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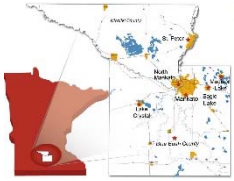

Mankato/North Mankato Area Planning Organization

Belgrade Avenue Corridor Study

Final Report

July 2017

Submitted by:
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I. EXECUTIVE SUMMARY

Introduction

The Mankato/North Mankato Area Planning Organization (MAPO) and the City of North Mankato, in partnership with the Minnesota Department of Transportation (MnDOT), completed this study to identify a long-term vision for multimodal improvements on Belgrade Avenue in North Mankato. The study extent includes Belgrade Avenue from Lee Boulevard on the west to the Veteran's Memorial Bridge on the east (**Figure 1**). Unless otherwise present in the study, report figures are included in **Appendix A**.

The Belgrade Avenue corridor has served the City of North Mankato as the central corridor of the downtown business district since before the City was incorporated in 1899. It provides the gateway to the City from US Trunk Highway (TH) 169 and the City of Mankato to the east.

The City has demonstrated a commitment to enhancing the quality of downtown through planning efforts and public outreach. The most recent effort, the Belgrade Avenue Master Plan, ran concurrently with this effort.

Study Partners

The Belgrade Avenue Corridor Study was a joint effort between

- The City of North Mankato
- MAPO
- MnDOT

Study Objectives

The study defines a comprehensive vision for Belgrade Avenue to continue momentum in the corridor fostering continued growth and mobility needs over the next 25 years. The corridor study process included the following elements:

- Understand the needs and opportunities in the corridor
- Develop and evaluate potential transportation improvement alternatives
- Gather public and business input on corridor needs and improvement alternatives
- Develop an implementation plan that prioritizes projects for completion over time

Coordination with the Belgrade Avenue Master Plan

The City of North Mankato initiated the Belgrade Avenue Master Plan in 2015 to achieve a framework for investment in the Central Business District and a shared vision for its future by the City, citizens and property owners in the area. Many consistent themes related to transportation needs emerged from the public and stakeholders during the plan's initial phases. As a result, the City of North Mankato requested MAPO fund a study of Belgrade Avenue to identify transportation issues and potential improvement solutions that could be considered and woven into the Belgrade Avenue Master Plan process.

Issues Identification

Improvement alternatives were identified and evaluated based on the existing conditions analysis and issues and needs identified through public, agency and stakeholder involvement. The following describes alternatives studied for the Belgrade Avenue corridor.

A. Focus Area 1: Lee Boulevard Intersection

The primary issue in this focus area is the delay on Belgrade Avenue for westbound traffic entering Lee Boulevard southbound. Under existing (2016) conditions, the westbound approach to Lee Boulevard exhibits traffic delay below acceptable standards during both the AM and PM peak hour periods.

B. Focus Area 2: Nicollet Avenue to Lake Street

The primary issue in this segment is a gap in the bicycle network between Nicollet Avenue and Lake Street along Belgrade Avenue. Both Nicollet Avenue and Lake Street have sharrows indicating their service as on-street bike routes in the community. Generally, there are no bicycle facilities planned along Belgrade Avenue due to the parallel route along Nicollet Avenue, however, completing this gap is necessary to create a more complete network.

C. Focus Area 3: Intersections between Lake Street and Range Street

The primary issue in this segment is a crash issue at Sherman Street. Two of the six crashes that occurred at this intersection between 2010 and 2014 involved pedestrians. The Sherman Street intersection exhibited serious injury crashes outside of the normal range for this intersection type. This is concerning as Sherman Street is designated and signed as a bicycle route and serves pedestrians by providing access to Spring Lake Park north of Belgrade Avenue.

D. Focus Area 4: 200 Block (Range Street to the TH 169 Southbound Ramp)

Issues in this segment include:

- Back-ups on Belgrade Avenue at Range Street – Traffic currently back-ups at the Range Street/Belgrade Avenue intersection during the PM peak hour.
- Traffic speeds in the 200 Block – The speed of traffic is a concern within the 200 Block of Belgrade Avenue. Citizens and business owners have expressed that vehicles travel too fast within this area causing issues for pedestrian movements from the north to the south side of the street.
- Safe Pedestrian Crossings in the 200 Block – There is a demand for pedestrian crossings at the Range Street intersection with Belgrade Avenue as well as mid-block in the 200 Block for patrons parking in public lots north of Belgrade Avenue and visiting businesses on the south side.
- Several property access locations closely spaced – Multiple access points exist within close proximity in the 200 Block of Belgrade Avenue. This is particularly true along the north side of the roadway where six accesses are located within roughly 500 feet. These access locations can be problematic for vehicles and pedestrians.
- Perceived Parking shortage – The Downtown Planning Study (2012) quantified available public and private parking facilities within the downtown area and found a parking shortage is perceived, but actual supply is generally sufficient for existing uses at most times. However, the location of facilities and proximity to businesses may contribute to perceptions that the area is underserved.

E. Focus Area 5: TH 169 Southbound Ramp Intersection

There are no traffic operational issues at this location today or projected into the future. However, this intersection provides the gateway to downtown North Mankato and is the primary location where speeds into the 200 Block are perceived as excessive.

Recommendations and Implementation Plan

Some of the improvements identified in this study are directly related to existing and/or safety issues on Belgrade Avenue. Others are related to an opportunity to enhance Belgrade Avenue for both motorized and non-motorized uses consistent with the Belgrade Avenue Master Plan. Study recommendations are organized into an implementation sequence for the City's consideration. This will allow the City to take incremental steps over time, ultimately working towards a corridor that operates safely and efficiently and compliments their downtown vision.

Next Steps

Additional design, studies and public input will be needed for each of the recommended improvement options to move forward. The purpose of the Belgrade Avenue Corridor Study was to develop a long-term plan for improvements to Belgrade Avenue that are consistent with the goals and objectives of both the City's Comprehensive Plan and the Belgrade Avenue Master Plan. The concepts developed as part of this study are high-level and will need additional refinement through preliminary and final design. Environmental review and permitting will also be required with exact requirements based on the scope of the project and the funding source.

The improvement options identified within this study and the projects prioritized as part of the implementation plan will help the City of North Mankato continue to maintain a functioning yet safe minor arterial roadway that supports their downtown vision.

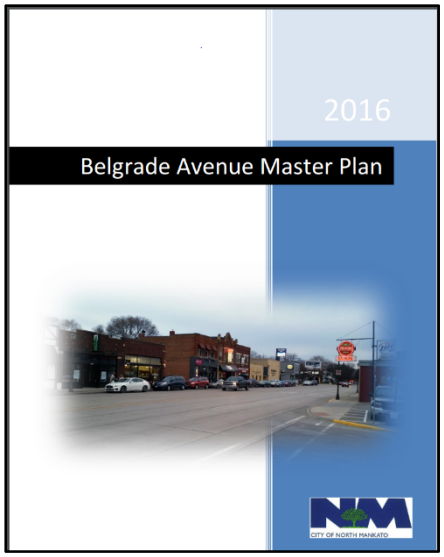
The City should work to further plan, obtain funding, design, and implement the recommended improvement projects. All partners have an active role in implementing these improvements. All competitive funding sources should be considered. Agencies should also update or amend their comprehensive and transportation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

II. INTRODUCTION

The Mankato/North Mankato Area Planning Organization (MAPO) and the City of North Mankato, in partnership with the Minnesota Department of Transportation (MnDOT), completed this study to identify a long-term vision for multimodal improvements on Belgrade Avenue in North Mankato. The study extent includes Belgrade Avenue from Lee Boulevard on the west to the Veterean's Memorial Bridge on the east (**Figure 1**). Unless otherwise present in the study, report figures are included in **Appendix A**.

The Belgrade Avenue corridor has served the City of North Mankato as the central corridor of the downtown business district since before the City was incorporated in 1899. It provides the gateway to the City from US Trunk Highway (TH) 169 and the City of Mankato to the east. The corridor contains a variety of business types serving as the commercial core of the City with various residential densities mixed in.

The City has demonstrated a commitment to enhancing the quality of downtown through planning efforts and public outreach. Previous plans include the North Mankato Comprehensive Plan (2015) with a dedicated chapter for downtown redevelopment as well as the Downtown Planning Study (2012) aimed at guiding future development and shaping the character of the downtown.



Another planning effort that ran concurrently with this effort was the Belgrade Avenue Master Plan which serves to achieve a framework for investment in the Central Business District and a shared vision of the future of the Central Business District by the City, citizens and property owners in the downtown area. The City's planning process for the Belgrade Avenue Master Plan began prior to the Belgrade Avenue Corridor Study and was a catalyst in the MAPO's decision to fund the study. The City and MAPO saw the opportunity to build on the momentum of the Master Plan effort, utilizing the same steering committee and combining public information meetings.

Consistent themes for the corridor within previous plans are to improve pedestrian facilities and streetscape appearance, reduce the speed of traffic in the 200 Block, enhance pedestrian safety, identify and address parking deficiencies, and encourage and promote renovation and rehabilitation of the existing buildings.

Due to the demonstrated commitment from the City to improve this area, the Belgrade Avenue Corridor Study was identified as a priority in the MAPO 2045 Long Range Transportation Plan. The City of North Mankato agreed that the timing was right to pursue this study which was funded through the MAPO.

The study defines a comprehensive vision for Belgrade Avenue to continue momentum in the corridor fostering continued growth and mobility needs over the next 25 years. The corridor study process included the following elements:

- Understand the needs and opportunities in the corridor
- Develop and evaluate potential transportation improvement alternatives
- Gather public and business input on corridor needs and improvement alternatives
- Develop an implementation plan that prioritizes projects for completion over time

Belgrade Avenue Corridor Study

Mankato/North Mankato Area Planning Organization

Study Corridor

July, 2016

Legend

- Corridor
- Central Business District (CBD)
- Parks
- City Buildings

0 0.1 Miles

Source: Mankato/North Mankato Area Planning Organization, City of North Mankato, ESRI

Map Document: \\Arcserver1\gis\MAPO_MUIT\42111862\ESRI\Maps\Belgrade - Basemap.mxd
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III. STUDY PARTNERS

The Belgrade Avenue Corridor Study was a joint effort between:

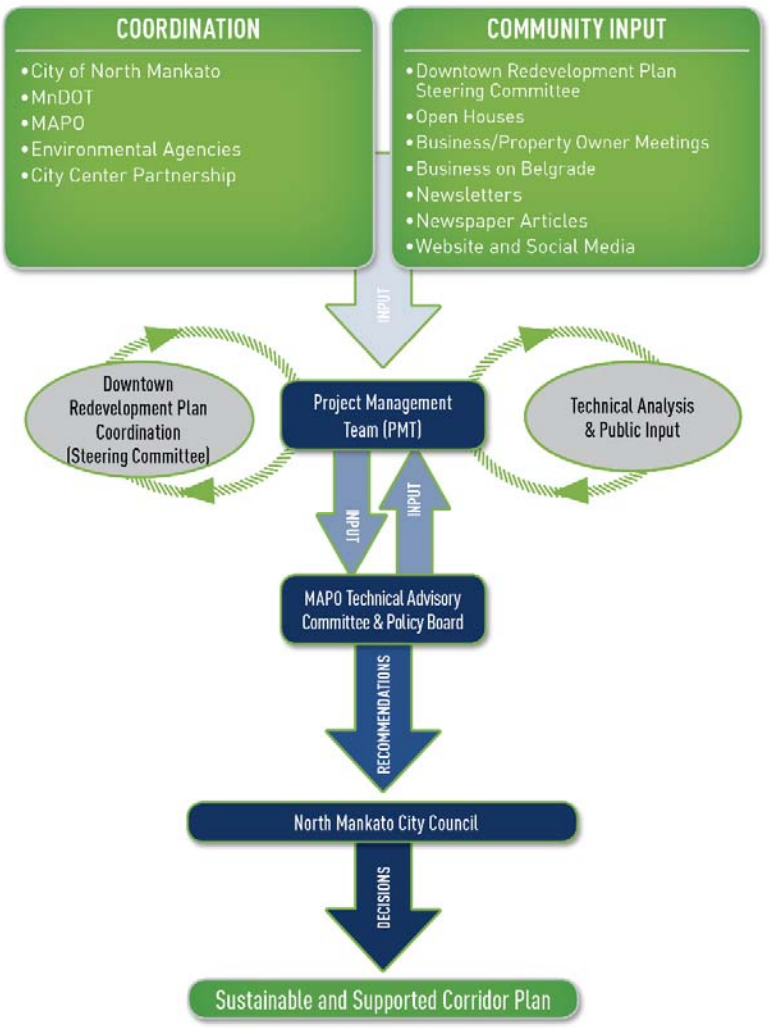
- The City of North Mankato
- MAPO
- MnDOT

These agencies served as a Project Management Team (PMT) and met monthly throughout the study process to review and discuss study progress and technical deliverables.

IV. PUBLIC INVOLVEMENT

Public involvement was an integral part of the Belgrade Avenue Corridor Study. Input from business owners, property owners, interested citizens, elected officials and other corridor users was critical to understand issues and needs and to vet improvement concepts and priorities. **Figure 2** outlines the different groups, outreach activities, and their interaction and roles in the overall study's decision-making process.

Figure 2. Public Involvement



The following methods were used to promote public involvement during the study:

- *Public Informational Open House Meetings* – A public open house meeting was held on January 26, 2017 to communicate to the public study goals and solicit input on improvement alternatives for identified for consideration. This meeting was repeated on January 28, 2017 to allow those unable to attend the first round an opportunity to offer their input. These meetings combined the Belgrade Avenue Corridor Study as well as the Belgrade Avenue Master Plan efforts, soliciting feedback on both. A summary of these meetings is included in **Appendix B**.
- *Property/Business Owner Meetings* – Project Staff met with five businesses on a one-on-one basis early in the issues identification process of the study. Businesses included:
    - Brunton Architects
    - Nakato
    - Dino's
    - Expressway Gas Station/CENEX
    - Frandsen Bank & Trust

  Property/Business Owner meeting summaries are included in **Appendix C**.
- *Buiness On Belgrade (BOB) Group Meetings* – Two meetings were held with the Business on Belgrade (BoB) Group on February 28th and March 2nd of 2017. The meetings were held to solicit feedback from the BoB group as business owner turnout was low at the January open house meetings. Eleven members total from the group attended the February/March meetings. BoB Group meeting summaries can be seen in **Appendix D**.
- *Agency and Elected Official Updates* - Meetings were held with agencies and elected officials to review the range of alternatives generated from this study. These included a North Mankato City Council meeting and meetings with MnDOT District 7 representatives.
- *MAPO Updates* – Project staff provided an update to the MAPO Policy Board in February and May 2017 and the MAPO Technical Advisory Committee (TAC) in July 2016 and another in January 2017.
- *Steering Committee Meetings* – A Steering Committee consisting of 18 interested citizens, stakeholders, and business representatives met three times throughout the study process. This group provided review of study initiatives and input on the generation of study materials throughout the study process. They also assisted with public and property/business representative meetings. Steering Committee meeting summaries can be seen in **Appendix E**.
- *Study Communications* – Bolton & Menk, Inc. hosted a project website for the Belgrade Avenue Corridor Study throughout the entire process. Study documents, concept alternatives and public involvement notices were posted on the website at key study milestones. Newsletters were prepared for each public information meeting and sent to stakeholders along Belgrade Avneue and a press release was also included in the Mankato Free Press Newspaper as notice to the community. A public comment web application was also hosted on the project website as well as the City's site to solicit public feedback as well. The results of the public comment web application can be seen in **Appendix F**.

V. COORDINATION WITH THE BELGRADE AVENUE MASTER PLAN

The City of North Mankato initiated the Belgrade Avenue Master Plan in 2015 to achieve a framework for investment in the Central Business District and a shared vision for its future by the City, citizens and property owners in the area. Although the City's planning process for the Belgrade Avenue Master Plan began prior to the Belgrade Avenue Corridor Study, many consistent themes related to transportation needs emerged from the public and stakeholders during the plan's initial phases. Many of these themes had also been identified in previous planning studies in the downtown area. As a result, the City of North Mankato requested MAPO fund a study of Belgrade Avenue to identify transportation issues and potential improvement solutions that could be considered and woven into the Belgrade Avenue Master Plan process.

The merging of these two planning efforts officially began in September 2016 when the Beglrade Avenue Corridor Study held the first Steering Committee meeting. The Steering Committee used for the corridor study was the same committee used for the master plan. In addition, the public open houses and business owner meetings held later in the corridor study also brought in content and recommendations of the Master Plan.

The vision for the Belgrade Avenue Master Plan was developed by terms used to describe an ideal future Central Business District by participants in the public process and is as follows:

> *The North Mankato Central Business District is a growing and safe district characterized by cohesive architectural design, pedestrian friendly streetscapes, and new destinations all contributing to a beautiful, thriving, and inviting area and serving as the core for community convention.*

The Master Plan is guided by goals directly from the community's Comprehensive Plan. Goal 2 from Chapter 9 – Downtown Redevelopment shows a desire to *"Create a safe and inviting pedestrian realm"* in the Central Business District. Consistent themes for the Belgrade Avenue corridor derived from public and stakeholder input during the Master Plan and recent planning efforts were to improve pedestrian facilities and streetscape appearance, reduce the speed of traffic in the 200 Block, enhance pedestrian safety, identify and address parking deficiencies, and encourage and promote renovation and rehabilitation of the existing buildings.

Themes consistent among stakeholders and citizens in past Central Business District planning efforts:

- *Improve pedestrian facilities and streetscape appearance*
- *Reduce the speed of traffic in the 200 Block*
- *Enhance pedestrian safety*
- *Identify and address parking deficiencies*
- *Encourage and promote renovation and rehabilitation of existing buildings*

The Belgrade Avenue Master Plan identifies a plan for 5, 10, and 20-year improvement implementation. Key transportation implementation initiatives identified in the Master Plan include the employment of traffic calming strategies, and streetscaping and pedestrian improvements to create a more inviting destination for public gathering.

The Belgrade Avenue Master Plan is meant to work in unison with the Belgrade Avenue Corridor Study to achieve a framework to implement this future vision. These efforts should be consulted together to inform decision-making for the future of the Central Business District.

VI. EXISTING CONDITIONS

This section documents existing conditions on Belgrade Avenue as it relates to land use, previous studies, traffic operations, safety, access, pedestrian/bicycle accommodations and environmental resources. This information serves as the framework to develop improvement options for Belgrade Avenue.

A. Previous Studies Overview

Several short and long-range documents have been completed which provide planning direction for future transportation system needs within and near the Belgrade Avenue corridor. The key points in each study relevant to Belgrade Avenue are summarized below by plan title.

Mankato/North Mankato Area Planning Organization (MAPO) 2045 Long-Range Transportation Plan (LRTP) (2015)

- Belgrade Avenue is a minor arterial roadway under the MAPO's existing functional classification system
- Forecasted 2045 Congested Roadway Segments:
    - Lee Boulevard - Lor Ray Drive to Belgrade Avenue; LOS F[1]; 1.27 V/C ratio
    - Belgrade Avenue - Lee Boulevard to Range Street; LOS E; .96 V/C ratio
- Future projects:
    - Restripe Belgrade Avenue from Center Street to Range Street as a 3-lane facility (2021-2025 timeframe)
    - Reconstruct Lee Boulevard from Lookout Drive to Belgrade Avenue as a 3-lane (2021-2025 timeframe)
    - Reconstruct Belgrade as 2-lane from Lee Boulevard to Range Street (2031-2045 timeframe)
    - Reconstruct Belgrade as 4-lane from Range Street to TH 169 (2031-2045 timeframe)
    - Expand Lee Boulevard to a 4-lane roadway from Lor Ray Drive to Belgrade Avenue (illustrative project)
    - Need for an Intersection Control Evaluation on Lee Boulevard at Belgrade Avenue (2021-2025 timeframe)

City of North Mankato Complete Streets Plan & Policy (2016)

- Proposed on-street bicycle accommodations chart which includes Lee Boulevard from Lookout Drive to Hoover Drive and Range Street from Nicollet Avenue to McKinley Street

North Mankato Comprehensive Plan (2015)

- Highlights the Central Business District as a development style common among other older downtowns with features such as being pedestrian oriented, on-street parking, and the preferred location for prominent community events
- Central Business District is the community focal point and plans for its continued momentum by:
    - Creating an attractive gateway to downtown off TH 169 through streetscape

[1] Level of Service (LOS) is defined on page 13 of this document and is a measure of intersection delay.

improvements and design standards

  - Implement land use standards that emphasize walkability (i.e., rear parking at businesses, wider sidewalks with no obstructions, unique streetscape methods)
  - References the Downtown Planning Study (2011) which found a "perceived shortage of parking" yet the supply is generally sufficient for the existing uses during the day

- Roadway design should consider the user friendliness of alternative modes of transportation while preserving on-street parking where feasible

The City of North Mankato Parks Master Plan (2015)

- Identifies Centennial Park, a 1 Acre Commemorative Park located at 840 Belgrade Avenue with a decorative water fountain and benches

City of North Mankato Downtown Planning Study (2012)

- Rates vehicular circulation as "generally good" but during peak traffic hours (7:45 – 8:15 AM and 4:45 – 5:15 PM), negotiating a turn at mid-block is difficult and parallel parking on Belgrade is problematic
- Recommends additional pedestrian access and circulation to promote pedestrian traffic to businesses across the street from each other in the 200 block
- Identified the following parking/traffic/pedestrian concerns from a July 26, 2011 public meeting:
  - More parking near businesses
  - Wheel stops to keep parked cars off of sidewalks
  - Manage traffic coming over the bridge and vehicles leaving businesses
  - Better public transportation service
  - Parking is a priority for future development efforts in the downtown
- Implies that the parking issue is a perceived inconvenience due to a lack of visibility of existing parking stalls on the 200 block of Belgrade Avenue and on Nicollet Avenue
- Recommends providing signage for patron and public parking and possibly asking the city to provide a single page flyer for businesses to distribute to show downtown parking options
- Recommends creating gathering spaces/opens spaces/green spaces/pathways that include amenities such as bike racks outdoor seating/benches and routes that tie into nearby parks and trails
- Recommends improving connectivity to Belgrade Avenue over Veterans' Memorial Bridge and beyond to Wheeler Park, City Hall, Taylor Library and Centennial Park

Downtown Focus Group (2010)

- Recommends a more attractive entrance to the downtown off Veterans' Memorial Bridge
- Recommends pedestrian, bicycle, family friendly and handicap accessible pathways
- Recommends lighting improvements on Belgrade Avenue
- Recommends slowing vehicular traffic coming over the bridge onto Belgrade Avenue

- Recommends reconfiguring the four-lane stretch of Belgrade to help increase pedestrian traffic
- Recommends adding signage indicating the location of parking

Belgrade Avenue Master Plan (2017)

- Identifies future redevelopment efforts at key intersections in the Central Business District along Belgrade Avenue to include two to three story multi-use buildings
- A steering committee of 27 members was assembled in early 2016 to assist with guiding planning efforts
- Plan adoption is anticipated in December 2016

B. Demographics And Trends

Located in south central Minnesota, the Mankato/North Mankato metropolitan planning area is 75 miles south of Minneapolis-St. Paul at the junction of US Trunk Highway (TH) 14 and TH 169. The area has experienced widespread growth across the metropolitan area and serves southern Minnesota as a hub for health care, education, retail, agriculture, and industry. The area is comprised of Mankato, North Mankato, Eagle Lake and Skyline; Blue Earth and Nicollet counties; and Belgrade, Lime, South Bend, LeRay and Mankato townships.

Population

The Mankato/North Mankato area has seen rapid growth. In 2010, the metropolitan statistical area (MSA) population was 96,740 with an urbanized population of 58,265. The 2010 population estimate represents a 12.9% change from the year 2000 for the MSA. **Table 1** illustrates historic population figures referenced from the Mankato/North Mankato Metropolitan Planning Organization's (MAPO) 2045 Long Range Transportation Plan.

	1980 CENSUS	1990 CENSUS	2000 CENSUS	% CHANGE 1990-2000	2010 CENSUS	% CHANGE 2000-2010	2015 ESTIMATE
North Mankato	9,145	10,164	11,798	16.1%	13,394	13.5%	13,529
MSA	79,243	82,120	85,712	4.4%	96,740	12.9%	99,134

Table 1. 1980 – 2010 Historic Population

(*Source*: US Census Bureau; Minnesota State Demographer (Mankato Area Housing Study Update, 2013; MAPO 2045 Long Range Transportation Plan.)

Age

The population's age distribution (**Table 2**) is important as it effects transportation usage. Within the period from 2000 to 2010, 18-34 year olds as well as those of retirement age saw the highest increases in populations indicating increased commuters and dial-a-ride transit users. Retirees exhibited the greatest increase in population while 18-20 year olds represented the largest demographic group. With a large 18-20 year old group, the area may see a higher demand for pedestrian and bicycle amenities.

	MSA		
AGE	2000	2010	CHANGE
0-9	9,869	11,466	1,597
10-17	9,447	8,298	(1,149)
18-20	17,249	19,606	2,357
25-34	10,460	13,342	2,882
35-44	11,879	10,009	(1,870)
45-54	10,640	12,129	1,489
55-64	6,161	10,411	4,250
65-74	4,785	5,627	842
75-84	3,649	3,867	218
85+	1,573	1,985	412
Total	**85,712**	**96,740**	**11,028**

Table 2. Population by Age

(*Source*: US Census Bureau; MAPO 2040 Long Range Transportation Plan)

Employment

Most household trips include travel to and from places of employment. Mankato and North Mankato are the major employment centers for the region with a labor shed spanning 16 counties. There is a net inflow of primary jobs in the MAPO market area

meaning there are more jobs in the market than people living in the market area. Almost 72 percent of labor force living in the market area also work there.

C. Transportation System Characteristics

Functional Classification

The functional classification system is used to create a roadway network that efficiently collects and distributes traffic from neighborhoods to the state highway system. A successful system coordinates and manages mobility, roadway design, and route alignment as well as seeks to match current and future access and land use with the adjacent roadway's purpose, speeds, and spacing. Functional classifications are comprised of principal arterials, minor arterials, major and minor collectors, and local roadways.

Belgrade Avenue serves is a minor arterial roadway spanning from Veterans' Memorial Bridge and the TH 169 Interchange to Lee Boulevard. It serves a diverse mix of personal vehicle, freight, transit, bicycle, and pedestrian traffic. It also bisects North Mankato's downtown Central Business District. From a regional perspective, mobility on Belgrade Avenue is important, as it provides connections to other minor arterial roadways such as Lee , Range Street and the Veterans Memorial Bridge which provide access to other portions of North Mankato and across the river into Mankato.

Existing Number of Lanes

Belgrade Avenue is a two lane undivided roadway from Lee Boulevard to Range Street with westbound right turn lanes at Lee Boulevard and Center Street; four lane undivided roadway from Range Street to Nicollet Avenue; and a four lane divided roadway from Nicollet Avenue to the TH 169 interchange ramps. The intersections of Belgrade Avenue at the TH 169 interchange ramps are signalized. The intersections of Belgrade at Range Street and Center Street are all way stop controlled. Belgrade Avenue at Sherman Street and Belgrade Avenue at Lake Street are side street stop controlled with Belgrade Avenue having the right of way. The intersection of Belgrade Ave at Lee Boulevard is side street stop controlled with Lee Boulevard having the right of way.

Parking Accommodations

Belgrade Avenue permits on-street parking within the Central Business District and westward towards Lee Boulevard. In addition, on-street parking is permitted on adjacent streets and off-street public, private, and private-shared parking is permitted at select businesses along Belgrade Avenue. A parking assessment reveals a total of 273 public parking spaces, 286 private parking spaces, and 211 private-shared parking spaces in the Central Business District of the study area (200 – 500 Block of Belgrade). The parking assessment took into account on-street parking resources along side streets intersecting Belgrade Avenue extending north and south to the next street. On Belgrade Avenue in the Central Business District, 34 public parking spaces are on the north side of the roadway and 58 spaces are on the south side. More information can be seen in the Parking Assessment map in the appendix.

D. Study Area Characteristics

This section contains existing conditions of Belgrade Avenue related to land use, traffic operations, crash history, roadway access, transit, and pedestrian and bicycle connections.

Several Figures are appended to this document relating to the existing characteristics described within the study area in the text below. Refer to **Appendix A** for the following existing conditions graphics:

- Figure A.1 - Land Use
- Figure A.2 - Traffic Operations

- Figure A.3 - Crash History
- Figure A.4 - Access Inventory
- Figure A.5 - Existing Pedestrian and Bicycle Accommodations
- Figure A.6 - Transit
- Figure A.7 - Parking Assessment

A detailed Existing Traffic Conditions Technical Memorandum is attached in **Appendix G** which documents the traffic data collection, methodology and additional details on existing conditions analysis summarized in the sections below.

Land Use

Land uses along the study corridor consist of general commercial, high density residential, and low density residential within the Central Business District. Beyond the Central Business District, uses consist of predominately low density residential and institutional centers. Open spaces/parks are located north of the study corridor west of Lake Street. The eastern terminus of the study corridor is the TH 169 interchange and the western terminus is Lee Boulevard. Intersections where potential redevelopment may occur according to the Belgrade Avenue Master Plan are indicated. Major traffic generators along Belgrade Avenue include Cenex gas station, Frandsen, US Postal Office, multiple dining establishments, Belgrade Avenue United Methodist Church, Taylor Library and the City of North Mankato City Hall and Police Annex.

Traffic Operations

Approximately 21,500 vehicles per day currently use the Veterans Memorial Bridge. Approximately 9,800 vehicles per day continue onto Belgrade Avenue between the TH 169 west off ramp intersection and Range Street. There are 7,200 vehicles per day from Center Street to Sherman Street, and 6,700 vehicles from Cornelia Street to Lee Boulevard.

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

Table 3 shows all of the intersections along the study corridor are operating at generally acceptable levels of service. However, the individual movement of westbound to southbound at the Lee Boulevard intersection is operating at a LOS E/D during the AM and PM peak hours, respectively. Queues, or back-ups for the westbound left at the Range Street intersection with Belgrade Avenue, were observed extending beyond the American Legion driveway and the Frandsen Bank driveway during the PM peak hour periods. A copy of the Existing Traffic Conditions Technical Memorandum is included in **Appendix G**.

Table 3. Existing (2016) Traffic Operations Analysis

Traffic Control Scenario	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft) ****
NB TH 169 Ramp at Belgrade Ave *Signalized Intersection*	AM	4	A	14	B	NBL	WBT	44	109
	PM	5	A	16	B	NBL	WBT	99	190
SB TH 169 Ramp at Belgrade Ave *Signalized Intersection*	AM	11	B	21	C	SBL	WBL	72	129
	PM	11	B	25	C	SBL	WBL	123	225
Range St at Belgrade Ave *All-Way Stop Controlled*	AM	7	A	9	A	EBT	EBL/T	45	71
	PM	8	A	10	B	WBL/EBT	WBL	83	145
Center St at Belgrade Ave *All-Way Stop Controlled*	AM	7	A	9	A	WBT	EBL/T	41	74
	PM	8	A	10	A	WBT	WBT	54	86
Sherman St at Belgrade Ave *Side-Street Stop Controlled*	AM	3	A	8	A	SBT	SBL/T/R	38	62
	PM	3	A	9	A	SBL	SBL/T/R	35	60
Lake St at Belgrade Ave *Side-Street Stop Controlled*	AM	2	A	6	A	SBL	SBL/R	23	43
	PM	2	A	8	A	SBL	EBL/T	17	50
Lee Blvd at Belgrade Ave *Side-Street Stop Controlled*	AM	4	A	40	E	WBL	SBL	38	93
	PM	4	A	25	D	WBL	SBL	45	97

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay approach.

****Max Queue refers to the 95% Queue (Passenger car stored length = 25 ft, Heavy vehicle stored length = 45 ft)

Crash History 2010 to 2014

A crash review was completed using the Minnesota Crash Mapping Analysis Tool (MnCMAT) which identified 42 crashes on Belgrade Avenue between Lee Boulevard and the west TH 169 interchange ramp within a five-year period from 2010 to 2014. MnDOT uses a comparison of the crash rate and the critical rate when determining whether or not safety issues exist at an intersection. The crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside of the expected, normal range. The critical index reports the magnitude of this difference and a critical index of less than one shows that the intersection is operating within the normal range.

Most intersections in this segment exhibit crash counts within a normal range during the five-year period. The Sherman Street intersection exhibited serious injury crashes outside of the normal range for this intersection type. Six crashes occurred in this location within the 5-year period, two of these involved a pedestrian.

Access Inventory

There are 55 access points in this segment including six primary accesses (6 per mile), seven secondary accesses (7 per mile), and 42 private accesses (40 per mile). Both primary and secondary access counts fall below MAPO's recommendations for 9 to 19 accesses per mile along minor arterial roadways.

Pedestrian and Bicycle Accommodations

Sidewalks are present along both sides of the study corridor from Lee Boulevard to the TH 169 interchange. There are no bicycle facilities along Belgrade Avenue, however, two on-road bike routes intersect Belgrade Ave at Sherman Street. and Center Street. An on-road bike route exists on Lake St. from its intersection with Belgrade Ave. north to the recent trail addition on TH 14. In addition, an on-road bike route extends along Nicollet Avenue from its western intersection with Belgrade Avenue to its eastern intersection with Belgrade Avenue.

and continues east to join the Rex Macbeth River Trail.

There are a few high demand pedestrian crossing locations along Belgrade Avenue. The Wall Street intersection allows pedestrians' access from public parking lots access to Circle Inn, Dino's Pizzeria, and Like-Nu Cleaners. The Range Street intersection accommodates a high volume of pedestrians accessing the American Legion, Frandsen Bank, NaKato Bar & Grill, and Spinners Bar. The Center Street intersection provides an on-street bike path encouraging bicycle access across Belgrade Avenue to BellTower Apartments, Wheels Unlimited, and Benderz Bar and Grill. The Sherman Street intersection provides an on-street bike path encouraging bicycle access across Belgrade Avenue to Belgrade Avenue United Methodists Church. Pedestrian crossings exist at both intersections as well.

Transit Routes

Two routes of the Mankato Area Transit System pass through the study corridor. Bus stops are located at the intersections of Belgrade Avenue with Nicollet Avenue, Sherman Street, Center Street, Range Street.

Environmental Considerations - Social, Economic, and Environmental (SEE) Concerns

A high-level environmental screening using publicly available GIS datasets was conducted to identify any potential environmental resources within the study area as future roadway improvements were considered. No fatal flaws to roadway improvements were identified within the study area as part of this preliminary screening. Additional formal environmental documentation may be necessary as individual roadway improvement projects are pursued in the future. The environmental screening conducted as part of this study is included in **Appendix H**.

VII. STUDY GOALS

Based on the existing conditions findings and public, business and stakeholder input on issues and needs, goals were developed to guide the Belgrade Avenue Corridor Study. Study partners used the following goals to identify and evaluate transportation improvement alternatives along Belgrade Avenue:

- Provide an appropriate balance between vehicle mobility and access
- Safely accommodate all users (vehicles, transit, pedestrians, bicycles, heavy trucks)
- Support an inviting and safe pedestrian environment both along and across Belgrade Avenue
- Support bicycle connections across Belgrade Avenue to designated parallel bike routes and regional trails
- Support future land use and redevelopment plans
- Provide infrastructure improvements compatible with preferred design guidelines
- Enhance community character and the downtown environment

VIII. FUTURE TRAFFIC

Future traffic volumes for 2041 (25-year forecast) were developed using historical data and the Mankato/North Mankato Area Planning Organization (MAPO) 2045 Long Range Transportation Plan while recognizing population growth trends in the area. The historical growth rates (1997-2013) along Belgrade Avenue were found to be negative based on historical data. The MAPO 2045 Long Range Transportation Plan identified future growth rates between 0.9% and 1% on Belgrade Avenue.

Taking all sources into account a 0.5% growth rate was used along Belgrade Avenue between Lee Boulevard and the TH 169 South Ramp. This 0.5% growth rate accounts for some growth on Belgrade Avenue over the next 25 years but also recognizes Belgrade Avenue is a completely developed corridor and is not anticipated to experience a large increase in future traffic. The study partners felt this modest growth rate was appropriate considering the corridor's historical trend. The Future Conditions Traffic Analysis Memorandum is included in **Appendix I.** A map illustrating the 2041 forecasted traffic volumes for Belgrade Avenue is included in **Figure 3**.

Future Operations Analysis

A level of service (LOS) analysis of the peak hours was completed using the forecasted turning movement counts in SimTraffic. **Table 4** shows the results of the 2041 no-build traffic analysis.

Table 4. 2041 Existing Geometry (No Build) Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay*		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft)
NB TH 169 Exit Ramp & Belgrade Ave	AM	5	A	15	B	NBL	WBT	75	200
Signalized Intersection	PM	7	A	20	C	NBL	WBT	100	500
SB TH 169 Exit Ramp & Belgrade Ave	AM	14	B	24	C	SBL	WBL	125	250
Signalized Intersection	PM	16	B	30	C	SBL	WBT	75	350
Range St & Belgrade Ave	AM	7	A	9	A	EBT	SBL/T/R	50	125
Stop Controlled	PM	9	A	12	B	WBL	WBL/T	100	225
Center St & Belgrade Ave	AM	8	A	9	A	WBT	EBL/T	75	125
Stop Controlled	PM	9	A	11	B	WBT	WBT	75	150
Sherman St & Belgrade Ave	AM	3	A	10	B	SBT	SBL/T/R	50	100
Stop Controlled	PM	3	A	10	B	SBT	SBL/T/R	50	100
Belgrade Ave & Lake St	AM	2	A	6	A	SBL	SBL/R	50	75
Stop Controlled	PM	2	A	8	A	SBL	EBL/T	25	75
Lee Blvd & Belgrade Ave	AM	9	A	245	F	WBL	SBT/R	25	275
Stop Controlled	PM	7	A	86	F	WBL	SBL	75	200

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

- Overall intersection delay is acceptable with LOS A or B at all of the intersections during both peak hours.
- The westbound Belgrade Avenue to southbound Lee Boulevard movement is anticipated to operate at LOS F by 2041 if no changes are made to this intersection. This is a safety concern as traffic making this move is likely to get frustrated and take a chance on an inadequate gap to make their move. This often results in crashes.
- The average queue for the westbound left and thru movement at the Range Street/Belgrade Avenue intersection is anticipated to increase to 100 feet during the PM peak hour. Today, this queue blocks the American Legion driveway and Frandsen Bank driveway and by 2041 is anticipated to extend even further to block the western Cenex driveway. This is a safety concern for vehicles trying to navigate in and out of these driveways during these peak periods.

Belgrade Avenue Corridor Study

Mankato/North Mankato Area Planning Organization

Figure 1: Traffic Forecasting

September 2016

BOLTON & MENK
Real People. Real Solutions.

Lee Blvd
Lake St
Sherman St
Center St
Belgrade Ave
Nicollet Ave
Lookout Dr
Range St
169
MINNESOTA 60

20,300 (1.5%)
15,110 (0.5%)
16,300 (1%)
12,600

250 (-3.1%)
1,800 (0.5%)
1,550

9,000 (1%)
5,740 (-0.5%)
7,100 (0.5%)
6,200

10,500 (0.5%)
12,810 (1.3%)
11,900 (1%)
9,200

180 (-3.4%)
1,300 (0.5%)
1,150

40 (-3.9%)
2,200 (0.5%)
1,900

1,900 (0.5%)
1,900 (0.5%)
1,700

9,600 (1%)
4,730 (-1.5%)
7,200 (0.5%)
6,300

2,380 (-1.3%)
4,100 (0.5%)
3,600

13,100 (1%)
7,410 (-0.9%)
9,900 (0.5%)
8700

28,000 (0.9%)
40,050 (2.4%)
28,400 (1%)
21,500

Legend

- *X,XXX Most Recent AADT*
- *X,XXX 2041 Forecasted AADT (Recommended)*
- *X,XXX 2041 Forecasted Based on Historical Growth*
- *X,XXX 2045 Forecasted AADT from "MAPO 2045 Transportation Plan"*

0 800 Feet

Source: MnDOT, Google Imagery, MAPO

Map Document: \\metrosoutfs1\GIS\MAPO_MUT\42111862\ESRI\Maps\111862_TrafficForecasting_11x17L.mxd | Date Saved: 9/9/2016 2:40:34 PM

IX. ISSUES IDENTIFICATION & EVALUATION OF ALTERNATIVES

Improvement alternatives were identified and evaluated based on the existing conditions analysis and issues and needs identified through public, agency and stakeholder involvement. The following describes alternatives studied for the Belgrade Avenue corridor, organized into five focus areas based on their location along the corridor. The improvement options discussed here can be seen on the MAPO website (www.mnmapo.org). Also, a discussion of the traffic analysis completed for each alternative is included in the Future Conditions Traffic Analysis Memorandum in **Appendix I.**

A. Focus Area 1: Lee Boulevard Intersection

The primary issue in this focus area is the delay on Belgrade Avenue for westbound traffic entering Lee Boulevard southbound. Under existing (2016) conditions, the westbound approach to Lee Boulevard exhibits traffic delay during both the AM and PM peak hour periods operating with LOS E during the AM and LOS D during the PM.

Public and stakeholder input during the corridor study process supported the issue. The westbound to southbound delay at this intersection is anticipated to worsen to LOS F for both peak periods by 2041 as traffic volumes on Lee Boulevard increase and without any improvements to the intersection traffic control.

An intersection control evaluation was conducted at this intersection to determine the most appropriate traffic control to address the delay issues and future traffic needs. The evaluation found traffic signal warrants were not met for existing or 2041 traffic. All way stop warrants were met which indicates a roundabout could be a traffic control option. An all way stop itself is not recommended since it would increase delay on the Lee Boulveard approaches to the intersection. The overall intersection operations at this location are adequate in the LOS A/B range. Any improvements identified should not worsen the overall intersection operations.

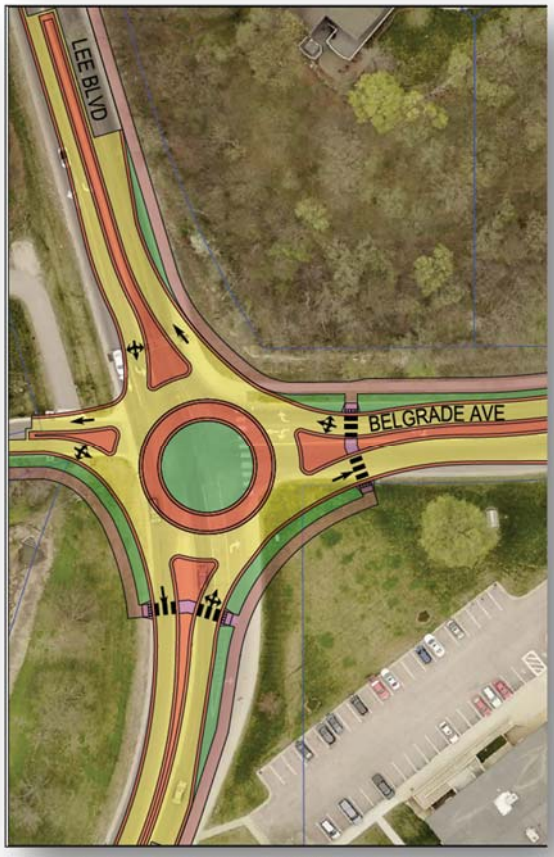


Figure 4. Lee Boulevard/Belgrade Avenue Roundabout Concept.

Based on the results of the traffic control evaluation, a roundabout was considered at this location (**Figure 4)**. The traffic analysis found a single-lane roundabout would adequately serve both existing and 2041 traffic volumes. A roundabout at Lee Boulevard and Belgrade Avenue would alleviate delays for the problematic westbound to southbound movement at this intersection.

Public and stakeholder input on the idea of a roundabout at this location was mixed. The majority of the concerns expressed were related to the grades of the intersection and how to safely navigate the roundabout from southbound Lee Boulevard to eastbound Belgrade Avenue during winter conditions. A detailed analysis of the intersection profiles was not conducted as part of the corridor planning study. However, the consultant traffic and design engineers did take a preliminary review of contours through this area and felt the roundabout was a feasible intersection control option in this location for future consideration. Additional

detailed design of the roundabout grades, placement, approach angles and geometric design and pedestrian crossing locations/connections will be required in the future if the City of North Mankato pursues implementation of this project.

A roundabout at Lee Boulevard and Belgrade Avenue is estimated to cost approximately $1.5 million.

B. Focus Area 2: Nicollet Avenue to Lake Street

The primary issue in this segment is a gap in the bicycle network between Nicollet Avenue and Lake Street along Belgrade Avenue. Both Nicollet Avenue and Lake Street have sharrows indicating their service as on-street bike routes in the community. However, both roads terminate at Belgrade Avenue as do the bicycle facilities they host. This leaves a nearly 700-foot gap in the bicycle network along Belgrade Avenue. Generally, there are no bicycle facilities planned along Belgrade Avenue due to the parallel route along Nicollet Avenue, however, completing this gap is necessary to create a more complete network.

Three alternatives were developed to provide a connection to complete this network. Each considers a crossing on Belgrade Avenue at a different location to take advantage of existing features. These options are described below.

Option 1: Trail Addition from Lee Boulevard to Lake Street with Crossing at Nicollet Avenue.

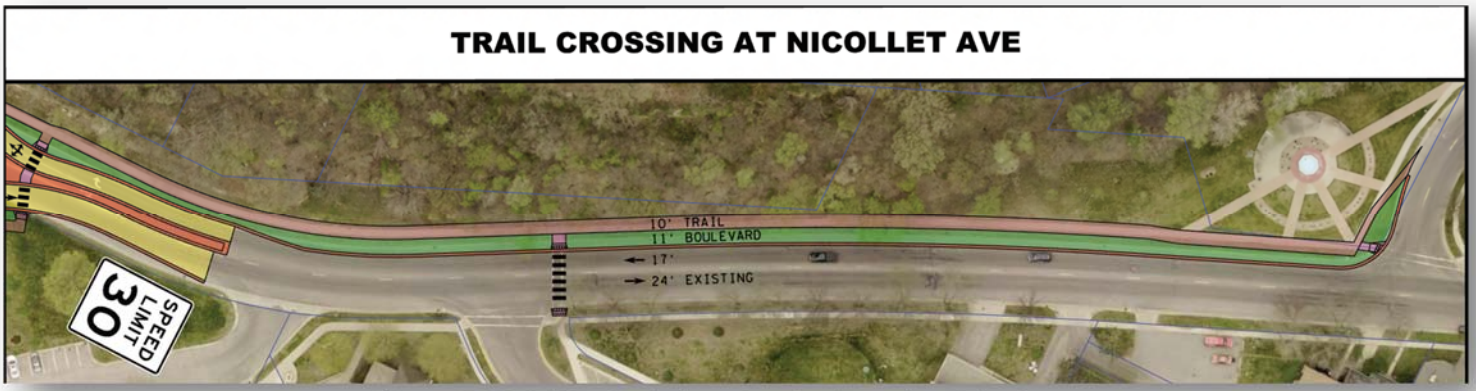


Figure 5. Multi-Use Path from Lee Boulevard to Lake Street.

Option 1 requires expansion of the existing sidewalk along Belgrade Avenue extending from Lee Boulevard to Lake Street. This would result in a 10-foot wide multi-use trail that would accommodate a bicycle connection to both the trail on Lee Boulevard and facilities on Lake Street. The crossing at Nicollet Avenue would utilize a crosswalk that currently exists at this location. The westbound lane on Belgrade Avenue would decrease in width from 24-feet currently to 17-feet to accommodate the proposed trail. This shift into the existing street section of Belgrade Avenue for the trail is due to the topography of the land adjacent to the existing trail. It would be difficult and costly to expand the current sidewalk to the north. The decrease in width on Belgrade Avenue would have little effect on the functionality of westbound Belgrade Avenue traffic movements. It would require removing parking in this section; however, it has been observed that this parking is rarely used. **Figure 5** illustrates this scenario. Option 1 is estimated to cost approximately $160,000.

Option 2: Multi-Use Path from Lake Street to Mid-Block Crossing at the North Mankato Water Plant.

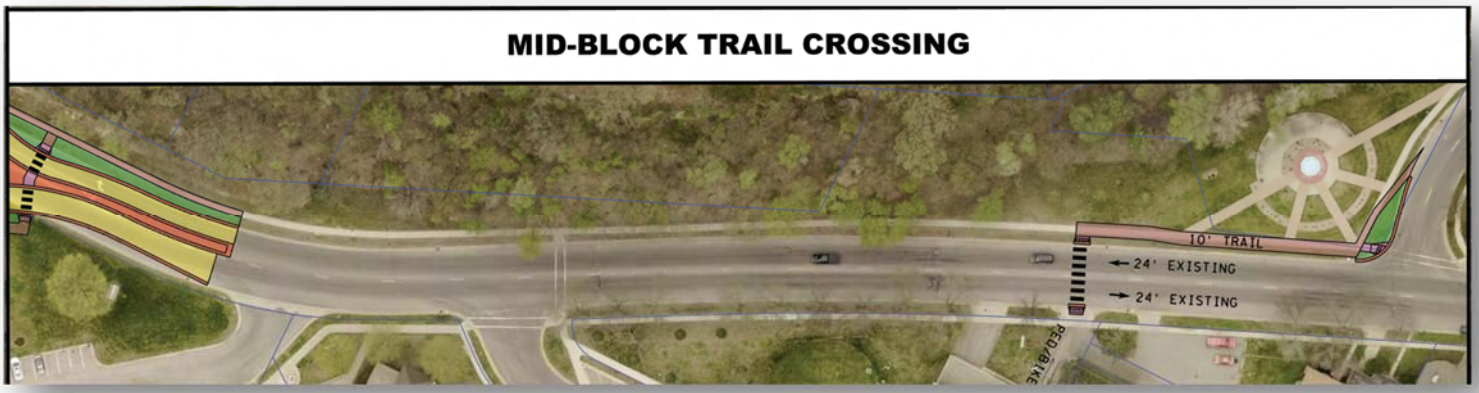


Figure 6. Multi-use path with Mid-Block Crossing

Option 2 (**Figure 6**) calls for a small segment (210-feet) of multi-use trail from Lake Street to a new, mid-block crossing at the North Mankato Water Plant that would take advantage of an existing walking path along the eastern side of that building. This would require the widening of that path segment adjacent to the building and moving the existing crosswalk from Nicollet Avenue to a mid-block location. The feasibility of widening the existing path shown in **Figure 7 & 8** should be studied further to determine if adequate room exists for this connection. The improvement is estimated to cost approximately $50,000. The disadvantage of this option is it does not provide a bicycle connection to the Lee Boulevard trail as Option 1 accomplishes.

Figure 7. View of the Water Plant Path from Nicollet Avenue

Option 3: On-Street Bike Lane from Lake Street To Mid-Block Crossing at the North Mankato Water Plant.

Option 3 (**Figure 9**) is the least invasive and lowest cost option which entails an on-street bicycle lane from Lake Street to a new mid-block crossing at the North Mankato Water Plant. This would require striping and marking a bike lane at a very low cost as an option without widening sidewalks into trails. Construction costs would be isolated to the trail expansion next to the water plant.

Figure 8. Existing Path Location
(*Source:* Google Maps)

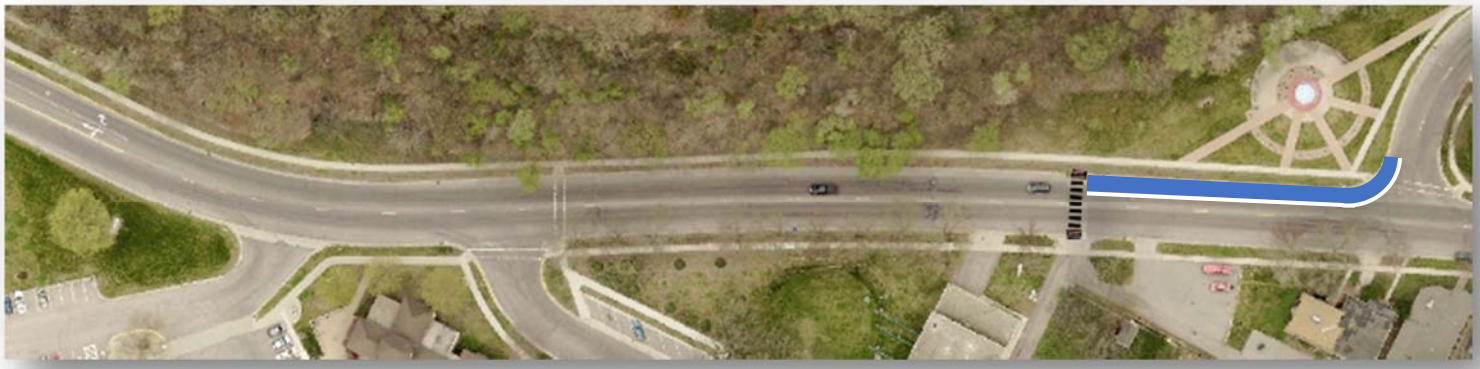


Figure 9. On-Street Bike-Lane

C. Focus Area 3: Intersection between Lake Street and Range Street

The primary issue in this segment is a crash issue at Sherman Street. Two of the six crashes that occurred at this intersection between 2010 and 2014 involved pedestrians. The Sherman Street intersection exhibited serious injury crashes outside of the normal range for this intersection type. This is concerning as Sherman Street is designated and signed as a bicycle route and serves bicycles and pedestrians by providing access to Spring Lake Park north of Belgrade Avenue.

Other pedestrian crossing demand locations along Belgrade Avenue between Lake Street and Range Street include:

- Center Street access to area schools and parks – Center Street is also designated and signed as a bicycle route that intersects Belgrade Avenue. This route provides access to the Monroe/Bridges School location as well as Wheeler Park to the north thus having potential for many to cross Belgrade Avenue on foot or bicycle.
- Cross Street access to area schools and parks – While not a designated bicycle route, Cross Street provides similar direct access to the area schools and Wheeler Park to the north of Belgrade Avenue.

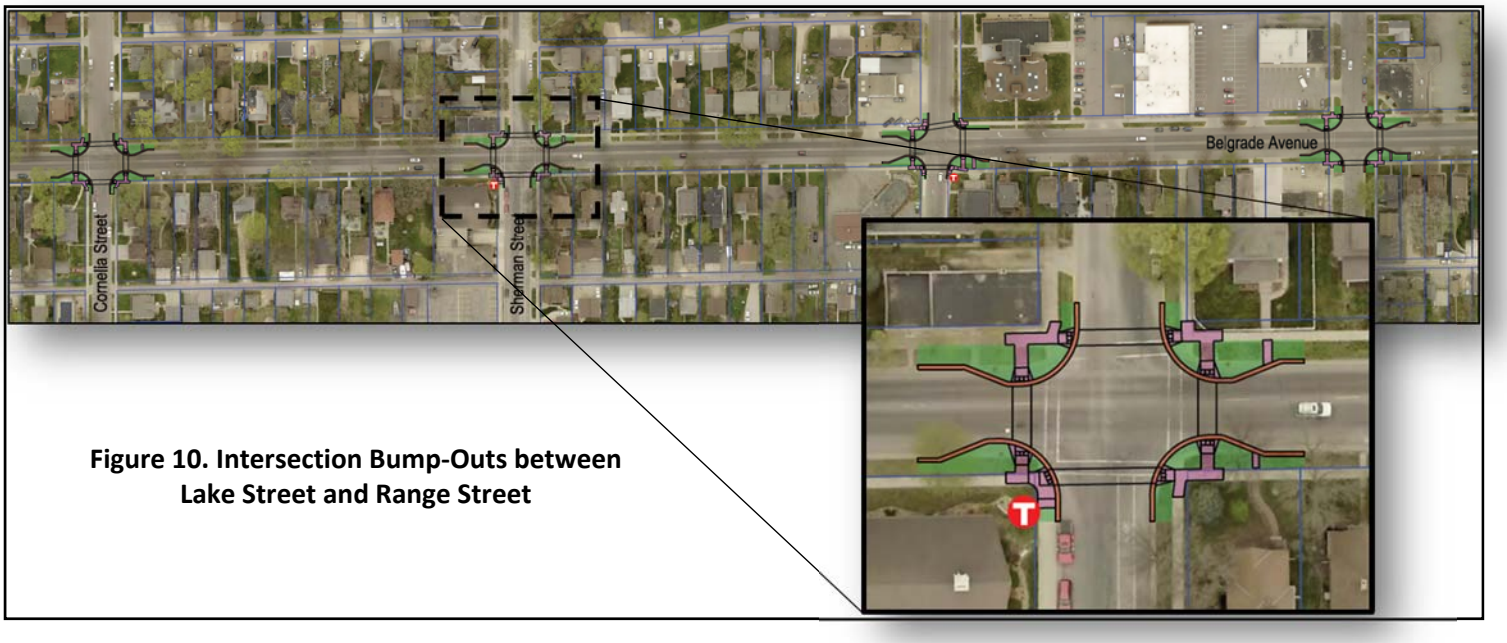


Figure 10. Intersection Bump-Outs between Lake Street and Range Street

In order to address pedestrian crossing demands and improve safety, intersection bump-outs were proposed at four locations along the Belgrade Avenue corridor between Lake Street and Range Street. Bump-outs provide a traffic calming effect by narrowing the roadway. They also shorten the crossing distance for pedestrians by 9-14 feet and make pedestrians more visible as they attempt to cross the street. **Figure 10** illustrates bump-outs at the intersections of Cornelia Street, Sherman Street, Center Street and Cross Street along Belgrade Avenue. The estimated cost of the bump-outs in these locations is approximately $40,000 per intersection.

D. Focus Area 4: 200 Block (Range Street to TH 169 Southbound Ramp)

Issues in this segment include:

- Back-ups on Belgrade Avenue at Range Street – Traffic currently back-ups at the Range Street/Belgrade Avenue intersection during the PM peak hour. This back-up is not problematic from a delay standpoint but is a safety concern as it extends past the American Legion and Frandsen Bank driveways. This back-up is projected to worsen by 2041 and also extend past the western Cenex driveway. This is a safety concern for traffic trying to enter and exist these driveways.
- Traffic speeds in the 200 Block – The speed of traffic is a concern within the 200 Block of Belgrade Avenue. Citizens and business owners have expressed that vehicles travel too fast within this area causing issues for pedestrian movements from the north to the south side of the street. A dynamic speed sign is located at the eastern entrance to Belgrade Avenue to make drivers aware of their speed and aid in slowing them down. The concern continues to exist despite this sign.
- Safe Pedestrian Crossings in the 200 Block – There is a demand for pedestrian crossings at the Range Street intersection with Belgrade Avenue as well as mid-block in the 200 Block for patrons parking in public lots north of Belgrade Avenue and visiting businesses on the south side. Public input in the Master Plan, Corridor Study and previous planning studies have expressed a desire for a mid-block crossing on the 200 Block of Belgrade Avenue. The City has also explored options for this in the past. Due to current conditions, a mid-block, marked crossing is not recommended as it would be difficult for vehicles to see a pedestrian trying to cross from the south side of Belgrade Avenue between parked cars.
- Several property access locations closely spaced – Multiple access points exist within close proximity in the 200 Block of Belgrade Avenue. This is particularly true along the north side of the roadway where six accesses are located within roughly 500 feet. These access locations can be problematic for vehicles and pedestrians. For instance, vehicles have been observed making a left turn from southbound Range Street to eastbound Belgrade Avenue, and then immediately turning again into a parking lot at the corner of Belgrade Avenue/Range Street. The proximity of the parking lot access to the intersection is problematic and results in vehicles blocking the Belgrade Avenue/Range Street intersection waiting to turn into the parking lot. The Circle Inn driveway onto Belgrade Avenue is also problematic as it is difficult to see eastbound pedestrians and vechicular traffic from this access point due to the building location directly adjacent to the sidewalk. Both of these driveways (Circle Inn and the city parking lot next to the American Legion) have access off of adjacent side streets.
- Perceived Parking shortage – On-street parking is located on the south side of Belgrade Avenue. Sixteen on-street stalls exist today. Off-street public parking is isolated to the 200 Block of Belgrade Avenue. The Downtown Planning Study (2012) quantified available public and private parking facilities within the downtown area and found a parking shortage is perceived, but actual supply is generally sufficient for existing uses at most times. However, the location of facilities and proximity to

businesses may contribute to perceptions that the area is underserved.

Several alternatives were developed for the 200 Block to assist with an improved vehicle and pedestrian traffic environment and to support the Belgrade Avenue Master Plan recommendations. Improvement options analyzed included options to improve pedestrian crossings with the existing four-lane section, an option to improve the pedestian environment, calm traffic and provid additional streetscape opportunities by reducing the number of lanes on Belgrade Avenue, and intersection control options at Range Street and the TH 169 southbound ramp intersection. Improvement options for this area are described below.

Option 1: Four-Lane Option

Figure 11. 200 Block 4-Lane Option

The four-lane option (**Figure 11**) maintains most of what is there today exhibiting minimal change. This option calls for two driveway closures on the north side of Belgrade Avenue to improve traffic flow and safety. Both of these properties have access to an adjacent side street and could reconfigure their parking lot striping to accommodate this change. This four-lane option includes a mid-block pedestrian crossing from the Circle Inn to the vacant lot on the south of Belgrade Avenue. Sidewalk bump-outs are proposed at Range Street and the new mid-block crossing location to shorten the pedestrian crossing distance and make pedestrians more visible to drivers. The bump-outs would require the loss of 3-4 on-street parking stalls on the south side of Belgrade Avenue. The bump-outs are necessary to provide a mid-block pedestrian crossing in this location. It is not recommended to add a mid-block crossing without the bump-out as it would be very difficult to see a pedestrian trying to cross from the south between parked cars.

A mid-block crossing in this four-lane option could be paired with an overhead rectangular rapid flashing beacon as seen in **Figure 12** to enhance the crossing location. The vehicle yield rate for an rectangular rapid flashing beacon is 88% as opposed to 7% for a

Figure 12. Overhead Rectangular Rapid Flashing Beacon
(*Source:* Google Maps)

crosswalk alone. A major consideration for the City of North Mankato will be whether or not an overhead rectangular rapid flashing beacon system fits within the context of their downtown as it would change the look and quaint feel of the surrounding land uses.

A ground mounted rectangular rapid flashing beacon is not recommended with a four-lane option as it difficult to see the ground mounted flashers on the side of the road with two lanes of traffic in each direction.

The estimated cost of the 4-lane improvements are approximately $25,000 for both bump-outs and $50,000 - $75,000 for an overhead rectangular rapid flashing beacon system.

Option 2: Three-Lane Option

Figure 13. 200 Block 3-Lane Option
with Mini-Roundabout, Mid-Block Crossing, and Dedicated Left Turn at Nicollet Avenue

Both existing traffic volumes (8,700 vehicles per day) and forecasted 2041 traffic volumes (9,900 vehilces per day) can be accommodated adequately by a 3-lane roadway through the 200 Block area. Three-lane roadway are able to efficiently accommodate upwards of 15,000 – 20,000+ vehicles per day.

A 3-lane roadway section was considered in the 200 Block area as an option to address concerns related to traffic speeds, pedestrian crossing safety and provide opportunities for additional streetscape space. These were consistent themes identified in previous downtown planning studies and concurrent Belgrade Avenue Master Plan.

Several variations of a three-lane option were considered. All options included one lane in each direction with a center turn lane. All options carried forward the proposed driveway closures shown in the four-lane option. The differences between the options included traffic control options at Range Street and TH 169 southbound ramp, and access to Wall Street and Nicollet Avenue.

Range Street Traffic Control Options:

There are two different traffic control options for the Range Street intersection. One option is a mini-roundabout (**Figure 13**) that would alleviate back-ups that occur at the westbound intersection approach and would move traffic efficiently through the intersection under both today and 2041 conditions. The roundabout option improves pedestrian crossings by shortening the crossing distance with fewer lanes at the intersection. Many concerns about the mini-roundabout were expressed during the public and business outreach phase of the corridor study. These concerns included disbelief that a mini-roundabout would operate efficiently and concern that it would increase speeds and decrease pedestrian safety and the intersection as a result.

The other Range Street traffic control option considered with a 3-lane option is to maintain the existing four-way stop scenario (**Figure 14**). The 3-lane section on Belgrade Avenue would need to widen to include a dedicated right-turn lane to northbound Range Street as exists today, for this option to operate efficiently. The advantage of this option is it maintains a status quo to what the public is comfortable with. The disadvantage is the back-ups that exist on westbound Belgrade Avenue at this interesction will not be addressed. The majority of the public and business owners seemed to accept this trade-off as it is contained within a peak hour and not an all day occurrence.

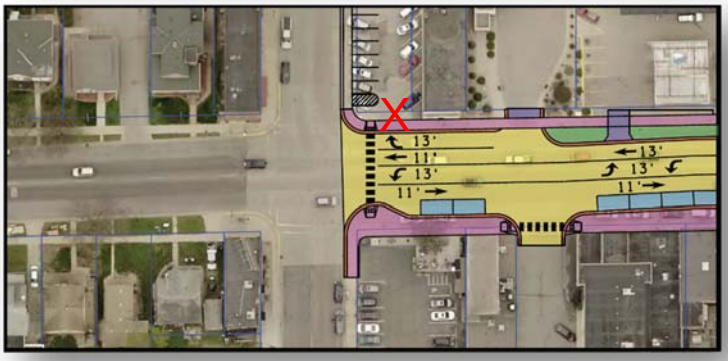


Figure 14. 3-Lane Option with All-Way Stop at Range Street

Wall Street/Nicollet Avenue Access Options:

Three options were considered for access to Wall Street and Nicollet Avenue with the three-lane option. The reason for the variations was related to a desire to consider a dedicated left-turn lane to Nicollet Avenue. This movement is prohibited today but was identified by several businesses in the 200 Block as a way to improve traffic detours through the area during events on Belgrade Avenue.

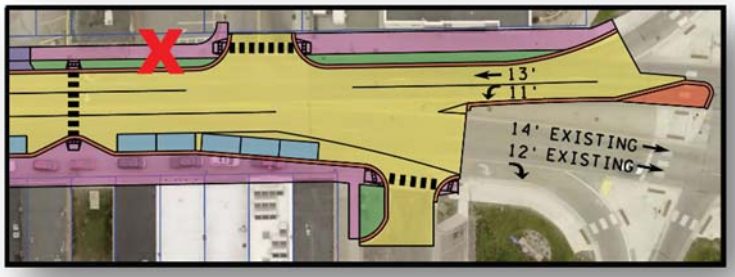


Figure 15. Dedicated left turn to Nicollet Avenue

The first option provides a dedicated left turn to Nicollet Avenue. This can work with a 3-lane configuration since space is available due to the lane reconfiguration. The left-turn lane is on the short-end of a desired turn lane length. Since this movement is prohibted today, it was difficult for the traffic study to know how many vehilces would want to make this movement. Therefore, a sensitivity analysis was completed in order to determine if there were adequate gaps for a westbound left from Belgrade Avenue onto Nicollet Avenue. It is anticipated that this movement could operate adequately based on the sensitivity analysis performed. The Future Conditions Traffic Memorandum in **Appendix I** documents the sensitivy analysis and when this movement could become problematic. Additional future study is recommended if this is an option the City wishes to implement. This option can be seen in **Figure 15.**

Another option is to prevent left turning traffic through this section altogether by extending the existing median to the proposed mid-block crossing at the Circle Inn. This would provide pedestrian refuge for those crossing mid-block providing the safest pedestrian environment of the options. However, the disadvantage of this option is the restrictions in turning movements at both Wall Street and Nicollet Avenue. This is likely not viable as there are several heavy trucks entering and exiting Wall Street to get to businesses such as the Cenex/Expressway Gas Station. Trucks would not be able to access the TH 169 Interchange with the restriction of lefts onto Belgrade Avenue at this location. It is unlikely that this option would be implemented. This option can be seen in **Figure 16**.

The third and final option is to extend the existing median through the Nicollet Avenue intersection to ensure lefts to Nicollet Avenue are not possible at all, stopping the existing

trend of vehicles taking illegal lefts onto Nicollet Avenue. The downside to this option is that it prevents any possibility of allowing left turns onto Nicollet Avenue during events. This option can be see in **Figure 17.**

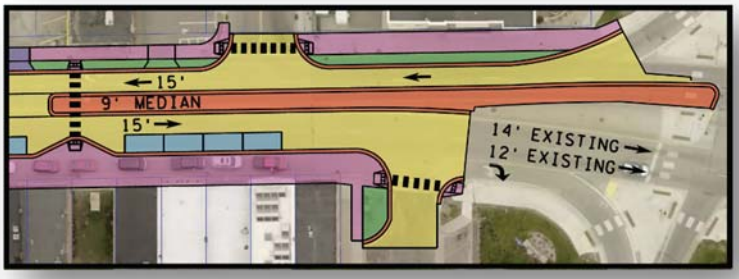


Figure 16. Extended Median Option

Mid-Block Crossing:

A mid-block crossing in this three-lane option could be paired with a ground mounted rectangular rapid flashing beacon as seen in **Figure 18** to enhance the crossing location. As with the overhead rectangular rapid flashing beacon, the vehicle yield rate for the ground-mounted beacon in this circumstance is 88% as opposed to 7% for a crosswalk alone. Again, the major consideration for the City of North Mankato will be whether or not a ground-mounted rectangular rapid flashing beacon system fits within the context of their downtown as it would also affect its character.

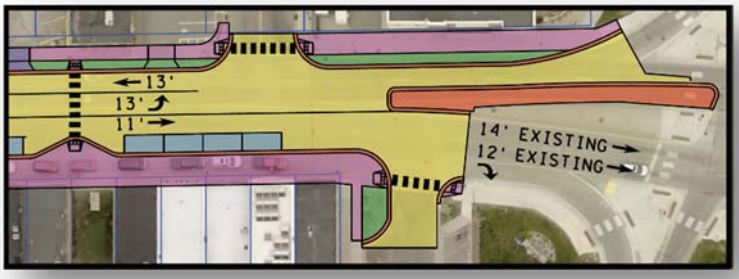


Figure 17. Nicollet Avenue Median

There was a lot of support for a mid-block crossing during the public, business and steering committee outreach during the corridor study.

Figure 18. Ground-Mounted Rectangular Rapid Flashing Beacon

Streetscape:

Streetscape is an important facet of an area such as the downtown. When asked of the importance of streetscape amenities, 81% of citizens and stakeholders responding suggested that it is important to provide additional streetscape amenities in the downtown (**Figure 19**).

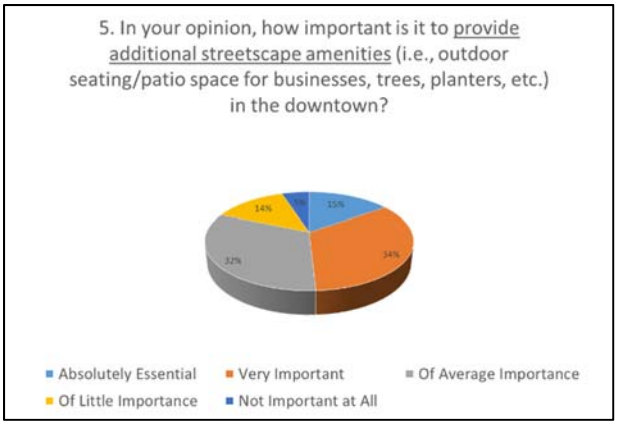


Figure 19. Support for Additional Streetscape Amenities

The implementation of a three-lane option provides perhaps most space for improvements to the streetscape. Wider sidewalks allow for an increased pedestrian amenity zone to accommodate landscaping, decorative pavement, seating, wayfinding signage, artwork, outdoor space for businesses, etc. The lane reduction, decorative pavement, and bumpout for the mid-block crossing could all work together to provide traffic calming in the 200 Block (**Figure 20**). These streetscape elements could be paired with any of the 3-lane options described above.

The estimated cost of the 3-lane options are approximately $750,000 - $1,000,000. This includes the 3-lane configuration, ground mounted rectangular rapid flashing beacon, and streetscape enhancements.

During the corridor study's outreach process, there was public and business support for the elements of a 3-lane option. This was shown in the support for wider sidewalks, improved pedestrian crossings and additional space for streetscape enhancements. Some business owners were concerned about change and the impact of construction on their business operations. The Steering Committee expressed support for a future 3-lane option as it is the option that most closely aligns with the vision of the Central Business District.

Figure 20. *Top:* 3-Lane Option *Bottom:* Potential Streetscape with 3-Lane Option

E. Focus Area 5: TH 169 Southbound Ramp Intersection

There are no traffic operational issues at this location today or projected into the future. However, this intersection provides the gateway to downtown North Mankato and is the primary location where speeds into the 200 Block are perceived as excessive. **Figure 21** shows a roundabout option that was considered at this location as a measure to calm traffic transition from the Veteran's Memorial Bridge to downtown.

Roundabout at TH 169 Southbound Ramp Intersection

The TH 169 Southbound Ramp intersection currently operates acceptably and is projected to continue this trend. Justification for an improvement would be difficult at this time as no problem currently exists. Project partners agreed, however, and data supports, that the application of a roundabout at this intersection may be a viable option that would slow traffic entering the Central Business District. MnDOT expressed support for the roundabout in general but suggested that they would not be able to fund the reconstruction due to lack of a current operational or safety problem. The estimated cost of the roundabout at this location is approximately $2.0 million.

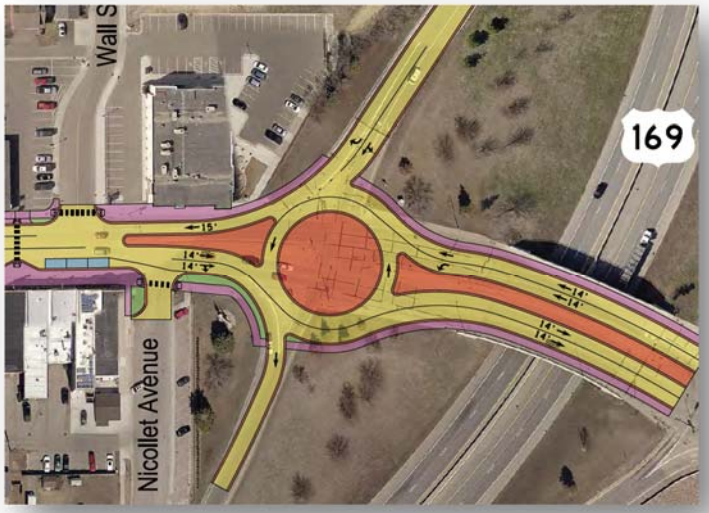


Figure 21. Potential Future Roundabout

X. RECOMMENDATIONS AND IMPLEMENTATION SEQUENCE

Some of the improvements identified in this study are directly related to existing and/or safety issues on Belgrade Avenue. Others are related to an opportunity to enhance Belgrade Avenue for both motorized and non-motorized uses consistent with the Belgrade Avenue Master Plan. The following recommendations are organized into an implementation sequence for the City's consideration. This will allow the City to take incremental steps over time, ultimately working towards a corridor that operates safely and efficiently and compliments their downtown vision.

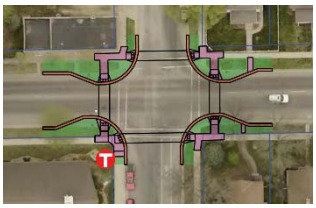
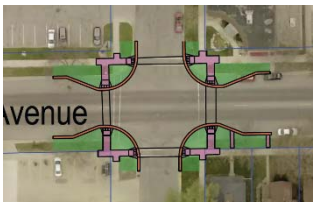
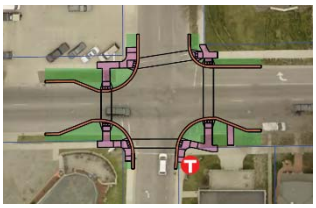
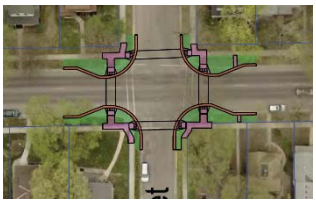
A. Focus Area 1: Lee Boulevard Intersection

	INITIAL RECOMMENDATION	• Continue to monitor intersection operations and safety conditions 
	RECOMMENDATION ESTIMATED COST	• No Cost
	ULTIMATE RECOMMENDATION	• Construct a roundabout 
	ULTIMATE RECOMMENDATION ESTIMATED COST	• **$1.5 Millon**
	TRIGGERS	• Increased crashes/Safety Concern • Delay worsens

B. Focus Area 2: Nicollet Avenue to Lake Street

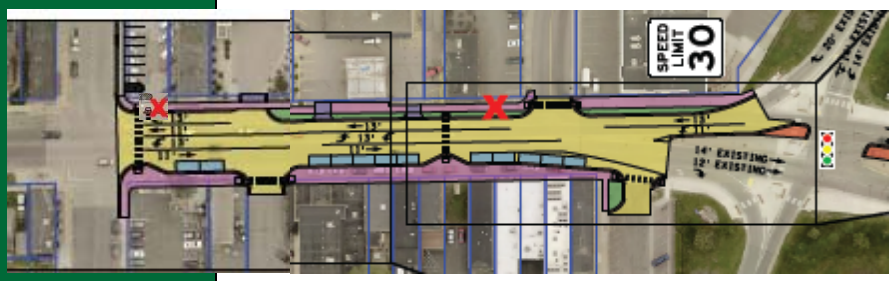
	INITIAL RECOMMENDATIONS	Complete the missing gap in the bicycle network by implementing one of these three options: • Option 1: Trail Crossing at Nicollet Avenue  OR • Option 2: Mid-Block Trail Crossing  OR • Option 3: On-Street Bicycle Lane to Mid-Block Crossing 
	ESTIMATED COST	• Option 1: $160,000 • Option 2: $50,000 • Option 3: Minimal

C. Focus Area 3: Intersection between Lake Street and Range Street

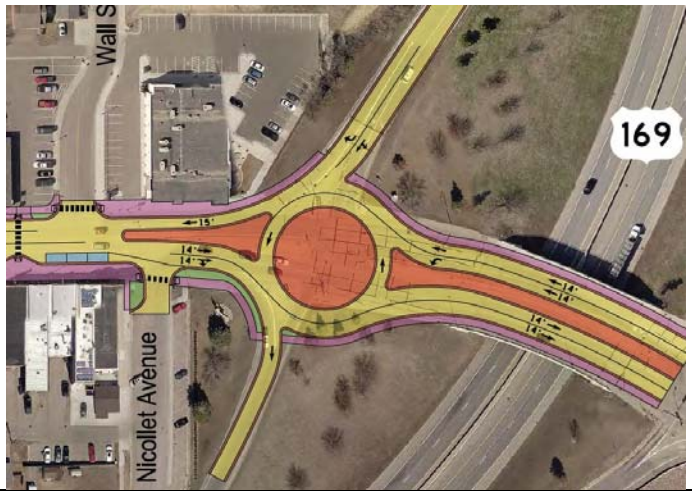
INITIAL RECOMMENDATIONS	• Test a bump-out with temporary materials such as paint or striping and traffic cones. Seek public feedback on improvement after the trial period • Continue to monitor intersection safety for pedestrian and bicycles
INITIAL ESTIMATED COST	• $900 per test bump-out
ULTIMATE RECOMMENDATION	If test is successful, install bump-outs on Belgrade Avenue between Lake Street and Range Street in the locations identified below. These locations are noted in order of priority if the City chooses to install bump-outs incrementally rather than all at one time.
	• **Sherman Street** – Highest priority location as pedestrian crashes are documented at this location with severity rates higher than average 
	• **Center Street –** Provides access to School/Wheeler Park 
	• **Cross Street** – Provides access to Wheeler Park 
	• **Cornelia Street –** If bump-outs are installed at the locations above, Cornelia Street should also be considered for corridor consistency 
ULTIMATE RECOMMENDATION ESTIMATED COST	• $40,000 per intersection
TRIGGERS	• Support for bump-outs following a trial period, OR • Continued and/or increased pedestrian crossing safety concerns

D. Focus Area 4: 200 Block (Range Street to TH 169 Southbound Ramp)

INITIAL RECOMMENDATION	• Allow left turns onto Nicollet Avenue during events • Test bump-outs with temporary materials to determine community/business support • If community/business support exists after testing bump-outs, implement a 4-lane improvement as shown below. This improvement includes the closure of two driveways, construction of a mid-block crossing with bump-out and Range Street crossing with bump-out 
INITIAL ESTIMATED COST	• $2,000 for bump-out test • $25,000 for permanent installation of both bump-outs • $50,000 - $75,000 Overhead rectangular rapid flashing beacon (if desired) • **Total Cost $75,000 - $100,000**
ULTIMATE RECOMMENDATION	When pavement conditions dictate the need for a more extensive reconstruction project in the 200 Block, re-evaluate whether or not the 4-lane improvements identified above have adequately addressed the community and business needs of the downtown and vision of the Belgrade Avenue Master Plan. If additional traffic calming measures, pedestrian environment improvements and streetscape space is desired, implement a 3-lane configuration with an all-way stop at Range Street, left turn at Nicollet Avenue, and streetscape improvements. This option is strongly supported by the Steering Committee as it most closely alignes with the future vision of the Centeral Business District as outlined in the Belgrade Master Plan.

		
	ULTIMATE ESTIMATED COST	• $600,000 to $750,000 – 3-lane • $10,000 to $15,000 – Ground mounted rectangular rapid flashing beacon (if desired) • $150,000 to $250,000 – Streetscape • **$750,000 to $1,000,000 – Total Cost**
	TRIGGERS	• Infrastructure Need • Community/Business Support

E. Focus Area 5: TH 169 Southbound Ramp Intersection

	INITIAL RECOMMENDATIONS	• Leave as traffic signal
	RECOMMENDATION ESTIMATED COST	• No Cost
	POTENTIAL FUTURE IMPROVEMENT	• Construct roundabout for traffic calming 
	FUTURE IMPROVEMENT ESTIMATED COST	• **$1.5 to $2.0 M**
	TRIGGERS	• Bridge Project and Adequate Funding

XI. NEXT STEPS

The recommendations and implementation section of this report outline an implementation sequence for the City's consideration. The intent of the implementation sequence is to allow the City of North Mankato to incrementally test and implement projects over time. This will allow gradual change to occur while testing community/business support along the way, ultimately working towards the city's downtown vision. It also allows flexibility in timing major improvements with future infrastructure needs to ensure financial responsibility.

Additional design, studies and public input will be needed for each of the recommended improvement options to move forward. The purpose of the Belgrade Avenue Corridor Study was to develop a plan for improvements to Belgrade Avenue that are consistent with the goals and objectives of both the City's Comprehensive Plan and the Belgrade Avenue Master Plan. The concepts developed as part of this study are high-level and will need additional refinement through preliminary and final design. Environmental review and permitting will also be required with exact requirements based on the scope of the project and the funding source.

The improvement options identified within this study and sequenced in the implementation plan will help the City of North Mankato continue to maintain a functioning yet safe minor arterial roadway supporting the City's downtown vision.

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

Appendix A: Figures

Belgrade Avenue Corridor Study

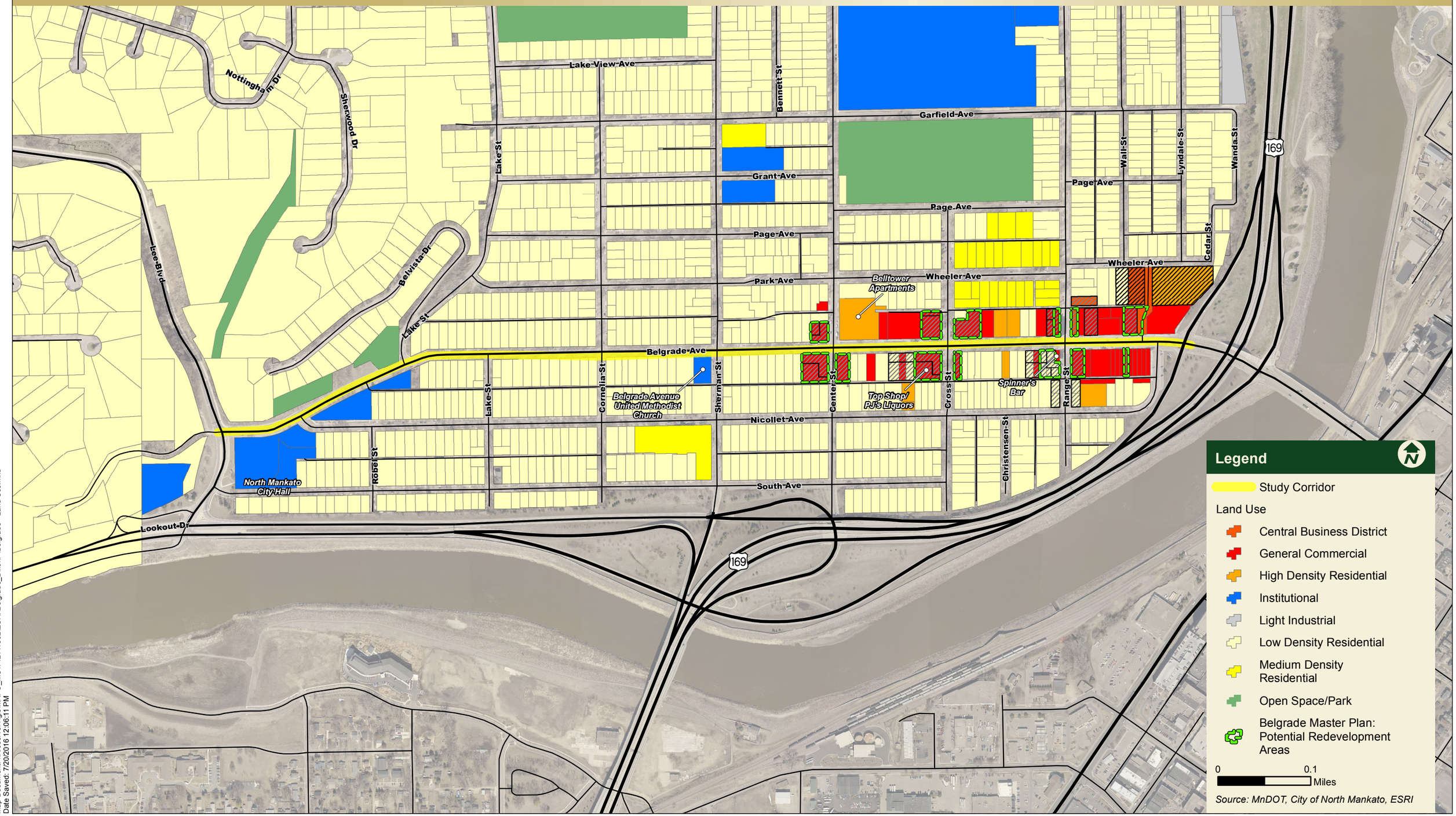
Mankato/North Mankato Area Planning Organization

Figure A.1

Existing & Future Land Use

July, 2016

BOLTON & MENK Engineers & Surveyors



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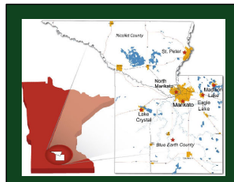

Belgrade Avenue Corridor Study

Mankato/North Mankato Area Planning Organization

Figure A.2

Traffic Operations

October, 2016

BOLTON & MENK Engineers & Surveyors

Lake View Ave
Bennett St
1,450
1,000
Garfield Ave
19,200
Lake St
Grant Ave
1,900
Page Ave
Page Ave
Page Ave
Wall St
Lyndale St
Wanda St
Cedar St
169
Lee Blvd
12,600
Belvista Dr
1,550
Park Ave
Belltower Apartments
Wheeler Ave
Wheeler Ave
3,600
Lake St
Belgrade Ave
6,300
8,700
AM/PM
21,500
21,100
Cornelia St
Belgrade Avenue United Methodist Church
Sherman St
1,100
1,700
Center St
Nicollet Ave
Top Shop/ PJ's Liquors
Cross St
Spinner's Bar
Range St
Christensen St
AM/PM
6,200
9,200
North Mankato City Hall
Robel St
South Ave
5,900
Lookout Dr
9,200
9,200
169
32,500

Legend

- #,### — Average Annual Daily Traffic (AADT) Volumes - 2015
- Problematic Traffic Back-Ups
- Problematic Traffic Delays
- Corridor
- Central Business District (CBD)
- AM/PM — Intersection Level of Service

Traffic Control

- STOP — All-Way Stop
- Traffic Signal

Level of Service Grade

A-C, D, E, F

0 0.1 Miles

Source: MnDOT, City of North Mankato, ESRI

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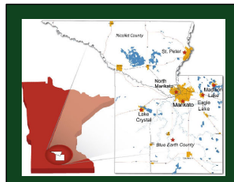

Belgrade Avenue Corridor Study

Mankato/North Mankato Area Planning Organization

Figure A.3

Crash History 2010 to 2014

July, 2016

BOLTON & MENK Engineers & Surveyors

1 RAN OFF ROAD
2 PEDESTRIAN CRASHES

4 RIGHT ANGLE
1 SIDESWIPE PASSING
1 SIDESWIPE OPPOSING
1 HEAD ON

1 REAR END
3 RIGHT ANGLE
1 HEAD ON
1 PEDESTRIAN CRASH 2007
1 PEDESTRIAN CRASH

1 LEFT TURN
1SIDESWIPE PASSING
2 REAR END

4 REAR END
2 RIGHT ANGLE
1 SIDESWIPE PASSING
1 PEDESTRIAN CRASH

7 REAR END
3 RIGHT ANGLE
2 LEFT TURN
1 RAN OFF ROAD
1 SIDESWIPE PASSING

1 LEFT TURN
1 RAN OFF ROAD
4 REAR END
4 RIGHT ANGLE
3 SIDESWIPE PASSING

Lake View Ave
Garfield Ave
Grant Ave
Page Ave
Park Ave
Wheeler Ave
Belgrade Ave
Nicollet Ave
South Ave
Lookout Dr
Nottingham Dr
Sherwood Dr
Lee Blvd
Belvista Dr
Lake St
Bennett St
Wall St
Lyndale St
Wanda St
Cedar St
Cornelia St
Sherman St
Center St
Cross St
Christensen St
Range St
Robel St
169

Belltower Apartments
Belgrade Avenue United Methodist Church
Top Shop/ PJ's Liquors
Spinner's Bar
North Mankato City Hall

3 4 6 7 8 13 14

Legend

- Corridor
- Central Business District (CBD)
- Pedestrian/Bicycle Crash (2010-2014)
- Pedestrian/Bicycle Crash (Other)
- Crashes Within Normal Range
- Serious Injury Crashes Outside Normal Range
- ## Number of Vehicle Crashes

0 0.1 Miles

Source: MnDOT, City of North Mankato, ESRI

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Belgrade Avenue Corridor Study

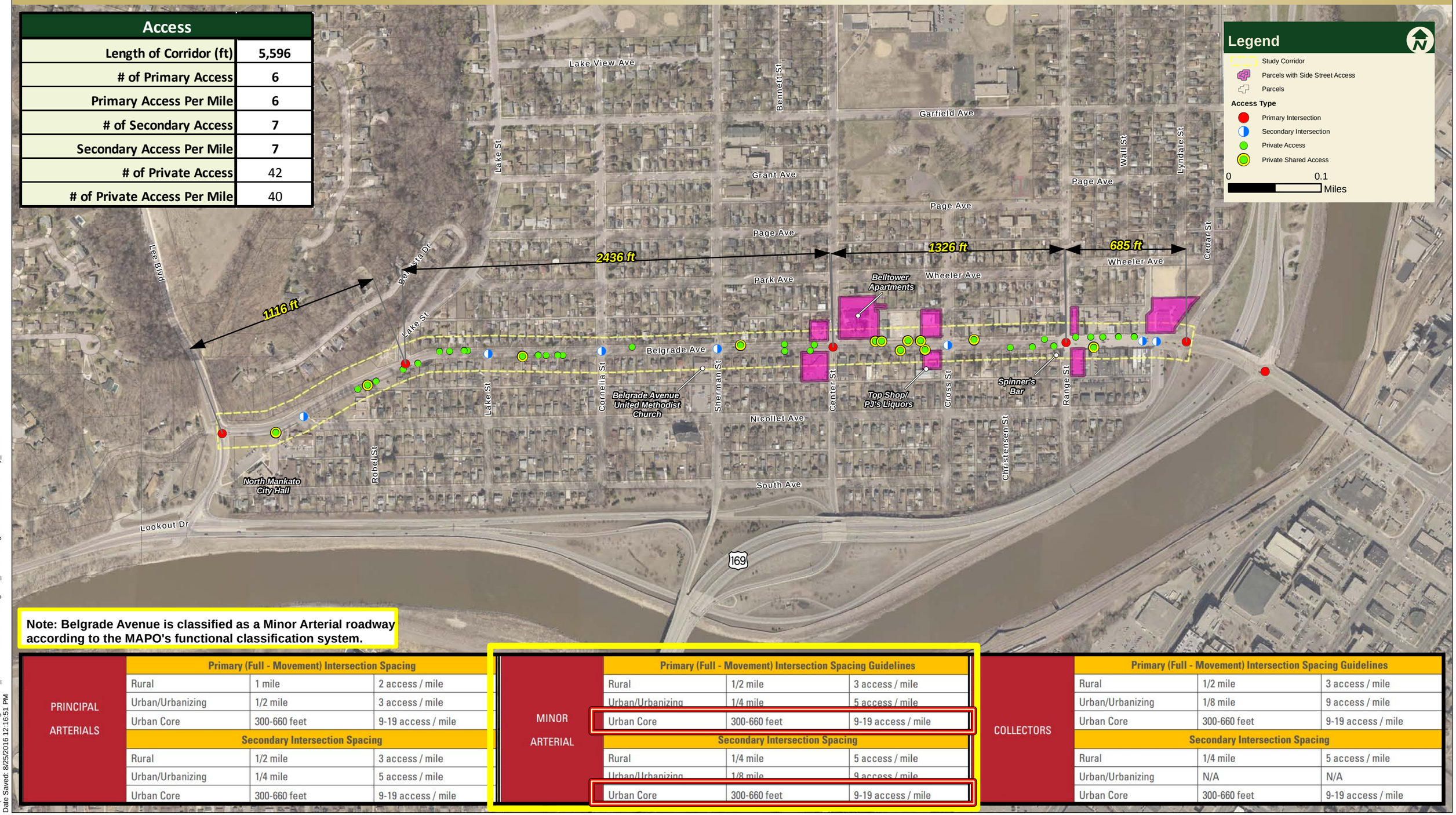
Mankato/North Mankato Area Planning Organization

Figure A.4

Access Inventory

August, 2016

Access	
Length of Corridor (ft)	5,596
# of Primary Access	6
Primary Access Per Mile	6
# of Secondary Access	7
Secondary Access Per Mile	7
# of Private Access	42
# of Private Access Per Mile	40



Note: Belgrade Avenue is classified as a Minor Arterial roadway according to the MAPO's functional classification system.

PRINCIPAL ARTERIALS			
Primary (Full - Movement) Intersection Spacing			
Rural	1 mile	2 access / mile
Urban/Urbanizing	1/2 mile	3 access / mile
Urban Core	300-660 feet	9-19 access / mile
Secondary Intersection Spacing		
Rural	1/2 mile	3 access / mile
Urban/Urbanizing	1/4 mile	5 access / mile
Urban Core	300-660 feet	9-19 access / mile

MINOR ARTERIAL			
Primary (Full - Movement) Intersection Spacing Guidelines			
Rural	1/2 mile	3 access / mile
Urban/Urbanizing	1/4 mile	5 access / mile
Urban Core	300-660 feet	9-19 access / mile
Secondary Intersection Spacing		
Rural	1/4 mile	5 access / mile
Urban/Urbanizing	1/8 mile	9 access / mile
Urban Core	300-660 feet	9-19 access / mile

COLLECTORS			
Primary (Full - Movement) Intersection Spacing Guidelines			
Rural	1/2 mile	3 access / mile
Urban/Urbanizing	1/8 mile	9 access / mile
Urban Core	300-660 feet	9-19 access / mile
Secondary Intersection Spacing		
Rural	1/4 mile	5 access / mile
Urban/Urbanizing	N/A	N/A
Urban Core	300-660 feet	9-19 access / mile

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Belgrade Avenue Corridor Study

Mankato/North Mankato Area Planning Organization

Figure A.5

Pedestrian & Bicycle Connections

August, 2016

BOLTON & MENK Engineers & Surveyors

Lake View Ave
Bennett St
Garfield Ave
Lake St
Grant Ave
Page Ave
Page Ave
Wall St
Lyndale St
Wanda St
Rex Macbeth River Trail
169
Cedar St
Lee Blvd
Belvista Dr
Park Ave
Bellflower Apartments
Wheeler Ave
Wheeler Ave
Lake St
Belgrade Ave
Cornelia St
Belgrade Avenue United Methodist Church
Sherman St
Center St
Top Shop/ PJ's Liquors
Cross St
Spinner's Bar
Range St
Nicollet Ave
Christensen St
Robel St
North Mankato City Hall
South Ave
Lookout Dr
169
North Star Bridge Trail
Minnesota River Trail

Legend

- Existing Sidewalks
- Proposed Sidewalks

Trail System

- Existing On-Road Bike Route
- Existing Trails
- Proposed On-Road Bike Route
- Proposed Trail
- Corridor
- Central Business District (CBD)

0 0.1 Miles

Source: City of North Mankato, ESRI

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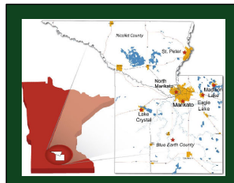

Belgrade Avenue Corridor Study

Mankato/North Mankato Area Planning Organization

Figure A.6

Transit Routes

October, 2016

BOLTON & MENK Engineers & Surveyors

Lee Blvd
Belvista Dr
Lake St
Grant Ave
Page Ave
Park Ave
Belgrade Ave
Belgrade Avenue United Methodist Church
Cornelia St
Sherman St
Nicollet Ave
Center St
Top Shop/ PJ's Liquors
Cross St
Spinner's Bar
Range St
Christensen St
South Ave
Belltower Apartments
Wheeler Ave
Wall St
Lyndale St
Cedar St
Wanda St
169
North Mankato City Hall
Rebel St
Lookout Dr

Legend

- Bus Stations
- MTS Bus Route 4
- MTS Bus Route 5

0 0.1 Miles

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Belgrade Avenue Corridor Study

Mankato/North Mankato Area Planning Organization

Figure A.7

Parking Assessment

August, 2016

500 Block North (Corner)		
Public	Private	Priv. Shared
6	12	0

400 Block North		
Public	Private	Priv. Shared
30	40	90

300 Block North		
Public	Private	Priv. Shared
39	18	55

200 Block North		
Public	Private	Priv. Shared
73	105	0

Belltower Apartments

Top Shop/ PJ's Liquors

Spinner's Bar

500 Block South (Corner)		
Public	Private	Priv. Shared
3	40	0

400 Block South		
Public	Private	Priv. Shared
25	40	25

300 Block South		
Public	Private	Priv. Shared
41	0	0

200 Block South		
Public	Private	Priv. Shared
56	31	41

Legend

Parking Type

- Public
- Private
- Private - Shared
- Central Business District (CBD)

0 250 Feet

Source: MnDOT, City of North Mankato, ESRI

Parking Totals		
Public	Private	Priv. Shared
273	286	211

Parking Data											
500 Block			400 Block			300 Block			200 Block		
Public	Private	Priv. Shared	Public	Private	Priv. Shared	Public	Private	Priv. Shared	Public	Private	Priv. Shared
9	52	0	55	80	115	80	18	55	129	136	41

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Appendix B: Open House Summaries

Belgrade Avenue Corridor Study
&
Belgrade Master Plan
Open House 1 Summary
January 26, 2017
&
January 28, 2017
5:30 to 7:30 PM
St. Paul's Evangelical Church, North Mankato

Purpose:
The purpose of the Belgrade Avenue Corridor Study Public Information Meeting was to introduce the study and to solicit input on issues, needs and opportunities along the corridor.

Attendees:
There were a combined 55 people that signed into the open house events including members of City Staff, Elected Officials, stake holders along the corridor, and the general public.

Materials Presented:
The meeting was set up in an open house format giving attendees the opportunity to view materials and visit with project staff at their leisure. A brief presentation began at 6:00 PM. The following information was available for public review and input:

Belgrade Avenue Corridor Study:
- Study Purpose
- Study Schedule
- Parking Assessment
- Traffic Operations
- Crash History
- Pedestrian/Bicycle Connections
- Typical Sections/Streetscaping

Belgrade Master Plan:
- Plan Purpose
- Plan Goals
- Community Input
- Implementation Plan
- Design Guidelines

Comments Received:
Public Input was collected throughout the duration of the open house through discussions with staff and written comments. Questions were also asked through Audience Polling during the presentation. The following summarizes public comments collected:

Written Comments:
- One participant questioned the importance of a pedestrian friendly atmosphere stating that funds that would be used to accomplish that would be best spent on general road repairs. This participant also stated that the bumpouts in the downtown are acceptable but further down the corridor they are not.

- One participant expressed support for the 3-Lane option as opposed to the other layouts mentioning that if parking would be located south of the 200-Block, the six-plexes should be removed as Nakato and Spinners lots tend to overflow and fill other businesses spots. The participant suggested that locating parking there may assist with solving drainage issues.
- One participant is concerned about the cost, who pays. "I think we have a solution in search of a problem."

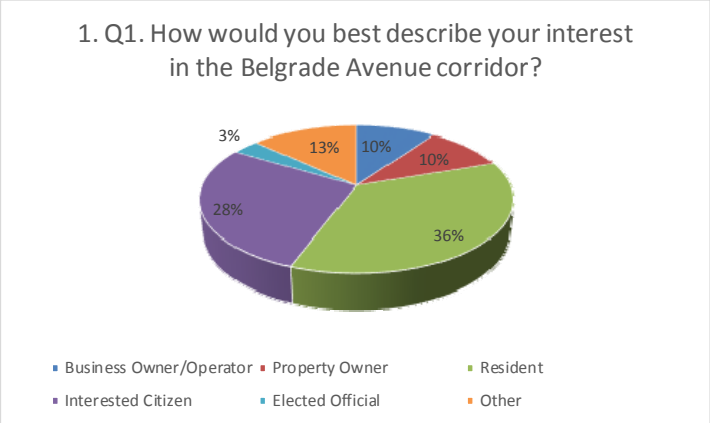
Verbal Comments:

- Some participants expressed concern regarding proposed bumpouts. After discussion and a better understanding potential benefits were acknowledged by the group.
- Some expressed concerns for heavy trucks turning at the proposed mini roundabout. There was general lack of understanding as to the function of the mini-roundabouts. The mini roundabout at Range didn't receive a lot of support.
- Participants generally had concerns with a roundabout added at the Lee/Belgrade intersection. There were concerns with the downward slope traveling south into the roundabout. Concerns were that cars wouldn't be able to yield and would slide into the roundabout in the winter months. Project and City Staff explained that the roundabout would need more engineering if implemented and that there is potential to shift it south and flatten some of the area of concern if necessary.
- Several supported a mid-block crossing over the 200 Block of Belgrade.
- One participant didn't support change along the corridor suggesting that our proposed changes would work toward the detriment of the area.
- Some liked the idea of wider sidewalks in the 200 block and generally supported the proposed changes presented.
- Some were concerned about the identifying of homes as future parking areas in the southern part of the CBD. Staff explained that those identified are not marked for destruction but that if the need arises for the City to add parking and there are willing sellers, negotiations could take place to convert properties. Staff also explained that this would only be necessary if redevelopment occurs in the district and parking becomes scarce.
- One participant was concerned about drainage issues in front of Sharon's Craft and wondered if the street reconstruction would alleviate that issue.

Audience Polling Questions and Results:

Q1. How would you best describe your interest in the Belgrade Avenue corridor? (Multiple Choice)

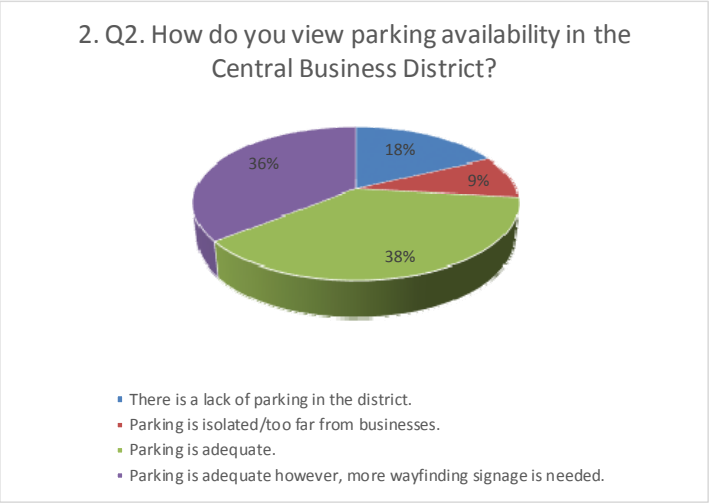
	Percent
Business Owner/Operator	10%
Property Owner	10%
Resident	36%
Interested Citizen	28%
Elected Official	3%
Other	13%
Totals	100%



•Based on the results from question 1, the majority of attendees were residents and interested citizens.

Q2. How do you view parking availability in the Central Business District? (Multiple Choice)

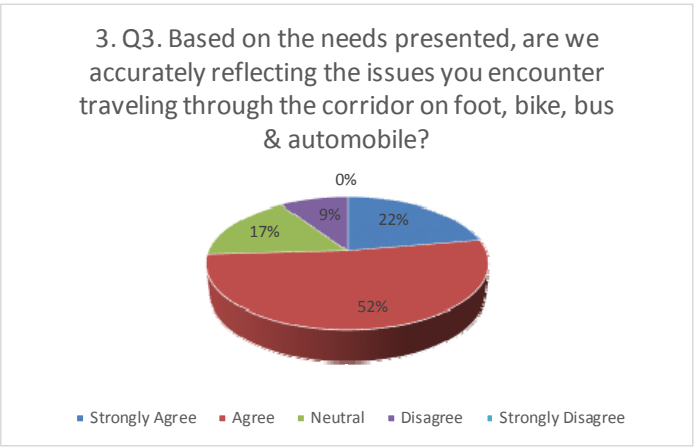
	Percent
There is a lack of parking in the district.	18%
Parking is isolated/too far from businesses.	9%
Parking is adequate.	38%
Parking is adequate however, more wayfinding signage is needed.	36%
Totals	100%



•Based on results from Question 2, most participates view parking as adequate and suggest that wayfinding signage is needed.

Q3. Based on the needs presented, are we accurately reflecting the issues you encounter traveling through the corridor on foot, bike, bus & automobile? (Multiple Choice)

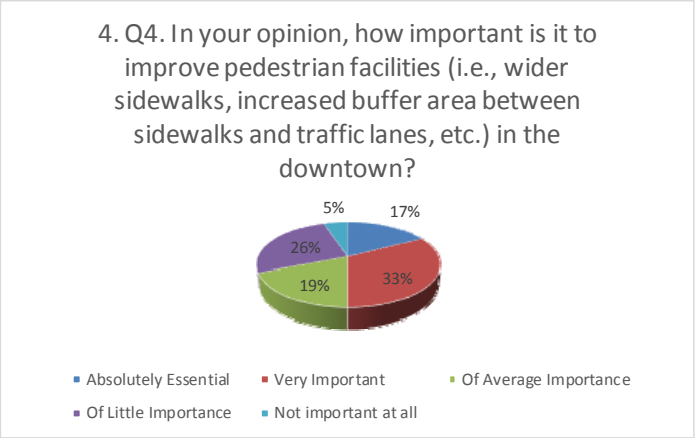
	Percent
Strongly Agree	22%
Agree	52%
Neutral	17%
Disagree	9%
Strongly Disagree	0%
Totals	100%



•Based on results from Question 3, 74% of participants agree that project teams are accurately reflecting the issues encountered when traveling though the corridor.

Q4. In your opinion, how important is it to improve pedestrian facilities (i.e., wider sidewalks, increased buffer area between sidewalks and traffic lanes, etc.) in the downtown? (Multiple Choice)

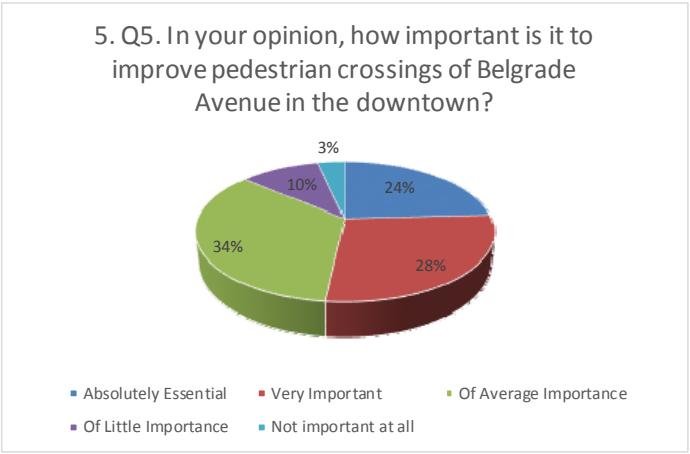
	Percent
Absolutely Essential	17%
Very Important	33%
Of Average Importance	19%
Of Little Importance	26%
Not important at all	5%
Totals	100%



•Based on results from Question 4, 50% of those responding think it is of greater than average importance to improve pedestrian facilities in the downtown. 19% think it is of average importance.

Q5. In your opinion, how important is it to improve pedestrian crossings of Belgrade Avenue in the downtown? (Multiple Choice)

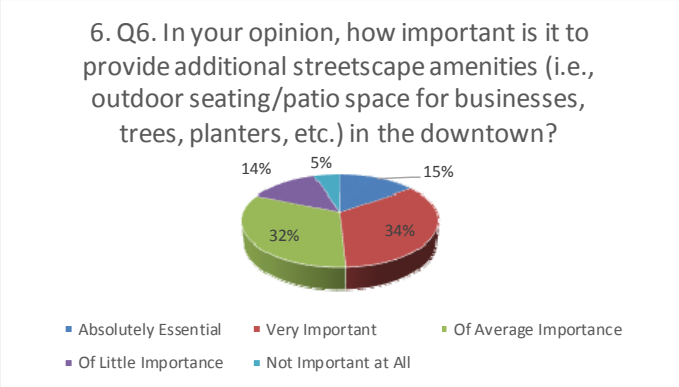
	Percent
Absolutely Essential	24%
Very Important	28%
Of Average Importance	34%
Of Little Importance	10%
Not important at all	3%
Totals	100%



•Based on Question 5, 52% of those responding stated that it is important to improve pedestrian crossings in the downtown. 34% suggested it was of average importance.

Q6. In your opinion, how important is it to provide additional streetscape amenities (i.e., outdoor seating/patio space for businesses, trees, planters, etc.) in the downtown? (Multiple Choice)

	Percent
Absolutely Essential	15%
Very Important	34%
Of Average Importance	32%
Of Little Importance	14%
Not Important at All	5%
Totals	100%



•Based on results from Question 6, 49% suggested that it was more than of average importance to provide additional streetscape amenities in the district. 32% suggested it was of average importance.

Appendix C: Property/Business Owner Meeting Summaries

Belgrade Avenue Corridor Study

North Mankato, Minnesota

Business Owner Meetings

October 2016

1. **Brunton Architects – 1:00 PM – 10/18/16**

Attendees:

- Cory Brunton – Owner
- Jake Huebsch – Transportation Planner, Mankato/North Mankato Area Planning Organization (MAPO)
- Matt Lassonde – Transportation Planner, Bolton & Menk, Inc.

Discussion:

- Cory provided the following information about his business operations and functionality of Belgrade overall:
  - Cory recognized his business as destination business that doesn't attract pedestrians but has noticed in influx of pedestrians in the area that he attributed to the various events in the downtown that bring people and create recognition for the area.
  - Greater Corridor Comments:
    - Cory commented that the grate at the bottom of Lee Boulevard is problematic in the winter; it is really slick with ice and can cause vehicles to spin out/lose control.
  - 200 Block Comments:
    - Inability to take a left turn onto Nicollet Avenue when traveling west is problematic acting as a catalyst for other circulation issues throughout the 200 Block that include:
      - Forces vehicles wanting to access parking on Nicollet Avenue near Belgrade Avenue to go to the Range Street intersection and take a left to circle back.
      - Vehicles will often turn left into Frandsen Bank and access alley from Range and pass through behind businesses.
      - During events, this creates enhanced traffic flows onto Wall Street to Wheeler Avenue for those passing through the downtown to the west. Cory suggested a left turn would allow for vehicles to be routed onto Nicollet which may be better suited to accommodate temporary traffic during these times.
    - Traffic coming over the bridge makes crossing difficult in the 200 Block. Would like to see pedestrian crossing at mid-block.

- The Frandsen lot has no directional signage and this causes confusing vehicle conflicts. Parking is angled for vehicles to enter from Belgrade but vehicles also exit at the same location where space is limited causing conflicts. Semi-trucks delivering to Nakato pull into this entrance and park along the Nakato building as well causing increase friction in circulation here. Cory suggested that signage may assist with this.
- Traffic in the alley is awkward in general with semi-truck deliveries blocking throughways. Cory suggested that this is problematic from many perspectives, especially from an emergency access perspective as fire trucks would have trouble getting through.
- Semi-trucks delivering to Spinner's park on Range Street and take up the southbound lane in front of the establishment right next to the intersection. This is problematic to those that have committed to turning left or right onto Range (traveling south) as they are forced into oncoming traffic. There was suggestion of the potential for a loading zone instead of parking at this location to accommodate deliveries.
- Cory mentioned that sandwich boards on the corner outside of Spinner's are distracting to drivers at the intersection suggesting that they pull them back from the intersection to reduce distraction.

2. **Nakato – 3:00 PM – 10/18/16**

Attendees:

- Jim and Jan Downs – Owners
- Jake Huebsch – Transportation Planner, Mankato/North Mankato Area Planning Organization (MAPO)
- Matt Lassonde – Transportation Planner, Bolton & Menk, Inc.

Discussion:

- Jim and Jan provided the following information about business operations for Nakato and functionality of Belgrade overall:
  - They value their parking lot and the access they have to the property.
  - One issue that they have experienced is that trucks have to deal with the overhead power lines and these are problematic when attempting to traverse through the alley and behind properties.
  - Matt and Jake mentioned that sidewalk expansion is a common topic in meetings. They suggested that they are not interested in expanding the patio but would welcome any beautification efforts to the sidewalks. As owners of Pagliai's Pizza in Mankato as well, they talked about how that area has benefited largely due to the recent enhancements to the sidewalks and traffic calming that has taken place surrounding that location. They mentioned that has only increased patronage to the

restaurant.
    - They have noticed an increase in pedestrians with the art sculpture walk and area events.
    - Their parking lot is shared with Spinner's and is key to area events where the community gathers at the Range Street/Belgrade Avenue Intersection.

3. **Dino's – 3:30 PM – 10/24/16**

Attendees:

- Natasha O'Hara – Owner
- Jake Huebsch – Transportation Planner, Mankato/North Mankato Area Planning Organization (MAPO)
- Matt Lassonde – Transportation Planner, Bolton & Menk, Inc.

Discussion:

- Natasha provided the following information about business operations for Dino's Pizzeria and functionality of Belgrade overall:
    - Natasha reiterated others' concerns with high traffic speeds on Belgrade within the 200 Block.
    - She is generally concerned with peoples' ability to get across at mid-block. As Dino's is a busy establishment, they will often send patrons over to the Circle Inn to have drinks while they wait for a table at the pizzeria. She is concerned that this is a dangerous crossing in current conditions.
    - Natasha asked if increased parking was in the plans; she believes that current parking resources are scarce in the downtown. Mentioned possibly having saw-tooth parking on the south side of Belgrade in the 200 Block.
    - She mentioned that the restaurant could use wider sidewalks and would expand patio space as this is the only type of expansion that would be feasible. She agreed that the transformation on Front Street works well and brings in a lot more pedestrians in Mankato's downtown.
    - There are issues at the Range Street intersection with vehicles and pedestrians not knowing who has the right-of-way; there is confusion.
    - She has also experienced issues with food vendors parking in the alley.

4. **Expressway Gas Station/CENEX – 1:00 PM – 10/25/16**

Attendees:

- Daric Zimmerman – Business Rep
- Jake Huebsch – Transportation Planner, Mankato/North Mankato Area Planning Organization (MAPO)
- Matt Lassonde – Transportation Planner, Bolton & Menk, Inc.

Discussion:

- Daric provided the following information about business operations for the

Expressway/Cenex Station and functionality of Belgrade overall:

- Daric mentioned that access for deliveries on the property is tight. Would like to be able to send trucks through the property to the back alley and out to Range Street intersection to exit.
- Left turns into the parking lot and out are problematic and a center turn lane might help with this. Currently crossing two lanes of traffic to get out.
- This property gets completely blocked off during events and they lose business. Perhaps signage to direct vehicles to the alley to access the property would be beneficial as they remain open and can accommodate patrons.
- They would like to raise the store sign.
- Parking added to the north side of Belgrade in the 200 Block may be problematic with traffic entering and exiting the property.

5. Frandsen Bank – 2:00 PM – 10/25/16

Attendees:

- Shane Van Engen/ Pam Habinger – Business Reps
- Jake Huebsch – Transportation Planner, Mankato/North Mankato Area Planning Organization (MAPO)
- Matt Lassonde – Transportation Planner, Bolton & Menk, Inc.

Discussion:

- Shane and Pam provided the following information about business operations for the Frandsen Bank and functionality of Belgrade overall:
  - Parking with Nakato is an issue. People are parking in front of the Bank and leaving vehicles while the Bank is open and patrons can't find a place to park. Employees have been forced to park over on Nicollet Public Parking areas at these times.
  - Matt asked Shane if there are plans to move the drive through. Shane and Pam suggested that they don't have current plans to move the drive through but would consider this in the future if the Central Business District expands to the south and opportunity opens up. Shane and Pam mentioned that the bank drive through was moved there due to heavy traffic in previous years. Currently, the traffic isn't as heavy as it used to be through the drive through.
  - Pam and other employees often cross Range several times a day between the bank and the drive through.
  - There is a post office box in the Frandsen Bank lot that causes issues with traffic passing through.
  - Delivery food trucks will block in employees for long amounts of time in the alleys.
  - They said they would consider signage or directional arrows for the

parking lot.

- They mentioned that there are drainage issues in front of the building that cause water to come up to the front doors.
- Pam mentioned that traffic is heavy in the back alley.

Appendix D: Business on Belgrade Group Meeting Summary

Belgrade Avenue Corridor Study

North Mankato, Minnesota

Business On Belgrade Meetings

Tuesday, February 28, 2017
&
Thursday, March 2, 2017
Bolton & Menk, Inc

Summary

Attendees:

Name	*Title*
John Harrenstein	*City Administrator, City of North Mankato*
Mark Dehen	*Mayor, City of North Mankato*
Courtney Kietzer	*Intern, City of North Mankato*
Jim Whitlock	*President, Business on Belgrade Association; Owner, Brickhouse Graphics*
Jim Downs	*Owner, Nakato*
Jan Downs	*Owner, Nakato*
Derric Zimmerman	*Development Director, Cenex Gas Station*
Angie Bersaw	*Senior Transportation Planner, Bolton & Menk, Inc.*
Matt Lassonde	*Transportation Planner, Bolton & Menk, Inc.*
Katie Heintz	*North Mankato Taylor Library*
Ellen Keonigs	*Y Barbers/Onatah*
Brenda Wilcox	*Y Barbers/Onatah*
Raymond Gong	*Like Nu Dry Cleaners*
Scott Kamps	*DeMars Construction*
Max DeMars	*DeMars Construction*
Jeni Bobholz	*Circle Inn*

Two meetings were held at Bolton & Menk, Inc. between Project and City Staff and the Business on Belgrade (BoB) Group on February 28th and March 2nd of 2017. The meetings were held to solicit feedback from the BoB group as most were absent from the open houses held in January. Eleven members total from the group were present at the meetings.

The following is summary of the discussions that took place during both meetings:

- *Both meetings were set up to facilitate informal discussion. The 200 Block concepts dominated the conversation among participants.*
- *Midblock Crossing at Wall Street:*
    - *There was ample discussion of the midblock crossing near Wall Street. Impacts to parking are an issue in front of businesses that depend on vehicles stopping briefly in front of the store for a haircut or to drop items at the cleaners. The bumpout shown with the midblock crossing would remove at least two parallel parking spots from the front of those businesses.*

Mayor Dehen and Administrator Harrenstein inquired about possibly moving the crossing to better align with a path located along the eastern edge of the Cenex parking lot, adjacent to the Circle Inn Bar. This would move the crossing west approximately 80-feet placing a potential bumpout in front of the White Orchid clothing store and the vacant lot on the south side of Belgrade. The Mayor mentioned that he would like to see the crossing develop in phases beginning with striping the facility first, adding the bumpouts if needed in the future, and potentially adding a pedestrian flasher to the crossing if needed later on. Project Staff agreed that phased implementation seemed reasonable and will work to validate whether this is possible or not.

- *Like Nu Cleaners and Y Barbers representatives were not supportive of removing parking stalls from the south side of Belgrade at all. They raised concerns about potential loss of business. Raymond G. argued that his customers are carrying heavy loads of clothing into the building and need close access. Also, insurance reasons prevent him from having customers enter from the rear of the building. Ellen K also said that Y Barbers depends on customers stopping briefly for a haircut stressing the need for parking stalls.*

- *3-lane option with mini-roundabout:*
  - *The mini-roundabout, a concern of participants at previous meetings, continued to be an issue among participants. Mayor Dehen and Administrator Harrenstein were wondering if there was an option to remove the mini-roundabout and still maintain a three lane option. It was discussed that the roundabout would be problematic during events such as the Fun Days parade where floats move through the intersection and Blues on Belgrade where a stage occupies the area during the event. Angie suggested that she has discussed the 3-lane option without the mini-roundabout with the project traffic engineer who has confirmed that as a viable option. Project Staff will move forward with development of that as an option.*
  - *Derric from Cenex mentioned that the 3-lane option works well for his business as it is currently difficult for vehicles turning left into the gas station, specifically delivery trucks. The center turn-lane option would facilitate left hand turns, removing one westbound thru-lane of conflict traffic to compete with.*
  - *BoB representatives at the meeting generally supported wider sidewalks in the area and improvements to the streetscape.*
  - *Some were concerned that it would be impossible to parallel park with the 3-lane option.*
- *4-lane option with bumpouts at Range and midblock:*
  - *Administrator Harrenstein expressed preference for the existing 4-lane scenario that exists today and mentioned that he has received calls from people who also support non-action.*
  - *Participants supported closing accesses on Belgrade to the public parking lot adjacent to the American legion as well as the Circle Inn Bar. Mayor Dehen suggested he would like to see the mid-block crossings and access closure implemented in one phase as a short-term project.*
- *Wall Street, Nicollet Avenue, and USTH 169 intersections:*
  - *Angie and Matt explained the various options for access to Wall Street, Nicollet Avenue, and the USTH 169 intersection. The first option identifying a dedicated turn-lane onto Nicollet Avenue was generally supported by the group. Matt reminded the group that the turn onto Nicollet wasn't wholly supported by the Project Engineer but remained a viable option. Matt explained that previous concerns have been raised by vehicles detoured onto Wall Street as a*

result of events downtown. Traffic entering the downtown have a long way to travel to access businesses on the south side of Belgrade during events due to detours and heavy traffic is routed onto Wall and Wheeler which are not well suited to accommodate that traffic. One solution discussed is to provide a removable barrier to allow left-turning traffic onto Nicollet during events. This may alleviate most of the aforementioned issues.

- *Max DeMars questioned if Nicollet Avenue could somehow be hooked up to a roundabout at the USTH 169 intersection. Participants also wondered if a mini-roundabout could work at Nicollet/USTH 169. Matt mentioned he would discuss with the project team.*

- *In General:*
  - *Some didn't support less traffic or slowed traffic through the area. They believe it is good for business. Those participants also believe that narrower and less lanes will deter customers from accessing businesses and they will stop passing through there.*
  - *Some would like Staff to consider an option with keeping four lanes and only widening sidewalks on the south side of the road.*
  - *Discussion occurred regarding a path through the vacant lot on the south side of Belgrade accessing a new parking lot placed in the rear of the buildings. Max DeMars owns the vacant lot and parking area on the south side and said he'd be open to discussions of selling the property for those purposes. This would increase parking in the area in the direct vicinity of businesses.*
- *Lee Boulevard:*
  - *Participants were generally supportive of a roundabout at the Lee Boulevard/Belgrade Avenue Intersection. Mayor Dehen mentioned that he would like to see an oblong roundabout that facilitates southbound thru-traffic more than other directions. Angie and Matt mentioned they would speak with other Project Staff.*
  - *City and Project Staff agreed that it was feasible to move the proposed crosswalk from Nicollet Avenue to the path adjacent to the North Mankato Water Treatment Facility just west of Lake Street. Project Staff will work to insert this connection into concepts.*

Appendix E: Steering Committee Meeting Summaries

Belgrade Avenue Corridor Study

North Mankato, Minnesota

Steering Committee Meeting

Wednesday, September 8, 2016
North Mankato Police Annex
5:30 – 6:30 pm

Summary

Attendees:

Name	Title/Agency
Jake Huebsch	Transportation Planner; Mankato Area Planning Organization (MAPO)
Angie Bersaw	Senior Transportation Planner; Bolton & Menk, Inc.
Michael Fischer	City Planner; City of North Mankato
Matt Lassonde	Transportation Planner; Bolton & Menk, Inc.
Tom Hagen	Steering Committee Member
Barb Church	Steering Committee Member
Matthias Leyrer	Steering Committee Member
Jon Hamel	Steering Committee Member
Sheila Skilling	Steering Committee Member

1. Introduction and Roles

- *Agency and Consulting Staff introduced themselves and their affiliation to Steering Committee members and discussed roles in the project.*
- *Staff discussed the role of the Steering Committee in the Project*

2. Presentation

A presentation was given to introduce project goals, relationship to the Belgrade Master Plan efforts, status of the corridor study, existing conditions on Belgrade Avenue, schedule, and next steps.

The following materials were provided to Steering Committee members for discussion of existing conditions:

- *Maps:*
  - *Access Inventory*
  - *Parking Assessment*
  - *Traffic Operations*
  - *Crash History*
  - *Pedestrian and Bicycle Connections*
  - *Land Use*
  - *Transit*
- *Project Schedule*

- *Project Handout (This included: general project information, contact information, website location)*

3. Steering Committee Discussion with Staff

Staff led a discussion with committee members to identify answers to the following overarching questions:

- *What are your primary transportation concerns with Belgrade Avenue?*
- *What do you want to achieve with improvements to Belgrade Avenue?*

The following is a summary of the discussion between staff and committee participants:

- *One member discussed the significance of ambience along the corridor that has been a part of several discussions in many previous planning efforts. He suggested that changes to the corridor will need to keep this in mind in regards to roadway design. Angie mentioned that streetscaping will be a consideration in our roadway design alternatives.*
- *One participant would like to see commercial development spread further west along Belgrade rather than clustering it at the eastern edge of the corridor near the Veteran's Memorial Bridge.*
- *Several participants suggested that they would like to see slower traffic along Belgrade, specifically within the Central Business District (CBD). Staff suggested there are measures that can be implemented in streetscape design that can cause drivers to slow down. Measures include sidewalk bumpouts, narrower lanes, parking configurations, etc. Staff confirmed that several methods could be explored in concept alternative development. One participant suggested that the Veteran's Memorial Bridge is designed like a highway and that encourages drivers to exceed the speed limit through the CBD.*
- *There was some discussion regarding lane configuration downtown. Matt suggested that the removal of one lane in the four lane section at the 200 Block has been a discussion topic in many previous Belgrade Master Plan meetings. Angie asked whether participants would like to see wider sidewalks, increased on-street parking, or other infrastructure if more space becomes available at the road sides. Some suggested they would like to see wider sidewalks along the 200 Block of Belgrade to accommodate patio dining at restaurants and increased pedestrian movement. Alternative parking measures were also discussed such as angled parking in front of the south side businesses or parking on both sides of the street. Staff confirmed that several options would be considered during concept alternative development.*
- *A participant suggested that cameras located at key locations in Mankato have been quite beneficial for traffic accident and other purposes and recommended that consulting staff consider integrating this into design.*
- *Participants began discussing the adequacy of parking resources along the corridor. One participant mentioned that previous studies suggested that there is a perceived shortage of parking resources along the corridor. Matt confirmed that several studies do state that the shortage is perceived. One participant recommended additional lighting on side streets to make on-street parking there seem more inviting and safe. This would perhaps encourage patrons to park there and remove some of the strain on other parking resources and assist with ending the perception of a parking shortage. Wayfinding signage to parking was also discussed as a tool to solve parking perceptions.*
- *The general opinion of the group was that pedestrian/bicycle crossings are unsafe in most locations as vehicles speed and ignore stop signs. Matt asked the group if pedestrians could be accountable for also not following the rules of the road.*

Participants suggested that bicyclists are often seen failing to exercise appropriate roadway conduct while riding, also running stop signs and getting into traffic which was seen as problematic along the corridor. Matt and Angie described Nicollet Avenue as a designated bike route per the City's complete streets policy along with Sherman Street and Center Street. One participant asked how these were marked and suggested that "sharrows" are not good means of marking a designated on-road bike path. Participants suggested a stop sign at Sherman to accommodate the existing on-road path.

- *Another concern with pedestrian access was identified in the 200 Block. Participants identified the block as very long and not easy to cross. The crossing at Range Street is a far distance from most public parking.*
- *Participants inquired about transit routes and the general future of transit in North Mankato. Jake mentioned that the MAPO already has a planning effort in the works to study the transit system and identify any potential changes.*
- *Traffic control measures were discussed for various intersections. The southbound ramp on 169 was discussed and participants inquired to the feasibility of a roundabout option in that location. Matt mentioned that the City requested a high level design to assess the potential geometric fit for a roundabout but discussions have not moved forward from there. Angie and Matt discussed that a future Intersection Control Evaluation (ICE) study will be taking place and will explore multiple possibilities. Some inquired about the potential for a mini-roundabout at the Range/Belgrade intersection to improve potential delays and pedestrian movements. Angie suggested that participants view an informational video prepared for the City of Shakopee to see how mini-roundabouts operate. Angie suggested that many possibilities would be explored through concept development.*
- *One participant suggested that the gas station and the bank drive through are vehicle focused businesses and cause a lot of traffic in the area. Angie said access modifications will be looked at closely in the CBD but noted that discussions with individual businesses would also need to occur to make sure proposed changes, if any, would work with their business operations.*

4. Next Steps

a. Development & Evaluation of Alternatives—October 2016 to January 2017
b. Future Traffic Analysis—November to December 2016
c. Downtown Plan Steering Committee Meeting #2—November 2016
d. Public Open House #1—December 2016

Belgrade Avenue Corridor Study
&
Belgrade Avenue Master Plan
North Mankato, Minnesota
Steering Committee Meeting

January 19th, 2017
North Mankato Police Annex
6:00 to 7:30 pm

Summary

Attendees:

Name	Title/Agency
Jake Huebsch	Transportation Planner; Mankato Area Planning Organization (MAPO)
Angie Bersaw	Senior Transportation Planner; Bolton & Menk, Inc.
Michael Fischer	City Planner; City of North Mankato
Matt Lassonde	Transportation Planner; Bolton & Menk, Inc.
Courtney Kietzer	Planning Analyst, City of North Mankato
Randy Zellmer	Committee Chair
Megan Flanagan	City Center Partnership
Linda Myron	Committee Member
Lynn Schreiner	Committee Member
Barb Church	Committee Member
Jon Hammel	Committee Member
Matthias Leyrer	Committee Member
Sheila Skilling	Committee Member
Tom Hagen	Committee Member
Tom Bohrer	Committee Member

1. Welcome and Introductions

2. Belgrade Master Plan Updates

- *Matt opened discussion with the proposed revisions to the Belgrade Master Plan - Section 4.6 Historic Preservation and Design Guidelines. Tom H. raised concerns he had with the language in the section referring to the City using the Planning Commission as the authority on historic preservation instead of a historic preservation commission.*
- *Courtney gave a brief rundown of the Design Guideline Document Updates. All agreed that the guidelines were done well and conveyed the right message. However, Jon H. questioned the*

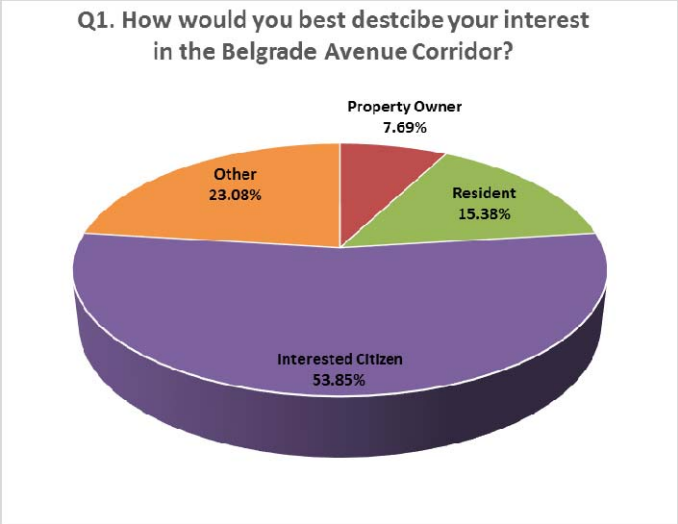
City's ability to enforce the guidelines as policy. Tom H. and others encouraged Project Staff to work with the City to change the language.

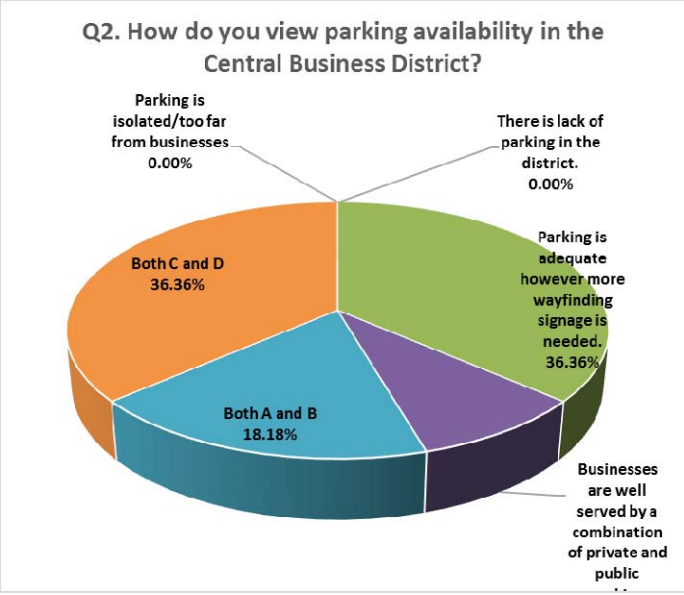
- *Matt said that he would work with City Staff and Project Partners to find a suitable solutions to the concerns. Several potential courses of action were discussed including moving forward with finalizing an inventory of historic resources begun by Courtney K. and involving the State Historic Preservation Office in the process for guidance on action to take. Matt reassured the group that this would be resolved.*

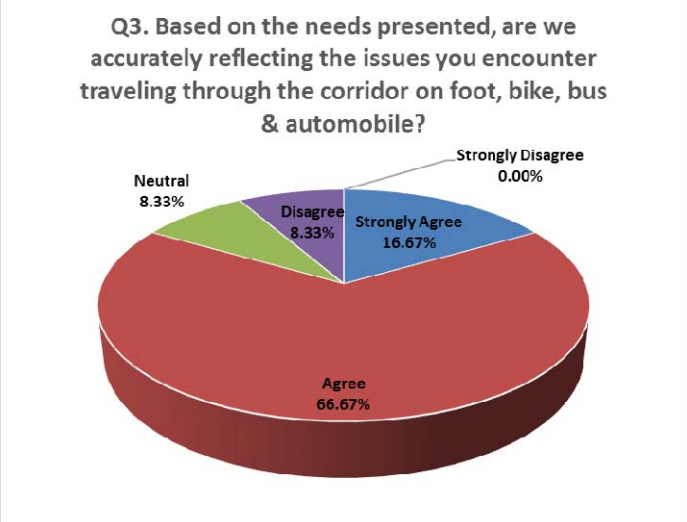
3. Belgrade Corridor Study Updates Presentation

- *The following materials were presented to Steering Committee members for discussion:*
  - *Study Progress*
  - *Brief review of existing conditions:*
    - *Access Inventory*
    - *Parking Assessment*
    - *Traffic Operations*
    - *Crash History*
    - *Pedestrian and Bicycle Connections*
    - *Land Use*
    - *Transit*
  - *Study Goals*
  - *Range of Concept Alternatives including:*
    - *Improvements from Lee Boulevard to Lake Street*
    - *The addition of bumpouts to the following intersections:*
      - *Cornelia Street*
      - *Sherman Street*
      - *Center Street*
      - *Cross Street*
    - *200 Block Concepts including:*
      - *4-lane option with added bumpouts*
      - *3-lane options with mini roundabout at the Range/Belgrade intersection and access closures at Circle Inn (adjacent to Wall St) and public parking lot (adjacent to Range St). The 3-lane option would provide extended sidewalk widths and space for streetscape amenities and potential patio opportunities for businesses. This option would also include one of the following variations of the Wall Street, Nicollet Avenue, USTH 169 SB Ramp intersections:*
        - *Dedicated WB turn-lane onto Nicollet from Beglrade.*
        - *Extended median past Wall Street to provide pedestrian refuge for mid-block crossing. This would prevent traffic from turning left onto Nicollet and Wall Street.*
        - *Maintained existing median preventing left hand turns onto Nicollet Avenue.*
          - *Roundabout at USTH 169 providing traffic calming conditions for traffic entering the downtown from the Veteran's Memorial Bridge. This option would maintain a similar median preventing left turns onto Nicollet as exists*

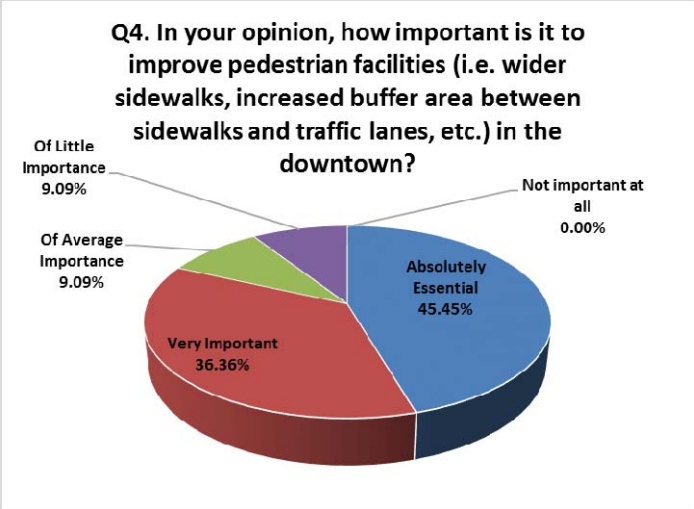
today.

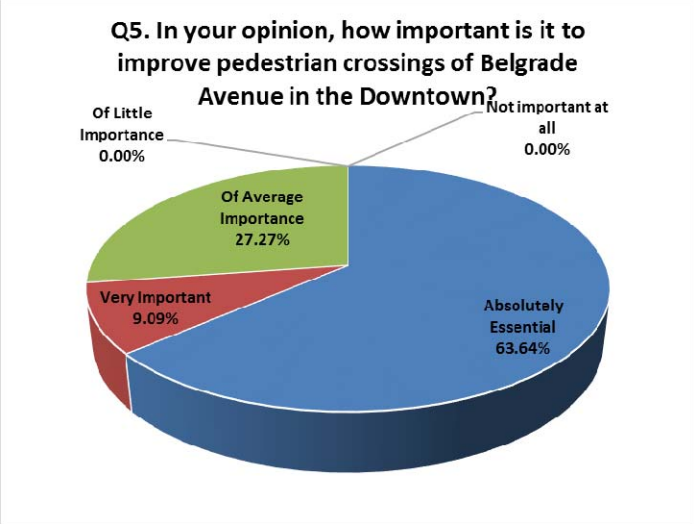


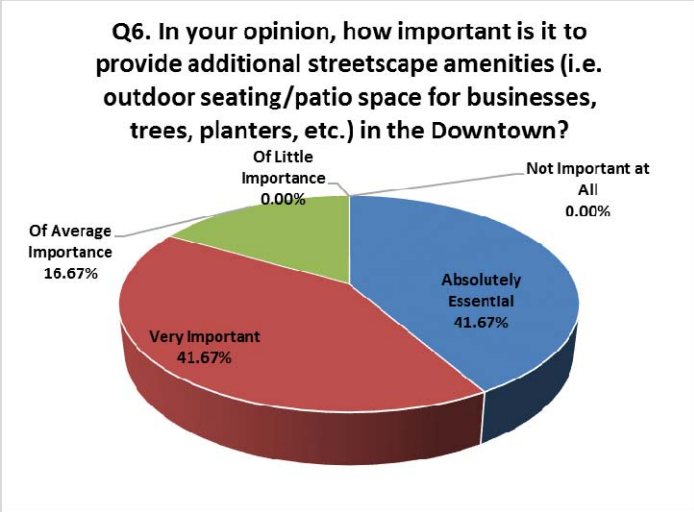




- *Throughout the presentation, several questions were presented to the committee through polling software. The following represents the questions presented and the responses received:*
- *Question 1 assessed the interests of those attending the meeting. Most members of the Steering Committee are Interested Citizens.*
- *Question 2 assessed the groups views on parking availability in the district. Most believed that the district is well served by parking but would benefit from wayfinding signage.*
- *Question 3 asked if the group thought the study accurately reflects the issues on the corridor. The vast majority agreed that it did.*
- *Question 4 asked the importance of improved pedestrian facilities. Most (90%) favored improved pedestrian facilities.*
- *Question 5 asked about the importance of crossings of Belgrade in the Downtown. All participants found this important.*







- *Question 6 asked about the importance of streetscape amenities. Most placed high importance on additional streetscape amenities.*

4. Next Steps

- Project Staff explained next steps and upcoming meetings asking the commission to attend and assist with asking questions to the general public.

a. Next Steering Committee Meeting – February/March

b. Upcoming Open Houses:

i. January 26, 5:30pm to 7:30pm

ii. January 28, 10:00am to 11:30am

Belgrade Avenue Corridor Study
&
Belgrade Avenue Master Plan
North Mankato, Minnesota
Steering Committee Meeting

April 25th, 2017
North Mankato City Hall
6:00 to 7:30 pm

Summary

Attendees:

Name	Title/Agency
Angie Bersaw	Senior Transportation Planner; Bolton & Menk, Inc.
Michael Fischer	City Planner; City of North Mankato
Matt Lassonde	Transportation Planner; Bolton & Menk, Inc.
Randy Zellmer	Committee Chair
Linda Myron	Committee Member
Barb Church	Committee Member
Matthias Leyrer	Committee Member
Tom Hagen	Committee Member
Chris Person	Committee Member

1. Matt and Angie presented the results of the Open House Meetings and the Business on Belgrade Meetings as well as the draft study recommendations to the Steering Committee Group.
2. The group then discussed the status of the Corridor Study and Next Steps. The following outlines the ensuing discussion:
    a. All in attendance were asked to review the proposed Belgrade Avenue Master Plan before completing the Belgrade Avenue Corridor Study.
    b. All participants agreed that the two efforts need a stronger link with language incorporated in both plans linking them. It was discussed that, when drafting the Corridor Study for 200 – 500 blocks of Belgrade, the study would incorporate proposals that align with the Belgrade Master Plan.
    c. Angie and Matt initially identified timeframes from implementation and the group didn't feel that this fit with the project recommendations. The committee suggested we do away with Priority identification in years. Concern being, a bulk of what is proposed is in the 6 – 20 year category, with likelihood little will actually be implemented.
    d. The Steering Committee Chair, Randy Zellmer, suggested, and the group agreed, that the Belgrade Avenue Corridor Study should represent the views of those who participated while avoiding allowing those with negative thoughts to control the plan. Those present

at the open houses agreed that they didn't experienced the same negative views at the open houses for the Master Plan.

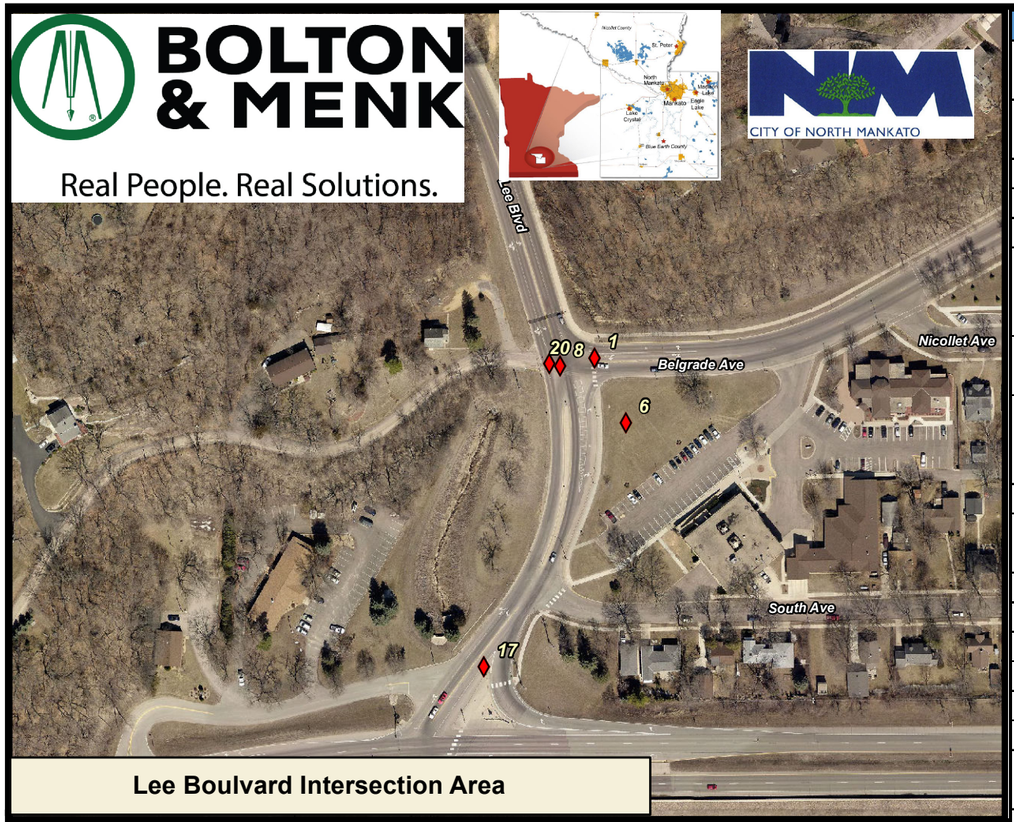
e. The group was in approval of proposing some temporary trials as has been done in the Riverfront Drive Corridor Study in the Mankato Old Town area thinking that maybe people will have a different view after a trial run.
f. A preference from the group was to request the presentation to the City Council be at a Work Session to allow more time to present and discuss both studies.
g. The group would like to wrap up the planning efforts before summer stating "It has been over a year for the Master Plan. It would be nice to bring to an end before summer, when folk's priorities shift to summer activities."

Appendix F: Public Comment Web Application Results Summary

BOLTON & MENK

Real People. Real Solutions.

CITY OF NORTH MANKATO



Lee Boulvard Intersection Area

Sherman Street to Nicollet Avenue

ID	Problem Areas	Comments
1	Unsafe Driving Conditions	Left turns onto Lee Boulevard from Belgrade are unsafe at peak traffic times. This will cause delays and force drivers to drive into heavy oncoming traffic.
2	Other	The inability to take a left turn here is problematic and has repercussions extending throughout the CBD. This causes unwanted traffic flow through the alley and Frandsen/Nakato Parking Lots.
3	Lack of Pedestrian Crossings	
4	Difficulties Accessing Riverfront	Hard to get onto Belgrade from Wall street
5	Other	There needs to be a bike lane, or no cars parked on the side of the road
6	Unsafe Driving Conditions	bicycles should NOT be on the streets, thry DO NOT obey street signs (ie: running stop signs) riding 2 to 6 wide taking up the whole lane and holding up traffic, this is the worst idea ever. then forcing the tax payer to pay for unused hike/bike trails
7	Difficulties Accessing Riverfront	Cars at the four way stop sign on Belgrade either don't come to a complete stop or don't take their turn at the intersection- creating problems and an unsafe intersection.
8	Unsafe Pedestrian Conditions	Crossing Lee Blvd at the bottom of the hill is extremely dangerous. It's also dangerous crossing Belgrade Ave. at the intersection of Lee Blvd and Belgrade Ave. Drivers speed and do not give pedestrians or bicyclists the opportunity to cross.
9	High Traffic Speeds	The entire Belgrade should be pedistrian-centric- currently car-centric.
10	Lack of Pedestrian Crossings	As a pedestrian, I generally feel unsafe crossing Belgrade in morning and evening rush hours. Also, there is not a good place to cross Belgrade at the Circle Inn/Marigold Building corner.
11	Inadequate Parking	I seldom shop there because I don't see safe places to park. Parallel parking is just too risky with the traffice.
12	Lighting	When walking alone Belgrade much of the block is dark except for the corner
13	Inadequate Parking	Need more
14	Lack of Pedestrian Crossings	and some street intersections in lower north have no stop or yield signs.
15	Inadequate Parking	
16	Traffic Delay	
17	Trail and Sidewalk Gaps	Having a painted cycling lane from veteran's memorial bridge to lookout drive would be great for connecting existing cycling routes. The lanes on broad street in Mankato are a fantastic example.
18	High Traffic Speeds	Intersections by highwy,LeeBlvd and belgrade fountain are sometimes difficult w\lack of driver speeds unaware of pedestrians
19	Other	What are the considerations that have been made regarding the needs of an aging population?
20	Unsafe Pedestrian Conditions	Roundabouts are EXTREMELY unsafe for for pedestrians. Many athletes use our hills - let's keep them safe
21	Unsafe Conditions for School Children	Need to reduce the amount of lanes and have bump-outs at intersections so kids, elderly people, bikes, parents with kids/dogs, etc. can cross more safely.
22	Difficulties Accessing Riverfront	Too many people going through stop signs or entering wrong way on Belgrade and Center. Too hard to make a left turn at the end of Belgrade Ave during rush hours. Roundabouts ARE NOT the solution.

Belgrade Avenue Corridor Study - Public Comment Geoform

This Public Comment Geoform was hosted on the project website to collect input. 25 users responded throughout the study process. Each location corresponds with a concern identified in the table above.

Appendix G: Existing Traffic Conditions Technical Memorandum

BOLTON & MENK
Real People. Real Solutions.

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Burnsville, MN 55337-1649

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Bolton-Menk.com

MEMORANDUM

Date: September 19, 2016

To: Paul Vogel

From: Ross B. Tillman, P.E.
Kelsey E. Retherford, E.I.T.

Subject: Existing Traffic Conditions
Belgrade Avenue Corridor Study
City of Northern Mankato, MN
Project No.: T42.111862

Introduction

The Mankato/North Mankato Area Planning Organization in cooperation with the City of North Mankato have requested a corridor study along Belgrade Avenue from Lee Boulevard to TH 169 North Ramp. Belgrade Avenue is located along the southern edge of the City of Northern Mankato. This memorandum provides a summary of the existing conditions as a baseline to understand the needs and potential solutions.

Data Collection

13-hour turning movement counts were completed at the intersections analyzed in May of 2016. The AM peak hour was found to be from 7:15-8:15am and the PM peak hour was found to be from 5:00-6:00pm. The existing traffic volumes are shown in **Figure 1** of **Appendix A**.

Existing Conditions

Belgrade Avenue is a two lane undivided roadway from Lee Boulevard to Range Street, four lane undivided roadway from Range Street to Nicollet Avenue and a four lane divided roadway from Nicollet Avenue to east of the TH 169 North Ramps. The intersections of Belgrade Avenue at the TH 169 North and South Ramps are signalized. The intersections of Belgrade at Range Street and Center Street are all way stop controlled. Belgrade Avenue at Sherman Street and Belgrade Avenue at Lake Street are side street stop controlled with Belgrade Avenue having the right of way. The intersection of Belgrade Ave at Lee Boulevard is side street stop controlled with Lee Boulevard having the right of way.

The speed limit on roadways throughout the project area is 30 MPH. TH 169 is classified as a Principal Arterial. Belgrade Avenue and Lee Boulevard are classified as Minor Arterials. North of Belgrade Avenue Range Street is classified as a Major Collector. Center Street and Lake Street north of Belgrade Avenue are classified as a Minor Collector. All other roadways are classified as Local roadways.

Safety Analysis

A crash review was completed using the Minnesota Crash Mapping Analysis Tool (MnCMAT) for the previous five years (2010-2014). MnDOT uses a comparison of the crash rate and the critical rate when

determining whether or not there is a safety issue at an intersection. The crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside of the expected, normal range. The critical index reports the magnitude of this difference and a critical index of less than one shows that the intersection is operating within the normal range. **Table 1** shows the critical index comparing the total number of crashes and the critical index for the amount of fatal and serious injury crashes at each intersection analyzed.

Table 1. Intersection Crash Indices

Intersection	Total Crash Critical Index	Fatal & Serious Injury Crash Critical Index
Belgrade Avenue at TH 169 North Ramp	0.32	-
Belgrade Avenue at TH 169 South Ramp	0.53	0.86
Belgrade Avenue at Range Street	0.6	-
Belgrade Avenue at Center Street	0.35	-
Belgrade Avenue at Sherman Street	0.88	1.26
Belgrade Avenue at Lake Street	0.47	-
Belgrade Avenue at Lee Boulevard	0.68	-

All intersections have a total crash critical index less than one showing that the number of crashes reported at each of the intersections between 2010 and 2014 is within the normal range. However when analyzing the number of fatal and serious injury crashes reported at each intersection it was found the intersection of Belgrade Avenue at Sherman Street is experiencing a higher than usual number compared to similar intersections statewide.

Table 2 below summarizes the crashes reported at the intersection of Belgrade Avenue at Sherman Street from 2010 to 2014. There were a total of 6 reported crashes.

Table 2. Crash Type and Severity at Belgrade Avenue at Sherman Street

Crash Type	Incapacitating Injury	Possible Injury	Property Damage
Right Angle	-	1	2
Rear End	-	-	1
Pedestrian	1	-	-
Head On	-	-	1

Due to the low volume at this intersection having an incapacitating injury crash is what caused this intersection to operate outside the normal range compared to similar intersection for fatal and serious injury crashes. Additionally with a total crash critical index of 0.88, if there had been one more crash reported over the five year period analyzed this intersection would also be operating outside the normal range for total crashes.

At the intersection of Belgrade Avenue at TH 169 North Ramps there were 13 crashes reported. **Table 3** below summarizes the crashes.

Table 3. Crash Type and Severity at Belgrade Avenue at TH 169 North Ramps

Crash Type	Possible Injury	Property Damage
Rear End	1	3
Right Angle	3	1
Sideswipe Passing	-	3
Left Turn	-	1
Ran off Road	-	1

At the intersection of Belgrade Avenue at TH 169 North Ramps rear end and right angle crashes were the most common types of crashes. One of the rear end crashes and three of the right angle crashes resulted in possible injury crashes. All other crashes at the intersection were property damage only crashes.

At the intersection of Belgrade Avenue at TH 169 South Ramps there were 14 crashes reported. **Table 4** below summarizes the crashes.

Table 4. Crash Type and Severity at Belgrade Avenue at TH 169 South Ramps

Crash Type	Incapacitating Injury	Possible Injury	Property Damage
Rear End	1	1	5
Right Angle	-	-	3
Sideswipe Passing	-	-	1
Left Turn	-	-	2
Ran off Road	-	-	1

At the intersection of Belgrade Avenue at TH 169 South Ramps rear end crashes were the most common types of crash. One of the rear end crashes resulted in an incapacitating injury, one was a possible injury crash and the other five were property damage only crashes. All other crashes at the intersection were property damage only crashes.

At the intersection of Belgrade Avenue at Range Street there were 8 crashes reported. **Table 5** below summarizes the crashes.

Table 5. Crash Type and Severity at Belgrade Avenue at Range Street

Crash Type	Non-Incapacitating Injury	Possible Injury	Property Damage
Rear End	-	1	3
Right Angle	-	1	1
Sideswipe Passing	-	-	1
Pedestrian	1	-	-

Rear end crashes were the most common at the intersection of Belgrade Avenue at Range Street. Three of the rear end crashes were property damage only crashes and one was a possible injury crash. There were two right angle crashes, one sideswipe crash and a pedestrian crash that resulted in a non-incapacitating injury.

At the intersections of Belgrade Avenue with Center Street, Lake Street, and Lee Boulevard there were seven or less reported crashes between 2010 and 2014. At Center Street there were two rear end crashes, one sideswipe passing, and one left turn crash. One of the rear end crashes was a possible injury crash. The other three crashes reported at Center Street were property damage only crashes. At Lake Street there were two pedestrian crashes with one resulting in a non-incapacitating injury and the other was a possible injury crash. There was a property damage only crash from a vehicle who ran off the road at Lake Street. At the intersection of Belgrade Avenue at Lee Boulevard there were four right angle crashes with two resulting in possible injury crashes and two were property damage only crashes. There was also a head on, sideswipe opposing, and a sideswipe passing crash that were all property damage only crashes. The intersection crash rate worksheets are included in **Appendix B**.

Segment Crashes

A crash analysis was also completed along Belgrade Avenue to analyze non-intersection related crashes along the corridor from 2010 to 2014. All of the segment crashes were property damage only crashes. **Table 6** below shows the types of crashes reported along Belgrade Avenue.

Table 6. Belgrade Avenue Segment Crashes

Location	Crash Type
Lee Blvd to S Lake St	2-Sideswipe Passing, 3-Ran Off Road
S Lake St to Center St	1-Rear End
Center St to Nicollet Ave	1-Parking Related Crash
Nicollet Ave to TH 14	No Reported Crashes

There were two sideswipe passing crashes and three crashes from vehicles driving off the roadway between Lee Boulevard and South Lake Street. There was one rear end crash reported between South Lake Street and Center Street and one crash between Center Street and Nicollet Avenue from a car backing up into a parked car.

Existing Operational Analysis

A level of service (LOS) analysis of the peak hours was completed using the existing turning movement counts in SimTraffic. The LOS results are based on average delay per vehicle as calculated by the 2010 Highway Capacity Manual (HCM), which defines the level of service, based on control delay. Control delay is the delay experienced by vehicles slowing down as they are approaching the intersection, the wait time at the intersection, and the time for the vehicle to speed up through the intersection and enter into the traffic stream. The average intersection control delay is a volume weighted average of delay experienced by all motorists entering the intersection on all intersection approaches. Intersections and each intersection approach are given a ranking from LOS A through LOS F. LOS A indicates the best traffic operation, with vehicles experiencing minimal delays. LOS A through D is generally perceived to be acceptable to drivers. LOS E indicates that an intersection is operating at, or very near, its capacity and that drivers experience considerable delays. LOS F indicates an intersection where demand exceeds capacity and drivers experience substantial delays. **Table 7** includes the results of the existing traffic analysis.

Table 7 - Existing (2016) Traffic Operations Analysis

Traffic Control Scenario	Peak Hour	Intersection Delay*- LOS		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft) ****
NB TH 169 Ramp at Belgrade Ave *Signalized Intersection*	AM	4	A	14	B	NBL	WBT	44	109
	PM	5	A	16	B	NBL	WBT	99	190
SB TH 169 Ramp at Belgrade Ave *Signalized Intersection*	AM	11	B	21	C	SBL	WBL	72	129
	PM	11	B	25	C	SBL	WBL	123	225
Range St at Belgrade Ave *All-Way Stop Controlled*	AM	7	A	9	A	EBT	EBL/T	45	71
	PM	8	A	10	B	WBL/EBT	WBL	83	145
Center St at Belgrade Ave *All-Way Stop Controlled*	AM	7	A	9	A	WBT	EBL/T	41	74
	PM	8	A	10	A	WBT	WBT	54	86
Sherman St at Belgrade Ave *Side-Street Stop Controlled*	AM	3	A	8	A	SBT	SBL/T/R	38	62
	PM	3	A	9	A	SBL	SBL/T/R	35	60
Lake St at Belgrade Ave *Side-Street Stop Controlled*	AM	2	A	6	A	SBL	SBL/R	23	43
	PM	2	A	8	A	SBL	EBL/T	17	50
Lee Blvd at Belgrade Ave *Side-Street Stop Controlled*	AM	4	A	40	E	WBL	SBL	38	93
	PM	4	A	25	D	WBL	SBL	45	97

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

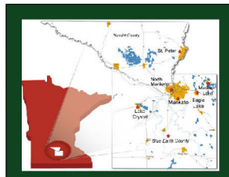
***Limiting Movement is the highest delay approach.

****Max Queue refers to the 95% Queue (Passenger car stored length = 25 ft, Heavy vehicle stored length = 45 ft)

- Intersection delay is acceptable with LOS B or better at all of the intersections during both peak hours.
- The limiting movement operates with LOS E during the AM peak hour at the intersections of Lee Boulevard at Belgrade Avenue and LOS D during the PM peak hour.
- Queue Lengths
    - Belgrade Avenue at Range Street
        - The westbound left average queue extends beyond the American Legion and Frandsen Bank driveway

Tables C1 and **C2** in **Appendix C** show the existing delay and queue lengths for each movement at all of the intersections analyzed.

Appendix A: Turning Movement Counts



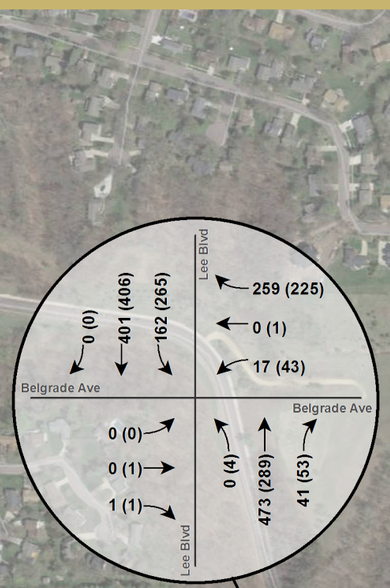
Belgrade Avenue Corridor Study

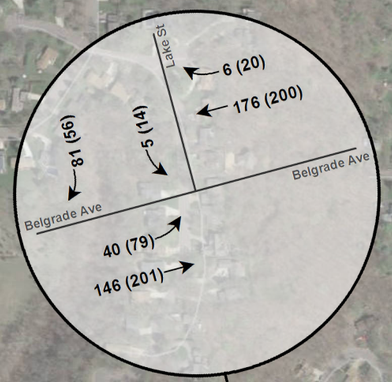
Mankato/North Mankato Area Planning Organization

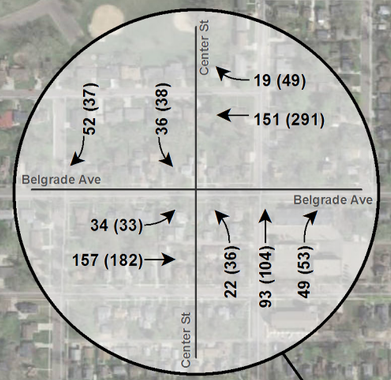
Existing (May 2016) Turning Movement Counts

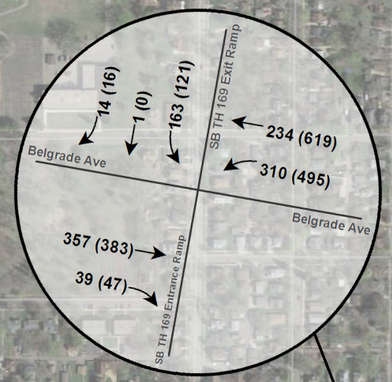
July 2016

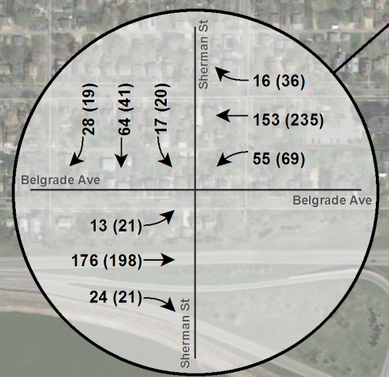
BOLTON & MENK Engineers & Surveyors

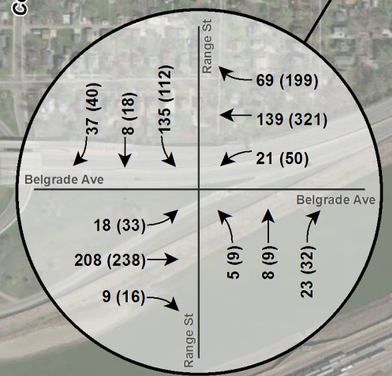












Lake St
Lee Blvd
Belgrade Ave
Lookout Dr
Sherman St
Center St
Nicollet Ave
Range St
S Riverfront Dr
169
MINNESOTA 60

Legend

Existing TMC - May 2016

AM (PM)

0 500 Feet

Source: MnDOT, Google Imagery

Map Document: \\METROSOUTH1\gis\MAPO_MULT\42111862\ESRI\Maps\111862_Existing_TMC_11x17L_RAW.mxd
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Appendix B: Intersection Crash Rates

Intersection Safety Screening

Intersection: Belgrade Avenue at NB TH 169 Ramps

Crash Data, 2010-2014

Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	0
Possible Injury	4
Property Damage	9
Total Crashes	13

Intersection Characteristics	
Entering Volume	21,400
Traffic Control	Signals
Environment	Suburban
Speed Limit	30 mph

Annual crash cost = $78,120

Statewide Comparison

Signals: high volume, low speed

Total Crash Rate	
Observed	0.33
Critical Rate	1.04
Critical Index	**0.32**

Fatal & Serious Injury Crash Rate	
Observed	0.00
Critical Rate	3.72
Critical Index	**0.00**

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.33 per MEV; this is 68% below the critical rate. Based on similar statewide intersections, an additional 28 crashes over the five years would indicate this intersection operaters outside the normal range.

The observed fatal and serious injury crash rate for this period is 0.00 per 100 MEV; this is 100% below the critical rate. The intersection operates within the normal range.

Intersection Safety Screening

Intersection: Belgrade Avenue at SB TH 169 Ramps

Crash Data, 2010-2014

Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	1
Non-incapacitating Injury	0
Possible Injury	1
Property Damage	12
Total Crashes	14

Intersection Characteristics	
Entering Volume	15,600
Traffic Control	Signals
Environment	Suburban
Speed Limit	30 mph

Annual crash cost = $143,960

Statewide Comparison

Signals: low volume, low speed

Total Crash Rate	
Observed	0.49
Critical Rate	0.92
Critical Index	**0.53**

Fatal & Serious Injury Crash Rate	
Observed	3.51
Critical Rate	4.06
Critical Index	**0.86**

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.49 per MEV; this is 47% below the critical rate. Based on similar statewide intersections, an additional 13 crashes over the five years would indicate this intersection operaters outside the normal range.

The observed fatal and serious injury crash rate for this period is 3.51 per 100 MEV; this is 14% below the critical rate. The intersection operates within the normal range.

Intersection Safety Screening

Intersection: Belgrade Avenue at Range Street

Crash Data, 2010-2014

Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	1
Possible Injury	2
Property Damage	5
Total Crashes	8

Intersection Characteristics	
Entering Volume	10,300
Traffic Control	All stop
Environment	Suburban
Speed Limit	30 mph

Annual crash cost = $71,800

Statewide Comparison *All Way Stop*

Total Crash Rate	
Observed	0.43
Critical Rate	0.71
Critical Index	**0.60**

Fatal & Serious Injury Crash Rate	
Observed	0.00
Critical Rate	5.02
Critical Index	**0.00**

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.43 per MEV; this is 40% below the critical rate. Based on similar statewide intersections, an additional 6 crashes over the five years would indicate this intersection operaters outside the normal range.

The observed fatal and serious injury crash rate for this period is 0.00 per 100 MEV; this is 100% below the critical rate. The intersection operates within the normal range.

Intersection Safety Screening

Intersection: Belgrade Avenue at Center Street

Crash Data, 2010-2014

Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	0
Possible Injury	1
Property Damage	3
Total Crashes	4

Intersection Characteristics	
Entering Volume	8,200
Traffic Control	All stop
Environment	Suburban
Speed Limit	30 mph

Annual crash cost = $20,640

Statewide Comparison *All Way Stop*

Total Crash Rate	
Observed	0.27
Critical Rate	0.76
Critical Index	**0.35**

Fatal & Serious Injury Crash Rate	
Observed	0.00
Critical Rate	5.93
Critical Index	**0.00**

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.27 per MEV; this is 65% below the critical rate. Based on similar statewide intersections, an additional 8 crashes over the five years would indicate this intersection operaters outside the normal range.

The observed fatal and serious injury crash rate for this period is 0.00 per 100 MEV; this is 100% below the critical rate. The intersection operates within the normal range.

Intersection Safety Screening

Intersection: Belgrade Avenue at Sherman Street

Crash Data, 2010-2014

Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	1
Non-incapacitating Injury	0
Possible Injury	1
Property Damage	4
Total Crashes	6

Intersection Characteristics	
Entering Volume	7,000
Traffic Control	Thru / stop
Environment	Suburban
Speed Limit	30 mph

Annual crash cost = $132,120

Statewide Comparison *Urban Thru / Stop*

Total Crash Rate	
Observed	0.47
Critical Rate	0.53
Critical Index	**0.88**

Fatal & Serious Injury Crash Rate	
Observed	7.82
Critical Rate	6.21
Critical Index	**1.26**

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.47 per MEV; this is 12% below the critical rate. Based on similar statewide intersections, an additional 1 crashes over the five years would indicate this intersection operaters outside the normal range.

The observed fatal and serious injury crash rate for this period is 7.82 per 100 MEV; this is 1.3 times the critical rate.

Intersection Safety Screening

Intersection: Belgrade Avenue at Lake Street

Crash Data, 2010-2014

Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	1
Possible Injury	1
Property Damage	1
Total Crashes	3

Intersection Characteristics	
Entering Volume	6,250
Traffic Control	Thru / stop
Environment	Suburban
Speed Limit	30 mph

Annual crash cost = $49,680

Statewide Comparison *Urban Thru / Stop*

Total Crash Rate	
Observed	0.26
Critical Rate	0.56
Critical Index	**0.47**

Fatal & Serious Injury Crash Rate	
Observed	0.00
Critical Rate	6.80
Critical Index	**0.00**

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.26 per MEV; this is 53% below the critical rate. Based on similar statewide intersections, an additional 4 crashes over the five years would indicate this intersection operaters outside the normal range.

The observed fatal and serious injury crash rate for this period is 0.00 per 100 MEV; this is 100% below the critical rate. The intersection operates within the normal range.

Intersection Safety Screening

Intersection: Belgrade Avenue at Lee Street

Crash Data, 2010-2014

Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	0
Possible Injury	2
Property Damage	5
Total Crashes	7

Intersection Characteristics	
Entering Volume	13,450
Traffic Control	Thru / stop
Environment	Suburban
Speed Limit	30 mph

Annual crash cost = $39,800

Statewide Comparison *Urban Thru / Stop*

Total Crash Rate	
Observed	0.29
Critical Rate	0.43
Critical Index	**0.68**

Fatal & Serious Injury Crash Rate	
Observed	0.00
Critical Rate	3.78
Critical Index	**0.00**

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.29 per MEV; this is 32% below the critical rate. Based on similar statewide intersections, an additional 4 crashes over the five years would indicate this intersection operaters outside the normal range.

The observed fatal and serious injury crash rate for this period is 0.00 per 100 MEV; this is 100% below the critical rate. The intersection operates within the normal range.

Appendix C: Existing Traffic Operations

Table C1. 2016 Traffic Operational Analysis - Existing Geometry

Traffic Control Scenario	Peak Hour	Intersection Delay*- LOS		Movement Delay (sec/veh)																					
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
NB TH 169 Ramp at Belgrade Ave	AM	4	A	5	A	2	A	-		-		3	A	3	A	14	B	0	A	5	A	-		-		-	
Signalized Intersection	PM	5	A	7	A	3	A	-		-		6	A	4	A	16	B	3	A	5	A	-		-		-	
SB TH 169 Ramp at Belgrade Ave	AM	11	B	-		14	B	3	A	9	A	4	A	-		-		-		-		21	C	16	B	2	A
Signalized Intersection	PM	11	B	-		17	B	4	A	12	B	4	A	-		-		-		-		25	C	0	A	2	A
Range St at Belgrade Ave	AM	7	A	7	A	9	A	5	A	6	A	7	A	4	A	5	A	7	A	3	A	6	A	9	A	4	A
All-Way Stop Controlled	PM	8	A	9	A	10	A	7	A	10	B	10	A	6	A	5	A	7	A	4	A	7	A	9	A	5	A
Center St at Belgrade Ave	AM	7	A	7	A	7	A	-		-		9	A	6	A	5	A	8	A	5	A	6	A	-		4	A
All-Way Stop Controlled	PM	8	A	6	A	8	A	-		-		10	A	6	A	5	A	9	A	5	A	6	A	-		4	A
Sherman St at Belgrade Ave	AM	3	A	3	A	1	A	1	A	4	A	2	A	2	A	-		-		-		7	A	8	A	4	A
Side-Street Stop Controlled	PM	3	A	4	A	2	A	1	A	5	A	3	A	3	A	-		-		-		8	A	9	A	4	A
Lake St at Belgrade Ave	AM	2	A	3	A	1	A	-		-		1	A	1	A	-		-		-		6	A	-		3	A
Side-Street Stop Controlled	PM	2	A	4	A	1	A	-		-		1	A	1	A	-		-		-		8	A	-		3	A
Lee Blvd at Belgrade Ave	AM	4	A	0	A	0	A	18	C	40	E	0	A	2	A	0	A	6	A	7	A	9	A	1	A	0	A
Side-Street Stop Controlled	PM	4	A	0	A	13	B	4	A	25	D	2	A	2	A	7	A	6	A	6	A	6	A	1	A	0	A

*Delay in seconds per vehicle

Table C2. 2016 Peak Hour Queues by Movement - Existing Geometry

Traffic Control Scenario	Peak Hour	Queue Lengths																					
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max*	Avg	Max*	Avg	Max*	Avg	Max*	Avg	Max*	Avg	Max*	Avg	Max*	Avg	Max*	Avg	Max*	Avg	Max*	Avg	Max*	Avg	Max*
NB TH 169 Ramp at Belgrade Ave	AM	9	32	11	52	-		-		44	109	0	0	9	32	9	32	0	0	-		-		-	
Signalized Intersection	PM	12	42	20	72	-		-		99	190	0	0	21	48	21	48	0	0	-		-		-	
SB TH 169 Ramp at Belgrade Ave	AM	-		56	98	0	0	72	129	26	64	-		-		-		-		59	113	59	113	0	0
Signalized Intersection	PM	-		67	111	1	13	123	225	53	108	-		-		-		-		45	85	45	85	0	0
Range St at Belgrade Ave	AM	45	71	45	71	8	30	45	68	45	68	30	57	-		18	46	-		-		36	66	-	
All-Way Stop Controlled	PM	55	87	55	87	14	41	83	145	83	145	49	83	-		28	51	-		-		35	63	-	
Center St at Belgrade Ave	AM	41	74	41	74	-		-		42	67	14	41	17	43	40	67	40	67	23	45	-		23	45
All-Way Stop Controlled	PM	47	77	47	77	-		-		54	86	26	51	21	45	43	70	43	70	23	44	-		23	44
Sherman St at Belgrade Ave	AM	-		4	25	-		-		9	32	-		-		-		-		-		38	62	-	
Side-Street Stop Controlled	PM	-		8	43	-		-		13	43	-		-		-		-		-		35	60	-	
Lake St at Belgrade Ave	AM	7	33	7	33	-		-		0	0	0	0	-		-		-		23	43	-		23	43
Side-Street Stop Controlled	PM	17	50	17	50	-		-		0	0	0	0	-		-		-		25	46	-		25	46
Lee Blvd at Belgrade Ave	AM	-		0	5	-		10	32	10	32	14	38	0	0	0	4	1	10	38	93	4	50	4	50
Side-Street Stop Controlled	PM	-		2	10	-		19	47	19	47	12	34	2	16	2	16	2	13	45	97	2	26	2	26

*Max Queue refers to the 95% Queue (Passenger car stored length = 25 ft, Heavy vehicle stored length = 45 ft)

Appendix H: Environmental Screening

Environmental Screening
Belgrade Ave Corridor Study

SEE Topics	Considerations	Existing Conditions
Water Resources	Effects to water resources. Wetlands that may be impacted by partial or complete filling, excavation or drainage, or severance of water supply	Known Water Resources Locations (Figure 1) • The Minnesota River traverses to the east and south of the study area. • The Minnesota River is listed as an Impaired Stream. • No wetlands were located near the study area.
Floodplains	Development encroachments on the 100-year floodplain	Known Floodplains Locations (Figure 1) • Flood Hazard Areas are associated with the Minnesota River to the east and south of TH 169. • Study area protected from the 100-year flood by levee or other structure which may be subject to possible failure or overtopping during prolonged floods or high riverstages.
Surface Water Drainage/Water Quality	Effects of drainage modifications. Run-off effects to protected lakes and watercourses	Drainage infrastructure alterations and impervious surface additions may affect the bodies of water.
Wildlife, Threatened and Endangered Species	• Unique habitats • Widened section • Federal and state listed threatened and endangered species	There are no known wildlife, threatened and endangered species in the study area.
Fisheries	• Trout streams • Fish migrations • Spawning runs • Unique habitats	There are no designated trout streams within the study area.
Vegetation	• Native plant communities • Landscape vegetation • Functional vegetation • High value vegetation • Hazard trees	The study area is dominated by devleoped residential and commerical uses with altered vegetation.

Environmental Screening
Belgrade Ave Corridor Study

SEE Topics	Considerations	Existing Conditions
Contaminated Properties	Disturbance of contaminated properties may increase project cost	Known history of contamination in the study area (Figure 2). • 1 activity in southwest quadrant of Belgrade Ave. and Nicollet Ave. • 1 activity on north side of Belgrade Ave. at Nicollet Ave. intersection • 1 activity on the north side of Belgrade Ave. between Range St. and Nicollet Ave. mid-block • 2 activities in northeast quadrant of Belgrade Ave. and Range St. intersection • 1 activity in southwest quadrant of Belgrade Ave.and Cross St. intersection • 1 activity in northwest quadrant of Belgrade Ave. and Cross St. intersection • 1 activity on north side of Belgrade Ave. between Center St. and Cross St. mid-block • 1 activity in southeast quadrant of Belgrade Ave. and Center St. intersection • 2 activities in northwest quadrant of Belgrade Ave. and Center St. intersection • 1 activity on west side of Center St. between Belgrade Ave. and Wheeler Ave. mid-block • 1 activity on south side of Belgrade Ave. between Lake St. and South Lake St. mid-block • 1 activity at Belgrade Ave. and Lake St. intersection south side • 1 activity on south side of Belgrade Ave. and Nicollet Ave. intersection More detailed investigations may be recommended for properties with existing/past land uses that may have used hazardous/chemical waste.
Parks and Recreation Areas (Section 4f/6f Resources)	• Parks and recreation areas • Land and Water Conservation (LAWCON) funds • Wildlife & waterfowl refuges • Historic sites • Landscapes • Highways • Bridges • Buildings & districts • Wildlife management areas • School playgrounds • Fairgrounds • Public multiple-use land holdings • Public golf courses • Archaeological sites • Wild & scenic rivers	Known Parks and Recreational Areas (Figure 3) • Centennial Park at the northwest corner of Belgrade Ave. and Lake St. and meets the Section 4(f) criteria. • BellTower Apartments at 442 Belgrade Avenue is listed on the National Register of Historic Places and meets the Section 4(f) criteria. • No LAWCON parks identified in the study area. • No Schools identified in the study area.

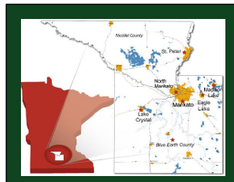
Environmental Screening
Belgrade Ave Corridor Study

SEE Topics	Considerations	Existing Conditions
Environmental Justice	Disproportionate effects to low-income or minority populations	Known current Zoning (Figure 4) • The study area predominately includes the CBD and R-1 (One Family Dwelling) housing. • Smaller concentrations of R-3 (Limited Multiple Dwelling) and R-4 (Multiple Dwelling) housing are in the vicinity of the study area. • Improvements to the study area are not expected to cause disproportionately high or adverse effects.
Social and Community	• Hospitals • Schools • Libraries • Churches • Government buildings • Post offices	Known Social and Community Locations (Figure 3) • U.S. Post Office located between Nicollet Ave. and Range St. on the south side mid-block • Belgrade Avenue United Methodist Church located in the southwest quadrant of the intersection of Belgrade Ave. and Sherman St. • City of North Mankato Water Plant No. 1 located between Lake St. and Nicollet Ave. on the south side mid-block • North Mankato Taylor Library located on the south corner of Belgrade Ave. and Nicollet St. • North Mankato Police Annex located in the sotheast quadrant of Belgrade Ave. and Lee Blvd. • North Mankato Municipal Building located in the sotheast quadrant of Belgrade Ave. and Lee Blvd.
Cultural Resources	Buildings that exceed 50 years in age, archaeological sites, and Traditional Cultural Properties.	Known Cultural Resources Locations (Figure 3) • BellTower Apartments; the former North Mankato Public School at 442 Belgrade Ave. • Additional buildings along Belgrade Ave. exceed 50 years of age and may be eligible for designation
Pedestrian & Bicycle Facilities	Bicycle and pedestrian safety	Known Pedestrian and Bicycle Facilities (Figure 3) • A Regional Trail exists along east side of TH 169 and crosses the Minnesota River on Veterans' Memorial Bridge into the City of Mankato. • On-Road Bicycle Routes exist on Nicollet Ave, Center St, Sherman St, Lake St & Robel St. to South Ave.
Transit & Intermodal Issues	All modes of transportation and existing facilities for alternatives.	Known Transit & Intermodal Issues • The eastern terminus of Belgrade Avenue is serviced by TH 169. • Greater Mankato Transit System Bus Routes 4 and 5 traverse through the study area.
Air Quality	• Impacts to air quality • Mobile source air toxins	The need for an air quality analysis, conformity determination, or Mobile Source Air Toxics analysis will be determined once individual improvement projects are identified.*
Traffic Noise	• Comply with federal noise criteria and Minnesota Noise Standards • Identify of sensitive noise receptors	The need for a noise analysis will be determined once individual improvement projects are identified.*

Environmental Screening
Belgrade Ave Corridor Study

SEE Topics	Considerations	Existing Conditions
Costruction Noise	• Comply with federal noise criteria and Minnesota Noise Standards • Identify of sensitive noise receptors	Construction noise will be further considered in a future environmental review.* City ordinances can regulate the daytime hours of construction activities in order to minimize potential impacts to adjacent areas.
Utilities	Impacts to utilities may incur additional project costs.	To be considered in future environmental review.*
Farmland and Soils	• Minimization of effects to agricultural land • Properties of soils • Suitability for roadway construction	There are no designated farmland and soils in the project area.
Erosion	• Erosional effects • Water pollution	To be considered in a future environmental review.*
Right of Way and Relocation	Effects of right of way acquisition	Additional right-of-way may need to be acquired for future improvement projects. Temporary easements and changes to local roadway and property access points are also likely. Any impacts resulting from right-of-way acquisition, relocation or access changes will be identified in a future environmental review.
Visual Quality	• Scenic intrusion • Grading, Trails • Vegetation modifications • Bridges • Walls • Lighting • Fencing • Railings	The proposed project is not anticipated to result in adverse visual impacts.

*Additional study considerations will be pursued when improvements are identified.



Belgrade Avenue Corridor Study

Mankato/North Mankato Area Planning Organization

Figure 1: Water Resources & Floodplains

July, 2016

BOLTON & MENK Engineers & Surveyors

Lake View Ave
Bennett St
Garfield Ave
Notingham Dr
Sherwood Dr
Lake St
Grant Ave
Wall St
Lyndale St
Wanda St
169
Page Ave
Page Ave
Page Ave
Cedar St
Lee Blvd
Park Ave
Belltower Apartments
Wheeler Ave
Wheeler Ave
Belvista Dr
Belgrade Ave
Lake St
Cornelia St
Belgrade Avenue United Methodist Church
Sherman St
Center St
Top Shop/ PJ's Liquors
Cross St
Spinner's Bar
Range St
Nicollet Ave
Christensen St
Robel St
North Mankato City Hall
South Ave
Lookout Dr
169

Legend

- Study Corridor
- Impaired Streams
- Wetlands
- Flood Hazard Area

0 0.1 Miles

Description

Study area protected from the 100-year flood by levee or other structure which may be subject to possible failure or overtopping during prolonged floods or high riverstages.

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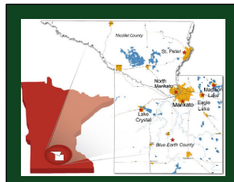

Belgrade Avenue Corridor Study

Mankato/North Mankato Area Planning Organization

Figure 2: Contaminated Properties

July, 2016

BOLTON & MENK Engineers & Surveyors

Lee Blvd
Belvista Dr
Lake St
Grant Ave
Page Ave
Park Ave
Belltower Apartments
Wheeler Ave
Belgrade Ave
Cornelia St
Belgrade Avenue United Methodist Church
Sherman St
Center St
Top Shop/ PJ's Liquors
Cross St
Spinner's Bar
Range St
Nicollet Ave
Christensen St
Wall St
Lyndale St
Cedar St
Wanda St
169
Robel St
North Mankato City Hall
South Ave
Lookout Dr

Legend

- Study Corridor

ACTIVITY

- Construction Stormwater Permit
- Hazardous Waste, Small to Minimal QG
- Multiple Activities
- Petroleum Brownfield
- Tank Site
- Wastewater Discharger

0 0.1 Miles

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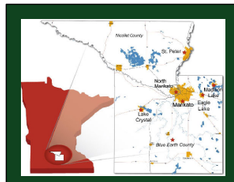

Belgrade Avenue Corridor Study

Mankato/North Mankato Area Planning Organization

Figure 3: Parks, Trails & Cultural Spaces

July, 2016

BOLTON & MENK Engineers & Surveyors

Nottingham Dr
Sherwood Dr
Lake View Ave
Bennett St
Garfield Ave
Wheeler Park
Wall St
Lyndale St
Wanda St
169
Grant Ave
Page Ave
Page Ave
Page Ave
Cedar St
Wheeler Ave
Wheeler Ave
Belltower Apartments
Lee Blvd
Belvista Dr
Centennial Park
Belgrade Ave
Park Ave
Lake St
Cornelia St
Belgrade Avenue United Methodist Church
Sherman St
Center St
Cross St
Top Shop/ PJ's Liquors
Spinner's Bar
Range St
U.S. Post Office
Water Plant No. 1
Nicollet Ave
Taylor Library
Robel St
Christensen St
North Mankato City Hall
South Ave
South Avenue Playlot
Lookout Dr
169

Legend

- Study Corridor
- Regional Trails
- Water Plant No. 1
- Police Annex
- Taylor Library
- City Hall
- National Register Properties
- Belgrade Avenue United Methodist Church
- U.S. Post Office
- On-Road Bicycle Trails
- Parks

0 0.1 Miles

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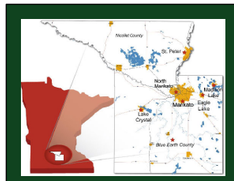

Belgrade Avenue Corridor Study

Mankato/North Mankato Area Planning Organization

Figure 4: Zoning

July, 2016

BOLTON & MENK Engineers & Surveyors

Lee Blvd
Lookout Dr
Belvista Dr
Lake St
Robert St
Cornelia St
Sherman St
Center St
Cross St
Range St
Christensen St
Grant Ave
Page Ave
Park Ave
Wheeler Ave
Belgrade Ave
Nicollet Ave
South Ave
Wall St
Lyndale St
Cedar St
Wanda St
169
Belltower Apartments
Belgrade Avenue United Methodist Church
Top Shop/ PJ's Liquors
Spinner's Bar
North Mankato City Hall

Legend

- Study Corridor

Zoning

Residential

- R-A Residential Agricultural
- R-1 One Family Living
- R-2 One and Two Family Dwelling
- R-3 Limited Multiple Dwelling
- R-4 Multiple Dwelling

Business

- OR-1 Office Residential
- CBD Central Business
- B-1 Neighborhood Business
- B-3 General Commercial
- B-2 Community Business

Industrial

- M-2 Heavy Industrial
- M-1 Light Industrial
- I-1 Planned Industrial

Miscellaneous

- TUD Transitional Unzoned District
- P-1 Public Park

0 0.1 Miles

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Appendix I: Future Traffic Conditions Technical Memorandum

BOLTON & MENK
Real People. Real Solutions.

12224 Nicollet Avenue
Burnsville, MN 55337-1649

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Fax: (952) 890-8065
Bolton-Menk.com

MEMORANDUM

Date: May 3, 2017

To: Paul Vogel

From: Ross B. Tillman, P.E.
Kelsey E. Retherford, E.I.T.

Subject: Future Traffic Analysis
Belgrade Avenue Corridor Study
Mankato/North Mankato Area Planning Organization
Project No.: T42.111862

Introduction

The Mankato/North Mankato Area Planning Organization in cooperation with the City of North Mankato have requested a corridor study along Belgrade Avenue from Lee Boulevard to TH 169 North Ramp. Riverfront Drive is located along the western edge of the City of Mankato. Belgrade Avenue is located along the southern edge of the City of Northern Mankato. This memorandum provides a summary of the future conditions and potential solutions.

Traffic Forecasting

Future traffic volumes for 2041 (25-yr forecast) were developed using historical data and the Mankato/North Mankato Area Planning Organization (MAPO) 2045 Long Range Transportation Plan while recognizing population growth trends in the area, which are likely to affect traffic volumes.

The historical growth rates (1997-2013) along Belgrade Avenue were all found to be negative based on historical data except east of the TH 169 North Ramp which was found to have a growth rate of 2.4%. Historical growth rates on the side streets were found to be between -3.9% and 0.5%. The historical growth rate on Lee Boulevard north of Belgrade Avenue was found to be 0.5% and south of Belgrade Avenue it was found to be 1.3%. The MAPO 2045 Long Range Transportation Plan indicated future growth rates to be between 0.9% and 1% on Belgrade Avenue. For Lee Boulevard north of Belgrade Avenue the MAPO 2045 Long Range Transportation Plan showed growth of 1.5% north of Belgrade Avenue and 0.5% south of Belgrade Avenue.

Taking all sources into account a 0.5% growth rate was used along Belgrade Avenue between Lee Boulevard and the TH 169 South Ramp as the historical data shows a decrease in traffic, but the Transportation Plan shows a 1% growth rate. A 0.5% growth rate was assumed for all side streets off of Belgrade Avenue as well between Lake Street and Range Street. A 1% growth rate was used on Belgrade Avenue east of the TH 169 North Ramp as the historical growth rate of 2.4% was assumed to be too high and the Transportation Plan had a growth rate of 0.9%. A 1% growth rate was used on Lee Boulevard both north and south of Belgrade Avenue.

Figure 1 in the **Appendix** shows the most recent AADT, the 2041 forecasted AADT based on historical growth, the 2045 forecasted AADT from the MAPO 2045 Long Range Transportation Plan and a 2041 forecasted AADT based on the recommended growth rate. **Figure 2** in the **Appendix** shows the 2041 forecasted turning movement counts.

Future Operations Analysis

A level of service (LOS) analysis of the peak hours was completed using the forecasted turning movement counts in SimTraffic. **Table 1** shows the results of the 2041 no build traffic analysis.

Table 1 - 2041 Existing Geometry (No Build) Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay*		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft)
NB TH 169 Exit Ramp & Belgrade Ave	AM	5	A	15	B	NBL	WBT	75	200
Signalized Intersection	PM	7	A	20	C	NBL	WBT	100	500
SB TH 169 Exit Ramp & Belgrade Ave	AM	14	B	24	C	SBL	WBL	125	250
Signalized Intersection	PM	16	B	30	C	SBL	WBT	75	350
Range St & Belgrade Ave	AM	7	A	9	A	EBT	SBL/T/R	50	125
Stop Controlled	PM	9	A	12	B	WBL	WBL/T	100	225
Center St & Belgrade Ave	AM	8	A	9	A	WBT	EBL/T	75	125
Stop Controlled	PM	9	A	11	B	WBT	WBT	75	150
Sherman St & Belgrade Ave	AM	3	A	10	B	SBT	SBL/T/R	50	100
Stop Controlled	PM	3	A	10	B	SBT	SBL/T/R	50	100
Belgrade Ave & Lake St	AM	2	A	6	A	SBL	SBL/R	50	75
Stop Controlled	PM	2	A	8	A	SBL	EBL/T	25	75
Lee Blvd & Belgrade Ave	AM	9	A	245	F	WBL	SBT/R	25	275
Stop Controlled	PM	7	A	86	F	WBL	SBL	75	200

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

- Intersection delay is acceptable with LOS A or B at all of the intersections during both peak hours.
- The limiting movement operates with LOS F at the intersection of Lee Boulevard at Belgrade Avenue during both peak hours. All other intersection operate with LOS C or better during both peak hours.
- Queuing Issues:
    - Maximum westbound left at SB TH 169 Exit Ramp during both peak hours
    - Maximum westbound thru at SB TH 169 Exit Ramp during PM peak hour
    - Maximum westbound left and thru at Range St during AM peak hour
    - Average westbound left and thru at Range St during PM peak hour
    - Maximum westbound right at Range St during PM peak hour
    - Maximum westbound left and thru at Lee Boulevard during both peak hours
    - Maximum southbound left, thru and right at Lee Boulevard during AM peak hour
    - Maximum southbound left at Lee Boulevard during PM peak hour

Tables A1 and **A2** in the **Appendix** show the delay and queue lengths for each movement at all of the intersections.

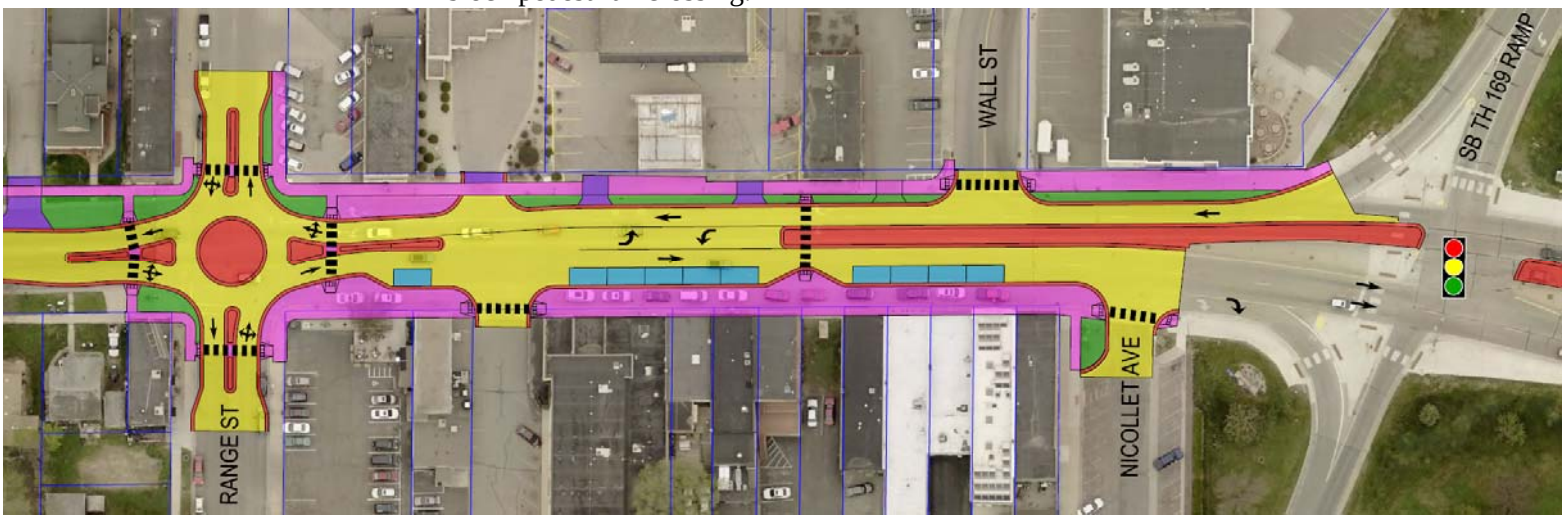
Alternative Concepts

Alternatives were identified and evaluated based on the existing and no build analysis. The alternatives studied for the Belgrade Avenue corridor are described below.

200 Block of Belgrade Avenue (Range Street to SB TH 169 Ramp):

- A three lane was analyzed with a mini roundabout at Range Street, a mid-block pedestrian crossing with a bump-out west of Wall Street, and parking maintained along south side of the roadway. The westbound through lane is dropped along the bridge between the NB and SB TH 169 Ramps by eliminating the existing westbound left turn lane and changing the left most westbound through lane to a westbound left lane. This allows for a smooth transition of the roadway from a four lane to three lane. This alternative was analyzed with multiple sub-options:

    - Extend median along Belgrade Avenue from the SB TH 169 Ramp to the mid-block pedestrian crossing.



    - Extend median along Belgrade Avenue from the SB TH 169 Ramp to Nicollet Avenue to eliminate left turn from Belgrade Avenue onto Nicollet Avenue.

- Install turn lane on Belgrade Avenue for vehicles turning left onto Nicollet Avenue west of the SB TH 169 Ramp.

- A three lane was analyzed along Belgrade Avenue from the SB TH 169 Ramp to Range Street with an all way stop at Range Street (which is the existing traffic control), a mid-block pedestrian crossing with a bump-out west of Wall Street, and parking is maintained along south side of the roadway.

- Keep existing four lane section, adding bump-outs for a mid-block crossing and on the east leg of the intersection of Range Street at Belgrade Avenue.

Lee Boulevard at Belgrade Avenue:

- A single lane roundabout was analyzed at this intersection to reduce the failing westbound left delay issue.

Alternative Operations Analysis

A traffic operational analysis was completed using the forecasted turning movement counts in SimTraffic for each option.

200 Block Alternative: Three Lane with Median along Belgrade Avenue, Mini-Roundabout at Range Street

The 200 block was analyzed as a three lane with a mini roundabout at Range Street. Counts were not taken at Nicollet Avenue or Wall Street so the operations of the two alternatives with a median along Belgrade Avenue was assumed to be the same. With the median extending from the TH 169 SB Ramp to the mid-block crossing, Wall Street and Nicollet Avenue would become right in right outs which would shift traffic normally making left turns at these intersections to Range Street and other intersections. With the median extending from the TH 169 SB Ramp to Nicollet Avenue, Nicollet Avenue would become a right in right out which would shift traffic normally making left turns at this intersections to Range Street or other locations. Nicollet Avenue is currently restricted with it signed for people not to make a westbound left turn, however so drivers were observed to currently make this movement. **Table 2** show the results of the 2041 traffic analysis.

Table 2 - 2041 Three Lane with Median and Mini Roundabout Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay*		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft)
NB TH 169 Exit Ramp & Belgrade Ave	AM	5	A	20	C	NBL	EBT	25	150
Signalized Intersection	PM	6	A	18	B	NBL	WBT	125	275
SB TH 169 Exit Ramp & Belgrade Ave	AM	14	B	24	C	SBL	WBL	125	250
Signalized Intersection	PM	16	B	30	C	SBL	WBL	225	400
Range St & Belgrade Ave	AM	5	A	8	A	EBL/T/R	EB/WB/SB	-	25
Mini-Roundabout	PM	8	A	9	A	WBL/T/R	WB	-	75

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

- The delay at the NB TH 159 Ramp is acceptable with LOS A for the intersection overall and LOS C or better for all movements for both peak hours.
- The delay at the SB TH 169 Ramp is acceptable and the same as 2041 no build operations with LOS B for the intersection overall and LOS C for the limiting movement during both peak hours.
- The SB TH 169 Ramp maximum queue extends the full length of the bridge during the PM peak hour.
- The delay at the Range Street is acceptable with LOS A for the intersection overall and all movements during both peak hours.
- The westbound maximum queue is decreased from 225 to 75 feet in the PM peak hour at Range Street.

Tables A3 and **A4** in the **Appendix** show the delay and queue lengths for each movement at both of the intersections.

200 Block Alternative: Three Lane, Mini-Roundabout at Range Street, EBL Turn Lane for Nicollet Avenue

Since counts were not taken at Nicollet Avenue a sensitivity analysis was completed in order to determine if there were adequate gaps for a westbound left from Belgrade Avenue onto Nicollet Avenue as only an 85 feet turn lane would fit at this location. **Table 3** shows the operational analysis for Nicollet Avenue and the SB TH 169 Ramp.

Table 3 – 2041 Left Turn Lane for Nicollet Avenue Traffic Operations Analysis

Peak Hour	Number of Left Turning Vehicles	Belgrade Ave & Nicollet Ave - WBL				Belgrade Ave & SB TH 169 Ramp - WBT			
		Average Queue (ft)	Max Queue (ft)	Movement Delay (sec/veh)		Average Queue (ft)	Max Queue (ft)	Movement Delay (sec/veh)	
AM	25	10	40	10	B	50	135	5	A
PM	25	15	70	25	D	130	350	7	A
AM	50	20	50	9	A	50	105	4	A
PM	50	25	80	21	C	140	390	9	A
AM	75	25	70	7	A	45	100	4	A
PM	75	30	100	17	C	145	395	9	A
AM	100	35	80	13	B	55	190	7	A
PM	100	40	110	22	C	165	375	12	B

Table 3 shows that with 75 or more left turning vehicles in the PM peak hour at the intersection of Belgrade Avenue and Nicollet Avenue the westbound left queue extends beyond the channelized left turn lane. The westbound thru is blocked at most for 3 minutes in the PM peak hour with 100 left turning vehicles or just over one minute with 75 left turners. Since the westbound thru movement is not blocked for long operations at the SB TH 169 Ramp remain acceptable with LOS B or better for the WBT movement.

200 Block Alternative: Three Lane, All-Way Stop at Range Street

The 200 block was analyzed as a three lane roadway with the existing all way stop control at Range Street. The three lane configuration allows for a designated left turn lane in addition to a thru and right turn lane on the east leg of the intersection of Range Street at Belgrade Avenue. **Table 4** show the results of the 2041 traffic analysis

Table 4 - 2041 Three Lane with All Way Stop Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay*		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue		
							Direction	Average Queue (ft)	Max Queue (ft)
NB TH 169 Exit Ramp & Belgrade Ave	AM	5	A	16	B	NBL	WBT	50	150
Signalized Intersection	PM	10	B	20	C	NBL	WBT	175	500
SB TH 169 Exit Ramp & Belgrade Ave	AM	14	B	30	C	SBT	WBL	125	300
Signalized Intersection	PM	18	C	35	D	SBL	WBL	200	400
Range St & Belgrade Ave	AM	9	A	12	B	EBT	EBL/T/R	75	150
Stop Controlled	PM	10	B	12	B	EBT	WBT	100	200

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

- The intersection delay remains acceptable with LOS C or better for all of the intersections during both peak hours.
- The limiting movement during the PM peak hour at the SB TH 169 Ramp is LOS D, but delay is only increased by 5 seconds from the 2041 no build condition. All other limiting movement delay operates with LOS C or better during both peak hours.
- The SB TH 169 Ramp maximum queue extends the full length of the bridge during the PM peak hour.
- The westbound maximum queue is decreased by one vehicle from 2041 no build analysis in the PM peak hour at Range Street.

Tables A5 and **A6** in the **Appendix** show the delay and queue lengths for each movement at both of the intersections.

Lee Boulevard at Belgrade Avenue: Single Lane Roundabout

A single lane roundabout was analyzed at the intersection of Lee Boulevard at Belgrade Avenue. The results of the 2041 traffic analysis is shown in **Table 5** below.

Table 5 - 2041 Roundabout Traffic Operations Analysis

Intersection	Peak Hour	Intersection Delay*		Maximum Delay-LOS**		Limiting Movement ***	Max Approach Queue	
							Direction	Max Queue (ft)
Lee Blvd & Belgrade Ave	AM	12	B	14	B	WB	NB	150
Roundabout	PM	12	B	13	B	SB	SB	175

*Delay in seconds per vehicle

**Maximum delay and LOS on any approach and/or movement

***Limiting Movement is the highest delay movement.

- The intersection delay and the delay of all movements during both peak hours is acceptable with LOS B or better.

- The westbound left delay with the existing side street stop traffic control is anticipated to have 245 seconds of delay in 2041, but with a single lane roundabout this delay is reduced to 14 seconds.
- The southbound queue is reduced from 275 in the AM peak hour under existing conditions in 2041 to 100 feet with the single lane roundabout.

Tables A7 and **A8** in the **Appendix** show the delay and queue lengths for each movement at both of the intersections.

Appendix

Belgrade Avenue Corridor Study

Mankato/North Mankato Area Planning Organization

Figure 1: Traffic Forecasting

September 2016

BOLTON & MENK
Real People. Real Solutions.

Lee Blvd
Lake St
Sherman St
Center St
Belgrade Ave
Nicollet Ave
Range St
Lookout Dr
169
MINNESOTA 60

20,300 (1.5%)
15,110 (0.5%)
16,300 (1%)
12,600

250 (-3.1%)
1,800 (0.5%)
1,550

9,000 (1%)
5,740 (-0.5%)
7,100 (0.5%)
6,200

10,500 (0.5%)
12,810 (1.3%)
11,900 (1%)
9,200

180 (-3.4%)
1,300 (0.5%)
1,150

40 (-3.9%)
2,200 (0.5%)
1,900

1,900 (0.5%)
1,900 (0.5%)
1,700

9,600 (1%)
4,730 (-1.5%)
7,200 (0.5%)
6,300

2,380 (-1.3%)
4,100 (0.5%)
3,600

13,100 (1%)
7,410 (-0.9%)
9,900 (0.5%)
8700

28,000 (0.9%)
40,050 (2.4%)
28,400 (1%)
21,500

Legend

- *X,XXX* Most Recent AADT
- *X,XXX* 2041 Forecasted AADT (Recommended)
- *X,XXX* 2041 Forecasted Based on Historical Growth
- *X,XXX* 2045 Forecasted AADT from "MAPO 2045 Transportation Plan"

0 800 Feet

Source: MnDOT, Google Imagery, MAPO

Map Document: \\metrosouth1\GIS\MAPO_MUT\42111862\ESRI\Maps\111862_TrafficForecasting_11x17L.mxd | Date Saved: 9/9/2016 2:40:34 PM

Belgrade Avenue Corridor Study

Mankato/North Mankato Area Planning Organization

Figure 2: 2041 Forecasted Turning Movement Counts

September 2016

BOLTON & MENK
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Lee Blvd
0 (0)
515 (535)
190 (310)
305 (265)
0 (5)
20 (50)
0 (0)
0 (5)
5 (5)
0 (5)
630 (395)
55 (70)
Belgrade Ave

Lake St
90 (65)
5 (15)
5 (25)
200 (225)
45 (90)
165 (230)
Belgrade Ave

Center St
60 (40)
40 (45)
40 (35)
180 (205)
20 (55)
170 (330)
25 (40)
105 (120)
55 (60)
Belgrade Ave

SB TH 169 Exit Ramp
SB TH 169 Entrance Ramp
20 (20)
5 (0)
225 (175)
265 (710)
405 (655)
435 (475)
45 (55)
Belgrade Ave

Belgrade Ave
Lookout Dr
Lee Blvd
Sherman St
Center St
Range St
Nicollet Ave
S Riverfront Dr

Sherman St
30 (20)
70 (45)
20 (25)
20 (40)
175 (265)
60 (80)
15 (25)
200 (225)
25 (25)
Belgrade Ave

Range St
40 (45)
10 (20)
155 (125)
80 (225)
155 (365)
25 (55)
20 (35)
235 (270)
10 (20)
5 (10)
10 (10)
25 (35)
Belgrade Ave

NB TH 169 Entrance Ramp
NB TH 169 Exit Ramp
50 (45)
620 (600)
135 (235)
680 (1385)
20 (40)
5 (0)
840 (460)
Belgrade Ave

169
MINNESOTA
60

Legend

2041 Forecasted TMC

AM (PM)

0 500 Feet

Source: MnDOT, Google Imagery

Google

Map Document: \\METROSOUTH1\gis\MAPO_MUT\4211862\ESRIMaps\111862_2041_TMC_11x17L_RAW.mxd | Date Saved: 9/26/2016 12:07:41 PM

Table A1. 2041 Traffic Operational Analysis - Existing Geometry

Intersection	Peak Hour	Intersection Delay*- LOS		Movement Delay (sec/veh)																					
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
NB TH 169 Ramp at Belgrade Ave	AM	5	A	5	A	2	A	-		-		4	A	3	A	15	B	0	A	8	A	-		-		-	
Signalized Intersection	PM	7	A	10	B	3	A	-		-		9	A	4	A	20	C	4	A	4	A	-		-		-	
SB TH 169 Ramp at Belgrade Ave	AM	14	B	-		18	B	4	A	12	B	4	A	-		-		-		-		24	C	14	B	2	A
Signalized Intersection	PM	16	B	-		29	C	4	A	17	B	5	A	-		-		-		-		30	C	0	A	2	A
Range St at Belgrade Ave	AM	7	A	9	A	9	A	6	A	7	A	8	A	4	A	6	A	7	A	3	A	7	A	8	A	5	A
All-Way Stop Controlled	PM	9	A	9	A	10	B	7	A	12	B	11	B	6	A	6	A	8	A	4	A	7	A	9	A	5	A
Center St at Belgrade Ave	AM	8	A	7	A	8	A	-		-		10	A	6	A	6	A	9	A	5	A	7	A	-		5	A
All-Way Stop Controlled	PM	9	A	9	A	9	A	-		-		11	B	7	A	7	A	10	A	5	A	7	A	-		5	A
Sherman St at Belgrade Ave	AM	3	A	3	A	1	A	1	A	5	A	3	A	2	A	-		-		-		9	A	10	A	5	A
Side-Street Stop Controlled	PM	3	A	4	A	2	A	2	A	5	A	3	A	2	A	-		-		-		9	A	10	A	5	A
Lake St at Belgrade Ave	AM	2	A	3	A	1	A	-		-		1	A	1	A	-		-		-		6	A	-		4	A
Side-Street Stop Controlled	PM	2	A	4	A	2	A	-		-		1	A	1	A	-		-		-		8	A	-		3	A
Lee Blvd at Belgrade Ave	AM	9	A	0	A	0	A	5	A	240	F	0	A	3	A	0	A	6	A	7	A	22	C	2	A	0	A
Side-Street Stop Controlled	PM	7	A	0	A	16	C	6	A	86	F	10	A	2	A	13	B	6	A	7	A	8	A	1	A	0	A

*Delay in seconds per vehicle

Table A2. 2041 Peak Hour Queues by Movement - Existing Geometry

Intersection	Peak Hour	Queue Lengths																							
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
NB TH 169 Exit Ramp & Belgrade Ave	AM	25	75	25	100	-	-	-	-	25	125	-	-	25	50	25	50	-	-	-	-	-	-	-	-
Signalized Intersection	PM	25	100	25	125	-	-	-	-	100	500	-	-	25	75	25	75	-	-	-	-	-	-	-	-
SB TH 169 Exit Ramp & Belgrade Ave	AM	-	-	75	200	25	100	125	250	50	100	-	-	-	-	-	-	-	-	100	175	100	175	-	-
Signalized Intersection	PM	-	-	125	225	25	100	200	325	75	350	-	-	-	-	-	-	-	-	75	175	75	175	-	-
Range St & Belgrade Ave	AM	75	100	75	100	25	50	50	100	50	100	50	75	25	50	25	50	25	50	50	125	50	125	50	125
Stop Controlled	PM	75	125	75	125	25	50	100	225	100	225	75	125	50	75	50	75	50	75	50	100	50	100	50	100
Center St & Belgrade Ave	AM	75	125	75	125	-	-	-	-	50	100	25	50	25	50	50	100	50	100	50	100	50	100	50	100
Stop Controlled	PM	75	125	75	125	-	-	-	-	75	150	25	50	25	75	50	100	50	100	25	75	25	75	25	75
Sherman St & Belgrade Ave	AM	25	50	25	50	25	50	25	75	25	75	25	75	-	-	-	-	-	-	50	100	50	100	50	100
Stop Controlled	PM	25	75	25	75	25	75	25	75	25	75	25	75	-	-	-	-	-	-	50	100	50	100	50	100
Belgrade Ave & Lake St	AM	25	50	25	50	-	-	-	-	0	25	0	25	-	-	-	-	-	-	50	75	50	75	50	75
Stop Controlled	PM	25	75	25	75	-	-	-	-	25	50	25	50	-	-	-	-	-	-	25	75	25	75	25	75
Lee Blvd & Belgrade Ave	AM	25	25	25	25	25	25	50	150	50	150	25	75	-	-	25	50	25	50	75	250	25	275	25	275
Stop Controlled	PM	25	25	25	25	25	25	50	150	50	150	25	100	25	75	25	75	25	50	75	200	25	75	25	75

Table A3: 2041 Three Lane with Median Traffic Operations Analysis - Belgrade Avenue Corridor Study

Intersection	Peak Hour	Intersection Delay*		Movement Delay (sec/veh)																					
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
NB TH 169 Exit Ramp & Belgrade Ave	AM	5	A	5	A	3	A	-		-		4	A	3	A	20	C	-		8	A	-		-		-	
Signalized Intersection	PM	6	A	9	A	4	A	-		-		8	A	4	A	18	B	-		4	A	-		-		-	
SB TH 169 Exit Ramp & Belgrade Ave	AM	14	B	-		18	B	4	A	12	B	5	A	-		-		-		-		24	C	19	B	1	A
Signalized Intersection	PM	16	B	-		26	C	8	A	16	B	7	A	-		-		-		-		30	C	-		2	A
						EBL/T/R						WBL/T/R						NBL/T/R						SBL/T/R			
Range St & Belgrade Ave	AM	5	A	-		6	A	-		-		5	A	-		-		5	A	-		-		5	A	-	
Mini-Roundabout	PM	8	A	-		7	A	-		-		9	A	-		-		5	A	-		-		7	A	-	

*Delay in seconds per vehicle

Table A4: 2041 Three Lane with Median Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths																							
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
NB TH 169 Exit Ramp & Belgrade Ave	AM	25	75	25	150	-	-	-	-	50	150	-	-	25	75	25	75	-	-	-	-	-	-	-	-
Signalized Intersection	PM	25	75	50	175	-	-	-	-	125	275	-	-	50	75	50	75	-	-	-	-	-	-	-	-
SB TH 169 Exit Ramp & Belgrade Ave	AM	-		100	175	100	175	125	250	50	125	-		-		-		-		100	250	100	250	-	
Signalized Intersection	PM	-		125	175	125	175	225	400	175	350	-		-		-		-		100	200	100	200	-	
				EBL/T/R						WBL/T/R						NBL/T/R						SBL/T/R			
Range St & Belgrade Ave	AM	-		-	25	-		-		-	25	-		-		-	0	-		-		-	25	-	
Mini-Roundabout	PM	-		-	25	-		-		-	75	-		-		-	0	-		-		-	25	-	

Table A5: 2041 Three Lane with All-Way Stop - Traffic Operations Analysis - Belgrade Avenue Corridor Study

Intersection	Peak Hour	Intersection Delay*		Movement Delay (sec/veh)																							
				EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
NB TH 169 Exit Ramp & Belgrade Ave	AM	5	A	5	A	2	A	-		-		3	A	3	A	16	B	-		9	A	-		-		-	
Signalized Intersection	PM	10	B	9	A	4	A	-		-		16	B	5	A	20	C	-		4	A	-		-		-	
SB TH 169 Exit Ramp & Belgrade Ave	AM	14	B	-		18	B	5	A	13	B	5	A	-		-		-		-		24	C	30	C	2	A
Signalized Intersection	PM	18	C	-		26	C	10	B	18	B	11	B	-		-		-		-		35	D	-		2	A
Range St & Belgrade Ave	AM	9	A	9	A	12	B	9	A	6	A	8	A	4	A	6	A	8	A	5	A	8	A	9	A	7	A
Stop Controlled	PM	10	B	11	B	12	B	8	A	7	A	12	B	7	A	7	A	9	A	5	A	9	A	9	A	6	A

*Delay in seconds per vehicle

Table A6: 2041 Three Lane with All-Way Stop - Peak Hour Queues By Movement

Intersection	Peak Hour	Queue Lengths																							
		EBL		EBT		EBR		WBL		WBT		WBR		NBL		NBT		NBR		SBL		SBT		SBR	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
NB TH 169 Exit Ramp & Belgrade Ave	AM	25	75	25	125	-	-	-	-	50	150	-	-	25	75	25	75	-	-	-	-	-	-	-	-
Signalized Intersection	PM	25	100	50	150	-	-	-	-	175	500	25	225	25	75	25	75	-	-	-	-	-	-	-	-
SB TH 169 Exit Ramp & Belgrade Ave	AM	-	-	100	175	100	175	125	300	50	150	-	-	-	-	-	-	-	-	100	200	100	200	-	-
Signalized Intersection	PM	-	-	125	175	125	175	200	400	150	375	-	-	-	-	-	-	-	-	100	175	100	175	0	25
Range St & Belgrade Ave	AM	75	150	75	150	75	150	25	50	50	100	50	100	25	75	25	75	25	75	50	125	50	125	50	125
Stop Controlled	PM	75	150	75	150	75	150	50	100	100	200	75	175	50	75	50	75	50	75	50	150	50	150	50	150

Table A7: 2041 Roundabout Traffic Operations Analysis - Belgrade Avenue Corridor Study

Intersection	Peak Hour	Intersection Delay*		EBL/T/R		WBL/T/R		NBL/T/R		SBL/T/R	
Lee Blvd & Belgrade Ave	AM	12	B	6	A	14	B	14	B	9	A
Roundabout	PM	12	B	7	A	9	A	11	B	13	B

*Delay in seconds per vehicle

Table A8: 2041 Roundabout Peak Hour Queues By Movement

Intersection	Peak Hour	Maximum Queue Lengths (ft)			
		EBL/T/R	WBL/T/R	NBL/T/R	SBL/T/R
Lee Blvd & Belgrade Ave	AM	0	75	150	100
Roundabout	PM	0	50	75	175