BOZEMAN MT
Transportation Master Plan

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Acronyms

AADT	Average Annual Daily Traffic
AAGR	Average Annual Growth Rate
ACS	American Community Survey
ADA	Americans with Disabilities Act
ASMSU	Associated Students of Montana State University
BABAB	Bozeman Area Bicycle Advisory Board
BNSF	BNSF Railway
CEIC	Census & Economic Information Center
CIP	Capital Improvement Plan
EPA	Environmental Protection Agency
eREMI	Regional Economic Models, Inc.
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FY	Fiscal Year
GVLT	Gallatin Valley Land Trust
HAWK	High-Intensity Activated Crosswalk
HOV	High Occupancy Vehicle
HRDC	Human Resource Development Council
HUD	Department of Housing and Urban Development
ITS	Intelligent Transportation System
LOS	Level of Service
LPI	Leading Pedestrian Interval
LRTP	Long Range Transportation Plan
LTS	Level of Traffic Stress
MACI	Montana Air Congestion Initiative
MCA	Montana Code Annotated
MDT	Montana Department of Transportation
MPO	Metropolitan Planning Organization
MRL	Montana Rail Link
MSN	Major Street Network
MSU	Montana State University
NHTS	National Household Travel Survey
PCI	Pavement Condition Index
PDO	Property Damage Only
PROWAG	Public Rights-of-Way Accessibility Guidelines
PTSC	Pedestrian Traffic Safety Committee
RPA	Robert Peccia and Associates
RRFB	Rectangular Rapid Flashing Beacon
SOV	Single Occupancy Vehicle
TA	Transportation Alternatives

TBL	Triple Bottom Line
TCC	Transportation Coordinating Committee
TDM	Travel Demand Model
TDM	Transportation Demand Management
TMP	Transportation Master Plan
TPCC	Transportation Policy Coordinating Committee
TSM	Transportation System Management
TTAC	Transportation Technical Advisory Committee
TWG	Technical Working Group
TWLTL	Two-way, Left-turn Lane
UDO	Unified Development Ordinance
URD	Urban Renewal District
USC	United States Code
USDOT	US Department of Transportation
v/c	Volume to Capacity Ratio
VMT	Vehicle Miles of Travel
vpd	Vehicles per day
W&P	Woods and Pool Economics, Inc.
WTI	Western Transportation Institute

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Chapter 1
Introduction

The *Bozeman Transportation Master Plan (TMP)* serves as a guide for development of and investment in the community's transportation systems in a comprehensive manner. The TMP was developed through a collaborative approach with city and state staff, elected officials, and local residents and provides the blueprint for a transportation system that will serve the community's citizens well into the future.

The TMP provides for guiding transportation infrastructure investments based on system needs and associated decision-making principles. Land use changes in the surrounding area, substantial upgrades to the community's transportation system, and the community's increasing interest in transportation-related matters have necessitated development of the TMP. The Plan incorporates all applicable background information, includes detailed analysis of options and alternatives, incorporates meaningful input from citizens and local officials, and provides a framework for future efforts within the context of State and Federal rules, regulations, and funding allocations.

This comprehensive plan identifies community goals and improvements to the transportation infrastructure and services within the city of Bozeman and that portion within Gallatin County that is likely to include future urban area expansion. The Plan addresses regional transportation issues, overall travel convenience, traffic safety, sustainability, complete streets, funding, transportation demand management (TDM), and multi-modal connections. The Plan includes recommendations for short-term improvements as well as recommended modifications and capital improvements to major roadways. The Plan also includes policy suggestions to align with the community's vison for the Bozeman area.

1.1. BACKGROUND

As a community rich in history, committed to economic development, and poised for continued growth, Bozeman faces a future of opportunity balanced against the impacts of that growth. A well-planned transportation system can make the difference between successful growth and good quality of life verses failure to grow and a deteriorating quality of life. A comprehensive transportation master plan is needed to address the needs of the community and to help direct future growth through innovative planning.

Bozeman is a rapidly growing community of 43,000 and is one of the fastest growing micropolitan areas in the United States.

The city of Bozeman and Montana Department of Transportation (MDT) partnered to develop this community-wide transportation planning process. A previous transportation plan was completed in 2007[1] which provided a blueprint for guiding transportation infrastructure investments based on system needs and associated decision making principles. The 2007 plan provided an excellent picture of infrastructure needs for the City for both motorized and non-motorized uses.

This TMP further examines what the community values are and what the community is willing to do such that the quality of life and economic vitality within Bozeman is not compromised. Rapid growth, changes in land use, substantial upgrades to the community's transportation system, and the community's increasing interest in transportation related matters necessitated a new examination of transportation issues within the Bozeman area. Transportation is a major concern to area residents today and is expected to remain a concern as growth continues and the challenges of accommodating travel needs become more difficult.

1.2. STUDY AREA

The Bozeman community is basically on the verge of reaching its jurisdictional growth limit. The study area boundary for this update aligns with the growth boundary of the *Bozeman Community Plan*[2]. The boundary includes the entire Bozeman urban boundary limits that resulted from the 2010 Census. The study area includes major employers in the area, as well as land that may be used for employment centers in the next twenty years that could possibly be annexed into the city limits. It also includes densely developed residential land uses in the area, and those areas likely to increase the housing supply in the future and subsequently add traffic onto the transportation network. The study area boundary is shown on **Figure 1.1**.

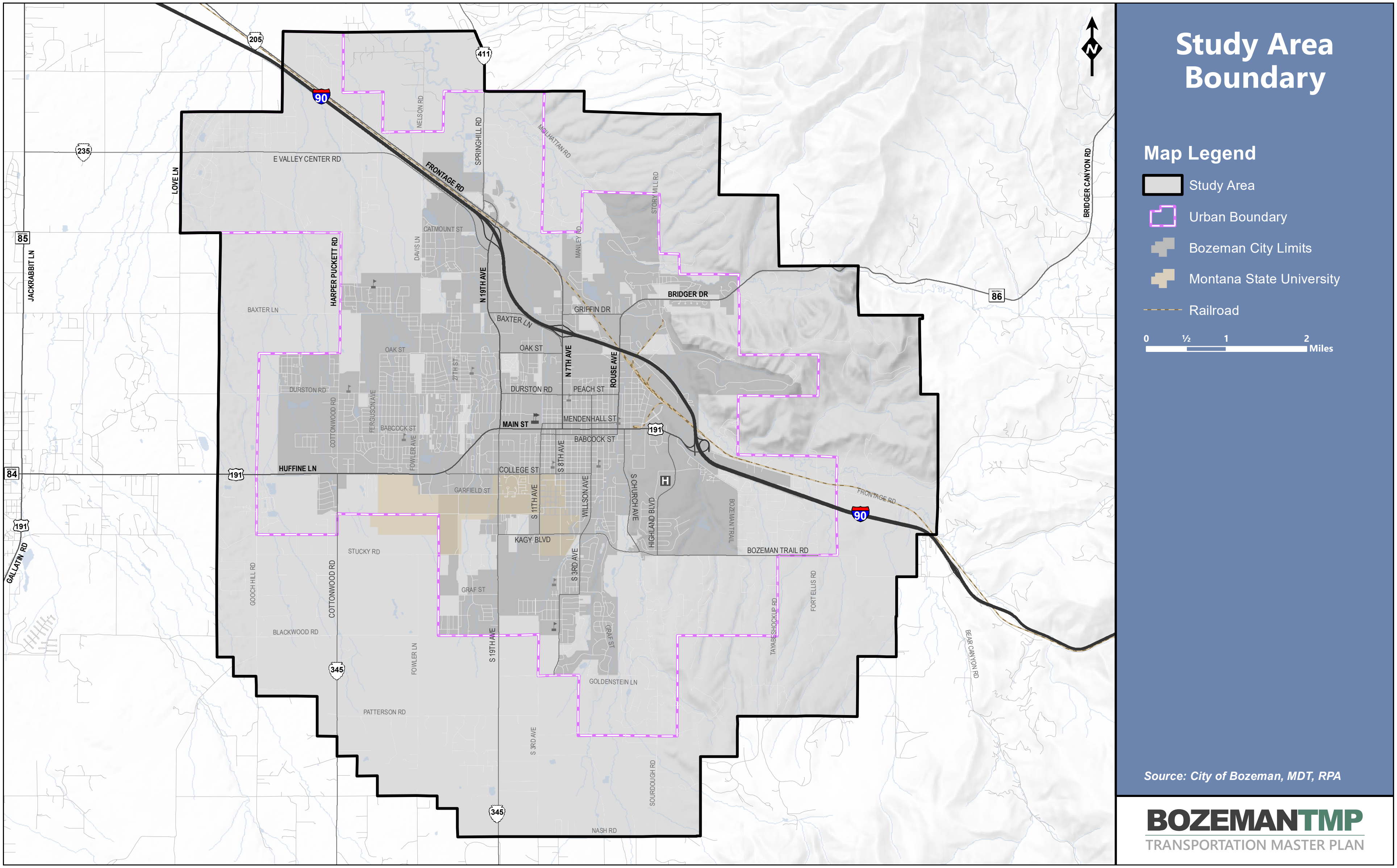


Figure 1.1: Bozeman TMP Study Area

1.3. GOALS AND OBJECTIVES

Development of goals and objectives for the TMP is a critical step in the transportation planning process. In addition to capturing all related information from previous community planning efforts, the goals and objectives lay out the general course of action for the TMP development and represent the community's vision for the future transportation system.

The goals and objectives developed for the TMP were identified in hopes of accurately reflecting the condition of planning within the general community, and more specifically, reflecting the needs and desires relative to transportation. Goals represent the overarching statements of the TMP intent and the direct elements of the community's vision while objectives are more focused statements of specific actions, measures or procedures that reflect how a particular goal can be attained.

The goals and objectives developed for the TMP are connected concepts – that is they represent the desired end result of the community's transportation system once projects identified are implemented. Goals and objectives also provide direction on how to get to that end result. Collectively, the goals and objectives inform the planning process and set the course of action for the transportation system for years to come.

Numerous local planning documents were reviewed to determine what, if any, transportation related goals and objectives have already been developed within the community. Based on a review of relevant planning efforts within the community, five primary principles were identified for the TMP:

Visionary Principals

1. The community desires a connected, smarter transportation system through land use and transportation planning. This type of system allows citizens to choose what mode of travel they desire, and makes travel more convenient while promoting an active lifestyle by choice for its citizens.
2. Bozeman provides a stable economic base for a variety of services and industry. The community embraces the opportunity to attract jobs and support ongoing economic vitality.
3. Efficient travel and increased mobility is desirable to minimize transportation and associated costs.
4. Transportation influences quality of life. The community desires a transportation system that is compatible with the environment and context of the Bozeman area, with special consideration given to sustainability and conserving natural and cultural resources.
5. The community desires a safe and secure transportation system, and strives for a reduction in crashes, injuries and fatalities.

Goal 1: Maintain the Existing Transportation System.

The City has made great strides in developing a transportation maintenance program that focuses on optimizing the existing transportation system to the greatest extent possible. A citywide pavement condition inventory was recently completed to quantify roadway conditions and determine logical priorities for annual maintenance activities throughout the community.

Objectives:

1.1. Maintain existing roadway systems to optimize their usefulness and minimize life-cycle costs.
1.2. Monitor the performance of key facilities and work with local and regional partners to identify critical deficiencies in the roadway network.
1.3. Use transportation project selection criteria to identify and prioritize maintenance activities and project development.
1.4. Relieve pressures on the existing transportation system through minor infrastructure improvements, maintenance and system preservation activities rather than expanding the current system.
1.5. Encourage reuse and/or redevelopment around existing transportation facilities.

GOAL 2: Improve the Efficiency, Performance, and Connectivity of a Balanced Transportation System.

A transportation system that performs well allows users to choose multiple transportation modes and to move through those modes in a safe and efficient manner. An efficient system allows people to move from place to place in as direct a route as possible, allowing them to reduce the amount of time spent in travel, the distance that must be traveled, and the amount of time spent in congested traffic. Connectivity allows citizens to make route decisions and mode choices based on traffic and road conditions, or desired destinations.

Objectives:

2.1. Ensure the current street network of collectors, minor arterials, principal arterials and the interstate is adequate to safely and efficiently handle projected traffic.
2.2. Promote the development of an effective roadway network through improvements in intersection and roadway capacity.
2.3. Improve opportunities for active transportation (non-motorized) as part of daily travel mode choice within the community by increasing pedestrian, bicycle and transit connections.
2.4. Ensure that mobility-challenged populations, such as low income, persons with disabilities, or senior citizens, have travel options in the Bozeman area.
2.5. Identify and reduce (or eliminate) freight movement impacts on area roadways and identify improvements to eliminate deficiencies with the objective of improving freight movement.

2.6 Promote and support the expansion of the Streamline Transit system" to express the importance that transit plays in improved efficient use of existing transportation network.

2.7 Explore options to utilize technology to increase operational efficiency of the existing transportation network.

GOAL 3: Promote Consistency and Coordination between Land Use and Transportation Planning to Manage and Develop the Transportation System for all Modes and Users.

Land use decisions affect the quality and quantity of transportation infrastructure throughout the study area. Rural, low-density developments may necessitate transportation features different than urban, high-density developments. Transportation system facilities are not always required to be similar between the different development types and forms. An urban boundary exists as delineated from the 2010 Census. Consistency in infrastructure within the urban boundary should be met if possible for continuity of urban form and function, to the extent that future urban density growth and potential annexation is realized. Additionally, as Bozeman's population ages and the number of persons per household decreases, options in housing and transportation will be needed to meet the demands of the population. Transportation improvements should be integrated with local land use planning to ensure the proper mix of roads, trails, transit, paths and other bicycle and pedestrian features co-exist.

Objectives:

3.1. Develop and implement road design and construction standards within the urban area that reflect the potential for annexations of currently unincorporated land. As urban development occurs, ensure that basic transportation facilities are in place within the urban area.

3.2. Recognize that land use policy discussions regarding future development and corresponding density in the "Triangle" between Bozeman, Four Corners and Belgrade are on-going. Land use decisions are tied to the adequacy of transportation infrastructure and may serve to constrain growth depending on policy directions both within and outside of the Bozeman city limits.

3.3. Develop and implement consistent access management and corridor preservation standards, ordinances and plans appropriate to the roadway network and land use within the study area boundary.

3.4. Integrate land use planning and transportation planning to manage and develop the transportation system.

3.5. Use transportation project programming to encourage desired development patterns within the community and ensure new development is adequately served.

3.6. Ensure an environmentally responsible and sound transportation system that minimizes adverse environmental impacts within the community.

Goal 4: Provide a Safe and Secure Transportation System.

Most community planning efforts recognize the desire for a safe transportation system. Community safety and security can be improved by transportation efforts in a number of ways. Reducing crashes, improving the ability of emergency responders to quickly and reliably respond to emergencies, and providing evacuation routes in the event of a natural disaster will all assist to improving safety and security. Educational programs that help travelers understand the particular safety concerns associated with various travel modes can also help all users travel with increased confidence and security.

Objectives:

4.1. Reduce the rates of fatalities and crashes occurring on all transportation facilities.

4.2. Identify barriers to effective and prompt emergency response.

4.3. Implement safety initiatives and educational programs for all modes of transportation.

4.4. Coordinate with freight operators and agencies on projects that can enhance the security of the freight transportation system in the region.

GOAL 5: Support Economic Vitality of the Community.

All economic activity relies on a functioning, diverse transportation network. Vehicle, freight, air, transit, rail and non-motorized infrastructure all have a purpose to serve when linking economic vitality to the costs of doing business. Transportation in terms of economic vitality is only one component of a successful business environment. High quality schools, diversity in housing types, low debt, availability of infrastructure, and access to a highly educated workforce all contribute to the economic success of a community.

Objectives:

5.1. Optimize the transportation system to meet the needs of Bozeman and its citizens, including employment centers, and industrial and commercial areas.

5.2. Provide attractive and convenient transportation facilities that attract and retain business, young professionals, families and older adults.

5.3. Facilitate the movement of goods and freight to commercial and industrial centers.

GOAL 6: Protect and Enhance Environmental Sustainability, Provide Opportunities for Active Lifestyles, and Conserve Natural and Cultural Resources.

Both the FAST Act planning factors and the livability principles from HUD/EPA/USDOT (see **Section 5.6** for more information) point to quality of life concerns in the development of TMP's. Not only are impacts to the environment taken more seriously, but increasingly citizens are demanding a more holistic approach to transportation. The preservation of natural, historic and cultural resources, as well as promoting a healthy, active lifestyle, are priorities of this TMP and current Federal transportation planning guidance.

Objectives:

6.1. Promote transportation projects, plans and/or programs that encourage reducing fuel consumption, reducing vehicle miles of travel, and thereby minimizing air pollution.

6.2. Coordinate transportation planning activities with appropriate federal, state, and local agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation.

6.3. Engage stakeholders and the public in the decision-making stage of the transportation planning process.

6.4. Coordinate transportation planning activities with local and regional land use planning activities, including the City's Community Plan and Gallatin County's Growth Policy (and subsequent updates to both).

GOAL 7: Promote a Financially Sustainable Transportation Plan that is Actively Used to Guide the Transportation Decision-making Process.

Transportation facilities that provide options to the public, reduce the time spent traveling, reduce fuel consumption, and make the best use of limited public funds for infrastructure improvements are desirable. Not only are costs related to the cost of building facilities, but there are also associated costs of time spent in vehicles.

Objectives:

7.1. Identify available funding mechanisms potentially including federal and state gas tax revenue, impact fees, transportation bond issues, local option gas taxes, and other revenue funding sources used in similar cities.

7.2. Encourage cooperation between public, private and non-profit organizations in the development, funding, and management of transportation projects.

7.3. Promote cost-effective recommendations that balance transportation system needs with available funding and expected expenditures.

7.4. As funds become available for transportation projects, place priority for funding on those projects and programs identified in the TMP.

1.4. OUTREACH AND PUBLIC INVOLVEMENT

Education and public outreach are essential parts of fulfilling the responsibility to successfully inform the public about the transportation planning process. The development of the TMP involved early communication with interested parties to help identify needs, constraints, and opportunities to determine reasonable improvements given available resources and local support.

Community, stakeholder, agency, and other involvement were important components to this planning process. The goal of the outreach effort was to have significant and ongoing public engagement. A number of strategies were utilized to disseminate information and elicit meaningful participation. These opportunities included:

- Providing information on the critical elements included in the transportation planning process within the TMP study area;
- Providing input and asking questions throughout the planning process; and
- Presenting findings and recommendations.

Public participation means participation in planning by people within the Bozeman community, its citizens and entities, planning and engineering professionals, and those who are not professional planners or government officials. It is a process of taking part in the transportation planning and decision-making that affects the community. Efforts to secure participation were targeted to stakeholders who are individuals or entities that could be significantly affected by the TMP recommendations or could significantly influence implementation.

A proactive approach was taken to provide an opportunity for the public to be engaged early and with a continuing involvement in all phases of the planning process. For this project, a number of public engagement strategies were utilized to reach the most people possible and elicit meaningful participation. These strategies are discussed in the following sections.

An informational booth was provided at the Christmas Stroll in December, 2015.

RPA and city of Bozeman staff conduct an informational meeting at the Bozeman High School Cafeteria.

Technical Working Group

A Technical Working Group (TWG) was established to guide process, review deliverables, and provide technical oversight during the planning process. Meetings were generally held every month. The TWG included representatives from the City of Bozeman, Montana Department of Transportation, and other stakeholders. The TWG was the principal guiding force behind the TMP.

Bozeman Area Transportation Coordinating Committee

Much like the TWG, the Bozeman Area Transportation Coordinating Committee (TCC) also provided oversight during the planning process. The TCC managed the executive business of the Bozeman TMP, and is a regular standing committee that generally meets every quarter to discuss transportation matters in the community. The TCC works closely with the City, County, and State to develop and keep current urban transportation planning, design and construction in the Greater Bozeman area. Outreach to the TCC was generally conducted quarterly.

Public Informational Meetings

Three public informational meetings were held during the TMP planning process. The first meeting was an introductory meeting to discuss and identify the issues and visioning to be addressed as part of the TMP. This meeting focused on informing the public about the scope of the planning process, key dates during its development, and a review of the study area boundary. The meeting was held on December 1st, 2015 at the Bozeman High School Cafeteria.

The second public meeting was held to review the transportation system issues and areas of concern, and to assure that all of the major transportation problems were identified and included in the analysis. A summary of the existing and proposed transportation system conditions was presented. A variety of key issues were identified. The issues generally fell within four categories: 1) the need to plan for future growth; 2) to relieve traffic congestion; 3) to improve traffic safety; and 4) to provide alternatives to the automobile. Specific problem intersections and roadway corridors were identified and presented at this second meeting. The meeting was held on May 12th, 2016 at the Bozeman High School Cafeteria.

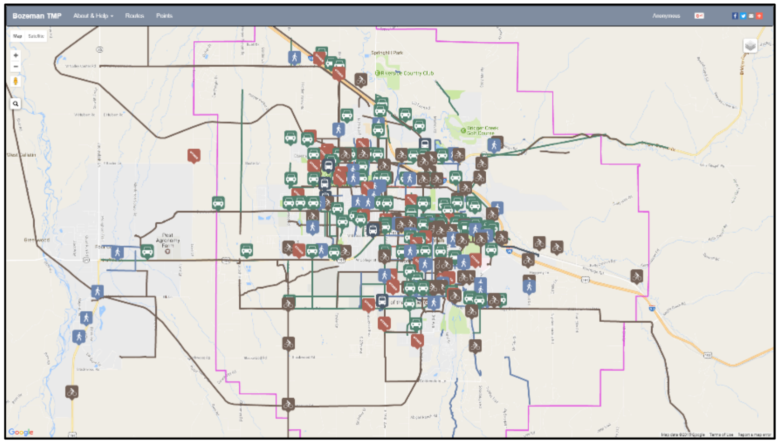
The third public meeting was held after the preliminary project recommendations were completed and was coincident to release of the draft TMP report. This meeting gave the public the opportunity to review the project recommendations in their entirety, including a thorough review of the draft TMP report that contains mitigation strategies to solve existing transportation issues and measures to accommodate future growth. The meeting was held on March 2, 2017 at the Bozeman High School Cafeteria.

Appendix A contains all public comments received over the course of the planning process.

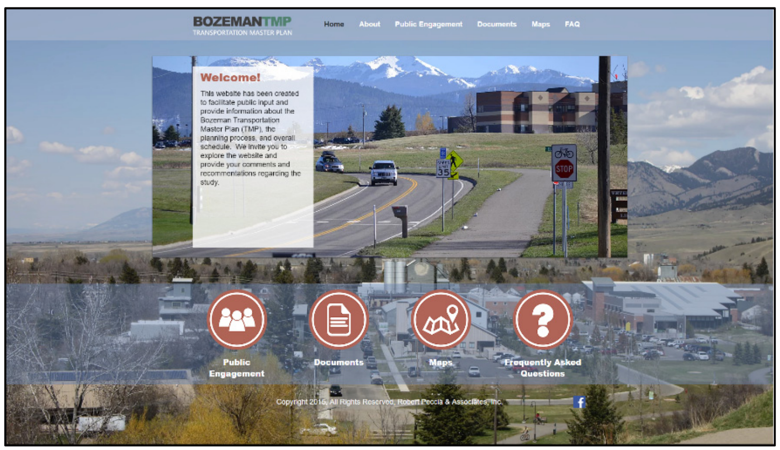
Special Agency and Stakeholder Involvement

A number of outreach activities to special agencies and other stakeholders occurred through the planning duration. These activities included attendance at board meetings and/or special presentations. Targeted outreach occurred as follows:

- City Commission (6 meetings)
- City of Bozeman Department Directors
- Western Transportation Institute (WTI)
- North 7th Avenue Urban Renewal District Board (2 meetings)
- Gallatin Valley Land Trust (GVLT)
- Bozeman Area Bicycle Advisory Board (BABAB)
- Gallatin County Staff & Elected Officials
- Inter-Neighborhood Council
- University Neighborhood Association
- Pedestrian and Traffic Safety Committee (PTSC)
- City of Bozeman Parks and Recreation Department Staff
- Bike Kitchen
- MDT Modeling/Planning Staff
- City of Bozeman Parking Commission
- Downtown TIF Board
- Downtown BID Board
- Bozeman Area Chamber of Commerce
- Northeast Neighborhood Association
- Christmas Stroll
- Bogert Park Neighborhood Association
- Southeast Neighborhood Association
- Land Use Forecasting Workshop
- MDT Modeling/Planning Staff
- Engineering Consultant Community
- City of Bozeman Public Works Director and Sanderson Stewart, Inc.
- Bozeman Creek Neighborhood Association
- New Hyalite View Neighborhood
- Campus Sustainability Advisory Council & Bozeman Climate Partners
- Gallatin Valley Bike Club



Over 550 unique comments were made on the interactive commenting platform.



A study website (www.bozemantmp.com) was created for the TMP.

Other Public Outreach Activities

A number of other public outreach activities occurred over the planning duration:

- **Website:** A website was developed for the TMP (www.bozemantmp.com) as a landing page for information developed during the planning process. Draft technical memorandum, links to additional resources, frequently asked questions, and contact information was included on the website. In addition, a Facebook site was created and maintained throughout the process to disseminate information about meetings and TMP progress.
- **News Releases:** Television and newspaper articles were used several times during the planning process to help keep the public informed. News releases were issued two weeks prior to public meetings to generate interest in the process, and to encourage participation by the public.
- **Newsletters:** Several newsletters were created and distributed in hard copy format during the various outreach events, including specific stakeholder meetings and the formal informational meetings. The newsletters were generally available and posted to the TMP website one month before each of the informational meetings.
- **Wikimapping:** An interactive mapping platform, called a "wikimap", was developed for the TMP. The platform allowed the public to provide feedback on the transportation network via an online map. Users were asked to provide comments related to transportation at spot or roadway segment locations. There were a total of 556 unique comments made on the platform, with an additional 931 likes or dislikes made on the comments.
- **Survey:** A survey on transportation issues was developed for the TMP. The survey was hosted by the City and was open for three-months. A total of 519 people attended the online survey with 393 providing responses. In total, 19.7 hours of public comment were made on the survey.

Chapter 2
State of the Community

To clearly understand the needs of a community, it is important to evaluate the state of the existing land use, transportation network, social, and economic conditions of the community. To achieve this task for the Bozeman community, information was collected on many aspects of the transportation system, socioeconomic conditions, and land use. Available and collected data were used to establish existing conditions for the community. The existing conditions were used to determine issues and concerns related to the transportation system.

Bozeman serves as an important hub to economic, recreational and educational interests across several counties in southwest Montana. Yellowstone International Airport, which serves Bozeman and the surrounding areas, has the highest annual boardings in the state.

2.1. SOCIOECONOMICS

Local and regional population and economic characteristics have important influences on motor vehicle travel in the Bozeman area. The study area for the Bozeman TMP includes all of the land within the city of Bozeman and encompasses adjacent lands in Gallatin County where suburban development has occurred and will likely occur in the future. Although not directly within the study area, population and employment growth occurring in the incorporated areas of Belgrade, Manhattan, and Three Forks and in the unincorporated Four Corners area is an important consideration for the TMP. Residents of these Gallatin Valley areas work, shop, attend educational institutions, and recreate in Bozeman and their commuting patterns have impacts on the local transportation system.

2.1.1. Population and Demographic Trends

Gallatin County has been one of Montana's fastest growing counties over the last 30 years. In terms of numeric increases, Gallatin County has seen the most new residents of any county in the state since 1980. The total population of Gallatin County grew from 32,505 in 1970 to 89,513 in 2010—adding more than 57,000 residents. With the exception of the 1980s, the county's population has increased by more than 30% every decade since 1970. Population growth during the 1980s was still notable and the number of county residents increased by nearly 18% between 1980 and 1990. Likewise, the city of Bozeman experienced significant growth between 1970-2010 when the city's population grew from 18,670 to 37,280 residents. Population growth within Bozeman slowed to less than 5% during the 1980s similar to the trend seen for Gallatin County. Population increases of between 15 percent and 35 percent within Bozeman were seen during the other decades of the 1970-2010 period.

Between 1970 and 2010, the population of the City of Bozeman doubled from 18,670 to 37,280. Gallatin County's population grew by 2.75 times over the same period while the population for the state of Montana grew by over 40 percent.

Both the state of Montana and the United States (U.S.) showed population increases during each decade between 1970 and 2010 but the rates of increase were well below those seen in Gallatin County and the city of Bozeman during those periods. The population of the U.S. and Montana grew by about 52% and 42%, respectively, between 1970 and 2010.

Historical census data also shows that all other incorporated communities within Gallatin County grew significantly between 1970 and 2010. The population of the city of Belgrade, the second largest incorporated area in the county, grew from just over 1,300 residents in 1970 to a 2010 population of 7,389. The populations of the town of Manhattan increased by 86%, the city of Three Forks increased by more than 57%, and the town of West Yellowstone grew by 68% during the four-decade long period.

The population of unincorporated areas of Gallatin County increased by 311% between 1970-2010, with significant growth seen during the 1970s and after 1990. In 2010, the number of residents living in unincorporated communities in Gallatin County was 40,184, 4.1 times higher than in 1970. The majority of the unincorporated area population in 2010 lived in the greater Gallatin Valley area between Bozeman, Belgrade and Four Corners and along the I-90/Frontage Road corridor between Manhattan and Three Forks.

Table 2.1 shows historic and estimates of current (as of July 1, 2014) population for Gallatin County, the city of Bozeman, the state of Montana, and the U.S. Annual population growth rate for Gallatin County has far exceeded rates seen for the state and the nation since 1970. Similarly, the city of Bozeman's population grew at rates higher than those seen for the state and nation. The annual average percent change in population are shown in the table.

Table 2.1: Population Change (1970-2014)

Area	1970	1980	1990	2000	2010	2014*	Annual Average % Change
Gallatin County	32,505	42,865	50,463	67,831	89,513	97,308	**2.53%**
City of Bozeman	18,670	21,645	22,660	27,509	37,280	41,660	**1.81%**
State of Montana	694,409	786,690	799,065	902,195	989,415	1,023,579	**0.86%**
United States	203,392,031	226,545,805	248,709,873	281,421,906	308,745,538	318,857,056	**1.04%**

** Estimate as of July 1, 2014*
Source: U.S. Bureau of the Census, Current Estimates Data, available at http://census.missouri.edu/acs/profiles/

2.1.1.1. Age Distribution

A comparison of resident age was made between Gallatin County, the city of Bozeman, the state of Montana, and the U.S. **Table 2.2** depicts the changes in age distribution for residents between 1980 and 2010. The county's population is shown to be younger than that of the state and nation. Demographic data shows Gallatin County and the city of Bozeman have a larger share of residents in the "less than 18 years old" category and fewer residents in the "65 years and over" category than either the state or nation. The age group from 18 to 64 generally represents the working-age population.

The median age of Gallatin County residents increased from 25.1 years to 32.5 years between 1980 and 2010. The median ages for residents of the city of Bozeman showed a slightly lower increase in median age—from 23.3 years in 1980 to 27.2 years in 2010. In both geographies, the median ages of County and City residents were consistently below that seen for the state and nation.

Residents aged 20-34 comprised nearly 29 percent of the county's population and almost 42 percent of the city's population in 2010. Residents aged 45 to 64 accounted for about 24 percent of the county's population and some 17 percent of the city's population in 2010. This age group generally represents the "Baby Boom" generation and includes people born from mid-1946 to 1964. Between 2000 and 2010, the share of the county and city populations within this age group increased by 4% and 2%, respectively.

Table 2.2: Age Distribution (1980-2010)

Area	1980	1990	2000	2010
Gallatin County Median Age	**25.1**	**29.8**	**30.7**	**32.5**
% Less than 18 Years Old	*23.8*	*24.3*	*22.0*	*20.9*
% 18-64 Years Old	*68.7*	*66.8*	*69.5*	*69.6*
% 65 Years and Older	*7.5*	*8.9*	*8.5*	*9.5*
City of Bozeman Median Age	**23.3**	**25.7**	**25.4**	**27.2**
% Less than 18 Years Old	*16.8*	*18.1*	*16.0*	*15.7*
% 18-64 Years Old	*75.2*	*72.8*	*76.0*	*76.2*
% 65 Years and Older	*8.0*	*9.1*	*8.0*	*8.1*
State of Montana Median Age	**29.0**	**33.8**	**37.5**	**39.8**
% Less than 18 Years Old	*29.4*	*27.8*	*25.5*	*22.6*
% 18-64 Years Old	*59.9*	*58.9*	*61.1*	*62.6*
% 65 Years and Older	*10.7*	*13.3*	*13.4*	*14.8*
United States Median Age	**30.0**	**32.9**	**35.3**	**37.2**
% Less than 18 Years Old	*28.2*	*25.6*	*25.7*	*24.0*
% 18-64 Years Old	*60.5*	*61.8*	*61.9*	*63.0*
% 65 Years and Older	*11.3*	*12.6*	*12.4*	*13.0*

Source: U.S. Bureau of the Census, Census of the Population 1980-2010

MSU's enrollment grew by 3,438 between 2005 and 2015.

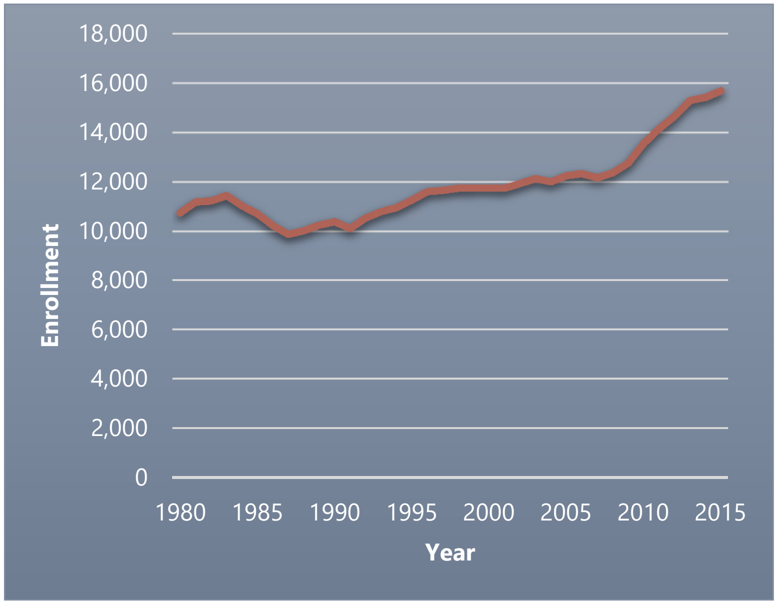


Figure 2.1: Fall Enrollment at MSU

2.1.1.2. Montana State University Student Population

Montana State University-Bozeman (MSU) attracts a large number of full-time and part-time students to the city of Bozeman each year. Enrollment at MSU has increased steadily since 1991 and the university has seen record enrollment nine times over the past 10 years. **Figure 2.1** shows the trend in enrollment at MSU since 1980. As of fall semester 2015, MSU's enrollment was 15,688 including 12,196 (78%) full-time students and 3,492 (22%) part-time students.

The *Montana State University Strategic Plan 2012*[3] indicates it is a goal of the university to continue growing the student enrollment. The 2012 plan identified a goal of increasing the total student population to 16,000 by the year 2019. It is clear from the recent enrollment numbers that the university is poised to exceed this target population well ahead of that time. In fact, fall 2016 numbers showed a record enrollment of 16,440 students.

The annual influx of students to MSU means the city of Bozeman and surrounding areas must accommodate this population. Housing opportunities for students are available both on campus and off campus within the greater Bozeman area. With the addition of a new dormitory in 2016, MSU is now capable of housing more than 3,700 students in the residence halls at the university. MSU also offers family and graduate housing in nearly 600 apartments located within walking distance of the campus. Approximately 70 percent of the on-campus population is comprised of freshmen undergraduate students.

2.1.1.3. Personal Travel and Commuting Characteristics

According to the American Community Survey (ACS) profile for the 2009-2013 period, residents in approximately 96 percent of all occupied housing units in Gallatin County had access to one or more vehicles to commute to work or meet other personal needs. In the city of Bozeman, 93 percent of residents had access to at least one vehicle. In comparison, residents of nearly 95 percent of all occupied housing units in Montana and 91 percent of all occupied housing units in the nation had access to one or more vehicles.

Information about the number of workers (16 years and older) and their commuting characteristics is also available from the ACS. The ACS information provided estimates of the total share of workers who commute or work at home, the transportation modes used by commuters, and the mean travel times to work for commuters. **Table 2.3** presents commuting characteristics for workers in the various geographies of Gallatin County and the city of Bozeman. Similar statistics for the state of Montana and the U.S. are provided for comparison.

The table shows that approximately 81 percent of commuting workers in Gallatin County rely on personal vehicles or carpools for transportation to work destinations. Approximately 77 percent of commuting workers in the city of Bozeman drove alone or carpooled. Workers in Gallatin County and the city of Bozeman were more likely to walk to work as compared to all workers in the state and nation. The data also shows workers in the city used public transportation for commuting more than typically seen for all workers in Montana. Workers in Gallatin County and the city of Bozeman also have notably shorter commute times than elsewhere in the state or nation.

Table 2.3: Mode of Transportation to Work (2009-2013)

Subject	City of Bozeman	Gallatin County	State of Montana	United States
Number of Workers 16 Years and Older	**21,050**	**48,847**	**469,319**	**139,786,640**
Commuted to Work	*94.7%*	*92.5%*	*93.7%*	*95.6%*
Worked at Home	*5.3%*	*7.5%*	*6.3%*	*4.3%*
Transportation Mode				
Drove alone, car, truck, van	*69.5%*	*71.8%*	*75.4%*	*76.3%*
Carpooled	*7.3%*	*9.2%*	*10.1%*	*9.8%*
Public Transportation (excluding taxicabs)	*1.3%*	*0.9%*	*0.8%*	*5.0%*
Walked to Work	*9.8%*	*6.1%*	*4.9%*	*2.8%*
Other means of commuting	*6.8%*	*4.5%*	*2.5%*	*1.8%*
Mean Travel Time to Work	**13.6 min**	**16.8 min**	**18.0 min**	**25.5 min**

Source: U.S. Bureau of the Census, American Community Survey (ACS) Profile Report: 2009-2013 (5-year estimates), available at http://census.missouri.edu/acs/profiles/

Table 2.4: Housing Units

Area	1980	1990	2000	2010
Gallatin County				
Population	42,865	50,463	67,831	89,513
Housing Units	17,173	21,350	29,489	42,289
Population per Housing Unit	**2.50**	**2.36**	**2.30**	**2.12**
City of Bozeman				
Population	21,645	22,660	27,509	37,280
Housing Units	7,971	9,117	11,577	17,464
Population per Housing Unit	**2.72**	**2.49**	**2.38**	**2.13**
Unincorporated Areas of the County				
Population	15,914	21,231	30,293	40,184
Housing Units	6,949	9,298	13,559	18,826
Population per Housing Unit	**2.29**	**2.28**	**2.23**	**2.13**

Source: US Bureau of the Census, Census of the Population

2.1.1.4. Housing Units

The Census Bureau identifies a housing unit as a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or if vacant, is intended for occupancy) as separate living quarters. Separate living quarters are those in which the occupants live and eat separately from any other persons in the building and which have direct access from outside of the building or through a common hall. The occupants may be a single family, one person living alone, two or more families living together, or any other group of related or unrelated persons who share living arrangements.

Table 2.4 lists the number of housing units that existed within Gallatin County and the city of Bozeman during recent decennial censuses. Overall, the number of housing units in the County increased by nearly 146 percent during the 1980-2010 period, with significant increases in the number of housing units recorded during each of the last two decades in the County. This trend is similar for the city of Bozeman which showed a 119 percent increase in housing units between 1980 and 2010 and a 51 percent increase in the number of housing units between 2000 and 2010.

Historic census data for Gallatin County areas showed notable increases in the number of housing units in other incorporated communities within the Gallatin Valley. Between 1990 and 2010, nearly 1,900 new housing units were added to the city of Belgrade with 935 new housing units being added during the 2000-2010 period. The town of Manhattan recorded an increase of 589 housing units over the 1990-2010 period with 72% of these housing units (424 units) being added between 2000 and 2010. The number of new housing units in the city of Three Forks did not increase as dramatically as in Belgrade or Manhattan. However, more than 300 new housing units were added in Three Forks over the 1990-2010 period. These communities, particularly Belgrade and Manhattan, are within commuting distance of Bozeman and likely offer housing costs lower than those generally available in Bozeman.

2.1.2. Employment and Income Trends

Gallatin County is Montana's fourth most populous county, while the city of Bozeman, the county seat, is the state's fourth largest city. The economy of Gallatin County is fairly diverse with construction, government, manufacturing, technology, retail trade, services, and agriculture all playing notable roles. Bozeman's transition into a regional trade and service center provide a solid basis for continued economic growth. Montana State University (MSU) comprises the largest component of Gallatin County's economic base.

In 2013, there were 70,269 full-time and part-time jobs with more than 98 percent of the jobs being non-farm related employment. Total full and part-time employment in Gallatin County in 2013 was 223 percent higher than that recorded in 1980. Over this 33-year period, the average annual increase in employment in Gallatin County was 3.6 percent per year.

The services industry experienced the highest growth between 1980 and 2013 with the total number of jobs increased by 25,300. Other industry sectors showing sizable increases in employment since 1980 include: construction (net gain of 5,166 jobs); finance, insurance and real estate (net gain of 4,752 jobs); retail trade (net gain of 4,371 jobs) and state and local government (net gain of 3,408 jobs). The industries showing the lowest gains in employment since 1980 were federal and civilian government, the military, agriculture and forestry, mining, and transportation.

MSU is the largest employer in Gallatin County with 3,092 permanent faculty and staff, and 649 graduate teaching and research assistants in 2014. Of the 3,092 permanent employees, 2,321 were classified as full time and 771 were part time employees. The Bozeman Public School District, Gallatin County, and city of Bozeman are also large public employers in the county. Large private employers within Gallatin County include:

- Bozeman Deaconess Hospital (1,000+ employees)
- Right Now Technologies (500-999 employees)
- Walmart (250-499 employees)
- 17 other businesses with 100 to 249 employees

The Bozeman area economy experienced a significant contraction early in the 2008 recession. However, the economy began to turn around in 2010 and has continued upward ever since. According to the *2015 Economic Outlook* (by Paul Polzin, Bureau of Business and Economic Research) only Gallatin County and Yellowstone County significantly exceeded the statewide growth rates during the recovery phase of this business cycle.

2.2. LAND USE AND DEVELOPMENT

Land use plays a critical role in shaping transportation networks. Land use decisions affect the transportation system and can increase viable options for people to access work and recreation sites, goods, services, and other resources in the community. In turn, the existing and future transportation system may be impacted by the location, type, and design of land use developments through changes in travel demands, travel mode choices, and travel patterns. For this reason, it is important to review community development patterns over time and understand where conditions may be favorable for new residential and commercial growth.

2.2.1. HISTORIC DEVELOPMENT PATTERNS AND CURRENT LAND USES

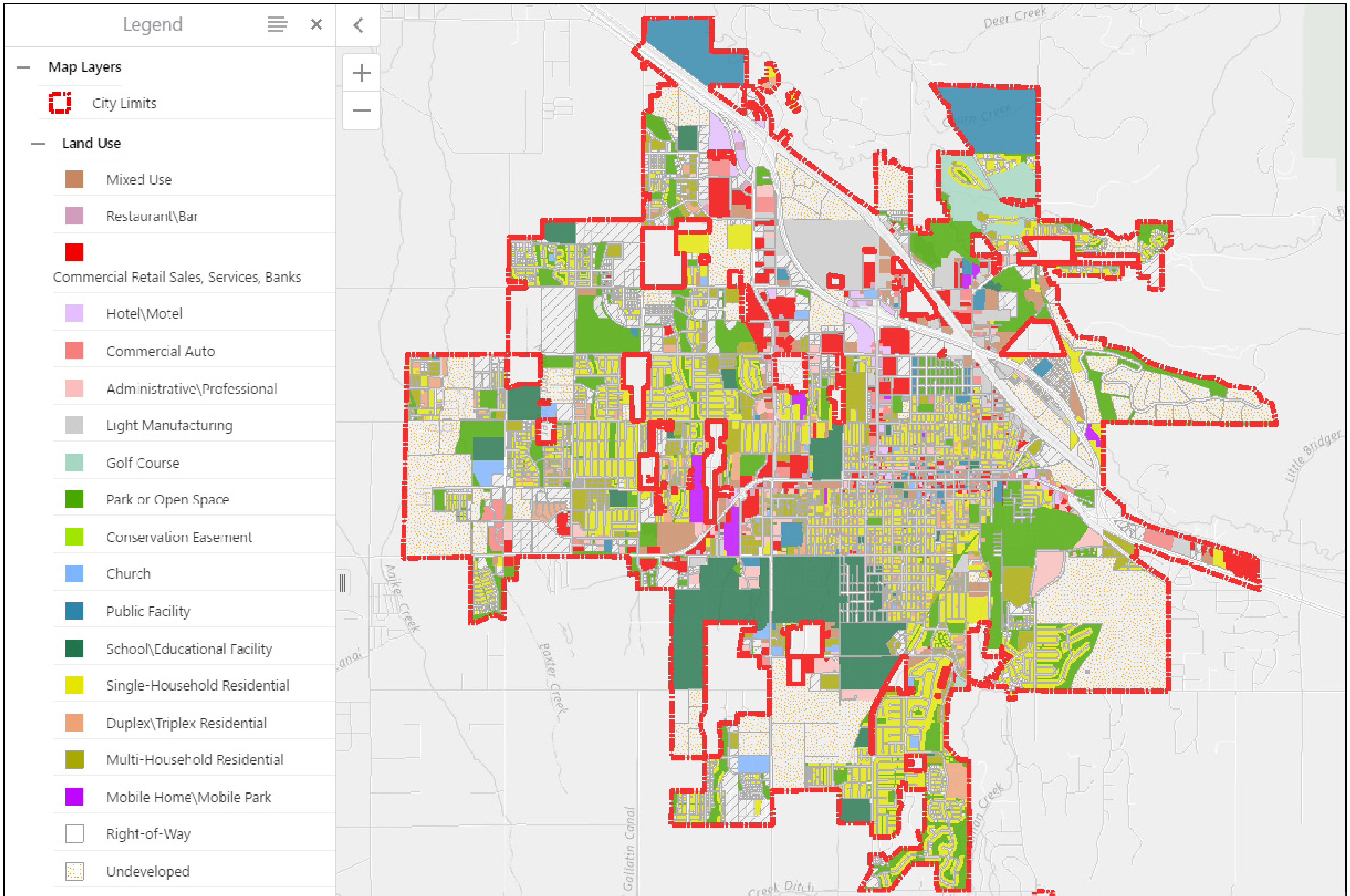
Bozeman's developed land use pattern has evolved steadily from the time of first settlement. The historic development of the city of Bozeman was centered on the commercial core of Main Street and later included the industrial core established around the railroad yard. The city developed around a street and block pattern that served residents by providing for most basic needs within relatively close proximity to residential areas. This pattern flourished for many years and maintained a thriving central core area within the city.

The development pattern changed as automobiles became commonplace and allowed people to move greater distances over a shorter period. The newfound mobility served to create commercial corridors as business owners relocated to or expanded on parcels of less expensive land on the edges of town. The development of Interstate 90 (I-90) along the north edge of the city reinforced the commercial corridor pattern seen in the community. Commercial development, with concentrations of motels/hotels and other services, was spurred in areas along East Main Street and North 7th Avenue (and later North 19th Avenue) where interchanges were constructed along I-90.

The periods of rapid residential growth seen in the Bozeman area from 1980 forward resulted in significant new residential areas on former agricultural lands that surrounded the city. This growth has manifested itself through numerous large residential developments, primarily on lands adjoining the north, west, and southwest portions of the city and through infill developments in other areas of the city. Residential and commercial development on lands near MSU has also been notable in recent years.

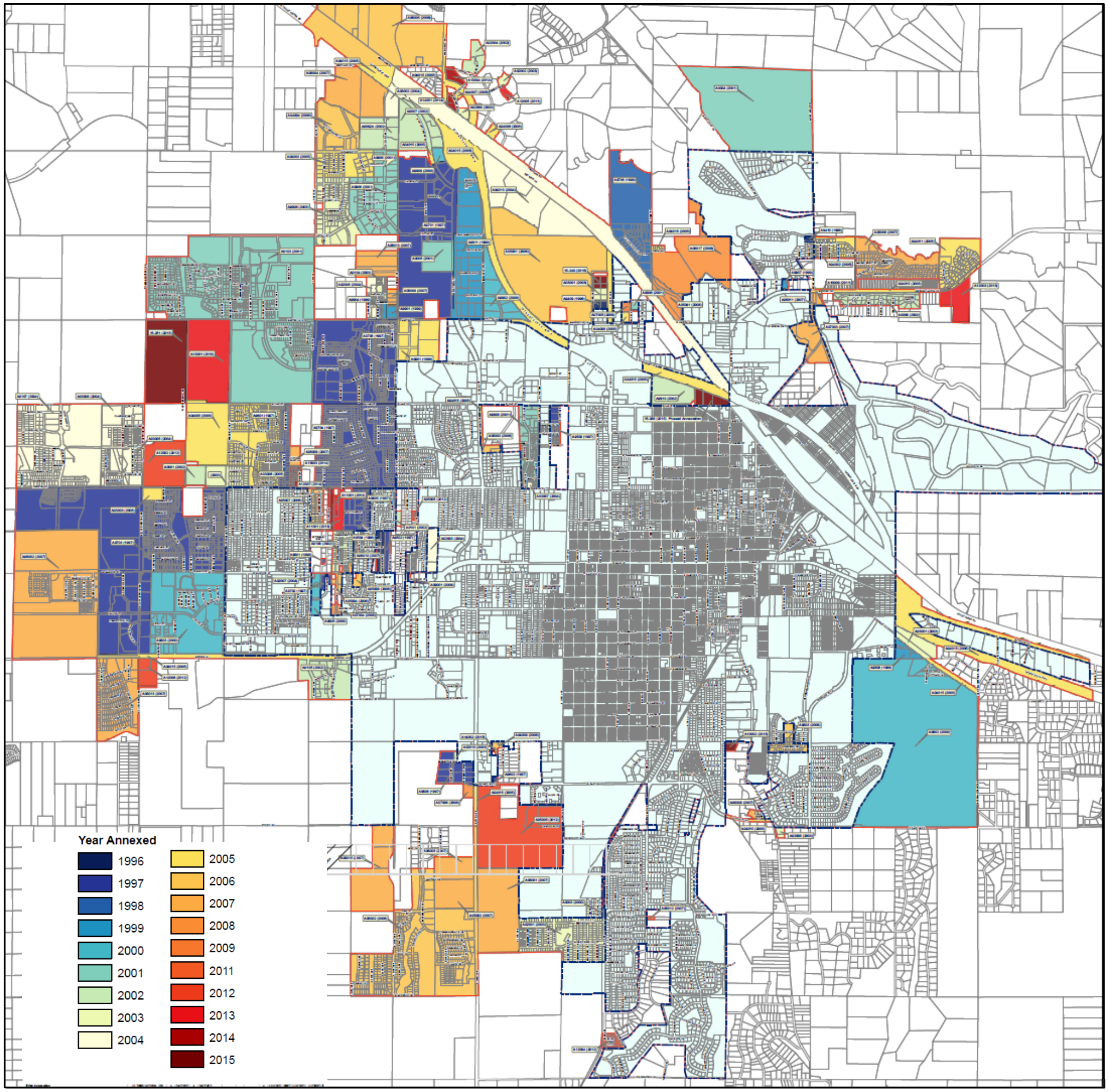
Today, the city is seeing substantial redevelopment and enhancements within its historic downtown core area and East Main Street. This activity has contributed to making downtown Bozeman a very vibrant area. Rapid expansion of commercial uses has also continued along North 19th Avenue and portions of West Main Street. Most other major streets in the city also have some level of commercial development.

Figure 2.2 depicts current land uses for the community as compiled by the city of Bozeman GIS Department.



Source: City of Bozeman GIS Department, accessed December 27, 2106, http://gisweb.bozeman.net/Html5Viewer/?viewer=maps

Figure 2.2: Existing Land Use in the City of Bozeman (2016)



Source: City of Bozeman GIS Department, http://www.bozeman.net/Smarty/media/GIS_Media/maps/Annexation_Map.pdf

Figure 2.3: City of Bozeman Annexations (1996-2015)

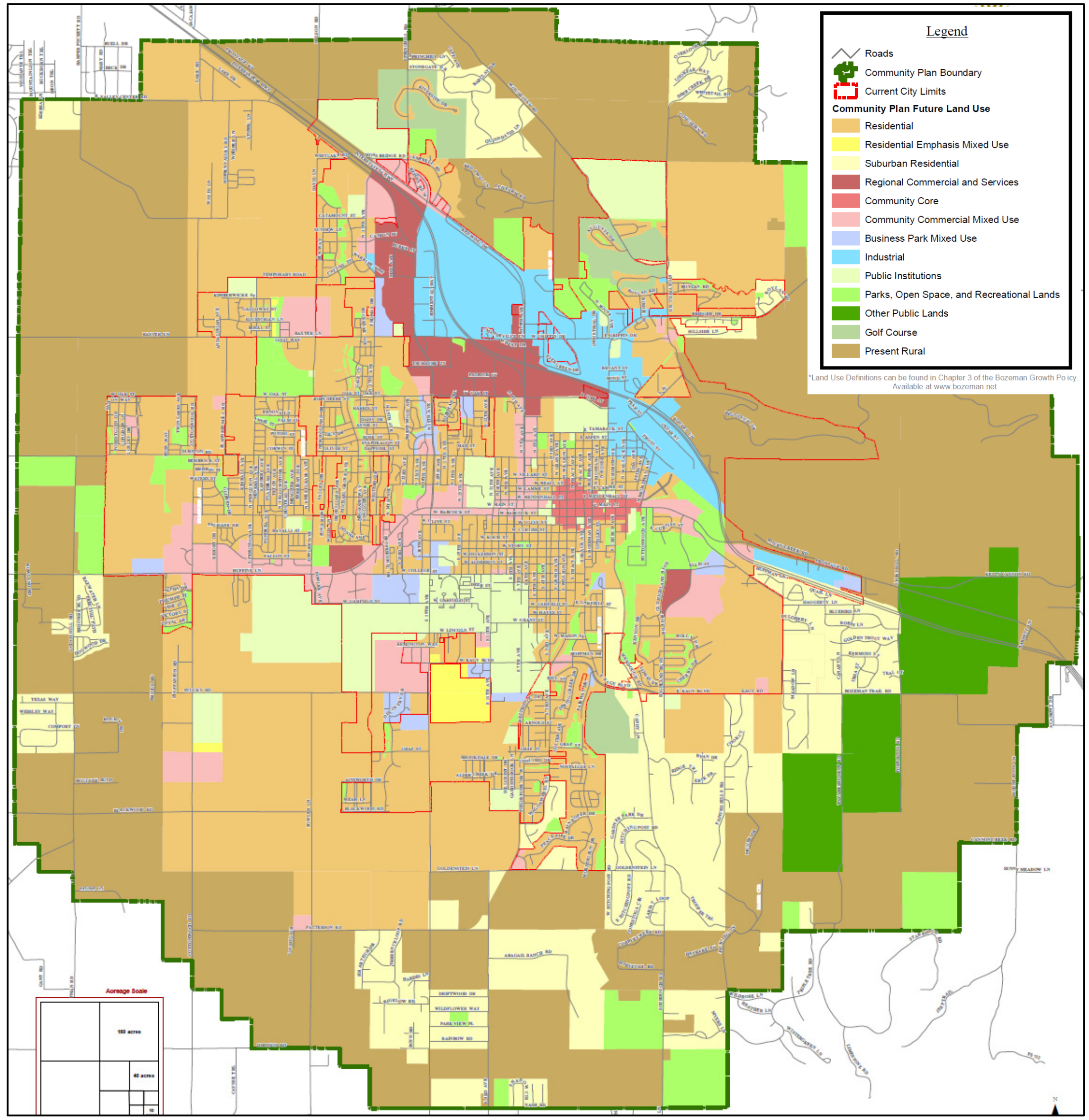
2.2.2. Recent Annexations

The city of Bozeman has increased in size over the years due to annexations. Annexations are typically done to accommodate new developments and/or extend municipal services. **Figure 2.3** shows annexations from 1996 through 2015. The light blue area in the map shows the municipal boundaries as of 1996 and the colored areas represent annexed lands for subsequent years with orange to red colors representing the most recent annexations.

In 1996, the City encompassed about 7,100 acres. Between 1999 and 2007, the city annexed nearly 4,150 acres. As of the end of 2015, the municipal boundaries of Bozeman covered approximately 12,900 acres, an increase of over 80 percent from 1996. It is apparent from the map that most lands annexed since 1996 were on the north and west perimeters of the city.

2.2.3. Future Land Use

Figure 2.4 presents a future land use map for the Bozeman area taken from the *Bozeman Community Plan*[2] adopted in 2009. In general, the future land use plan for the city seeks to move away from the auto-oriented development pattern of the past, increased the urban density by implementing more mixed use developments that combine uses on one site or within one building and more efficiently use land. Center-based commercial development is viewed as desirable. The city also seeks to create more options in housing choice, location, and cost.



Source: Bozeman Community Plan (2009), http://www.bozeman.net/Smarty/files/e6/e6a049b8-fad5-4886-b7f5-3ebfbd2f4556.pdf

Figure 2.4: Future Land Use Map for the Bozeman Area

Included in the current study area are roadways with functional classifications of interstate system, principal arterial, minor arterial, collector routes, and local streets. . The following list provides general descriptions of these functional classifications:

Interstate: The main purpose of an interstate highway is to provide for regional and interstate transportation of people and goods. Primary users are all types, including local residents, commuters, travelers, and freight operators. Interstate highways are characterized by having fully controlled access (provided by a limited number of interchanges), high design speeds, and a high level of driver comfort and safety. The interstate system has been designed as a high-speed facility with all road intersections being grade separated.

Principal Arterial: The purpose of the principal arterial is to serve the major centers of activity, the highest traffic volume corridors, and the longest trip distances in an area. This classification of roadway carries a high proportion of the total traffic. Most of the vehicles entering and leaving the area utilize principal arterials. Significant intra-area travel, such as between central business districts and outlying residential areas and between major suburban centers, is served by principal arterials.

Minor Arterial: The minor arterial street system interconnects with and augments the principal arterial system. They accommodate trips of moderate length at a somewhat lower level of travel mobility as compared to principal arterials, and they distribute travel to smaller geographic areas.

Collector: The collector street network serves a joint purpose – provide equal priority to the movement of traffic and to access residential, business, and industrial areas. This type of roadway differs from those of the arterial system in that collector roadways may traverse residential neighborhoods. The collector system distributes trips from the arterials to the user's ultimate destinations. The collector streets also collect traffic from local streets in the residential neighborhoods, and channel the traffic to the arterial system.

Local: The local street network comprises all facilities not included in the higher systems. The primary purpose of local streets is to permit direct access to abutting lands and connections to higher systems. Usually service to through-traffic movements is intentionally discouraged either through low speed limits or other traffic calming measures.

2.3. TRANSPORTATION NETWORK

Information about the current transportation system was analyzed to establish existing traffic conditions, non-motorized network gaps and limitations, and to determine potential problem areas. Existing transportation data were provided by MDT and the city of Bozeman. Additional data were collected in the fall of 2015 to supplement the available information. Using a combination of the supplied and collected data, the existing operational characteristics of the transportation network was determined.

2.3.1. Major Street Network

A community's transportation system is made up of a hierarchy of roadways, with each roadway being classified according to certain parameters including, but not limited to, geometric configuration, traffic volumes, spacing in the community's transportation grid, speed, and adjacent land use. Functional classification is a method of classifying roads by the service they provide as part of the overall roadway network. Most travel involves movement through a network of roads. Functional classification defines the nature of traveling within a network in a logical and efficient manner by defining the part that any particular road or street should play in serving the flow of trips through the entire network.

For this TMP, emphasis was placed on roadways that are functionally classified as collectors, minor arterials, or principal arterials within the study area. **Figure 2.5** presents the existing major street network. This major street network builds off information contained in the adopted *Greater Bozeman Area Transportation Plan (2007 Update)* and was modified to reflect changed conditions. Note that the functional classifications shown in the figure may not represent the "Federally approved" functional classification system, rather, they show the local classifications which are used for planning purposes and may not be representative of existing conditions.

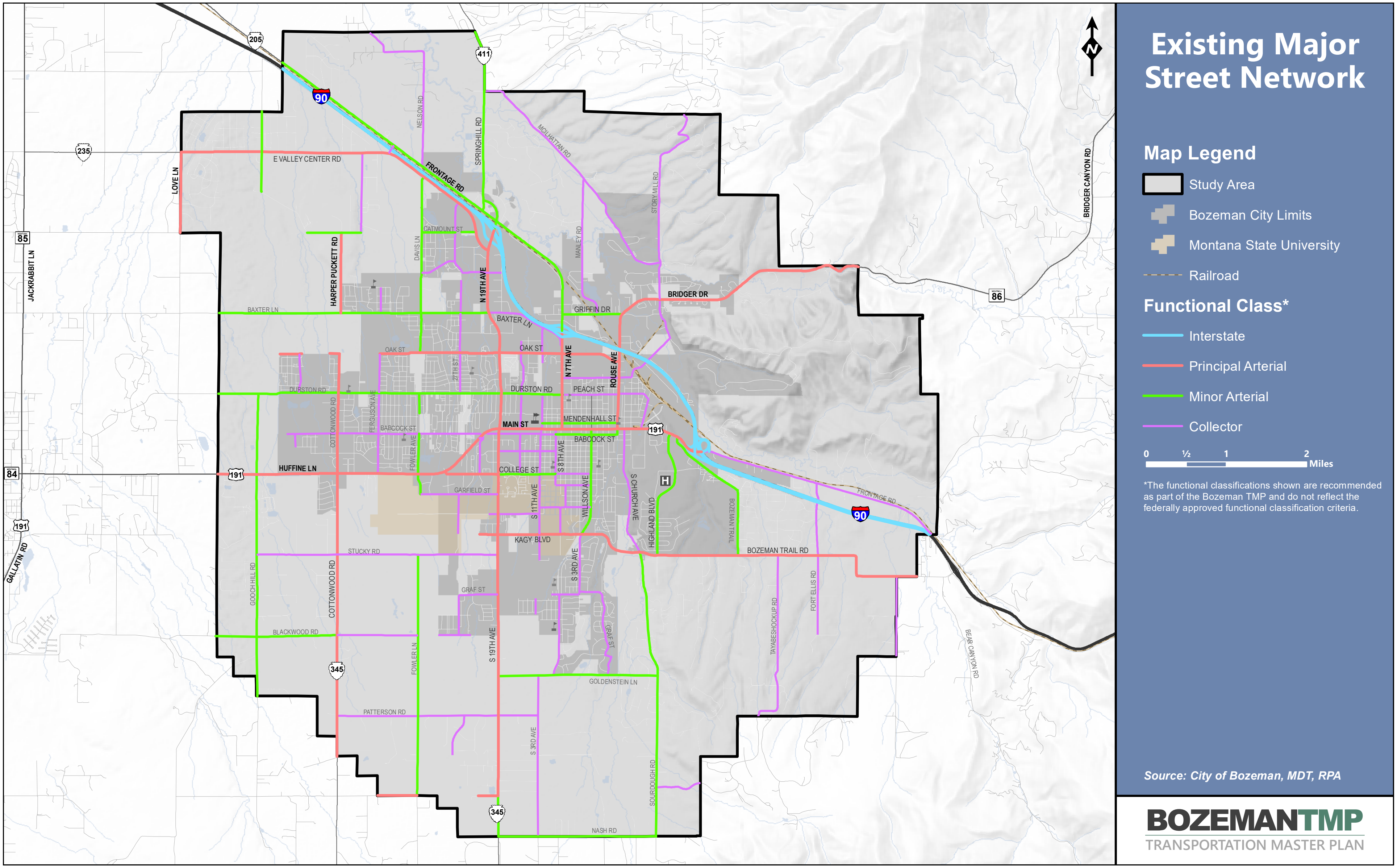


Figure 2.5: Existing Major Street Network

2.3.2. Active Transportation Network

2.3.2.1. Bicycle Facilities

The city of Bozeman has made great progress on its active transportation network since the *Greater Bozeman Area Transportation Plan (2007 Update)* and the *2007 Parks, Recreations, and Open Space Plan*. The mileage of all facility types have approximately doubled since 2007. The increase in facilities has resulted in measured increases in bicycling in Bozeman. Bicycle commuting mode share increased from 4.7 percent of commute trips in 2000 to 6.3 percent of commute trips in 2010. The city of Bozeman measured an instantaneous increase in bicycling and walking of 256 percent along West Babcock Street when bike lanes and sidewalks were installed in 2007. The following list describes the various bicycle facilities found in Bozeman and other cities. **Figure 2.6** shows the existing bicycle facilities within the TMP study area.

Bike Routes

Bike routes include paved shoulders and shared roadways where bicyclists and cars operate within the same travel lane, either side by side or in single file depending on roadway configuration. The most basic type of bikeway is a signed shared roadway. This facility is used to connect other bikeways – usually bike lanes - or designate preferred routes through high-demand corridors. Bozeman has a network of signed bike routes that operate both as shared roadways and, in some instances, with paved shoulders. Some of these roadways, such as Mendenhall Street, have shared lane markings installed which raise the visibility of bicycling and promote safer behavior by both bicyclists and motorists. Bozeman has approximately 18 miles of bike routes officially designated through signage.

Bike Lanes

Bike lanes are a type of on-street bikeway that uses signage and striping to delineate the right-of-way assigned to bicyclists and motorists. Bike lanes encourage predictable movement by both bicyclists and motorists. Bike lanes can vary in comfort depending on the speed and volume of passing motorists and the overall size of the roadway. Bike lanes of greater width help to make them more comfortable along busier roadways. Bozeman has approximately 33 miles of on-street bike lanes.

Shared-use Paths

Shared-use paths are off-street paved trails that are designated for the use of bicyclists, pedestrians, and other non-motorized users such as skateboarders and rollerbladers. Examples include the Oak Street shared-use path and the College Street to Huffine Lane pathway. Bozeman has approximately 23 miles of shared-use paths.

Bicycle Boulevards

Bicycle boulevards are streets that are comfortable for most bicyclists to ride on due to low motorized traffic volumes and speeds. They are designed to give bicycle travel priority. Bicycle boulevards are designated with signs, pavement markings, and wayfinding elements. Additionally, they create safe, convenient bicycle crossings of busy arterial streets. If necessary, they can also employ speed or volume management techniques to keep them comfortable for bicyclists by reducing speeds and cut-through traffic. The city of Bozeman has not officially designated any streets as bicycle boulevards, however, there are many streets that currently have many of these features including pavement markings, wayfinding signage, and even a diverter, such as South 6th Avenue.

Separated Bike Lanes

While not currently found in Bozeman, separated bike lanes combine the user experience of a separate path with the on-street infrastructure of conventional bike lanes through various forms of physical separation from adjacent traffic. Two such facilities are currently in place in Missoula.

Natural Surface Trails

Natural surface trails are present in nearly every part of Bozeman. These facilities link neighborhoods, provide connections along streams (West Side Trail) and follow old railroad alignments like the Gallagator Trail and Story Mill Spur. These facilities fulfill, along with the rest of the sidewalk and shared use path network, both transportation and recreational functions. Bozeman has an extensive network that is constantly being expanded through developer built trails and other initiatives led by the city of Bozeman and Gallatin Valley Land Trust (GVLT). Much of the trail system has wayfinding and kiosks with maps and other information. Bozeman has approximately 92 miles of unpaved natural surface trails. Bozeman's network of natural surface trails provide significant transportation utility for many residents; however many can become unusable in the winter due to snow accumulation.

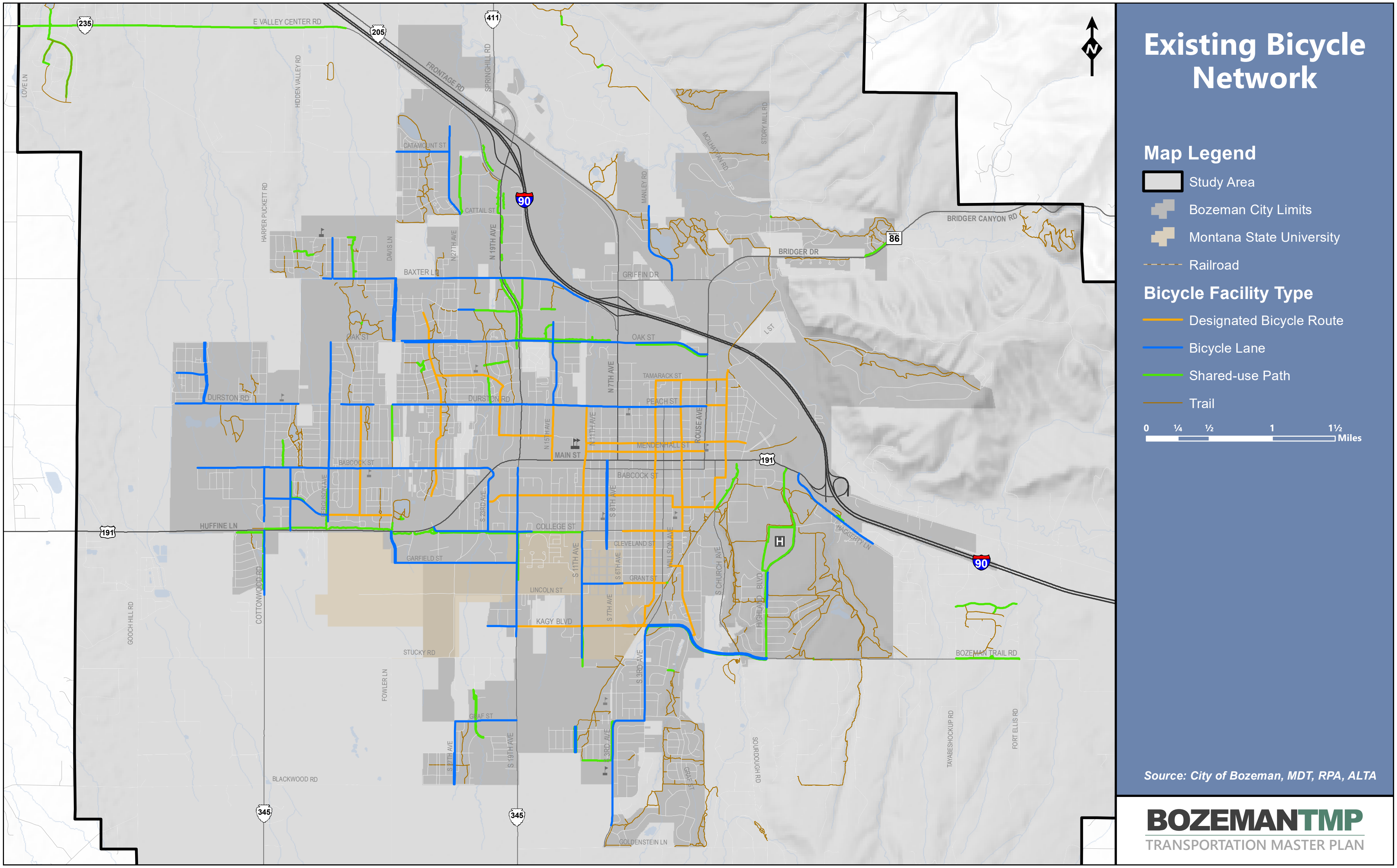


Figure 2.6: Existing Bicycle Network

2.3.2.2. Pedestrian Facilities

Bozeman's pedestrian facilities are generally good, with plentiful sidewalks that are typically in good condition. The City does have several challenges to achieving a fully connected pedestrian network. The following list describes these challenges. **Figure 2.7** presents the existing pedestrian network within the TMP study area.

Neighborhoods Lacking Sidewalks

Many County subdivisions and some City neighborhoods lack sidewalks completely. Most of these areas were constructed in the 1970s and 1980s. The City has made attempts to bring sidewalks to some of these neighborhoods and met resistance from some of the residents.

Incomplete Subdivisions

The responsibility to construct sidewalks currently lies at the individual lot level when the lot is developed. This has resulted in piecemeal sidewalk connectivity in subdivisions that have not yet been fully built out. Developers are required to construct the sidewalks after three years if the lots are not developed. However, the economic down-turn of 2008 through 2013 left many developers bankrupt and resulted in significant gaps in the side-walk network.

Arterials and Collectors

Several of Bozeman's arterials and collectors were originally constructed to County standards many years ago. As the City has grown, many of these streets have been reconstructed to newer standards to include sidewalks. Many streets, such as West Babcock Street between 11^{th} to 19^{th} Avenues, have never been reconstructed. Similar to on-street bicycle facilities, an arterial or collectors width and traffic speed and/or volume can influence how comfortable or pleasant the street is to walk along. Greater separation distance from moving traffic generally increases comfort.

Old Infrastructure

Many of Bozeman's older neighborhoods still have their original sidewalks, some of which have been in place for more than a century. While many are in good condition, some are cracked, heaved by tree roots, or lack accessible ramps at street corners. The City has been addressing these issues and making steady annual progress, however, there is a backlog that will still require many years of effort. According to Section 12.20.035 of the *Bozeman Municipal Code*, the City may notify property owners that repairs are necessary and the property owner has 30 days for repair or replacement.

Crossings

Many of Bozeman's signalized and unsignalized pedestrian crossings could benefit from enhancements which would make the crossing more visible to motorists and more comfortable to pedestrians and trail users. Many key pedestrian desire lines, such as mid-block trail crossings, are not accommodated.

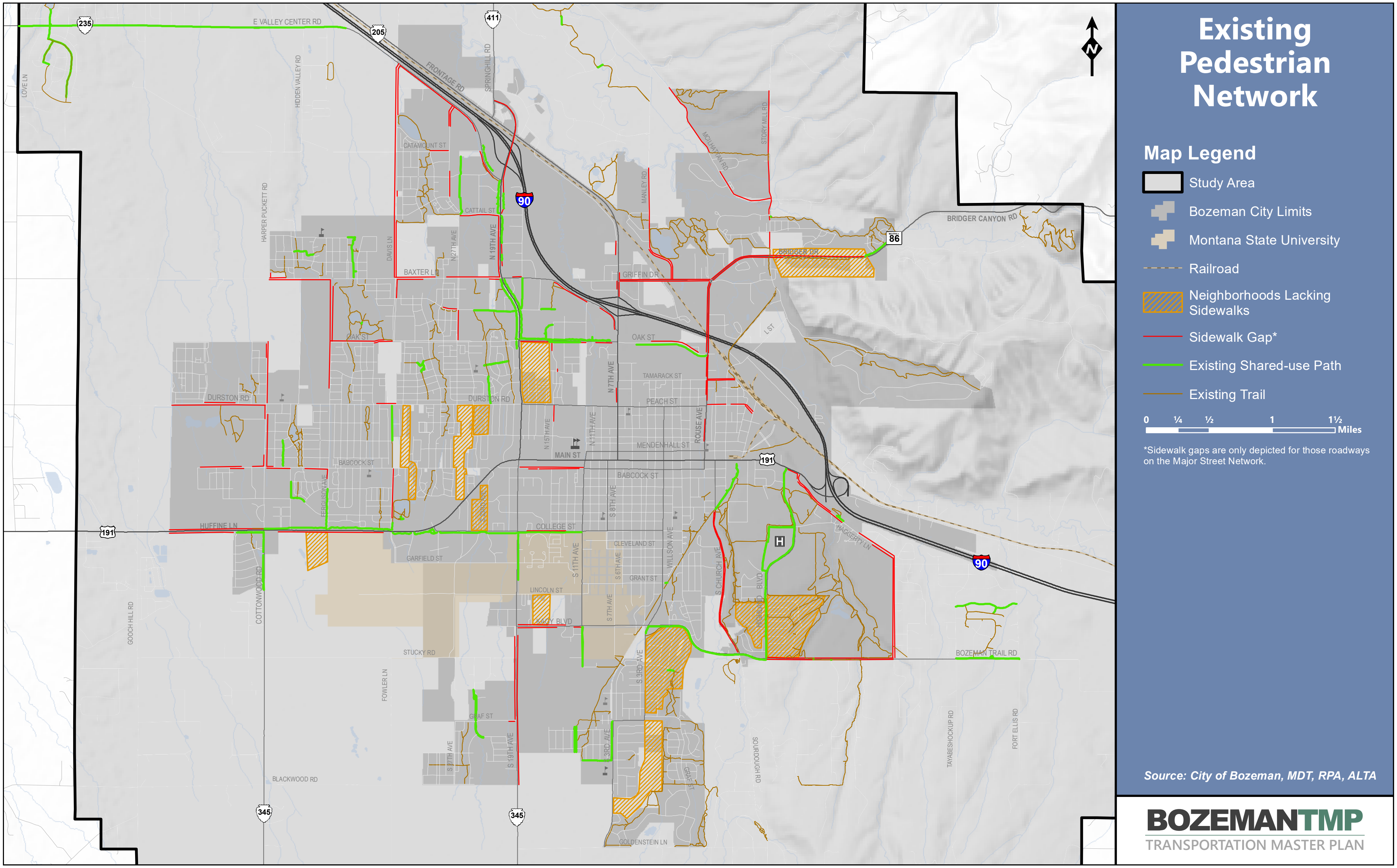


Figure 2.7: Existing Pedestrian Network

2.3.2.3. Transit Facilities

Streamline provides fixed route public transportation in Bozeman, Belgrade, and Livingston. Streamline began as a partnership between the Human Resource Development Council (HRDC), District IX, and the Associated Students of Montana State University (ASMSU). The partnership now includes the cities of Bozeman and Belgrade and the President's Office at Montana State University. Streamline was recently honored as one of five urban transit systems throughout the nation to be awarded an Outstanding Service Award by the Federal Transit Administration (FTA).

Streamline has realized an average annual ridership growth rate of 7.5 percent between 2007 and 2015.

Riders are overwhelmingly MSU students, faculty, and staff. This is both because universities tend to generate significant ridership, and because Streamline's service is MSU-centric with routes and schedules designed to serve MSU students and employees. Streamline currently offers six routes[4], all of which are fare free:

- Daytime (Fixed Route)
- Latenight (Deviated Fixed Route)
- Bridger Bowl/Bohart Ranch (Deviated Fixed Route, Seasonal)
- Saturday Service (Fixed Route)
- Livingston Commuter (Fixed Route)
- Belgrade Commuter (Fixed Route)

Streamline Ridership Trends

Ridership data are collected by the drivers when a passenger boards the bus. Monthly ridership data for all routes between fiscal year 2007 and 2015 were provided by Streamline. Streamline ridership trends can be summarized on a year-to-year and a month-to-month basis. Data show that total ridership has increased year-to-year from 2010 until 2014. A slight decrease in ridership was seen in 2015. The average annual growth between 2007 and 2015 is 7.5 percent.

On a month-by-month basis, seasonal variation in ridership can be seen with winter months generally having greater ridership as compared to summer months. It can also be seen that ridership in December decreases as compared to November and

January. This trend could be attributed to the holiday season and university students returning home for winter break. The daytime, Saturday, and Livingston categories show less seasonal variation, possible due to more non-university users. The late night category shows the greatest variation throughout the year with peaks in April and October and a low in July. Weather and availability of other transportation modes may also contribute seasonal variation of ridership.

Galavan

Galavan was established in 1973 to provide transportation services to senior citizens and persons with a disability. This demand-response service provides over 30,000 rides per year, and is considered an important part of the transportation service in the greater Bozeman area.

Streamline and Galavan Funding

For Fiscal Year 2017, Galavan's budget was approximately $400,000, which is about one-fourth of that of Streamline's $1.6 million budget. As the Bozeman area grows, increased support (funding) for these services will be important so that the community can reduce the number of single occupancy vehicle trips in the area. People will be able to reduce their individual costs for mobility, and the existing infrastructure will be more efficient, by having multiple people on one vehicle (bus).

Based on current expenses, adding an additional route to Streamline will cost about $258,000 per year. That provides twelve hours of service per day for six days per week (Monday – Saturday). Based on previous and current studies, it is anticipated that by 2040, Streamline and Galavan will need to add additional services to meet demands. Given the growth in the greater Bozeman area, it is anticipated that the Streamline/Galavan budget should grow to $6 million per year by 2040.

It should be noted that the $6 million per year figure does not include the full cost of capital equipment (buses). Under the current funding program, Federal Transit Administration funds, managed by the Montana Department of Transportation, pay for 80 to 86% of the cost of the vehicles used by Streamline and Galavan. The "local portion" for the vehicles is the in annual budget, however.

Pedestrian and Bicycle Connectivity to Transit

Streamline's five weekday lines are all one-way loops and have been adjusted over the years to become more efficient and beneficial to the community. Bus stop amenities are varied and range from high-quality custom designed shelters with benches and information to simple bus stop signs with a route timetable. Walking and bicycling are natural compliments to transit use. Transit use can be improved by high-quality pedestrian and bicycle facilities that can fill in the "first or last mile" of transit journeys. For the most part pedestrian amenities are present along bus routes, with some exceptions, such as along collector or arterial roads that have not fully been built out yet.

2.3.2.4. Active Transportation Facility Maintenance

Active transportation facilities are maintained in different ways by different departments and groups within the city of Bozeman. The following describes current maintenance activities for active transportation facilities:

- **On-Street Pavement Markings:** Bike lane and crosswalk striping is replaced in conjunction with the overall pavement marking replacement. The city of Bozeman contracts restriping annually. Some pavement markings have been installed as recessed thermoplastic which lasts much longer. For example, when South 3rd Avenue was chip sealed in 2013, the existing thermoplastic pavement markings that were applied in the late 1990s were still in good condition. Streets are snow plowed by MDT and City crews. The city of Bozeman has worked in recent years to improve plowing of bike lanes so that they are functional during the winter months and to sweep them clear of debris in the spring.
- **Paved Shared-Use Paths:** Most of Bozeman's asphalt shared-use paths are under 15 years old, however, some are reaching the point where surface preservation is needed. One of the issues faced is the varying quality of construction as many of these facilities were built by developers. There are multiple examples of asphalt trails deteriorating due to improper construction. The city of Bozeman has responded to some spot location for repairs, however, there is no substantial funding or program in place to conduct maintenance. Parks and Recreation and the Streets Departments have worked together to manage the inventory of asphalt shared-use paths. Various departments including Streets, Forestry, Cemetery, and Parks and Recreation have plowing responsibilities. Parks has taken a larger role and has received additional equipment from the Streets Department.
- **Natural Surface Trails:** Natural surface trails are a cost effective facility type with nearly 100 miles of facilities in place. The City's Parks and Recreation Department has a "Trail Boss" position which organizes and conducts maintenance on 67 miles of natural surface trail – including 66 bridges. Additionally, the city of Bozeman partners with the GVLT for maintenance. GVLT maintains trails that are in the County and organizes volunteer work days on City trails. Natural surface trails are not maintained during the winter months.

2.3.2.5. Active Transportation Programs and Events

Since 2007, there have been many new programs created and sustained by a variety of groups within Bozeman. **Table 2.5** summarizes these programs.

Table 2.5: Active Transportation Programs and Events

Program	Summary	Group/Agency
Bike Counts	Each September since 2011 the Bozeman Area Bicycle Advisory Board (BABAB) has organized volunteers to count bicycles at 15 locations around Bozeman. The counts are conducted in accordance with the National Bicycle and Pedestrian Documentation Project.	BABAB
Bike Swap	Each May the Gallatin Valley Fairgrounds are utilized to sell used bicycle equipment. The event is well attended each year.	Gallatin Valley Bike Club
Bike to Work Week	Each May volunteers and local businesses work together to encourage and reward individuals for biking to work. "Energizer Stations" each morning provide free coffee and breakfast treats to participating bicyclists. Additionally, other bicycle themed events are organized.	BABAB, MSU
Bike Training/Education	Classes involving teaching the rules of the road, proper riding technique and bicycle safety are periodically taught at a variety of venues.	BABAB, MSU, Bike Kitchen
Bozeman Biking Website	The city of Bozeman hosts a website (http://www.bozeman.net/bicycles) that has some materials in development including the recommendations from the League of American Bicyclists. There are two other websites that could cause redundancy and confusion among users.	BABAB
Community Bikes	Complete bicycles are provided to individuals who are endorsed by a selection of participating local community organizations.	Bike Kitchen, Human Resource Development Council, Gallatin Valley Food Bank, Thrive, Haven, etc.
Community Shop	The Bike Kitchen has open tools and repair stands available any time during regular hours for members of the public to conduct and learn bicycle repair.	Bike Kitchen
Discovery Walks	In 2015, there were 15 community walks with a theme: art, history, bird watching, etc. The program reached 267 participants over 38 free guided walks. This has resulted in getting more people to know the trail system.	GVLT
Earn a Bike	Volunteers at the Bike Kitchen can pick out a bike frame and build a complete bicycle from it after 16 hours of volunteer time.	Bike Kitchen
High School Driver's Education and Safety	BABAB developed a presentation aimed at raising awareness of bicycling issues for the Bozeman High School Driver's Education class. The program was initiated in 2013. Furthermore, BABAB has a high school ambassador who has organized events targeted at Bozeman High students.	BABAB
Speed Enforcement	Mobile speed trailers are relocated frequently around Bozeman to remind drivers of the speed limit. Permanent radar speed signs are installed near most of the City's elementary schools.	Bozeman Police Department

Program	Summary	Group/Agency
Trail/Bike Maps	Both GVLT and the BABAB publish a hard copy paper map of the city of Bozeman. The maps contain similar information, with the GVLT map costing $3 and focusing on the trail system. The BABAB map focuses more on bicycle facilities and is free. There is no user friendly on-line map as of 2015.	GVLT, BABAB
Trail Ambassadors	Volunteers are present at trailheads and on the trail system to assist users with wayfinding, etiquette, and handing out dog bags and leashes. In 2015, there were 225 hours of patrols and 2,748 contacts made with the public.	GVLT
Trail Volunteers	GVLT organizes volunteers to help maintain the trail system. GVLT oversees the work and the City provides materials. In fiscal year 2015, there were 753 volunteers amassing 2,823 volunteer hours.	GVLT, city of Bozeman
Trail Wayfinding	In 2015, GVLT added or replaced 575 signs for the trail wayfinding totems. GVLT has also installed 25 kiosks with 15 additional kiosks to be installed in the future.	GVLT
Trails Rx	In 2015, 15 health providers "prescribed" physical activity on the trail system. GVLT has provided the providers with trail maps, handouts, etc.	GVLT

2.3.3. Freight and Rail Network

Freight and Heavy Vehicles

The city of Bozeman is situated near the junction of I-90, US Highway 191 (US 191), and State Highway 84. I-90 connects Bozeman with Billings and Interstate 94 to the east and Butte and Interstate 15 to the west. US 191 extends south to West Yellowstone were it connects to US Highway 20. State Highway 84 travels west to its junction with US Highway 287 in Norris. Each of these routes serve regional, national, and international trade. As such, it is important that delivery vehicles are able to travel through the area in a safe and effective manner.

Within the study area, of major concern is the volume of heavy vehicle traffic in downtown Bozeman. A 2015 study found that of the approximately 300 heavy vehicles that use Main Street on a typical weekday, approximately 39 percent are through trips.[5] No truck routes are designated within the City of Bozeman. Roadway capacity, functional classification, and geography generally dictate which routes heavy vehicles use. Heavy vehicle traffic on major roadways within the study area is summarized in **Table 2.6**.

Table 2.6: Heavy Vehicle Traffic at Select Locations

Location	2014 AADT	2014 Heavy Vehicles (per day average)	Percent Heavy Vehicles
I-90 east of Main St.	15,330	2,178	14.2
I-90 between Main St and 7th Ave	16,820	2,097	12.5
I-90 between 7th Ave and 19th Ave	17,940	2,257	12.6
I-90 west of 19th Ave	19,050	2,257	11.8
Main St east of Highland Blvd*	12,680	392	3.1
Main St west of 19th Ave*	22,920	476	1.7
Huffine Ln west of Cottonwood Road*	23,000	476	2.1
19th Ave north of Baxter Ln*	25,030	260	1.9
7th Ave north of Oak St*	21,190	312	1.5
Oak St west of 7th Ave*	16.300	295	1.8
Durston Rd west of 7th Ave*	11,170	139	1.2
19th Ave north of College St*	17,120	254	1.5
Kagy Blvd east of 19th Ave*	13,560	150	1.1

** MDT does not collect classification data at these locations due to heavy traffic. Heavy vehicle percentages are derived based on adjustment formulas.*

The specific location of trucking activity centers can greatly affect the transportation network as a whole. For example, if a business receives daily deliveries from heavy vehicles, they would need to ensure that the trucks have a safe location to unload goods. If a loading dock or large parking area were not available, it is possible the truck would have to stop in the roadway while unloading. This results in blocked traffic and creates a safety hazard. Many businesses that generate a high volume of truck traffic tend to be located in industrial or commercial areas that allow for large unloading areas. While not exhaustive, **Figure 2.8** presents the locations of trucking activity centers located within the study area boundary.

Delays at at-grade train crossings affect overall transportation system performance. At-grade crossings were heavily commented on by Bozeman citizens througout the planning process.

Rail

The main rail line through Bozeman is currently owned by BNSF Railway (BNSF) and is leased to Montana Rail Link (MRL). Speed limits range from 10 to 45 miles per hour on the main track and 10 to 35 miles per hour on turnouts, sidings, and other track. The section of track through Bozeman is designated as a "Federal Railroad Administration Excepted Track", effectively limiting operations to a maximum of 10 miles per hour.

Data on the current number of daily trains through Bozeman are unavailable, however, in 2006, a total of 5,669 trains passed through Bozeman for an average of 16 trains per day[6]. Through trains average approximately 110 cars per train.

In Bozeman, railroad siding locations for loading and offloading (including local car gathering) currently only exist at the Idaho Pole site on North Wallace Street. The prospective Mandeville Industrial Park would include the second site.

A total of nine at-grade crossings exist within the study area. Traffic control at these sites varies and includes crossbucks, gates, or post with flashing lights. **Figure 2.8** displays the location and traffic control for each at-grade rail crossing within the study area.

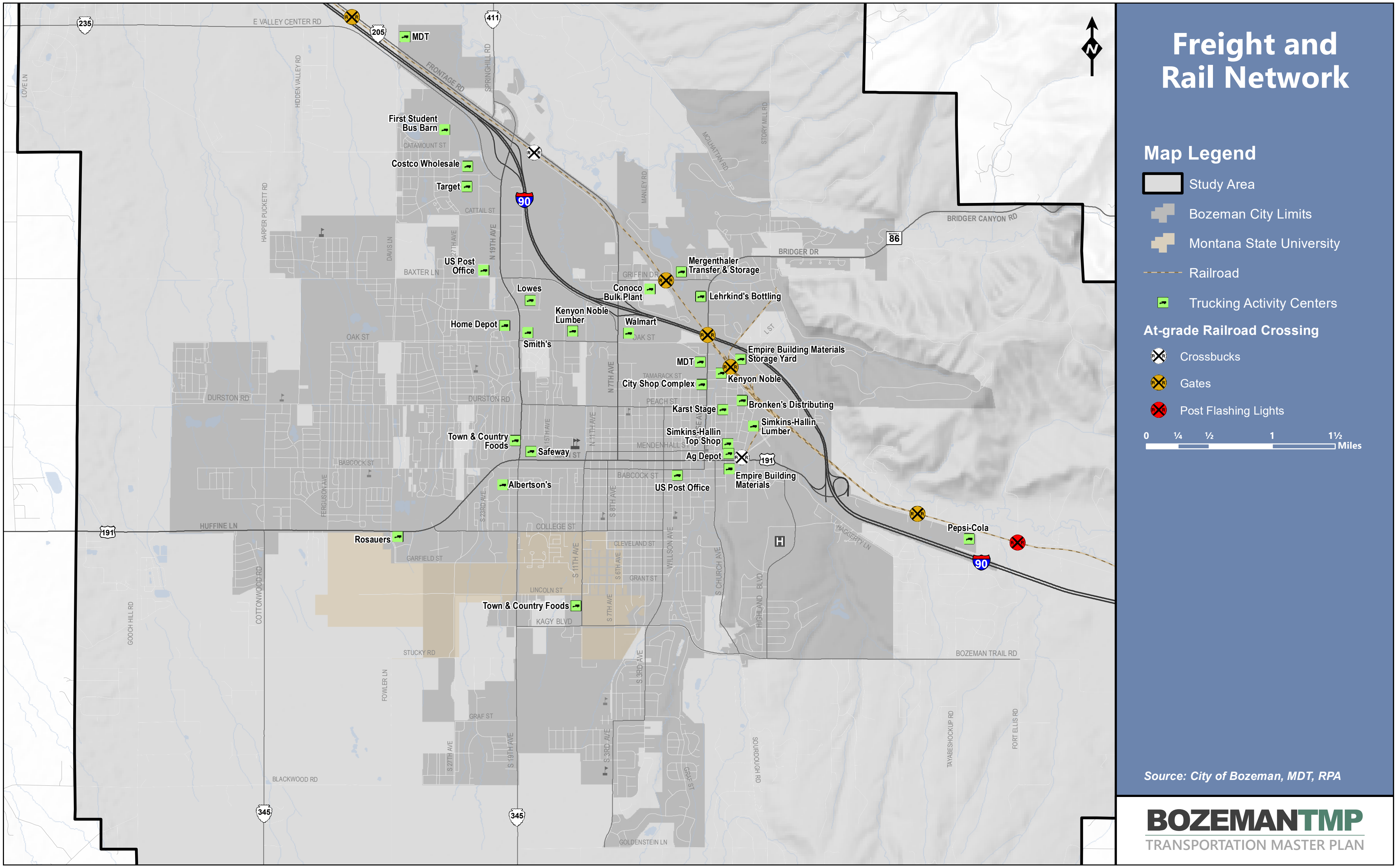


Figure 2.8: Freight and Rail Network

2.4. TRANSPORTATION CONDITIONS

Current information about the transportation system was analyzed to establish the existing traffic conditions and to determine potential problem areas. Existing data were provided by MDT and the city of Bozeman. Additional data were collected in the fall of 2015 to supplement the available information. Using a combination of the supplied and collected data, the existing operational characteristics of the transportation network were determined.

2.4.1. Roadway Volumes and Capacity

Existing roadway traffic data were collected by MDT and the city of Bozeman. The data were used to establish traffic conditions and to provide reliable data on historic traffic volumes. Average annual daily traffic (AADT) counts for the year 2014 were used to represent existing conditions.

The capacity of the roadways is of critical importance when looking at the growth of the community. As traffic volumes increase, vehicle flow deteriorates. When traffic volumes approach and exceed the available capacity, users experience congestion and vehicle delay. As such, it is important to investigate the size and configuration of the existing roadways and to determine if these roads need to be expanded to accommodate the existing or projected traffic demands.

The capacity of a roadway is based on a number of features including the number of lanes, intersection function, access and intersection spacing, vehicle fleet mix, roadway geometrics, and vehicle speeds. Individual roadway capacity varies greatly and should be calculated on an individual basis. However, for planning and comparison purposes, theoretical roadway capacities were developed based on simplistic roadway configurations. **Table 2.7** presents the capacities that have been used for this work. These values are not intended to be used to set any thresholds for roadway performance, but rather provide general information to be used for comparison purposes.

Table 2.7: Theoretical Roadway Capacity

Road Configuration	Capacity (vpd)*
2 Lane	12,000
2 Lane – Divided/TWLTL**	18,000
4 Lane	24,000
4 Lane – Divided/TWLTL**	32,000
Interstate	68,000

** Values represent planning level daily capacities developed for this TMP and are intended for comparison purposes only. Actual physical roadway capacity can vary greatly depending on roadway design features and access control.*
*** Two-way Left-turn Lane*

A roadway's capacity, and volume-to-capacity (v/c) ratio, can be used as a comparison tool when looking at the transportation system. The v/c ratio of a roadway is defined as the traffic volume on the roadway divided by the capacity of the roadway. **Figure 2.9** presents the resultant v/c ratios for the existing major street network. The v/c ratios help identify potential capacity deficiencies on the transportation system.

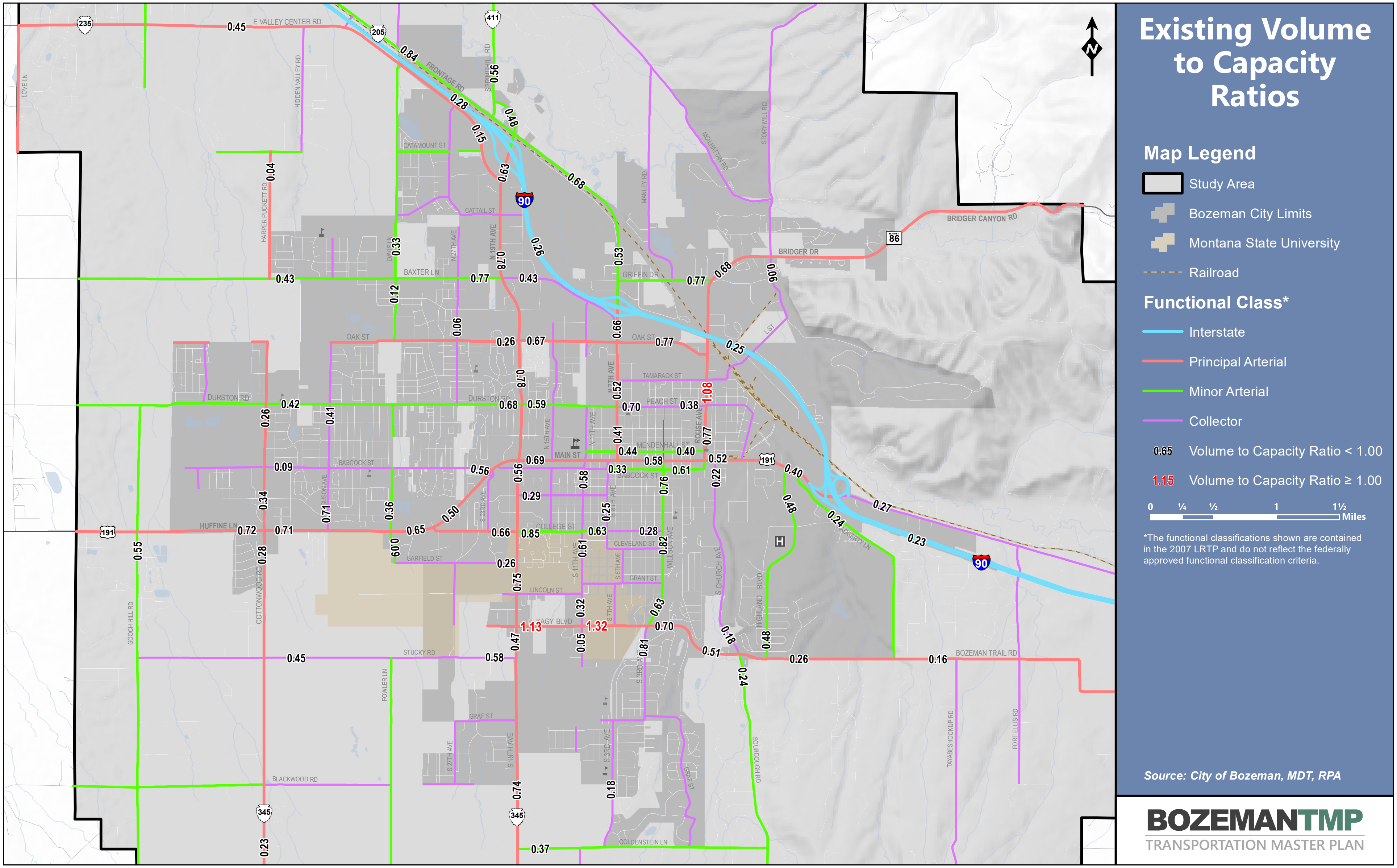


Figure 2.9: Existing Roadway Volume to Capacity Ratios

2.4.2. Active Transportation Data

Providing an accurate picture of pedestrian and bicycle activity within any community is difficult. Data are typically not available or not comprehensive enough to form a complete picture of active transportation behavior. Data for vehicles is, by comparison, more readily available. Both MDT and the city of Bozeman have collected limited pedestrian and bicyclist data for years, allowing long-term trends to be understood. Overall, Bozeman exhibits high levels of walking and bicycling by national standards. Bozeman is comparable to Missoula within the state of Montana. The following subsections summarize available data pertaining to active transportation.

Journey to Work/Commuting (ACS) 2010-2014 Data

The US Census has long been one of the only readily available sources of data to measure general levels of transportation choices. The data are limited to commute based trips to work and do not reflect the spectrum of potential trip types available. The American Community Survey (ACS) has supplemented the 10-year cycle of the US Census to provide additional annual data. For communities the size of Bozeman, annual data are not statistically valid, therefore five-year averages are used. This method provides some insight, however, it is slow to note changes over time. For walking and bicycling, the margins of error are over one percent. **Table 2.8** compares the city of Bozeman to Gallatin County and the State of Montana. City of Bozeman data are visualized in **Figure 2.10** by census block to show how patterns of resident commuting change depending on location. Neighborhoods near the historic core of Bozeman and those near MSU exhibit high overall active transportation modes, totaling over half of all commute trips south of Main Street. These levels reduce to approximately 30 and 15 percent as the census block generally gets farther away from downtown. It should be noted that the Valley West Area census block, defined by neighborhoods north of Huffine Lane and west of 19th Avenue, shows much lower levels of active transportation based on commuting. This indicates needs with infrastructure or encouragement as the majority of this area is not any farther away from major destinations in Bozeman.

Table 2.8: Commute Mode Share and Travel Time

Mode Share	State of Montana	Gallatin County	City of Bozeman
Walking*	4.8%	6.0%	9.5%
Biking*	1.3%	3.1%	5.5%
Driving**	85.6%	81.7%	77.9%
Drove Alone	*75.3%*	*73.0%*	*71.3%*
Transit	0.9%	0.9%	1.3%
Travel Time to Work (mean)	**18.0 min**	**16.8 min**	**14.6 min**

Source: American Community Survey (ACS) Five Year Estimates, 2010-2015
** Due to small sample sizes the margin of error is approximately 1.2 percent for walking and 1.4 percent for bicycling*
*** Driving mode share combines single occupancy vehicles and carpools*

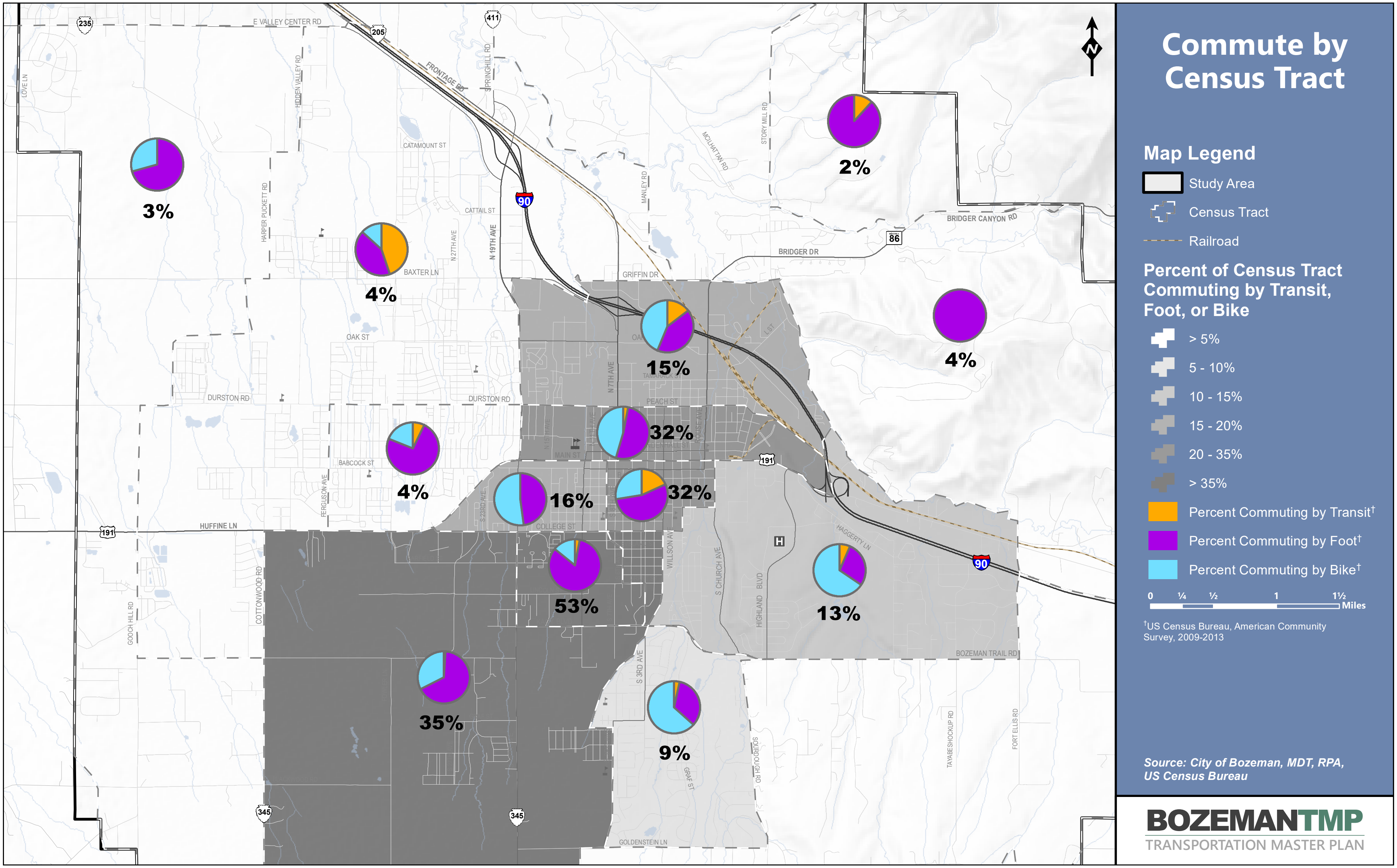


Figure 2.10: Commute by Census Tract Data

Commuting patterns have changed slightly when compared with those of the 2000 Census. While the margin for error inherent in the ACS is significant, it is likely that walking has gone down slightly or is statistically similar to the year 2000. A decrease could be due to a larger number of households being constructed at a greater distance to destinations over the previous years. Bicycling has increased slightly and transit use has fluctuated between 1.3 to 2.0 percent over the past several years within the five-year ACS averages. Overall, active forms of transportation have seen a slight increase over the past 15 years. **Figure 2.11** compares the year 2000 mode shares against the ACS years 2010-2014 shares.

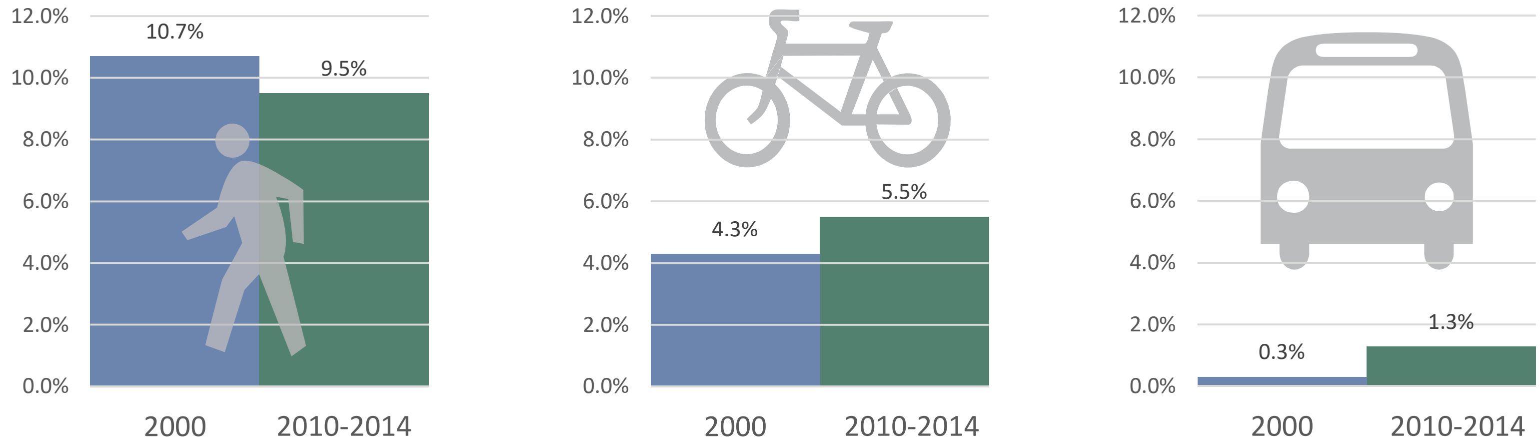


Figure 2.11: Commute Mode Share Changes from Year 2000

National Household Travel Survey (NHTS) 2009 Data

Data from the National Household Travel Survey (NHTS) provides mode share data aggregated at the national level for all trips and not just commute to work trips. For example, NHTS indicates that for every one bike to work trip, there are another 1.6 utilitarian bike trips (shopping, personal trips, transporting others, medical or dental visits, meals, or other reasons), 0.5 bike to school trips, and 4.8 social or recreational trips. Overall bike to work trips represent only approximately 7.5 percent of all bike trips nationally. It should be noted that approximately 41 percent of bike trips counted by NHTS are return home trips, indicating many bicyclists perform part of their round trip by other means. While it is likely that travel patterns in Bozeman, particularly recreational based travel, do not match the national averages, it is very likely that the ACS commute mode share noted in **Table 2.8** under represents overall mode share and the overall levels of walking and bicycling in Bozeman.

Intersection Traffic Counts (2015)

Traffic counts conducted as part of the data collection phase of this TMP included pedestrian and bicyclists. While these data are not comprehensive or city-wide, they do provide a snapshot of mode share at intersections and the variability in mode share around the city. Mode share at four intersections is presented in **Figure 2.12**.

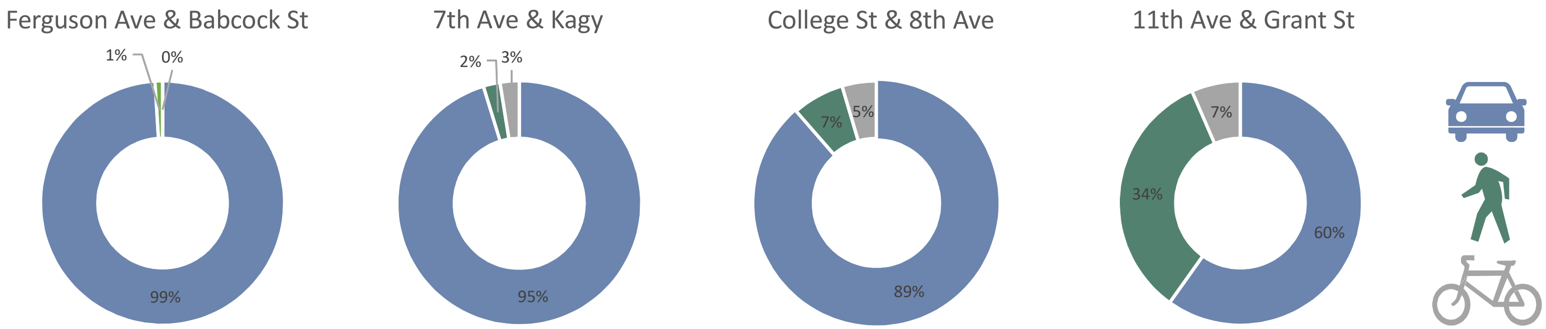


Figure 2.12: Mode Share at Select Intersections

2.4.3. Intersection Operations

Urban road systems are ultimately controlled by the efficiency of the major intersection. High amounts of vehicle delay at major intersections directly reduces the number of vehicles that can be accommodated along the road during peak hours. Intersection performance is evaluated in terms of vehicle delay. The amount of vehicle delay experienced at an intersection correlates to a measure called level of service (LOS). LOS is used as a means for identifying intersections that are experiencing operational difficulties, as well as a means to compare multiple intersections. The LOS scale represents the full range of operating conditions. The scale is based on the ability of an intersection or street segment to accommodate the amount of traffic using the intersection. The scale ranges from "A" which indicates little, if any, vehicle delay, to "F" which indicates significant vehicle delay and traffic congestion.

LOS are a microscopic approach to evaluating traffic operations. Intersection LOS defines intersection performance in terms of vehicle delay and does not factor in alternative travel modes nor does it take into consideration the health of the overall transportation system. Intersection LOS is often based on a single hour, or peak hours, for which the system is most congested. A more macroscopic approach to improving the transportation system, not just reducing peak hour delay at single intersections, should be taken.

The LOS at 63 intersections within the study area was calculated. Data were collected during the fall of 2015 at 30 of the 63 intersections (11 signalized and 19 unsignalized locations). Each intersection was counted during the peak hours, defined as 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM. Additionally, peak hour turning movement counts were obtained from MDT for 15 intersections (10 signalized and 5 unsignalized locations). Data at these locations were collected on various dates over the past few years. The remaining intersection counts were provided by various sources and were collected as part of recent planning efforts. The existing intersection LOS is shown in **Figure 2.13**.

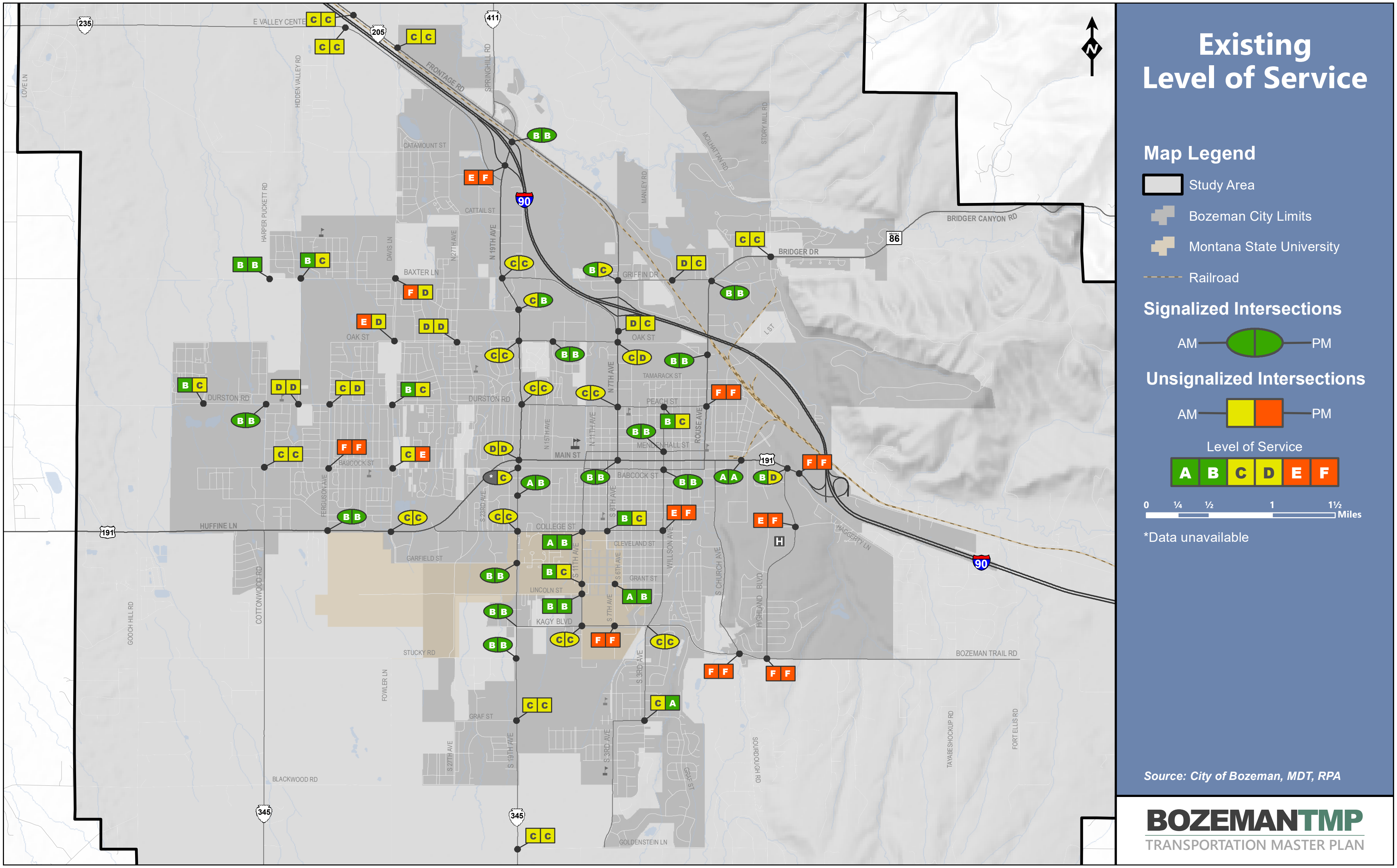


Figure 2.13: Existing Intersection Level of Service

2.4.4. Bicycle Operations

Vehicular LOS has been a standard metric to evaluate transportation networks for decades. Transportation professionals have struggled over the years to develop a comparable means of evaluation for pedestrians and bicyclists. For these modes, it is the qualitative metrics, or how a street feels that may determine how it performs.

As shown previously in **Figure 2.10**, levels of walk and bicycle commuting varies around Bozeman. Particularly notable is the area of Bozeman north of Huffine Lane and west of 19th Avenue. Despite being within a generally comfortable distance for bicycling, the bike to work rate in this area is 0.5 percent (less than the national average of 0.6 percent). Huffine Lane and 19th Avenue essentially create a barrier around this area which discourages many people from choosing to travel by bicycle. Incomplete roadways such as Durston Road, Oak Street, and Baxter Lane also create impediments for many residents.

One tool to analyze the level of traffic stress (LTS) for bicyclists has been outlined in the *Mineta Transportation Institute Report 11-19*[7]. A LTS for bicyclists is determined based on factors including posted speed limit, street width, and the presence and character of bicycles lanes. The combinations of these criteria separates the bicycle network into one of four scores:

LTS 1: Low-stress roadway suitable for all ages and abilities,
LTS 2: Roadway comfortably ridden by the mainstream adult population,
LTS 3: Roadway ridden by the "enthused and confident" cyclists, and
LTS 4: Roadway ridden by the "strong and fearless" cyclists.

The results of the LTS analysis help identify existing areas with a high level of stress as well as focus areas for improvement. Local streets with low traffic and low volume can be quite comfortable to most bicyclists despite being a shared lane environment. The LTS analysis is specifically focused on the street environment. Adjacent shared-use offer a more comfortable facility type that is not reflected in the LTS score. The results of the LTS analysis are presented in **Figure 2.14.**

Bicycle level of traffic stress (LTS) is determined based on factors including posted speed limit, street width, and the presence and character of bicycles lanes.

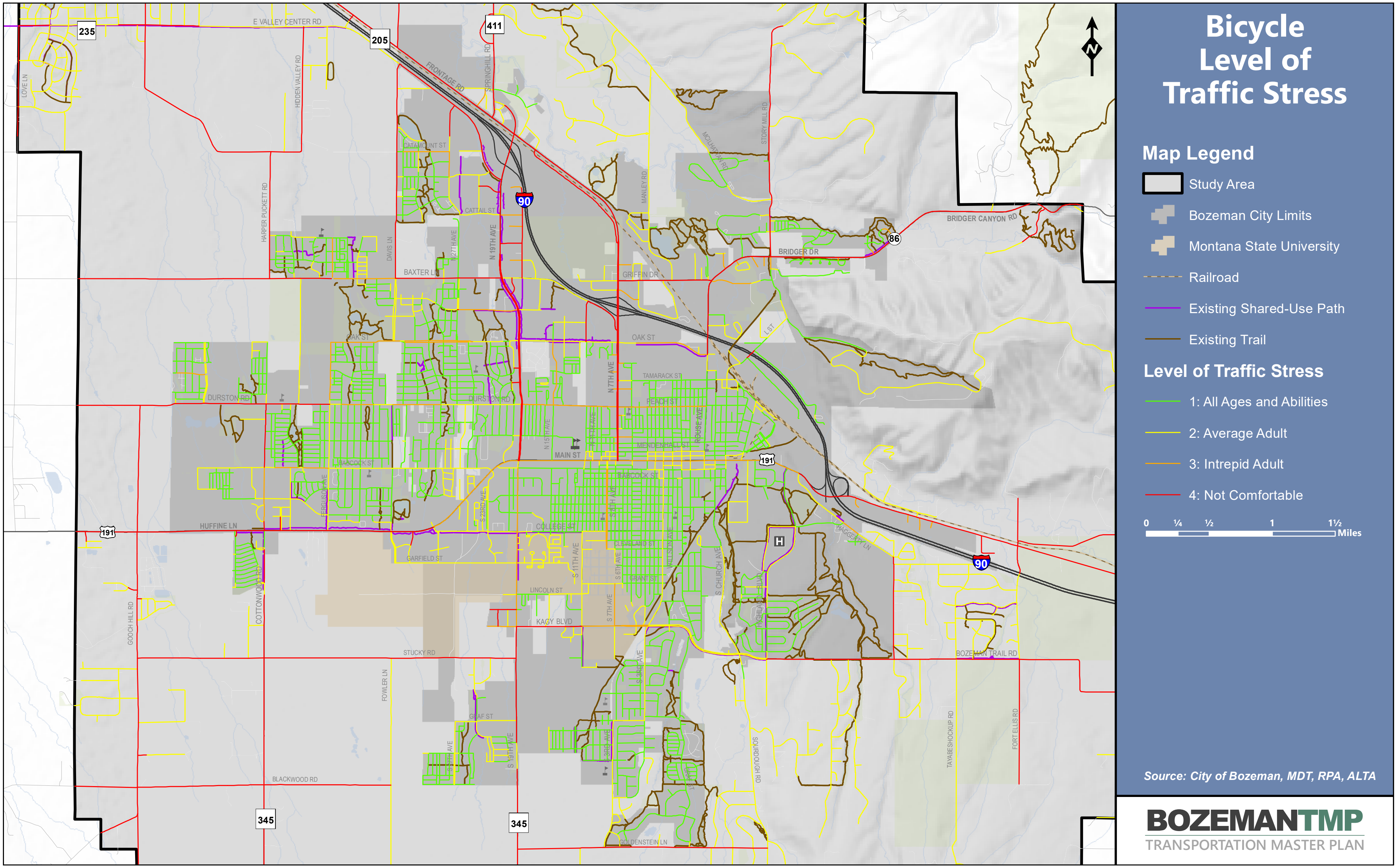


Figure 2.14: Bicycle Level of Traffic Stress

2.5. SAFETY

Crash data were provided by the MDT Traffic and Safety Bureau for the five-year period between January 1st, 2010 and December 31st, 2014. The crash reports are a summation of information from the scene of the crash provided by the responding officer. As such, some of the information contained in the crash reports may be subjective.

According to the MDT crash database, there were 3,763 crashes reported within the study area during the analysis time period. The number of crashes per year increased from 747 crashes in 2010 to 825 crashes in 2012. After 2012 the number of yearly crashes decreased to 633 crashes in 2014. The number of injury crashes followed a similar trend to that of the total crashes with 191 crashes in 2010, peaking in 2012 with 246 crashes, and decreasing to 194 crashes in 2014. The number of non-injury crashes per year in 2010 was 556 crashes and increased to a peak in 2011 with 605 crashes before decreasing to 436 crashes in 2014. **Figure 2.15** presents the total, injury, and non-injury crashes per year for the five-year analysis period.

The crash data was plotted spatially based on GPS coordinates tagged to each crash report. The spatial analysis was conducted to determine "hot-spot" crash locations. The density of crashes based on the GPS coordinates are shown in **Figure 2.16**.

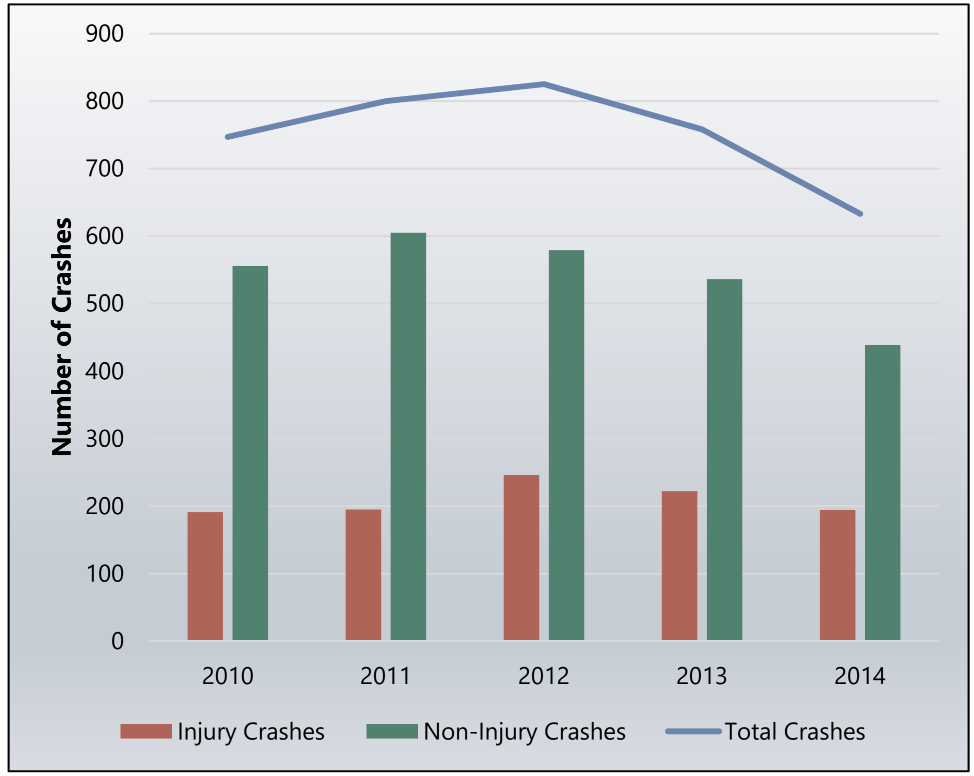


Figure 2.15: Crashes per Year

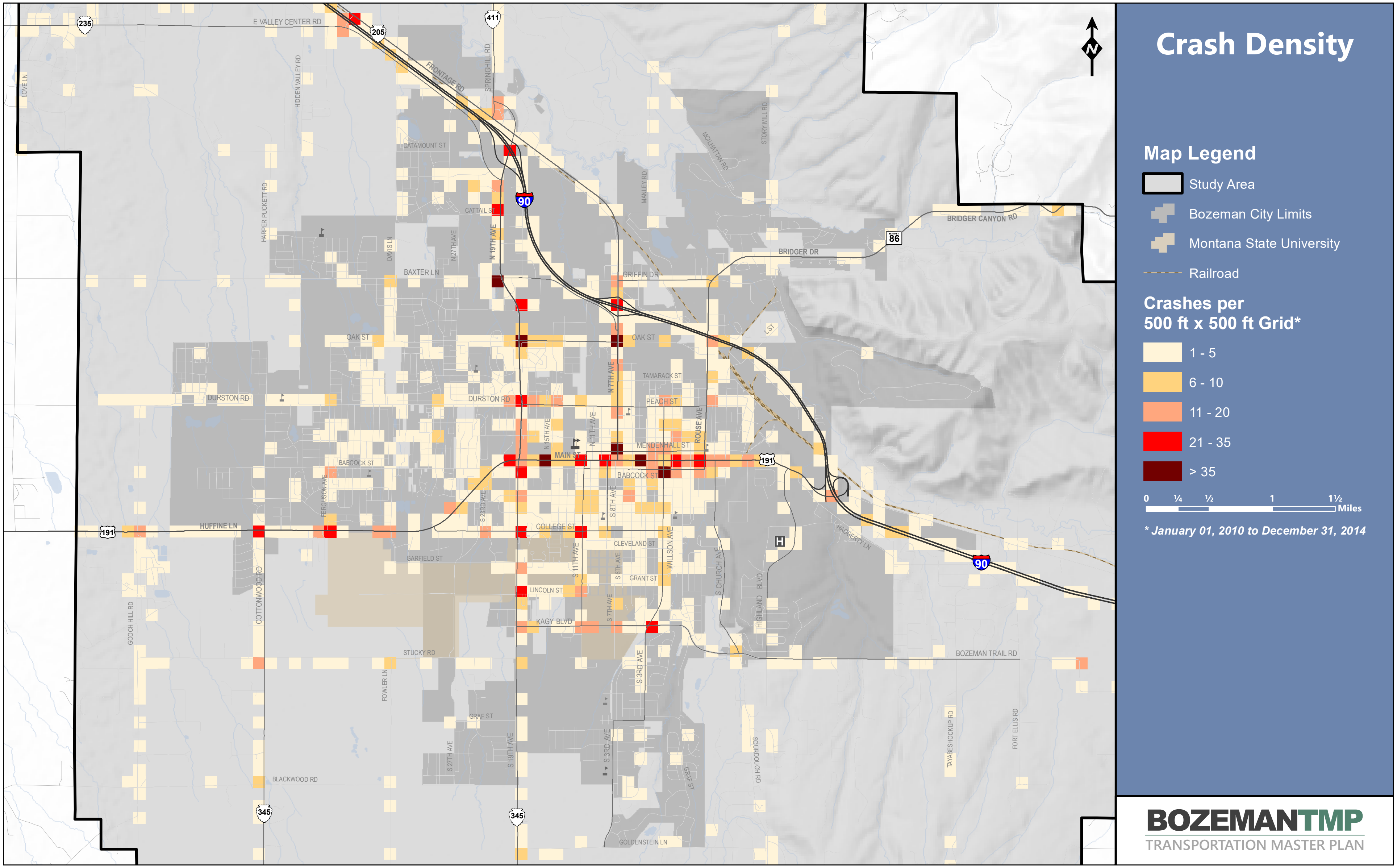


Figure 2.16: Crash Density

2.5.1. Crash Severity

Crash severity is categorized based on the most severe injury of the crash. For example if a crash results in two possible injuries and an incapacitating injury, the crash is reported as an incapacitating injury crash. An incapacitating injury is defined as an injury, other than a fatality, which prevents the injured individual from walking, driving, or normally continuing the activities they were capable of performing before the injury.

During the five year analysis period, there were a total of 1,032 injury and 16 fatal crashes, accounting for 27 and 0.4 percent of all crashes, respectively. Of the injury crashes, 64 resulted in incapacitating injuries. As a result of multiple individuals being injured in a single crash, a total of 1,355 individuals were injured during the crash analysis period. Furthermore, 16 individuals sustained fatal injuries during the same period.

The locations of severe crashes, those resulting in incapacitating or fatal injuries, were plotted in **Figure 2.17**. The following locations appear to have a trend of severe crashes occurring during the analysis period:

- Interstate 90 west of the East Main interchange,
- Interstate 90 west of the Valley Center Spur overpass,
- Intersection of Valley Center Spur and Frontage Road,
- The chicane on Durston Road west of Laurel Parkway, and
- Intersection of Cottonwood Road and Stucky Road.

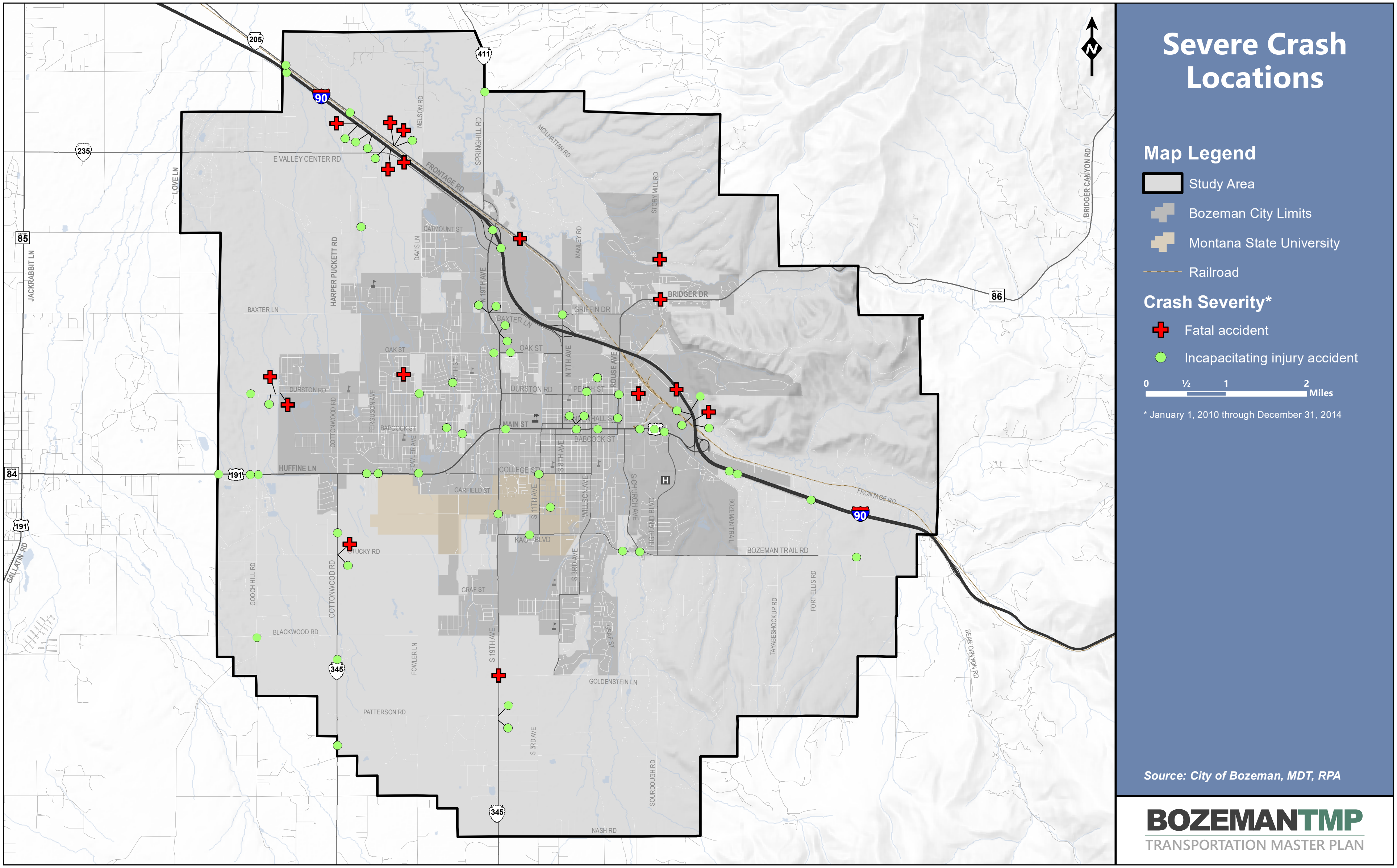


Figure 2.17: Severe Crash Locations

2.5.2. Intersection Crashes

The 63 intersection that were studied for LOS were also investigated for crashes. The crash information was analyzed to identify those intersections with crash characteristics that may warrant further study. Crash rates were used to represent the number of crashes against the daily traffic volume. The rate is expressed as the number of crashes per million entering vehicles as shown in **Equation 1**.

Equation 1:

$$\frac{Total\ Number\ of\ Crashes\ \times 1{,}000{,}000\ Vehicles}{Vehicles\ per\ day\ \times Number\ of\ Years\ \times 365\ days\ per\ year} = Crash\ Rate$$

Equation 2:

$$\frac{(\#PDO \times 1.0) + (\#Injury \times 3.0) + (\#Fatal\ of\ Incap \times 8.0)}{Total\ Number\ of\ Crashes} = Severity\ Index$$

The severity index was calculated by applying multipliers to crashes based on severity. Severity is defined by three categories: property damage only (PDO), non-incapacitating injury, and fatal or incapacitating injury crashes. Each of these three types was given a different multiplier: 1.0 for PDO, 3.0 for injury, and 8.0 for fatal or incapacitating injury crashes. **Equation 2** was used to calculate the severity index.

The intersection crash severity rate was calculated by multiplying the crash rate by the severity index. The severity rate accounts for the exposure or traffic volume at a given location. For example, an intersection with a high number of PDO crashes and a high traffic volume would have a low severity rate. Alternately, an intersection with a fatal crash and low traffic volume would have a high severity rate. **Table 2.9** presents the intersections with crash severity rates greater than 1.00.

Table 2.9: High Crash Severity Locations

Intersection	Crash Rate	Severity Index	Severity Rate
Valley Center Spur and Frontage Road	1.16	2.68	3.11
19th Avenue and Goldenstein Lane	0.58	2.44	1.41
Willson Avenue and Peach Street	0.72	1.91	1.38
Ferguson Avenue and Babcock	0.70	1.89	1.32
Wilson Avenue and Babcock Street	0.74	1.76	1.30
Story Mill Road and Bridger Drive	0.37	3.20	1.20
7th Avenue and Oak Street	0.68	1.67	1.14
19th Avenue and Baxter Lane	0.55	2.05	1.13
19th Avenue and Tschache Way	0.51	1.96	1.00

2.5.3. Bicyclist and Pedestrian Crashes

Bicycle and pedestrian crash data are part of the same data set as the vehicular crash data. All pedestrian crashes have the reported crash type listed as pedestrian. Bicycle crashes, however, could be listed as right angle, sideswipe, etc. crashes. Pedestrian and bicycle crash data are typically underreported as many minor collisions that do not involve injury or significant property damage are unlikely to be reported to the police.

Crash data were reviewed for the five year period between January 1st, 2010 to December 31st, 2014 and some interesting trends were noted. **Figure 2.18** provides a summary of this analysis. The vast majority of pedestrian and bicycle involved crashes occur at intersection or drive-ways; essentially, places where vehicle turning movements conflict. Most of these intersections are on Bozeman's arterial and collector system. Many crashes occurred due to impaired driving (also impaired walking in the case of 19 percent of pedestrian crashes). The following bicyclist and pedestrian crash trends were noted:

- There were 88 crashes involving bicyclists, and 47 crashes involving pedestrians, in the analysis period.
- Of the 135 total bicycle and pedestrian crashes in the analysis period, 16 crashes (12%) resulted in incapacitating or fatal injuries.
- 78% of bicycle crashes, and 64% of pedestrian crashes, occurred at intersections or driveways.
- 23% of bicycle crashes occurred within a bicycle lane.
- 19% of pedestrian crashes involved impaired pedestrians.

The crash data indicate a focus on intersection safety may yield reductions in the number of future crashes. Additionally, as so few pedestrian and bicycle crashes occur on local streets, they may be another place to invest future improvements such as bicycle boulevards and arterial crossing improvements for pedestrians and bicyclists.

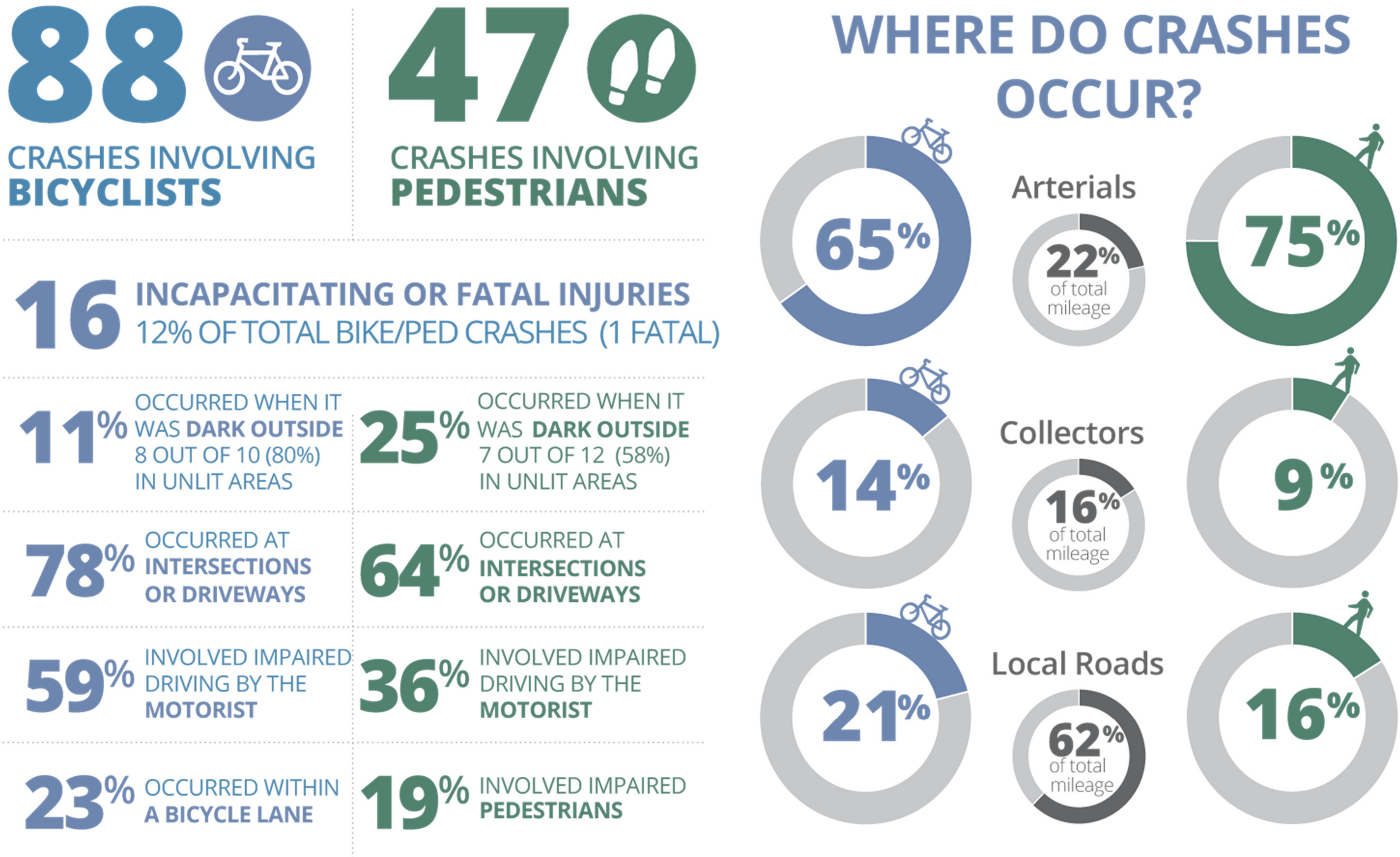


Figure 2.18: Bicyclist and Pedestrian Crash Statistics

Chapter 3

Growth, Travel Forecasts, and Needs

This chapter discusses the background and assumptions used to project growth in the Bozeman area to the year 2040. By using population, employment, and other socioeconomic trends as aids, the future transportation needs were projected. A travel demand model of the transportation system for Gallatin County was built by MDT. Information about future growth was used to allocate residential and employment development to project future conditions. Changes to the transportation system that are committed to occur in the next five years were incorporated into the model to forecast future transportation conditions. An analysis of the projected transportation conditions was performed to estimate how traffic patterns and characteristics may change from existing conditions.

Projecting to the year 2040 is necessary to comply with guidance set forth by FHWA and MDT in the development of community long range transportation plans that suggests long range planning for a minimum 20-year planning horizon. It is acknowledged that the City of Bozeman may not plan or allocate transportation funds on the same time horizon and generally focuses on a 5-year horizon per the CIP process to plan projects.

3.1. FUTURE GROWTH AND DEVELOPMENT

3.1.1. Population and Housing Projections

Projections are estimates of the population for future dates. They illustrate reasonable estimates of future population based on assumptions about current or expected demographic trends. Population projections (along with forecasts of the number of future housing units or households and employment conditions) are used to help predict future travel patterns and assess the performance of the transportation system.

Gallatin County

Several sources of population projections were examined to help understand potential growth within Gallatin County. These sources consisted of both published community planning documents and recognized sources for demographic projections. The following sources provide some level of population projections for Gallatin County and are summarized in **Table 3.1**.

- Gallatin County Growth Policy (2003)
- Greater Bozeman Area Transportation Plan (2007 Update)
- Bozeman Community Plan (2009)
- Regional Economic Models, Inc. (eREMI)
- Woods & Poole Economics, Inc. (W&P)

Table 3.1: Population Projections for Gallatin County

Estimate or Projection Source	2010	2014	2015	2020	2025	2030	2035	2040	AAGR
U.S. Census Bureau/CEIC Estimate	89,513	97,308	--	--	--	--	--	*167,438**	2.11%
Gallatin County Growth Policy	82,000	--	--	--	--	116,000	--	*137,969**	1.75%
Greater Bozeman Area Transportation Plan (2007 Update)									
Low Growth Projection	84,935	--	92,177	100,037	108,567	117,824	--	*138,774**	1.65%
Moderate Growth Projection	87,406	--	97,618	109,023	121,760	135,986	--	*169,618**	2.23%
High Growth Projection	90,727	--	105,187	121,930	141,350	163,863	--	*220,218**	3.00%
Bozeman Community Plan	88,300	--	97,780	107,100	116,450	--	--	*153,574**	1.86%
eREMI Model	89,616	95,470	97,197	105,568	112,302	116,627	119,368	122,432	1.05%
Woods & Poole Economics, Inc.	**89,587**	**96,989**	**99,352**	**112,214**	**126,452**	**142,028**	**158,662**	**176,191**	**2.28%**

** Estimated using average annual growth rate (AAGR).*

For the purposes of the TMP, the W&P projections were selected as the preferred set of population projections for Gallatin County. With a projected year 2040 population of more than 176,000, these projections reflect sustained and significant growth in Gallatin County and are generally in line with the "Moderate Growth Projection" presented in the *Greater Bozeman Area Transportation Plan (2007 Update)*.

City of Bozeman

Population projections for the city of Bozeman are not available from eREMI or W&P. Additional sources specific to the city of Bozeman were reviewed to help project future population for the city. The following published community planning documents were reviewed and are summarized in **Table 3.2**:

- Bozeman Wastewater Collection Facilities Plan Update (2015)
- Bozeman Integrated Water Resource Plan (2013)
- Bozeman Community Plan (2009)
- Fire Protection Master Plan (2006)
- Bozeman Water Facility Plan (2005)
- Bozeman 20/20 Community Plan (2001)

Table 3.2: Population Projections for the City of Bozeman

Estimate or Projection Source	2010	2014	2015	2020	2024	2025	2030	2034	2035	2040	AAGR
U.S. Census Bureau/CEIC Estimate	37,280	41,660	--	--	--	--	--	--	--	*85,763**	2.82%
Bozeman Community Plan	42,700	--	54,500	69,500	--	88,700	--	--	--	*184,255**	4.99%
Bozeman Integrated Water Resource Plan											
Moderate Projection (2% annual growth)	--	--	41,160	45,444	--	50,174	55,396	--	61,161	67,527	2.00%
High Projection(3% annual growth)	--	--	42,383	49,133	--	56,959	66,031	--	76,548	88,740	3.00%
Bozeman Wastewater Collection Facilities Plan Update	--	41,056	--	--	55,176	--	--	63,964	--	*73,064**	2.24%
Bozeman Water Facility Plan	42,700	--	54,500	69,500	--	88,700	--	--	--	*184,255**	4.99%
Bozeman Fire Protection Master Plan											
Census Based Projection	--	34,029	--	--	37,747	--	--	--	--	*44,559**	1.04%
Development Based Projection	--	42,400	--	--	49,400	--	--	--	--	*63,082**	1.54%
Wastewater Facilities Plan/Bozeman Community Plan (2008)	44,500	--	56,800	72,500	--	92,500	--	--	--	*192,275**	5.00%
Bozeman 20/20 Community Plan, 2001	39,600	--	43,120	46,600	--	--	--	--	--	*64,531**	1.64%
Woods & Poole Economics, Inc.**	**37,280**	**40,798**	**41,728**	**46,708**	**51,116**	**52,281**	**58,520**	**64,042**	**65,503**	**73,319**	**2.28%**

** Estimated using average annual growth rate (AAGR).*
*** Estimated using 2010 Census and Woods & Pool Economics, Inc. AAGR calculated for Gallatin County.*

It is apparent from a review of **Table 3.2** that substantial variation exists between the population projections for the city. This is due in part to the fact that several of the planning documents were produced before 2010 Census data became available that firmly established populations for all geographies of the county. Planning studies prior to the 2010 Census data had to rely on older Census data or other information to help estimate population growth trends. Several planning documents also presented projections based on a range of growth rates to help frame the magnitude of future growth. More recent planning studies containing population projections for the city have the advantage of additional information from the 2010 Census information and current estimates of population from the CEIC to establish growth trends and project future populations.

While the W&P projections are not available specifically for the city of Bozeman, the 2.28 percent AAGR calculated for Gallatin County was applied to city of Bozeman population for reference purposes. This method results in a projected city of Bozeman population of approximately 73,000 for the year 2040.

Bozeman TMP Study Area

The share of the population living within the TMP study area was estimated using Census population data. GIS analysis was used to identify the total population within all census blocks entirely within or crossed by the study area boundary. This analysis established the study area population to be 49,814 in 2010 and 56,924 in 2014. The population of the TMP study area accounted for approximately 56 percent of the County's total population in 2010 and 57 percent in 2014. For future projections, the percentage of population within the TMP study area in the year 2014 was held constant through the year 2040.

The number of housing units is a key component in the traffic model. Housing units represent the population and act as a hub for traffic within the network. According to the 2014 baseline conditions, Gallatin County had 99,586 residents distributed among 47,048 housing units. Within the study area, the baseline conditions show a population of 56,924 distributed among 26,035 housing units. The number of occupants per housing unit under baseline conditions is 2.12 and 2.19, respectively, for Gallatin County and the study area.

Applying this occupancy rate to the projected 2040 population for Gallatin County results in 83,239 housing units; an increase of 36,191 from the year 2014. For the TMP study area, an increase of 20,027 housing units is projected for the year 2040. **Table 3.3** shows population and housing unit projections for Gallatin County and the TMP study area for the year 2040.

Table 3.3: Population and Housing Unit Projections

Area	2010 (Census)	2014 (Baseline)	2040 (Projection)	Net Change (2014-2040)
Gallatin County				
Population	89,513	99,586	176,191	76,605
Housing Units	42,289	47,048	83,239	36,191
Population per Housing Unit				**2.12**
TMP Study Area				
Population	49,814	56,924	100,712	43,788
Housing Units	22,783	26,035	46,062	20,027
Population per Housing Unit				**2.19**
Outside Study Area				
Population	39,699	42,662	75,479	32,817
Housing Units	19,506	21,013	37,177	16,164
Population per Housing Unit				**2.03**

3.1.2. Employment Projections

Employment numbers are used in the travel demand model to help distribute vehicle traffic within the street and road network. Places with high levels of employment will tend to generate high levels of vehicle traffic. The traffic generated is based in part on the employment type: retail, service, or basic.

Gallatin County

Table 3.4 presents full and part-time employment data for Gallatin County over the 2010 to 2040 period. Future employment projections for Gallatin County to the year 2050 are available from Wood's and Poole Economics, Inc. The W&P projections show that total nonfarm employment in the county may reach 127,937 by 2040—56,868 more jobs than seen in 2014. This represents a total overall increase of approximately 80 percent in nonfarm employment over the 2014-2040 period and an average increase in employment of just under 2.3 percent per year. The W&P employment projections clearly suggest Gallatin County will continue to see steady and significant job growth in the future.

Table 3.4: Employment Projections to 2040 for Gallatin County

Employment Projection	2010	2014	2015	2020	2030	2040	Net Change (2014-2040)	AAGR (2014-2040)
Total Full and Part-time Employment	63,768	72,210	74,182	81,751	105,604	129,184	56,974	2.26%
Farm Employment	1,116	1,141	1,148	1,180	1,225	1,247	106	0.34%
Nonfarm Employment	**62,652**	**71,069**	**73,034**	**82,931**	**104,379**	**127,937**	**56,868**	**2.29%**

NOTES:
1. Employment data for 2010 was obtained from US Department of Commerce Bureau of Economic Analysis – Table CA25 and Table CA25N.
2. Employment data for years 2015 through 2014 were obtained from the Woods & Poole Economics, Inc. dataset for Gallatin County. Montana.

Bozeman TMP Study Area

The total employment within the TMP study area was extracted from the travel demand model. Similar to the process followed to establish baseline population data, GIS analysis was used to identify the total employment within all census blocks entirely within or crossed by the study area boundary. This analysis of the model established the total employment for the study area to be 38,387 in 2014. This means that almost 63 percent of employment in Gallatin County occurred within the TMP study area.

Table 3.5 presents employment projections for the year 2040. Future employment was projected using the AAGR established by W&P data discussed in the previous section (2.29 percent). Applying this growth rate to the 2014 baseline employment numbers from the model resulted in 30,288 new jobs within the TMP study area. Outside of the study area, 17,970 new jobs are projected for the purposes of the model. The percent distribution of retail, service, and basic job classifications was held constant for year 2040 projections.

Table 3.5: Employment Projections to 2040 for the TMP Study Area

Area	2010	2014 (Baseline)	2040 (Projection)*	Net Change (2014 - 2040)
Gallatin County	**48,550**	**61,163**	**109,421**	**48,258**
Retail	*22,810*	*33,671*	*60,238*	*26,567*
Service	*12,825*	*13,645*	*24,411*	*10,766*
Basic	*12,915*	*13,847*	*24,772*	*10,925*
TMP Study Area	**30,267**	**38,387**	**68,675**	**30,288**
Retail	*15,004*	*21,720*	*38,857*	*17,137*
Service	*9,196*	*10,050*	*17,979*	*7,929*
Basic	*6,067*	*6,617*	*11,838*	*5,221*
Outside Study Area	**18,283**	**22,776**	**40,746**	**17,970**
Retail	*7,806*	*11,951*	*21,380*	*9,429*
Service	*3,629*	*3,595*	*6,431*	*2,836*
Basic	*6,848*	*7,230*	*12,935*	*5,705*

** 2040 projections were based on a 2.29 percent per year AAGR as calculated based on Woods & Poole projections.*

3.1.3. Allocation of Future Growth

Modeling of future travel patterns out to the year 2040 planning horizon using the travel demand model required identification of future socioeconomic characteristics within each census tract and census block. County population and employment projections were translated into predictions of increases in housing and employment within Gallatin County and the TMP study area. An initial allocation of future housing and employment growth within the study area was made based on a review of existing community planning documents. These planning documents helped identify where residential, commercial and industrial development has occurred in the Bozeman area and provided information about where future residential and commercial growth is expected in the community.

A land use workshop was held with various city and county staff on January 20, 2016 to discuss and reach consensus on the distribution of future housing and employment growth within the study area. This enabled local staff to consider and revise the growth assignments as needed based on their knowledge of recent land use trends, land availability, development limitations, land use regulations, planned public improvements, and known development proposals. As discussed previously, 20,027 new housing units were allocated within the study area. An additional 16,164 units were distributed outside of the study area and within the County. Within the study area, 30,288 new jobs were allocated wih an additional 17,970 new jobs distributed outside of the study area and within the County.

3.2. PROJECTED TRANSPORTATION CONDITIONS

An analysis of the projected transportation system was performed to estimate how motor vehicle traffic patterns and characteristics may change from the existing conditions. The inputs for this analysis include the existing conditions and potential growth in housing and jobs out to the year 2040. The travel demand model was used to evaluate the projected 2040 year conditions by applying additional housing and jobs to the existing travel demand model. Census blocks and census tracts were used to distribute the population and employment growth that was projected to occur between 2014 and 2040. In addition, known roadway infrastructure projects expected to be constructed within the next five years were included as part of the projected conditions model.

One assumption that was built into the model is that traffic characteristics will remain similar to those that are seen today. Many factors can influence this assumption, such a fuel prices, technological advances, and other unknown circumstances. Another assumption of the model is that the socioeconomic projections will be realized by the year 2040. Ultimately, the projected conditions model was used as a planning tool to help evaluate how traffic patterns might be affected by anticipated future development.

3.2.1. Projected Roadway Volumes and Capacity

Projected traffic volumes were estimated using the travel demand model. A comparison of the existing and projected conditions models was made to determine the percent change in traffic volume. The percent change was then applied to known existing AADT count sites to reflect projected daily traffic volumes. **Figure 3.1** presents the projected v/c ratios for the major street network. It must be noted that the values shown in the figure are based on the "existing plus committed" roadway network. In other words, these are the projected volumes and projected v/c ratios if no changes to the transportation system, other than those currently committed to, are implemented.

3.2.2. Projected Intersection Operations

Projections for intersection traffic volumes were made for the 63 intersections analyzed previously. These projections were based on the percent growth rates calculated from the travel demand model between the years 2014 and 2040. The growth rate was determined for each intersection as a whole. Intersections that are scheduled for reconfiguration or reconstruction, as per the City's *Capital Improvement Plan (CIP)*, were changed to reflect the future configuration of the intersection. Note that changes in travel patterns and volumes resulting from new road connections and revised intersection configurations make traffic volume predictions difficult, and in some cases may not represent the ultimate future volumes that may be realized at a given location. The results of this analysis are presented in **Figure 3.2**.

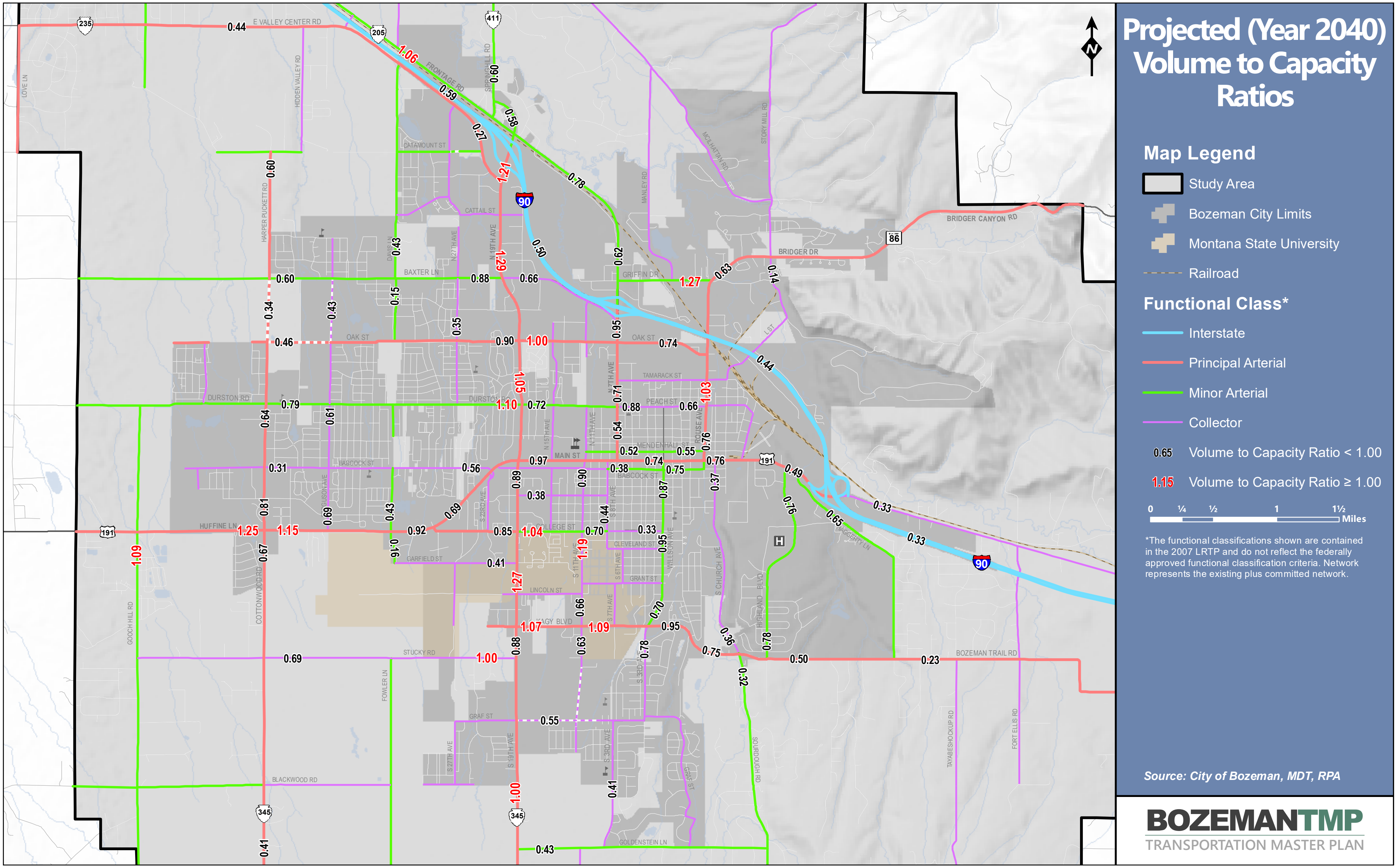


Figure 3.1: Projected Roadway Volume to Capacity Ratios

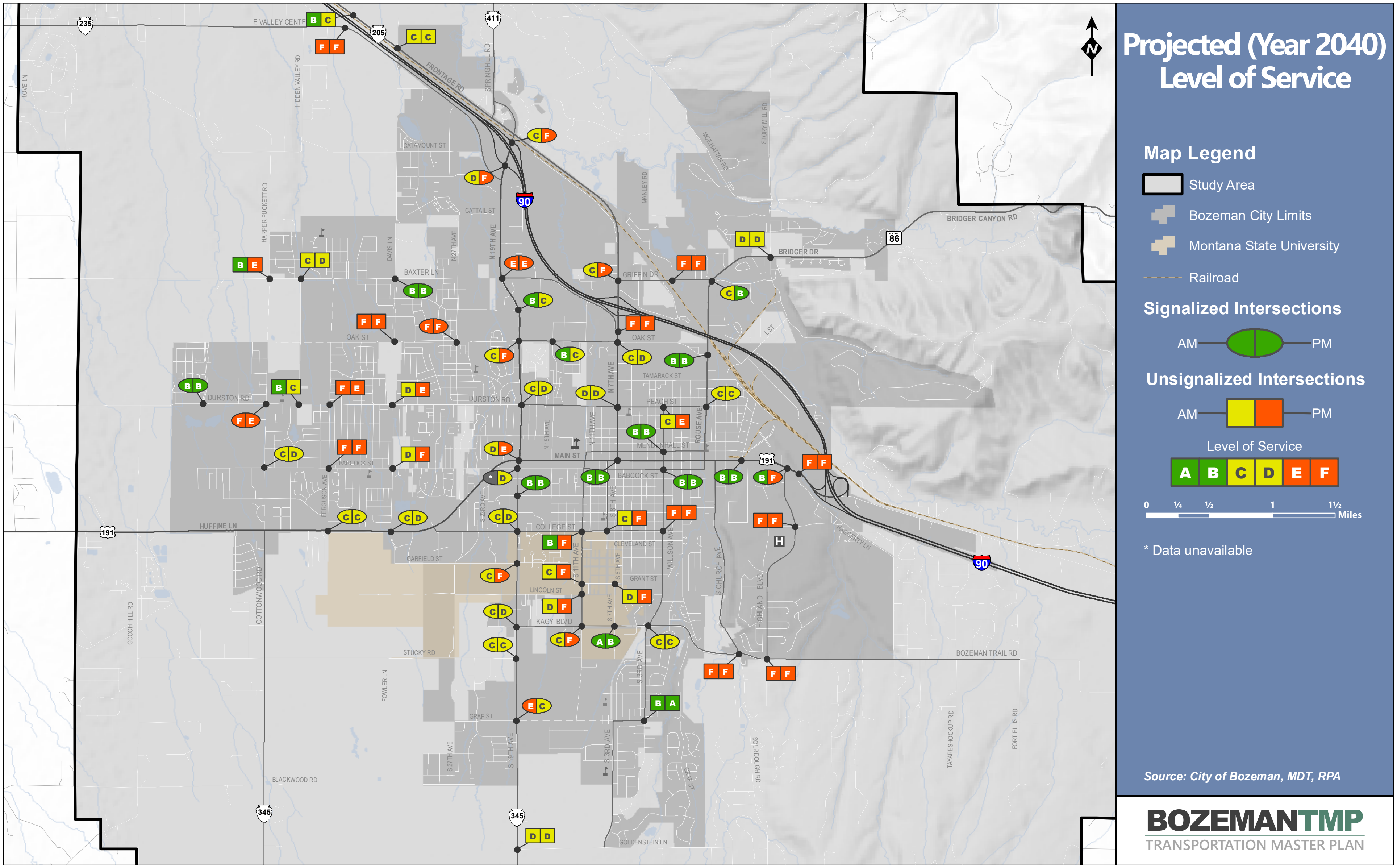


Figure 3.2: Projected Intersection Level of Service

3.2.3. Active Transportation Benefits

With pedestrian and bicycle mode shares higher than most of the other communities in the United States, Bozeman enjoys substantial benefits that are directly attributable to these active modes. This benefits analysis was conducted with a combination of available local data as well as data collected from similar peer communities and national sources of data such as the USDOT TIGER BCA Resource Guide (2014), the National Household Transportation Survey (2009), the National Center for Safe Routes to School Travel Data (2010), the American Community Survey, and the Automobile Association of America. For Bozeman, the peer communities of Crested Butte, CO; Durango, CO; Ashland, OR; Corvallis, OR; Eugene, OR; and Madison, WI were analyzed.

Several types of benefits were evaluated including health, environmental, and transportation. The impact analysis uses a standard methodology for calculating health, environmental, and transportation related benefits. All projections are based on the most recent five-year estimates from the ACS, which are then extrapolated through the use of various multipliers derived from national studies and quantified in terms of monetary value where appropriate. The estimated monetary values are then calibrated to baseline values and compared to bicycle and walk mode commute splits of peer cities. This analysis was bolstered by local enrollment numbers for the Bozeman Unified School District and MSU. These figures were significantly different than was recorded in the American Community Survey. Further, this analysis is likely to under represent the existing levels of walking and bicycling as it is heavily influenced by the National Household Transportation Survey. It is likely that the typical Bozeman resident walks and bicycles more than the average American. A local comprehensive travel survey would provide better Bozeman specific data.

Future estimates were derived from an estimate of future mode share in Bozeman based on the peer city analysis. Low, mid, and high mode share growth scenarios were considered for 2040, the planning horizon of this TMP. Bozeman's projected population at 2040 is included in this analysis. The estimates presented in **Table 3.6** are not intended to be mode share targets or policy, but they are useful in quantifying some of the benefit of continuing Bozeman's upward trajectory of active transportation mode share.

Table 3.6: Projected Mode Share

Source	Existing		Projected Low-Growth		Projected Mid-Growth		Projected High-Growth	
	Bike (%)	Walk (%)	Bike (%)	Walk (%)	Bike (%)	Walk (%)	Bike (%)	Walk (%)
Est. Commute Mode Share (ACS)	5.8	9.8	6.3	9.8	7.7	10.4	11.4	12.0
Est. Overall Mode Share for all Trip Purposes (ACS + NHTS)	8.2	26.4	8.8	26.4	10.8	28.2	16.1	32.5

Health Benefits

Bozeman's existing levels of walking and bicycling equate to a great deal of physical activity. The Benefit Impact Model quantifies the existing estimated hours of physical activity and projected increases of mode share. Benefits include improved community health and reduced household healthcare spending. The primary inputs into the health components of the Benefit Impact Model were derived from 2009 to 2013 ACS journey to work data, 2009 NHTS, and historic Safe Routes to School data. Existing bicycle and walk commute data were multiplied by national trip purpose ratios to generate mode split data that include all trip purposes. These balanced mode split data were indexed against the mode split data of Bozeman's peer cities and multiplied by various health factors. **Table 3.7** tabulates the estimated health benefits.

Table 3.7: Health Benefit Estimate

Type	Existing		Low-Growth		Mid-Growth		High-Growth	
	Bike	Walk	Bike	Walk	Bike	Walk	Bike	Walk
Annual Trips	4,958,000	10,013,000	5,341,000	10,013,000	6,564,000	10,677,000	9,726,000	12,299,000
Annual Miles	11,233,000	7,027,000	11,732,000	7,027,000	13,326,000	7,235,000	17,445,000	7,743,000
Annual Hours of Physical Activity	1,123,000	2,342,000	1,173,000	2,342,000	1,333,000	2,412,000	1,745,000	2,581,000
Rec. Physical Activity Minimum Met	8,638	18,015	9,023	18,015	10,254	18,554	13,423	19,854
Regional Physical Activity Need Met	22.6%	47.2%	23.6%	47.2%	26.8%	48.6%	35.1%	52.0%
Healthcare Cost Savings	$291,000	$401,000	$313,000	$401,000	$385,000	$428,000	$571,000	$493,000

Environmental Benefits

The existing levels of walking and bicycling provide environmental benefits to the community by not being emissions generating trips. Building off of the health benefits analysis and the mode share growth scenarios, the implications for hydrocarbon, particulate matter, nitrous oxides, carbon monoxide, and carbon dioxide can be estimated. This analysis uses national methodologies to determine trip replacement. Every walking or bicycling trip is not equal to a vehicle trip. Based on a review of air emissions studies, each pound of emissions was assigned an equivalent dollar amount based on how much it would cost to clean up the pollutant or the cost equivalent of how much damage the pollutant causes to the environment. Other potential ecological services associated with the bicycle projects such as water regulation, carbon sequestration, carbon storage, and waste treatment exist but the quantifiable value of these services are negligible on the overall impact. **Table 3.8** presents the estimated environmental benefits of active transportation modes.

Table 3.8: Environmental Benefit Estimates

Type	Existing		Low-Growth		Mid-Growth		High-Growth	
	Bike	Walk	Bike	Walk	Bike	Walk	Bike	Walk
CO_2 Emissions Reduced (lbs)	5,960,000	5,960,000	6,420,000	5,960,000	7,891,000	6,355,000	11,691,000	7,320,000
Other Vehicle Emissions Reduced (lbs)	136,000	102,000	146,000	102,000	180,000	109,000	266,000	125,000
Total Vehicle Emissions Cost Reduced	$140,000	$105,000	$151,000	$105,000	$185,000	$112,000	$275,000	$129,000

Transportation Benefits

The most readily identifiable benefits of active transportation exist in its ability to increase transportation options and access to activity centers for Bozeman residents and visitors. While money rarely changes hands, real savings can be estimated from the reduced costs associated with congestion, vehicle crashes, road maintenance, and household vehicle operations. Using the same annual vehicle miles travelled (VMT) reduction estimates highlighted in the health and environmental components, transportation-related costs savings were calculated. By multiplying the amount of VMT reduced by established multipliers for traffic congestion, vehicle collisions, road maintenance, and vehicle operating costs, monetary values were assigned to the transportation-related benefits. This analysis is the most conceptual of the three and actual savings may not result in the estimates given in **Table 3.9**.

Table 3.9: Transportation Benefit Estimates

Type	Existing		Low-Growth		Mid-Growth		High-Growth	
	Bike	Walk	Bike	Walk	Bike	Walk	Bike	Walk
Annual VMT Reduced	4,185,000	3,141,000	4,508,000	3,141,000	5,541,000	3,349,000	8,211,000	3,857,000
Reduced Traffic Congestion Costs	$293,000	$220,000	$316,000	$220,000	$388,000	$234,000	$575,000	$270,000
Reduced Vehicle Crash Cost	$2,093,000	$1,570,000	$2,254,000	$1,570,000	$2,771,000	$1,674,000	$4,105,000	$1,929,000
Reduced Road Maintenance Costs	$628,000	$471,000	$676,000	$471,000	$831,000	$502,000	$1,232,000	$579,000
Household Vehicle Operation Cost Savings	$2,386,000	$1,790,000	$2,570,000	$1,790,000	$3,159,000	$1,909,000	$4,680,000	$2,199,000

Total Benefits

Further improving the walking and bicycling system in Bozeman will result in more trips being taken via these modes. Increases in mode share can yield significant annual benefits to Bozeman and its residents. As summarized in **Table 3.10**, the City currently experiences approximately $10-million in annual benefits from active modes of transportation and could experience a further $500,000 to $6.6 million in additional benefits depending on population growth and varying levels of future mode share increases.

Table 3.10: Total Benefit Estimates

Type	Existing		Low-Growth		Mid-Growth		High-Growth	
	Bike	Walk	Bike	Walk	Bike	Walk	Bike	Walk
Health Benefits	$291,000	$401,000	$313,000	$401,000	$385,000	$428,000	$571,000	$493,000
Environmental Benefits	$140,000	$105,000	$151,000	$105,000	$185,000	$112,000	$275,000	$129,000
Transportation Benefits	$5,400,000	$4,051,000	$5,816,000	$4,051,000	$7,149,000	$4,319,000	$10,592,000	$4,977,000
Total Benefits	**$10,388,000**		**$10,837,000**		**$12,578,000**		**$17,037,000**	
Total Additional Benefits	--		$499,000		$2,190,000		$6,649,000	

Vehicle Trip Reduction

The monetary benefits provided in **Table 3.10** combine multiple sources of small amounts of savings. Using the methodology to estimate reductions in vehicle miles traveled, estimates for the overall benefits to the future capacity of Bozeman's streets can also be estimated. For this analysis, Streamline transit ridership data was included and annual growth projections were given for 2%, 3.5% and 5% to represent the low, mid and high growth scenarios. Transit's vehicle trip replacement was also accounted for as only a portion of transit trips may be a direct replacement of a vehicle trip. The purpose of this analysis is to estimate the potential 'load' that active modes of transportation could carry on Bozeman's network. Assuming active modes increase, streets in Bozeman would be carrying more people with fewer vehicles. Such a scenario could negate or substantially delay the need for expensive intersection and roadway capacity projects.

Table 3.11: Potential Vehicle Trip Reduction from Increased Active Transportation Mode Share in 2040

Active Transportation Growth Scenario	Vehicle Miles Traveled Reduced	Total Annual Trips Reduced (estimated)	Daily Trips Reduced
Low Growth	8,740,000	2,914,000	8,000
Mid Growth	10,483,000	3,395,000	10,000
High Growth	14,361,000	4,787,000	14,000

Based on the data in **Table 3.11**, it can be estimated that under the high growth scenario, active modes could be carrying 14,000 trips per day in Bozeman. This value is an average and would be higher during the summer months and lower during the winter months. This benefit would be distributed over the network. Improving active transportation mode share and overall mobility can be accomplished by completing gaps in the network, improving intersections and overcoming some of the barriers which seem to be suppressing mode share in certain areas of Bozeman such as Valley West.

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Chapter 4
Improving the System

Recommended improvements were developed through a combination of public process, project solicitation from partnering agencies, travel demand modeling, traffic engineering analysis, and policy choices to support TMP goals and objectives. In most cases, the recommended projects are either needed to meet the anticipated traffic demands for the year 2040 or to bring sub-standard roadways up to current standards based on the functional classification of the roadway. There are two categories of street improvement projects; major street network (MSN) and transportation system management (TSM) projects. These two categories are consistent with past long range transportation planning efforts completed in the greater Bozeman community. Accomplishing all of the recommended MSN and TSM projects over the 20-year planning horizon will cost well over $200 Million. Historically, City of Bozeman CIP projects total between $15 and $20 Million over a 5-year CIP time period. Accordingly, it would be reasonable to assume the City could complete recommended projects on the order of $3 to $4 Million per year in the foreseeable future.

4.1. RECOMMENDED MAJOR STREET NETWORK IMPROVEMENTS

MSN projects are typically large road reconstruction projects that take time to develop, are costly, and are needed to meet existing or future capacity demands. The 2007 update of the Transportation Plan included 46 recommended MSN projects. Of these projects, 12 were completed, 12 are partially completed, and 22 have not been completed. Of the either partially completed or not completed projects from the previous plan, 25 projects have been included in this TMP as recommended projects. Recommended MSN projects are shown in **Figure 4.1** at the end of this section. Committed MSN projects, currently in process for FY 2018 thru FY 2022[8], are shown in **Table 4.1** and **Figure 4.1**.

4.1.1. Committed MSN Improvements

Committed projects in the MSN category are only listed if the project will affect capacity and/or delay characteristics of a roadway facility and/or intersection. This distinction is necessary since some committed improvement projects, likely to occur within the next five years, are not listed here as they will not have an effect on capacity and/or delay characteristics (an example might be a street overlay). Committed improvements listed are only considered if they are likely to be constructed within a five-year timeframe (i.e. fiscal year 2018 through fiscal year 2022), and a funding source has been identified and is assigned to the specific project. Committed MSN projects are shown in **Table 4.1**.

Table 4.1: Committed MSN Improvements (FY 2018 to FY 2022)

TMP ID	Title	Description	Cost	YOE	Project ID	Source
CMSN-1	Griffin Dr (N. 7th Ave to Rouse Ave)	This project consists of reconstructing Griffin Drive, from the intersection of North 7th Avenue to Rouse Avenue, to a three-lane urban minor arterial standard. This includes one travel lane in each direction, bike lanes on each side, curb and gutter throughout, boulevard, and sidewalks. Turn-bays and flushed or raised medians should be incorporated at major intersections as applicable.	$5,000,000	FY19	SIF113	City
CMSN-2	Cottonwood Rd (Babcock St to Durston Rd)	This project consists of widening Cottonwood Road, from West Babcock Street to Durston Road, to a five-lane urban principal arterial standard. This includes two travel lanes in each direction, bike lanes on each side, curb and gutter throughout, boulevard, sidewalk on the west side and a shared use path on the east side and a raised median. Cottonwood Road serves as an important element in Bozeman's west side street system and serves as a primary north-south corridor on the west side of the city.	$2,555,883	FY18	SIF036	City
CMSN-3	Oak St (New Holland Dr to Ferguson Ave)	This project is the completion of the street segment of Oak Street, from New Holland Drive to Ferguson Avenue, to a five-lane urban principal arterial standard. This includes two travel lanes in each direction, bike lanes on each side, curb and gutter throughout, shared use paths on both sides and a raised median. Currently, the south half of the street is missing, creating a bottleneck in the street network.	$2,000,000	FY18	SIF046	City
CMSN-4	Oak St (Ferguson Ave to Ryunson Way)	This project is the completion of the street segment of Oak Street, from Ferguson Avenue to Ryunson Way, to a five-lane urban principal arterial standard. This includes two travel lanes in each direction, bike lanes on each side, curb and gutter throughout, boulevard, shared use path and a raised median.	$100,000	FY19	SIF135	City
CMSN-5	Durston Rd (Ferguson Rd to Fowler Ave)	Complete Durston Road, from Fowler Avenue to Ferguson Road, to a three-lane urban minor arterial standard including sidewalks, parking, medians, boulevards and bike lanes.	$1,514,842	FY19	SIF062	City
CMSN-6	Ferguson Ave (Baxter Ln to Oak St)	Complete Ferguson Avenue, from Baxter Lane to Oak Street, to a two-lane urban collector standard with bike lanes, curb and gutter, boulevards, parking and a sidewalk on the west side and shared use path on the east side.	$1,000,000	FY18	SIF080	City
CMSN-7	S. 11th Ave (Kagy Blvd to Graf St Extension)	Complete South 11th Avenue, from Kagy Boulevard to Graf Street, to a two-lane urban collector standard including shared use paths on both sides, curb and gutter and bike lanes.	$1,600,000	FY18	SIF102	City
CMSN-8	Story Mill Rd (Griffin Dr to Bridger Canyon Rd)	Reconstruct Story Mill Road, between Griffin Drive and Bridger Canyon Road, to a two-lane urban collector standard. This would include one travel lane in each direction, bike lanes on each side, curb and gutter, and sidewalks. Also, north of Griffin Drive install shared use path on the west side as part of a continuous trail connection from south Bozeman to the M trailhead (Story Hill Rail Trail).	$500,000	FY21	SIF117	City
CMSN-9	W. Babcock St (S. 11th Ave to S. 19th Ave)	Upgrade West Babcock Street, between South 11th Avenue and South 19th Avenue, to a three-lane urban collector standard. This would include one travel lane in each direction, bike lanes on each side, curb and gutter, boulevards, parking, and sidewalks, with a flush or raised center lane or median.	$1,500,000	FY22	SIF118	City
CMSN-10	Oak St (Rouse Ave thru Cannery District)	Improve Oak Street from Rouse Avenue thru the Cannery District to include curb, gutter, sidewalks, and a turning lane to provide left-turn movement access to the two drive accesses from Oak Street into the Cannery District.	$266,000	FY19	SIF109	City
CMSN-11	Rouse Ave (E Main St to Oak St)	Complete the reconstruction of Rouse Avenue, between East Main Street and Oak Street, to a three-lane urban principal arterial standard with bike lanes and sidewalks.	$9,185,756	FY18	UPN4805	MDT

4.1.2. Recommended MSN Improvements

A number of MSN projects have been identified and are described in this section and shown on **Figure 4.1**. **Table 4.2** contains a summary of the recommended MSN projects that are not identified for funding in the next five years as per the City's 5-Year CIP. The project numbering scheme does not represent or imply priority with respect to individual projects. System deficiencies and needs are often not fundable in the foreseeable future. However, funding opportunities often arise during the course of time, often from unexpected sources. To be prepared to take advantage of such opportunities, the following list of projects is provided, with no identified funding source or schedule for construction/implementation. It is likely that some of them will become funded at some point during the twenty-four year planning horizon even though no current source is known.

As part of the TMP planning effort, conceptual corridor striping plans were developed for every collector, minor arterial and principal arterial roadway on the City's Major Street Network. Representative typical sections were chosen from the 2007 Long Range Transportation Plan under the broad assumption that most of the Major Street Network would become an urban roadway, with urban characteristics such as curb and gutter, bicycle lanes and sidewalks, at some time in the future. **Appendix K** shows the conceptual corridor striping plans developed for this purpose. It is acknowledged that there will need to be flexibility when developing this network, especially as it pertains to individual intersections. Intersections will need to be sized according to traffic demand at the time of individual project development.

For planning level cost estimates, representative "costs per mile" were developed using recent roadway cost estimates from the Oak Street Improvements project and the Cottonwood/Durston Road Improvements project. Furthermore, for some projects the city of Bozeman's most current Street Impact Fee (SIF) Fund CIP (FY 18-22) and Arterial and Collector District CIP (FY 18-22) was utilized. Planning level cost estimates include construction, design, construction administration, utilities and contingencies. The basis of planning cost estimates for the MSN projects, absent other defined sources, are as follows:

- $2.2M per mile (2-lane urban)
- $3.0M per mile (3-lane urban)
- $5.0M per mile (4/5-lane urban)
- $1.5M per mile (2-lane rural)
- $1.9M per mile (3-lane rural)
- $250 per sq ft (bridge construction)

Table 4.2: Recommended MSN Improvements

TMP ID	Title	Description	Cost
MSN-1	Kagy Blvd (Willson Ave to Highland Blvd)	Reconstruct Kagy Boulevard, from the intersection of Willson Avenue to Highland Boulevard, to a four-lane urban principal arterial standard. (SIF 129)	$6,000,000
MSN-2	Oak Street (N. 7th Avenue to west edge of Cannery District)	Reconstruct Oak Street, from the intersection of North 7th Avenue to the west edge of the Cannery District, to a three-lane urban principal arterial standard.	$1,950,000
MSN-3	N. 11th Avenue (Durston Road to Oak Street)	Construct North 11th Avenue, from the intersection with Durston Road to the intersection with Oak Street, to a two-lane urban collector standard.	$1,120,000
MSN-4	N. 15th Avenue (Patrick Street to Baxter Lane)	Construct North 15th Avenue, from the intersection with Patrick Street to the intersection with Baxter Lane, to a three-lane urban collector standard.	$705,000
MSN-5	N. 19th Avenue (Interstate 90 to Springhill Road)	Reconstruct North 19th Avenue, from Interstate 90 to the intersection with Springhill Road, to a 5-lane urban principal arterial standard. This project includes widening the I-90 overpass on North 19th Avenue.	$2,500,000 (road only) $4,700,000 (includes bridge widening)
MSN-6	Springhill Road (Frontage Road to Sypes Canyon Road)	Reconstruct Springhill Road, from the intersection with the Frontage Road to the intersection with Sypes Canyon Road, to a three-lane rural minor arterial roadway.	$2,850,000
MSN-7	N. 27th Avenue (Baxter Lane to Valley Center Road)	Construct North 27th Avenue, from the intersection with Baxter Lane to the intersection with Valley Center Road, to a three-lane urban collector standard.	$4,200,000
MSN-8	Kagy Blvd (Willson Ave to S. 19th Ave)	Reconstruct Kagy Boulevard, from the intersection of South 19th Avenue to Willson Avenue, to a four-lane urban principal arterial standard. (SIF 009)	$8,000,000
MSN-9	Oak Street (N. 27th Avenue to N. 19th Avenue)	Reconstruct Oak Street, from North 27th Avenue to North 19th Avenue, to a five-lane urban principal arterial standard.	$2,100,000
MSN-10	Cattail Street (Davis Lane to Harper Puckett Road)	Construct Cattail Street, from the intersection with Davis Lane west of its current termini point, to a three-lane urban collector roadway. The portion of Cattail Street between Davis Lane and Ferguson Avenue has been constructed but not to a full build-out configuration.	$3,000,000
MSN-11	Davis Lane (Baxter Lane to Valley Center Road)	Reconstruct Davis Lane, from the intersection with Baxter Lane to the intersection with Valley Center Road, to a five-lane urban minor arterial standard.	$8,500,000
MSN-12	Cottonwood Road (Oak Street to Cattail Street)	Construct Cottonwood Road, from Oak Street to Cattail Street, to a five lane urban principal arterial standard.	$5,000,000
MSN-13	Fowler Avenue Connection (Huffine Lane to Oak Street)	Reconstruct Fowler Avenue, from the intersection with Huffine Lane to the intersection with Oak Street, to a five-lane urban minor arterial standard. (SIF 114)	$7,500,000
MSN-14	Durston Road (Gooch Hill Road to Westgate Avenue)	Reconstruct Durston Road, from Gooch Hill Road to Westgate Avenue, to a three-lane urban minor arterial standard.	$900,000
MSN-15	Cottonwood Road (Durston Road to Oak Street)	Construct Cottonwood Road, from Durston Road to Oak Street, to a five lane urban principal arterial standard. (SIF 105)	$2,500,000
MSN-16	Stucky Road (S. 19th Avenue to Gooch Hill Road)	Reconstruct Stucky Road, from the intersection with South 19th Avenue west to the intersection with Gooch Hill Road, to a three-lane urban collector roadway.	$9,000,000

TMP ID	Title	Description	Cost
MSN-17	College Street (S. 11th Avenue to S. 19th Avenue)	Reconstruct College Street, from the intersection of South 11th Avenue to South 19th Avenue, to a three-lane urban minor arterial standard. The roundabout at College Street and South 11th Avenue should remain. (SIF 115)	$1,100,000
MSN-18	Oak Street (Cottonwood Road to Flanders Mill)	Reconstruct Oak Street, from Cottonwood Road to Flanders Mill, to a five-lane urban principal arterial standard. (SIF 134)	$1,550,000
MSN-19	W. College Street (S. 8th Avenue to S. 11th Avenue)	Reconstruct College Street, from the intersection of South 8th Avenue to South 11th Avenue, to a two-lane urban minor arterial standard. The roundabout at College Street and South 11th Avenue should remain. Explore bicycle and pedestrian features such as bike lanes and bulb-outs for this high traffic pedestrian area.	$440,000
MSN-20	Mendenhall Street and Babcock Street (Streetscape Improvements)	Complete streetscape improvements along Mendenhall Street and Babcock Street to include curb bulb-outs, landscaping and crossing enhancements.	$2,100,000
MSN-21	S. 3rd Avenue (Graf Street to Kagy Boulevard)	Reconstruct South 3rd Avenue, from the intersection with Graf Street to the intersection with Kagy Boulevard, to a three-lane urban collector roadway.	$2,100,000
MSN-22	Highland Boulevard (Main Street to Kagy Boulevard)	Reconstruct Highland Boulevard, from the intersection with Main Street to the intersection with Knolls Drive, to a five-lane urban principal arterial standard; and from the intersection with Knolls Drive south to the intersection with Kagy Boulevard, to a three-lane urban principal arterial standard. (SIF 111)	$10,000,000
MSN-23	Bozeman Trail Road / Haggerty Lane (Main Street to Kagy Boulevard)	Reconstruct Bozeman Trail Road, from the intersection with Kagy Boulevard north to the intersection with Haggerty Lane, to a three-lane urban minor arterial roadway.	$5,550,000
MSN-24	Kagy Boulevard (Highland Boulevard to Bozeman Trail Road)	Reconstruct Kagy Boulevard, from the intersection with Highland Boulevard to the intersection with Bozeman Trail Road, to a three-lane urban principal arterial standard.	$5,000,000
MSN-25	Kagy Boulevard / Bozeman Trail Road (Bozeman Trail Road to Interstate 90)	Reconstruct Kagy Boulevard, from the intersection with Bozeman Trail Road east to Interstate 90, to a two-lane rural principal arterial standard.	$4,350,000
MSN-26	Cottonwood Road (Loyal Drive to Graf Street)	Reconstruct Cottonwood Road, from the intersection of Loyal Drive to Graf Street, to a five-lane urban principal arterial standard.	$5,500,000
MSN-27	Graf Street Extension (Ritter Drive to S. 19th Avenue)	Complete Graf Street, from Ritter Drive to South 19th Avenue, to a two-lane urban collector standard.	$1,035,000
MSN-28	Gooch Hill Road (Huffine Lane to Durston Road)	Reconstruct Gooch Hill Road, from Huffine Lane to Durston Road, to a five lane urban minor arterial standard.	$5,000,000
MSN-29	Valley Center Road (Valley Center Spur Road to N. 27th Avenue)	Reconstruct Valley Center Road, from the intersection with Valley Center Spur Road (at underpass) to the intersection with North 27th Avenue, to a three-lane urban principal arterial standard.	$3,510,000
MSN-30	Church Street (Main Street to Kagy Boulevard)	Reconstruct Church Street, from the intersection with Main Street south to the intersection with Kagy Boulevard, to a two-lane urban collector standard.	$3,520,000
MSN-31	"L" Street / Story Mill Road (Tamarack Street to Griffin Drive)	Reconstruct "L" Street and Story Mill Road, from the intersection with Tamarack Street to Griffin Drive, to a two-lane urban collector standard.	$2,140,000
MSN-32	Interstate 90 Corridor Planning Study	Complete a “pre-NEPA/MEPA Corridor Planning Study” for Interstate 90, between the West Belgrade Interchange and the Bear Canyon Exit, to assess issues, constraints and opportunities regarding operations and access between Belgrade and east of Bozeman before entering the canyon.	$250,000

TMP ID	Title	Description	Cost
MSN-33	Harper Puckett Road (Gooch Hill Road to E. Valley Center Road)	Reconstruct Harper Puckett Road, from Gooch Hill Road to East Valley Center Road, to a five lane urban minor arterial standard.	$2,500,000
MSN-34	Cattail Street (N. 19th Avenue to N. 27th Avenue)	Construct Cattail Street, from the intersection with North 19th Avenue west to North 27th Avenue, to a three-lane urban collector roadway.	$960,000
MSN-35	Story Mill Road North / McIlhattan Road (Bridger Canyon Drive to Landfill)	Reconstruct Story Mill Road north to McIlhattan Road, and McIlhattan Road northwest to the Landfill, to a two-lane urban collector road standard.	$3,080,000
MSN-36	Manley Road (Griffin Drive to Gallatin Park Drive North)	Reconstruct Manley Road, from Griffin Drive to Gallatin Park Drive North, to an urban collector road standard.	$1,950,000
MSN-37	W. Lincoln Street (N. 19th Avenue to S. 11th Avenue)	Reconstruct West Lincoln Street, from South 11th Avenue to South 19th Avenue, to a three-lane urban collector roadway.	$1,500,000
MSN-38	Oak Street (Flanders Mill to Ryunson Way)	Reconstruct Oak Street, from Flanders Mill to Ryunson Way, to a five-lane urban principal arterial standard. (SIF 057)	$1,500,000
MSN-39	Baxter Ln (Ferguson Ave to Harper Puckett Rd)	Complete Baxter Lane, from Ferguson Avenue to Cottonwood Road, to a three-lane urban minor arterial standard.	$1,500,000
MSN-40	Baxter Lane (N. 19th Avenue to Davis Lane)	Complete Baxter Lane, from North 19th Avenue to Davis Lane, to a three-lane urban minor arterial standard.	$1,500,000
MSN-41	Baxter Ln (N. 7th Avenue to N. 19th Avenue)	Complete Baxter Lane, from North 7th Avenue to North 19th Avenue, to a three-lane urban collector standard.	$1,500,000
MSN-42	Catamount Street (N. 27th Avenue to Valley Center Road)	Complete Catamount Street, from North 27th Avenue to Valley Center Road, to a two-lane urban minor arterial standard.	$600,000
MSN-43	Oak Street (N. 15th Avenue to N. 19th Avenue)	Complete Oak Street, from 15th Avenue to 19th Avenue, to a five-lane urban principal arterial standard.	$765,000
MSN-44	N. 27th Ave (Oak St to Tschache Ln)	Complete North 27th Avenue, from Oak Street to Tschache Lane, to a five-lane urban collector standard including medians for utility poles.	$350,000
MSN-45	N. 11th Avenue (Oak Street to Baxter Lane)	Reconstruct North 11th Avenue, from the intersection with Oak Street to the intersection with Baxter Lane, to a two-lane urban collector standard.	$750,000
MSN-46	S. 19th Avenue (Kagy Boulevard to Goldenstein Lane)	Reconstruct South 19th Avenue, from the intersection with Kagy Boulevard south to the intersection with Goldenstein Lane, to a five-lane principal arterial standard.	$9,000,000
MSN-47	Durston Road (Cottonwood Road to Ferguson Avenue)	Reconstruct Durston Road, from the intersection with Cottonwood Road to the intersection with Ferguson Avenue, to a three-lane urban minor arterial standard.	$2,500,000
MSN-48	I-90 Overpass/Underpass	Construct a new overpass/underpass across Interstate 90 between North 19th Avenue and North 7th Avenue. The exact location is unknown at this time. Potential locations include a new connection of Baxter Lane with Mandeville Drive or a new extension of Dead Mans Gulch.	$7,500,000

4.1.3. Future Road Connections

Establishing a plan for a community's future street layout is essential to coordinate land development and community planning. The future connections shown are conceptual in nature and may vary based on factors such as topography, wetlands, land ownership, and other unforeseen factors. The purpose is to illustrate the anticipated network at full build-out. It is likely that many of the corridors shown will not be developed for many decades to come. On the other hand, if development occurs in a particular area, the recommended road network establishes an efficient and logical future road system. **Table 4.3** contains the list of future road connections to complete the network over the foreseeable planning horizon. **Figure 4.1** shows the future road connections as dashed lines.

Table 4.3: Future Road Connections

Road Segment	Begin	End	Length (ft)	Estimated Cost
Principal Arterials				
Kagy Boulevard	Cottonwood Road	South 19th Avenue	9,370	$8,870,000
Oak Street	Twin Lakes Avenue	Laurel Parkway	1,930	$1,830,000
Oak Street	West Termini	Study Area Boundary	4,000	$3,790,000
Harper Puckett Road	Cattail Street	Valley Center Road	7,910	$7,490,000
Johnson Road	Fowler Avenue	Private Approach	4,030	$1,680,000
Minor Arterials				
Fowler Avenue	Garfield Street	Stucky Road	4,000	$3,790,000
Goldenstein Lane	Cottonwood Road	South 19th Avenue	10,625	$4,430,000
Gooch Hill Road	Durston Road	Harper Puckett Road	13,330	$12,620,000
Catamount Street	Davis Lane	Love Lane	15,900	$9,030,000
Goldenstein Lane	Sourdough Road	Tayebeshockup Road	13,180	$5,490,000
Baxter Lane	Cottonwood Road	Study Area Boundary	8,010	$4,550,000
Durston Road	Gooch Hill Road	Study Area Boundary	2,640	$1,500,000
Collectors				
Ferguson Avenue	Huffine Lane	Johnson Road	21,200	$12,050,000
Blackwood Road	Fowler Avenue	South 31st Avenue	1,345	$560,000
Blackwood Road	South 3rd Avenue	Parkway Avenue	5,830	$2,430,000
South 27th Avenue	Garfield Street	Stucky Road	3,975	$2,260,000
South 27th Avenue	Stucky Road	Graf Street	2,675	$1,520,000

Road Segment	Begin	End	Length (ft)	Estimated Cost
South 27th Avenue	Blackwood Road	Patterson Road	5,340	$2,230,000
Garfield Street	Fowler Avenue	Ferguson Avenue	2,815	$1,600,000
Ferguson Avenue	Cattail Street	Valley Center Road	7,650	$4,350,000
South 11th Avenue	Alder Creek	Goldenstein Lane	4,020	$2,280,000
Johnson Road	South 19th Avenue	Sourdough Road	10,440	$4,350,000
Sir Arthur Drive	Subdivision Access	Johnson Road	2,670	$1,110,000
N/S Connector	Goldenstein Lane	Nash Road	10,630	$4,430,000
Goldenstein Lane	Tayebeshockup Road	Study Area Boundary	13,190	$5,500,000
Fort Ellis Road	Termini	Goldenstein Lane	2,700	$1,130,000
Cattail Street	Cottonwood Road	Study Area Boundary	7,980	$4,530,000
Laurel Parkway	Valley Center Road	Oak Street	13,265	$7,540,000
Babcock Street	Water Lily	Study Area Boundary	6,430	$2,680,000
Laurel Parkway	Durston Road	Huffine Lane	5,325	$3,030,000

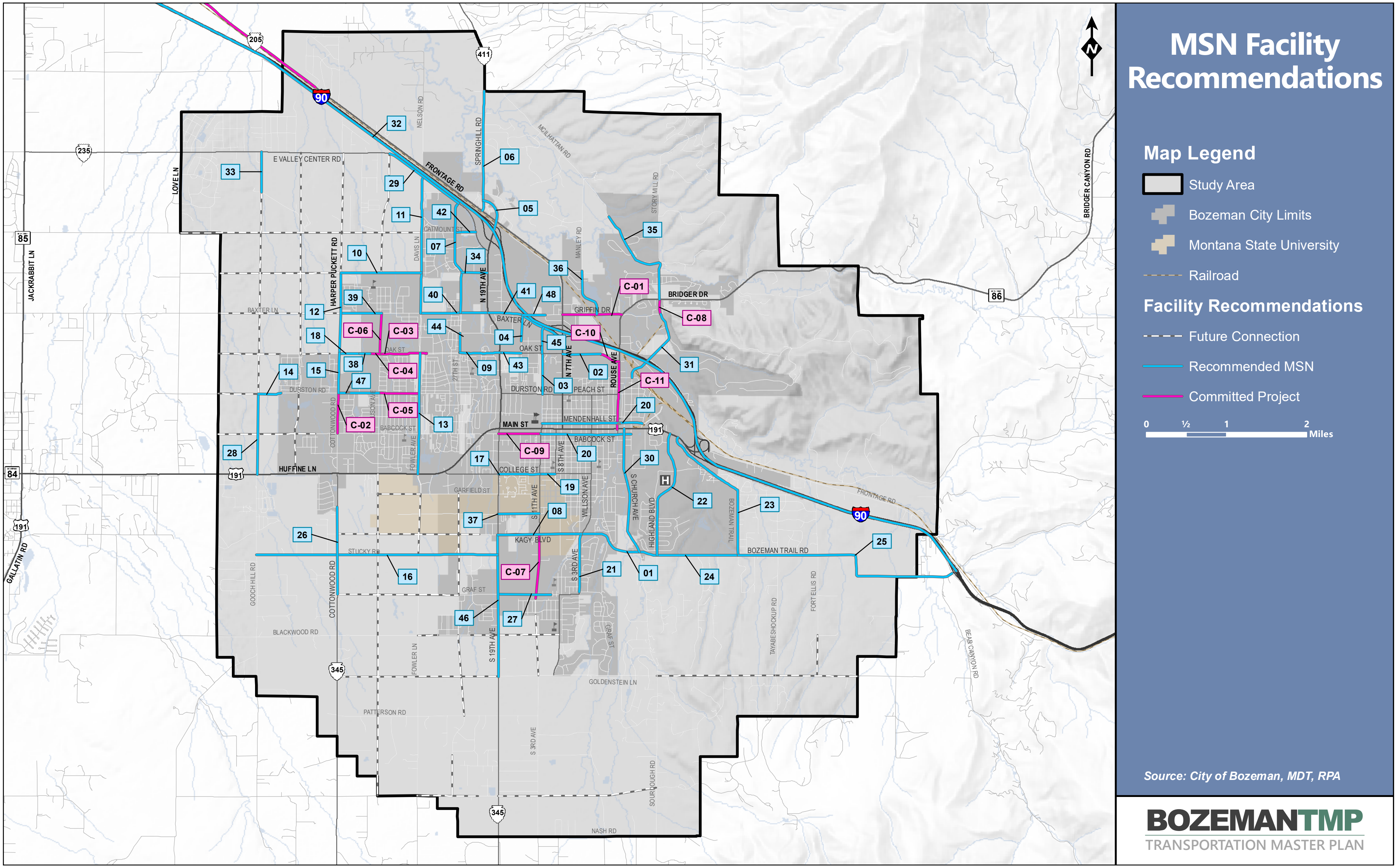


Figure 4.1: MSN Facility Recommendations

4.2. RECOMMENDED TRANSPORTATION SYSTEM MANAGEMENT IMPROVEMENTS

Transportation System Management (TSM) projects are "tune-up" type improvements with a reasonable chance of being implemented within a two- to ten-year timeframe. Problem areas which can usually be addressed in the short range are as follows: intersection capacity problems (both signalized and unsignalized), pavement condition problems (i.e. overlays, chip seals, etc.), crash problems (i.e. sight distance improvements, better signing and/or pavement markings), and roadway/lane width and capacity concerns. The 2007 update of the Transportation Plan included 43 recommended TSM projects. Of these projects, 20 were completed, 2 are partially completed, and 21 have not been completed. Of the either partially completed or not completed projects from the previous plan, 15 projects have been included in this update of the plan as recommended projects. Recommended TSM projects are shown in **Figure 4.2** at the end of this section. Committed TSM projects currently in process for FY 2018 thru FY 2022[8] are shown in **Table 4.4** and **Figure 4.2**.

4.2.1. Committed TSM Improvements

As described for the MSN projects, committed projects are typically only listed if the project will affect capacity and/or delay characteristics of a roadway facility and/or intersection. This distinction is necessary since some committed improvement projects, likely to occur within the next five years, are not necessarily listed since they will not affect capacity. Committed TSM projects are shown in **Table 4.4**.

Table 4.4: Committed TSM Improvements (FY 2018 to FY 2022)

TMP ID	Title	Description	Cost	YOE	Project ID	Source
CTSM-1	Manley Rd and Griffin Dr	Improvements to the intersection to include installation of a traffic signal, roundabout or other adequate traffic control device when warrants are met.	$2,000,000	FY19	SIF110	City
CTSM-2	Ferguson Ave and Durston Rd	Control of the intersection of Ferguson Avenue & Durston Road. Includes the installation of a traffic signal or roundabout. Future development and the resulting increased traffic indicate that intersection improvements will be needed.	$2,256,220	FY18	SIF039	City
CTSM-3	Oak St and Davis Lane	Installation of a roundabout at the intersection of Oak Street & Davis Lane. Peak hour level of service for northbound traffic is degrading due to lack of north-south connectivity in the network. Geometric deficiencies will be addressed.	$1,761,508	FY18	SIF074	City
CTSM-4	Oak St and Ferguson Ave	Includes installation of a traffic signal, roundabout or other adequate traffic control device when warrants are met.	$1,345,331	FY18	SIF061	City
CTSM-5	S. 3rd Ave and Graf St	Control of the intersection of South 3rd Avenue & Graf Street. Includes the installation of a traffic signal or roundabout. Future development and the resulting increased traffic indicate that intersection improvements will be needed.	$1,000,000	FY19	SIF108	City
CTSM-6	Cottonwood Rd and Babcock St	Installation of a traffic signal when warrants are met.	$1,435,336	FY18	SIF104	City
CTSM-7	N. 19th Ave Interchange	Signal on I-90 eastbound (EB) off-ramp.	$1,494,900	FY19	UPN8999	MDT
CTSM-8	SF 129 - Slope Flattening Belgrade	Slope flattening from reference post (RP) 22.5-24.3 on Primary 205 (Frontage Road).	$3,716,816	FY18	UPN8031	MDT

TMP ID	Title	Description	Cost	YOE	Project ID	Source
CTSM-9	Bozeman Signal Safety	Upgrade signals in 4 systems (Main Street, West Main Street, Bozeman Radio System, & isolated intersections) and signals along Huffine Lane, and Jackrabbit Lane (Baxter Lane & Durston Road) - flashing yellow arrows. Adding a protective left turn phase signal at signal of Ferguson Avenue and Huffine Lane.	$1,635,776	FY17	UPN8642	MDT
CTSM-10	Cottonwood Rd & Stucky Rd	Roundabout installation at the intersection of Cottonwood Road and Stucky Road.	$3,158,260	FY18	UPN8190	MDT
CTSM-11	Highland Blvd and Main St	Improve intersection control at Highland Boulevard and Main Street by adding additional phases and improving geometry to increase capacity for deficient movements.	$150,000	FY18	SIF112	City
CTSM-12	Baxter Lane and Davis Street	Improve intersection to include signalization and geometric improvements.	$2,500,000	FY20	SIF121	City
CTSM-13	Babcock St and Ferguson Ave	Improve intersection to include geometric improvements with installation of a traffic signal.	$800,000	FY18	SIF122	City
CTSM-14	Kagy Blvd (S. 19th Ave to Willson Ave) – Interim Improvements	Improve Kagy Boulevard from approximately 500 feet west of South 11th Avenue to approximately 500 feet east of South 7th Avenue to a full three-lane cross section with TWLTL.	$500,000	FY18	SIF130	City

4.2.2. Recommended TSM Improvements

A number of TSM projects have been identified and are described in this section and shown on **Figure 4.2**. **Table 4.5** contains a summary of the recommended TSM projects that are not identified in the City's 5-Year CIP. The project numbering scheme does not represent or imply priority with respect to individual projects. System deficiencies and needs are often not fundable in the foreseeable future. However, funding opportunities often arise during the course of time, often from unexpected sources. To be prepared to take advantage of such opportunities, the following list of projects is provided, with no identified funding source or schedule for construction/implementation. It is likely that some will become funded at some point over the planning horizon. Planning level cost estimates were developed based on recent roadway cost estimates. For some projects, the city of Bozeman's most current Street Impact Fee Fund CIP (FY 18-22) and Arterial and Collector District CIP (FY 18-22) was utilized. Planning level cost estimates include construction, design, construction administration, utilities and contingencies. The basis of planning cost estimates for the TSM projects, absent other defined sources, are as follows:

- $2.35M (traffic signal – large)
- $1.15M (traffic signal – small to medium)
- $750K (traffic signal – modifications to existing)
- $2.85M (roundabout – large)
- $2.00M (roundabout – small)

Many of the TSM recommendations identified in this section call for the separation of turning movements at intersections by installing left-turn, thru- or right-turn lanes (bays). There are some instances where a recommendation may suggest a "combination thru- / right- turn lane". These recommendations may be for projects that are already in design which have approved corridor concept plans (Oak Street, Baxter Lane, Cottonwood Road), or are in constrained locations where the lane can't be separated at the intersection. Separating the thru movement and the right-turn movement by a designated right-turn lane is generally more desirable, especially for bicyclists.

Many of the TSM projects include recommendations for traffic signals or roundabouts. Both types of intersection control treatments have different initial set-up and long-term maintenance costs. The costs for building a roundabout and a traffic signal are quite different. Generally, initial capital costs are less for a traffic signal compared to a roundabout. Part of the reason is that a roundabout may need more property within the actual intersection. In the long-term, however, roundabouts eliminate hardware, maintenance and electrical costs associated with traffic signals, which can cost between $5,000 and $10,000 per year. Roundabouts are also favorable during power outages. Unlike traditional signalized intersections, which must be treated as a four-way stop or require police to direct traffic, roundabouts continue to work like normal.

Table 4.5: Recommended TSM Improvements

TMP ID	Title	Description	Cost
TSM-1	Durston Road and Laurel Parkway	Geometric improvements to the intersection with traffic signalization control. The intersection should include dedicated left-turn bays and shared through/right turn lanes for all four legs of the intersection. Signal warrants would need to be met prior to installation of a traffic signal. On-street bicycle lanes will be marked on all four legs of the intersection.	$1,150,000
TSM-2	N. 27th Avenue and Oak Street	Geometric improvements to the intersection with includes installation of a traffic signal, roundabout or other adequate traffic control device when warrants are met. (SIF 058)	$650,000
TSM-3	Baxter Lane and Cottonwood Road	Geometric improvements to the intersection with includes installation of a traffic signal, roundabout or other adequate traffic control device when warrants are met. (SIF 086)	$2,500,000
TSM-4	Oak Street and Cottonwood Road	Geometric improvements to the intersection with includes installation of a traffic signal, roundabout or other adequate traffic control device when warrants are met. (SIF 098)	$2,750,000
TSM-5	Durston Road and Flanders Mill Road	Geometric improvements to the intersection with installation of a single-lane roundabout. Mark on-street bicycle lanes on all legs of the intersection. School zone context should be considered.	$2,000,000
TSM-6	Bridger Drive and Story Mill Road	Geometric improvements to the intersection with includes installation of a traffic signal, roundabout or other adequate traffic control device when warrants are met. (SIF 116)	$1,000,000
TSM-7	Fowler Avenue and Babcock Street	Geometric improvements to the intersection with installation of a traffic signal when warrants are met. Trail crossing amenities should be provided. (SIF 063)	$2,000,000
TSM-8	Construction of ADA Compliant Roadway Crossing Improvements	Construct ADA compliant pedestrian roadway crossing improvements at three locations: (1) Fowler Avenue and Babcock Street, (2) Oak Street and Hunters Way, and (3) Durston Road Trail Crossing between Hunters Way and North 27th Avenue. ADA crossing improvements may include widened sidewalks, curb ramps, refuge islands, rectangular rapid flashing beacons and crosswalk markings.	$167,000
TSM-9	Fowler Avenue and Durston Road	Geometric improvements to construct a four legged intersection with traffic signal control. Signal warrants would need to be met prior to installation of a traffic signal. (SIF 073)	$2,000,000
TSM-10	Davis Lane and Cattail Street	Geometric improvements to the intersection with a single-lane roundabout or traffic signal when warrants are met.	$2,000,000
TSM-11	Davis Lane and Catamount Street	Geometric improvements to the intersection with a single-lane roundabout or traffic signal when warrants are met.	$2,000,000

TMP ID	Title	Description	Cost
TSM-12	Durston Road and N. 27th Avenue	Geometric improvements to include left-turn lanes as necessitated by the growing traffic demand. A traffic signal, roundabout, or other traffic control device should be added to this intersection when warrants are met.	$1,150,000
TSM-13	N. 27th Avenue and Tschache Lane	Geometric improvements to the intersection with traffic signalization when warrants are met. Due to the varying existing and future cross sections on each of the roadways, a traffic signal will likely be the better choice for intersection control compared to a roundabout.	$2,000,000
TSM-14	Davis Lane and Valley Center Road	Geometric improvements with traffic signalization when warrants are met. Potential lane configuration include northbound left and right-turn bays, a westbound left-turn bay, and an eastbound right-turn lane.	$2,000,000
TSM-15	N. 27th Avenue and Valley Center Road	Geometric improvements with traffic signalization at the intersection when warrants are met. Potential lane configuration modifications include the addition of an eastbound right-turn lane.	$2,000,000
TSM-16	Oak Street and N. 19th Avenue	Modify the intersection of Oak Street and North 19th Avenue to add additional lanes on the west approach of Oak Street, coupled with traffic signal modification.	$530,000
TSM-17	Oak Street and N. 11th Avenue	Geometric improvements to the intersection of Oak Street and North 11th Avenue with traffic signal installation when signal warrants are met.	$1,150,000
TSM-18	N. 7th Avenue and Griffin Drive	Modify the intersection of North 7th Avenue and Griffin Drive to add additional designated turning lanes on all approaches, and to provide revised traffic signalization.	$2,350,000
TSM-19	Oak Street and N. 7th Avenue	Modify the intersection of Oak Street and North 7th Avenue to add additional lanes on the east approach of Oak Street, along with traffic signal modification.	$750,000
TSM-20	N. 7th Avenue and Mendenhall Street	Revise the northeast quadrant at the intersection of North 7th Avenue and Mendenhall Street to provide a short right-turn bay for westbound to northbound turning vehicles.	$120,000
TSM-21	Babcock Street and Willson Avenue	Update the traffic signal hardware at the intersection of Babcock Street and Willson Avenue, and relocate the poles out of the sidewalks/pedestrian ramps. Make geometric improvements to the intersection corners to provide better crosswalk alignment.	$750,000
TSM-22	Main Street and Haggerty Lane	Modify the intersection of Main Street and Haggerty Lane to include a designated northbound right turn lane, a northbound left turn lane, and an eastbound right turn lane. Install traffic signalization control when warrants are met.	$1,150,000
TSM-23	Highland Boulevard and Ellis Street	Geometric improvements to include the installation of a traffic signal, roundabout, or other adequate traffic control device when warrants are met.	$2,000,000
TSM-24	Highland Boulevard and Kagy Boulevard	Geometric improvements to include the installation of a traffic signal, roundabout, or other adequate traffic control device when warrants are met.	$2,850,000
TSM-25	Kagy Boulevard and S. Church Avenue / Sourdough Road	Includes three options to improve safety and reduce delay at the intersection of Kagy Boulevard and South Church Avenue / Sourdough Road: **Option 1:** Installation of a roundabout or traffic signal when warrants are met. This option would be a major project due to chasing the grades both east and west of the intersection on Kagy Boulevard, and would require a fair amount of road work on Kagy Boulevard. **Option 2:** Narrowing (i.e. necking) down Kagy Boulevard just east and west of the intersection for about 200 feet to reduce the distance that vehicles, pedestrians and bicyclists must cross. **Option 3**: Restrict turning movements at the intersection such that the north-south movements could only make right-in and right-out turns. This would be accomplished by placing a raised median on Kagy Boulevard in an east – west direction to effectively block off left-turns and through movements from the north and south legs of the approach.	$2,850,000 (Option 1) $280,000 (Option 2) $100,000 (Option 3)

TMP ID	Title	Description	Cost
TSM-26	Huffine Lane and Ferguson Avenue	Continue to evaluate eastbound and westbound left-turn phasing on Huffine Lane (designated left-turn phases were not recommended nor warranted during MDT's most recent signal upgrade project on Huffine Lane).	$150,000
TSM-27	Huffine Lane and Fowler Avenue	Continue to evaluate eastbound and westbound left-turn phasing on Huffine Lane (designated left-turn phases were not recommended nor warranted during MDT's most recent signal upgrade project on Huffine Lane).	$150,000
TSM-28	Flanders Mill Road and Oak Street	Install traffic diverter or other form of traffic calming to limit cut through traffic near the intersection of Oak Street.	$30,000
TSM-29	Oak Street and Stoneridge Drive	Make Stoneridge Drive approaches on both sides of Oak Street three-quarter movement approaches such that "left-out" turning movements are prohibited.	$70,000
TSM-30	Durston Road and N. 19th Avenue	Geometric improvements to revise the east leg by providing a longer westbound right-turn bay, which will improve storage and operations for this heavy movement onto North 19th Avenue.	$750,000
TSM-31	Durston Road and N. 15th Avenue	Consider a single-lane roundabout to better meter traffic flows. All four legs of the intersection receive approximately equal traffic, and its proximity to the schools warrants long term improvements to the intersection.	$2,000,000
TSM-32	Beall Street and N. 15th Avenue	Geometric improvements to include traffic signalization or single-lane roundabout installation when warrants are met (i.e. for traffic signalization).	$1,150,000 (Traffic Signal) $2,000,000 (Roundabout)
TSM-33	Willson Avenue and Peach Street	Geometric improvements to include installation of a traffic signal (when warrants are met) or single-lane roundabout.	$1,150,000 (Traffic Signal) $2,000,000 (Roundabout)
TSM-34	Willson Avenue and Grant Street	The intersection of Willson Avenue and Grant Street could use a higher level of traffic control in the form of a single-lane roundabout. This traffic control would allow for left-turn movements off of both legs of Grant Street, but not at the expense of impeding traffic flow adversely on Willson Avenue. Some parking would likely be lost at each quadrant of the intersection. Additional study will be needed.	$2,000,000 (Roundabout)
TSM-35	Main Street and Cypress Street	Revise Cypress Street legs to "right-in, right-out" approaches to alleviate cut-thru traffic though the neighborhood. In addition, remove the existing pedestrian crossing across Main Street as it has no control and is on the hill into downtown where traffic is decelerating from 40 mph. The new signal at Broadway offers nearby controlled crossing.	$70,000
TSM-36	Durston Road (West of Laurel Parkway)	Revise and straighten the segment of Durston Road just west of Westgate Avenue to remove the two back-to-back horizontal curves.	$200,000
TSM-37	Grant Street and S. 11th Avenue	Geometric improvements to include a single-lane urban compact roundabout to better meter traffic flow, calm traffic, and improve pedestrian and bicycle access.	$2,000,000 (Roundabout)
TSM-38	Grant Street and S. 7th Avenue	Geometric improvements to include a single-lane roundabout to better meter traffic flow, calm traffic, and improve pedestrian and bicycle access. A single-lane roundabout in this location may also serve as a "gateway" treatment on the eastern side of MSU's core campus.	$2,000,000 (Roundabout)
TSM-39	Lincoln Street and S. 11th Avenue	Geometric improvements to include a single-lane roundabout to better meter traffic flow, calm traffic, and improve pedestrian and bicycle access.	$2,000,000 (Roundabout)
TSM-40	Citywide Street Sign Evaluation	Evaluate all street signs in Bozeman for uniformity and readability. Identify signs in disrepair and possible letter size upgrades for visibility.	$25,000 (Evaluation)
TSM-41	Rail Crossing Noise Mitigation Study	Study to identify mitigation needs and costs at the at-grade rail crossings that could result in improved safety and elimination of train whistle noise within the community.	$100,000 (Study)

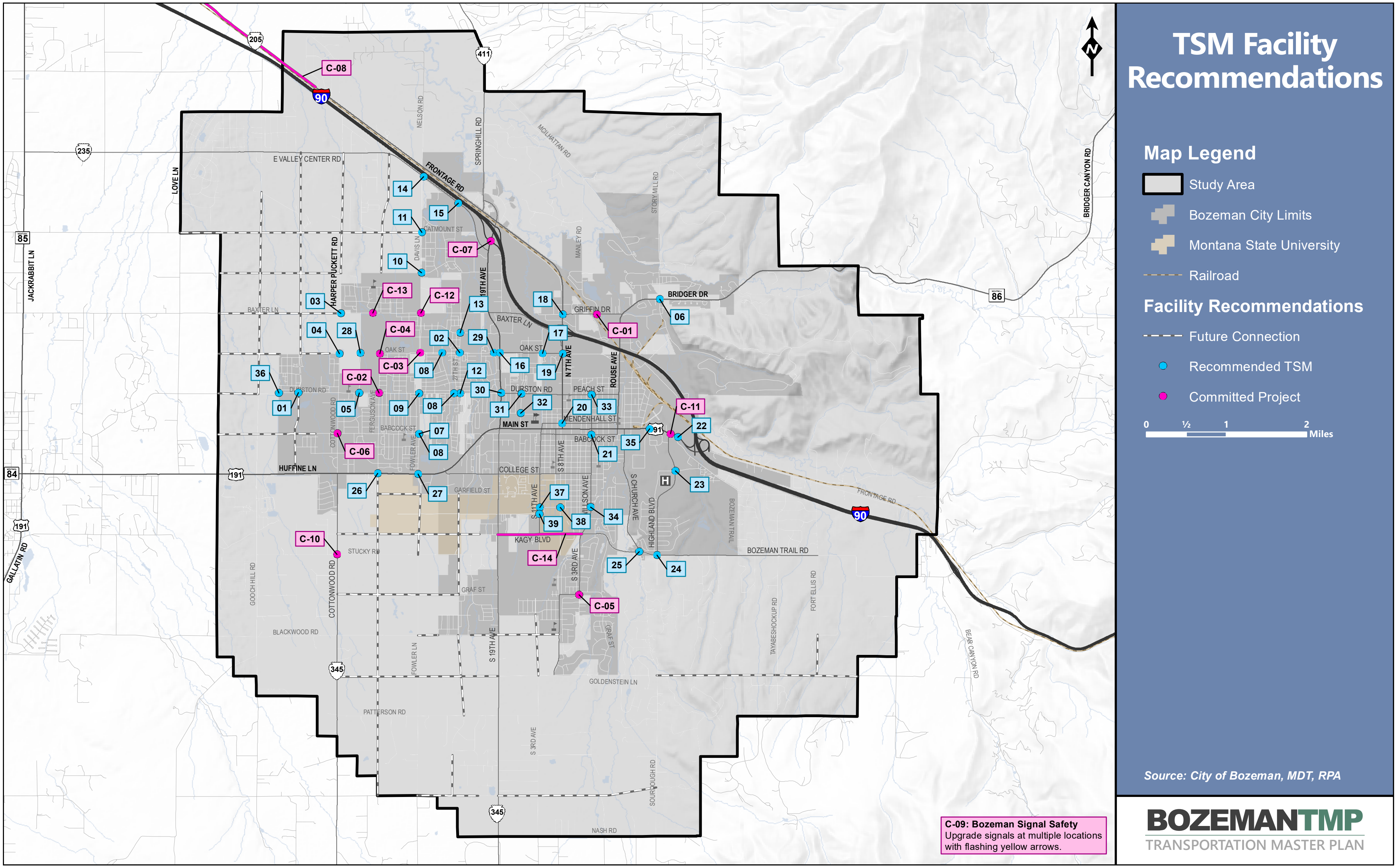


Figure 4.2: TSM Facility Recommendations

4.3. PEDESTRIAN IMPROVEMENTS

This section outlines potential active transportation facilities relative to sidewalks, street crossings, and natural surface trails. The recommendations are intended to encourage active living by residents and visitors and accommodate a variety of ability levels with particular emphasis on establishing a well-connected pedestrian network that is comfortable and accessible to a wider range of the population. As Bozeman's growth rate is currently very high, projects are organized into a number of different implementation mechanisms.

4.3.1. Overview

Bozeman is a walking city. Residents and visitors frequently make use of the City's sidewalks and trails for all types of transportation and recreational trips. The existing conditions and needs analysis identified a number of pedestrian issues including:

- Neighborhoods lacking sidewalks completely
- Incomplete subdivision sidewalks due to piecemeal development
- Arterial and collector streets lacking sidewalks
- Old infrastructure
- Crossings

Each of these issues is addressed in this section through a variety of infrastructure and programmatic improvements. **Figure 4.3** displays the recommended sidewalks, intersection improvements, and trails which will benefit pedestrian (and in many cases bicycle) activity. All improvements will improve the City's accessibility to pedestrians of all ages and abilities through accessible design. The city of Bozeman should consider adopting the draft Public Rights-of-Way Accessibility Guidelines (PROWAG) and continue to retrofit its network for improved accessibility for all users.

4.3.2. Specific Pedestrian Recommendations

Bozeman's sidewalk gaps constitute some of the greatest challenges to pedestrian connectivity. Some sidewalk gaps can be expected to be closed though already committed or planned roadway projects. Facilities like Oak Street, Durston Road, Babcock Street, Cottonwood Road and Rouse Avenue will all see significant improvements to sidewalk connectivity and accommodation through planned MSN roadway projects. This plan also identifies key sidewalk gaps that do not have an overall road project as a source of implementation. These recommendations include some local streets where connectivity needs are the greatest.

Incomplete subdivision sidewalks were also identified as a major barrier to pedestrian connectivity. As of 2016, subdivision sidewalks on non-publically fronted property are developed with individual lot development. With the growth Bozeman has been experiencing an up to date inventory of sidewalks is nearly impossible as concrete is being poured daily across the City. The current policy of the City requiring the developer to return and complete unfinished sidewalks after three years has proved problematic during the economic downturn of 2009-2012. Tracking and enforcing this policy has been difficult due to lack of data and staff time.

Recommended Policy Change

This plan recommends that the Unified Development Ordinance (UDO) be amended to require sidewalk construction as a basic component of subdivisions and should be installed with the streets and utilities before individual lots are developed. Builders can temporarily bury the sidewalks so that they are not damaged by heavy equipment during the building process. While this change would potentially increase lot prices, the cost of the sidewalk would not be a component of the lot development, so the end cost to the homeowner would be similar.

4.3.3. Crossing Improvements

This plan includes recommendations for a variety of intersection and mid-block pedestrian crossing improvements, as shown in **Table 4.6** and **Figure 4.3**. Generally, improvements are focused around establishing a safe pedestrian crossing where existing use and/or desire is high. The project numbering scheme does not represent or imply priority with respect to individual projects. Recommended crossing improvements vary; however, generally include the following typologies:

Pedestrian Refuge

Pedestrian refuges provide protected space placed in the center of the street to facilitate bicycle and pedestrian crossings. Pedestrian refuges are the most valuable at uncontrolled crossing locations where the refuge breaks up the crossing into smaller directional crossings, often placing the pedestrian in a less complex situation. No more than two lanes in any direction should be crossed at a time when a pedestrian refuge is utilized without signalization.

Existing pedestrian refuge on Highland Boulevard

RRFBs in front of Whittier School on Peach Street

Rectangular Rapid Flashing Beacons (RRFB)

RRFBs use an irregular flash pattern similar to emergency flashers on police vehicles and can be installed on either two-lane or multi-lane roadways. RRFBs are used to reinforce a driver's legal obligation to yield where pedestrians and/or bicyclists have the right-of-way crossing a road. RRFBs drastically improve motor vehicle yielding compliance over no beacon and even considerably more over steady flashing yellow ball beacons.

Pedestrian Hybrid Beacon in Billings, MT

Pedestrian Hybrid Beacon

A hybrid beacon, also known as a High-intensity Activated Cross-walk (HAWK), consists of a signal-head with two red lenses over a single yellow lens on the major street, and pedestrian signal heads for the minor street or trail crossing. There are no signal indications for motor vehicles on the minor street approaches. Hybrid beacons are used to improve non-motorized crossings of major streets in locations where side-street volumes do not support installation of a conventional traffic signal. Hybrid beacons can operate in areas of heavy traffic and multiple travel lanes where a RRFB would be less effective.

Table 4.6: Recommended Spot Improvements

TMP ID	Project Type	Location	Comments	Cost (Low)	Cost (High)
SPOT-1	Grade Separation	W. Kagy Blvd and S. 7th Ave	As part of the West Kagy Boulevard improvements, a pedestrian tunnel will be constructed linking the main MSU Campus to WTI, the Museum of the Rockies and the neighborhoods to the south.	Part of road project	Part of road project
SPOT-2	Grade Separation	W. Garfield St and S. 19th Ave (south of intersection)	Over or underpass for future central bicycle and pedestrian route as proposed in the *MSU Long Range Campus Development Plan (LRCDP)*[9].	$1,200,000	$3,500,000
SPOT-3	Install full signal	W. Lincoln St and S. 19th Ave	Recommend installing a full signal to protect pedestrian and bike crossings on West Lincoln Street. This could allow the current right turn out restrictions to remain and signal would activate for left turns and pedestrian signal calls. This pedestrian crossing has exhibited crash trends in the past.	$40,000	$60,000
SPOT-4	Intersection Improvements	W. Lincoln St and S. 11th Ave	**Short Term:** As EB and NB approaches have combination outer lanes, the stop bar should be set back to provide 6 feet of bicycle forward stop bar. The SB approach does not need improvement. **Long Term:** Convert to roundabout similar to South 11th Avenue and College Street.	$3,000	$5,000
SPOT-5	Intersection Improvements	W. Grant St and S. 11th Ave	**Short Term:** All approaches have combination outer lanes, the stop bar should be set back to provide 6 feet of bicycle forward stop bar. **Long Term:** Convert to roundabout similar to South 11th Avenue and College Street.	$3,000	$5,000
SPOT-6	Intersection Improvements	W. Kagy Blvd and S. 11th Ave	**Short Term:** Prior to Kagy Boulevard reconstruction, install bicycle boxes in north and south directions with a "right turn on red" prohibition on South 11th Avenue. This will help queue and move large numbers of bicyclists travelling between campus, the Stadium View Apartments, and trails to the south. **Long Term:** Improvements associated with Kagy Boulevard project. Recommend roundabout with grade separation across Kagy Boulevard. If signal is to remain, include leading pedestrian interval, and bike lane to path transitions.	$15,000	Part of road project
SPOT-7	Grade Separation	W. Kagy Blvd (MSU Stadium)	As part of the W Kagy Boulevard improvements, a pedestrian tunnel will be constructed linking the main MSU Campus to the Stadium.	Part of road project	Part of road project
SPOT-8	Grade Separation	W. Kagy Blvd and S. Willson Ave	**Short Term:** Prior to reconstruction of Kagy Boulevard, provide bike box on the Willson Avenue approach in front of the through/right lane. Provide new ramp for Gallagator Trail users to access the bike box and provide paved path from end of Gallagator Trail. Provide sharrows in the right turn only lane of the South 3rd Avenue approach. Formalize short sections of bike lane next to north and south "free right" porkchop islands. **Long Term:** As part of the Kagy Boulevard improvements, a pedestrian tunnel will be constructed providing beneficial pedestrian and bicycle improvements to the Kagy Boulevard/ Willson Avenue / South 3rd Avenue intersection, as well as serving the existing and future Gallagator Trail. The crossing should serve the intersection and the trail alignment, and should be approximately 75 feet back from the existing pedestrian crossing.	$35,000	Part of road project
SPOT-9	RRFB	W. College St and S. 13th Ave	School crossing for students living in family housing to go to Irving School. Two options. **Option 1:** RRFB at W. College Street and S. 13th Avenue. **Option 2:** Install a protected intersection or roundabout.	$12,000	$16,000
SPOT-10	RRFB	W. College St and S. 15th Ave	Provide crosswalk and RRFB based crossing for trail/sidewalk connection.	$12,000	$16,000

TMP ID	Project Type	Location	Comments	Cost (Low)	Cost (High)
SPOT-11	Pedestrian Hybrid Beacon	W. Lamme St and N. 7th Ave	This project supports the formalization of a bicycle boulevard along Lamme Street. Lamme Street is an existing high bicycle and pedestrian use street. This crossing point at North 7th Avenue is currently difficult and limits the east-west potential of the route. With the 4-lane cross section with no median, a rapid flashing beacon would not be visible enough with the two approach lanes in each direction. A Pedestrian Hybrid Beacon is recommended with a bulb-out on the NE and SW corners for bicyclists to enter and use the pedestrian signal.	$50,000	$75,000
SPOT-12	Beacon Improvement	W. Oak St and Hunters Way	Two options; **Option 1:** Pedestrian Hybrid Beacon to serve shared use path crossings. **Option 2:** RRFB with median extension to create refuge area and allow for two beacons facing each direction.	$20,000	$70,000
SPOT-13	RRFB	Durston Rd and Hunters Way (east of intersection)	Add median refuge and install RRFB. This will be more direct than diverting to Hunters Way where there is significantly more traffic. The mid-block location will also simplify crossings as there will be no turning conflicts or turn lanes to interact with.	$22,000	$26,000
SPOT-14	RRFB	W. Babcock St and Hunters Way	Two location options for RRFB. **Option 1:** Hunters Way has more traffic. No refuge can be provided due to narrow cross-section and the need to accommodate eastbound lefts. **Option 2:** The crossing could also be moved 120 feet to the west and improved with a median refuge to isolate trail crossings from the intersection.	$22,000	$26,000
SPOT-15	Crosswalk	W. Babcock St and Hanley Ave	With warning signage.	$3,000	$5,000
SPOT-16	Curb Extensions	W. Lincoln St and S. Willson Ave	Install curb extensions at Gallagator Trail crossing. This crossing will become more heavily used when Kagy Boulevard project is complete. RRFB could be a value added option, however yielding compliance on Willson Avenue is usually good.	$10,000	$15,000
SPOT-17	Intersection Improvement	Bridger Dr and Story Mill Rd	Improve bicycle and pedestrian crossing opportunity here. Rouse Avenue/Bridger Drive will ultimately become 3-lanes which will make this crossing more difficult. Suggest signal, roundabout or a pedestrian hybrid beacon.	$45,000	$90,000
SPOT-18	Realign Path Crossing	Huffine Lane and Harmon Stream Blvd	Re-route path crossing from current location to a location approximately 20 feet south. Utilize median for single lane crossing at a time. Vehicles can then interact with pathway users in a different decision process than merging into/out of traffic.	$18,000	$25,000
SPOT-19	RRFB	W. Kagy Blvd and S. Tracy Ave	Install RRFB to aid bicyclists and pedestrians crossing Kagy Boulevard at this point.	$15,000	$18,000
SPOT-20	RRFB	Carol Place and E. Kagy Blvd	Install RRFB at this location to aid bicyclists and pedestrians crossing Kagy Boulevard. Add bicycle specific buttons on Carol Place and Fairway Drive.	$15,000	$18,000
SPOT-21	RR Grade Crossing Improvement	N. Wallace Ave and Railroad	Extend sidewalks and widen paved surface to at least 34 feet over railroad tracks, with shared use path on the north side of the street.	$7,000	$10,000
SPOT-22	Intersection Improvements	S. 23rd Ave and W. Main St	Add a bike box on Babcock Street in the EB direction in front of the combination lane. This will help bicyclists position to use South 23rd Avenue to reach College Street. Perform traffic study on WB approach on South 23rd Avenue to verify right turn queuing requirements. If possible, significantly shorten right turn lane and add through bike lane to connect with Babcock Street. Add lead pedestrian interval when actuated.	$10,000	$15,000
SPOT-23	RRFB	E. Baxter Ln and Buckrake Ave	Install RRFB to assist shared use pathway users.	$12,000	$16,000

TMP ID	Project Type	Location	Comments	Cost (Low)	Cost (High)
SPOT-24	RRFB	E. Baxter Ln and Flanders Mill Rd	Install RRFB to assist shared use pathway users.	$12,000	$16,000
SPOT-25	RRFB	Cascade St and N. Ferguson Ave	New crosswalk and RRFB with bicycle push buttons in addition to pedestrian features.	$17,000	$25,000
SPOT-26	Intersection Improvements	W. Main St and S. 8th Ave	Provide leading pedestrian interval to get pedestrians in crosswalks before vehicles are given green lights. Add shared lane markings in left and right turn lanes in the northbound direction. Add a gore separator between left and right only lanes. Main Street does not currently have receiving bicycle lanes, so bikes should be in the travel lane or use crosswalk.	$1,500	$5,000
SPOT-27	Intersection Improvement	S. 8th Ave and W. College St	South 8th Avenue approaches at College Street are confusing for bikes and drivers. Three options; **Option 1:** Create right turn lane that is shared with the bike lane (this will potentially reduce pedestrian safety). **Option 2:** Mark bike lanes up to intersection and gore out the parking area. **Option 3:** Install bulb-outs to be retrofitted with any roadway/streetscape work on College Street.	$1,500	$4,000
SPOT-28	Trail Crossing	Breeze Ln and Buckrake Ave	Install curb cuts/warning signage.	$8,000	$10,000
SPOT-29	RRFB	N. 25th Ave and Durston Rd	Add RRFB to existing crossing.	$5,000	$7,000
SPOT-30	Pedestrian Hybrid Beacon	W. Main St and S. 3rd Ave	Pedestrian activated 3-lens beacon. Only activates when pedestrian calls it. Could be coordinated with existing signal progression along Main Street.	$50,000	$75,000
SPOT-31	Ped crossing improvement	Ellis St and Highland Blvd	Important to hospital staff, residents, and all season trail users including skiers. Could be grade separated or a roundabout.	$150,000	$250,000
SPOT-32	Trail Underpass	Trail and Curtis St	Need improved pedestrian crossing in conjunction with new development at Curtis Street or in association with trails. Crossing should be underpass, which should be somewhat straight forward with existing grading on west side. On east side the city of Bozeman owns the land and significant excavation may be needed.	$80,000	$150,000
SPOT-33	Trail Underpass	Trail west of Kagy Blvd and Painted Hills Rd	Replace at-grade crossing with underpass where grading is favorable.	$60,000	$100,000
SPOT-34	Trail Underpass	Kagy Blvd and Painted Hills Trail	Replace at-grade crossing with underpass where grading is favorable.	$60,000	$100,000
SPOT-35	RRFB	Westridge Dr and S. 3rd Ave	Add pedestrian crossing and RRFB.	$12,000	$16,000
SPOT-36	RRFB	W. Arnold St and S. 3rd Ave	Upgrade crossing to include RRFB.	$5,000	$7,000
SPOT-37	RRFB	W. Oak St and Trail	Design with widening of Oak Street. Should have a RRFB and median.	$20,000	$30,000
SPOT-38	Bike/Ped Overpass	I-90	Visionary project, but would provide more direct access for Valley West residents to Bridger Drive trails.	$2,500,000	$4,000,000
SPOT-39	Grade separated crossing	Huffine Ln and Fowler Ave	Could be over or underpass connecting Fowler Avenue trails and MSU to Huffine Lane Trail. Engineering study needed.	$200,000	$400,000

TMP ID	Project Type	Location	Comments	Cost (Low)	Cost (High)
SPOT-40	Signal or grade separation	W. Stevens St and N. 19th Ave or W. Stevens St and N. 22nd Ave	Conceptual project depends on ability to create east-west bicycle boulevard. One option would be at W. Stevens Street and N. 19th Avenue. An alternative option would be at W. Stevens Street and N. 22nd Avenue.	$60,000	$250,000
SPOT-41	Remove crosswalk	E. Main St and Cypress St	Existing pedestrian crossing has no control and is on the hill into downtown where traffic is decelerating from 40 mph. New signal at Broadway offers nearby controlled crossing. Warrants would not likely support a signalized crossing at this location.	$1,500	$2,500
SPOT-42	RRFB	Peach St and Black Ave	Add a pedestrian crossing and RRFB.	$12,000	$16,000
SPOT-43	RRFB	N 7th Ave and Villard St	Add a pedestrian crossing and RRFB.	$20,000	$30,000
SPOT-44	RRFB	Cattail St and Davis Ln	Add a pedestrian crossing and RRFB.	$12,000	$16,000

4.3.4. General Intersection Improvements

This section provides general recommendations for pedestrian oriented improvements that can be implemented throughout Bozeman as projects are implemented. These recommendations represent national best practices and may be applied as opportunities are provided.

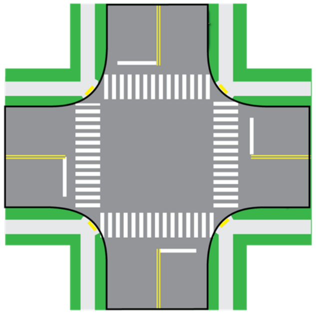
Leading Pedestrian Intervals

A leading pedestrian interval (LPI) is a phase setting for signalized intersections with pedestrian signals. It involves pedestrians being given a walk signal to cross the intersection several seconds in advance of parallel vehicle traffic. This allows pedestrians to begin crossing with a physical head start, which can greatly increase the visibility of pedestrians and reinforce that turning motor vehicles are required to yield to pedestrians in the crosswalk. The LPI may be an actuated setting where the lead interval is only introduced when a push-button is activated. Having several seconds dedicated to a LPI may mean that there is a corresponding reduction in time in a traffic signal cycle available for motor vehicle travel. Since the pedestrian lead interval is relatively short (generally 3 – 5 seconds) the impacts are usually minimal.

Crosswalk Placement and Corner Radii

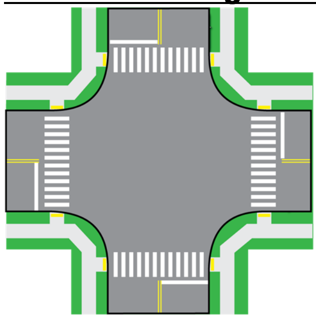
Children are less mentally and physically developed than adults, and often have limited peripheral vision and less ability to judge speed and distance, locate sounds and comprehend street signs. They lack familiarity with traffic, and may act impulsively or unpredictably. Older adults often exhibit degrading sensory or physical capabilities. This can lead to loss of vision and hearing, the ability to react quickly, and the strength to walk otherwise normal distances between places. Similar to designing walking facilities for users with disabilities, similar consideration should be given to young and elderly users. Larger corner radii accommodates heavy vehicles turning while keeping them inside their designated lane. This practice often results in wide sweeping corners that allow smaller vehicles to turn at higher speeds. Additionally crosswalks are typically longer resulting in longer crossing distances, increased pedestrian clearance times and greater exposure to moving vehicles. Several strategies can be employed to mitigate this issue.

Reduce Corner Radii



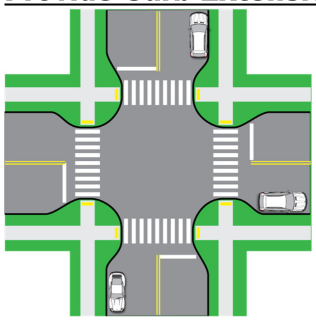
Design engineers should consider the effective turning radius of vehicles to provide for turning while reducing the physical radius of the corner. For example, the presence of a parking lane and/or bike lane allow for a tight corner radius while still providing a larger effective radius for turning vehicles.

Locate Crossings at Narrowest Point

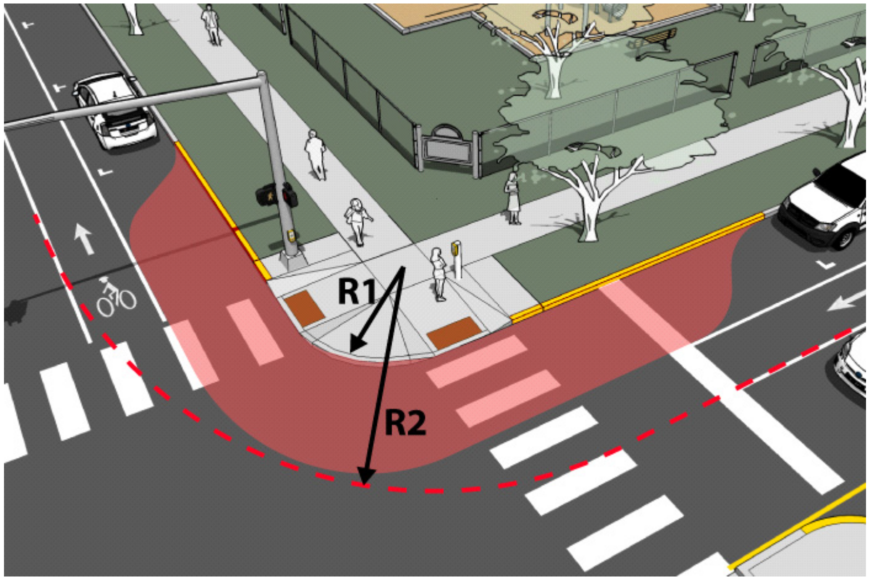


If the corner radius can't be narrowed significantly, placing the crosswalks with directional pedestrian ramps at the curve tangent minimizes crossing distance and exposure while affording vehicles greater visibility of pedestrians while turning due to the angle of the vehicle when it encounters the crosswalk while turning.

Provide Curb Extensions



Curb extensions (also known as bulb-outs) utilize the parking setbacks (if a parking lane is present) to make pedestrians more visible when crossing streets and to shorten crossing distance. Bozeman has a number of successful curb extensions and this treatment should be considered as a key component to any future project.



Where R1 is the actual corner radius and R2 is the effective corner radius. Curb extensions are also possible in otherwise unused intersection space.

Downtown Pedestrian Recommendations

Downtown Bozeman is a key activity center for residents and visitors. Significant public comment was received during this planning process about perceived pedestrian safety issues. Mendenhall and Babcock Streets currently do not have traffic control with the exception of Willson Avenue. As a result this busy area has marked crosswalks that rely on motorist yielding. Parked vehicles often make pedestrian visibility difficult and the two travel lanes create a 'double threat' where a yielding vehicle could block the view of a vehicle in the adjacent lane of the pedestrian in the crosswalk. Curb extensions should be a component of any new property development project where the street is being changed or reconstructed. The City should continue to work with the Downtown Bozeman Partnership to identify key intersections with the poorest pedestrian visibility. South Bozeman Avenue and East Babcock Street is a priority intersection.

Sidewalk Program

Sidewalk replacement and expansion is an issue that is important in every Montana city. Currently the city of Bozeman notifies property owners of issues and requires that they repair or replace deficient sidewalk within 30 days. Equitably balancing property owner responsibility with the overall public benefit of sidewalks in a way that can accelerate sidewalk maintenance and expansion should be a primary goal of a community's sidewalk program. The City's current ADA ramp upgrade program is a good example of proactive incremental progress and could be a key component of an overall sidewalk program.

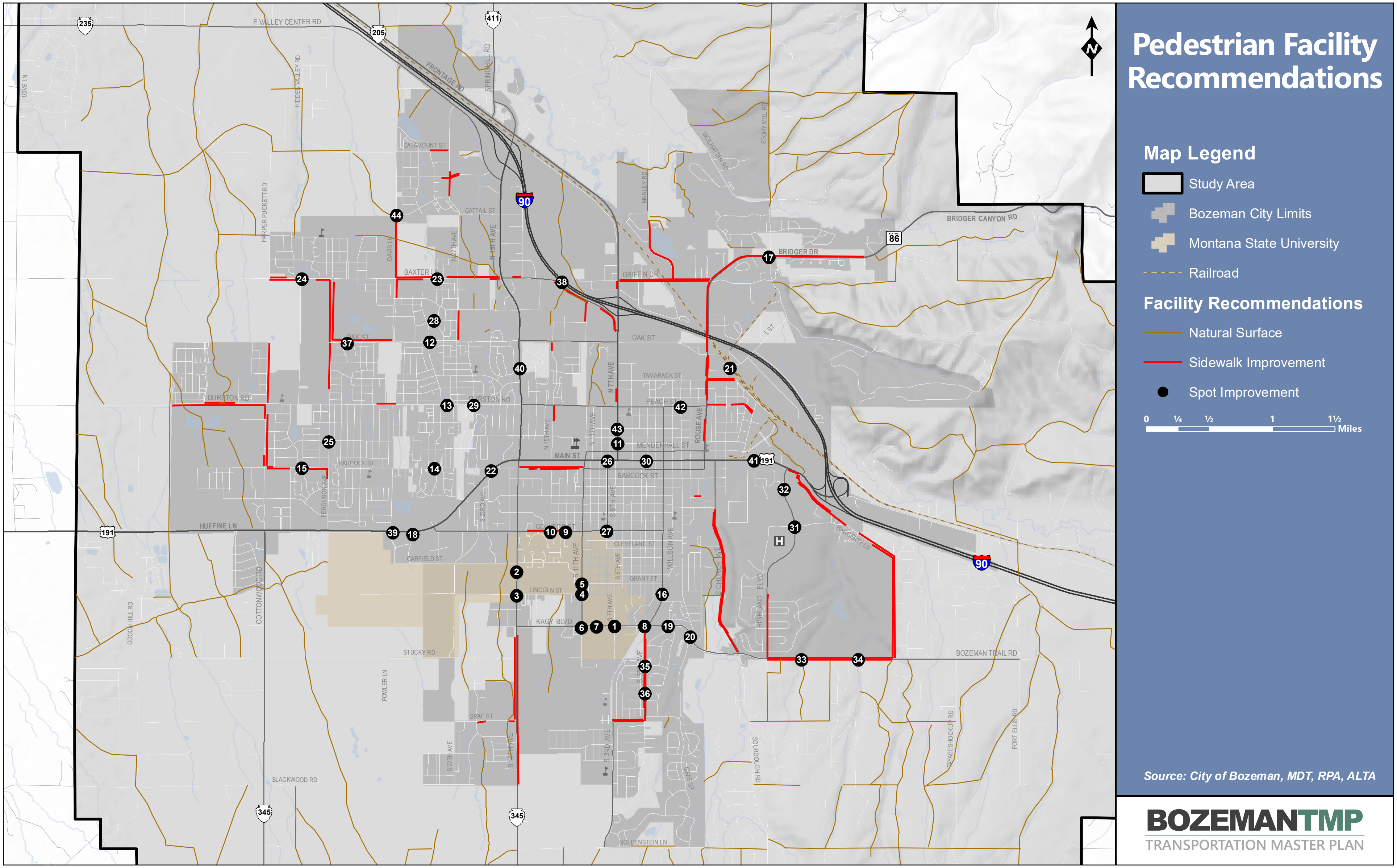


Figure 4.3: Pedestrian Facility Recommendations

4.4. BICYCLE IMPROVEMENTS

Some non-motorized improvements will be completed as part of committed or future MSN or TSM projects. Others will be completed as a component of future site development for residential or commercial purposes. A subset of bikeway projects will need dedicated funding to be realized. Where applicable, recommended bikeways are incorporated into the MSN and TSM project descriptions described earlier, with more detail provided in **Appendix H**.

The majority of the recommendations for distinct bikeway projects (which will not be implemented as part of a MSN, TSM or development project) provide more detailed guidance including roadway cross-sections and various options where multiple roadway configurations may exist. For example streets with excess road space could be configured in a number of ways including a wide bike lane, a buffered bike lane or even a separated bike lane. Some recommendations, however, are more conceptual and additional coordination and study will be needed for implementation. All recommendations are subject to change and refinement as site conditions and development patterns change and as other adjacent or intersecting projects are implemented. Some projects may require feasibility studies to verify routing or applicability.

Figure 4.4 summarizes the existing study area mileage and the proposed additional mileage if all recommended projects are completed.

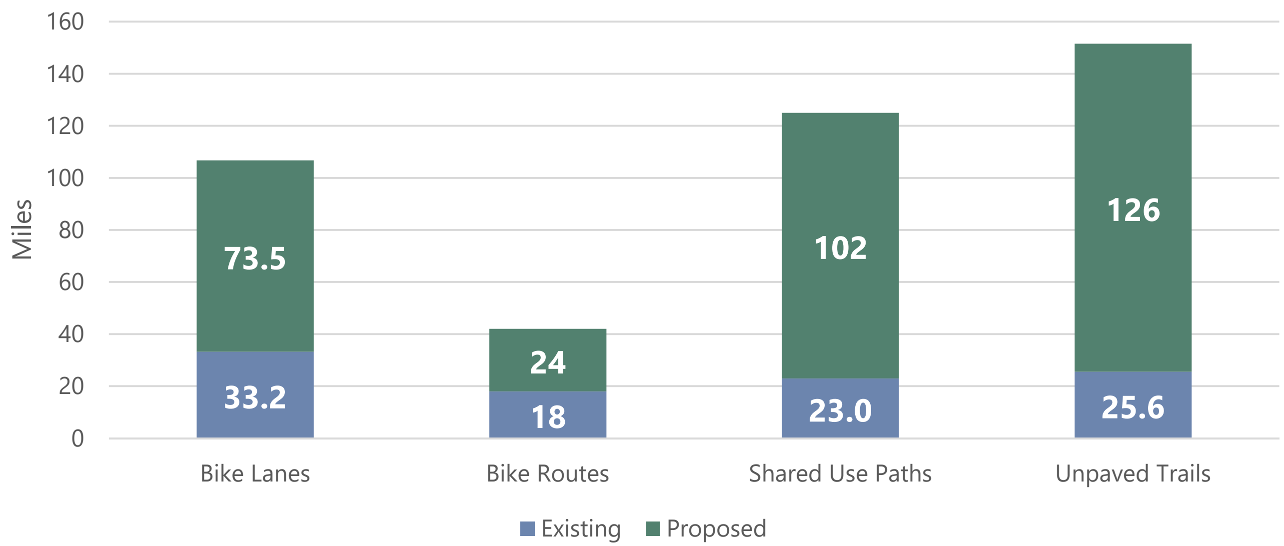


Figure 4.4: Mileage of Existing and Proposed Active Transportation Facilities within the Study Area

4.4.1. Overview

Bozeman's bicycle transportation mode share is nearly 10 times the national average. This figure is averaged throughout the year and peak bicycle use in the spring, summer and early fall is higher still. Bicycle commuting is, however, not evenly distributed throughout the City, despite distances being comparable in the south, north and west quadrants. The on and off-street recommendations outlined in this Plan are intended to, over time, create a balanced bicycle transportation network for all ages and abilities that includes convenient and comfortable routes connecting residents to destinations. The recommended Bozeman bikeway network includes:

- Bicycle boulevards (and other streets with shared lane markings)
- Bike lanes
- Buffered bike lanes
- Separated (also known as protected) bike lanes
- Shared use path projects (and connections to natural surface trails)
- Spot improvements including crossings (signalization, markings, ramps, etc.)

Figure 4.5 depicts the recommended bicycle network improvements. Types of projects shown on the figure include stand-alone bicycle improvement projects, bicycle projects that are components of the previously defined MSN or TSM projects, shared use path segments depicted in the *PROST Plan*[10], and other unique bicycle improvement projects from the City's CIP and/or other committed project lists. Those stand-alone bicycle improvement projects which are intended to be implemented as a distinct active transportation focused project are summarized in **Table 4.7**. The project numbering scheme does not represent or imply priority with respect to individual projects.

Table 4.7: Recommended Bicycle Improvement Projects

TMP ID	Street	Begin	End	Length (ft)	Comments	Cost (Low)	Cost (High)
Bike Lane							
BL-1	W. Grant St	S. 11th Ave	S. 6th Ave	1,707	Add bike lane signs and stencils every 200 feet, or after ped crossings and at far side of intersections. When road is resurfaced, add buffer to bike lane with the following cross-section. 5' bike lane, 2' buffer (double white line), 10' travel lane. Alternatively, bike lane could be 6' and vehicle lanes 11.	$3,000	$5,000
BL-2	W. Grant St	S. 6th Ave	S. Willson Ave	1,669	Extend existing bike lanes from MSU campus to South Willson Avenue. Currently there is parking on the north side, however parking is prohibited on the south. Road is approximately 35 feet wide. **Option 1:** Parking remains on north side where the cross section should be made the same as Peach Street, with a combined bike/parking lane of 12 feet, and a 5' bike lane on the south side. **Option 2:** Prohibit parking on both sides. All homes have side street frontages and/or alley parking opportunities. Use 35 feet to provide buffered bike lanes on both sides. 6.5 ' bike lanes and 11' travel lanes.	$6,000	$8,000
BL-3	W. Garfield St	S. 19th Ave	S. 12th Ave	2,137	MSU Campus project. New signal in 2015 at South 19th Ave makes this even more important as a bike route into campus. Road is 34-35 feet wide. Short Term: **Option 1:** Preserve parking on one side of the street and configure street as an advisory bike lane. Advisory bike lanes have dashed bike lane lines which can be encroachable by vehicles if needed for passing. The cross section would include an 8' parking lane, 5-6' bike lanes and 18' foot driving area. **Option 2:** Utilize shared lane markings every 150 feet and at far sides of minor intersections and keep both parking lanes, however this is less desirable and provides less continuity. **Option 3:** Remove parking on both sides and provide full bike lanes on both sides. 11 foot travel lanes and 6.5 foot bike lanes. Long Term: Road is reconstructed to include bike lanes by design.	$4,000	$4,000
BL-4	S. 11th Ave	W. College St	W. Cleveland Ave	540	MSU Campus Project. For the section of bike lane between the roundabout and the southern parking access just south of Harrison Street, South 11th Avenue is approximately 45 feet wide. The bike lanes could be significantly wider here and be buffered to provide a more comfortable entrance to the MSU Campus. 7 foot bike lanes with 3 foot striped buffers should be added with 12.5 foot travel lanes in each direction.	$1,000	$2,000
BL-5	S. 11th Ave	W. Cleveland Ave	W. Grant St	1,469	MSU Campus Project. Add bike lane signs and stencils every 200 feet, or after ped crossings and at far side of intersections. Add 6 inch lane stripe.	$3,000	$3,000
BL-6	W. Grant Street	S. 12th Ave	S. 11th Ave	297	MSU Campus Project. This short section of Grant has no bike lanes. Bike lanes can be added with lane striping, stenciling and signage.	$1,000	$1,000

TMP ID	Street	Begin	End	Length (ft)	Comments	Cost (Low)	Cost (High)
BL-7	W. Lincoln St	S. 19th Ave	S. 11th Ave	2,722	MSU Campus Project. Between South 19th Avenue and South 11th Avenue. The eastern section of West Lincoln Street has curb and gutter and is approximately 37 feet wide. There is a short-term parking lane on south side of road by businesses. Each of these businesses have off-street parking, some of which is underused in large lots with little parking delineation. Short Term: **Option 1:** Restrict parking and provide 6.5 foot bike lanes and 12 foot travel lanes. Alternate design to improve bicycling further would be a 5 foot bike lane, 3 foot buffer and 10.5 foot travel lanes. If parking cannot be removed it should be reduced to 7 feet in width, with 5 foot bike lanes and 10 foot travel lanes. It is generally undesirable to have on-street parking on collector roadways. The western segment is currently more primitive. **Option 2:** Re-stripe roadway to include 5' minimum bike lanes, this may result in 10 to 11 foot travel lanes depending on location. The current shoulder is 4 feet or narrower. Mid-Term: reconstruct with curb, gutter and sidewalk to accommodate 6 foot minimum bike lanes, 7' preferred.	$5,000	$7,000
BL-8	W. Garfield St	S. 12th Ave	S. 11th Ave	572	MSU Campus Project. Long Term: If West Garfield Street is ever extended to South 11th Avenue, bike lanes should be incorporated into the design.	N/A	N/A
BL-9	W. College St	S. 11th Ave	S. 8th Ave	899	The section of West College Street between South 11th Avenue and South 8th Avenue is generally regarded as a poor facility and experience by all road users. The corridor could benefit from some short term improvements, however a full reconstruction is desired due to poor sidewalks, driveway ramps and pavement quality. Short Term: Eliminate parking on the north side of the street. This side hosts the bulk of the driveways and due to sight distance restrictions does not host a large number of parking spaces. It is estimated that 8 parking spaces currently exist on the north side, several of which would probably not meet current standards for setbacks from side streets. With removal of parking 40 feet exists. Recommend an 8 foot parking lane on the south side, with a 6 foot bike lane next to it. The north side should have a 5 foot bike lane and the travel lanes will be 10.5 feet wide. Long Term: Full road reconstruction which would hopefully expand the roadway slightly to the south to achieve wider lanes, better detached sidewalks, pedestrian ramps, crosswalks, landscaping and driveways.	$3,000	$5,000

TMP ID	Street	Begin	End	Length (ft)	Comments	Cost (Low)	Cost (High)
BL-10	W. College St	S. 19th Ave	S.11th Ave	2,009	This is the last part of College Street west of South 11th Avenue that will not have been reconstructed. The roadway has no curb and gutter and has sub-standard shoulders. There is approximately 32 feet of asphalt. Short Term: The shoulders should be restriped as designated 5' bike lanes with 11 foot travel lanes. Remove parking on the south side of the street on the approach to the roundabout. This parking is not permitted by MSU and currently is highly desired as there is no fee restriction causing many vehicles to drive by to look for free spaces. Approximately 12 spaces exist on the south side of College Street. Long Term: buffered bike lanes should be incorporated into the roadway design if possible when and if the street is ever reconstructed. Parking should be prohibited except for in front of the residences on the north side of the street between South 13th Avenue and South 12th Avenue.	$4,000	$6,000
BL-11	W. Garfield St	Fowler Ave	S. 19th Ave	5,116	On this roadway, a "bike lane only" currently is designated on the north side of the street. This is due to the road being constructed by the development to the north, with the future expectation that any development on the south side by MSU would provide curb/gutter sidewalk and additional width. There is currently space to stripe the bike lane in both directions while still allowing for future improvements which may still be many years away. Short Term: There is 40 feet of pavement which should in the center section (no turn lanes) be 5 foot bike lanes with 3 foot buffers and 11 foot travel lanes. Where turn lanes exist, use 10 foot lanes to maintain a 5 foot bike lane on both sides of the street. Long Term: Build to standards set forth in the Bozeman TMP.	$13,000	$20,000
BL-12	E. Tamarack St	N. 7th Ave	N. Rouse Ave	3,720	Street is currently 36 feet wide with parking prohibited on the north. The street is narrow, however Peach Street has the same width and was successfully retrofitted with bike lanes.	$7,000	$8,000
BL-13	E. College St	S. 8th Ave	S. Black Ave	3,161	Street is too narrow for conventional bike lanes. Project involves creating an "advisory bike lane" by removing the roadway centerline and striping 5 foot dashed bike lanes. The center line would be removed leaving an approximate 18 foot center two-way driving lane. Vehicles may encroach into an empty bike lane if needed. Passenger vehicles should be able to pass each other without encroaching into the advisory lane.	$16,000	$19,000
BL-14	W. Griffin Dr	I-90 Frontage Rd	N. Rouse Ave	3,899	Approximate 5 foot shoulders currently exist. Short Term: This project involves marking and signing a bike lane along Griffin Drive in the short term. Long Term: if the street is improved, bike lanes should be improved and included in the design.	$10,000	N/A
BL-15	N. 7th Ave	W. Oak St	E. Beall St	3,984	Convert parking lanes to buffered bike lanes. Parking is underutilized. Coordination may be necessary near Oak Street and the hotel/Santa Fe Reds area.	$7,000	$11,000

TMP ID	Street	Begin	End	Length (ft)	Comments	Cost (Low)	Cost (High)
BL-16	N. 7th Ave	Red Wing Dr	W. Oak St	4,193	I-90 overpass was designed for bike lanes, but never had them marked or signed. This project completes the bike lanes, adds dotted lane line extensions across the I-90 ramps, and signs/marks bike lane on North 7th Avenue north of the interchange.	$7,000	$8,000
BL-17	N. 19th Ave	E. Valley Center Rd	Durston Rd	9,584	8 foot minimum shoulders already exist. This project involves adding bicycle lane stencils and signage. Future additions include adding through bike lanes where right only lanes exist at intersections. This project is similar to other MDT highways of similar land use in Missoula and Kalispell.	$17,000	$17,000
BL-18	W. Babcock St	W. Main St	S. 19th Ave	827	Would require parking removal. Parking is not necessary on this street due to large off-street lots for existing and future businesses. This project should be implemented along with any future rebuild of West Babcock Street from South 19th Avenue to South 11th Avenue.	$2,000	$3,000
BL-19	Graf St	S. 27th Ave	S. 19th Ave	2,567	Current road section has intermittent parking lanes and turn lanes causing the bike lane to deflect multiple times. There is no reason for on-street parking along Graf Street. Restripe bike lane to have buffers where no turn lane exists. This will enhance comfort and simplify the street.	$3,000	$7,000
BL-20	S. 11th Ave	W. Main Street	W. College St	2,931	South 11th Avenue is proportioned as a local street, however it is classified as a minor arterial. This is a popular biking and walking route to reach MSU and it carries considerable traffic volumes. South 11th Avenue is approximately 34 feet in width. This project prohibits parking along South 11th Avenue and establishes bike lanes 6 foot minimum. If 10 foot travel lanes are acceptable 5 foot bike lanes with 2 foot buffers are possible. This project will improve sight lines for pedestrians and reduce crashes, including collisions with parked vehicles. This project can be striped and signed at any time, or it can be done in conjunction with pavement preservation.	$5,000	$8,000
BL-21	E. Babcock St	S. Grand Ave	S. Wallace Ave	2,964	Short term: provide shared lane markings in both travel lanes. Mid-term: remove northern parking lane and provide a separated two-way bike lane (cycle track) on the north side of the street. This side generally has less existing parking and better aligns with best practice. This route will be the primary bicycle east-west connector through downtown. Maintain two lanes of one-way travel.	$53,000	$282,000
					Bicycle Boulevard		
BB-1	Grand Ave	W. Tamarack St	S. 3rd Ave	10,331	Pavement quality poor from College Street to Babcock Street. Has bike route signs, needs shared lane markings and improved wayfinding.	$34,000	N/A
BB-2	Black Ave	W. Tamarack St	Private St	12,624	Creates a longer north south route using the Gallagator Trail and Sourdough Trail. Currently has shared lane markings and some signage.	$42,000	N/A
BB-3	Lamme St	N. 11th Ave	N. Broadway Ave	7,331	Already has shared lane markings and bike route signs. Needs some intersection treatments (see SPOT-11) and improved wayfinding.	$25,000	N/A

TMP ID	Street	Begin	End	Length (ft)	Comments	Cost (Low)	Cost (High)
BB-4	S. 15th Ave	Durston Rd	Goldstein Ln	18,654	Connection would provide critical north-south route west of 11th Avenue. Future improvements would need to allow bike/ped access from Babcock Street to Main Street. On south side, will connect to trails that have neighborhood connections. Will need coordination with Kagy Boulevard project design.	$62,000	N/A
BB-5	Koch St	S. 23rd Ave	S. Church Ave	10,092	Sharrows and bike route signs are present. The signal at South 19th Avenue makes this an important connection for bicyclists and pedestrians. Volumes have been recorded higher than desired just east of South 19th Avenue at 3,700 vehicles per day.	$34,000	N/A
BB-6	Annie St		Stoneridge Dr	18,535	Still has some gaps, however as streets continue to develop, this route will be an important east-west corridor in Valley West. Volumes should be monitored. Some signage may exist, requires improved signage, wayfinding, shared lane markings and minor intersection treatments.	$61,000	N/A
BB-7	Beal St	N. 25th Ave	N. 11th Ave	5,048	Interrupted at Bozeman High School, however extents the Lamme Street Bicycle Boulevard. The signal at North 19th Avenue is the key element. Requires shared lane markings, and wayfinding signage. Work with High School to formalize a signed route through campus. Many residents currently use this route now.	$17,000	N/A
BB-8	N. 25th Ave	W. Oak St	W. Babcock St	5,410	Connects Babcock Street to Oak Street; also links Emily Dickinson School and takes advantage of improved crossing at Durston Road. Will require shared lane markings and wayfinding signage.	$18,000	N/A
BB-9	Cascade / Mendenhall	Cottonwood Rd	N. 25th Ave	9,405	This could be one of the most important east-west routes as it ultimately feeds into downtown and avoids the busiest of North 19th Avenue for a crossing. At Valley Drive, there is a Gallatin County inholding, which has two existing street rights of way that do not currently connect (Bitterroot Way and Mendenhall St). If streets are not likely to extend, short shared use paths could make the connection through the street easements.	$31,000	N/A
BB-10	Yellowstone Ave	W. Oak St	Valley Commons Dr	7,733	North / south on-street bikeway to complement trail access.	$26,000	N/A
BB-11	Broadway / Peach / Tamarack	N. Rouse Ave	E. Main St	5,123	Provides alternative north-south travel to Wallace, which has more vehicle traffic. Also lines up with new signal at Broadway and Main, including a future shared-use path connector to the Gallagator Trail. This will be the primary route for users to connect from the Story Mill Spur to the Gallagator Trail.	$17,000	N/A
BB-12	Garfield St	S. 6th Ave	S. Black Ave	2,507	Connects MSU Centennial Mall and Garfield Street route to the west with the Gallagator Trail. Requires signing and striping only.	$9,000	N/A
BB-13	N. 20th Ave	N. 22nd Ave	W. Main St	3,520	Provides alternative route to North 19th Avenue through constrained corridor. Shared use path along West Main Street needed to connect to West Babcock Street.	$12,000	N/A

TMP ID	Street	Begin	End	Length (ft)	Comments	Cost (Low)	Cost (High)
BB-14	Juniper St / Stevens St / Windsor St	Annie St	W. Tamarack St	5,764	Conceptual bicycle boulevard corridor that could be a very important east/west connector. Would require the opportunity to connect Juniper Street with Stevens Street which is unlikely in the short term. Also would require development of vacant land west of North 7th Avenue and a crossing improvement or grade separated crossing of North 19th Avenue.	$19,000	N/A
				Shared Roadway			
SR-1	S. 12th Ave	W. Garfield St	W. Grant St	974	Short term: Add shared lane markings and bicycle route signage. Mid-term: Street is constructed as a plaza shared street or if reconstructed to a street standard, provide full buffered bike lane.	$1,000	$4,000
SR-2	W. Harrison St	S. 11th Ave	S. 8th Ave	1,006	The presence of angled parking, residence halls, and this street being a gap between bike lanes on South 11th Avenue and South 8th Avenue indicates a need to install shared lane markings. Recommend every 100 feet due to the intensity of use.	$1,000	$4,000
SR-3	W. Babcock St	S. 11th Ave	S. Grand Ave	2,982	Requires sharrows to provide eastbound bicycle treatment to match Mendenhall Street.	$3,000	$10,000
SR-4	S. 8th Ave	W. Harrison St	W. Cleveland Ave	348	Median was constructed too narrow to allow for full bike lanes. Shared lane markings should be installed, or 5-foot bike lane and 10’ travel lane could also be implemented, to provide route continuity.	$1,000	$2,000
				Shared Use Path			
SP-1	S. 7th Ave	W. Kagy Blvd	Westridge Cut Through	1,634	MSU Campus Project. This section of South 7th Avenue is a key linkage for neighborhoods to the south utilizing the Gallagator Trail to access campus. Currently there is no sidewalk or bicycle facilities. A 10' shared use path on the east side of South 7th Avenue would align with the trail connection. The RRFB or underpass at Kagy Boulevard may influence the location of the path to the east.	$148,000	$156,000
SP-2	Campus Shared Use Path	S. 7th Ave	W. Kagy Ave	1,355	MSU Campus Project. Would provide a shortcut to people accessing campus from Kagy Boulevard.	$109,000	$129,000
SP-3	S. 7th Ave	W. Grant St	W. Kagy Ave	1,697	MSU Campus Project. 14' wide shared use pathway with grade separated crossing at Kagy Boulevard. Connect to Gallagator Trail south of Museum of Rockies. The east side currently has fewer driveway openings and vehicular conflicts and should continue to be so even after the addition of the parking garage. Shared use paths are desirable on both sides of the street.	$153,000	$162,000

TMP ID	Street	Begin	End	Length (ft)	Comments	Cost (Low)	Cost (High)
SP-4	Gallagator Extension	W. Kagy Blvd	Gallagator Trail	1,437	This is a crucial missing link for the Bozeman trail system, creating a sizeable gap in the Gallagator Trail. The former rail bed is on Museum of the Rockies property. Efforts by the city and other groups have been unsuccessful due to concerns with the living history display. This can be effectively mitigated though design. This particular segment may not have a significant role in campus transportation, however its importance is still significant. This is estimated to be a longer term project coordinated with redevelopment of the Museum.	$115,000	$137,000
SP-5	Campus Shared Use Path	W. College St	S. 12th Ave	1,631	MSU Campus Project. As proposed in the *Long Range Campus Development Plan (LRCDP)*	$131,000	$155,000
SP-6	S. 19th Ave	Region 3 HQ's	W Kagy Blvd	1,844	Reconstruct existing sidewalk to shared use path width to extend existing shared use path.	$166,000	$176,000
SP-7	Lincoln St	S. 19th Ave	S. 11th Ave	2,649	MSU Campus Project. 12-14' Shared Use Pathway to connect South 19th Ave and also the F-lot where some vehicle commuters in this remote lot would benefit from a better route to campus.	$239,000	$252,000
SP-8	S. 11th Ave	W. Grant St	W. Kagy Blvd	1,704	MSU Campus Project. Widen sidewalk to 10'-12' shared use path standard. Provide bike lane transitions at Lincoln Street and Kagy Boulevard.	$154,000	$162,000
SP-9	S. 8th Ave	W. Harrison St	W. Cleveland St	336	Widen sidewalk on west side to shared use path standard, or construct new pathway parallel to it in conjunction with new building development. Provide bike lane transitions at West Harrison Street.	$31,000	$32,000
SP-10	Westside Greenway	Trout Meadows Rd	Huffine Ln	19,487	This project would improve existing segments of trail, re-routes and new segments to create a continuous 10-foot minimum paved north-south shared use path. This path would be plowed in the winter and make bicycle use for transportation more feasible for a larger number of Valley West residents. The route depicted is conceptual where no existing path is present.	$1,559,000	$1,852,000
SP-11	Gallagator Trail	S Church Ave	Goldenstein Ln	16,026	This project seeks to pave the unpaved portions of the Gallagator Trail. Advantages would include winter maintenance and a more reliable experience year-round.	$1,283,000	$1,523,000
SP-12	Story Mill Spur	Bridge Dr	"L" St	5,292	This project would pave the Story Mill Spur, develop the trail over the existing rail bed, abandoned bridges, etc. Maintain unpaved trail for runners or others that prefer soft surface. This shared use path will connect with the M-Trail and the Oak Street shared use path.	$424,000	$636,000
SP-13	Oak St Extension	N. Rouse Ave	"L" St	1,270	Utilizing City right-of-way, connect the Oak Street and Story Mill Spur shared use paths.	$127,000	$188,000
SP-14	Oak St Extension	N. 12th Ave	N. 7th Ave	2,392	Connects existing sections of shared use path and replaces some existing sidewalk.	$216,000	$228,000
SP-15	N. 11th Ave	N. 11th Ave	W. Oak St	1,025	As called for in the *PROST Plan*. Parts of alignment have been implemented.	$82,000	$123,000

TMP ID	Street	Begin	End	Length (ft)	Comments	Cost (Low)	Cost (High)
SP-16	Tschache Ln	Davis Ln	N. 27th Ave	2,721	Improve east-west connection and legibility. Ideally a wide shared use path would be continued to the west linking other north-south facilities.	$245,000	$259,000
SP-17	Story Hill Rail Trail	Story Mill Spur	N. Broadway Ave	8,990	Project would involve property acquisition and the restoration of several significant bridge structures, but would create a continuous trail connection from south Bozeman to the M trailhead with no on-street segments.	$830,000	$875,000
SP-18	Huffine Ln	Willow Peak Dr	Cottonwood Rd	7,863	Provide shared use path to Four Corners (mileage is to study area boundary only).	$630,000	$944,000
SP-19	Springhill Rd	Sypes Canyon Rd	I-90 Frontage Rd	7,884	Path linking Frontage Road with Sypes Canyon Road. Could also connect to conceptual path to Story Mill/Bridger Drive.	$631,000	$947,000
SP-20	Fowler Ave	W. Babcock St	Bozeman Ponds Park	809	Extend through the Bozeman Ponds Park to Babcock Street.	$65,000	$98,000
SP-21	Kimberwicke St	Harper Puckett Rd	Gallatin Green Blvd	3,197	As recommended in *PROST Plan*.	$256,000	$384,000
SP-22	Springhill to Story Mill Rd	Springhill Rd	Story Mill Rd	19,420	Conceptual project improves existing natural surface trails, utilizes *PROST Plan* recommendations and new proposed trail to create continuous route from Springhill Road to Story Mill Road. Alignment has high transportation and recreation potential.	$1,554,000	$2,331,000
SP-23	Gallagator Extension	Cambridge Dr	Goldenstein Ln	3,925	Extend Gallagator Trail to the south.	$314,000	$471,000
SP-24	Huffine Ln	Rowland Rd	Advance Dr	6,626	Provide shared use path to Four Corners.	$531,000	$796,000
SP-25	Abandoned RR alignment	Front St	L St	2,646	As proposed in *PROST Plan*, likely only if railroad area redevelops and there is no freight service.	$212,000	$318,000
SP-26	S. 19th Ave	W. Kagy Blvd	Nash Rd	19,898	As recommended in the *Bozeman Area Alternative Transportation Study* and *PROST Plan*. Full extents go to Hyalite Canyon Road.	$1,592,000	$2,388,000
SP-27	Valley Center Rd (west)	Catamount St	Catron St	494	Completes connection between exiting Valley Center Road paths and North 19th Avenue.	$40,000	$60,000
SP-28	Valley Center Rd (east)	Catron St	N. 19th Ave	428	Completes connection between exiting Valley Center Road paths and North 19th Avenue.	$35,000	$52,000
SP-29	Valley Center Rd (west)	Catron St	N. 19th Ave	290	Completes connection between exiting Valley Center Road paths and North 19th Avenue.	$24,000	$35,000
SP-30	S. 3rd Ave	Goldstein Ln	Nash Rd	10,566	Could extend Gallagator Trail to Nash Road, this was also proposed in the Bozeman Area Alternative Transportation Study.	$846,000	$1,268,000
SP-31	W. Main St	W. Babcock St	N. 20th Ave	617	12-foot wide sidewalk to facilitate connections between bikeways that provide alternatives to Main Street and North 19th Avenue.	$68,000	$68,000

TMP ID	Street	Begin	End	Length (ft)	Comments	Cost (Low)	Cost (High)
SP-32	Sidewalk	S. 23rd Ave	W. Babcock St	249	12-foot wide sidewalk to facilitate connections between bikeways that provide alternatives to West Main St and North 19th Avenue.	$28,000	$28,000
SP-33	Gallagator Connector	Gallagator Linear Trail	Golf Way	1,452	Formalizes a commuter route that is maintainable in the winter months.	$117,000	$175,000
SP-34	Frontage Road	I-90 WB on- & off-ramp	Study Area Boundary; ~2,750 ft west of Coulee Dr	26,400	Shared use path contained in the *PROST Plan*; has robust public support. Locate to the north of existing Frontage Road and east of North 7th Avenue. Only includes portion of path between Bozeman (I-90) and TMP study area boundary (~5 miles in length). Approximately 4 miles remaining from TMP study area boundary to downtown Belgrade.	$2,508,000	$2,904,000
SP-35	Lincoln St	S. Willson Ave	S. 7th Ave	1,930	Trail would use utility easement to connect Gallagator Trail to MSU. May require redevelopment of MSU property just east of South 7th Avenue.	$155,000	$184,000
SP-36	N. 5th Ave	W. Oak St	W. Tamarack St	1,692	To be developed within the North 5th Avenue right-of-way.	$136,000	$161,000
SP-37	N. 8th Ave	Just south of W. Birch St	W. Durston St	1,968	To be added into the North 8th Avenue right-of-way.	$158,000	$187,000
SP-38	W. Aspen St	N. 8th Ave	N. 7th Ave	372	To be added within the Aspen St right-of-way.	$30,000	$45,000
SP-39	E Valley Center Rd	Frontage Rd	E Valley Center Rd	670	Provide as part of any Bozeman to Belgrade Trail to connect To Valley Center Rd Shared Use Path.	$54,000	$64,000
SP-40	Vaquero Pkwy	Gallatin Green Blvd	Vaquero Pkwy	280	Provide to connect new multifamily housing to Chief Joseph Middle School	$23,000	$27,000

4.4.2. Downtown Bozeman Bicycle Recommendations

Downtown Bozeman is a challenging environment for the provision of dedicated bikeways. Main, Mendenhall, Babcock, Olive and Lamme Streets all act as the primary east-west corridors. While Lamme Street lends itself to a bicycle boulevard, Olive Street exhibits higher speed and volume. Mendenhall and Babcock are both one-way streets with minimal additional space for bike lanes other than absolute minimum parking lanes, travel lanes and bike lanes (this configuration was voted down by BABAB when Mendenhall Street was reconstructed in 2014). Main Street is incompatible with bike lanes in its current four-lane configuration. Additionally, even if Main Street were converted to a three-lane configuration, bike lanes would likely be feasible only in the door zone of short term vehicle parking. The cumulative effect of these facts results in the conclusion that providing dedicated space for bicycle travel in Downtown Bozeman is extremely difficult without creating additional space through parking removal. This plan does propose a two-way separated bikeway on the north side of Babcock Street from Grand Avenue to Wallace Avenue. For this stretch of Babcock Street, parking is currently restricted for a portion of the frontage due to sight restrictions with driveways and cross-streets. Parking removal would be a requirement for implementation of this project and this would require political support or timing with another source of new parking such as a second parking garage on the south side of Downtown.

An increased bicycle parking supply is recommended for Downtown. Both through the provision of at least two additional seasonal on-street parking corrals and for an increase in the number of racks placed in the furnishing zones of the Downtown Streets. Partnerships with existing and new businesses should be sought to locate additional parking in alleys or on private property for employee parking to preserve street parking for patrons. One car parking space can park the equivalent of 14 bicycles if configured properly.

An evaluation of reversing the one-way directional flow on Babcock and Mendenhall Streets was not completed as part of this TMP, nor was an evaluation of other downtown road configurations, such as single travel lanes with angled parking on Babcock and Mendenhall Streets, or converting Main Street from four to three lanes. This was intentional as directed by the Technical Working Group and City staff due to budget limitations. Additionally, the travel demand model available as part of this TMP effort is good for macroscopic analysis, but a detailed traffic analysis of the downtown would require much more in depth modelling than that available with the TMP.

4.4.3. Enhanced Bicycle Wayfinding System

GVLT has implemented a trail wayfinding system that includes over 600 signs. In 2005, the city of Bozeman installed on-street bicycle route signs that featured limited wayfinding elements such as 'Trails', 'Downtown', or 'MSU' as destinations. With the recommended bicycle boulevard system it is recommended that a comprehensive bicycle wayfinding system be created to upgrade and replace the existing bicycle route sign system. New signs should feature three destinations per sign, distance information and travel time. Signs could complement the existing 'City of Bozeman Bike Route' signs or be of a new enhanced design. Destinations should be identified, categorized and programmed onto a system of signs throughout the on-street network of bikeways.

4.4.4. Desirable Bike Lane Widths

The following table provides desirable bike lane widths based on facility posted speed limits. While these widths are generally considered desirable, specific local characteristics of each project will be considered during design.

Table 4.8: Desirable Bike Lane Widths

Posted Speed Limit	25 mph	30 mph	35 mph	40 mph	45 mph +
Bike Lane Width (no buffer)	6 ft	6.5 ft	--	--	--
Travel Lane Side Buffer (bike lane + minimum buffer)	--	--	5 ft + 2 ft	5 ft + 3 ft	6 ft + 3 ft

Supporting Considerations:
Streets with multiple travel lanes benefit more from the presence of buffers.
Consider 2-3 feet parking side buffer if on-street parking is high-turnover (2 hours or less).
Bike lanes may be marked at 4 feet if buffers on both sides are used.
Combined width of buffers and bike lane should not typically exceed 9 feet total as it could promote use of the space by motor vehicles.

4.4.5. Shared Use Path Maintenance

The vast majority of Bozeman's paved shared use paths have never been structurally maintained since construction. Maintenance activities can generally be categorized into one of two types; 'routine maintenance' which is done annually or more frequently, and 'major' or 'capital maintenance' which involves more intensive activity at a less than annual frequency. A robust routine maintenance program may include sweeping, trash removal, mowing, tree trimming, weed abatement, snow removal, restroom maintenance, and sign replacement. However, it should be noted that each segment of shared use path in Bozeman will have different needs and levels of expenditure due to its setting and amenities. It is estimated that for routine maintenance approximately $1,000 to $1,500 should be budgeted annually per mile of trail. Generally the City and GVLT have kept up adequate routine maintenance. Bozeman Parks and Recreation is now conducting snow removal on all of the City's paved shared use paths.

Capital Maintenance

Major or capital maintenance activities typically involve more intensive maintenance repairs such as pavement seal coating, pavement overlays, pavement reconstruction or other structural rehabilitations. Any paved trail surface will deteriorate over time with asphalt surfaces dropping in quality rapidly after 10 years. Preservation efforts such as seal coating extend the life of asphalt efficiently and at a lower cost than waiting for the surface to fail requiring expensive reconstruction. Maintenance activities vary considerably around the country and different approaches and pavement preservation intervals could be considered.

Financial planning for trail maintenance can be challenging to budget for. Typically trails require greater capital maintenance activities with age and ultimately require full reconstruction at some point. Some jurisdictions focus on eventual reconstruction and treat this as a maintenance item to be budgeted for, whereas some treat this as a separate capital project to be considered in the future.

Recent Jackson Hole Community Pathway maintenance costs have contracted seal coating of the pathways at approximately $9,000 per mile which averages (on a 5-year seal coat cycle) approximately $1,800 per year, per mile of path annually. This experience provides a valuable benchmark for Bozeman and if a similar program were to be budgeted the City would need to perform approximately $30,000 in shared use path surfacing annually, increasing over time as the system mileage increases.

Shared Use Path Surfacing

Due to the expensive burden of ongoing capital maintenance to asphalt paths, it is recommended that wherever possible Bozeman adopt a concrete surface standard for future shared use paths. Concrete does not require seal coats, or resurfacing of any kind and lasts considerably longer resulting in a lower life-cycle cost for the City. A new City standard detail should be created that incorporates expansion joints every 100 feet, with saw-cut intermediate joints every 10 feet for path smoothness and snow removal.

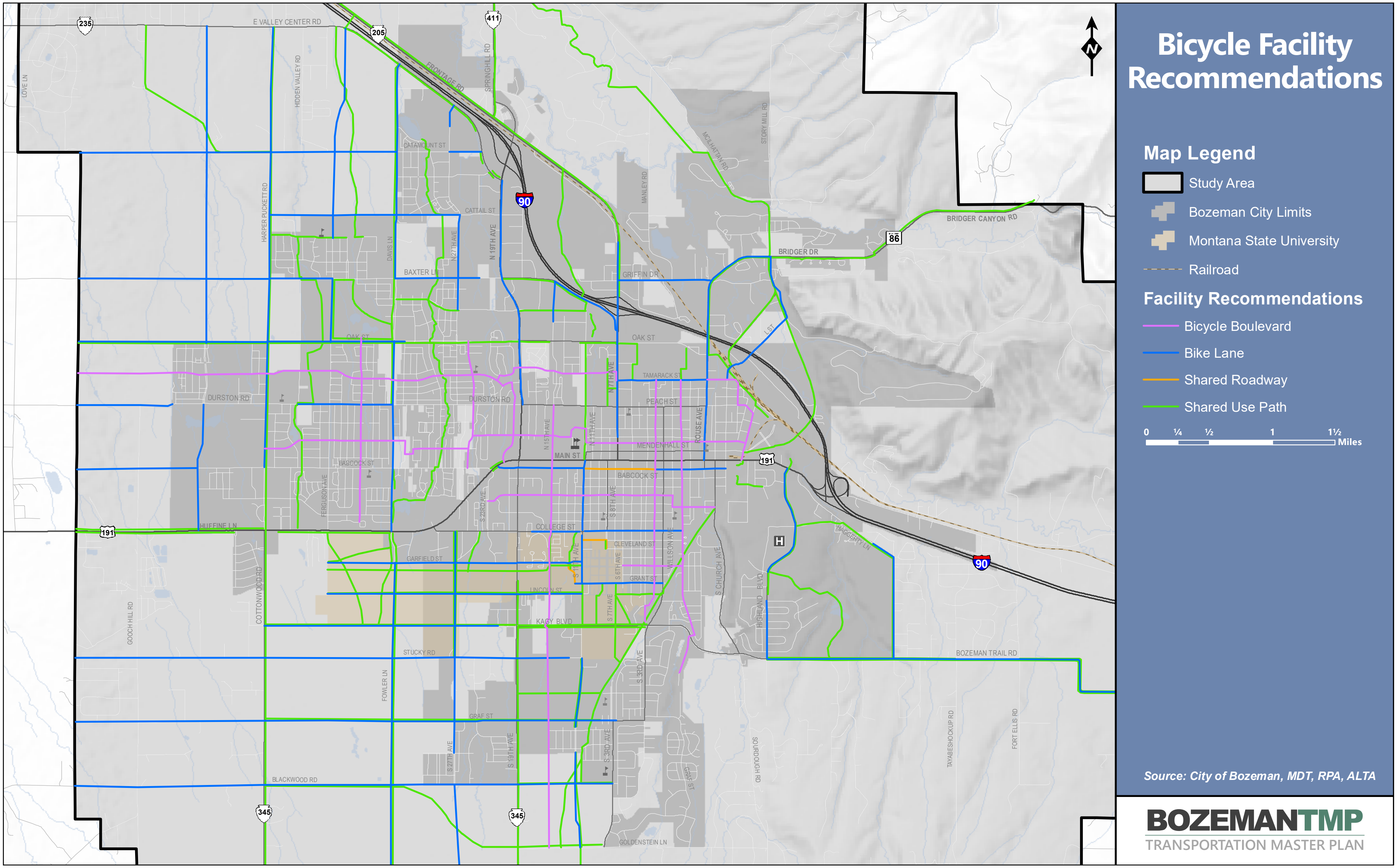


Figure 4.5: Bicycle Facility Recommendations

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Chapter 5
Policy and Planning Framework

This portion of the TMP addresses several topics that link the transportation system to broader quality of life considerations within the community. Federal regulations for Metropolitan Planning Organizations (MPOs) require long range transportation plans "include both long-range and short-range program strategies/actions that lead to the development of an integrated intermodal transportation system that facilitates the efficient movement of people and goods." While this is obviously a key consideration for the Bozeman TMP (i.e. non-MPO), it must be recognized that the design, modal mix, and location of transportation infrastructure and facilities can directly affect urban form, functions, and community character.

Current directions in transportation planning place importance on developing transportation systems that help reduce unnecessary travel delays and manage travel demands in ways that create balanced multimodal networks that offer multiple transportation choices. Transportation systems also need to provide facilities and services to help achieve reliable and timely access to jobs, community services, affordable housing, and schools while helping create safe streets and improving economic competitiveness, and enhancing unique community characteristics.

Topics addressed on the following pages include: the triple bottom line (TBL) framework, transportation demand management, active transportation programs, level of service, MPO planning requirements, and livability. These topics are all key components to the development of a TMP that helps support and enhance the overall quality of life in the Bozeman area.

5.1. TRIPLE BOTTOM LINE INFLUENCE

Throughout the TMP process, it became clear that Bozeman citizens desire to live in a sustainable community and expect planning activities to promote a sustainability philosophy each and every day. Numerous Bozeman planning documents express the community's resolve to act sustainably. This philosophy could be captured in the following phrase: *to systemically, creatively, and thoughtfully utilize environmental, human, and economic resources to meet present needs and those of future generations without compromising the ecosystems upon which its citizens depend.*

Projects, programs and targets developed as part of this TMP were done so with sensitivity to the social, economic and environmental well-being of the community.

Many communities express their desire for sustainability through a concept known as the Triple Bottom Line (TBL). The TBL approach means that an entity is committed to incorporate sustainable development principles into its decisions and actions. There are numerous examples nationwide of TBL assessment methods for internal or external City projects. The impacts of a transportation project can be measured both quantitatively and qualitatively against three "impact factors" to judge how the City is progressing in meeting sustainability goals.

Projects, programs and targets developed as part of this TMP were done so with sensitivity to the social, economic and environmental well-being of the community. A description of the three primary impact factors that comprise the TBL framework are shown below.

5.1.1. Economic Health

The premise of Economic Health is that Bozeman supports creation of a healthy local economy with new jobs, businesses, and economic opportunities. Goals for Economic Health focus on development of a diverse economy, enhanced sustainable practices for existing businesses, green and clean technology jobs, and creation or retention of family waged jobs.

5.1.2. Environmental Health

The premise of Environmental Health is that Bozeman promotes healthy, resilient ecosystems, clean air, water, and land. Goals include decreased pollution and waste, lowering carbon emissions that contribute to climate change, lowering fossil fuel use, and decreasing or eliminating toxic product use. Environmental Health advocates preventing pollution, reducing use, promoting reuse, and recycling natural resources.

5.1.3. Social Equity

The premise of Social Equity is that Bozeman places priority upon protecting, respecting, and fulfilling the full range of universal human rights, including those pertaining to civil, political, social, economic, and cultural concerns. Goals include providing adequate access to employment, food, housing, clothing, recreational opportunities, a safe and healthy environment and social services. Goals also include eliminating systemic barriers to equitable treatment and inclusion, and accommodating the differences among people. Social equity emphasizes justice, impartiality, and equal opportunity for all.

5.2. TRANSPORTATION DEMAND MANAGEMENT

TDM measures came into being during the 1970s and 1980s in response to a desire to save energy, improve air quality, and reduce peak-period congestion. TDM strategies focused on identifying alternates to single occupant vehicle use during commuting hours. Therefore, such things as carpooling, vanpooling, transit use, walking and bicycling for work purposes are most often associated with TDM. Recent TDM measures include flextime, a compressed workweek and telecommuting. In addition to addressing commute trip issues, managing demand on the transportation system includes addressing traffic congestion associated with special events, such as MSU football games, concerts, the Downtown Christmas Stroll, and other large cultural or sporting events held within the community. A definition of TDM follows:

> *TDM programs are designed to maximize the people-moving capability of the transportation system by increasing the number of persons in a vehicle, or by influencing the time of, or need to, travel. (FHWA, 1994)*

Since 1994, TDM has been expanded to also include route choice. A parallel arterial with excess capacity near a congested arterial can be used to manage the transportation system to decrease congestion for all transportation users.

The city of Bozeman is embarking on a golden opportunity beginning in Fiscal Year (FY) 2017 with the commitment for financial participation for a newly created TDM initiative. This is the first initiative of its kind in the Greater Bozeman area, and is being funded by the Western

Transportation Institute through a Federal grant, with match funds being provided by the city of Bozeman and Montana State University. It is anticipated that this initiative will initially be funded for three years, and will focus on reducing overall vehicle miles traveled through a number of TDM efforts, including an emphasis on walking, biking, carpooling, vanpooling and transit. Additional information on these and other TDM strategies is provided in the following section.

5.2.1. Role Of Transportation Demand Management

TDM strategies are an important part of the Bozeman TMP due to their inherent ability to provide the following benefits to the commuting public:

- Better transportation accessibility
- Better transportation predictability
- More, and timelier, information
- A range of commute choices
- Enhanced transportation system performance

TDM measures can also be applied to non-commuter traffic and are especially easy to adapt to tourism, special events, emergencies and construction. The benefits to these traffic users are similar to those for commuters

5.2.2. TDM Strategies

TDM strategies, which are or have been used by other communities in the United States, are discussed in this section. By capitalizing on the use of these options, the existing vehicular infrastructure can be made to function at better levels of service for longer periods of time. Ultimately, this will result in lower per year costs for infrastructure replacement and expansion projects, not to mention less disruption to the users of the transportation system.

While some of these options may work well in the Bozeman area, some may be inappropriate. Additionally, some of these options are more effective than others. To provide a TDM system that is effective in managing demand, a combination of these methods will be necessary.

Flextime

When provided by employers, flextime allows workers to adjust their commuting time away from the peak periods. This means that employees are allowed some flexibility in their daily work schedules. For example, rather than all employees working 8:00 to 4:30, some might work 7:30 to 4:00, and others 9:00 to 5:30. This provides the workers with a less stressful commute, allows flexibility for family activities and lowers the number of vehicles using the transportation system during peak times. This in turn can translate into reduced traffic congestion, support for ridesharing and public transit use, and benefits to employees. Flextime allows commuters to match their work schedules with transit and rideshare schedules, which can significantly increase the feasibility of using these modes. Costs for implementing this type of TDM strategy can include increased administrative and management responsibilities for the employer, and more difficulty in evaluating an employee's productivity.

Alternate Work Schedule

This strategy involves using alternate work hours for all employees. It would entail having the beginning of the normal workday start at a time other than 8:00 a.m. For example, starting the workday at 7:30 a.m. would allow all employees to reach the work site in advance of the peak commute time. Additionally, since they will be leaving work at 4:30 p.m., they will be home before the peak commute time, and have more time in the evening to participate in family or community activities. This can be a very desirable side benefit for the employees. This has a similar effect on traffic as flextime, but does not give individual employees as much control over their schedules.

Compressed Work Week

A compressed work week is different from offering "flextime" or the "alternate work schedule" in that the work week is actually reduced from the standard "five-days-a-week" work schedule. An example would be employers giving their workers the opportunity to work four ten-hour days a week. A compressed work week reduces commute travel (although this reduction may be modest if employees take additional car trips during non-work days or move farther from worksites). Costs for implementing this type of TDM strategy may be a reduction in productivity (employees become less productive at the end of a long day), a reduction in total hours worked, and it may be perceived as wasteful by the public (for example, if staffing at public agencies is low on Fridays).

Telecommuting

Telecommuting in the work place offers a good chance to reduce the dependence to travel to work via car or bus. This is especially true in technical positions and some fields in the medical industry (such as medical transcription). Additionally, opportunities for distance learning, shopping via computers, basic health care services and recreation also exist and can serve to reduce vehicular travel on the transportation system. Telecommuting is usually implemented in response to an employee request, more so than instigated by the employer. Since telecommuting reduces commute trips, it can significantly reduce congestion and parking costs. It is highly valued by many employees and tends to increase their productivity and job satisfaction. Costs associated with this TDM strategy include increased administrative and management responsibilities, and more difficult evaluation of employee productivity. Some employees find telecommuting difficult and isolating. Telecommuting also may reduce staff coverage and interaction, and make meetings difficult to schedule. Many employers in Bozeman currently allow some form of telecommuting.

Ride Sharing (carpooling)

Carpooling is traditionally one of the most widely considered TDM strategies. The idea is to consolidate drivers of single occupancy vehicles into fewer vehicles, with the result being a reduction in congestion. Carpooling is generally limited to those persons whose schedules are rigid and not flexible in nature. Studies have shown that carpooling is most effective for longer trips greater than ten miles in each direction. Aside for the initial administrative cost of set-up and marketing, ridesharing also may encourage urban sprawl by making longer-distance commutes more affordable.

Vanpooling

Vanpooling is a strategy that encourages employees to utilize a larger vehicle than the traditional standard automobile to arrive at work. Vans typically hold twelve or more persons. Vanpooling generally does not require high levels of subsidy usually associated with a fixed-route or demand-responsive transit service. They can often times be designed to be self-sufficient. The van is typically provided by the employer, or a vanpool brokerage agency, which provides the insurance.

Bicycling

Bicycling can substitute directly for automobile trips. Communities that improve cycling conditions often experience significant increases in bicycle travel and related reductions in vehicle travel. Providing increased bicycling opportunities can help contribute to quality of life improvements as well. Incentives to increase bicycle usage as a TDM strategy include: construction improvements to bike paths and bike lanes; correcting specific roadway hazards (potholes, cracks, narrow lanes, etc.); development of a more connected bikeway street network; development of safety education, law enforcement and encouragement programs; and the solicitation and addressing of bicycling security/safety concerns. Potential costs of this TDM strategy are expenses associated with creating and maintaining the bikeway network, potential liability and accident risks (in some cases), and increased stress to drivers.

Walking

Walking as a TDM strategy has the ability to substitute directly for automobile trips. A relatively short non-motorized trip often substitutes for a longer car trip. For example, a shopper might choose between walking to a small local store versus driving a longer distance to shop at a supermarket. Incentives to encourage walking in a community can include: making improvements to sidewalks, crosswalks and paths by designing transportation systems that accommodate special needs (including people using wheelchairs, walkers, strollers and hand carts); providing covered walkways, loading and waiting areas; improving pedestrian accessibility by creating location-efficient, clustered, mixed land use patterns; and soliciting and addressing pedestrian security/safety concerns. Costs are similar to that of bicycling and are generally associated with program expenses and facility improvements.

Park & Ride Lots

Park and ride lots are effective for communities with substantial suburb to downtown commute patterns. Park and ride consists of parking facilities at transit stations, bus stops and highway on-ramps, particularly at the urban fringe, to facilitate transit and rideshare use. Parking is generally free or significantly less expensive than in urban centers. Costs are primarily associated with facility construction and operation.

Car Sharing

Car sharing is a demand reducing technique that allows families within a neighborhood to reduce the number of cars they own and share a vehicle for the limited times when an additional vehicle is absolutely essential. Costs are primarily related to creation, startup and administrative costs of a car sharing organization.

Traditional Transit

Traditional transit service is an effective TDM strategy. Several methods to increase transit usage within the community are to improve overall transit service (including more service, faster service and more comfortable service) and improve rider information and marketing programs. The costs of providing transit depend on many factors, including the type of transit service, traffic conditions and ridership. TDM strategies that encourage increased ridership can be very cost effective. These strategies may include offering bicycle carrying components on the transit vehicle, changing schedules to complement adjacent industries, etc.

Express Bus Service

Express bus service as a TDM strategy has been used by larger cities in the nation as a means to change driver vehicle characteristics. The use of an express bus service is founded on the idea that service between two points of travel can either be done faster or equal to the private automobile (or a conventional bus service that is not “express”).

Installing/Increasing Intelligent Transportation Systems (ITS)

The use of ITS methods to alert motorists of disruptions to the transportation system will be well received by the transportation users, and are highly effective tools for managing transportation demands.

Installing High Occupancy Vehicle (HOV) Lanes

HOV lanes are generally used on very congested highways where intersections and access control is somewhat limited. They also can be utilized on urban arterials. A HOV is typically described as having two or more persons in the vehicle during the time of travel. The benefits of a HOV lane in a congested corridor is that increased travel speeds and reliability for HOV passengers is realized. The costs include project construction, management and enforcement. Some critics also argue that HOV lanes encourage urban sprawl, contribute to poor air quality, and increase crash rates due to conflicts between vehicles in higher-speed HOV lanes and vehicles in lower speed general use lanes.

Ramp Metering

Ramp metering has been used by some communities and consists of providing a modified traffic signal at on ramps to interstate highway facilities.

Traffic Calming

Traffic calming refers to various design features and strategies intended to reduce vehicle traffic speeds and volumes on a particular roadway. Traffic calming projects can range from minor modifications of an individual street to comprehensive redesign of a road network. Traffic calming can be an effective TDM strategy in that its use can alter and/or deter driver characteristics by forcing the driver to either use a different route or to use an alternative type of transportation (such as transit, bicycling, walking, etc.). Costs of this TDM strategy include construction, potential increase in drivers' effort and frustration, and potential problems for bicyclists and visually impaired pedestrians.

Identifying and Using Special Routes and Detours for Emergencies or Special Events

This type of TDM strategy includes modifications to driver patterns during special events or emergencies. They can typically be completed with intensive temporary signing or traffic control personnel. A prime example would be modifying travel patterns before, during and after a MSU football game or the Downtown Christmas Stroll. Temporary traffic control via signs and flaggers are implemented to provide a swift and safe exit after applicable events.

Linked Trips

This strategy entails combining trips into a logical sequence that reduces the total miles driven on the surrounding transportation system. These trips are generated by associated facilities within a mixed-use development or within an area of the community where adjacent land uses are varied and offer services that would limit the need to travel large distances on the transportation system.

Higher Parking Costs for Single Occupant Vehicles (SOV)

Intuitively, free parking provided by employers is a tremendous incentive for driving alone. If the driver of a SOV is not penalized in some form, there is no perceived reason not to drive to the workplace. One way to counter this reality is to charge a higher price for parking for the SOV user.

Preferential Parking for Rideshare/Carpool/Vanpools

This concept ties into the discussion above regarding parking of the SOV user. Preferential parking, such as delineating spaces closer to an office for riders sharing their commute or reduced/free parking, can be an effective TDM strategy.

Subsidized Transit by Employers

A subsidized transit program, typically offered by employers to their employees, consists of the employer either reimbursing or paying for transit services in full as a benefit to the employee. This usually comes in the form of a monthly or annual transit pass. Studies show that once a pass is received by an employee, the tendency to use the system rises dramatically.

Guaranteed Ride Home (GRH) Programs

The guaranteeing of a ride home for transit users is a wise choice for all transit systems, since it gives the users a measure of calm knowing that they will be able to get home. A GRH program provides an occasional subsidized ride to commuters who use alternative modes, for example, if a bus rider must return home in an emergency, or a car pooler must stay at work later than expected. This addresses a common objection to the use of alternative modes. GRH programs may use taxies, company vehicles or rental cars. GRH trips may be free or they may require a modest co-payment.

Mandatory TDM Measures for Large Employers

Some communities encourage large employers (typically with at least 50 to 100 employees) to mandate TDM strategies for their employees. This is a control that can be required by local governments on developers, employers, or building managers. The regulatory agencies often times provide incentives for large employers to make TDM strategies more appealing, such as reduced transit fares, preferred parking, etc.

Required Densification / Mixed Use Elements for New Developments

Requiring new developments to be dense and contain mixed-use elements will ensure that these developments are urban in character and have some services that can be reached by biking, walking or using other non-automobile methods. This also relates to the concept of “linked” or “shared” trips presented earlier. As new developments are proposed, local and regional planners have the opportunity to dictate responsible and effective land use to encourage “shared” trips and reduce impacts to the surrounding transportation system.

Transit Oriented Development (TOD)

Transit Oriented Development (TOD) refers to residential and commercial areas designed to maximize access by transit and non-motorized transportation, and with other features to encourage transit ridership. A TOD usually consists of a neighborhood with a rail or bus station, surrounded by relatively high-density development, with progressively lower-density spreading outwards. Transit Oriented Development generally requires about seven residential units per acre in residential areas and twenty-five employees per acre in commercial centers to adequately justify transit ridership. Transit ridership is also affected by factors such as employment density and clustering, demographic mix (students, seniors and lower-income people tend to be heavy transit users), transit pricing and rider subsidies, and the quality of transit service.

Alternating Directions of Travel Lanes

This method of TDM is similar to that of traffic calming in that it strives to change driver characteristics and possibly enable users of the system to try different modes of travel. It also can serve to relieve a corridor during particularly heavy times of the day.

5.2.3. Effectiveness of TDM Strategies

Measuring the effectiveness of TDM strategies can be done using several different methods such as cost, usage, or those listed below:

- Reduced traffic during commute times;
- Reduced or stable peak hour traffic volumes;
- Increased commuter traffic at off peak times;
- Increased use of modes other than single occupant vehicles;
- Increased use of designated routes during emergencies or special events;
- Eased use of the transportation system by tourists or others unfamiliar with the system;
- Reduced travel time during peak hours; and/or
- Fewer crashes during peak hours.

In order to provide a TDM system that will address the needs of the Bozeman area, the elements of the system must be acceptable to the general population. If elements are proposed which are not acceptable, the TDM system goals will not be reached.

5.2.4. TDM Conclusions

Many TDM options are available for use in the Bozeman area. Portions of a connected network are in place to use alternative modes of transportation including transit, walking and bicycling. Increased connectivity and expansion of these networks will be needed as the community grows. There are several major employers in the Bozeman area including government, Bozeman Deaconess, Montana State University, Oracle, and the Bozeman School District who could be approached to implement work week adjustments such as flex time, alternate work hours, and/or compressed work weeks. Designating some prime parking spots for carpooling could increase use among employees and provide positive recognition for those who carpool.

Developing strategies to manage the demand on the system generated by specific repeatable events such as MSU football games, concerts, or the Christmas Stroll would involve a one-time use of City and/or County staff time. Adjustments to these strategies could be made after seeing how they work. Coordination with the Police Department and/or Sheriff's Office, or other departments that would help implement these plans, would then be needed on an intermittent basis. Implementing these strategies in the Bozeman area could be done quickly and would be obvious to the traveling public. As such, it would be easy to demonstrate a successful TDM program and build approval for implementing additional TDM strategies.

5.3. ACTIVE TRANSPORTATION PROGRAMS

Active transportation programs are a component of an overall TDM strategy; however, rather than focusing solely on reducing vehicle trips, these programs target a wider variety of topics and subject matter. Active transportation programs are typically focused around the 'Six E's', which include:

- Encouragement
- Education
- Enforcement
- Evaluation
- Equity
- Engineering (infrastructure covered in **Chapter 4**)

Bozeman has a supportive network of community groups and non-profits that have implemented many active transportation programs meant to educate and encourage residents to walk and bicycle for transportation and recreation. **Table 2.5** in **Chapter 2** summarizes the existing programs that are currently supported by a variety of groups and the City of Bozeman. While the number and scope of these programs is impressive, there remain a number of other potential active transportation programs that could be implemented that would provide additional benefit. **Table 5.1** provides a variety of potential programs that have been effective in similar communities nationwide. This table is intended to provide ideas from which to advance programs rather than be a definitive list of recommendations. Most implemented programs may involve partnerships with the City of Bozeman; however, will likely be organized by local non-profits or advocacy groups.

Table 5.1: Potential Future Non-motorized Program Ideas

Program Name	Program Description	Program Example
Encouragement: *Encouragement programs seek to create a supportive environment and culture around walking and biking.*		
Media Campaign	Positive images and messages of people walking and/or biking are displayed on a variety of media outlets including billboards, banners, buses, posters, or sidewalk stencils. The goal of a media campaign can be to create a supportive culture by showing people of different ages and backgrounds walking and biking or to encourage people to try walking and biking by showing the benefits.	Bike PGH (Pittsburgh, PA): http://bikepgh.org/care/
Kidical Mass	Fun, short group bike ride for all ages of kids and their parents. Rides often has a theme (e.g. Halloween ride, light right) and connects to parks.	Kidical Mass (Eugene, OR): http://www.kidicalmass.org/ Ames Kidical Mass (Ames, IA): https://www.facebook.com/ameskidicalmass/
Bike Friendly Businesses	Businesses are recognized for their efforts to make their business more welcoming to bicycling employees and customers.	Becoming a Bicycle Friendly Business (The League of American Bicyclists:) http://bikeleague.org/business

Program Name	Program Description	Program Example
Bike Valet	Volunteers park bikes at events to make bicycling there more convenient. Event attendees pay for valet services raising money for the organization volunteering at the valet station.	Bike SLO County Bike Valet (San Luis Obispo County, CA): https://bikeslocounty.org/programs/valet/ Go by Bike - Bike Valet (Portland, OR): http://www.gobybikepdx.com/
Bike Buddy Program	Less-experienced bicyclists are paired with a trained mentor to help them plan routes, answer questions about gear, and practice riding. The partners may bike to work or school together to help the less-experienced bicyclist feel more confident about biking there.	Bike Buddy (University of Washington): https://www.washington.edu/facilities/transportation/bikebuddy Chicago Bike Buddies (Chicago, IL): http://chicagobikebuddies.com/
SmartTrips Program	A target area or group such as neighborhood residents, employees, students, or new residents receive transportation information customized to their interests to help them try walking, biking, riding transit, and sharing rides. In further support of helping participants change their transportation habits, the program hosts fun events and sends communications with encouraging messages.	Green Trips (Chattanooga, TN): http://www.greentripscha.org/about/what-is-green-trips/ SmartTrips (Eugene, OR): https://www.eugene-or.gov/656/SmartTrips-Eugene
Education: *Education programs help participants develop the skills and knowledge to be safe and confident while walking and biking.*		
Active Transportation Safety Campaign	Active Transportation Safety Campaigns educate drivers, pedestrians, and bicyclists on the rules of the road; encourage road users to respect one another; or target a specific behavior like looking for pedestrians while driving. Audiences can be reached through messaging and graphics on a variety of media outlets including public safety announcements, billboards, banners, buses, and posters. Lights, helmets, and bumper stickers giveaways can reinforce the campaign message.	Heads Up Pedestrian Safety Campaign, City of Eureka, CA: http://www.krcrtv.com/north-coast-news/eureka-news/humboldt/new-campaign-heads-up-promotes-pedestrian-safety_20160513185612626/11247238 Bike Brightly, Bicycle Coalition of Maine: http://www.bikemaine.org/bike-brightly
Family Bicycling Program	Families learn about biking with little ones including what to ride, how to transport children, what to bring, and important safety skills to know.	Youth and Family Classes (San Francisco, CA): http://www.sfbike.org/our-work/youth-family/
Diversion Program	First-time offenders of bicycle and/or pedestrian violations take a class instead of paying a fine. The class can cover topics such as local and state laws.	Huntington Beach Ticket Diversion Program (Huntington Beach, CA): http://gohumansocal.org/Documents/Tools/CaseStudy_HuntingtonBeach.pdf Tucson City Court and Pima County (Tucson, AZ): http://www.ezazbikeped.com/
Videos	Videos show how to ride on and near new facilities. Videos can play at locations like Courthouses, Driver's License Stations, and schools.	How to Ride: Drive Your Bicycle (Safe Streets Save Lives): https://www.youtube.com/watch?v=EezZDtGV5Fo "Walk This Way": Pedestrian Safety for Young Children (Pennsylvania Department of Transportation): https://www.youtube.com/watch?v=-t2oX6zQEyU
Adult Learn-to-Ride Program	Adults learn how to bike and practice skills at an off-street location and then graduate to practicing on the street as a group. Certified League of American Bicyclists could teach this class.	Learn to Ride (Washington Area Bicyclist Association): http://www.waba.org/adult-education/

Program Name	Program Description	Program Example
Enforcement: *Enforcement programs support safe behaviors for drivers and people walking and biking.*		
Bicycle and Pedestrian Stings	Police departments organize stings for cars that do not yield the right of way to a pedestrian or attempts an unsafe passing of a bicyclist. Media should be notified of the sting for additional coverage. Instead of tickets, officers can provide drivers with information.	City of Chicago: http://www.cityofchicago.org/city/en/depts/cdot/provdrs/ped/svcs/crosswalk_enforcementinitiatives.html
Police Bicycle and Pedestrian Education Course	Police receive education around bike and pedestrian laws, safety, crash investigation, and other topics.	Watch For Me - NC Tactical Training Workshop Enforcement for Pedestrian Safety (NC): http://www.webike.org/tag/law-enforcement-training
Evaluation: *Evaluation efforts monitor programs to measure investments and document lessons learned.*		
Student Hand Raising Tally	School students raise their hands in response to questions about whether they biked or walked to school and document responses.	Student Hand Tallies (Spare the Air Youth): http://www.sparetheairyouth.org/student-hand-tallies
Improved Bicycle and Pedestrian Count Program	Bicyclists and pedestrians are counted with all traffic data collection. Traffic signal equipment can be utilized counting. Trail counters can be funded and installed at key locations such as along the Gallagator trail.	Trail Counter Program (New River Valley Regional Commission, VA): http://www.nrvrc.org/trailcounterprogram/#
Equity: *Equity programs seek to educate and encourage all social and economic groups, in addition to using active transportation as a ladder of opportunity.*		
Bike Program for Women	Women-focused clinics cover the basics of bike maintenance, riding safety, shopping by bike, and commute tips.	Women Bike (Street Trust, Portland, OR): https://www.thestreettrust.org/get-involved/women-bike/
Education programs as part of Bike Kitchen Activities	The Bozeman Bike Kitchen already fulfills an equity niche and programs run out of the bike kitchen aimed at education and encouragement may target different demographics than similar programs done by other organizations.	
Other		
Tactical Urbanism/Demonstration Project	Low-cost, temporary changes are made to a street to allow people to try walking or biking on a new facility. An example could include the proposed cycle track along Babcock Street in Downtown Bozeman.	The Tactical Urbanists Guide: http://tacticalurbanismguide.com/
Formation of a Technical Advisory Committee (TAC)	Form a TAC for the various non-profits and organizations planning biking and walking activities in Bozeman to coordinate and combine efforts. A calendar of all bicycle and pedestrian events could be offered on the City's website.	

5.3.1. Data Collection

The Bozeman Area Bicycle Advisory Board has collected volunteer based counts to track bicycle use annually for the past six years. While helpful to provide information for a snapshot in time, the data is highly variable due to weather conditions and other influences. Developing a more formalized approach may be desirable to help achieve the goal of collecting more representative data. Information collected over longer durations will allow meaningful long term conclusions to be gleaned on the trends in bicycle and pedestrian use in Bozeman. The following sections discuss potential approaches to collecting useful active transportation data.

5.3.1.1. Trail Counts

There are multiple options for temporary or permanent counters based on Bozeman's trail corridors. Most communities start with a limited number of permanent counters and several mobile counters which can be repositioned to meet the needs of the program. Additional growth in counter locations is recommended to grow the system over time.

Procuring three mobile trail counters will allow a significant amount of high-quality data to be obtained each year through two-week minimum installations at various locations around the City. Locations should be selected so that they are repeatable year-over year at the same time. Many communities count each location at different times of the year and compare this data to the permanent counters to estimate year-round use. Potential locations for temporary counters typically focus around the trails that are not the main focal points of use, but still draw significant use. Some suggested locations include:

- Oak Street west of North 15th Avenue
- North 19th Avenue south of East Baxter Lane
- North Ferguson Avenue south of Ravalli Street
- South Fowler Avenue near Bozeman Pond

Examples of permanent (top) and mobile (bottom) data collectors along trails in Billings, MT.

- College to Huffine Trail east of South Ferguson Avenue
- Gallagator Trail near Bozeman Library
- Gallagator Trail near Morning Star School
- Highland Boulevard near Bozeman Deaconess Hospital
- South 19th Avenue north of West Garfield Street
- Story Mill Spur Trail
- Fowler Avenue Trail just south of Durston Road

Permanent trail counters are superior to mobile counts because they provide continuous data, year-round. Data from these devices give a more complete understanding of bicycle and pedestrian travel behavior, and minimize the impact of short-term variations caused by weather and other factors. Potential locations for permanent counters include:

- Gallagator Trail near Garfield Street
- College to Huffine Trail just west of South 11th Avenue
- Oak Street Trail just west of Rouse Avenue
- M Trail just east of Story Mill (after construction)

5.3.1.2. On-Street Counts

Spot Counts

Bicycle and pedestrian counts were collected during regular intersection counts as part of the data collection for this plan. It is recommended that the City of Bozeman require all intersection counts to include bicycle and pedestrian data collection in the future for all private and city led efforts. This data should then be stored and accessible so that relative bicycle and pedestrian use can be obtained. This data is also limited in durations so conclusions are difficult to make as weather and temperature variability can impact bicycle and pedestrian numbers significantly.

Intersection Counts

The City of Bozeman has installed or upgraded several signalized intersections in recent years. This TMP also has recommendations for the installation of additional signals. Existing and future technology makes these intersections prime candidates to become continuous permanent data collectors with little effort and additional cost. The two main video detection systems, *Iteris* and *GRIDSMART*, both have software upgrades that allow bicyclists and pedestrians to be counted. This tends to work best at intersections with bike lane approaches, however, the software is getting better and some systems can distinguish bicyclists from motor vehicles in mixed traffic. Coordination with MDT will be required for signals maintained by the State. The following list provides good candidate locations for continuous intersection counts. Current readiness will vary with some requiring software only, some upgrades to signal controllers and detection.

- West College Street and South 23rd Avenue
- West Kagy Boulevard and South 11th Avenue
- West Kagy Boulevard and South Wilson Avenue
- West Durston Road and North 19th Avenue
- West Durston Road and North 15th Avenue
- East Oak Street and North Rouse Avenue
- West Oak Street and North 15th Avenue
- Tschacke Lane and North 19th Avenue
- West Beall Street and North 19th Avenue
- West Koch Street and South 19th Avenue

In addition to the above locations, any intersection that will be signalized in the future through MSN or TSM projects could include this technology.

Screenline Counts

In addition to intersection counts, it could be advantageous to conduct temporary or permanent on-street screenline counts at non-intersection locations. Some of these locations could allow the efforts of the manual count program to have value as historical data. Technology for each of these application is improving over time and increased levels of precision and lower costs continue to evolve.

5.3.1.3. Bi-Annual Benchmarking Report

With new sources of data, it is recommended that a brief report be prepared every two years that summarizes the progress of the count program and highlight some of the data to show changes in bicycle and pedestrian use and distribution over time. The most recent US Census / American Community Survey Journey to Work data should also be referenced to track changes in commuting patterns and total miles of bike lanes, shared-use paths, trails and bicycle boulevards should also be updated. This report will allow progress and changes to active transportation to be understood as investments in the system are made.

5.4. TRAFFIC OPERATIONS STANDARDS

Traffic performance measure policies are used to assist in determining when a given facility or intersection needs to be upgraded or improved due to new development. The city of Bozeman's current development standards are defined in the *Bozeman Code of Ordinance*[11] and provide requirements for intersection performance based on LOS. The current standards were evaluated to determine if changes are necessary to better mitigate impacts from development. A review of traffic operations and development standards for other peer communities was conducted. While no single reviewed standard may be directly applicable to Bozeman, the review does provide some ideas for modifications to Bozeman's existing development standards. **Appendix J** contains *the Traffic Operations and Best Practices Technical Memorandum*.

The existing standards for the Bozeman require developers to submit traffic impact studies documenting existing and projected traffic conditions adjacent to the development. This approach relies on intersection LOS to measure the impact of developments and often results in a narrowly focused view of the transportation system. Impacts from development are felt throughout the community, not just at adjacent intersections. The current standards are often unattainable due to funding or other constraints, and in some cases, may be undesirable.

Standards based on intersection LOS are a microscopic approach to evaluating traffic operations. Intersection LOS defines intersection performance in terms of vehicle delay and does not factor in alternative travel modes nor does it take into consideration the health of the overall transportation system. Intersection LOS is often based on a single hour, or peak hours, for which the system is most congested. A more macroscopic approach to improving the transportation system, not just reducing peak hour delay at single intersections, should be taken.

Investment in other parts of the transportation network may be more appropriate than trying to fix intersections near new development. Some areas of town require more infrastructure investment than others. For example, a residential development on the outskirts of town where current infrastructure is lacking would be more costly to the community than the same size and type of development in an area where infrastructure is already built to current standards. Older areas of town are already built up and have constraints which limit the ability to add vehicle capacity. These areas are likely at their ultimate capacity. Undeveloped areas, however, require higher investment costs to provide new infrastructure. Other approaches to improving travel conditions, such as providing for active transportation modes and TDM strategies, should be encouraged to help reduce impacts, delay, and improve safety for all users.

Instead of requiring developers to conduct traffic impact studies, it may be desirable, and simpler, to evaluate impacts based on the type, location and size of the development. Ultimately, the goal is to develop the transportation network to the standards contained in the Bozeman TMP. For those roadways already built to recommended standards, no further infrastructure investment is needed; focus can instead be put on improving accommodations for active travel modes and implementing TDM strategies. For other areas, significant costs are likely needed to improve infrastructure to meet current standards. Standards focusing on the specifics of the development, not just on a set threshold for adjacent intersection, would allow for a holistic approach to improving the transportation system.

5.5. METROPOLITAN PLANNING ORGANIZATION PLANNING REQUIREMENTS

An MPO is a federally mandated and federally funded transportation policy-making organization in the United States that is made up of representatives from local government and governmental transportation authorities. MPOs were introduced by the Federal-Aid Highway Act of 1962, which required the formation of an MPO for any urbanized area with a population greater than 50,000. Federal funding for transportation projects and programs are channeled through this planning process. Congress created MPOs in order to ensure that existing and future expenditures of governmental funds for transportation projects and programs are based on a continuing, cooperative, and comprehensive ("3-C") planning process. Statewide and metropolitan transportation planning processes are governed by federal law (23 U.S.C. §§ 134–135). Transparency through public access to participation in the planning process and electronic publication of plans is required by federal law. It is highly likely that if the current criteria for MPOs remain, the Greater Bozeman area will surpass the 50,000 population threshold within the urban area during the 2020 census.

The federal government mandates MPOs to ensure that federal transportation funds are spent in a manner that has a basis in metropolitan region-wide plans developed through intergovernmental collaboration, rational analysis, and consensus-based decision making. Accordingly, MPOs are essential to ensure that:

- Scarce federal and other transportation funding resources are allocated appropriately;
- Planning reflects the region's shared vision for its future;
- A comprehensive examination of the region's future and investment alternatives has occurred; and
- Facilitation of governments, interested parties, and residents occur in a collaborative manner in the planning process.

5.5.1. Organizational Structure

Typically, an MPO governance structure includes a variety of committees as well as a professional staff. The "transportation policy coordinating committee" is the top-level decision-making body for the planning organization. In most MPOs, the TPCC comprises:

- Elected or appointed officials from local governmental jurisdictions such as municipalities or counties;
- Representatives of different transportation modes, such as public transit, freight, bicycle/pedestrian;
- State agency officials such as, state Department of Transportation, environmental agency, etc.; and
- Non-voting members such as FHWA, FTA, FAA, FRA, staff advisers from state DOTs, Chambers of Commerce, etc.

A TPCC member typically is an elected or appointed official of one of the MPO's constituent local jurisdictions. The TPCC member thus has legal authority to speak and act on behalf of that jurisdiction in the MPO setting. Federal law, however, does not require members of an MPO TPCC to be representatives of the metropolitan areas' populations. The TPCC's responsibilities include debating and making decisions on key

MPO actions and issues, including adoption of the metropolitan long-range transportation plans, transportation improvement programs, annual planning work programs, budgets, and other policy documents. The TPCC also may play an active role in key decision points or milestones associated with MPO plans and studies, as well as conducting public hearings and meetings. An appointed transportation technical advisory committee (TTAC) develops the recommendations for consideration by the TPCC and establishes a ranked proposal for work plans.

The TTAC acts as an advisory body to the TPCC for transportation issues that primarily are technical in nature. The TTAC interacts with the MPO's professional staff on technical matters related to planning, analysis tasks, and projects. Through this work, the TTAC develops recommendations on projects and programs for TPCC consideration. The TTAC typically comprises staff-level officials of local, state, and federal agencies. In addition, a TTAC may include representatives of interest groups, various transportation modes, and local citizens.

Usually MPOs retain a core professional staff in order to ensure the ability to carry out the required metropolitan planning process in an effective and expeditious manner. The size and qualifications of this staff may vary by MPO, since no two metropolitan areas have identical planning needs. Most MPOs, however, require at least some staff dedicated solely to MPO process oversight and management because of the complexity of the process and need to ensure that requirements are properly addressed.

5.5.2. Core Functions

There are five core functions of an MPO:

1. Establish a setting. Establish and manage a fair and impartial setting for effective regional decision-making in the metropolitan area.
2. Evaluate alternatives. Evaluate transportation alternatives, scaled to the size and complexity of the region, to the nature of its transportation issues, and to the realistically available options.
3. Maintain a Regional Transportation Plan. Develop and update a fiscally constrained long-range transportation plan covering a planning horizon of at least twenty years that fosters mobility and access for people and goods, efficient system performance and preservation, and quality of life.
4. Develop a Transportation Improvement Program. Develop a fiscally constrained program based on the long-range transportation plan and designed to serve the metropolitan area's goals, while using spending, regulating, operating, management, and financial tools.
5. Involve the public. Involve the general public and all the significantly affected sub-groups in the four essential functions listed above.

If the metropolitan area is designated as an air quality non-attainment or maintenance area, then the MPO must also protect air quality – i.e. transportation plans, programs, and projects must conform with the air quality plan, known as the "state implementation plan", for the state within which the metropolitan area lies.

Presently, most MPOs have no authority to raise revenues such as to levy taxes on their own, rather, they are designed to allow local officials to decide collaboratively how to spend available federal and other governmental transportation funds in their urbanized areas. The funding for the operations of an MPO comes from a combination of federal transportation funds and required matching funds from state and local governments.

5.6. LIVABILITY

Livability is a national movement with local implications that are supported within the Bozeman area. Providing transportation options to improve access to housing, jobs, businesses, services and social activities are fundamental desires of most transportation system user groups. Active transportation results in a physically fit population, minimizes auto emissions, extends the life of transportation infrastructure, and delays the needs for infrastructure improvements. Fostering livability in transportation projects and programs will result in improved quality of life; will create a more efficient and accessible transportation network; and will serve the mobility needs of communities, families, and businesses.

The concept of livability, which has evolved over the years, is often used to describe a range of initiatives aimed at improving community quality of life while supporting broader sustainability goals. Livability encompasses multi-dimensional issues relative to community design, land use, environmental protection and enhancement, mobility and accessibility, public health, and economic well-being. Incorporating livability into transportation planning, programs, and projects is not a new concept. Communities, developers, advocacy groups, businesses, and neighborhood residents have been working for generations to make places more livable through transportation initiatives, with varying degrees of support from local, regional, State, and Federal agencies. These initiatives have used a range of terms to describe an overlapping set of objectives and strategies-livability, sustainability, community impact assessment, scenario planning, land use and transportation, smart growth, walkable communities, new urbanism, healthy neighborhoods, active living, transit-oriented development, complete streets, context-sensitive solutions, and many others. The key concept behind livability in transportation: transportation planning is a process that must consider broader community goals.

"Livability means being able to take your kids to school, go to work, see a doctor, drop by the grocery or Post Office, go out to dinner and a movie, and play with your kids at the park – all without having to get in your car" – *Former U.S. Secretary of Transportation Ray LaHood*

Livability in transportation is about integrating the quality, location, and type of transportation facilities and services available with other more comprehensive community plans and programs to help achieve broader community goals such as access to a variety of jobs, community services, affordable housing, quality schools, and safe streets. This includes:

- Addressing road safety and capacity issues through better planning, design, and construction.
- Integrating health and community design considerations into the transportation planning process to create more livable places where residents and workers have a full range of transportation choices.
- Using TDM approaches and system management and operation strategies to maximize the efficiency of transportation investments.
- Maximizing and expanding new technologies such as ITS, green infrastructure, and quiet pavements.
- Developing fast, frequent, dependable public transportation to foster economic development and accessibility to a wide range of housing choices.
- Strategically connecting the modal pieces-bikeways, pedestrian facilities, transit services, and roadways-into a truly intermodal, interconnected system.
- Enhancing the natural environment through improved storm water mitigation, enhanced air quality, and decreased greenhouse gases.

Livability provides economic benefits to communities, businesses, and consumers. In practice, livable transportation systems accommodate a range of modes (walking, bicycling, transit, and automobiles) by creating mobility choice within more balanced multimodal transportation networks. This in turn helps support more sustainable patterns of development, whether in an urban, suburban, or rural context. Livable transportation systems can provide better access to jobs, community services, affordable housing, and schools, while helping to create safe streets, reduce energy use and emissions, reduce impacts on and enhance the natural and built environment, and support more efficient land use patterns.

5.6.1. Livability and the TMP

The TMP reflects the future transportation needs of the Bozeman area and includes recommended actions, programs and projects to improve, enhance and better manage and operate the area's transportation systems, promote alternative modes, accommodate bicyclists and pedestrians, consider other non-motorized modes of transportation, and provide freight mobility. In general, recommendations in the TMP adhere to the livability principles established by the US DOT, HUD and EPA which are aimed at improving access to affordable housing, providing more transportation options, and lower transportation costs. By keeping these considerations in mind, transportation improvement programs and projects will not only accommodate existing travel, make the current transportation system more efficient, meet growing travel requirements and improve mobility, but also be a catalyst for enhancing the overall livability of the Bozeman area.

Livability is about linking the quality and location of transportation facilities to broader opportunities such as access to good jobs, affordable housing, quality schools, and safe streets. This includes addressing safety and capacity issues on all roads through better planning and design, making judicious decisions about improvement projects, and expanding the use of new technologies.

The TMP continues local efforts to make the transportation network operate as efficiently and effectively as possible and promote a balanced transportation system with alternatives to the private vehicle. The analyses conducted for the TMP show that some components of the system operate poorly and congestion occurs daily and reaches severe conditions at some locations. However, it is important to preserve and maintain essential infrastructure and services, while making the system operate as efficiently as possible. It is also equally critical to enhance the mobility of people and goods by increasing mode choice, access and convenience, and strategically expanding transportation capacity. Although the highway system dominates movement, non-highway components are equally important and provide alternatives for other system users.

5.6.2. Alignment of Goals with FAST Act and Livability Principles

Although technically not required since Bozeman is not an MPO as per the 2010 Census, it is still desirable to ensure the alignment of local TMP transportation goals with the FAST Act planning factors. Additionally, the Livability Principles from HUD/EPA/USDOT[12], while technically not Federal law, are worthy national transportation process objectives that should be reviewed and considered. **Table 5.2** depicts the relationship between the proposed Bozeman TMP goals, the required FAST Act planning factors, and the objectives contained in the Livability Principles from HUD/EPA/USDOT.

City residents commented throughout the planning process that Bozeman's transportation system should provide choices, be sustainable, respect the environment and enhance livability.

Table 5.2: Alignment of Goals with FAST Act and Livability Principles

			Bozeman TMP Goals						
			Goal 1: Maintain the existing transportation system.	**Goal 2**: Improve the efficiency, performance and connectivity of a balanced transportation system.	**Goal 3**: Promote consistency and coordination between land use and transportation planning to manage and develop the transportation system for all modes and users.	**Goal 4**: Provide a safe and secure transportation system.	**Goal 5**: Support economic vitality of the community.	**Goal 6**: Protect and enhance environmental sustainability, provide opportunities for active lifestyles, and conserve natural and cultural resources.	**Goal 7**: Promote a financially sustainable transportation plan that is actively used to guide the transportation decision-making process.
FAST Act Planning Factors	1	Support the **economic vitality** of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.					✓		✓
	2	Increase the **safety** of the transportation system for motorized and non-motorized users.				✓			
	3	Increase the **security** of the transportation system for motorized and non-motorized users.				✓			
	4	Increase the **accessibility and mobility** of **people and for freight**.		✓	✓		✓		
	5	**Protect and enhance the environment**, promote **energy conservation**, improve the **quality of life**, and promote **consistency between transportation improvements** and State and local planned growth and economic development patterns.			✓			✓	✓
	6	Enhance the **integration and connectivity** of the transportation system, across and between modes, people and freight.		✓	✓				
	7	Promote **efficient system management and operation**.		✓					
	8	Emphasize the **preservation of the existing transportation system**.	✓						
Livability Principles	1	Provide more **transportation choices**.		✓					
	2	Promote equitable, **affordable housing**.		✓	✓				✓
	3	Enhance **economic competitiveness**.					✓		
	4	**Support** existing **communities**.	✓	✓	✓	✓		✓	
	5	Coordinate policies and **leverage investment**.							✓
	6	**Value communities and neighborhoods**.	✓	✓	✓	✓			

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Chapter 6

Implementation and Financial Strategies

6.1. VISIONARY TRANSPORTATION NETWORK

The visionary transportation network for Bozeman includes motorized and non-motorized facilities and services. For motorized, the visionary major street network consists of all interstate principal arterial, non-interstate principal arterial, minor arterial, and collector routes. Local streets are not included on the visionary major street network. This network is shown in **Figure 6.1**. For the visionary non-motorized transportation network, facilities include bicycle lane, bicycle boulevards, shared roadways, and shared use paths. This network is shown in **Figure 6.2**.

Establishing a visionary transportation network is essential to ensure coordinated land development and overall community planning is realized. It is important that planners, landowners, developers, and City officials know where the future transportation network needs to be located. With an approved visionary major street and active transportation network, everyone will know where future facilities need to be located. This will assist everyone involved in anticipating right-of-way needs, and complimentary land uses.

The study area was examined to determine the most appropriate long-term vision for the transportation network. For the motorized network, the principal arterials were set in place generally with two-mile spacing. The minor arterials were then generally inserted on a one-mile spacing to fill in between the principals. Some collector routes were also established. It is assumed that other collector routes would be established when the development patterns in an area are defined. For the non-motorized transportation network, facility attributes were defined on the basis of continuity, connecting destinations, topography, and geometric features of adjacent lands and roadways.

All future alignments shown in **Figure 6.1** and **Figure 6.2** are conceptual in nature and may vary based on factors such as topography, wetlands, land ownership, and other unforeseen factors. The purpose of these figures is to illustrate the visionary transportation network at full build-out. It is likely that many of the corridors shown will not be developed into roads or paths for many decades to come. On the other hand, if development is proposed in a particular area, the visionary transportation network will ensure that the various facilities will be established in a fashion that produces an efficient and logical future transportation system. Presenting the visionary transportation network herein is an effort to help plan for the future development of the transportation system in the community.

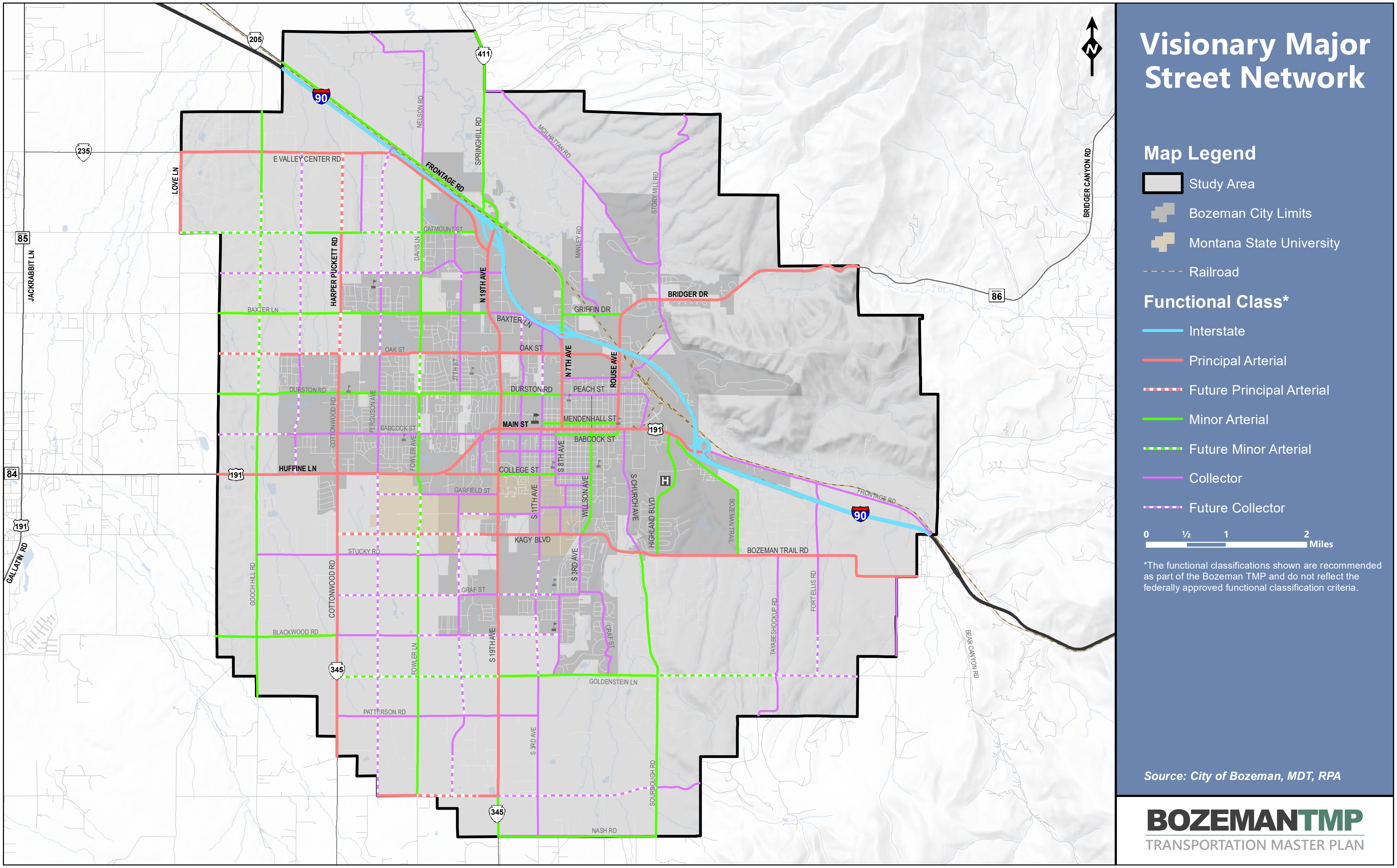

Figure 6.1: Visionary Major Street Network

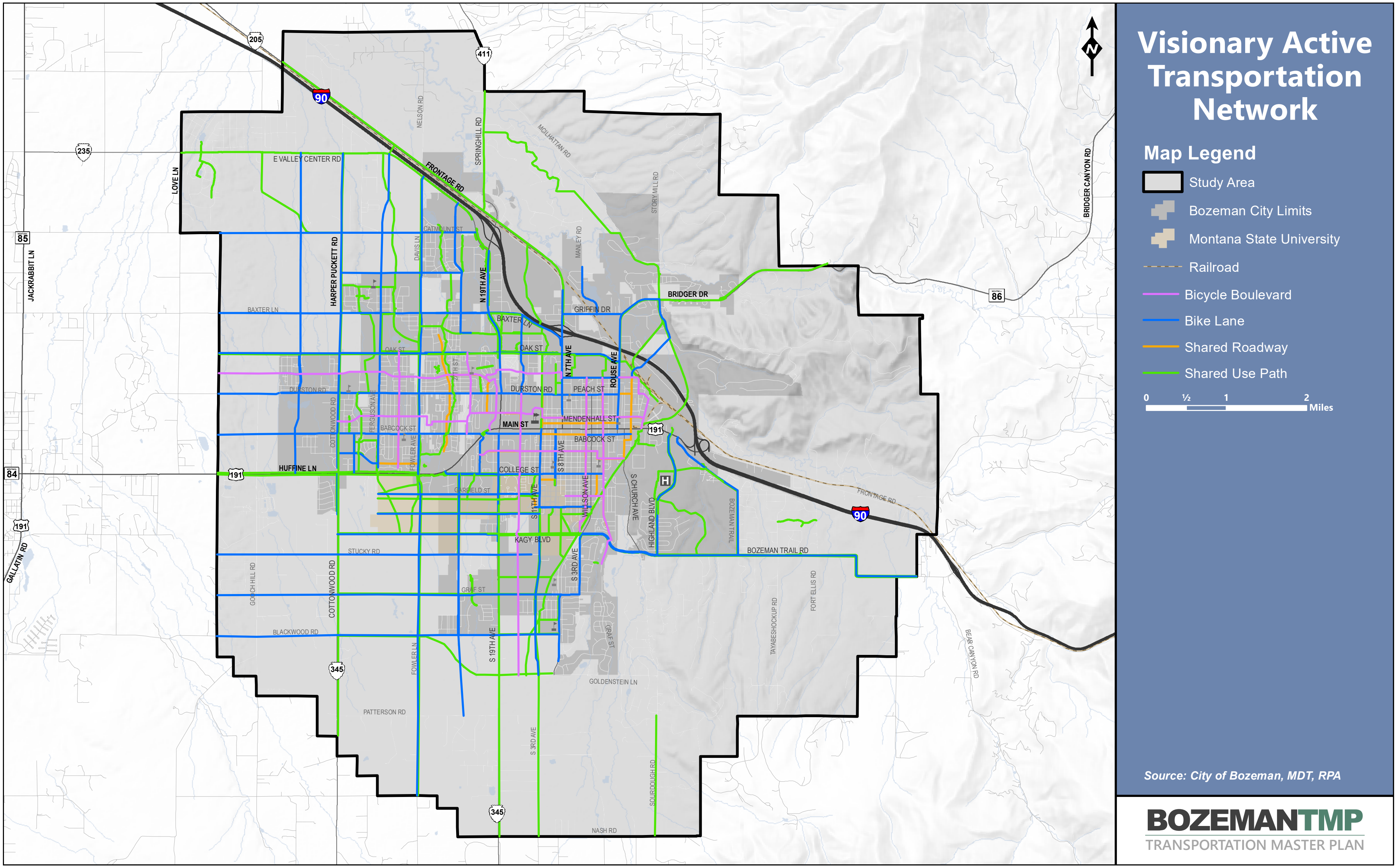

Figure 6.2: Visionary Active Transportation Network

6.2. PERFORMANCE MEASURES AND TARGETS

Simply examining intersection level of service, roadway capacity and automobile travel times as a means of monitoring performance of the transportation system is no longer sufficient. Establishing and monitoring performance standards to measure annual progress in meeting transportation goals and achieving objectives, though technically not required according to the FAST Act, is fundamentally good planning practice. Performance measures must relate to the TMP goals and objectives and use statistical evidence to determine progress toward those goals and objectives. Performance measurements address the public's demand for increased accountability and inform decision-makers on the effectiveness of the TMP.

Goals and objectives were developed as part of the TMP planning process, and presented at multiple public forums. A range of possible performance measures and targets were developed and reviewed via a brainstorming session with the TMPs Technical Working Group in February, 2016. Concern was expressed by the TWG that any performance measure developed must be easily quantified and not unduly excessive to do so. The actual number of performance measures that were identified to carry forward in the TMP were limited due to the concern of staff and funding availability to track the progress.

The following section depicts suggested performance measures and targets to consider for tracking over the planning horizon. Some of the suggested performance measures will require the collection of data that has not been collected in the past and will require coordination between multiple jurisdictions. Because performance measures have not previously been collected, the first round of measurements will take jurisdictional coordination to determine and refine the data collection methodology and may need to be used to set benchmarks for future year comparative evaluations. In certain cases, a specific measurement may be used to address more than one goal or objective.

6.2.1. Proposed Performance Measures and Targets

The proposed performance measures are directly related to the TMP goals and objectives. As presented in **Chapter 1**, the Bozeman TMP goals are generalized statements which broadly relate the physical environment to values and objectives that are specific and measurable statements related to the attainment of goals. During the planning process, numerous potential performance measures were identified and discussed for inclusion in the TMP. The TWG desired simple performance measures that could be easily quantified by staff, and that would make best use of limited City resources. A range of simple performance measures were developed that could be applied to a goal, or in many cases several goals. The goals and proposed performance measures, along with targets to monitor progress, are depicted in **Table 6.1**.

Table 6.1: Proposed Performance Measures

Goal	Proposed Performance Measure	Targets to Monitor Progress
1. Maintain the Existing Transportation System.	• Annual pavement condition index (PCI) inventories • Number of miles of chip seal or pavement replacement • Number of miles bike lanes / multi-use paths swept and plowed	• Maintain the average PCI in Bozeman at 77. • Maintenance expenditures keep pace with system expansion and age.
2. Improve the Efficiency, Performance, and Connectivity of a Balanced Transportation System.	• Number of miles of bike lanes added per year • Number of miles of shared-use paths added per year • Number of miles of bike boulevards added per year • Annual transit ridership • Percent of city within 1/4 mile of bus stop or bike lane • Percent mode share shifts as presented through annual ACS updates	• 75% of city within 1/4 mile of transit stop or bike lane. • All street projects meet complete streets policy.
3. Promote Consistency and Coordination between Land Use and Transportation Planning to Manage and Develop the Transportation System for all Modes and Users.	• Number of miles of bike lanes added per year • Number of miles of shared-use paths added per year • Number of miles of bike boulevards added per year • Annual transit ridership • Percent of city within 1/4 mile of bus stop or bike lane • Percent mode share shifts as presented through annual ACS updates	• Transportation projects conform to TMP and land use standards. • Maximum road sized capped at 5 lanes. • All street projects meet complete streets policy. • Bike lanes/routes/multi-use paths with all arterials and collectors.
4. Provide a Safe and Secure Transportation System.	• Response time • Number of crashes involving inattentive / distracted driving • Number of fatalities and incapacitating injuries involving inattentive / distracted driving • Number of citations issued by law enforcement for inattentive / distracted driving • Number of unbelted persons involved in crashes • Number of unbelted fatal and incapacitating injuries • Number of citations issued by law enforcement for non-use of seat belts • Annual number of bicyclists and pedestrians involved in crashes • Annual number of bicyclist and pedestrian fatalities • Annual number of bicyclist and pedestrian injuries	• Less than 90% crash rate of peer communities. • Emergency services response time less than 6 minutes, 90% of time.
5. Support Economic Vitality of the Community.	• Number of miles of bike lanes added per year • Number of miles of shared-use paths added per year • Number of miles of bike boulevards added per year • Annual transit ridership • Percent of city within 1/4 mile of bus stop or bike lane • Percent mode share shifts as presented through annual ACS updates	• All street projects meet complete streets policy.

Goal	Proposed Performance Measure	Targets to Monitor Progress
6. Protect and Enhance Environmental Sustainability, Provide Opportunities for Active Lifestyles, and Conserve Natural and Cultural Resources.	• Number of miles of bike lanes added per year • Number of miles of shared-use paths added per year • Number of miles of bike boulevards added per year • Annual transit ridership • Percent of city within 1/4 mile of bus stop or bike lane • Percent mode share shifts as presented through annual ACS updates	• Increase commute mode share (ACS) from 5.8% to 11.4% (bicycles) and from 9.8% to 12.0% (pedestrians) by 2040. • Increase overall mode share (ACS + NHTS) from 8.2% to 16.1% (bicycles) and from 26.4% to 32.5% (pedestrians) by 2040.
7. Promote a Financially Sustainable Transportation Plan that is Actively Used to Guide the Transportation Decision-making Process.	• Number of miles of bike lanes added per year • Number of miles of shared-use paths added per year • Number of miles of bike boulevards added per year • Annual transit ridership • Percent of city within 1/4 mile of bus stop or bike lane • Percent mode share shifts as presented through annual ACS updates	• Funding increase proportionate to system expansion. • All arterials are subject to advance design.

6.3. FUNDING

Transportation improvements can be implemented using Federal, State, local and private funding sources. Historically, Federal and State funding programs have been used almost exclusively to construct and upgrade the major roads in the Bozeman area. Considering the current funding limits of these traditional programs, and the extensive list of recommended road projects, more funding will be required from local and private sources if all of the transportation network needs are to be met.

This section discusses the financial plan for the TMP, projected out to the year 2040. The financial element of the TMP includes estimates of costs that would be required to implement the TMP as well as estimates of existing and contemplated sources of funds available to pay for these improvements. Due to the current funding limitations of these traditional programs, and the anticipated road development needs of the community, a greater amount of financing will be required from local and private sources if these needs are to be met.

Much of the following information concerning the Federal and State funding programs was assembled with the assistance of the Statewide and Urban Planning Section of MDT. The intent was to identify traditional Federal, State and local sources of funds for transportation related projects and programs in the Bozeman area. A narrative description of each potential funding source is provided, including: the source of revenue; required match; purpose for which funds are intended; means by which the funds are distributed; and the agency or jurisdiction responsible for establishing priorities for use of the funds.

6.3.1. Overview of Traditional Funding Sources

MDT administers a number of programs that are funded from State and Federal sources. Each year, in accordance with 60-2-127, Montana Code Annotated (MCA), the Montana Transportation Commission allocates a portion of available Federal-aid highway funds for construction purposes and for projects located on the various systems in the state as described throughout this chapter.

The following sections discuss Federal and State funding sources developed for the distribution of Federal and State transportation funding. This includes Federal funds the State receives under the FAST Act[13]. The list also includes local funding sources available through the city and county, as well as private sources. It should be understood that other funding sources are possible, but those listed below reflect the most probable sources at this time.

6.3.2. Federal Funding Sources

The following summary of major Federal transportation funding categories received by the State through Titles 23-49 U.S.C., including state developed implementation/sub-programs that may be potential sources for projects. In order to receive project funding under these programs, projects must be included in the State Transportation Improvement Program (STIP), where relevant.

6.3.2.1. National Highway Performance Program (NHPP)

The National Highway Performance Program (NHPP) provides funding for the National Highway System, including the Interstate System and National Highways system roads and bridges. The purpose of the National Highway System (NHS) is to provide an interconnected system of principal arterial routes which will serve major population centers, international border crossings, intermodal transportation facilities and other major travel destinations; meet national defense requirement; and serve interstate and interregional travel. The National Highway System includes all Interstate routes, a large percentage of urban and rural principal arterials, the defense strategic highway network, and strategic highway connectors.

Allocations and Matching Requirements: NHPP funds are Federally-apportioned to Montana and allocated to Districts by the Montana Transportation Commission. Based on system performance, the funds are allocated to three programs:

Interstate Maintenance

Interstate Maintenance (IM) funds are Federally-apportioned to Montana and allocated based on system performance by the Montana Transportation Commission. The Commission approves and awards projects for improvements on the Interstate Highway System which are let through a competitive bidding process. The Federal share for IM projects is 91.24% and the State is responsible for 8.76%.

National Highway

The Federal share for non-Interstate NHS projects is 86.58% and the State is responsible for the remaining 13.42%. The State share is funded through the Highway State Special Revenue Account.

Eligibility and Planning Considerations: Activities eligible for the National Highway System funding include construction, reconstruction, resurfacing, restoration, and rehabilitation of segments of the NHS roadway; construction, replacement, rehabilitation, preservation and protection of bridges on the National Highway System; and projects or part of a program supporting national goals for improving infrastructure condition, safety, mobility, or freight movements on the National Highway System. Operational improvements as well as highway safety improvements are also eligible. Other miscellaneous activities that may qualify for NHS funding include bikeways and pedestrian walkways, environmental mitigation, restoration and pollution control, infrastructure based intelligent transportation systems, traffic and traveler monitoring and control, and construction of intra or inter-city bus terminals serving the National Highway System. The Transportation Commission establishes priorities for the use of National Highway Performance Program funds and projects are let through a competitive bidding process.

NHPP Bridge

Federal and state funds under this program are used to finance bridge inspection, improvement, and replacement projects on Interstate and non-Interstate National Highway System routes. NHPB program funding is established at the discretion of the state. However, Title 23 U.S.C. establishes minimum standards for NHS bridge conditions. If more than 10% of the total deck area of NHS bridges in a state is on structurally deficient bridges for three consecutive years, the state must direct NHPB funds equal to 50% of the state's FY 2009 Highway Bridge Program to improve bridges each year until the state's NHS bridge condition meets the minimum standard.

6.3.2.2. Surface Transportation Program (STP)

Surface Transportation Program (STP) funds are Federally-apportioned to Montana and allocated by the Montana Transportation Commission to various programs including the Surface Transportation Program Primary Highways (STPP), Surface Transportation Program Secondary Highways (STPS)* and the Surface Transportation Program Urban Highways (STPU). The Federal share for these projects is 86.58% with the non-Federal share typically funded through Highway State Special Revenue (HSSR).

Primary Highway System (STPP)

The Federal and State funds available under this program are used to finance transportation projects on the state-designated Primary Highway System. The Primary Highway System includes highways that have been functionally classified by MDT as either principal or minor arterials and that have been selected by the Montana Transportation Commission to be placed on the primary highway system [MCA 60-2-125(3)].

Allocations and Matching Requirements: Primary funds are distributed statewide (MCA 60-3-205) to each of five financial districts. The Commission distributes STPP funding based on system performance. Of the total received, 86.58% is Federal and 13.42% is State funds from the Highway State Special Revenue Account.

Eligibility and Planning Considerations: STP Primary funds are eligible for a wide range of transportation improvement projects and activities, ranging from roadway reconstruction and rehabilitation, to bridge construction and inspection, to highway and transit safety infrastructure, environmental mitigation, carpooling, and bicycle and pedestrian transportation facilities.

Secondary Highway System (STPS)

The Federal and State funds available under this program are used to finance transportation projects on the state-designated Secondary Highway System. The Secondary Highway System includes any highway that is not classified as a local route or rural minor collector and that has been selected by the Montana Transportation Commission to be placed on the Secondary Highway System. Funding is distributed by formula and is utilized to resurface, rehabilitate and reconstruct roadways and bridges on the Secondary System.

Allocations and Matching Requirements: Secondary funds are distributed statewide (MCA 60-3-206) to each of five financial districts, based on a formula, which takes into account the land area, population, road mileage and bridge square footage. Federal funds for secondary highways must be matched by non-Federal funds. Of the total received 86.58% is Federal and 13.42 % is non-Federal match. Normally, the match on these funds is from the Highway State Special Revenue Account.

Eligibility and Planning Considerations: Eligible activities for the use of Secondary funds fall under three major types of improvements: Reconstruction, Rehabilitation, and Pavement Preservation. The Reconstruction and Rehabilitation categories are allocated a minimum of 65% of the program funds with the remaining 35% dedicated to Pavement Preservation. Secondary funds can also be used for any project that is eligible for STP under Title 23, U.S.C. Priorities are identified in consultation with the appropriate local government authorizes and approved by the Montana Transportation Commission.

Urban Highway System (STPU)

The Federal and state funds available under this program are used to finance transportation projects on Montana's Urban Highway System, as per MCA 60-3-211. STPU allocations are based on a per capita distribution and are recalculated each decade following the census. STPU funds are primarily used for resurfacing, rehabilitation or reconstruction of existing facilities; operational improvements; bicycle facilities; pedestrian walkways and carpool projects.

Allocations and Matching Requirements: State law guides the allocation of Urban funds to projects on the Urban Highway System in Montana's urban areas (population of 5,000 or greater) through a statutory formula based on each area's population compared to the total population in all urban areas. Of the total received, 86.58% is Federal and 13.42% is non-Federal match typically provided from the Special State Revenue Account for highway projects.

Eligibility and Planning Considerations: Urban funds are used primarily for major street construction, reconstruction, and traffic operation projects on the 430 miles on the State-designated Urban Highway System, but can also be used for any project that is eligible for STP under Title 23 U.S. C. Priorities for the use of Urban funds are established at the local level through local planning processes with final approval by the Transportation Commission.

Bridge Program (STP)

The Federal and state funds available under this program are used to finance bridge projects for on-system and off-system routes in Montana. Title 23 U.S.C. requires that a minimum amount (equal to 15 percent of Montana's 2009 Federal Bridge Program apportionment) be set aside for off-system bridge projects. The remainder of the Bridge Program funding is established at the discretion of the state. Bridge Program funds are primarily used for bridge rehabilitation or reconstruction activities on Primary, Secondary, Urban or off-system routes. Projects are identified based on bridge condition and performance metrics.

Surface Transportation Program for Other Routes - Off-system (STPX)

The Federal and state funds available under this program are used to finance transportation projects on state-maintained highways (or in other areas) that are not located on a defined highway system.

Urban Pavement Preservation Program (UPP)

The Urban Pavement Preservation Program (UPP) is a sub-allocation of the larger Surface Transportation Program that provides funding to urban areas with qualifying Pavement Management Systems (as determined jointly by MDT and FHWA). This sub-allocation is approved annually by the Transportation Commission and provides opportunities for pavement preservation work on urban routes (based on system needs identified by the local Pavement Management Systems).

6.3.2.3. Highway Safety Improvement Program

HSIP funds are apportioned to Montana for allocation to safety improvement projects approved by the Commission and are consistent with the strategic highway safety improvement plan. Projects described in the State strategic highway safety plan must correct or improve a hazardous road location or feature, or address a highway safety problem. The Commission approves and awards the projects which are let through a competitive bidding process. Generally, the Federal share for the HSIP projects is 90% with the non-Federal share typically funded through the HSSR account.

6.3.2.4. Congestion Mitigation and Air Quality Improvement Program (CMAQ)

Federal funds available under this program are used to finance transportation projects and programs to help improve air quality and meet the requirements of the Clean Air Act. Montana's air pollution problems are attributed to carbon monoxide (CO) and particulate matter (PM10 and PM2.5).

Allocations and Matching Requirements: CMAQ funds are Federally-apportioned to Montana and allocated to various eligible programs by formula and by the Commission. As a minimum apportionment state a Federally-required distribution of CMAQ funds goes to projects in Missoula since it was Montana's only designated and classified air quality non-attainment area. The remaining, non-formula funds, referred to as "flexible CMAQ" is primarily directed to areas of the state with emerging air quality issues through various state programs. The Transportation Commission approves and awards both formula and non-formula projects on MDT right-of-way. Infrastructure and capital equipment projects are let through a competitive bidding process. Of the total funding received, 86.58% is Federal and 13.42% is non-Federal match provided by the state for projects on state highways and local governments for local projects.

Eligibility and Planning Considerations: In general, eligible activities include transit improvements, traffic signal synchronization, bicycle pedestrian projects, intersection improvements, travel demand management strategies, traffic flow improvements, air quality equipment purchases, and public fleet conversions to cleaner fuels. At the project level, the use of CMAQ funds is not constrained to a particular system (i.e. Primary, Urban, and NHS). A requirement for the use of these funds is the estimation of the reduction in pollutants resulting from implementing the program/project. These estimates are reported yearly to FHWA.

CMAQ (formula)

Mandatory CMAQ funds that come to Montana based on a Federal formula and are directed to Missoula, Montana's only classified, moderate CO non-attainment area. Not applicable to Whitefish. Projects are prioritized through the Missoula Metropolitan planning process.

Montana Air & Congestion Initiative (MACI)–Guaranteed Program (flexible)

This is state program funded with flexible CMAQ funds that the Commission allocates annually to Billings and Great Falls to address carbon monoxide issues in these designated, but "not classified", CO non-attainment areas. The air quality in these cities is roughly equivalent to Missoula, however, since these cities are "not classified" so they do not get direct funding through the Federal formula. Projects are prioritized through the respective Billings and Great Falls Metropolitan planning processes.

Montana Air & Congestion Initiative (MACI)–Discretionary Program (flexible)

The MACI – Discretionary Program provides funding for projects in areas designated non-attainment or recognized as being "high-risk" for becoming non-attainment. Since 1998, MDT has used MACI-Discretionary funds to get ahead of the curve for CO and PM10 problems in non-attainment and high-risk communities across Montana. District Administrators and local governments nominate projects cooperatively. Projects are prioritized and selected based on air quality benefits and other factors. The most beneficial projects to address these pollutants have been sweepers and flushers, intersection improvements and signal synchronization projects.

6.3.2.5. Transportation Alternatives Program

The Transportation Alternatives Program (TA) requires MDT to obligate 50% of the funds within the state based on population, using a competitive process, while the other 50% may be obligated in any area of the state. The Federal share for these projects is 86.58, with the non-Federal share funded by the project sponsor through the HSSR.

Funds may be obligated for projects submitted by:

- Local governments
- Transit agencies
- Natural resource or public land agencies
- School district, schools, or local education authority
- Tribal governments
- Other local government entities with responsibility for recreational trails for eligible use of these funds.

<u>Eligibility and Planning Considerations:</u> Eligible categories include:

- On-road and off-road trail facilities for pedestrians and bicyclists, including ADA improvements;
- Historic Preservation and rehabilitation of transportation facilities;
- Archeological activities relating to impacts for a transportation project;
- Any environmental mitigation activity, including prevention and abatement to address highway related stormwater runoff and to reduce vehicle/animal collisions including habitat connectivity;
- Turnouts, overlooks, and viewing areas;
- Conversion/use of abandoned railroad corridors for trails for non-motorized users;
- Inventory, control, and removal of outdoor advertising;
- Vegetation management in transportation right of way for safety, erosion control, and controlling invasive species;
- Construction, maintenance, and restoration of trails and development and rehabilitation of trailside and trailhead facilities;
- Development and dissemination of publications and operation of trail safety and trail environmental protection programs;
- Educations funds for publications, monitoring, and patrol programs and for trail-related training;
- Planning, design, and construction of projects that will substantially improve the ability of students to walk and bicycle to school; and

- Non-infrastructure-related activities to encourage walking and bicycling to school, including public awareness campaigns, outreach to press and community leaders, traffic education and enforcement school vicinities, student sessions on bicycle and pedestrian safety, health, and environment, and funding for training.

Competitive Process: The State and any Metropolitan Planning Organizations required to obligate Transportation Alternative funds must develop a competitive process to allow eligible applicants an opportunity to submit projects for funding. MDT's process emphasizes safety, ADA, relationships to State and community planning efforts, existing community facilities, and project readiness.

6.3.2.6. Federal Lands Highway Program (FLAP)

The Federal Lands Access Program was created to improve access to Federal lands. Western Federal Lands administers the funds, not MDT. However, MDT is an eligible applicant for the funds.

The program is directed towards Public Highways, Roads, Bridges, Trails, and Transit systems that are under State, county, town, township, tribal, municipal, or local government jurisdiction or maintenance and provide access to Federal lands. The Federal lands access program funds improvements to transportation facilities that provide access to, are adjacent to, or are located within Federal lands. The program supplements State and local resources for public roads, transit systems, and other transportation facilities, with an emphasis on high-use recreation sites and economic generators. Program funds are subject to the overall Federal-aid obligation limitation. Funds are allocated among the states using a statutory formula based on road mileage, number of bridges, land area, and visitation.

Eligibility and Planning Considerations: The following activities are eligible for consideration on Federal Lands Access Transportation Facilities:

- Preventive maintenance, rehabilitation, restoration, construction and reconstruction
- Adjacent vehicular parking areas
- Acquisition of necessary scenic easements and scenic or historic sites
- Provisions for pedestrian and bicycles
- Environmental mitigation in or adjacent to Federal land to improve public safety and reduce vehicle-wildlife mortality while maintaining habitat connectivity
- Construction and reconstruction of roadside rest areas, including sanitary and water facilities.
- Operation and maintenance of transit facilities

Proposed projects must be located on a public highway, road, bridge, trail or transit system that is located on, is adjacent to, or provides access to Federal lands for which title or maintenance responsibility is vested in a State, county, town, township, tribal, municipal, or local government.

Allocation and Matching Requirements: Projects are funded in Montana to the ratio of 87.58% federal funds and 13.42% non-federal matching funds. Funding is authorized and allocated for each state under USC, Title 23, Chapter 2, MAP-21, Division A, Title I, Subtitle A, Section 1119 distribution formula.

6.3.2.7. Congressionally Directed Funds

Congressionally Directed funds may be received through either highway program authorization or annual appropriations processes. These funds are generally described as “demonstration” or “earmark” funds. Discretionary funds are typically awarded through a Federal application process or Congressional direction. If a local sponsored project receives these types of funds, MDT will administer the funds in accordance with the Montana Transportation Commission Policy #5 – *“Policy resolution regarding Congressionally directed funding: including Demonstration Projects, High Priority Projects, and Project Earmarks.”*

6.3.3. State Funding Sources

6.3.3.1. State Fuel Tax

The State of Montana assesses a tax of $0.2775 per gallon on gasoline and diesel fuel used for transportation purposes (MCA Section 15-70-101). According to State law, each incorporated city and town within the State receives an allocation of the total tax funds ($16,766,000) based upon:

1. the ratio of the population within each city and town to the total population in all cities and towns in the State, and
2. the ratio of the street mileage within each city and town to the total street mileage in all incorporated cities and towns in the State. (The street mileage is exclusive of the Federal-Aid Interstate and Primary Systems.)

State law also establishes that each county be allocated a percentage of the total tax funds ($6,306,000) based upon:

1. the ratio of the rural population of each county to the total rural population in the state, excluding the population of all incorporated cities or towns within the county and State;
2. the ratio of the rural road mileage in each county to the total rural road mileage in the State, less the certified mileage of all cities or towns within the county and State; and
3. the ratio of the land area in each county to the total land area of the State.

For State Fiscal Year 2017, the city of Bozeman will receive $693,945 (MCA 15-70-101) and Gallatin County will receive $328,092 (MCA 15-70-101 and MCA 7-14-102(2)) in State fuel tax funds. The amount varies annually, but the current level provides a reasonable base for projection throughout the planning period.

All fuel tax funds allocated to the city and county governments must be used for the construction, reconstruction, maintenance, and repair of rural roads or city streets and alleys. The funds may also be used for the share that the city or county might otherwise expend for proportionate matching of Federal funds allocated for the construction of roads or streets that are part of the primary, secondary or urban system. Priorities for the use of these funds are established by each recipient jurisdiction.

6.3.3.2. State Funds for Transit Subsidies

The 46th Montana Legislature amended Section 7-14-102 MCA providing funds to offset up to 50 percent of the expenditures of a municipality or urban transportation district for public transportation. The allocation to operators of transit systems is based on the ratio of its local support for public transportation to the total financial support for all general purpose transportation systems in the State. Local support is defined as:

$$\text{Local Support} = \frac{\text{Expenditure for public transportation operations}}{\text{Mill value of City or urban transportation district}}$$

6.3.3.3. State Special Revenue/State Funded Construction

Allocations and Matching Requirements: The State Funded Construction Program, which is funded entirely with state funds from the Highway State Special Revenue Account, provides funding for projects that are not eligible for Federal funds. This program is totally State funded, requiring no match.

Eligibility and Planning Considerations: This program funds projects to preserve the condition and extend the service life of highways. Eligibility requirements are that the highways be maintained by the State. MDT staff nominates the projects based on pavement preservation needs. The District's establish priorities and the Transportation Commission approves the program.

6.3.3.4. TransADE

The TransADE grant program offers operating assistance to eligible organizations providing transportation to the elderly and persons with disabilities.

Allocations and Matching Requirements: This is a state funding program within Montana statute. State funds pay 54.11 percent of deficit operating costs, 80 percent of administrative costs, and 80 percent of maintenance costs. The remaining 45.89, 20, and 20 percent respectively must come from the local recipient. Applicants are also eligible to use this funding as match for the Federal transit grant programs.

Eligibility and Planning Considerations: Eligible recipients of this funding are counties, incorporated cities and towns, transportation districts, or non-profit organizations. Applications are due to the MDT Transit Section by the first working day of March each year. To receive this funding the applicant is required by state law (MCA 7-14-112) to develop a strong, coordinated system in their community and/or service area.

6.3.3.5. Rail/Loan Funds

Administration and Matching Requirements: The Montana Rail Freight Loan Program (MRFL) is a revolving loan fund administered by the Montana Department of Transportation to encourage projects for construction, reconstruction, or rehabilitation of railroads and related facilities in the State and implements MCA 60-11-113 to MCA 60-11-115. Loans are targeted to rehabilitation and improvement of railroads and their attendant facilities, including sidings, yards, buildings, and intermodal facilities. Rehabilitation and improvement assistance projects require a 30 percent loan-to value match. Facility construction assistance projects require a 50 percent match.

Eligibility and Planning Consideration: Eligible applicants for loans under the program include railroads, cities, counties, companies, and regional rail authorities. Port authorities may also qualify, provided they have been included in the state transportation planning process. Projects must be integrally related to the railroad transportation system in the State and demonstrate that they will preserve and enhance cost-effective rail service to Montana communities and businesses.

6.3.4. Local Funding Sources

Local governments generate revenue through a variety of funding mechanisms. Typically, several local programs related to transportation exist for budgeting purposes and to disperse revenues. These programs are tailored to fulfill specific transportation functions or provide particular services. The following text summarizes programs that are or could be used to finance transportation improvements by the city and county.

6.3.4.1. City of Bozeman

Special Revenue Funds

These funds are used to budget and distribute revenues that are legally restricted for a specific purpose. Several such funds that benefit the transportation system are discussed briefly in the following paragraphs.

SID Revolving Fund

This fund provides financing to satisfy bond payments for special improvement districts in need of additional funds. The City can establish street SID’s with bond repayment to be made by the adjoining landowners receiving the benefit of the improvement. The City has provided labor and equipment for past projects through the General Fund, with an SID paying for materials.

Gas Tax Apportionment

Revenues are generated through State gasoline taxes apportioned from the State of Montana. The City's FY 2017 state gas tax apportionment will be approximately $693,945. Transfers are made from this fund to the General Fund to reimburse expenditures for construction, reconstruction, repair and maintenance of streets.

Street Maintenance Assessment

Every parcel within the city limits is assessed for street maintenance, with a square footage cap based on the type of property (residential versus commercial). Revenues generated from the assessment fund maintenance activities on public roadways. Street maintenance includes, but is not limited to, the following: sprinkling; graveling; oiling; chip sealing; seal coating; overlaying; treating; general cleaning; sweeping; flushing; snow and ice removal; and leaf and debris removal.

Bozeman Parking Commission

Monthly lease rental payments and meter collections fund this program. Revenues are used to fund parking improvements in the downtown area.

Street Impact Fees

Bozeman collects impact fees that help fund transportation improvements. Review and recommendations for expending impact fee monies comes through the City's Impact Fee Advisory Committee (IFAC). The actual dollar amount collected varies from year to year based on the economy and development market, but has averaged approximately $2.9 Million over the five-year period from 2012 to 2016. Fiscal Year 2016 collections realized a record for the program at $4.2 Million. For planning purposes, the five-year average of $2.9 Million was carried forward as a reasonable future annual revenue amount for this program.

Arterial and Collector District

Bozeman created the Arterial and Collector District in 2015 as a mechanism to collect revenue for funding the "local share" in advance of projects of critical importance. The District also provides funding via a Payback District to recover the "local share" once an adjacent project is developed. The first year of assessment was Fiscal Year 2016, and the District was based on a three-year phase-in to an annual total assessment of $2.0 Million by Fiscal Year 2018. After 2018, only modest growth will be expected based on annexation activity. For planning purposes, an amount of $2.2 Million was carried forward as a reasonable future annual revenue amount for this program.

6.3.4.2. Private Funding Sources

Private financing of roadway improvements, in the form of right of way donations and cash contributions, has been successful for many years. In recent years, the private sector has recognized that better access and improved facilities can be profitable due to increases in land values and commercial development possibilities. Several forms of private financing for transportation improvements used in other parts of the United States are described in this section.

Cost Sharing

The private sector pays some of the operating and capital costs for constructing transportation facilities required by development actions.

Transportation Corporations

These private entities are non-profit, tax exempt organizations under the control of state or local government. They are created to stimulate private financing of highway improvements.

Road Districts

These are areas created by a petition of affected landowners, which allow for the issuance of bonds for financing local transportation projects.

Private Donations

The private donation of money, property, or services to mitigate identified development impacts is the most common type of private transportation funding. Private donations are very effective in areas where financial conditions do not permit a local government to implement a transportation improvement itself.

Private Ownership

This method of financing is an arrangement where a private enterprise constructs and maintains a transportation facility, and the government agrees to pay for public use of the facility. Payment for public use of the facility is often accomplished through leasing agreements (wherein the facility is rented from the owner), or through access fees whereby the owner is paid a specified sum depending upon the level of public use.

Privatization

Privatization is either the temporary or long term transfer of a public property or publicly owned rights belonging to a transportation agency to a private business. This transfer is made in return for a payment that can be applied toward construction or maintenance of transportation facilities.

General Obligation (G.O.) Bonds

The sale of general obligation bonds could be used to finance a specific set of major highway improvements. A G.O. bond sale, subject to voter approval, would provide the financing initially required for major improvements to the transportation system. The advantage of this funding method is that when the bond is retired, the obligation of the taxpaying public is also retired. State statutes limiting the level of bonded indebtedness for cities and counties restrict the use of G.O. bonds. The present property tax situation in Montana, and recent adverse citizen responses to proposed tax increases by local government, would suggest that the public may not be receptive to the use of this funding alternative.

Tax Increment Financing (TIF)

Increment financing has been used in many municipalities to generate revenue for public improvements projects. As improvements are made within the district, and as property values increase, the incremental increases in property tax revenue are earmarked for this fund. The fund is then used for improvements within the district. Expenditures of revenue generated by this method are subject to certain spending restrictions and must be spent within the district. Tax increment districts could be established to accomplish transportation improvements in other areas of the community where property values may be expected to increase. A TIF is currently being utilized in downtown Bozeman. Additional TIF districts could be established in other areas of the city and county to accomplish a variety of transportation-related improvements.

Multi-Jurisdictional Service District

This funding option was authorized in 1985 by the State Legislature. This procedure requires the establishment of a special district, somewhat like an SID or RSID, which has the flexibility to extend across city and county boundaries. Through this mechanism, an urban transportation district could be established to fund a specific highway improvement that crosses municipal boundaries (e.g., corporate limits, urban limits, or county line). This type of fund is structured similar to an SID with bonds backed by local government issued to cover the cost of a proposed improvement. Revenue to pay for the bonds would be raised through assessments against property owners in the service district.

Local Improvement District

This funding option is only applicable to counties wishing to establish a local improvement district for road improvements. While similar to an RSID, this funding option has the benefit of allowing counties to initiate a local improvement district through a more streamlined process than that associated with the development of an RSID.

6.3.4.3. Future Potential Funding Sources

Local Sales Tax

If authorizing legislation were to be approved, local governments would be able to initiate local option taxes as a potential funding source for transportation improvements. One local option tax would be a local sales tax.

Wheel Tax

If initiated, a tax per wheel on vehicles licensed in counties could generate substantial revenue. The cost to each user of the transportation network would be proportional to the number and type of vehicles owned.

Local Option Motor Fuel Tax

A local option fuel tax is another means of raising revenue for the construction, reconstruction, maintenance, and repair of public streets and roads. This local tax may be imposed by the people of the county or by the adoption of a resolution by the county commissioners and referred to the people. An advantage to a local motor fuel tax, as with a wheel tax, is that it taxes only the users of the transportation system and the tax paid by each individual is directly proportional to their use of the facilities. The revenue from a motor fuel tax must be distributed proportionately among the county and its member municipalities based on vehicle registration.

Excise Taxes

Excise taxes are similar to sales taxes with the exception that items taxed are those considered to be indulgent. The demand for items on which there is an excise tax is generally large, therefore, there is potential to raise a substantial amount of local revenue. Products on which an excise tax could be imposed for additional local revenue include such items as tobacco, alcohol, and various forms of entertainment. A potential problem with excise taxes arises when the tax causes inter-area competition.

Value Capture Taxes

Value capture taxes are a means of raising revenue following the development of transportation improvements. Whereas development fees are assessed to make necessary transportation improvements, value capture taxes impose a fee to businesses which benefit due to their location along improved, highly traveled routes, which assumes improvements have been made. Value capture taxes may be a means to enter into other forms of funding future improvements. One method to consider would be cash flow management that makes wise use of existing revenue rather than continuing to introduce new sources.

6.3.5. Summary Of Current Financial Status

Current financial information was obtained from the MDT Statewide and Urban Planning Section to get a picture of the projected revenue available for funding transportation projects in the Bozeman area over the next 20 years. This information is summarized in **Table 6.2**. A comparison of the estimated costs shown in **Chapter 4** for the MSN ($158,625,000) and TSM ($55,412,000) projects, and the potential revenue from sources most likely to be used to fund the various projects shown in **Table 6.2**, confirms that the TMP is not fiscally constrained and will encounter significant financial shortfalls over the 24-year life of the Plan. The anticipated costs for the various improvements are more than the potential revenue available over the planning horizon. Additionally, some of the potential funding sources listed in **Table 6.2** are not entirely available for construction of capital improvements. Several of the funding sources listed also allocate money for routine and/or deferred maintenance activities. Portraying the 20-year revenue estimates as shown in **Table 6.2** is a function of MDT and FHWA planning requirements and portrays typical MPO revenue estimate depiction in transportation plans. It is acknowledged that the City of Bozeman may not allocate transportation revenues on the same time horizon and generally focuses on a 5-year horizon per the CIP process to plan projects.

Table 6.2: Projected Funding (Estimated)

	Funding Source	Current Account Balance	Yearly Annual Allocation (Estimated Per Year)	Summation of Projected Revenues (Years 2017 thru 2030)	Summation of Projected Revenues (Years 2017 thru 2040)
MDT Funding Sources	**NHPP – NH, IM ***	$0	$250,000	$3,500,000	$6,000,000
	HSIP Safety *	$0	$150,000	$2,100,000	$3,600,000
	STPU – Primary	$0	$500,000	$7,000,000	$12,000,000
	STPU – Urban	$1,449,771[(a)]	$960,000	$13,440,000	$23,040,000
	STPS – Secondary *	$0	$0	$0	$0
	STP – Bridge *	$0	$0	$0	$0
	RRS – Railroad *	$0	$0	$0	$0
	UPP – Preservation *	$0	$100,000	$1,400,000	$2,400,000
	TA		$50,000 [(b)]	$700,000	$1,200,000
	MACI -State Disc.		$300,000	$4,200,000	$7,200,000
	State Fuel Tax (City)		$700,000	$9,800,000	$16,800,000
	State Fuel Tax (County)		$330,000	$4,620,000	$7,920,000
City of Bozeman Funding Sources	**Bozeman Street Impact Fees**		$2,900,000	$40,600,000	$69,600,000
	Bozeman Arterial and Collector District		$2,200,000	$30,800,000	$52,800,000
	Other (Private, Bonds, TIF, CBDG, etc.) Local Transit Mill Levy		$250,000	$3,500,000	$6,000,000
	SID's / RID's[(c)]		VARIES	VARIES	VARIES

Notes: Although FAST Act only provides for Federal funding through Federal FY 2020, 2030 and 2040 projections are based on continuance of current levels of funding unless otherwise noted. It is important to note that the projected funding estimates are based on the best information available at this time and that there is no guarantee that these funding sources will be available beyond FAST Act. Estimated Federal fund allocations do not include amounts of any required local matching funds. Federal revenues, local revenues and local and state matching funds are held constant and do not inflate over time due to uncertainty with federal transportation program reauthorization. Accordingly, future year allocation for year 2030 and 2040 are based on current annual allocations being projected out to the future. Reevaluation of revenue estimation may be necessary as part of a future TMP update.

** Estimates from MDT are based on historical obligation figures with input from district. Not all of the future revenue stream may be available for "capital" improvement projects, as historically some maintenance activities have been funded under the program applications. Additionally, funds may already be tagged to specific projects, as is the case with the following: NHPP – NH,IM (North 19th Avenue Interchange Signalization), STPP-Primary (Rouse Avenue Reconstruction) and STPU – Urban (Kagy Boulevard).*

(a) Current account balance (01/2017) per MDT Statewide and Urban Planning Section.

(b) The TA (Transportation Alternatives) funding program does not have a set allocation. For purposes of estimating, an annual allocation of $50,000 was identified, assuming Bozeman would be successful in procuring some of the statewide TA available funding.

(c) Local SID/RIDs (Special / Rural Improvement Districts) are primarily available for "local" road projects and not on Major Street Network roadways.

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