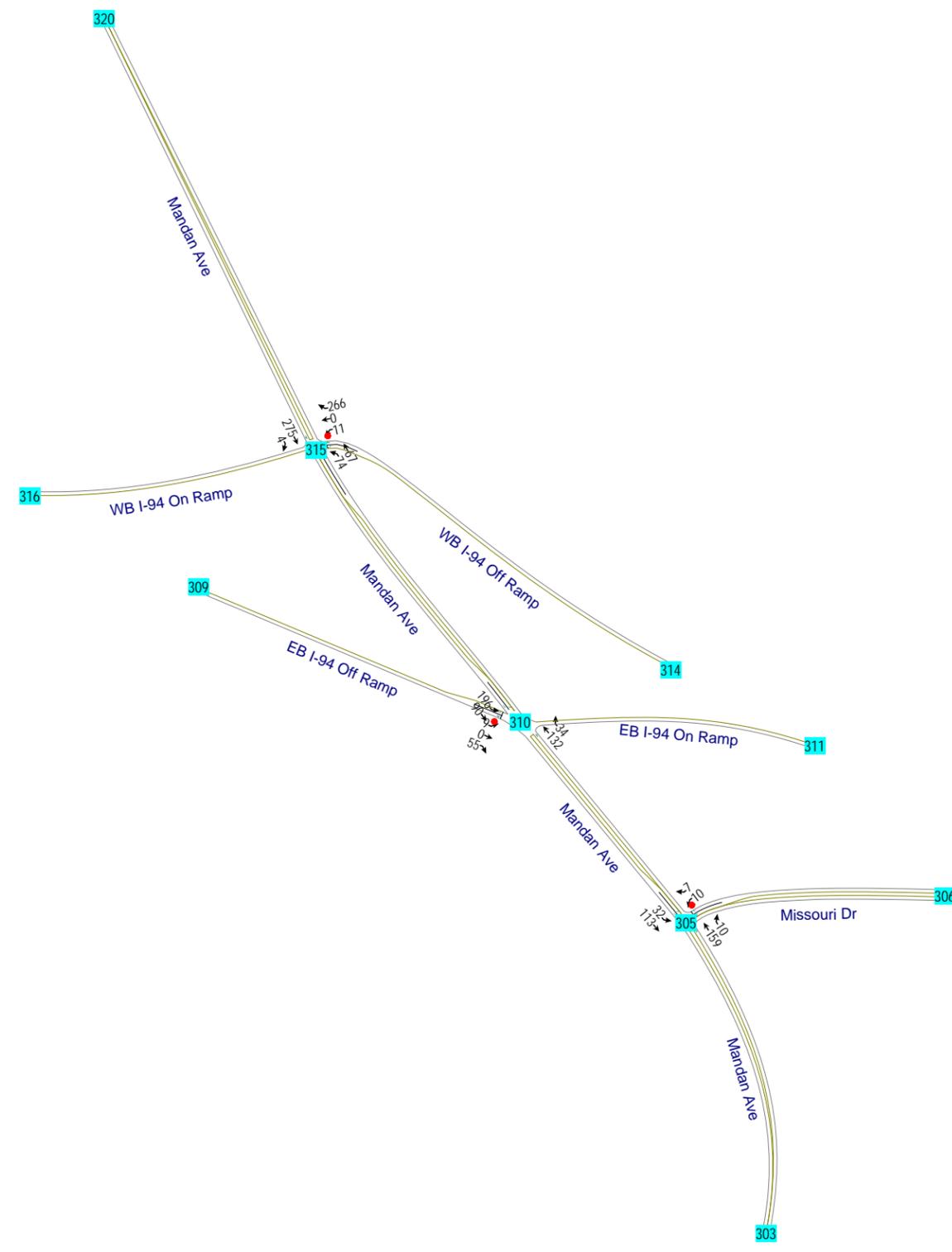


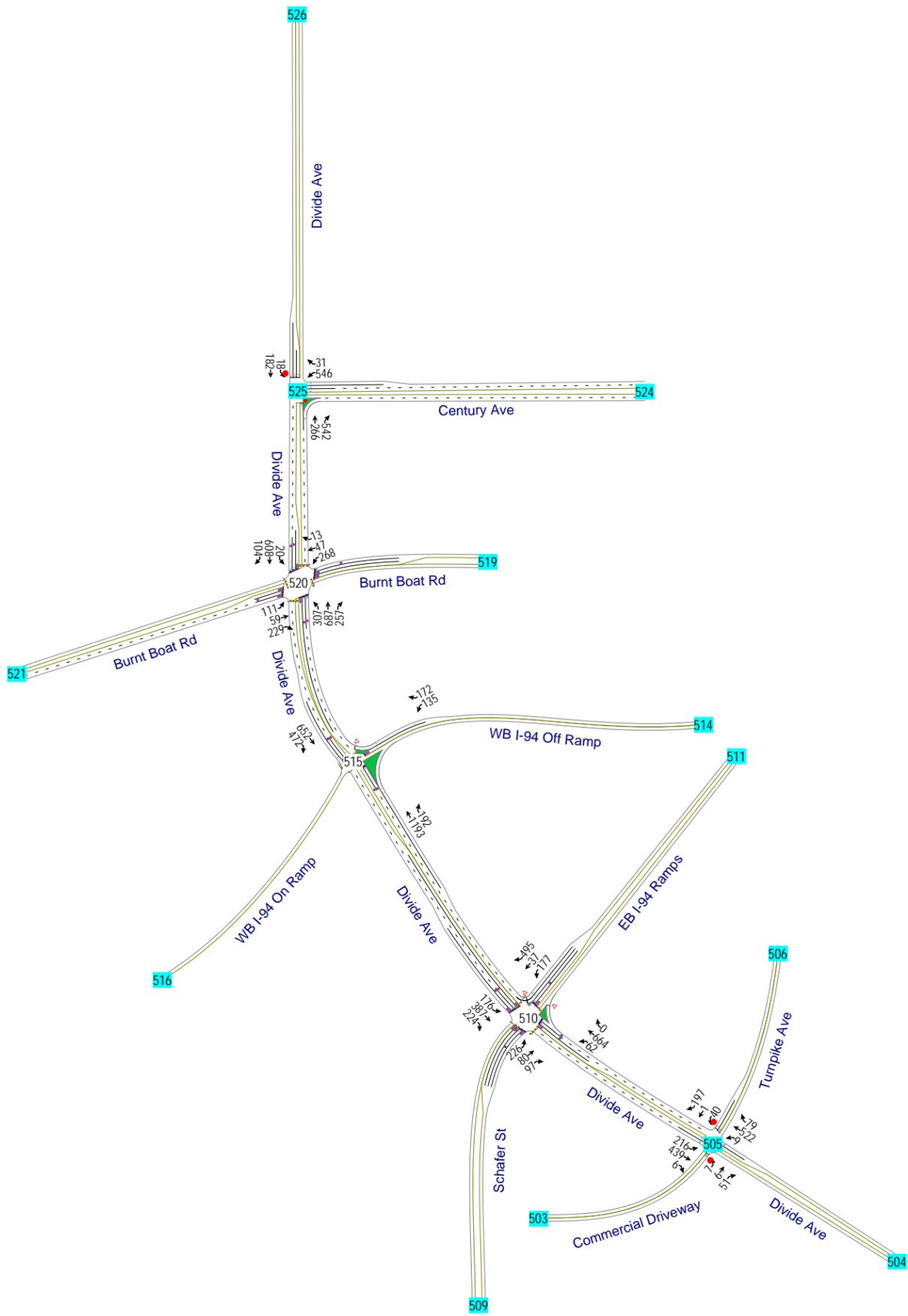




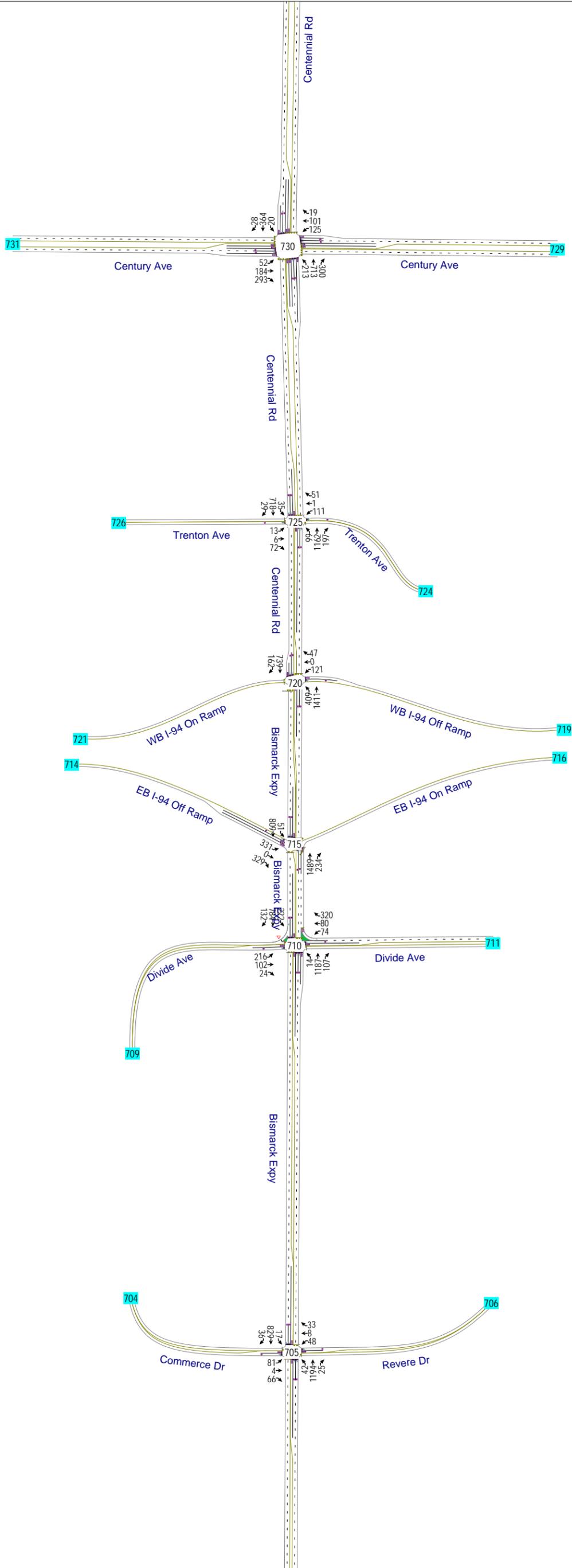












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# Appendix B – Existing Intersection Peak Hour Level of Service

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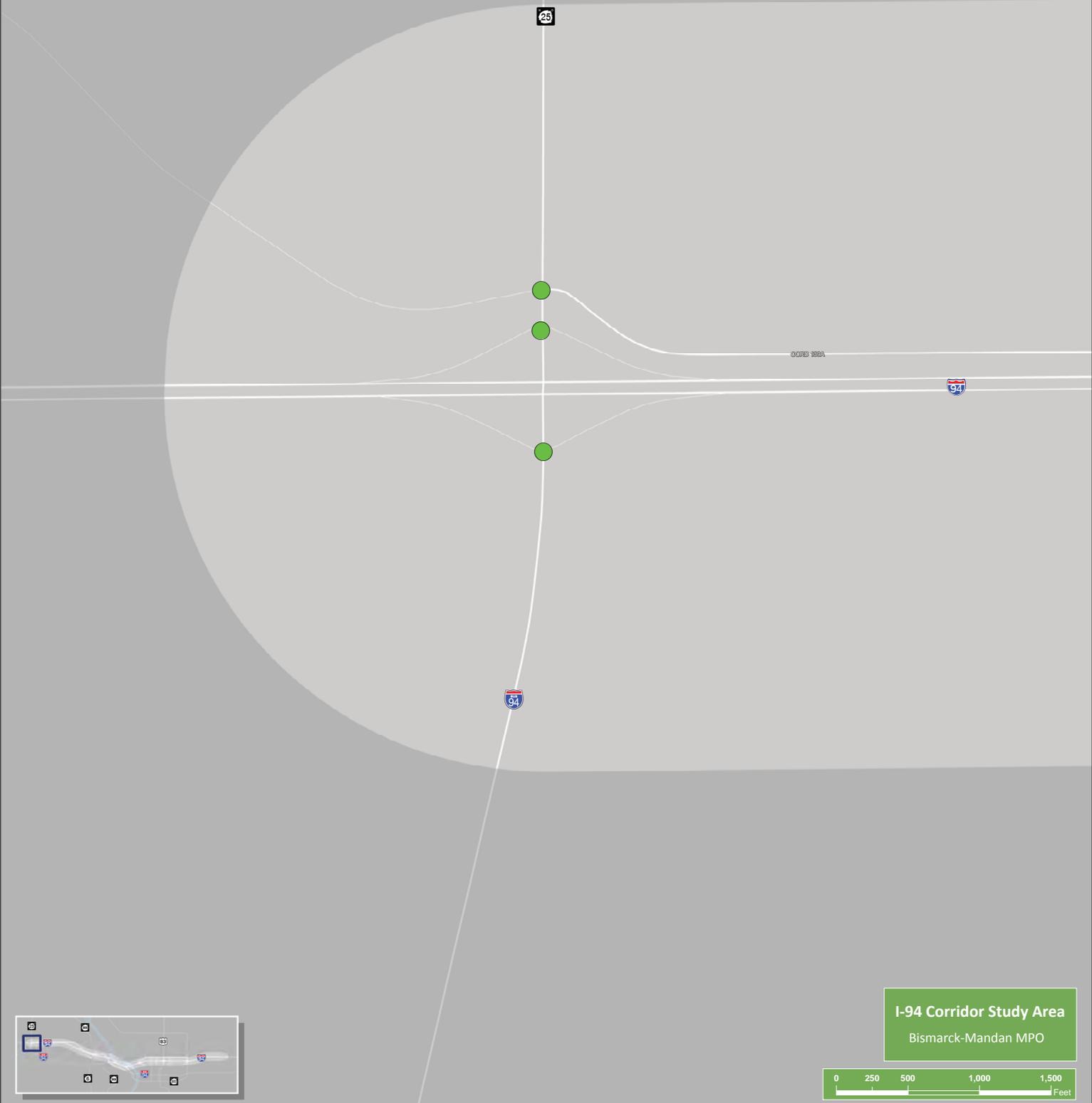
## Highway 25 / BUS. I-94

**Intersection Level of Service**

- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)
- 250' - 300' Noticeable Queue
- 301' - 400' Emerging Queue
- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO





## SUNSET DR

**Intersection Level of Service**

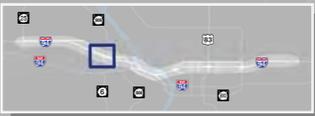
- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)

**Queue Lengths**

- 250' - 300' Noticeable Queue
- 301' - 400' Emerging Queue
- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO







## TYLER PKWY / DIVIDE AVE W

**Intersection Level of Service**

- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)

**Queue Length**

- 250' - 300' Noticeable Queue
- 301' - 400' Emerging Queue
- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO



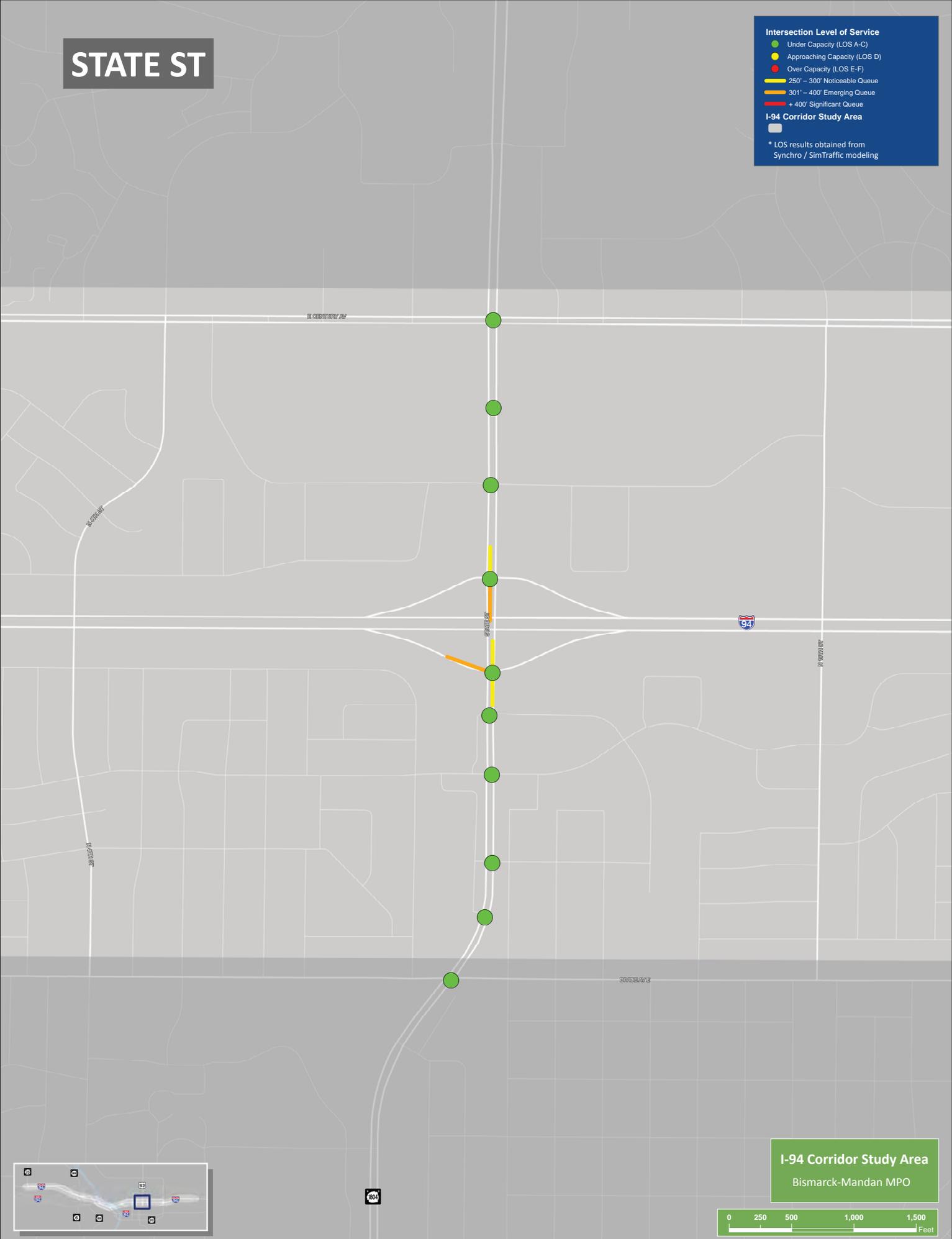
## STATE ST

**Intersection Level of Service**

- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)
- 250' - 300' Noticeable Queue
- 301' - 400' Emerging Queue
- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO





## CENTENNIAL RD

**Intersection Level of Service**

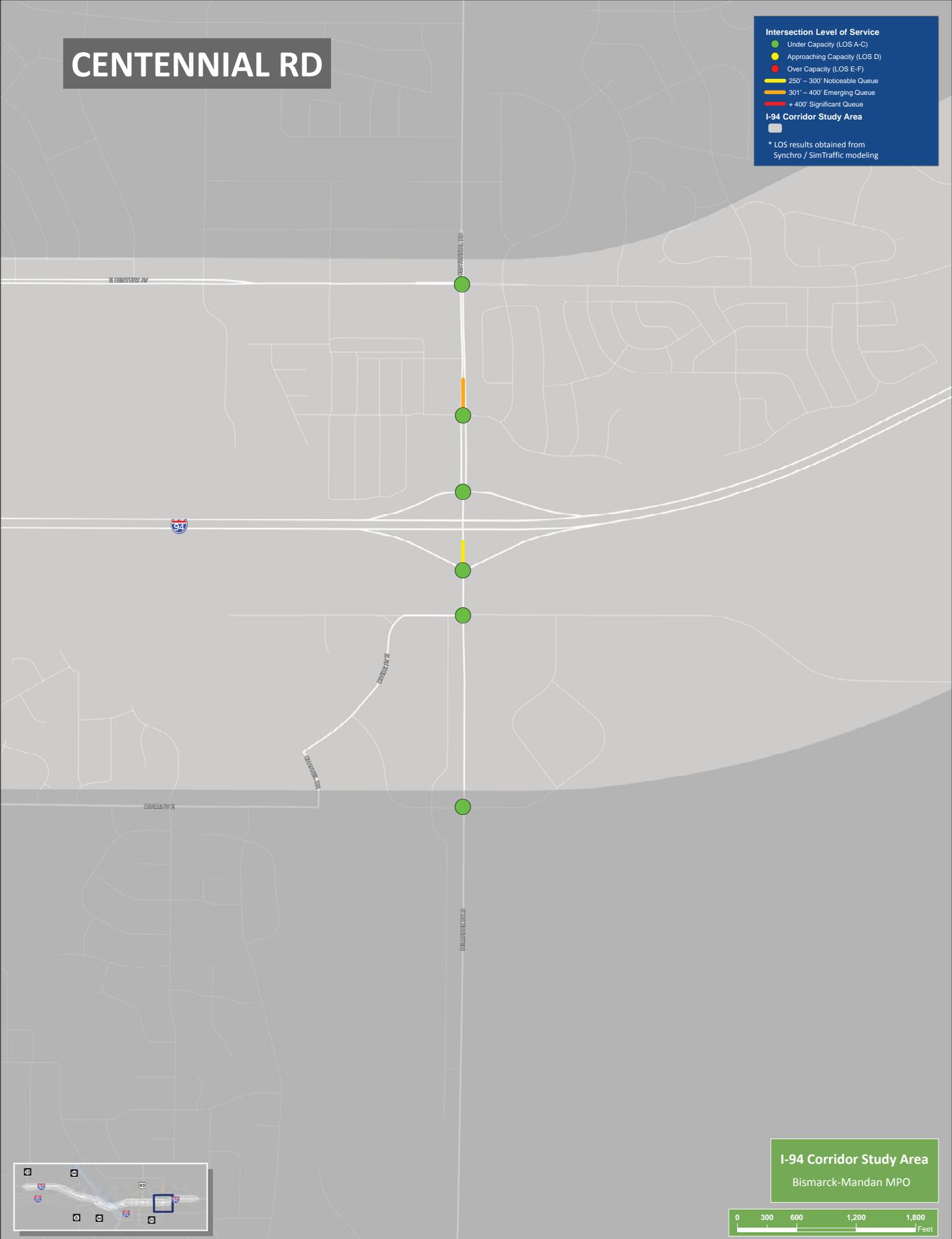
- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)

**Queue Lengths**

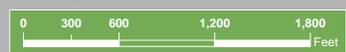
- 250' - 300' Noticeable Queue
- 301' - 400' Emerging Queue
- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO



## Highway 25 / BUS. I-94

**Intersection Level of Service**

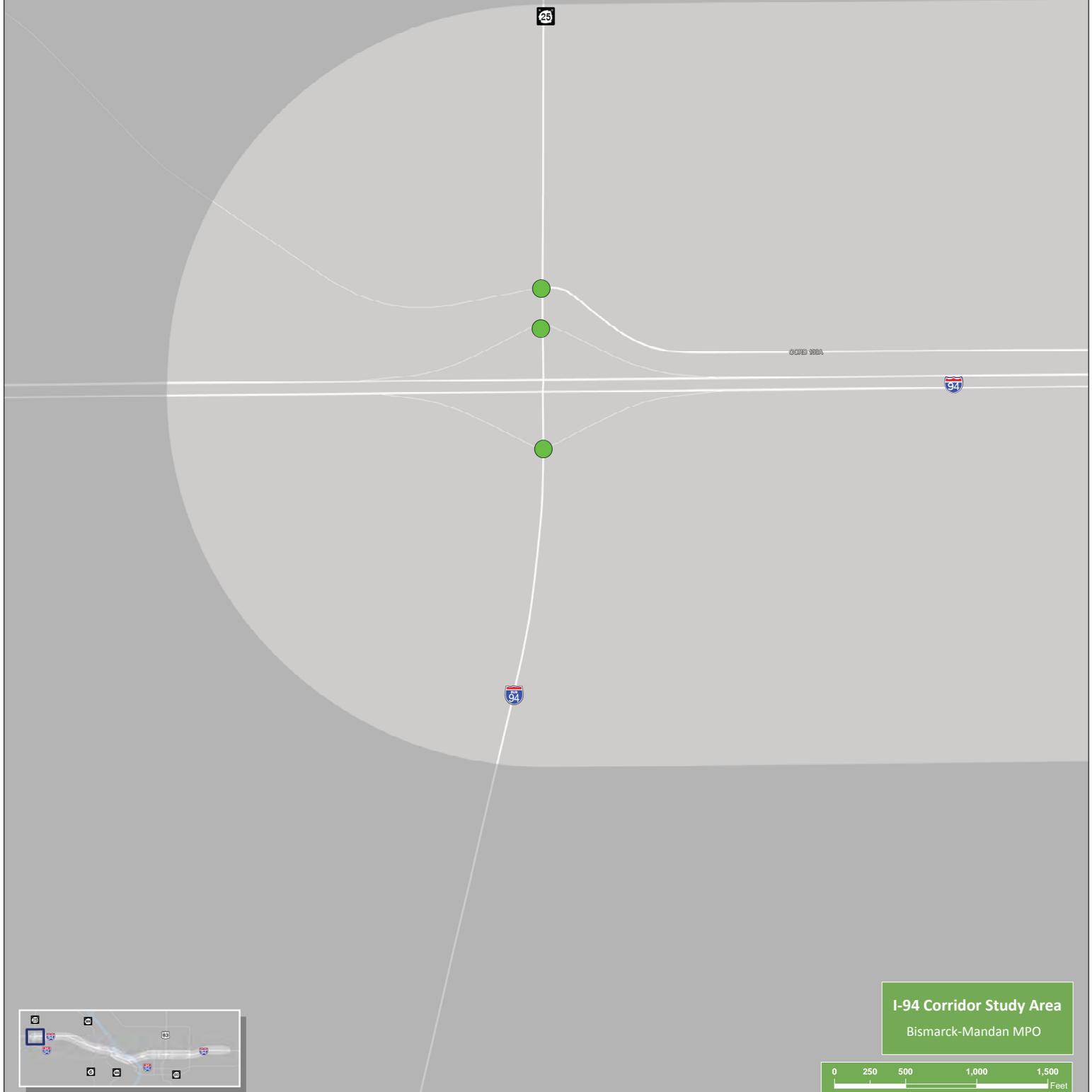
- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)

**Queue Lengths**

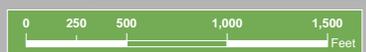
- 250' - 300' Noticeable Queue
- 301' - 400' Emerging Queue
- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO





## SUNSET DR

**Intersection Level of Service**

- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)

250' - 300' Noticeable Queue  
301' - 400' Emerging Queue  
+ 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO





## MANDAN AVE

**Intersection Level of Service**

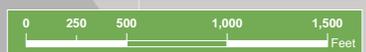
- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)
- 250' - 300' Noticeable Queue
- 301' - 400' Emerging Queue
- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO



# TYLER PKWY / DIVIDE AVE W

**Intersection Level of Service**

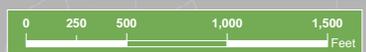
- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)
- 250' - 300' Noticeable Queue
- 301' - 400' Emerging Queue
- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO



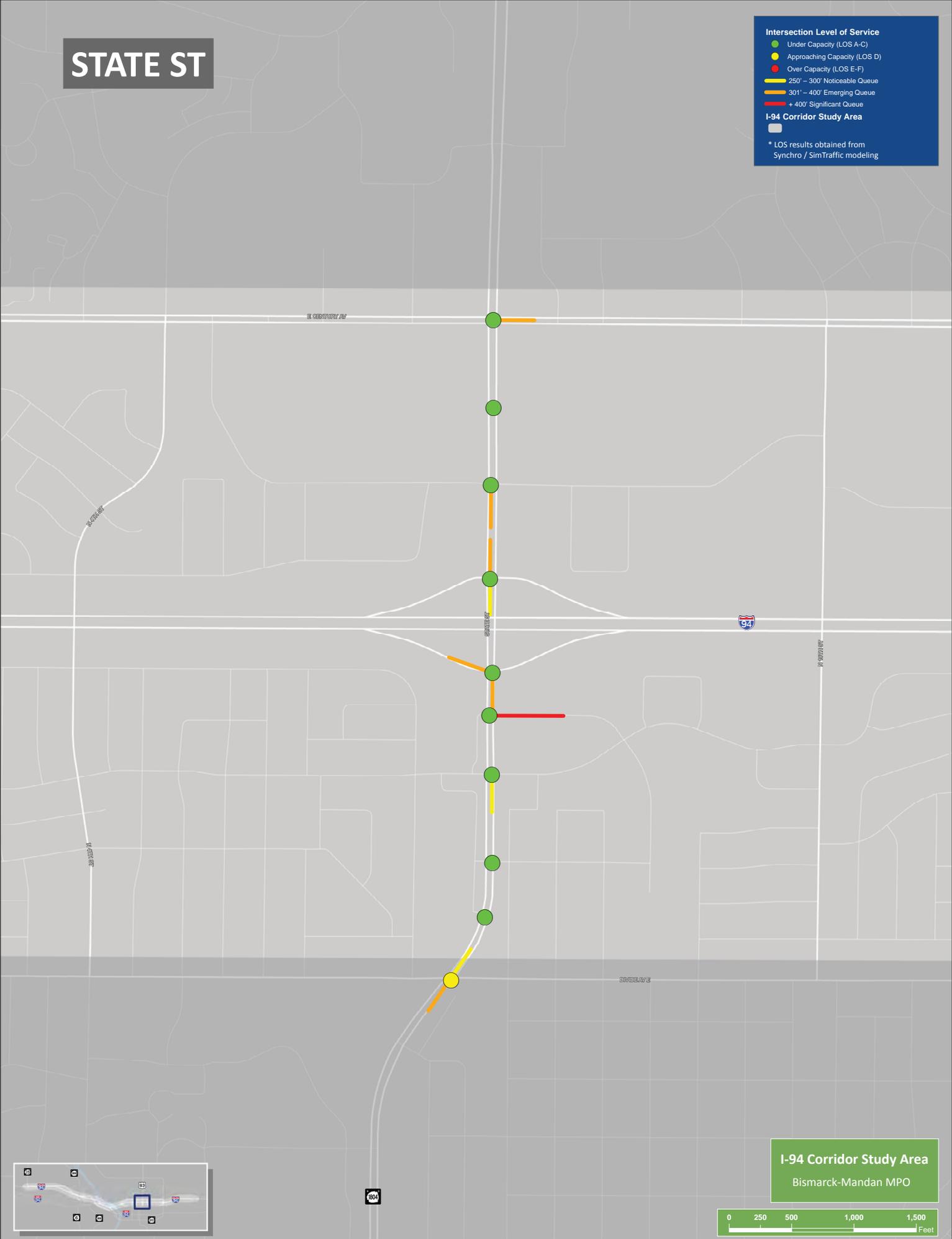
## STATE ST

**Intersection Level of Service**

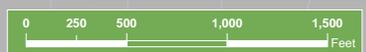
- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)
- 250' - 300' Noticeable Queue
- 301' - 400' Emerging Queue
- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO





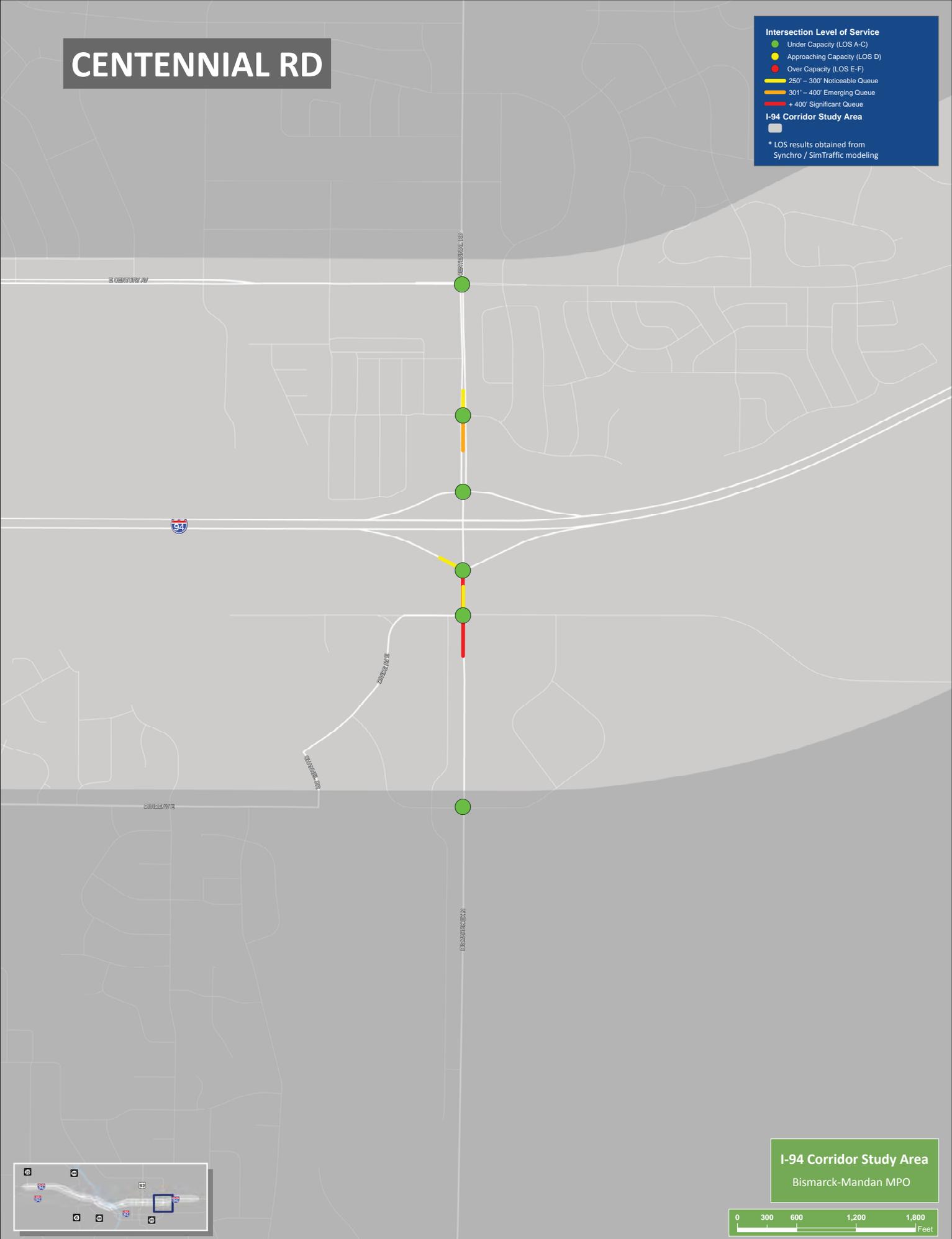
## CENTENNIAL RD

**Intersection Level of Service**

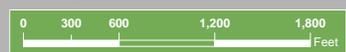
- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)
- 250' - 300' Noticeable Queue
- 301' - 400' Emerging Queue
- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO



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# Appendix C – Daily and Peak Hour Freeway Volumes

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Location	Existing			Year 2040 No Build		
	2012 AADT*	AM Pk Hr	PM Pk Hr	Daily	AM Pk Hr	PM Pk Hr
EB I-94	5,123	392	405	8,500	625	750
Hwy 25 Off-Ramp	640	18	43	900	50	75
EB I-94	4,534	374	362	7,600	575	675
Hwy 25 On-Ramp	1,890	176	106	4,400	425	250
EB I-94	6,475	550	468	12,000	1,000	925
Hwy 6 (Sunset Dr) Off-Ramp	585	67	79	2,900	325	400
EB I-94	4,849	483	389	9,100	675	525
Hwy 6 (Sunset Dr) On-Ramp	4,580	648	621	8,500	1,000	975
EB I-94	8,388	1,131	1,010	17,600	1,675	1,500
Mandan Ave Off-Ramp	825	76	64	2,600	200	175
EB I-94	7,301	1,055	946	15,000	1,475	1,325
Mandan Ave On-Ramp	2,520	336	230	4,700	775	525
EB I-94	9,560	1,391	1,176	19,700	2,250	1,850
Main St On-Ramp	9,298	840	797	15,000	1,350	1,275
EB I-94	18,858	2,231	1,973	34,700	3,600	3,125
Bismarck Expy Off-Ramp	7,645	916	713	12,000	1,450	1,025
EB I-94	10,771	1,315	1,260	22,700	2,150	2,100
Bismarck Expy On-Ramp	3,325	380	415	5,000	550	650
EB I-94	13,655	1,695	1,675	27,700	2,700	2,750
Tyler Pkwy Off-Ramp	6,105	538	709	9,800	875	1,075
EB I-94	8,638	1,157	966	17,900	1,825	1,675
Tyler Pkwy On-Ramp	2,485	209	256	4,100	375	400
EB I-94	12,210	1,366	1,222	22,000	2,200	2,075
State St Off-Ramp	7,055	841	755	11,400	1,225	1,125
EB I-94	4,946	525	467	10,600	975	950
State St On-Ramp	2,570	225	344	3,800	375	500
EB I-94	7,308	750	811	14,400	1,350	1,450
Bismarck Expy Off-Ramp	5,180	594	660	10,100	1,125	1,200
EB I-94	2,256	156	151	4,300	225	250
Bismarck Expy On-Ramp	1,605	195	285	3,200	375	550
EB I-94	3,990	351	436	7,500	600	800
WB I-94	3,990	246	420	7,500	450	775
Centennial Rd Off-Ramp	1,610	87	168	3,100	175	325
WB I-94	2,211	159	252	4,400	275	450
Centennial Rd On-Ramp	5,265	657	571	10,200	1,175	1,025
WB I-94	7,308	816	823	14,600	1,450	1,475
State St Off-Ramp	2,940	365	236	4,000	525	350
WB I-94	4,774	451	587	10,600	925	1,125
State St On-Ramp	7,030	594	811	11,400	1,075	1,200
WB I-94	12,210	1,045	1,398	22,000	2,000	2,325
Tyler Pkwy Off-Ramp	2,670	274	307	4,200	425	500
WB I-94	8,510	771	1,091	17,800	1,575	1,825
NB Tyler Pkwy On-Ramp	2,050	131	192	3,200	185	235
WB I-94	10,045	902	1,283	21,000	1,760	2,060
SB Tyler Pkwy On-Ramp	4,125	412	472	6,300	640	715
WB I-94	13,655	1,314	1,755	27,300	2,400	2,775
Bismarck Expy Off-Ramp	2,975	312	382	4,500	475	575
WB I-94	11,179	1,002	1,373	22,800	1,925	2,200
Bismarck Expy On-Ramp	7,180	579	1,307	11,500	925	2,100
WB I-94	18,858	1,581	2,680	34,300	2,850	4,300
Main St Off-Ramp	9,298	623	1,128	15,000	1,000	1,825
WB I-94	9,560	958	1,552	19,300	1,850	2,475
Mandan Ave Off-Ramp	2,250	160	277	4,500	425	675
WB I-94	7,421	798	1,275	14,800	1,425	1,800
Mandan Ave On-Ramp	855	61	78	2,600	125	200
WB I-94	8,388	859	1,353	17,400	1,550	2,000
Hwy 6 (Sunset Dr) Off-Ramp	4,430	341	155	8,400	750	375
WB I-94	4,886	518	1,198	9,000	800	1,625
Hwy 6 (Sunset Dr) On-Ramp	660	97	81	3,000	325	375
WB I-94	6,475	615	1,279	12,000	1,125	2,000
Hwy 25 Off-Ramp	1,895	63	181	4,400	225	400
WB I-94	4,531	552	1,098	7,600	900	1,600
Hwy 25 On-Ramp	640	52	43	900	75	50
WB I-94	5,123	604	1,141	8,500	975	1,650

\*Existing volumes along I-94 do not necessarily balance. Mainline segments between interchanges assumed to have 50-50 daily directional splits of count volume; segments between interchange off and on ramps are average of approach and departure volumes

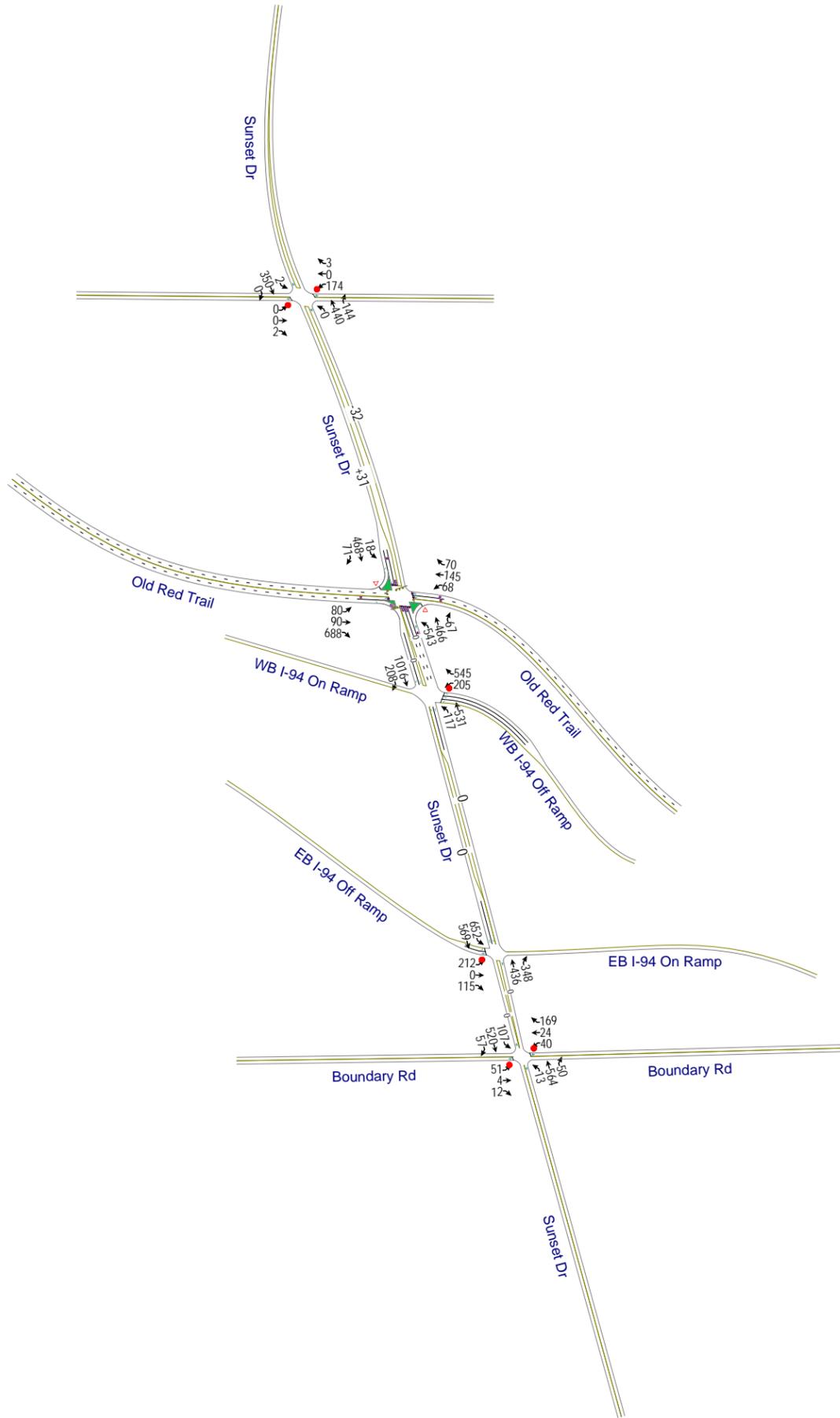
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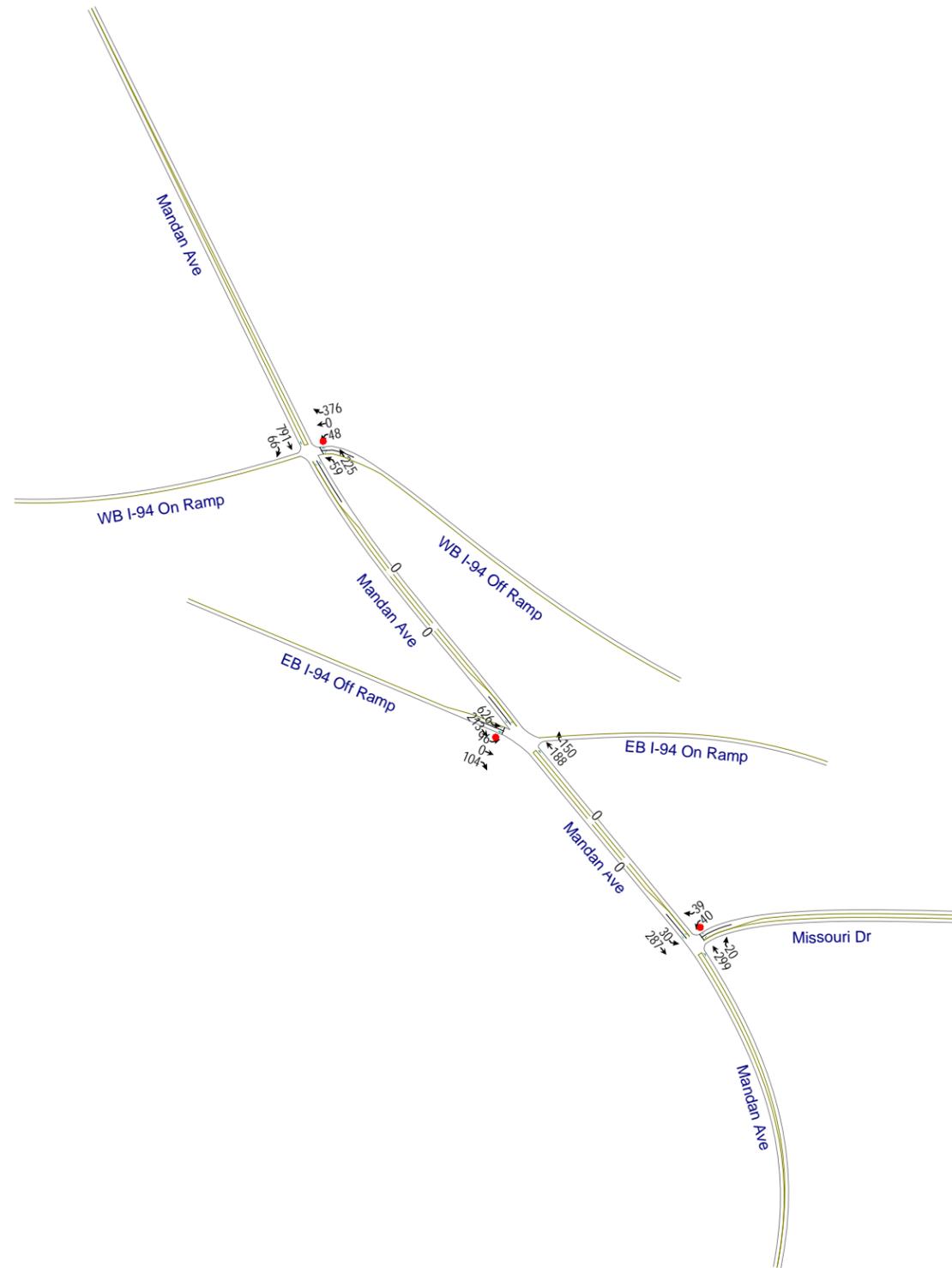
# Appendix D – 2040 Turning Movement Counts

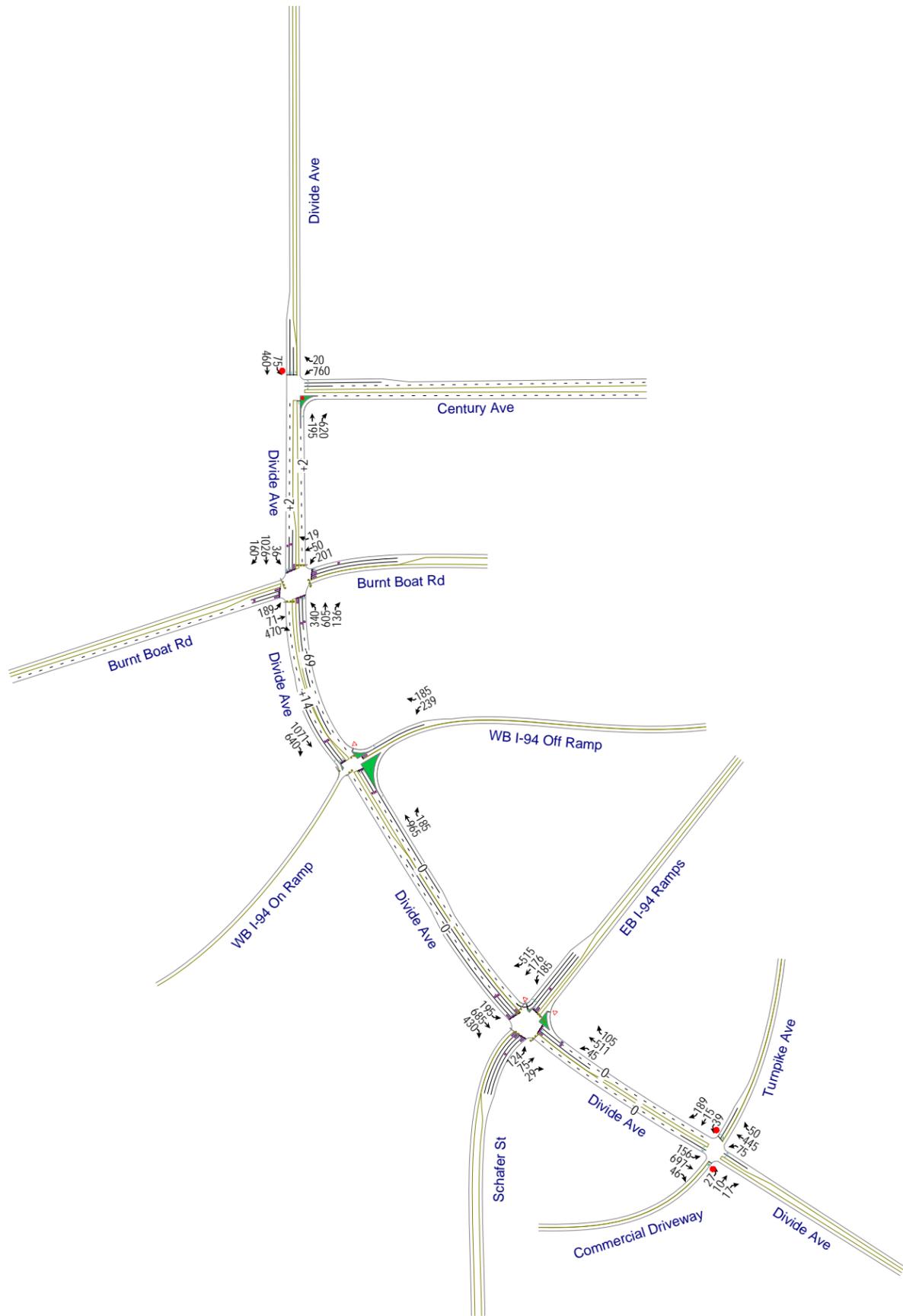
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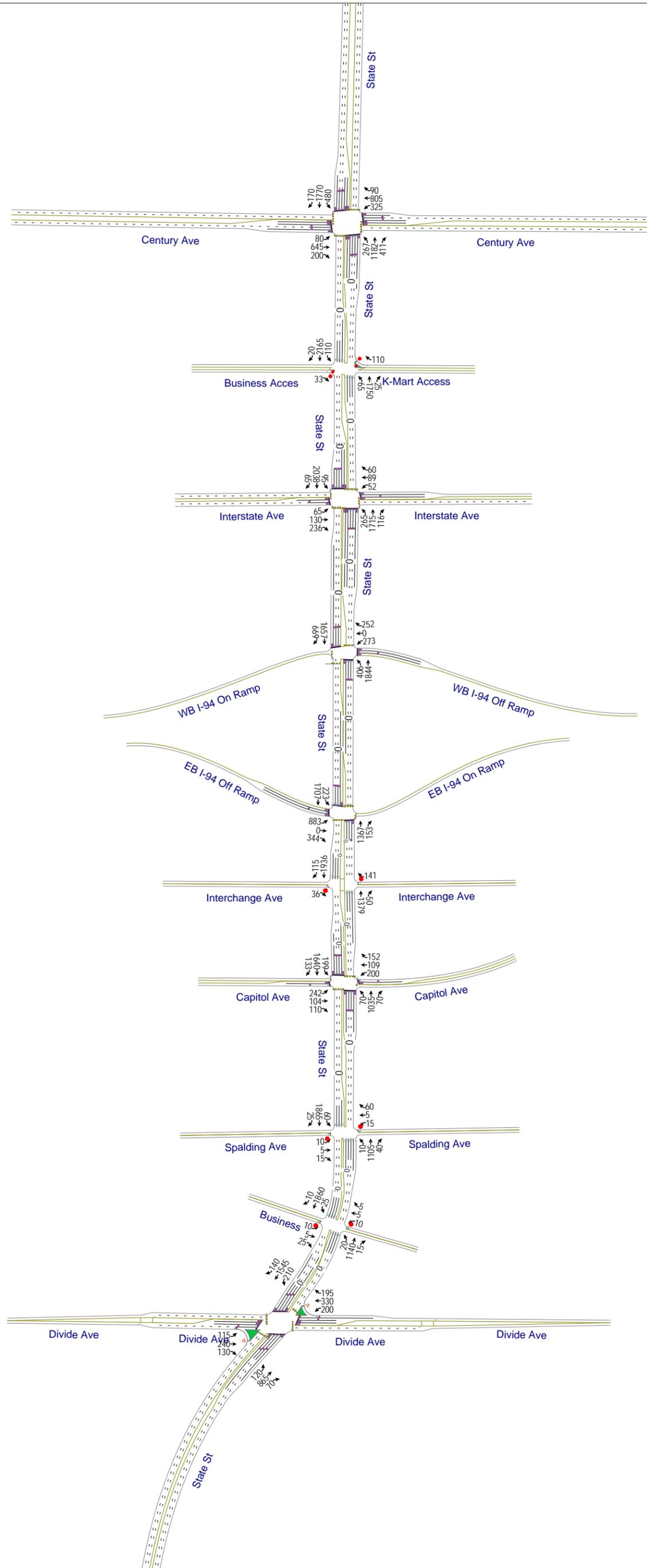


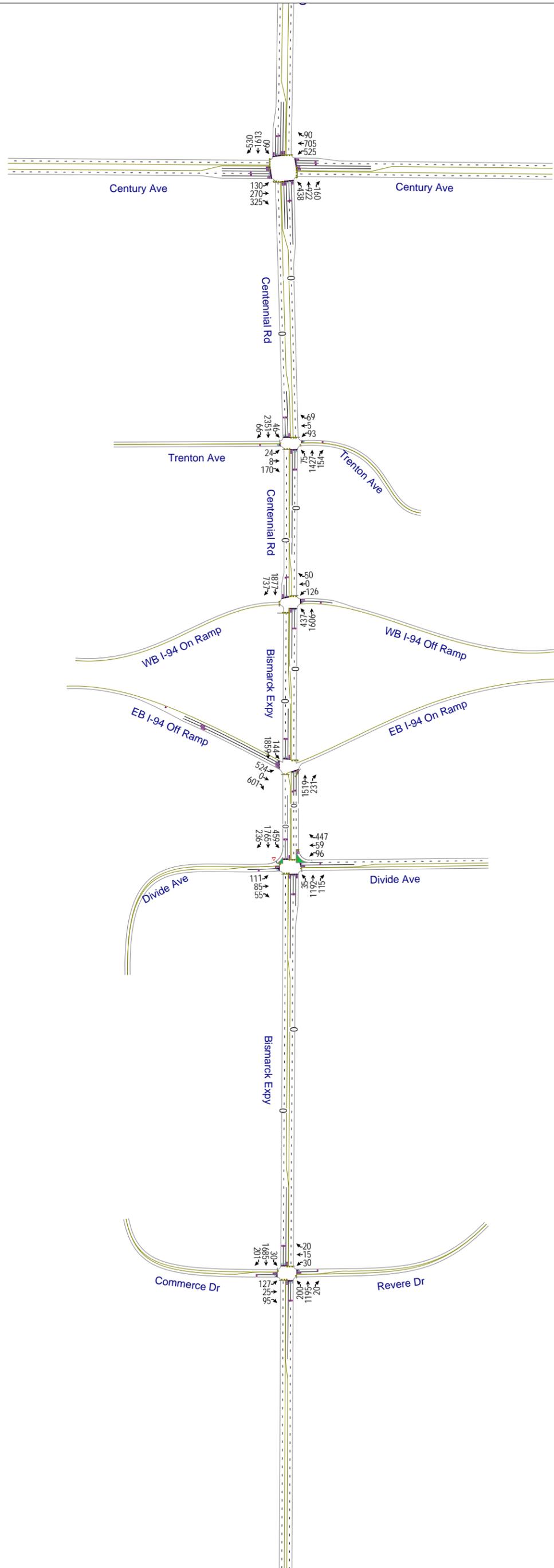


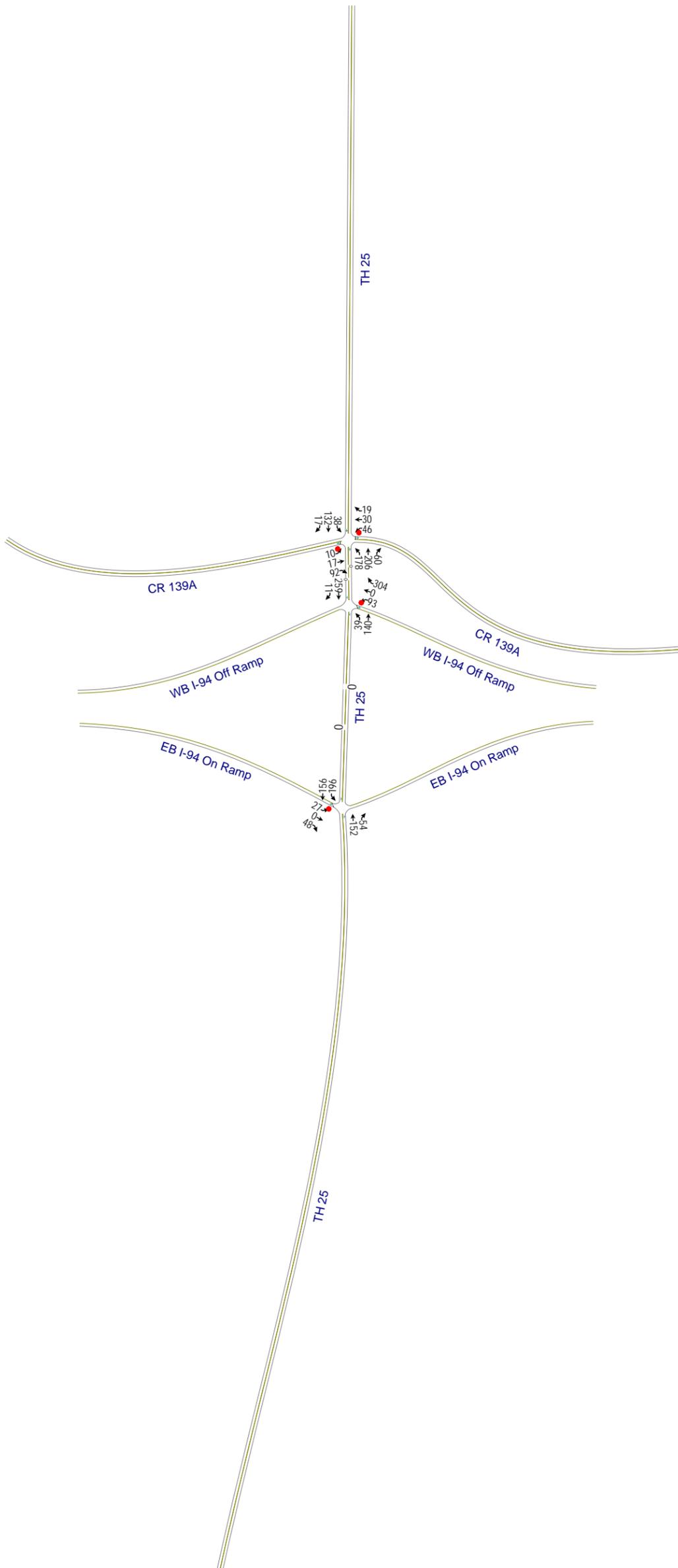


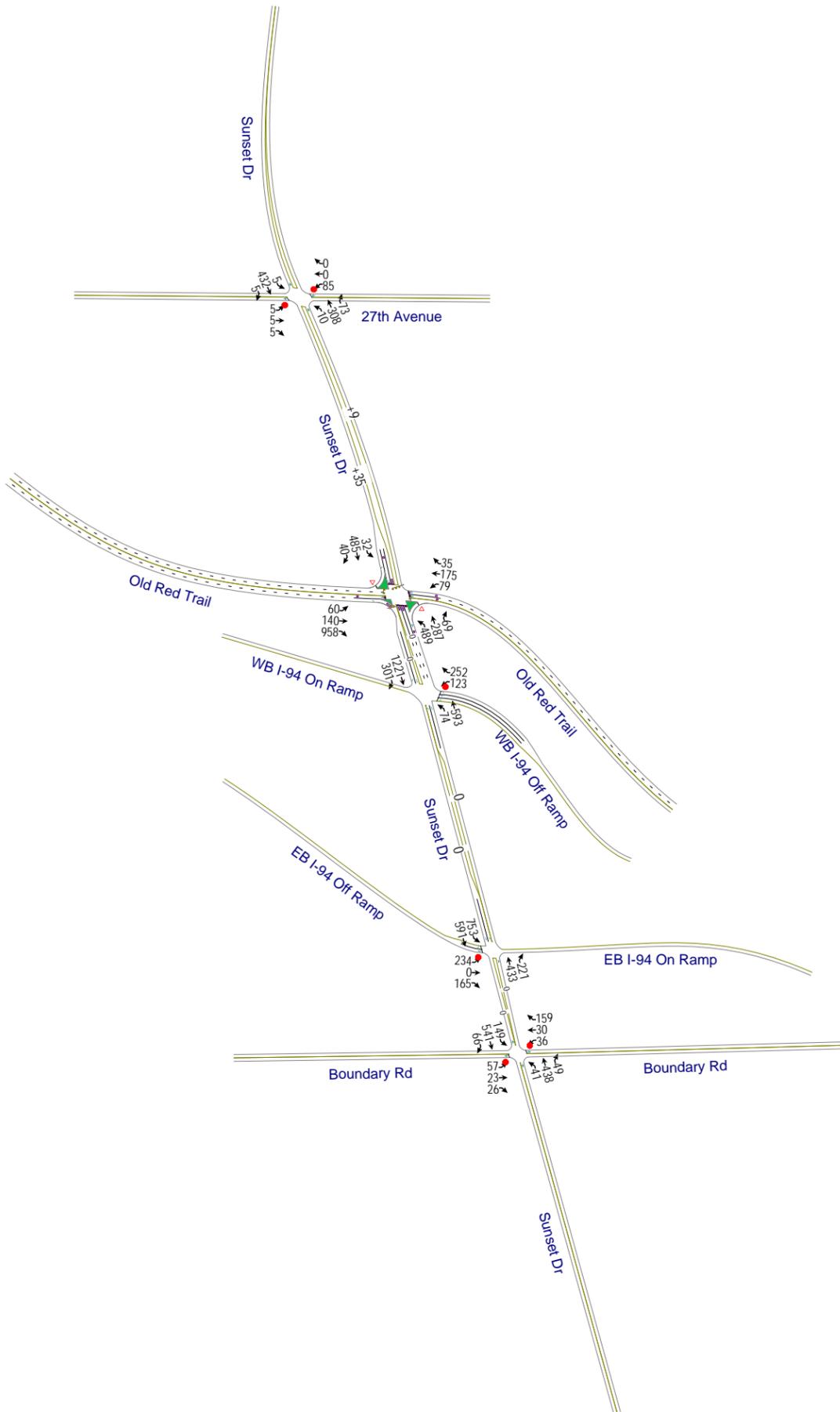


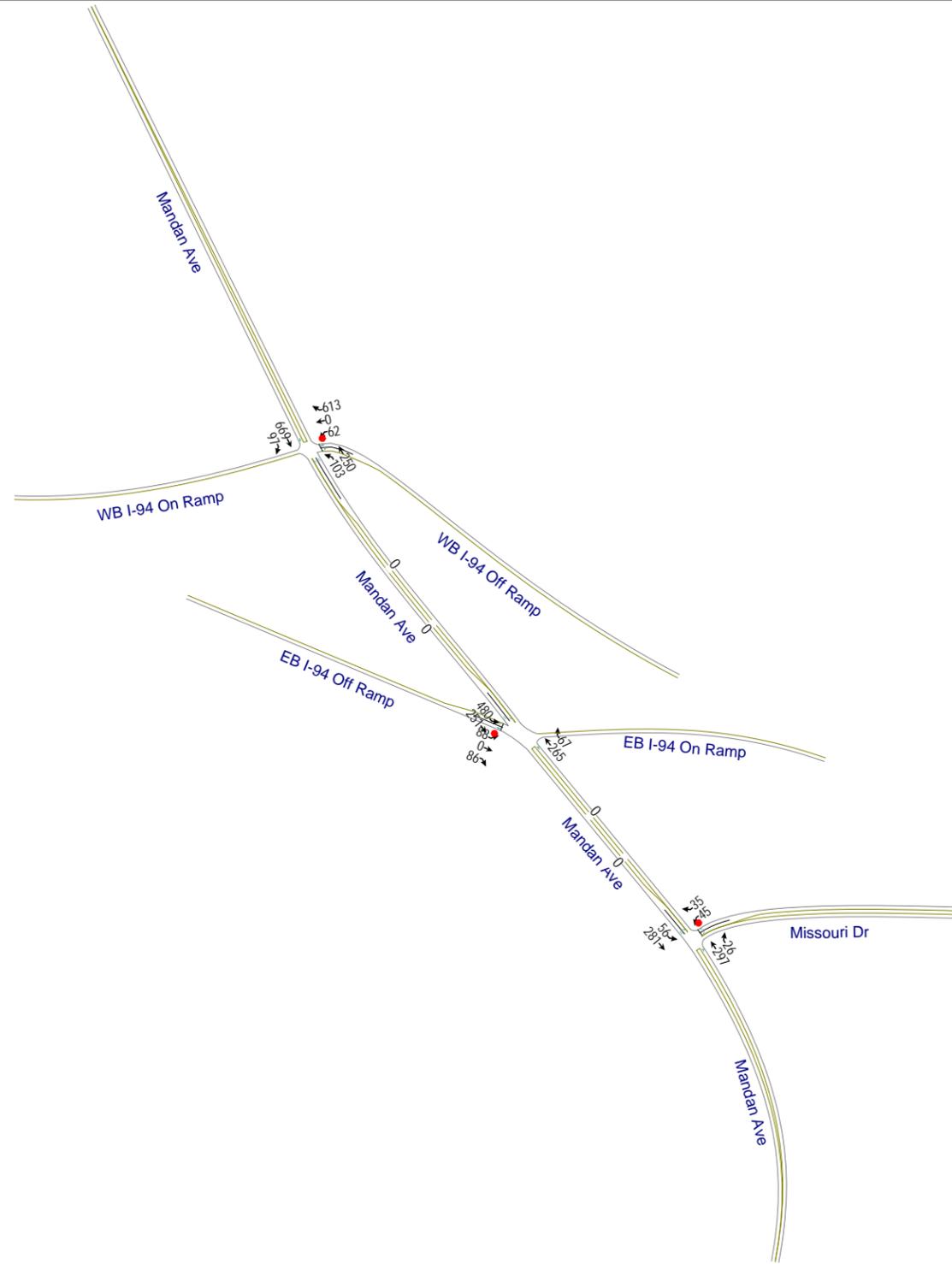


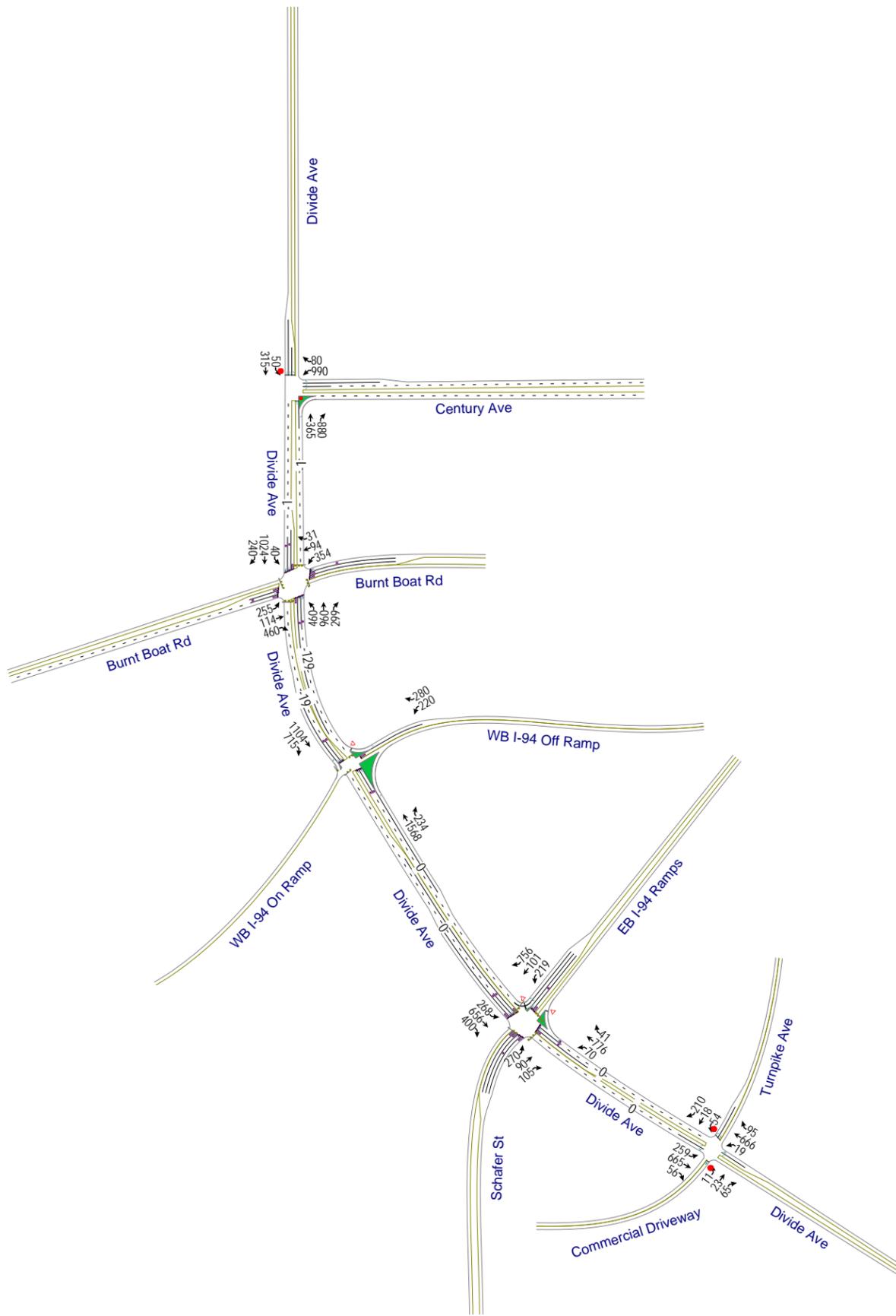


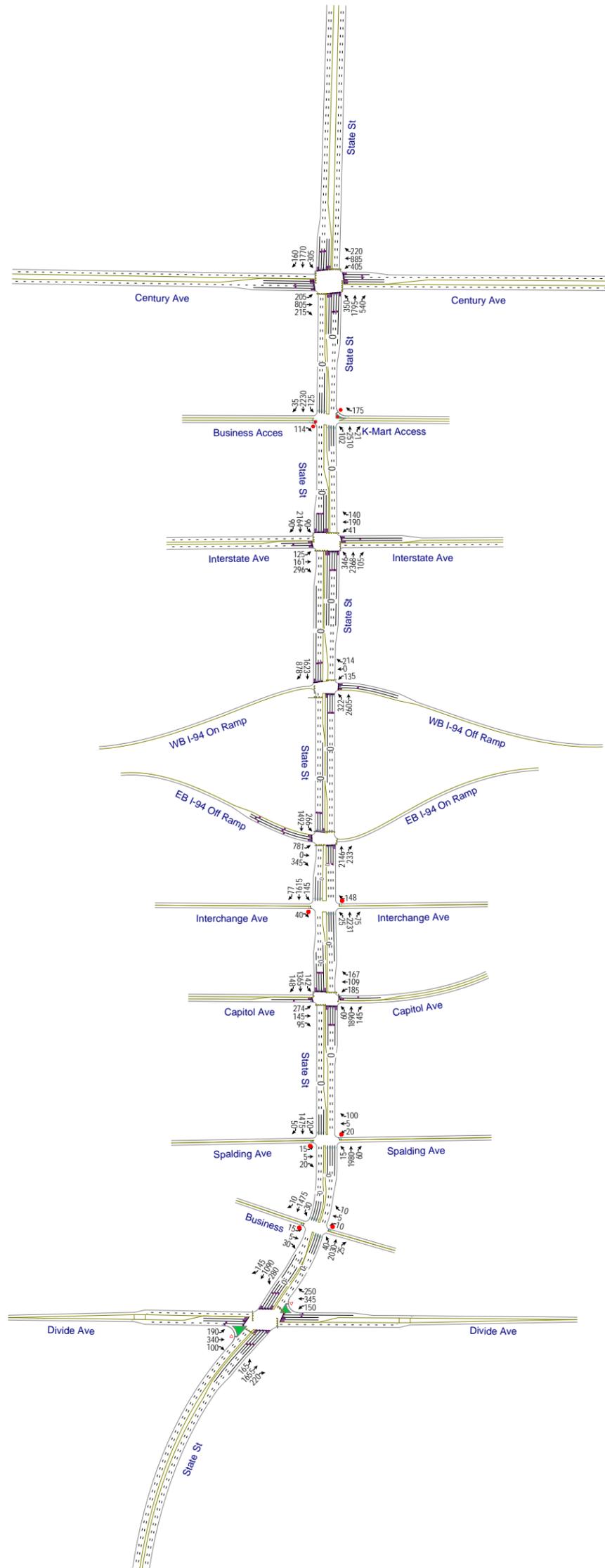


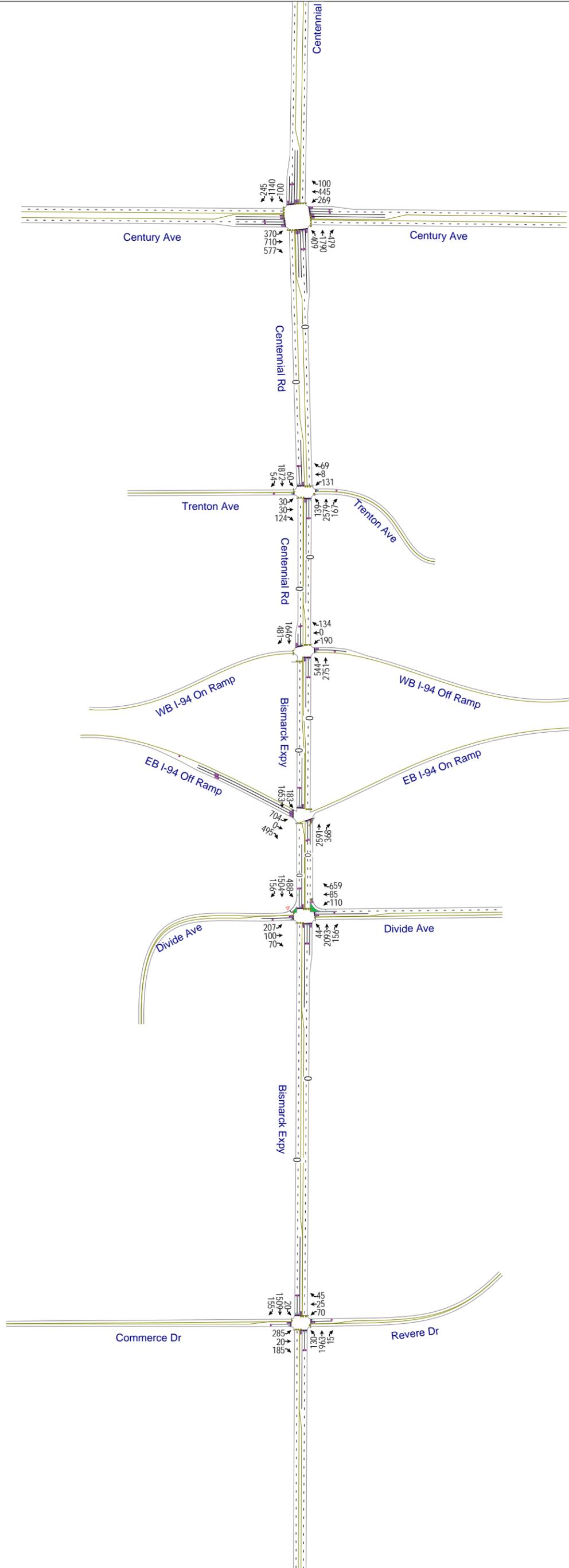












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# Appendix E – Traffic Forecast Reasonableness Checks

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**Table 1**

Bis-Man I-94 Corridor Study  
 Traffic Forecast Reasonableness Check  
 Year 2040 No Build Conditions

**DRAFT**

**AM Peak Hour Percentage and Directional Distribution Comparison**

Facility	Segment	Existing (2010)											Year 2040 No Build											Growth Factor	
		Number of Lanes		Hourly Capacity		Two Way			NB/EB		SB/WB		Number of Lanes		Hourly Capacity		Two Way			NB/EB		SB/WB			
		NB/EB	SB/WB	NB/EB	SB/WB	Daily	Peak	% of Daily	Peak Hour	Dir %	Peak Hour	Dir %	NB/EB	SB/WB	NB/EB	SB/WB	Daily	Peak	% of Daily	Peak Hour	Dir %	Peak Hour	Dir %	Daily	Peak
I-94	West of Hwy 25	2	2	4500	4500	10,245	996	9.7%	392	39%	604	61%	2	2	4500	4500	17,000	1,600	9.4%	625	39%	975	61%	1.66	1.61
	Hwy 25 to Sunset Dr	2	2	4500	4500	12,950	1,165	9.0%	550	47%	615	53%	2	2	4500	4500	24,000	2,125	8.9%	1,000	47%	1,125	53%	1.85	1.82
	Sunset Dr to Mandan Ave	2	2	4500	4500	16,775	1,990	11.9%	1,131	57%	859	43%	2	2	4500	4500	35,000	3,225	9.2%	1,675	52%	1,550	48%	2.09	1.62
	Mandan Ave to Main St	2	2	4500	4500	19,120	2,349	12.3%	1,391	59%	958	41%	2	2	4500	4500	39,000	4,100	10.5%	2,250	55%	1,850	45%	2.04	1.75
	Main St to Bismarck Expy	3	3	6600	6600	37,715	3,812	10.1%	2,231	59%	1,581	41%	3	3	6600	6600	69,000	6,450	9.3%	3,600	56%	2,850	44%	1.83	1.69
	Bismarck Expy to Tyler Pkwy	2	2	4500	4500	27,310	3,009	11.0%	1,695	56%	1,314	44%	2	2	4500	4500	55,000	5,100	9.3%	2,700	53%	2,400	47%	2.01	1.69
	Tyler Pkwy to State Street	2	2	4500	4500	24,420	2,411	9.9%	1,366	57%	1,045	43%	2	2	4500	4500	44,000	4,200	9.5%	2,200	52%	2,000	48%	1.80	1.74
	State Street to E. Bismarck Expy	2	2	4500	4500	14,615	1,566	10.7%	750	48%	816	52%	2	2	4500	4500	29,000	2,800	9.7%	1,350	48%	1,450	52%	1.98	1.79
East of E. Bismarck Expy	2	2	4500	4500	7,980	597	7.5%	351	59%	246	41%	2	2	4500	4500	15,000	1,050	7.0%	600	57%	450	43%	1.88	1.76	

**PM Peak Hour Percentage and Directional Distribution Comparison**

Facility	Segment	Existing (2010)											Year 2040 No Build											Growth Factor	
		Number of Lanes		Hourly Capacity		Two Way			NB/EB		SB/WB		Number of Lanes		Hourly Capacity		Two Way			NB/EB		SB/WB			
		NB/EB	SB/WB	NB/EB	SB/WB	Daily	Peak	% of Daily	Peak Hour	Dir %	Peak Hour	Dir %	NB/EB	SB/WB	NB/EB	SB/WB	Daily	Peak	% of Daily	Peak Hour	Dir %	Peak Hour	Dir %	Daily	Peak
I-94	West of Hwy 25	2	2	4500	4500	10,245	1,546	15.1%	405	26%	1,141	74%	2	2	4500	4500	17,000	2,400	14.1%	750	31%	1,650	69%	1.66	1.55
	Hwy 25 to Sunset Dr	2	2	4500	4500	12,950	1,747	13.5%	468	27%	1,279	73%	2	2	4500	4500	24,000	2,925	12.2%	925	32%	2,000	68%	1.85	1.67
	Sunset Dr to Mandan Ave	2	2	4500	4500	16,775	2,363	14.1%	1,010	43%	1,353	57%	2	2	4500	4500	35,000	3,500	10.0%	1,500	43%	2,000	57%	2.09	1.48
	Mandan Ave to Main St	2	2	4500	4500	19,120	2,728	14.3%	1,176	43%	1,552	57%	2	2	4500	4500	39,000	4,325	11.1%	1,850	43%	2,475	57%	2.04	1.59
	Main St to Bismarck Expy	3	3	6600	6600	37,715	4,653	12.3%	1,973	42%	2,680	58%	3	3	6600	6600	69,000	7,425	10.8%	3,125	42%	4,300	58%	1.83	1.60
	Bismarck Expy to Tyler Pkwy	2	2	4500	4500	27,310	3,430	12.6%	1,675	49%	1,755	51%	2	2	4500	4500	55,000	5,525	10.0%	2,750	50%	2,775	50%	2.01	1.61
	Tyler Pkwy to State Street	2	2	4500	4500	24,420	2,620	10.7%	1,222	47%	1,398	53%	2	2	4500	4500	44,000	4,400	10.0%	2,075	47%	2,325	53%	1.80	1.68
	State Street to E. Bismarck Expy	2	2	4500	4500	14,615	1,634	11.2%	811	50%	823	50%	2	2	4500	4500	29,000	2,925	10.1%	1,450	50%	1,475	50%	1.98	1.79
East of E. Bismarck Expy	2	2	4500	4500	7,980	856	10.7%	436	51%	420	49%	2	2	4500	4500	15,000	1,575	10.5%	800	51%	775	49%	1.88	1.84	

FINAL

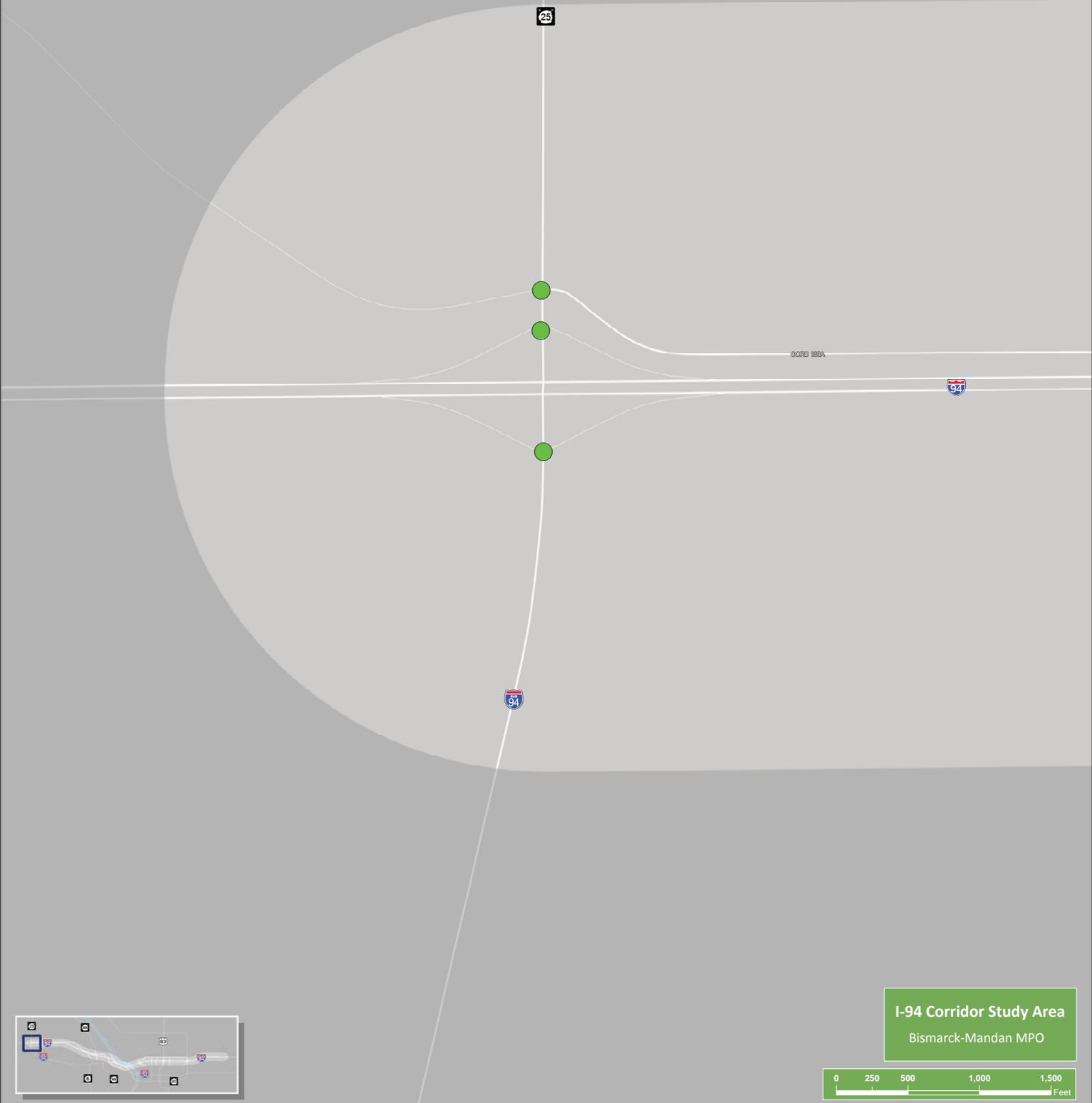
# Appendix F – 2040 Intersection Peak Hour Level of Service

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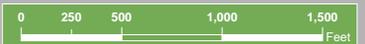


## Highway 25 / BUS. I-94

- Intersection Level of Service**
- Under Capacity (LOS A-C)
  - Approaching Capacity (LOS D)
  - Over Capacity (LOS E-F)
- Queue Lengths**
- 250' - 300' Noticeable Queue
  - 301' - 400' Emerging Queue
  - + 400' Significant Queue
- I-94 Corridor Study Area**
- \* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO





# SUNSET DR

**Intersection Level of Service**

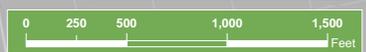
- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
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- 301' - 400' Emerging Queue
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**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO







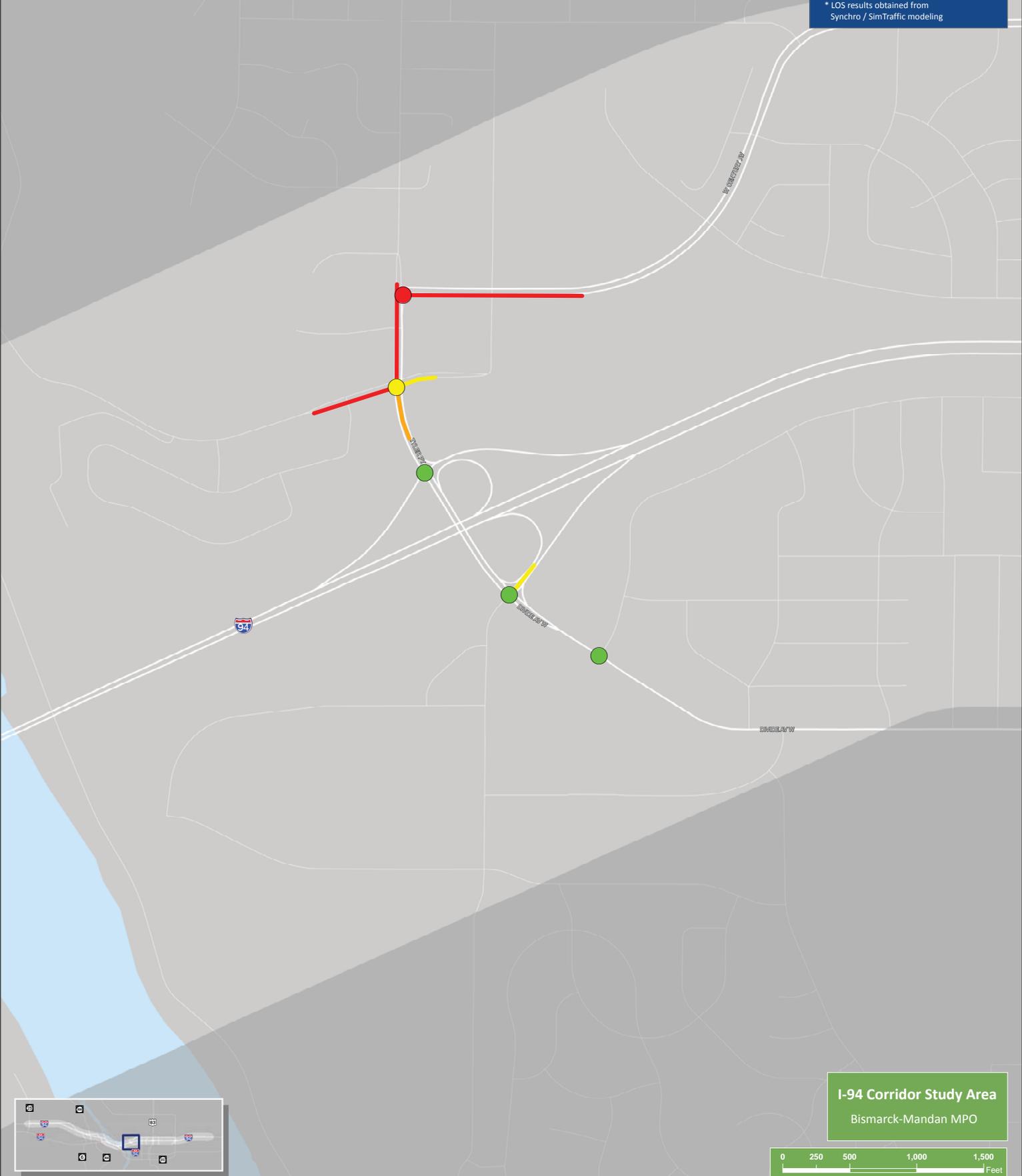
# TYLER PKWY / DIVIDE AVE W

**Intersection Level of Service**

- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)
- 250' - 300' Noticeable Queue
- 301' - 400' Emerging Queue
- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO





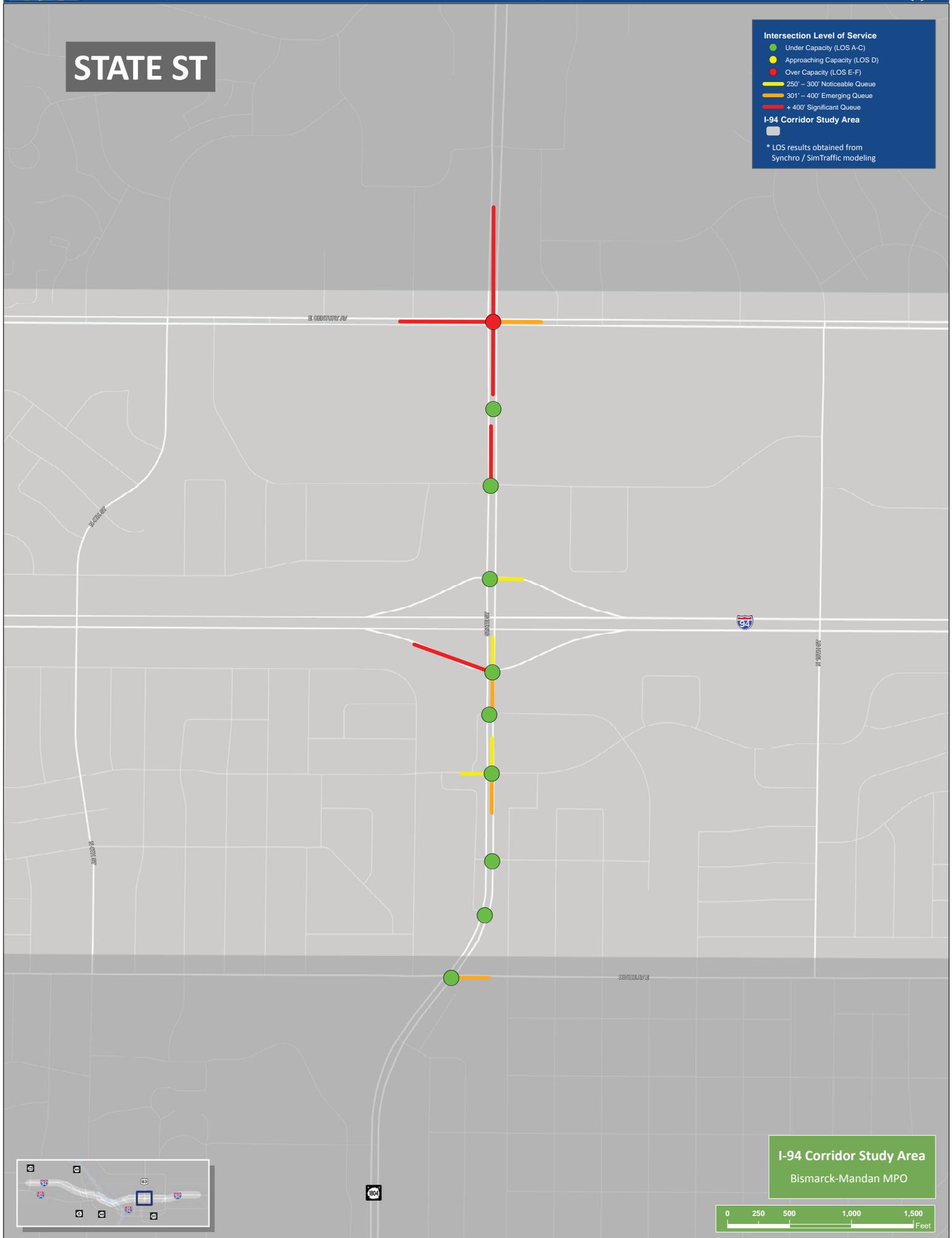
## STATE ST

**Intersection Level of Service**

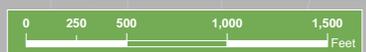
- Under Capacity (LOS A-C)
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**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO





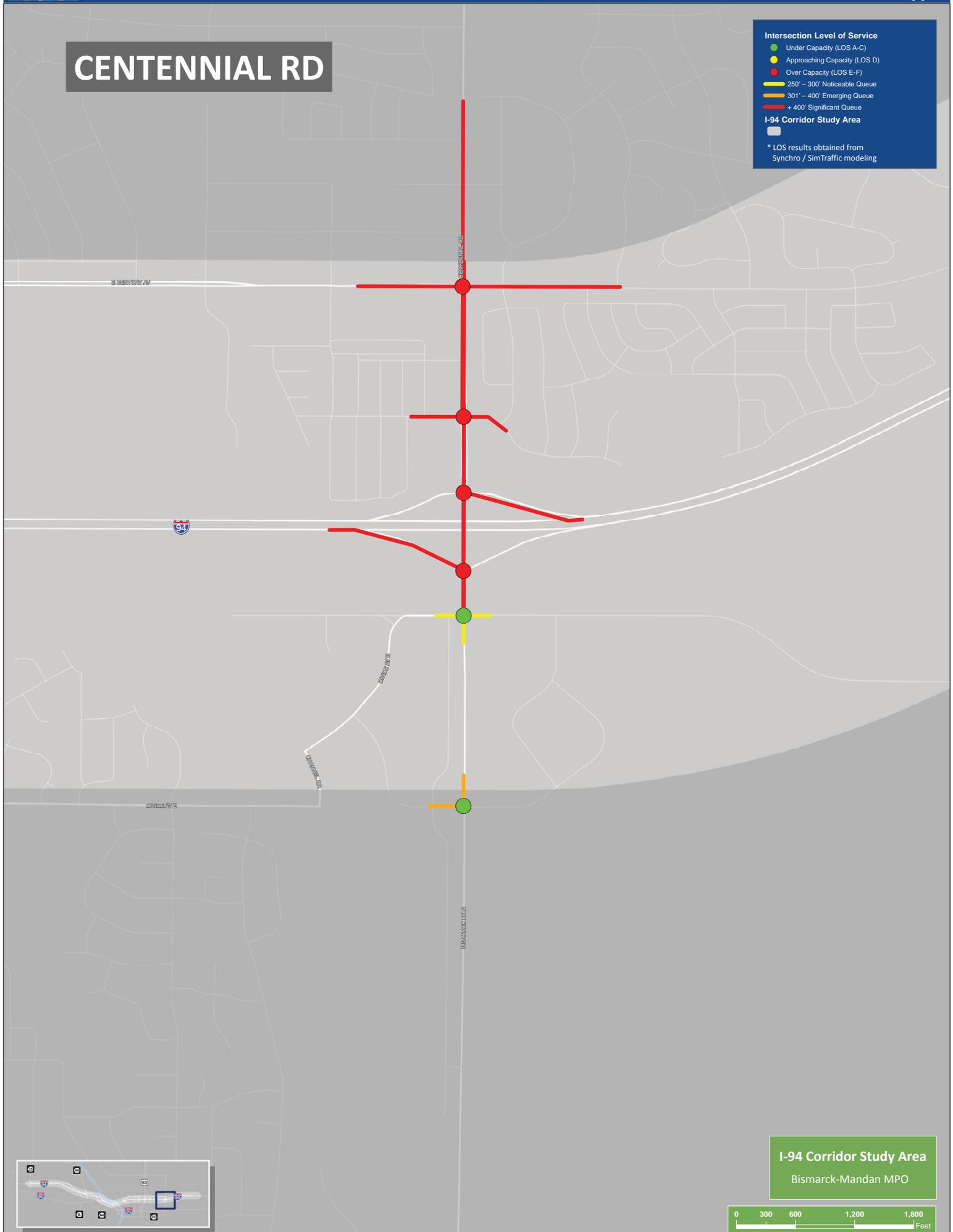
## CENTENNIAL RD

**Intersection Level of Service**

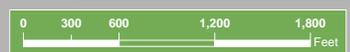
- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
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**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling

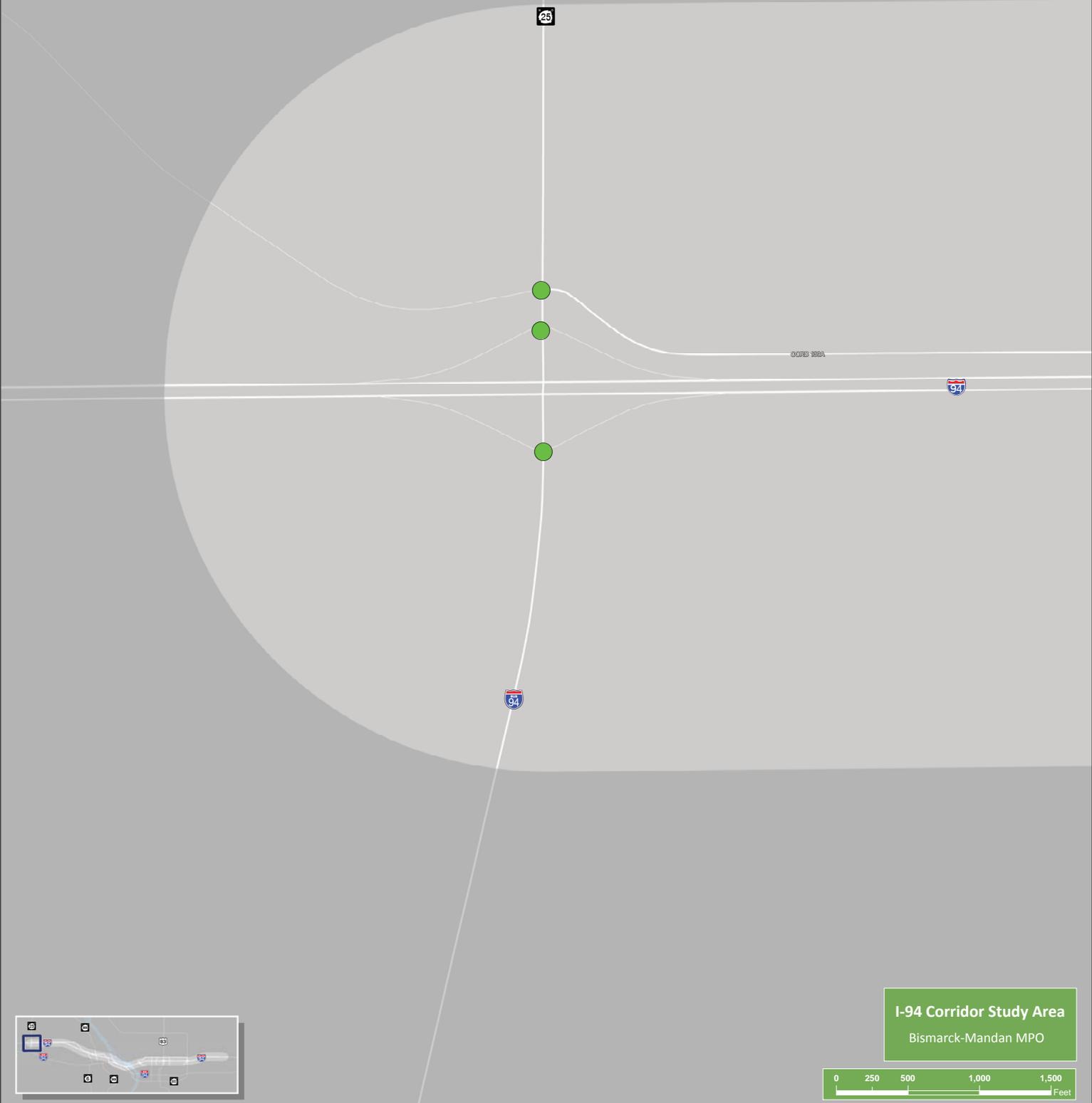


**I-94 Corridor Study Area**  
Bismarck-Mandan MPO

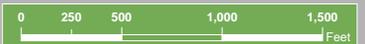


## Highway 25 / BUS. I-94

- Intersection Level of Service**
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  - + 400' Significant Queue
- I-94 Corridor Study Area**
- \* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO







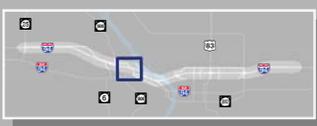
# MANDAN AVE

**Intersection Level of Service**

- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)
- 250' - 300' Noticeable Queue
- 301' - 400' Emerging Queue
- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO





# TYLER PKWY / DIVIDE AVE W

**Intersection Level of Service**

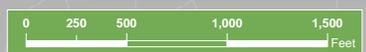
- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)
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- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO





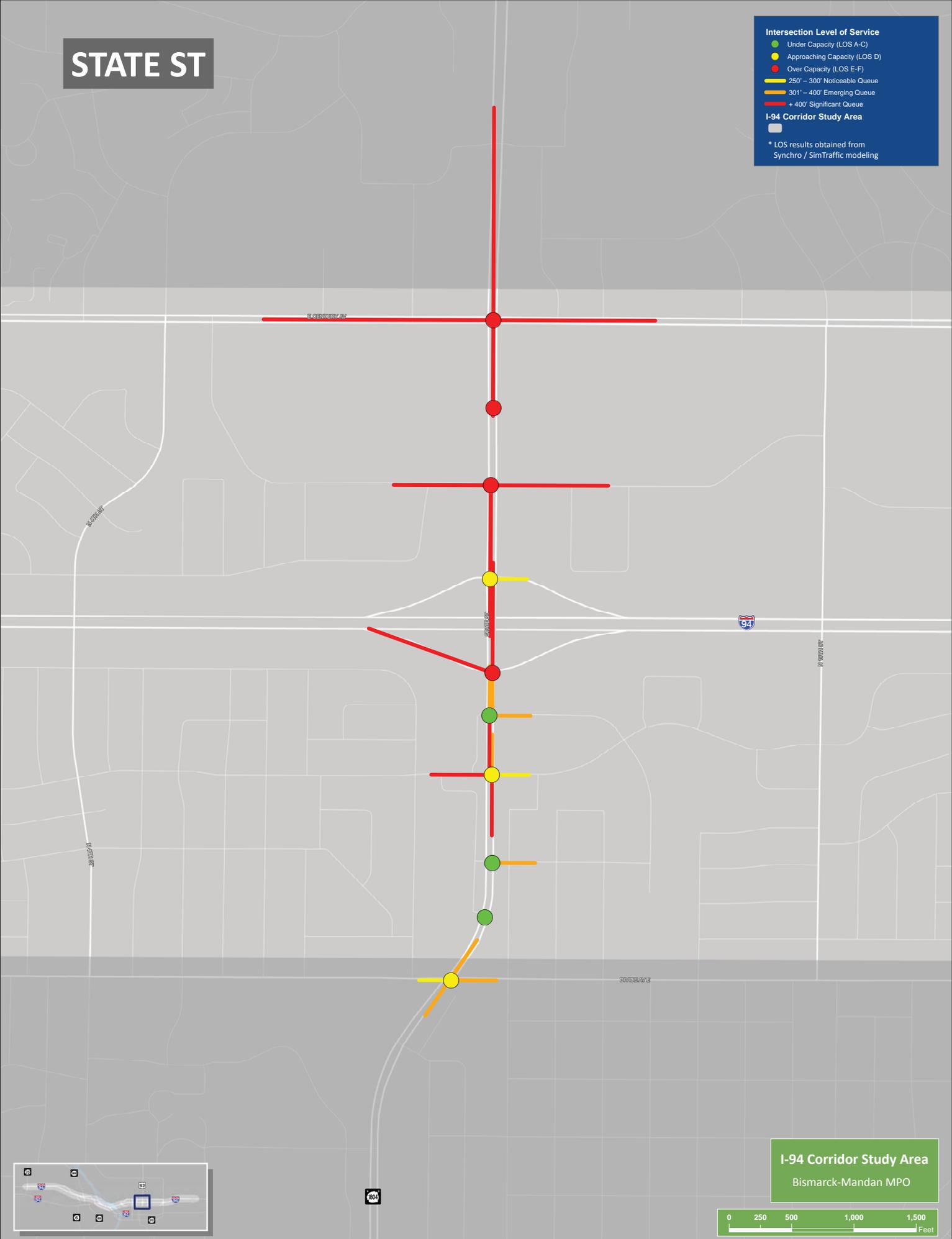
## STATE ST

**Intersection Level of Service**

- Under Capacity (LOS A-C)
- Approaching Capacity (LOS D)
- Over Capacity (LOS E-F)
- 250' - 300' Noticeable Queue
- 301' - 400' Emerging Queue
- + 400' Significant Queue

**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO





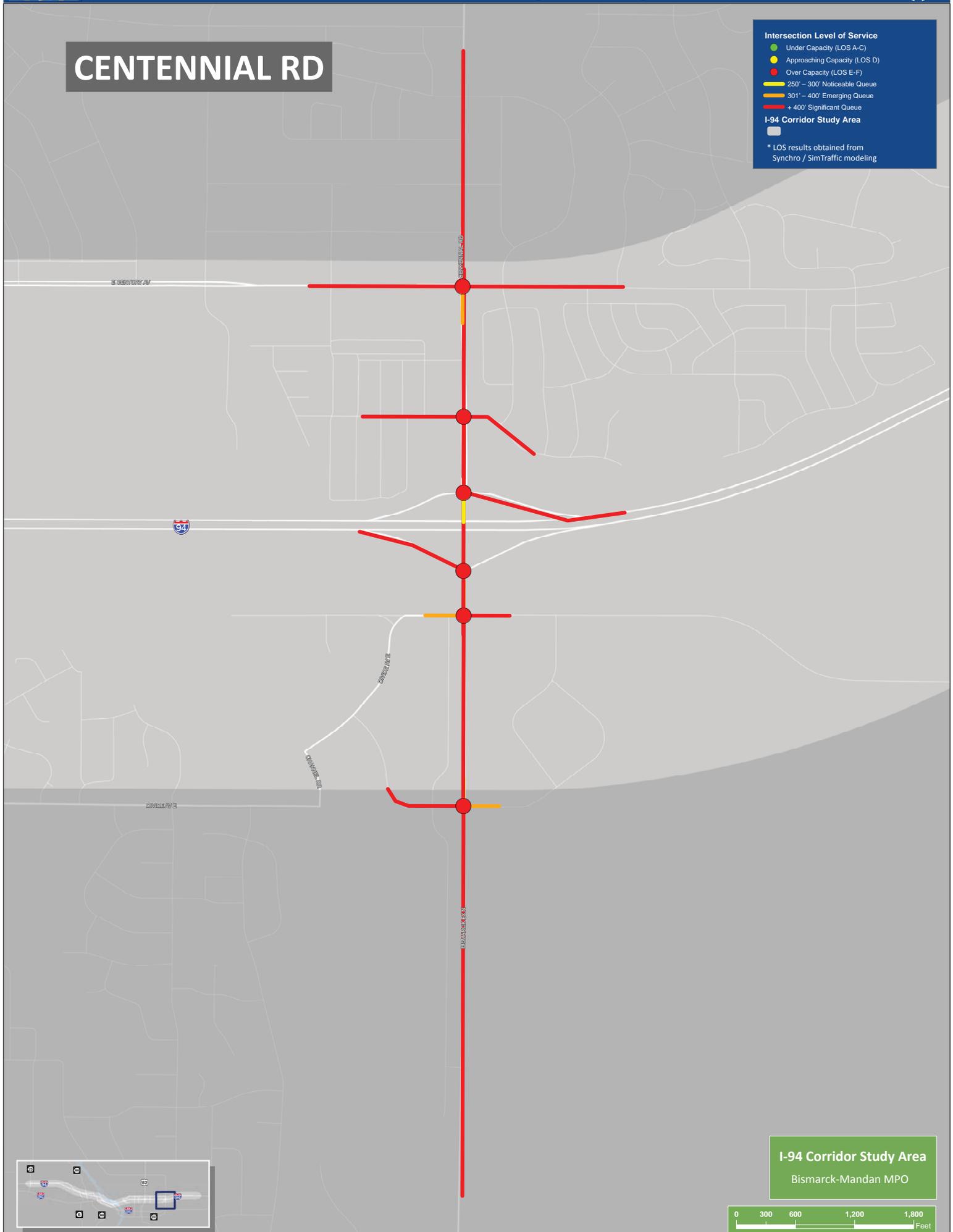
## CENTENNIAL RD

**Intersection Level of Service**

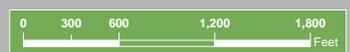
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**I-94 Corridor Study Area**

\* LOS results obtained from Synchro / SimTraffic modeling



**I-94 Corridor Study Area**  
Bismarck-Mandan MPO



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# Appendix B – Technical Memorandum #2: Purpose and Need Statement

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**FINAL REPORT**



# **Bismarck-Mandan MPO I-94 Corridor Study**



## **Technical Memorandum #2 Purpose and Need Statement**

*FINAL*

**Prepared by:**

**Bismarck-Mandan Metropolitan Planning Organization**

**In Association with:**



**and Project Partners:**

**City of Bismarck, City of Mandan, Burleigh County, Morton County, NDDOT, and FHWA**

April 2013

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## Purpose and Need Statement

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The preparation of a Purpose and Need Statement (PNS) is an essential step in defining a potential project and providing guidance for future analysis. Defining the scope and depth of the issues and the reasons for a project provides a focus to guide stakeholders, officials and the public in sorting through various alternatives. The PNS can also help build consensus among various stakeholder groups, business people, landowners, modal interests, each of which are likely to view the corridor from a different perspective. Finally, the PNS can help select a recommended alternative(s) for more detailed analysis in a future environmental document.

Thus, one of the principle objectives of the I-94 Corridor Study is to assess, early in the project development process, if sufficient transportation needs along the corridor exist, or are anticipated in the future. If so, the PNS can also help define the magnitude of the problems, determine if the needs document a purpose for the project, and if further analysis (e.g., alternative development and evaluation) should continue.

Since any major future I-94 corridor and/or most crossroad improvements will likely seek federal funding, pertinent Federal Highway Administration (FHWA) transportation purpose and need guidelines are used to help define needs. The purpose and need analysis utilizes the existing conditions data, the future conditions technical analysis, and stakeholder public input received early in the study process.

### **1. PURPOSE OF THE PROPOSED PROJECT**

The purpose of the proposed project(s) is to address current and future transportation issues identified within the study boundaries along I-94 and its accessible crossroads. Such issues may pertain to system deficiencies (traffic operations-vehicle delay, traffic operations-intersection-queues, roadway design), safety (access and crash), capacity constraints (deficient roadway geometry and right-of-way (ROW)), and system linkage (north-south system connectivity and mobility). Improvements should operate to provide Bismarck, Mandan, Burleigh, and Morton Counties and NDDOT with a safe and efficient transportation system that can serve them today and into the year 2040 horizon.

### **2. NEED FOR THE PROJECT**

The need for the transportation improvements and the relationship to regional transportation need is based on the analyses completed as part of this study. The Project Steering Committee (PSC) has reviewed the needs assessment analyses and determined sufficient need was identified to justify continuation of this corridor study process and warrants development of future system improvement concepts.



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It was determined that future corridor planning and improvements should address the following critical needs and considerations:

1. **System deficiencies**
2. **Safety**
3. **Capacity/mobility**
4. **System linkage**
5. Modal relationships
6. *Social or economic goals*
7. *Other environmental factors*

Those identified with bold text indicate primary needs; others identified are considered secondary supporting needs (i.e., opportunities for other system improvements within the project study area that may be able to be addressed, if feasible, concurrent with addressing the primary needs). Additional important considerations are identified in italics. The long-term transportation needs are summarized in the matrices that follow.

It is important to note, based on direction from FHWA-ND (including guidance within 23 Code of Federal Regulations (CFR) 450 Appendix A), that critical elements of this corridor-level planning study, if developed appropriately, can be “linked” directly into the National Environmental Policy Act (NEPA) process. It is the position of Federal, State, and Metropolitan Planning Organization (MPO) officials within the State of North Dakota that corridor-level planning studies may identify, and may delete from future consideration, alternatives that do not meet this purpose and need statement; however, the corridor study **will not** select a “preferred alternative,” as this determination can only be made during the NEPA phase of the project.

This purpose and need statement and the subsequent corridor study recommendations are intended as a planning tool to initiate the identification of suitable and feasible alternatives for the I-94 corridor / crossroad improvements. The corridor study results will inform staff and elected officials so that sound land use, economic development, and transportation planning decisions made during the planning phase can be fully linked with, and integrated into, the NEPA phase of the project in the future.



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## Documentation of Need

FHWA P/N Guidelines	Specific Corridor Need Identified	Documentation of Need
System Deficiencies	Traffic Operations	<ul style="list-style-type: none"> <li>• PM peak hour operations approaching capacity under existing conditions at State Street/Divide Avenue intersection (Level of Service (LOS) D)</li> <li>• Peak hour queues greater than 300' at interchange intersections throughout the corridor (e.g., Divide Avenue/Burnt Boat Road, State Street/Interchange Avenue, Bismarck Expressway/Divide Avenue, etc.)</li> <li>• Year 2040 peak hour queues during the AM and PM are expected along I-94 corridor due to backups from accessible ramp intersections (3,000 ft. and 9,000 ft., respectively)</li> <li>• Numerous key intersections expected to perform at or below LOS D in the AM (12) and PM (23) peak hours by year 2040, with queue lengths resulting in additional congestion and system failure</li> </ul>
	ROW	<ul style="list-style-type: none"> <li>• Year 2040 traffic demand along State Street and Bismarck Expressway / Centennial Road exceeds corridor and intersection capacity which will require significant interchange reconfiguration</li> <li>• Potential ROW encroachments on private property</li> </ul>
	Roadway Capacity (V/C)	<ul style="list-style-type: none"> <li>• Year 2040 traffic forecasts projected along Sunset Dr, Mandan Ave, Tyler Pkwy/Divide Ave, State St, and Bismarck Expy / Centennial Rd exceeds the capacity of the current roadways</li> </ul>
	Geometric Design Standards	<ul style="list-style-type: none"> <li>• Posted speed exceeds design speed near three interchanges: ND 25, State Street, and Centennial Road</li> <li>• Skew angles at I-94 exit ramps create problems at intersections (Sunset Drive and Mandan Avenue)</li> </ul>



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FHWA P/N Guidelines	Specific Corridor Need Identified	Documentation of Need
Safety	Access	<ul style="list-style-type: none"> <li>• Public and private access points along four I-94 accessible north-south corridors exceed standards established in the Bismarck Access Management Policy for Principal and Minor Arterials (access points per mile are 1 to 5 times greater than standards on Sunset Dr, Mandan Ave, Tyler Pkwy/Divide Ave, and State Street)</li> </ul>
	Crashes	<ul style="list-style-type: none"> <li>• Significant crash rates at 13 key intersections along I-94 accessible north-south corridors (2009-2011)</li> <li>• Significant crash rates along segments of I-94 (2009-2011) (i.e., segments between Mandan Avenue and 158th Street)</li> <li>• High severity crash rates at 21 key intersections along I-94 accessible north-south corridors (2009-2011)</li> <li>• Minimal bicycle/pedestrian crashes along I-94 accessible north-south corridors (2009-2011) (7 crashes)</li> </ul>
Capacity/Mobility	Congestion	<ul style="list-style-type: none"> <li>• Daily traffic volumes expected to nearly double along the I-94 corridor and grow by 2 - 6 % annually along I-94 accessible north-south corridors between years 2012 and 2040</li> <li>• Increased traffic demand by year 2040 results in unacceptable queue lengths on crossroad corridors that extend to I-94, resulting in additional congestion and system failures within the system</li> <li>• High number of access points along four I-94 accessible north-south corridors (reduces corridor <b>mobility</b> and causes safety problems)</li> </ul>



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FHWA P/N Guidelines	Specific Corridor Need Identified	Documentation of Need
<b>System Linkage</b>	Regional Connectivity	<ul style="list-style-type: none"> <li>• I-94 Grand Marsh Bridge is a key link across the Missouri River and to other regional highway corridors (e.g., West Bismarck Expressway, East Bismarck Expressway, etc.); carries the majority of the east-west regional traffic</li> <li>• North-south transportation movement for all modes is impeded by current and future forecast congestion</li> </ul>
	Local Connectivity	<ul style="list-style-type: none"> <li>• High traffic volumes and congestion near interstate entrance and exit ramps is an impediment for north-south travel within the cities</li> <li>• North-south transportation movement for all modes is impeded by current and future forecast congestion</li> </ul>
	System Continuity	<ul style="list-style-type: none"> <li>• Two I-94 north-south corridors have system continuity issues with non-connecting termini (Sunset Dr and Tyler Pkwy)</li> </ul>
<b>Modal Relationships</b>	Pedestrian, Bicycle, Truck, and Transit	<ul style="list-style-type: none"> <li>• Bicycle network has gaps along and adjacent to north-south intersecting corridors (e.g., Sunset Drive, Collins Avenue, North Washington Street, etc.)</li> <li>• I-94 accessible north-south corridors are significant facilities for local fixed-route transit service, Capital Area Transit (CAT), and freight traffic; efficient operations and minimized congestion are important for freight efficiency and transit ridership/performance for these corridors</li> <li>• I-94 corridor is a critical route for CAT and freight transportation between Bismarck and Mandan</li> </ul>



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FHWA P/N Guidelines	Specific Corridor Need Identified	Documentation of Need
<b>Social or Economic Goals</b>	Local Plan Consistency	<ul style="list-style-type: none"> <li>• Coordination with North Mandan Sub-Area Study (e.g., consideration of planned development needs near Sunset Dr, etc.)</li> <li>• Character of development is consistent with Future Land Use Plans (i.e., City of Mandan, City of Bismarck, Morton County, Burleigh County)</li> <li>• 2035 Long Range Transportation Plan interchange improvements, corridor expansion, and bicycle/shared use facility projects support corridor study needs</li> </ul>
	Business Relocations	<ul style="list-style-type: none"> <li>• Year 2040 traffic demand along State Street and Bismarck Expressway / Centennial Road exceeds corridor and intersection capacity which will require significant interchange reconfiguration</li> </ul>
	Neighborhood Linkages	<ul style="list-style-type: none"> <li>• Bicycle impediments put limits on linkages between employers, State Capitol grounds, retail locations, parks, high schools, and college campuses</li> <li>• Congestion on I-94 accessible north-south corridors is an impediment to mobility between and access to the city's neighborhoods and activity areas</li> </ul>
	Corridor Aesthetics	<ul style="list-style-type: none"> <li>• Limited aesthetic screening between I-94 and residential land uses</li> <li>• Landscape buffers along multiple segments of I-94 included in future land use plans</li> </ul>
	Agency/Public Input	<ul style="list-style-type: none"> <li>• Consideration of existing infrastructure is important (study should not focus only on future infrastructure additions)</li> <li>• Multiple intersections along I-94 accessible north-south corridors need improvements (e.g., additional traffic control, reconfiguration, etc.)</li> </ul>



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FHWA P/N Guidelines	Specific Corridor Need Identified	Documentation of Need
		<ul style="list-style-type: none"> <li>• New I-94 interchange needed (i.e. near 32nd Ave, west of Sunset Drive NW, 54th Ave)</li> <li>• Bicycle/Pedestrian design and safety considerations should be included in the study</li> <li>• Improved access ramps to/from Sunset Dr</li> <li>• State St interchange should be reconfigured to better accommodate traffic accessing State St and I-94</li> </ul>
<b>Other Environmental Factors</b>	Ecological/Community Resources	<ul style="list-style-type: none"> <li>• Ecological and community resources are located near the corridor (data from the North Dakota Parks and Recreation Department shows nine known Land and Water Conservation Fund sites, two ecological communities of concern, one animal species of concern, and four Regional Trail Program projects located within 1/2 mile of the corridor)</li> </ul>
	Environmental Justice	<ul style="list-style-type: none"> <li>• Impacts to low-income and minority communities (U.S. Census and American Community Survey data show 15 blocks (2 percent) with a minority population greater than 25 percent and one block group (three percent) with a population below poverty greater than 25 percent within 1/2 mile of the I-94 corridor)</li> <li>• Limited English Proficiency populations are located near the I-94 corridor (American Community Survey data show 21 block groups (58 percent) with a Limited English proficiency population within 1/2 mile of the corridor)</li> </ul>
	Active Living Considerations	<ul style="list-style-type: none"> <li>• There are numerous bicycle impediments and system connectivity gaps (see “Bicycle and Pedestrian Facilities” section of the Needs Assessment Tech Memo #1) throughout Bismarck and Mandan; City of Bismarck has been pursuing a Complete Streets initiative since 2010)</li> </ul>



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Appendix C –  
Technical Memorandum #3:  
Alternatives Development, Evaluations,  
and Options to Carry Forward

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**FINAL REPORT**



# Bismarck-Mandan MPO I-94 Corridor Study



## Technical Memorandum #3 Alternatives Development, Evaluation, and Options to Carry Forward

*FINAL*

Prepared by:

**Bismarck-Mandan Metropolitan Planning Organization**

In Association with:



and Project Partners:

**City of Bismarck, City of Mandan, Burleigh County, Morton County, NDDOT, and FHWA**

March 2014

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## Appendix A – Planning-Level Network Configuration Review

Comprehensive Network Alternatives and Resultant Modified Network Alternative Volume Comparison Matrix

## Appendix B – Preliminary Alternatives for Screening

Line Drawings

## Appendix C – Detailed Measures of Effectiveness Reports

## Appendix D – Refined Concept Alternatives for Formal Evaluation

## Appendix E – Stage 2 Formal Evaluation

Detailed Matrices



## Alternatives Development

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The purpose of this study is to identify, evaluate, and recommend future I-94 interchange and corridor alternatives to carry forward for further analysis in future environmental documentation. To accomplish this task, the study's goals, objects, and purpose and need statement were considered when developing the initial alternatives. Below is a summary of the plan's goals and objects:

- Identify potential projects within a half-mile area of the I-94 influence area that can have a positive impact on corridor operations
- Continually provide a safe and efficient transportation system that serves Bismarck, Mandan, Burleigh, and Morton Counties and NDDOT through the year 2040 planning horizon
- Limit impact to the traveling public
- Address traffic operations, safety, pavement and bridge preservation needs
- Develop an implementation schedule that identifies the phasing of projects that minimizes overall investment dollars through the year 2040 planning horizon

In order to satisfy the project's goal of providing a safe and efficient transportation system, a range of conceptual alternatives were developed that serve Bismarck, Mandan, Burleigh, and Morton Counties and NDDOT through the year 2040 planning horizon. For the purpose of this study, both quantitative and qualitative analyses were used to evaluate the I-94 interchange and corridor alternatives. This comprehensive analysis process resulted in a set of potential alternatives to be examined in an environmental analysis for further consideration.

### **1. ALTERNATIVE DEVELOPMENT PROCESS**

The development process was multifaceted using a range of inputs, including technical data, public comments, the purpose and need statement, and direction from the Project Steering Committee (PSC). Some of the issue areas considered included:

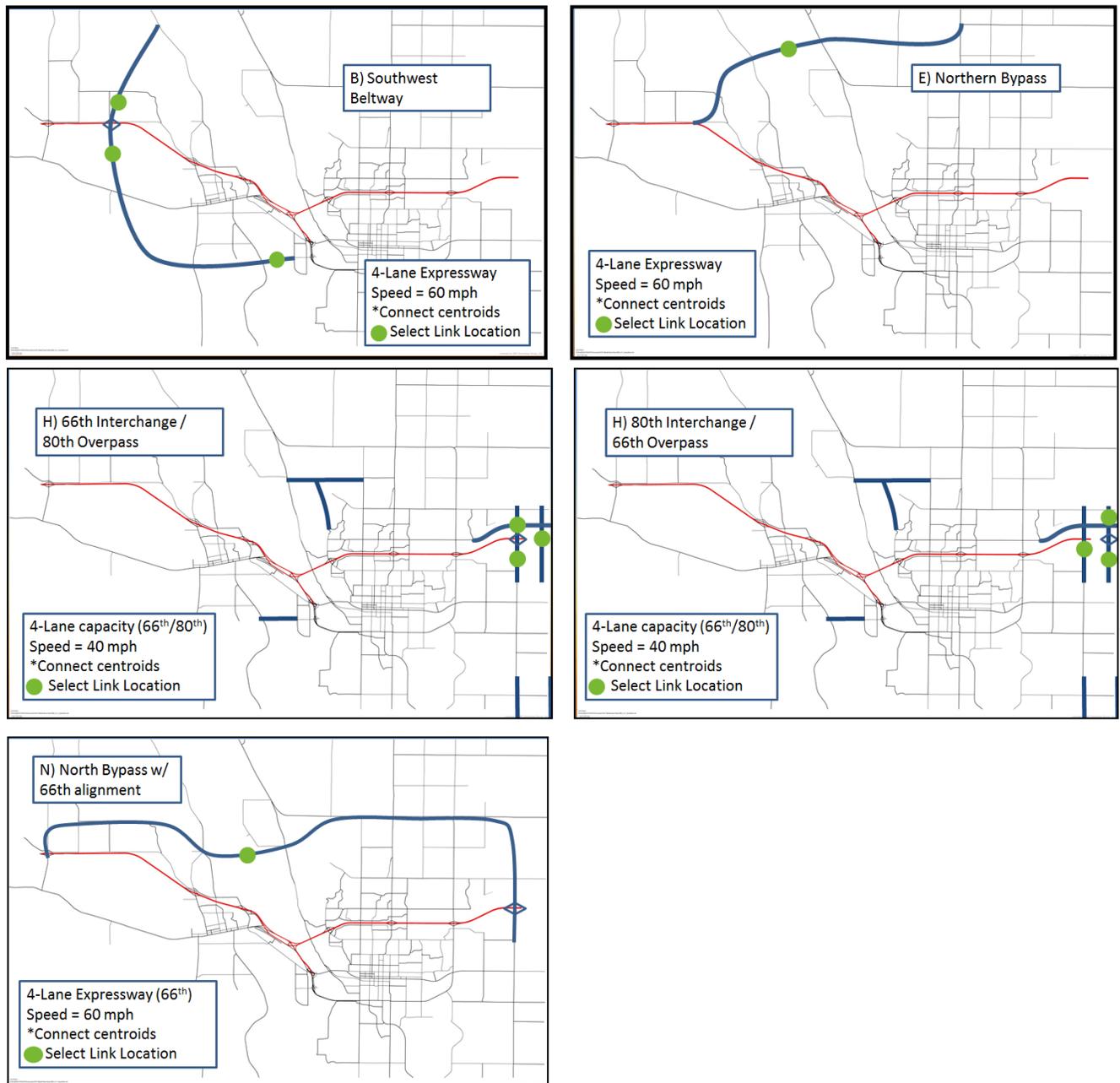
1. Corridor Access
2. Vehicle Crashes
3. Bicycle and Pedestrian Facilities and Gaps
4. Existing Truck and Transit Routes
5. Existing Corridor Geometry
6. Pavements, Bridges, Utilities
7. Land Use Review/Refinement/Best Practices
8. Cultural and Natural Resources
9. Environmental Justice
10. Traffic Operations



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## Future Network Configuration

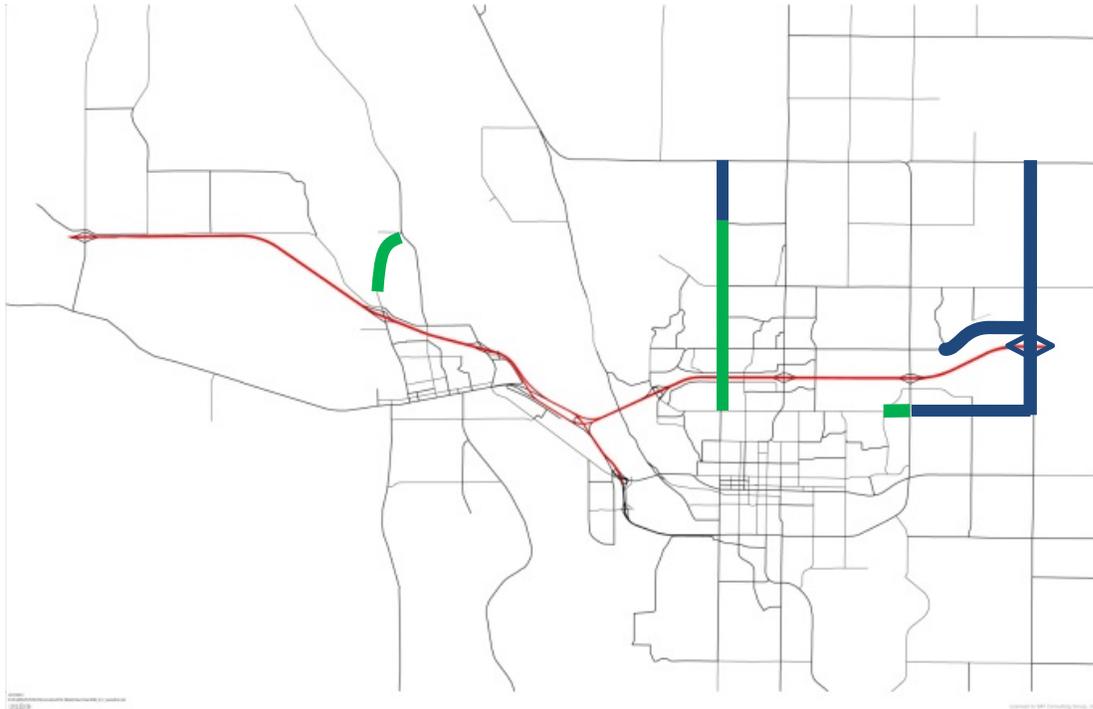
Prior to developing potential corridor alternatives the future transportation network was set. Based on the resultant forecasts, alternatives could be considered to mitigate residual issues. As discussed in the *Corridor Needs Assessment – Technical Memorandum #1*, the 2040 no build transportation network included existing and committed projects. Numerous additional, reasonable transportation network improvements were considered to understand what system benefit might be observed on the I-94 corridor and its crossroads (approximately 18 network configurations were reviewed – the figure collage below provides representative network configurations). Appendix A contains all network configurations considered.



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Based on review of the various network configurations and their respective impacts on the transportation system, plus discussion with the Project Steering Committee regarding which projects were reasonable to consider within the 25-year time horizon, the following two timeframes and system configurations were used as the modified network condition from which potential corridor alternatives were developed.

**Figure 1: Year 2025 E+C+ (Existing plus Committed Projects plus additional considerations)**



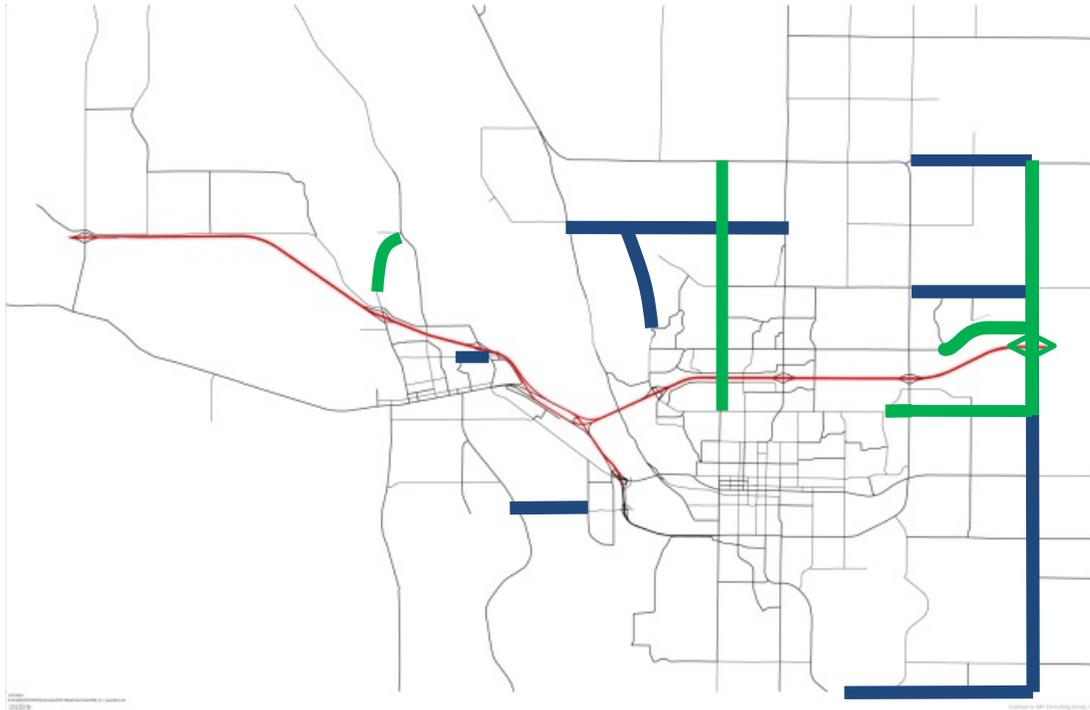
\* Green denotes existing + committed projects; blue denotes additional project considerations

- Sunset Dr. Extension to Hwy 1806
- Divide Ave Extension
- Washington St Geometric Changes from Divide Ave to 71st Ave
- Century Ave Extension East/West between Sumter Dr and 66th St
- 66th St Expansion/Extension from Divide Ave to 71st Ave, and 66th St Interchange at I-94



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**Figure 2: Year 2040 E+C++ (Existing plus Committed Projects plus additional considerations)**



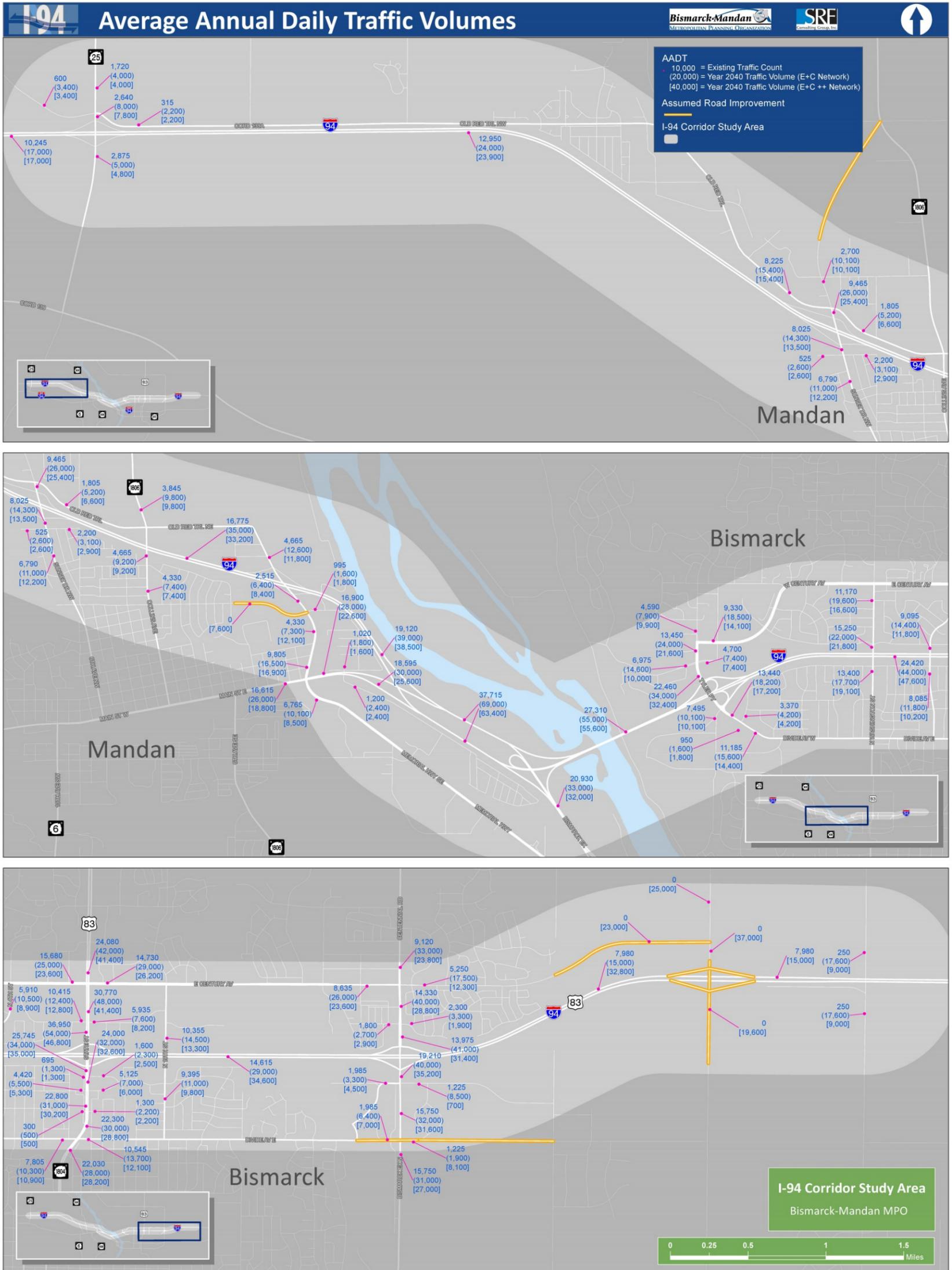
\* Green denotes existing + committed projects plus (from year 2025); blue denotes additional project considerations

- Sunset Dr. Extension to Hwy 1806
- Divide Ave Extension
- Washington St Geometric Changes from Divide Ave to 71st Ave
- Century Ave Extension East/West between Sumter Dr and 66th St
- 66th St Expansion/East Bypass, 66th St Interchange at I-94 and 48th Ave South Extension
- McKenzie Dr Extension, East/West between 40th Ave and Hwy 1806
- 57th Ave Extension, East/West between River Rd and State St
- Tyler Pkwy Extension, South to Tyler Pkwy – from 57th Ave Extension
- 43rd Ave Expansion to 4-Lane between Centennial Rd and 66th St
- Division St Extension East to Mandan Ave

The Advanced Traffic Analysis Center (ATAC) developed traffic forecasts for each condition; Appendix A contains a summary matrix that compares No Build E+C conditions to the respective E+C+ and E+C++ conditions. Figure 3 presents the traffic forecasts throughout the project study area for the existing, year 2040 E+C, and year 2040 E+C++ conditions.



Figure 3: Average Daily Traffic Volumes – Existing, Year 2040 E+C & Year 2040 E+C++

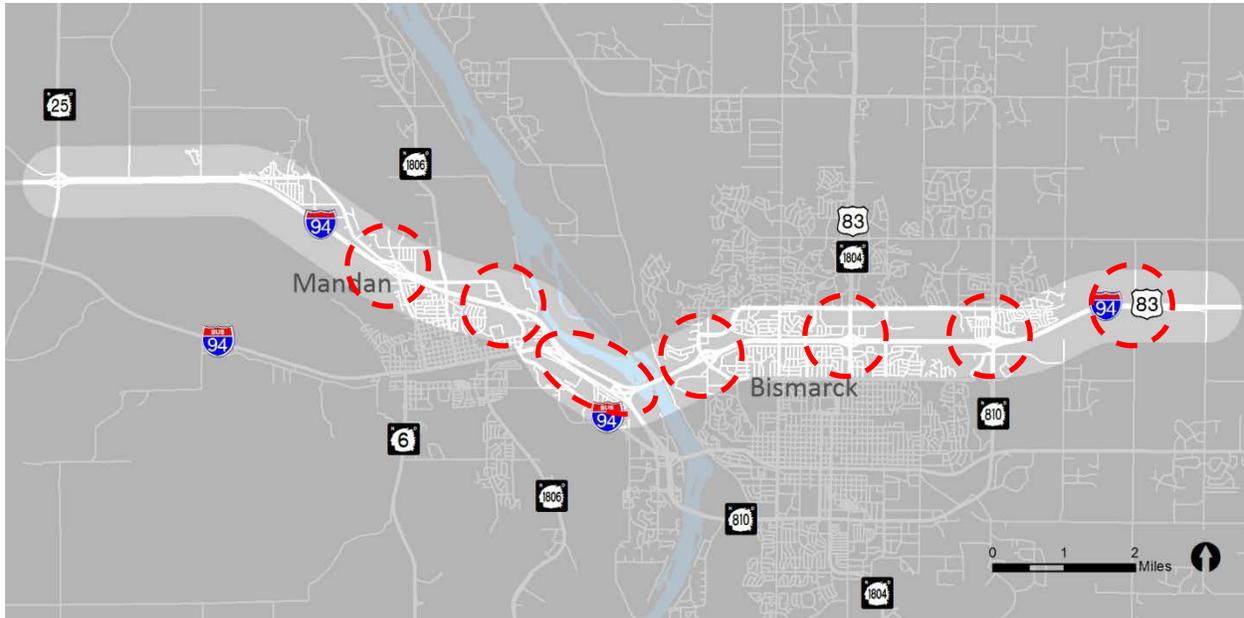


# FINAL

## Preliminary Alternatives

The study team facilitated a PSC meeting at which the committee members discussed initial corridor alternatives for I-94 and its crossroads. This meeting was a brainstorming session meant to consider virtually all potential options. SRF presented 17 preliminary alternatives for consideration, at seven (7) different locations along the I-94 corridor (see Figure 4 for the affected areas along the I-94 corridor).

**Figure 4: Affected Areas of the I-94 Corridor**



The preliminary alternatives were no more than line drawings on an aerial map, or figurative concepts of interchange alternatives that could be applied at the respective locations being discussed. Further concept development did not occur until after the stage one preliminary screening process discussed later in this document.

The concepts developed by the PSC were compared against a No Build Alternative for each improvement location. The No Build Alternatives evaluated as part of this study do not make any changes or improvements to the corridor(s).

Access modifications or reductions were identified where appropriate to achieve acceptable operations within the functional interchange area. Final closures or modifications are considered a detailed design element and will be identified during the environmental documentation phase of project development.

Potential signals shown on the corridor concept layouts are either replacements of existing signals or potential locations for signals under future conditions. In the event that a concept alternative layout advances through a future environmental documentation stage, these potential signals would not be constructed until signals are warranted.



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In addition, recommendations were made regarding other north-south crossroad improvements that could be implemented to improve traffic flow along the local arterials but do not have a direct functional impact on the interstate corridor operations. These improvements were discussed and will be carried forward as part of the I-94 Corridor Study for documentation purposes and future consideration by others. However, only the improvements that directly have a positive impact on the I-94 corridor or its functional area on the north-south crossroads were evaluated against the purpose and need criteria.



## Evaluation of Alternatives

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### **1. STAGE 1 PRELIMINARY SCREENING**

Based on the study process, alternatives reviewed and developed in coordination with project stakeholders were identified to achieve acceptable operations within the functional interchange area. These alternatives were identified addressing issues related to system deficiencies, safety, capacity constraints, system connectivity, and regional mobility.

To further develop and evaluate the alternatives for each of the seven identified locations along the I-94 corridor, a preliminary screening evaluation was conducted. High-level evaluation criteria were considered for each alternative at this preliminary stage. These criteria focus the screening process efforts in order to identify satisfactory alternatives to be analyzed further in the Purpose and Need Evaluation.

#### **Evaluation Criteria**

The preliminary screening of each alternative considers evaluation criteria from the following perspectives:

1. Social: Evaluates the impacts and benefits related to surrounding landowners, right-of-way acquisitions, access and movements throughout the corridor.
2. Environmental: Considers impacts on the potential consequences associated with the physical and/or social environment.
3. Engineering: Focuses on the feasibility of each alternative as it relates to the design and construction.

#### **Screening Process**

The qualitative preliminary screening process evaluates and organizes alternatives into three categories:

1. Eliminate the alternative from consideration.
2. Maintain the alternative for further evaluation in this study.
3. Carry the alternative forward to a more detailed environmental review evaluation.



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## **Alternatives Evaluated**

The preliminary evaluation matrix shown in Table 1 describes each alternative. This matrix shows the comprehensive set of alternatives evaluated against each perspective in order to formulate recommendations. The preliminary alternative concept line drawings of interchange alternatives to apply at each respective location are shown in Appendix B.

Information obtained from the North Mandan Subarea Study is also included in this matrix. The preliminary screening process evaluated these locations and alternatives. However, because the decisions regarding these alternatives were made as part of the North Mandan Subarea Study, they are carried forward at this point for further analysis as part of future environmental review. Further, the north-south crossroad improvements that do not have a functional impact on the I-94 corridor are included Table 2 for reference and documentation purposes. These improvements were not evaluated beyond this step or formally recommended as part of this project; however, they are included here in order to retain them for further discussion as part of future City/County consideration as interchange related projects are conceived.

Detailed traffic operations analysis was conducted for the preliminary concept alternatives to ensure they could mitigate the capacity issues observed under year 2040 conditions. The result of this analysis is documented as part of the evaluation matrix at a high level, indicating if the alternative achieves acceptable level of service operations. The detailed measures of effectiveness reports that go along with this analysis, where appropriate, are provided in Appendix C.

It should be noted that discussion took place as the project progressed regarding the freeway operations of the Grant Marsh Bridge section of I-94. Historical analysis of the I-94 corridor had identified a deficiency across the bridge with the existing four-lane capacity and future 20-year traffic projections. The operations analysis conducted as part of this current effort were completed with a micro-simulation model; the results indicated that the Grant Marsh Bridge section of I-94 is expected to operate near the LOS C/D border under year 2040 traffic projections. We consulted NDDOT staff regarding this situation and it is understood that this section of the I-94 corridor should be monitored as traffic volumes increase and improvements recommended from the I-94 Corridor Study are programmed, which will help to mitigate potential issues.



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**Table 1: Preliminary Evaluation – 2040 Modified Network – Improvement Options Screening Summary (with direct functional benefit to the I-94 corridor)**

Corridor / Location	Improvement Description	ID	Planning-Level Evaluation by Perspective			Recommendation / Notes
			Social	Environmental	Engineering	
ND HWY 25	None Applicable		None Applicable	None Applicable	None Applicable	None Applicable
Sunset Drive Interchange Options (all information obtained from North Mandan Subarea Study project documentation)	No interchange modifications <ul style="list-style-type: none"> <li>Add Signals at I-94 Ramp Terminals, Boundary Drive, and restripe Sunset Drive to provide southbound left-turn lane on to I-94.</li> </ul>		<ul style="list-style-type: none"> <li>Pedestrian crossing would be improved with the addition of a PED phase in the signal operation.</li> </ul>	None Applicable	<ul style="list-style-type: none"> <li>Management of the interchange area operations with signals will provide acceptable traffic operations for some time (<math>\pm</math> 5 years) based on assumed development patterns, after which queues on Sunset Drive will begin to overlap, resulting in returning failures.</li> </ul>	<b>Retain as SHORT-TERM Improvement</b> <ul style="list-style-type: none"> <li>Adding signals at I-94 terminal intersections will improve operations for a while, after which (with growing traffic) intersection queues will overlap – unacceptable (Spillback condition).</li> <li>NDDOT prepared an alternative that includes a northbound right-turn lane at the south terminal and separate left- and right-turn lanes on the ramps – These improvements provide minor benefits and increase cost based on the NMSAS.</li> </ul>
	Reconfigure I-94 Interchange <ul style="list-style-type: none"> <li>Southwest quadrant Loop Ramp (Retain Current Ramp for Northbound to Eastbound Movement)</li> </ul>	A	<ul style="list-style-type: none"> <li>Preferred loop radius (230 feet) footprint extends outside the current ROW line in the southwest quadrant – Impacts adjacent land uses.</li> <li>Could reduce loop radius to 150 feet and not require more ROW.</li> </ul>	<ul style="list-style-type: none"> <li>Land use impacts – Moderate with 230 foot radius (No Buildings).</li> <li>Can stay within current ROW with 150 foot radius</li> </ul>	<ul style="list-style-type: none"> <li>Eliminates need to signalize the South Terminal intersection – Southbound queue at Boundary Road spills back to South Terminal Intersection</li> <li>Overlapping queues between North Terminal intersection and Old Red Trail remain</li> <li>Loop speed is 25 MPH – Accelerating uphill – Extends ramp length.</li> </ul>	<b>Carry Forward</b> <ul style="list-style-type: none"> <li>NDDOT has retained it as an alternative in their assessment. Not considered a long-term solution by the North Mandan Subarea Study.</li> <li>❖ Evaluation of this alternative will occur as part of any future environmental project documentation.</li> </ul>
	Reconfigure I-94 Interchange <ul style="list-style-type: none"> <li>Single Point Urban Interchange (SPUI) Configuration</li> </ul>	A	<ul style="list-style-type: none"> <li>Substantially smaller footprint. Can be accommodated within current ROW.</li> </ul>	None Applicable	<ul style="list-style-type: none"> <li>Acceptable LOS C intersection operations are achieved (including queuing) along Sunset Drive at Old Red Trail, I-94 terminals and Boundary Road.</li> </ul>	<b>Carry Forward</b> <ul style="list-style-type: none"> <li>Likely a long-term improvement as cost is high and lower cost intermediate improvements will work for a while.</li> <li>❖ Evaluation of this alternative will occur as part of any future environmental project documentation.</li> </ul>



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Corridor / Location	Improvement Description	ID	Planning-Level Evaluation by Perspective			Recommendation / Notes
			Social	Environmental	Engineering	
Mandan Avenue Interchange Options (all information obtained from North Mandan Subarea Study project documentation)	<p>No interchange modifications</p> <ul style="list-style-type: none"> <li>Signalize the north and south ramp intersections and operate them under semi-actuated signal control. Off-ramps would not receive green-time unless there is demand.</li> <li>Include signal at Division Street (based on I-94 Corridor Study).</li> </ul>		<ul style="list-style-type: none"> <li>Minimal or no impacts – Adding signals can be accommodated in current right-of-way.</li> </ul>	None Applicable	<ul style="list-style-type: none"> <li>Acceptable LOS C or better intersection operations can be achieved in the AM and PM peak periods.</li> </ul>	<p><b>Carry Forward</b></p> <ul style="list-style-type: none"> <li>Addresses capacity needs with little impact.</li> <li>NOTE: if Old Red Trail is realigned to 16th Street NE location, reconfiguration of the interchange would be necessary to achieve proper access spacing.</li> </ul>
Mandan Avenue Interchange Options (all information obtained from North Mandan Subarea Study project documentation)	<p>Reconfigure I-94 Interchange</p> <ul style="list-style-type: none"> <li>Re-design ramps to reduce skew. Would not require bridge modification.</li> <li>Includes signalization of ramp nodes and Division Street as well.</li> </ul>	B	<ul style="list-style-type: none"> <li>Minimal or no impacts – Revised alignment is all within the current right-of-way.</li> </ul>	None Applicable	<ul style="list-style-type: none"> <li>Substantial improvement to sight distance, skews reduced, offset left turns to/from ramps is eliminated. Would not need to replace bridges.</li> </ul>	<p><b>Carry Forward</b></p> <ul style="list-style-type: none"> <li>Removes/reduces the current skewed intersection condition (Severe skew reduces sight distance – creating a safety concern).</li> <li>NOTE: if Old Red Trail is realigned to 16th Street NE location, reconfiguration of the interchange would be necessary to achieve proper access spacing.</li> <li>❖ Evaluation of this alternative will occur as part of any future environmental project documentation.</li> </ul>
I-94 between Main Avenue and Grant Marsh bridge Corridor Options, including Access and Interchanges	<p>Reconfigure I-94 / I-194 Interchange and mainline alignment</p> <ul style="list-style-type: none"> <li>Realign westbound I-94, reconfigure westbound access to I-194 southbound to a right-exit, reconfigure northbound I-194 access to I-94 westbound as a right-entrance with two-lane auxiliary lane, reconfigure Main Street exit with two-lane auxiliary lane.</li> </ul>	C	None Applicable	<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>Acceptable LOS C or better mainline operations can be achieved in the AM and PM peak periods.</li> <li>Improves driver expectancy with right-hand entrances and exits.</li> <li>Requires reconstruction of the I-194 and Main Street bridges.</li> </ul>	<p><b>Eliminate</b></p> <ul style="list-style-type: none"> <li>Removes uncommon left-hand entrances and exits – theoretically improving safety.</li> <li>❖ PSC determined that this alternative should not advance to the Purpose and Need Criteria Evaluation</li> </ul>



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Corridor / Location	Improvement Description	ID	Planning-Level Evaluation by Perspective			Recommendation / Notes
			Social	Environmental	Engineering	
I-94 between Main Avenue and Grant Marsh bridge Corridor Options, including Access and Interchanges	Reconfigure I-94 / I-194 Interchange and mainline alignment <ul style="list-style-type: none"> <li>• Realign westbound I-94, reconfigure westbound access to I-194 southbound to a right-exit, use existing I-94 alignment as a 2-lane collector-distributor for the I-94 westbound to Main Street and I-194 northbound to I-94 westbound movements.</li> </ul>	D	None Applicable	<ul style="list-style-type: none"> <li>• Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>• Acceptable LOS C or better mainline operations can be achieved in the AM and PM peak periods.</li> <li>• Improves driver expectancy with right-hand entrances and exits.</li> <li>• Requires reconstruction of the I-194 and Main Street bridges.</li> </ul>	<b>Retain for Evaluation</b> <ul style="list-style-type: none"> <li>• Removes uncommon left-hand entrances and exits – theoretically improving safety.</li> </ul>
	Reconfigure I-94 / I-194 Interchange <ul style="list-style-type: none"> <li>• Reconfigure westbound access to I-194 southbound to a right-exit, reconfigure I-194 northbound access to I-94 westbound as a right-entrance, reconfigure I-94 westbound to Main Street to a right-exit.</li> </ul>	E	None Applicable	<ul style="list-style-type: none"> <li>• Impacts to North Dakota Park and Recreation Area/500-year Floodplain located between I-94 and Missouri River</li> </ul>	<ul style="list-style-type: none"> <li>• Acceptable LOS C or better mainline operations can be achieved in the AM and PM peak periods.</li> <li>• Improves driver expectancy with right-hand entrances and exits.</li> <li>• Requires reconstruction of the Main Street Bridge.</li> </ul>	<b>Eliminate</b> <ul style="list-style-type: none"> <li>• Removes uncommon left-hand entrances and exits – theoretically improving safety.</li> <li>• Bismarck Expr Bridge may need to be replaced due to intolerable clearance.</li> <li>❖ PSC determined that this alternative should not advance to the Purpose and Need Criteria Evaluation</li> </ul>
I-94 between Main Avenue and Grant Marsh bridge Corridor Options, including Access and Interchanges	Reconfigure I-94 / I-194 Interchange and mainline alignment <ul style="list-style-type: none"> <li>• Realign westbound I-94, reconfigure westbound access to I-194 southbound to a right-exit, reconfigure I-194 northbound access to I-94 westbound as a right-entrance, use existing I-94 westbound alignment as the Main Street exit.</li> </ul>	F	None Applicable	<ul style="list-style-type: none"> <li>• Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>• Acceptable LOS C or better mainline operations can be achieved in the AM and PM peak periods.</li> <li>• Improves driver expectancy with right-hand entrances and exits.</li> <li>• Requires reconstruction of the I-194 and Main Street bridges.</li> </ul>	<b>Retain for Evaluation</b> <ul style="list-style-type: none"> <li>• Removes uncommon left-hand entrances and exits – theoretically improving safety.</li> </ul>
	Reconfigure I-94 / I-194 Interchange <ul style="list-style-type: none"> <li>• Remove lane drop on I-194 northbound access to I-94, reconfigure I-94 westbound to a 4-lane section between the I-194 access and the Main Street exit.</li> </ul>	G	None Applicable	<ul style="list-style-type: none"> <li>• Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>• Acceptable LOS C or better mainline operations can be achieved in the AM and PM peak periods.</li> </ul>	<b>Retain for Evaluation</b> <ul style="list-style-type: none"> <li>• Bismarck Expressway Bridge may need to be replaced due to intolerable clearance.</li> </ul>
Tyler Parkway / Divide Avenue Interchange Options	No Interchange modifications		None Applicable	None Applicable	None Applicable	None Applicable



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Corridor / Location	Improvement Description	ID	Planning-Level Evaluation by Perspective			Recommendation / Notes
			Social	Environmental	Engineering	
Tyler Parkway / Divide Avenue Intersection Improvements	<p>Burnt Boat Road</p> <ul style="list-style-type: none"> <li>Add northbound right-turn lane at Burnt Boat Road. May need to close access to commercial development east of Tyler Parkway.</li> <li>Develop eastbound curbside lane as a free-right turn lane to Tyler Parkway. May need to close access to the commercial development west of Tyler Parkway. Lane will continue into existing southbound right-turn lane at north ramp terminal.</li> </ul>		<ul style="list-style-type: none"> <li>Access restrictions levied on commercial property. Anticipate ROW acquisition from adjacent property owners.</li> </ul>	None Applicable	<ul style="list-style-type: none"> <li>Achieve an acceptable LOS C/D threshold operation in the AM and PM peak periods.</li> <li>Queues are significantly reduced.</li> <li>Will have some utility conflicts with existing signal configuration, street lighting, monument signage, culverts, etc.</li> </ul>	<p><b>Retain for Evaluation</b></p> <ul style="list-style-type: none"> <li>Improvement needed to achieve acceptable LOS operations; without it this intersection will experience significant queues and approach failures that result in the overall intersection failing and queues spilling back into adjacent intersections (including the ramp terminals).</li> </ul>
State Street Interchange Options	<p>No interchange modifications</p> <ul style="list-style-type: none"> <li>Maintain existing diamond interchange configuration. "No Build"</li> </ul>		<ul style="list-style-type: none"> <li>Impacts mobility all along State Street corridor</li> </ul>	None Applicable	<ul style="list-style-type: none"> <li>No geometric improvements alone to the current configuration can be implemented that will achieve acceptable LOS C or better in the AM and PM peak periods.</li> </ul>	<p><b>Retain for Evaluation</b></p> <ul style="list-style-type: none"> <li>Does not provide acceptable operations and impacts the entire State Street corridor.</li> </ul>
	<p>Reconfigure I-94 Interchange</p> <ul style="list-style-type: none"> <li>Diverging Diamond (double crossover) configuration.</li> </ul>	H	<ul style="list-style-type: none"> <li>Does not properly accommodate the north / south movements through the interchange area.</li> <li>Significant congestion.</li> </ul>	None Applicable	<ul style="list-style-type: none"> <li>Unacceptable LOS operation during the AM and PM peak periods.</li> </ul>	<p><b>Eliminate</b></p> <ul style="list-style-type: none"> <li>Does not provide acceptable operations and impacts the entire State Street corridor.</li> <li>❖ PSC determined that this alternative should not advance to the Purpose and Need Criteria Evaluation</li> </ul>
	<p>Reconfigure I-94 Interchange</p> <ul style="list-style-type: none"> <li>Southwest and Northeast quadrant Loop Ramps (retain current northwest and southeast ramps at this location and reconstruct the exit ramps).</li> </ul>	I	<ul style="list-style-type: none"> <li>May reduce north/south left-turn crashes.</li> <li>Would not have left turns occurring on the bridge.</li> <li>Would still have a significant eastbound to northbound left-turn movement at the south ramp terminal.</li> </ul>	None Applicable	<ul style="list-style-type: none"> <li>Acceptable LOS C or better intersection operations are achieved at the ramp terminals.</li> <li>Queues are significantly reduced</li> <li>Continue to have queuing and delay for the eastbound left-turn movement at the south ramp terminal.</li> </ul>	<p><b>Eliminate</b></p> <ul style="list-style-type: none"> <li>NDDOT studied this alternative as part of the State Street Preliminary Scoping Study.</li> <li>❖ PSC determined that this alternative should not advance to the Purpose and Need Criteria Evaluation</li> </ul>



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Corridor / Location	Improvement Description	ID	Planning-Level Evaluation by Perspective			Recommendation / Notes
			Social	Environmental	Engineering	
	Reconfigure I-94 Interchange <ul style="list-style-type: none"> <li>Southeast and Northeast quadrant Loop Ramps (retain current west ramps at this location and reconstruct entrance and exit ramps on the east).</li> </ul>	J	<ul style="list-style-type: none"> <li>Preferred loop radius (230 feet) footprint extends outside the current ROW boundaries – significant property impacts to adjacent buildings.</li> <li>Will impact how Interchange Avenue is configured.</li> </ul>	<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>Acceptable LOS C or better intersection operations are achieved (including queuing) at the ramp terminals.</li> <li>Queues are significantly reduced, which in turn reduce the negative impacts to the I-94 mainline.</li> </ul>	<b>Eliminate</b> <ul style="list-style-type: none"> <li>Improvement achieves acceptable LOS operations; without it interchange area will not function acceptably and the I-94 mainline may be impacted.</li> <li>Access restriction is impactful for the adjacent businesses; however, the overall corridor will benefit.</li> <li>❖ PSC determined that this alternative should not advance to the Purpose and Need Criteria Evaluation</li> </ul>
State Street Interchange Options	Reconfigure I-94 Interchange <ul style="list-style-type: none"> <li>Single Point Urban Interchange (SPUI) Configuration</li> </ul>	K	<ul style="list-style-type: none"> <li>Substantially smaller footprint. Can be accommodated within current ROW.</li> <li>Does not negatively affect adjacent property owners.</li> </ul>	None Applicable	<ul style="list-style-type: none"> <li>Acceptable LOS C operations are achieved at I-94 ramp terminal.</li> <li>Queues are significantly reduced but greater than the Partial Clover interchange configuration.</li> <li>Increases distance between adjacent intersections.</li> </ul>	<b>Retain for Evaluation</b> <ul style="list-style-type: none"> <li>Improvement achieves acceptable LOS operations without requiring additional ROW which is a significant positive.</li> </ul>
Centennial Road / Bismarck Expressway Corridor Improvement	<ul style="list-style-type: none"> <li>Entire corridor needs to be reconstructed as a six-lane roadway facility. Six lanes should start approximately 1/4 mile north of Century Avenue and extend through Commerce Avenue.</li> </ul>		<ul style="list-style-type: none"> <li>Further review needed to determine if this can be accommodated within current ROW.</li> </ul>	<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>Will accommodate daily traffic volume projections.</li> </ul>	<b>Retain for Evaluation</b> <ul style="list-style-type: none"> <li>Improvement provides enough capacity when coupled with other node improvements that can achieve acceptable LOS operations during the peak periods.</li> </ul>
Centennial Road / Bismarck Expressway Interchange Options	No interchange modifications <ul style="list-style-type: none"> <li>Maintain existing diamond interchange configuration with the reconstruction of Centennial Road / Bismarck Expressway as a six-lane facility.</li> </ul>		<ul style="list-style-type: none"> <li>Traffic volumes north/south along corridor continue to impact accessibility to the corridor.</li> </ul>	None Applicable	<ul style="list-style-type: none"> <li>No geometric improvements to the current diamond configuration can be implemented that will achieve acceptable LOS C or better in the AM and PM peak periods.</li> <li>Significant queues on the eastbound off ramp.</li> </ul>	<b>Retain for Evaluation</b> <ul style="list-style-type: none"> <li>Does not provide acceptable operations and impacts the entire Bismarck Expressway to the south corridor.</li> </ul>
	Reconfigure I-94 Interchange <ul style="list-style-type: none"> <li>Diverging Diamond (double crossover) configuration.</li> </ul>	H	<ul style="list-style-type: none"> <li>Does not properly accommodate the north / south movements through the interchange area.</li> <li>Significant congestion.</li> </ul>	None Applicable	<ul style="list-style-type: none"> <li>Unacceptable LOS operation during the AM and PM peak periods.</li> </ul>	<b>Eliminate</b> <ul style="list-style-type: none"> <li>Does not provide acceptable operations and negatively impacts the corridor.</li> <li>❖ PSC determined that this alternative should not advance to the Purpose and Need Criteria Evaluation</li> </ul>



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Corridor / Location	Improvement Description	ID	Planning-Level Evaluation by Perspective			Recommendation / Notes
			Social	Environmental	Engineering	
Centennial Road / Bismarck Expressway Interchange Options	Reconfigure I-94 Interchange <ul style="list-style-type: none"> <li>Southeast and Northwest quadrant Loop Ramps.</li> </ul>	L	<ul style="list-style-type: none"> <li>Preferred loop radius (230 feet) footprint extends outside the current ROW boundaries – significant property impacts to adjacent buildings.</li> <li>Will impact residential and commercial property.</li> </ul>	<ul style="list-style-type: none"> <li>Potential impacts to concentration of low-income population.</li> </ul>	<ul style="list-style-type: none"> <li>Acceptable LOS C or better intersection operations are achieved (including queuing) at the ramp terminals.</li> <li>Queues are significantly reduced, which in turn reduce the negative impacts to the I-94 mainline.</li> </ul>	<b>Eliminate</b> <ul style="list-style-type: none"> <li>Improvement achieves acceptable LOS operations.</li> <li>❖ PSC determined that this alternative should not advance to the Purpose and Need Criteria Evaluation</li> </ul>
Centennial Road / Bismarck Expressway Interchange Options	Reconfigure I-94 Interchange <ul style="list-style-type: none"> <li>Southeast and Northeast quadrant Loop Ramps (retain current west ramps at this location and reconstruct entrance and exit ramps on the east).</li> </ul>	M	<ul style="list-style-type: none"> <li>Preferred loop radius (230 feet) footprint extends outside the current ROW boundaries – significant property impacts to adjacent buildings.</li> </ul>	<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>Acceptable LOS C or better intersection operations are achieved (including queuing) at the ramp terminals.</li> <li>Queues are significantly reduced, which in turn reduce the negative impacts to the I-94 mainline.</li> </ul>	<b>Retain for Evaluation</b> <ul style="list-style-type: none"> <li>Improvement achieves acceptable LOS operations.</li> </ul>
	Reconfigure I-94 Interchange <ul style="list-style-type: none"> <li>Single Point Urban Interchange (SPUI) Configuration.</li> </ul>	N	<ul style="list-style-type: none"> <li>Substantially smaller footprint. Can be accommodated within current ROW.</li> <li>Does not negatively affect adjacent property owners.</li> </ul>	<p style="text-align: center;">None Applicable</p>	<ul style="list-style-type: none"> <li>Acceptable LOS C operations are achieved at I-94 ramp terminal.</li> <li>Queues are significantly reduced but greater than the Partial Clover interchange configurations.</li> <li>Increases distance between adjacent intersections.</li> </ul>	<b>Retain for Evaluation</b> <ul style="list-style-type: none"> <li>Improvement achieves acceptable LOS operations without requiring additional ROW which is a significant positive.</li> </ul>
66th Street Interchange Options	Construct Interchange: <ul style="list-style-type: none"> <li>Conventional diamond interchange with proper ramp spacing to accommodate future loop ramps (if necessary).</li> </ul>	O	<ul style="list-style-type: none"> <li>Will require the acquisition of one homestead.</li> <li>Impacts a communication tower location.</li> </ul>	<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>Will operate with acceptable LOS C or better during the peak periods.</li> </ul>	<b>Carry Forward</b> <ul style="list-style-type: none"> <li>Minimal interchange configuration.</li> </ul>
	Construct Interchange: <ul style="list-style-type: none"> <li>Southeast quadrant Loop Ramp with full diamond configuration (represents the largest footprint for this interchange area)</li> </ul>	O	<ul style="list-style-type: none"> <li>Will require the acquisition of one homestead.</li> <li>Impacts a communication tower location.</li> </ul>	<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>Will operate with acceptable LOS C or better during the peak periods.</li> </ul>	<b>Carry Forward</b> <ul style="list-style-type: none"> <li>Accommodates the large eastbound to northbound movement from I-94.</li> </ul>
	Construct Interchange: <ul style="list-style-type: none"> <li>Single Point Urban Interchange (SPUI) Configuration.</li> </ul>	P	<ul style="list-style-type: none"> <li>Substantially smaller footprint. Can be accommodated within current ROW.</li> <li>Does not negatively affect adjacent property owners.</li> </ul>	<p style="text-align: center;">None Applicable</p>	<ul style="list-style-type: none"> <li>Will operate with acceptable LOS C or better during the peak periods.</li> </ul>	<b>Carry Forward</b> <ul style="list-style-type: none"> <li>Accommodates all movements acceptably.</li> </ul>



# FINAL

**Table 2: Preliminary Evaluation – 2040 Modified Network – North-South Crossroad Improvement Options Screening Summary (without direct functional benefit to the I-94 corridor)**

Corridor / Location	Improvement Description	ID	Planning-Level Evaluation by Perspective			Recommendation / Notes
			Social	Environmental	Engineering	
Tyler Parkway / Divide Avenue Intersection Improvements	Century Avenue <ul style="list-style-type: none"> <li>Add signal</li> </ul>		<ul style="list-style-type: none"> <li>Minimal or no impacts – Adding signal can be accommodated within current right-of-way.</li> </ul>	None Applicable	<ul style="list-style-type: none"> <li>Acceptable LOS C or better mainline operations can be achieved in the AM and PM peak periods. This improvement was recommended under the “year 2040 no build conditions” as well.</li> <li>Queues are significantly reduced.</li> </ul>	<b>Retain for discussion</b> <ul style="list-style-type: none"> <li>Improvement needed to provide accessibility to Tyler Parkway for Century Avenue</li> </ul>
	Turnpike Avenue <ul style="list-style-type: none"> <li>Restrict access to 3/4 – Right-in/Right-out/Left-in (no left out from side street)</li> </ul>		<ul style="list-style-type: none"> <li>Access restrictions levied on commercial property.</li> <li>Will require traffic east of Divide Avenue destined south of Turnpike Avenue to circulate using Capitol Avenue and Owens Avenue.</li> </ul>	None Applicable	<ul style="list-style-type: none"> <li>Achieve an acceptable LOS C or better operation in the AM and PM peak periods.</li> <li>Queues are significantly reduced.</li> </ul>	<b>Retain for discussion</b> <ul style="list-style-type: none"> <li>Improvement achieves acceptable LOS operations; without it this intersection will experience significant queues and approach failures.</li> <li>Access restriction is impactful for the adjacent businesses; however, the overall corridor will benefit.</li> </ul>
State Street Intersection Improvements	Century Avenue <ul style="list-style-type: none"> <li>Extend the southbound dual left-turn lane storage distance (to approximately 300 feet).</li> </ul>		<ul style="list-style-type: none"> <li>Southbound dual left-turn lane modification will impact the “green median” that exists. Does not require access closures or other corridor modifications. Can be accommodated.</li> </ul>	<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>These improvements do not achieve an acceptable LOS C or better (<b>anticipate LOS E</b>).</li> <li>However, queues are significantly reduced.</li> </ul>	<b>Retain for discussion</b> <ul style="list-style-type: none"> <li>Limited ROW exists in this area.</li> <li>Need additional discussion with the PSC regarding short-term congestion during peak periods.</li> <li>This improvement is needed under either interchange scenario.</li> </ul>
	Capitol Avenue <ul style="list-style-type: none"> <li>Construct a westbound right-turn lane</li> </ul>		<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>This improvement does not achieve an acceptable LOS C or better (<b>anticipate LOS E</b>).</li> <li>However, queues are reduced.</li> <li>The eastbound approach needs a dual left-turn lane but implementing this would come with significant ROW acquisition.</li> </ul>	<b>Retain for discussion</b> <ul style="list-style-type: none"> <li>Limited ROW exists in this area.</li> <li>Need additional discussion with the PSC regarding short-term congestion during peak periods.</li> <li>This improvement is needed under either interchange scenario.</li> </ul>



# FINAL

Corridor / Location	Improvement Description	ID	Planning-Level Evaluation by Perspective			Recommendation / Notes
			Social	Environmental	Engineering	
State Street Intersection Improvements	Access Restrictions: Interchange Avenue <ul style="list-style-type: none"> <li>Modify intersection to RIRO.</li> </ul> Kelly Inn / Dairy Queen AND Spaulding Avenue <ul style="list-style-type: none"> <li>Modify intersection to 3/4 access</li> </ul>		<ul style="list-style-type: none"> <li>Access restrictions levied on commercial property.</li> <li>Will require left turning traffic from State Street to circulate to their destinations via Capitol Avenue.</li> <li>Frontage and backage roads will need to be used for the access restrictions at Spaulding Avenue and Kelly Inn/Dairy Queen.</li> </ul>	<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>Achieve an acceptable LOS C or better operation in the AM and PM peak periods.</li> <li>Queues are reduced.</li> </ul>	<b>Retain for discussion</b> <ul style="list-style-type: none"> <li>This improvement is needed under either interchange scenario.</li> </ul>
Centennial Road / Bismarck Expressway Intersection Improvements	Century Avenue <ul style="list-style-type: none"> <li>Extend the eastbound and northbound dual left-turn lane storage distance (to approximately 300 feet).</li> </ul>		<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>These improvements do not achieve an acceptable LOS C or better (<b>anticipate LOS D</b>).</li> <li>However, queues are significantly reduced.</li> </ul>	<b>Retain for discussion</b> <ul style="list-style-type: none"> <li>Need additional discussion with the PSC regarding short-term congestion during peak periods.</li> <li>This improvement is needed under either interchange scenario.</li> </ul>
Centennial Road / Bismarck Expressway Intersection Improvements	Divide Avenue <ul style="list-style-type: none"> <li>Construct dual eastbound and southbound left-turn lanes.</li> </ul>		<ul style="list-style-type: none"> <li>Will result in ROW acquisition</li> </ul>	<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>These improvements do not achieve an acceptable LOS C or better (<b>anticipate LOS E</b>).</li> <li>Queues are reduced.</li> <li>Poor operation continues due to close intersection spacing with the ramp terminals.</li> </ul>	<b>Retain for discussion</b> <ul style="list-style-type: none"> <li>Need additional discussion with the PSC regarding short-term congestion during peak periods.</li> <li>Closing this access to RIRO would help operations. If this were implemented a full access could be constructed at approximately 1/4 mile south of the south ramp terminal.</li> </ul>
	Commerce Avenue <ul style="list-style-type: none"> <li>Construct dual eastbound left-turn lanes.</li> </ul>		<ul style="list-style-type: none"> <li>May result in ROW acquisition</li> </ul>	<ul style="list-style-type: none"> <li>Minimal or no impacts</li> </ul>	<ul style="list-style-type: none"> <li>These improvements do not achieve an acceptable LOS C or better (<b>anticipate LOS D</b>).</li> <li>Queues are reduced.</li> </ul>	<b>Retain for discussion</b> <ul style="list-style-type: none"> <li>Need additional discussion with the PSC regarding short-term congestion during peak periods.</li> </ul>



# FINAL

## 2. STAGE 2 FORMAL EVALUATION

The purpose of the proposed alternatives is to address current and future transportation issues identified within the study boundaries along I-94 and its accessible crossroads. The need for the transportation improvements was reviewed by the PSC through a needs assessment evaluation. The sufficient need was identified to justify continuation of this corridor study process and warrants development of future system improvement concepts.

The purpose and need statement, along with the subsequent corridor study recommendations are intended as a planning tool to initiate the identification of suitable and feasible alternatives for the I-94 corridor/crossroad improvements. Alternatives analyzed in the purpose and need evaluation follow the recommendations and corridor descriptions found in the Stage 1 Preliminary Screening (note: for only those improvements that were defined to have a functional benefit to the I-94 corridor). Refined through the PSC, improvement concept images were modified to clearly show detailed potential alternatives. These refined concept alternatives can be found in Appendix D.

### Concept Evaluation Guidelines and Criteria

The foundation for the concept evaluation was the purpose and need statement. Evaluation factors were developed based on these guiding principles (i.e., System Deficiencies, Safety, Capacity Mobility, Modal Relationships, and System Linkage). The formal evaluation matrix shows the direct relationship between the purpose and need factors and the measurable criteria used to evaluate the concepts. In addition, other non-purpose and need related factors (Other Environmental Factors) were established by the PSC to be used in the evaluation process. The evaluation criteria include:

#### SYSTEM DEFICIENCIES

- Minimize the number of key intersections expected to perform at or below LOS D in the a.m. and p.m. peak hours by year 2040
- Reduce queues and congestion along the I-94 corridor
- Reduce the number of intersections with queues greater than 400 feet
- Minimize ROW acquisition, when possible
- Improve geometric designs near interchanges with recommended improvements that adhere to FHWA/AASHTO Green Book

#### SAFETY

- Improve compliance with access spacing guidelines, where possible
- Implement improvements that reduce unsafe roadway geometrics for all roadway users  
Capacity/Mobility
- Maintain good north-south mobility with improvements along these corridors
- Maintain and improve upon east-west mobility across the Grant Marsh Bridge (i.e., through the I-194/I-94 interchange area)



# FINAL

## SYSTEM LINKAGE

- Maintain good north-south and east-west connections

## MODAL RELATIONSHIPS

- Incorporate bicycle facilities with identified improvements, if possible

## SOCIAL OR ECONOMIC GOALS

- Compatibility with Bismarck-Mandan Long Range Transportation Plan, the Preliminary State Street Scoping Study, and the North Mandan Sub-Area Study
- Seek to minimize public cost (2014 cost)
- Address major concerns from agencies and the public

## OTHER ENVIRONMENTAL FACTORS

- Minimize impacts to known/previously identified ecological and community resources (i.e., known land and water conservation fund sites, ecological communities of concern, animal species of concern, and regional trail program project areas)
- Limit disproportionate impacts to Environmental Justice communities (low-income, minority, Limited English Proficiency populations) along the corridor

## **Concept Evaluation Scoring**

The concepts were evaluated based on a quantitative estimate of each alternative’s ability to address the evaluation factors. Each concept was assigned a rating relative to its ability to meet the criteria. The rating system is as follows:

5	Good; meets criteria well
4	Acceptable; but relatively less desirable than 5
3	Neutral; marginally meets criteria
2	Less desirable; considers criteria
1	Poor; fails to meet criteria

The ranking and reasoning is presented in a detailed evaluation matrix. For example, the number of intersections that will continue to operate with a poor level of service is identified. The PSC participated in an assessment process to ensure that criteria, documented impacts, and rankings are accurate. The criteria and ranks were also presented to NDDOT for further comment.

The higher the technical evaluation score, the better the concept is valued. The highest scoring concept for each location is the one that best meets the purpose and need criteria. A summary table is provided below for each detailed evaluation matrix. The detailed evaluation matrix and point totals are provided in Appendix E for the following improvement locations: the I-94/I-94 interchange and mainline alignment, Tyler Parkway/Divide Avenue at Burnt Boat Road, State Street/I-94 and Centennial Road/Bismarck Expressway/I-94.



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**Table 3: Stage 2 Formal Evaluation – Ranking Summary – I-94/I-194 Interchange and Mainline Alignment**

<b>Bismarck-Mandan I-94 Corridor Study – Ranking Summary</b>								
<b>Alternative Ranking</b>	Reconfigure I-94 / I-194 Interchange and Mainline Alignment							
	No Build		Concept D		Concept F		Concept G	
	Count	Point Total	Count	Point Total	Count	Point Total	Count	Point Total
5	1	5	5	25	6	30	0	0
4	0	0	1	4	0	0	1	4
3	2	6	2	6	2	6	2	6
2	0	0	0	0	0	0	6	12
1	6	6	1	1	1	1	0	0
<b>Total Points:</b>	<b>17</b>		<b>36</b>		<b>37</b>		<b>22</b>	

**Table 4: Stage 2 Formal Evaluation – Ranking Summary – Tyler Parkway / Divide Avenue at Burnt Boat Road Intersection Improvements**

<b>Bismarck-Mandan I-94 Corridor Study – Ranking Summary</b>				
<b>Alternative Ranking</b>	Tyler Parkway / Divide Avenue at Burnt Boat Road Intersection Improvements			
	No Build		Intersection Imps	
	Count	Point Total	Count	Point Total
5	1	5	3	15
4	0	0	4	16
3	2	6	1	3
2	2	4	1	2
1	4	4	0	0
<b>Total Points:</b>	<b>19</b>		<b>36</b>	



# FINAL

**Table 5: Stage 2 Formal Evaluation – Ranking Summary – State Street/I-94 Interchange**

<b>Bismarck-Mandan I-94 Corridor Study - Ranking Summary</b>				
<b>Alternative Ranking</b>	Reconfigure State Street/I-94 Interchange			
	No Build		Concept K - SPUI	
	Count	Point Total	Count	Point Total
5	1	5	3	15
4	0	0	6	24
3	1	3	0	0
2	3	6	1	2
1	5	5	0	0
<b>Total Points:</b>	<b>19</b>		<b>41</b>	

**Table 6: Stage 2 Formal Evaluation – Ranking Summary – Centennial Road/Bismarck Expressway/I-94 Interchange**

<b>Bismarck-Mandan I-94 Corridor Study -Point Summary</b>								
<b>Alternative Ranking</b>	Reconfigure Centennial Road/Bismarck Expressway / I-94 Interchange							
	No Build		Concept M/M <sup>2</sup>		Concept M-Shift		Concept N	
	Count	Point Total	Count	Point Total	Count	Point Total	Count	Point Total
5	1	5	2	10	2	10	6	30
4	0	0	5	20	5	20	3	12
3	2	6	1	3	0	0	0	0
2	2	4	0	0	1	2	1	2
1	5	5	2	2	2	2	0	0
<b>Total Points:</b>	<b>20</b>		<b>35</b>		<b>34</b>		<b>44</b>	



## Alternatives to be Carried Forward

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As part of the evaluation process, alternatives were identified in each of the seven locations on the I-94 corridor to be compared against the no build alternative in a future environmental documentation stage of the project development process. The discussion of whether or not the no build alternative met the project's purpose and need was merely meant to serve as the beginning of the framework used to support the need for improvements in the corridor. Furthermore, where multiple alternatives were considered, the PSC selected a singular alternative that it felt best fit the needs of that location. While others may be carried forward for consideration during the future environmental stage of the project, this singular alternative is the initial recommendation of the guiding committee of this study. During a future environmental stage of the project, the alternatives that were not eliminated in this evaluation process will be compared to the no build alternative. Moving forward from the evaluation process the north-south crossroad improvements, without direct functional impacts, will also be re-incorporated into the selected build alternative for each segment and evaluated as a composite build alternative in the next stage of project development process.

The construction cost estimates included in the summary tables that follow were developed based on the best practices and design standards for the respective improvements. Average contractor bid prices were used to calculate estimated quantities and the dollars represent current year 2014 values; no inflationary costs were added at this time. Further, the cost estimates are construction costs only and do not include costs for engineering design and construction administration nor costs for potential right-of-way acquisition. It is understood these additional costs will increase the estimates when applied.

Recommendations for the I-94 corridor include the following:

### **1. SUNSET DRIVE INTERCHANGE OPTIONS**

The Sunset Drive interchange build alternatives were developed as part of the North Mandan Subarea Study; the alternatives include a southwest quadrant loop ramp with standard diamond configuration, a single point urban interchange configuration, and a no build alternative. Evaluation of these alternatives will occur as part of future environmental documentation required for project development.

### **2. MANDAN AVENUE INTERCHANGE OPTIONS**

Alternatives for the Mandan Avenue interchange were analyzed as part of the North Mandan Subarea Study. The build alternative at Mandan Avenue redesigns the ramps to reduce skew. To address the capacity needs, signalized intersections are incorporated. Evaluation of these alternatives, along with the no build alternative will occur as part of future environmental documentation.



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## 3. I-94/I-194 INTERCHANGE AREA

Based on the technical evaluation score, cost, and the PSC ranking – Alternative F has the most support at this time for the I-94/I-194 interchange and mainline alignment (see Table 7). This alternative, along with Alternative D, improves the driver expectancy issue associated with the left-hand exits and entrances. All alternatives improve the northbound queuing at I-194, along with mobility and connectivity throughout the corridor. Public comments showed no opposition for alternatives presented at the I-94/I-194 interchange area. All three build alternatives and the no build alternative will be advanced as part of future environmental documentation.

**Table 7: I-94 / I-194 Interchange and Mainline Alignment**

Bismarck-Mandan I-94 Corridor Study –Evaluation Summary				
Alternative	Reconfigure I-94 / I-194 Interchange and Mainline Alignment			
	No Build	Concept D	Concept F	Concept G
Technical Evaluation Score *	17	36	37	22
Construction Cost	\$0M	\$34.5M	\$31.5M	\$13M
PSC Ranking	4	2	1	3
Public Comment	None Received	None Received	None Received	Mostly Positive

\* The higher the technical evaluation score, the better the alternative is valued.



# FINAL

## 4. TYLER PARKWAY / BURNT BOAT ROAD

Intersection improvements were recommended at the Tyler Parkway/Burnt Boat Road intersection by the PSC (see Table 8). Public comments show split support for these improvements. This alternative includes geometric improvements that will improve intersection operations and limit impacts to the I-94 functional area along Tyler Parkway. The intersection improvement alternative and the no build alternative will be advanced as part of future environmental documentation.

**Table 8: Tyler Parkway / Divide Avenue at Burnt Boat Road**

Bismarck-Mandan I-94 Corridor Study – Evaluation Summary		
	Tyler Parkway / Divide Avenue at Burnt Boat Road Intersection Improvements	
Alternative	No Build	Intersection Imps
Technical Evaluation Score *	19	36
Construction Cost	\$0M	\$0.6M
PSC Ranking	2	1
Public Comment	None Received	Mixed

\* The higher the technical evaluation score, the better the alternative is valued.



# FINAL

## 5. STATE STREET INTERCHANGE AREA

Based on the technical evaluation score, cost, and public comments, the PSC supports Alternative K for the State Street Interchange Area (see Table 9). The single point urban interchange provides additional spacing between access points along State Street to reduce conflicts through the interchange area. This alternative will also improve the corridors connectivity with locations further north and south. Both the build alternative and the no build alternative will be advanced as part of future environmental documentation.

**Table 9: State Street / I-94 Interchange**

Bismarck-Mandan I-94 Corridor Study – Evaluation Summary		
	Reconfigure State Street/I-94 Interchange	
Alternative	No Build	Concept K - SPUI
Technical Evaluation Score *	19	41
Construction Cost	\$0M	\$18M
PSC Ranking	2	1
Public Comment	None Received	Mostly Positive

\* The higher the technical evaluation score, the better the alternative is valued.



# FINAL

## 6. CENTENNIAL ROAD / BISMARCK EXPRESSWAY INTERCHANGE / I-94 INTERCHANGE AREA

The PSC supports Alternative N for the Centennial Road/Bismarck Expressway Interchange /I-94 Interchange Area (see Table 10). Public comments showed no opposition toward the alternatives presented within the interchange area. All alternatives accommodate the anticipated truck volumes. Due to the PSC concept rankings and the committee’s desire to eliminate Concepts M1, M2, M3 and M-shift from further consideration, Concept N and the no build alternative will be advanced as part of future environmental documentation.

**Table 10: Centennial Road / Bismarck Expressway / I-94 Interchange**

Bismarck-Mandan I-94 Corridor Study –Evaluation Summary				
Reconfigure Centennial Road/Bismarck Expressway / I-94 Interchange				
Alternative	No Build	Concept M1/M2/M3	Concept M-Shift	Concept N
Technical Evaluation Score *	20	35	34	44
Construction Cost	\$0M	\$22.7M/ \$24.4M/ \$22.8M	\$23.6M	\$18M
PSC Ranking	2	3	4	1
Public Comments	None Received	None Received	Mostly Positive	Mostly Positive

\* The higher the technical evaluation score, the better the alternative is valued.



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## 7. 66TH STREET INTERCHANGE AREA

The 66th Street interchange build alternatives include a single point urban interchange, southeast quadrant loop ramp with full diamond configuration, and a conventional diamond interchange configuration. Each alternative configuration will accommodate future traffic volumes forecast for this area during peak periods. Evaluation of these alternatives will occur as part of future environmental documentation.

The quantitative and qualitative analysis of the alternatives identified at each of the seven locations on the I-94 corridor presented concepts to be evaluated in a future environment documentation state of the project development process. Moving forward, the identified alternatives along with projects identified from the NDDOT's STIP project list, the MPO's TIP project list and Long Range Transportation Plan are incorporated into the implementation plan. This satisfies the project's goal of providing a safe and efficient transportation system by identifying alternatives throughout the corridor as potential improvements that serve Bismarck and Mandan through the year 2040 planning horizon.

## 8. I-94 CORRIDOR DEFICIENCIES

There are a number of other improvements that were identified as well that will improve operations along the I-94 corridor; however, these improvements are not significant reconstruction improvements but rather corridor deficiencies that were identified based on our review. These improvements are included due to the low cost/high benefit they provide the I-94 corridor. The improvements identified include:

- Partial reconstruction of the westbound I-94 entrance ramp at Tyler Parkway and lengthen the loop acceleration lane (note this improvement is more significant; a refined concept drawing is included for this improvement – Concept H in Appendix D)
- Restripe the tapers for the eastbound I-94 entrance ramp and exit loop at Tyler Parkway
- Restripe the westbound I-94 entrance ramp taper at State Street
- Restripe the westbound I-94 entrance ramp taper at Sunset Drive
- Restripe the westbound I-94 entrance ramp taper at Mandan Avenue



FINAL

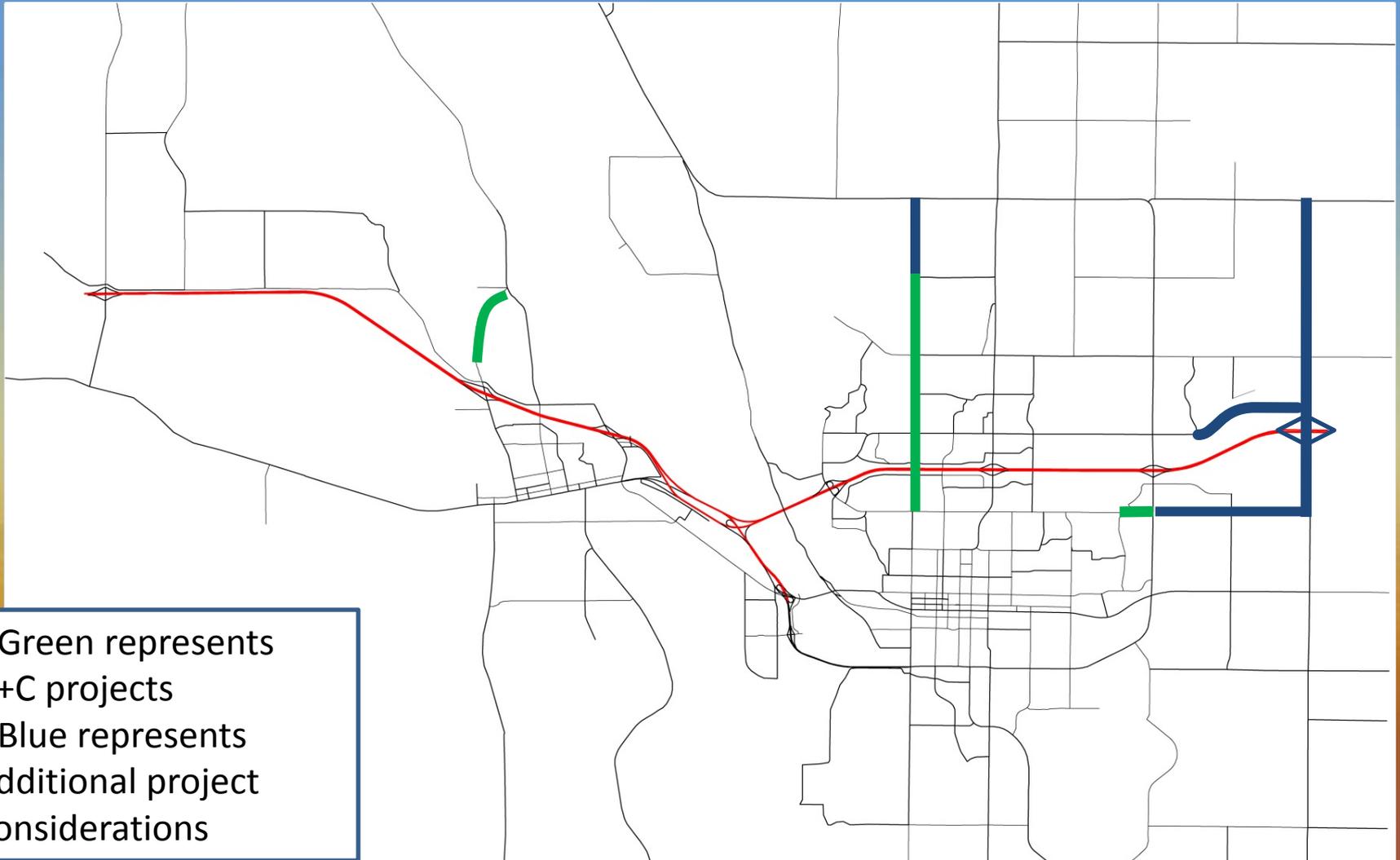
# Appendix A – Planning-Level Network Configuration Review

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**COMPREHENSIVE NETWORK ALTERNATIVES AND  
RESULTANT MODIFIED NETWORK ALTERNATIVE VOLUME COMPARISON MATRIX**



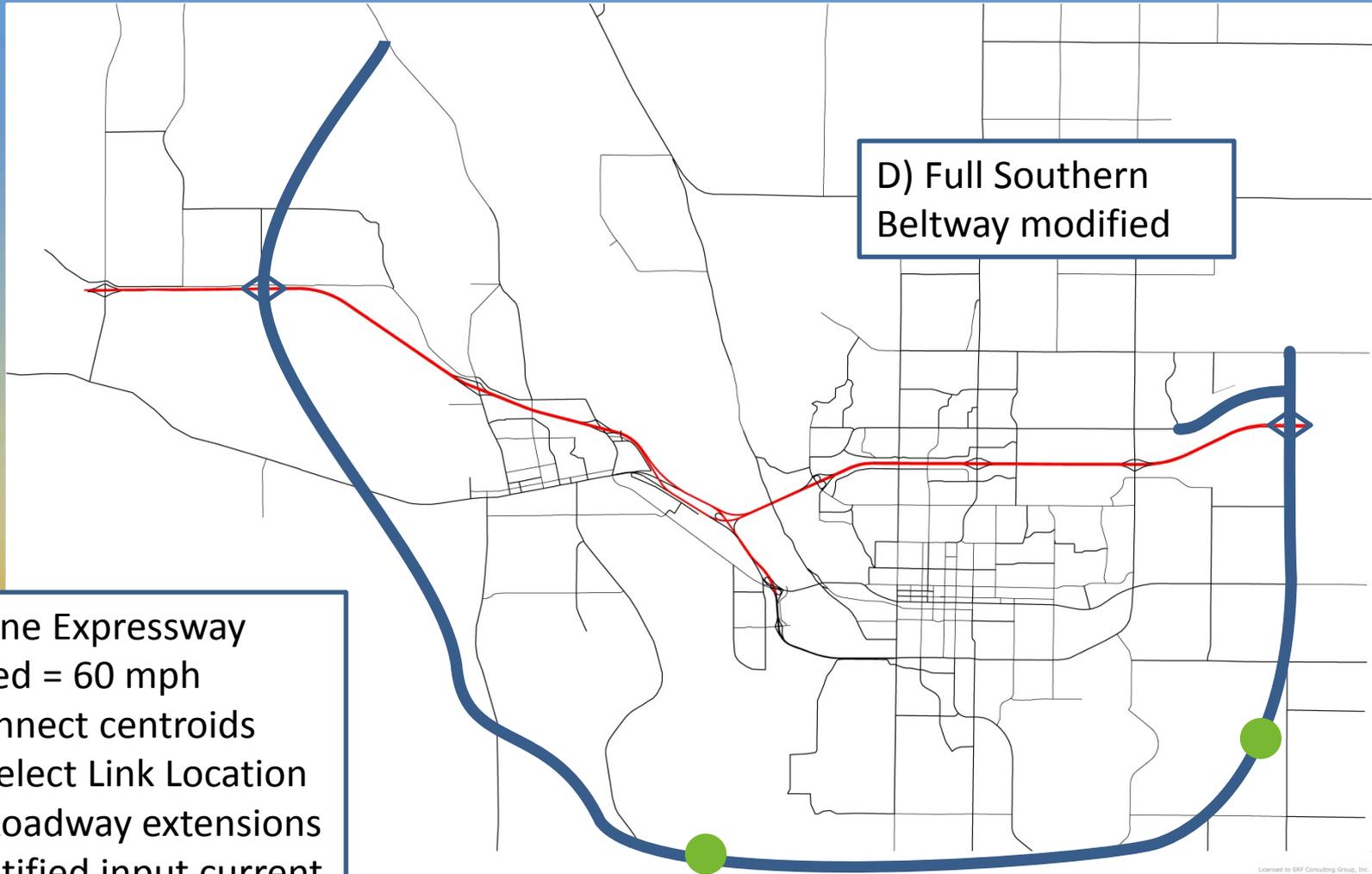
# Year 2025 Network Alt A (E+C+)



- Green represents E+C projects
- Blue represents additional project considerations



# Network Alternative D



4-Lane Expressway

Speed = 60 mph

\*Connect centroids

● Select Link Location

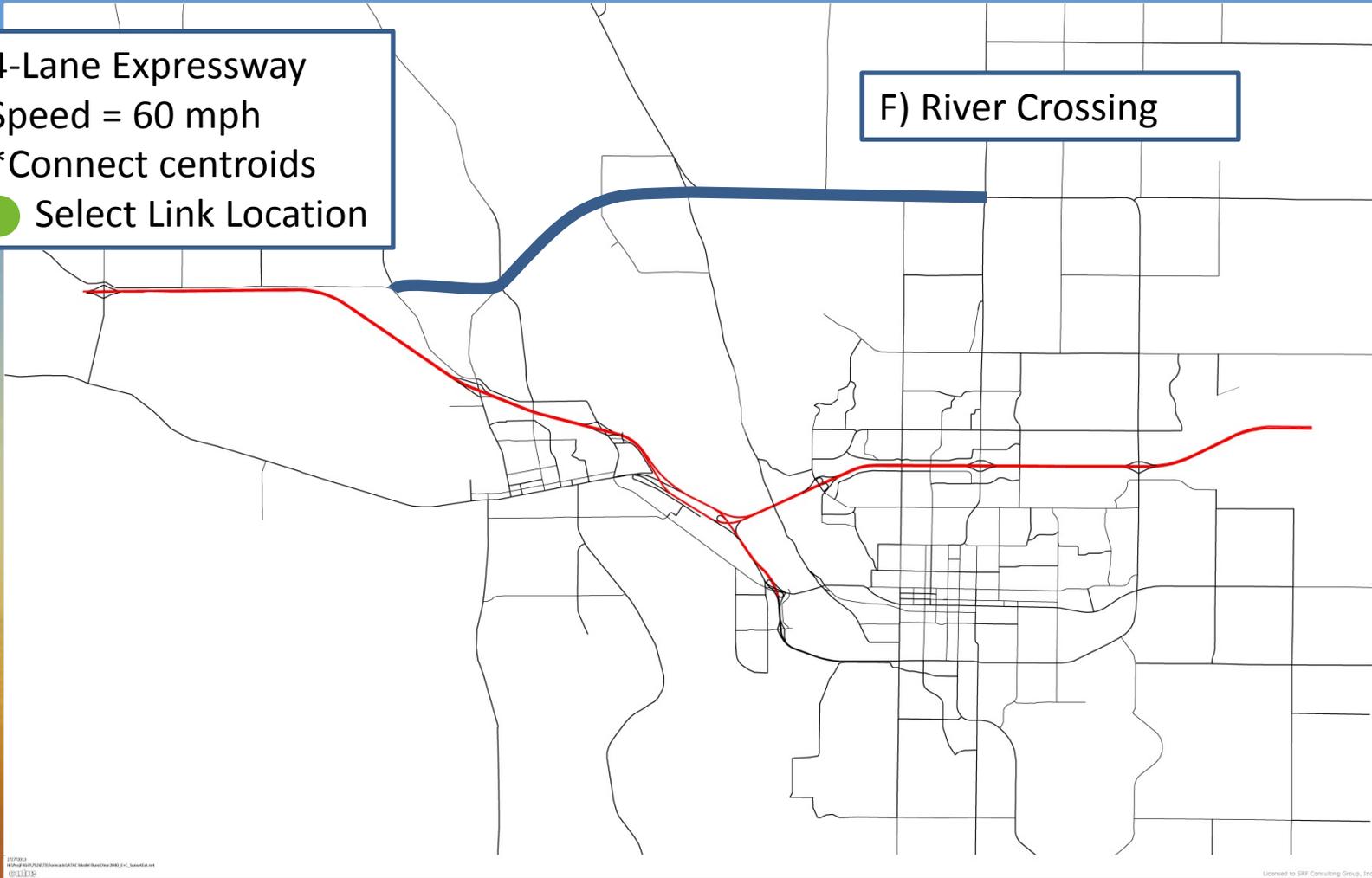
\*\* Roadway extensions identified input current corridor capacity and speeds



# Network Alternative F

4-Lane Expressway  
Speed = 60 mph  
\*Connect centroids  
● Select Link Location

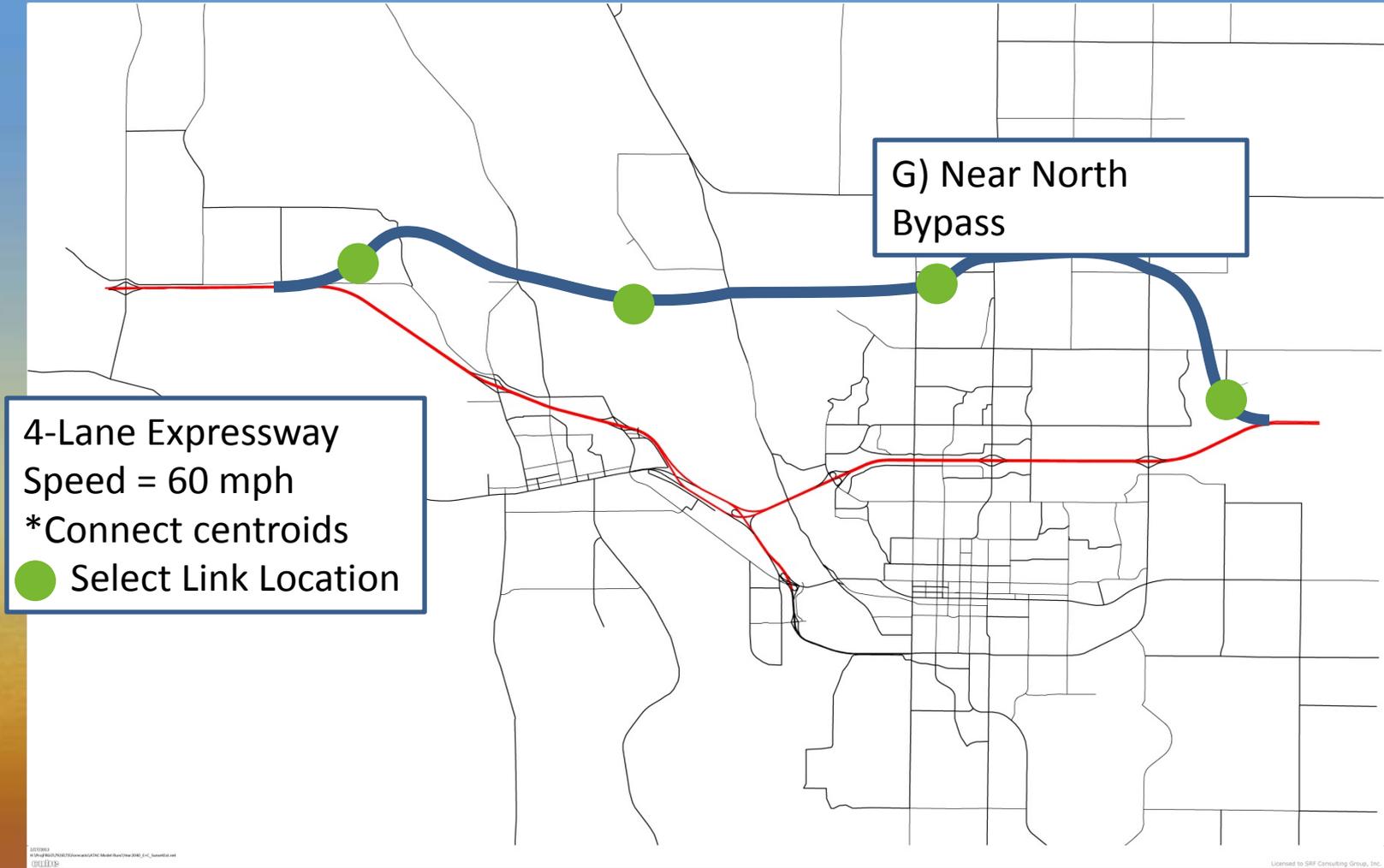
F) River Crossing



2/27/2013  
Project: Bismarck-Mandan Metropolitan Planning Organization  
Model Run: 2013\_01\_27\_Summit.mxd  
0:00:00

Licensee to SRF Consulting Group, Inc.

# Network Alternative G



# Network Alternative H1

H) 80th Interchange /  
66th Overpass

4-Lane capacity (66<sup>th</sup>/80<sup>th</sup>)  
Speed = 40 mph  
\*Connect centroids  
● Select Link Location  
\*\* Roadway extensions  
identified input current  
corridor capacity and  
speeds



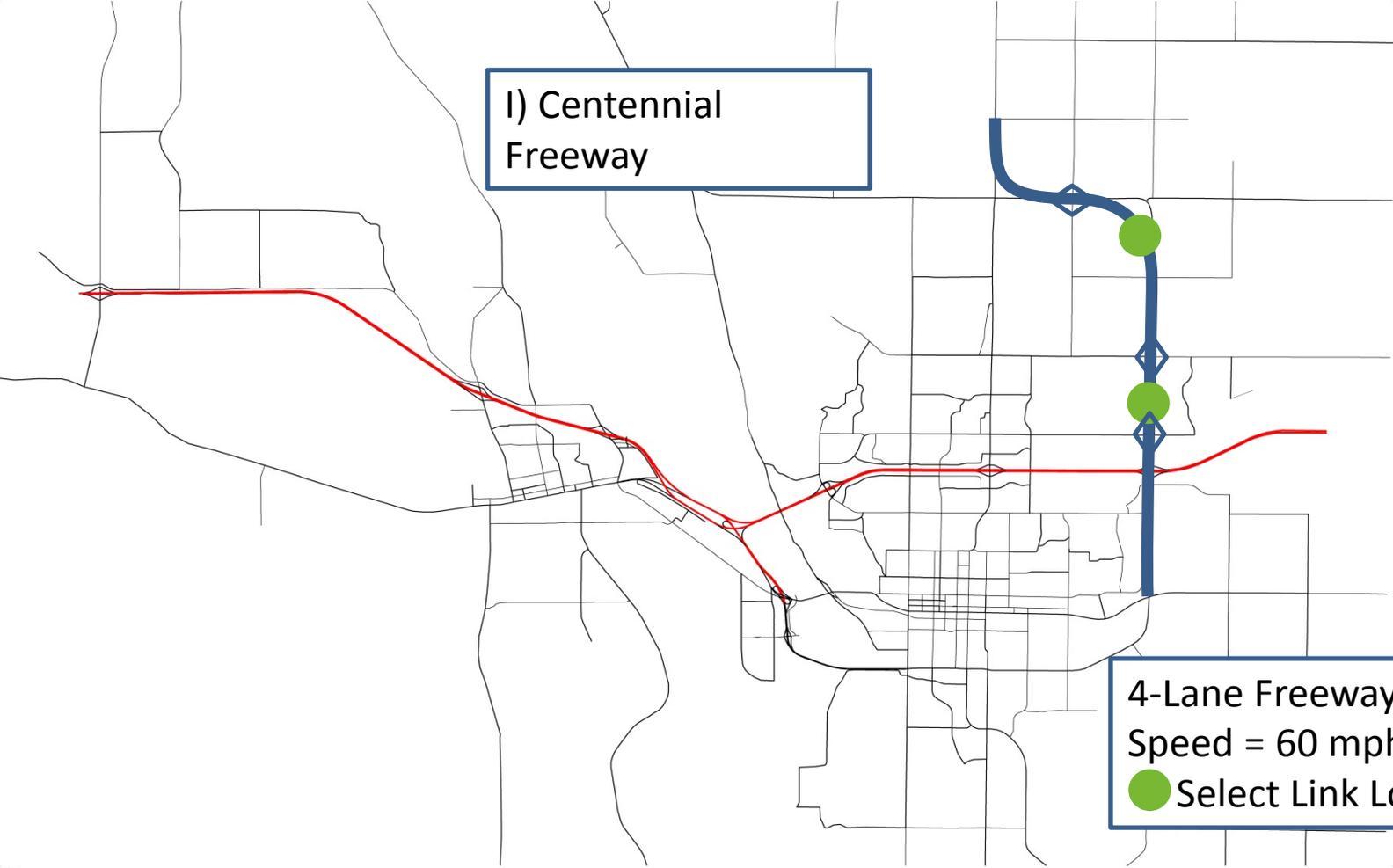
# Network Alternative H2

H) 66th Interchange /  
80th Overpass

4-Lane capacity (66<sup>th</sup>/80<sup>th</sup>)  
Speed = 40 mph  
\*Connect centroids  
● Select Link Location  
\*\* Roadway extensions  
identified input current  
corridor capacity and  
speeds



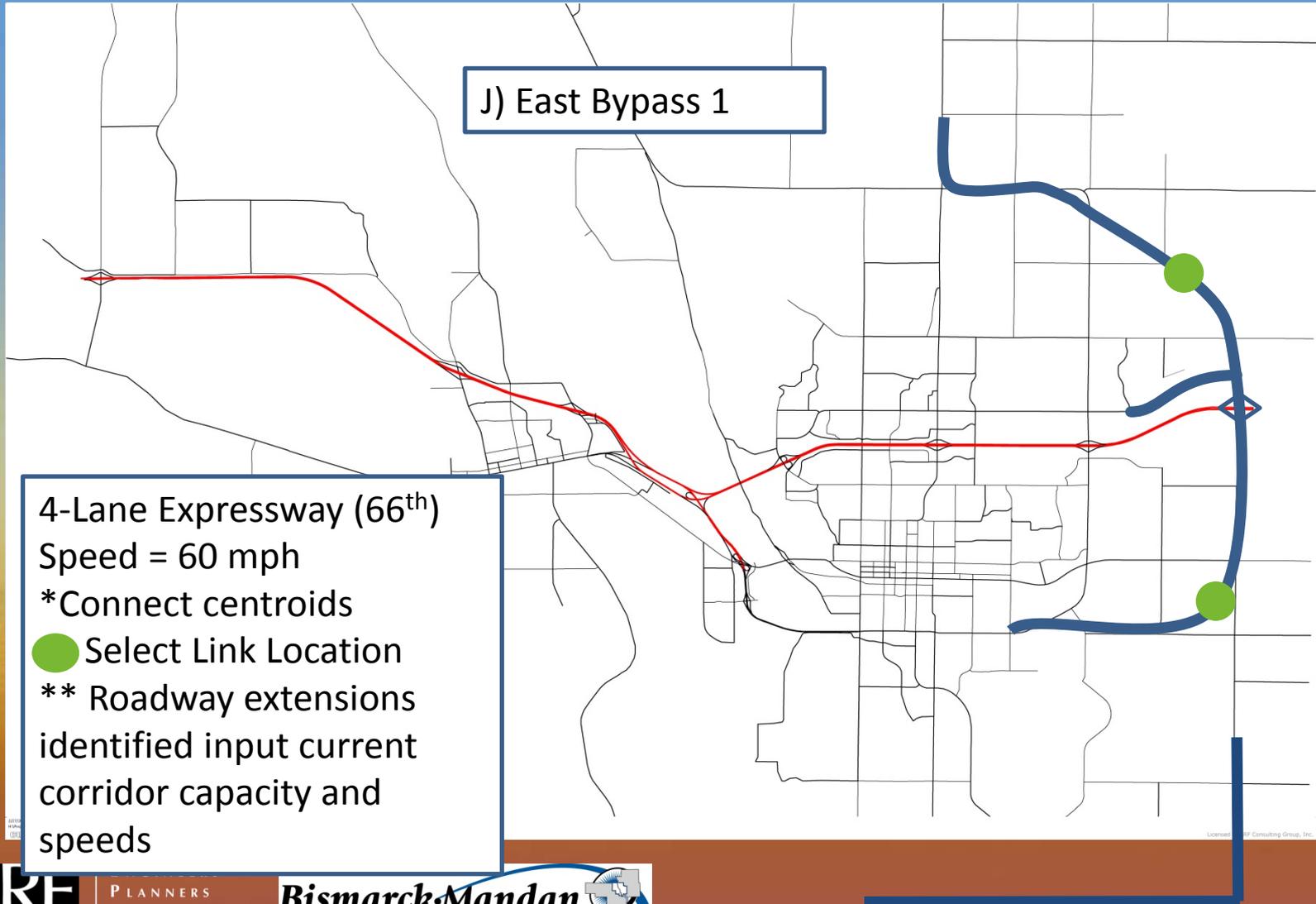
# Network Alternative I



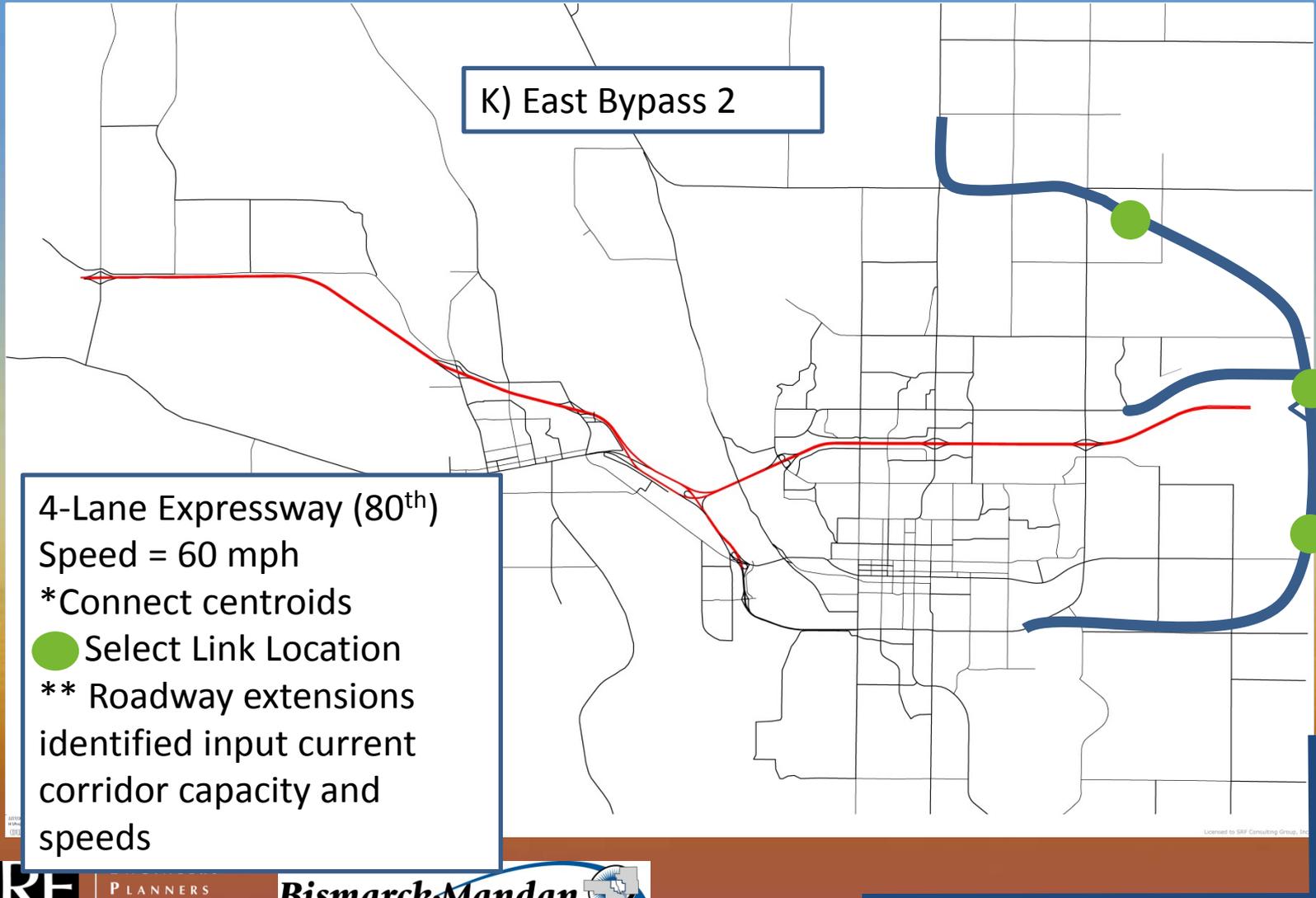
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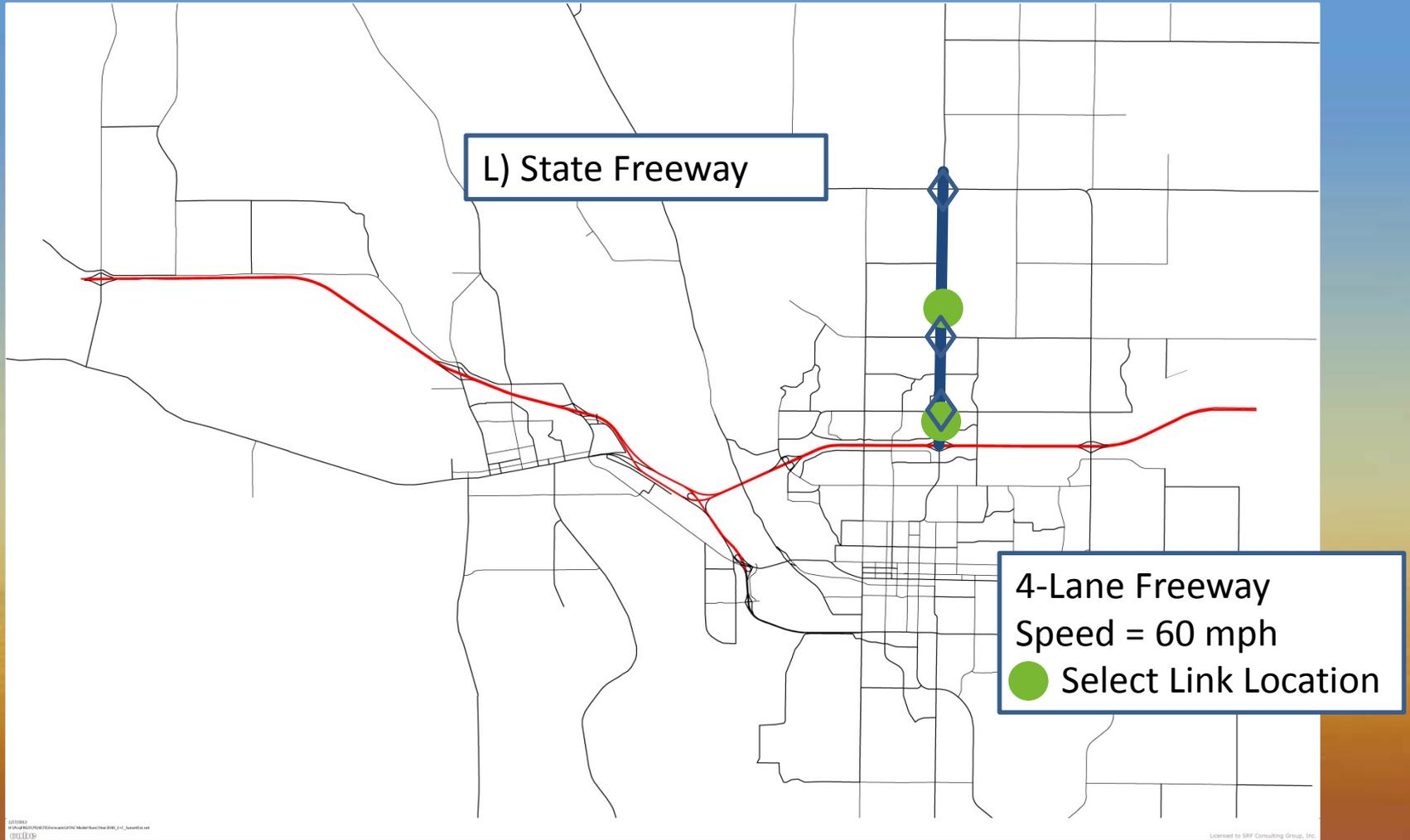
# Network Alternative J



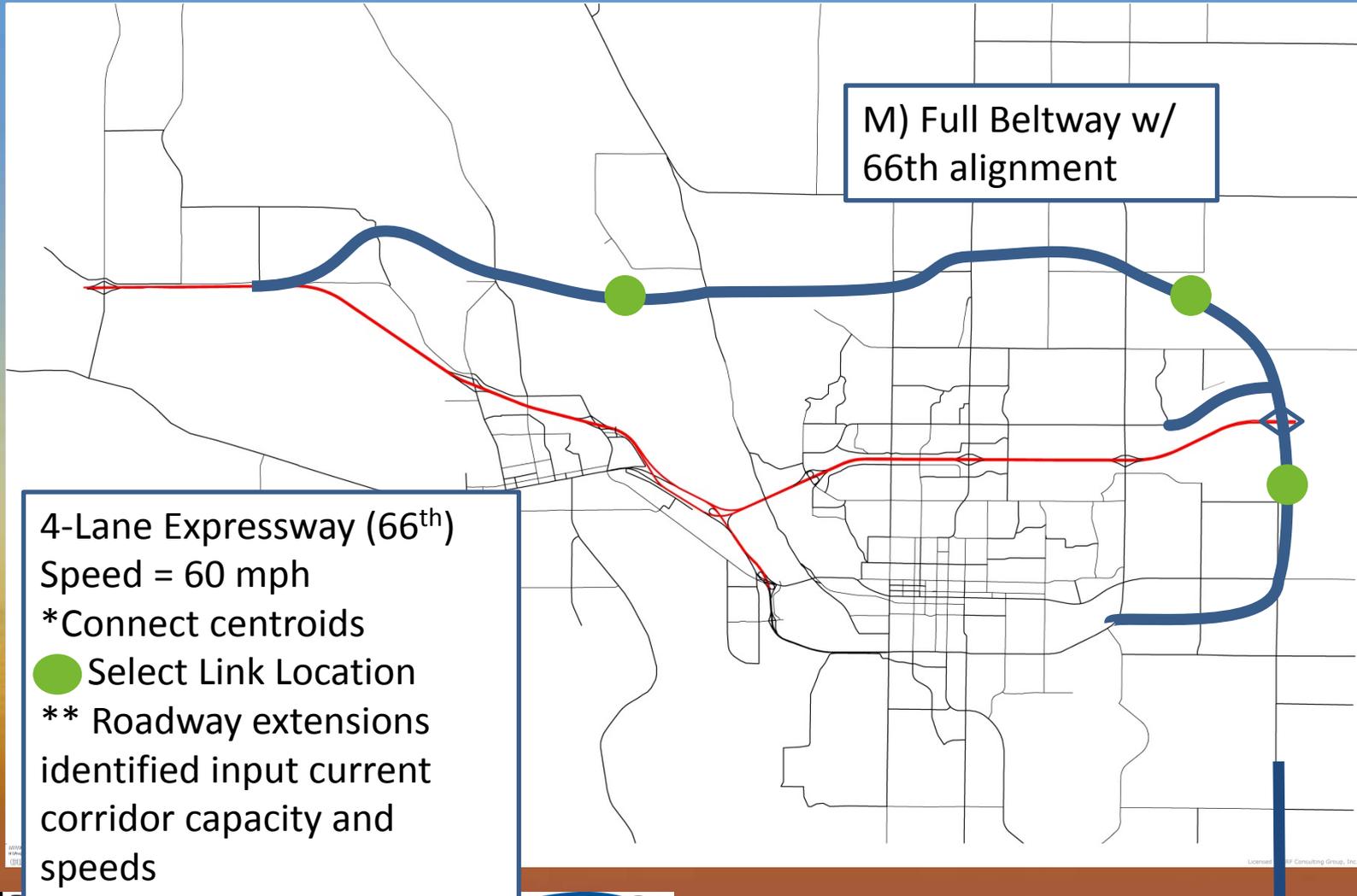
# Network Alternative K



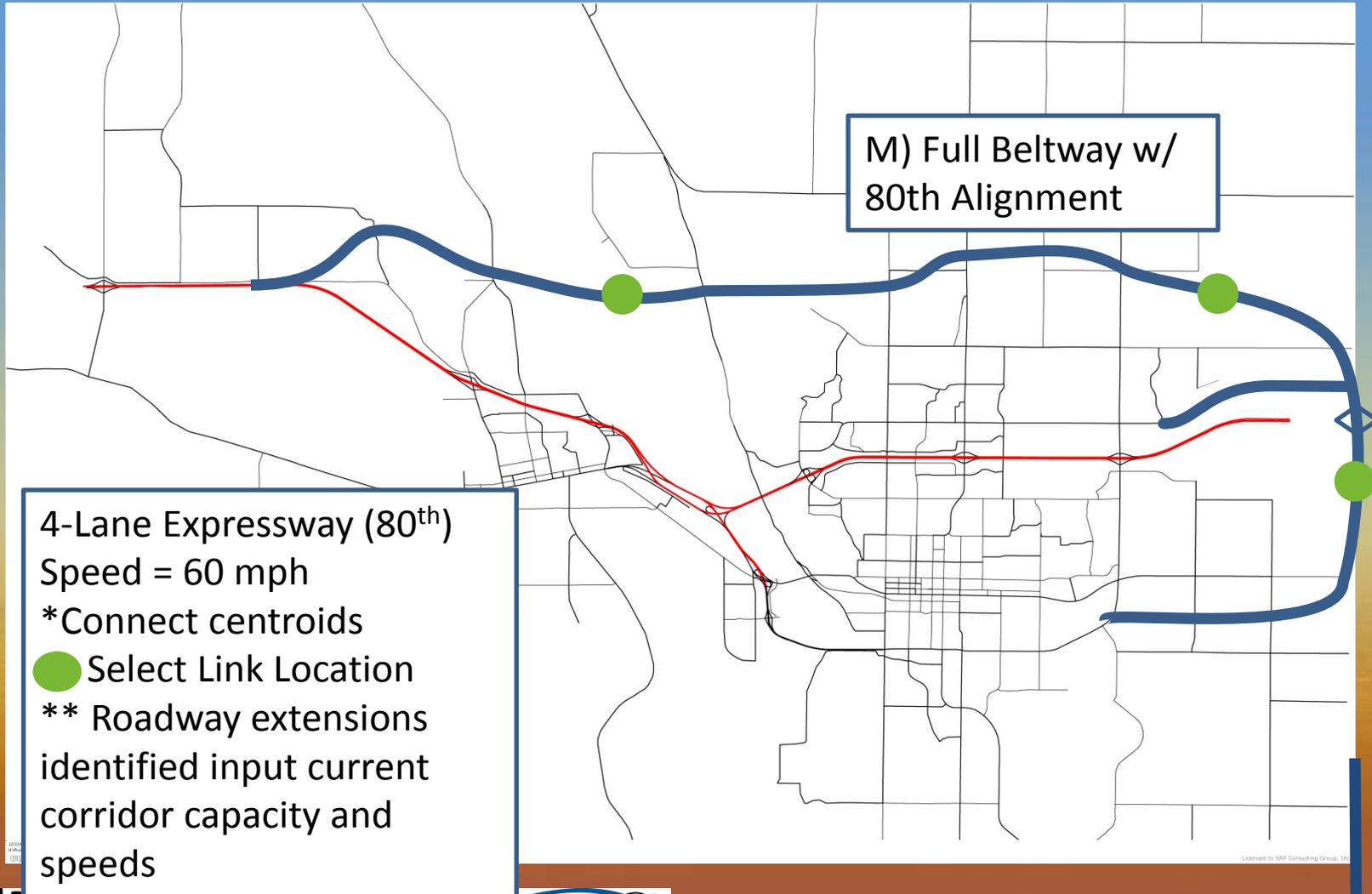
# Network Alternative L



# Network Alternative M1

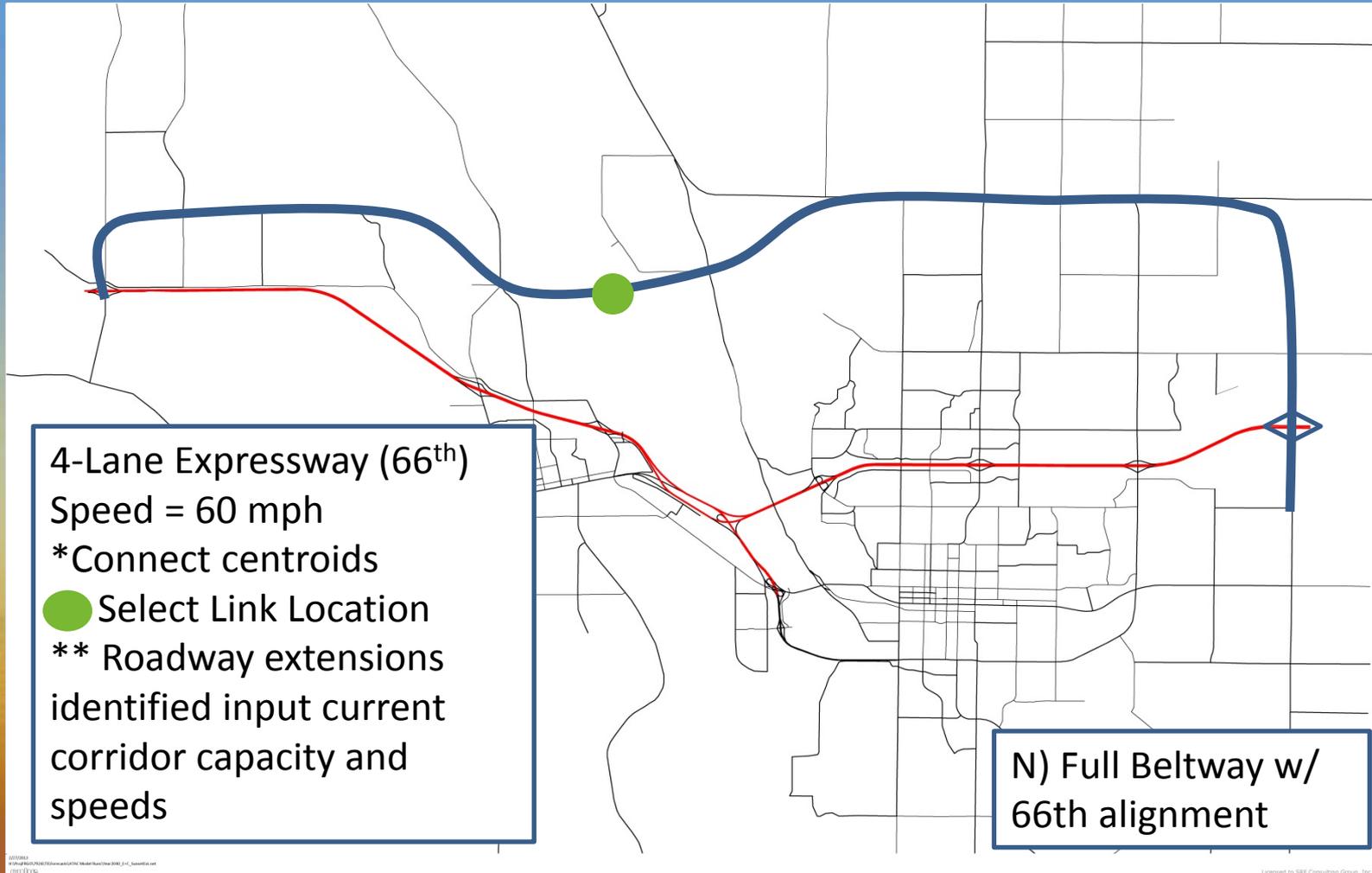


# Network Alternative M2

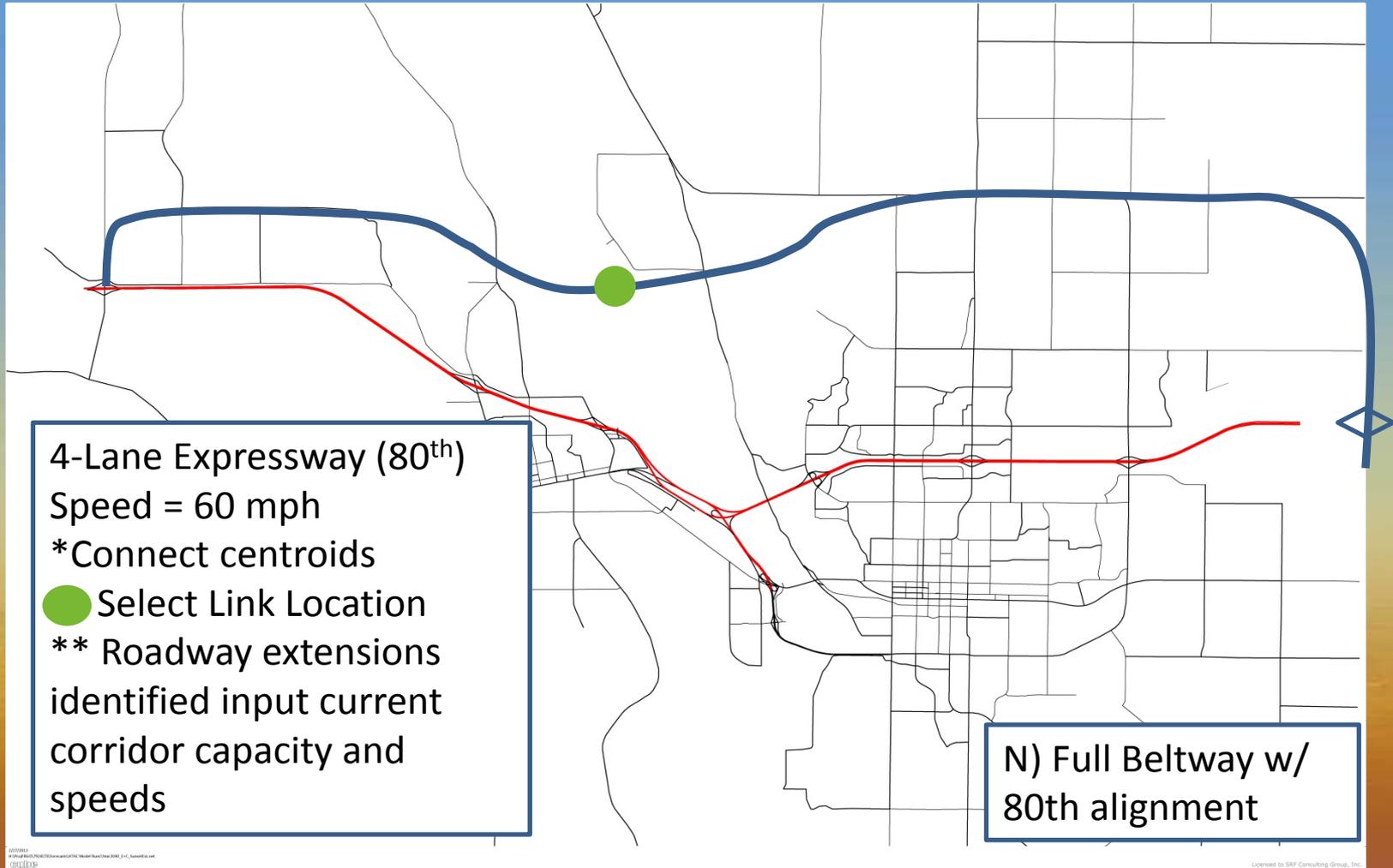




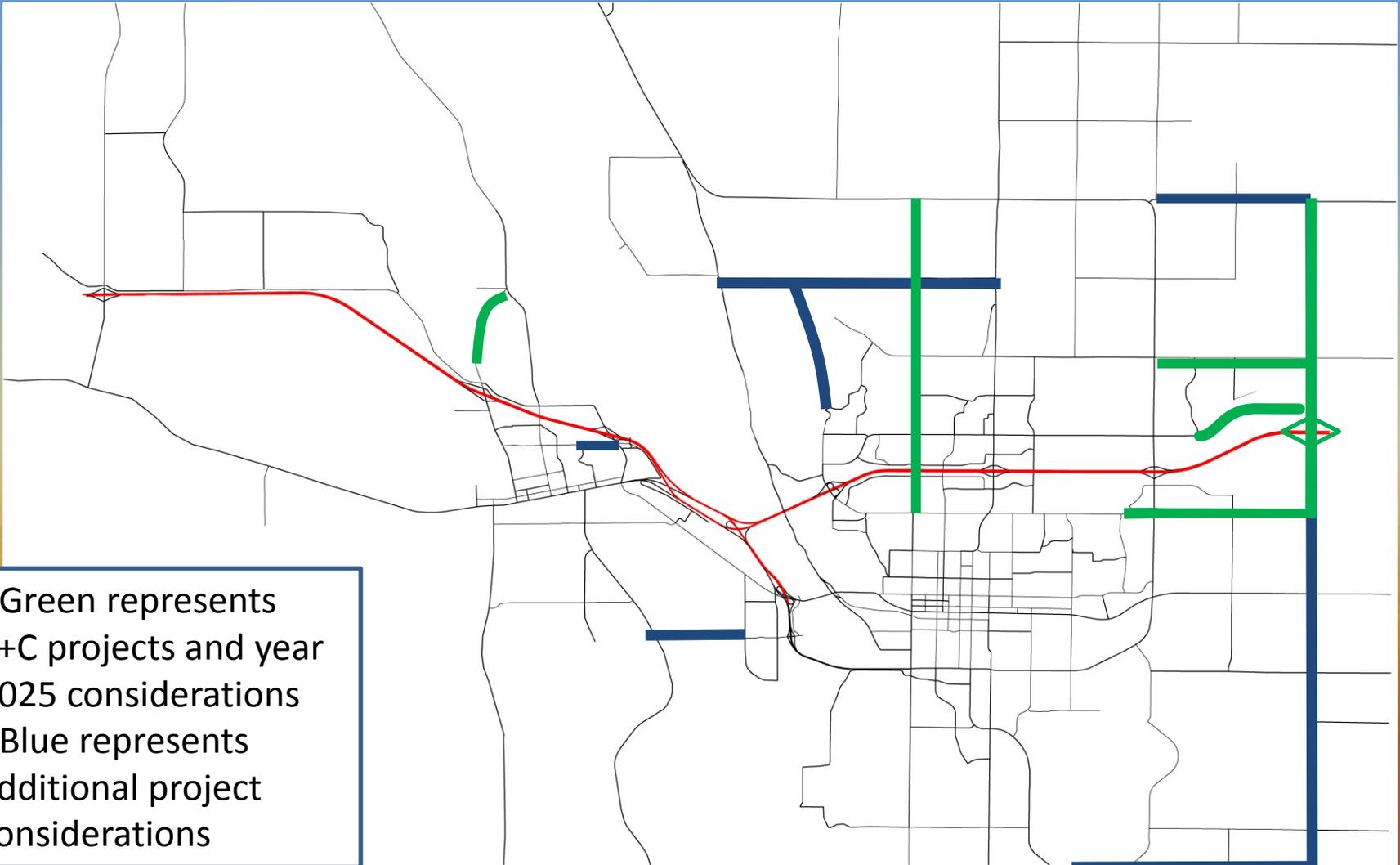
# Network Alternative N1



# Network Alternative N2



# Resultant Year 2040 Network Alt O1 (E+C++)



- Green represents E+C projects and year 2025 considerations
- Blue represents additional project considerations



**Bis-Man I-94 Corridor Study**  
**Summary of Network Alternatives**

5/5/2014

Location/Alt	2010	Year 2025		Year 2040		Cap Lo	Cap Hi	110%
		E+C	E+C++	E+C	E+C++			
I-94 (West of Hwy 25)	10,245	13,100	13,100	17,000	17,000	60,000	80,000	88,000
I-94/Hwy 25 West Ramps	1,280	1,400	1,400	1,800	1,800	16,000	20,000	22,000
I-94/Hwy 25 East Ramps	3,785	5,700	5,700	8,800	8,700	16,000	20,000	22,000
Hwy 25 North of I-94	2,640	4,600	4,600	8,000	7,800	14,000	15,000	16,500
Hwy 25 South of I-94	2,875	3,800	3,800	5,000	4,800	14,000	15,000	16,500
I-94 (Hwy 25 to Hwy 6)	12,950	17,800	17,800	24,000	23,900	60,000	80,000	88,000
I-94/Hwy 6 (Sunset Dr) West Ramps	1,245	4,400	4,400	5,900	6,000	16,000	20,000	22,000
I-94/Hwy 6 (Sunset Dr) East Ramps	9,010	11,300	11,200	16,900	15,400	16,000	20,000	22,000
Sunset Dr North of I-94	9,465	20,800	20,400	26,000	25,400	14,000	17,000	18,700
Sunset Dr South of I-94	8,025	12,700	12,700	14,300	13,500	8,000	10,000	11,000
I-94 (Sunset Dr to Mandan Ave)	16,775	24,600	24,500	35,000	33,200	60,000	80,000	88,000
I-94/Mandan Ave West Ramps	1,680	4,400	4,400	5,200	5,600	16,000	20,000	22,000
I-94/Mandan Ave East Ramps	4,770	6,800	6,900	9,200	10,800	16,000	20,000	22,000
Mandan Ave North of I-94	4,665	9,400	9,600	12,600	11,800	8,000	10,000	11,000
Mandan Ave South of I-94	2,515	5,000	5,000	6,400	8,400	14,000	17,000	18,700
I-94 (Mandan Ave to Main St)	19,120	26,900	27,000	39,000	38,500	60,000	80,000	88,000
I-94 (Main St to Bismarck Expy)	37,715	51,400	51,500	69,000	63,400	60,000	80,000	88,000
I-94 (River Crossing)	27,310	42,800	43,200	55,000	55,600	60,000	80,000	88,000
I-94/Tyler Pkwy West Ramps	12,280	15,200	14,900	19,300	17,500	24,000	30,000	33,000
I-94/Tyler Pkwy East Ramps	5,155	7,400	7,800	8,300	9,500	16,000	20,000	22,000
Tyler Pkwy North of I-94	22,460	28,600	28,200	34,000	32,400	28,000	32,000	35,200
Divide Ave South of I-94	13,440	17,000	17,000	18,200	17,200	14,000	17,000	18,700
I-94 (Tyler Pkwy to State St)	24,420	34,900	36,000	44,000	47,600	60,000	80,000	88,000
I-94/State St West Ramps	14,085	19,700	19,700	22,800	21,600	16,000	20,000	22,000
I-94/State St East Ramps	5,510	4,500	4,500	7,800	8,800	16,000	20,000	22,000
State St North of I-94	36,950	46,200	44,400	54,000	46,800	42,000	48,000	52,800
State St South of I-94	25,745	33,200	33,800	34,000	35,000	42,000	48,000	52,800
I-94 (State St to Centennial Rd-Bismarck Expy)	14,615	19,700	20,700	29,000	34,600	60,000	80,000	88,000
I-94/Centennial Rd West Ramps	10,445	12,800	10,200	20,300	12,000	16,000	20,000	22,000
I-94/Centennial Rd East Ramps	3,215	4,000	6,500	6,300	10,200	16,000	20,000	22,000
Centennial Rd North of I-94	13,975	33,400	28,000	41,000	31,400	28,000	32,000	35,200
Bismarck Expy South of I-94	19,210	28,200	27,400	40,000	35,200	28,000	32,000	35,200
I-94 (East of Centennial Rd-Bismarck Expy)	7,980	11,000	11,000	15,000	32,800	60,000	80,000	88,000
I-94/66th St West Ramps	0	0	9,500	0	24,100	16,000	20,000	22,000
I-94/66th St East Ramps	0	0	3,500	0	6,200	16,000	20,000	22,000
66th St North of I-94	0	0	31,600	0	37,000	28,000	32,000	35,200
66th St South of I-94	0	0	13,600	0	19,600	28,000	32,000	35,200
80th St (17th Ave NE to 43rd Ave NE)	80	4,600	2,000	18,000	9,400	14,000	15,000	16,500
I-94 (East of 66th St)	7,980	11,000	11,000	15,000	15,000	60,000	80,000	88,000

"West Ramps" - WB On/EB Off

"East Ramps" - EB On/WB Off

Under Capacity
Between Capacity Limits
Over Capacity
Over 110% of Capacity

FINAL

# Appendix B – Preliminary Alternatives for Screening

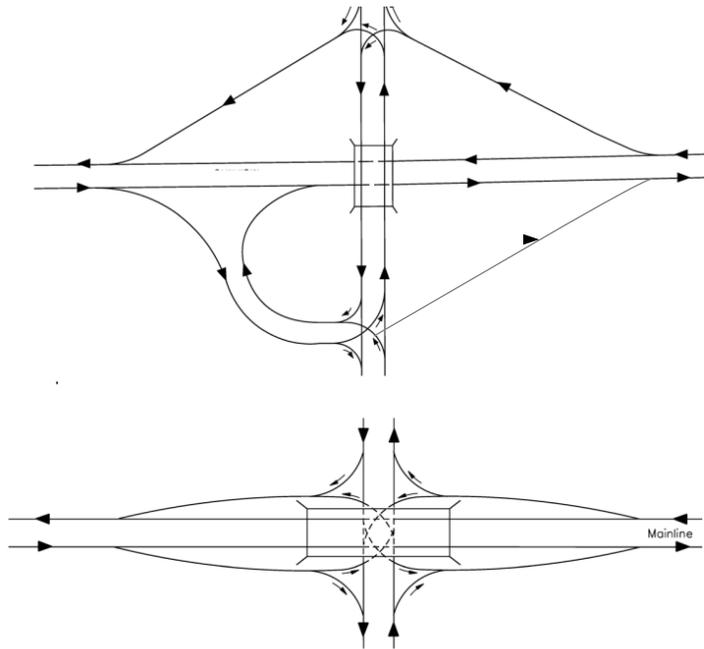
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**LINE DRAWINGS**



## Alternate Concepts Reviewed

Add Loop In SW Quadrant



Single Point Urban

## Single Point Urban Interchange (Long Term Concept)

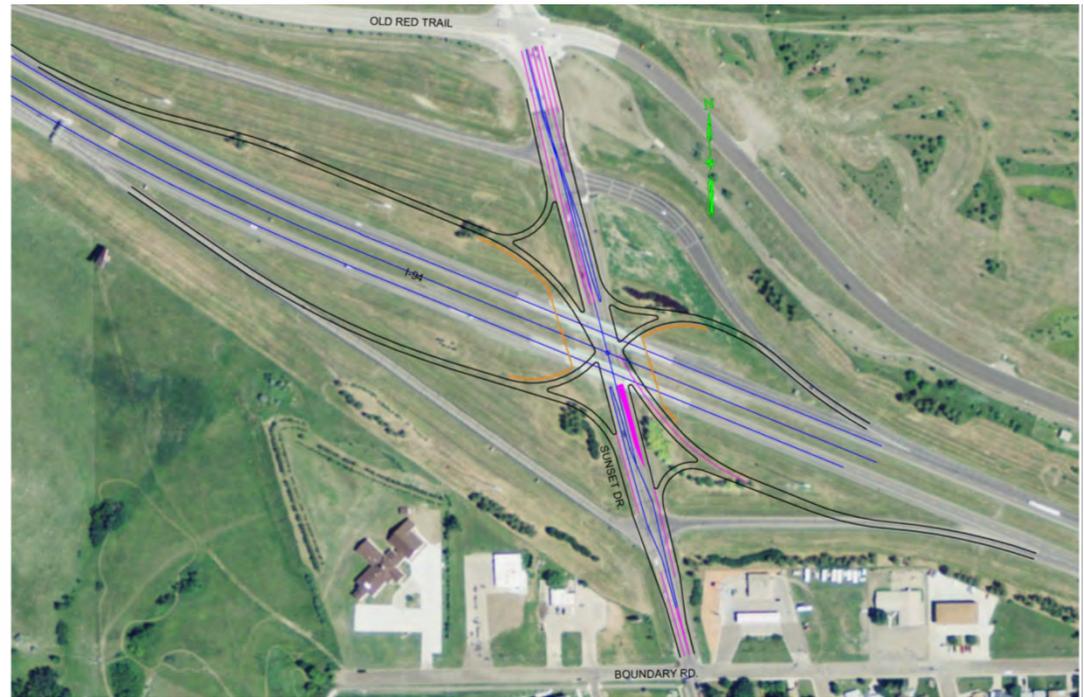
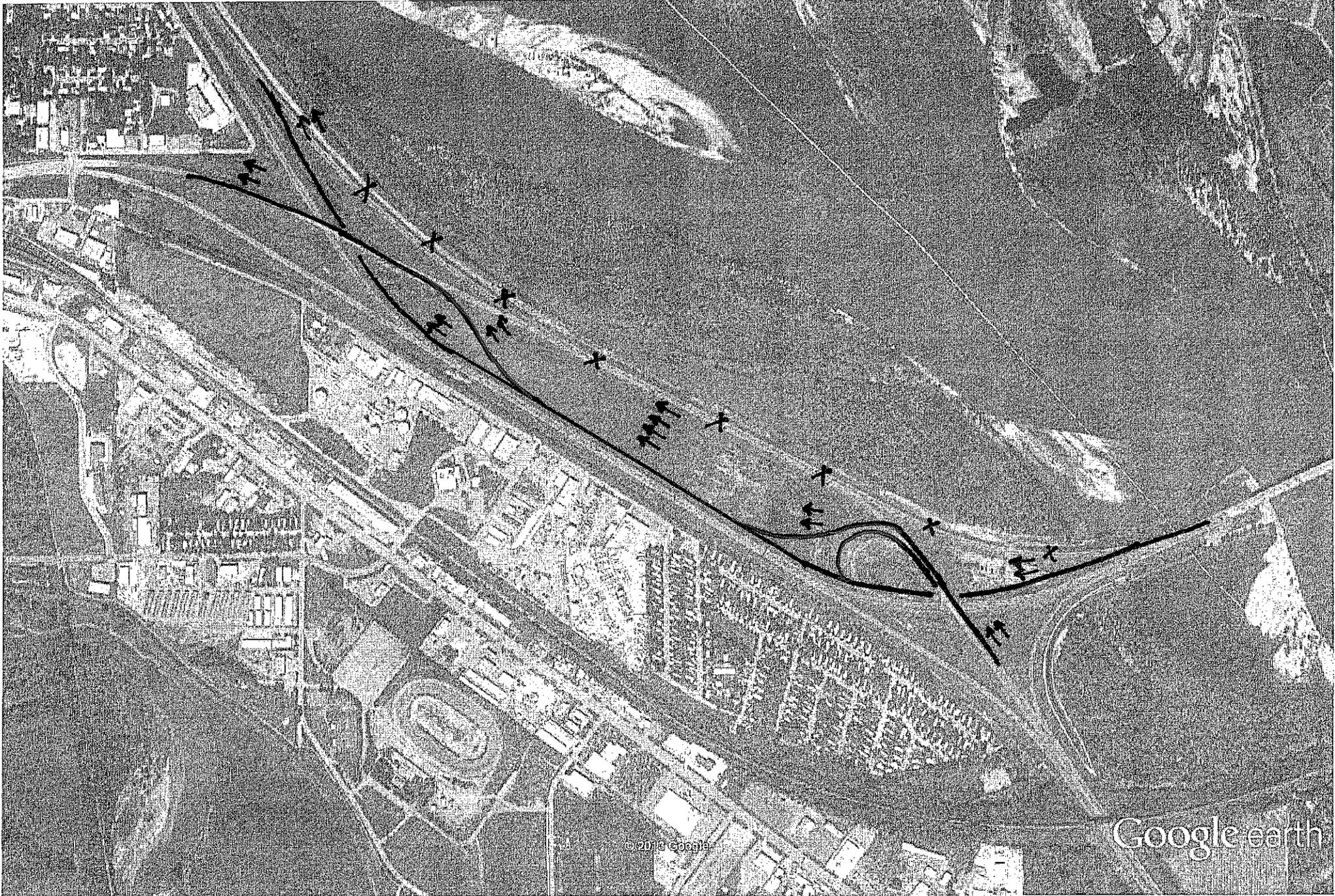


Figure A-2  
Old Red Trail and Mandan Avenue – 3-Lane Concept  
(ND 1806 to Mandan Avenue)

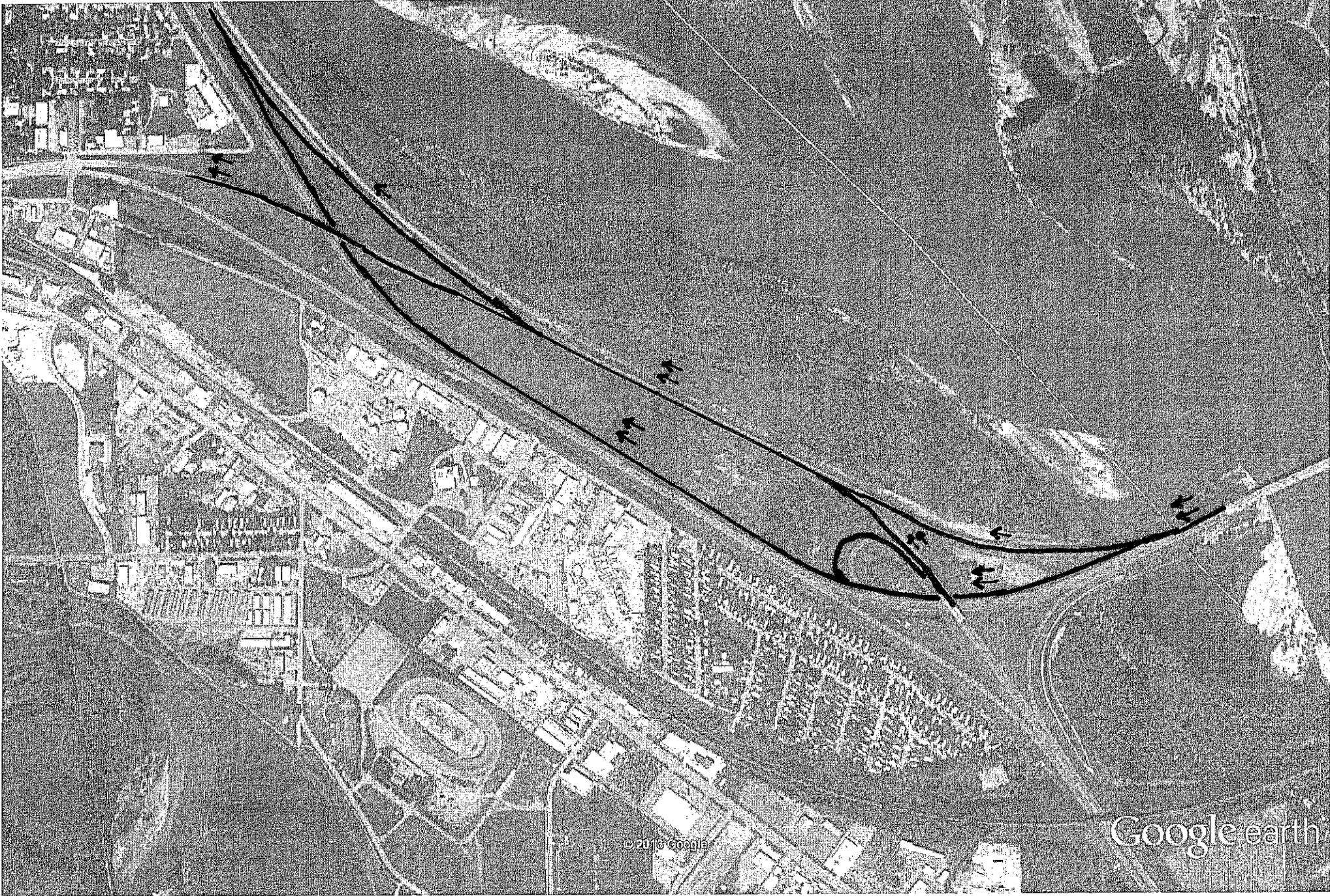


Figure A-7  
Diamond Interchange Rehabilitation Concept – I-94/Mandan Avenue

ID - C



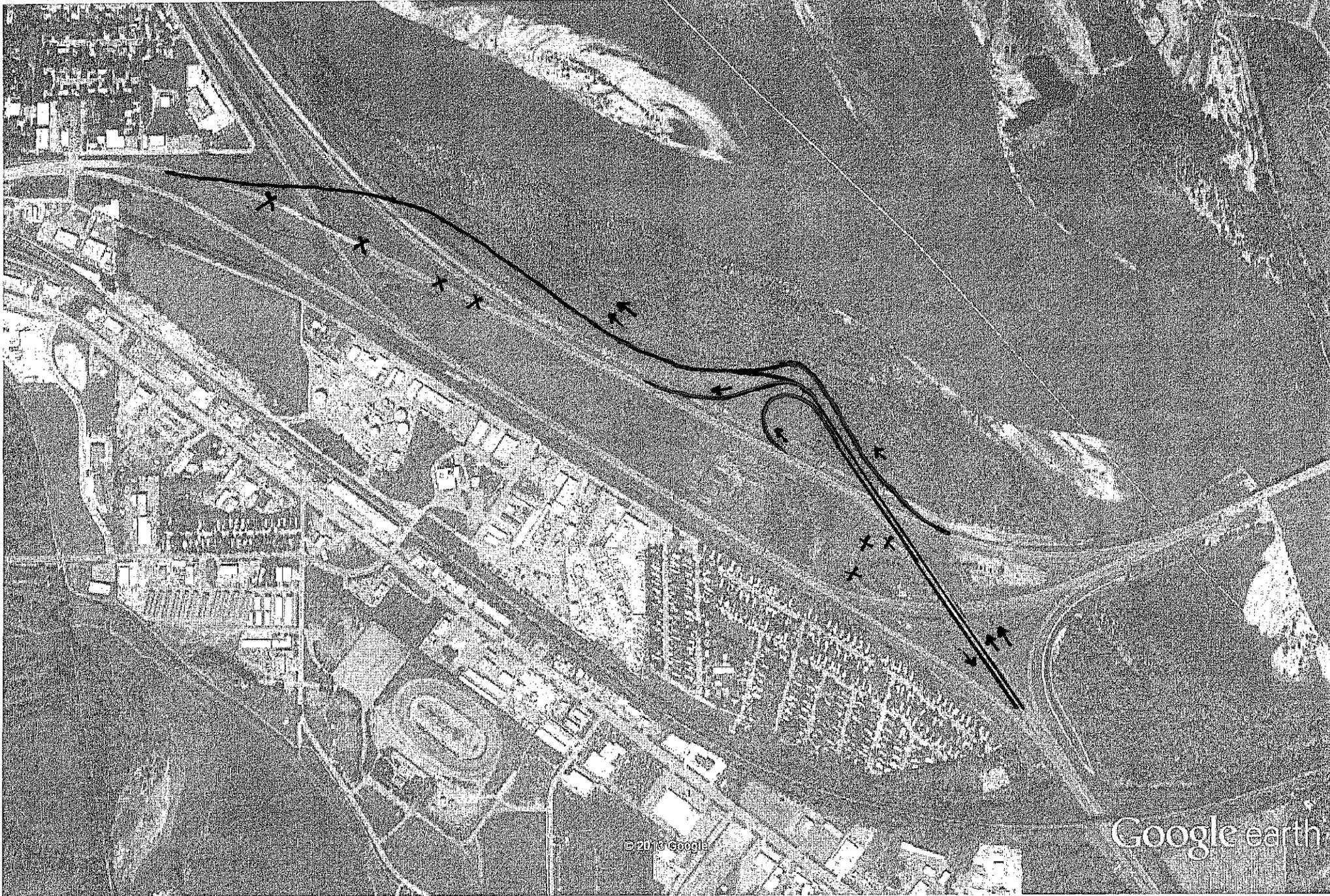
ID-D



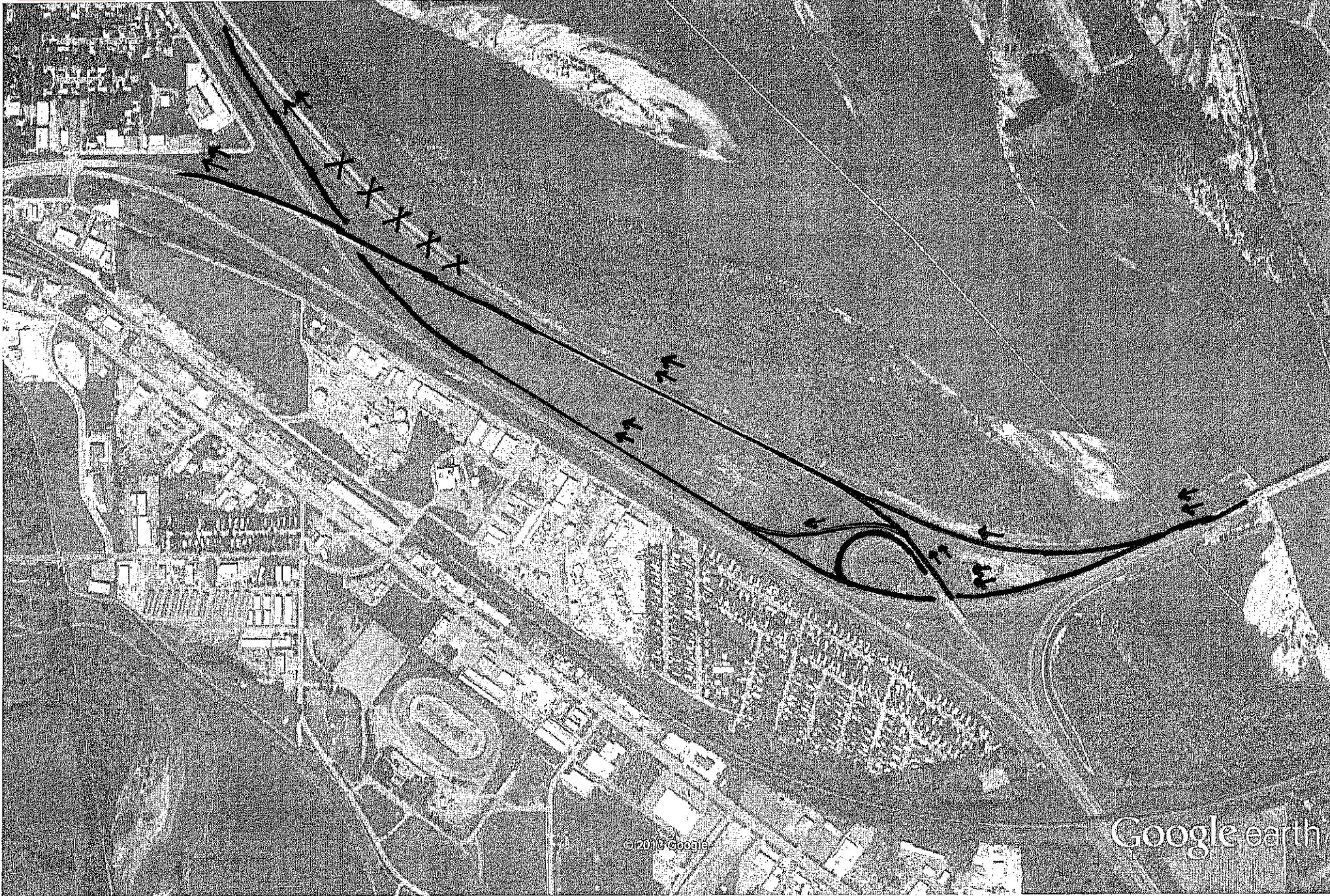
© 2016 Google

Google earth

ID - E



ID - F



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Google earth

ID - G

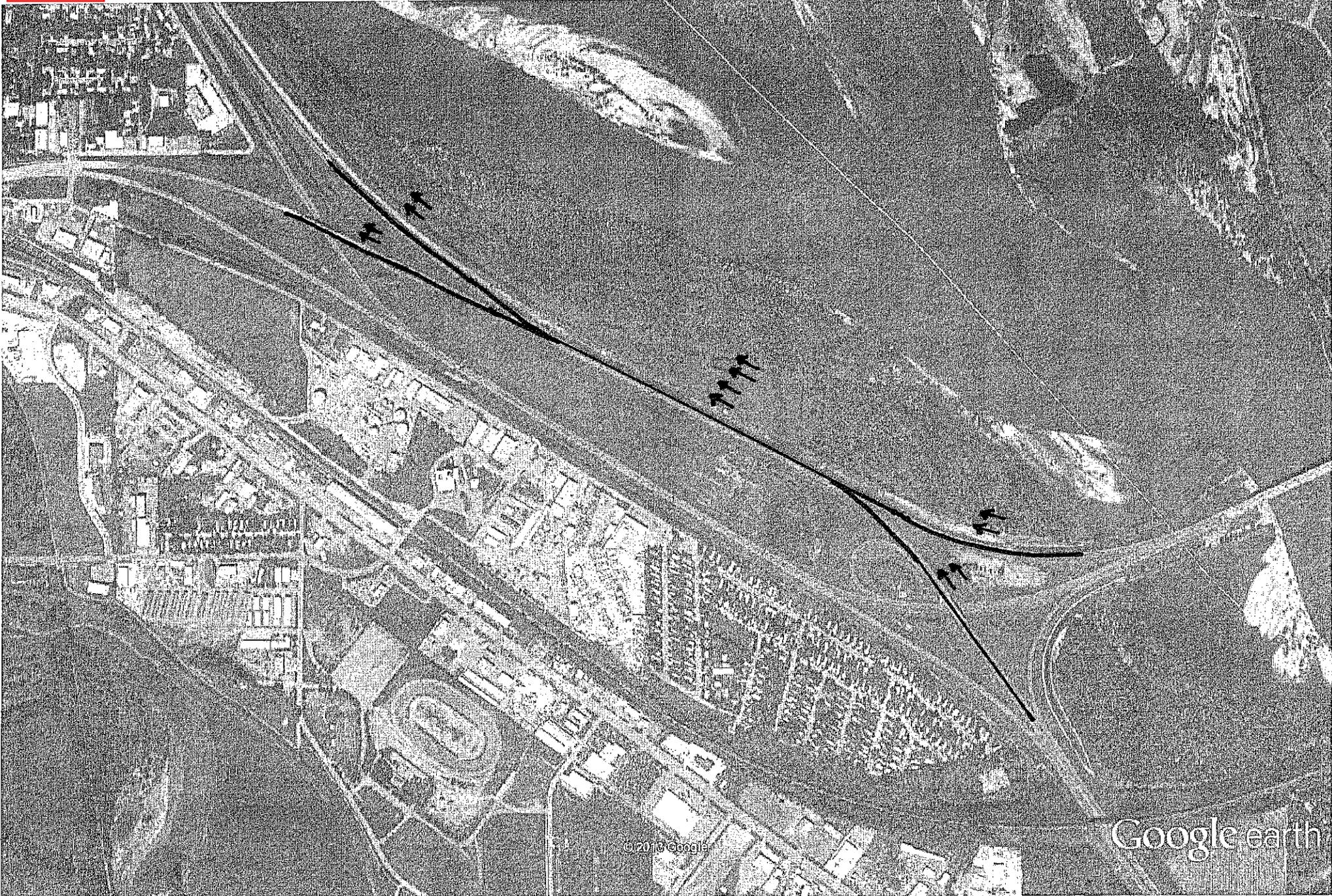




Figure 32 – Double Crossover Interchange in Missouri



SE Loop

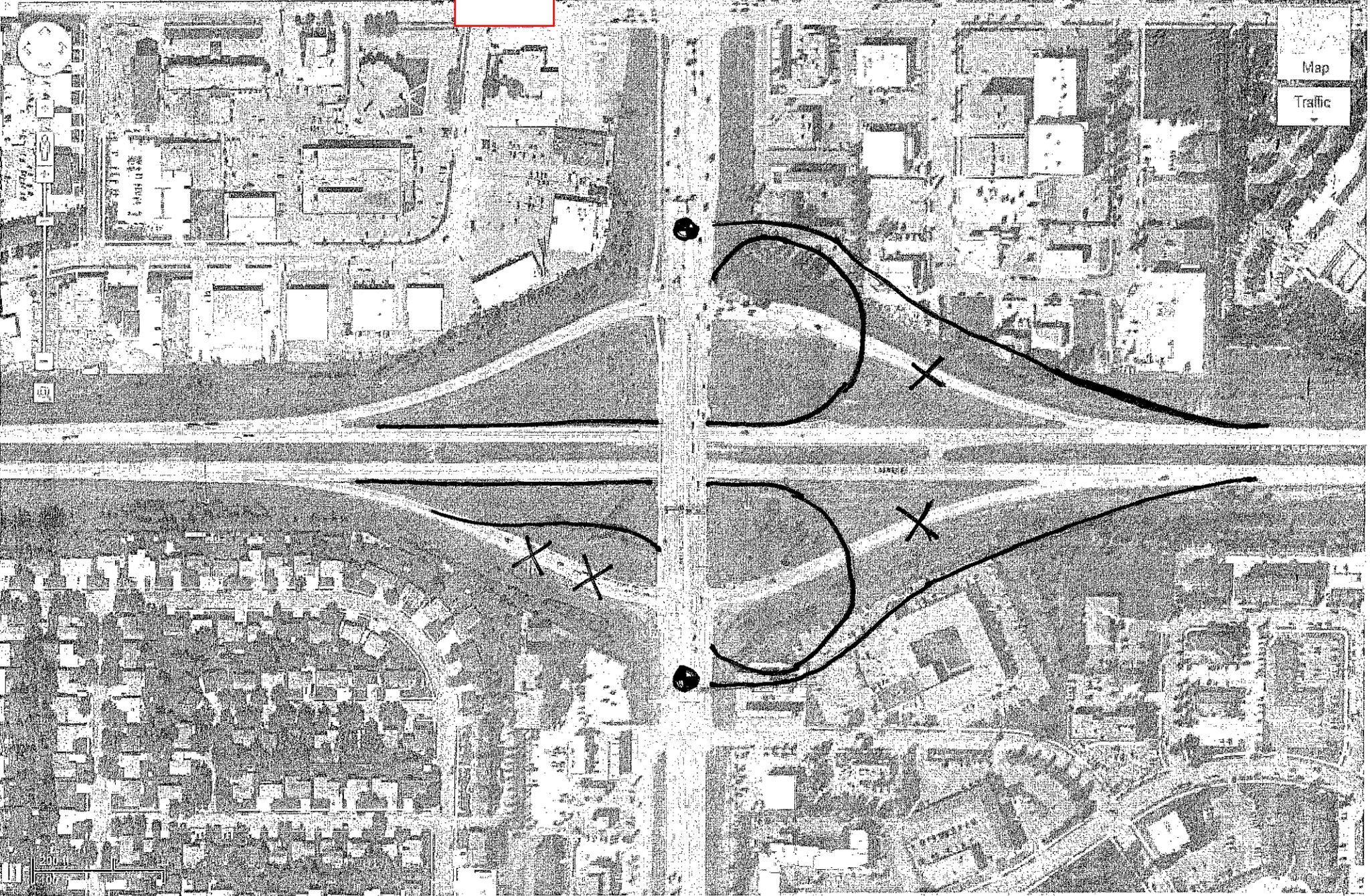
NE Loop

ID-J

State St.

Map

Traffic



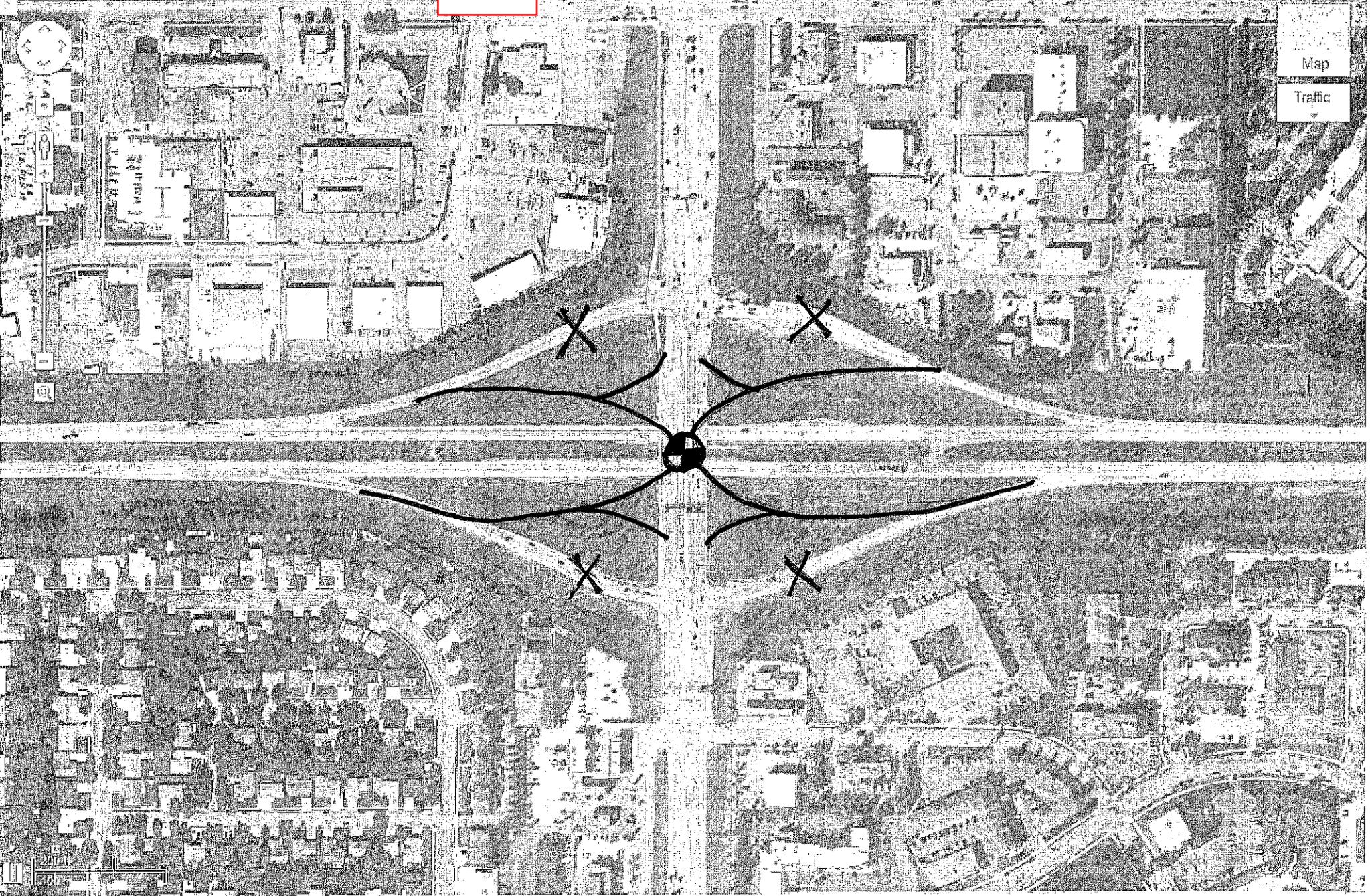
Single Point

ID-K

State St.

Map

Traffic





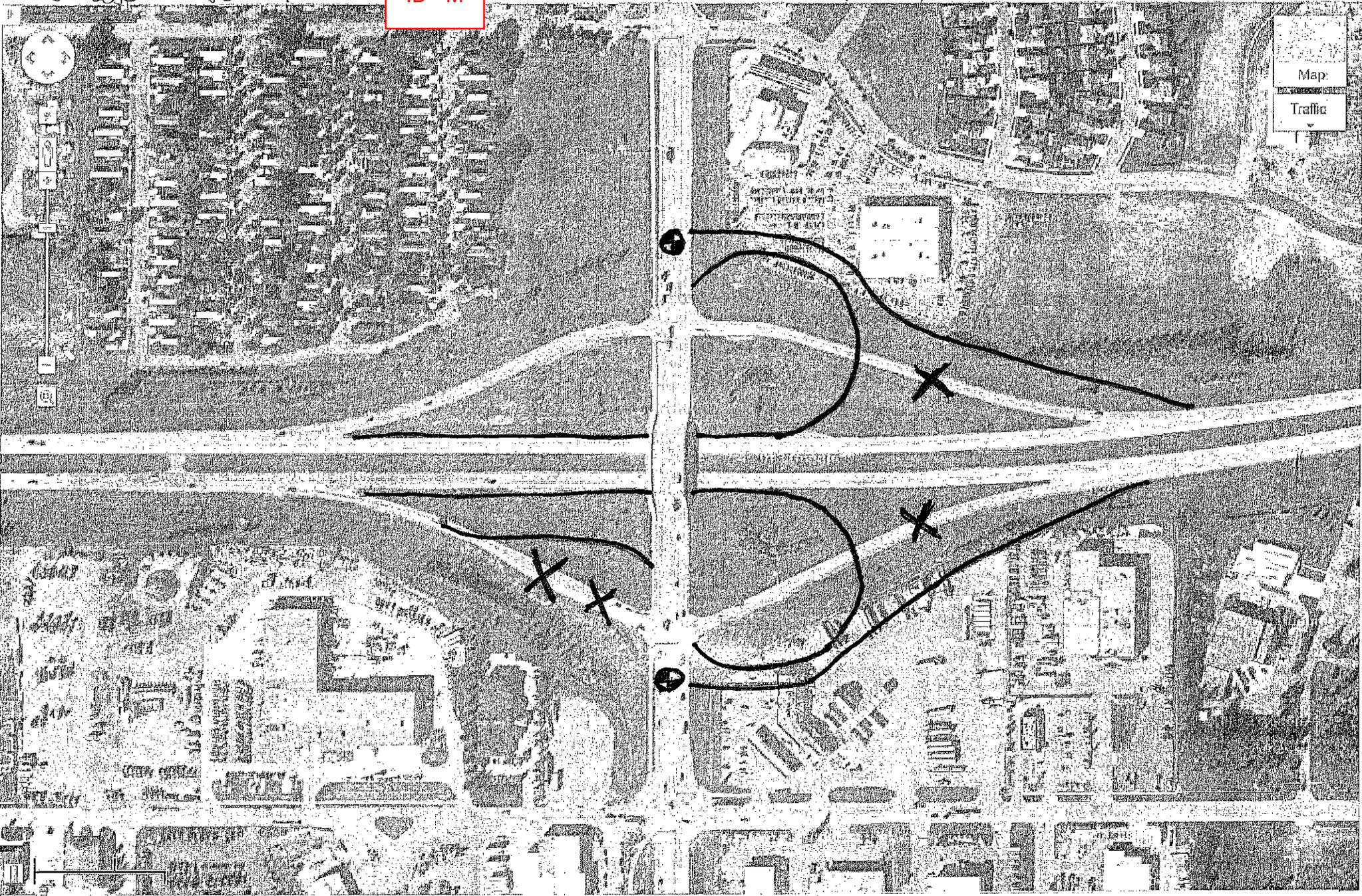
SE Loop

NE Loop

ID - M

Centennial / Bismarck Expressway

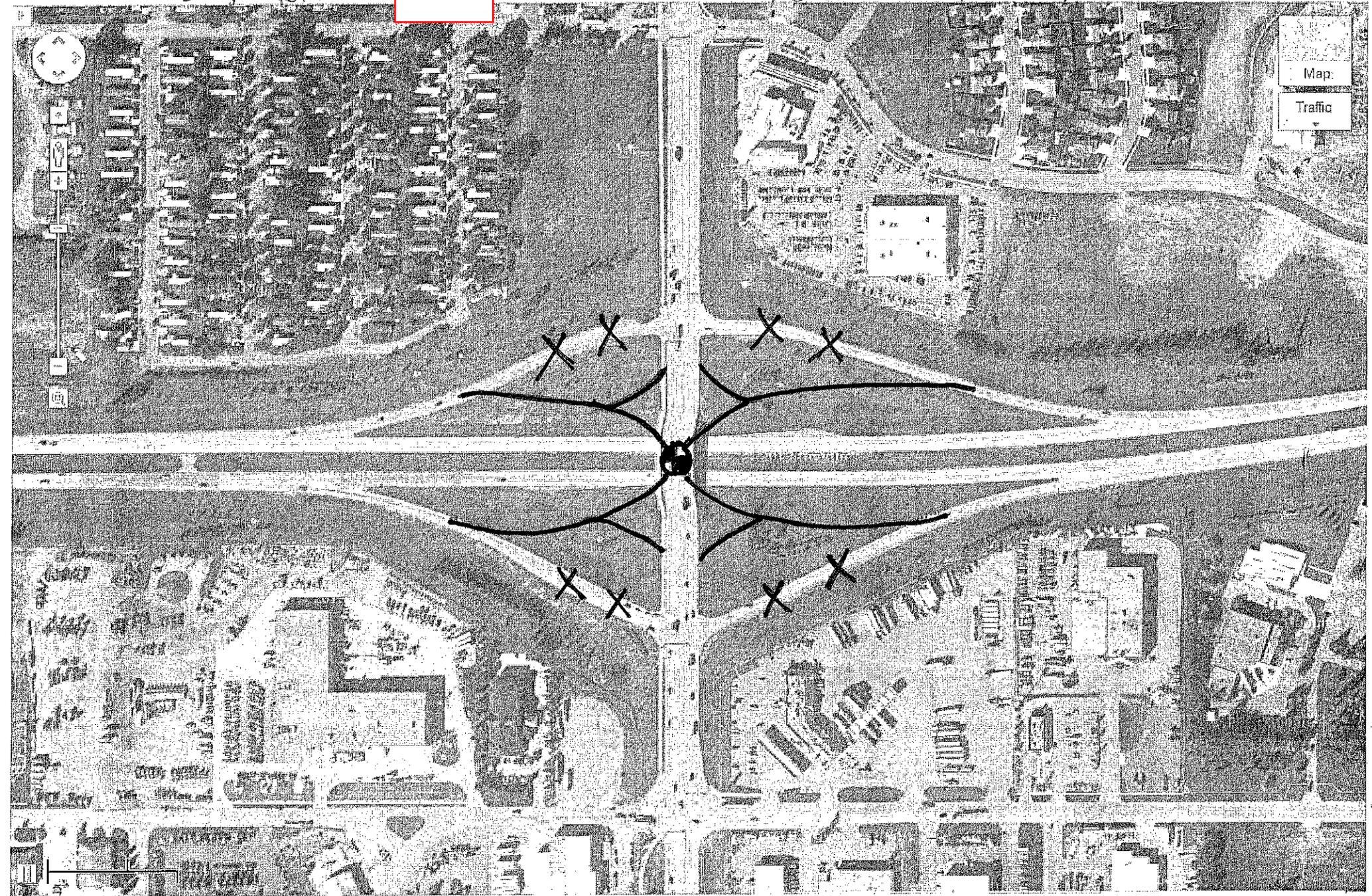
Map  
Traffic



Single Point

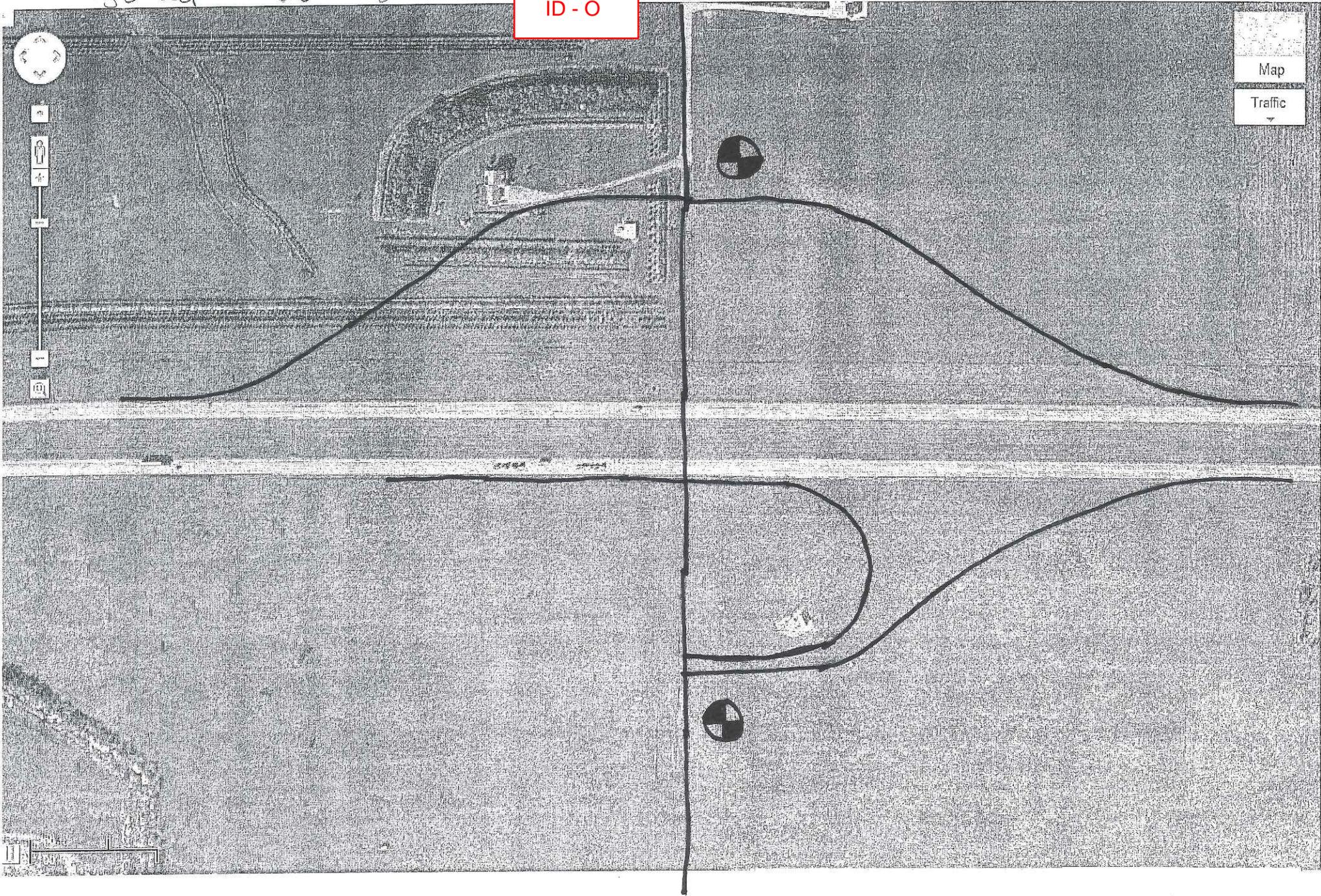
ID-N

Centennial Dr./Bismarck Expressway

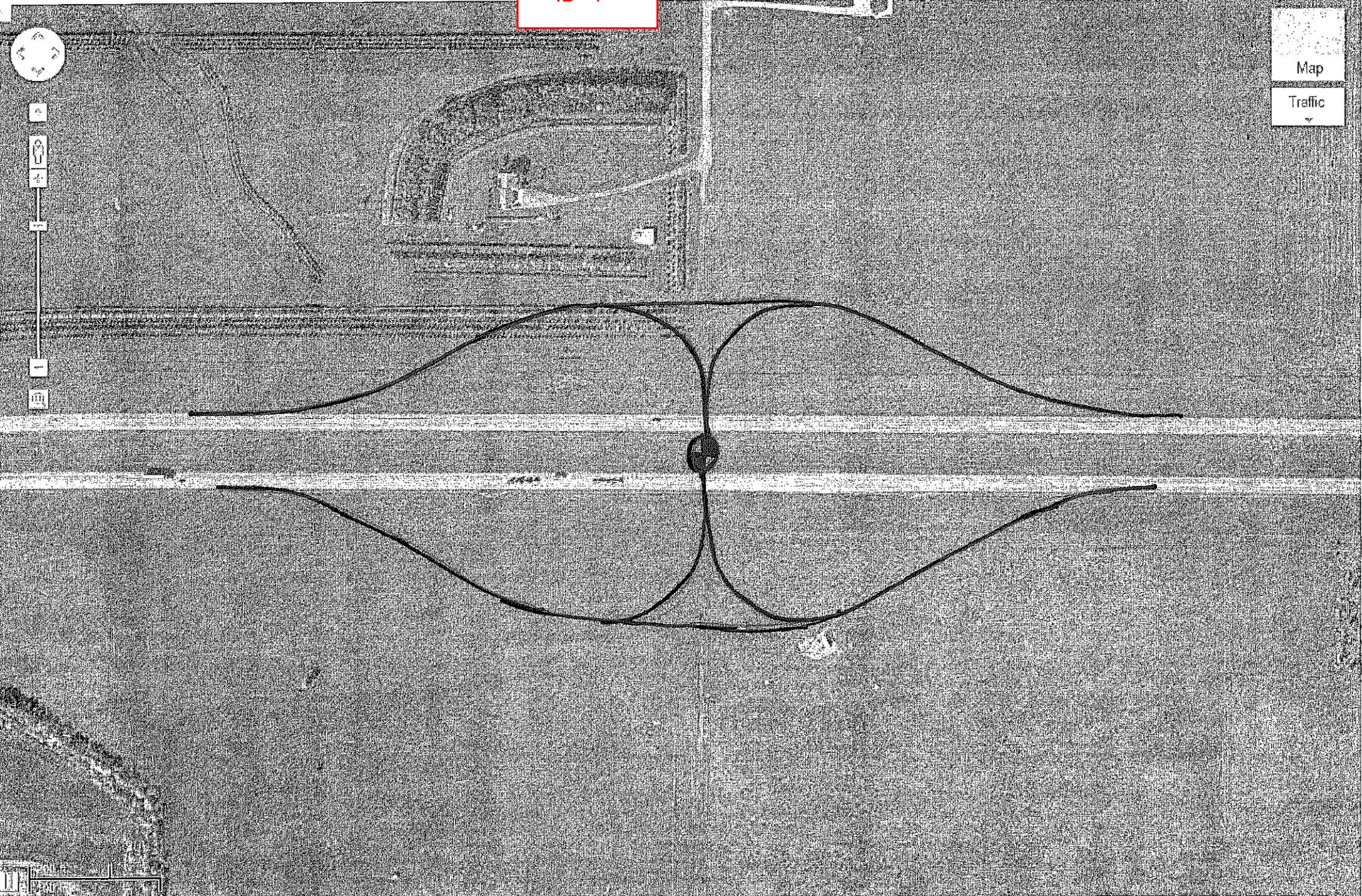


SE Loop 66<sup>th</sup> St.

ID - 0



ID - P

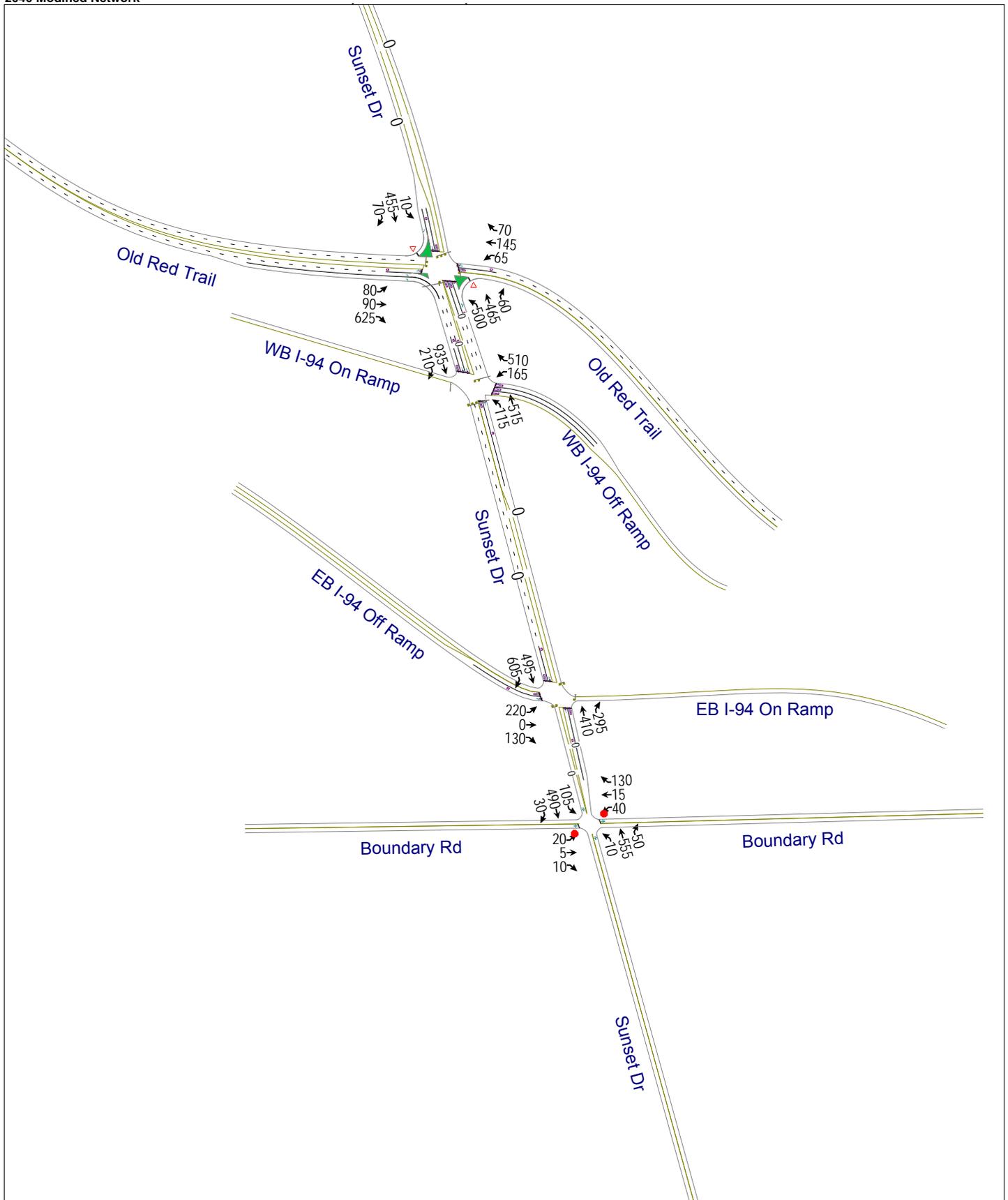


FINAL

# Appendix C – Detailed Measures of Effectiveness Reports

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**205: Sunset Dr & Boundary Rd Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.2	0.2	0.2	0.4	0.5	0.4	0.0	0.0	0.0
Total Del/Veh (s)	33.9	38.1	16.7	35.9	38.2	21.9	7.3	2.2	1.9	6.8	3.4	2.8

**205: Sunset Dr & Boundary Rd Performance by movement**

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	6.6

**210: EB I-94 Off Ramp/EB I-94 On Ramp & Sunset Dr Performance by movement**

Movement	EBL	EBR	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	3.3	0.6	0.0	0.0	0.0	0.0	0.4
Total Del/Veh (s)	37.7	7.9	4.5	2.1	6.2	5.5	8.4

**215: Sunset Dr & WB I-94 On Ramp/WB I-94 Off Ramp Performance by movement**

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	3.3	2.0	0.0	0.0	0.0	0.0	0.6
Total Del/Veh (s)	36.1	8.9	24.6	4.7	10.5	5.4	11.0

**220: Old Red Trail & Sunset Dr Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.3	0.3	0.5	0.1	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	39.2	38.7	7.1	24.3	26.6	17.9	35.3	9.8	3.6	61.7	32.9	8.5

**220: Old Red Trail & Sunset Dr Performance by movement**

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	21.5

**225: Sunset Dr Performance by movement**

Movement	EBL	EBT	EBR	WBL	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.4	0.4	0.1	0.2
Total Del/Veh (s)	18.7	15.2	6.7	22.1	5.1	3.1	2.8	6.9	1.1	1.2	3.9

**Total Network Performance**

Denied Del/Veh (s)	1.0
Total Del/Veh (s)	34.4

**Intersection: 205: Sunset Dr & Boundary Rd**

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	72	178	103	206
Average Queue (ft)	25	77	14	69
95th Queue (ft)	60	145	58	155
Link Distance (ft)	952	1094	1263	300
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 210: EB I-94 Off Ramp/EB I-94 On Ramp & Sunset Dr**

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	TR	T	R	T	R
Maximum Queue (ft)	214	188	150	85	201	168
Average Queue (ft)	124	38	66	34	84	65
95th Queue (ft)	188	97	129	68	159	123
Link Distance (ft)		1047	300		821	821
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	200			200		
Storage Blk Time (%)	1	0				
Queuing Penalty (veh)	1	0				

**Intersection: 215: Sunset Dr & WB I-94 On Ramp/WB I-94 Off Ramp**

Movement	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	R	L	T	T	T	R
Maximum Queue (ft)	189	153	133	119	162	207	267	52
Average Queue (ft)	92	66	62	58	60	89	98	23
95th Queue (ft)	165	121	102	106	118	177	199	50
Link Distance (ft)		891			821	247	247	247
Upstream Blk Time (%)						0	0	
Queuing Penalty (veh)						0	0	
Storage Bay Dist (ft)	325		325	250				
Storage Blk Time (%)								
Queuing Penalty (veh)								

**Intersection: 220: Old Red Trail & Sunset Dr**

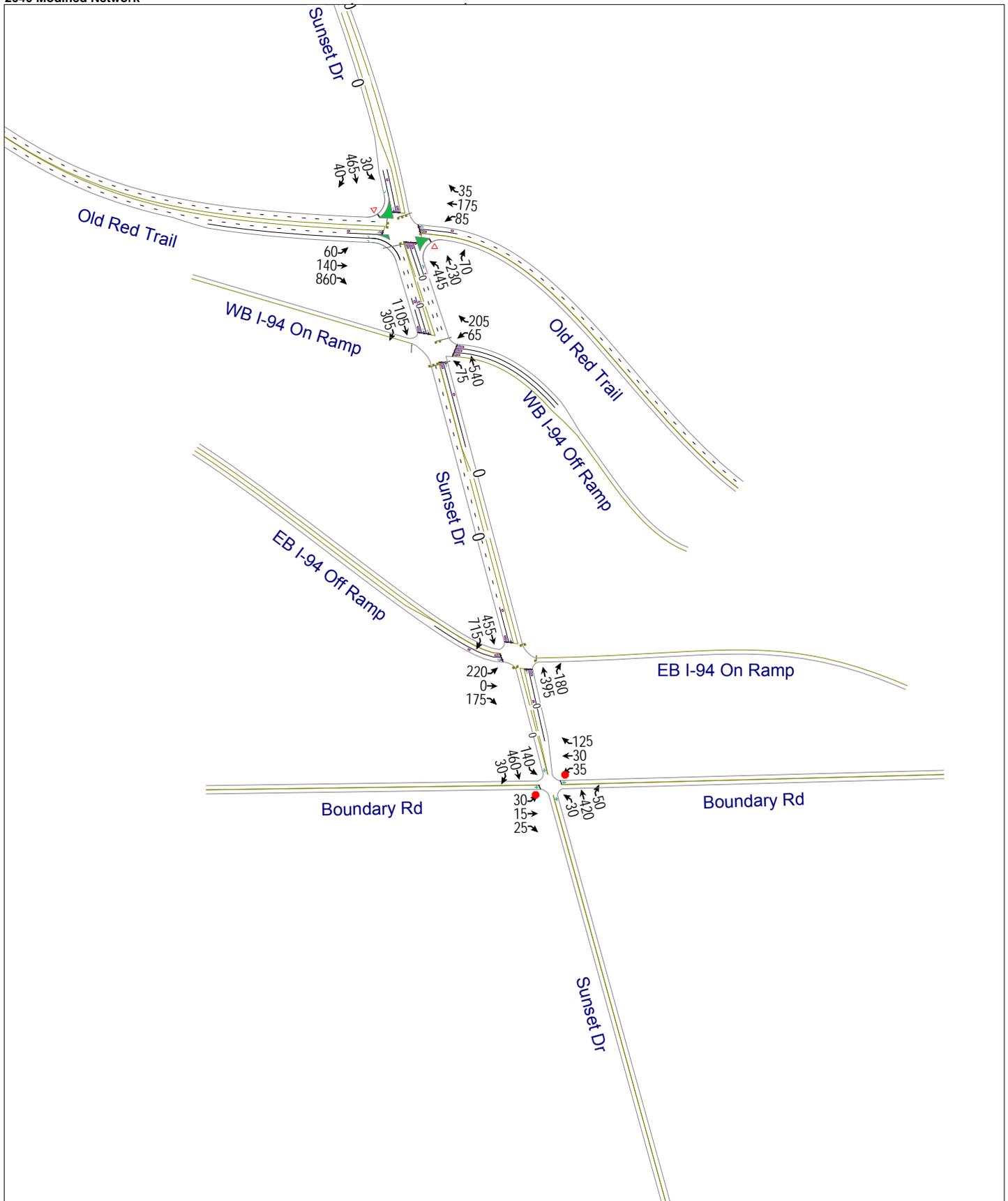
Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	R	L	TR	L	L	TR	L	T	R
Maximum Queue (ft)	245	256	140	73	212	209	232	244	92	545	225
Average Queue (ft)	102	112	8	26	89	130	140	119	8	242	42
95th Queue (ft)	180	237	58	62	163	195	204	218	51	447	187
Link Distance (ft)	1384	1384		1189	1189	247	247	247		1001	
Upstream Blk Time (%)						0	0	0			
Queuing Penalty (veh)						0	0	1			
Storage Bay Dist (ft)			500						125		125
Storage Blk Time (%)										31	
Queuing Penalty (veh)										25	

**Intersection: 225: Sunset Dr**

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	40	134	93	79
Average Queue (ft)	9	39	9	5
95th Queue (ft)	28	90	49	36
Link Distance (ft)	732	612	1001	987
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Network Summary**

Network wide Queuing Penalty: 28
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2040 Modified Network Alt O1 PM Peak Hour - Mandan - Imp 9-Sunset SW Loop

205: Sunset Dr & Boundary Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.3	0.3	0.2	0.4	0.4	0.4	0.0	0.0	0.0
Total Del/Veh (s)	37.3	32.4	17.4	51.3	40.8	26.0	5.6	2.2	1.5	5.9	3.0	2.2

205: Sunset Dr & Boundary Rd Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	8.4

210: EB I-94 Off Ramp/EB I-94 On Ramp & Sunset Dr Performance by movement

Movement	EBL	EBR	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	3.3	0.8	0.0	0.0	0.0	0.0	0.4
Total Del/Veh (s)	36.7	8.1	4.6	1.6	5.9	6.6	8.9

215: Sunset Dr & WB I-94 On Ramp/WB I-94 Off Ramp Performance by movement

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	3.8	1.5	0.0	0.0	0.0	0.0	0.2
Total Del/Veh (s)	43.3	7.0	26.9	3.2	7.8	6.4	7.9

220: Old Red Trail & Sunset Dr Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.4	0.4	0.6	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	40.7	38.1	15.6	30.7	24.7	18.7	35.6	7.0	1.7	29.9	28.6	7.4

220: Old Red Trail & Sunset Dr Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	23.3

225: Sunset Dr Performance by movement

Movement	EBL	EBT	EBR	WBL	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.6	0.4	0.4	0.2
Total Del/Veh (s)	6.5	13.2	4.2	11.1	5.5	1.9	1.2	3.3	1.1	0.7	2.4

Total Network Performance

Denied Del/Veh (s)	0.7
Total Del/Veh (s)	34.6

**Intersection: 205: Sunset Dr & Boundary Rd**

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	122	235	82	148
Average Queue (ft)	41	96	24	64
95th Queue (ft)	86	201	69	125
Link Distance (ft)	952	1094	1263	300
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Intersection: 210: EB I-94 Off Ramp/EB I-94 On Ramp & Sunset Dr**

Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	TR	T	R	T	R
Maximum Queue (ft)	216	135	170	61	157	202
Average Queue (ft)	124	44	69	26	76	91
95th Queue (ft)	197	92	135	53	138	166
Link Distance (ft)		1047	300		821	821
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	200			200		
Storage Blk Time (%)	1	0	0			
Queuing Penalty (veh)	2	0	0			

**Intersection: 215: Sunset Dr & WB I-94 On Ramp/WB I-94 Off Ramp**

Movement	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	R	L	T	T	T	R
Maximum Queue (ft)	123	98	86	98	122	169	196	75
Average Queue (ft)	42	36	31	43	40	57	81	30
95th Queue (ft)	90	65	62	80	99	130	154	64
Link Distance (ft)		891			821	247	247	247
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	325		325	250				
Storage Blk Time (%)								
Queuing Penalty (veh)								

**Intersection: 220: Old Red Trail & Sunset Dr**

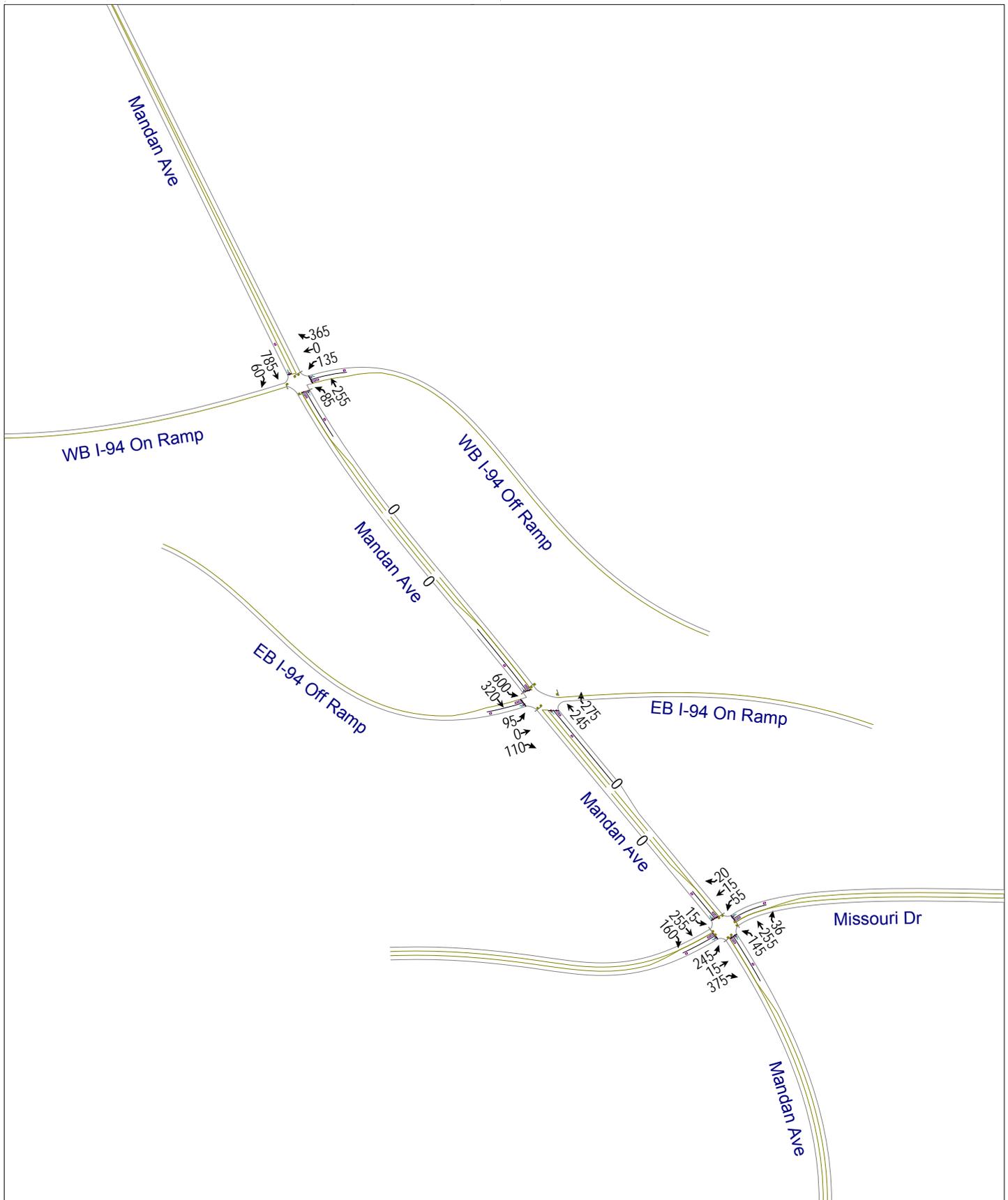
Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	R	L	TR	L	L	TR	L	T	R
Maximum Queue (ft)	226	427	380	142	172	249	237	139	224	416	225
Average Queue (ft)	113	207	87	51	84	127	134	47	37	234	32
95th Queue (ft)	191	387	280	111	154	214	208	97	140	377	161
Link Distance (ft)	1384	1384		1189	1189	247	247	247		1001	
Upstream Blk Time (%)						1	0				
Queuing Penalty (veh)						2	1				
Storage Bay Dist (ft)			500						125		125
Storage Blk Time (%)										29	
Queuing Penalty (veh)										20	

**Intersection: 225: Sunset Dr**

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	18	70	66	34
Average Queue (ft)	7	26	6	2
95th Queue (ft)	21	53	35	20
Link Distance (ft)	732	612	1001	987
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Network Summary**

Network wide Queuing Penalty: 24
----------------------------------



**305: Mandan Ave & Missouri Dr Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.2	1.0	1.1	4.1	0.2	0.3	3.4	0.7	0.9	0.2	0.0	0.0
Total Del/Veh (s)	20.0	26.0	13.3	24.0	31.3	10.8	15.8	10.2	7.0	12.4	20.4	13.7

**305: Mandan Ave & Missouri Dr Performance by movement**

Movement	All
Denied Del/Veh (s)	1.4
Total Del/Veh (s)	15.7

**310: Mandan Ave & EB I-94 Off Ramp/EB I-94 On Ramp Performance by movement**

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	3.1	0.4	0.0	0.1	0.0	0.0	0.2
Total Del/Veh (s)	28.5	6.3	29.9	17.1	20.4	8.5	18.6

**315: Mandan Ave & WB I-94 On Ramp/WB I-94 Off Ramp Performance by movement**

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	2.5	0.6	0.0	0.0	0.8	0.7	0.7
Total Del/Veh (s)	31.9	9.2	20.7	7.6	15.4	12.6	14.3

**Total Network Performance**

Denied Del/Veh (s)	1.4
Total Del/Veh (s)	30.4

**Intersection: 305: Mandan Ave & Missouri Dr**

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	200	345	75	84	148	181	101	266
Average Queue (ft)	100	120	37	31	64	82	13	141
95th Queue (ft)	172	238	68	66	112	141	55	237
Link Distance (ft)		950		836		1056		745
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	100		100		150		100	
Storage Blk Time (%)	6	9		0	0	0		14
Queuing Penalty (veh)	24	22		0	1	0		2

**Intersection: 310: Mandan Ave & EB I-94 Off Ramp/EB I-94 On Ramp**

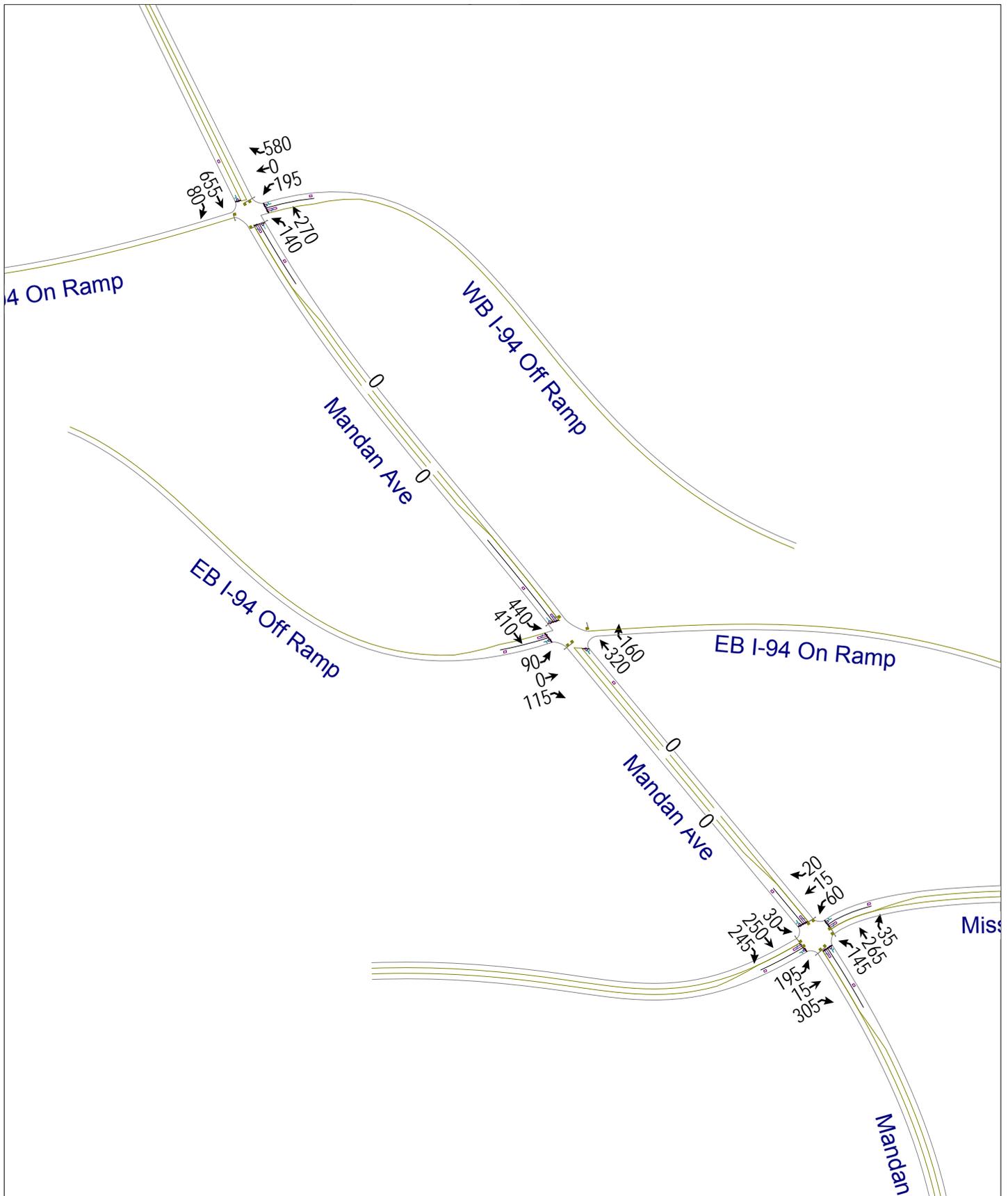
Movement	EB	EB	NB	NB	SB	SB
Directions Served	L	TR	T	R	L	T
Maximum Queue (ft)	128	84	262	232	323	316
Average Queue (ft)	59	35	115	101	178	70
95th Queue (ft)	104	68	213	187	293	188
Link Distance (ft)		1188	745			1067
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	100			275	225	
Storage Blk Time (%)	3	0	0	0	4	
Queuing Penalty (veh)	3	0	1	0	13	

**Intersection: 315: Mandan Ave & WB I-94 On Ramp/WB I-94 Off Ramp**

Movement	WB	WB	NB	NB	SB
Directions Served	L	TR	L	T	TR
Maximum Queue (ft)	169	176	93	129	428
Average Queue (ft)	79	86	49	49	203
95th Queue (ft)	135	144	87	108	349
Link Distance (ft)		1423		1067	1543
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	100		150		
Storage Blk Time (%)	5	3		0	
Queuing Penalty (veh)	17	5		0	

**Network Summary**

Network wide Queuing Penalty: 88
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**305: Mandan Ave & Missouri Dr Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.2	0.9	0.8	3.9	0.2	0.5	3.4	0.6	0.7	0.0	0.0	0.0
Total Del/Veh (s)	21.9	22.4	10.6	24.9	29.3	8.2	16.7	9.9	6.4	12.6	19.3	12.9

**305: Mandan Ave & Missouri Dr Performance by movement**

Movement	All
Denied Del/Veh (s)	1.1
Total Del/Veh (s)	14.8

**310: Mandan Ave & EB I-94 Off Ramp/EB I-94 On Ramp Performance by movement**

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	3.1	0.4	0.0	0.0	0.0	0.0	0.2
Total Del/Veh (s)	32.1	7.2	34.1	26.4	21.7	7.7	20.5

**315: Mandan Ave & WB I-94 On Ramp/WB I-94 Off Ramp Performance by movement**

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	2.5	1.0	0.0	0.0	0.7	0.7	0.8
Total Del/Veh (s)	37.8	22.8	31.6	14.4	34.3	30.2	28.0

**Total Network Performance**

Denied Del/Veh (s)	1.3
Total Del/Veh (s)	40.4

**Intersection: 305: Mandan Ave & Missouri Dr**

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	183	180	79	85	128	185	199	337
Average Queue (ft)	80	97	36	29	62	78	26	153
95th Queue (ft)	150	159	67	65	106	152	95	268
Link Distance (ft)		950		836		1056		753
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	100		100		150		100	
Storage Blk Time (%)	6	4	0	0	0	1		15
Queuing Penalty (veh)	19	9	0	0	0	1		4

**Intersection: 310: Mandan Ave & EB I-94 Off Ramp/EB I-94 On Ramp**

Movement	EB	EB	NB	SB	SB
Directions Served	L	TR	TR	L	T
Maximum Queue (ft)	122	112	404	285	216
Average Queue (ft)	57	42	216	171	75
95th Queue (ft)	106	80	362	280	173
Link Distance (ft)		1188	753		1067
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	100			225	
Storage Blk Time (%)	2	0		3	
Queuing Penalty (veh)	2	0		11	

**Intersection: 315: Mandan Ave & WB I-94 On Ramp/WB I-94 Off Ramp**

Movement	WB	WB	NB	NB	SB
Directions Served	L	TR	L	T	TR
Maximum Queue (ft)	200	496	174	200	745
Average Queue (ft)	137	219	78	94	344
95th Queue (ft)	227	408	143	175	654
Link Distance (ft)		1423		1067	1543
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	100		150		
Storage Blk Time (%)	13	32	1	1	
Queuing Penalty (veh)	78	63	3	2	

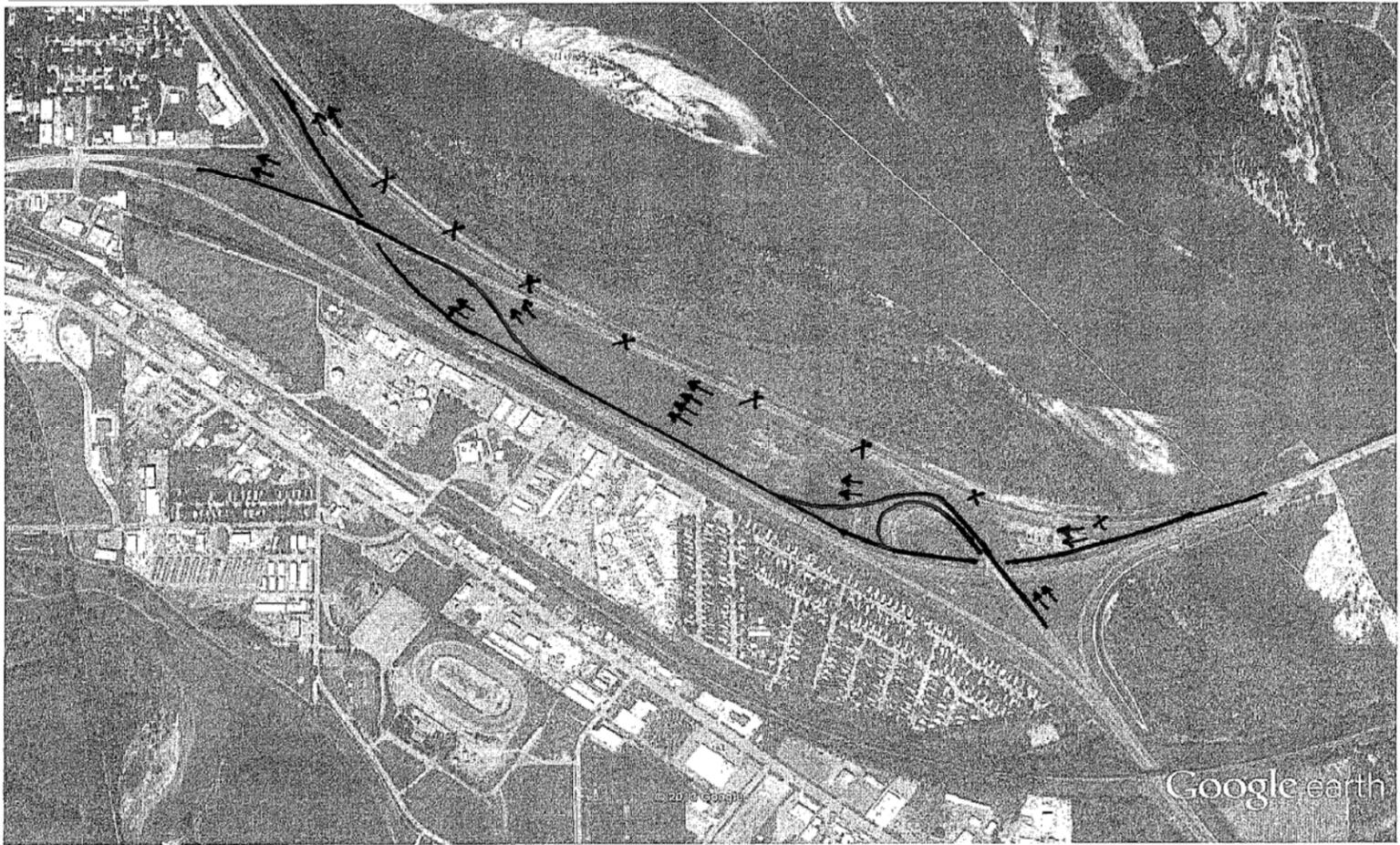
**Network Summary**

Network wide Queuing Penalty: 192

# Year 2040 Alternative C

## Freeway MOEs

ID - C



**Bismarck-Mandan I-94 Corridor Study**

Year 2040 Build Alternative C CORSIM Model  
Freeway MOEs - AM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
EB I-94 Mainline	EB I-94 Mainline	5110	5114	51105114	2	1900	624	622	-2	0%	69	4	A			
EB I-94 Mainline	TH 25 Off-Ramp	5114	5118	51145118	2	1537	624	618	-6	-1%	69	4	A	69	4	A
TH 25 Off-Ramp	EB I-94 Mainline	5118	5122	51185122	2	1132	573	565	-8	-1%	69	4	A	69	4	A
EB I-94 Mainline	TH 25 On-Ramp	5122	5126	51225126	2	1076	573	565	-8	-1%	69	4	A			
TH 25 On-Ramp	EB I-94 Mainline	5126	5130	51265130	2	1930	999	986	-13	-1%	66	8	A			
EB I-94 Mainline	EB I-94 Mainline	5130	5134	51305134	2	1995	999	983	-16	-2%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5134	5138	51345138	2	1972	999	982	-17	-2%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5138	5142	51385142	2	1931	999	982	-17	-2%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5142	5146	51425146	2	1950	999	982	-17	-2%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5146	5150	51465150	2	1927	999	979	-20	-2%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5150	5154	51505154	2	1946	999	977	-22	-2%	66	7	A	66	7	A
EB I-94 Mainline	EB I-94 Mainline	5154	5158	51545158	2	1941	999	976	-23	-2%	65	7	A			
EB I-94 Mainline	EB I-94 Mainline	5158	5162	51585162	2	1941	999	977	-22	-2%	66	7	A			
EB I-94 Mainline	EB I-94 Mainline	5162	5166	51625166	2	1951	999	977	-22	-2%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5166	5170	51665170	2	1957	999	972	-27	-3%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5170	5174	51705174	2	1560	999	972	-27	-3%	63	8	A			
EB I-94 Mainline	Sunset Dr Off-Ramp	5174	5178	51745178	2	1523	999	969	-30	-3%	62	8	A			
Sunset Dr Off-Ramp	EB I-94 Mainline	5178	5182	51785182	2	1577	649	647	-2	0%	64	5	A	64	5	A
EB I-94 Mainline	Sunset Dr On-Ramp	5182	5186	51825186	2	1157	649	647	-2	0%	64	5	A			
Sunset Dr On-Ramp	EB I-94 Mainline	5186	5190	51865190	2	791	1550	1549	-1	0%	60	13	B			
EB I-94 Mainline	EB I-94 Mainline	5190	5194	51905194	2	1162	1550	1547	-3	0%	63	12	B			
EB I-94 Mainline	EB I-94 Mainline	5194	5198	51945198	2	1950	1550	1547	-3	0%	63	12	B	62	12	B
EB I-94 Mainline	EB I-94 Mainline	5198	5310	51985310	2	1401	1550	1546	-4	0%	63	12	B			
EB I-94 Mainline	Mandan Ave Off-Ramp	5310	5314	53105314	2	1398	1550	1545	-5	0%	63	12	B			
Mandan Ave Off-Ramp	EB I-94 Mainline	5314	5318	53145318	2	920	1349	1341	-8	-1%	63	11	B	63	11	B
EB I-94 Mainline	Mandan Ave On-Ramp	5318	5322	53185322	2	1091	1349	1343	-6	0%	63	11	B			
Mandan Ave On-Ramp	EB I-94 Mainline	5322	5326	53225326	2	1944	2224	2217	-7	0%	61	18	B			
EB I-94 Mainline	EB I-94 Mainline	5326	5330	53265330	2	1092	2224	2218	-6	0%	62	18	B	61	18	B
EB I-94 Mainline	EB I-94 Mainline	5330	5334	53305334	2	857	2224	2219	-5	0%	62	18	B			
EB I-94 Mainline	Main St On-Ramp	5334	5338	53345338	2	1671	2224	2220	-4	0%	62	18	B			
Main St On-Ramp	EB I-94 Mainline	5338	5342	53385342	3	1621	3399	3386	-13	0%	61	19	B			
EB I-94 Mainline	SB TH 810 Off-Ramp	5342	5346	53425346	3	1502	3399	3379	-20	-1%	58	19	B	59	19	B
SB TH 810 Off-Ramp	EB I-94 Mainline	5346	5350	53465350	2	1073	2100	2066	-34	-2%	61	17	B	61	17	B
EB I-94 Mainline	NB TH 810 On-Ramp	5350	5354	53505354	2	1054	2100	2064	-36	-2%	62	17	B			
NB TH 810 On-Ramp	EB I-94 Mainline	5354	5358	53545358	2	1969	2726	2688	-38	-1%	58	23	C			
EB I-94 Mainline	EB I-94 Mainline	5358	5362	53585362	2	1279	2726	2687	-39	-1%	60	22	C	58	23	C
EB I-94 Mainline	EB I-94 Mainline	5362	5366	53625366	2	1258	2726	2686	-40	-1%	59	23	C			
EB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp Loop	5366	5370	53665370	2	1444	2726	2681	-45	-2%	55	24	C			
Divide Ave/Tyler Pkwy Off-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp	5370	5374	53705374	2	1141	1926	1890	-36	-2%	60	16	B			
Divide Ave/Tyler Pkwy On-Ramp	EB I-94 Mainline	5374	5378	53745378	2	1924	2350	2308	-42	-2%	58	20	B			
EB I-94 Mainline	EB I-94 Mainline	5378	5382	53785382	2	1942	2350	2305	-45	-2%	60	19	B			
EB I-94 Mainline	EB I-94 Mainline	5382	5386	53825386	2	1942	2350	2301	-49	-2%	61	19	B	59	19	B
EB I-94 Mainline	EB I-94 Mainline	5386	5390	53865390	2	1300	2350	2299	-51	-2%	60	19	B			
EB I-94 Mainline	SB State St Off Ramp	5390	5394	53905394	2	1350	2350	2296	-54	-2%	58	20	B			
SB State St Off Ramp	NB State St Off Ramp	5394	5398	53945398	2	961	1859	1832	-27	-1%	60	15	B	61	13	B
NB State St Off Ramp	State St On-Ramp	5398	5510	53985510	2	1232	1200	1177	-23	-2%	63	9	A			
State St On-Ramp	EB I-94 Mainline	5510	5514	55105514	2	1949	1626	1604	-22	-1%	62	13	B			
EB I-94 Mainline	EB I-94 Mainline	5514	5518	55145518	2	1950	1626	1602	-24	-1%	63	13	B			
EB I-94 Mainline	EB I-94 Mainline	5518	5522	55185522	2	1934	1626	1602	-24	-1%	62	13	B	62	13	B
EB I-94 Mainline	EB I-94 Mainline	5522	5526	55225526	2	1369	1626	1600	-26	-2%	62	13	B			
EB I-94 Mainline	NB Centennial Rd Off-Ramp	5526	5530	55265530	2	1263	1626	1603	-23	-1%	61	13	B			
NB Centennial Rd Off-Ramp	SB Bismarck Expy Off Ramp	5530	5534	55305534	2	1015	1154	1125	-29	-3%	63	9	A			
SB Bismarck Expy Off Ramp	Bismarck Expy/Centennial Rd On-Ramp	5534	5538	55345538	2	1278	948	912	-36	-4%	63	7	A			
Bismarck Expy/Centennial Rd On-Ramp	EB I-94 Mainline	5538	5542	55385542	2	1947	1498	1458	-40	-3%	61	12	B			
EB I-94 Mainline	EB I-94 Mainline	5542	5546	55425546	2	1934	1498	1454	-44	-3%	66	11	B			
EB I-94 Mainline	EB I-94 Mainline	5546	5550	55465550	2	1950	1498	1454	-44	-3%	67	11	B			
EB I-94 Mainline	EB I-94 Mainline	5550	5552	55505552	2	1092	1498	1451	-47	-3%	66	11	B	64	11	B
EB I-94 Mainline	EB I-94 Mainline	5552	5554	55525554	2	1782	1498	1448	-50	-3%	64	11	B			
EB I-94 Mainline	66th St Off-Rmap	5554	5558	55545558	2	981	1498	1443	-55	-4%	57	13	B			
66th St Off-Rmap	EB I-94 Mainline	5558	5562	55585562	2	1201	348	340	-8	-2%	66	3	A			
EB I-94 Mainline	66th St On-Ramp	5562	5564	55625564	2	1336	599	591	-8	-1%	66	4	A			
66th St On-Ramp	66th St On-Ramp	5564	5566	55645566	2	1119	599	591	-8	-1%	69	4	A			
66th St On-Ramp	66th St On-Ramp	5566	5570	55665570	2	1725	599	590	-9	-2%	69	4	A	69	4	A
66th St On-Ramp	66th St On-Ramp	5570	5574	55705574	2	1749	599	589	-10	-2%	69	4	A			
EB I-94 Mainline	EB I-94 Mainline	5574	5578	55745578	2	1753	599	589	-10	-2%	69	4	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5118	5218	51185218	1	316	51	51	0	0%	60	1	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5218	5219	52185219	1	407	51	51	0	0%	55	1	A			
TH 25 On-Ramp	TH 25 On-Ramp	5225	5226	52255226	1	354	426	427	1	0%	45	10	A			
TH 25 On-Ramp	TH 25 On-Ramp	5226	5126	52265126	1	222	426	427	1	0%	47	9	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5178	5278	51785278	1	222	350	322	-28	-8%	58	6	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5278	5279	52785279	1	370	350	322	-28	-8%	53	6	A			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5285	5286	52855286	1	208	901	901	0	0%	44	20	C			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5286	5186	52865186	1	198	901	901	0	0%	47	19	B			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5314	5414	53145414	1	153	201	204	3	1%	60	3	A			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5414	5415	54145415	1	207	201	204	3	1%	58	4	A			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5421	5422	54215422	1	118	875	874	-1	0%	44	20	B			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5422	5322	54225322	1	362	875	873	-2	0%	49	18	B			
Main St On-Ramp	Main St On-Ramp	5437	5438	54375438	2	1694	1175	1169	-6	-1%						

Bismarck-Mandan I-94 Corridor Study

Year 2040 Build Alternative C CORSIM Model  
 Freeway MOEs - AM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
WB I-94 Mainline	State St Off-Ramp	6174	6178	61746178	2	1866	1747	1700	-47	-3%	59	14	B			
State St Off-Ramp	NB State St On-Ramp	6178	6182	61786182	2	1208	1178	1141	-37	-3%	61	9	A			
NB State St On-Ramp	SB State St On-Ramp	6182	6186	61826186	2	1002	1623	1582	-41	-3%	60	13	B			
SB State St On-Ramp	WB I-94 Mainline	6186	6190	61866190	2	1418	2179	2138	-41	-2%	60	18	B			
WB I-94 Mainline	WB I-94 Mainline	6190	6194	61906194	2	1300	2179	2134	-45	-2%	62	17	B			
WB I-94 Mainline	WB I-94 Mainline	6194	6198	61946198	2	1941	2179	2128	-51	-2%	62	17	B	61	17	B
WB I-94 Mainline	WB I-94 Mainline	6198	6310	61986310	2	1950	2179	2122	-57	-3%	62	17	B			
WB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp	6310	6314	63106314	2	1973	2179	2120	-59	-3%	61	17	B			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy On-Ramp Loop	6314	6318	63146318	2	1385	1675	1615	-60	-4%	63	13	B			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave /Tyler Pkwy On-Ramp	6318	6322	63186322	2	1169	1835	1776	-59	-3%	62	14	B			
Divide Ave /Tyler Pkwy On-Ramp	WB I-94 Mainline	6322	6326	63226326	2	1257	2425	2361	-64	-3%	60	20	B			
WB I-94 Mainline	WB I-94 Mainline	6326	6330	63266330	2	1279	2425	2356	-69	-3%	61	19	B			
WB I-94 Mainline	WB I-94 Mainline	6330	6334	63306334	2	1913	2425	2345	-80	-3%	61	19	B	60	20	B
WB I-94 Mainline	WB I-94 Mainline	6334	6338	63346338	2	690	2425	2343	-82	-3%	60	19	B			
WB I-94 Mainline	SB TH 810 Off-Ramp	6338	6342	63386342	2	723	2425	2340	-85	-4%	57	20	C			
SB TH 810 Off-Ramp	NB TH 810 On-Ramp	6342	6344	63426344	2	1221	1824	1776	-48	-3%	62	14	B			
NB TH 810 On-Ramp	WB I-94 Mainline	6344	6346	63446346	4	952	2624	2561	-63	-2%	62	10	B			
WB I-94 Mainline	Main St Off-Ramp	6346	6350	63466350	4	1565	2624	2553	-71	-3%	62	10	B	62	10	B
Main St Off-Ramp	WB I-94 Mainline	6350	6354	63506354	2	1590	1823	1786	-37	-2%	62	14	B			
WB I-94 Mainline	WB I-94 Mainline	6354	6358	63546358	2	936	1823	1782	-41	-2%	62	14	B			
WB I-94 Mainline	WB I-94 Mainline	6358	6362	63586362	2	1254	1823	1780	-43	-2%	62	14	B	62	14	B
WB I-94 Mainline	Mandan Ave Off-Ramp	6362	6366	63626366	2	1919	1823	1778	-45	-2%	62	14	B			
Mandan Ave Off-Ramp	WB I-94 Mainline	6366	6370	63666370	2	1098	1323	1292	-31	-2%	63	10	B			
WB I-94 Mainline	Mandan Ave On-Ramp	6370	6374	63706374	2	1496	1323	1290	-33	-2%	62	10	B	62	10	B
Mandan Ave On-Ramp	WB I-94 Mainline	6374	6378	63746378	2	733	1474	1438	-36	-2%	61	12	B			
WB I-94 Mainline	WB I-94 Mainline	6378	6382	63786382	2	1404	1474	1434	-40	-3%	61	12	B			
WB I-94 Mainline	WB I-94 Mainline	6382	6386	63826386	2	1942	1474	1431	-43	-3%	60	12	B	59	12	B
WB I-94 Mainline	WB I-94 Mainline	6386	6390	63866390	2	1158	1474	1428	-46	-3%	58	12	B			
WB I-94 Mainline	Sunset Dr Off-Ramp	6390	6394	63906394	2	1186	1474	1425	-49	-3%	55	13	B			
Sunset Dr Off-Ramp	WB I-94 Mainline	6394	6398	63946398	2	1154	800	789	-11	-1%	60	7	A	60	7	A
WB I-94 Mainline	Sunset Dr On-Ramp	6398	6510	63986510	2	1807	800	789	-11	-1%	60	7	A			
Sunset Dr On-Ramp	WB I-94 Mainline	6510	6514	65106514	2	884	1125	1111	-14	-1%	59	9	A			
WB I-94 Mainline	WB I-94 Mainline	6514	6518	65146518	2	1564	1125	1112	-13	-1%	64	9	A			
WB I-94 Mainline	WB I-94 Mainline	6518	6522	65186522	2	1961	1125	1109	-16	-1%	66	8	A			
WB I-94 Mainline	WB I-94 Mainline	6522	6526	65226526	2	1953	1125	1110	-15	-1%	67	8	A			
WB I-94 Mainline	WB I-94 Mainline	6526	6530	65266530	2	1938	1125	1107	-18	-2%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6530	6534	65306534	2	1961	1125	1104	-21	-2%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6534	6538	65346538	2	1964	1125	1104	-21	-2%	68	8	A	67	8	A
WB I-94 Mainline	WB I-94 Mainline	6538	6542	65386542	2	1925	1125	1101	-24	-2%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6542	6546	65426546	2	1950	1125	1097	-28	-2%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6546	6550	65466550	2	1930	1125	1095	-30	-3%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6550	6554	65506554	2	1939	1125	1094	-31	-3%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6554	6558	65546558	2	1990	1125	1091	-34	-3%	68	8	A			
WB I-94 Mainline	TH 25 Off-Ramp	6558	6562	65586562	2	1890	1125	1088	-37	-3%	66	8	A			
TH 25 Off-Ramp	WB I-94 Mainline	6562	6566	65626566	2	1154	901	853	-48	-5%	67	6	A	67	6	A
WB I-94 Mainline	TH 25 On-Ramp	6566	6570	65666570	2	1045	901	853	-48	-5%	67	6	A			
TH 25 On-Ramp	WB I-94 Mainline	6570	6574	65706574	2	1627	976	926	-50	-5%	65	7	A	65	7	A
WB I-94 Mainline	WB I-94 Mainline	6574	6578	65746578	2	1898	976	923	-53	-5%	64	7	A			
66th St Off-Ramp	66th St Off-Ramp	6126	6226	61266226	1	271	251	259	8	3%	58	4	A			
66th St Off-Ramp	66th St Off-Ramp	6226	6227	62266227	1	202	251	259	8	3%	56	5	A			
66th St On-Ramp	66th St On-Ramp	6233	6234	62336234	1	265	1225	1225	0	0%	44	28	C			
66th St On-Ramp	66th St On-Ramp	6234	6134	62346134	1	257	1225	1224	-1	0%	48	26	C			
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6150	6250	61506250	1	249	302	289	-13	-4%	59	5	A			
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6250	6251	62506251	1	380	302	288	-14	-5%	54	5	A			
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6253	6254	62536254	1	130	341	341	0	0%	45	8	A			
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6254	6154	62546154	1	201	341	341	0	0%	47	7	A			
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6257	6258	62576258	1	279	285	285	0	0%	45	6	A			
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6258	6158	62586158	1	201	285	284	-1	0%	47	6	A			
State St Off-Ramp	State St Off-Ramp	6178	6278	61786278	1	215	569	556	-13	-2%	56	10	A			
State St Off-Ramp	State St Off-Ramp	6278	6279	62786279	1	315	569	555	-14	-2%	53	11	B			
NB State St On-Ramp	NB State St On-Ramp	6281	6282	62816282	1	148	445	443	-2	0%	45	10	A			
NB State St On-Ramp	NB State St On-Ramp	6282	6182	62826182	1	195	445	443	-2	0%	47	9	A			
SB State St On-Ramp	SB State St On-Ramp	6285	6286	62856286	1	426	556	557	1	0%	45	12	B			
SB State St On-Ramp	SB State St On-Ramp	6286	6186	62866186	1	198	556	557	1	0%	47	12	B			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6314	6414	63146414	1	241	504	501	-3	-1%	58	9	A			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6414	6415	64146415	1	534	504	500	-4	-1%	50	10	A			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6417	6418	64176418	1	237	160	161	1	1%	35	5	A			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6418	6318	64186318	1	200	160	161	1	1%	39	4	A			
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6421	6422	64216422	1	466	590	592	2	0%	45	13	B			
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6422	6322	64226322	1	200	590	591	1	0%	47	13	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6342	6436	63426436	1	430	601	559	-42	-7%	44	13	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6436	6437	64366437	1	320	601	558	-43	-7%	38	15	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6437	6438	64376438	1	568	601	557	-44	-7%	34	16	B			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6440	6442	64406442	2	455	800	790	-10	-1%	59	7	A			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6442	6443	64426443	2	405	800	790	-10	-1%	54	7	A			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6443	6444	64436444	2	377	800	790	-10	-1%	49	8	A			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6444	6344	64446344	2	358	800	788	-12	-2%	53	7	A			
Main St Off-Ramp	Main St Off-Ramp	6350	6450	63506450	2	506	801	764	-37	-5%	59	7	A			
Main St Off-Ramp	Main St Off-Ramp	6450	6451	64506451	2	524	801	764	-37	-5%	51	7	A			
Main St Off-Ramp	Main St Off-Ramp	6451	6452	64516452	2	672	801	764	-37	-5%	44	9	A			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	6366	6466	63666466	1	473	500	487	-13	-3%	58	8	A			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	6466	6467	64666467	1	210	500	487	-13	-3%	55	9	A			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	6473	6474	64736474	1	418	151	151	0	0%	45	3	A			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	6474	6374	64746374	1	205	151	151	0	0%	47	3	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	6394	6494	63946494	1	201	674	634	-40	-6%	52	12	B			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	6494	6495	64946495	1	290	674	633	-41	-6%	50	13	B			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	6609	6610	66096610	1	251	325	323	-2	-1%	45	7	A			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	6610	6510	66106510	1	202	325	323	-2	-1%	47	7	A			
TH																

**Bismarck-Mandan I-94 Corridor Study**

Year 2040 Build Alternative C CORSIM Model  
Freeway MOEs - PM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
EB I-94 Mainline	EB I-94 Mainline	5110	5114	51105114	2	1900	750	751	1	0%	69	5	A			
EB I-94 Mainline	TH 25 Off-Ramp	5114	5118	51145118	2	1537	750	750	0	0%	69	5	A	69	5	A
TH 25 Off-Ramp	EB I-94 Mainline	5118	5122	51185122	2	1132	675	674	-1	0%	69	5	A	69	5	A
EB I-94 Mainline	TH 25 On-Ramp	5122	5126	51225126	2	1076	675	673	-2	0%	69	5	A			
TH 25 On-Ramp	EB I-94 Mainline	5126	5130	51265130	2	1930	925	923	-2	0%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5130	5134	51305134	2	1995	925	922	-3	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5134	5138	51345138	2	1972	925	922	-3	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5138	5142	51385142	2	1931	925	920	-5	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5142	5146	51425146	2	1950	925	919	-6	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5146	5150	51465150	2	1927	925	916	-9	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5150	5154	51505154	2	1946	925	914	-11	-1%	66	7	A	67	7	A
EB I-94 Mainline	EB I-94 Mainline	5154	5158	51545158	2	1941	925	912	-13	-1%	66	7	A			
EB I-94 Mainline	EB I-94 Mainline	5158	5162	51585162	2	1941	925	912	-13	-1%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5162	5166	51625166	2	1951	925	910	-15	-2%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5166	5170	51665170	2	1957	925	911	-14	-2%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5170	5174	51705174	2	1560	925	908	-17	-2%	63	7	A			
EB I-94 Mainline	Sunset Dr Off-Ramp	5174	5178	51745178	2	1523	925	908	-17	-2%	63	7	A			
Sunset Dr Off-Ramp	EB I-94 Mainline	5178	5182	51785182	2	1577	526	518	-8	-2%	64	4	A	64	4	A
EB I-94 Mainline	Sunset Dr On-Ramp	5182	5186	51825186	2	1157	526	518	-8	-2%	64	4	A			
Sunset Dr On-Ramp	EB I-94 Mainline	5186	5190	51865190	2	791	1426	1420	-6	0%	60	12	B			
EB I-94 Mainline	EB I-94 Mainline	5190	5194	51905194	2	1162	1426	1417	-9	-1%	63	11	B			
EB I-94 Mainline	EB I-94 Mainline	5194	5198	51945198	2	1950	1426	1422	-4	0%	63	11	B	62	11	B
EB I-94 Mainline	EB I-94 Mainline	5198	5310	51985310	2	1401	1426	1421	-5	0%	63	11	B			
EB I-94 Mainline	Mandan Ave Off-Ramp	5310	5314	53105314	2	1398	1426	1420	-6	0%	63	11	B			
Mandan Ave Off-Ramp	EB I-94 Mainline	5314	5318	53145318	2	920	1226	1221	-5	0%	64	10	A	63	10	A
EB I-94 Mainline	Mandan Ave On-Ramp	5318	5322	53185322	2	1091	1226	1219	-7	-1%	63	10	A			
Mandan Ave On-Ramp	EB I-94 Mainline	5322	5326	53225326	2	1944	1825	1815	-10	-1%	62	15	B			
EB I-94 Mainline	EB I-94 Mainline	5326	5330	53265330	2	1092	1825	1815	-10	-1%	63	14	B	62	15	B
EB I-94 Mainline	EB I-94 Mainline	5330	5334	53305334	2	857	1825	1813	-12	-1%	63	15	B			
EB I-94 Mainline	Main St On-Ramp	5334	5338	53345338	2	1671	1825	1814	-11	-1%	62	15	B			
Main St On-Ramp	EB I-94 Mainline	5338	5342	53385342	3	1621	2950	2941	-9	0%	61	16	B			
EB I-94 Mainline	SB TH 810 Off-Ramp	5342	5346	53425346	3	1502	2950	2938	-12	0%	60	16	B	60	16	B
SB TH 810 Off-Ramp	EB I-94 Mainline	5346	5350	53465350	2	1073	2050	2042	-8	0%	62	16	B	62	16	B
EB I-94 Mainline	NB TH 810 On-Ramp	5350	5354	53505354	2	1054	2050	2040	-10	0%	62	16	B			
NB TH 810 On-Ramp	EB I-94 Mainline	5354	5358	53545358	2	1969	2768	2757	-11	0%	58	24	C			
EB I-94 Mainline	EB I-94 Mainline	5358	5362	53585362	2	1279	2768	2757	-11	0%	61	23	C	58	24	C
EB I-94 Mainline	EB I-94 Mainline	5362	5366	53625366	2	1258	2768	2755	-13	0%	59	23	C			
EB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp Loop	5366	5370	53665370	2	1444	2768	2755	-13	0%	55	25	C			
Divide Ave/Tyler Pkwy Off-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp	5370	5374	53705374	2	1141	1793	1755	-38	-2%	60	15	B			
Divide Ave/Tyler Pkwy On-Ramp	EB I-94 Mainline	5374	5378	53745378	2	1924	2244	2205	-39	-2%	59	19	B			
EB I-94 Mainline	EB I-94 Mainline	5378	5382	53785382	2	1942	2244	2207	-37	-2%	60	18	B			
EB I-94 Mainline	EB I-94 Mainline	5382	5386	53825386	2	1942	2244	2204	-40	-2%	61	18	B	60	18	B
EB I-94 Mainline	EB I-94 Mainline	5386	5390	53865390	2	1300	2244	2205	-39	-2%	61	18	B			
EB I-94 Mainline	SB State St Off Ramp	5390	5394	53905394	2	1350	2244	2205	-39	-2%	59	19	B			
SB State St Off Ramp	NB State St Off Ramp	5394	5398	53945398	2	961	1798	1762	-36	-2%	61	15	B	61	12	B
NB State St Off Ramp	State St On-Ramp	5398	5510	53985510	2	1232	1169	1166	-3	0%	63	9	A			
State St On-Ramp	EB I-94 Mainline	5510	5514	55105514	2	1949	1743	1739	-4	0%	62	14	B			
EB I-94 Mainline	EB I-94 Mainline	5514	5518	55145518	2	1950	1743	1738	-5	0%	63	14	B			
EB I-94 Mainline	EB I-94 Mainline	5518	5522	55185522	2	1934	1743	1738	-5	0%	62	14	B	62	14	B
EB I-94 Mainline	EB I-94 Mainline	5522	5526	55225526	2	1369	1743	1738	-5	0%	62	14	B			
EB I-94 Mainline	NB Centennial Rd Off-Ramp	5526	5530	55265530	2	1263	1743	1735	-8	0%	61	14	B			
NB Centennial Rd Off-Ramp	SB Bismarck Expy Off Ramp	5530	5534	55305534	2	1015	1367	1350	-17	-1%	62	11	B			
SB Bismarck Expy Off Ramp	Bismarck Expy/Centennial Rd On-Ramp	5534	5538	55345538	2	1278	972	957	-15	-2%	63	8	A			
Bismarck Expy/Centennial Rd On-Ramp	EB I-94 Mainline	5538	5542	55385542	2	1947	1823	1806	-17	-1%	61	15	B			
EB I-94 Mainline	EB I-94 Mainline	5542	5546	55425546	2	1934	1823	1808	-15	-1%	66	14	B			
EB I-94 Mainline	EB I-94 Mainline	5546	5550	55465550	2	1950	1823	1806	-17	-1%	66	14	B			
EB I-94 Mainline	EB I-94 Mainline	5550	5552	55505552	2	1092	1823	1809	-14	-1%	66	14	B	63	14	B
EB I-94 Mainline	EB I-94 Mainline	5552	5554	55525554	2	1782	1823	1812	-11	-1%	63	14	B			
EB I-94 Mainline	66th St Off-Rmap	5554	5558	55545558	2	981	1823	1814	-9	0%	56	16	B			
66th St Off-Rmap	EB I-94 Mainline	5558	5562	55585562	2	1201	500	496	-4	-1%	66	4	A			
EB I-94 Mainline	66th St On-Ramp	5562	5564	55625564	2	1336	800	797	-3	0%	66	6	A			
66th St On-Ramp	66th St On-Ramp	5564	5566	55645566	2	1119	800	797	-3	0%	69	6	A			
66th St On-Ramp	66th St On-Ramp	5566	5570	55665570	2	1725	800	798	-2	0%	69	6	A	68	6	A
66th St On-Ramp	66th St On-Ramp	5570	5574	55705574	2	1749	800	802	2	0%	69	6	A			
EB I-94 Mainline	EB I-94 Mainline	5574	5578	55745578	2	1753	800	798	-2	0%	69	6	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5118	5218	51185218	1	316	75	76	1	1%	59	1	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5218	5219	52185219	1	407	75	76	1	1%	54	1	A			
TH 25 On-Ramp	TH 25 On-Ramp	5225	5226	52255226	1	354	250	249	-1	0%	45	6	A			
TH 25 On-Ramp	TH 25 On-Ramp	5226	5126	52265126	1	222	250	249	-1	0%	47	5	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5178	5278	51785278	1	222	399	389	-10	-3%	58	7	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5278	5279	52785279	1	370	399	389	-10	-3%	53	7	A			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5285	5286	52855286	1	208	900	901	1	0%	44	20	C			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5286	5186	52865186	1	198	900	902	2	0%	47	19	B			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5314	5414	53145414	1	153	200	198	-2	-1%	59	3	A			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5414	5415	54145415	1	207	200	198	-2	-1%	57	3	A			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5421	5422	54215422	1	118	599	601	2	0%	44	14	B			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5422	5322	54225322	1	362	599	600	1	0%	49	12	B			
Main St On-Ramp	Main St On-Ramp	5437	5438	54375438	2	1694	1125	1130	5	0%	42	13				

Bismarck-Mandan I-94 Corridor Study

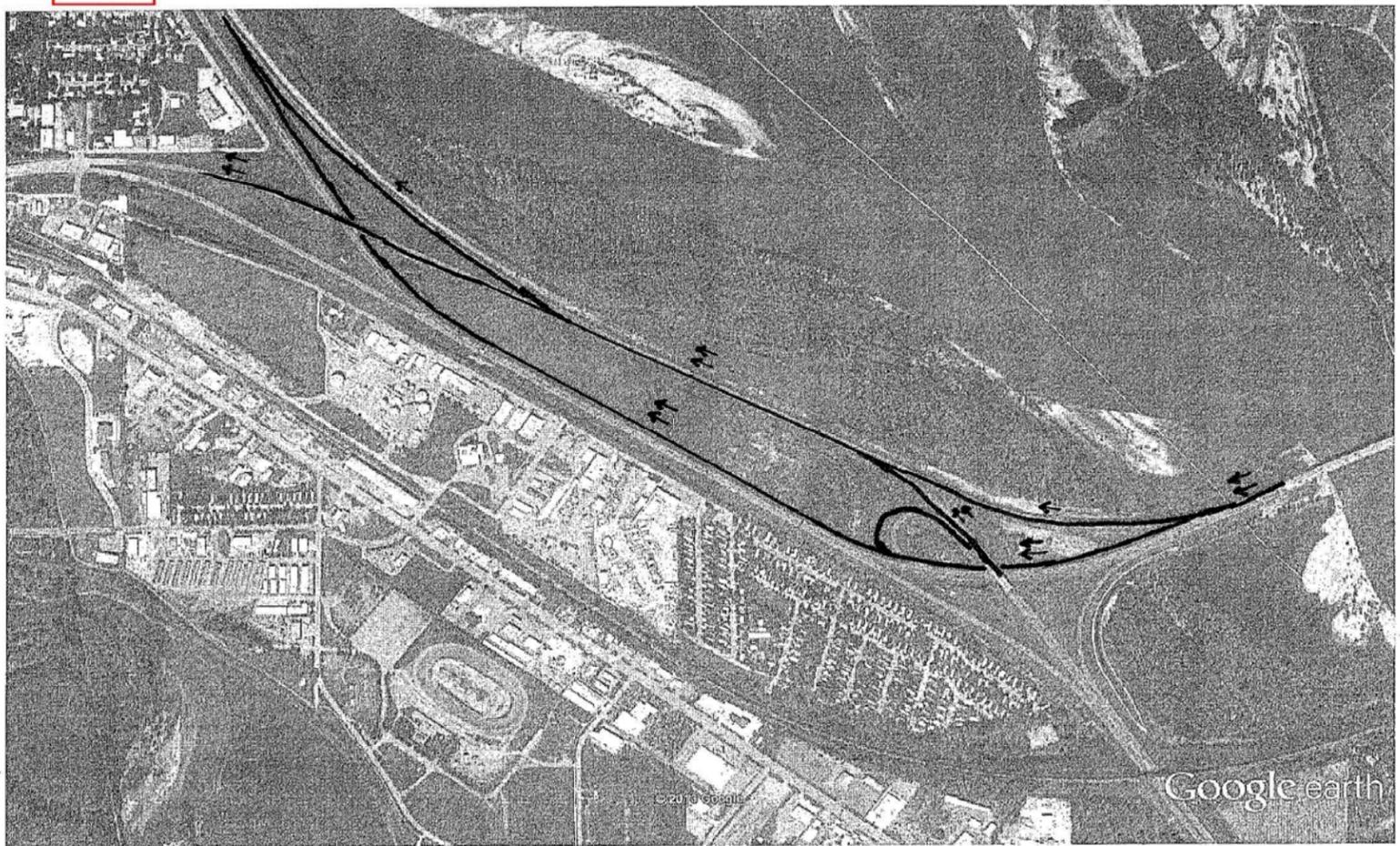
Year 2040 Build Alternative C CORSIM Model  
 Freeway MOEs - PM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
WB I-94 Mainline	State St Off-Ramp	6174	6178	61746178	2	1866	1726	1708	-18	-1%	60	14	B			
State St Off-Ramp	NB State St On-Ramp	6178	6182	61786182	2	1208	1355	1356	1	0%	61	11	B			
NB State St On-Ramp	SB State St On-Ramp	6182	6186	61826186	2	1002	1774	1776	2	0%	59	15	B			
SB State St On-Ramp	WB I-94 Mainline	6186	6190	61866190	2	1418	2505	2514	9	0%	58	22	C			
WB I-94 Mainline	WB I-94 Mainline	6190	6194	61906194	2	1300	2505	2515	10	0%	61	21	C	60	21	C
WB I-94 Mainline	WB I-94 Mainline	6194	6198	61946198	2	1941	2505	2515	10	0%	61	21	C			
WB I-94 Mainline	WB I-94 Mainline	6198	6310	61986310	2	1950	2505	2519	14	1%	61	21	C			
WB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp	6310	6314	63106314	2	1973	2505	2517	12	0%	60	21	C			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy On-Ramp Loop	6314	6318	63146318	2	1385	1928	1935	7	0%	62	16	B			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave /Tyler Pkwy On-Ramp	6318	6322	63186322	2	1169	2138	2146	8	0%	61	18	B			
Divide Ave /Tyler Pkwy On-Ramp	WB I-94 Mainline	6322	6326	63226326	2	1257	2803	2811	8	0%	58	24	C			
WB I-94 Mainline	WB I-94 Mainline	6326	6330	63266330	2	1279	2803	2810	7	0%	61	23	C	59	24	C
WB I-94 Mainline	WB I-94 Mainline	6330	6334	63306334	2	1913	2803	2812	9	0%	61	23	C			
WB I-94 Mainline	WB I-94 Mainline	6334	6338	63346338	2	690	2803	2814	11	0%	59	24	C			
WB I-94 Mainline	SB TH 810 Off-Ramp	6338	6342	63386342	2	723	2803	2814	11	0%	56	25	C			
SB TH 810 Off-Ramp	NB TH 810 On-Ramp	6342	6344	63426344	2	1221	2102	2110	8	0%	62	17	B			
NB TH 810 On-Ramp	WB I-94 Mainline	6344	6346	63446346	4	952	3960	3965	5	0%	61	16	B	60	16	B
WB I-94 Mainline	Main St Off-Ramp	6346	6350	63466350	4	1565	3960	3968	8	0%	60	17	B			
Main St Off-Ramp	WB I-94 Mainline	6350	6354	63506354	2	1590	2461	2471	10	0%	61	20	C			
WB I-94 Mainline	WB I-94 Mainline	6354	6358	63546358	2	936	2461	2471	10	0%	61	20	C	61	20	B
WB I-94 Mainline	WB I-94 Mainline	6358	6362	63586362	2	1254	2461	2471	10	0%	61	20	C			
WB I-94 Mainline	Mandan Ave Off-Ramp	6362	6366	63626366	2	1919	2461	2470	9	0%	60	21	C			
Mandan Ave Off-Ramp	WB I-94 Mainline	6366	6370	63666370	2	1098	1683	1663	-20	-1%	62	13	B	62	13	B
WB I-94 Mainline	Mandan Ave On-Ramp	6370	6374	63706374	2	1496	1683	1662	-21	-1%	62	13	B			
Mandan Ave On-Ramp	WB I-94 Mainline	6374	6378	63746378	2	733	1908	1889	-19	-1%	60	16	B			
WB I-94 Mainline	WB I-94 Mainline	6378	6382	63786382	2	1404	1908	1891	-17	-1%	61	16	B	59	16	B
WB I-94 Mainline	WB I-94 Mainline	6382	6386	63826386	2	1942	1908	1889	-19	-1%	59	16	B			
WB I-94 Mainline	WB I-94 Mainline	6386	6390	63866390	2	1158	1908	1886	-22	-1%	58	16	B			
WB I-94 Mainline	Sunset Dr Off-Ramp	6390	6394	63906394	2	1186	1908	1887	-21	-1%	56	17	B			
Sunset Dr Off-Ramp	WB I-94 Mainline	6394	6398	63946398	2	1154	1634	1608	-26	-2%	57	14	B	57	14	B
WB I-94 Mainline	Sunset Dr On-Ramp	6398	6510	63986510	2	1807	1634	1608	-26	-2%	56	14	B			
Sunset Dr On-Ramp	WB I-94 Mainline	6510	6514	65106514	2	884	2009	1983	-26	-1%	55	18	B			
WB I-94 Mainline	WB I-94 Mainline	6514	6518	65146518	2	1564	2009	1984	-25	-1%	60	17	B			
WB I-94 Mainline	WB I-94 Mainline	6518	6522	65186522	2	1961	2009	1986	-23	-1%	64	16	B			
WB I-94 Mainline	WB I-94 Mainline	6522	6526	65226526	2	1953	2009	1985	-24	-1%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6526	6530	65266530	2	1938	2009	1979	-30	-1%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6530	6534	65306534	2	1961	2009	1976	-33	-2%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6534	6538	65346538	2	1964	2009	1976	-33	-2%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6538	6542	65386542	2	1925	2009	1975	-34	-2%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6542	6546	65426546	2	1950	2009	1976	-33	-2%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6546	6550	65466550	2	1930	2009	1975	-34	-2%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6550	6554	65506554	2	1939	2009	1978	-31	-2%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6554	6558	65546558	2	1990	2009	1977	-32	-2%	66	15	B			
WB I-94 Mainline	TH 25 Off-Ramp	6558	6562	65586562	2	1890	2009	1979	-30	-1%	64	16	B			
TH 25 Off-Ramp	WB I-94 Mainline	6562	6566	65626566	2	1154	1611	1619	8	0%	65	13	B	65	12	B
WB I-94 Mainline	TH 25 On-Ramp	6566	6570	65666570	2	1045	1611	1618	7	0%	65	12	B			
TH 25 On-Ramp	WB I-94 Mainline	6570	6574	65706574	2	1627	1661	1670	9	1%	63	13	B	62	13	B
WB I-94 Mainline	WB I-94 Mainline	6574	6578	65746578	2	1898	1661	1670	9	1%	61	14	B			
66th St Off-Ramp	66th St Off-Ramp	6126	6226	61266226	1	271	300	289	-11	-4%	58	5	A			
66th St Off-Ramp	66th St Off-Ramp	6226	6227	62266227	1	202	300	290	-10	-3%	56	5	A			
66th St On-Ramp	66th St On-Ramp	6233	6234	62336234	1	265	1150	1151	1	0%	44	26	C			
66th St On-Ramp	66th St On-Ramp	6234	6134	62346134	1	257	1150	1151	1	0%	48	24	C			
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6150	6250	61506250	1	249	524	523	-1	0%	58	9	A			
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6250	6251	62506251	1	380	524	523	-1	0%	53	10	A			
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6253	6254	62536254	1	130	430	428	-2	0%	45	10	A			
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6254	6154	62546154	1	201	430	428	-2	0%	47	9	A			
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6257	6258	62576258	1	279	195	194	-1	-1%	45	4	A			
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6258	6158	62586158	1	201	195	194	-1	-1%	47	4	A			
State St Off-Ramp	State St Off-Ramp	6178	6278	61786278	1	215	371	351	-20	-5%	57	6	A			
State St Off-Ramp	State St Off-Ramp	6278	6279	62786279	1	315	371	351	-20	-5%	54	7	A			
NB State St On-Ramp	NB State St On-Ramp	6281	6282	62816282	1	148	419	419	0	0%	44	9	A			
NB State St On-Ramp	NB State St On-Ramp	6282	6182	62826182	1	195	419	419	0	0%	47	9	A			
SB State St On-Ramp	SB State St On-Ramp	6285	6286	62856286	1	426	731	733	2	0%	45	16	B			
SB State St On-Ramp	SB State St On-Ramp	6286	6186	62866186	1	198	731	733	2	0%	47	16	B			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6314	6414	63146414	1	241	577	579	2	0%	58	10	B			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6414	6415	64146415	1	534	577	580	3	1%	50	12	B			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6417	6418	64176418	1	237	210	211	1	0%	35	6	A			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6418	6318	64186318	1	200	210	211	1	0%	39	5	A			
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6421	6422	64216422	1	466	665	666	1	0%	45	15	B			
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6422	6322	64226322	1	200	665	666	1	0%	47	14	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6342	6436	63426436	1	430	701	706	5	1%	44	16	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6436	6437	64366437	1	320	701	707	6	1%	38	19	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6437	6438	64376438	1	568	701	707	6	1%	34	21	C			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6440	6442	64406442	2	455	1858	1856	-2	0%	57	16	B			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6442	6443	64426443	2	405	1858	1856	-2	0%	52	18	B			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6443	6444	64436444	2	377	1858	1857	-1	0%	48	19	B			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6444	6344	64446344	2	358	1858	1858	0	0%	52	18	B			
Main St Off-Ramp	Main St Off-Ramp	6350	6450	63506450	2	506	1499	1495	-4	0%	58	13	B			
Main St Off-Ramp	Main St Off-Ramp	6450	6451	64506451	2	524	1499	1493	-6	0%	50	15	B			
Main St Off-Ramp	Main St Off-Ramp	6451	6452	64516452	2	672	1499	1494	-5	0%	44	17	B			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	6366	6466	63666466	1	473	778	805	27	3%	56	14	B			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	6466	6467	64666467	1	210	778	805	27	3%	54	15	B			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	6473	6474	64736474	1	418	225	226	1	0%	45	5	A			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	6474	6374	64746374	1	205	225	226	1	0%	47	5	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	6394	6494	63946494	1	201	274	279	5	2%	55	5	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	6494	6495	64946495	1	290	274	280	6	2%	53	5	A			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	6609	6610	66096610	1	251	375	373	-2	-1%	45	8	A			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	6610	6510	66106510	1	202	375	373	-2	-1%	47	8	A</			

# Year 2040 Alternative D

## Freeway MOEs

ID - D



Bismarck-Mandan I-94 Corridor Study

Year 2040 Build Alternative D CORSIM Model  
 Freeway MOEs - AM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
EB I-94 Mainline	EB I-94 Mainline	5110	5114	51105114	2	1900	624	620	-4	-1%	69	4	A			
EB I-94 Mainline	TH 25 Off-Ramp	5114	5118	51145118	2	1537	624	619	-5	-1%	69	4	A	69	4	A
TH 25 Off-Ramp	EB I-94 Mainline	5118	5122	51185122	2	1132	573	565	-8	-1%	69	4	A	69	4	A
EB I-94 Mainline	TH 25 On-Ramp	5122	5126	51225126	2	1076	573	565	-8	-1%	69	4	A			
TH 25 On-Ramp	EB I-94 Mainline	5126	5130	51265130	2	1930	999	989	-10	-1%	66	7	A			
EB I-94 Mainline	EB I-94 Mainline	5130	5134	51305134	2	1995	999	988	-11	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5134	5138	51345138	2	1972	999	987	-12	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5138	5142	51385142	2	1931	999	983	-16	-2%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5142	5146	51425146	2	1950	999	982	-17	-2%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5146	5150	51465150	2	1927	999	979	-20	-2%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5150	5154	51505154	2	1946	999	979	-20	-2%	66	7	A			
EB I-94 Mainline	EB I-94 Mainline	5154	5158	51545158	2	1941	999	978	-21	-2%	65	7	A			
EB I-94 Mainline	EB I-94 Mainline	5158	5162	51585162	2	1941	999	976	-23	-2%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5162	5166	51625166	2	1951	999	975	-24	-2%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5166	5170	51665170	2	1957	999	972	-27	-3%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5170	5174	51705174	2	1560	999	969	-30	-3%	63	8	A			
EB I-94 Mainline	Sunset Dr Off-Ramp	5174	5178	51745178	2	1523	999	970	-29	-3%	62	8	A			
Sunset Dr Off-Ramp	EB I-94 Mainline	5178	5182	51785182	2	1577	649	638	-11	-2%	64	5	A	64	5	A
EB I-94 Mainline	Sunset Dr On-Ramp	5182	5186	51825186	2	1157	649	638	-11	-2%	64	5	A			
Sunset Dr On-Ramp	EB I-94 Mainline	5186	5190	51865190	2	791	1550	1538	-12	-1%	60	13	B			
EB I-94 Mainline	EB I-94 Mainline	5190	5194	51905194	2	1162	1550	1538	-12	-1%	63	12	B			
EB I-94 Mainline	EB I-94 Mainline	5194	5198	51945198	2	1950	1550	1537	-13	-1%	63	12	B	62	12	B
EB I-94 Mainline	EB I-94 Mainline	5198	5310	51985310	2	1401	1550	1535	-15	-1%	63	12	B			
EB I-94 Mainline	Mandan Ave Off-Ramp	5310	5314	53105314	2	1398	1550	1535	-15	-1%	63	12	B			
Mandan Ave Off-Ramp	EB I-94 Mainline	5314	5318	53145318	2	920	1349	1329	-20	-1%	63	11	B	63	11	B
EB I-94 Mainline	Mandan Ave On-Ramp	5318	5322	53185322	2	1091	1349	1329	-20	-1%	63	11	B			
Mandan Ave On-Ramp	EB I-94 Mainline	5322	5326	53225326	2	1944	2224	2203	-21	-1%	61	18	B			
EB I-94 Mainline	EB I-94 Mainline	5326	5330	53265330	2	1092	2224	2206	-18	-1%	62	18	B	62	18	B
EB I-94 Mainline	EB I-94 Mainline	5330	5334	53305334	2	857	2224	2206	-18	-1%	62	18	B			
EB I-94 Mainline	Main St On-Ramp	5334	5338	53345338	2	1671	2224	2206	-18	-1%	62	18	B			
Main St On-Ramp	EB I-94 Mainline	5338	5342	53385342	3	1621	3399	3365	-34	-1%	61	19	B			
EB I-94 Mainline	SB TH 810 Off-Ramp	5342	5346	53425346	3	1502	3399	3363	-36	-1%	58	19	B	59	19	B
SB TH 810 Off-Ramp	EB I-94 Mainline	5346	5350	53465350	2	1073	2100	2048	-52	-2%	62	17	B	62	17	B
EB I-94 Mainline	NB TH 810 On-Ramp	5350	5354	53505354	2	1054	2100	2050	-50	-2%	62	17	B			
NB TH 810 On-Ramp	EB I-94 Mainline	5354	5358	53545358	2	1969	2726	2669	-57	-2%	59	23	C			
EB I-94 Mainline	EB I-94 Mainline	5358	5362	53585362	2	1279	2726	2665	-61	-2%	60	22	C	59	23	C
EB I-94 Mainline	EB I-94 Mainline	5362	5366	53625366	2	1258	2726	2663	-63	-2%	59	23	C			
EB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp Loop	5366	5370	53665370	2	1444	2726	2658	-68	-2%	56	24	C			
Divide Ave/Tyler Pkwy Off-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp	5370	5374	53705374	2	1141	1926	1886	-40	-2%	60	16	B			
Divide Ave/Tyler Pkwy On-Ramp	EB I-94 Mainline	5374	5378	53745378	2	1924	2350	2305	-45	-2%	58	20	B			
EB I-94 Mainline	EB I-94 Mainline	5378	5382	53785382	2	1942	2350	2298	-52	-2%	60	19	B			
EB I-94 Mainline	EB I-94 Mainline	5382	5386	53825386	2	1942	2350	2294	-56	-2%	61	19	B	59	19	B
EB I-94 Mainline	EB I-94 Mainline	5386	5390	53865390	2	1300	2350	2290	-60	-3%	60	19	B			
EB I-94 Mainline	SB State St Off Ramp	5390	5394	53905394	2	1350	2350	2288	-62	-3%	58	20	B			
SB State St Off Ramp	NB State St Off Ramp	5394	5398	53945398	2	961	1859	1815	-44	-2%	60	15	B	61	13	B
NB State St Off Ramp	State St On-Ramp	5398	5510	53985510	2	1232	1200	1178	-22	-2%	63	9	A			
State St On-Ramp	EB I-94 Mainline	5510	5514	55105514	2	1949	1626	1602	-24	-1%	62	13	B			
EB I-94 Mainline	EB I-94 Mainline	5514	5518	55145518	2	1950	1626	1599	-27	-2%	63	13	B			
EB I-94 Mainline	EB I-94 Mainline	5518	5522	55185522	2	1934	1626	1598	-28	-2%	63	13	B	62	13	B
EB I-94 Mainline	EB I-94 Mainline	5522	5526	55225526	2	1369	1626	1597	-29	-2%	62	13	B			
EB I-94 Mainline	NB Centennial Rd Off-Ramp	5526	5530	55265530	2	1263	1626	1598	-28	-2%	61	13	B			
NB Centennial Rd Off-Ramp	SB Bismarck Expy Off Ramp	5530	5534	55305534	2	1015	1154	1127	-27	-2%	63	9	A			
SB Bismarck Expy Off Ramp	Bismarck Expy/Centennial Rd On-Ramp	5534	5538	55345538	2	1278	948	924	-24	-3%	63	7	A			
Bismarck Expy/Centennial Rd On-Ramp	EB I-94 Mainline	5538	5542	55385542	2	1947	1498	1471	-27	-2%	61	12	B			
EB I-94 Mainline	EB I-94 Mainline	5542	5546	55425546	2	1934	1498	1468	-30	-2%	66	11	B			
EB I-94 Mainline	EB I-94 Mainline	5546	5550	55465550	2	1950	1498	1464	-34	-2%	67	11	B	64	12	B
EB I-94 Mainline	EB I-94 Mainline	5550	5552	55505552	2	1092	1498	1461	-37	-2%	66	11	B			
EB I-94 Mainline	EB I-94 Mainline	5552	5554	55525554	2	1782	1498	1457	-41	-3%	64	11	B			
EB I-94 Mainline	66th St Off-Ramp	5554	5558	55545558	2	981	1498	1453	-45	-3%	57	13	B			
66th St Off-Ramp	EB I-94 Mainline	5558	5562	55585562	2	1201	348	349	1	0%	67	3	A			
EB I-94 Mainline	66th St On-Ramp	5562	5564	55625564	2	1336	599	600	1	0%	67	5	A			
66th St On-Ramp	66th St On-Ramp	5564	5566	55645566	2	1119	599	599	0	0%	69	4	A			
66th St On-Ramp	66th St On-Ramp	5566	5570	55665570	2	1725	599	598	-1	0%	69	4	A	69	4	A
66th St On-Ramp	66th St On-Ramp	5570	5574	55705574	2	1749	599	598	-1	0%	69	4	A			
EB I-94 Mainline	EB I-94 Mainline	5574	5578	55745578	2	1753	599	597	-2	0%	69	4	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5118	5218	51185218	1	316	51	54	3	6%	60	1	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5218	5219	52185219	1	407	51	54	3	6%	55	1	A			
TH 25 On-Ramp	TH 25 On-Ramp	5225	5226	52255226	1	354	426	426	0	0%	45	10	A			
TH 25 On-Ramp	TH 25 On-Ramp	5226	5126	52265126	1	222	426	426	0	0%	47	9	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5178	5278	51785278	1	222	350	332	-18	-5%	59	6	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5278	5279	52785279	1	370	350	333	-17	-5%	54	6	A			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5285	5286	52855286	1	208	901	902	1	0%	44	20	C			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5286	5186	52865186	1	198	901	902	1	0%	47	19	B			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5314	5414	53145414	1	153	201	205	4	2%	59	3	A			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5414	5415	54145415	1	207	201	205	4	2%	57	4	A			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5421	5422	54215422	1	118	875	874	-1	0%	44	20	B			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5422	5322	54225322	1	362	875	875	0	0%	49	18	B			
Main St On-Ramp	Main St On-Ramp	5437	5438	54375438	2	1694	1175	1169	-6	-1						

Bismarck-Mandan I-94 Corridor Study

Year 2040 Build Alternative D CORSIM Model  
 Freeway MOEs - AM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
WB I-94 Mainline	WB I-94 Mainline	6162	6166	61626166	2	1368	1747	1720	-27	-2%	63	14	B	61	14	B
WB I-94 Mainline	WB I-94 Mainline	6166	6170	61666170	2	1934	1747	1716	-31	-2%	62	14	B			
WB I-94 Mainline	WB I-94 Mainline	6170	6174	61706174	2	1949	1747	1709	-38	-2%	61	14	B			
WB I-94 Mainline	State St Off-Ramp	6174	6178	61746178	2	1866	1747	1706	-41	-2%	59	14	B	61	17	B
State St Off-Ramp	NB State St On-Ramp	6178	6182	61786182	2	1208	1178	1139	-39	-3%	62	9	A			
NB State St On-Ramp	SB State St On-Ramp	6182	6186	61826186	2	1002	1623	1584	-39	-2%	60	13	B			
SB State St On-Ramp	WB I-94 Mainline	6186	6190	61866190	2	1418	2179	2136	-43	-2%	60	18	B	61	17	B
WB I-94 Mainline	WB I-94 Mainline	6190	6194	61906194	2	1300	2179	2133	-46	-2%	62	17	B			
WB I-94 Mainline	WB I-94 Mainline	6194	6198	61946198	2	1941	2179	2131	-48	-2%	62	17	B			
WB I-94 Mainline	WB I-94 Mainline	6198	6310	61986310	2	1950	2179	2127	-52	-2%	62	17	B	61	17	B
WB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp	6310	6314	63106314	2	1973	2179	2124	-55	-3%	61	17	B			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy On-Ramp Loop	6314	6318	63146318	2	1385	1675	1618	-57	-3%	63	13	B			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp	6318	6322	63186322	2	1169	1835	1776	-59	-3%	62	14	B	60	20	B
Divide Ave/Tyler Pkwy On-Ramp	WB I-94 Mainline	6322	6326	63226326	2	1257	2425	2359	-66	-3%	59	20	B			
WB I-94 Mainline	WB I-94 Mainline	6326	6330	63266330	2	1279	2425	2355	-70	-3%	61	19	B			
WB I-94 Mainline	Main St Off-Ramp	6330	6334	63306334	2	1913	2425	2352	-73	-3%	60	19	B	60	14	B
Main St Off-Ramp	WB I-94 Mainline	6334	6338	63346338	2	690	1784	1723	-61	-3%	62	14	B			
WB I-94 Mainline	SB TH 810 Off-Ramp	6338	6342	63386342	2	723	1784	1722	-62	-3%	58	15	B			
SB TH 810 Off-Ramp	WB I-94 Mainline	6342	6344	63426344	2	1221	1183	1170	-13	-1%	63	9	A	63	9	A
WB I-94 Mainline	WB I-94 Mainline	6344	6346	63446346	2	952	1183	1170	-13	-1%	63	9	A			
WB I-94 Mainline	WB I-94 Mainline	6346	6350	63466350	2	1565	1183	1170	-13	-1%	63	9	A			
WB I-94 Mainline	NB TH 810 On-Ramp	6350	6354	63506354	2	1590	1183	1170	-13	-1%	63	9	A	61	15	B
NB TH 810 On-Ramp	WB I-94 Mainline	6354	6358	63546358	2	936	1823	1791	-32	-2%	60	15	B			
WB I-94 Mainline	WB I-94 Mainline	6358	6362	63586362	2	1254	1823	1789	-34	-2%	62	14	B			
WB I-94 Mainline	Mandan Ave Off-Ramp	6362	6366	63626366	2	1919	1823	1787	-36	-2%	61	15	B	62	10	B
Mandan Ave Off-Ramp	WB I-94 Mainline	6366	6370	63666370	2	1098	1324	1279	-45	-3%	62	10	B			
WB I-94 Mainline	Mandan Ave On-Ramp	6370	6374	63706374	2	1496	1324	1275	-49	-4%	62	10	B			
Mandan Ave On-Ramp	WB I-94 Mainline	6374	6378	63746378	2	733	1475	1423	-52	-4%	61	12	B	59	12	B
WB I-94 Mainline	WB I-94 Mainline	6378	6382	63786382	2	1404	1475	1422	-53	-4%	61	12	B			
WB I-94 Mainline	WB I-94 Mainline	6382	6386	63826386	2	1942	1475	1417	-58	-4%	60	12	B			
WB I-94 Mainline	WB I-94 Mainline	6386	6390	63866390	2	1158	1475	1416	-59	-4%	58	12	B	60	7	A
WB I-94 Mainline	Sunset Dr Off-Ramp	6390	6394	63906394	2	1186	1475	1415	-60	-4%	56	13	B			
Sunset Dr Off-Ramp	WB I-94 Mainline	6394	6398	63946398	2	1154	799	790	-9	-1%	60	7	A			
WB I-94 Mainline	Sunset Dr On-Ramp	6398	6510	63986510	2	1807	799	791	-8	-1%	60	7	A	67	8	A
Sunset Dr On-Ramp	WB I-94 Mainline	6510	6514	65106514	2	884	1124	1118	-6	-1%	59	9	A			
WB I-94 Mainline	WB I-94 Mainline	6514	6518	65146518	2	1564	1124	1115	-9	-1%	64	9	A			
WB I-94 Mainline	WB I-94 Mainline	6518	6522	65186522	2	1961	1124	1113	-11	-1%	66	8	A	67	8	A
WB I-94 Mainline	WB I-94 Mainline	6522	6526	65226526	2	1953	1124	1111	-13	-1%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6526	6530	65266530	2	1938	1124	1110	-14	-1%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6530	6534	65306534	2	1961	1124	1105	-19	-2%	68	8	A	67	8	A
WB I-94 Mainline	WB I-94 Mainline	6534	6538	65346538	2	1964	1124	1103	-21	-2%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6538	6542	65386542	2	1925	1124	1101	-23	-2%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6542	6546	65426546	2	1950	1124	1100	-24	-2%	68	8	A	67	8	A
WB I-94 Mainline	WB I-94 Mainline	6546	6550	65466550	2	1930	1124	1097	-27	-2%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6550	6554	65506554	2	1939	1124	1097	-27	-2%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6554	6558	65546558	2	1990	1124	1096	-28	-2%	68	8	A	67	6	A
WB I-94 Mainline	TH 25 Off-Ramp	6558	6562	65586562	2	1890	1124	1091	-33	-3%	66	8	A			
TH 25 Off-Ramp	WB I-94 Mainline	6562	6566	65626566	2	1154	900	859	-41	-5%	67	6	A			
WB I-94 Mainline	TH 25 On-Ramp	6566	6570	65666570	2	1045	900	859	-41	-5%	67	6	A	64	7	A
TH 25 On-Ramp	WB I-94 Mainline	6570	6574	65706574	2	1627	975	934	-41	-4%	65	7	A			
WB I-94 Mainline	WB I-94 Mainline	6574	6578	65746578	2	1898	975	933	-42	-4%	64	7	A			
66th St Off-Ramp	66th St Off-Ramp	6126	6226	61266226	1	271	251	249	-2	-1%	58	4	A	67	8	A
66th St Off-Ramp	66th St Off-Ramp	6226	6227	62266227	1	202	251	249	-2	-1%	56	4	A			
66th St On-Ramp	66th St On-Ramp	6233	6234	62336234	1	265	1225	1222	-3	0%	44	28	C			
66th St On-Ramp	66th St On-Ramp	6234	6134	62346134	1	257	1225	1222	-3	0%	47	26	C	61	5	A
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6150	6250	61506250	1	249	302	292	-10	-3%	59	5	A			
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6250	6251	62506251	1	380	302	292	-10	-3%	54	5	A			
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6253	6254	62536254	1	130	341	342	1	0%	45	8	A	67	8	A
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6254	6154	62546154	1	201	341	342	1	0%	47	7	A			
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6257	6258	62576258	1	279	285	286	1	0%	45	6	A			
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6258	6158	62586158	1	201	285	285	0	0%	47	6	A	67	6	A
State St Off-Ramp	State St Off-Ramp	6178	6278	61786278	1	215	569	564	-5	-1%	56	10	B			
State St Off-Ramp	State St Off-Ramp	6278	6279	62786279	1	315	569	563	-6	-1%	53	11	B			
NB State St On-Ramp	NB State St On-Ramp	6281	6282	62816282	1	148	445	445	0	0%	45	10	A	67	9	A
NB State St On-Ramp	NB State St On-Ramp	6282	6182	62826182	1	195	445	445	0	0%	47	9	A			
SB State St On-Ramp	SB State St On-Ramp	6285	6286	62856286	1	426	556	556	0	0%	45	12	B			
SB State St On-Ramp	SB State St On-Ramp	6286	6186	62866186	1	198	556	556	0	0%	47	12	B	67	9	A
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6314	6414	63146414	1	241	504	501	-3	-1%	58	9	A			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6414	6415	64146415	1	534	504	502	-2	0%	51	10	A			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6417	6418	64176418	1	237	160	159	-1	-1%	35	5	A	67	9	A
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6418	6318	64186318	1	200	160	159	-1	-1%	39	4	A			
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6421	6422	64216422	1	466	590	589	-1	0%	45	13	B			
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6422	6322	64226322	1	200	590	589	-1	0%	47	13	B	67	11	B
Main St Off-Ramp	Main St Off-Ramp	6334	6434	63346434	1	875	641	624	-17	-3%	58	11	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6342	6436	63426436	1	430	601	547	-54	-9%	44	12	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6436	6437	64366437	1	320	601	547	-54	-9%	38	14	B	67	16	B
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6437	6438	64376438	1	568	601	545	-56	-9%	34	16	B			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6454	6354	64546354	1	998	640	623	-17	-3%	57	11	B			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	6366	6466	63666466	1	473	499	505	6	1%	58	9	A	67	9	A
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	6466	6467	64666467	1	2										

Bismarck-Mandan I-94 Corridor Study

Year 2040 Build Alternative D CORSIM Model  
 Freeway MOEs - PM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
EB I-94 Mainline	EB I-94 Mainline	5110	5114	51105114	2	1900	750	748	-2	0%	69	5	A	69	5	A
EB I-94 Mainline	TH 25 Off-Ramp	5114	5118	51145118	2	1537	750	747	-3	0%	69	5	A			
TH 25 Off-Ramp	EB I-94 Mainline	5118	5122	51185122	2	1132	675	676	1	0%	69	5	A	69	5	A
EB I-94 Mainline	TH 25 On-Ramp	5122	5126	51225126	2	1076	675	677	2	0%	69	5	A			
TH 25 On-Ramp	EB I-94 Mainline	5126	5130	51265130	2	1930	925	925	0	0%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5130	5134	51305134	2	1995	925	921	-4	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5134	5138	51345138	2	1972	925	920	-5	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5138	5142	51385142	2	1931	925	919	-6	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5142	5146	51425146	2	1950	925	921	-4	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5146	5150	51465150	2	1927	925	922	-3	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5150	5154	51505154	2	1946	925	919	-6	-1%	66	7	A			
EB I-94 Mainline	EB I-94 Mainline	5154	5158	51545158	2	1941	925	919	-6	-1%	66	7	A			
EB I-94 Mainline	EB I-94 Mainline	5158	5162	51585162	2	1941	925	916	-9	-1%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5162	5166	51625166	2	1951	925	914	-11	-1%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5166	5170	51665170	2	1957	925	912	-13	-1%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5170	5174	51705174	2	1560	925	913	-12	-1%	63	7	A			
EB I-94 Mainline	Sunset Dr Off-Ramp	5174	5178	51745178	2	1523	925	914	-11	-1%	62	7	A			
Sunset Dr Off-Ramp	EB I-94 Mainline	5178	5182	51785182	2	1577	526	511	-15	-3%	64	4	A	64	4	A
EB I-94 Mainline	Sunset Dr On-Ramp	5182	5186	51825186	2	1157	526	508	-18	-3%	64	4	A			
Sunset Dr On-Ramp	EB I-94 Mainline	5186	5190	51865190	2	791	1426	1411	-15	-1%	60	12	B			
EB I-94 Mainline	EB I-94 Mainline	5190	5194	51905194	2	1162	1426	1409	-17	-1%	63	11	B			
EB I-94 Mainline	EB I-94 Mainline	5194	5198	51945198	2	1950	1426	1409	-17	-1%	63	11	B			
EB I-94 Mainline	EB I-94 Mainline	5198	5310	51985310	2	1401	1426	1408	-18	-1%	63	11	B			
EB I-94 Mainline	Mandan Ave Off-Ramp	5310	5314	53105314	2	1398	1426	1407	-19	-1%	63	11	B			
Mandan Ave Off-Ramp	EB I-94 Mainline	5314	5318	53145318	2	920	1226	1219	-7	-1%	64	10	A	64	10	A
EB I-94 Mainline	Mandan Ave On-Ramp	5318	5322	53185322	2	1091	1226	1219	-7	-1%	63	10	A			
Mandan Ave On-Ramp	EB I-94 Mainline	5322	5326	53225326	2	1944	1825	1820	-5	0%	62	15	B			
EB I-94 Mainline	EB I-94 Mainline	5326	5330	53265330	2	1092	1825	1818	-7	0%	63	15	B			
EB I-94 Mainline	EB I-94 Mainline	5330	5334	53305334	2	857	1825	1817	-8	0%	63	15	B			
EB I-94 Mainline	Main St On-Ramp	5334	5338	53345338	2	1671	1825	1812	-13	-1%	63	14	B			
Main St On-Ramp	EB I-94 Mainline	5338	5342	53385342	3	1621	2950	2941	-9	0%	61	16	B			
EB I-94 Mainline	SB TH 810 Off-Ramp	5342	5346	53425346	3	1502	2950	2941	-9	0%	60	16	B			
SB TH 810 Off-Ramp	EB I-94 Mainline	5346	5350	53465350	2	1073	2050	2039	-11	-1%	62	16	B	62	16	B
EB I-94 Mainline	NB TH 810 On-Ramp	5350	5354	53505354	2	1054	2050	2040	-10	0%	62	16	B			
NB TH 810 On-Ramp	EB I-94 Mainline	5354	5358	53545358	2	1969	2768	2777	9	0%	58	24	C			
EB I-94 Mainline	EB I-94 Mainline	5358	5362	53585362	2	1279	2768	2776	8	0%	60	23	C			
EB I-94 Mainline	EB I-94 Mainline	5362	5366	53625366	2	1258	2768	2771	3	0%	59	24	C			
EB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp Loop	5366	5370	53665370	2	1444	2768	2768	0	0%	55	25	C			
Divide Ave/Tyler Pkwy Off-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp	5370	5374	53705374	2	1141	1793	1793	0	0%	60	15	B			
Divide Ave/Tyler Pkwy On-Ramp	EB I-94 Mainline	5374	5378	53745378	2	1924	2244	2240	-4	0%	59	19	B			
EB I-94 Mainline	EB I-94 Mainline	5378	5382	53785382	2	1942	2244	2240	-4	0%	60	19	B			
EB I-94 Mainline	EB I-94 Mainline	5382	5386	53825386	2	1942	2244	2235	-9	0%	61	18	B			
EB I-94 Mainline	EB I-94 Mainline	5386	5390	53865390	2	1300	2244	2233	-11	0%	61	18	B			
EB I-94 Mainline	SB State St Off Ramp	5390	5394	53905394	2	1350	2244	2238	-6	0%	59	19	B			
SB State St Off Ramp	NB State St Off Ramp	5394	5398	53945398	2	961	1798	1795	-3	0%	60	15	B			
NB State St Off Ramp	State St On-Ramp	5398	5510	53985510	2	1232	1169	1163	-6	-1%	63	9	A	61	13	B
State St On-Ramp	EB I-94 Mainline	5510	5514	55105514	2	1949	1743	1741	-2	0%	62	14	B			
EB I-94 Mainline	EB I-94 Mainline	5514	5518	55145518	2	1950	1743	1740	-3	0%	63	14	B			
EB I-94 Mainline	EB I-94 Mainline	5518	5522	55185522	2	1934	1743	1734	-9	-1%	63	14	B			
EB I-94 Mainline	EB I-94 Mainline	5522	5526	55225526	2	1369	1743	1737	-6	0%	62	14	B			
EB I-94 Mainline	NB Centennial Rd Off-Ramp	5526	5530	55265530	2	1263	1743	1735	-8	0%	61	14	B			
NB Centennial Rd Off-Ramp	SB Bismarck Expy Off Ramp	5530	5534	55305534	2	1015	1367	1366	-1	0%	62	11	B			
SB Bismarck Expy Off Ramp	Bismarck Expy/Centennial Rd On-Ramp	5534	5538	55345538	2	1278	972	966	-6	-1%	63	8	A			
Bismarck Expy/Centennial Rd On-Ramp	EB I-94 Mainline	5538	5542	55385542	2	1947	1823	1817	-6	0%	60	15	B			
EB I-94 Mainline	EB I-94 Mainline	5542	5546	55425546	2	1934	1823	1817	-6	0%	66	14	B			
EB I-94 Mainline	EB I-94 Mainline	5546	5550	55465550	2	1950	1823	1817	-6	0%	66	14	B			
EB I-94 Mainline	EB I-94 Mainline	5550	5552	55505552	2	1092	1823	1820	-3	0%	66	14	B			
EB I-94 Mainline	EB I-94 Mainline	5552	5554	55525554	2	1782	1823	1821	-2	0%	63	14	B			
EB I-94 Mainline	66th St Off-Ramp	5554	5558	55545558	2	981	1823	1821	-2	0%	56	16	B			
66th St Off-Ramp	EB I-94 Mainline	5558	5562	55585562	2	1201	500	499	-1	0%	66	4	A			
EB I-94 Mainline	66th St On-Ramp	5562	5564	55625564	2	1336	800	801	1	0%	66	6	A			
66th St On-Ramp	66th St On-Ramp	5564	5566	55645566	2	1119	800	800	0	0%	69	6	A			
66th St On-Ramp	66th St On-Ramp	5566	5570	55665570	2	1725	800	800	0	0%	69	6	A			
66th St On-Ramp	66th St On-Ramp	5570	5574	55705574	2	1749	800	799	-1	0%	69	6	A			
EB I-94 Mainline	EB I-94 Mainline	5574	5578	55745578	2	1753	800	800	0	0%	69	6	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5118	5218	51185218	1	316	75	71	-4	-5%	60	1	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5218	5219	52185219	1	407	75	71	-4	-5%	54	1	A			
TH 25 On-Ramp	TH 25 On-Ramp	5225	5226	52255226	1	354	250	249	-1	0%	45	6	A			
TH 25 On-Ramp	TH 25 On-Ramp	5226	5126	52265126	1	222	250	249	-1	0%	47	5	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5178	5278	51785278	1	222	399	401	2	1%	58	7	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5278	5279	52785279	1	370	399	401	2	1%	53	8	A			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5285	5286	52855286	1	208	900	904	4	0%	44	20	C			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5286	5186	52865186	1	198	900	904	4	0%	47	19	B			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5314	5414	53145414	1	153	200	188	-12	-6%	59	3	A			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5414	5415	54145415	1	207	200	188	-12	-6%	57	3	A			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5421	5422	54215422	1	118	599	599	0	0%	44	13	B			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5422	5322	54225322	1	362	599	599	0	0%	49	12	B			
Main St On-Ramp	Main St On-Ramp	5437	5438	54375438	2	1694	1125	1126	1	0%	42	13	B			
Main St On-Ramp	Main St On-Ramp	5438	5338	54385												

Bismarck-Mandan I-94 Corridor Study

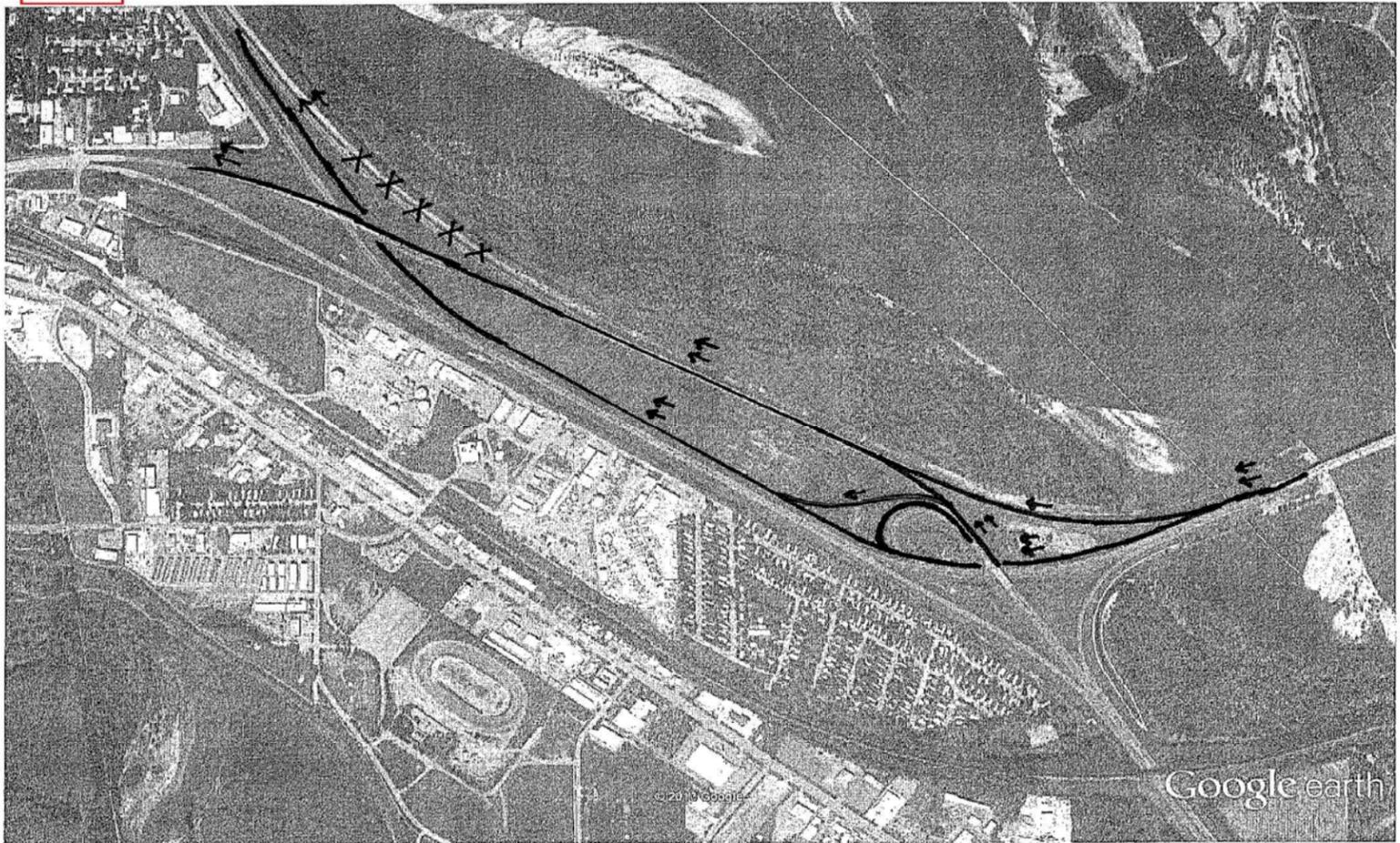
Year 2040 Build Alternative D CORSIM Model  
 Freeway MOEs - PM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
WB I-94 Mainline	WB I-94 Mainline	6162	6166	61626166	2	1368	1726	1712	-14	-1%	63	14	B	61	14	B
WB I-94 Mainline	WB I-94 Mainline	6166	6170	61666170	2	1934	1726	1710	-16	-1%	62	14	B			
WB I-94 Mainline	WB I-94 Mainline	6170	6174	61706174	2	1949	1726	1710	-16	-1%	61	14	B			
WB I-94 Mainline	State St Off-Ramp	6174	6178	61746178	2	1866	1726	1712	-14	-1%	60	14	B	60	21	C
State St Off-Ramp	NB State St On-Ramp	6178	6182	61786182	2	1208	1355	1349	-6	0%	61	11	B			
NB State St On-Ramp	SB State St On-Ramp	6182	6186	61826186	2	1002	1774	1768	-6	0%	59	15	B			
SB State St On-Ramp	WB I-94 Mainline	6186	6190	61866190	2	1418	2505	2502	-3	0%	57	22	C	60	21	C
WB I-94 Mainline	WB I-94 Mainline	6190	6194	61906194	2	1300	2505	2499	-6	0%	61	21	C			
WB I-94 Mainline	WB I-94 Mainline	6194	6198	61946198	2	1941	2505	2503	-2	0%	61	21	C			
WB I-94 Mainline	WB I-94 Mainline	6198	6310	61986310	2	1950	2505	2503	-2	0%	61	21	C	60	21	C
WB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp	6310	6314	63106314	2	1973	2505	2506	1	0%	60	21	C			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy On-Ramp Loop	6314	6318	63146318	2	1385	1928	1940	12	1%	62	16	B			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave /Tyler Pkwy On-Ramp	6318	6322	63186322	2	1169	2138	2148	10	0%	61	18	B	59	24	C
Divide Ave /Tyler Pkwy On-Ramp	WB I-94 Mainline	6322	6326	63226326	2	1257	2803	2814	11	0%	58	24	C			
WB I-94 Mainline	WB I-94 Mainline	6326	6330	63266330	2	1279	2803	2811	8	0%	61	23	C			
WB I-94 Mainline	Main St Off-Ramp	6330	6334	63306334	2	1913	2803	2813	10	0%	58	24	C	59	16	B
Main St Off-Ramp	WB I-94 Mainline	6334	6338	63346338	2	690	1866	1890	24	1%	61	16	B			
WB I-94 Mainline	SB TH 810 Off-Ramp	6338	6342	63386342	2	723	1866	1891	25	1%	57	17	B			
SB TH 810 Off-Ramp	WB I-94 Mainline	6342	6344	63426344	2	1221	1165	1177	12	1%	63	9	A	63	9	A
WB I-94 Mainline	WB I-94 Mainline	6344	6346	63446346	2	952	1165	1178	13	1%	64	9	A			
WB I-94 Mainline	WB I-94 Mainline	6346	6350	63466350	2	1565	1165	1178	13	1%	63	9	A			
WB I-94 Mainline	NB TH 810 On-Ramp	6350	6354	63506354	2	1590	1165	1179	14	1%	63	9	A	58	21	C
NB TH 810 On-Ramp	WB I-94 Mainline	6354	6358	63546358	2	936	2467	2454	-13	-1%	55	22	C			
WB I-94 Mainline	WB I-94 Mainline	6358	6362	63586362	2	1254	2467	2455	-12	0%	60	21	C			
WB I-94 Mainline	Mandan Ave Off-Ramp	6362	6366	63626366	2	1919	2467	2454	-13	-1%	59	21	C	61	14	B
Mandan Ave Off-Ramp	WB I-94 Mainline	6366	6370	63666370	2	1098	1692	1675	-17	-1%	62	14	B			
WB I-94 Mainline	Mandan Ave On-Ramp	6370	6374	63706374	2	1496	1692	1672	-20	-1%	61	14	B			
Mandan Ave On-Ramp	WB I-94 Mainline	6374	6378	63746378	2	733	1917	1902	-15	-1%	59	16	B	58	16	B
WB I-94 Mainline	WB I-94 Mainline	6378	6382	63786382	2	1404	1917	1905	-12	-1%	60	16	B			
WB I-94 Mainline	WB I-94 Mainline	6382	6386	63826386	2	1942	1917	1901	-16	-1%	59	16	B			
WB I-94 Mainline	WB I-94 Mainline	6386	6390	63866390	2	1158	1917	1903	-14	-1%	57	17	B	57	14	B
WB I-94 Mainline	Sunset Dr Off-Ramp	6390	6394	63906394	2	1186	1917	1900	-17	-1%	55	17	B			
Sunset Dr Off-Ramp	WB I-94 Mainline	6394	6398	63946398	2	1154	1641	1610	-31	-2%	57	14	B			
WB I-94 Mainline	Sunset Dr On-Ramp	6398	6510	63986510	2	1807	1641	1610	-31	-2%	56	14	B	64	15	B
Sunset Dr On-Ramp	WB I-94 Mainline	6510	6514	65106514	2	884	2016	1984	-32	-2%	56	18	B			
WB I-94 Mainline	WB I-94 Mainline	6514	6518	65146518	2	1564	2016	1985	-31	-2%	60	16	B			
WB I-94 Mainline	WB I-94 Mainline	6518	6522	65186522	2	1961	2016	1987	-29	-1%	64	16	B	65	13	B
WB I-94 Mainline	WB I-94 Mainline	6522	6526	65226526	2	1953	2016	1981	-35	-2%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6526	6530	65266530	2	1938	2016	1977	-39	-2%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6530	6534	65306534	2	1961	2016	1977	-39	-2%	66	15	B	64	15	B
WB I-94 Mainline	WB I-94 Mainline	6534	6538	65346538	2	1964	2016	1979	-37	-2%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6538	6542	65386542	2	1925	2016	1979	-37	-2%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6542	6546	65426546	2	1950	2016	1978	-38	-2%	66	15	B	64	15	B
WB I-94 Mainline	WB I-94 Mainline	6546	6550	65466550	2	1930	2016	1977	-39	-2%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6550	6554	65506554	2	1939	2016	1978	-38	-2%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6554	6558	65546558	2	1990	2016	1976	-40	-2%	65	15	B	65	13	B
WB I-94 Mainline	TH 25 Off-Ramp	6558	6562	65586562	2	1890	2016	1975	-41	-2%	63	16	B			
TH 25 Off-Ramp	WB I-94 Mainline	6562	6566	65626566	2	1154	1621	1616	-5	0%	65	12	B			
WB I-94 Mainline	TH 25 On-Ramp	6566	6570	65666570	2	1045	1621	1616	-5	0%	65	13	B	62	14	B
TH 25 On-Ramp	WB I-94 Mainline	6570	6574	65706574	2	1627	1671	1668	-3	0%	63	13	B			
WB I-94 Mainline	WB I-94 Mainline	6574	6578	65746578	2	1898	1671	1672	1	0%	61	14	B			
66th St Off-Ramp	66th St Off-Ramp	6126	6226	61266226	1	271	300	307	7	2%	58	5	A	62	14	B
66th St Off-Ramp	66th St Off-Ramp	6226	6227	62266227	1	202	300	308	8	3%	56	5	A			
66th St On-Ramp	66th St On-Ramp	6233	6234	62336234	1	265	1150	1149	-1	0%	44	26	C			
66th St On-Ramp	66th St On-Ramp	6234	6134	62346134	1	257	1150	1149	-1	0%	48	24	C	65	13	B
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6150	6250	61506250	1	249	524	515	-9	-2%	58	9	A			
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6250	6251	62506251	1	380	524	515	-9	-2%	53	10	A			
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6253	6254	62536254	1	130	430	431	1	0%	45	10	A	64	15	B
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6254	6154	62546154	1	201	430	431	1	0%	47	9	A			
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6257	6258	62576258	1	279	195	196	1	1%	45	4	A			
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6258	6158	62586158	1	201	195	196	1	1%	47	4	A	65	13	B
State St Off-Ramp	State St Off-Ramp	6178	6278	61786278	1	215	371	362	-9	-2%	57	6	A			
State St Off-Ramp	State St Off-Ramp	6278	6279	62786279	1	315	371	362	-9	-2%	53	7	A			
NB State St On-Ramp	NB State St On-Ramp	6281	6282	62816282	1	148	419	419	0	0%	44	9	A	66	15	B
NB State St On-Ramp	NB State St On-Ramp	6282	6182	62826182	1	195	419	419	0	0%	47	9	A			
SB State St On-Ramp	SB State St On-Ramp	6285	6286	62856286	1	426	731	732	1	0%	45	16	B			
SB State St On-Ramp	SB State St On-Ramp	6286	6186	62866186	1	198	731	732	1	0%	47	16	B	64	15	B
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6314	6414	63146414	1	241	577	563	-14	-2%	58	10	A			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6414	6415	64146415	1	534	577	563	-14	-2%	50	11	B			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6417	6418	64176418	1	237	210	210	0	0%	35	6	A	64	15	B
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6418	6318	64186318	1	200	210	210	0	0%	39	5	A			
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6421	6422	64216422	1	466	665	666	1	0%	45	15	B			
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6422	6322	64226322	1	200	665	665	0	0%	47	14	B	65	13	B
Main St Off-Ramp	Main St Off-Ramp	6334	6434	63346434	1	875	937	924	-13	-1%	57	16	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6342	6436	63426436	1	430	701	712	11	2%	43	16	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6436	6437	64366437	1	320	701	712	11	2%	37	19	B	64	15	B
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6437	6438	64376438	1	568	701	713	12	2%	33	21	C			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6454	6354	64546354	1	998	1302	1274	-28	-2%	55	23	C			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	6366	6466	63666466	1	473	775	780	5	1%	56	14	B	66	15	B
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	64														

# Year 2040 Alternative F

## Freeway MOEs

ID - F



Bismarck-Mandan I-94 Corridor Study

Year Build Alternative F CORSIM Model  
Freeway MOEs - AM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
EB I-94 Mainline	EB I-94 Mainline	5110	5114	51105114	2	1900	624	619	-5	-1%	69	4	A			
EB I-94 Mainline	TH 25 Off-Ramp	5114	5118	51145118	2	1537	624	617	-7	-1%	69	4	A			
TH 25 Off-Ramp	EB I-94 Mainline	5118	5122	51185122	2	1132	573	570	-3	-1%	69	4	A	69	4	A
EB I-94 Mainline	TH 25 On-Ramp	5122	5126	51225126	2	1076	573	570	-3	-1%	69	4	A			
TH 25 On-Ramp	EB I-94 Mainline	5126	5130	51265130	2	1930	999	995	-4	0%	66	8	A			
EB I-94 Mainline	EB I-94 Mainline	5130	5134	51305134	2	1995	999	992	-7	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5134	5138	51345138	2	1972	999	989	-10	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5138	5142	51385142	2	1931	999	988	-11	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5142	5146	51425146	2	1950	999	985	-14	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5146	5150	51465150	2	1927	999	985	-14	-1%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5150	5154	51505154	2	1946	999	983	-16	-2%	66	7	A			
EB I-94 Mainline	EB I-94 Mainline	5154	5158	51545158	2	1941	999	982	-17	-2%	65	8	A			
EB I-94 Mainline	EB I-94 Mainline	5158	5162	51585162	2	1941	999	980	-19	-2%	66	7	A			
EB I-94 Mainline	EB I-94 Mainline	5162	5166	51625166	2	1951	999	980	-19	-2%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5166	5170	51665170	2	1957	999	978	-21	-2%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5170	5174	51705174	2	1560	999	977	-22	-2%	63	8	A			
EB I-94 Mainline	Sunset Dr Off-Ramp	5174	5178	51745178	2	1523	999	972	-27	-3%	63	8	A			
Sunset Dr Off-Ramp	EB I-94 Mainline	5178	5182	51785182	2	1577	649	647	-2	0%	64	5	A	64	5	A
EB I-94 Mainline	Sunset Dr On-Ramp	5182	5186	51825186	2	1157	649	647	-2	0%	64	5	A			
Sunset Dr On-Ramp	EB I-94 Mainline	5186	5190	51865190	2	791	1550	1545	-5	0%	60	13	B			
EB I-94 Mainline	EB I-94 Mainline	5190	5194	51905194	2	1162	1550	1544	-6	0%	63	12	B			
EB I-94 Mainline	EB I-94 Mainline	5194	5198	51945198	2	1950	1550	1546	-4	0%	63	12	B	62	12	B
EB I-94 Mainline	EB I-94 Mainline	5198	5310	51985310	2	1401	1550	1546	-4	0%	63	12	B			
EB I-94 Mainline	Mandan Ave Off-Ramp	5310	5314	53105314	2	1398	1550	1544	-6	0%	63	12	B			
Mandan Ave Off-Ramp	EB I-94 Mainline	5314	5318	53145318	2	920	1349	1349	0	0%	63	11	B	63	11	B
EB I-94 Mainline	Mandan Ave On-Ramp	5318	5322	53185322	2	1091	1349	1349	0	0%	63	11	B			
Mandan Ave On-Ramp	EB I-94 Mainline	5322	5326	53225326	2	1944	2224	2223	-1	0%	61	18	B			
EB I-94 Mainline	EB I-94 Mainline	5326	5330	53265330	2	1092	2224	2223	-1	0%	62	18	B			
EB I-94 Mainline	EB I-94 Mainline	5330	5334	53305334	2	857	2224	2224	0	0%	62	18	B			
EB I-94 Mainline	Main St On-Ramp	5334	5338	53345338	2	1671	2224	2225	1	0%	62	18	B			
Main St On-Ramp	EB I-94 Mainline	5338	5342	53385342	3	1621	3399	3390	-9	0%	61	19	B			
EB I-94 Mainline	SB TH 810 Off-Ramp	5342	5346	53425346	3	1502	3399	3385	-14	0%	58	19	B	59	19	B
SB TH 810 Off-Ramp	EB I-94 Mainline	5346	5350	53465350	2	1073	2100	2081	-19	-1%	61	17	B			
EB I-94 Mainline	NB TH 810 On-Ramp	5350	5354	53505354	2	1054	2100	2080	-20	-1%	62	17	B			
NB TH 810 On-Ramp	EB I-94 Mainline	5354	5358	53545358	2	1969	2726	2711	-15	-1%	58	23	C			
EB I-94 Mainline	EB I-94 Mainline	5358	5362	53585362	2	1279	2726	2710	-16	-1%	60	23	C			
EB I-94 Mainline	EB I-94 Mainline	5362	5366	53625366	2	1258	2726	2708	-18	-1%	59	23	C			
EB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp Loop	5366	5370	53665370	2	1444	2726	2706	-20	-1%	56	24	C			
Divide Ave/Tyler Pkwy Off-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp	5370	5374	53705374	2	1141	1926	1920	-6	0%	59	16	B			
Divide Ave/Tyler Pkwy On-Ramp	EB I-94 Mainline	5374	5378	53745378	2	1924	2350	2341	-9	0%	58	20	C			
EB I-94 Mainline	EB I-94 Mainline	5378	5382	53785382	2	1942	2350	2333	-17	-1%	60	20	B			
EB I-94 Mainline	EB I-94 Mainline	5382	5386	53825386	2	1942	2350	2328	-22	-1%	61	19	B			
EB I-94 Mainline	EB I-94 Mainline	5386	5390	53865390	2	1300	2350	2323	-27	-1%	60	19	B			
EB I-94 Mainline	SB State St Off Ramp	5390	5394	53905394	2	1350	2350	2317	-33	-1%	58	20	B			
SB State St Off Ramp	NB State St Off Ramp	5394	5398	53945398	2	961	1859	1845	-14	-1%	60	15	B			
NB State St Off Ramp	State St On-Ramp	5398	5510	53985510	2	1232	1200	1205	5	0%	63	10	A	61	13	B
State St On-Ramp	EB I-94 Mainline	5510	5514	55105514	2	1949	1626	1631	5	0%	62	13	B			
EB I-94 Mainline	EB I-94 Mainline	5514	5518	55145518	2	1950	1626	1630	4	0%	63	13	B			
EB I-94 Mainline	EB I-94 Mainline	5518	5522	55185522	2	1934	1626	1631	5	0%	63	13	B			
EB I-94 Mainline	EB I-94 Mainline	5522	5526	55225526	2	1369	1626	1630	4	0%	62	13	B			
EB I-94 Mainline	NB Centennial Rd Off-Ramp	5526	5530	55265530	2	1263	1626	1629	3	0%	61	13	B			
NB Centennial Rd Off-Ramp	SB Bismarck Expy Off Ramp	5530	5534	55305534	2	1015	1154	1146	-8	-1%	63	9	A			
SB Bismarck Expy Off Ramp	Bismarck Expy/Centennial Rd On-Ramp	5534	5538	55345538	2	1278	948	933	-15	-2%	63	7	A			
Bismarck Expy/Centennial Rd On-Ramp	EB I-94 Mainline	5538	5542	55385542	2	1947	1498	1477	-21	-1%	61	12	B			
EB I-94 Mainline	EB I-94 Mainline	5542	5546	55425546	2	1934	1498	1476	-22	-1%	66	11	B			
EB I-94 Mainline	EB I-94 Mainline	5546	5550	55465550	2	1950	1498	1476	-22	-1%	67	11	B			
EB I-94 Mainline	EB I-94 Mainline	5550	5552	55505552	2	1092	1498	1476	-22	-1%	66	11	B			
EB I-94 Mainline	EB I-94 Mainline	5552	5554	55525554	2	1782	1498	1471	-27	-2%	64	11	B			
EB I-94 Mainline	66th St Off-Ramp	5554	5558	55545558	2	981	1498	1470	-28	-2%	57	13	B			
66th St Off-Ramp	EB I-94 Mainline	5558	5562	55585562	2	1201	348	349	1	0%	66	3	A			
EB I-94 Mainline	66th St On-Ramp	5562	5564	55625564	2	1336	599	599	0	0%	66	5	A			
66th St On-Ramp	66th St On-Ramp	5564	5566	55645566	2	1119	599	599	0	0%	69	4	A			
66th St On-Ramp	66th St On-Ramp	5566	5570	55665570	2	1725	599	598	-1	0%	69	4	A			
66th St On-Ramp	66th St On-Ramp	5570	5574	55705574	2	1749	599	596	-3	-1%	69	4	A	68	4	A
EB I-94 Mainline	EB I-94 Mainline	5574	5578	55745578	2	1753	599	595	-4	-1%	69	4	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5118	5218	51185218	1	316	51	46	-5	-10%	60	1	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5218	5219	52185219	1	407	51	46	-5	-10%	55	1	A			
TH 25 On-Ramp	TH 25 On-Ramp	5225	5226	52255226	1	354	426	425	-1	0%	45	9	A			
TH 25 On-Ramp	TH 25 On-Ramp	5226	5126	52265126	1	222	426	425	-1	0%	47	9	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5178	5278	51785278	1	222	350	324	-26	-7%	58	6	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5278	5279	52785279	1	370	350	323	-27	-8%	54	6	A			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5285	5286	52855286	1	208	901	898	-3	0%	44	20	C			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5286	5186	52865186	1	198	901	899	-2	0%	47	19	B			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5314	5414	53145414	1	153	201	196	-5	-2%	59	3	A			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5414	5415	54145415	1	207	201	196	-5	-2%	57	3	A			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5421	5422	54215422	1	118	875	873	-2	0%	44	20	B			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5422	5322	54225322	1	362	875	873	-2	0%	49	18	B			
Main St On-Ramp	Main St On-Ramp	5437	5438	54375438	2	1694	1175	1169	-6	-1%	42	14	B			
Main St On-Ramp	Main St On-Ramp	5438														

Bismarck-Mandan I-94 Corridor Study

Year Build Alternative F CORSIM Model  
Freeway MOEs - AM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
WB I-94 Mainline	WB I-94 Mainline	6162	6166	61626166	2	1368	1747	1718	-29	-2%	63	14	B	61	14	B
WB I-94 Mainline	WB I-94 Mainline	6166	6170	61666170	2	1934	1747	1713	-34	-2%	62	14	B			
WB I-94 Mainline	WB I-94 Mainline	6170	6174	61706174	2	1949	1747	1711	-36	-2%	61	14	B			
WB I-94 Mainline	State St Off-Ramp	6174	6178	61746178	2	1866	1747	1707	-40	-2%	59	14	B	61	17	B
State St Off-Ramp	NB State St On-Ramp	6178	6182	61786182	2	1208	1178	1141	-37	-3%	61	9	A			
NB State St On-Ramp	SB State St On-Ramp	6182	6186	61826186	2	1002	1623	1583	-40	-2%	60	13	B			
SB State St On-Ramp	WB I-94 Mainline	6186	6190	61866190	2	1418	2179	2137	-42	-2%	60	18	B	61	17	B
WB I-94 Mainline	WB I-94 Mainline	6190	6194	61906194	2	1300	2179	2135	-44	-2%	62	17	B			
WB I-94 Mainline	WB I-94 Mainline	6194	6198	61946198	2	1941	2179	2132	-47	-2%	62	17	B			
WB I-94 Mainline	WB I-94 Mainline	6198	6310	61986310	2	1950	2179	2128	-51	-2%	62	17	B	61	17	B
WB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp	6310	6314	63106314	2	1973	2179	2128	-51	-2%	61	17	B			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy On-Ramp Loop	6314	6318	63146318	2	1385	1675	1632	-43	-3%	63	13	B			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave /Tyler Pkwy On-Ramp	6318	6322	63186322	2	1169	1835	1787	-48	-3%	62	15	B	60	20	B
Divide Ave /Tyler Pkwy On-Ramp	WB I-94 Mainline	6322	6326	63226326	2	1257	2425	2374	-51	-2%	60	20	B			
WB I-94 Mainline	WB I-94 Mainline	6326	6330	63266330	2	1279	2425	2369	-56	-2%	61	19	B			
WB I-94 Mainline	Main St Off-Ramp	6330	6334	63306334	2	1913	2425	2362	-63	-3%	60	20	B	60	15	B
Main St Off-Ramp	WB I-94 Mainline	6334	6338	63346338	2	690	1784	1734	-50	-3%	62	14	B			
WB I-94 Mainline	SB TH 810 Off-Ramp	6338	6342	63386342	2	723	1784	1731	-53	-3%	58	15	B			
SB TH 810 Off-Ramp	NB TH 810 On-Ramp	6342	6344	63426344	2	1221	1183	1159	-24	-2%	63	9	A	60	15	B
NB TH 810 On-Ramp	WB I-94 Mainline	6344	6346	63446346	2	952	1823	1774	-49	-3%	60	15	B			
WB I-94 Mainline	WB I-94 Mainline	6346	6350	63466350	2	1565	1823	1773	-50	-3%	62	14	B			
WB I-94 Mainline	WB I-94 Mainline	6350	6354	63506354	2	1590	1823	1771	-52	-3%	62	14	B	62	14	B
WB I-94 Mainline	WB I-94 Mainline	6354	6358	63546358	2	936	1823	1767	-56	-3%	62	14	B			
WB I-94 Mainline	WB I-94 Mainline	6358	6362	63586362	2	1254	1823	1766	-57	-3%	62	14	B			
WB I-94 Mainline	Mandan Ave Off-Ramp	6362	6366	63626366	2	1919	1823	1757	-66	-4%	61	14	B	62	10	B
Mandan Ave Off-Ramp	WB I-94 Mainline	6366	6370	63666370	2	1098	1324	1265	-59	-4%	63	10	B			
WB I-94 Mainline	Mandan Ave On-Ramp	6370	6374	63706374	2	1496	1324	1264	-60	-5%	62	10	B			
Mandan Ave On-Ramp	WB I-94 Mainline	6374	6378	63746378	2	733	1475	1412	-63	-4%	61	12	B	59	12	B
WB I-94 Mainline	WB I-94 Mainline	6378	6382	63786382	2	1404	1475	1412	-63	-4%	61	12	B			
WB I-94 Mainline	WB I-94 Mainline	6382	6386	63826386	2	1942	1475	1406	-69	-5%	60	12	B			
WB I-94 Mainline	WB I-94 Mainline	6386	6390	63866390	2	1158	1475	1403	-72	-5%	58	12	B	60	7	A
WB I-94 Mainline	Sunset Dr Off-Ramp	6390	6394	63906394	2	1186	1475	1400	-75	-5%	56	13	B			
Sunset Dr Off-Ramp	WB I-94 Mainline	6394	6398	63946398	2	1154	801	784	-17	-2%	60	7	A			
WB I-94 Mainline	Sunset Dr On-Ramp	6398	6510	63986510	2	1807	801	783	-18	-2%	60	7	A	60	7	A
Sunset Dr On-Ramp	WB I-94 Mainline	6510	6514	65106514	2	884	1126	1105	-21	-2%	59	9	A			
WB I-94 Mainline	WB I-94 Mainline	6514	6518	65146518	2	1564	1126	1102	-24	-2%	64	9	A			
WB I-94 Mainline	WB I-94 Mainline	6518	6522	65186522	2	1961	1126	1101	-25	-2%	67	8	A	67	8	A
WB I-94 Mainline	WB I-94 Mainline	6522	6526	65226526	2	1953	1126	1099	-27	-2%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6526	6530	65266530	2	1938	1126	1098	-28	-2%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6530	6534	65306534	2	1961	1126	1097	-29	-3%	68	8	A	67	8	A
WB I-94 Mainline	WB I-94 Mainline	6534	6538	65346538	2	1964	1126	1097	-29	-3%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6538	6542	65386542	2	1925	1126	1094	-32	-3%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6542	6546	65426546	2	1950	1126	1092	-34	-3%	68	8	A	67	8	A
WB I-94 Mainline	WB I-94 Mainline	6546	6550	65466550	2	1930	1126	1090	-36	-3%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6550	6554	65506554	2	1939	1126	1088	-38	-3%	68	8	A			
WB I-94 Mainline	WB I-94 Mainline	6554	6558	65546558	2	1990	1126	1086	-40	-4%	68	8	A	67	6	A
WB I-94 Mainline	TH 25 Off-Ramp	6558	6562	65586562	2	1890	1126	1082	-44	-4%	66	8	A			
TH 25 Off-Ramp	WB I-94 Mainline	6562	6566	65626566	2	1154	902	851	-51	-6%	67	6	A			
WB I-94 Mainline	TH 25 On-Ramp	6566	6570	65666570	2	1045	902	851	-51	-6%	67	6	A	67	6	A
TH 25 On-Ramp	WB I-94 Mainline	6570	6574	65706574	2	1627	977	924	-53	-5%	65	7	A			
WB I-94 Mainline	WB I-94 Mainline	6574	6578	65746578	2	1898	977	925	-52	-5%	64	7	A			
66th St Off-Ramp	66th St Off-Ramp	6126	6226	61266226	1	271	251	254	3	1%	58	4	A	65	7	A
66th St Off-Ramp	66th St Off-Ramp	6226	6227	62266227	1	202	251	254	3	1%	57	4	A			
66th St On-Ramp	66th St On-Ramp	6233	6234	62336234	1	265	1225	1224	-1	0%	44	28	C			
66th St On-Ramp	66th St On-Ramp	6234	6134	62346134	1	257	1225	1223	-2	0%	47	26	C	65	7	A
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6150	6250	61506250	1	249	302	287	-15	-5%	59	5	A			
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6250	6251	62506251	1	380	302	287	-15	-5%	54	5	A			
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6253	6254	62536254	1	130	341	341	0	0%	45	8	A	65	7	A
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6254	6154	62546154	1	201	341	340	-1	0%	47	7	A			
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6257	6258	62576258	1	279	285	285	0	0%	45	6	A			
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6258	6158	62586158	1	201	285	285	0	0%	47	6	A	65	7	A
State St Off-Ramp	State St Off-Ramp	6178	6278	61786278	1	215	569	564	-5	-1%	56	10	B			
State St Off-Ramp	State St Off-Ramp	6278	6279	62786279	1	315	569	563	-6	-1%	52	11	B			
NB State St On-Ramp	NB State St On-Ramp	6281	6282	62816282	1	148	445	443	-2	0%	45	10	A	65	7	A
NB State St On-Ramp	NB State St On-Ramp	6282	6182	62826182	1	195	445	443	-2	0%	47	9	A			
SB State St On-Ramp	SB State St On-Ramp	6285	6286	62856286	1	426	556	557	1	0%	45	12	B			
SB State St On-Ramp	SB State St On-Ramp	6286	6186	62866186	1	198	556	557	1	0%	47	12	B	65	7	A
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6314	6414	63146414	1	241	504	494	-10	-2%	58	8	A			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6414	6415	64146415	1	534	504	494	-10	-2%	51	10	A			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6417	6418	64176418	1	237	160	159	-1	-1%	35	5	A	65	7	A
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6418	6318	64186318	1	200	160	160	0	0%	39	4	A			
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6421	6422	64216422	1	466	590	592	2	0%	45	13	B			
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6422	6322	64226322	1	200	590	591	1	0%	47	13	B	65	7	A
Main St Off-Ramp	Main St Off-Ramp	6334	6434	63346434	1	875	641	622	-19	-3%	58	11	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6342	6436	63426436	1	430	601	569	-32	-5%	44	13	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6436	6437	64366437	1	320	601	569	-32	-5%	38	15	B	65	7	A
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6437	6438	64376438	1	568	601	567	-34	-6%	34	17	B			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6443	6444	64436444	1	377	640	618	-22	-3%	48	13	B			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6444	6344	64446344	1	358	640	617	-23	-4%	52	12	B	65	7	A
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	6366	6466	63666466												

Bismarck-Mandan I-94 Corridor Study

Year 2040 Build Alternative F CORSIM Model  
 Freeway MOEs - PM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
EB I-94 Mainline	EB I-94 Mainline	5110	5114	51105114	2	1900	750	747	-3	0%	69	5	A	69	5	A
EB I-94 Mainline	TH 25 Off-Ramp	5114	5118	51145118	2	1537	750	750	0	0%	69	5	A			
TH 25 Off-Ramp	EB I-94 Mainline	5118	5122	51185122	2	1132	675	680	5	1%	69	5	A	69	5	A
EB I-94 Mainline	TH 25 On-Ramp	5122	5126	51225126	2	1076	675	680	5	1%	69	5	A			
TH 25 On-Ramp	EB I-94 Mainline	5126	5130	51265130	2	1930	925	926	1	0%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5130	5134	51305134	2	1995	925	923	-2	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5134	5138	51345138	2	1972	925	922	-3	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5138	5142	51385142	2	1931	925	922	-3	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5142	5146	51425146	2	1950	925	923	-2	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5146	5150	51465150	2	1927	925	924	-1	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5150	5154	51505154	2	1946	925	919	-6	-1%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5154	5158	51545158	2	1941	925	920	-5	-1%	66	7	A			
EB I-94 Mainline	EB I-94 Mainline	5158	5162	51585162	2	1941	925	920	-5	-1%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5162	5166	51625166	2	1951	925	921	-4	0%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5166	5170	51665170	2	1957	925	916	-9	-1%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5170	5174	51705174	2	1560	925	916	-9	-1%	63	7	A			
EB I-94 Mainline	Sunset Dr Off-Ramp	5174	5178	51745178	2	1523	925	916	-9	-1%	62	7	A			
Sunset Dr Off-Ramp	EB I-94 Mainline	5178	5182	51785182	2	1577	526	511	-15	-3%	64	4	A	64	4	A
EB I-94 Mainline	Sunset Dr On-Ramp	5182	5186	51825186	2	1157	526	509	-17	-3%	64	4	A			
Sunset Dr On-Ramp	EB I-94 Mainline	5186	5190	51865190	2	791	1426	1408	-18	-1%	60	12	B			
EB I-94 Mainline	EB I-94 Mainline	5190	5194	51905194	2	1162	1426	1407	-19	-1%	63	11	B			
EB I-94 Mainline	EB I-94 Mainline	5194	5198	51945198	2	1950	1426	1410	-16	-1%	63	11	B	62	11	B
EB I-94 Mainline	EB I-94 Mainline	5198	5310	51985310	2	1401	1426	1408	-18	-1%	63	11	B			
EB I-94 Mainline	Mandan Ave Off-Ramp	5310	5314	53105314	2	1398	1426	1408	-18	-1%	63	11	B			
Mandan Ave Off-Ramp	EB I-94 Mainline	5314	5318	53145318	2	920	1226	1220	-6	0%	63	10	A	63	10	A
EB I-94 Mainline	Mandan Ave On-Ramp	5318	5322	53185322	2	1091	1226	1217	-9	-1%	63	10	A			
Mandan Ave On-Ramp	EB I-94 Mainline	5322	5326	53225326	2	1944	1825	1815	-10	-1%	62	15	B			
EB I-94 Mainline	EB I-94 Mainline	5326	5330	53265330	2	1092	1825	1816	-9	0%	63	15	B			
EB I-94 Mainline	EB I-94 Mainline	5330	5334	53305334	2	857	1825	1812	-13	-1%	63	14	B			
EB I-94 Mainline	Main St On-Ramp	5334	5338	53345338	2	1671	1825	1812	-13	-1%	62	15	B			
Main St On-Ramp	EB I-94 Mainline	5338	5342	53385342	3	1621	2950	2936	-14	0%	61	16	B			
EB I-94 Mainline	SB TH 810 Off-Ramp	5342	5346	53425346	3	1502	2950	2940	-10	0%	60	16	B	60	16	B
SB TH 810 Off-Ramp	EB I-94 Mainline	5346	5350	53465350	2	1073	2050	2037	-13	-1%	62	16	B			
EB I-94 Mainline	NB TH 810 On-Ramp	5350	5354	53505354	2	1054	2050	2037	-13	-1%	62	16	B			
NB TH 810 On-Ramp	EB I-94 Mainline	5354	5358	53545358	2	1969	2768	2744	-24	-1%	58	24	C			
EB I-94 Mainline	EB I-94 Mainline	5358	5362	53585362	2	1279	2768	2745	-23	-1%	60	23	C			
EB I-94 Mainline	EB I-94 Mainline	5362	5366	53625366	2	1258	2768	2750	-18	-1%	59	23	C	58	24	C
EB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp Loop	5366	5370	53665370	2	1444	2768	2750	-18	-1%	55	25	C			
Divide Ave/Tyler Pkwy Off-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp	5370	5374	53705374	2	1141	1793	1779	-14	-1%	60	15	B			
Divide Ave/Tyler Pkwy On-Ramp	EB I-94 Mainline	5374	5378	53745378	2	1924	2244	2228	-16	-1%	59	19	B			
EB I-94 Mainline	EB I-94 Mainline	5378	5382	53785382	2	1942	2244	2230	-14	-1%	60	19	B			
EB I-94 Mainline	EB I-94 Mainline	5382	5386	53825386	2	1942	2244	2229	-15	-1%	61	18	B			
EB I-94 Mainline	EB I-94 Mainline	5386	5390	53865390	2	1300	2244	2225	-19	-1%	61	18	B			
EB I-94 Mainline	SB State St Off Ramp	5390	5394	53905394	2	1350	2244	2224	-20	-1%	59	19	B			
SB State St Off Ramp	NB State St Off Ramp	5394	5398	53945398	2	961	1798	1788	-10	-1%	60	15	B			
NB State St Off Ramp	State St On-Ramp	5398	5510	53985510	2	1232	1169	1179	10	1%	63	9	A	61	13	B
State St On-Ramp	EB I-94 Mainline	5510	5514	55105514	2	1949	1743	1756	13	1%	62	14	B			
EB I-94 Mainline	EB I-94 Mainline	5514	5518	55145518	2	1950	1743	1755	12	1%	63	14	B			
EB I-94 Mainline	EB I-94 Mainline	5518	5522	55185522	2	1934	1743	1755	12	1%	62	14	B			
EB I-94 Mainline	EB I-94 Mainline	5522	5526	55225526	2	1369	1743	1754	11	1%	62	14	B			
EB I-94 Mainline	NB Centennial Rd Off-Ramp	5526	5530	55265530	2	1263	1743	1753	10	1%	61	14	B			
NB Centennial Rd Off-Ramp	SB Bismarck Expy Off Ramp	5530	5534	55305534	2	1015	1367	1373	6	0%	62	11	B			
SB Bismarck Expy Off Ramp	Bismarck Expy/Centennial Rd On-Ramp	5534	5538	55345538	2	1278	972	965	-7	-1%	63	8	A			
Bismarck Expy/Centennial Rd On-Ramp	EB I-94 Mainline	5538	5542	55385542	2	1947	1823	1818	-5	0%	61	15	B			
EB I-94 Mainline	EB I-94 Mainline	5542	5546	55425546	2	1934	1823	1818	-5	0%	66	14	B			
EB I-94 Mainline	EB I-94 Mainline	5546	5550	55465550	2	1950	1823	1820	-3	0%	66	14	B			
EB I-94 Mainline	EB I-94 Mainline	5550	5552	55505552	2	1092	1823	1820	-3	0%	66	14	B			
EB I-94 Mainline	EB I-94 Mainline	5552	5554	55525554	2	1782	1823	1820	-3	0%	64	14	B			
EB I-94 Mainline	66th St Off-Ramp	5554	5558	55545558	2	981	1823	1825	2	0%	56	16	B			
66th St Off-Ramp	EB I-94 Mainline	5558	5562	55585562	2	1201	500	517	17	3%	66	4	A			
EB I-94 Mainline	66th St On-Ramp	5562	5564	55625564	2	1336	800	817	17	2%	66	6	A			
66th St On-Ramp	66th St On-Ramp	5564	5566	55645566	2	1119	800	817	17	2%	69	6	A			
66th St On-Ramp	66th St On-Ramp	5566	5570	55665570	2	1725	800	817	17	2%	69	6	A			
66th St On-Ramp	66th St On-Ramp	5570	5574	55705574	2	1749	800	817	17	2%	69	6	A	68	6	A
EB I-94 Mainline	EB I-94 Mainline	5574	5578	55745578	2	1753	800	819	19	2%	69	6	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5118	5218	51185218	1	316	75	70	-5	-7%	60	1	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5218	5219	52185219	1	407	75	70	-5	-7%	55	1	A			
TH 25 On-Ramp	TH 25 On-Ramp	5225	5226	52255226	1	354	250	250	0	0%	45	6	A			
TH 25 On-Ramp	TH 25 On-Ramp	5226	5126	52265126	1	222	250	250	0	0%	47	5	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5178	5278	51785278	1	222	399	406	7	2%	58	7	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5278	5279	52785279	1	370	399	407	8	2%	53	8	A			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5285	5286	52855286	1	208	900	899	-1	0%	44	20	C			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5286	5186	52865186	1	198	900	899	-1	0%	47	19	B			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5314	5414	53145414	1	153	200	187	-13	-7%	59	3	A			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5414	5415	54145415	1	207	200	187	-13	-7%	57	3	A			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5421	5422	54215422	1	118	599	602	3	1%	44	14	B			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5422	5322	54225322	1	362	599	602	3	1%	49	12	B			
Main St On-Ramp	Main St On-Ramp	5437	5438	54375438	2	1694	1125	1126	1	0%	42	13	B			
Main St On-R																

Bismarck-Mandan I-94 Corridor Study

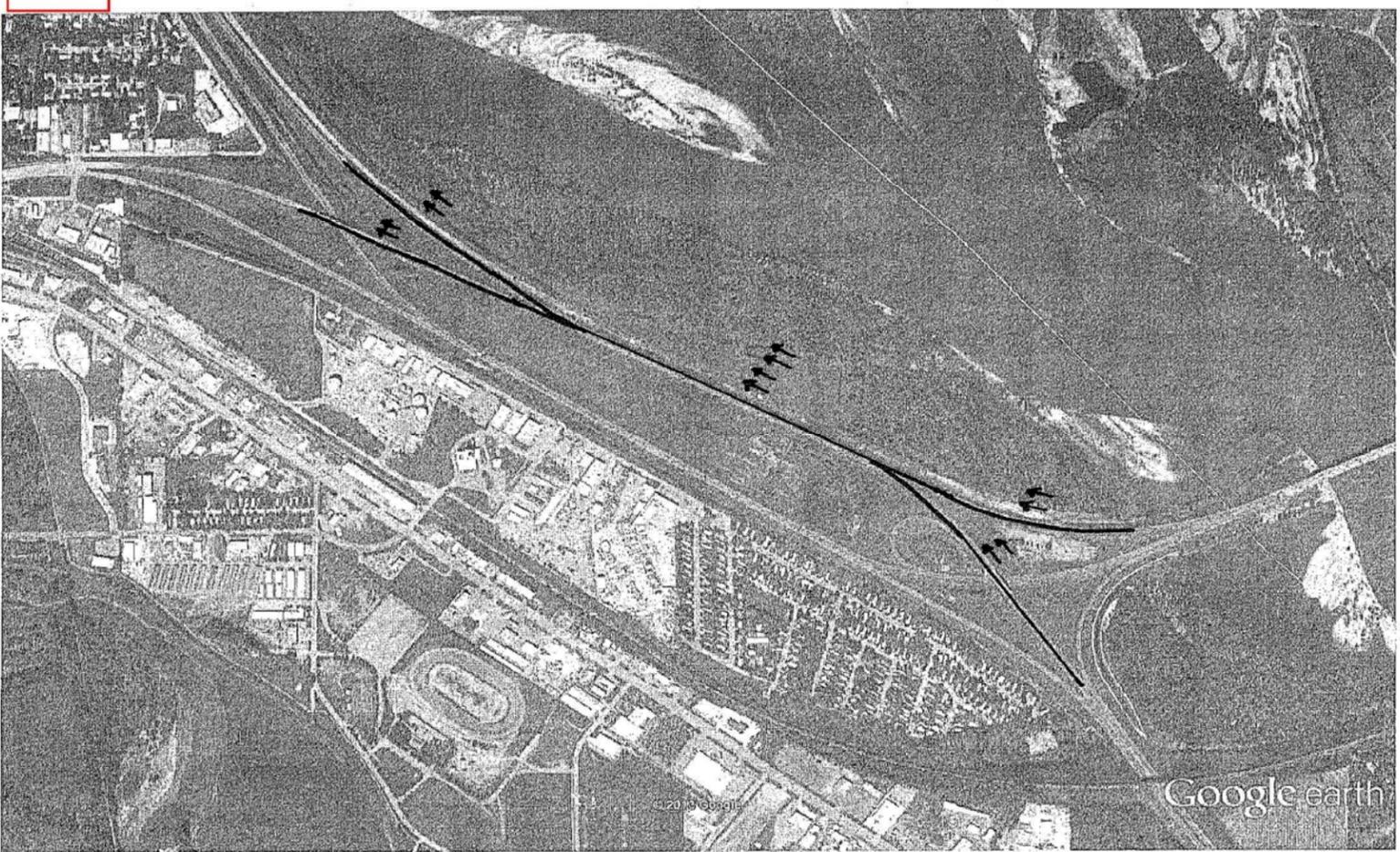
Year 2040 Build Alternative F CORSIM Model  
 Freeway MOEs - PM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
WB I-94 Mainline	WB I-94 Mainline	6162	6166	61626166	2	1368	1726	1708	-18	-1%	62	14	B	61	14	B
WB I-94 Mainline	WB I-94 Mainline	6166	6170	61666170	2	1934	1726	1706	-20	-1%	62	14	B			
WB I-94 Mainline	WB I-94 Mainline	6170	6174	61706174	2	1949	1726	1705	-21	-1%	61	14	B			
WB I-94 Mainline	State St Off-Ramp	6174	6178	61746178	2	1866	1726	1704	-22	-1%	60	14	B			
State St Off-Ramp	NB State St On-Ramp	6178	6182	61786182	2	1208	1355	1359	4	0%	61	11	B			
NB State St On-Ramp	SB State St On-Ramp	6182	6186	61826186	2	1002	1774	1776	2	0%	59	15	B			
SB State St On-Ramp	WB I-94 Mainline	6186	6190	61866190	2	1418	2505	2508	3	0%	58	22	C			
WB I-94 Mainline	WB I-94 Mainline	6190	6194	61906194	2	1300	2505	2509	4	0%	61	21	C	60	21	C
WB I-94 Mainline	WB I-94 Mainline	6194	6198	61946198	2	1941	2505	2512	7	0%	61	21	C			
WB I-94 Mainline	WB I-94 Mainline	6198	6310	61986310	2	1950	2505	2516	11	0%	61	21	C			
WB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp	6310	6314	63106314	2	1973	2505	2518	13	1%	60	21	C			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy On-Ramp Loop	6314	6318	63146318	2	1385	1928	1939	11	1%	62	16	B			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp	6318	6322	63186322	2	1169	2138	2148	10	0%	61	18	B			
Divide Ave/Tyler Pkwy On-Ramp	WB I-94 Mainline	6322	6326	63226326	2	1257	2803	2814	11	0%	59	24	C			
WB I-94 Mainline	WB I-94 Mainline	6326	6330	63266330	2	1279	2803	2811	8	0%	61	23	C	59	24	C
WB I-94 Mainline	Main St Off-Ramp	6330	6334	63306334	2	1913	2803	2811	8	0%	59	24	C			
Main St Off-Ramp	WB I-94 Mainline	6334	6338	63346338	2	690	1866	1876	10	1%	61	15	B			
WB I-94 Mainline	SB TH 810 Off-Ramp	6338	6342	63386342	2	723	1866	1877	11	1%	57	17	B	59	16	B
SB TH 810 Off-Ramp	NB TH 810 On-Ramp	6342	6344	63426344	2	1221	1165	1163	-2	0%	63	9	A			
NB TH 810 On-Ramp	WB I-94 Mainline	6344	6346	63446346	2	952	2467	2466	-1	0%	55	22	C			
WB I-94 Mainline	WB I-94 Mainline	6346	6350	63466350	2	1565	2467	2467	0	0%	60	21	C	60	21	C
WB I-94 Mainline	WB I-94 Mainline	6350	6354	63506354	2	1590	2467	2467	0	0%	61	20	C			
WB I-94 Mainline	WB I-94 Mainline	6354	6358	63546358	2	936	2467	2471	4	0%	61	20	C			
WB I-94 Mainline	WB I-94 Mainline	6358	6362	63586362	2	1254	2467	2472	5	0%	61	20	C			
WB I-94 Mainline	Mandan Ave Off-Ramp	6362	6366	63626366	2	1919	2467	2471	4	0%	60	21	C			
Mandan Ave Off-Ramp	WB I-94 Mainline	6366	6370	63666370	2	1098	1692	1690	-2	0%	62	14	B	62	14	B
WB I-94 Mainline	Mandan Ave On-Ramp	6370	6374	63706374	2	1496	1692	1686	-6	0%	62	14	B			
Mandan Ave On-Ramp	WB I-94 Mainline	6374	6378	63746378	2	733	1917	1910	-7	0%	60	16	B			
WB I-94 Mainline	WB I-94 Mainline	6378	6382	63786382	2	1404	1917	1911	-6	0%	61	16	B	59	16	B
WB I-94 Mainline	WB I-94 Mainline	6382	6386	63826386	2	1942	1917	1909	-8	0%	59	16	B			
WB I-94 Mainline	WB I-94 Mainline	6386	6390	63866390	2	1158	1917	1910	-7	0%	58	17	B			
WB I-94 Mainline	Sunset Dr Off-Ramp	6390	6394	63906394	2	1186	1917	1908	-9	0%	56	17	B			
Sunset Dr Off-Ramp	WB I-94 Mainline	6394	6398	63946398	2	1154	1641	1629	-12	-1%	58	14	B	58	14	B
WB I-94 Mainline	Sunset Dr On-Ramp	6398	6510	63986510	2	1807	1641	1628	-13	-1%	57	14	B			
Sunset Dr On-Ramp	WB I-94 Mainline	6510	6514	65106514	2	884	2016	2003	-13	-1%	56	18	B			
WB I-94 Mainline	WB I-94 Mainline	6514	6518	65146518	2	1564	2016	2002	-14	-1%	61	16	B	64	16	B
WB I-94 Mainline	WB I-94 Mainline	6518	6522	65186522	2	1961	2016	2003	-13	-1%	64	16	B			
WB I-94 Mainline	WB I-94 Mainline	6522	6526	65226526	2	1953	2016	2003	-13	-1%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6526	6530	65266530	2	1938	2016	2000	-16	-1%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6530	6534	65306534	2	1961	2016	2001	-15	-1%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6534	6538	65346538	2	1964	2016	2000	-16	-1%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6538	6542	65386542	2	1925	2016	2004	-12	-1%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6542	6546	65426546	2	1950	2016	2004	-12	-1%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6546	6550	65466550	2	1930	2016	2004	-12	-1%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6550	6554	65506554	2	1939	2016	2001	-15	-1%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6554	6558	65546558	2	1990	2016	2002	-14	-1%	66	15	B			
WB I-94 Mainline	TH 25 Off-Ramp	6558	6562	65586562	2	1890	2016	2005	-11	-1%	64	16	B			
TH 25 Off-Ramp	WB I-94 Mainline	6562	6566	65626566	2	1154	1621	1635	14	1%	65	13	B	65	13	B
WB I-94 Mainline	TH 25 On-Ramp	6566	6570	65666570	2	1045	1621	1637	16	1%	65	13	B			
TH 25 On-Ramp	WB I-94 Mainline	6570	6574	65706574	2	1627	1671	1688	17	1%	63	13	B			
WB I-94 Mainline	WB I-94 Mainline	6574	6578	65746578	2	1898	1671	1687	16	1%	61	14	B	62	14	B
66th St Off-Ramp	66th St Off-Ramp	6126	6226	61266226	1	271	300	306	6	2%	58	5	A			
66th St Off-Ramp	66th St Off-Ramp	6226	6227	62266227	1	202	300	306	6	2%	56	5	A			
66th St On-Ramp	66th St On-Ramp	6233	6234	62336234	1	265	1150	1151	1	0%	44	26	C			
66th St On-Ramp	66th St On-Ramp	6234	6134	62346134	1	257	1150	1151	1	0%	47	24	C			
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6150	6250	61506250	1	249	524	512	-12	-2%	58	9	A			
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6250	6251	62506251	1	380	524	512	-12	-2%	53	10	A			
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6253	6254	62536254	1	130	430	429	-1	0%	45	10	A			
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6254	6154	62546154	1	201	430	429	-1	0%	47	9	A			
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6257	6258	62576258	1	279	195	197	2	1%	45	4	A			
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6258	6158	62586158	1	201	195	196	1	1%	47	4	A			
State St Off-Ramp	State St Off-Ramp	6178	6278	61786278	1	215	371	347	-24	-6%	56	6	A			
State St Off-Ramp	State St Off-Ramp	6278	6279	62786279	1	315	371	346	-25	-7%	53	6	A			
NB State St On-Ramp	NB State St On-Ramp	6281	6282	62816282	1	148	419	417	-2	0%	45	9	A			
NB State St On-Ramp	NB State St On-Ramp	6282	6182	62826182	1	195	419	417	-2	0%	47	9	A			
SB State St On-Ramp	SB State St On-Ramp	6285	6286	62856286	1	426	731	733	2	0%	45	16	B			
SB State St On-Ramp	SB State St On-Ramp	6286	6186	62866186	1	198	731	732	1	0%	47	16	B			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6314	6414	63146414	1	241	577	581	4	1%	58	10	B			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6414	6415	64146415	1	534	577	580	3	1%	50	12	B			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6417	6418	64176418	1	237	210	209	-1	0%	35	6	A			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6418	6318	64186318	1	200	210	209	-1	0%	39	5	A			
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6421	6422	64216422	1	466	665	666	1	0%	45	15	B			
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6422	6322	64226322	1	200	665	666	1	0%	47	14	B			
Main St Off-Ramp	Main St Off-Ramp	6334	6434	63346434	1	875	937	935	-2	0%	57	16	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6342	6436	63426436	1	430	701	712	11	2%	44	16	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6436	6437	64366437	1	320	701	713	12	2%	37	19	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6437	6438	64376438	1	568	701	715	14	2%	34	21	C			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6443	6444	64436444	1	377	1302	1304	2	0%	47	28	C			

# Year 2040 Alternative G

## Freeway MOEs

ID-G



Bismarck-Mandan I-94 Corridor Study

Year 2040 Build Alternative G CORSIM Model  
Freeway MOEs - AM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
EB I-94 Mainline	EB I-94 Mainline	5110	5114	51105114	2	1900	624	621	-3	0%	69	4	A			
EB I-94 Mainline	TH 25 Off-Ramp	5114	5118	51145118	2	1537	624	619	-5	-1%	69	4	A	69	4	A
TH 25 Off-Ramp	EB I-94 Mainline	5118	5122	51185122	2	1132	573	573	0	0%	69	4	A	69	4	A
EB I-94 Mainline	TH 25 On-Ramp	5122	5126	51225126	2	1076	573	572	-1	0%	69	4	A			
TH 25 On-Ramp	EB I-94 Mainline	5126	5130	51265130	2	1930	999	994	-5	-1%	66	8	A			
EB I-94 Mainline	EB I-94 Mainline	5130	5134	51305134	2	1995	999	992	-7	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5134	5138	51345138	2	1972	999	992	-7	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5138	5142	51385142	2	1931	999	988	-11	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5142	5146	51425146	2	1950	999	987	-12	-1%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5146	5150	51465150	2	1927	999	987	-12	-1%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5150	5154	51505154	2	1946	999	986	-13	-1%	66	7	A			
EB I-94 Mainline	EB I-94 Mainline	5154	5158	51545158	2	1941	999	985	-14	-1%	65	8	A			
EB I-94 Mainline	EB I-94 Mainline	5158	5162	51585162	2	1941	999	980	-19	-2%	66	7	A			
EB I-94 Mainline	EB I-94 Mainline	5162	5166	51625166	2	1951	999	979	-20	-2%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5166	5170	51665170	2	1957	999	978	-21	-2%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5170	5174	51705174	2	1560	999	977	-22	-2%	63	8	A			
EB I-94 Mainline	Sunset Dr Off-Ramp	5174	5178	51745178	2	1523	999	976	-23	-2%	62	8	A			
Sunset Dr Off-Ramp	EB I-94 Mainline	5178	5182	51785182	2	1577	649	650	1	0%	64	5	A	64	5	A
EB I-94 Mainline	Sunset Dr On-Ramp	5182	5186	51825186	2	1157	649	650	1	0%	64	5	A			
Sunset Dr On-Ramp	EB I-94 Mainline	5186	5190	51865190	2	791	1550	1547	-3	0%	60	13	B			
EB I-94 Mainline	EB I-94 Mainline	5190	5194	51905194	2	1162	1550	1546	-4	0%	63	12	B			
EB I-94 Mainline	EB I-94 Mainline	5194	5198	51945198	2	1950	1550	1545	-5	0%	63	12	B	62	12	B
EB I-94 Mainline	EB I-94 Mainline	5198	5310	51985310	2	1401	1550	1546	-4	0%	63	12	B			
EB I-94 Mainline	Mandan Ave Off-Ramp	5310	5314	53105314	2	1398	1550	1547	-3	0%	63	12	B			
Mandan Ave Off-Ramp	EB I-94 Mainline	5314	5318	53145318	2	920	1349	1346	-3	0%	63	11	B	63	11	B
EB I-94 Mainline	Mandan Ave On-Ramp	5318	5322	53185322	2	1091	1349	1346	-3	0%	63	11	B			
Mandan Ave On-Ramp	EB I-94 Mainline	5322	5326	53225326	2	1944	2224	2221	-3	0%	61	18	B			
EB I-94 Mainline	EB I-94 Mainline	5326	5330	53265330	2	1092	2224	2219	-5	0%	62	18	B	62	18	B
EB I-94 Mainline	EB I-94 Mainline	5330	5334	53305334	2	857	2224	2218	-6	0%	62	18	B			
EB I-94 Mainline	Main St On-Ramp	5334	5338	53345338	2	1671	2224	2218	-6	0%	62	18	B			
Main St On-Ramp	EB I-94 Mainline	5338	5342	53385342	3	1621	3399	3382	-17	-1%	61	19	B			
EB I-94 Mainline	SB TH 810 Off-Ramp	5342	5346	53425346	3	1502	3399	3380	-19	-1%	59	19	B	60	19	B
SB TH 810 Off-Ramp	EB I-94 Mainline	5346	5350	53465350	2	1073	2100	2079	-21	-1%	62	17	B	62	17	B
EB I-94 Mainline	NB TH 810 On-Ramp	5350	5354	53505354	2	1054	2100	2080	-20	-1%	62	17	B			
NB TH 810 On-Ramp	EB I-94 Mainline	5354	5358	53545358	2	1969	2726	2708	-18	-1%	58	23	C			
EB I-94 Mainline	EB I-94 Mainline	5358	5362	53585362	2	1279	2726	2706	-20	-1%	60	22	C	58	23	C
EB I-94 Mainline	EB I-94 Mainline	5362	5366	53625366	2	1258	2726	2701	-25	-1%	59	23	C			
EB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp Loop	5366	5370	53665370	2	1444	2726	2699	-27	-1%	55	24	C			
Divide Ave/Tyler Pkwy Off-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp	5370	5374	53705374	2	1141	1926	1894	-32	-2%	60	16	B			
Divide Ave/Tyler Pkwy On-Ramp	EB I-94 Mainline	5374	5378	53745378	2	1924	2350	2314	-36	-2%	58	20	B			
EB I-94 Mainline	EB I-94 Mainline	5378	5382	53785382	2	1942	2350	2310	-40	-2%	60	19	B			
EB I-94 Mainline	EB I-94 Mainline	5382	5386	53825386	2	1942	2350	2307	-43	-2%	61	19	B	59	19	B
EB I-94 Mainline	EB I-94 Mainline	5386	5390	53865390	2	1300	2350	2302	-48	-2%	60	19	B			
EB I-94 Mainline	SB State St Off Ramp	5390	5394	53905394	2	1350	2350	2301	-49	-2%	58	20	B			
SB State St Off Ramp	NB State St Off Ramp	5394	5398	53945398	2	961	1859	1823	-36	-2%	60	15	B	61	13	B
NB State St Off Ramp	State St On-Ramp	5398	5510	53985510	2	1232	1200	1189	-11	-1%	63	9	A			
State St On-Ramp	EB I-94 Mainline	5510	5514	55105514	2	1949	1626	1612	-14	-1%	62	13	B			
EB I-94 Mainline	EB I-94 Mainline	5514	5518	55145518	2	1950	1626	1611	-15	-1%	63	13	B			
EB I-94 Mainline	EB I-94 Mainline	5518	5522	55185522	2	1934	1626	1610	-16	-1%	63	13	B	62	13	B
EB I-94 Mainline	EB I-94 Mainline	5522	5526	55225526	2	1369	1626	1611	-15	-1%	62	13	B			
EB I-94 Mainline	NB Centennial Rd Off-Ramp	5526	5530	55265530	2	1263	1626	1611	-15	-1%	61	13	B			
NB Centennial Rd Off-Ramp	SB Bismarck Expy Off-Ramp	5530	5534	55305534	2	1015	1154	1139	-15	-1%	63	9	A			
SB Bismarck Expy Off-Ramp	Bismarck Expy/Centennial Rd On-Ramp	5534	5538	55345538	2	1278	948	935	-13	-1%	63	7	A			
Bismarck Expy/Centennial Rd On-Ramp	EB I-94 Mainline	5538	5542	55385542	2	1947	1498	1484	-14	-1%	61	12	B			
EB I-94 Mainline	EB I-94 Mainline	5542	5546	55425546	2	1934	1498	1483	-15	-1%	66	11	B			
EB I-94 Mainline	EB I-94 Mainline	5546	5550	55465550	2	1950	1498	1482	-16	-1%	67	11	B	64	12	B
EB I-94 Mainline	EB I-94 Mainline	5550	5552	55505552	2	1092	1498	1479	-19	-1%	66	11	B			
EB I-94 Mainline	EB I-94 Mainline	5552	5554	55525554	2	1782	1498	1477	-21	-1%	64	12	B			
EB I-94 Mainline	66th St Off-Ramp	5554	5558	55545558	2	981	1498	1474	-24	-2%	57	13	B			
66th St Off-Ramp	EB I-94 Mainline	5558	5562	55585562	2	1201	348	345	-3	-1%	66	3	A			
EB I-94 Mainline	EB I-94 Mainline	5562	5564	55625564	2	1336	599	595	-4	-1%	66	5	A			
EB I-94 Mainline	EB I-94 Mainline	5564	5566	55645566	2	1119	599	594	-5	-1%	69	4	A			
EB I-94 Mainline	EB I-94 Mainline	5566	5570	55665570	2	1725	599	591	-8	-1%	69	4	A	68	4	A
EB I-94 Mainline	EB I-94 Mainline	5570	5574	55705574	2	1749	599	592	-7	-1%	69	4	A			
EB I-94 Mainline	EB I-94 Mainline	5574	5578	55745578	2	1753	599	592	-7	-1%	69	4	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5118	5218	51185218	1	316	51	45	-6	-12%	60	1	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5218	5219	52185219	1	407	51	45	-6	-12%	54	1	A			
TH 25 On-Ramp	TH 25 On-Ramp	5225	5226	52255226	1	354	426	425	-1	0%	45	10	A			
TH 25 On-Ramp	TH 25 On-Ramp	5226	5126	52265126	1	222	426	425	-1	0%	47	9	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5178	5278	51785278	1	222	350	325	-25	-7%	58	6	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5278	5279	52785279	1	370	350	324	-26	-7%	53	6	A			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5285	5286	52855286	1	208	901	899	-2	0%	44	20	C			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5286	5186	52865186	1	198	901	899	-2	0%	47	19	B			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5314	5414	53145414	1	153	201	200	-1	0%	59	3	A			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5414	5415	54145415	1	207	201	200	-1	0%	57	3	A			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5421	5422	54215422	1	118	875	877	2	0%	44	20	B			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5422	5322	54225322	1	362	875	876	1	0%	49	18	B			
Main St On-Ramp	Main St On-Ramp	5437	5438	54375438	2	1694	1175	1167	-8	-1%	41					

Bismarck-Mandan I-94 Corridor Study

Year 2040 Build Alternative G CORSIM Model  
 Freeway MOEs - AM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics													
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS											
WB I-94 Mainline	WB I-94 Mainline	6162	6166	61626166	2	1368	1747	1718	-29	-2%	63	14	B	61	14	B										
WB I-94 Mainline	WB I-94 Mainline	6166	6170	61666170	2	1934	1747	1712	-35	-2%	62	14	B													
WB I-94 Mainline	WB I-94 Mainline	6170	6174	61706174	2	1949	1747	1708	-39	-2%	61	14	B													
WB I-94 Mainline	State St Off-Ramp	6174	6178	61746178	2	1866	1747	1704	-43	-2%	59	14	B	61	18	B										
State St Off-Ramp	NB State St On-Ramp	6178	6182	61786182	2	1208	1178	1143	-35	-3%	61	9	A													
NB State St On-Ramp	SB State St On-Ramp	6182	6186	61826186	2	1002	1623	1586	-37	-2%	60	13	B													
SB State St On-Ramp	WB I-94 Mainline	6186	6190	61866190	2	1418	2179	2144	-35	-2%	59	18	B	61	20	B										
WB I-94 Mainline	WB I-94 Mainline	6190	6194	61906194	2	1300	2179	2145	-34	-2%	62	17	B													
WB I-94 Mainline	WB I-94 Mainline	6194	6198	61946198	2	1941	2179	2142	-37	-2%	62	17	B													
WB I-94 Mainline	WB I-94 Mainline	6198	6310	61986310	2	1950	2179	2136	-43	-2%	62	17	B	61	20	B										
WB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp	6310	6314	63106314	2	1973	2179	2131	-48	-2%	61	17	B													
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy On-Ramp Loop	6314	6318	63146318	2	1385	1675	1642	-33	-2%	63	13	B													
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave /Tyler Pkwy On-Ramp	6318	6322	63186322	2	1169	1835	1799	-36	-2%	62	15	B	61	20	B										
Divide Ave /Tyler Pkwy On-Ramp	WB I-94 Mainline	6322	6326	63226326	2	1257	2425	2383	-42	-2%	60	20	B													
WB I-94 Mainline	WB I-94 Mainline	6326	6330	63266330	2	1279	2425	2381	-44	-2%	61	19	B													
WB I-94 Mainline	SB TH 810 Off-Ramp	6330	6334	63306334	2	1410	2425	2373	-52	-2%	61	20	B	63	14	B										
SB TH 810 Off-Ramp	WB I-94 Mainline	6334	6338	63346338	2	1336	1824	1798	-26	-1%	63	14	B													
WB I-94 Mainline	NB TH 810 On-Ramp	6338	6342	63386342	2	1268	1824	1796	-28	-2%	63	14	B													
NB TH 810 On-Ramp	WB I-94 Mainline	6342	6346	63426346	4	1069	2624	2568	-56	-2%	62	10	B	62	10	B										
WB I-94 Mainline	Main St Off-Ramp	6346	6350	63466350	4	1125	2624	2562	-62	-2%	62	10	B													
Main St Off-Ramp	WB I-94 Mainline	6350	6354	63506354	2	1942	1823	1789	-34	-2%	62	14	B													
WB I-94 Mainline	WB I-94 Mainline	6354	6358	63546358	2	1023	1823	1788	-35	-2%	62	14	B	62	16	B										
WB I-94 Mainline	WB I-94 Mainline	6358	6362	63586362	2	1254	1823	1787	-36	-2%	62	14	B													
WB I-94 Mainline	Mandan Ave Off-Ramp	6362	6366	63626366	2	1919	1823	1785	-38	-2%	61	15	B													
Mandan Ave Off-Ramp	WB I-94 Mainline	6366	6370	63666370	2	1098	1323	1278	-45	-3%	62	10	B	62	10	B										
WB I-94 Mainline	Mandan Ave On-Ramp	6370	6374	63706374	2	1496	1323	1278	-45	-3%	62	10	B													
Mandan Ave On-Ramp	WB I-94 Mainline	6374	6378	63746378	2	733	1474	1427	-47	-3%	61	12	B													
WB I-94 Mainline	WB I-94 Mainline	6378	6382	63786382	2	1404	1474	1424	-50	-3%	61	12	B	59	12	B										
WB I-94 Mainline	WB I-94 Mainline	6382	6386	63826386	2	1942	1474	1417	-57	-4%	60	12	B													
WB I-94 Mainline	WB I-94 Mainline	6386	6390	63866390	2	1158	1474	1417	-57	-4%	59	12	B													
WB I-94 Mainline	Sunset Dr Off-Ramp	6390	6394	63906394	2	1186	1474	1414	-60	-4%	56	13	B	60	7	A										
Sunset Dr Off-Ramp	WB I-94 Mainline	6394	6398	63946398	2	1154	800	787	-13	-2%	60	7	A													
WB I-94 Mainline	Sunset Dr On-Ramp	6398	6510	63986510	2	1807	800	787	-13	-2%	60	7	A													
Sunset Dr On-Ramp	WB I-94 Mainline	6510	6514	65106514	2	884	1125	1111	-14	-1%	59	9	A	67	8	A										
WB I-94 Mainline	WB I-94 Mainline	6514	6518	65146518	2	1564	1125	1109	-16	-1%	64	9	A													
WB I-94 Mainline	WB I-94 Mainline	6518	6522	65186522	2	1961	1125	1105	-20	-2%	67	8	A													
WB I-94 Mainline	WB I-94 Mainline	6522	6526	65226526	2	1953	1125	1103	-22	-2%	68	8	A	67	8	A										
WB I-94 Mainline	WB I-94 Mainline	6526	6530	65266530	2	1938	1125	1102	-23	-2%	68	8	A													
WB I-94 Mainline	WB I-94 Mainline	6530	6534	65306534	2	1961	1125	1103	-22	-2%	68	8	A													
WB I-94 Mainline	WB I-94 Mainline	6534	6538	65346538	2	1964	1125	1102	-23	-2%	68	8	A	67	8	A										
WB I-94 Mainline	WB I-94 Mainline	6538	6542	65386542	2	1925	1125	1100	-25	-2%	68	8	A													
WB I-94 Mainline	WB I-94 Mainline	6542	6546	65426546	2	1950	1125	1097	-28	-2%	68	8	A													
WB I-94 Mainline	WB I-94 Mainline	6546	6550	65466550	2	1930	1125	1096	-29	-3%	68	8	A	67	8	A										
WB I-94 Mainline	WB I-94 Mainline	6550	6554	65506554	2	1939	1125	1093	-32	-3%	68	8	A													
WB I-94 Mainline	WB I-94 Mainline	6554	6558	65546558	2	1990	1125	1092	-33	-3%	68	8	A													
WB I-94 Mainline	TH 25 Off-Ramp	6558	6562	65586562	2	1890	1125	1089	-36	-3%	66	8	A	67	6	A										
TH 25 Off-Ramp	WB I-94 Mainline	6562	6566	65626566	2	1154	901	863	-38	-4%	67	6	A													
WB I-94 Mainline	TH 25 On-Ramp	6566	6570	65666570	2	1045	901	862	-39	-4%	67	6	A													
TH 25 On-Ramp	WB I-94 Mainline	6570	6574	65706574	2	1627	976	936	-40	-4%	65	7	A	65	7	A										
WB I-94 Mainline	WB I-94 Mainline	6574	6578	65746578	2	1898	976	933	-43	-4%	65	7	A													
66th St Off-Ramp	66th St Off-Ramp	6126	6226	61266226	1	271	251	244	-7	-3%	58	4	A													
66th St Off-Ramp	66th St Off-Ramp	6226	6227	62266227	1	202	251	243	-8	-3%	56	4	A	66th St On-Ramp	6233	6234	62336234	1	265	1225	1225	0	0%	44	28	C
66th St On-Ramp	66th St On-Ramp	6233	6234	62336234	1	265	1225	1225	0	0%	44	28	C													
66th St On-Ramp	66th St On-Ramp	6234	6134	62346134	1	257	1225	1224	-1	0%	48	26	C													
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6150	6250	61506250	1	249	302	301	-1	0%	59	5	A	67	8	A										
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6250	6251	62506251	1	380	302	301	-1	0%	54	6	A													
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6253	6254	62536254	1	130	341	341	0	0%	45	8	A													
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6254	6154	62546154	1	201	341	341	0	0%	47	7	A	67	8	A										
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6257	6258	62576258	1	279	285	286	1	0%	45	6	A													
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6258	6158	62586158	1	201	285	285	0	0%	47	6	A													
State St Off-Ramp	State St Off-Ramp	6178	6278	61786278	1	215	569	557	-12	-2%	56	10	A	67	8	A										
State St Off-Ramp	State St Off-Ramp	6278	6279	62786279	1	315	569	556	-13	-2%	53	11	B													
NB State St On-Ramp	NB State St On-Ramp	6281	6282	62816282	1	148	445	444	-1	0%	44	10	A													
NB State St On-Ramp	NB State St On-Ramp	6282	6182	62826182	1	195	445	445	0	0%	47	10	A	67	8	A										
SB State St On-Ramp	SB State St On-Ramp	6285	6286	62856286	1	426	556	558	2	0%	45	12	B													
SB State St On-Ramp	SB State St On-Ramp	6286	6186	62866186	1	198	556	558	2	0%	47	12	B													
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6314	6414	63146414	1	241	504	487	-17	-3%	58	8	A	67	8	A										
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6414	6415	64146415	1	534	504	486	-18	-4%	51	10	A													
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6417	6418	64176418	1	237	160	159	-1	-1%	35	5	A													
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6418	6318	64186318	1	200	160	159	-1	-1%	39	4	A	67	8	A										
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6421	6422	64216422	1	466	590	588	-2	0%	45	13	B													
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6422	6322	64226322	1	200	590	588	-2	0%	47	13	B													
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6334	6434	63346434	1	157	601	569	-32	-5%	58	10	A	67	8	A										
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6434	6435	64346435	1	403	601	569	-32	-5%	58	10	A													
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6435	6436	64356436	1	1445	601	567	-34	-6%	58	10	A													
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6436	6437	64366437	1	560	601	567	-34	-6%	47	12	B	67	8	A										
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6437	6438	64376438	1	750	601	566	-35	-6%	34	17	B													
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6440	6441	64406441	2	569	800	778	-22	-3%	59	7	A													
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6441	6442	64416442	2	304																				

Bismarck-Mandan I-94 Corridor Study

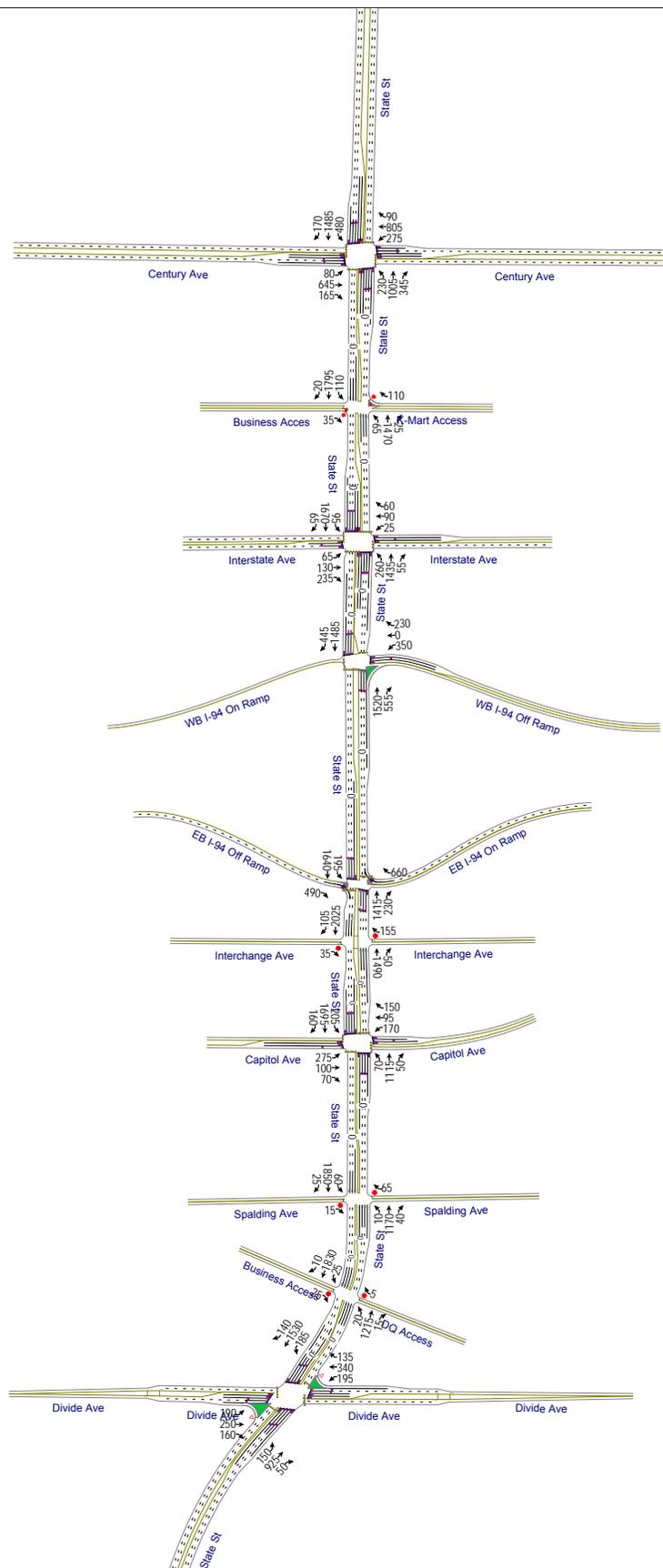
Year 2040 Build Alternative G CORSIM Model  
Freeway MOEs - PM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
EB I-94 Mainline	EB I-94 Mainline	5110	5114	51105114	2	1900	750	750	0	0%	69	5	A	69	5	A
EB I-94 Mainline	TH 25 Off-Ramp	5114	5118	51145118	2	1537	750	749	-1	0%	69	5	A			
TH 25 Off-Ramp	EB I-94 Mainline	5118	5122	51185122	2	1132	675	681	6	1%	69	5	A	69	5	A
EB I-94 Mainline	TH 25 On-Ramp	5122	5126	51225126	2	1076	675	682	7	1%	69	5	A			
TH 25 On-Ramp	EB I-94 Mainline	5126	5130	51265130	2	1930	925	929	4	0%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5130	5134	51305134	2	1995	925	928	3	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5134	5138	51345138	2	1972	925	926	1	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5138	5142	51385142	2	1931	925	926	1	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5142	5146	51425146	2	1950	925	924	-1	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5146	5150	51465150	2	1927	925	924	-1	0%	68	7	A			
EB I-94 Mainline	EB I-94 Mainline	5150	5154	51505154	2	1946	925	926	1	0%	66	7	A			
EB I-94 Mainline	EB I-94 Mainline	5154	5158	51545158	2	1941	925	927	2	0%	66	7	A			
EB I-94 Mainline	EB I-94 Mainline	5158	5162	51585162	2	1941	925	927	2	0%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5162	5166	51625166	2	1951	925	924	-1	0%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5166	5170	51665170	2	1957	925	921	-4	0%	67	7	A			
EB I-94 Mainline	EB I-94 Mainline	5170	5174	51705174	2	1560	925	920	-5	-1%	63	7	A			
EB I-94 Mainline	Sunset Dr Off-Ramp	5174	5178	51745178	2	1523	925	920	-5	-1%	62	7	A			
Sunset Dr Off-Ramp	EB I-94 Mainline	5178	5182	51785182	2	1577	526	515	-11	-2%	64	4	A	64	4	A
EB I-94 Mainline	Sunset Dr On-Ramp	5182	5186	51825186	2	1157	526	514	-12	-2%	64	4	A			
Sunset Dr On-Ramp	EB I-94 Mainline	5186	5190	51865190	2	791	1426	1415	-11	-1%	60	12	B			
EB I-94 Mainline	EB I-94 Mainline	5190	5194	51905194	2	1162	1426	1415	-11	-1%	63	11	B			
EB I-94 Mainline	EB I-94 Mainline	5194	5198	51945198	2	1950	1426	1415	-11	-1%	63	11	B			
EB I-94 Mainline	EB I-94 Mainline	5198	5310	51985310	2	1401	1426	1411	-15	-1%	63	11	B			
EB I-94 Mainline	Mandan Ave Off-Ramp	5310	5314	53105314	2	1398	1426	1412	-14	-1%	63	11	B			
Mandan Ave Off-Ramp	EB I-94 Mainline	5314	5318	53145318	2	920	1226	1221	-5	0%	64	10	A	63	10	A
EB I-94 Mainline	Mandan Ave On-Ramp	5318	5322	53185322	2	1091	1226	1220	-6	0%	63	10	A			
Mandan Ave On-Ramp	EB I-94 Mainline	5322	5326	53225326	2	1944	1825	1816	-9	0%	62	15	B			
EB I-94 Mainline	EB I-94 Mainline	5326	5330	53265330	2	1092	1825	1815	-10	-1%	63	14	B			
EB I-94 Mainline	EB I-94 Mainline	5330	5334	53305334	2	857	1825	1812	-13	-1%	63	14	B			
EB I-94 Mainline	Main St On-Ramp	5334	5338	53345338	2	1671	1825	1813	-12	-1%	62	15	B			
Main St On-Ramp	EB I-94 Mainline	5338	5342	53385342	3	1621	2950	2945	-5	0%	61	16	B			
EB I-94 Mainline	SB TH 810 Off-Ramp	5342	5346	53425346	3	1502	2950	2947	-3	0%	60	16	B			
SB TH 810 Off-Ramp	EB I-94 Mainline	5346	5350	53465350	2	1073	2050	2025	-25	-1%	62	16	B			
EB I-94 Mainline	NB TH 810 On-Ramp	5350	5354	53505354	2	1054	2050	2024	-26	-1%	62	16	B			
NB TH 810 On-Ramp	EB I-94 Mainline	5354	5358	53545358	2	1969	2768	2741	-27	-1%	59	23	C			
EB I-94 Mainline	EB I-94 Mainline	5358	5362	53585362	2	1279	2768	2743	-25	-1%	61	23	C			
EB I-94 Mainline	EB I-94 Mainline	5362	5366	53625366	2	1258	2768	2743	-25	-1%	59	23	C			
EB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp Loop	5366	5370	53665370	2	1444	2768	2744	-24	-1%	56	25	C			
Divide Ave/Tyler Pkwy Off-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp	5370	5374	53705374	2	1141	1793	1791	-2	0%	60	15	B			
Divide Ave/Tyler Pkwy On-Ramp	EB I-94 Mainline	5374	5378	53745378	2	1924	2244	2234	-10	0%	59	19	B			
EB I-94 Mainline	EB I-94 Mainline	5378	5382	53785382	2	1942	2244	2233	-11	0%	60	19	B			
EB I-94 Mainline	EB I-94 Mainline	5382	5386	53825386	2	1942	2244	2233	-11	0%	61	18	B			
EB I-94 Mainline	EB I-94 Mainline	5386	5390	53865390	2	1300	2244	2231	-13	-1%	61	18	B			
EB I-94 Mainline	SB State St Off Ramp	5390	5394	53905394	2	1350	2244	2226	-18	-1%	59	19	B			
SB State St Off Ramp	NB State St Off Ramp	5394	5398	53945398	2	961	1798	1795	-3	0%	61	15	B			
NB State St Off Ramp	State St On-Ramp	5398	5510	53985510	2	1232	1169	1180	11	1%	63	9	A	62	13	B
State St On-Ramp	EB I-94 Mainline	5510	5514	55105514	2	1949	1743	1754	11	1%	62	14	B			
EB I-94 Mainline	EB I-94 Mainline	5514	5518	55145518	2	1950	1743	1756	13	1%	63	14	B			
EB I-94 Mainline	EB I-94 Mainline	5518	5522	55185522	2	1934	1743	1752	9	1%	62	14	B			
EB I-94 Mainline	EB I-94 Mainline	5522	5526	55225526	2	1369	1743	1752	9	1%	62	14	B			
EB I-94 Mainline	NB Centennial Rd Off-Ramp	5526	5530	55265530	2	1263	1743	1756	13	1%	61	14	B			
NB Centennial Rd Off-Ramp	SB Bismarck Expy Off-Ramp	5530	5534	55305534	2	1015	1367	1372	5	0%	62	11	B			
SB Bismarck Expy Off-Ramp	Bismarck Expy/Centennial Rd On-Ramp	5534	5538	55345538	2	1278	972	971	-1	0%	63	8	A			
Bismarck Expy/Centennial Rd On-Ramp	EB I-94 Mainline	5538	5542	55385542	2	1947	1823	1823	0	0%	61	15	B			
EB I-94 Mainline	EB I-94 Mainline	5542	5546	55425546	2	1934	1823	1822	-1	0%	66	14	B			
EB I-94 Mainline	EB I-94 Mainline	5546	5550	55465550	2	1950	1823	1821	-2	0%	66	14	B			
EB I-94 Mainline	EB I-94 Mainline	5550	5552	55505552	2	1092	1823	1819	-4	0%	66	14	B			
EB I-94 Mainline	EB I-94 Mainline	5552	5554	55525554	2	1782	1823	1819	-4	0%	63	14	B			
EB I-94 Mainline	66th St Off-Rmap	5554	5558	55545558	2	981	1823	1820	-3	0%	56	16	B			
66th St Off-Rmap	EB I-94 Mainline	5558	5562	55585562	2	1201	500	503	3	1%	66	4	A			
EB I-94 Mainline	EB I-94 Mainline	5562	5564	55625564	2	1336	800	805	5	1%	66	6	A			
EB I-94 Mainline	EB I-94 Mainline	5564	5566	55645566	2	1119	800	806	6	1%	69	6	A			
EB I-94 Mainline	EB I-94 Mainline	5566	5570	55665570	2	1725	800	807	7	1%	69	6	A			
EB I-94 Mainline	EB I-94 Mainline	5570	5574	55705574	2	1749	800	807	7	1%	69	6	A			
EB I-94 Mainline	EB I-94 Mainline	5574	5578	55745578	2	1753	800	807	7	1%	69	6	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5118	5218	51185218	1	316	75	66	-9	-12%	59	1	A			
TH 25 Off-Ramp	TH 25 Off-Ramp	5218	5219	52185219	1	407	75	66	-9	-12%	54	1	A			
TH 25 On-Ramp	TH 25 On-Ramp	5225	5226	52255226	1	354	250	251	1	0%	45	6	A			
TH 25 On-Ramp	TH 25 On-Ramp	5226	5126	52265126	1	222	250	251	1	0%	47	5	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5178	5278	51785278	1	222	399	404	5	1%	58	7	A			
Sunset Dr Off-Ramp	Sunset Dr Off-Ramp	5278	5279	52785279	1	370	399	404	5	1%	53	8	A			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5285	5286	52855286	1	208	900	902	2	0%	44	20	C			
Sunset Dr On-Ramp	Sunset Dr On-Ramp	5286	5186	52865186	1	198	900	902	2	0%	47	19	B			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5314	5414	53145414	1	153	200	192	-8	-4%	59	3	A			
Mandan Ave Off-Ramp	Mandan Ave Off-Ramp	5414	5415	54145415	1	207	200	191	-9	-5%	57	3	A			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5421	5422	54215422	1	118	599	600	1	0%	44	14	B			
Mandan Ave On-Ramp	Mandan Ave On-Ramp	5422	5322	54225322	1	362	599	600	1	0%	49	12	B			
Main St On-Ramp	Main St On-Ramp	5437	5438	54375438	2	1694	1125	1130	5	0%	42	13	B			
Main St On-Ramp	Main St On-Ramp	5438	5338	54												

Bismarck-Mandan I-94 Corridor Study

Year 2040 Build Alternative G CORSIM Model  
 Freeway MOEs - PM

Location		Node		# of Lanes	Length (ft)	Volumes				Link Statistics			Aggregate Statistics			
From	To	From	To			Actual	Simulated	Difference	% Diff	Speed (mph)	Density (vplpm)	LOS	Speed (mph)	Density (vplpm)	LOS	
WB I-94 Mainline	WB I-94 Mainline	6162	6166	61626166	2	1368	1726	1719	-7	0%	62	14	B	61	14	B
WB I-94 Mainline	WB I-94 Mainline	6166	6170	61666170	2	1934	1726	1718	-8	0%	62	14	B			
WB I-94 Mainline	WB I-94 Mainline	6170	6174	61706174	2	1949	1726	1712	-14	-1%	61	14	B			
WB I-94 Mainline	State St Off-Ramp	6174	6178	61746178	2	1866	1726	1710	-16	-1%	60	14	B	60	21	C
State St Off-Ramp	NB State St On-Ramp	6178	6182	61786182	2	1208	1355	1357	2	0%	61	11	B			
NB State St On-Ramp	SB State St On-Ramp	6182	6186	61826186	2	1002	1774	1778	4	0%	59	15	B			
SB State St On-Ramp	WB I-94 Mainline	6186	6190	61866190	2	1418	2505	2513	8	0%	58	22	C	60	21	C
WB I-94 Mainline	WB I-94 Mainline	6190	6194	61906194	2	1300	2505	2514	9	0%	61	21	C			
WB I-94 Mainline	WB I-94 Mainline	6194	6198	61946198	2	1941	2505	2518	13	1%	61	21	C			
WB I-94 Mainline	WB I-94 Mainline	6198	6310	61986310	2	1950	2505	2514	9	0%	61	21	C	60	21	C
WB I-94 Mainline	Divide Ave/Tyler Pkwy Off-Ramp	6310	6314	63106314	2	1973	2505	2512	7	0%	60	21	C			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy On-Ramp Loop	6314	6318	63146318	2	1385	1928	1933	5	0%	62	16	B			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave /Tyler Pkwy On-Ramp	6318	6322	63186322	2	1169	2138	2144	6	0%	61	18	B	59	24	C
Divide Ave /Tyler Pkwy On-Ramp	WB I-94 Mainline	6322	6326	63226326	2	1257	2803	2809	6	0%	58	24	C			
WB I-94 Mainline	WB I-94 Mainline	6326	6330	63266330	2	1279	2803	2810	7	0%	60	23	C			
WB I-94 Mainline	SB TH 810 Off-Ramp	6330	6334	63306334	2	1410	2803	2809	6	0%	59	24	C	62	17	B
SB TH 810 Off-Ramp	WB I-94 Mainline	6334	6338	63346338	2	1336	2102	2118	16	1%	62	17	B			
WB I-94 Mainline	NB TH 810 On-Ramp	6338	6342	63386342	2	1268	2102	2116	14	1%	62	17	B			
NB TH 810 On-Ramp	WB I-94 Mainline	6342	6346	63426346	4	1069	3960	3972	12	0%	60	17	B	60	17	B
WB I-94 Mainline	Main St Off-Ramp	6346	6350	63466350	4	1125	3960	3975	15	0%	60	17	B			
Main St Off-Ramp	WB I-94 Mainline	6350	6354	63506354	2	1942	2461	2481	20	1%	61	20	C			
WB I-94 Mainline	WB I-94 Mainline	6354	6358	63546358	2	1023	2461	2483	22	1%	61	20	C	61	24	C
WB I-94 Mainline	WB I-94 Mainline	6358	6362	63586362	2	1254	2461	2486	25	1%	61	20	C			
WB I-94 Mainline	Mandan Ave Off-Ramp	6362	6366	63626366	2	1919	2461	2482	21	1%	60	21	C			
Mandan Ave Off-Ramp	WB I-94 Mainline	6366	6370	63666370	2	1098	1683	1692	9	1%	62	14	B	62	14	B
WB I-94 Mainline	Mandan Ave On-Ramp	6370	6374	63706374	2	1496	1683	1693	10	1%	62	14	B			
Mandan Ave On-Ramp	WB I-94 Mainline	6374	6378	63746378	2	733	1908	1917	9	0%	60	16	B			
WB I-94 Mainline	WB I-94 Mainline	6378	6382	63786382	2	1404	1908	1915	7	0%	60	16	B	58	16	B
WB I-94 Mainline	WB I-94 Mainline	6382	6386	63826386	2	1942	1908	1913	5	0%	59	16	B			
WB I-94 Mainline	WB I-94 Mainline	6386	6390	63866390	2	1158	1908	1915	7	0%	57	17	B			
WB I-94 Mainline	Sunset Dr Off-Ramp	6390	6394	63906394	2	1186	1908	1913	5	0%	56	17	B	56	14	B
Sunset Dr Off-Ramp	WB I-94 Mainline	6394	6398	63946398	2	1154	1634	1627	-7	0%	57	14	B			
WB I-94 Mainline	Sunset Dr On-Ramp	6398	6510	63986510	2	1807	1634	1628	-6	0%	56	15	B			
Sunset Dr On-Ramp	WB I-94 Mainline	6510	6514	65106514	2	884	2009	2000	-9	0%	55	18	B	64	16	B
WB I-94 Mainline	WB I-94 Mainline	6514	6518	65146518	2	1564	2009	1998	-11	-1%	60	17	B			
WB I-94 Mainline	WB I-94 Mainline	6518	6522	65186522	2	1961	2009	2004	-5	0%	64	16	B			
WB I-94 Mainline	WB I-94 Mainline	6522	6526	65226526	2	1953	2009	2006	-3	0%	65	15	B	64	16	B
WB I-94 Mainline	WB I-94 Mainline	6526	6530	65266530	2	1938	2009	2003	-6	0%	65	15	B			
WB I-94 Mainline	WB I-94 Mainline	6530	6534	65306534	2	1961	2009	1999	-10	0%	65	15	B			
WB I-94 Mainline	WB I-94 Mainline	6534	6538	65346538	2	1964	2009	2000	-9	0%	66	15	B	64	16	B
WB I-94 Mainline	WB I-94 Mainline	6538	6542	65386542	2	1925	2009	2003	-6	0%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6542	6546	65426546	2	1950	2009	2000	-9	0%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6546	6550	65466550	2	1930	2009	2001	-8	0%	66	15	B	64	16	B
WB I-94 Mainline	WB I-94 Mainline	6550	6554	65506554	2	1939	2009	2002	-7	0%	66	15	B			
WB I-94 Mainline	WB I-94 Mainline	6554	6558	65546558	2	1990	2009	1996	-13	-1%	65	15	B			
WB I-94 Mainline	TH 25 Off-Ramp	6558	6562	65586562	2	1890	2009	1997	-12	-1%	63	16	B	64	13	B
TH 25 Off-Ramp	WB I-94 Mainline	6562	6566	65626566	2	1154	1611	1633	22	1%	65	13	B			
WB I-94 Mainline	TH 25 On-Ramp	6566	6570	65666570	2	1045	1611	1632	21	1%	64	13	B			
TH 25 On-Ramp	WB I-94 Mainline	6570	6574	65706574	2	1627	1661	1680	19	1%	62	13	B	61	14	B
WB I-94 Mainline	WB I-94 Mainline	6574	6578	65746578	2	1898	1661	1682	21	1%	60	14	B			
66th St Off-Ramp	66th St Off-Ramp	6126	6226	61266226	1	271	300	298	-2	-1%	58	5	A			
66th St Off-Ramp	66th St Off-Ramp	6226	6227	62266227	1	202	300	298	-2	-1%	56	5	A	61	14	B
66th St On-Ramp	66th St On-Ramp	6233	6234	62336234	1	265	1150	1149	-1	0%	44	26	C			
66th St On-Ramp	66th St On-Ramp	6234	6134	62346134	1	257	1150	1149	-1	0%	48	24	C			
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6150	6250	61506250	1	249	524	517	-7	-1%	58	9	A	61	14	B
Bismarck Expy/Centennial Rd Off-Ramp	Bismarck Expy/Centennial Rd Off-Ramp	6250	6251	62506251	1	380	524	517	-7	-1%	53	10	A			
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6253	6254	62536254	1	130	430	432	2	0%	45	10	A			
NB Bismarck Expy/Centennial Rd On-Ramp	NB Bismarck Expy/Centennial Rd On-Ramp	6254	6154	62546154	1	201	430	432	2	0%	47	9	A	61	14	B
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6257	6258	62576258	1	279	195	195	0	0%	45	4	A			
SB Bismarck Expy/Centennial Rd On-Ramp	SB Bismarck Expy/Centennial Rd On-Ramp	6258	6158	62586158	1	201	195	195	0	0%	47	4	A			
State St Off-Ramp	State St Off-Ramp	6178	6278	61786278	1	215	371	353	-18	-5%	57	6	A	61	14	B
State St Off-Ramp	State St Off-Ramp	6278	6279	62786279	1	315	371	353	-18	-5%	54	7	A			
NB State St On-Ramp	NB State St On-Ramp	6281	6282	62816282	1	148	419	419	0	0%	45	9	A			
NB State St On-Ramp	NB State St On-Ramp	6282	6182	62826182	1	195	419	420	1	0%	47	9	A	61	14	B
SB State St On-Ramp	SB State St On-Ramp	6285	6286	62856286	1	426	731	732	1	0%	45	16	B			
SB State St On-Ramp	SB State St On-Ramp	6286	6186	62866186	1	198	731	731	0	0%	47	16	B			
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6314	6414	63146414	1	241	577	580	3	1%	58	10	B	61	14	B
Divide Ave/Tyler Pkwy Off-Ramp	Divide Ave/Tyler Pkwy Off-Ramp	6414	6415	64146415	1	534	577	580	3	1%	50	12	B			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6417	6418	64176418	1	237	210	212	2	1%	35	6	A			
Divide Ave/Tyler Pkwy On-Ramp Loop	Divide Ave/Tyler Pkwy On-Ramp Loop	6418	6318	64186318	1	200	210	212	2	1%	39	5	A	61	14	B
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6421	6422	64216422	1	466	665	667	2	0%	45	15	B			
Divide Ave/Tyler Pkwy On-Ramp	Divide Ave/Tyler Pkwy On-Ramp	6422	6322	64226322	1	200	665	666	1	0%	47	14	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6334	6434	63346434	1	157	701	694	-7	-1%	58	12	B	61	14	B
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6434	6435	64346435	1	403	701	693	-8	-1%	58	12	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6435	6436	64356436	1	1445	701	690	-11	-2%	58	12	B			
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6436	6437	64366437	1	560	701	689	-12	-2%	46	15	B	61	14	B
SB TH 810 Off-Ramp	SB TH 810 Off-Ramp	6437	6438	64376438	1	750	701	690	-11	-2%	34	20	C			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6440	6441	64406441	2	569	1858	1856	-2	0%	57	16	B			
NB TH 810 On-Ramp	NB TH 810 On-Ramp	6441	6442	64416442	2	304	1858	1855	-3	0%	57	16	B	61	14	B
NB TH 810 On-Ramp																



**605: State St & Divide Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.2	2.5	0.0	0.0	0.0
Total Del/Veh (s)	68.7	53.8	2.6	71.3	69.8	2.1	69.5	27.8	4.8	60.3	40.1	8.1

**605: State St & Divide Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	41.7

**610: Business Access/DQ Access & State St Performance by movement**

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	23.5	11.1	40.3	4.8	4.9	15.2	1.8	1.6	3.5

**615: State St & Spalding Ave Performance by movement**

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	13.6	8.4	26.8	0.9	0.9	18.3	5.0	5.1	3.9

**620: State St & Capitol Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.6	1.0	1.0	3.6	0.9	3.6	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	74.3	56.5	42.7	45.2	57.2	21.7	77.3	20.5	5.8	68.7	22.7	6.6

**620: State St & Capitol Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.6
Total Del/Veh (s)	30.6

**625: State St & Interchange Ave Performance by movement**

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	40.4	41.7	5.6	2.6	5.3	5.2	7.2

**630: EB I-94 Off Ramp/EB I-94 On Ramp & State St Performance by movement**

Movement	EBR	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	11.4	17.6	15.8	5.7	65.1	7.4	14.0

**635: State St & WB I-94 On Ramp/WB I-94 Off Ramp Performance by movement**

Movement	WBL	WBR	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	0.9	2.8	0.0	0.0	0.0	0.0	0.2
Total Del/Veh (s)	65.1	23.4	13.5	12.3	7.6	5.1	15.2

**640: State St & Interstate Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.6	0.4	0.3	3.8	0.5	3.9	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	53.0	58.2	29.5	48.3	53.8	14.4	67.8	13.0	3.2	75.5	12.0	3.3

**640: State St & Interstate Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	20.9

**645: State St & Business Acces/K-Mart Access Performance by movement**

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	1.9	1.9	42.7	3.2	3.3	37.5	5.1	5.2	6.0

**650: State St & Century Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.3	0.2	2.3	2.3	0.3	2.3	0.0	0.0	0.0	2.0	0.5	1.9
Total Del/Veh (s)	91.0	50.5	24.1	73.1	46.0	15.6	76.1	36.6	24.9	64.4	38.2	19.8

**650: State St & Century Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	44.4

**Total Network Performance**

Denied Del/Veh (s)	0.9
Total Del/Veh (s)	84.9

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**Intersection: 1: Bend**

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Movement	EB
Directions Served	T
Maximum Queue (ft)	25
Average Queue (ft)	1
95th Queue (ft)	11
Link Distance (ft)	582
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

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**Intersection: 2: Bend**

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Movement	WB
Directions Served	T
Maximum Queue (ft)	309
Average Queue (ft)	16
95th Queue (ft)	152
Link Distance (ft)	494
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Queuing and Blocking Report  
 2040 Modified Network - Concept J - NE SE Loops

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Intersection: 605: State St & Divide Ave

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	L	T	T
Maximum Queue (ft)	156	178	229	212	71	139	274	358	334	215	233	245
Average Queue (ft)	57	96	127	103	6	71	116	201	163	103	108	98
95th Queue (ft)	126	164	193	178	62	126	228	321	293	189	194	189
Link Distance (ft)			494	494				582	582		1327	1327
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200	200			200	175	175			300		
Storage Blk Time (%)	0	0	1	0	0	0	0	21	0			
Queuing Penalty (veh)	0	0	1	0	0	0	0	40	0			

Intersection: 605: State St & Divide Ave

Movement	NB	NB	SB	SB	SB	SB	SB
Directions Served	T	R	L	T	T	T	R
Maximum Queue (ft)	262	1	339	409	414	438	375
Average Queue (ft)	117	0	154	250	282	302	88
95th Queue (ft)	218	0	279	421	446	471	336
Link Distance (ft)	1327			409	409	409	
Upstream Blk Time (%)				1	1	4	
Queuing Penalty (veh)				4	8	24	
Storage Bay Dist (ft)		225	275				275
Storage Blk Time (%)	1		0	11		18	
Queuing Penalty (veh)	0		1	20		25	

Intersection: 610: Business Access/DQ Access & State St

Movement	EB	WB	NB	SB	SB	SB	SB
Directions Served	R	R	L	L	T	T	TR
Maximum Queue (ft)	67	36	47	71	18	44	84
Average Queue (ft)	18	4	9	19	1	3	11
95th Queue (ft)	51	20	31	53	13	22	52
Link Distance (ft)	471	523			390	390	390
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			100	100			
Storage Blk Time (%)				0			
Queuing Penalty (veh)				0			

Queuing and Blocking Report  
 2040 Modified Network -Concept J - NE SE Loops

1/3/2014

Intersection: 615: State St & Spalding Ave

Movement	EB	WB	NB	NB	SB	SB	SB
Directions Served	R	R	L	R	L	T	TR
Maximum Queue (ft)	53	64	44	14	90	193	7
Average Queue (ft)	13	26	9	1	32	7	1
95th Queue (ft)	40	49	33	7	73	110	6
Link Distance (ft)	716	760				644	644
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			150	150	200		
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 620: State St & Capitol Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	L	TR	L	T	R	L	T	T	T	R	L
Maximum Queue (ft)	304	308	235	202	228	161	144	209	306	372	217	287
Average Queue (ft)	117	181	105	119	83	68	70	90	118	187	26	178
95th Queue (ft)	238	281	200	185	167	125	130	173	226	312	119	277
Link Distance (ft)			614		755			644	644	644		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	350	350		200		150	350				200	250
Storage Blk Time (%)				1	2	1				9		3
Queuing Penalty (veh)				2	5	2				5		16

Intersection: 620: State St & Capitol Ave

Movement	SB	SB	SB	SB
Directions Served	T	T	T	R
Maximum Queue (ft)	353	368	376	300
Average Queue (ft)	231	242	260	68
95th Queue (ft)	329	337	349	220
Link Distance (ft)	389	389	389	
Upstream Blk Time (%)	0	0	0	
Queuing Penalty (veh)	0	0	0	
Storage Bay Dist (ft)				200
Storage Blk Time (%)	4		16	
Queuing Penalty (veh)	8		26	

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Intersection: 625: State St & Interchange Ave

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	R	R	T	T	T	R	T	T	T
Maximum Queue (ft)	94	231	185	227	356	233	10	7	9
Average Queue (ft)	24	97	15	18	77	8	0	0	0
95th Queue (ft)	68	178	83	109	263	96	6	4	5
Link Distance (ft)	777	750	389	389	389		209	209	209
Upstream Blk Time (%)				0	0				
Queuing Penalty (veh)				0	2				
Storage Bay Dist (ft)						250			
Storage Blk Time (%)					2				
Queuing Penalty (veh)					1				

Intersection: 630: EB I-94 Off Ramp/EB I-94 On Ramp & State St

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	R	R	R	R	T	T	T	R	L	T	T	T
Maximum Queue (ft)	233	209	313	313	232	234	256	143	310	195	237	266
Average Queue (ft)	115	62	142	149	133	142	191	48	145	77	66	98
95th Queue (ft)	217	173	268	267	238	248	281	107	258	170	169	214
Link Distance (ft)	1043	1043	1075	1075	209	209	209	209		961	961	961
Upstream Blk Time (%)					3	3	10	0				
Queuing Penalty (veh)					14	12	40	0				
Storage Bay Dist (ft)									450			
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 635: State St & WB I-94 On Ramp/WB I-94 Off Ramp

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	T	T	T	T	T	T	R
Maximum Queue (ft)	293	314	211	274	257	285	234	215	214	196
Average Queue (ft)	143	172	96	79	74	92	85	78	77	50
95th Queue (ft)	244	267	167	207	191	220	186	181	183	121
Link Distance (ft)		1369		961	961	961	460	460	460	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300		300							475
Storage Blk Time (%)	1	1								
Queuing Penalty (veh)	2	4								

Queuing and Blocking Report  
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Intersection: 640: State St & Interstate Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Directions Served	L	T	R	L	T	R	L	L	T	T	T	R
Maximum Queue (ft)	99	193	233	62	180	71	171	176	276	281	326	45
Average Queue (ft)	46	95	116	20	75	24	98	116	113	117	163	12
95th Queue (ft)	92	172	204	49	138	55	160	171	248	243	301	35
Link Distance (ft)		728	728		811				460	460	460	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	150			300		300	375	375				375
Storage Blk Time (%)		4										0
Queuing Penalty (veh)		2										0

Intersection: 640: State St & Interstate Ave

Movement	SB	SB	SB	SB	SB	SB
Directions Served	L	L	T	T	T	R
Maximum Queue (ft)	99	113	179	196	224	43
Average Queue (ft)	38	63	82	103	144	12
95th Queue (ft)	78	104	149	170	208	37
Link Distance (ft)			539	539	539	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	220	220				250
Storage Blk Time (%)			0		0	
Queuing Penalty (veh)			0		0	

Intersection: 645: State St & Business Acces/K-Mart Access

Movement	EB	WB	NB	NB	NB	SB	SB
Directions Served	R	R	L	T	TR	L	TR
Maximum Queue (ft)	40	97	133	106	52	188	18
Average Queue (ft)	3	15	48	6	3	80	1
95th Queue (ft)	21	62	98	54	25	154	15
Link Distance (ft)	663	555		539	539		600
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			125			200	
Storage Blk Time (%)			1	0		1	
Queuing Penalty (veh)			6	0		4	

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Intersection: 650: State St & Century Ave

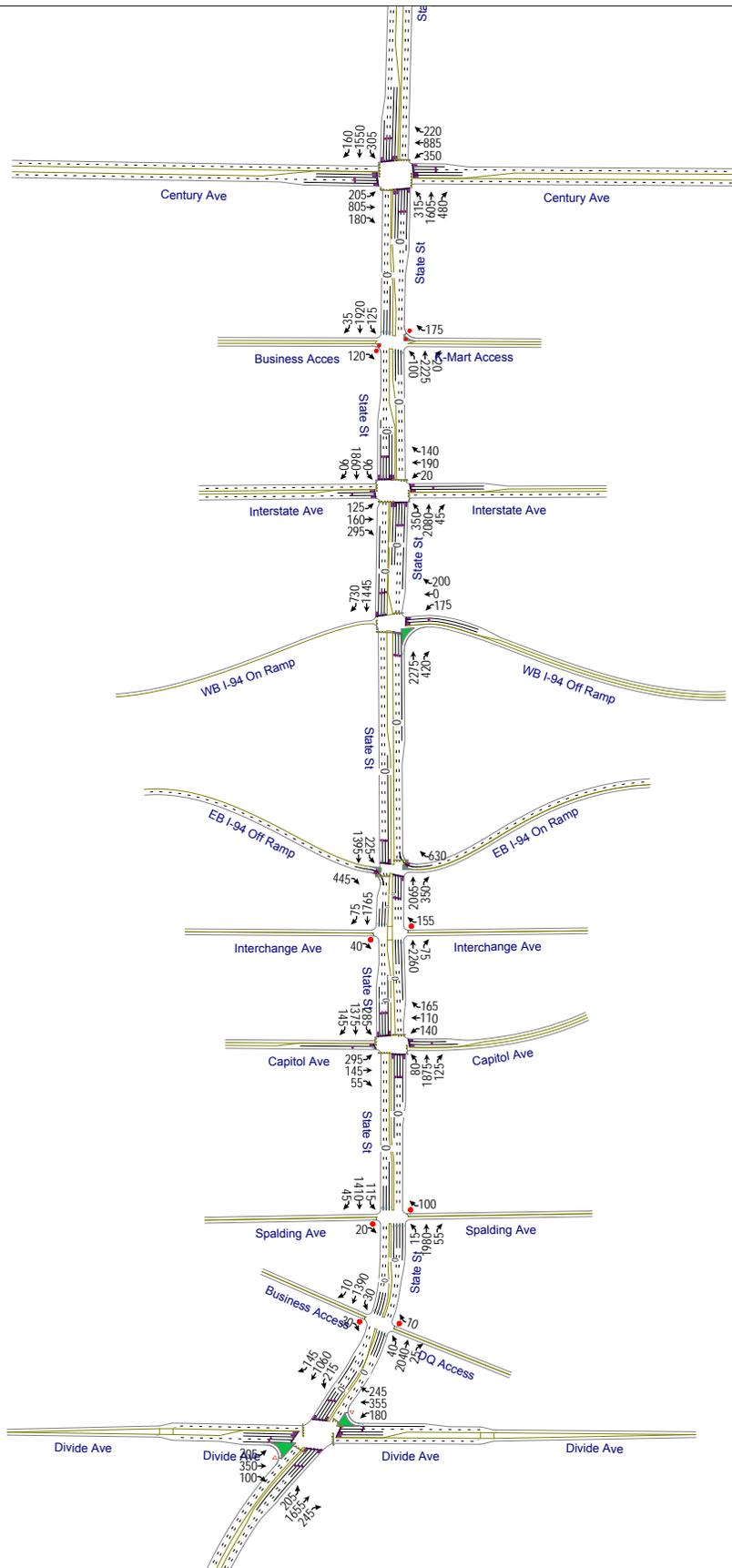
Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	95	134	362	353	127	226	300	416	415	225	190	206
Average Queue (ft)	27	70	237	224	63	117	160	269	264	97	103	112
95th Queue (ft)	80	123	338	322	119	198	245	376	379	254	161	168
Link Distance (ft)			1517	1517				1354	1354			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250			300	200	200			125	200	200
Storage Blk Time (%)			7	1		1	4	25	36	0	0	1
Queuing Penalty (veh)			6	2		2	17	67	32	0	0	2

Intersection: 650: State St & Century Ave

Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	T	R	L	L	T	T	T	R
Maximum Queue (ft)	242	255	262	234	274	305	427	384	459	260
Average Queue (ft)	141	160	172	111	181	215	284	267	287	115
95th Queue (ft)	213	236	249	211	249	287	381	367	420	282
Link Distance (ft)	600	600	600				1334	1334	1334	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)				250	300	300				160
Storage Blk Time (%)	2		1	0		0	6		28	
Queuing Penalty (veh)	4		4	1		1	31		47	

Network Summary

Network wide Queuing Penalty: 495



**605: State St & Divide Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.4	1.8	0.0	0.0	0.0
Total Del/Veh (s)	77.5	81.4	2.4	84.9	105.5	9.9	72.2	32.5	9.4	66.9	30.1	7.5

**605: State St & Divide Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	44.1

**610: Business Access/DQ Access & State St Performance by movement**

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	7.4	25.0	28.1	8.1	10.4	44.6	1.0	1.0	5.9

**615: State St & Spalding Ave Performance by movement**

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	10.0	36.1	19.8	2.9	1.9	63.5	4.5	4.7	6.5

**620: State St & Capitol Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	84.5	83.1	99.6	3.6	0.8	3.5	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	181.1	105.1	92.7	53.1	62.7	33.8	79.2	39.6	25.1	100.8	23.1	6.5

**620: State St & Capitol Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	9.5
Total Del/Veh (s)	50.3

**625: State St & Interchange Ave Performance by movement**

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	71.0	103.6	9.6	4.0	7.0	3.8	12.2

**630: EB I-94 Off Ramp/EB I-94 On Ramp & State St Performance by movement**

Movement	EBR	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	11.4	24.0	14.1	7.8	68.3	7.9	15.4

**635: State St & WB I-94 On Ramp/WB I-94 Off Ramp Performance by movement**

Movement	WBL	WBR	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	0.8	0.8	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	66.4	51.8	12.2	11.6	5.9	9.0	13.5

**640: State St & Interstate Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.2	0.5	0.3	3.4	0.7	3.6	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	56.9	49.5	35.4	45.0	70.1	30.0	73.4	19.7	3.7	67.8	24.2	9.1

**640: State St & Interstate Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	29.7

**645: State St & Business Acces/K-Mart Access Performance by movement**

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	13.8	9.9	51.2	5.4	4.1	56.1	6.5	6.7	8.5

**650: State St & Century Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.1	0.3	2.0	2.2	0.4	2.2	0.0	0.0	0.0	2.0	0.5	1.9
Total Del/Veh (s)	258.0	82.2	36.3	88.2	45.9	25.3	136.8	43.3	35.1	147.7	48.9	28.3

**650: State St & Century Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.6
Total Del/Veh (s)	65.5

**Total Network Performance**

Denied Del/Veh (s)	4.4
Total Del/Veh (s)	111.7

Intersection: 1: Bend

Movement	EB
Directions Served	T
Maximum Queue (ft)	370
Average Queue (ft)	23
95th Queue (ft)	193
Link Distance (ft)	582
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Bend

Movement	WB
Directions Served	T
Maximum Queue (ft)	441
Average Queue (ft)	26
95th Queue (ft)	201
Link Distance (ft)	494
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

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Intersection: 605: State St & Divide Ave

Movement	EB	EB	EB	EB	EB	B2	WB	WB	WB	WB	WB	NB
Directions Served	L	L	T	T	R	T	L	L	T	T	R	L
Maximum Queue (ft)	187	299	430	380	197	106	145	275	491	428	364	277
Average Queue (ft)	68	135	218	184	11	4	72	142	253	223	84	147
95th Queue (ft)	146	269	374	319	102	61	132	282	432	404	263	248
Link Distance (ft)			494	494		635			582	582		
Upstream Blk Time (%)			1	0								
Queuing Penalty (veh)			0	0								
Storage Bay Dist (ft)	200	200			200		175	175			350	300
Storage Blk Time (%)	0	1	16	6				1	41	3	0	0
Queuing Penalty (veh)	0	2	33	6				1	73	7	0	3

Intersection: 605: State St & Divide Ave

Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	T	T	T	R	L	T	T	T	R
Maximum Queue (ft)	400	404	443	325	288	216	262	281	70
Average Queue (ft)	227	215	231	36	149	115	136	152	11
95th Queue (ft)	332	326	358	192	244	202	223	245	42
Link Distance (ft)	1327	1327	1327			409	409	409	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)				225	275				275
Storage Blk Time (%)	2		11		1			1	
Queuing Penalty (veh)	5		28		4			2	

Intersection: 610: Business Access/DQ Access & State St

Movement	EB	WB	NB	NB	SB	SB	SB
Directions Served	R	R	L	TR	L	T	TR
Maximum Queue (ft)	51	29	67	41	60	26	25
Average Queue (ft)	19	7	24	2	24	1	1
95th Queue (ft)	45	27	54	15	56	15	11
Link Distance (ft)	471	523		409		390	390
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			100		100		
Storage Blk Time (%)							
Queuing Penalty (veh)							

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Intersection: 615: State St & Spalding Ave

Movement	EB	WB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	R	R	L	T	T	T	R	L	T	TR
Maximum Queue (ft)	53	129	64	6	216	283	14	207	96	6
Average Queue (ft)	16	56	12	0	10	27	0	102	3	0
95th Queue (ft)	43	104	41	3	89	149	6	179	40	3
Link Distance (ft)	716	760		390	390	390			650	650
Upstream Blk Time (%)						0				
Queuing Penalty (veh)						0				
Storage Bay Dist (ft)			150				150	200		
Storage Blk Time (%)						1		0		
Queuing Penalty (veh)						1		2		

Intersection: 620: State St & Capitol Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB	SB
Directions Served	L	TR	L	T	R	L	T	T	T	R	L	T
Maximum Queue (ft)	400	666	240	258	203	330	519	635	662	300	350	438
Average Queue (ft)	349	446	97	105	90	107	246	341	435	132	262	280
95th Queue (ft)	472	827	184	198	156	250	439	573	678	344	392	445
Link Distance (ft)		613		755			650	650	650			395
Upstream Blk Time (%)		43						0	1			9
Queuing Penalty (veh)		0						0	6			56
Storage Bay Dist (ft)	300		200		150	350				200	250	
Storage Blk Time (%)	58	2	2	3	1	0	2		48		28	3
Queuing Penalty (veh)	116	7	4	10	4	0	2		60		126	7

Intersection: 620: State St & Capitol Ave

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	329	353	300
Average Queue (ft)	203	220	67
95th Queue (ft)	305	311	216
Link Distance (ft)	395	395	
Upstream Blk Time (%)	0	0	
Queuing Penalty (veh)	0	0	
Storage Bay Dist (ft)			200
Storage Blk Time (%)		11	
Queuing Penalty (veh)		16	

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Intersection: 625: State St & Interchange Ave

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	R	R	T	T	T	R	T	T	T
Maximum Queue (ft)	142	385	342	394	411	229	214	246	219
Average Queue (ft)	33	160	79	90	111	12	37	36	19
95th Queue (ft)	101	330	272	312	361	117	163	183	119
Link Distance (ft)	777	750	395	395	395		209	209	209
Upstream Blk Time (%)				0	1		4	4	0
Queuing Penalty (veh)				0	11		27	27	1
Storage Bay Dist (ft)						250			
Storage Blk Time (%)					6				
Queuing Penalty (veh)					4				

Intersection: 630: EB I-94 Off Ramp/EB I-94 On Ramp & State St

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	R	R	R	R	T	T	T	R	L	T	T	T
Maximum Queue (ft)	260	196	314	325	239	234	247	254	346	232	198	238
Average Queue (ft)	87	49	184	163	168	170	192	87	191	71	58	78
95th Queue (ft)	233	185	302	295	263	267	270	172	317	194	164	195
Link Distance (ft)	1043	1043	1075	1075	209	209	209	209		961	961	961
Upstream Blk Time (%)					7	6	10	0				
Queuing Penalty (veh)					44	38	60	0				
Storage Bay Dist (ft)									450			
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 635: State St & WB I-94 On Ramp/WB I-94 Off Ramp

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LTR	R	T	T	T	T	T	T	R
Maximum Queue (ft)	223	256	228	313	291	286	225	201	214	373
Average Queue (ft)	102	165	99	76	62	84	55	45	47	83
95th Queue (ft)	191	244	199	200	171	197	152	129	135	244
Link Distance (ft)		1369		961	961	961	460	460	460	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300		300							475
Storage Blk Time (%)										
Queuing Penalty (veh)										

Queuing and Blocking Report  
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Intersection: 640: State St & Interstate Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Directions Served	L	T	R	L	T	R	L	L	T	T	T	R
Maximum Queue (ft)	216	236	337	67	282	178	254	326	461	474	469	315
Average Queue (ft)	99	123	168	16	153	73	148	165	216	237	263	12
95th Queue (ft)	185	210	265	49	248	140	218	251	411	444	464	95
Link Distance (ft)		728	728		811				460	460	460	
Upstream Blk Time (%)								0	0	0	1	0
Queuing Penalty (veh)								0	2	3	9	0
Storage Bay Dist (ft)	150			300		300	375	375				375
Storage Blk Time (%)	4	6			0				2		5	
Queuing Penalty (veh)	7	8			0				8		2	

Intersection: 640: State St & Interstate Ave

Movement	SB	SB	SB	SB	SB	SB
Directions Served	L	L	T	T	T	R
Maximum Queue (ft)	94	182	321	434	534	350
Average Queue (ft)	32	59	165	209	316	55
95th Queue (ft)	74	122	272	361	461	214
Link Distance (ft)			539	539	539	
Upstream Blk Time (%)				0	0	
Queuing Penalty (veh)				0	2	
Storage Bay Dist (ft)	220	220				250
Storage Blk Time (%)			3		26	
Queuing Penalty (veh)			3		24	

Intersection: 645: State St & Business Acces/K-Mart Access

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	R	R	L	T	TR	L	T	TR
Maximum Queue (ft)	161	217	165	227	33	200	85	53
Average Queue (ft)	57	80	72	20	2	101	3	3
95th Queue (ft)	127	182	137	116	18	182	46	31
Link Distance (ft)	663	555		539	539		600	600
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			125			200		
Storage Blk Time (%)			4	0		1	0	
Queuing Penalty (veh)			32	0		5	0	

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Intersection: 650: State St & Century Ave

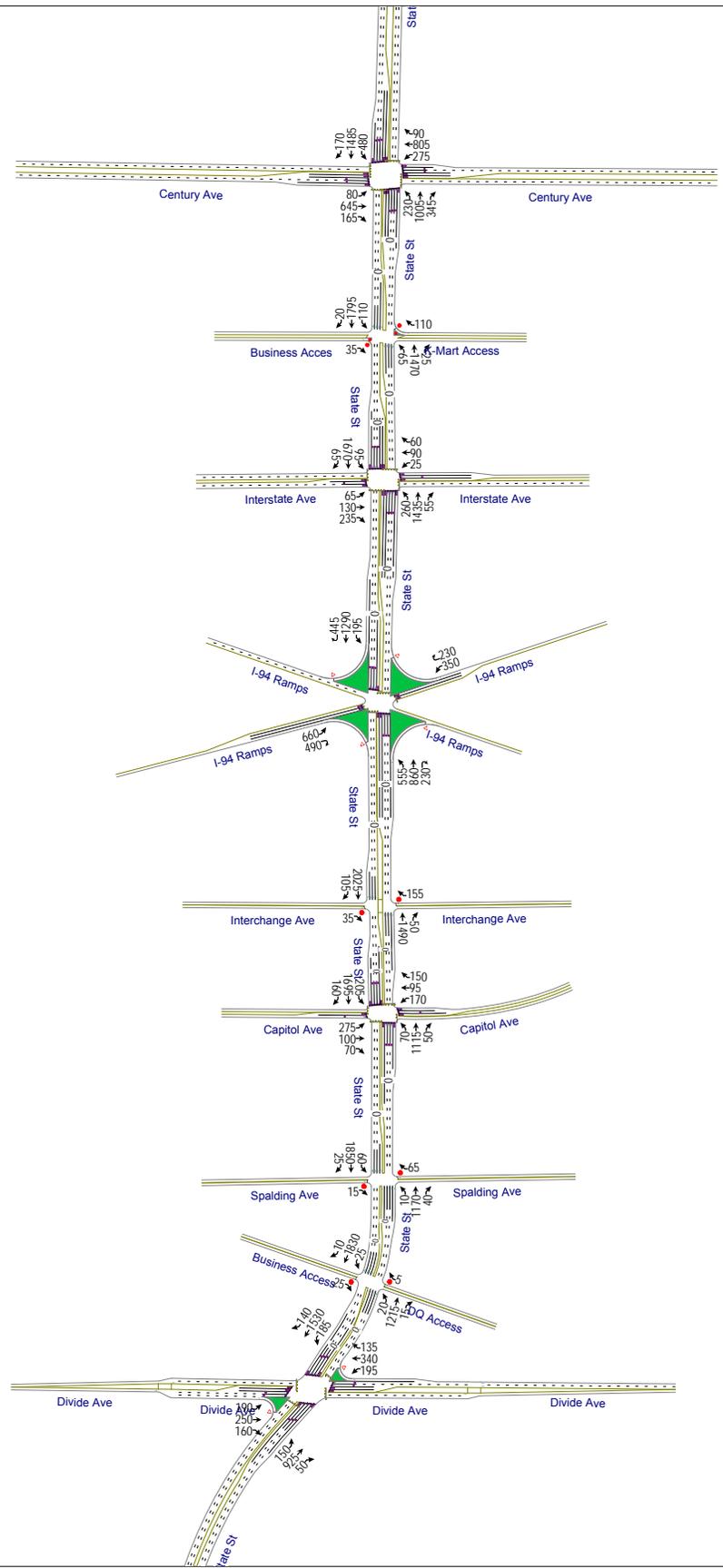
Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	321	469	715	699	400	282	379	530	551	225	277	401
Average Queue (ft)	205	306	415	400	155	158	214	323	323	163	195	227
95th Queue (ft)	371	526	717	694	403	271	343	478	481	288	338	421
Link Distance (ft)			1517	1517				1354	1354			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250			300	200	200			125	200	200
Storage Blk Time (%)	21	28	32	23		5	16	26	39	2	22	26
Queuing Penalty (veh)	85	114	66	42		21	73	91	87	10	119	139

Intersection: 650: State St & Century Ave

Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	T	R	L	L	T	T	T	R
Maximum Queue (ft)	466	483	495	350	296	469	529	590	623	260
Average Queue (ft)	267	284	294	223	211	249	333	332	379	158
95th Queue (ft)	442	442	439	384	336	390	467	503	555	343
Link Distance (ft)	600	600	600				1334	1334	1334	
Upstream Blk Time (%)	0	0	0							
Queuing Penalty (veh)	0	0	0							
Storage Bay Dist (ft)				250	300	300				160
Storage Blk Time (%)	22		20	8	5	11	13		42	
Queuing Penalty (veh)	70		96	43	24	56	38		67	

Network Summary

Network wide Queuing Penalty: 2140



**605: State St & Divide Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.3	2.4	0.0	0.0	0.0
Total Del/Veh (s)	65.5	51.5	2.7	67.1	53.5	2.2	70.0	29.4	4.0	72.4	32.8	6.5

**605: State St & Divide Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	37.5

**610: Business Access/DQ Access & State St Performance by movement**

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	30.4	6.6	19.1	4.8	4.0	8.8	2.6	1.4	3.9

**615: State St & Spalding Ave Performance by movement**

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	21.2	9.8	19.2	0.9	0.6	13.4	4.4	4.0	3.4

**620: State St & Capitol Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.6	1.2	0.9	3.6	1.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	59.5	58.0	42.1	41.2	55.1	15.6	81.3	30.7	10.7	66.7	24.7	7.5

**620: State St & Capitol Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.6
Total Del/Veh (s)	33.1

**625: State St & Interchange Ave Performance by movement**

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	37.0	16.8	3.5	2.2	13.8	13.8	9.9

**635: State St & I-94 Ramps Performance by movement**

Movement	EBL	EBR2	WBL	WBR2	NBL	NBT	NBR2	SBL	SBT	SBR2	All
Denied Del/Veh (s)	3.4	2.6	3.4	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Total Del/Veh (s)	40.7	16.4	31.7	3.8	40.2	21.4	5.9	50.7	34.8	11.2	28.0

**640: State St & Interstate Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.5	0.4	0.3	4.0	0.5	3.8	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	53.4	49.6	25.6	52.2	51.5	15.8	65.3	20.5	7.9	71.6	21.1	8.9

**640: State St & Interstate Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	26.9

**645: State St & Business Acces/K-Mart Access Performance by movement**

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	2.7	2.8	27.5	3.5	3.2	25.5	5.7	5.3	5.6

**650: State St & Century Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.2	0.2	2.2	2.3	0.3	2.3	0.0	0.0	0.0	2.0	0.6	1.9
Total Del/Veh (s)	80.3	51.9	25.1	72.4	44.1	14.4	72.6	46.9	31.7	71.4	38.3	20.2

**650: State St & Century Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	46.9

**Total Network Performance**

Denied Del/Veh (s)	1.3
Total Del/Veh (s)	89.9

**Intersection: 2: Bend**

Movement	WB
Directions Served	T
Maximum Queue (ft)	261
Average Queue (ft)	14
95th Queue (ft)	131
Link Distance (ft)	494
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

**Intersection: 605: State St & Divide Ave**

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	T
Maximum Queue (ft)	152	163	201	182	162	165	208	287	244	55	217	296
Average Queue (ft)	60	77	119	93	6	68	98	167	131	2	97	163
95th Queue (ft)	116	136	183	169	67	136	168	241	216	32	188	261
Link Distance (ft)			494	494	494			582	582			1327
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200	200				175	175			350	300	
Storage Blk Time (%)		0	0			0	0	8				0
Queuing Penalty (veh)		0	1			0	1	16				0

**Intersection: 605: State St & Divide Ave**

Movement	NB	NB	SB	SB	SB	SB	SB
Directions Served	T	T	L	T	T	T	R
Maximum Queue (ft)	264	192	374	436	428	425	375
Average Queue (ft)	123	78	155	225	258	272	60
95th Queue (ft)	234	167	301	409	438	452	282
Link Distance (ft)	1327	1327		411	411	411	
Upstream Blk Time (%)				1	2	2	
Queuing Penalty (veh)				7	11	15	
Storage Bay Dist (ft)			275				275
Storage Blk Time (%)			2	7		13	
Queuing Penalty (veh)			8	13		18	

**Intersection: 610: Business Access/DQ Access & State St**

Movement	EB	WB	NB	SB	SB	SB	SB
Directions Served	R	R	L	L	T	T	TR
Maximum Queue (ft)	84	30	48	33	92	134	158
Average Queue (ft)	30	4	10	6	4	10	16
95th Queue (ft)	67	20	34	24	35	62	85
Link Distance (ft)	528	513			388	388	388
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			100	100			
Storage Blk Time (%)					0		
Queuing Penalty (veh)					0		

**Intersection: 615: State St & Spalding Ave**

Movement	EB	WB	NB	NB	SB	SB
Directions Served	R	R	L	R	L	TR
Maximum Queue (ft)	46	65	31	14	78	6
Average Queue (ft)	13	27	5	0	25	0
95th Queue (ft)	38	53	22	6	60	4
Link Distance (ft)	716	760				650
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			150	150	125	
Storage Blk Time (%)						
Queuing Penalty (veh)						

**Intersection: 620: State St & Capitol Ave**

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB	SB
Directions Served	L	TR	L	T	R	L	T	T	T	R	L	T
Maximum Queue (ft)	299	502	203	169	129	359	570	517	431	299	349	406
Average Queue (ft)	207	196	104	74	54	77	276	204	215	51	180	227
95th Queue (ft)	319	419	172	138	104	190	503	397	371	191	310	375
Link Distance (ft)		618		755			650	650	650			395
Upstream Blk Time (%)		0					0					1
Queuing Penalty (veh)		0					0					5
Storage Bay Dist (ft)	200		200		150	350				200	250	
Storage Blk Time (%)	21	2	1	2	0		6		10		3	7
Queuing Penalty (veh)	35	6	2	5	1		4		5		19	13

**Intersection: 620: State St & Capitol Ave**

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	404	406	300
Average Queue (ft)	242	267	97
95th Queue (ft)	394	414	293
Link Distance (ft)	395	395	
Upstream Blk Time (%)	1	1	
Queuing Penalty (veh)	4	6	
Storage Bay Dist (ft)			200
Storage Blk Time (%)		20	
Queuing Penalty (veh)		32	

**Intersection: 625: State St & Interchange Ave**

Movement	EB	WB	NB	SB	SB	SB
Directions Served	R	R	T	T	T	T
Maximum Queue (ft)	57	120	159	73	48	86
Average Queue (ft)	21	55	6	4	2	5
95th Queue (ft)	48	98	91	41	22	38
Link Distance (ft)	777	749	395	806	806	806
Upstream Blk Time (%)			0			
Queuing Penalty (veh)			0			
Storage Bay Dist (ft)						
Storage Blk Time (%)						0
Queuing Penalty (veh)						0

Intersection: 635: State St & I-94 Ramps

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	NB	SB	SB
Directions Served	L	L	>	L	L	L	L	T	T	T	L	T
Maximum Queue (ft)	315	457	599	224	244	302	306	288	250	284	337	385
Average Queue (ft)	188	230	146	88	134	169	168	113	100	118	142	192
95th Queue (ft)	278	377	493	172	206	260	263	219	192	217	255	347
Link Distance (ft)			1102					806	806	806		860
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	500	500		300	300	450	450				300	
Storage Blk Time (%)			4								0	3
Queuing Penalty (veh)			29								2	6

Intersection: 635: State St & I-94 Ramps

Movement	SB	SB	SB
Directions Served	T	T	>
Maximum Queue (ft)	395	425	357
Average Queue (ft)	198	210	31
95th Queue (ft)	345	369	190
Link Distance (ft)	860	860	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			475
Storage Blk Time (%)		0	
Queuing Penalty (veh)		1	

**Intersection: 640: State St & Interstate Ave**

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Directions Served	L	T	R	L	T	R	L	L	T	T	T	R
Maximum Queue (ft)	113	194	237	62	146	70	189	200	335	315	373	51
Average Queue (ft)	43	104	102	21	63	26	104	122	138	154	202	10
95th Queue (ft)	95	183	192	50	123	55	165	180	264	286	336	35
Link Distance (ft)		728	728		810				860	860	860	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	150			300		300	375	375				375
Storage Blk Time (%)		3							0		0	
Queuing Penalty (veh)		2							0		0	

**Intersection: 640: State St & Interstate Ave**

Movement	SB	SB	SB	SB	SB	SB
Directions Served	L	L	T	T	T	R
Maximum Queue (ft)	82	319	475	495	534	350
Average Queue (ft)	35	82	192	205	260	67
95th Queue (ft)	73	213	416	446	523	267
Link Distance (ft)			539	539	539	
Upstream Blk Time (%)			0	0	1	
Queuing Penalty (veh)			0	1	7	
Storage Bay Dist (ft)	220	220				250
Storage Blk Time (%)			7		10	
Queuing Penalty (veh)			7		7	

**Intersection: 645: State St & Business Acces/K-Mart Access**

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	R	R	L	T	TR	L	T	TR
Maximum Queue (ft)	53	112	88	82	14	133	26	81
Average Queue (ft)	8	19	35	7	1	52	1	6
95th Queue (ft)	36	77	77	51	6	111	15	50
Link Distance (ft)	663	555		539	539		600	600
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			125			200		
Storage Blk Time (%)				0				
Queuing Penalty (veh)				0				

**Intersection: 650: State St & Century Ave**

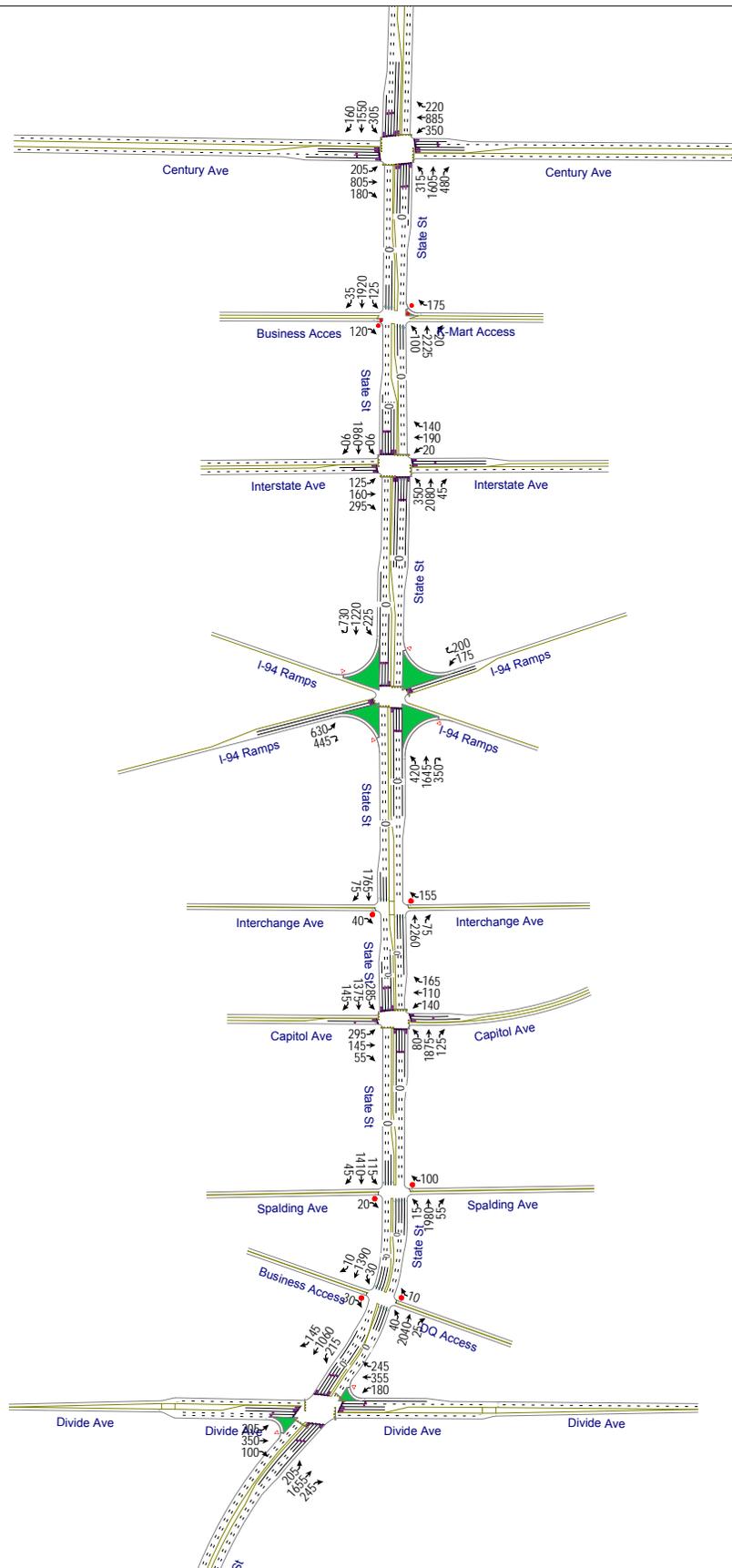
Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	120	134	350	349	165	235	361	406	418	225	210	222
Average Queue (ft)	27	57	236	225	71	115	162	275	277	93	107	119
95th Queue (ft)	76	108	325	317	137	198	285	382	396	255	190	202
Link Distance (ft)			1517	1517				1354	1354			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250			300	200	200			125	200	200
Storage Blk Time (%)			8	2		1	5	24	37		1	2
Queuing Penalty (veh)			7	3		3	20	67	33		3	6

**Intersection: 650: State St & Century Ave**

Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	T	R	L	L	T	T	T	R
Maximum Queue (ft)	361	388	401	350	340	370	412	393	456	260
Average Queue (ft)	208	234	250	171	197	229	280	257	272	136
95th Queue (ft)	319	338	349	332	303	336	374	356	392	309
Link Distance (ft)	600	600	600				1334	1334	1334	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)				250	300	300				160
Storage Blk Time (%)	12		9	3	1	3	7		27	
Queuing Penalty (veh)	27		32	11	4	15	33		46	

**Network Summary**

Network wide Queuing Penalty: 599



**605: State St & Divide Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.4	1.8	0.0	0.0	0.0
Total Del/Veh (s)	65.2	60.0	2.1	70.8	75.5	7.6	75.8	37.4	9.1	58.9	36.9	6.0

**605: State St & Divide Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	41.8

**610: Business Access/DQ Access & State St Performance by movement**

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	11.3	24.4	20.9	7.9	7.9	22.6	1.4	1.0	5.7

**615: State St & Spalding Ave Performance by movement**

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	11.6	30.3	11.5	2.2	1.4	36.1	3.7	3.6	4.6

**620: State St & Capitol Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	49.8	50.0	44.5	3.6	1.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	189.0	124.6	104.5	57.1	61.1	27.2	87.5	34.2	19.5	108.7	20.0	6.1

**620: State St & Capitol Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	5.1
Total Del/Veh (s)	48.2

**625: State St & Interchange Ave Performance by movement**

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.3	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	32.8	42.9	4.9	3.3	12.7	10.6	9.9

**635: State St & I-94 Ramps Performance by movement**

Movement	EBL	EBR2	WBL	WBR2	NBL	NBT	NBR2	SBL	SBT	SBR2	All
Denied Del/Veh (s)	3.2	2.0	3.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Total Del/Veh (s)	45.4	5.0	31.3	3.6	56.2	26.8	7.4	66.5	41.1	26.5	31.7

**640: State St & Interstate Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.1	0.6	0.3	3.5	0.7	3.6	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	61.7	49.4	32.1	45.1	58.2	35.5	68.1	27.5	10.4	66.8	41.1	23.1

**640: State St & Interstate Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	38.3

**645: State St & Business Acces/K-Mart Access Performance by movement**

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	79.8	14.1	78.2	6.4	5.1	56.1	13.2	17.5	14.2

**650: State St & Century Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.2	0.3	2.0	2.3	0.5	2.2	0.0	0.0	0.0	1.9	0.5	2.0
Total Del/Veh (s)	86.2	63.7	31.9	138.9	52.7	29.9	94.6	46.7	34.4	105.1	54.9	34.8

**650: State St & Century Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.6
Total Del/Veh (s)	59.4

**Total Network Performance**

Denied Del/Veh (s)	3.0
Total Del/Veh (s)	117.4

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**Intersection: 1: Bend**

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Movement	EB
Directions Served	T
Maximum Queue (ft)	114
Average Queue (ft)	4
95th Queue (ft)	66
Link Distance (ft)	582
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

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**Intersection: 2: Bend**

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Movement	WB
Directions Served	T
Maximum Queue (ft)	327
Average Queue (ft)	22
95th Queue (ft)	188
Link Distance (ft)	494
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

**Intersection: 605: State St & Divide Ave**

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	T	L	L	T	T	R	L	T	T
Maximum Queue (ft)	139	182	266	240	128	274	380	338	280	364	482	450
Average Queue (ft)	62	86	171	143	61	118	201	167	69	157	293	268
95th Queue (ft)	123	145	244	229	119	242	319	286	237	290	427	410
Link Distance (ft)			494	494			582	582			1327	1327
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200	200			175	175			350	300		
Storage Blk Time (%)		0	4			0	23	0	0	1	8	
Queuing Penalty (veh)		0	9			0	41	0	0	5	17	

**Intersection: 605: State St & Divide Ave**

Movement	NB	NB	SB	SB	SB	SB	SB
Directions Served	T	R	L	T	T	T	R
Maximum Queue (ft)	470	325	282	342	330	344	176
Average Queue (ft)	248	61	156	181	215	228	11
95th Queue (ft)	398	263	259	295	318	332	80
Link Distance (ft)	1327			411	411	411	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		225	275				275
Storage Blk Time (%)	11		1	1		5	
Queuing Penalty (veh)	27		3	1		7	

**Intersection: 610: Business Access/DQ Access & State St**

Movement	EB	WB	NB	NB	SB	SB
Directions Served	R	R	L	TR	L	TR
Maximum Queue (ft)	53	44	55	15	65	6
Average Queue (ft)	20	9	18	1	15	0
95th Queue (ft)	47	32	47	9	45	3
Link Distance (ft)	528	513		411		388
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			100		100	
Storage Blk Time (%)						
Queuing Penalty (veh)						

2040 Modified Network - Concept K - State St. Single Point

Intersection: 615: State St & Spalding Ave

Movement	EB	WB	NB	NB	NB	NB	SB	SB
Directions Served	R	R	L	T	T	R	L	T
Maximum Queue (ft)	60	157	38	17	104	13	156	141
Average Queue (ft)	16	50	7	1	5	1	71	7
95th Queue (ft)	44	105	28	12	40	7	131	55
Link Distance (ft)	716	760		388	388			650
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)			150			150	125	
Storage Blk Time (%)							2	0
Queuing Penalty (veh)							10	0

Intersection: 620: State St & Capitol Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB	SB
Directions Served	L	TR	L	T	R	L	T	T	T	R	L	T
Maximum Queue (ft)	300	664	246	247	182	450	630	622	670	300	350	434
Average Queue (ft)	280	521	117	98	81	114	382	360	404	127	286	284
95th Queue (ft)	355	843	201	205	150	301	592	567	637	341	400	477
Link Distance (ft)		618		755			650	650	650			395
Upstream Blk Time (%)		47					0	0	1			12
Queuing Penalty (veh)		0					1	0	4			71
Storage Bay Dist (ft)	200		200		150	350				200	250	
Storage Blk Time (%)	75	4	3	2	1		11		21		35	4
Queuing Penalty (veh)	150	13	7	7	2		9		26		159	12

Intersection: 620: State St & Capitol Ave

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	384	381	300
Average Queue (ft)	202	216	60
95th Queue (ft)	348	358	201
Link Distance (ft)	395	395	
Upstream Blk Time (%)	0	0	
Queuing Penalty (veh)	2	1	
Storage Bay Dist (ft)			200
Storage Blk Time (%)		11	
Queuing Penalty (veh)		16	

2040 Modified Network - Concept K - State St. Single Point

Intersection: 625: State St & Interchange Ave

Movement	EB	WB	NB	SB	SB
Directions Served	R	R	T	T	T
Maximum Queue (ft)	114	218	10	271	141
Average Queue (ft)	30	101	0	62	13
95th Queue (ft)	77	186	6	246	95
Link Distance (ft)	777	749	395	806	806
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 635: State St & I-94 Ramps

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	>	L	L	L	T	T	T	L	T	T
Maximum Queue (ft)	308	329	262	86	128	511	466	413	452	316	413	508
Average Queue (ft)	182	216	17	40	63	289	246	227	255	174	238	218
95th Queue (ft)	275	303	122	77	110	474	415	388	423	289	377	374
Link Distance (ft)			1102				806	806	806		871	871
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	500	500		300	300	450				300		
Storage Blk Time (%)						2			0	2	5	
Queuing Penalty (veh)						11			1	9	11	

Intersection: 635: State St & I-94 Ramps

Movement	SB	SB
Directions Served	T	>
Maximum Queue (ft)	743	575
Average Queue (ft)	295	350
95th Queue (ft)	585	683
Link Distance (ft)	871	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		475
Storage Blk Time (%)		8
Queuing Penalty (veh)		34

2040 Modified Network - Concept K - State St. Single Point

Intersection: 640: State St & Interstate Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Directions Served	L	T	R	L	T	R	L	L	T	T	T	R
Maximum Queue (ft)	203	299	335	54	243	169	231	240	441	442	492	58
Average Queue (ft)	101	127	164	21	145	81	143	154	231	251	296	11
95th Queue (ft)	178	225	274	48	233	150	217	221	393	407	444	37
Link Distance (ft)		728	728		810				871	871	871	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	150			300		300	375	375				375
Storage Blk Time (%)	5	7							1		3	
Queuing Penalty (veh)	9	9							5		2	

Intersection: 640: State St & Interstate Ave

Movement	SB	SB	SB	SB	SB	SB
Directions Served	L	L	T	T	T	R
Maximum Queue (ft)	87	320	550	571	626	350
Average Queue (ft)	34	101	293	401	506	149
95th Queue (ft)	69	265	559	689	736	413
Link Distance (ft)			539	539	539	
Upstream Blk Time (%)			0	2	19	
Queuing Penalty (veh)			2	15	127	
Storage Bay Dist (ft)	220	220				250
Storage Blk Time (%)			16		42	
Queuing Penalty (veh)			14		38	

Intersection: 645: State St & Business Acces/K-Mart Access

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	R	R	L	T	T	TR	L	T	T	TR
Maximum Queue (ft)	278	191	198	330	263	191	179	395	431	521
Average Queue (ft)	120	80	77	50	29	15	90	33	73	152
95th Queue (ft)	294	179	167	256	218	149	166	194	319	458
Link Distance (ft)	663	555		539	539	539		600	600	600
Upstream Blk Time (%)				2	0	0			0	1
Queuing Penalty (veh)				13	0	0			2	6
Storage Bay Dist (ft)			125				200			
Storage Blk Time (%)			11	0			1	0		
Queuing Penalty (veh)			83	0			5	0		

2040 Modified Network - Concept K - State St. Single Point

Intersection: 650: State St & Century Ave

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	184	301	490	479	356	292	419	653	613	225	271	412
Average Queue (ft)	89	144	320	312	113	221	307	415	388	173	142	168
95th Queue (ft)	175	287	471	454	281	337	481	691	653	294	247	321
Link Distance (ft)			1517	1517				1354	1354			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250			300	200	200			125	200	200
Storage Blk Time (%)	0	0	23	14		22	41	29	43	2	6	9
Queuing Penalty (veh)	0	0	47	24		98	181	102	96	9	34	48

Intersection: 650: State St & Century Ave

Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	T	R	L	L	T	T	T	R
Maximum Queue (ft)	534	552	616	350	280	409	565	590	650	260
Average Queue (ft)	324	355	383	273	149	194	368	399	442	169
95th Queue (ft)	487	520	614	431	239	326	503	573	624	345
Link Distance (ft)	600	600	600				1334	1334	1334	
Upstream Blk Time (%)	0	0	2							
Queuing Penalty (veh)	0	0	13							
Storage Bay Dist (ft)				250	300	300				160
Storage Blk Time (%)	27		24	8	0	0	19		47	0
Queuing Penalty (veh)	85		117	42	1	2	59		76	0

Network Summary

Network wide Queuing Penalty: 2031



**705: Bismarck Expy & Commerce Dr/Revere Dr Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.7	0.9	0.7	3.6	0.9	3.6	1.1	0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	81.1	43.9	16.1	66.1	53.8	17.3	37.0	28.0	20.8	33.3	21.3	11.5

**705: Bismarck Expy & Commerce Dr/Revere Dr Performance by movement**

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	27.4

**710: Bismarck Expy & Divide Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.3	0.6	0.7	3.4	0.4	0.3	0.1	0.0	0.2	0.0	0.0	0.0
Total Del/Veh (s)	64.1	64.1	42.2	60.5	64.0	1.2	66.5	22.9	11.1	53.5	12.0	6.8

**710: Bismarck Expy & Divide Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	21.6

**715: EB I-94 Off Ramp/EB I-94 On Ramp & Bismarck Expy Performance by movement**

Movement	EBR	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	1.0	0.1	0.1	0.1	0.6	0.0	0.2
Total Del/Veh (s)	41.1	2.0	20.2	8.7	68.5	10.2	19.0

**720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp Performance by movement**

Movement	EBR	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.3	0.2	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	47.9	71.5	53.3	6.6	7.2	7.5	14.1

**725: Centennial Rd & Trenton Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.4	0.2	0.2	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	59.6	59.3	38.4	57.0	63.8	29.7	37.3	10.2	5.0	28.5	12.9	11.8

**725: Centennial Rd & Trenton Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	15.7

2040 Modified Network - Concept L - Centennial NW SE Loops

730: Centennial Rd & Century Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.9	0.3	3.0	2.6	0.4	2.5	0.1	0.0	0.0	1.7	0.4	1.8
Total Del/Veh (s)	96.2	54.1	23.9	70.9	50.0	15.4	61.9	32.3	6.5	74.7	43.2	34.1

730: Centennial Rd & Century Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	45.7

Total Network Performance

Denied Del/Veh (s)	1.2
Total Del/Veh (s)	79.0

2040 Modified Network - Concept L - Centennial NW SE Loops

Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	L	TR	L	T	R	L	T	T	TR	L	T
Maximum Queue (ft)	249	296	320	120	52	333	265	254	280	253	426	281
Average Queue (ft)	113	154	69	35	15	149	120	136	144	126	219	124
95th Queue (ft)	231	266	180	94	44	268	226	227	238	228	353	237
Link Distance (ft)			821		957			3119	3119	3119		1842
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200	200		100		300	375				375	
Storage Blk Time (%)	1	6	0	2		1					1	0
Queuing Penalty (veh)	1	7	0	9		0					3	0

Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	286	315	296
Average Queue (ft)	149	166	63
95th Queue (ft)	262	289	176
Link Distance (ft)	1842	1842	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			200
Storage Blk Time (%)		6	0
Queuing Penalty (veh)		16	1

2040 Modified Network - Concept L - Centennial NW SE Loops

Intersection: 710: Bismarck Expy & Divide Ave

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	NB	SB	SB
Directions Served	L	L	TR	L	T	L	T	T	T	R	L	L
Maximum Queue (ft)	168	222	267	195	146	155	326	307	386	250	184	220
Average Queue (ft)	74	109	120	88	50	32	163	145	187	72	99	123
95th Queue (ft)	141	180	226	168	111	97	272	260	325	215	152	181
Link Distance (ft)			1082		870		1842	1842	1842			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250		250		400				150	350	350
Storage Blk Time (%)		0	1						14	0		
Queuing Penalty (veh)		0	2						16	0		

Intersection: 710: Bismarck Expy & Divide Ave

Movement	SB	SB	SB	SB
Directions Served	T	T	T	R
Maximum Queue (ft)	314	322	332	200
Average Queue (ft)	133	137	158	31
95th Queue (ft)	243	247	275	149
Link Distance (ft)	417	417	417	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				100
Storage Blk Time (%)	0		16	0
Queuing Penalty (veh)	0		46	0

Intersection: 715: EB I-94 Off Ramp/EB I-94 On Ramp & Bismarck Expy

Movement	EB	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	R	R	R	T	T	T	R	L	L	T	T	T
Maximum Queue (ft)	340	286	79	438	434	435	427	185	210	243	224	231
Average Queue (ft)	227	189	3	259	216	189	112	102	132	133	113	149
95th Queue (ft)	317	284	33	443	412	396	284	166	195	214	191	218
Link Distance (ft)	1085		1266	417	417	417	417			700	700	700
Upstream Blk Time (%)				1	0	0	0					
Queuing Penalty (veh)				4	1	2	0					
Storage Bay Dist (ft)		500						240	240			
Storage Blk Time (%)											0	
Queuing Penalty (veh)											1	

2040 Modified Network - Concept L - Centennial NW SE Loops

Intersection: 720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp

Movement	EB	WB	NB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	R	R	L	L	T	T	T	T	T	T	R
Maximum Queue (ft)	368	268	244	258	84	42	25	180	138	151	105
Average Queue (ft)	167	121	132	144	8	7	2	75	68	72	44
95th Queue (ft)	307	221	212	231	41	28	13	136	118	134	94
Link Distance (ft)	994	1245			700	700	700	701	701	701	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)			240	240							150
Storage Blk Time (%)			0	1						0	
Queuing Penalty (veh)			0	2						1	

Intersection: 725: Centennial Rd & Trenton Ave

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LTR	LTR	L	T	T	TR	L	T	T	TR
Maximum Queue (ft)	334	217	225	271	235	199	94	140	218	279
Average Queue (ft)	155	105	77	122	102	66	30	69	82	112
95th Queue (ft)	271	189	149	235	208	160	67	133	156	204
Link Distance (ft)	777	684		701	701	701		1222	1222	1222
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)			500				220			
Storage Blk Time (%)										
Queuing Penalty (veh)										

2040 Modified Network - Concept L - Centennial NW SE Loops

Intersection: 730: Centennial Rd & Century Ave

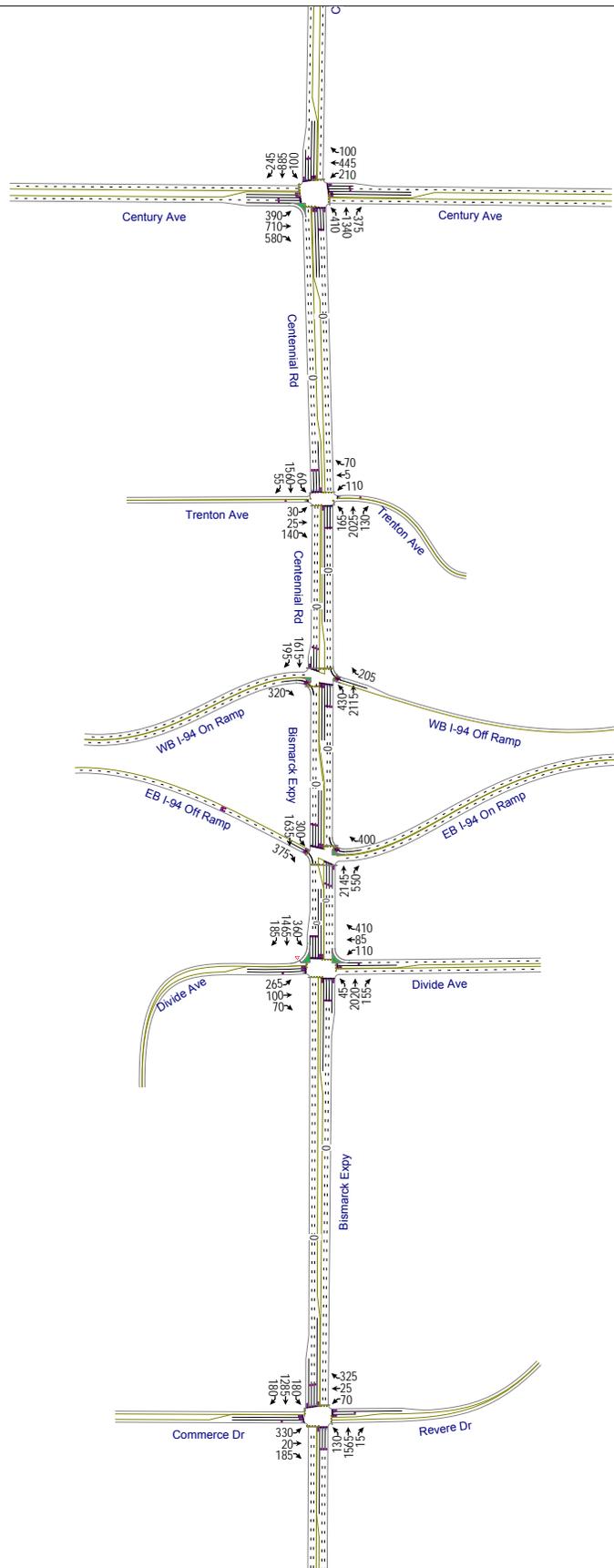
Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	192	222	179	176	267	313	337	359	392	200	333	362
Average Queue (ft)	77	119	117	98	126	195	221	249	255	109	186	204
95th Queue (ft)	172	199	176	169	218	284	309	342	350	254	307	338
Link Distance (ft)			1231	1231				1214	1214			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	225	225			225	350	350			100	300	300
Storage Blk Time (%)		0			1		0	0	42	0	1	1
Queuing Penalty (veh)		0			1		0	1	37	0	3	4

Intersection: 730: Centennial Rd & Century Ave

Movement	NB	NB	NB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	T	R
Maximum Queue (ft)	431	406	84	47	269	390	362	366	446
Average Queue (ft)	237	248	26	12	52	274	252	233	231
95th Queue (ft)	377	368	60	36	144	375	353	335	369
Link Distance (ft)	1222	1222	1222			1741	1741	1741	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)				250	250				400
Storage Blk Time (%)	3					12		0	1
Queuing Penalty (veh)	12					7		0	3

Network Summary

Network wide Queuing Penalty: 185



2040 Modified Network - Concept L - Centennial NW SE Loops

705: Bismarck Expy & Commerce Dr/Revere Dr Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.5	1.3	1.1	3.7	1.1	3.6	0.8	0.2	0.1	0.1	0.0	0.1
Total Del/Veh (s)	68.6	35.3	17.3	56.2	61.7	35.1	28.3	32.6	32.6	42.4	33.2	17.5

705: Bismarck Expy & Commerce Dr/Revere Dr Performance by movement

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	35.2

710: Bismarck Expy & Divide Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.2	0.9	0.8	3.2	0.4	0.3	0.2	0.0	0.1	0.5	0.1	0.2
Total Del/Veh (s)	99.9	63.2	43.0	54.1	58.8	1.6	74.0	28.2	20.6	185.0	21.2	10.1

710: Bismarck Expy & Divide Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	40.0

715: EB I-94 Off Ramp/EB I-94 On Ramp & Bismarck Expy Performance by movement

Movement	EBR	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	61.2	13.5	15.8	11.8	90.9	28.5	26.2

720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp Performance by movement

Movement	EBR	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.5	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	8.8	7.4	51.0	7.8	14.1	7.9	13.8

725: Centennial Rd & Trenton Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.2	0.3	0.3	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	51.5	57.4	34.0	63.7	60.0	49.4	34.9	22.7	16.4	45.9	21.8	21.8

725: Centennial Rd & Trenton Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	25.2

2040 Modified Network - Concept L - Centennial NW SE Loops

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730: Centennial Rd & Century Ave Performance by movement

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.3	0.9	2.2	3.0	0.2	2.8	0.0	0.0	0.0	2.1	0.4	2.1
Total Del/Veh (s)	77.9	56.2	8.9	169.2	58.6	29.6	86.4	43.4	21.1	84.1	46.1	19.5

730: Centennial Rd & Century Ave Performance by movement

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Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	51.5

Total Network Performance

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Denied Del/Veh (s)	1.1
Total Del/Veh (s)	105.9

2040 Modified Network - Concept L - Centennial NW SE Loops

Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	L	TR	L	T	R	L	T	T	TR	L	T
Maximum Queue (ft)	279	319	183	114	197	370	123	386	415	427	403	483
Average Queue (ft)	153	188	73	50	32	195	70	278	292	304	142	261
95th Queue (ft)	243	279	145	102	110	310	114	395	408	419	277	399
Link Distance (ft)			803		957			3119	3119	3119		1842
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	300	300		100		300	375				375	
Storage Blk Time (%)	0	0		3	0	2		1			0	1
Queuing Penalty (veh)	0	1		10	1	1		1			0	2

Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	490	530	300
Average Queue (ft)	299	325	181
95th Queue (ft)	446	486	394
Link Distance (ft)	1842	1842	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			200
Storage Blk Time (%)		20	
Queuing Penalty (veh)		36	

2040 Modified Network - Concept L - Centennial NW SE Loops

Intersection: 710: Bismarck Expy & Divide Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	L	TR	L	T	R	L	T	T	T	R	L
Maximum Queue (ft)	256	311	363	179	156	81	363	451	452	543	250	350
Average Queue (ft)	142	176	140	87	68	7	69	198	205	268	83	318
95th Queue (ft)	252	287	262	154	136	42	199	376	369	478	243	399
Link Distance (ft)			1082		870	870		1842	1842	1842		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250		250			400				150	300
Storage Blk Time (%)	0	4	2				0	1		24		16
Queuing Penalty (veh)	0	6	4				0	0		37		77

Intersection: 710: Bismarck Expy & Divide Ave

Movement	SB	SB	SB	SB	SB
Directions Served	L	T	T	T	R
Maximum Queue (ft)	400	487	447	510	200
Average Queue (ft)	355	384	275	285	71
95th Queue (ft)	458	556	431	461	227
Link Distance (ft)		403	403	403	
Upstream Blk Time (%)	13	35	1	2	
Queuing Penalty (veh)	0	233	4	12	
Storage Bay Dist (ft)	300				100
Storage Blk Time (%)	48	6		23	
Queuing Penalty (veh)	234	22		42	

2040 Modified Network - Concept L - Centennial NW SE Loops

Intersection: 715: EB I-94 Off Ramp/EB I-94 On Ramp & Bismarck Expy

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	R	R	R	R	T	T	T	R	L	L	T	T
Maximum Queue (ft)	416	388	240	208	350	427	460	425	216	420	658	681
Average Queue (ft)	246	203	138	61	175	181	268	140	123	231	380	312
95th Queue (ft)	367	324	228	177	296	368	511	326	196	468	772	749
Link Distance (ft)	1082	1082	1266	1266	403	403	403	403			698	698
Upstream Blk Time (%)					0	0	2	0			10	4
Queuing Penalty (veh)					1	1	14	1			62	27
Storage Bay Dist (ft)									240	240		
Storage Blk Time (%)									0	0	35	
Queuing Penalty (veh)									0	2	104	

Intersection: 715: EB I-94 Off Ramp/EB I-94 On Ramp & Bismarck Expy

Movement	SB
Directions Served	T
Maximum Queue (ft)	588
Average Queue (ft)	231
95th Queue (ft)	537
Link Distance (ft)	698
Upstream Blk Time (%)	0
Queuing Penalty (veh)	2
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

2040 Modified Network - Concept L - Centennial NW SE Loops

Intersection: 720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp

Movement	EB	EB	WB	WB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	R	R	R	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	286	238	151	110	284	297	142	80	58	542	420	317
Average Queue (ft)	100	31	59	16	177	195	16	13	7	157	95	100
95th Queue (ft)	218	133	135	66	271	284	73	46	33	407	314	269
Link Distance (ft)	994	994	1262				698	698	698	700	700	700
Upstream Blk Time (%)										0	0	
Queuing Penalty (veh)										1	0	
Storage Bay Dist (ft)				150	240	240						
Storage Blk Time (%)			1	0	1	3						18
Queuing Penalty (veh)			1	0	6	23						35

Intersection: 720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp

Movement	SB
Directions Served	R
Maximum Queue (ft)	108
Average Queue (ft)	35
95th Queue (ft)	88
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	50
Storage Blk Time (%)	3
Queuing Penalty (veh)	18

Intersection: 725: Centennial Rd & Trenton Ave

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LTR	LTR	L	T	T	TR	L	T	T	TR
Maximum Queue (ft)	289	324	240	521	450	402	181	301	921	287
Average Queue (ft)	131	149	102	324	304	252	59	167	225	186
95th Queue (ft)	246	264	191	462	419	378	122	257	654	262
Link Distance (ft)	777	684		700	700	700		1229	1229	1229
Upstream Blk Time (%)									0	
Queuing Penalty (veh)									1	
Storage Bay Dist (ft)			500				220			
Storage Blk Time (%)				0				3		
Queuing Penalty (veh)				1				2		

2040 Modified Network - Concept L - Centennial NW SE Loops

Intersection: 730: Centennial Rd & Century Ave

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	274	325	553	638	325	260	289	357	324	200	298	400
Average Queue (ft)	182	232	304	290	93	172	189	192	175	74	197	231
95th Queue (ft)	260	344	473	489	329	309	330	294	269	184	288	360
Link Distance (ft)			1243	1243				1214	1214			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	225	225			225	350	350			100	300	300
Storage Blk Time (%)	2	7	20	16		1	2	0	33	0	0	2
Queuing Penalty (veh)	6	26	80	95		2	5	0	33	1	1	14

Intersection: 730: Centennial Rd & Century Ave

Movement	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	R
Maximum Queue (ft)	664	749	374	98	278	492	514	225
Average Queue (ft)	336	353	140	35	77	305	312	161
95th Queue (ft)	510	549	252	79	189	444	474	294
Link Distance (ft)	1229	1229	1229			1741	1741	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)				250	250			125
Storage Blk Time (%)	17					16	38	1
Queuing Penalty (veh)	72					16	94	7

Network Summary

Network wide Queuing Penalty: 1475



**705: Bismarck Expy & Commerce Dr/Revere Dr Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.7	0.7	0.7	3.5	1.0	3.6	1.1	0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	92.2	48.5	15.9	63.1	69.3	15.6	36.9	29.6	20.0	34.6	20.8	10.7

**705: Bismarck Expy & Commerce Dr/Revere Dr Performance by movement**

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	28.2

**710: Bismarck Expy & Divide Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.3	0.8	0.6	3.4	0.5	0.3	0.1	0.0	0.1	0.0	0.0	0.0
Total Del/Veh (s)	61.3	62.9	43.6	60.8	67.5	1.5	70.5	22.9	12.5	56.8	11.4	7.1

**710: Bismarck Expy & Divide Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	21.7

**715: EB I-94 Off Ramp/EB I-94 On Ramp & Bismarck Expy Performance by movement**

Movement	EBR	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	1.1	0.1	0.0	0.1	0.6	0.0	0.2
Total Del/Veh (s)	38.2	2.0	17.7	9.3	77.2	10.2	18.2

**720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp Performance by movement**

Movement	WBL	WBR	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	1.4	3.4	0.0	0.0	0.0	0.0	0.2
Total Del/Veh (s)	63.3	16.6	6.5	9.9	3.9	4.9	8.8

**725: Centennial Rd & Trenton Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.2	0.2	0.2	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	60.9	54.6	35.2	57.3	47.9	32.1	37.6	9.7	5.6	24.9	12.9	13.9

**725: Centennial Rd & Trenton Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	15.2

730: Centennial Rd & Century Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.1	0.3	3.0	2.7	0.4	2.5	0.1	0.0	0.0	1.6	0.4	1.8
Total Del/Veh (s)	79.0	54.2	24.4	69.3	50.8	14.6	52.7	28.8	5.1	75.8	44.6	44.5

730: Centennial Rd & Century Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	45.4

Total Network Performance

Denied Del/Veh (s)	1.3
Total Del/Veh (s)	75.9

Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	L	TR	L	T	R	L	T	T	TR	L	T
Maximum Queue (ft)	249	298	403	123	197	341	277	267	282	285	431	265
Average Queue (ft)	127	174	89	41	25	140	114	138	155	141	228	110
95th Queue (ft)	256	291	258	98	106	273	210	234	263	243	391	221
Link Distance (ft)			821		957			3119	3119	3119		1842
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200	200		100		300	375				375	
Storage Blk Time (%)	1	12		2	1	1	0				1	
Queuing Penalty (veh)	1	14		7	2	0	1				5	

Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	300	314	300
Average Queue (ft)	135	152	59
95th Queue (ft)	262	273	174
Link Distance (ft)	1842	1842	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			200
Storage Blk Time (%)		5	0
Queuing Penalty (veh)		13	1

**Intersection: 710: Bismarck Expy & Divide Ave**

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	L	TR	L	T	R	L	T	T	T	R	L
Maximum Queue (ft)	172	221	279	179	129	26	203	292	401	463	250	167
Average Queue (ft)	73	122	131	79	47	2	33	139	162	225	83	99
95th Queue (ft)	148	197	237	149	102	19	114	256	308	390	243	153
Link Distance (ft)			1082		870	870		1842	1842	1842		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250		250			400				150	350
Storage Blk Time (%)				1						19		
Queuing Penalty (veh)				2						22		

**Intersection: 710: Bismarck Expy & Divide Ave**

Movement	SB	SB	SB	SB	SB
Directions Served	L	T	T	T	R
Maximum Queue (ft)	188	268	245	270	200
Average Queue (ft)	119	131	124	135	28
95th Queue (ft)	168	235	212	225	143
Link Distance (ft)		417	417	417	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	350				100
Storage Blk Time (%)				15	
Queuing Penalty (veh)				43	

**Intersection: 715: EB I-94 Off Ramp/EB I-94 On Ramp & Bismarck Expy**

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	R	R	R	R	T	T	T	R	L	L	T	T
Maximum Queue (ft)	343	266	39	39	346	434	450	419	209	244	233	198
Average Queue (ft)	211	168	1	3	178	182	211	131	114	147	146	113
95th Queue (ft)	309	263	22	32	331	365	396	329	184	221	219	187
Link Distance (ft)	1085		1266	1266	417	417	417	417			692	692
Upstream Blk Time (%)						0	1	0				
Queuing Penalty (veh)						1	3	1				
Storage Bay Dist (ft)		500							240	240		
Storage Blk Time (%)									0	1	0	
Queuing Penalty (veh)									0	4	0	

**Intersection: 715: EB I-94 Off Ramp/EB I-94 On Ramp & Bismarck Expy**

Movement	SB
Directions Served	T
Maximum Queue (ft)	245
Average Queue (ft)	146
95th Queue (ft)	218
Link Distance (ft)	692
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

**Intersection: 720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp**

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	213	227	183	52	61	36	122	121	129	48
Average Queue (ft)	110	112	67	9	10	4	25	23	34	12
95th Queue (ft)	188	182	129	35	38	21	78	75	92	37
Link Distance (ft)		1244		692	692	692	696	696	696	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300		150							150
Storage Blk Time (%)		4	0						0	
Queuing Penalty (veh)		9	1						0	

**Intersection: 725: Centennial Rd & Trenton Ave**

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LTR	LTR	L	T	T	TR	L	T	T	TR
Maximum Queue (ft)	275	246	213	247	244	178	79	136	139	206
Average Queue (ft)	141	103	90	117	99	73	33	65	81	117
95th Queue (ft)	241	197	169	216	200	165	65	124	139	192
Link Distance (ft)	777	684		696	696	696		1222	1222	1222
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	500					220				
Storage Blk Time (%)										
Queuing Penalty (veh)										

**Intersection: 730: Centennial Rd & Century Ave**

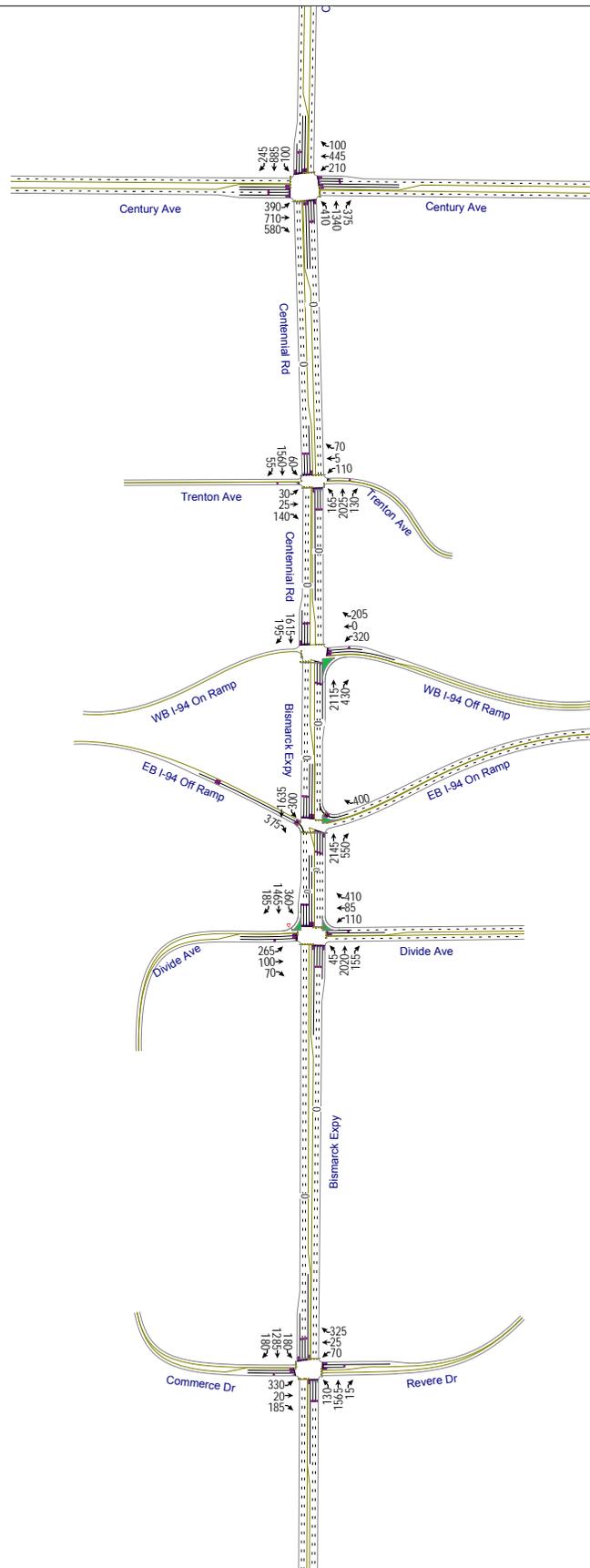
Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	145	172	224	208	275	279	375	406	406	200	282	279
Average Queue (ft)	62	104	119	94	131	179	217	250	256	95	172	184
95th Queue (ft)	136	165	186	172	237	262	309	355	371	235	254	267
Link Distance (ft)			1231	1231				1214	1214			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	225	225			225	350	350			100	300	300
Storage Blk Time (%)			0	0	1	0	1	43	0	0	0	0
Queuing Penalty (veh)			0	0	2	0	3	38	1	0	0	0

**Intersection: 730: Centennial Rd & Century Ave**

Movement	NB	NB	NB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	T	R
Maximum Queue (ft)	358	333	74	48	174	410	487	472	457
Average Queue (ft)	204	215	23	11	49	280	267	264	301
95th Queue (ft)	319	313	54	36	136	371	410	444	491
Link Distance (ft)	1222	1222	1222			1741	1741	1741	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)				250	250				400
Storage Blk Time (%)	1					14		0	6
Queuing Penalty (veh)	5					8		1	25

**Network Summary**

Network wide Queuing Penalty: 215



**705: Bismarck Expy & Commerce Dr/Revere Dr Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.5	1.0	1.0	3.5	0.9	3.6	0.9	0.1	0.2	0.0	0.0	0.1
Total Del/Veh (s)	68.2	51.1	21.1	54.3	60.2	37.7	35.0	29.7	20.0	53.2	26.6	14.1

**705: Bismarck Expy & Commerce Dr/Revere Dr Performance by movement**

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	33.1

**710: Bismarck Expy & Divide Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.2	0.8	0.8	3.2	0.5	0.3	0.5	0.1	0.0	0.8	0.0	0.1
Total Del/Veh (s)	77.1	60.3	40.9	53.5	55.9	1.7	71.6	52.8	59.7	206.7	25.5	12.3

**710: Bismarck Expy & Divide Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	52.1

**715: EB I-94 Off Ramp/EB I-94 On Ramp & Bismarck Expy Performance by movement**

Movement	EBR	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.9	0.1	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	60.0	9.8	13.8	11.7	103.0	32.6	27.3

**720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp Performance by movement**

Movement	WBL	WBR	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	102.8	93.2	0.0	0.0	0.5	0.5	10.8
Total Del/Veh (s)	155.1	58.4	11.2	10.9	21.1	7.4	24.8

**725: Centennial Rd & Trenton Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.3	0.2	0.2	0.3	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	57.4	51.1	34.5	60.4	64.8	48.0	35.1	19.8	15.6	37.5	19.6	15.3

**725: Centennial Rd & Trenton Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	22.9

730: Centennial Rd & Century Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.2	0.8	2.2	3.0	0.2	2.9	0.0	0.0	0.0	2.2	0.4	2.1
Total Del/Veh (s)	73.2	55.4	35.0	91.0	57.7	34.4	84.7	42.7	18.4	107.7	44.1	19.8

730: Centennial Rd & Century Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.8
Total Del/Veh (s)	50.1

Total Network Performance

Denied Del/Veh (s)	6.8
Total Del/Veh (s)	115.7

Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	L	TR	L	T	R	L	T	T	TR	L	T
Maximum Queue (ft)	249	285	311	177	283	367	167	423	452	460	333	384
Average Queue (ft)	153	187	103	65	45	194	72	254	274	277	133	171
95th Queue (ft)	241	260	218	130	172	325	135	390	413	403	251	344
Link Distance (ft)			821		957			3119	3119	3119		1842
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200	200		100		300	375				375	
Storage Blk Time (%)	1	10	1	6	1	3		1			0	0
Queuing Penalty (veh)	3	21	2	20	5	3		1			0	0

Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	459	497	300
Average Queue (ft)	194	214	92
95th Queue (ft)	379	414	286
Link Distance (ft)	1842	1842	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			200
Storage Blk Time (%)		12	
Queuing Penalty (veh)		21	

**Intersection: 710: Bismarck Expy & Divide Ave**

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	L	TR	L	T	R	L	T	T	T	R	L
Maximum Queue (ft)	266	271	278	190	156	66	498	1093	1188	1196	250	399
Average Queue (ft)	122	170	144	78	62	3	123	483	561	643	156	336
95th Queue (ft)	218	244	251	148	124	26	353	961	1076	1120	332	447
Link Distance (ft)			1082		870	870		1842	1842	1842		
Upstream Blk Time (%)												0
Queuing Penalty (veh)												0
Storage Bay Dist (ft)	250	250		250			400				150	350
Storage Blk Time (%)	0	0	1				1	7		43		5
Queuing Penalty (veh)	0	1	4				4	3		67		22

**Intersection: 710: Bismarck Expy & Divide Ave**

Movement	SB	SB	SB	SB	SB
Directions Served	L	T	T	T	R
Maximum Queue (ft)	416	491	491	486	200
Average Queue (ft)	366	394	301	297	71
95th Queue (ft)	484	562	480	477	228
Link Distance (ft)		417	417	417	
Upstream Blk Time (%)	14	32	2	2	
Queuing Penalty (veh)	0	215	13	11	
Storage Bay Dist (ft)	350				100
Storage Blk Time (%)	38	21		27	
Queuing Penalty (veh)	185	76		49	

**Intersection: 715: EB I-94 Off Ramp/EB I-94 On Ramp & Bismarck Expy**

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	R	R	R	R	T	T	T	R	L	L	T	T
Maximum Queue (ft)	415	357	213	198	296	442	474	433	248	360	561	542
Average Queue (ft)	270	222	104	52	126	161	239	127	142	243	348	292
95th Queue (ft)	391	340	225	174	219	329	476	294	229	463	829	759
Link Distance (ft)	1085		1266	1266	417	417	417	417			692	692
Upstream Blk Time (%)					0	0	2	0			19	7
Queuing Penalty (veh)					1	1	11	1			125	46
Storage Bay Dist (ft)		500							240	240		
Storage Blk Time (%)									1	2	36	
Queuing Penalty (veh)									5	12	109	

**Intersection: 715: EB I-94 Off Ramp/EB I-94 On Ramp & Bismarck Expy**

Movement	SB
Directions Served	T
Maximum Queue (ft)	547
Average Queue (ft)	249
95th Queue (ft)	678
Link Distance (ft)	692
Upstream Blk Time (%)	4
Queuing Penalty (veh)	23
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

**Intersection: 720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp**

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	T	T	T	T	T	T	R
Maximum Queue (ft)	364	697	250	157	179	144	550	544	453	102
Average Queue (ft)	209	378	112	74	80	57	171	135	115	29
95th Queue (ft)	388	1047	250	145	155	117	529	470	410	116
Link Distance (ft)		1244		692	692	692	696	696	696	
Upstream Blk Time (%)		16					2	1	0	
Queuing Penalty (veh)		0					12	4	1	
Storage Bay Dist (ft)	300		150							150
Storage Blk Time (%)	18	24	4						6	
Queuing Penalty (veh)	66	87	11						11	

**Intersection: 725: Centennial Rd & Trenton Ave**

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LTR	LTR	L	T	T	TR	L	T	T	TR
Maximum Queue (ft)	244	260	232	398	384	371	170	313	299	325
Average Queue (ft)	126	152	94	273	265	225	50	175	182	209
95th Queue (ft)	212	236	171	367	359	334	116	277	273	299
Link Distance (ft)	777	684		696	696	696		1222	1222	1222
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	500					220				
Storage Blk Time (%)									4	
Queuing Penalty (veh)									2	

**Intersection: 730: Centennial Rd & Century Ave**

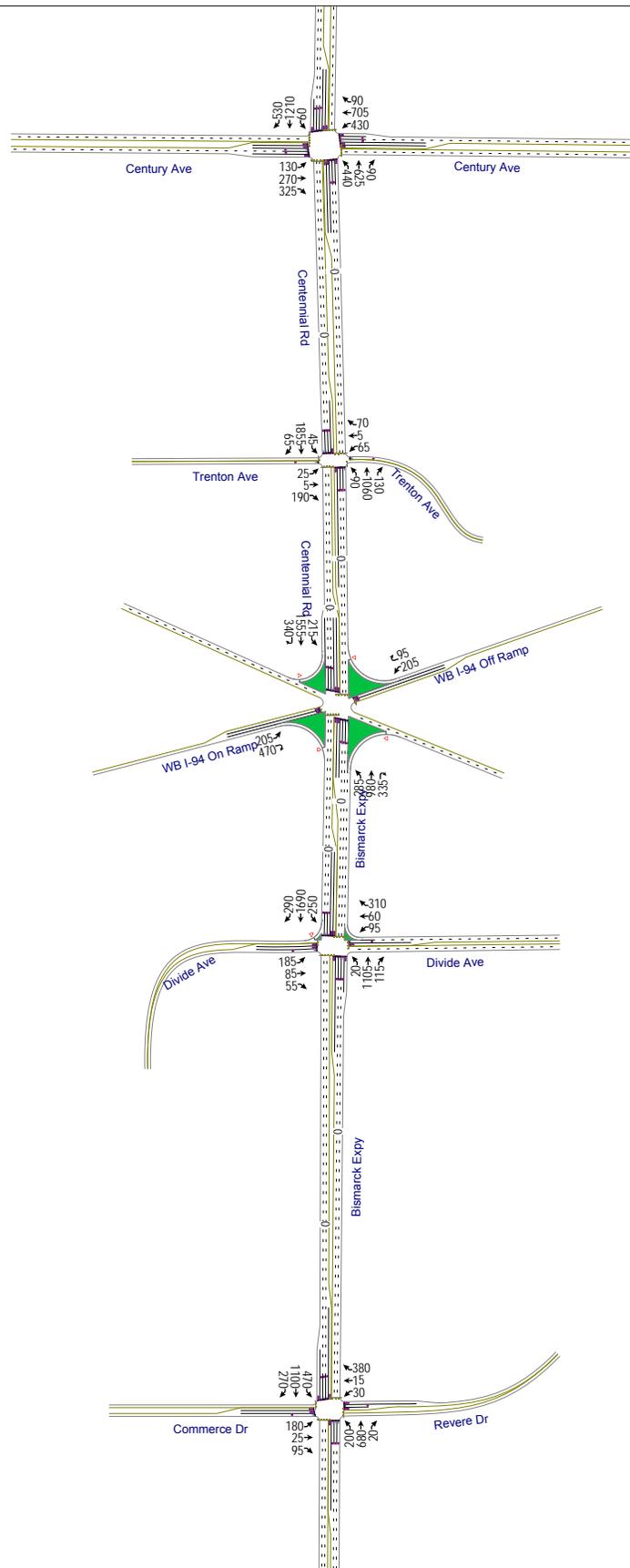
Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L	
Maximum Queue (ft)	256	325	544	636	325	179	199	298	316	200	318	399	
Average Queue (ft)	170	227	314	332	268	93	125	187	173	79	200	227	
95th Queue (ft)	248	335	462	534	386	171	193	274	277	189	288	339	
Link Distance (ft)			1243	1243			1214	1214					
Upstream Blk Time (%)													
Queuing Penalty (veh)													
Storage Bay Dist (ft)	225	225				225	350	350			100	300	300
Storage Blk Time (%)	1	6	22	18	21			0	31	3	1	3	
Queuing Penalty (veh)	4	20	85	104	74			0	31	6	9	18	

**Intersection: 730: Centennial Rd & Century Ave**

Movement	NB	NB	NB	SB	SB	SB	SB	SB	
Directions Served	T	T	R	L	L	T	T	R	
Maximum Queue (ft)	538	522	249	124	349	483	480	225	
Average Queue (ft)	332	337	113	52	104	300	305	149	
95th Queue (ft)	452	447	205	117	237	443	452	290	
Link Distance (ft)	1222	1222	1222			1741	1741		
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)				250	250				125
Storage Blk Time (%)	20					16	37	2	
Queuing Penalty (veh)	80					16	90	7	

**Network Summary**

Network wide Queuing Penalty: 1801



**705: Bismarck Expy & Commerce Dr/Revere Dr Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.7	0.6	0.8	3.9	0.9	3.6	1.0	0.1	0.2	0.0	0.0	0.0
Total Del/Veh (s)	84.1	52.0	20.8	55.4	75.9	17.9	40.1	35.0	26.4	40.3	22.0	11.2

**705: Bismarck Expy & Commerce Dr/Revere Dr Performance by movement**

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	30.8

**710: Bismarck Expy & Divide Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.3	0.7	0.6	3.2	0.4	0.3	0.1	0.0	0.2	0.1	0.0	0.0
Total Del/Veh (s)	76.2	61.5	39.5	66.4	73.7	1.2	33.3	22.2	12.3	83.0	26.7	27.0

**710: Bismarck Expy & Divide Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	31.1

**720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp Performance by movement**

Movement	EBL	EBR2	WBL	WBR2	NBL	NBT	NBR2	SBL	SBT	SBR2	All
Denied Del/Veh (s)	3.4	1.1	3.5	0.5	0.1	0.0	0.0	0.8	0.0	0.1	0.5
Total Del/Veh (s)	50.7	29.6	41.7	3.1	50.3	14.4	9.8	51.0	17.7	9.4	22.6

**725: Centennial Rd & Trenton Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.3	0.4	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	55.9	69.7	31.0	59.2	29.0	32.1	40.7	16.0	10.2	19.9	21.1	21.8

**725: Centennial Rd & Trenton Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	21.5

730: Centennial Rd & Century Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.0	0.3	3.1	2.6	0.4	2.6	0.1	0.0	0.0	1.7	0.4	1.7
Total Del/Veh (s)	82.1	55.5	26.6	70.4	49.6	15.9	92.5	23.7	4.7	74.3	48.1	42.1

730: Centennial Rd & Century Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	49.3

Total Network Performance

Denied Del/Veh (s)	1.4
Total Del/Veh (s)	87.7

Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	L	TR	L	T	R	L	T	T	TR	L	T
Maximum Queue (ft)	268	290	187	86	60	281	243	276	280	352	432	377
Average Queue (ft)	119	150	67	34	19	157	117	168	167	181	250	145
95th Queue (ft)	237	257	136	82	48	258	216	265	268	313	430	334
Link Distance (ft)			849		957			3119	3119	3119		1842
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	300	300		100		300	375					375
Storage Blk Time (%)	0	0		0		0						4
Queuing Penalty (veh)	0	0		2		0						14

Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	308	346	300
Average Queue (ft)	153	171	61
95th Queue (ft)	281	299	181
Link Distance (ft)	1842	1842	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			200
Storage Blk Time (%)		7	
Queuing Penalty (veh)		19	

**Intersection: 710: Bismarck Expy & Divide Ave**

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	NB	SB	SB
Directions Served	L	L	TR	L	T	L	T	T	T	R	L	L
Maximum Queue (ft)	192	195	299	192	162	105	404	374	506	250	212	367
Average Queue (ft)	95	115	131	87	63	21	188	144	206	68	119	141
95th Queue (ft)	165	192	246	162	129	65	346	292	407	209	191	229
Link Distance (ft)			1082		870		1842	1842	1842			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250		250		400				150	350	350
Storage Blk Time (%)			1			0		14	0			
Queuing Penalty (veh)			3			0		17	0			

**Intersection: 710: Bismarck Expy & Divide Ave**

Movement	SB	SB	SB
Directions Served	T	T	TR
Maximum Queue (ft)	393	411	433
Average Queue (ft)	181	197	243
95th Queue (ft)	333	366	413
Link Distance (ft)	902	902	902
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)	1		
Queuing Penalty (veh)	2		

**Intersection: 720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp**

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	NB	NB	SB
Directions Served	L	L	>	L	L	L	L	T	T	T	>	L
Maximum Queue (ft)	132	378	725	202	218	173	186	478	437	196	262	163
Average Queue (ft)	64	146	286	64	98	99	106	133	118	85	13	78
95th Queue (ft)	120	401	771	139	175	163	173	310	283	168	124	136
Link Distance (ft)			981					902	902	902	902	
Upstream Blk Time (%)			1									
Queuing Penalty (veh)			0									
Storage Bay Dist (ft)	400	400		400	400	240	240					300
Storage Blk Time (%)			16					1				
Queuing Penalty (veh)			34					3				

**Intersection: 720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp**

Movement	SB	SB	SB	SB	SB
Directions Served	L	T	T	T	>
Maximum Queue (ft)	342	368	287	298	116
Average Queue (ft)	112	173	170	157	7
95th Queue (ft)	213	301	275	261	85
Link Distance (ft)		928	928	928	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	300			300	
Storage Blk Time (%)		1		0	
Queuing Penalty (veh)		2		0	

**Intersection: 725: Centennial Rd & Trenton Ave**

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LTR	LTR	L	T	T	TR	L	T	T	TR
Maximum Queue (ft)	328	296	243	524	351	302	73	581	309	395
Average Queue (ft)	139	109	84	160	130	98	24	203	203	255
95th Queue (ft)	260	197	176	344	264	219	58	393	290	360
Link Distance (ft)	777	684		928	928	928		1222	1222	1222
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)			500				220			
Storage Blk Time (%)								7		
Queuing Penalty (veh)								3		

**Intersection: 730: Centennial Rd & Century Ave**

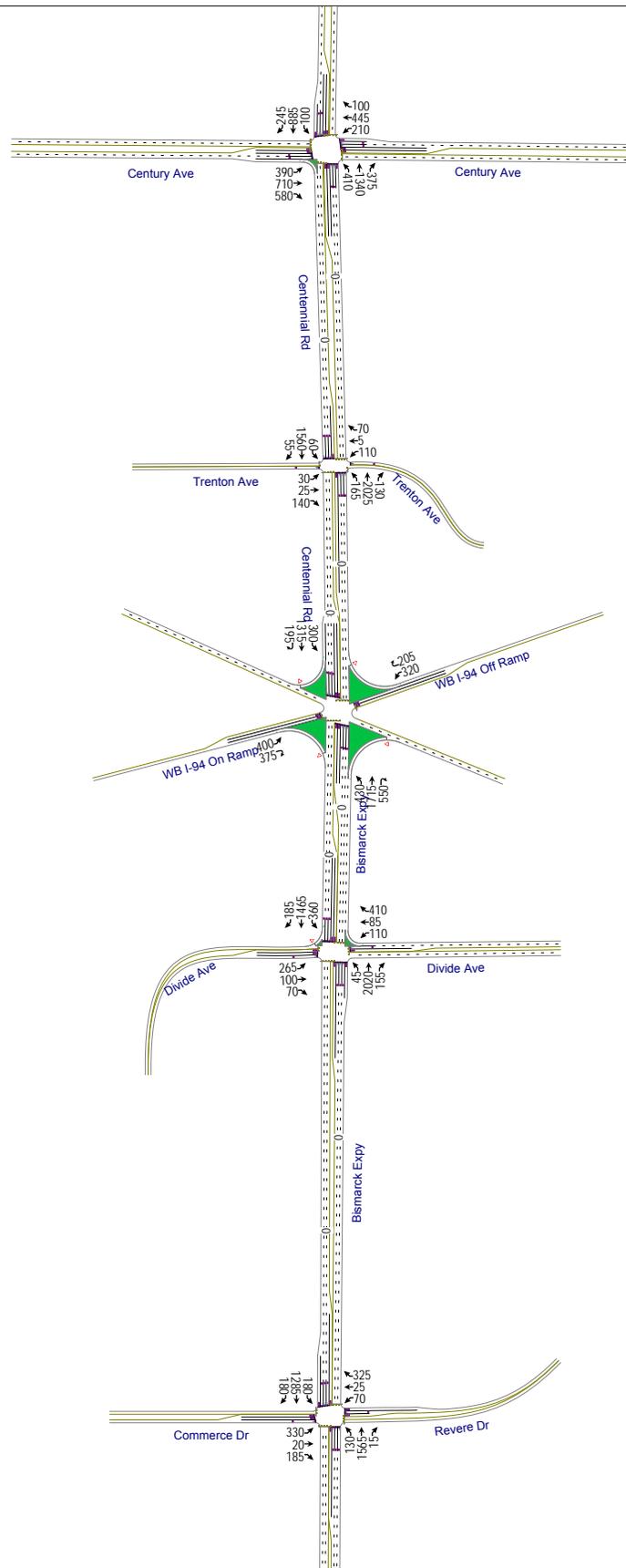
Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	150	159	206	289	312	340	372	417	414	200	333	370
Average Queue (ft)	56	99	122	101	142	184	217	252	249	82	218	235
95th Queue (ft)	130	154	190	200	262	285	319	365	361	222	312	333
Link Distance (ft)			1231	1231				1214	1214			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	225	225			225	350	350			100	300	300
Storage Blk Time (%)			0	0	3	0	0	1	42	0	3	4
Queuing Penalty (veh)			0	0	4	0	1	5	38	1	9	12

**Intersection: 730: Centennial Rd & Century Ave**

Movement	NB	NB	NB	SB	SB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	T	R
Maximum Queue (ft)	357	278	53	61	336	418	521	578	225
Average Queue (ft)	132	137	22	16	66	290	307	376	211
95th Queue (ft)	260	228	48	47	210	401	447	554	264
Link Distance (ft)	1222	1222	1222			1741	1741	1741	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)				250	250				125
Storage Blk Time (%)						16		33	36
Queuing Penalty (veh)						9		175	143

**Network Summary**

Network wide Queuing Penalty: 497



**705: Bismarck Expy & Commerce Dr/Revere Dr Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.4	1.1	1.2	3.7	1.2	3.6	0.9	0.2	0.2	0.1	0.0	0.1
Total Del/Veh (s)	71.2	39.5	21.4	57.2	58.2	40.0	34.2	34.9	30.2	65.6	29.3	14.1

**705: Bismarck Expy & Commerce Dr/Revere Dr Performance by movement**

Movement	All
Denied Del/Veh (s)	0.8
Total Del/Veh (s)	36.9

**710: Bismarck Expy & Divide Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.2	0.8	0.8	3.2	0.5	0.4	0.2	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	104.7	65.7	42.3	53.0	70.7	1.7	40.3	47.0	37.2	79.5	24.9	24.6

**710: Bismarck Expy & Divide Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	42.1

**720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp Performance by movement**

Movement	EBL	EBR2	WBL	WBR2	NBL	NBT	NBR2	SBL	SBT	SBR2	All
Denied Del/Veh (s)	3.2	1.4	3.1	0.9	0.1	0.0	0.0	0.1	0.0	0.0	0.5
Total Del/Veh (s)	43.4	11.1	38.6	3.9	50.7	24.5	16.1	52.5	19.0	7.7	25.6

**725: Centennial Rd & Trenton Ave Performance by movement**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.2	0.2	0.2	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	58.9	52.7	33.7	62.4	44.4	47.5	41.2	29.4	23.0	36.0	25.4	23.2

**725: Centennial Rd & Trenton Ave Performance by movement**

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	29.8

730: Centennial Rd & Century Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.2	0.8	2.3	3.0	0.2	3.0	0.0	0.0	0.0	2.0	0.4	2.0
Total Del/Veh (s)	76.3	53.5	6.8	127.7	57.4	34.7	100.5	41.2	13.9	100.5	49.7	21.7

730: Centennial Rd & Century Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.8
Total Del/Veh (s)	50.3

Total Network Performance

Denied Del/Veh (s)	1.4
Total Del/Veh (s)	104.3

Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	L	TR	L	T	R	L	T	T	TR	L	T
Maximum Queue (ft)	298	324	269	152	474	396	246	450	478	471	384	415
Average Queue (ft)	161	195	94	60	51	216	74	280	295	313	168	198
95th Queue (ft)	254	288	195	114	232	360	157	409	428	448	325	359
Link Distance (ft)			849		957			3119	3119	3119		1842
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	300	300		100		300	375				375	
Storage Blk Time (%)	0	0	0	4	0	5		2			1	0
Queuing Penalty (veh)	0	1	0	13	1	5		2			3	0

Intersection: 705: Bismarck Expy & Commerce Dr/Revere Dr

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	418	483	300
Average Queue (ft)	222	245	99
95th Queue (ft)	390	434	282
Link Distance (ft)	1842	1842	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			200
Storage Blk Time (%)		15	
Queuing Penalty (veh)		27	

**Intersection: 710: Bismarck Expy & Divide Ave**

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	L	TR	L	T	R	L	T	T	T	R	L
Maximum Queue (ft)	241	277	350	181	212	50	499	760	867	963	250	288
Average Queue (ft)	145	172	152	84	77	2	67	425	437	524	121	190
95th Queue (ft)	228	259	280	146	161	23	269	671	737	857	301	287
Link Distance (ft)			1082		870	870		1842	1842	1842		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250		250			400				150	350
Storage Blk Time (%)	0	2	3		0			12		41		
Queuing Penalty (veh)	0	3	7		0			5		63		

**Intersection: 710: Bismarck Expy & Divide Ave**

Movement	SB	SB	SB	SB
Directions Served	L	T	T	TR
Maximum Queue (ft)	308	315	395	410
Average Queue (ft)	205	152	191	230
95th Queue (ft)	306	297	348	388
Link Distance (ft)		902	902	902
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	350			
Storage Blk Time (%)	0	0		
Queuing Penalty (veh)	0	0		

**Intersection: 720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp**

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Directions Served	L	L	>	L	L	>	L	L	T	T	T	>
Maximum Queue (ft)	253	337	611	227	250	84	244	360	918	931	973	906
Average Queue (ft)	111	154	93	106	136	3	144	169	288	291	436	182
95th Queue (ft)	206	276	392	194	214	48	216	269	663	693	1032	682
Link Distance (ft)			981			1099			902	902	902	902
Upstream Blk Time (%)			0						0	0	1	0
Queuing Penalty (veh)			0						1	1	8	1
Storage Bay Dist (ft)	400	400		400	400		240	240				
Storage Blk Time (%)			3				0	1	5			
Queuing Penalty (veh)			12				1	3	23			

**Intersection: 720: Bismarck Expy/Centennial Rd & WB I-94 On Ramp/WB I-94 Off Ramp**

Movement	SB	SB	SB	SB	SB	SB
Directions Served	L	L	T	T	T	>
Maximum Queue (ft)	183	205	364	306	320	120
Average Queue (ft)	95	97	183	162	164	4
95th Queue (ft)	152	164	318	285	293	69
Link Distance (ft)			928	928	928	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	300	300				300
Storage Blk Time (%)			1		0	
Queuing Penalty (veh)			2		1	

**Intersection: 725: Centennial Rd & Trenton Ave**

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LTR	LTR	L	T	T	TR	L	T	T	TR
Maximum Queue (ft)	284	315	210	547	560	527	177	647	1234	625
Average Queue (ft)	138	148	95	287	288	246	50	231	229	231
95th Queue (ft)	256	255	169	495	495	460	130	431	556	421
Link Distance (ft)	777	684		928	928	928		1229	1229	1229
Upstream Blk Time (%)									0	0
Queuing Penalty (veh)									1	0
Storage Bay Dist (ft)			500				220			
Storage Blk Time (%)				1				11		
Queuing Penalty (veh)				2				6		

**Intersection: 730: Centennial Rd & Century Ave**

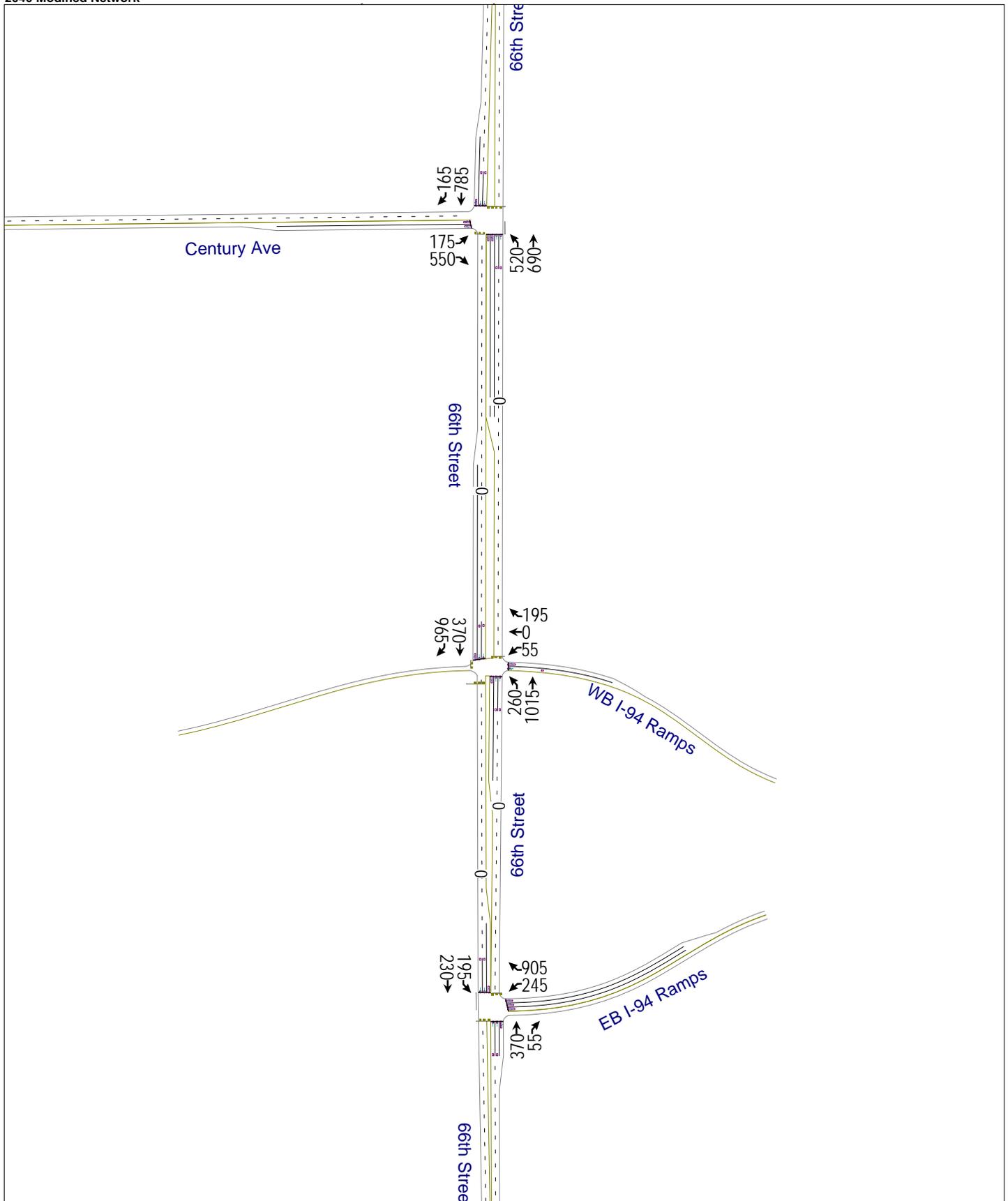
Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	274	324	448	436	325	228	272	315	294	200	349	400
Average Queue (ft)	183	230	273	255	53	125	147	179	162	70	220	251
95th Queue (ft)	260	336	412	385	245	213	239	276	258	180	329	375
Link Distance (ft)			1243	1243				1214	1214			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	225	225			225	350	350			100	300	300
Storage Blk Time (%)	1	6	15	13			0		33	3	3	7
Queuing Penalty (veh)	4	20	58	76			0		33	6	21	45

**Intersection: 730: Centennial Rd & Century Ave**

Movement	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	T	T	R	L	L	T	T	R
Maximum Queue (ft)	591	608	180	120	349	546	574	225
Average Queue (ft)	287	299	78	40	112	343	347	151
95th Queue (ft)	479	483	146	89	282	491	517	296
Link Distance (ft)	1229	1229	1229			1741	1741	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)				250	250			125
Storage Blk Time (%)	13					21	40	1
Queuing Penalty (veh)	52					21	98	4

**Network Summary**

Network wide Queuing Penalty: 630



**805: 66th Street & EB I-94 Ramps Performance by movement**

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	2.8	3.7	0.3	3.4	0.0	0.0	2.2
Total Del/Veh (s)	14.9	20.3	29.4	3.8	43.2	16.1	22.4

**810: 66th Street & WB I-94 Ramps Performance by movement**

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.7	3.7	0.0	0.0	0.0	0.0	0.3
Total Del/Veh (s)	37.0	12.5	43.8	5.8	10.8	60.1	29.2

**815: 66th Street & Century Ave Performance by movement**

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	1.4	3.0	0.0	0.0	39.0	39.3	13.3
Total Del/Veh (s)	28.8	33.1	40.6	9.8	84.2	73.1	44.5

**Total Network Performance**

Denied Del/Veh (s)	12.5
Total Del/Veh (s)	73.3

Queuing and Blocking Report  
 2040 Modified Network [ ] & [ ] 66th Street SE Loop

Intersection: 805: 66th Street & EB I-94 Ramps

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	R	T	T	R	L	T	T
Maximum Queue (ft)	201	397	358	273	192	52	253	153	148
Average Queue (ft)	88	237	176	160	43	21	111	41	54
95th Queue (ft)	164	351	312	242	136	47	201	104	114
Link Distance (ft)	797			828	828			911	911
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		550	550			100	200		
Storage Blk Time (%)					0		3		
Queuing Penalty (veh)					0		4		

Intersection: 810: 66th Street & WB I-94 Ramps

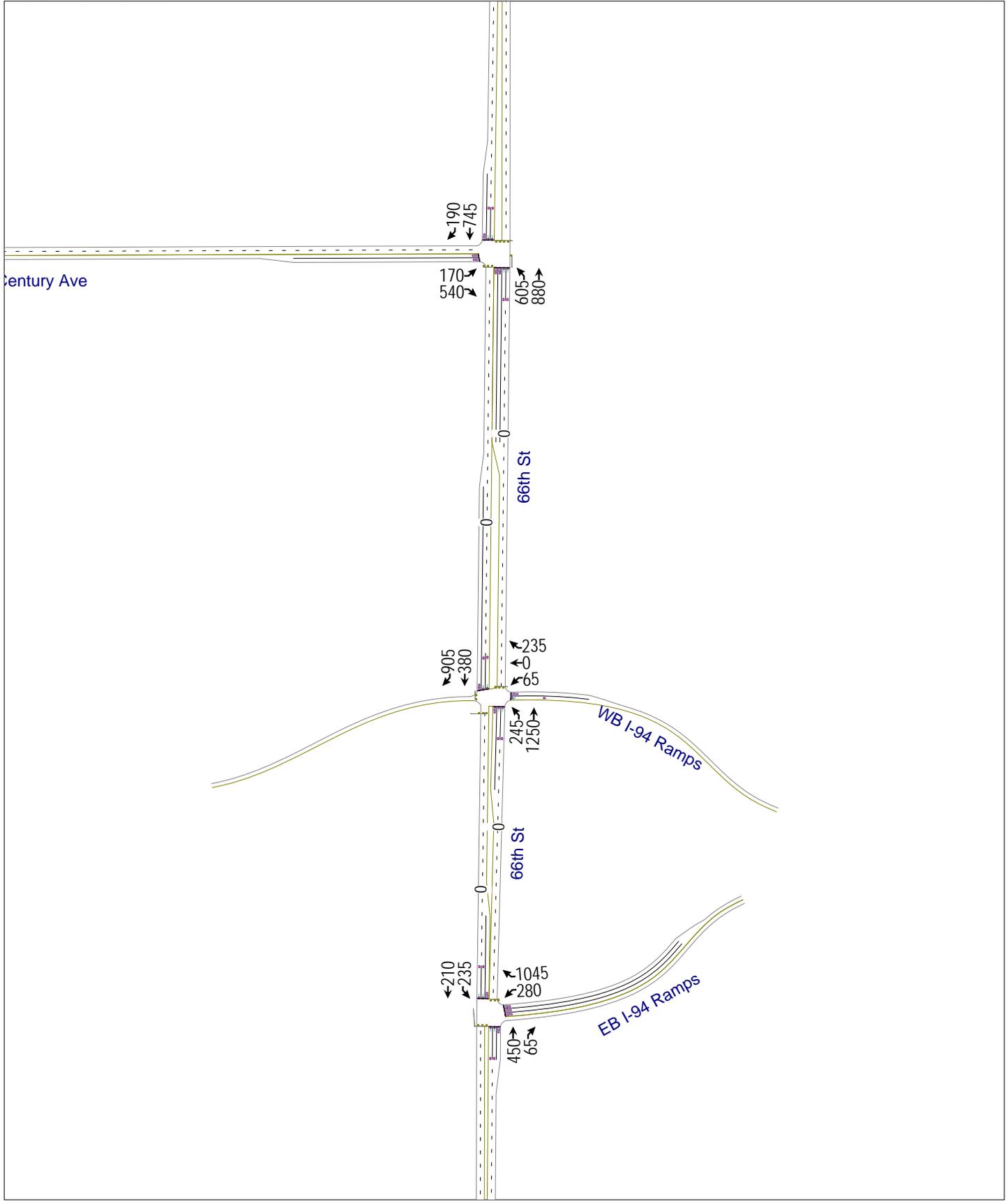
Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	T	T	T	R
Maximum Queue (ft)	96	132	286	197	161	503	987	650
Average Queue (ft)	40	69	155	66	45	73	387	458
95th Queue (ft)	84	122	248	154	120	335	1135	800
Link Distance (ft)	850			911	911	1214	1214	
Upstream Blk Time (%)						0	0	
Queuing Penalty (veh)						0	1	
Storage Bay Dist (ft)		300	300					550
Storage Blk Time (%)			0				0	26
Queuing Penalty (veh)			2				2	48

Intersection: 815: 66th Street & Century Ave

Movement	EB	EB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	L	T	T	T	T	R
Maximum Queue (ft)	390	532	248	251	201	194	682	741	300
Average Queue (ft)	107	247	147	161	71	89	457	553	189
95th Queue (ft)	259	456	219	234	150	160	1116	1122	394
Link Distance (ft)	1353				1214	1214	1027	1027	
Upstream Blk Time (%)							9	25	
Queuing Penalty (veh)							0	0	
Storage Bay Dist (ft)		550	525	525					200
Storage Blk Time (%)		1						47	
Queuing Penalty (veh)		2						78	

Network Summary

Network wide Queuing Penalty: 137



**805: 66th St & EB I-94 Ramps Performance by movement**

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	3.5	4.2	0.2	1.7	0.0	0.0	2.5
Total Del/Veh (s)	17.6	25.5	37.2	6.8	35.4	19.4	26.7

**810: 66th St & WB I-94 Ramps Performance by movement**

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.9	3.8	0.0	0.0	0.0	0.0	0.3
Total Del/Veh (s)	33.5	16.4	62.2	8.4	11.3	55.4	28.3

**815: 66th St & Century Ave Performance by movement**

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.6	1.0	0.0	0.0	0.4	1.8	0.4
Total Del/Veh (s)	31.0	34.4	35.8	10.2	39.8	15.0	28.0

**Total Network Performance**

Denied Del/Veh (s)	2.1
Total Del/Veh (s)	62.6

# Queuing and Blocking Report

1/27/2014

## Intersection: 805: 66th St & EB I-94 Ramps

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	R	T	T	R	L	T	T
Maximum Queue (ft)	312	537	442	249	212	80	249	124	152
Average Queue (ft)	111	314	260	148	115	33	126	42	62
95th Queue (ft)	242	469	420	230	184	65	208	96	123
Link Distance (ft)	822			2134	2134			879	879
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		600	600			100	250		
Storage Blk Time (%)		0			14	0	0		
Queuing Penalty (veh)		0			9	0	0		

## Intersection: 810: 66th St & WB I-94 Ramps

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	T	T	T	R
Maximum Queue (ft)	96	203	311	337	191	144	851	700
Average Queue (ft)	44	91	169	119	76	53	193	487
95th Queue (ft)	84	154	288	246	159	110	688	811
Link Distance (ft)	900			879	879	1260	1260	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		230	250					600
Storage Blk Time (%)		0	7	0			0	16
Queuing Penalty (veh)		0	43	1			3	30

## Intersection: 815: 66th St & Century Ave

Movement	EB	EB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	L	T	T	T	T	R
Maximum Queue (ft)	275	545	264	276	162	219	411	475	298
Average Queue (ft)	101	262	155	171	79	103	163	284	143
95th Queue (ft)	201	476	227	246	148	171	319	458	330
Link Distance (ft)	2613				1260	1260	1678	1678	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		550	525	525					200
Storage Blk Time (%)		1						27	
Queuing Penalty (veh)		1						52	

## Network Summary

Network wide Queuing Penalty: 138

FINAL

# Appendix D – Refined Concept Alternatives for Formal Evaluation

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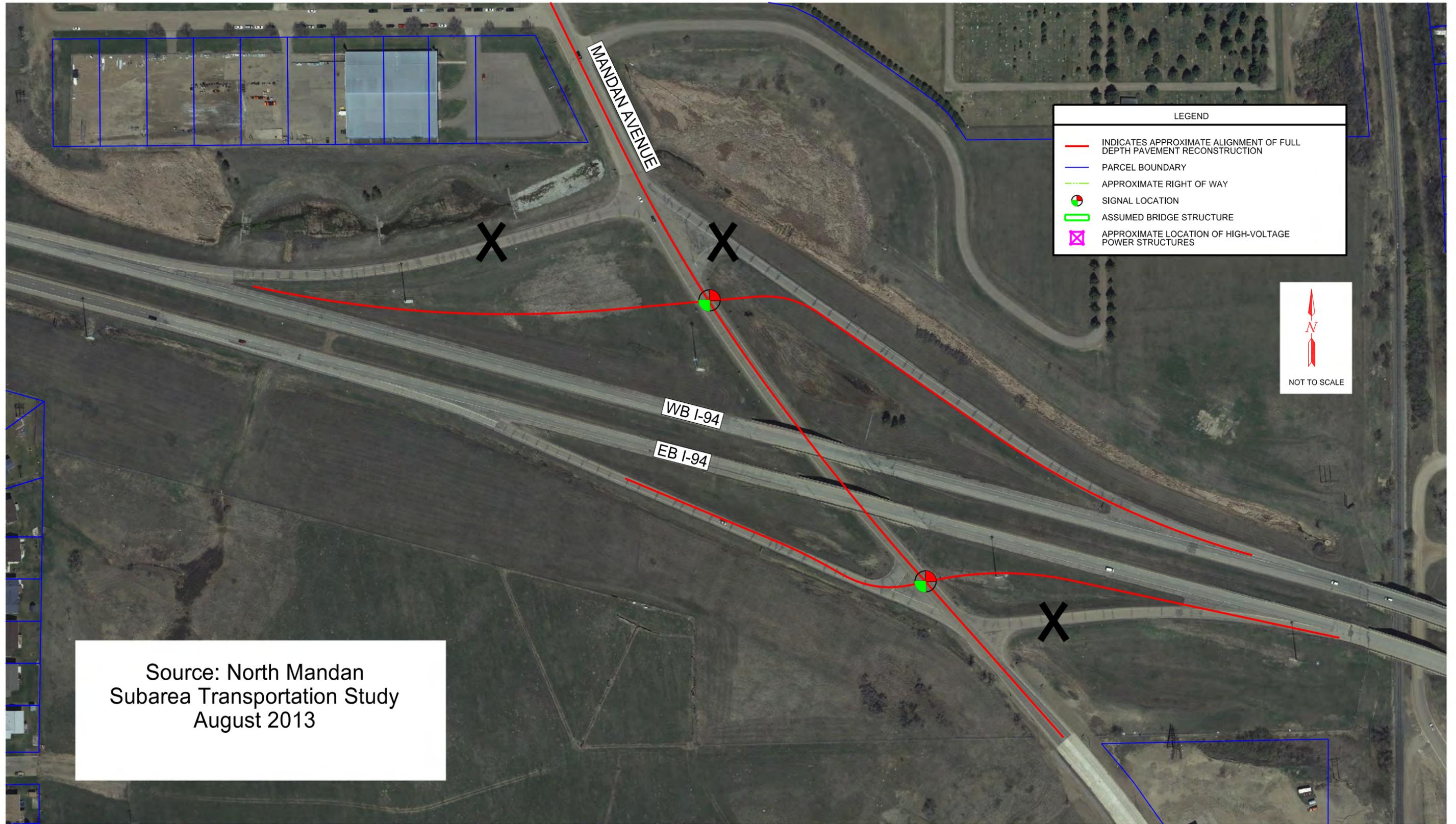
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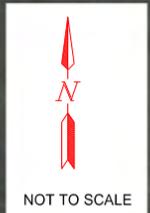
**Concept A - Singlepoint - Sunset Drive**  
Bismarck Mandan I-94 Corridor Study

Job #  
SDATES

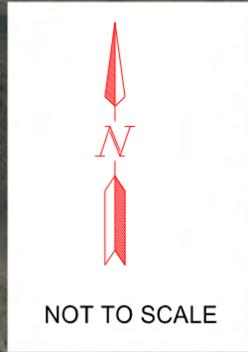
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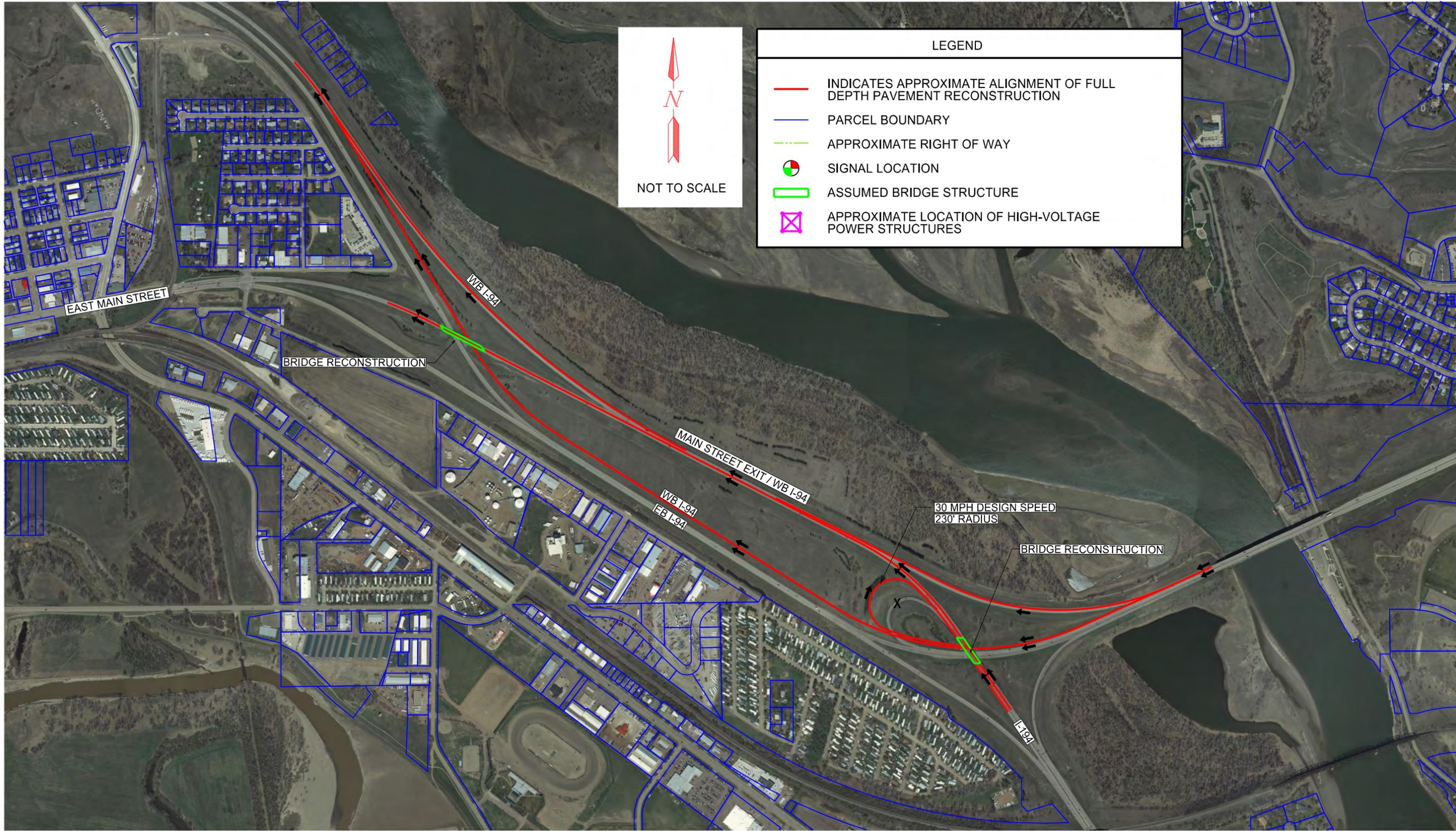
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	PARCEL BOUNDARY
	APPROXIMATE RIGHT OF WAY
	SIGNAL LOCATION
	ASSUMED BRIDGE STRUCTURE
	APPROXIMATE LOCATION OF HIGH-VOLTAGE POWER STRUCTURES



Source: North Mandan  
Subarea Transportation Study  
August 2013



LEGEND	
	INDICATES APPROXIMATE ALIGNMENT OF FULL DEPTH PAVEMENT RECONSTRUCTION
	PARCEL BOUNDARY
	APPROXIMATE RIGHT OF WAY
	SIGNAL LOCATION
	ASSUMED BRIDGE STRUCTURE
	APPROXIMATE LOCATION OF HIGH-VOLTAGE POWER STRUCTURES

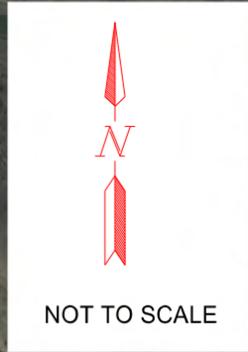


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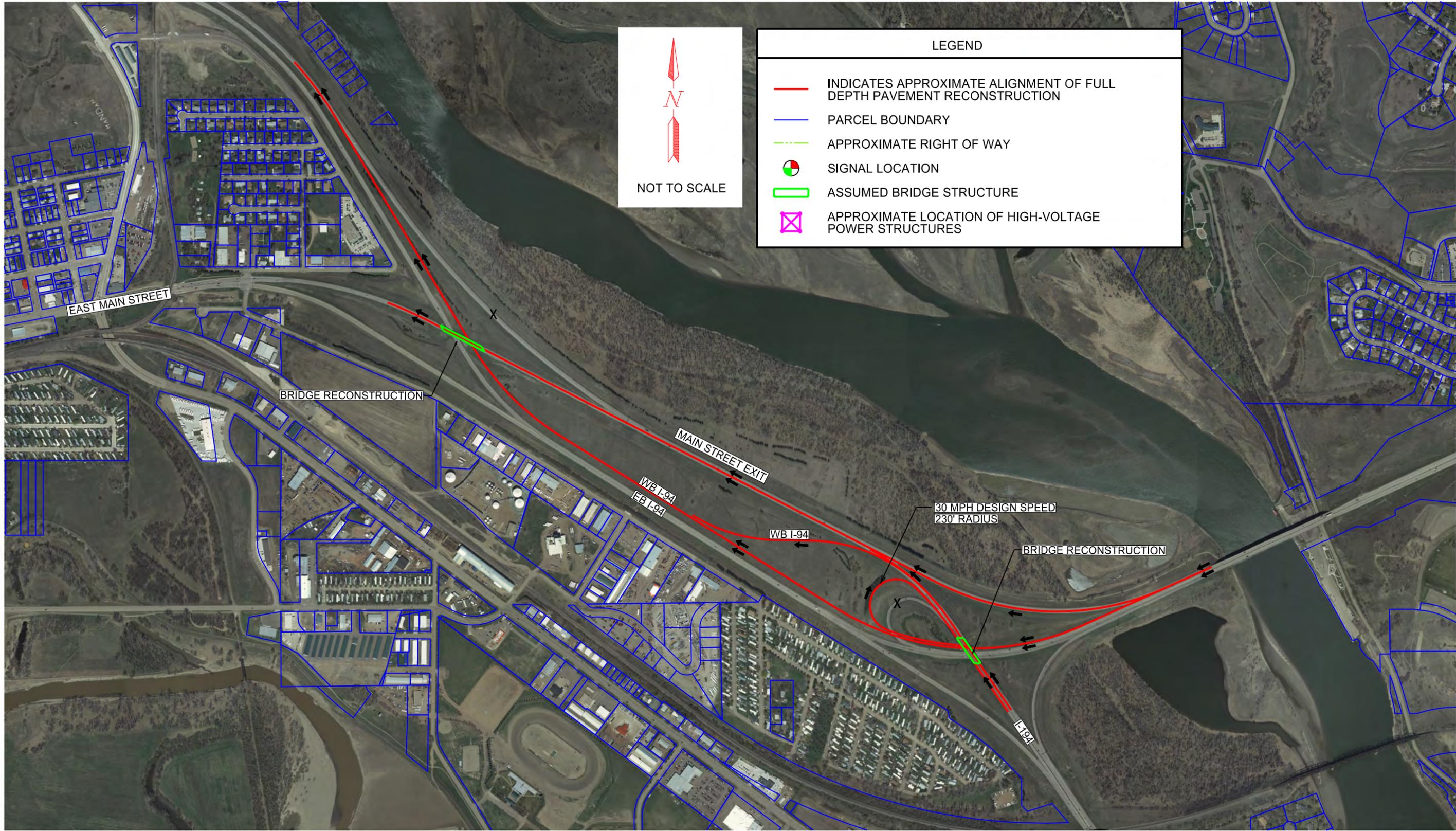


**Concept D - I-94 Main Street to Grant Marsh Bridge**  
 Bismarck Mandan I-94 Corridor Study

Job #  
 \$DATES



LEGEND	
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	PARCEL BOUNDARY
	APPROXIMATE RIGHT OF WAY
	SIGNAL LOCATION
	ASSUMED BRIDGE STRUCTURE
	APPROXIMATE LOCATION OF HIGH-VOLTAGE POWER STRUCTURES

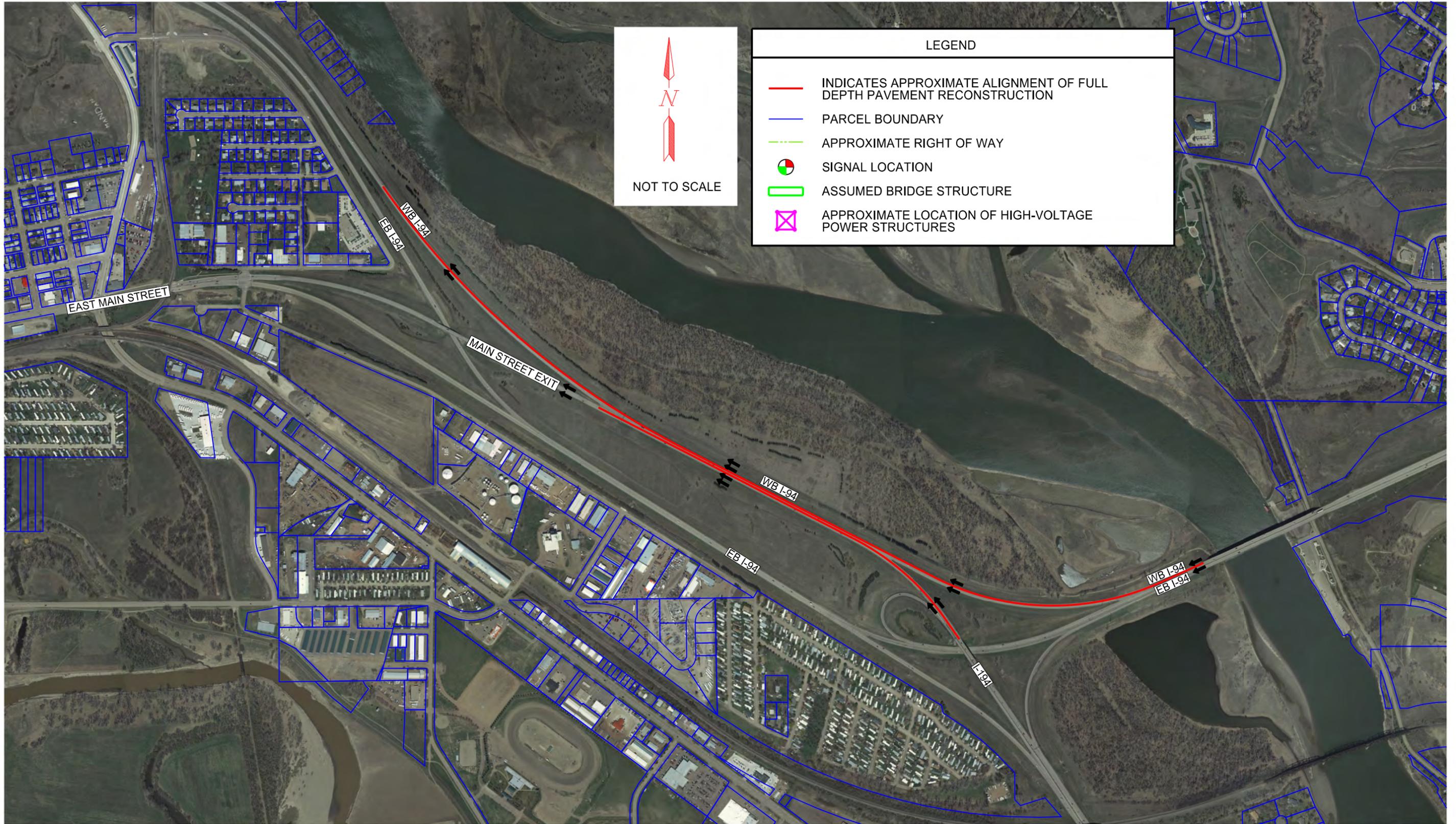


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**Concept F - I-94 Main Street to Grant Marsh Bridge**  
Bismarck Mandan I-94 Corridor Study

Job #  
\$DATES

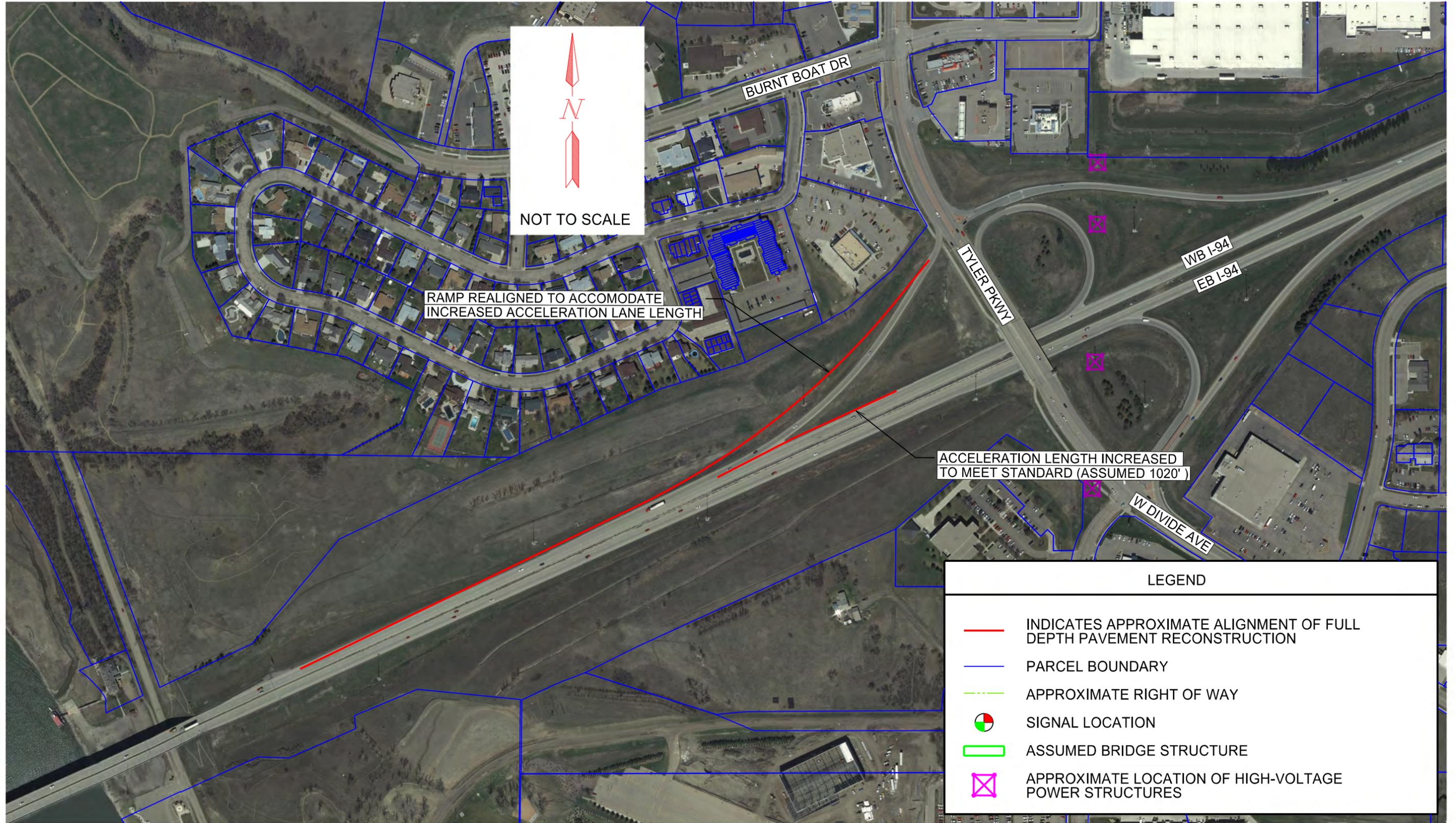


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**Concept G - I-94 Main Street to Grant Marsh Bridge**  
 Bismarck Mandan I-94 Corridor Study

Job #  
 \$DATES



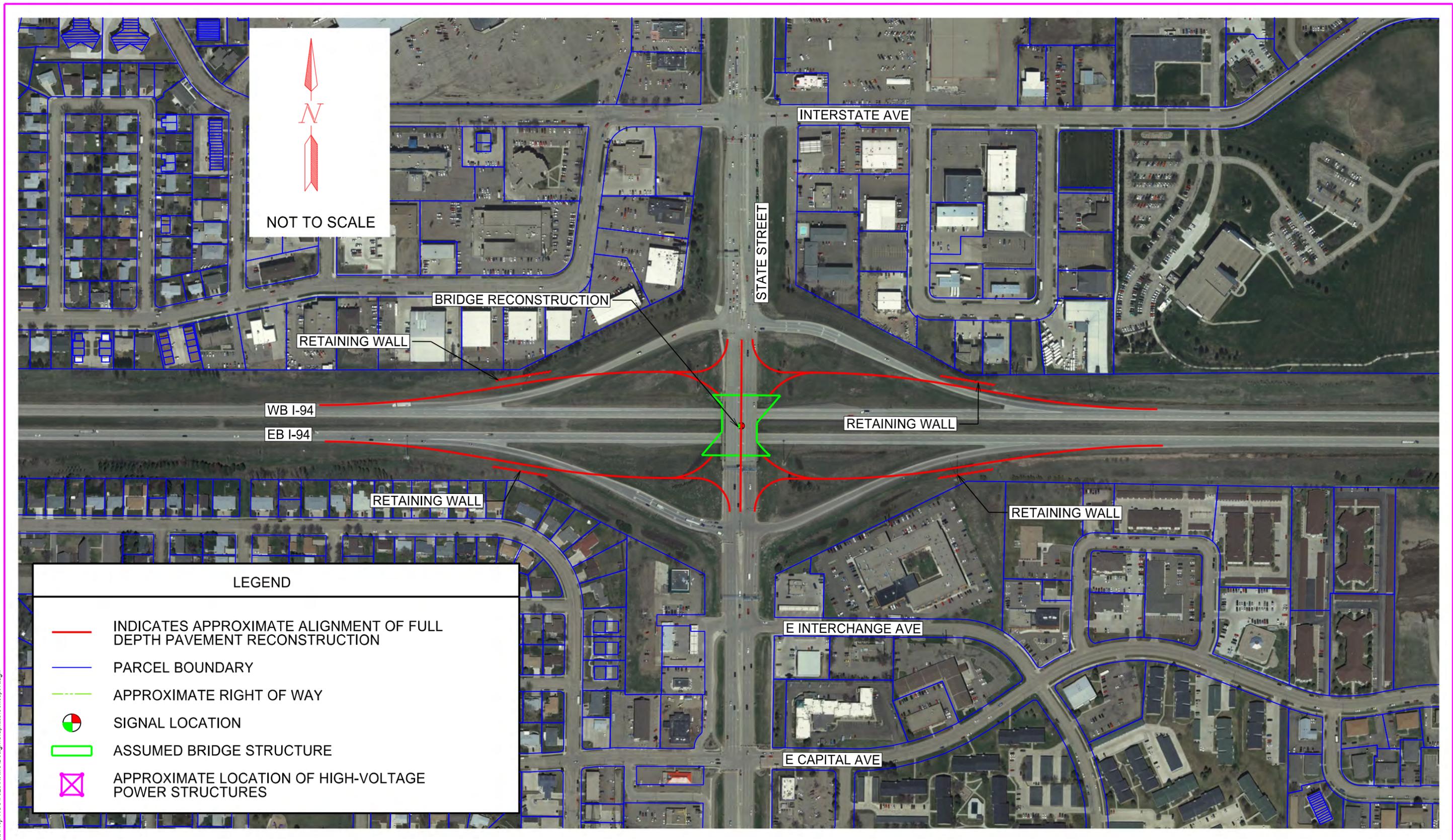
RAMP REALIGNED TO ACCOMMODATE INCREASED ACCELERATION LANE LENGTH

ACCELERATION LENGTH INCREASED TO MEET STANDARD (ASSUMED 1020')

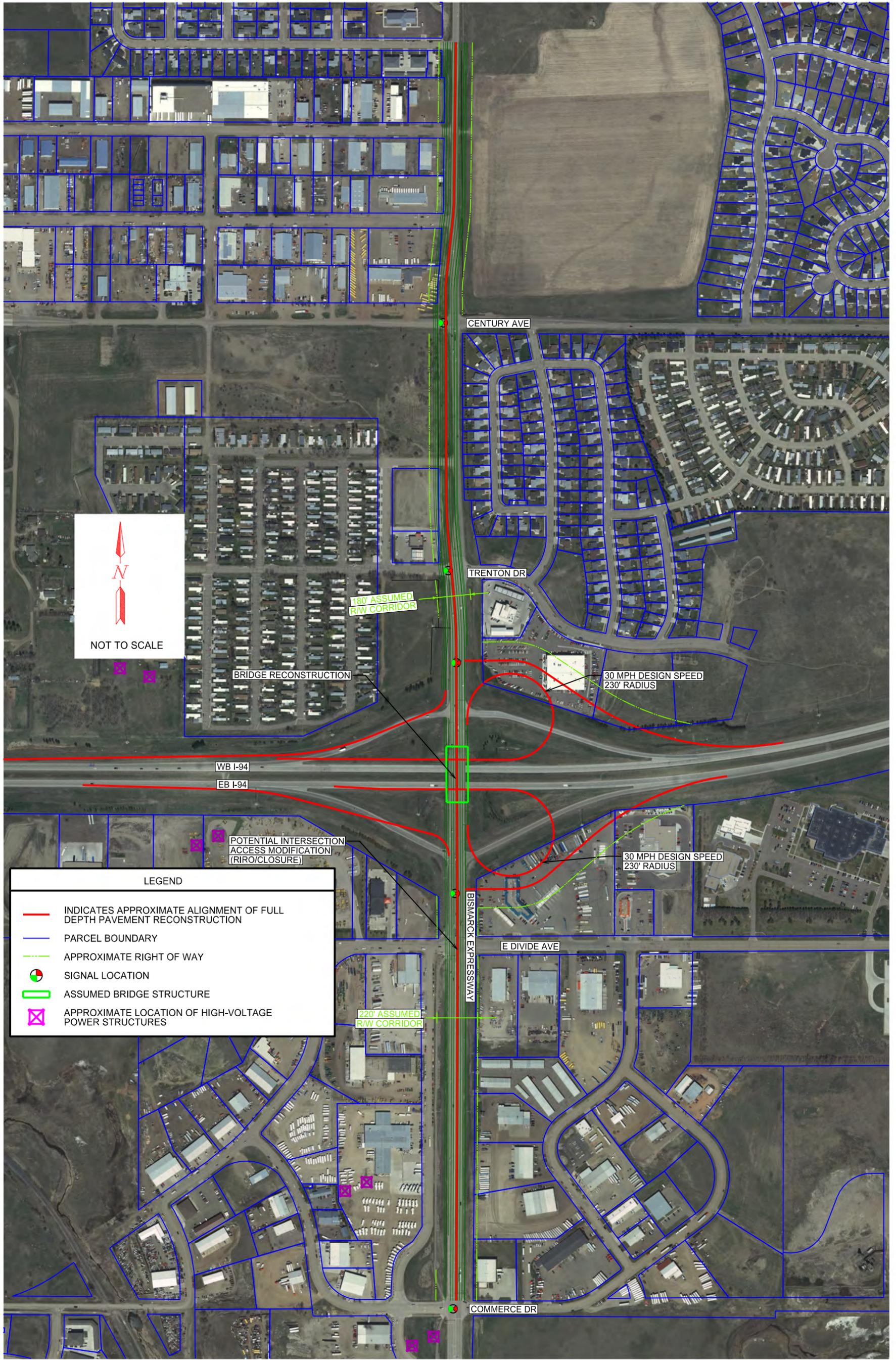
**LEGEND**

- INDICATES APPROXIMATE ALIGNMENT OF FULL DEPTH PAVEMENT RECONSTRUCTION
- PARCEL BOUNDARY
- - - APPROXIMATE RIGHT OF WAY
- SIGNAL LOCATION
- ▭ ASSUMED BRIDGE STRUCTURE
- ✕ APPROXIMATE LOCATION OF HIGH-VOLTAGE POWER STRUCTURES

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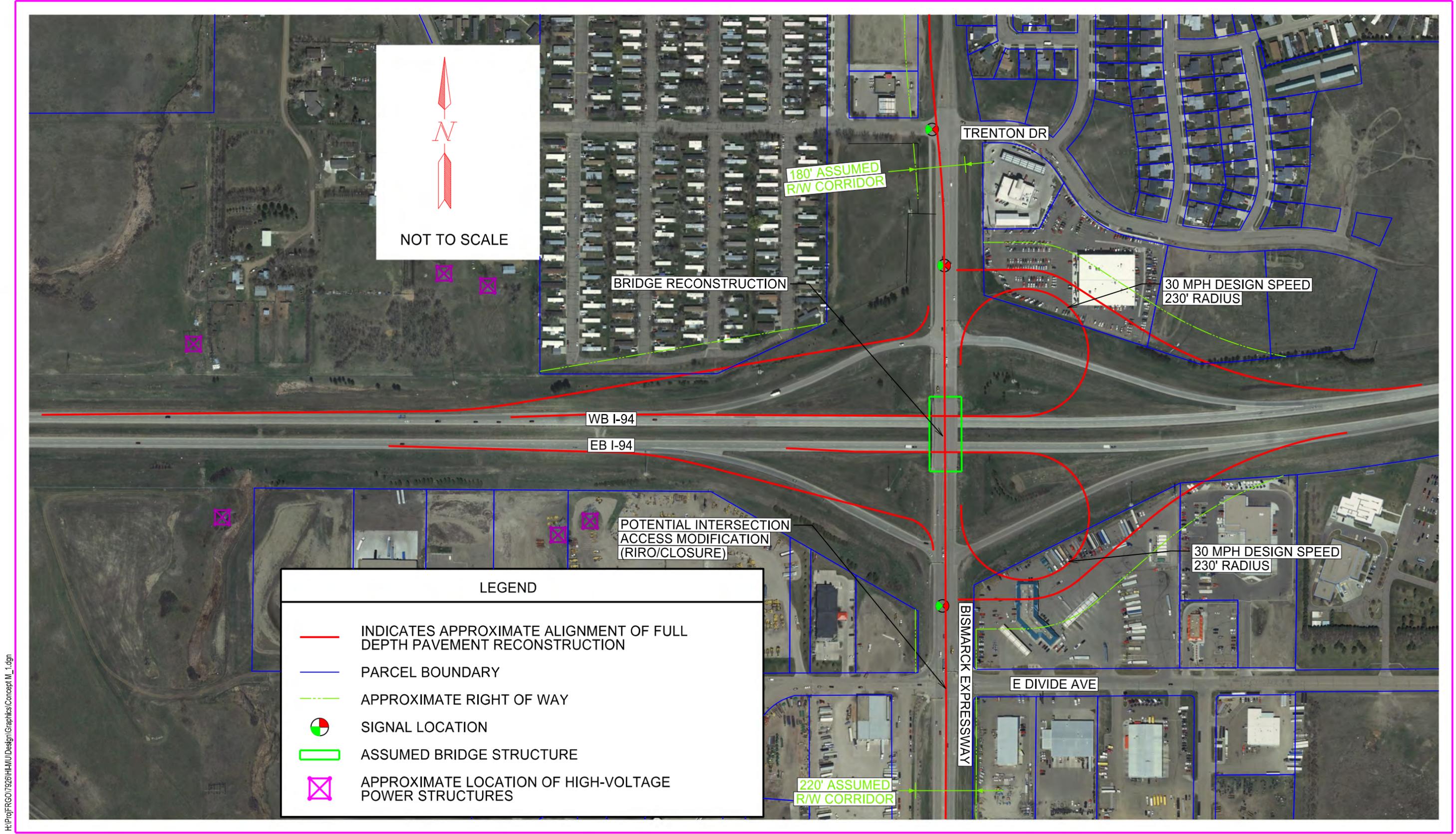


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**Concept M' - 6 Lane Configuration - Centennial/Bismarck Expressway**  
 Bismarck Mandan I-94 Corridor Study

Job #  
 \$DATES



  
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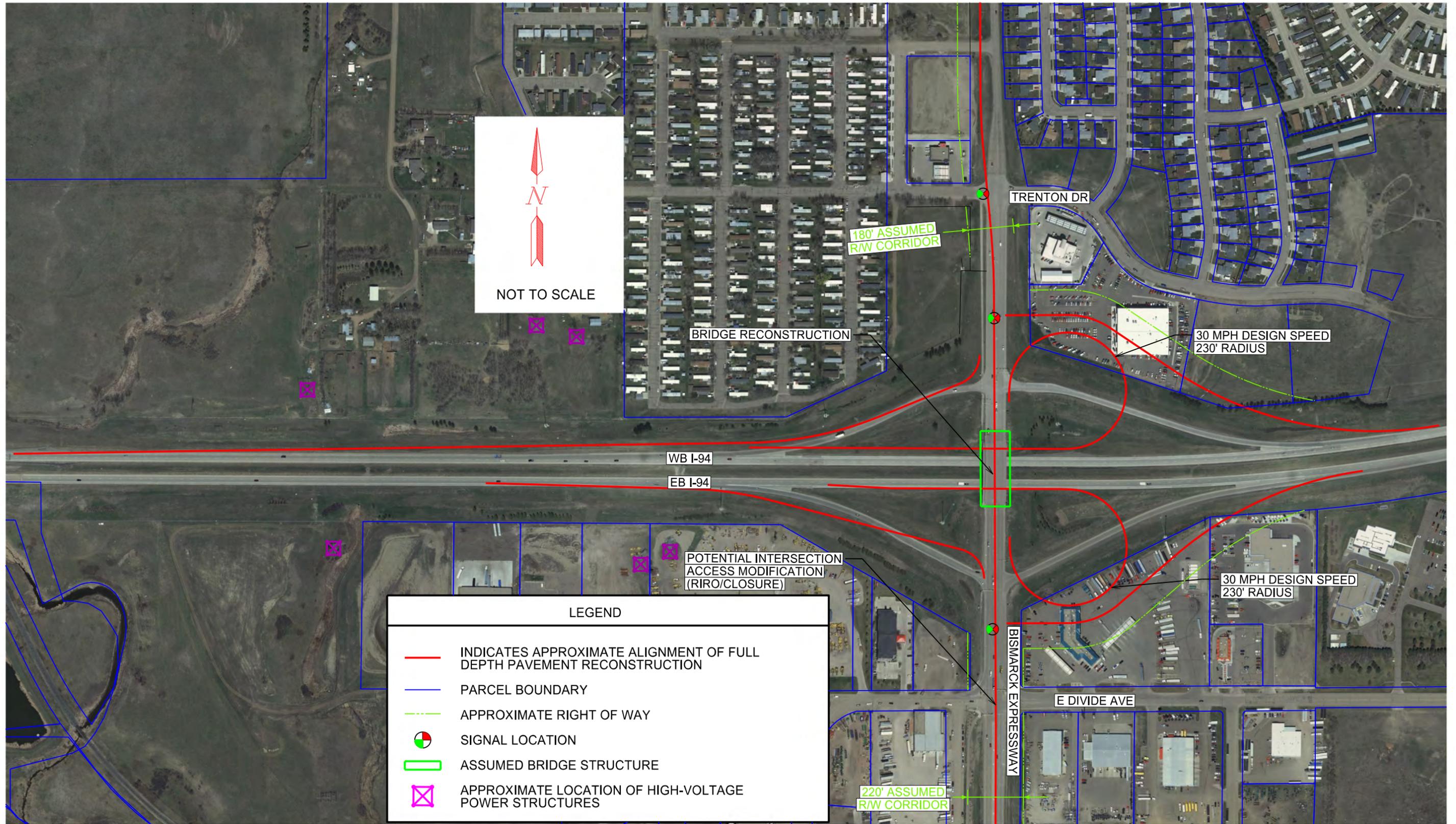
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	PARCEL BOUNDARY
	APPROXIMATE RIGHT OF WAY
	SIGNAL LOCATION
	ASSUMED BRIDGE STRUCTURE
	APPROXIMATE LOCATION OF HIGH-VOLTAGE POWER STRUCTURES

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**Concept M 1 - Partial Cloverleaf - Centennial/Bismarck Expressway**  
 Bismarck Mandan I-94 Corridor Study

Job #  
 \$DATES

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LEGEND	
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	PARCEL BOUNDARY
	APPROXIMATE RIGHT OF WAY
	SIGNAL LOCATION
	ASSUMED BRIDGE STRUCTURE
	APPROXIMATE LOCATION OF HIGH-VOLTAGE POWER STRUCTURES

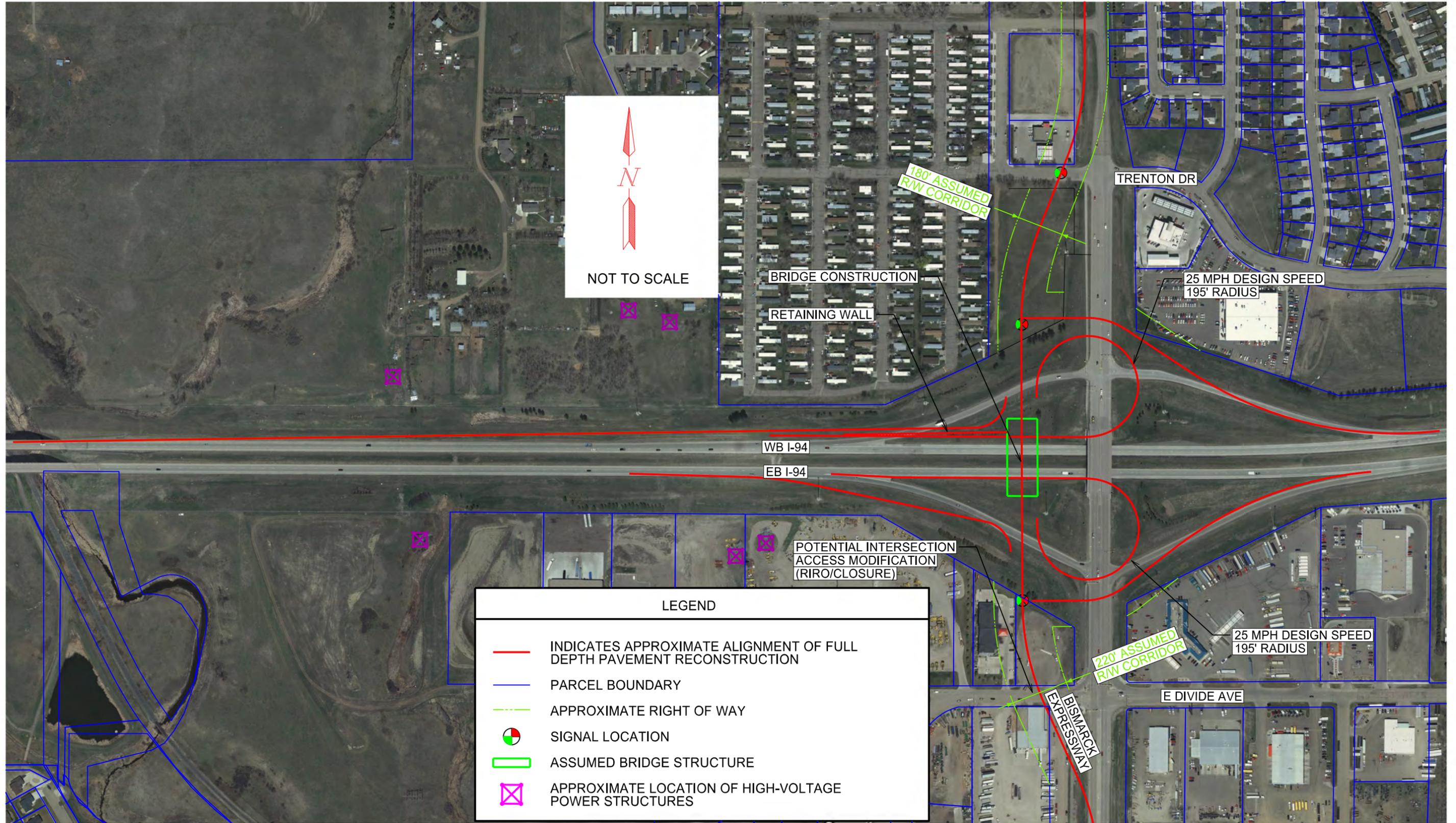


**Concept M 1 CD - Partial Cloverleaf - Centennial/Bismarck Expressway**

Bismarck Mandan I-94 Corridor Study

Job #  
SDATES

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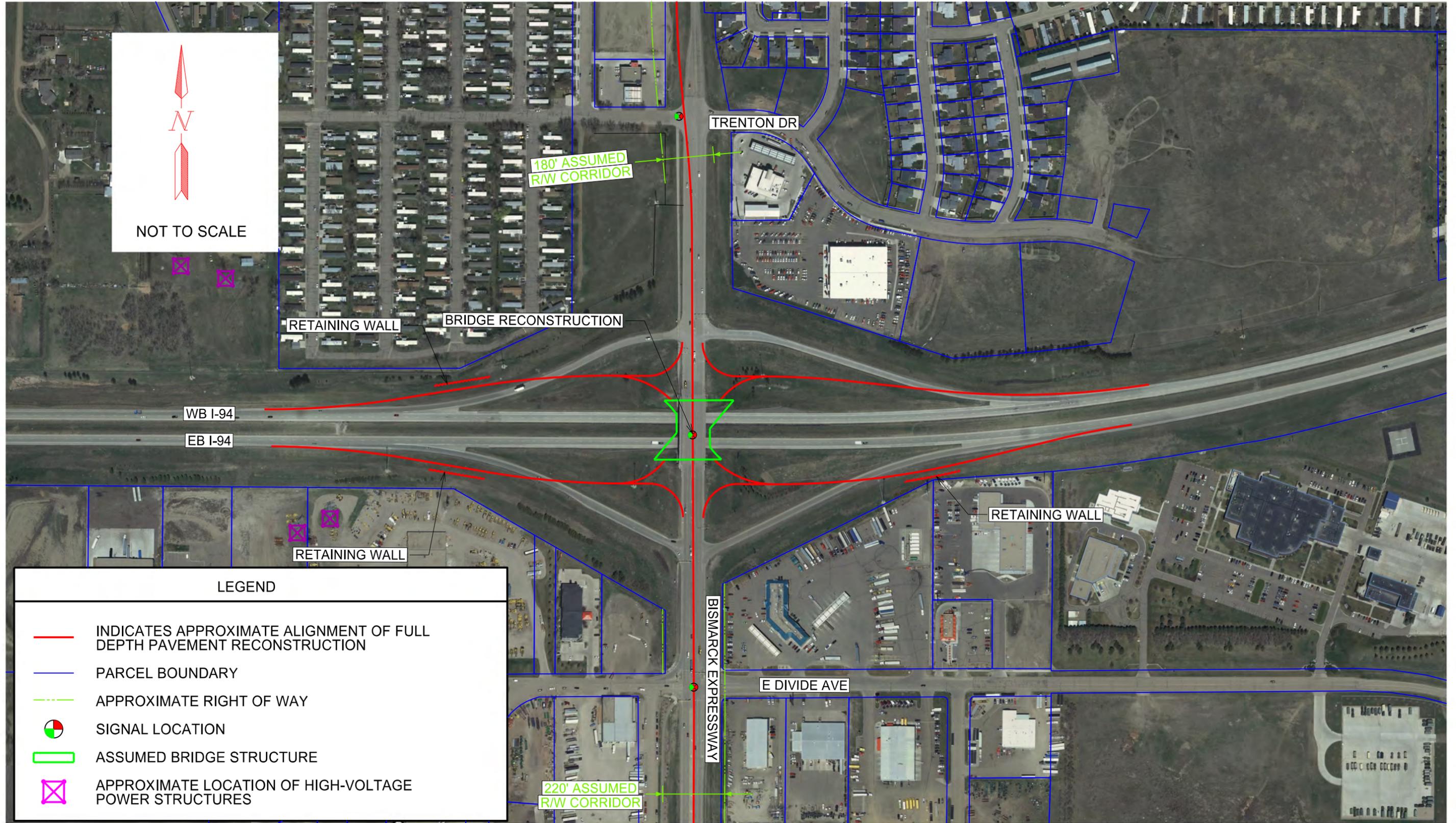
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	PARCEL BOUNDARY
	APPROXIMATE RIGHT OF WAY
	SIGNAL LOCATION
	ASSUMED BRIDGE STRUCTURE
	APPROXIMATE LOCATION OF HIGH-VOLTAGE POWER STRUCTURES



**Concept M 3 CD with Bismarck Expressway Alignment Shift - Partial Cloverleaf - Centennial/Bismarck Expressway**

Bismarck Mandan I-94 Corridor Study

Job #  
SDATES

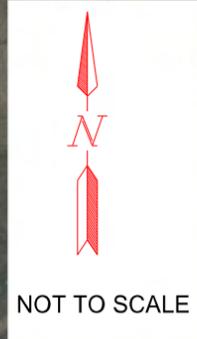


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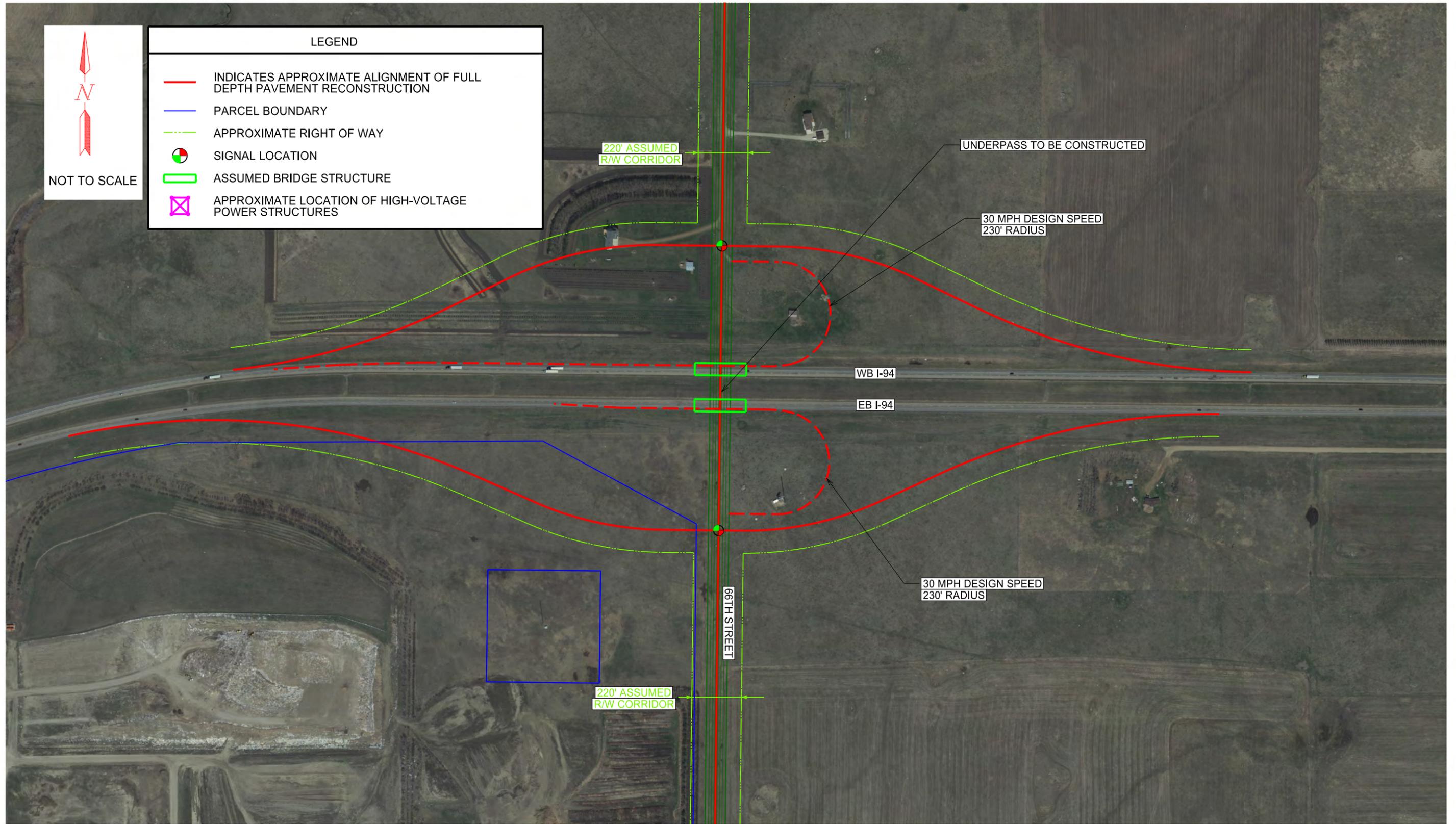


**Concept N - Singlepoint - Centennial/Bismarck Expressway**  
 Bismarck Mandan I-94 Corridor Study

Job #  
SDATES



LEGEND	
	INDICATES APPROXIMATE ALIGNMENT OF FULL DEPTH PAVEMENT RECONSTRUCTION
	PARCEL BOUNDARY
	APPROXIMATE RIGHT OF WAY
	SIGNAL LOCATION
	ASSUMED BRIDGE STRUCTURE
	APPROXIMATE LOCATION OF HIGH-VOLTAGE POWER STRUCTURES

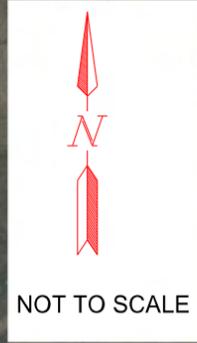


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**Concept O - Partial Cloverleaf/Diamond Interchange - 66th Street**  
Bismarck Mandan I-94 Corridor Study

Job #  
\$DATES



LEGEND	
	INDICATES APPROXIMATE ALIGNMENT OF FULL DEPTH PAVEMENT RECONSTRUCTION
	PARCEL BOUNDARY
	APPROXIMATE RIGHT OF WAY
	SIGNAL LOCATION
	ASSUMED BRIDGE STRUCTURE
	APPROXIMATE LOCATION OF HIGH-VOLTAGE POWER STRUCTURES

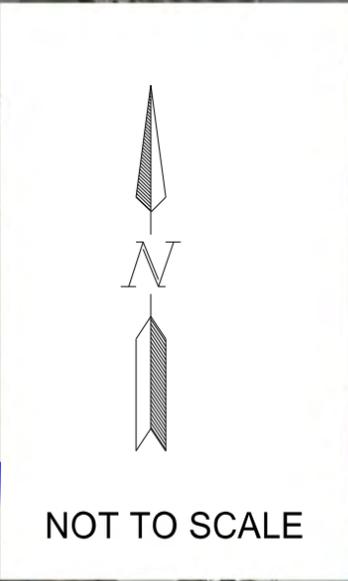
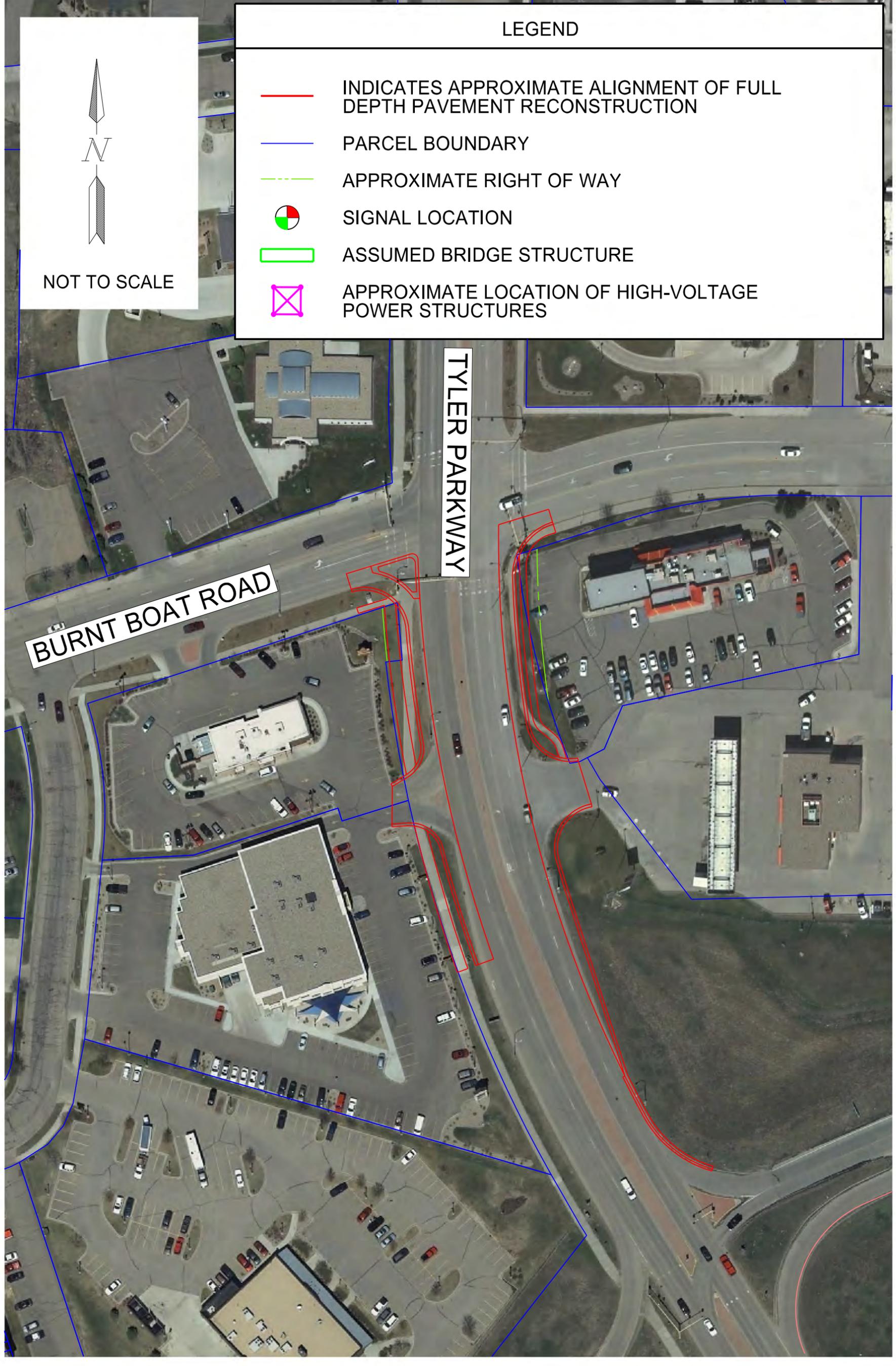


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**Concept P - Singlepoint - 66th Street**  
Bismarck Mandan I-94 Corridor Study

Job #  
\$DATES



LEGEND	
	INDICATES APPROXIMATE ALIGNMENT OF FULL DEPTH PAVEMENT RECONSTRUCTION
	PARCEL BOUNDARY
	APPROXIMATE RIGHT OF WAY
	SIGNAL LOCATION
	ASSUMED BRIDGE STRUCTURE
	APPROXIMATE LOCATION OF HIGH-VOLTAGE POWER STRUCTURES

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FINAL

# Appendix E – Stage 2 Formal Evaluation

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## DETAILED MATRICES



### Bismarck-Mandan I-94 Corridor Study – Concept Evaluation Matrix

FHWA P/N Guidelines	Specific Corridor Need	Criteria	Reconfigure I-94 / I-194 Interchange and Mainline Alignment				Notes
			No Build	Concept D	Concept F	Concept G	
System Deficiencies	Traffic Operations	Reduce queues and congestion along the I-94 corridor	1	4	5	3	Concept's D and F improve the driver expectancy issue associated with the left-hand exits and entrances. All concepts improve the northbound I-194 queuing issue.
			Do-nothing; queues and congestion will occur  AM – None PM – LOS E operations for NB I-194 to WB I-94	Incorporates the NB I-194 to WB I-94 access into a Collector-Distributor roadway with Main St. exit  AM – None PM – None	Separates the NB I-194 to WB I-94 access and the Main St. exit  AM – None PM – None	Minimal improvement needed for the congestion issue. Maintains the left-hand exits and entrances.  AM – None PM – None	
	Right-of-Way	Minimize ROW acquisition	5	5	5	4	Two of the three concepts would definitely not require additional ROW. Concept G may have potential impacts on private park land and floodplains.
			Do-nothing	Additional ROW would not be necessary to accommodate this concept – all is within NDDOT control		Additional ROW should not be needed for this concept – although more detailed analysis is necessary.	
	Geometric Design Standards	Improve geometric designs near interchanges with recommended improvements that adhere to FWHA/AASHTO Green Book	1	3	3	3	The concepts work toward improve geometric design in this area
			Do-nothing; does not improve left-hand exits/entrances	Improves capacity and exit/entrance ramp points		Only improves the capacity deficiency; does not improve other geometric design issues related to exit/entrance ramps	

### Bismarck-Mandan I-94 Corridor Study – Concept Evaluation Matrix

FHWA P/N Guidelines	Specific Corridor Need	Criteria	Reconfigure I-94 / I-194 Interchange and Mainline Alignment				Notes
			No Build	Concept D	Concept F	Concept G	
Safety	Access	Improve compliance with access spacing guidelines, where possible	N/A				Concepts provide alternatives that balance safety and congestion improvements
			N/A				
	Crashes	Implement improvements that reduce unsafe roadway geometrics for all roadway users	1	5	5	2	
			Do-nothing; does nothing to improve the poor crash rates that exist	Improves unsafe roadway geometrics for vehicles and should alleviate many of the crash issues		Generally does nothing to improve unsafe roadway geometrics	
Capacity/ Mobility	Mobility	Maintain and improve upon east-west mobility across the Grant Marsh Bridge (i.e., through the I-194/I-94 interchange area)	1	5	5	2	
			Do-nothing	Improves westbound mobility across the Grant Marsh bridge with improved access to I-194		Does not improve westbound mobility across the bridge but does improve I-194 access to I-94	
System Linkage	Connectivity	Maintain good north-south and east-west connections	1	5	5	2	
			Do-nothing	Improves driver expectancy by removing the left-hand exits and entrances		Does not improve driver expectancy; but does improve the I-194 connection to I-94 westbound	
Modal Relationships	Pedestrian, Bicycle, Truck, and Transit	Incorporate bicycle facilities with identified improvements, if possible	N/A				
			N/A				

## Bismarck-Mandan I-94 Corridor Study – Concept Evaluation Matrix

FHWA P/N Guidelines	Specific Corridor Need	Criteria	Reconfigure I-94 / I-194 Interchange and Mainline Alignment				Notes
			No Build	Concept D	Concept F	Concept G	
Social or Economic Goals	Local Plan Consistency	Compatibility with Bismarck-Mandan Long Range Transportation Plan (fiscally constrained – Seek to minimize public cost (2014 cost))	3	1	1	2	2040 travel demand model outputs were used to perform I-94 corridor study analyses
			Do-nothing	These alternatives were not specifically identified in the 2010 -2035 L RTP \$34.5M	These alternatives were not specifically identified in the 2010 -2035 L RTP \$31.5M	These alternatives were not specifically identified in the 2010 -2035 L RTP \$13M	
	Agency/Public Input	Address major concerns from agencies and the public	1	5	5	2	
			Do-nothing; does not address geometric design issues related to exit/entrance ramps, nor future congestion	Addresses the geometric design issues related to exit/entrance ramps and future congestion		Does not address geometric design issues related to exit/entrance ramps	
Other Environmental Factors	Ecological/Community Resources	Minimize impacts to known/previously identified ecological and community resources (i.e., known land and water conservation fund sites, ecological communities of concern, animal species of concern, and regional trail program project areas)	3	3	3	2	Would potentially impact North Dakota Park and Recreation Area/500-year Floodplain located between I-94 and Missouri River
			Do-nothing	Does not extend outside of the existing ROW area			

<b>Bismarck-Mandan I-94 Corridor Study –Ranking Summary</b>								
<b>Alternative Ranking</b>	Reconfigure I-94 / I-194 Interchange and Mainline Alignment							
	No Build		Concept D		Concept F		Concept G	
	Count	Point Total	Count	Point Total	Count	Point Total	Count	Point Total
5	1	5	5	25	6	30	0	0
4	0	0	1	4	0	0	1	4
3	2	6	2	6	2	6	2	6
2	0	0	0	0	0	0	6	12
1	6	6	1	1	1	1	0	0
<b>Total Points:</b>	<b>17</b>		<b>36</b>		<b>37</b>		<b>22</b>	

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## Bismarck-Mandan I-94 Corridor Study – Concept Evaluation Matrix

FHWA P/N Guidelines	Specific Corridor Need	Criteria	Tyler Parkway / Divide Avenue at Burnt Boat Road Intersection Improvements		Notes
			No Build	Intersection Imps	
System Deficiencies	Traffic Operations	Minimize the number of key intersections expected to perform at or below LOS D in the a.m. and p.m. peak hours by year 2040  Reduce the number of intersections with queues greater than 400 feet	1	5	The intersection improvements will not only improve operations and queues at the intersection but also operations and queues at the adjacent ramp terminals.
			Do-nothing; queues and congestion will occur  AM – 2 intersections ≤ LOS E, 3 queues over 400 feet PM – 3 intersections ≤ LOS E, 8 queues over 400 feet	Provides additional capacity at the intersection to move volume through the intersection, reducing queues at other locations along the N-S corridor  AM – None PM – 2 queues over 400 feet	
	Right-of-Way	Minimize ROW acquisition	5	2	The adjacent properties could be accommodated with the recommended improvements. However, RIRO access may need to be closed to each affected property.
			Do-nothing	Would need a fairly significant amount of ROW from adjacent private property owners	
	Geometric Design Standards	Improve geometric designs near interchanges with recommended improvements that adhere to FWHA/AASHTO Green Book	N/A		
			N/A		
Safety	Access	Improve compliance with access spacing guidelines, where possible	2	4	NDDOT uses the TRB access management manual guidance; access adjacent to ramp terminals should not be located closer than 750 feet (RIRO).
			Do-nothing; RIRO access is within ~ 450 feet	The recommended right-turn lanes could be combined with access closures on Tyler Pkwy	

**Bismarck-Mandan I-94 Corridor Study – Concept Evaluation Matrix**

FHWA P/N Guidelines	Specific Corridor Need	Criteria	Tyler Parkway / Divide Avenue at Burnt Boat Road Intersection Improvements		Notes
			No Build	Intersection Imps	
			Crashes	Implement improvements that reduce unsafe roadway geometrics for vehicles	
Capacity/ Mobility	Mobility	Maintain good north-south mobility with improvements along these corridors	1	5	This intersection is a “choke” point for north-south travel along Tyler Pkwy
			Do-nothing; mobility is significantly reduced limiting connectivity	Significantly Improves north-south mobility	
System Linkage	Connectivity	Maintain good north-south and east-west connections	1	5	Improving this intersection will ultimately improve the corridors connectivity with points further north.
			Do-nothing; connectivity is limited significantly	Opens up the corridor and thus improves connectivity through this area	
Modal Relationships	Pedestrian, Bicycle, Truck, and Transit	Incorporate bicycle facilities with identified improvements, if possible	3	3	The intersection improvements do not include additional pedestrian facilities beyond what is in place today
			Do-nothing		
Social or Economic Goals	Local Plan Consistency	Compatibility with Bismarck-Mandan Long Range Transportation Plan (fiscally constrained – Seek to minimize public cost (2014 cost))	3	4	Needs assessment at this location aligns with the LRTP. Pavements along Tyler Pkwy are listed as unsatisfactory in the southbound direction between Burnt Boat Road and Schafer Street.
			Do-nothing	These improvements were not specifically identified in the 2010 -2035 LRTP  \$0.4M	

**Bismarck-Mandan I-94 Corridor Study – Concept Evaluation Matrix**

FHWA P/N Guidelines	Specific Corridor Need	Criteria	Tyler Parkway / Divide Avenue at Burnt Boat Road Intersection Improvements		Notes
			No Build	Intersection Imps	
		Agency/Public Input	Address major concerns from agencies and the public	1	5
		Do-nothing; does not address the projected operational issues		Addresses the future congestion and outlines an improvement that can be implemented over time	
Other Environmental Factors	Ecological/Community Resources	Limit disproportionate impacts to Environmental Justice communities (low-income, minority, Limited English Proficiency populations) along the corridor	N/A		
			N/A		

<b>Bismarck-Mandan I-94 Corridor Study - Ranking Summary</b>				
<b>Alternative Ranking</b>	Tyler Parkway / Divide Avenue at Burnt Boat Road Intersection Improvements			
	No Build		Intersection Imps	
	Count	Point Total	Count	Point Total
5	1	5	3	15
4	0	0	4	16
3	2	6	1	3
2	2	4	1	2
1	4	4	0	0
<b>Total Points:</b>	<b>19</b>		<b>36</b>	

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## Bismarck-Mandan I-94 Corridor Study – Concept Evaluation Matrix

FHWA P/N Guidelines	Specific Corridor Need	Criteria	Reconfigure State Street/I-94 Interchange		Notes
			No Build	Concept K - SPUI	
System Deficiencies	Traffic Operations	Minimize the number of key intersections expected to perform at or below LOS D in the a.m. and p.m. peak hours by year 2040  Reduce the number of intersections with queues greater than 400 feet	1	4	This interchange design will accommodate all vehicular types and movements acceptably.
			Do-nothing; queues and congestion will occur  AM – 1 queue over 400 feet PM – 3 intersections ≤ LOS E, 9 queues over 400 feet	Provides additional capacity and intersection spacing through the interchange area, reducing queues at other locations along the N-S corridor  AM – 1 queue over 400 feet PM – 1 intersection at LOS D, 4 queues over 400 feet	
			5	4	
	Right-of-Way	Minimize ROW acquisition	Do-nothing	Would not require additional ROW	While additional ROW is not needed, retaining walls would potentially be needed to accomplish this in the four quadrants
	Geometric Design Standards	Improve geometric designs near interchanges with recommended improvements that adhere to FWHA/AASHTO Green Book	2	4	The concept improvement is only ranked with a 4 relative to the deficient taper ratio under existing conditions being a relatively low level deficiency.
			Do-nothing; the current entrance ramp taper is deficient	The improvement will be designed with the proper taper ratios that will mitigate the existing condition	
Safety	Access	Improve compliance with access spacing guidelines, where possible	2	4	NDDOT uses the TRB access management manual guidance; access adjacent to ramp terminals should not be located closer than 750 feet (RIRO), 990 feet (3/4 access), and 2,640 feet (full access).
			Do-nothing; RIRO access is within ~ 450 feet	The SPUI design would provide ~750 feet and 1,100 feet respective to the adjacent south and north intersections.	

**Bismarck-Mandan I-94 Corridor Study – Concept Evaluation Matrix**

FHWA P/N Guidelines	Specific Corridor Need	Criteria	Reconfigure State Street/I-94 Interchange		Notes
			No Build	Concept K - SPUI	
	Crashes	Implement improvements that reduce unsafe roadway geometrics for vehicles	2	4	The additional spacing between access points will also help to reduce conflict through the interchange area
			Do-nothing; does nothing to improve the poor crash rates that exist	Improving the operations through this area should have a positive impact on the interchange area safety with vehicles not taking as small gaps	
Capacity/ Mobility	Mobility	Maintain good north-south mobility with improvements along these corridors	1	5	The interchange area is a confluence point of volume transferring from the Interstate to this heavily traveled north-south roadway.
			Do-nothing; mobility is significantly reduced limiting connectivity	Significantly Improves north-south mobility	
System Linkage	Connectivity	Maintain good north-south and east-west connections	1	5	Improving the interchange area will ultimately improve the corridors connectivity with points further north/south.
			Do-nothing; connectivity of this corridor is significantly impacted	Improvements mitigate the connectivity issues	
Modal Relationships	Pedestrian, Bicycle, Truck, and Transit	Incorporate bicycle facilities with identified improvements, if possible	3	2	The SPUI design should be investigated to see if a separate pedestrian/bicycle crossing can be incorporated into the interchange area design to mitigate this issue (this may increase costs).
			Do-nothing	The SPUI design does not preclude pedestrian/bicycle movements research indicates that the crossing distance is typically longer and more difficult to understand through SPUI's	

**Bismarck-Mandan I-94 Corridor Study – Concept Evaluation Matrix**

FHWA P/N Guidelines	Specific Corridor Need	Criteria	Reconfigure State Street/I-94 Interchange		Notes
			No Build	Concept K - SPUI	
Social or Economic Goals	Local Plan Consistency	Compatibility with Bismarck-Mandan Long Range Transportation Plan (fiscally constrained – Seek to minimize public cost (2014 cost)) and the Preliminary State Street Scoping Study	1	4	The State St corridor is currently being studied with preliminary design of interim improvements north-south along the corridor to mitigate safety and operational issues.
			Do-nothing	The State St interchange area was identified as requiring improvement under future conditions in the LRTP and preliminary scoping documentation  \$18M	
	Agency/Public Input	Address major concerns from agencies and the public	1	5	Agency feedback has been that consideration of existing infrastructure is important; cannot focus only on future infrastructure addition
			Do-nothing; does not address the projected operational issues	Addresses the future congestion and outlines an improvement that can be implemented over time	
Other Environmental Factors	Ecological/Community Resources	Limit disproportionate impacts to Environmental Justice communities (low-income, minority, Limited English Proficiency populations) along the corridor	N/A		
			N/A		

<b>Bismarck-Mandan I-94 Corridor Study - Ranking Summary</b>				
<b>Alternative Ranking</b>	Reconfigure State Street/I-94 Interchange			
	No Build		Concept K - SPUI	
	Count	Point Total	Count	Point Total
5	1	5	3	15
4	0	0	6	24
3	1	3	0	0
2	3	6	1	2
1	5	5	0	0
<b>Total Points:</b>	<b>19</b>		<b>41</b>	

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**Bismarck-Mandan I-94 Corridor Study – Alternative Evaluation Matrix**

FHWA P/N Guidelines	Specific Corridor Need	Criteria	Reconfigure Centennial Road/Bismarck Expressway/ I-94 Interchange				Notes
			No Build	Concept M/M <sup>2</sup>	Concept M-Shift	Concept N	
System Deficiencies	Traffic Operations	<p>Minimize the number of key intersections expected to perform at or below LOS D in the a.m. and p.m. peak hours by year 2040</p> <p>Reduce the number of intersections with queues greater than 400 feet</p>	1	4	4	5	<p>All concepts accommodate the trucks that are anticipated at this busy interchange. Consideration is needed for the northbound truck movements with the SPUI.</p>
			<p>Do-nothing; queues and congestion will occur</p> <p>AM – 4 intersections ≤ LOS E, 14 queues over 400 feet</p> <p>PM – 6 intersections ≤ LOS E, 16 queues over 400 feet</p>	<p>NE/SE Loop Ramps - Operationally accommodates heavy turning movements well and achieves acceptable LOS</p> <p>AM – 1 intersection LOS D, 1 queue over 400 feet</p> <p>PM – 3 intersections LOS D or worse, 9 queues over 400 feet</p>	<p>NE/SE Loop Ramps - Operationally accommodates heavy turning movements well and achieves acceptable LOS</p> <p>AM – 1 intersection LOS D, 1 queue over 400 feet</p> <p>PM – 3 intersections LOS D, 9 queues over 400 feet</p>	<p>SPUI – Achieves an acceptable LOS with significantly reduced queues vs. No Build; however, longer queues on Expressway than Concept M/M’</p> <p>AM – 1 intersection LOS D, 3 queues over 400 feet</p> <p>PM – 3 intersections LOS D, 7 queues over 400 feet</p>	
	Right-of-Way	Minimize ROW acquisition	5	1	1	5	<p>The SPUI may require retaining walls in three of the four quadrants to maintain ROW boundary.</p>
			Do-nothing	<p>ROW impacts are significant in the NE and SE quadrants – full parcel takes with standard loop radii. Reduced loop radii can be applied to minimize impacts but not eliminate them.</p>	<p>ROW impacts are significant in the NW and SW quadrants – full parcel takes of the Cenex Station, some portion of the Trailer Park, Ramada Hotel, and Johnson Trailer.</p>	<p>Substantially smaller footprint can be accommodated within current ROW.</p>	

**Bismarck-Mandan I-94 Corridor Study – Alternative Evaluation Matrix**

FHWA P/N Guidelines	Specific Corridor Need	Criteria	Reconfigure Centennial Road/Bismarck Expressway/ I-94 Interchange				Notes
			No Build	Concept M/M <sup>2</sup>	Concept M-Shift	Concept N	
			Geometric Design Standards	Improve geometric designs near interchanges with recommended improvements that adhere to FWHA/AASHTO Green Book	N/A		
		N/A					
Safety	Access	Improve compliance with access spacing guidelines, where possible	2	1	1	5	NDDOT uses the TRB access management manual guidance; access adjacent to ramp terminals should not be located closer than 750 feet (RIRO), 990 feet (3/4 access), and 2,640 feet (full access).
	Crashes	Implement improvements that reduce unsafe roadway geometrics for vehicles	2	4	4	4	
			Do-nothing; does nothing to improve the poor crash rates that exist	Improving the operations through this area should have a positive impact on the interchange area safety with vehicles not taking as small gaps and queues not being as severe			The loop configurations vs. the SPUI each have advantages and disadvantages that are balanced between the two.

**Bismarck-Mandan I-94 Corridor Study – Alternative Evaluation Matrix**

FHWA P/N Guidelines	Specific Corridor Need	Criteria	Reconfigure Centennial Road/Bismarck Expressway/ I-94 Interchange				Notes
			No Build	Concept M/M <sup>2</sup>	Concept M-Shift	Concept N	
Capacity/ Mobility	Mobility	Maintain good north-south mobility with improvements along these corridors	1	5	5	5	The interchange area is a confluence point of volume transferring from the Interstate to this heavily traveled north-south roadway.
			Do-nothing; mobility is significantly reduced limiting connectivity	Significantly Improves north-south mobility			
System Linkage	Connectivity	Maintain good north-south and east-west connections	1	5	5	5	Improving the interchange area will ultimately improve the corridors connectivity with points further north/south.
			Do-nothing; connectivity of this corridor is significantly impacted	Improvements mitigate the connectivity issues			
Modal Relationships	Pedestrian, Bicycle, Truck, and Transit	Incorporate bicycle facilities with identified improvements, if possible	3	4	4	2	There is an existing bicycle/pedestrian path on the west side of Centennial Road/Bismarck Expressway that should be maintained with any new interchange concept.
			Do-nothing	The NE/SE loop ramp configurations should include a bicycle/pedestrian crossing as an integrated part of the bridge		SPUI design does not preclude pedestrian/bicycle movements; research indicates that the crossing distance is typically longer and more difficult to understand through SPUI's	

**Bismarck-Mandan I-94 Corridor Study – Alternative Evaluation Matrix**

FHWA P/N Guidelines	Specific Corridor Need	Criteria	Reconfigure Centennial Road/Bismarck Expressway/ I-94 Interchange				Notes
			No Build	Concept M/M <sup>2</sup>	Concept M-Shift	Concept N	
<b>Social or Economic Goals</b>	<b>Local Plan Consistency</b>	Compatibility with Bismarck-Mandan Long Range Transportation Plan (fiscally constrained – Seek to minimize public cost (2014 cost))	1	4	4	4	Long Range Transportation Plan forecast model outputs were used to perform corridor study analyses
			Do-nothing	The Centennial Road interchange area was identified as requiring improvement under future conditions in the LRTP  \$18M/\$17M	The Centennial Road interchange area was identified as requiring improvement under future conditions in the LRTP  \$20.5M	The Centennial Road interchange area was identified as requiring improvement under future conditions in the LRTP  \$17M	
	<b>Agency/Public Input</b>	Address major concerns from agencies and the public	1	4	4	4	Agency feedback has been that consideration of existing infrastructure is important; cannot focus only on future infrastructure addition
			Do-nothing; does not address the existing geometric issues	Addresses the existing geometric issues and future congestion		May not fully address the City’s view that SPUI’s do not accommodate trucks in this area	
<b>Other Environmental Factors</b>	<b>Ecological/Community Resources</b>	Limit disproportionate impacts to Environmental Justice communities (low-income, minority, Limited English Proficiency populations) along the corridor	3	3	2	5	
			Do-nothing	Extends outside of the existing ROW, however, does not appear to impact low-income or minority populations	Extends outside of the existing ROW and will impact low-income populations	Does not extend outside of the existing ROW area	

<b>Bismarck-Mandan I-94 Corridor Study -Point Summary</b>								
<b>Alternative Ranking</b>	Reconfigure Centennial Road/Bismarck Expressway / I-94 Interchange							
	No Build		Concept M/M <sup>2</sup>		Concept M-Shift		Concept N	
	Count	Point Total	Count	Point Total	Count	Point Total	Count	Point Total
5	1	5	2	10	2	10	6	30
4	0	0	5	20	5	20	3	12
3	2	6	1	3	0	0	0	0
2	2	4	0	0	1	2	1	2
1	5	5	2	2	2	2	0	0
<b>Total Points:</b>	<b>20</b>		<b>35</b>		<b>34</b>		<b>44</b>	

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FINAL

# Appendix D – Technical Memorandum #4: Implementation Plan

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**FINAL REPORT**



# Bismarck-Mandan MPO I-94 Corridor Study



## Technical Memorandum #4 Implementation Plan

*FINAL*

**Prepared by:**

**Bismarck-Mandan Metropolitan Planning Organization**

**In Association with:**



**and Project Partners:**

**City of Bismarck, City of Mandan, Burleigh County, Morton County, NDDOT, and FHWA**

May 2014

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Appendix A – Implementation Plan Project Cost Estimate Summary



# Implementation Plan

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As part of the I-94 Corridor Study, an Implementation Plan was developed. The purpose of the implementation plan is to provide a clear systematic blueprint that outlines the vision of the I-94 Corridor Study over time with a series of projects. This plan coordinates not only improvements that were identified based upon safety or operational need as part of this study, but also scheduled NDDOT (STIP 2014-2017) and MPO (TIP 2014-2017) infrastructure investments and projects identified in the MPO's long-range transportation plan. The implementation plan is an important component of the I-94 Corridor Study, as it looks to satisfy the following study goals and objectives:

- Identify potential projects within a half-mile area of the I-94 influence area that can have a positive impact on corridor operations
- Continually provide a safe and efficient transportation system that serves Bismarck, Mandan, Burleigh, and Morton Counties and NDDOT through the year 2040 planning horizon
- Limit impact to the traveling public
- Address traffic operations, safety, pavement and bridge preservation needs
- Develop an implementation schedule that identifies the phasing of projects that minimizes overall investment dollars through the year 2040 planning horizon

The implementation plan was developed with consideration of the following key components:

- When the operational improvement is needed based on traffic analysis and future forecasted traffic volumes (years 2025 and 2040)
- Minimizing impacts to the traveling public by avoiding multi-year impacts to the same roadway and providing additional capacity to parallel corridors
- Reducing overall investment dollars by combining infrastructure replacement/maintenance with improvement projects

As a result, projects were broken up into three phases:

- Phase 1 (2014-2017)
- Phase 2 (2018-2025)
- Phase 3 (2026-2040)

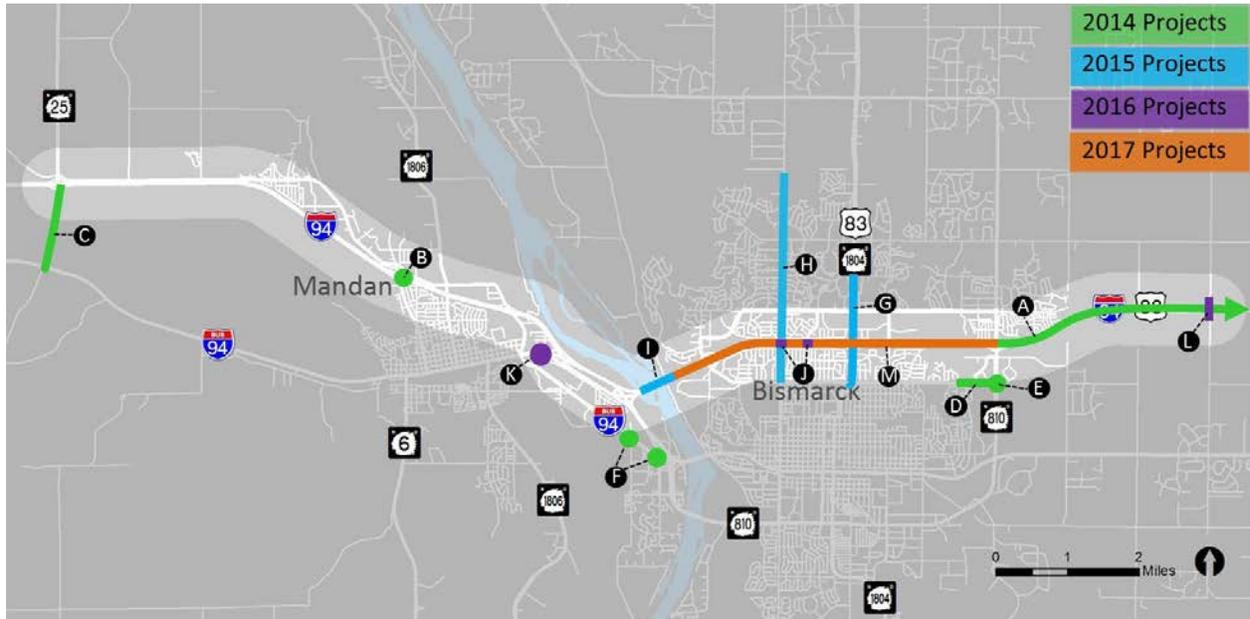
## 1. PROJECTS FOR IMPLEMENTATION

### Programmed Projects

The first step in developing the implementation plan was to understand and document current programmed improvements along and near the I-94 corridor. Planned and programmed improvements along and near the I-94 corridor are currently scheduled for the years 2014 through 2017. These projects were identified from NDDOT's STIP project list and the MPO's TIP project list. An overview of all improvements is provided in Figure 1.



**Figure 1: STIP and TIP Projects (2014 – 2017)**



The projects identified from NDDOT’s STIP project list and the MPO’s TIP project list include:

TIP and STIP Projects – Year 2014

- A. Eastbound and westbound I-94 mill and overlay from Bismarck Expressway/Centennial Road to north of Sterling
- B. Addition of a turn lane at the I-94/Sunset Drive interchange
- C. Business I-94 reconstruction from I-94 to Old Highway 10
- D. Divide Avenue reconstruction from Volk Drive to Bismarck Expressway
- E. Addition of a southbound right-turn lane at Divide Avenue and Bismarck Expressway
- F. Installation of traffic signals at the intersections of Memorial Highway/40th Avenue and Memorial Highway/46th Avenue (these two projects may occur in 2015)

TIP and STIP Projects – Year 2015

- G. Addition of turn lanes on State Street from Divide Avenue to Calgary Avenue
- H. Reconstruct Washington Street to a five-lane section from Calgary Avenue to 57th Avenue
- I. Repair and paint the I-94 Bridge over the Missouri River

TIP and STIP Projects – Year 2016

- J. Replace the eastbound and westbound I-94 bridge decks over Washington Street and 4th Street
- K. Traffic signal improvement at the intersection of Main Street and Twin City Drive
- L. Replace the 80th Street Bridge over I-94



The capacity (two-lane vs. four-lane) of the 80th Street Bridge is dependent on whether the I-94/66th Street interchange is constructed. With the interchange at 66th Street, volumes on the 80th Street Bridge are expected to be 9,500 vehicles per day (vpd) in year 2040. Without the interchange at 66th Street, volumes on the 80th Street Bridge are expected to be 17,500 vpd.

#### TIP and STIP Projects – Year 2017

- M. Eastbound and westbound I-94 concrete pavement repair and structural overlay from the Missouri River Bridge and Bismarck Expressway/Centennial Road

This pavement repair project should be constructed concurrently with the bridge re-decking projects that were identified in year 2016. Constructing the projects concurrently in 2016 or 2017 will reduce construction impacts to motorists.

The current NDDOT STIP and MPO TIP extend through the year 2017 and it is assumed that further construction of the improvements identified as a part of the I-94 Corridor Study will take place at that time. Therefore, the improvements listed above are assumed to be in place when remaining elements of the I-94 Corridor Study are implemented.

#### **I-94 Study Projects**

Based on the study process and evaluation, projects were identified to address issues related to system deficiencies, safety, capacity constraints, system connectivity and regional mobility. Projects were developed in order to satisfy the project's goal of providing a safe and efficient transportation system that serves Bismarck and Mandan through the year 2040 planning horizon. These projects were reviewed and developed in coordination with project stakeholders and shared with the public as a part of the study's public involvement process.

The following projects—presented in no particular order—were identified as viable options to carry forward:

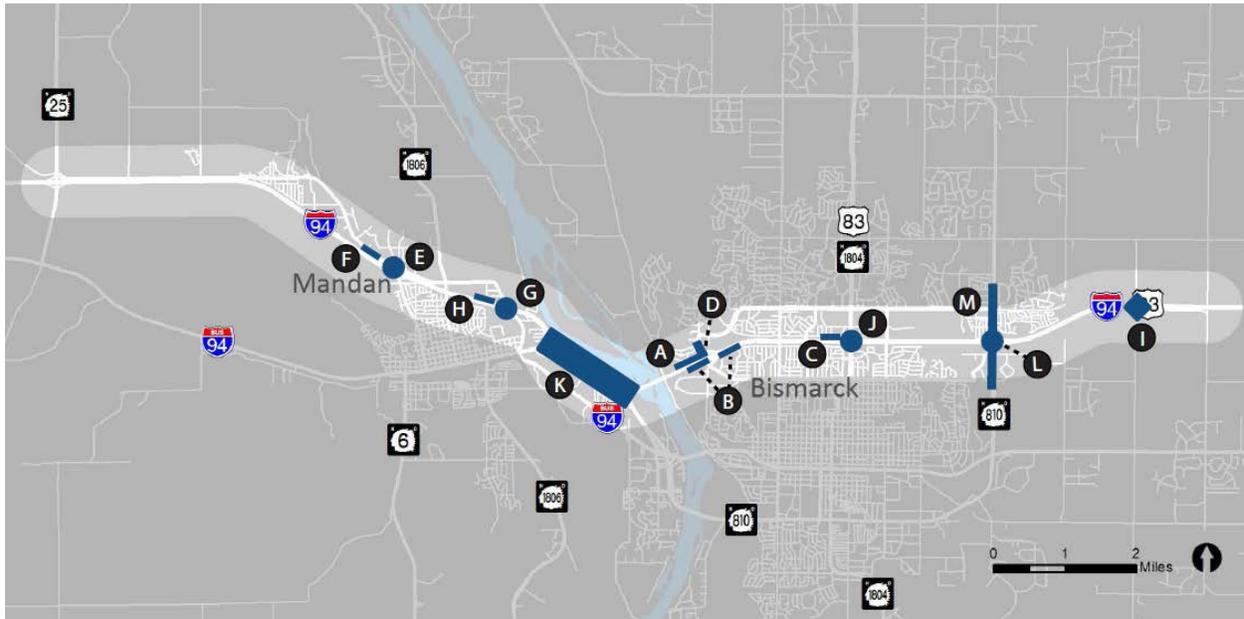
- A. Partial reconstruction of the westbound I-94 entrance ramp at Tyler Parkway and lengthen the loop acceleration lane
- B. Restripe the tapers for the eastbound I-94 entrance ramp and exit loop at Tyler Parkway
- C. Restripe the westbound I-94 entrance ramp taper at State Street
- D. Turn lane improvements at the intersection of Tyler Parkway and Burnt Boat Road
- E. Reconstruct the I-94 and Sunset Drive interchange
- F. Restripe the westbound I-94 entrance ramp taper at Sunset Drive
- G. Reconstruct the I-94 and Mandan Avenue interchange
- H. Restripe the westbound I-94 entrance ramp taper at Mandan Avenue
- I. Construct a new interchange at I-94 and 66th Street
- J. Reconstruct the interchange at I-94 and State Street
- K. Reconstruct I-94 between Main Street and I-194



- L. Reconstruct the I-94 and Bismarck Expressway/Centennial Road interchange
- M. Reconstruct Bismarck Expressway/Centennial Road from Divide Avenue to Jericho Road

The improvement locations for the I-94 study projects are illustrated in Figure 2.

**Figure 2: I-94 Study Projects**



### Potential LRTP Projects (2010-2035)

The last component of the project identification process for the implementation plan was to review and incorporate projects identified as a part of the MPO’s 2010 Long Range Transportation Plan. A subset of the LRTP’s projects were included as part of the implementation plan, due to their location and potential construction impacts to the previously identified projects. In addition to summarizing projects from the LRTP that are associated with the I-94 corridor, localized improvements were identified to reduce congestion and improve safety. This subset of improvements identified supporting local system improvements that are needed to accommodate the proposed interchange at I-94 and 66th Street.

The following LRTP projects—presented in no particular order—were included due to their location and potential construction impacts to the previously identified projects:

- A. Restripe Divide Avenue to a three-lane roadway from I-94 to 26th Street
- B. Improve and signalize the intersection of Collins Avenue/Old Red Trail
- C. Extend and improve East Divide Avenue from Bismarck Expressway to 66th Street
- D. Reconstruct and widen State Street from Calgary Avenue to 57th Avenue
- E. Extend Sunset Drive to future north bridge corridor and connect to Highway 1806
- F. Widen Washington Street to a three-lane section from 57th Avenue to 71st Avenue
- G. Extend Division Street to Mandan Avenue

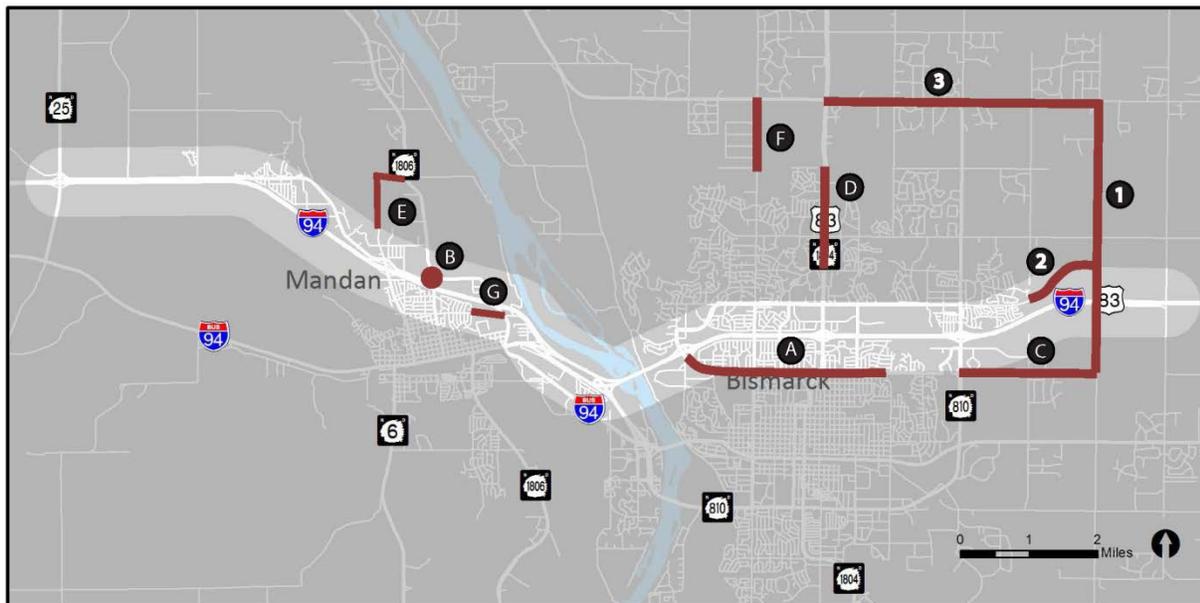


In order to accommodate the proposed interchange at I-94 and 66th Street, the following projects, at a minimum, should be constructed to develop the local roadway network:

1. Construct 66th Street from East Divide Avenue to 71st Street
2. Extend Century Avenue to 66th Street
3. Reconstruct and widen 71st Avenue from Highway 1804 to 66th Street

The improvement locations for the LRTP (2010-2035) and local supporting roadway improvement projects are illustrated in Figure 3.

**Figure 3: LRTP (2010-2035) and Local Projects**



In addition to the LRTP projects listed above, the overpass/underpass at I-94/32nd Avenue NW was identified in the North Mandan Subarea Study. This project may influence the sequencing of the following projects and should be considered as projects become funded and are scheduled for construction.

## 2. PROJECT SEQUENCING

Recognizing that projects will be implemented in phases as a part of the implementation plan, a series of smaller stages were nested within each phase to further refine the sequencing of projects through the year 2040 planning horizon. The result is a series of eleven stages (A-K) spread throughout the three phases. The three phases are:

- Phase 1 (2014-2017)
- Phase 2 (2018-2025)
- Phase 3 (2026-2040)



### **Phase 1 (2014-2017), Stage A**

Stage A, within Phase 1, consists of projects identified in the STIP/TIP. Due to the difficulty of accelerating new projects into the STIP/TIP, no new projects have been incorporated into 2014.

- Eastbound and westbound I-94 mill and overlay from Bismarck Expressway/Centennial Road to north of Sterling (2014 STIP/TIP)
- Addition of a turn lane at the I-94/Sunset Drive interchange (2014 STIP/TIP)
- Business I-94 reconstruction from I-94 to Old Highway 10 (2014 STIP/TIP)
- Divide Avenue reconstruction from Volk Drive to Bismarck Expressway (2014 STIP/TIP)
- Addition of a southbound right-turn lane at Divide Avenue and Bismarck Expressway (2014 STIP/TIP)
- Installation of traffic signals at the intersections of Memorial Highway/40th Avenue and Memorial Highway/46th Avenue (these two projects may occur in 2015) (2014 STIP/TIP)

### **Phase 1 (2014-2017), Stage B**

Stage B, within Phase 1, consists of three projects identified in the STIP/TIP along with one project from the LRTP. The LRTP project was included due to its ability to provide additional capacity along Divide Avenue, which may help accommodate the potential traffic diversion from future I-94 projects (e.g., Washington Street and 4th Street bridge re-decking projects and the I-94 overlay project from Missouri River to Bismarck Expressway).

- Addition of turn lanes on State Street from Divide Avenue to Calgary Avenue (2015 STIP/TIP)
- Reconstruct Washington Street to a five-lane section from Divide Avenue to 57th Avenue (2015 STIP/TIP)
- Repair and paint the I-94 Bridge over the Missouri River (2015 STIP/TIP)
- Restripe Divide Avenue to a three-lane roadway from I-94 to 26th Street (LRTP)

### **Phase 1 (2014-2017), Stage C**

Stage C, within Phase 1, consists of only projects identified in the STIP/TIP. Construction synergies or cost savings were not identified for other projects identified as a part of this study or from the LRTP.

- Replace the eastbound and westbound I-94 bridge decks over Washington Street and 4th Street (2016 STIP/TIP)
- Traffic signal improvement at the intersection of Main Street and Twin City Drive (2016 STIP/TIP)
- Replace the 80th Street Bridge over I-94 (2016 STIP/TIP)

The capacity (two-lane vs. four-lane) of the 80th Street Bridge is dependent on whether the I-94/66th Street interchange is constructed. With the interchange at 66th Street, volumes on the 80th Street Bridge are expected to be 9,500 vehicles per day (vpd) in year 2040. Without the interchange at 66th Street, volumes on the 80th Street Bridge are expected to be 17,500 vpd.



### **Phase 1 (2014-2017), Stage D**

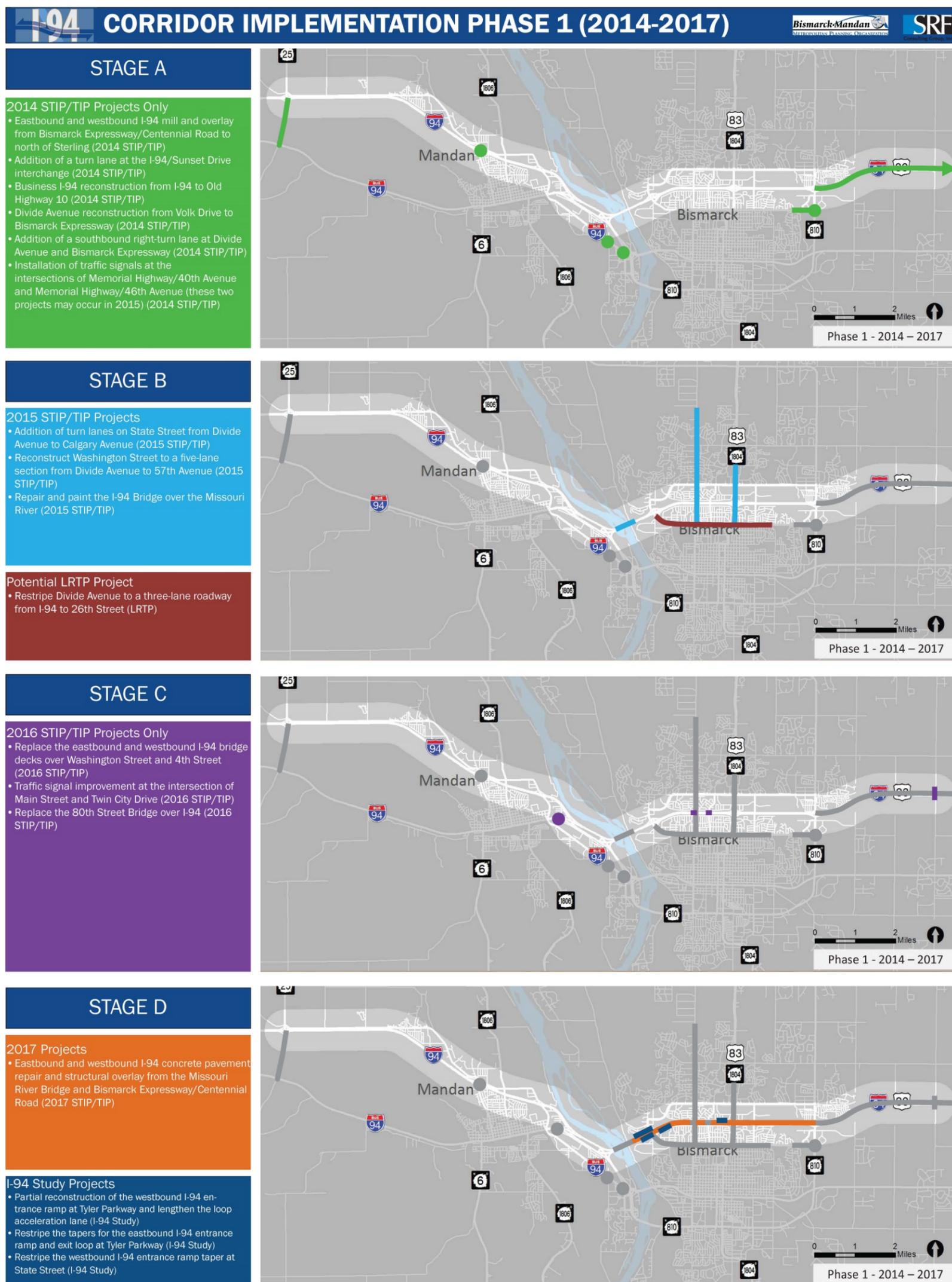
Stage D, within Phase 1, consists of one project identified in the STIP/TIP along with projects from the I-94 Study. The I-94 Study projects were identified to be constructed along with the pavement repair project to minimize construction impacts to motorists. In addition, the pavement repair project should be constructed concurrently with the bridge re-decking projects that were identified in year 2016. Constructing the projects concurrently in 2016 or 2017 will reduce construction impacts to motorists.

- Eastbound and westbound I-94 concrete pavement repair and structural overlay from the Missouri River Bridge and Bismarck Expressway/Centennial Road (2017 STIP/TIP)
- Partial reconstruction of the westbound I-94 entrance ramp at Tyler Parkway and lengthen the loop acceleration lane (I-94 Study)
- Restripe the tapers for the eastbound I-94 entrance ramp and exit loop at Tyler Parkway (I-94 Study)
- Restripe the westbound I-94 entrance ramp taper at State Street (I-94 Study)

Figure 4 graphically presents Phase 1, with Stages A-D.



Figure 4: Corridor Implementation Phase 1 (2014-2017)



### **Phase 2 (2018-2025), Stage E**

Stage E, within Phase 2, consists of one project identified from the I-94 Study and two projects from the LRTP. The LRTP project at Collins Avenue/Old Red Trail address existing operational and safety needs, while the project along Divide Avenue builds the local supporting roadway network. Both of the aforementioned projects provide immediate benefits, while providing the needed improvements to support future interchange projects.

- Turn lane improvements at the intersection of Tyler Parkway and Burnt Boat Road (I-94 Study)
- Improve and signalize the intersection of Collins Avenue/Old Red Trail (LRTP)
- Extend and improve East Divide Avenue from Bismarck Expressway to 66th Street (LRTP)

### **Phase 2 (2018-2025), Stage F**

Stage F, within Phase 2, consists of the two projects identified from the I-94 Study and three projects from the LRTP. Reconstructing I-94 and the Sunset Drive interchange addresses the “functionally obsolete” bridge and can be combined with the ramp improvements to reduce construction impacts to motorists. The LRTP projects build the local supporting roadway network to provide the needed improvements to support a future interchange at I-94 and 66th Street.

- Reconstruct the I-94 and Sunset Drive interchange (I-94 Study)
- Restripe the westbound I-94 entrance ramp taper at Sunset Drive (I-94 Study)
- Construct 66th Street from East Divide Avenue to 71st Street (LRTP)
- Extend Century Avenue to 66th Street (LRTP)
- Reconstruct and widen 71st Avenue from Highway 1804 to 66th Street (LRTP)

### **Phase 2 (2018-2025), Stage G**

Stage G, the last stage within Phase 2, consists of three projects identified from the I-94 Study. Reconstructing the Mandan Avenue interchange at I-94 addresses expected operational problems and bridge preservation needs and can be combined with the ramp improvements to reduce construction impacts to motorists. Note that the Mandan Avenue interchange improvement project could be split into two projects; 1-signals and ramp reconfiguration, 2-bridge replacement. An interchange at I-94 and 66th Street should be constructed before State Street (Phase 3, Stage H) and Bismarck Expressway (Phase 3, Stage J) reconstruction projects to accommodate potential traffic diversions.

- Reconstruct the I-94 and Mandan Avenue interchange (I-94 Study)
- Restripe the westbound I-94 entrance ramp taper at Mandan Avenue (I-94 Study)
- Construct a new interchange at I-94 and 66th Street (I-94 Study)

Figure 5 graphically presents Phase 2, with Stages E-G.



Figure 5: Corridor Implementation Phase 2 (2018-2025)

**194 CORRIDOR IMPLEMENTATION PHASE 2 (2018-2025)** Bismarck-Mandan METROPOLITAN PLANNING ORGANIZATION SRF Consulting Group, Inc.

**STAGE E**

**I-94 Study Projects**

- Turn lane improvements at the intersection of Tyler Parkway and Burnt Boat Road (I-94 Study)

**Potential LRTP Projects**

- Improve and signalize the intersection of Collins Avenue/Old Red Trail (LRTP)
- Extend and improve East Divide Avenue from Bismarck Expressway to 66th Street (LRTP)



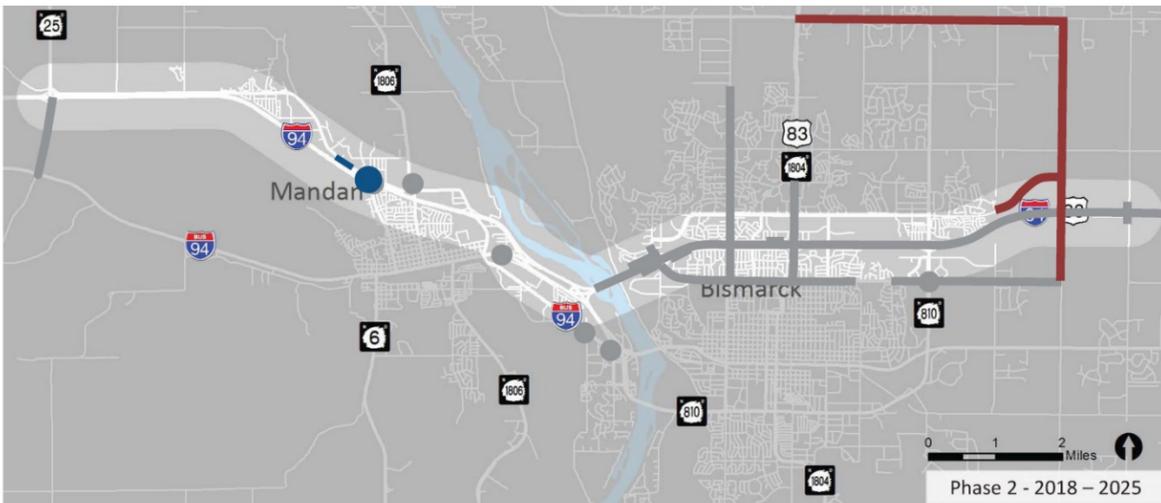
**STAGE F**

**I-94 Study Projects**

- Reconstruct the I-94 and Sunset Drive interchange (I-94 Study)
- Restripe the westbound I-94 entrance ramp taper at Sunset Drive (I-94 Study)

**Potential LRTP Projects**

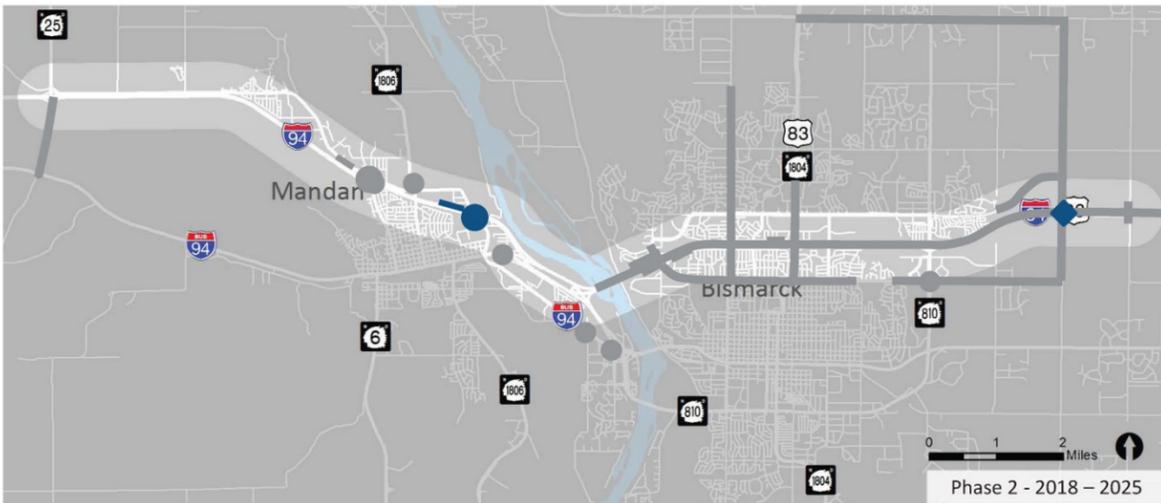
- Construct 66th Street from East Divide Avenue to 71st Street (LRTP)
- Extend Century Avenue to 66th Street (LRTP)
- Reconstruct and widen 71st Avenue from Highway 1804 to 66th Street (LRTP)



**STAGE G**

**I-94 Study Projects**

- Reconstruct the I-94 and Mandan Avenue interchange (I-94 Study)
- Restripe the westbound I-94 entrance ramp taper at Mandan Avenue (I-94 Study)
- Construct a new interchange at I-94 and 66th Street (I-94 Study)



### **Phase 3 (2026-2040), Stage H**

Stage H, the first stage within Phase 3, consists of one project identified from the I-94 Study and one project from the LRTP. Reconstructing the State Street interchange at I-94 addresses expected operational problems and bridge preservation needs and can be combined with the State Street corridor reconstruction to reduce construction impacts to motorists.

- Reconstruct the interchange at I-94 and State Street (I-94 Study)
- Reconstruct and widen State Street from Calgary Avenue to 57th Avenue (LRTP)

### **Phase 3 (2026-2040), Stage I**

Stage I, within Phase 3, consists of the one project identified from the I-94 Study. Reconstructing I-94 between Main Street and I-194 addresses the “functionally obsolete” bridge.

- Reconstruct I-94 between Main Street and I-194 (I-94 Study)

### **Phase 3 (2026-2040), Stage J**

Stage J, within Phase 3, consists of two projects identified from the I-94 Study. Reconstructing the Bismarck Expressway/Centennial Road interchange at I-94 addresses expected operational problems and bridge preservation needs and can be combined with the corridor reconstruction to reduce construction impacts to motorists.

- Reconstruct the I-94 and Bismarck Expressway/Centennial Road interchange (I-94 Study)
- Reconstruct Bismarck Expressway/Centennial Road from Divide Avenue to Jericho Road (I-94 Study)

### **Phase 3 (2026-2040), Stage K**

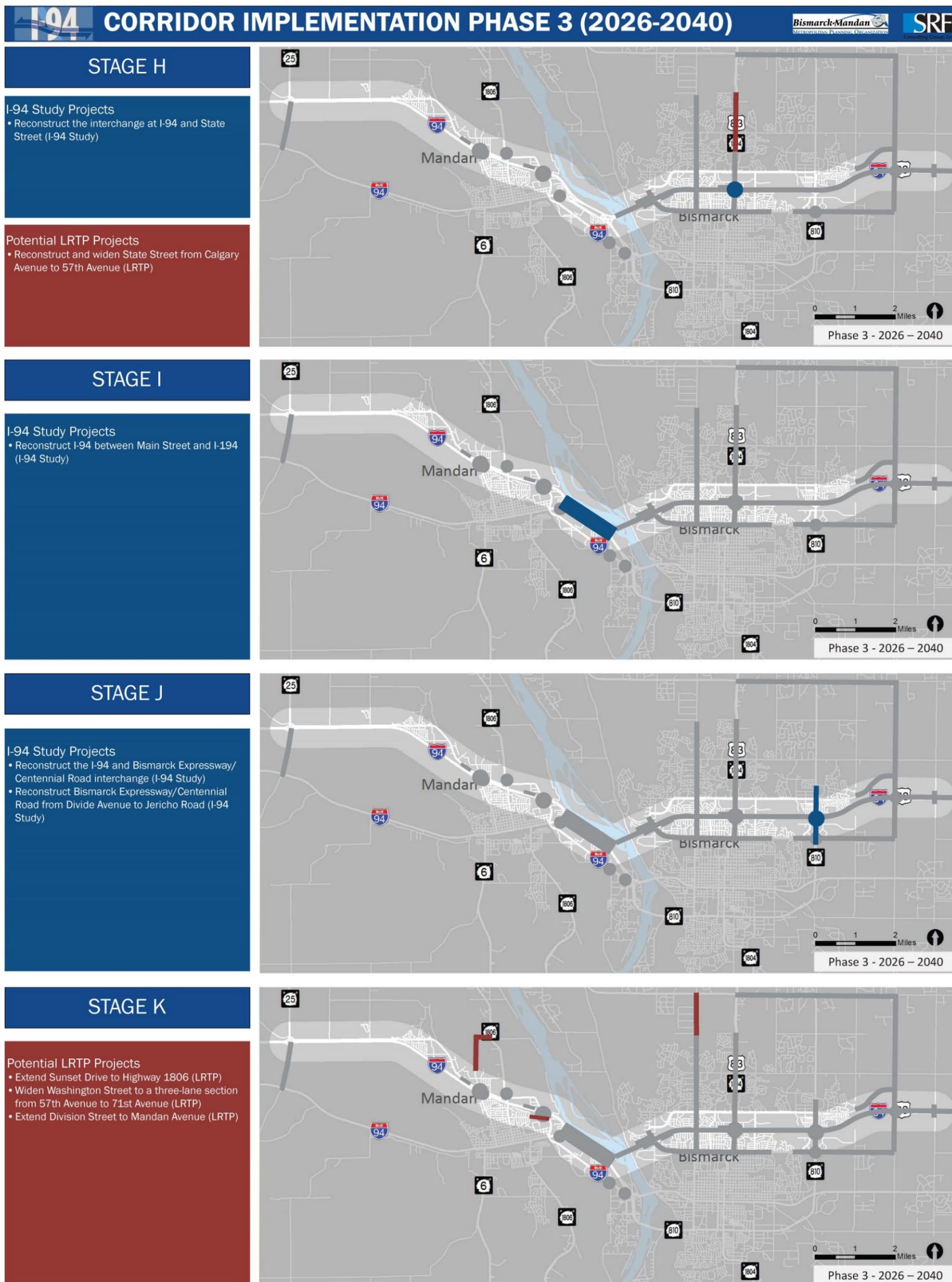
Stage K, within Phase 3, consists of three potential projects identified from the LRTP. The extensions of Sunset Drive and Division Street should only be considered after reconstruction projects have been completed on the Sunset Drive and Mandan Avenue interchanges along I-94 so that the interchanges are equipped to handle the additional traffic volume. Widening of Washington Street is expected to be driven by local development along the corridor.

- Extend Sunset Drive to Highway 1806 (LRTP)
- Widen Washington Street to a three-lane section from 57th Avenue to 71st Avenue (LRTP)
- Extend Division Street to Mandan Avenue (LRTP)

Figure 6 graphically presents Phase 3, with Stages H-K.



Figure 6: Corridor Implementation Phase 3 (2026-2040)



### **3. ADDITIONAL CONSIDERATIONS**

The project sequencing process identified how projects will be implemented in phases as part of the implementation plan using a series of smaller stages. However, some projects may take multiple years to construct, starting in one stage and ending in another.

Projects developed and sequenced as part of the implementation plan did not consider the fiscal constraints that may limit the implementation of the identified projects. Fiscal constraints may influence how quickly projects can be constructed and limit the time and scope of each project.

This plan accounts for projects in the vicinity of the I-94 corridor and does not include other preservation, operational or safety needs. The need for other projects within the Bismarck-Mandan area may influence available funds for the projects identified as part of the implementation plan.

### **4. PROJECT COSTS**

Project costs for the identified roadway improvements were developed in order to assess the investments needed to provide a safe and efficient transportation system that serves Bismarck, Mandan, Burleigh, and Morton Counties and NDDOT through the year 2040 planning horizon. Developing project costs for this study's implementation plan helps guide future corridor investments that meet the project's goals and are within the fiscal constraints of the MPO.

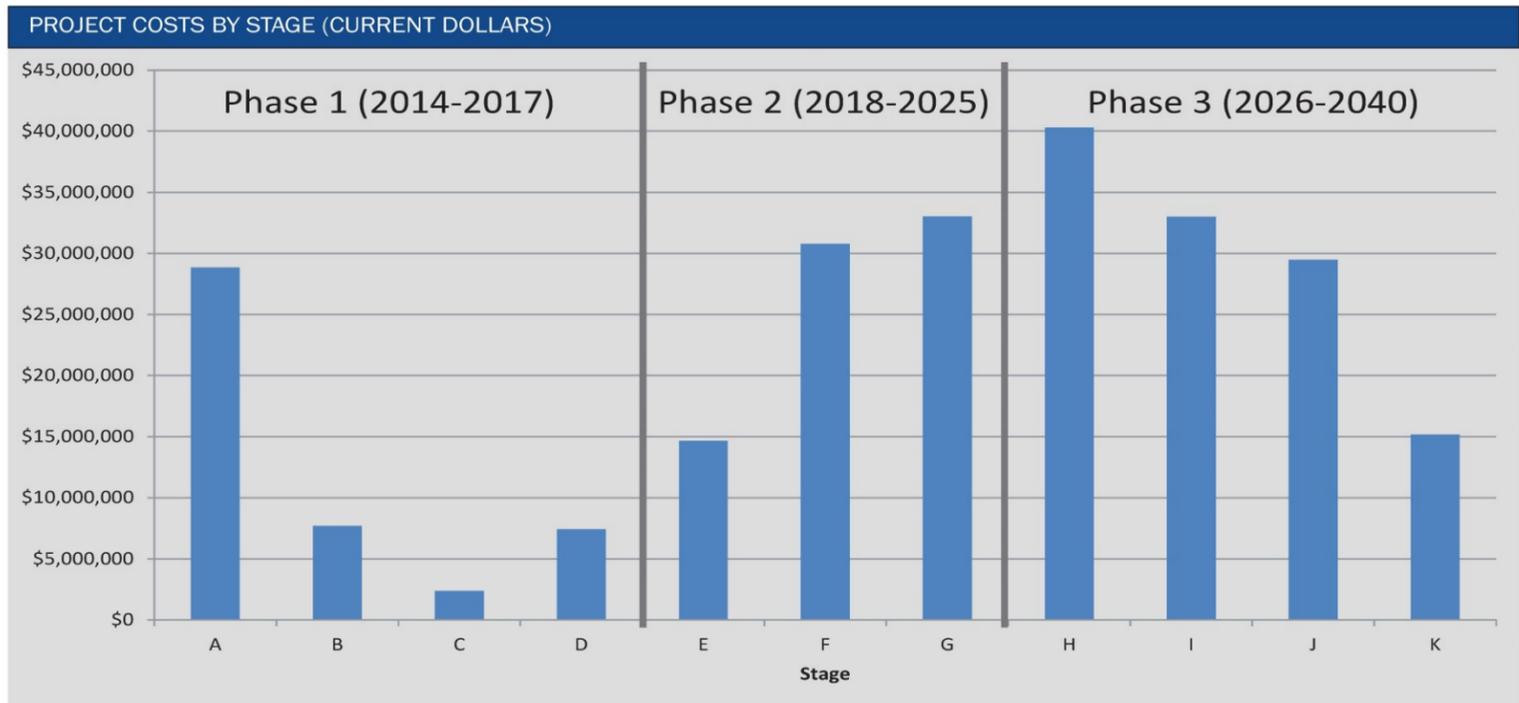
The total cost to implement the improvements identified as part of this plan was estimated at \$243 million dollars (2013 costs). Costs for each individual project were compiled from the NDDOT STIP, MPO TIP and the MPO's LRTP (factored from 2009 to 2013). Costs for projects developed specifically from this plan were developed using planning-level construction cost estimates. Appendix A contains the project cost estimates used for this implementation plan.

Figure 7 illustrates the anticipated investments needed for each stage of construction, while also illustrating the potential annual expenditures needed to complete the implementation plan. Each stage within Phase 1 represents an individual year within the phase, whereas Phase 2 and 3 are composed of stages that span multiple years in the "project cost by stage" chart. The hypothetical expenditure example provided in the "average cost per year" chart is just that an illustration of how the stages could possibly be implemented over a certain number of years.



Figure 7: Implementation Plan Cost Summary

**194 IMPLEMENTATION PLAN COST SUMMARY** Bismarck-Mandan Metropolitan Planning Organization SRF Consulting Group, Inc.



# Appendix A – Implementation Plan Project Cost Estimate Summary

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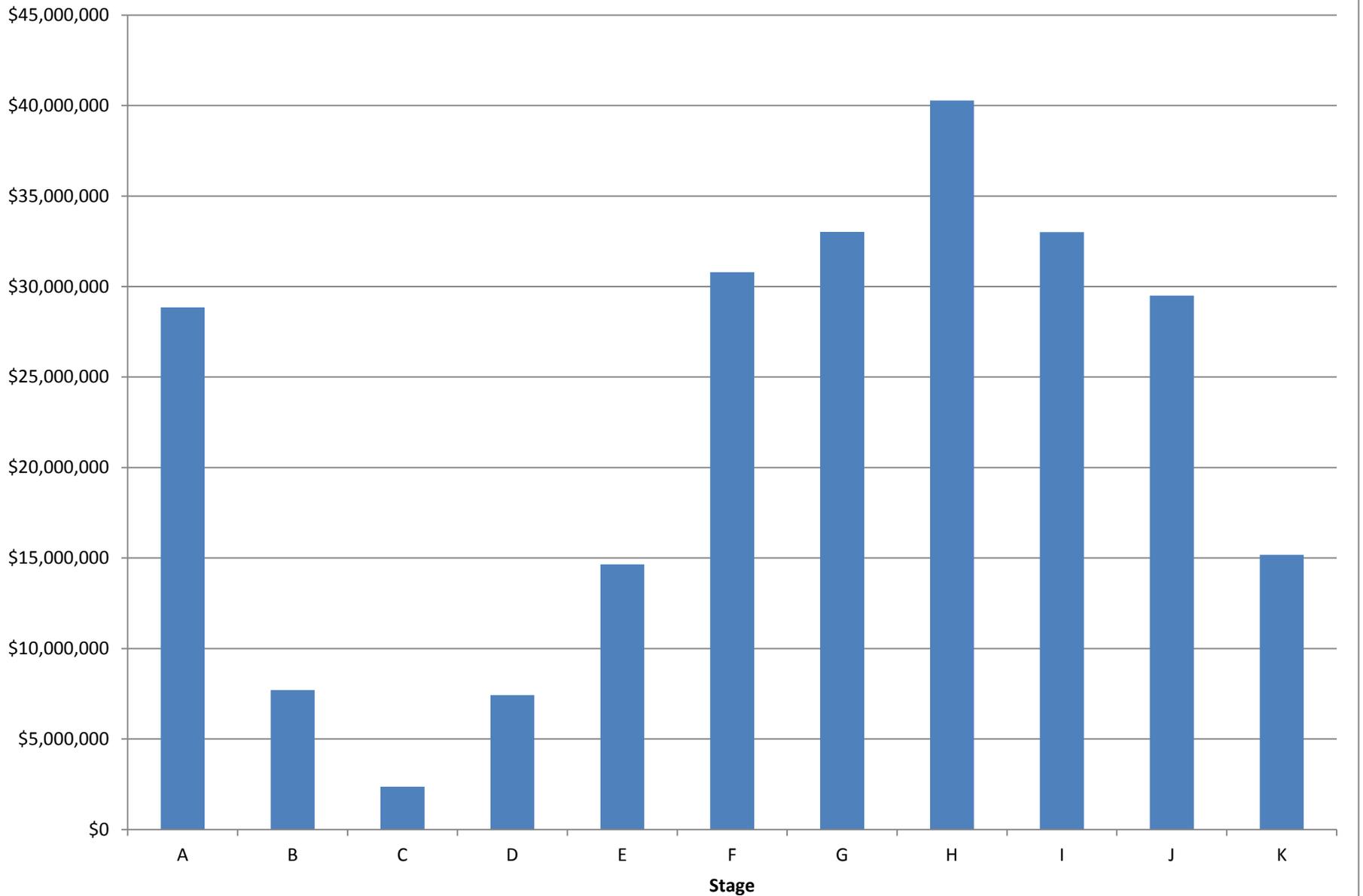
Phase	Stage	Year	Location	Project	Source	Cost	Note	2013 Adjusted Costs (3%/yr)
1	A	2014	Eastbound I-94 from Bismarck Expressway to US Highway 83 Exit North of Sterling	Mill and overlay	STIP/TIP	\$6,964,000	A majority of this cost is outside the project limits	\$6,964,000
			Westbound I-94 from Bismarck Expressway to US Highway 83 Exit North of Sterling	Mill and overlay	STIP/TIP	\$7,724,000	A majority of this cost is outside the project limits	\$7,724,000
			I-94 and Sunset Drive Interchange	Addition of a turn lane on Sunset Drive	STIP/TIP	\$350,000		\$350,000
			I-94 Business Loop from I-94 to Old Hwy 10	Reconstruction	STIP/TIP	\$3,386,000		\$3,386,000
			Divide Avenue from Volk Drive to Bismarck Expressway	Reconstruction and Widen	STIP/TIP	\$9,000,000		\$9,000,000
			Divide Avenue and Bismarck Expressway	Construction of a southbound right-turn lane	STIP/TIP	\$625,000		\$625,000
			Memorial Highway intersections with 46th Avenue and 40th Avenue	New traffic signals	STIP/TIP	\$800,000		\$800,000
						<b>\$28,849,000</b>		<b>\$28,849,000</b>
1	B	2015	State Street from Divide Avenue to Calgary Avenue	Addition of turn lanes	STIP/TIP	\$4,226,000		\$4,226,000
			I-94 Grant Marsh Bridge (3 miles west of I-94 and US 83 interchange)	Structure repair and paint	STIP/TIP	\$2,806,000		\$2,806,000
			Divide Avenue to 3-lane, I-94 to 26th Street	Implement West Divide TSM projects: Restripe Divide Avenue to 3-lane, I-94 to 26th Street, Signalize Country West/Tyler Parkway, Century/Tyler Parkway	L RTP	\$600,000	2009 cost, need to factor up	\$675,305
						<b>\$7,632,000</b>		<b>\$7,707,305</b>
1	C	2016	I-94 bridges over Washington Street and 4th Street	Replace bridge decks	STIP/TIP	\$812,000	\$406k was identified for Washington, \$406k is assumed for 4th	\$812,000
			80th Street bridge over I-94	Structure Replacement	STIP/TIP	\$1,298,000	This value may increase depending on the size of the bridge	\$1,298,000
			Main Street and Twin City Drive	Traffic Signal Improvement	STIP/TIP	\$250,000		\$250,000
						<b>\$2,360,000</b>		<b>\$2,360,000</b>

Phase	Stage	Year	Location	Project	Source	Cost	Note	2013 Adjusted Costs (3%/yr)
1	D	2017	Eastbound I-94 from the Grant Marsh Bridge to Bismarck Expressway	Concrete pavement repair and structural overlay (Eastbound and Westbound)	STIP/TIP	\$2,469,000		\$2,469,000
			Westbound I-94 from the Grant Marsh Bridge to Bismarck Expressway	Concrete pavement repair and structural overlay (Eastbound and Westbound)	STIP/TIP	\$2,442,000		\$2,442,000
			I-94 and Tyler Parkway Interchange	Partial reconstruction of the westbound entrance ramp to allow for lengthening the loop acceleration lane. Restripe the tapers for the eastbound entrance ramp and exit loop.	I-94 Study	\$2,500,000		\$2,500,000
			I-94 and State Street	Restripe the westbound entrance ramp taper	I-94 Study	minimal		\$20,000
						\$7,411,000		<b>\$7,431,000</b>
2	E		I-94 and Tyler Parkway Interchange	Turn lane improvements at the intersection of Tyler Parkway and Burnt Boat Road	I-94 Study	\$600,000		\$600,000
			Collins Avenue/Old Red Trail intersection	Improve and signalize Collins Avenue/Old Red Trail intersection	L RTP	\$7,440,000	2009 cost, need to factor up	\$8,373,786
			East Divide Avenue from Bismarck Expressway to 66th Street	Extend/Improve East Divide Avenue from Bismarck Expressway to 66th Street	L RTP	\$5,040,000	2009 cost, need to factor up	\$5,672,564
						\$13,080,000		<b>\$14,646,350</b>
2	F		I-94 and Sunset Drive	Reconstruct the I-94 and Sunset Drive interchange	I-94 Study	\$20,000,000		\$20,000,000
			I-94 and Sunset Drive	Restripe the westbound entrance ramp taper	I-94 Study	Minimal		\$20,000
			Washington Street, Divide Avenue to Century Avenue	Washington Street, Divide Avenue to Century Avenue, remove on-street parking and restripe center left-turn lane	L RTP	\$120,000	2009 cost, need to factor up	\$135,061
			Support roads for the new 66th Street interchange	Construct 66th Street from East Divide Avenue to 71st Street, Extend Century Avenue to 66th Street	I-94 Study and L RTP	\$9,450,000	This value was determined by using unit costs for the Divide Avenue project. 2009 cost, need to factor up	\$10,636,058
						\$29,570,000		<b>\$30,791,119</b>

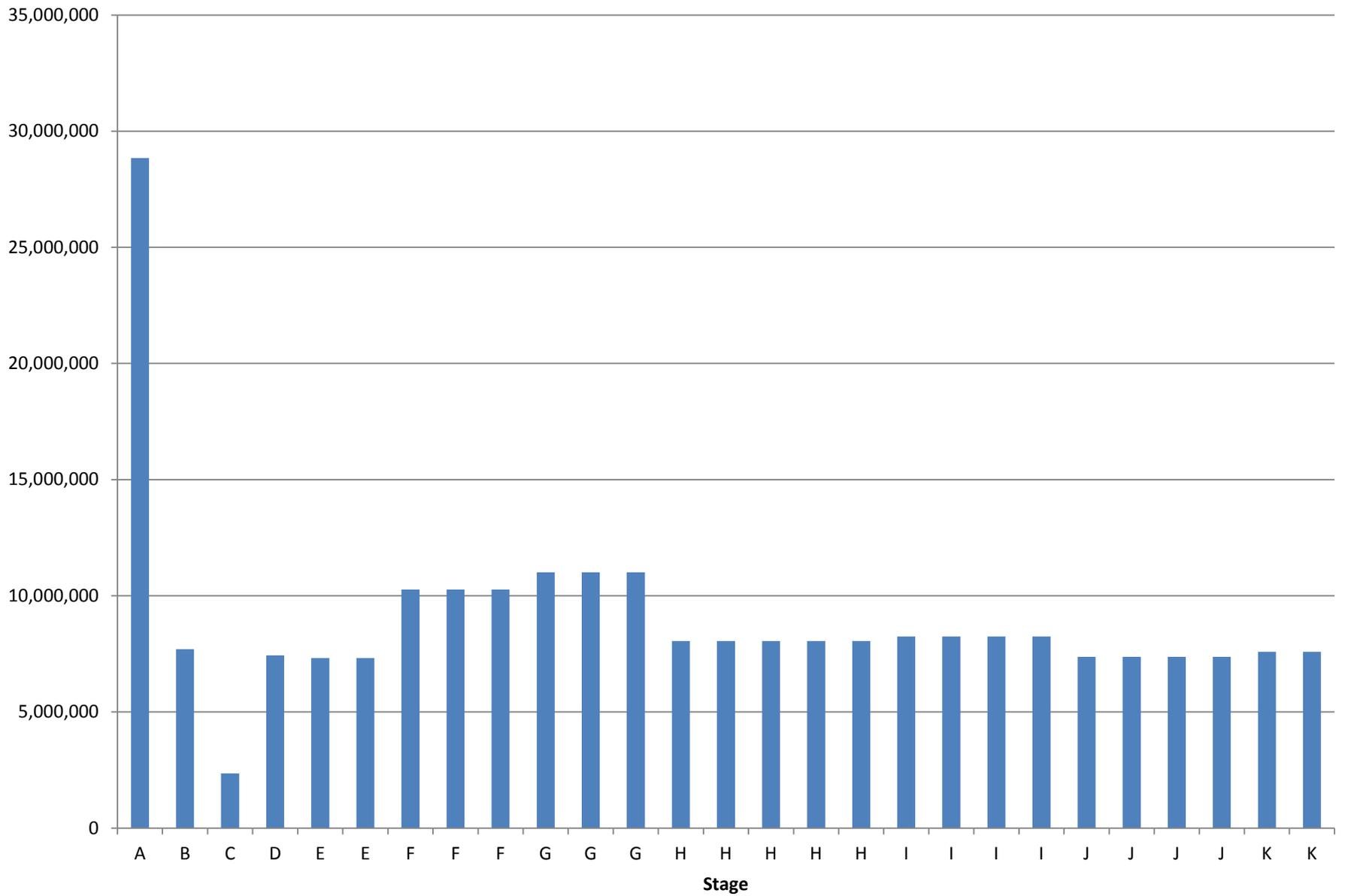
Phase	Stage	Year	Location	Project	Source	Cost	Note	2013 Adjusted Costs (3%/yr)
2	G		I-94 and Mandan Avenue	Reconstruct the I-94 and Mandan Avenue interchange	I-94 Study	\$15,000,000	Possibly move ahead of Sunset because of bridge condition and staging benefits	\$15,000,000
			I-94 and Mandan Avenue	Restripe the westbound entrance ramp taper	I-94 Study	Minimal		\$20,000
			I-94 and 66th Street	Construct a new interchange at I-94 and 66th Street	I-94 Study	\$18,000,000		\$18,000,000
						\$33,000,000		<b>\$33,020,000</b>
3	H		I-94 and State Street	Reconstruct the interchange at I-94 and State Street	I-94 Study	\$18,000,000		\$18,000,000
			US 83 (State Street)	US 83 (State Street) - Reconstruct and extend 6-lane section to 57th Avenue, include dual left-turn lanes at US 83/Century Avenue intersection	L RTP	\$19,800,000	2009 cost, need to factor up	\$22,285,074
						\$37,800,000		<b>\$40,285,074</b>
3	I		I-94 between Main Street and Bismarck Expressway	Reconstruct the common section of I-94 (Concept D or F)	I-94 Study	\$33,000,000		<b>\$33,000,000</b>
3	J		I-94 and Bismarck Expressway	Reconstruct the interchange	I-94 Study	\$18,000,000		\$18,000,000
			I-94 and Bismarck Expressway	Reconstruct Bismarck Expressway and Centennial Road between Divide Avenue and Jericho Road	I-94 Study	\$11,500,000		\$11,500,000
						\$29,500,000		<b>\$29,500,000</b>
3	K		Sunset Drive	Extend Sunset Drive to Highway 1806	L RTP	\$2,160,000	2009 cost, need to factor up	\$2,431,099
			Washington Street between Calgary Avenue and 43rd Avenue	Widen Washington Street to a 4-lane divided roadway between Calgary Avenue and 43rd Avenue	L RTP	\$5,000,000	2009 cost, need to factor up	\$5,627,544
			Washington Street between 43rd Avenue and 71st Avenue	Widen Washington Street to a 3-lane roadway between 43rd Avenue and 71st Avenue	L RTP	\$4,320,000	2009 cost, need to factor up	\$4,862,198
			Division Street	Extend Division Street east to Mandan Avenue	L RTP	\$2,000,000	2009 cost, need to factor up	\$2,251,018
						\$13,480,000		<b>\$15,171,859</b>

**Corridor Total \$242,761,708**

## Project Costs by Stage (Current Dollars)



## Project Costs Average per Year (Current Dollars)



FINAL

# Appendix E – Public Meeting Outreach and Comments

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**FINAL REPORT**



# Public Meeting(s) for I-94 Corridor Study and North Mandan Subarea Study

The Bismarck-Mandan Metropolitan Planning Organization (MPO) is presently conducting the following related studies:

- **I-94 Corridor Study**
- **North Mandan Subarea Study**

The **I-94 Corridor Study** will identify and address current and future transportation issues along approximately 17 miles of I-94 from ND Highway 25 (in Morton County) on the west to 80<sup>th</sup> Street NE (in Burleigh County) on the east side of the study area and its crossing roadways. The I-94 Corridor Study was initiated to address concerns of increasing traffic volumes and projected increases to traffic volumes along this stretch of roadway. At the end of the study in November 2013, the study team will provide recommendations for improvements to I-94 and its interchanges/cross streets. A public meeting will be held on March 5, 2013 to address I-94 and crossing street issues from the Missouri River to 80<sup>th</sup> Street NE.

The **North Mandan Subarea Study** is also being pursued to address existing and projected transportation needs in portions of Mandan and Morton County north of I-94. This will be the second public meeting associated with the North Mandan Subarea Study. At the end of the study in the Spring of 2013, recommendations will be provided to improve identified transportation issues.

As these studies impact each other on the west side of the Missouri River, a coordinated public meeting will be held on March 6, 2013. The purpose of the meeting(s) will be to brief the public on existing traffic conditions and traffic analysis and to gather input on information and ideas developed to date.

The meetings will be conducted primarily as an open house with staff available to discuss work that has been completed to date. There will be a presentation at 5:30 pm during each meeting, after which the informal discussion can continue with staff and officials from the respective governing agencies and consultant team. Information and graphics will be displayed outlining work done to date. No decisions have been made at this time. Your input at this state of the study is invaluable.

## Meeting Information

### I-94 Corridor Study (Bismarck Area)

Date: March 5, 2013

Time: 5:00 pm-7:00 pm

Location: Tom Baker Room  
City/County Building  
221 North 5<sup>th</sup> Street  
Bismarck, ND

### I-94 Corridor Study (Mandan area) and North Mandan Subarea Study Combined

Date: March 6, 2013

Time: 5:00 pm-7:00 pm

Location: Mandan Middle School  
2901 12<sup>th</sup> Avenue Northwest  
Mandan, ND

For more information call:  
Ben Ehreth, Transportation Planner  
701-355-1840  
Bismarck-Mandan MPO

## Project Websites and Social Media

I-94 Corridor Study

[www.bis-manI94study.com](http://www.bis-manI94study.com)

[www.facebook.com/BisManI94Study](https://www.facebook.com/BisManI94Study)

North Mandan Subarea Study

[www.northmandanstudy.com](http://www.northmandanstudy.com)

The MPO's public participation process is being followed within this notice. The public meeting facilities are accessible to mobility impaired individuals. For individuals requiring special needs related but not limited to, hearing or visual impairment, or language interpretive services, please contact MPO staff at (701) 355-1840.



## SIGN-IN SHEET

North Dakota Department of Transportation, Civil Rights Division  
SFN 59531 (Rev. 03-2012)

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Division/District/Consultant		
Meeting Location MANDAN MEDDUR SCHOOL	Meeting Type PUBLIC MEETING	Meeting Date 3/6/2013
Project Number _____	PCN _____	
Project Description I-94 CORRIDOR STUDY / NORTH MANDAN SUBAREA STUDY		

Name (Please print) TONY STAROY		Title/Representing STATION MGR. / M04	
Address P.O. Box 40			
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Name (Please print) JACK STARCK		Title/Representing SELF	
Address 8280 Willow Rd N			
City MANDAN	State ND	Zip code 58554	Email JDSTARCK@midco.net

Name (Please print) ROSS VASHUS		Title/Representing	
Address 1221 27 <sup>th</sup> ST NW			
City MANDAN	State ND	Zip code 58554	Email rossvashus@bis.midco.net

Name (Please print) Chris Holzer		Title/Representing self	
Address 801 N. 33 <sup>rd</sup> St			
City Bismarck	State ND	Zip code 58501	Email caholzer@bis.midco.net

Name (Please print) ROBERT VAYDA		Title/Representing	
Address 3904 OLDRED TRAIL NW			
City MANDAN	State ND	Zip code 58554	Email RAVayda@AOL.COM

Name (Please print) AL & VANLIE FITTERER		Title/Representing	
Address 709 4th Ave NW			
City MANDAN	State ND	Zip code 58554	Email al@asapc-net

Name (Please print) SHEILA SCHUMACHER		Title/Representing	
Address 404 DIVISION ST, NE			
City MANDAN	State ND	Zip code 58554	Email SMSCHUMACHER@BIS.MIDCO.NET

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North Dakota Department of Transportation, Civil Rights Division  
SFN 59531 (Rev. 03-2012)

Division/District/Consultant		
Meeting Location MANDAN MEDDLE SCHOOL	Meeting Type PUBLIC MEETING	Meeting Date 5/6/2013
Project Number	PCN	
Project Description I-94 CORRIDOR STUDY / NORTH MANDAN SUBSIDIA STUDY		

Name (Please print) Leonard Bachmeier		Title/Representing	
Address 8260 Willow Rd N			
City Mandan	State ND	Zip code 58554	Email lbachmeier@...

Name (Please print) Kathleen Spilman		Title/Representing	
Address 1122 24th St NW			
City Mandan	State ND	Zip code 58554	Email

Name (Please print) JEFF WRIGHT		Title/Representing	
Address 806 S Woodland Dr			
City Mandan	State ND	Zip code 58554	Email

Name (Please print) Ed & Delois Weber		Title/Representing	
Address 4405-Cortez Circle			
City Mandan	State ND	Zip code 58554	Email

Name (Please print) Bob Keller & Beth Yeager		Title/Representing	
Address 4200 41st Ave NW			
City Mandan	State ND	Zip code 58554	Email

Name (Please print) Franc Fishback		Title/Representing	
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City Mandan	State ND	Zip code 58554	Email FFishback@Bis.midea.net

Name (Please print) Dow McGuire		Title/Representing MVA	
Address 1908 RIVER DRIVE			
City MANDAN	State ND	Zip code 58554	Email DMPCI@Bis.midea.net

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North Dakota Department of Transportation, Civil Rights Division  
SFN 59531 (Rev. 03-2012)

Division/District/Consultant

Meeting Location MANDAN MEDDLE SCHOOL	Meeting Type PUBLIC MEETING	Meeting Date 3/6/2013
Project Number		PCN
Project Description I-94 CORRIDOR STUDY / NORTH MANDAN SUBAREA STUDY		

Name (Please print) Paul E Trauger		Title/Representing Self	
Address 2389 Business Loop I-94			
City MANDAN	State ND	Zip code 58554	Email

Name (Please print) Sheldon Wolf		Title/Representing self	
Address 2123 Morgan Circle N			
City Mandan	State ND	Zip code 58554	Email msw@wolf@gmail.com

Name (Please print) Esther Vogel		Title/Representing	
Address PO Box 484			
City Mandan	State ND	Zip code 58554	Email

Name (Please print) MICHAEL JOHNSON		Title/Representing NDDOT-LG	
Address 608 E BOULEVARD AVE			
City BISMARCK	State ND	Zip code 58505	Email mjohnson@nd.gov

Name (Please print) William C Davis		Title/Representing	
Address 500 Division St NW			
City Mandan	State	Zip code	Email davis@bis.mndot.net

Name (Please print) Lynne Thomten		Title/Representing PE/Keith	
Address <del>1000 1st St NW</del> 2610 Old Red Trl Suite C Po Box 98			
City Mandan	State ND	Zip code 58554	Email lthomten@keith.com

Name (Please print) Jim NEUBAUER		Title/Representing City of Mandan	
Address 205 2nd Ave NW			
City Mandan	State ND	Zip code 58554	Email jneubauer@cityofmandan.com

## SIGN-IN SHEET

North Dakota Department of Transportation, Civil Rights Division  
SFN 59531 (Rev. 03-2012)Page 5 of 7

Division/District/Consultant		
Meeting Location MANDAN MIDDLE SCHOOL	Meeting Type PUBLIC MEETING	Meeting Date 5/6/2013
Project Number _____	PCN _____	
Project Description I-94 CORRIDOR STUDY / NORTH MANDAN SUBAREA STUDY		

Name (Please print) MARK HANSON		Title/Representing SUNDE LAND SURVEYING LLC PRESIDENT	
Address 900 E BLOOMINGTON FRWY #118			
City BLOOMINGTON	State MN	Zip code 55420	Email MARK@SUNDE.COM

Name (Please print) SUDHEER DHULIPALA		Title/Representing ENGINEER/ULTEIG	
Address 1412 BASIN AVE			
City BIS	State ND	Zip code 58504	Email sudheer.dhulipala@ulteig.com

Name (Please print) Tom Peters		Title/Representing Mandan Middle School	
Address <del>2901 12th Ave NW</del> 2901 12th Ave NW			
City Mandan	State	Zip code	Email tom.peters@msd1.org

Name (Please print) Dave Yexley		Title/Representing MOU	
Address 400 N. 4th Street			
City Bismarck	State ND	Zip code 58501	Email dave.d.yexley@ndu.com

Name (Please print) Zachmeier, Andy		Title/Representing Morton County	
Address			
City	State	Zip code	Email

Name (Please print) Karen Jordan		Title/Representing URS	
Address 2907 Iowa Ln #210			
City Bismarck	State ND	Zip code 58503	Email

Name (Please print)		Title/Representing	
Address			
City	State	Zip code	Email

**SIGN-IN SHEET**

North Dakota Department of Transportation, Civil Rights Division  
SFN 59531 (Rev. 03-2012)

Division/District/Consultant		
Meeting Location MANDAN MIDDLE SCHOOL	Meeting Type PUBLIC MEETING	Meeting Date 5/6/2013
Project Number	PCN	
Project Description I-94 CORRIDOR STUDY / NORTH MANDAN SUBSIDIA STUDY		

Name (Please print) Mike Aebol		Title/Representing Morton County	
Address 2916 37th St NW			
City Mandan	State ND	Zip code 58554	Email mike.aebol@mortonnd.org

Name (Please print) Cody Schatz		Title/Representing Morton County Commission	
Address 1210 2nd St NE			
City Mandan	State ND	Zip code 58554	Email Cody.schatz@ndmail.com

Name (Please print)		Title/Representing	
Address			
City	State	Zip code	Email

Name (Please print)		Title/Representing	
Address			
City	State	Zip code	Email

Name (Please print)		Title/Representing	
Address			
City	State	Zip code	Email

Name (Please print)		Title/Representing	
Address			
City	State	Zip code	Email

Name (Please print)		Title/Representing	
Address			
City	State	Zip code	Email



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SFN 59531 (Rev. 03-2012)

Division/District/Consultant
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Meeting Location TOM BAKER ROOM BISMARCK CITY HALL	Meeting Type PUBLIC MEETING	Meeting Date 3/5/2013
Project Number _____	PCN _____	
Project Description I-94 CORRIDOR STUDY		

Name (Please print) Trenton Schwahn		Title/Representing	
Address 7308 Runnel Rd			
City Bismarck	State ND	Zip code 58503	Email

Name (Please print) PAUL BENNING		Title/Representing NDDOT - LOC GOV	
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Name (Please print) MICHAEL JOHNSON		Title/Representing NDDOT - LG	
Address 608 E. BOULEVARD AVE			
City BISMARCK	State ND	Zip code 58505	Email mjohnson@nd.gov

Name (Please print) Steve Windiss		Title/Representing	
Address 1014 Highland Pl			
City Bismarck	State ND	Zip code 58501	Email

Name (Please print) Craig Vaughan		Title/Representing SRF Consulting	
Address 1 Carlson Pkwy N			
City Frymouth	State MINN	Zip code 55447	Email cvaughn@SRFCONSULTING.COM

Name (Please print) Bob Shannon		Title/Representing Citizen at large	
Address 5964 Latat Loop			
City Bismarck	State ND	Zip code 58503	Email bob.shannon@keljeng.com

Name (Please print)		Title/Representing	
Address			
City	State	Zip code	Email

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Division/District/Consultant
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Meeting Location TOM BAKER ROOM BISMARCK CITY HALL	Meeting Type PUBLIC MEETING	Meeting Date 3/5/2013
Project Number _____	PCN _____	
Project Description I-94 CORRIDOR STUDY		

Name (Please print) KELLY HARRIS		Title/Representing SELF	
Address 10896 S 1000 E			
City SANDY	State UT	Zip code 84094	Email KELLYHARRIS8300@MSN.COM

Name (Please print)		Title/Representing	
Address			
City	State	Zip code	Email

Name (Please print)		Title/Representing	
Address			
City	State	Zip code	Email

Name (Please print)		Title/Representing	
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Name (Please print)		Title/Representing	
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City	State	Zip code	Email

Name (Please print)		Title/Representing	
Address			
City	State	Zip code	Email

Name (Please print)		Title/Representing	
Address			
City	State	Zip code	Email

ID	Comment	Description	~ Location
1	An interchange halfway between ND 25 and Sunset Dr would likely relieve some future congestion at the Sunset Dr interchange. The new interchange would provide an alternative access onto I-94. However, it would have to be designed carefully due to Old Red Trail running so close to I-94. Consider interchanges at 24th/56th Ave OR near 30th Ave to 37th Ave.	New interchange	Between Hwy 25 and Sunset Dr
2	State St and I-94 interchange should be reconfigured to better accommodate traffic accessing State St. and I-94	Reconfigure Interchange	State St & I-94
3	Sunset Dr interchange. Nearby intersections are too close to handle future traffic queues. Consider interchange reconfiguration long term.	Reconfigure Interchange	Sunset Dr & I-94
4	Pave Frontage Road (Old Red Trail) from Hwy 25 to Mandan. Widen and improve road to increase traffic flow to west and relieve congestion on Sunset exit	Pave, capacity improvements	Old Red Trail between Hwy 25 and Mandan Ave
5	Put a traffic light at the intersection of Old Red Trail and Collins	Signals Needed	Old Red Trail and Collins Ave
6	Put a 4th turning lane off the westbound off ramp of I-94 at Sunset Drive. This additional lane would only be a right turning lane continuing on to Old Red Trail going east to get to Walmart.	Add WB right-turn only lane	Sunset Dr and Old Red Trail
7	Eliminate proposed interchange at 24th/56th Avenue	Eliminate proposed interchange	I-94 and 24th Ave/56th Ave
8	Interstate access in the area of 34th Ave NW to handle truck traffic from industrial park (vs Sunset, Exit 152) and support development south of I-94. This would help a lot more than overpass/underpass in the 34th Ave area.	New Interchange	Between Hwy 25 and Sunset Dr
9	Traffic signals ASAP at I-94/Sunset South Ramp and at Sunset/Boundary or reconfigure interchange area as needed	Intersection/Interchange Improvements	Sunset Dr/Boundary Rd
10	Need interchange at Collins, would take pressure off of Sunset and Mandan	New interchange	I-94 and Collins Ave
11	Off ramps to State St. get congested in the morning; at least monthly it is backed up to the interstate	Congestion at exit ramps	State St. and I-94
12	State St at 5:00 is very busy with cars backed up through intersection. Traffic flowing north goes from 40 mph to 0 mph in seconds, lots of crashes near State St. and Capitol Ave	Safety/ Congestion Issues	State St. and E Capitol Ave
13	Please do not forget pedestrians. I have had a few close calls jogging and lots of students cross to the middle school at Sunset Dr	Pedestrian Safety	Sunset Dr., south of I-94

14	Please keep focus on shorter peak time. Traffic is already backing up to freeway on westbound exit to Sunset Dr. in the afternoon	Sunset Dr.	Sunset Dr.
15	How much traffic will a new interchange/underpass west of Sunset handle/eliminate off Sunset?	Sunset Dr.	Sunset Dr.
16	Longer turn lanes to Sunset Dr from freeway in both directions.	Longer Interstate exit ramps	Sunset Dr. and I-94
17	I-94 to US 83 bypass around Bismarck will help State St/US 83		
18	Very industrial area-road extremely narrow with traffic speed too fast-UNSAFE, not well lit area	Safety/Traffic Speed Concerns	Tyler Pkwy/Divide Ave Corridor
19	Roads very narrow. Traffic speed too fast (unsafe) - more traffic with the corp. headquarters development	Safety/Traffic Speed Concerns	Mandan Ave and Old Red Trail
20	Need for law enforcement presence with regard to speed. Road poorly maintained. Wildlife presence	Traffic Speed needs enforcement; pavement condition	Old Red Trail between Collins Ave and Mandan Ave
21	Collins and Mandan Ave needs a stoplight	Signals Needed	Collins Ave and Mandan Ave
22	South of a new interchange will need roadway system to flow back to East Mandan City Center	Off-system intersection and capacity improvements south of I-94	Between Hwy 25 and Sunset Dr
23	Need to extend Sunset Dr north to 1806.	Extend Sunset Drive to 1806	Between Sunset Dr (north terminus) and 1806
24	Traffic already backs up onto I-94 from the east at Sunset Dr in 8 am period - make off ramp longer, extend to east	Extend Sunset Exit ramps	Sunset Dr. and I-94 Exit Ramp (North Ramp - WB)
25	Need to address better access at Sunset and I-94	Reconfigure Interchange	Sunset Dr. and I-94
26	Centennial Rd and I-94 already has major traffic delays getting on and off I-94. Great need to go further North on Centennial Rd with 4 lanes. Almost impossible to access Centennial from 57th Ave and 43rd Ave	Exit Ramp/Capacity Issues	Centennial and I-94
27	Rebuild and change configuration at Sunset Dr. Rebuild to single traffic control intersection with longer approaches. Not diamond configuration.	Reconfigure Interchange	Sunset Dr. and I-94

28	Add traffic light at intersection of Collins/Old Red Trail	Signals Needed	Collins Ave and Old Red Trail
29	Skew angle makes navigation difficult. I believe this allows better truck movements but creates traffic safety concerns	Reconfigure Interchange	Mandan Ave and I-94
30	This intersection recently rebuilt. Traffic movements on Schafer St are confusing to most drivers. Right turn stop/control has most people confused regarding whether right turn permitted on red, sometimes cutting off vehicles with green light movements.	Safety/Traffic Operations/Signage Issues	Divide Ave and Schafer St.
31	Sunset Dr geometry does not permit safe left hand turns. Cars turning back up traffic, sometimes far enough to prevent other left hand turns from happening causing gridlock.	Safety (Left hand turn due to skew)/ Congestion Issues	Sunset Dr.
32	Future signals or roundabout at Collins/Old Red Trail and realign Old Red Trail E. of Collins	Intersection Control (Signal or Roundabout)/ Realign Old Red Trail	Collins Ave and Old Red Trail

## Public Meeting for the I-94 Corridor Study

The Bismarck-Mandan Metropolitan Planning Organization (MPO) is conducting the **I-94 Corridor Study**. This study has identified current and future transportation issues along approximately 17 miles of I-94 from ND Highway 25 (in Morton County) on the west to 80<sup>th</sup> Street NE (in Burleigh County) on the east side of the study area and its crossing roadways. The I-94 Corridor Study was initiated to address concerns of increasing traffic volumes and projected increases to traffic volumes along this stretch of roadway. The study team has been working with a Project Steering Committee comprised of local agencies to analyze, assess, and develop improvements to address the identified issues. A public meeting will be held on March 4, 2014 to present the I-94 and crossing street improvements for public feedback.

The meeting will be conducted primarily as an open house with staff available to discuss work that has been completed to date. There will be a presentation at 5:30 p.m., after which the informal discussion can continue with staff and officials from the respective governing agencies and consultant team. Information and graphics will be displayed outlining work done to date. While schematic design drawings have been developed, no decisions have been made at this time. Your input and feedback on these materials is invaluable.

### Meeting Information

Date: March 4, 2014

Time: 5:00 pm-7:00 pm

Location: Tom Baker Room  
City/County Building  
221 North 5th Street  
Bismarck, ND

For more information call:  
Ben Ehreth, Transportation Planner  
701-355-1840  
Bismarck-Mandan MPO

Project Website and Social Media  
I-94 Corridor Study  
[www.bis-manI94study.com](http://www.bis-manI94study.com)  
[www.facebook.com/BisManI94Study](http://www.facebook.com/BisManI94Study)

The MPO's public participation process is being followed within this notice. The public meeting facilities are accessible to mobility impaired individuals. For individuals requiring special needs related but not limited to, hearing or visual impairment, or language interpretive services, please contact MPO staff at (701) 355-1840.

**SIGN-IN SHEET**

North Dakota Department of Transportation, Civil Rights Division  
 SFN 59531 (Rev. 03-2012)

Division/District/Consultant BisMan MPO / SRF Consulting Group		
Meeting Location City / County Building	Meeting Type Public Open House	Meeting Date 3/4/2014
Project Number	PCN	
Project Description Bismarck-Mandan I-94 Corridor Study		

Name (Please print) Blaine Engelstad		Title/Representing self	
Address 5305 Highland Rd. N.W.			
City Mandan	State N.D.	Zip code 58554	Email bteengelstad@MSALive.com

Name (Please print) Jon Hoppert		Title/Representing T&E Energy Coop	
Address 219 N 20th St			
City Bismarck	State ND	Zip code 58501	Email joh@bismarckenex.com

Name (Please print) PAUL BENNING		Title/Representing	
Address 608 E BLVD AVE			
City BISMARCK	State ND	Zip code 58505	Email pbenning@nd.gov

Name (Please print) Tale Sandstrom		Title/Representing	
Address POB 144			
City Bismarck	State ND	Zip code 58502	Email sandstrom@biz.midco.net

Name (Please print) SUDHEER DHULIPALA		Title/Representing ULTEIG	
Address 1412 BASIN AVE			
City BISMARCK	State ND	Zip code 58504	Email sudheer.dhulipala@ulteig.com

Name (Please print) BRET GURHOLT		Title/Representing	
Address 3667 WINNIPEG DR.			
City Bismarck	State ND	Zip code 58503	Email bgurholt@gmail.com

Name (Please print) Pat Sweeney		Title/Representing	
Address 2553 Lyons Rd			
City Mandan	State ND	Zip code 58554	Email

**SIGN-IN SHEET**

North Dakota Department of Transportation, Civil Rights Division  
 SFN 59531 (Rev. 03-2012)

Division/District/Consultant BisMan MPO / SRF Consulting Group		
Meeting Location City / County Building	Meeting Type Public Open House	Meeting Date 3/4/2014
Project Number	PCN	
Project Description Bismarck-Mandan I-94 Corridor Study		

Name (Please print) KAT SEBEL		Title/Representing	
Address 1990 66 <sup>th</sup> ST SE			
City BE. ND	State ND	Zip code 58504	Email

Name (Please print) BOB SWANSON		Title/Representing Rani Engineering	
Address			
City Dickinson	State ND	Zip code 58601	Email Robert.Swanson@Rani.Eng.com

Name (Please print) Carroll Day		Title/Representing KLJ	
Address			
City Bismarck	State	Zip code	Email Carroll.day@kjeng.com

Name (Please print) Bill Wocken		Title/Representing City of Bismarck Admin	
Address PO Box 5503			
City Bismarck	State ND	Zip code 58506	Email Wwocken@nd.gov Lwocken@bs.midea.net

Name (Please print) Bob Shannon		Title/Representing	
Address 5964 Lariat Loop			
City Bismarck	State ND	Zip code 58503	Email

Name (Please print) CRAIG VAUGHN		Title/Representing SRF	
Address 2370 Vermont Avenue			
City Bismarck	State ND	Zip code 58504	Email Cvaughn@SRFCONSULTING.COM

Name (Please print)		Title/Representing	
Address			
City	State	Zip code	Email

# Public Input Meeting #2

## Bismarck-Mandan Metropolitan Planning Organization

### I-94 Corridor Study

YOUR COMMENTS ARE IMPORTANT TO US! Please write your comments on this form. You may either put your completed form in the comment box during the Public Input Meeting, mail it to the address listed on the reverse side of this sheet, email comments to Craig Vaughn at [cvaughn@srfconsulting.com](mailto:cvaughn@srfconsulting.com), or fill out the form on the project website (under Documents tab) - <http://www.bis-mani94study.com/>. **Please submit your written comments by noon, March 14, 2014, so your feedback can be incorporated in a timely fashion.**

For each of the improvement locations please indicate your preference given the alternatives presented. Note that a "No-Build" Alternative is an option for each location.

#### I-94 and Sunset Drive Interchange

- |                                     |                          |
|-------------------------------------|--------------------------|
| <input type="checkbox"/>            | No-Build                 |
| <input checked="" type="checkbox"/> | Concept A – Single Point |
- 
- 

#### I-94 and Mandan Avenue Interchange

- |                                     |                     |
|-------------------------------------|---------------------|
| <input type="checkbox"/>            | No-Build            |
| <input checked="" type="checkbox"/> | Concept B – Diamond |
- 
- 

#### I-94 and I-194 Interchange Area

- |                                     |   |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | No-Build  |
| <input type="checkbox"/>            | Concept D – I-94 Westbound Realignment                        |
| <input type="checkbox"/>            | Concept F – I-94 Westbound Realignment with Main Street Split |
| <input checked="" type="checkbox"/> | Concept G – I-194 Capacity Improvement Only                   |
- 
- 

#### Tyler Parkway and Burnt Boat Road

- |                                     |                                    |
|-------------------------------------|------------------------------------|
| <input checked="" type="checkbox"/> | No-Build                           |
| <input type="checkbox"/>            | Intersection Capacity Improvements |
- 
-

I-94 and State Street Interchange

<input checked="" type="checkbox"/>	
<input type="checkbox"/>	

No-Build

Concept K – Single Point

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I-94 and Bismarck Expressway Interchange

<input checked="" type="checkbox"/>	
<input type="checkbox"/>	
<input type="checkbox"/>	
<input type="checkbox"/>	
<input checked="" type="checkbox"/>	

No-Build

Concept M' – Centennial Rd/Bismarck Expy 6-Lane

Concept M – NE/SE I-94 Loop Ramps on Existing Alignment

Concept M-Shift – NE/SE I-94 Loop Ramps on Western Alignment

Concept N – Single Point

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I-94 and 66th Street Interchange

<input checked="" type="checkbox"/>	
<input type="checkbox"/>	
<input type="checkbox"/>	

No-Build

Concept O – Diamond

Concept P – Single Point

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*Fold Here Along Line*

From:



Mr. & Mrs. Leroy Klapprodt  
417 W Apollo Ave  
Bismarck, ND 58503-1414

BISMARCK ND 585

05 MAR 2014 PM 1 L



SRF Consulting Group, Inc.  
2370 Vermont Avenue  
Bismarck, ND 58504



Public Input Meeting #2 – March 4, 2014  
Bismarck-Mandan Metropolitan Planning Organization  
I-94 Corridor Study

Survey Monkey Summary

1. I-94 and Sunset Drive Interchange

Answer Options	Response Percent	Response Count
No-Build	33.3%	1
Concept A - Single Point	66.7%	2
<i>answered question</i>		<b>3</b>
<i>skipped question</i>		<b>0</b>

Comments:

- With frontage roads so close to the existing ramp terminals the single point provides the best solution.

2. I-94 and Mandan Avenue Interchange

Answer Options	Response Percent	Response Count
No-Build	33.3%	1
Concept B - Diamond	66.7%	2
<i>answered question</i>		<b>3</b>
<i>skipped question</i>		<b>0</b>

Comments:

- Concerns about both concepts. It would be good to align the ramp terminals as indicated in Concept B; but the SE on ramp has a lot of elevation to overcome to get on to I-94. The diamond would reduce the horizontal length and increase the vertical grade. Has this vertical grade been calculated yet? Is the existing the eastbound accelerating/merging lane adequate? Maybe it should be extended farther to the east?

### 3. I-94 and I-194 Interchange Area

Answer Options	Response Percent	Response Count
No-Build	0.0%	0
Concept D - I-94 Westbound Realignment	0.0%	0
Concept F - I-94 Westbound Realignment with Main Street Split	33.3%	1
Concept G - I-194 Capacity Improvement Only	66.7%	2
<i>answered question</i>		<b>3</b>
<i>skipped question</i>		<b>0</b>

#### Comments:

- D and F appear to be too confusing and costly to build. At the East Midway Interchange are you considering the westbound I-94 to southbound I-194 loop and merging movement with traffic coming from the west? Many others and I are using this route to travel from the north side of Bismarck to the south side. This merging movement will soon become a problem. Especially in segment between East Midway and the Memorial Bridge Interchange which is very short and will soon cause difficulties in moving from East Midway to the Main Avenue/Memorial Highway (Strip) exit ramp.

### 4. Tyler Parkway and Burnt Boat Road

Answer Options	Response Percent	Response Count
No-Build	33.3%	1
Intersection Capacity Improvements	66.7%	2
<i>answered question</i>		<b>3</b>
<i>skipped question</i>		<b>0</b>

#### Comments:

- Free right turns are not pedestrian friendly. Do not construct these.

### 5. I-94 and State Street Interchange

Answer Options	Response Percent	Response Count
No-Build	0.0%	0
Concept K - Single Point	100.0%	3
<i>answered question</i>		<b>3</b>
<i>skipped question</i>		<b>0</b>

## 6. I-94 and Bismarck Expressway Interchange

Answer Options	Response Percent	Response Count
No-Build	0.0%	0
Concept M' - Centennial Rd/Bismarck Expy 6-Lane	0.0%	0
Concept M - NE/SE I-94 Loop Ramps on Existing Alignment	0.0%	0
Concept M-Shift - NE/SE I-94 Loop Ramps on Western Alignment	33.3%	1
Concept N - Single Point	66.7%	2
<i>answered question</i>		<b>3</b>
<i>skipped question</i>		<b>0</b>

### Comments:

- Loops are an original (1950s or before) concept that worked well only with low traffic volumes.

## 7. I-94 and 66th Street Interchange

Answer Options	Response Percent	Response Count
No-Build	0.0%	0
Concept O - Diamond	100.0%	3
Concept P - Single Point	0.0%	0
<i>answered question</i>		<b>3</b>
<i>skipped question</i>		<b>0</b>

### Comments:

- Make sure to acquire ROW for loops to be included with this design.
- Ensure that frontage road connections cannot be closer than 1000 feet from the ramp terminals.

## Craig Vaughn

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**From:** Craig Vaughn  
**Sent:** Wednesday, March 05, 2014 4:09 PM  
**To:** 'LEROY KLAPPRODT'  
**Cc:** Ben Ehreth  
**Subject:** RE: Public Input Meeting #2

An interchange at approximately 56th Avenue NW was considered as part of the study, but determined to not be relevant within the 2040 time horizon for the I-94 Corridor Study. That's not to say that other future planning activities will not consider it again.

The 66th Street interchange did on the other hand have an overall system benefit during the 2040 time horizon and was relevant to the I-94 Corridor Study; therefore, conceptual designs were developed for consideration.

I am glad you were able to download the information from last night's meeting. Note that there is a comment form on the website as well for you to provide feedback on the concepts.

Craig

---

Craig Vaughn, PE (MN), PTOE  
Principal  
SRF Consulting Group, Inc.  
Direct: 763.249.6774 | Main: 763.475.0010  
[cvaughn@srfconsulting.com](mailto:cvaughn@srfconsulting.com)  
One Carlson Parkway North, Suite 150, Minneapolis, MN 55447-4443  
[www.srfconsulting.com](http://www.srfconsulting.com)



---

**From:** LEROY KLAPPRODT [<mailto:lklap@bis.midco.net>]  
**Sent:** Wednesday, March 05, 2014 2:29 PM  
**To:** Craig Vaughn  
**Subject:** Fwd: Public Input Meeting #2

Oops, I think I misread the map. The western interchange at Mandan is the Sunset Exchange, not the one I've heard about sorta near Cloverdale. I note that the 66th Street exit east of Bismarck is included in the presentation maps. I'm assuming because that is a potential interchange in the Beltway Plan. This is included but the 56th Ave NW west of Mandan, also a part of the Beltway Plan, apparently is not.

Begin forwarded message:

**From:** LEROY KLAPPRODT <[lklap@bis.midco.net](mailto:lklap@bis.midco.net)>  
**Subject:** Re: Public Input Meeting #2  
**Date:** March 5, 2014 at 2:22:58 PM CST  
**To:** Craig Vaughn <[cvaughn@srfconsulting.com](mailto:cvaughn@srfconsulting.com)>

Mr. Vaughn,

I looked through the meeting materials from your web site and didn't see anything on the potential interchange at 56th Ave NW west of Mandan. Did I miss it or is it not currently being considered? There appeared to be an interchange or something located to the west of the Sunset Interchange but I didn't find any details.

Thanks again.

Lee

On Mar 5, 2014, at 10:21 AM, Craig Vaughn <[cvaughn@srfconsulting.com](mailto:cvaughn@srfconsulting.com)> wrote:

Lee,

We will have the Open House meeting materials uploaded to the website this afternoon. Thanks for your continued interest in this project.

Craig

---

Craig Vaughn, PE (MN), PTOE  
Principal  
SRF Consulting Group, Inc.  
Direct: 763.249.6774 | Main: 763.475.0010  
[cvaughn@srfconsulting.com](mailto:cvaughn@srfconsulting.com)  
One Carlson Parkway North, Suite 150, Minneapolis, MN 55447-4443  
[www.srfconsulting.com](http://www.srfconsulting.com)

-----Original Message-----

From: LEROY KLAPPRODT [<mailto:lklap@bis.midco.net>]

Sent: Wednesday, March 05, 2014 10:13 AM

To: Craig Vaughn

Subject: Public Input Meeting #2

Dear Mr. Vaughn,

I was unable to attend the meeting held last night as I was out of town. This morning I found a public input form on your web site requesting opinions on alternatives presented at the meeting. I would love to provide input but I don't know what the alternatives entail. Is their information available that explains them? If so, how do I access it?

Thanks,  
Lee Klapprodt

## Craig Vaughn

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**From:** Judy <jcarlen60@gmail.com>  
**Sent:** Sunday, May 18, 2014 1:12 PM  
**To:** Craig Vaughn  
**Subject:** Re: I-94 Corridor Study - 66th Street Interchange Area Considerations

Thank you for the info Craig !!! Appreciate your time !!!

Sent from my iPhone

On May 18, 2014, at 12:32 PM, Craig Vaughn <[cvaughn@srfconsulting.com](mailto:cvaughn@srfconsulting.com)> wrote:

Judy,

The I-94 Corridor Study is a planning study that identified issues, needs, and potential roadway improvements to solve these problems. The 66th Street interchange scenarios are concepts at best right now; "what if" visualizations for potential designs. There is significant work (i.e., analysis, investigation, environmental review, design, right of way, etc.) that needs to be done to see either of these alternatives implemented. Therefore, at this point nothing is definitive. However, the planning work that has been conducted as part of this study does identify this 66th Street location as the most appropriate location for a future interchange and with that the public is made aware that something may occur. This provides additional background on next steps for a project in this location, but it does not give you an answer on how you should proceed with your private property; we cannot provide you with that answer.

I hope that you are able to come out to the third and final open house meeting we will have for the I-94 Corridor Study later this summer.

---

Craig Vaughn, PE (MN), PTOE  
Principal  
SRF Consulting Group, Inc.  
Direct: 763.249.6774 | Main: 763.475.0010  
[cvaughn@srfconsulting.com](mailto:cvaughn@srfconsulting.com)  
One Carlson Parkway North, Suite 150, Minneapolis, MN 55447-4443  
[www.srfconsulting.com](http://www.srfconsulting.com)  
<image001.jpg>

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**From:** Judy [<mailto:jcarlen60@gmail.com>]  
**Sent:** Monday, May 12, 2014 10:32 AM  
**To:** Craig Vaughn  
**Subject:** Re: I-94 Corridor Study - 66th Street Interchange Area Considerations

Hi Craig

Thank you for responding on this subject. I've looked at both concepts and if I'm looking at it correctly ..... It appears one concept will take huge section of our property including where our home is ? The other doesn't take much !? My question is : you say this project will go no further . What does this mean ? Our property is for sale and with that being said .. How do we go forward with no definite answers on

how much of our property will be left to purchase for potential buyers ?? We understand the money that is needed for this project one day but how can we move forward with our sale of property with out the rest of this puzzle piece ?!!

Thank you for your time !

Have a great day !

Judy

Sent from my iPhone

On May 11, 2014, at 12:30 PM, Craig Vaughn <[cvaughn@srfconsulting.com](mailto:cvaughn@srfconsulting.com)> wrote:

Hello Judy,

Ben Ehreth with the Bismarck-Mandan MPO forwarded your email message to me, which requested additional information regarding the potential 66th Street Interchange. As Ben pointed out, the project website contains the concept diagrams that are available for this area based on what has been studied, recommended and considered as part of the I-94 Corridor Study to date (see the attached 66th St Interchange Concepts). Beyond the concepts that are available for review and comment the I-94 Corridor Study is not going any further into project development, which would further outline or identify potential right-of-way impacts and project design details.

Hopefully this helps. We will have one final public outreach meeting in late June/early July for the project. I hope that you are able to attend; keep an eye for its notification in the local paper and on the project website or Facebook page.

---

Craig Vaughn, PE (MN), PTOE

Principal

SRF Consulting Group, Inc.

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[cvaughn@srfconsulting.com](mailto:cvaughn@srfconsulting.com)

One Carlson Parkway North, Suite 150, Minneapolis, MN 55447-4443

[www.srfconsulting.com](http://www.srfconsulting.com)

<image001.jpg>

<66th St Interchange Concepts.pdf>

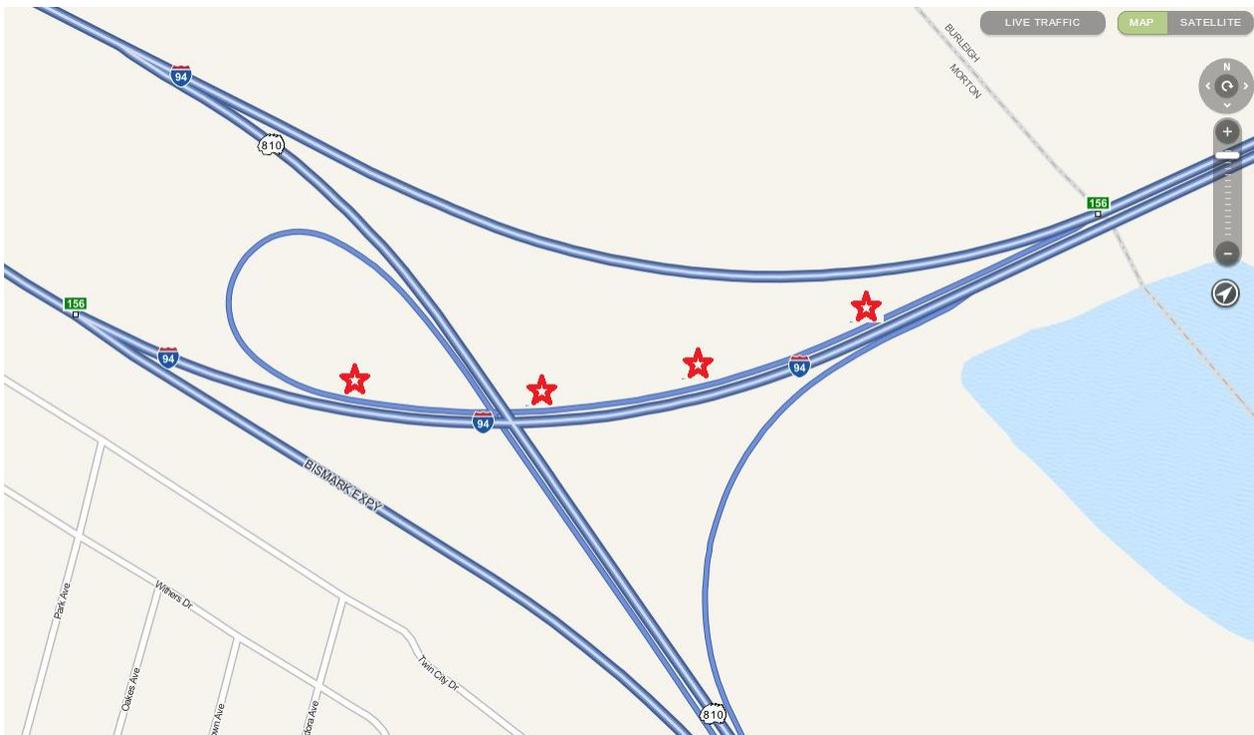
I drive from Bismarck to Mandan 5 days a week for work. The first thing I want to suggest. A new bridge north of Bismarck & Mandan cannot be built soon enough from my experience. From a 5 o'clock rush hour stand point, the number of vehicles going to and from the Mandan Ave. and State St. exits make it very challenging some days for myself to allow oncoming traffic onto I-94 and still allow myself time to get back into the same lane to find my off ramp at State st.. With the interstate I-94 nearing it's end of life soon I highly recommend that a new bridge be in place north of Bis/Man before work has to take place on the I-94 bridge. Most recent work done on or near the I-94 bridge the last few years really make for a lot of congestion. I'm surprised no one has not gotten hurt yet from those construction periods. And new bridge would help lighten the traffic on I-94. I also feel 3 lanes of traffic east and west bound is needed and may help. Especial with merging traffic at rush hour a lot of lane changing traffic and congestion at the 3 locations I'm pointing to below.



The I-94 east bound off ramp at Tyler Pkwy & Divide I recommend a longer off ramp even before the bridge and curve.



Drivers are suppose to and are expected to slow down from 60 to 20 by the time they get to the curve. There is so much traffic turning off at that ramp, plus some of the traffic is extra slow that I've seen several times where the traffic is actually backed up on I-94. I've experienced going from 60 miles per hour and coming to a complete stop on more than one occasion. I was afraid of rear-ending someone plus myself getting rear-ended at that time. Talk about being scared. 60 miles per hour to a complete stop happens fast. Longer off ramp there would definitely help. Plus giving drivers several speed signs (2 or 3) that would gradually step them down in speed on that ramp. Which is something that should be done on the west bound into Mandan's Memorial Hwy from Bismarck I-94. As shown below. The stars are where there should be signs placed to reduce drivers down in speed. Probably see a lot less drivers drive off the road.



The East Bound on ramp off I-94 to Mandan Ave. looking north, the I-94 Bridge creates a blind spot and is hard to see oncoming traffic from the north. It would be nice to see that exit extended to the south of the bridge or some way of seeing traffic.

Burnt Boat Dr. is a bottle neck for Divide traffic heading north. The divide turning lane, traffic on Divide heading north and west onto Burnt Boat Dr. is not big enough for the number car traffic required to turn at that hour for 5 o'clock rush hour. Somehow have to get a 2<sup>nd</sup> turn lane on to the west of Burnt Boat Dr. like at State St. onto Interstate ave. by Perkins.



Both turn lanes at States st. to allow traffic onto I-94 East and West bound have issues. The light to allow traffic onto I-94 west bound going north from State st. the light needs to turn quicker or more often. There's times that people trying to turn there get skipped and I've seen several people drive through red lights because it never seems like it's ever going to change green. From State St. heading south at the turn lane for I-94 east bound, during the day for each light change I bet an undercover city cop/Hwl patrol could pull over 1-2 vehicles 99% of the time for running a red light there. I've seen on average 2 – 3 go through a red light there. Number of problems. 1) Semi's are too slow to get through a quick light there. Creates others to drive through a red light following the semi's. 2) Too small of a turn lane again for the number of cars wanting to turn there. The average number of vehicles allowed through that light is too small. I understand the dilemma of also keeping traffic moving on state st. north and south bound however that bridge needs to be bigger to make those turn lanes work more smoothly or something else has to change.

Hope this helps Thanks Ryan

## Public Meeting for the I-94 Corridor Study

The Bismarck-Mandan Metropolitan Planning Organization (MPO) is conducting the **I-94 Corridor Study**. This study has identified current and future transportation issues along approximately 17 miles of I-94 from ND Highway 25 (in Morton County) on the west to 80<sup>th</sup> Street NE (in Burleigh County) on the east side of the study area and its crossing roadways. The I-94 Corridor Study was initiated to address concerns of increasing traffic volumes and projected increases to traffic volumes along this stretch of roadway. The study team has worked with a Project Steering Committee comprised of local agencies to analyze, assess, and develop improvements to address the identified issues. A public meeting is scheduled for July 7, 2014 to present the I-94 and crossing street improvements implementation plan. This is the final public involvement meeting for the I-94 Corridor Study.

The meeting will be conducted primarily as an open house with staff available to discuss the project, including all study components conducted throughout the study process. There will be a presentation at 6:00 p.m., after which the informal discussion can continue with staff and officials from the respective governing agencies and consultant team. Information and graphics will be displayed outlining work done to date. The implementation plan has been approved by the Project Steering Committee, and is being presented to the public for informational purposes. Your feedback continues to be valuable at this stage of final documentation.

### Meeting Information

Date: July 7, 2014

Time: 5:30 p.m. -7:00 p.m.

Location: Tom Baker Room  
City/County Building  
221 North 5th Street  
Bismarck, ND

For more information call:  
Steve Saunders, Transportation Planner  
701-355-1840  
Bismarck-Mandan MPO

Project Website and Social Media  
I-94 Corridor Study  
[www.bis-manI94study.com](http://www.bis-manI94study.com)  
[www.facebook.com/BisManI94Study](https://www.facebook.com/BisManI94Study)

The MPO's public participation process is being followed within this notice. The public meeting facilities are accessible to mobility impaired individuals. For individuals requiring special needs related but not limited to, hearing or visual impairment, or language interpretive services, please contact MPO staff at (701) 355-1840.

**SIGN-IN SHEET**

North Dakota Department of Transportation, Civil Rights Division  
 SFN 59531 (Rev. 03-2012)

*was Meeting*  
*ADA accessible? → Yes*

Division/District/Consultant BisMan MPO / SRF Consulting Group
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Meeting Location City / County Building	Meeting Type Public Open House	Meeting Date 7/7/2014
Project Number		PCN
Project Description Bismarck-Mandan I-94 Corridor Study		

Name (Please print) Sherwin Wanner		Title/Representing Houston Engineering	
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Name (Please print) CRAIG VAUGHAN		Title/Representing SRF CONSULTING	
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City	State	Zip code	Email

Name (Please print) Todd Polun		Title/Representing SRF	
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City	State	Zip code	Email

Name (Please print) <sup>Judy</sup> LOREN DELWITZ		Title/Representing	
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City BISMARCK	State ND	Zip code 58503	Email

Name (Please print) Cedric Theel		Title/Representing Cedric Theel TOYOTA	
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**SIGN-IN SHEET**

North Dakota Department of Transportation, Civil Rights Division  
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Division/District/Consultant BisMan MPO / SRF Consulting Group
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Meeting Location City / County Building	Meeting Type Public Open House	Meeting Date 7/7/2014
Project Number		PCN
Project Description Bismarck-Mandan I-94 Corridor Study		

Name (Please print) Rob Weyer		Title/Representing Home Owner / Cheyenne	
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Name (Please print) Bill Daniel		Title/Representing Daniel Companies - Scott & Judy Girda	
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City Bismarck	State ND	Zip code 58503	Email Bill@DanielCompanies.com

Name (Please print) Zac Smith		Title/Representing Bismarck-Mandan Chamber	
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Name (Please print) Mike Seminary		Title/Representing Self	
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City Bis	State ND	Zip code 58503	Email

**SIGN-IN SHEET**

North Dakota Department of Transportation, Civil Rights Division  
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Meeting Location City / County Building	Meeting Type Public Open House	Meeting Date 7/7/2014
Project Number		PCN
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Name (Please print) MEL BULLINGER	Title/Representing CITY OF BISMARCK ENGINEERING		
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Name (Please print) Bob Swanson	Title/Representing		
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City Dickinson	State ND	Zip code	Email

18

Name (Please print) Rachel Drewlow	Title/Representing MPO		
Address			
City Bismarck	State	Zip code	Email

Name (Please print)	Title/Representing		
Address			
City	State	Zip code	Email

Name (Please print)	Title/Representing		
Address			
City	State	Zip code	Email

Name (Please print)	Title/Representing		
Address			
City	State	Zip code	Email

Name (Please print)	Title/Representing		
Address			
City	State	Zip code	Email