2040 Bend Metropolitan Transportation Plan

Prepared For:

Bend Metropolitan Transportation Planning Organization

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Adopted on 9/17/19 via Resolution 2019-08

Bend Metropolitan Planning Organization

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Resolution Number 2019-08
Bend Metropolitan Planning Organization Policy Board

For the Purpose of Adopting the 2040 Metropolitan Transportation Plan

WHEREAS, the Census Bureau has declared that the City of Bend and the adjoining areas in Deschutes County form an Urbanized Area, named the Bend Urbanized Area; and

WHEREAS, the Bend Metropolitan Planning Organization (BMPO) has been designated by the State of Oregon as the official Metropolitan Planning Organization (MPO) for the Bend Urbanized Area; and

WHEREAS, the BMPO Policy Board has the specific responsibility to direct and administer the federally required urban transportation planning process; and

WHEREAS, the BMPO initiated an update to the Metropolitan Transportation Plan (MTP) in February 2018 in coordination with the City of Bend as it updates its Transportation System Plan; and

WHEREAS, a project identification and selection process was carried out through the development of the MTP and the projects in the 2040 MTP demonstrate financial constraint; and

WHEREAS, public engagement was secured through meetings of the Citywide Transportation Advisory Committee, Technical Advisory Committee, Policy Board, electronic notification, outreach to neighborhood associations, and on-line and in-person open houses; and

WHEREAS, the comments received at the committee meetings, Policy Board meetings, and through other forms of communication were explicitly considered; and

WHEREAS, the Policy Board is committed to a two phase approach to updating the MTP, with phase 1 complete today and phase 2 to begin immediately to incorporate the findings of several major planning and project development efforts underway within the MPO study area.

NOW, THEREFORE, BE IT RESOLVED, that the Policy Board of the Bend MPO approves and adopts the 2040 Metropolitan Transportation Plan.

Adopted by the Bend Metropolitan Planning Organization the 17th day of September, 2019.

Yes: 3 No: 0 Abstain: 0

Authenticated by the Chair this 17th day of September, 2019.

Justin Livingston, Chair

Attest:

Tyler Deke, MPO Manager

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Chapter 1: Introduction

The Bend Metropolitan Planning Organization

The Bend Metropolitan Planning Organization (BMPO) was designated in December 2002, by the Governor of Oregon. Local jurisdictions involved in the planning activities of the BMPO include the City of Bend and Deschutes County. In addition, the Oregon Department of Transportation (ODOT), Oregon Department of Land Conservation and Development, Federal Highway Administration, and Federal Transit Administration participate in the MPO process. The primary function of a MPO is to conduct a *continuing, cooperative,* and *comprehensive* transportation planning process that will result in plans and programs that consider all transportation modes and will support metropolitan community development and social goals.

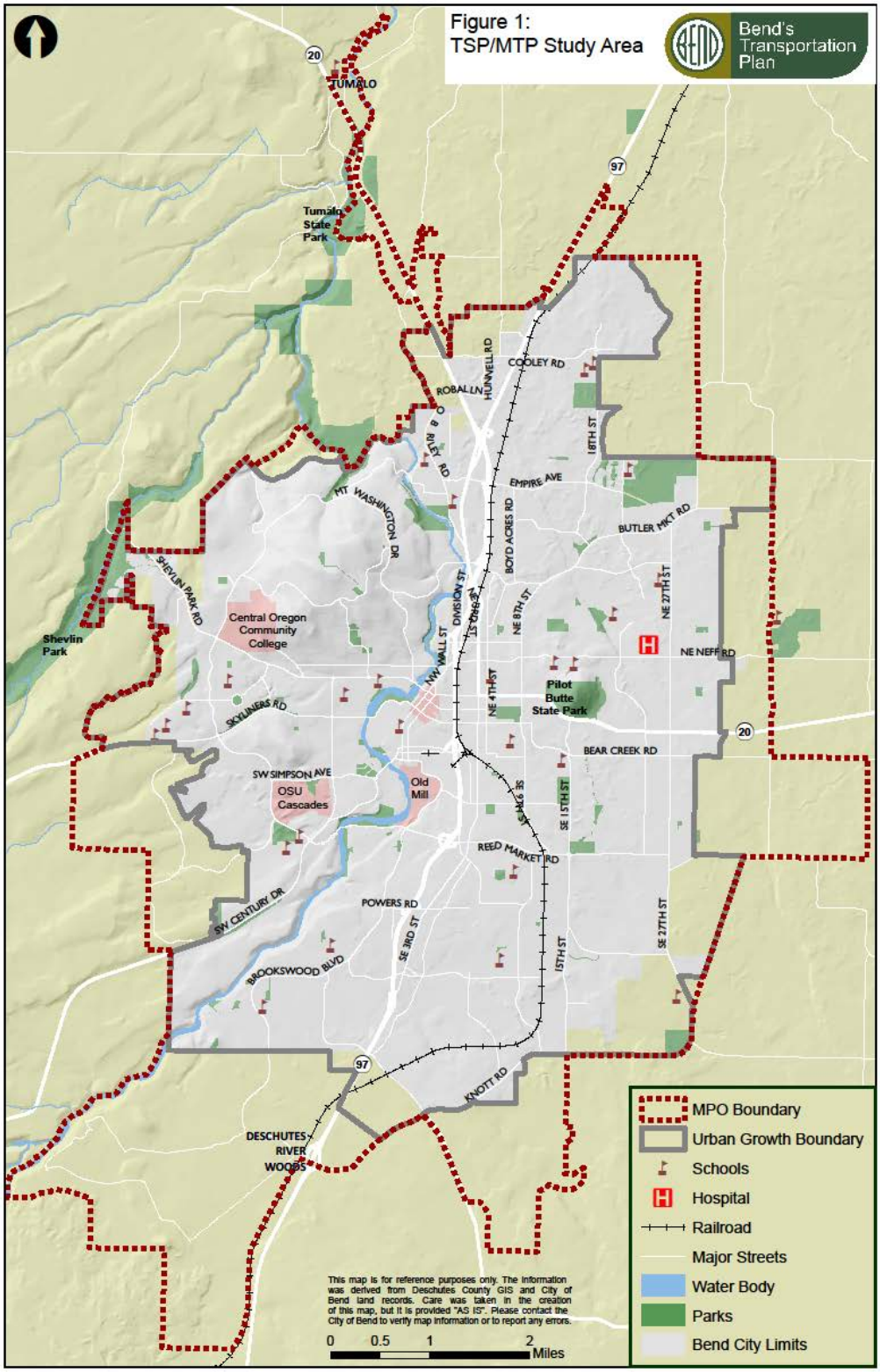
The BMPO organizational structure has been designed so that it operates as an entity separate from the participating jurisdictions so that no single entity dominates the organization's decision-making processes. A Policy Board has been established to oversee all processes of the BMPO. The Policy Board is comprised of three members of the Bend City Council, one member of the Deschutes County Commission, and an ODOT Region 4 representative. As future major transportation providers form, such as a Transit District, they will be added to the Policy Board. The Policy Board bylaws specify that no decisions shall be made by the BMPO Policy Board without representation from all parties. The BMPO planning boundary is shown in Figure 1-1.

Federal and state transportation planning responsibilities for the BMPO can generally be summarized as follows:

- Develop and maintain a Metropolitan Transportation Plan (MTP) and Metropolitan Transportation Improvement Program (MTIP) consistent with state and federal planning requirements.
- Review specific transportation and development projects for consistency with the MTP.
- Coordinate transportation decisions among local jurisdictions, state agencies, and area transit operators.
- Develop an annual work program (known as the Unified Planning Work Program [UPWP]).
- Maintain the regional travel-demand model for the purposes of assessing, planning, and coordinating regional travel demand impacts. (NOTE: ODOT's Transportation Planning Analysis Unit currently provides modeling support services to the BMPO).

The BMPO entered into an intergovernmental/interagency agreement with the City of Bend establishing the City of Bend as the administrative and fiscal agent for BMPO. This agreement is reviewed and renewed as appropriate.

Figure 1-1: Study Area Map



The Importance of Transportation

Transportation is a key contributor to the Bend area's quality of life and economic viability. Generally, the need for transportation stems from our need to access goods, services, and other people within and beyond the region. The ease by which we are able to get from home to school, to a job, to medical services, to shopping and back again is dependent upon the efficiency and effectiveness of the region's transportation system. As the region grows, additional demands are put on the system. With limited resources, determining the best means for improving the system and managing future demand is challenging. The framework for making decisions on the future of the region's transportation system has become more complex in recent years. Federal, state, and local policy calls for consideration of a wide range of factors in the preparation of a regional transportation plan, including:

- Identifying the means to reduce reliance on the automobile by increasing the transportation choices available in the region,
- Consideration of the interrelationships among the region's land use patterns and transportation system,
- Consideration of the financial, environmental, and neighborhood impacts of future plans, and
- Identifying strategies to maintain and improve the safety of the transportation system.

Ultimately, the most successful transportation plan will be one that enables us to minimize the time and resources required in the future to access the goods and services we need.

Trends and Issues

The region has experienced and is anticipating substantial population and employment growth. From the base year of 2010, the population of the Bend metropolitan area is expected to grow more than 100 percent by 2040. Employment in the region is expected to grow by more than 110 percent during that same period. A forecast of trends during the planning period points to several issues should land use patterns and travel behavior continue as they exist today.

- Congestion would rise dramatically, increasing the cost of travel and reducing the efficiency of the region's roadway network.
- Without a balanced approach to the development of future improvements, little change will be made in the transportation choices available to the region. With little improvement in choices, the proportion of trips using alternative modes will not see significant changes.

Overview of the MTP

The Metropolitan Transportation Plan (MTP) is a multi-modal transportation plan designed to meet the anticipated 20-year transportation needs within the BMPO planning area boundary. The MTP serves as a guide for the management of existing transportation facilities and for the design and implementation of future transportation facilities through the year 2040. The plan is intended to provide the framework and foundation for the transportation future in the metropolitan area. Policies and project descriptions are provided to enable the governments and citizens of the metropolitan area to understand and track projects that will be needed over the

next 20 years. As a plan, this document does not provide designs for individual projects. Such details are not within the scope of a metropolitan plan and will be completed on a project-by-project basis with the necessary analysis and community involvement.

The MTP provides a coordinated framework for identifying and meeting the region's transportation needs over the next 20 years. It provides the best projection for future growth and development based on current trends and planned land uses, policies and ordinances. The MTP looks at the different types of transportation opportunities that are available and what would be beneficial and useful in the future. It looks at how all the pieces should fit together and what other opportunities are available for a coordinated and contiguous system. The plan focuses on intra-regional (within the region) travel, but also addresses inter-regional (through the region) travel. The roadway element of the plan is emphasized in recognition that automobiles and trucks are the predominant mode of transportation today; however, the roadway element also plans for connectivity to other modes of travel. The roadway system provides for bicycle travel through the addition of upgraded urban streets with sidewalks and bike lanes or other provisions for safe bike travel. Key routes are identified throughout the urban area to provide accessible and safe pedestrian and bicycle travel. A low stress bicycle network is proposed for the City of Bend. In many cases, there are transit needs within the improvements designated for roadway improvements. All of these factors are critical when describing the transportation system. Other elements of the plan cover important aspects of the overall system including transportation system management (TSM), transportation demand management (TDM), freight, safety, and security.

The plan identifies the basic assumptions through the year 2040, including forecasts of future population and employment, and the resulting demand on the metropolitan arterial and collector street system. The resulting travel demand was determined through a "best practices" travel demand model. The model is a sophisticated planning tool and is continually refined and updated to ensure that it serves as an effective tool for future updates. The demographic assumptions used with the model are presented in the Land Use Chapter. Other aspects of the model are described in the technical reports and memoranda summarized in the Appendices.

A significant requirement of the MTP is that it must be financially constrained. The MTP must identify projects and recommended policies that can be implemented within the current funding trends of the metropolitan area. Ultimately, a 2040 financially constrained transportation system improvement strategy was developed to meet the transportation needs of the metropolitan area. The transportation system improvement strategy was reviewed by the Technical Advisory Committee and Policy Board.

The Technical Advisory Committee and Policy Board met throughout the planning process and reviewed the data, assumptions, and technical work. Much of the final product of the MTP was directed and developed from research and decisions based on these reports and memoranda.

Regulatory Framework

Federal, state, regional, and local requirements comprise the regulatory framework that shapes the Bend area's transportation planning process. The two most influential pieces of legislation are the federal Fixing America's Surface Transportation (FAST) Act and the Oregon Transportation Planning Rule (TPR). Federal statutes and regulations require development of a

regional transportation plan that demonstrates consideration of several factors, such as system preservation and efficiency, energy conservation, and congestion relief.

The plan must be constrained to financial resources reasonably expected to be available. The entire plan provides the overall vision for the Bend region, taking into consideration the needs anticipated because of planned growth. To meet federal and state requirements, the plan includes the present financial capabilities of the region's implementing agencies. Thus, the funded project list contains only those projects within the present financial capabilities of the agencies. The aspirational list identifies projects that are beyond current financial capabilities.

In compliance with provisions in the FAST Act and the TPR, the MTP contains transportation goals and policies. The MTP includes a description of the plan amendment process.

The ongoing nature of regional transportation planning allows the MTP to be a dynamic plan of action for the future transportation system, rather than a static snapshot in time. The range of policies and plan amendment and update processes ensure that the MTP will adapt to meet changing conditions within the region, as well as adapt to residents' changing needs. The plan's implementation and further refinement will continue through the collaborative efforts of citizens and organizations that own, operate, regulate, and use the transportation system.

The MTP is particularly important for guiding transportation policy and investment decision making over the three- to five-year period following plan adoption, until the next plan update. The federal metropolitan planning regulations require the transportation plan to be reviewed and updated at least every five years. Additionally, the MTP is important for identifying much larger projects that will be developed and implemented over a longer timeframe. Designing, funding and implementing larger projects (e.g. new highway alignments, major transit corridors) may take years or decades.

Prior to this document the Bend MPO MTP was last updated in 2014. It is important to update the MTP at this time to ensure compliance with federal requirements. However, there are multiple planning projects underway within the MPO that will be completed after adoption of this plan. Those plans include:

- US 97 Bend Parkway Plan
- City of Bend Transportation System Plan update
- Deschutes County Intelligent Transportation Systems Plan update
- Cascades East Transit Master Plan update
- Bend Transportation Safety Action Plan

These plans will all contain projects, programs and funding strategies that could significantly impact and influence the regional transportation system. Incorporating the findings from each of those plans will be critical.

Additionally, ODOT is seeking federal grant funding for improvements to US97, and the City of Bend will likely seek new voter approved funding for a range of improvements and programs. Should either or both of those gain approval, the financial capacity of the region will change and should be reflected in the MTP.

The current document summarizes a focused update of the 2014 MTP to a planning horizon year of 2040 to conform to federal requirements, reflect changes and work completed since the current plan's adoption, and, to the extent possible, incorporate goals of the most current federal surface transportation legislation (FAST Act).

Completing and adopting the MTP provides the building blocks for a comprehensive guide for the future and allow us to make wise use of limited financial resources. Although this update is focused, it is expected to provide a solid foundation for continuing our transportation system planning. We must use this foundation to strive for the implementation measures that will make a difference for the region as a whole.

Using the MTP

Based on this plan, the member jurisdictions and agencies should integrate the recommendations into their own comprehensive planning documents, incorporate local needs with the pending regional strategies, and coordinate project completion with other affected agencies. The MTP provides support and validation of some of the local transportation needs. It is anticipated that each BMPO member jurisdiction will adopt this MTP and will then tailor its comprehensive plan updates to meet the goals identified in the MTP.

The MTP in the Future

The BMPO Policy Board guides the development, updates, and amendments of the Plan and serves as the coordinating and problem-solving body during the MTP planning processes. The Policy Board is in a position to help as the agencies seek to implement essential MTP provisions and to seek ways to build the projects listed in it. Because of the strong implications for funding our transportation needs, we must ensure this document remains alive and is not just a reference or study. Taking current information and priorities into consideration, this document will be adjusted over time under the guidance of our community leaders.

MTP Update Cycle

At a minimum, the MTP must be reviewed, validated, and updated every five years. Plan updates give the BMPO the opportunity to evaluate past projections for growth and anticipated use of the system. During the plan update process, a comparison of existing land use, recent development trends, and the use of the different modal components of the transportation system will be evaluated. This new data will be used to refine growth projections and determine their implications. This provides a basis on which to modify the plan. These minor changes are essential to protecting the accuracy of the plan. In addition, planning sometimes requires a change of direction, including updated goals, policies, or other fundamentals. Such changes require a more in-depth planning process, and, therefore, constitute a major plan update.

Amendments to the Plan can be made between the five-year updates. Each time a major amendment is made to the MTP, it must go through the rigors of a financial-constraint determination. It is anticipated that only large projects that would conceptually change the MTP would require a plan amendment.

The region also has the Metropolitan Transportation Improvement Program (MTIP) that dovetails with the Statewide Transportation Improvement Program (STIP), which is updated every two to three years. The STIP primarily sets the short-term funding direction for transportation projects using federal and state funds.

A significant update to the MTP is expected to be completed in 2020. As noted on a prior page, multiple planning projects are underway that will be completed after adoption of this document. Additionally, new transportation funding may be available for projects and programs. These plans and funding sources will significantly impact the transportation system and should be incorporated in the MTP.

Therefore, this is a focused update resulting in the following updated chapters: Forecast Land Use, Motor Vehicles, Pedestrian & Bicycle System, Public Transportation System, Transportation Safety, Revenue Analysis, Performance Measures and Outstanding Issues Chapters. Minor updates will be made to the other chapters, including: Existing Conditions, Travel Demand Management, Truck Freight Systems, Security, Parking, Aviation Systems, Rail Systems, and Pipeline Systems. Several of these chapters will receive more significant updates during the comprehensive update to follow in 2020.

Summary

Change is inevitable. The question is not if growth will occur, or even when it will occur. The question is how best to manage the impact of growth as it happens. Can we progress from potential gridlock toward a systematic and affordable plan to keep people and goods moving efficiently from one place to another? The MTP represents many hours of community, staff, and elected officials' time. It provides a coordinated, comprehensive look into the future as the area continues to grow.

The Plan takes the ideas, potential growth factors, and the desires from the community and various entities, and provides a sense of structure. The MTP is a guide for the Bend Metropolitan Planning Organization. Not just a road and highway plan, the MTP looks at all of the transportation opportunities -cars, buses, bicycles, pedestrian paths, air travel, rail, and various combinations of transportation methods. The MTP is not just a wish list, but instead, it is financially constrained, meaning that the projects proposed can be financed with existing and anticipated resources. Although not all of the needs can be funded, the MTP identifies concerns and projects beyond the immediate availability of known funding trends.

The MTP provides answers and potential solutions, yet places the burden of implementation back into the hands of the community and our elected officials. Individual project designs are left to the respective communities to develop over time according to their needs and opportunities. Policies are identified throughout the plan that address alternative transportation uses, agency coordination, system management, and other transportation related concerns.

Chapter 2: The Planning Process

Introduction

The Bend Metropolitan Planning Organization (BMPO) has prepared this update to the regional long range transportation plan, called the Metropolitan Transportation Plan (MTP), for the Bend Metropolitan Planning Area. The MTP is being updated jointly with the City of Bend Transportation System Plan (TSP) update. One consultant team and one public engagement process are being utilized for both efforts. Additionally, one public advisory committee (the Citywide Transportation Advisory Committee) is being utilized.

This plan update is important to conform to state and federal requirements; to reflect changes to the MPO's transportation network, existing and planned future land uses, and socioeconomic characteristics that have occurred in recent years. It has also been completed to integrate other recently completed planning efforts such as Transportation Safety Action Plan (TSAP).

This update represents Phase 1 of a two phase update process. Phase 1 provides an update of the prior plan based on a new 2040 land use scenario that incorporates the City of Bend's urban growth boundary expansion that was completed in 2016. It also includes an updated revenue forecast.

Numerous planning studies are underway that will directly impact the MTP. These planning efforts will not conclude until after the deadline for completing Phase 1 of the MTP. Those studies include:

- City of Bend TSP update
- Deschutes County Intelligent Transportation Systems (ITS) Plan update
- US97 Bend Parkway Facility Plan
- Cascades East Transit (CET) Regional Transit Master Plan (RTMP) update
- Bend Transportation Safety Action Plan

Each of those planning efforts will identify projects, programs, policies and potential funding sources that will significantly impact the regional transportation system. Once those plans are complete, a comprehensive Phase 2 update of the MTP will be completed to be consistent with those plans.

Phase 1 is a focused update of the current MTP to conform to federal requirements, reflect changes and work completed since the current plan's adoption, and, to the extent possible, incorporate goals of current federal transportation legislation (FAST Act). This Phase 1 update is critical to maintain federal funding eligibility. The plan update is for a horizon year of 2040.

The timing of the two phased MTP update process can be summarized as follows:

- Phase 1 (spring 2018 September 2019)
    - Plan update based on using a new 2040 land use scenario in the current Bend MPO travel demand model (planning year 2040)
    - Incorporate recently completed planning efforts and available data
    - Prepare an updated revenue forecast and financial plan
    - Conform with federal requirements to maintain federal status and funding
- Phase 2 (to begin late 2019 and conclude spring/summer 2020)
    - Incorporate the findings from the City of Bend TSP
    - Incorporate the findings from the Deschutes County ITS Plan
    - Incorporate the findings from the US97 Parkway Facility Plan
    - Incorporate the findings from the CET RTMPO
    - Incorporate the findings from the Bend Transportation Safety Action Plan
    - Incorporate the findings of the updated Environmental Assessment for the US20/Cook Avenue intersection area in Tumalo
    - Incorporate the findings of other planning and project development efforts (e.g. US20 intersection analysis)
    - Incorporate the findings of the Southeast Area Plan
    - Incorporate the findings of the Core Area Project
    - Incorporate the findings from various land use master plans
    - Reassess the findings and projects outlined in Phase I based on the above listed plans and make updates as needed
    - Update the overall format of the MTP to make it more user-friendly and accessible
    - Identify a schedule and process to address additional concepts desired by the partnering agencies such as Alternate Mobility Standards and development of a detailed Pedestrian System Plan in the BMPO area (see Chapter 21 – Outstanding issues for more specifics)

Process

Determine Transportation System Plan Requirements

The MTP is designed to meet the requirements of the federal legislation and regulations encompassed in the FAST Act. In addition, the plan must be consistent with the Oregon Transportation Plan and its supporting plans, and local community plans and priorities.

Determine Transportation System Needs

Using population and employment forecasts for the year 2040, the travel demand model

was used to estimate transportation needs of the Bend metropolitan planning region for a 20 year horizon. The Forecast Land Use chapter (Chapter 5) summarizes the growth and development assumptions used for the forecast year.

A new travel demand model was developed a few years ago. The model now includes the City of Redmond and incorporates information from the Statewide Integrated Model (SWIM). The Transportation Planning and Analysis Unit (TPAU) at ODOT developed the travel demand model with the assistance of BMPO and member agency staff. The model is sophisticated and requires significant data definition and input to produce accurate results.

A travel demand model is a tool that can accurately replicate existing transportation conditions and evaluate a variety of future year scenarios. To replicate base year conditions, the essential transportation inputs include the existing roadway and public transportation networks, recent traffic counts, and current population and employment information. Once this data has been entered and adjusted, the model simulates base year traffic movements within a small percentage of error of those observed.

The next step in the modeling process involves projections for future population distribution, employment locations, and any changes in travel behavior. Using these inputs, the model is able to derive future demand and capacity limitations relative to the current roadway system. Once these deficiencies are identified, potential improvements are evaluated by rerunning the model with the “improved” transportation system. A range of different street networks, expansions of the public transportation network, and different land use scenarios can be tested this way. Although this is greatly over simplified, it demonstrates the usefulness of the model as a tool. Future year traffic and transit projections are based on numerous assumptions about population, employment, automobile operating costs, and other factors that will change over time. As such, future year forecasts are only as good as the assumptions in the model. Every effort has been made to ensure that the assumptions used in the development of the Bend Redmond travel demand model (BRM) are as reasonable and accurate as possible.

Transportation improvement projects needed within the planning horizon were identified during the needs assessment. This list of improvement projects was then assessed using the evaluation criteria. Once completed, this list became the financially unconstrained project list and vision beyond the present financial limitations of the MTP.

Develop Funding Plan and Project Lists

A financial analysis was conducted to support development of the MTP. The analysis included a review of past transportation expenditures for Deschutes County, the City of Bend, Cascades East Transit, and ODOT. The financial analysis estimated the level of transportation-related funding that jurisdictions could reasonably expect to be available over the planning horizon. A summary of the financial analysis is discussed in the Revenue Analysis chapter (Chapter 19).

The financial limitations described by the financial analysis were merged with the project lists from the various systems (streets, transit, bicycle, pedestrian, transportation demand management, and transportation system management). Taking the financial limitations into consideration, funded (financially constrained) and aspirational (unfunded) project lists were prepared. The funded list includes only those projects that are within the present financial limitations of the implementing agencies. The funded list consists of a combination of the following six components to help meet the area's transportation needs for the next 20 years:

(1) roadway improvements;
(2) transportation system management (TSM);
(3) transportation demand management (TDM);
(4) transit service;
(5) bicycle and pedestrian facilities; and
(6) safety improvements.

The funded project list meets the definition of a financially constrained transportation plan and forms the basis for the MTP.

The projects in the aspirational list may not be relied upon as planned improvements until funding has been identified and the project moved into the constrained plan. Projects included in this currently unfunded category are identified in the Appendices.

The Committee Process

As with any regional effort, the update to the BMPO MTP occurred with significant collaboration and input from invested stakeholders and partnering agencies.

The agency and stakeholder involvement for this process used a Project Management Team, the BMPO Technical Advisory Committee (TAC), the City of Bend Citywide Transportation Advisory Committee (CTAC), and the BMPO Policy Board to facilitate communication, support informed decision-making, and gain meaningful "buy-in" from all parties. Additional input was sought from other groups or organizations as needed through the process.

Policy Board

The BMPO Policy Board is composed of elected officials from each of the affected jurisdictions including City of Bend, Deschutes County, and ODOT. The BMPO Policy Board served as the ultimate decision making and adoption body for the MTP update.

Project Management Team

The Project Management Team consisted of Bend MPO staff, City of Bend Growth Management Department staff, and the consultant team. The Project Team was responsible for the on-going management of the work effort, the completion of technical work, and communication with other project committees and stakeholders.

Technical Advisory Committee
The BMPO Technical Advisory Committee (TAC) served as a sounding board to the Project Team and provided technical input as needed throughout the work effort. In addition to the Project Team members, the TAC consists of representatives from the City of Bend, Cascades East Transit, Deschutes County, the Oregon Department of Land Conservation and Development (DLCD), the Oregon Department of Transportation (ODOT), Oregon State University-Cascades, Central Oregon Community College, Bend-La Pine Schools, Commute Options, Deschutes County Bicycle and Pedestrian Advisory Committee, and two area residents. The Technical Advisory Committee (TAC) was responsible for gathering, reviewing, and validating technical information and data that were used in the update of MTP.

Citywide Transportation Advisory Committee
The City of Bend Citywide Transportation Advisory Committee (CTAC) served as a sounding board to the Project Team and Policy Board and provided overall guidance and input as needed throughout the work effort. The CTAC is comprised of approximately 25 Bend residents representing each quadrant of the city, the business community, and various interest groups. The CTAC also includes two ex officio members representing Deschutes River Woods and Tumalo (areas within the MPO, but outside the City). The Funding Work Group, a subgroup of the CTAC, is working to assess potential new transportation revenue sources. A series of subgroups were also formed to develop policies by topic area (e.g. mobility). One subgroup focused on equity policies and included external partners representing various local non-profits (e.g. Latino Community Association). Overall, the CTAC is responsible for making recommendations to the Policy Board and City of Bend City Council on the components of proposed MTP and TSP.

Public Involvement

A detailed public and stakeholder engagement plan was developed for the MTP and TSP updates. The plan outlines the process for committee engagement and oversight. It also outlines the efforts aimed at soliciting community input. Community input includes open houses, on-line open houses, polling, a project website, an interested parties email list, neighborhood workshops, meetings with neighborhood associations, meetings with the Neighborhood Leadership Alliance, equity outreach, meetings with interested parties and stakeholders, and engagement with local media.

The following links provide summaries of the open house and online public outreach events, as well as the neighborhood workshops and equity workshop:

- MPO/City open house and online events summary
- Neighborhood workshops and equity workshop summary

The plan allows for the BMPO to meet federal requirements which identify public engagement as a key component of the planning process. Through the public engagement process and detailed technical analyses, transportation needs were

identified and consensus was developed on system improvement strategies. Local agency staff, the TAC and the Policy Board guided the planning effort for the 2014-2040 MTP.

The public participation program also included public notices of all TAC and Policy Board meetings during plan development. The public involvement process, in addition to being a federal and state planning requirement, is a priority of BMPO and the local agencies involved in development of the MTP.

Chapter 3: Existing Conditions

As part of the Metropolitan Transportation Plan (MTP) and City of Bend TSP update processes, existing conditions (year 2018) were documented and analyzed in the Existing Conditions and Needs chapter, attached as Appendix B. This Existing Conditions chapter was prepared for the original 2007 MPO MTP and was not updated during the 2014 MTP update. Therefore, the remainder of this chapter presents the existing conditions as of 2007. It will be updated during the next comprehensive MPO MTP update, after completion of the City TSP process and other planning efforts.

Overview

The Bend MPO is the regional transportation planning organization for the City of Bend urban area. It is formed of local governments and is responsible for overseeing transportation related planning decisions such as the approval of federal transportation funding for the Bend region in order to meet current and future transportation needs. Other responsibilities include creating and maintaining a comprehensive MTP for the MPO area. The Bend MPO area is slightly larger than the City of Bend Urban Growth Boundary (UGB) and includes areas that are anticipated to develop into urbanized areas over the next 20-year horizon.

The MTP is designed to serve as the Bend metropolitan area's long term transportation plan. It addresses all travel modes, including pedestrians, bicycles, public transit, motor vehicles, freight, water, air, and pipelines, in an effort to address the region's long term projected transportation needs associated with future population growth. Projects identified in the MTP must be within projected levels of available financial resources and must also meet federal and state planning requirements. The primary objective of the plan is to identity both short-term and long-term actions in order to maintain the efficient movement of people and goods.

This chapter summarizes existing transportation operations and infrastructure within the Bend MPO boundary. Note that only highway, arterial, and collector roadways are discussed within this MTP. Field inventories conducted in spring 2006 and existing City of Bend and Deschutes County inventories were used to map existing transportation facilities in an effort to establish base year conditions. This existing inventory provides a framework (basis of comparison) for future assessment of transportation performance and needs within the Bend urban area transportation network relative to desired policies and goals.

Pedestrians

Figure 3-1 shows the existing sidewalk coverage along arterial and collector roadways in addition to existing trail inventory within the Bend MPO area. Network connectivity is typically carried out by means of collector and arterial roadways; therefore it is important

to have sidewalk coverage along these roadways to provide pedestrians with continuous connections. The existing sidewalk and trail infrastructure was assembled using City of Bend inventory[1] and field observations. As can be seen, significant portions of the arterial and collector roadway network currently have sidewalks on at least one side of the roadway, particularly in the downtown area and near residential land uses. Downtown Bend currently has fairly dense sidewalk coverage and is made up of mostly commercial, industrial, and residential land use that is characterized by a variety of small specialty retail shops, store front businesses and a historic grid roadway network. This dense sidewalk coverage therefore provides easy access to these small local businesses.

As mentioned, the majority of local streets in medium to high density residential areas feature sidewalks, which provide connections to major roadways and surrounding neighborhoods. This is likely due to the fact that the City currently requires sidewalks to be constructed on both sides of the roadway in new residential areas[2].

Overall, there is an estimated 60 miles of sidewalk coverage throughout the study area which is equivalent to approximately one-quarter of major roadway frontages[3]. In general, sidewalks are provided near and around schools and parks as illustrated in Figure 3-1. Sidewalks promoting access to local parks provide the public comfortable access to outdoor recreational facilities. Additionally, sidewalks leading to and surrounding school frontages is essential to ensure students have a safe route to school. With respect to this, the City of Bend is currently conducting a Safe Routes to School study. This program is intended to ensure children, grades kindergarten through twelve, have safe walking and biking routes within two miles of their respective school facility. The program helps communities target and reduce the number of hazards imposed on children while on their route to school. At this time, two schools in the City of Bend have participated in the program. The Safe Routes to School program stems from two pieces of legislation passed in 2005 (SAFETEA-LU and House Bill 2742).

While there is a significant amount of sidewalk coverage on arterial and collector roadways throughout the study area, there are considerable sidewalk coverage gaps that could be more in-filled to provide greater and safer pedestrian connectivity. Coverage gaps were defined where there is discontinuous sidewalk coverage along a single side of the roadway segment. Sidewalk coverage gaps were determined by visual inspection with no empirical analysis used. Table 3-1 lists several collector and arterial roadway segments which contain several sidewalk gaps. These sidewalk gaps are furthermore highlighted in Figure 3-1. Sidewalk gaps total to an estimated 61 miles in length. Of note, the City of Bend has planned to conduct an assessment of existing sidewalks to verify whether they comply with current American with Disabilities Act criteria[4].

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[1] Paved and unpaved sidewalk GIS data provided by Bend MPO.

[2] Bend Urban Area Transportation System Plan, City of Bend, page 32, Adopted October 11, 2000.

[3] *Ibid*

[4] *ADA Revised Draft Guidelines for Accessible Public Rights-Of-Way*, Department of Justice, November 2005.

Figure 3-1: Existing Pedestrian Facilities

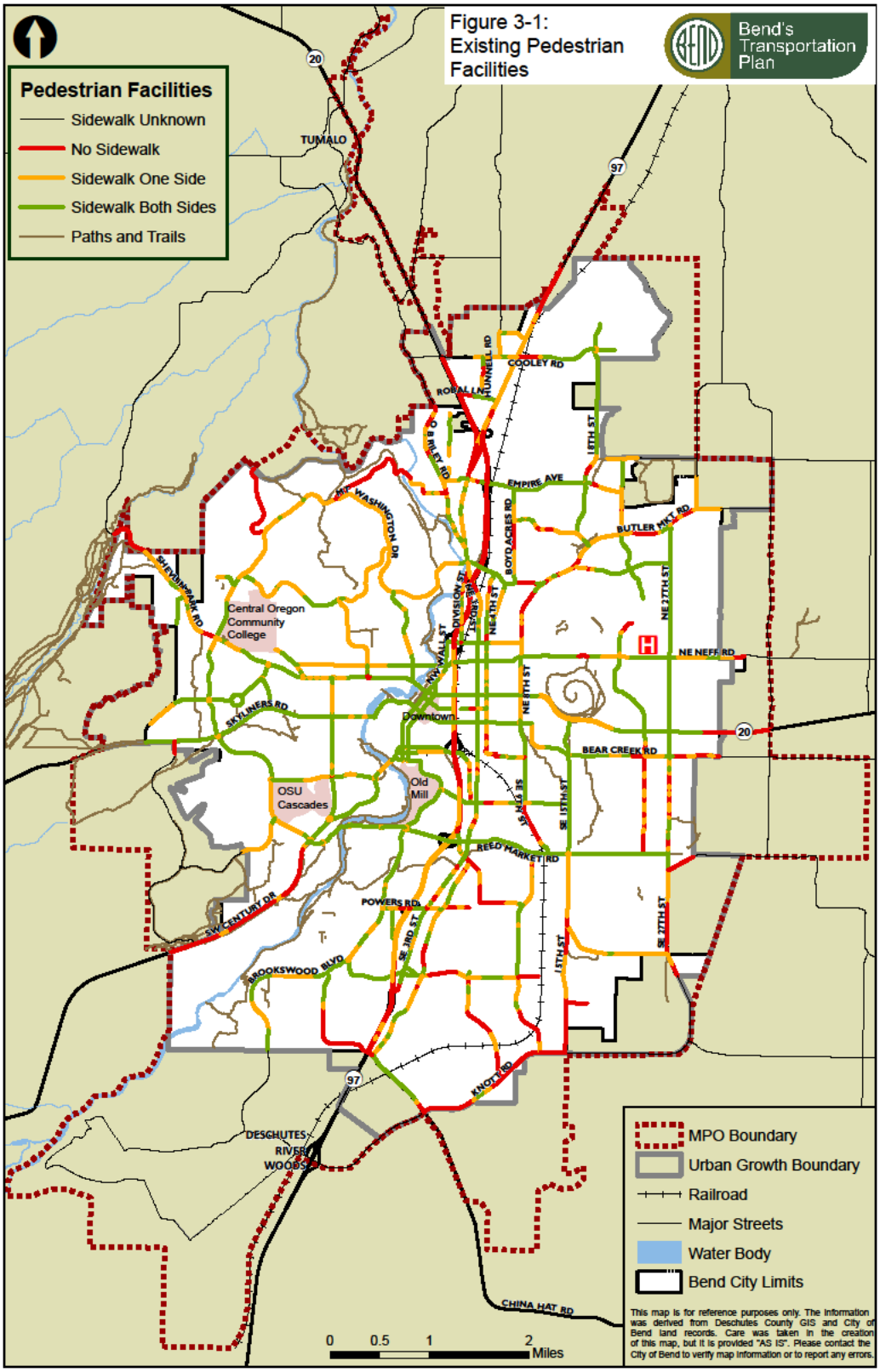


Table 3-1: Existing Sidewalk Deficiency Areas

Roadway	Limits	Functional Classification
Reed Market Road	3rd Street to 27th Street	Major Arterial
Empire Avenue	O.B. Riley to Purcell Boulevard	Major Arterial
27th Street	Bear Creek Road to Ferguson Road	Major Arterial
Bear Creek Road	Craven Road to east MPO boundary	Minor Arterial
Butler Market Road	Revere Avenue to east MPO boundary	Minor Arterial
Cooley Road	O.B. Riley to 18th Street	Minor Arterial
Boyd Acres Road	Ross Road to Empire Avenue	Minor Arterial
15th Street	Knott Road to King Hezekiah Way	Minor Arterial
Knott Road	Highway 97 to Ferguson Road	Minor Arterial
Galveston Avenue	14th Street to west MPO boundary	Minor Arterial
Century Drive	Mount Washington Drive to west MPO boundary	Minor Arterial
Baker Road	Brookswood Boulevard to Highway 97	Minor Arterial
Brookswood Boulevard	Hollygrape Street to Parkwood Court	Minor Arterial
Brookswood Boulevard	South city limits to China Hat	Minor Arterial
9th Street	Wilson Avenue to Reed Market Road	Minor Arterial
Neff Road	Eagle Road to east MPO boundary	Minor Arterial
Shevlin Park Road	McClain Drive to west MPO boundary	Minor Arterial
Brosterhous Road	Knott Road to Murphy Road	Major Collector
Brosterhous Road	American Lane to 3rd Street	Major Collector
American Lane	Brosterhous Road to Reed Market Road	Major Collector
O.B. Riley Road	North MPO boundary to Highway 20	
Murphy Road	3rd Street to Paulina Lane	Major Collector
Parrel Road	Grand Targhee Drive to Brosterhous Road	Major Collector
Ponderosa Street	Highway 97 to Poplar Street	Major Collector
Lodgepole Drive	Poplar Street to Mahogany Street	Major Collector
Country Club Drive	Knott Road to Murphy Road	Major Collector
Putnam Road	Mount Washington Drive to north MPO boundary	Major Collector
Chase Road	3rd Street to east end of roadway	Major Collector
Pettigrew Road	Reed Market Road to Twin Knolls Drive	Major Collector
Brinson Boulevard	Boyd Acres Road to Butler Market Road	Major Collector
Archie Briggs Road	Mount Washington Drive to O.B. Riley Road	Major Collector
Awbrey Road	Wilmington Avenue to Saginaw Avenue	Major Collector

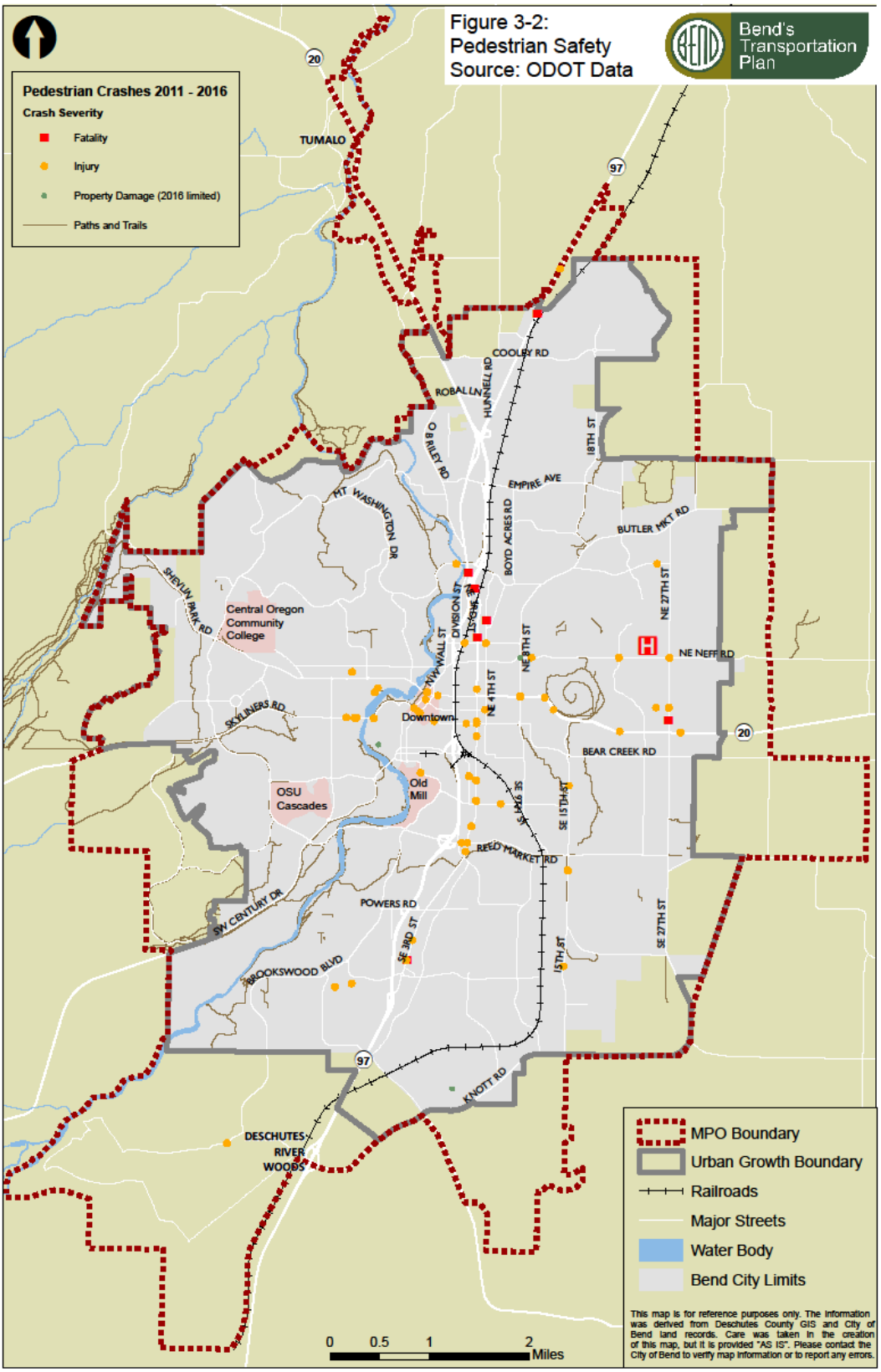
Pedestrian Collisions

When looking at pedestrian travel, it is important to consider the safety aspects of the pedestrian system. Careful attention must be directed towards pedestrian crossings and where they are subject to high vehicle volumes. Using City of Bend[5] records, locations of collisions involving pedestrians spanning the years 1995-2004 were identified and are illustrated in Figure 3-2. There were 80 collisions reported involving pedestrians during the 10-year span, yielding an average of 8 collisions per year. It appears that the majority of these collisions occurred on arterial roadways in the downtown area where pedestrian and traffic volumes are typically higher. Additionally, it appears that collisions occurred where sidewalks are currently present.

Interestingly, 56-percent of these crashes occurred at mid-block locations with the remaining 44-percent occurring at intersections. Of note, approximately 40-percent of the mid-block (23-percent of total collisions) collisions involving pedestrians occurred on 5-lane roadway segments. This may suggest the need for enhanced pedestrian crossings. Enhanced pedestrian crossings may include roadway lighting, signing, striping, textured crossings, medians, flashers, and curb extensions. Samples of enhanced pedestrian crossings within the study area are located at the intersections of Colorado Avenue/Arizona Avenue and Bond Street/Wall Street which both feature curb extensions and textured crossings.

[5] Pedestrian collision data provided by Bend MPO.

Figure 3-2: Pedestrian Crashes



Bicycles

Figure 3-3 shows the existing and proposed bicycle facilities in the Bend MPO area. These facilities were compiled using Deschutes County records[6] in addition to field observations. The majority of the collectors and arterials in the study area provide on-street paved bike lanes. Bike lanes currently connect the north, south, east, and west city limits, providing cyclists a wide number of through route options. For the most part, bike lanes are provided on both sides of roadways totaling an estimated 83.5 miles in length[7]. In addition to the already large inventory of bikes lanes, the City of Bend has proposed many additional paved bike lanes to ensure adequate connectivity throughout the city. The proposed bike lanes are also shown in Figure 3-3 and add an estimated total of 36.7 miles to the bike system[8].

In addition to on-street bike lanes, the Bend MPO area features many paved and unpaved trails and walkways that are also displayed in Figure 3-3. As shown, trails are provided almost along the entire extent of the Deschutes River within the study area providing a scenic route for walkers and bicyclists. Additionally, trails are provided leading to many of Bend's hilltops. There are approximately 28 miles of public trail facilities in the study area[9]. These trails serve as recreational facilities for walkers and bikers.

Overall, the existing bike lane and trail system provides substantially adequate connections to and from neighborhoods and schools, parks, and retail centers. Cyclists desiring to travel through the study area can select from the many designated routes on the major roadways or can share the road with motor vehicles on the lower volume, neighborhood streets to reach appropriate destinations.

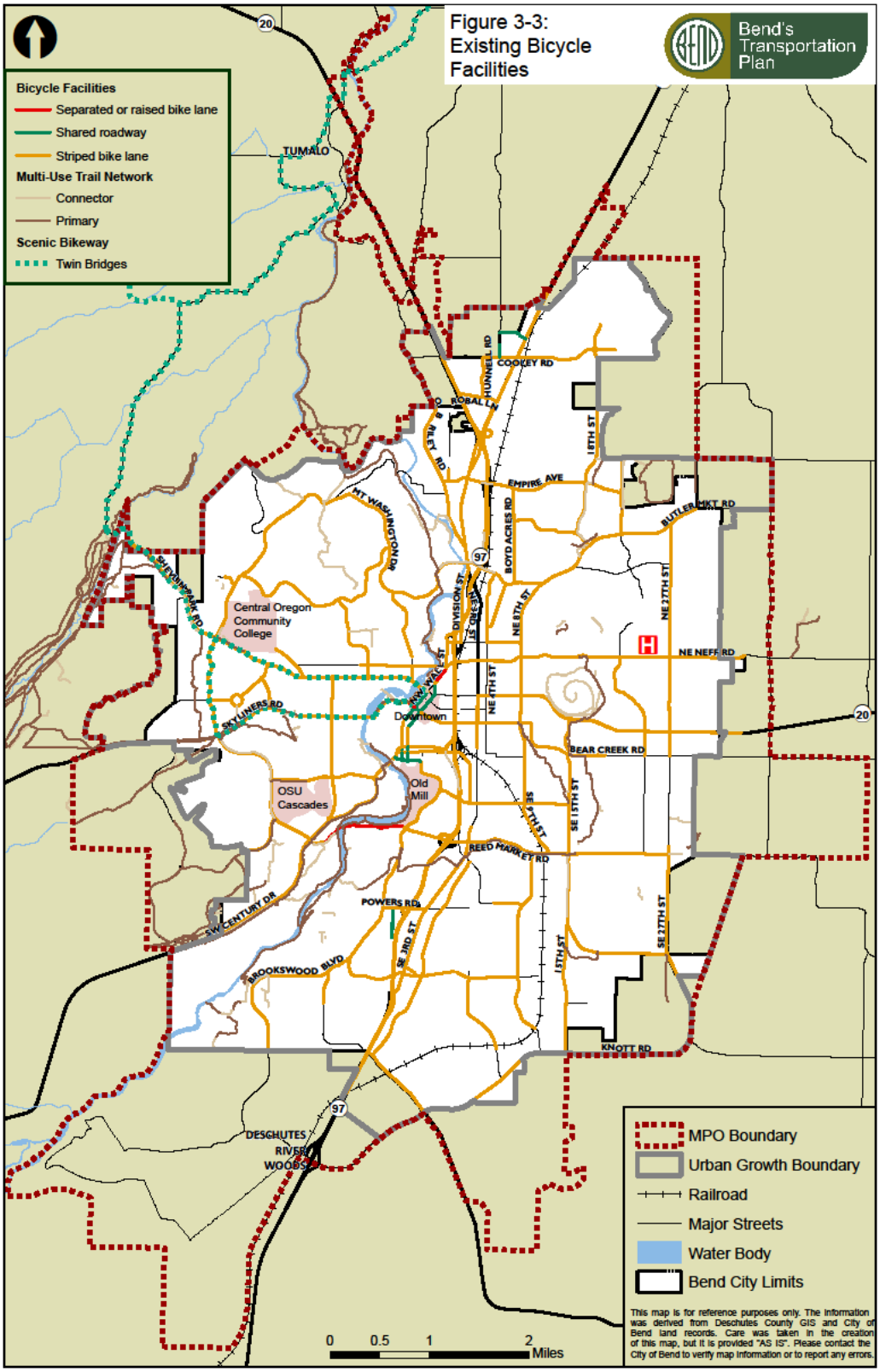
[6] Deschutes County GIS, Deschutes County GIS Service Center

[7] *Ibid*

[8] *Ibid*

[9] Bend Urban Area Transportation System Plan, Adopted October 11, 2000, page 32, City of Bend.

Figure 3-3: Existing Bicycle Facilities



Transit

Existing Transit Services

NOTE: Transit service has changed significantly in Bend since the time of the 2007 plan development. There is now fixed route transit service within the Bend MPO area and plans to continue to enhance that service. This information will be updated to reflect current updated conditions as part of the Stage II update.

Transit service is provided throughout the study area by means of a Dial-A-Ride program. There is currently no fixed route public transportation system within the MPO boundary. The Dial-A-Ride program provides demand responsive transportation to the general public including seniors and those that are disabled. The 17-vehicle fleet, each wheelchair ready, offers service seven days a week with scheduled operating hours Monday through Friday from 7:15am to 7:15pm and Saturday and Sunday from 8:30am to 4:15pm. Single trips (per direction) are available for a fee of $1.25 to the general public, $1.00 for youths (ages 10-17), and $0.75 for honored citizens. Free service is provided for youths ages 10 and younger when accompanied by an adult[10]. Table 3-2 summarizes the Dial-A-Ride ridership for the 2005 calendar year, aggregated by rider type[11]. Rider type, as defined by Bend Dial-A-Ride is provided in Appendix C.

Table 3-2: Bend Dial-A-Ride Ridership Summary (2005)

Rider Type	Total Riders
General Public	15,038
Youth	4,460
Disabled	25,226
Honored Citizen	32,015
Senior	17,094
Other	7,137
Low Income	2,454
Medicaid	1,398
Overall	**104,822**

Note: Rider type based on Bend Dial-A-Ride classification. Each rider is classified as one rider type.

A total of 104,822 riders were transported via the Dial-A-Ride system in 2005. This is a significant increase since the opening to the general public in 2002, when a total of 88,738 passengers were transported. Prior to 2002, service was only provided to seniors and those that were disabled. Since offering service to the general public in 2002, there has been an average 5 percent increase in ridership per year. This is

[10] City of Bend Dial-A-Ride, http://www.ci.bend.or.us/depts/public_works/_dial_a_ride__public_transportation.html, accessed May 19, 2006.

[11] Email from Kathy Ostrom, City of Bend Dial-A-Ride, April 12, 2006.

comparable to the average increase in population over the same time period for the City of Bend which was approximately 6 percent per year[12]. The average trip length per passenger on the system is just over 3 miles. Figure 3-4 illustrates the trend of increasing ridership on Bend's Dial-A-Ride system for the previous ten years.

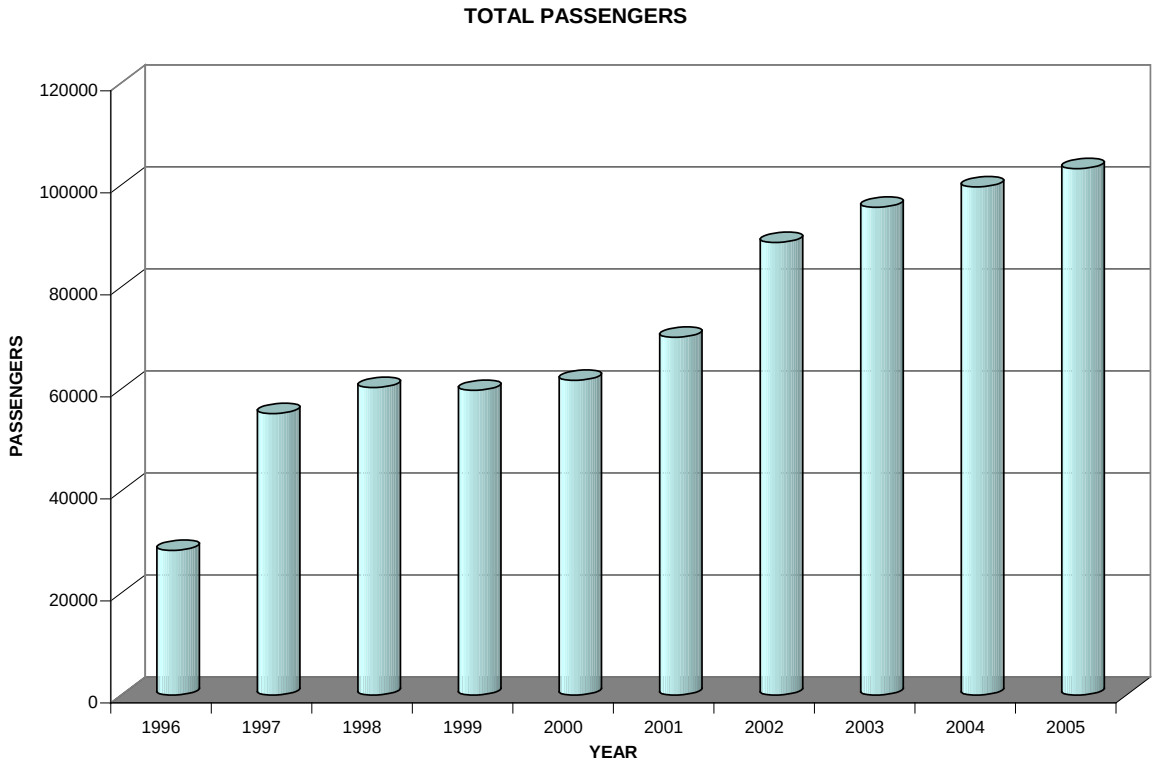


Figure 3-4: Bend Dial-A-Ride – Total Annual Ridership

Additionally, there are several commercial bus and airport taxi services within the study area. Porter Stage Lines offers daily scheduled bus service to and from Bend at 1315 NE 3rd Street (K Walker Enterprises Inc.). This station's operating hours are Monday through Friday 8:00am to 4:00pm and Saturday through Sunday from 8:30am to 2:00pm. Three Amtrak thruway buses currently pass through the study area. They are operated by Amtrak, Porter Stage Lines, and Valley Retriever Bus lines respectively. The nearest Amtrak station is in the city of Chemult, Oregon located approximately 65 miles south of Bend where Amtrak's Coast Starlight (Seattle-Portland-Los Angeles) passenger train passes through. Furthermore, People Mover offers bus service between Bend and John Day while C-A-C Transportation, Inc. provides daily shuttle service between Bend and Portland via the Central Oregon Breeze shuttle.

[12] Economic Development for Central Oregon, http://www.edforco.org/, accessed June 7, 2006.

Transportation to Bend's Mount Bachelor ski resort is provided via Mount Bachelor's Super Shuttle. Service is provided between the ski resort and their park and ride located at Colorado Avenue and Simpson Avenue during the winter season.

Planned Transit Services

A fixed-route transit feasibility study conducted in 1996 by the City of Bend found that fixed-route transit was feasible. However, when the option reached voting ballots in November 2000, the general public voted against the transit system. Voters again rejected the ballot for fixed route transit in the City of Bend in November 2004.

Recently, a Draft Service Plan[13] for fixed route transit in the City of Bend was completed as an update to the previous feasibility study. This plan investigated three fixed route alternatives and four service level options (operating frequency level). Based on the draft plan, an all-day 30 minute operating service level was recommended for weekdays along with a 60 minute operating service level on Saturday, and no service Sunday. The recommended route alternative would require a minimum 6 fixed-route vehicles. Revision of this plan is currently in progress with the preferred fixed route service options anticipated to begin September, 2006.

[13] City of Bend Draft Service Plan, Nelson/Nygaard consulting associates, May 2006

Motor Vehicles

This section discusses the physical roadway infrastructure and motor vehicle travel characteristics within the study area. Summary of the existing roadway classifications set forth by the City of Bend and ODOT in addition to roadway characteristics, traffic operations, and traffic safety within the study area is included. These all play substantial roles in determining the existing conditions of the roadway network and help to target deficient areas. Key roadway characteristics such as speed limits, roadway cross-section, intersection control, and traffic volumes are addressed as these elements play key roles in defining the capacity and efficiency of the roadway network.

Functional Classification

The roadway functional classification system is designed to serve varying transport needs within the community. The schematic diagram shown below illustrates the competing functional nature of roadway facilities as it relates to access, mobility, multi-modal transport, and facility design. The diagram is useful to understand how competing objectives can have opposing effects. For example, as mobility is increased (bottom axis), the provision for non-motor vehicle modes (top axis) is decreased accordingly. Similarly, as access increases (left axis), the facility design (right axis) dictates slower speeds, narrower travel lanes, and non-exclusive facilities. The primary goal of selecting functional classes for particular roadways is to provide a suitable balance of these competing objectives.

The diagram Figure 3-1 shows that as roadway classes progress from local to collector to arterial to expressway (top left corner to bottom right corner) the following occurs:

- *Mobility Increases* – Longer trips between destinations, greater proportion of freight traffic movement, and a higher proportion of through traffic.
- *Integration of Pedestrian and Bicycle Decreases* – Provisions for adjoining sidewalks and bike facilities are required up through the arterial class, however, the frequency of intersection or mid-block crossings for non-motorized vehicles steadily decreases with higher functional classes. The expressway and freeway facilities typically do not allow

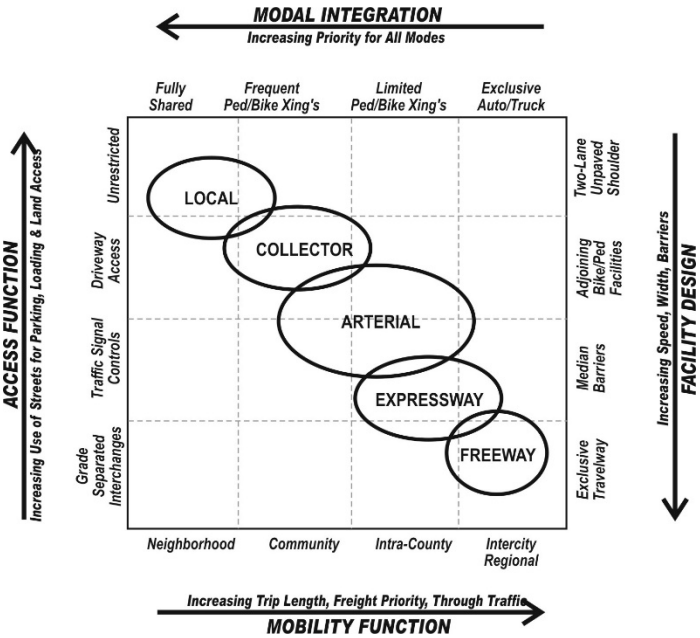


Figure 3-5 Roadway Classification

pedestrian and bike facilities adjacent to the roadway and any crossings are grade-separated to enhance mobility and safety.

- *Access Decreases* – The shared uses for parking, loading, and direct land access is reduced. This occurs through parking regulation, access control and spacing standards (see opposite axis).
- *Facility Design Standards Increase* – Roadway design standards require increasingly wider, faster facilities leading to exclusive travel ways for autos and trucks only. The opposite end of the scale is the most basic two-lane roadway with unpaved shoulders.

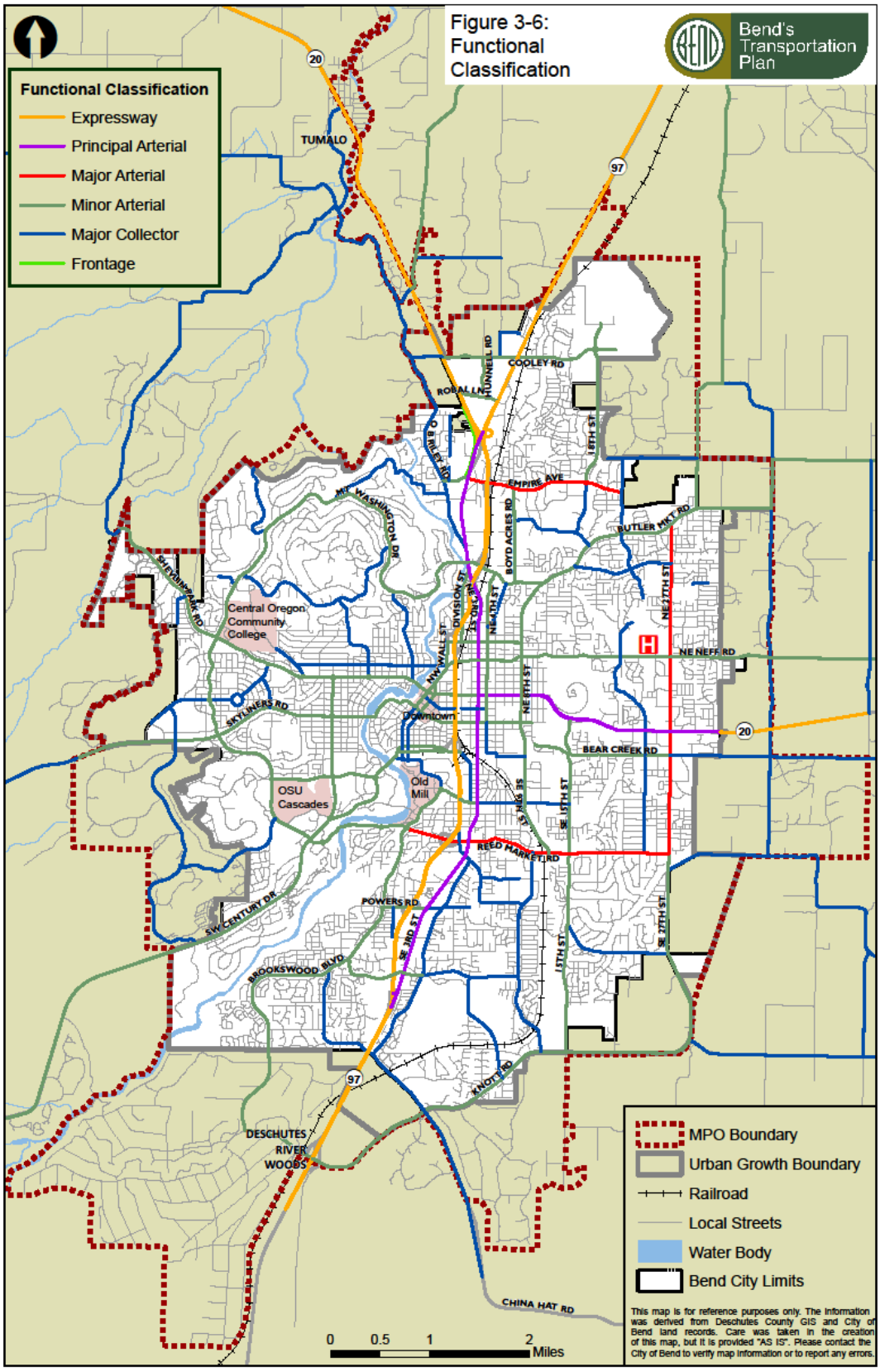
The existing City of Bend functional classification system, as set forth in the City's Transportation System Plan (TSP)[14], is shown in Figure 3-6. Both ODOT and Deschutes County roadway classifications are additionally shown in the figure. Roadway classifications are summarized in tabular form in Appendix C. The classification system is intended to allow for the safe and efficient movement of people and goods while optimizing certain objectives as noted earlier. There are a total of nine roadway classifications defined in the Bend TSP (expressway, principal arterial, major arterial, minor arterial, frontage road, major collector, local street, industrial street, and alley). This classification system is intended to serve the city over the next 20-year horizon.

Bend for the most part consists of a series of minor arterials which are responsible for the connection between large trip generators such as commercial and residential areas and consist of two to four travel lanes. These arterials provide a balance between access, mobility, multi-modal transport, and facility design within the study area. The collector roadways are intended to provide access and circulation to nearby arterial roadways in a multi-modal fashion. The Highway 97 and Highway 20 expressways traveling north/south and east/west through the city are intended to carry large vehicle volumes both though the city and to urban areas. These facilities have limited access and higher speeds and interestingly contain some bike lanes and sidewalks.

Roadway ownership and maintenance responsibilities of the various roadways in the study area are carried out by the City of Bend's Public Works Department and Deschutes County, with the exception of Highway 97 and Highway 20. These facilities are state routes and are under the jurisdiction of the Oregon Department of Transportation (ODOT).

[14] Bend Urban Area Transportation System Plan, City of Bend, page 25, Adopted October 11, 2000.

Figure 3-6: Existing Functional Classification



Roadway Characteristics

Field inventories and existing documentation were used to determine major roadway features within the study area. These features included posted speed limits, number of lanes per roadway segment, and intersection controls. Each of these features play key roles in defining roadway capacity and operating efficiency throughout the roadway network, which can influence travel path choices for drivers in Bend.

Figure 3-7 shows an illustration of posted speed limits on arterials and collectors within the Bend MPO boundary. The data were extracted from the City's existing inventory of speed limit signs. The majority of local roadways in Bend are posted at 20-25 miles per hour (mph). Major arterial roadways such as Reed Market Road and 27th Street have a speed limit ranging from 35-45 mph, while minor arterial roadways such as Newport Avenue, Butler Market Road, Mount Washington Drive, and Century Drive have a posted speed ranging from 25-45 mph. Collector roadways, including Portland Avenue and Parrell Road, have posted speeds ranging from 20-40 mph. Highway 97 as well as Highway 20 both have a posted speed limit of 55 mph outside of city limits. Within city limits, Highway 97 (Bend Parkway) maintains a 45 mph speed posting while Business 97 (3rd Street) and Highway 20 feature speed limits ranging between 35-45 mph.

Figure 3-8 shows the existing number of lanes on selected roadway segments in the study area. Highway 97, Highway 20, and Business 97 (3rd Street) maintain a cross-section of 4-5 travel lanes throughout the study area. For the most part, arterial roadways consist of 2-3 travel lanes featuring a shared center turn lane, while collector roadways maintain a two lane cross section. Local and County roads are 2 lane roadways.

Figure 3-7: Existing Speed Limits

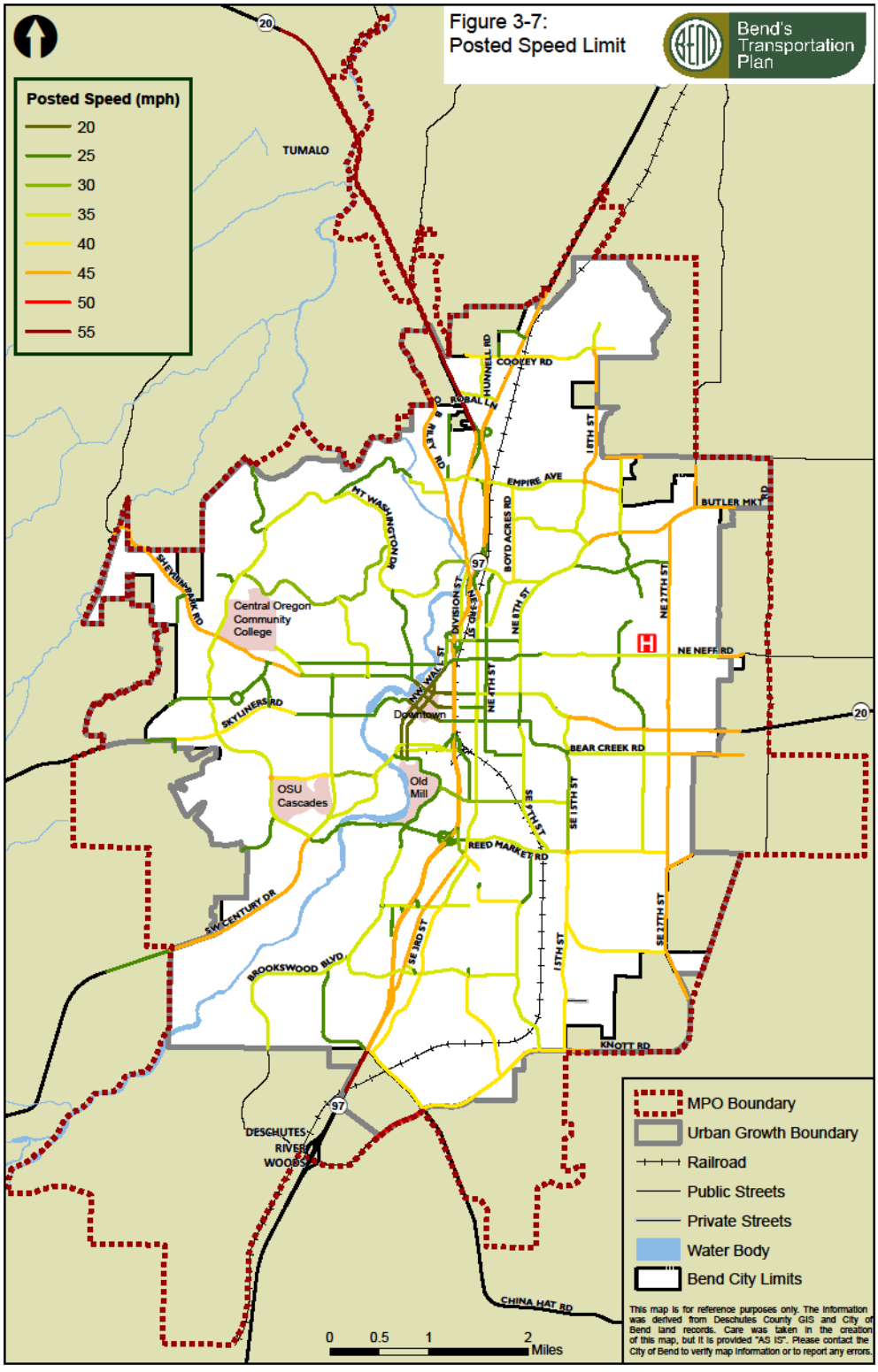
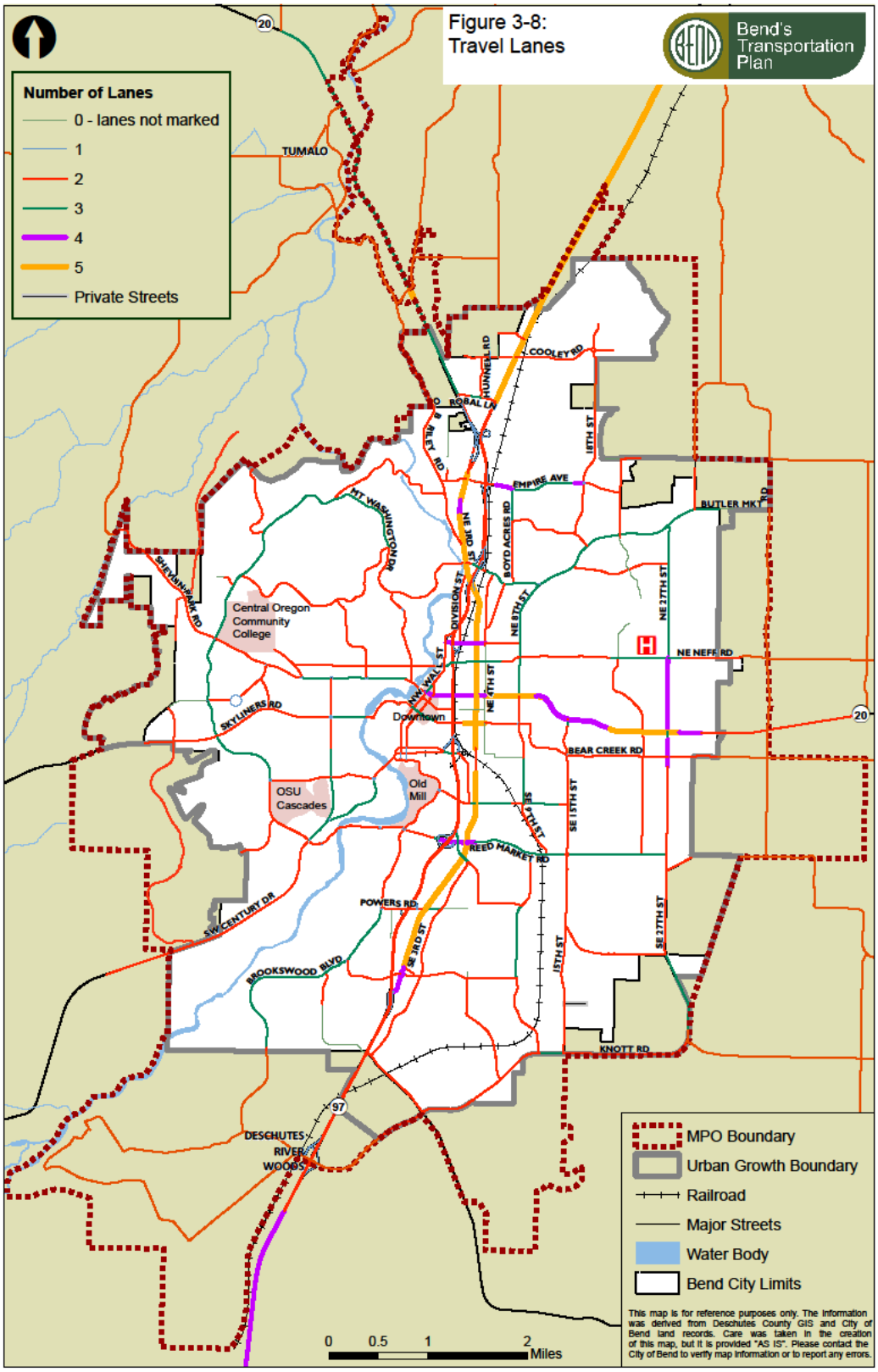


Figure 3-8: Existing Roadway Lanes



Motor Vehicle Volume

The City of Bend maintains an active traffic counting program in which they conduct 24-hour directional traffic counts along selected roadway segments. This program began in 2003 with counts now being conducted yearly. These traffic counts are conducted on weekdays between the months of April through October. Figure 3-9 presents the bi-directional existing traffic volumes collected by the City of Bend during 2004-2005.

As expected, Highway 97, Business 97 (3rd Street), and Highway 20 carry the majority of traffic within the study area. Reed Market Road and 27th Street, both classified as major arterials, transport high levels of traffic throughout the day (20,000-30,000 vehicles). These two facilities join to connect downtown Bend and Highway 97 to high residential land uses. Arterial and collector roadways carry approximately 2,000-20,000 vehicles per day.

Traffic Operations Performance Standards

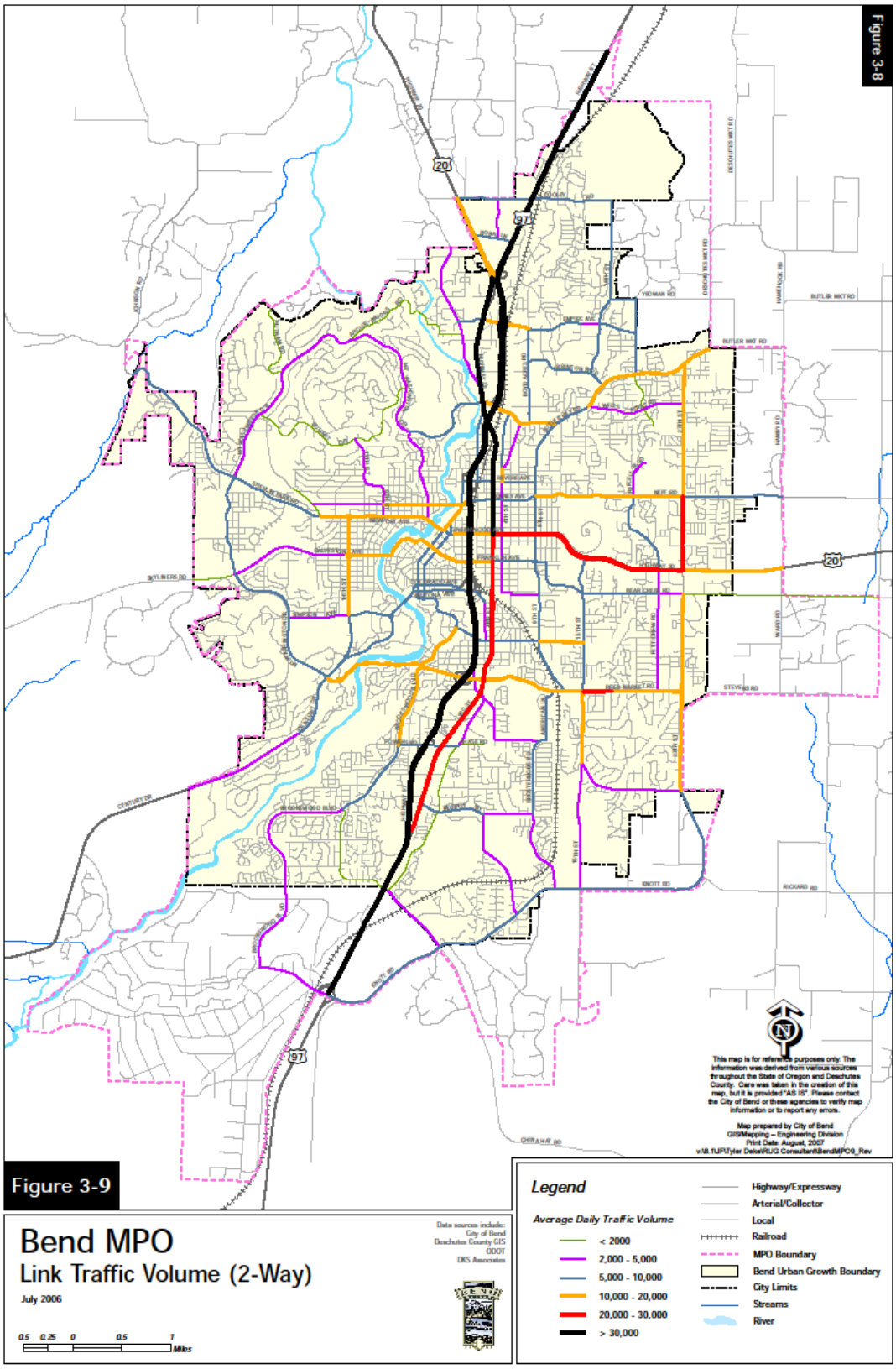
It is important to note that both Highway 97 and Highway 20 are classified as state facilities therefore they are subject to ODOT operational standards as set forth in the 1999 Oregon Highway Plan[15]. This plan states that these facilities must operate at a v/c ratio equal to or less than 0.80. The City of Bend additionally sets forth various intersection operational standards based on the type of intersection control. These standards are listed below and are based on measurements of v/c ratios and magnitude of delay[16].

- Two-Way Stop Control
    - Total delay for individual lane groups must be less than or equal to 50 seconds, and
    - Volume to capacity ratio for individual lane groups must be less than or equal to 1.0, and
    - 95th percentile queuing must be less than or equal to available storage length.
- All-Way Stop Control
    - Total delay for the intersection must be less than or equal to 80 seconds.
- Roundabout
    - Volume to capacity ratio for individual approaches must be less than or equal to 1.0.
- Signalized Intersection
    - Total delay for the intersection must be less than or equal to 80 seconds, and
    - Volume to capacity ratio for the intersection must be less than or equal to 1.0, and
    - 95th percentile queuing must be less than or equal to available storage length.

[15] Oregon Department of Transportation, Oregon Highway Plan, 1999.

[16] City of Bend, Street Policy No. 6, Section 6.3, Adopted May 7, 2003

Figure 3-9: ADT



Traffic Operations

Level of Service (LOS), delay, and volume to capacity (v/c) ratios are typically used as measures of effectiveness for intersection operations. LOS is similar to a "report card" rating based upon average vehicle delay. Level of Service A, B, and C indicate conditions where traffic moves about without significant delays during periods of peak hour travel demand. Level of Service D and E are progressively worse peak hour operating conditions. Level of Service F represents conditions where average vehicle delay exceeds 80 seconds per entering vehicle at a signalized intersection and demand has exceeded capacity (v/c>1.0). This condition is typically evident in long queues and delays. Unsignalized intersections provide levels of service for major and minor street turning movements. For this reason, LOS E and even LOS F can occur for a specific turning movement; however, the majority of traffic may not be delayed (in cases where major street traffic is not required to stop). LOS E or F conditions at unsignalized intersections generally provide a basis to study intersections further in efforts to determine the availability of acceptable gaps, safety and traffic signal warrants.

A volume to capacity ratio (v/c) is the peak hour traffic volume at an intersection divided by the maximum volume that intersection can handle. For example, a v/c ratio equivalent to 0.80 indicates that peak hour traffic is using 80 percent of the intersections capacity. If traffic volumes exceed capacity, queues will form and will lengthen until demand subsides below the available capacity. When v/c is less than, but close to 1.0, intersection operation becomes unstable and small disruptions can cause traffic flow to break down.

Intersection turn movement counts conducted during peak periods by the City of Bend were used in addition to intersection volumes documented in recent traffic analysis reports[17] were used to determine the existing intersection capacity levels based on the *2000 Highway Capacity Manual* methodology for signalized and unsignalized intersections[18]. Analysis for modern roundabouts is based on the Federal Highway Administration's (FHWA) guidelines. Seasonal adjustments were applied to Highway 97 and Highway 20 traffic volumes to reflect 30th highest hourly volumes based on 2004 records gathered from ODOT's Automatic Traffic Recording (ATR) stations located on these facilities.

Study intersections and intersection control are highlighted in Figure 3-10. These intersections were selected based on consultation with Bend MPO staff. Study intersections are a representation of where traffic volumes are highest and where operations and capacity may be of concern. Table 3-3 summarizes the existing weekday peak hour intersection operational levels at the study intersections that either fail to meet operational requirements or are nearing capacity. Intersection operational levels for remaining study intersections are included in Appendix C.

[17] 1) Newport Bridge Conceptual Design, Kittelson & Associates, Inc., December 2004. 2) Juniper Ridge Master Plan, Kittelson & Associates, Inc., January, 2006. 3) Reed Market Corridor Study, Parametrix, June 2005. 4) US 97 & US 20 Refinement Plan, Kittelson & Associates, November 2005.

[18] *2000 Highway Capacity Manual*, Transportation Research Board, 2000.

Figure 3-10: Study Intersections

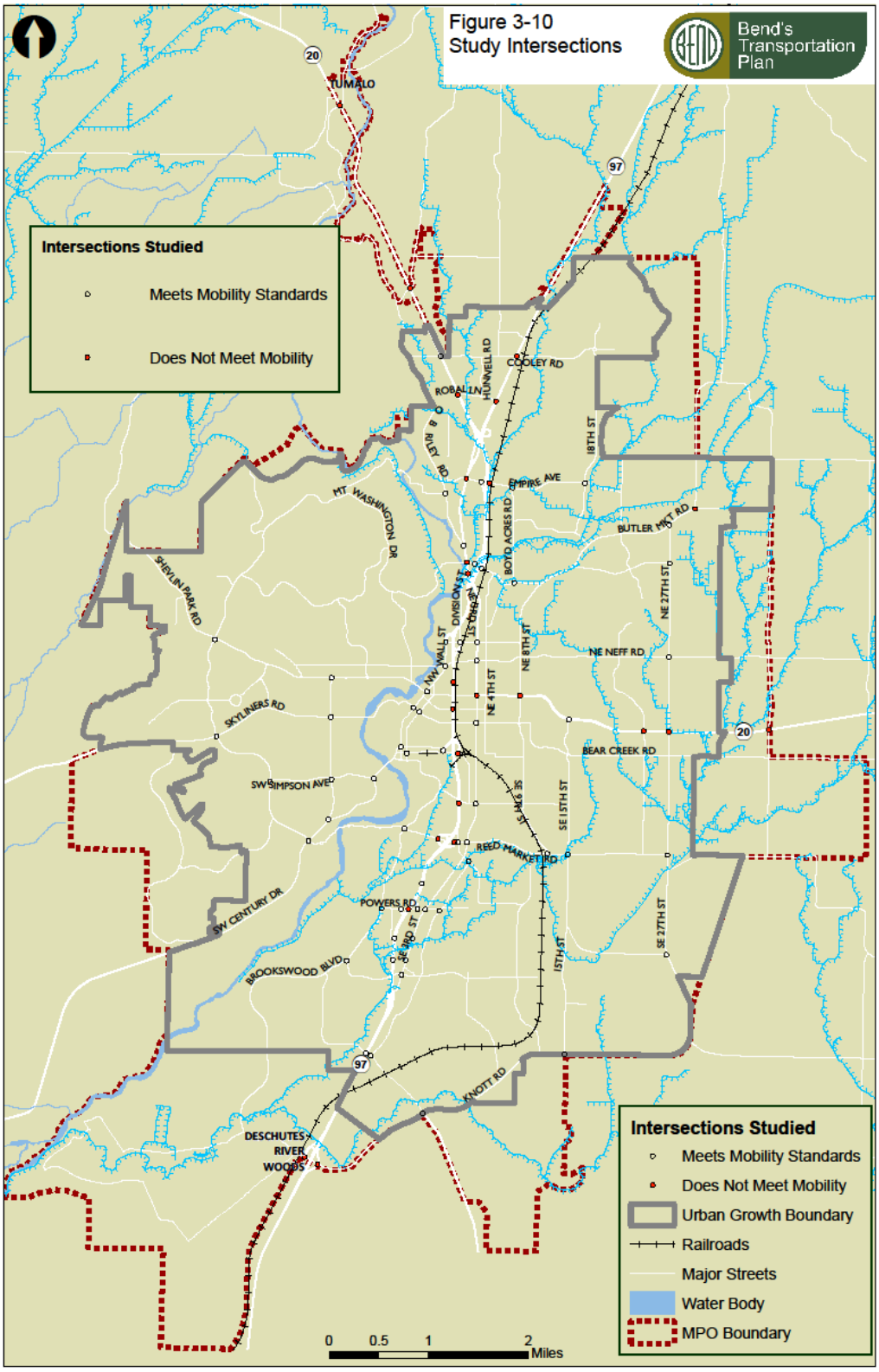


Table 3-3: Existing Weekday PM Peak Hour Intersection Level of Service

Intersection	*Level of Service*	*Delay (sec./veh)*	*Volume / Capacity*
Unsignalized Intersections			
ODOT Jurisdiction			
Highway 97/Ponderosa Road – China Hat Road	**F/B**	**>100**	**0.88**
Bend Jurisdiction			
Empire Avenue/Boyd Acres Road (all-way stop)	**F**	**>100**	**>1.00**
Empire Avenue/18th Street	**F/B**	**>100**	**>1.00**
Reed Market Road/American Lane	**F/B**	**>100**	**>1.00**
Roundabout			
Bend Jurisdiction			
Reed Market Road/Brookswood Boulevard	C	19.2	0.94
Signalized Intersections			
ODOT Jurisdiction			
Highway 20/Greenwood Avenue	**D**	**51.8**	**0.93**
Highway 20/27th Street	**D**	**43.9**	**0.85**
Highway 97/Cooley Road	**C**	**25.1**	**0.86**
Bend Jurisdiction			
3rd Street/Reed Market Road	D	47.4	0.90
27th Street/Neff Road	**E**	**69.5**	**>1.00**
Reed Market Road/15th Street	D	45.0	0.89
Portland Avenue – Olney Avenue/Wall Street	D	37.5	0.85
Olney Avenue – Neff Road/8th Street	D	43.3	0.88

Notes: Unsignalized Intersections:
A/A = Minor Street turn LOS/Major street turn LOS
V/C = Individual lane groups
Delay = Individual lane groups
Roundabouts:
V/C = Individual approach
Delay = Individual approach
Signalized and All-Way Stop Intersections:
Delay = Average vehicle delay in the peak hour for entire intersection in seconds.

Currently, four unsignalized study intersections (listed below) do not meet operational standards. Three of these intersections fall within City of Bend jurisdiction, while the intersection of Highway 97/Ponderosa Road-China Hat Road is under ODOT jurisdiction.

- Reed Market Road/American Lane
- Empire Boulevard/18th Street
- Empire Boulevard/Boyd Acres Road
- Highway 97/Ponderosa Road – China Hat Road

The northbound single lane approach at the intersection of Reed Market Road/American Lane suffers excessive delay (>100 seconds/vehicle) and has a v/c ratio of >1.0 which is greater than the maximum v/c ratio of 1.0 addressed as the City of Bend standard. This is due to minimal gaps on Reed Market Road during the PM peak hour which prohibits vehicles wishing to make a left turn onto Reed Market Road from doing so. The intersection of Empire Boulevard/18th Street also does not meet the city's standards with a v/c ratio >1.0 and delay of >100 seconds/vehicle on the southbound single lane approach. The all-way stop intersection of Empire Boulevard/Boyd Acres Road additionally does not currently meet city requirements yielding an average intersection delay of >100 seconds/vehicle, which is greater than the 80-second standard. The unsignalized intersection of Highway 97/Ponderosa Road -China Hat Road yields a v/c ratio greater than the ODOT standard of 0.80 as set forth in the Oregon Highway Plan. The minor street consists of single lane stopped approaches which experience high levels of delay when attempting to access Highway 97, especially left turning vehicles. All remaining study unsignalized intersections meet specified operational criteria set forth by ODOT and the City of Bend.

All study intersection roundabouts are located within the City of Bend jurisdiction and currently meet city operational standards. The southbound approach at the roundabout located at Reed Market Road/Brookswood Boulevard is however nearing capacity. One study signalized intersection under City of Bend jurisdiction and three signalized intersections under ODOT jurisdiction do not currently meet traffic signal operations criteria and are listed below.

- Highway 20/Greenwood Avenue
- Highway 20/27th Avenue
- Highway 20/Cooley Road
- Neff Road/27th Street

The intersection of Neff Road/27th Street currently has a v/c ratio of >1.0 which is greater than the City of Bend standard. Moreover, the ODOT maintained signalized intersections of Highway 20/Greenwood Avenue, Highway 20/27th Avenue, and Highway 20/Cooley Road currently have v/c ratios greater than the 0.80 standard. All remaining signalized intersections meet both ODOT and City of Bend operations criteria.

There are five signalized intersections that are nearing capacity as listed below, four of which fall under City of Bend jurisdiction and one under ODOT jurisdiction.

- 3rd Street/Reed Market Road
- Reed Market Road/15th Street
- Portland Avenue – Olney Avenue/Wall Street
- Olney Avenue – Neff Road/8th Street
- Highway 20/27th Street

Attention should be directed towards these intersections in order to maintain efficient operations and maximize throughput.

Traffic Safety

Collision data for the previous five years (2001-2005) was obtained from the Oregon Department of Transportation (ODOT) for selected corridors within the study area[19]. Analysis focused on the identification of existing high collision segments by fusing 2004 Average Daily Traffic (ADT) volumes conducted by the City of Bend and ODOT with the provided collision records and respective segment length. Equivalent collision rates per million vehicle miles traveled (MVMT) were then determined for each respective segment and used as the basis of identifying high collision segments within the study area. The use of MVMT reflects the level of exposure relevant to each roadway segment. Table 3-4 summarizes the average collision rates per MVMT over the previous five years.

[19] Oregon Department of Transportation, Collision data provided for 2001-2005. Note that 2005 collision data may be subject to change.

Table 3-4: Bend Roadway Segment Collision Rates (2000-2005)

Roadway Segment	Collision Type				Collision Severity			Total	Rate (per MVMT)	ODOT 2004 Rate (per MVMT) similar facilities
	Rear	Angle	Turn	Other	PDO	Injury	Fatal			
Reed Market Road										
Bond St. to Silver Lake Blvd.	0	2	2	3	7	0	0	7	0.84	2.04
Silver Lake Blvd. to American Ln.	37	27	46	10	70	50	0	120	**3.24**	2.04
American Ln. to SE 27th St.	43	2	11	19	40	34	0	74	**2.14**	2.04
27th Street										
Butler Market Rd. to Conners Ave.	8	4	12	4	18	10	0	28	1.06	2.04
Conners Ave. to Copperfield Ave.	34	15	27	13	54	35	0	89	1.81	2.04
Copperfield Ave. to Reed Market Rd.	8	1	5	1	2	13	0	15	**2.09**	2.04
Empire Avenue										
OB Riley Rd. to Boyd Acres Rd.	17	5	22	2	26	20	0	46	**2.77**	2.04
Boyd Acres Rd. to Purcell Blvd.	0	3	7	3	11	2	0	13	1.09	2.04
Business 97 (3rd Street)										
Greenwood Ave. to Brosterhous Rd.	82	31	89	27	128	100	1	229	**2.84**	2.04
Brosterhous Rd. Hwy 97/3rd St. (south)	22	21	54	15	61	50	1	112	1.29	2.04
Highway 97										
North MPO boundary to Nels Anderson Rd.	80	5	18	22	63	62	0	125	**1.54**	0.76
Nels Anderson Rd. to Greenwood Ave.	36	2	19	26	51	32	0	83	0.46	0.76
Greenwood Ave. to Reed Ln.	30	1	7	17	25	30	0	55	0.46	0.76
Reed Ln. to Hwy 97/3rd St. (south)	73	16	29	9	69	57	1	127	**2.24**	0.76
Hwy 97/3rd St. (south) to south MPO boundary	2	7	5	2	5	11	0	16	**0.92**	0.76
Highway 20										
North MPO boundary to Hwy 20/Hwy 97 (north)	8	0	2	3	5	8	0	13	0.27	0.76

Roadway Segment	Collision Type				Collision Severity			Total	Rate (per MVMT)	ODOT 2004 Rate (per MVMT) similar facilities
	Rear	Angle	Turn	Other	PDO	Injury	Fatal			
Hwy 20/Hwy 97 (north) to Railroad track	1	0	1	0	2	0	0	2	0.02	0.76
Railroad track to Greenwood Ave.	45	19	51	17	72	60	0	132	**2.60**	0.76
3rd St. to Pilot Butte Summit Dr.	38	17	59	22	79	57	0	136	**3.59**	0.76
Pilot Butte Summit Dr. to Purcell Blvd.	41	3	13	12	32	36	0	68	**1.83**	0.76
Purcell Blvd. to East MPO boundary	17	3	12	4	24	12	0	36	**1.54**	0.76

Notes:
- Other types of collisions include backing, pedestrian, head-on, sideswipe, parking, fixed object, non-collision, and miscellaneous.
- Injury includes A, B, and C type injuries
- PDO = Property damage only
- MVMT = Million vehicle miles traveled

These measured collision rates were compared to those of similar facilities as indicated in ODOT's 2004 Oregon State Highway Crash Rate Tables[20]. The basis of comparison for similar facilities is based on urban city arterials and urban city expressways which had respective collision rates of 2.04 and 0.76 per MVMT in 2004.

It is important to note that the criterion for mandatory collision reporting was revised effective after December 31, 2003. Collisions before December 31, 2003 were required to be reported if they met the following:

- Death
- Bodily injury or damage to any one's property in excess of $1,000

The revision consisted of changing legally reportable collisions to ones in which met the following for the driver:

- Death
- Bodily Injury
- $1,500 damage to your vehicle
- $1,500 damage to any one's property
- If any vehicle is towed from the scene due to damage.

[20] 2004 State Highway Crash Rate Tables, Oregon Department of Transportation, Transportation Data Section, August, 2005.

This revision poses less stringent guiding principles for collision reporting which would attribute to an expected decrease in reported collisions. This is supported by 2004 ODOT collision records where collision rates decreased by 54-percent and 17-percent for urban city arterials and expressways respectively.

Table 3-4 indicates that five collector/arterial roadway segments and seven highway/expressway segments analyzed have collision rates higher than similar state facilities. It must be noted that collision data analyzed contain data for three years under the previous mandatory collision reporting criteria and two years data under the new collision reporting criteria which is anticipated to yield a lower total number of reported collisions than previous criteria.

Reed Market Road

The segment between Silver Lake Boulevard and American Lane has an average collision rate over one-and-a-half times that of similar facilities. The majority of collisions occurring on this segment were a result of turn movements which is a reflection of vehicles turning onto Reed Market Road from minor street approaches. A significant number of these collisions occurred at the intersection of Reed Market Road/American Lane. The single lane approach at American Lane suffers excessive delay during peak periods and it is likely that drivers attempt to turn onto Reed Market Road when there are insufficient gaps. The intersections of Reed Market Road/Division Street and Reed Market Road/3rd Street, also in this same segment, were additionally engaged in numerous collisions. With respect to the segment between American Lane and SE 27th Street, the majority of collisions occurred at the intersections of Reed Market Road/SE 15th Street and Reed Market Road/SE 27th Street.

27th Street

There is one segment on 27th Street that experienced a collision rate higher than the compared normal. This segment is between Copperfield Avenue and Reed Market Road. This section yields a higher crash rate when compared to similar facilities due to lower traffic volumes which in turn yields a lower level of exposure.

Empire Boulevard

Empire Boulevard between O.B. Riley Road and Boyd Acres Road also has a higher than average collision rate. This section passes through the Highway 97 and Highway 20 interchanges which both experience high levels of traffic during peak periods. These collisions consisted mainly of rear end and turning movement collisions. Of note, Bend Parkway (Highway 97) opened in 2001, the first year of the analysis period.

Business 97 (3rd Street)

There are two study segments on Business 97 (3rd Street) that hold higher collision rates than similar facilities. Both of these segments are located within downtown Bend where 3rd Street consists of a 5-lane cross section and contains

many traffic signals. Collision trends reveal a large number of rear end and turn movement collisions which are typically expected with traffic signals and turn movements from minor streets onto a busy principal arterial. Of note, there was one fatality recorded over the previous five years on 3rd Street.

Highway 97

There are two study segments on Highway 97 where average collision rates are respectively two and three times higher than average. The segment between the north city limits and Nels Anderson Road experienced a significant number of rear end collisions. The intersections of Highway 97 and Cooley Road and Robal Road are signalized where the majority of collisions along this segment occurred. Recently, a shopping mall was introduced on the west side of Highway 97 between Cooley Road and Robal Road which in turn generated higher traffic volumes within the area. This high collision rate is likely attributed to the increase in traffic volumes associated with the shopping mall. The segment between Reed Lane and 3rd Street also experienced a large amount of rear end collisions. Highway 97 has a posted speed of 45 mph within this section and traffic signals are located at 3rd Street, Pinebrook Boulevard, and Powers Road. Of importance, there was one fatality experienced within this section. The sections of Highway 97 north and south of this segment do not contain any traffic signals. With this, these traffic signals are probable sources to the large number of rear end collisions along this segment.

Highway 20

Four segments analyzed along Highway 20 yielded higher collision rates than similar facilities. Three are all located on the east section, stemming from Business 97 (3rd Street). The segment between Business 97 (3rd Street) and Pilot Butte Access maintains a 5-lane cross section and has a posted speed of 25-35 mph. Throughout this segment are a large number of busy cross streets which is likely the source for the majority of collisions being the result of turn movements. The remaining two sections of highway 20 have a 4-lane cross section and have a posted speed of 45 mph. The largest percentage of collisions along these segments are rear ends. This is likely due to that both of these segments contain moderately spaced traffic signals.

The majority of crashes occurring on the northern section of Highway between the railroad tracks and Greenwood Avenue occurred at the busy intersection of Highway 20/Greenwood Avenue. The majority of these collisions were the result of turning movements and rear-ends.

Deschutes County High Crash Locations

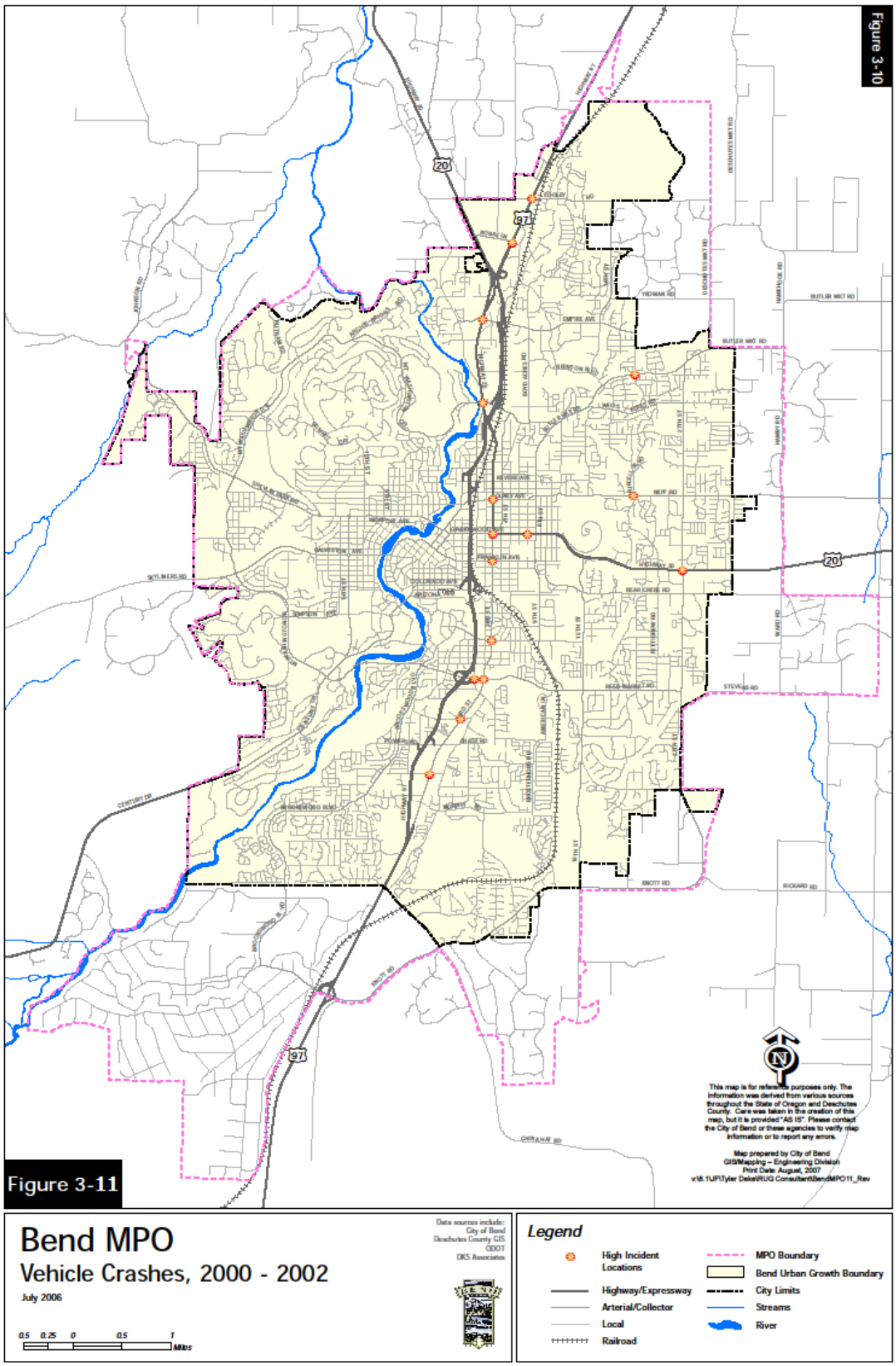
Deschutes County currently maintains a listing of high crash locations within the county. The County has identified a total of 16 intersections that they have designated as high crash locations in Bend which are shown in Figure 3-11.

ODOT SPIS

Furthermore, ODOT maintains a Safety Priority Index System (SPIS) that ranks high collision locations along state facilities. The system provides a weighted score based on the severity, frequency, and rate of collisions over the previous three years. Locations are aggregated into 0.10-mile segments. Only segments experiencing three or more collisions or one fatality over the three year analysis period are considered to be a SPIS site. The most recent ODOT SPIS data indicate that 21 one-tenth of a mile segments along Highway 97 and Highway 20 made the SPIS list for the 2001-2003 analysis period[21].

[21] ODOT, http://www.oregon.gov/ODOT/TD/TDATA/gis/odotmaps.shtml#SPIS_SIP_Maps

Figure 3-11: High Collision Locations



Truck Freight

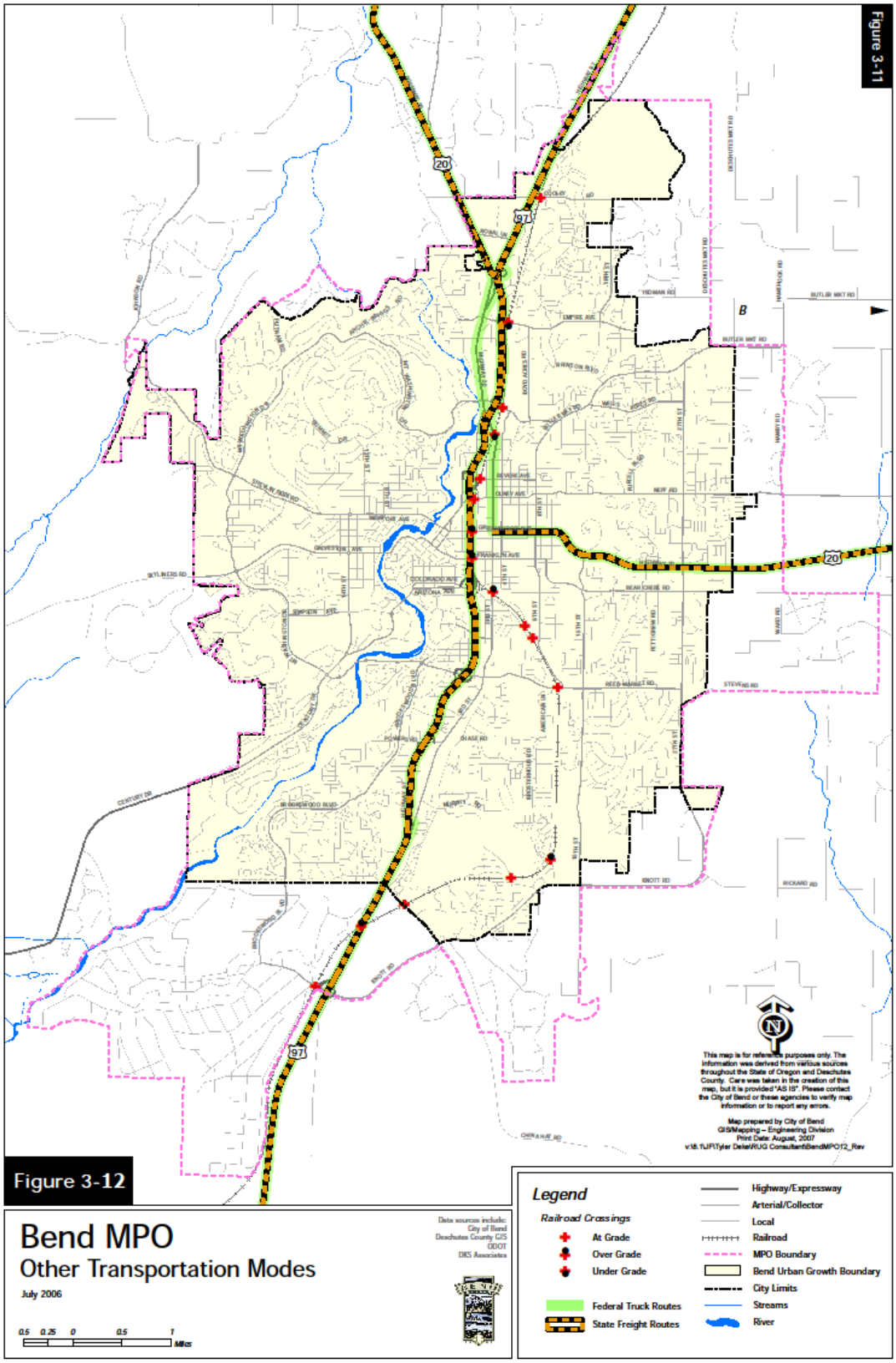
The movement of raw and furnished goods plays a vital role in our economy. The majority of these goods are transported via motor carrier; therefore efficient truck mobility is crucial to economic survival. The designation of through truck routes provides for this efficient movement while at the same time maintaining neighborhood livability, public safety, and minimizing maintenance costs of the roadway system. ODOT[22] identifies Highway 97 (Bend Parkway) as a designated federal truck route and a state freight route. Highway 20 is designated a federal truck route through the entire study area. The following two sections of Highway 20 are designated state freight routes: 1) from the west study area limits to Empire Avenue and 2) from NE 11th Street to the east study area limits. These routes are identified in Figure 3-12. The surrounding arterial roadway system links these highways with nearby businesses located in the industrial and commercial zoning regimes. Table 3-5 summarizes available 2004 truck traffic as a percentage of ADT at several permanent ODOT ATR stations within the City of Bend.

Table 3-5: Existing Truck Volumes

Route	Automatic Traffic Recorder Location	2004 Average Daily Traffic	Truck ADT	Truck %
Highway 97	south of Revere Avenue	38,600	2,740	7.1
Highway 97	south of Empire Boulevard	41,300	3,550	8.6
Highway 97	0.9 miles south of Bend	22,150	1795	8.1
Highway 20	5 miles east of Bend	2,750	650	23.5

[22] *1999 Oregon Highway Plan*, Oregon Department of Transportation, May 1999.

Figure 3-12: Truck Routes/RR Crossings



Other Travel Modes

There are four other modes of transportation in Bend included in this MTP: rail, pipeline, air, and water. The Deschutes River flows through the center of bend and serves as a scenic and recreational waterway. There is no freight activity along this waterway within the study area therefore it will be left out of the remaining discussion. These remaining modes of transportation can all be seen in the previous Figure 3-11 with the exception of pipelines.

Rail Freight

Burlington Northern Santa Fe (BNSF) and Union Pacific (UP) currently operate manifest trains through the City of Bend. The rail track, owned by BNSF, runs parallel to Highway 97 at the north city limits before veering east just south of Colorado Avenue towards the industrial zone. The rail track is regulated under the Federal Railroad Administrations (FRA) class 2, 3 and 4 track standards. In this, there are no weight or dimensional restrictions for freight movements through the study area.

BNSF and UP combined for an estimated 13 million gross ton miles being transported through the study area in 2002[23]. In 2005, BNSF was operating approximately 12-15 trains per 24 hours through the study area, while UP was operating one train daily in each direction. Additionally, BNSF operates a switch engine which transports freight to and from local businesses within the study area. The majority of freight being transported through the study area consists of various forest products, cement, diesel fuel, liquefied petroleum gas, wallboard, and other construction supplies[24].

With rail freight passing through the study area, attention needs to be directed towards the intersection of the rail track and the roadway. Railroad crossings were shown in Figure 3-11. Currently, there are a total of seventeen crossings. Of these, eleven are at-grade crossings featuring active traffic control devices (automatic gates). Of the remaining grade-separated crossings, three are over grade crossings where the railway travels over the roadway and two are under grade crossings where the roadway spans over the railway. For the most part, grade separated crossings are preferred so as to provide sufficient safety and eliminate large traffic delays. A review of the Reed Market Road at grade crossing over three consecutive weekdays yielded an average gate downtime of almost four minutes. Vehicle queues westbound on Reed Market extended back to 15th Street and beyond.

Gas Pipelines

Gas Transmission Northwest Corporation (TransCanada) currently operates high-pressure natural gas pipelines that run near Bend city limits. This pipeline extends between Kingsgate, British Columbia and Malin, Oregon thus traversing a distance of 612 miles. The pipeline currently passes through the southeast corner of the city limits

[23] Email from Bob Melbo of ODOT Rail Division to Tyler Deke of Bend MPO, January, 2006.

[24] *Ibid*

and consists of 36-inch and 42-inch diameter pipeline that is capable of delivering up to 1 billion cubic feet (BCF) of gas per day to the Pacific Northwest; however typical daily operations are in the range of 600-700 million cubic feet per day[25]. Cascade Natural Gas holds the role of distributing natural gas to the City of Bend through a series of 2-6 inch diameter piping. The maximum allowable operating pressure for the pipeline system is 911 pounds per square inch (psi).

Airport

The Bend Municipal Airport (Airport Identifier BDN) is located at 63136 Powell Butte Highway, approximately five miles northeast of city limits. It is a non-towered airport and classified as a Category 2 – Business or High Activity General Aviation Airport. In this, there is no scheduled passenger service to/from the airport. The existing single asphalt runway measures 75 feet in width and 5,005 feet in length serving approximately 42,000 annual aircraft operations (departures and arrivals) with an approximate average of 110 operations per day thus making it the 14th busiest airport in the state[26]. The existing asphalt runway has been noted to be in fair condition. Approximately 180 aircrafts in combination with 18 aviation type businesses are currently based at the airport. The airport was established in 1942 in response to World War II training efforts.

The Oregon Aviation Plan[27] found runway length/width and weather reporting to be key needs for this particular airport in order to preserve the airport system over the next twenty years. Recently, an automated weather observation system capable of announcing wind speed, wind direction, day versus night, current temperature and dew point, precipitation, cloud layers (up to three) and ceiling (up to 12,000 feet above ground level), density altitude, barometric pressure, visibility (1/4 mile to 10+ miles), and lightning strikes/activity within and beyond 10 miles[28]. Moreover, a new runway is anticipated to be completed in October 2007 which will replace the existing runway.

Pilot Butte Airport (Airport Identifier 8OR5) is a private use airstrip located south of Pilot Butte in the City of Bend. It consists of a 20 foot wide by 2400 foot asphalt runway.

Land Use

Land use plays a large role in driving transportation choices. Consequently, land use within the City of Bend is a key ingredient to understanding current transportation patterns and roadway traffic volumes. Industrial and commercial land uses are found within the central core of the city along Highway 97 and Highway 20, while residential land uses make up most of urban and rural Bend. Bend's Zoning Ordinance (NS 1178)

[25] Phone conversation with Robert Latimer, TransCanada GTN & NBP System, May 9, 2006.

[26] Airport update #7, Bend Municipal Airport, April 18, 2006 (http://www.ci.bend.or.us)

[27] *Oregon Aviation Plan*, Oregon Department of Transportation, February 2000.

[28] Airport update #7, Bend Municipal Airport, April 18, 2006 (http://www.ci.bend.or.us)

and Subdivision Ordinance (NS 1349) control and regulate the most appropriate use of land within the City.

Currently, the Bend Area General Plan (BAGP) is the key source for setting forth goals, objectives, and policies linking transportation and land use within the City of Bend. This document is intended to provide guidance to local, state, and federal agencies, neighborhood and community groups, and anyone interested in development with making appropriate land use decisions with regards to future development that will help meet the future needs of the state, community, and citizens. The plan consists of a package of goals, text, exhibits, policies, and illustrative maps in an effort to lay out where and how changes should happen in order to accommodate the rapid population and economic growth. Both the City's zoning and subdivision ordinance are designed in compliance with the goals, objectives and policies as stated in the BAGP and are intended to implement the general plan.

It should be noted that the BAGP is subject to changes over time and should be revised to reflect new information and attitudes towards future transportation and land use needs.

Intelligent Transportation Systems

In efforts to further examine the existing transportation infrastructure in Bend, a review of existing Intelligent Transportation Systems (ITS) was carried out. These systems are intended to better manage the existing roadway system. The Deschutes County ITS Plan[29] was used as the basis for this section.

ITS Systems

Bend currently houses several ITS systems including remote weather information systems (RWIS), automatic traffic recorders (ATR), video detection cameras, closed circuit television (CCTV) cameras, and an oversize vehicle closure telephone system. Figure 3-13 provides an overview of current ITS deployments within the City of Bend. These are all monitored and managed by the Bend Traffic Operations Center (TOC) which is currently suited to successfully carry out tasks in incident management, emergency management, traffic management, traveler information, winter operations, and maintenance operations.

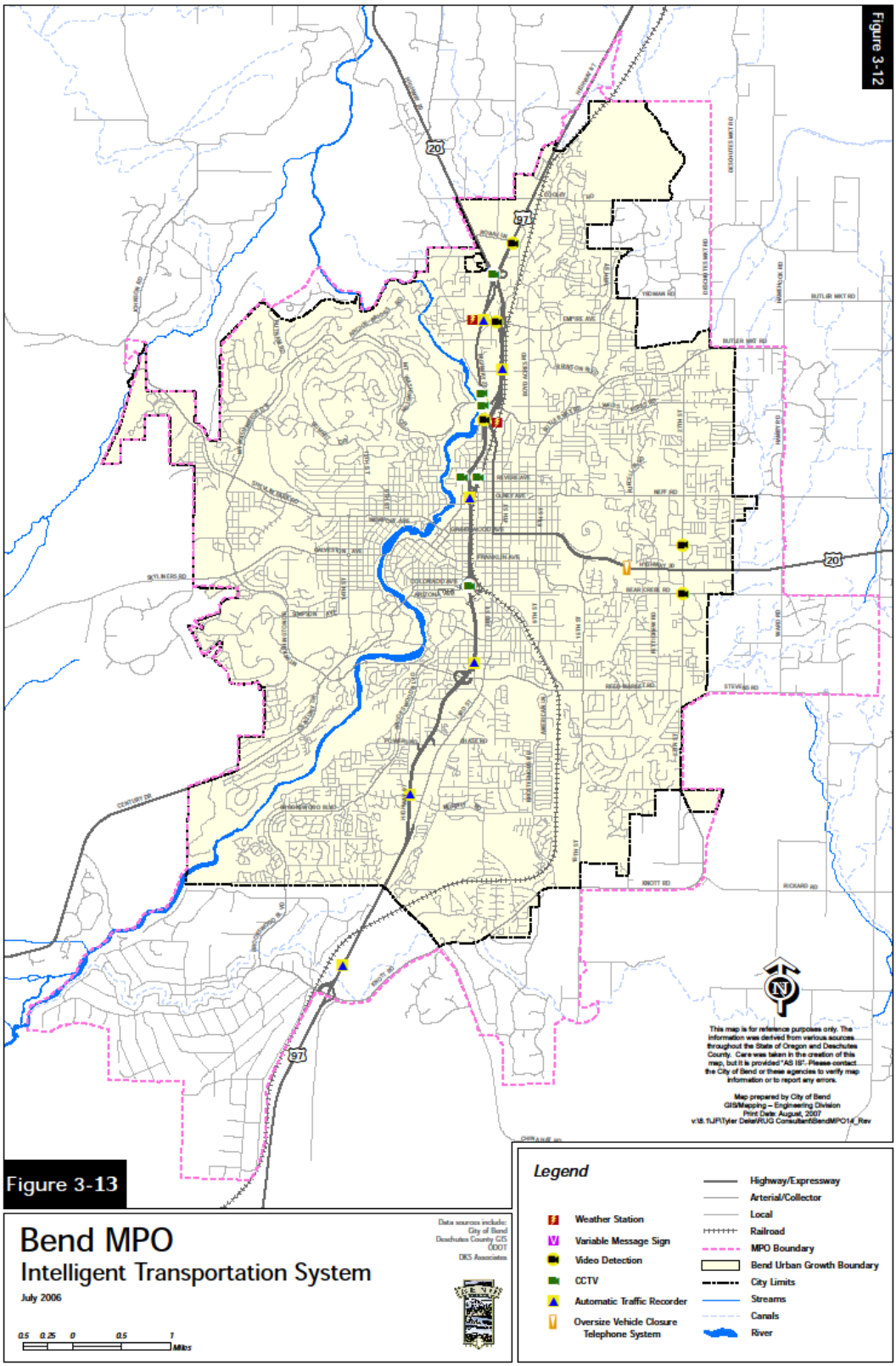
Six CCTV cameras are currently installed along Highway 97 (Bend Parkway). These cameras are used to monitor current traffic conditions and aid with incident, emergency, and traffic management strategies. Currently there are five ATR recorder stations within Bend city limits. These are all located on Highway 97 and Highway 20. Weather stations are used in an effort to aid travelers and maintenance crews of adverse weather conditions. There are two weather stations located in Bend in the northern part of the city. Typical measurements include air and pavement temperature, precipitation, wind

[29] Deschutes County ITS Plan, DKS Associates, March 2005.

speed and direction, and humidity. With the addition of new traffic signals and modifications, video detection systems are becoming more common. These units take the place of inductive loop detectors to allow for actuated traffic signal operations. A large sum of information reported from these field devices is broadcasted to the public via ODOT's Trip Check website.[30]

[30] Oregon Department of Transportation, Tripcheck, (http://www.tripcheck.com)

Figure 3-13: ITS



Chapter 4: Goals and Objectives

Introduction

The Goals and Objectives for the Bend MPO area reflect the transportation priorities of the jurisdictions within the MPO, the goals established by the state of Oregon and the guidelines set by the Federal Government for metropolitan regions.

The Goals and Objectives guided the development and evaluation of alternatives for the MTP. The Goals and Objectives will also serve to guide implementation of the MTP. They were used as a measuring stick to judge how well the alternatives and the final plan reflect values expressed by the community.

The Policy Board, with recommendations and suggestions from the TAC, originally developed and adopted Goals and Objectives in July 2006. These were confirmed with the 2014 MTP Update and were the basis for developing the Financially Constrained portion of this MTP. Since that time, the joint MTP Update and City of Bend Transportation System Plan Update planning process has developed Goals and Objectives that were used in creating the additional, aspirational projects and programs that are presented in this MTP document. Both sets of Goals and Objectives are provided in this chapter for context.

MTP Goals and Objectives

Mobility and Balance

Goal 1

Provide a variety of practical and convenient means to move people and goods to, from and within the MPO area.

Objectives:

1) Expand opportunities for rail and air transportation for passengers and freight
2) Promote the development of a comprehensive public transportation system that is proportional to the scale and economy of the Bend MPO area
3) Promote non-motorized modes of transportation by constructing a system of safe and efficient transportation and recreation routes for pedestrians, bicyclists, and equestrians.
4) Identify and support the development of local evacuation routes for wildfire, seismic events and national security events
5) Identify and support the development of local freight routes
6) Support the through movement of goods and people on the state transportation system

Goal 2

Develop a transportation system that serves the needs of all travel modes, provides intermodal connectivity, and provides a range of transportation options throughout the MPO area

Safety and Efficiency

Goal 1

Address traffic congestion and problem areas by evaluating the broadest range of transportation solutions, including but not limited to:

- Operational improvements to maximize the efficiency of existing facilities;
- Construction of new transportation corridors;
- Transportation Demand Management (TDM) - bicycle, pedestrian and carpool strategies; and
- Transportation Systems Management (TSM) – Intelligent Transportation Systems (ITS), intersection operations and access management.

Goal 2

Serve the existing, proposed and future land uses with an efficient and safe transportation network

Goal 3

Design and construct the transportation system to enhance safety for all modes.

Objective

1) In cases where improving safety will also improve efficiency, these projects should receive funding priority

Accessibility and Equity

Goal 1

Provide people of all income levels with a wide range of travel options within the MPO area

Goal 2

Support all Americans with Disabilities Act (ADA) requirements and policies

Land Use

Goal 1

Integrate land use and transportation by encouraging land use patterns that provide efficient, compact uses of land that facilitate a reduced number and length of trips

Goal 2

Promote development patterns that preserve the life of the existing transportation system

Goal 3

Promote development that does not rely on primary access to the state transportation system

Environment and Livability

Goal 1

Recognize and respect the natural and historical features over which transportation improvements pass to minimize adverse impacts

Goal 2

Design transportation improvements that protect the environment by preserving air and water quality, minimizing noise impacts and encouraging energy conservation

Goal 3

Use context sensitive design principles when designing and locating transportation facilities

Economic Development

Goal 1

Implement transportation improvements that foster economic development and business vitality

Goal 2

Develop a transportation network with transportation options that enhance linkages between centers of employment, education, medical facilities and neighborhoods

Goal 3

Recognize the importance of intermodal connections and maintain adaptable approaches to trends and opportunities that enhance intermodal connections

Financially Responsible

Goal 1

Coordinate and design transportation improvements to assure the expenditure of resources in the most cost-effective manner

Objective:

1) Ensure that the costs of planned improvements are commensurate with the benefits

Goal 2

Maximize the ability to leverage alternative and multiple funding sources for transportation system improvements

Objectives:

1) Develop innovative and sound funding policies to implement the Plan, including cost-sharing and other partnership arrangements with the public and private entities when appropriate
2) Increase the diversity of funding sources to provide greater stability, predictability and flexibility for funding transportation facilities and services.
3) Investigate the user pays concept to leverage resources when transportation improvements will benefit specific properties planned for development

Possible Future Goals and Objectives

The City of Bend and Bend MPO are updating their respective transportation plans concurrently. A single citizens committee, the Citywide Transportation Advisory Committee (CTAC) is being used for both plans. The Goals and Objectives listed below were developed by the CTAC after an extensive CTAC-led process of identifying issues and potential solutions for our regional and city transportation systems. As additional issues and solutions are identified and addressed, the goals and objectives may be modified. It is the express intent of CTAC that no issue, policy, solution or project should be excluded from CTAC deliberations and recommendations, regardless of whether the issue, policy, solution or project is specifically identified in this current version of the Goal and Objectives.

The final version of these goals and objectives will be considered in phase 2 of the MTP update. The goals and objectives listed below are shown for informational purposes only.

Goal 1 - Increase System Capacity, Quality, and Connectivity for All Users (e.g. drivers, walkers, bicyclists, transit riders, mobility device users, commercial vehicles, and other forms of transportation)

Objectives:

- Increase route choices and connections for all users
    - Roads: increase capacity and efficiency
    - Sidewalks: increase access and connectivity
    - Bicycle facilities: increase total miles of bike routes/facilities
    - Transit: increase transit participation
- Use technology to enhance system performance, including accessible technology (i.e. audible signals)
- Increase the number of people who walk, ride a bike and/or take transit
- Provide reliable travel times for commuters, emergency vehicles, and commercial users
- Minimize congestion
- Reduce vehicle operating and maintenance costs due to poor pavement conditions
- Emphasize asset management

Goal 2 - Ensure Safety for All Users

Objectives:

- Reduce serious injuries and fatalities
- Maximize safe routes within and between neighborhoods and throughout the community for all users
- Design and build facilities and routes that maximize safety for pedestrians and bicyclists
- Ensure safe speeds

Goal 3 - Facilitate Housing Supply, Job Creation, and Economic Development to Meet Demand/Growth

Objectives:

- Build new roads and upgrade existing roads to serve areas targeted for growth (prioritized opportunity and expansion areas) and job creation
- Provide access and connectivity to expanded housing supply
- Improve connectivity and route choices for commercial users

Goal 4 - Protect Livability and Ensure Equity and Access

Objectives:

- Incorporate a complete streets approach for all new road projects and road reconstruction
- Increase Safe Routes to Schools
- Ensure that all income levels and abilities have access to the transportation option that best meets their needs
- Encourage the use of roads for their stated classification
- Keep through freight traffic on ODOT facilities

Goal 5 - Steward the Environment

Objectives:

- Minimize the impacts of transportation system on natural features
- Minimize the impacts of system on air and water quality and noise
- Reduce carbon emissions from transportation

Goal 6 - Have a Regional Outlook and Future Focus

Objectives:

- Coordinate and partner with other public and private capital improvement projects and local/regional planning initiatives
- Create a system that is designed to implement innovative and emerging transportation technologies

Goal 7 - Implement a Comprehensive Funding and Implementation Plan

Objectives:

- Identify stable, equitable, adequate and achievable funding for transportation programs and projects
- Ensure that the financial plan and investment priorities are transparent, understandable, and broadly supported by the community
- Produce a funding plan that includes contributions from residents, visitors, and businesses and that delivers benefits to all users and geographies equitably and in a timely manner
- Include performance measures/benchmarks and a formal process to periodically assess progress to-date and adjust or update the plan as needed
- Achieve financial stability

Chapter 5: Forecast Land Use

Introduction

Population and employment forecasts are developed to assist in planning for land use, transportation, infrastructure, and other needs. Forecasts are as good as the data and assumptions upon which they are based and require updates as new information becomes available.

Population and employment in the Bend area has shown cycles of slow and fast growth over the past several decades. During the 1970s, the population in Bend grew by almost 26 percent, while growth slowed somewhat in the 1980s. The 1990s saw another population surge that included the annexation of the entire area contained in the city's Urban Growth Boundary. Rapid population growth continued into the first half of the 2000s, followed by slower growth in the second half due to the recession of 2007-2009. The vast majority of the area's recent population growth is due to in-migration and is intertwined with the region's economic health. Long-term forecasts reflect national trends and show an eventual slowing of this growth.

The number and location of workers and housing have a significant impact on regional travel. Population and employment are essential inputs to the computer-based transportation model. Estimates of base year dwelling unit and employment, and future projections of these same variables are needed to forecast future traffic. The population of the Bend area is expected to increase by about 62% by 2040 and by 95% by 2050. This increase in population will have a significant impact on the transportation system. The transportation needs of the population, however, will be changing as well. An aging population will be more reliant on alternative modes of transportation. At the same time, rapid technological changes (e.g. on-line shopping, connected and autonomous vehicles, micro-mobility) may affect travel patterns and behavior. Therefore, not only is the amount of growth important, but also the forecast characteristics of the population.

Population Growth

Historical Census data for Bend, Deschutes County and the state of Oregon is illustrated in Table 5-1. Central Oregon has seen high population growth rates for much of the last 45 years. As shown in Table 5-1, the growth has been especially high in the last 10-15 years.

Table 5-1: Population Growth Summary

Year	1960	1970	1980	1990	2000	2010
Oregon	1,768,687	2,091,533	2,633,156	2,842,321	3,421,399	3,831,074
Change	---	322,846	541,623	209,165	579,078	409,675
% Change	---	18%	26%	8%	20%	12%
Deschutes County	23,100	30,442	62,142	74,958	115,367	157,733
Change	---	7,342	31,700	12,816	40,409	42,366
% Change	---	32%	104%	21%	54%	37%
Deschutes County*	11,137	16,732	31,700	54,489	63,338	81,094
Change	---	5,595	14,968	22,789	8,849	17,756
% Change	---	50%	89%	72%	16%	28%
Bend	11,963	13,710	17,263	20,469	52,029	76,639
Change	---	1,747	3,553	3,206	31,560	24,610
% Change	---	5%	26%	19%	154%	47%

*Deschutes County excluding the Bend population total. Source: US Census Bureau (data for 1960, 1970, 1980, 1990, 2000 and 2010).

Since the late 1990s, the trend of regional population growth being driven by in-migration has continued as demonstrated in Table 5-2. Deschutes County's rate of growth from in-migration has significantly exceeded neighboring counties over the eight-year period. This illustrates that in-migrants play an important role in population growth and will likely play an equally important role in future economic growth.

Table 5-2: Population Change and In-migration trends for Deschutes and neighboring Counties (2010-2018)[31]

County	Total Population change	Natural Increase (births over deaths)	Net Migration (in-migrants over out migrants)
Crook	1,732	-327	2,059
Jefferson	1,840	663	1,177
Deschutes	31,247	3,012	28,235

Supporting the observation regarding in-migration in Deschutes County, Bend's population is composed mostly of people born in a different state. In 2012[32], only 40% of Bend's population was estimated to be born in Oregon. Whereas, in the U.S. and the State of Oregon, 60% and 46% currently reside in the same state they were born. The ACS 2012 data also shows that 53% of in-migration is from people born in other states and 6% from foreign born in-migration. From this, it can be concluded that in-migration to Bend is primarily driven by out-of-state residents, not residents born in Oregon.

One aspect of particular interest to the future transportation needs of the region is the growth in the population of people age 65 and over. The central Oregon region is an

[31] Portland State University Population Research Center, 2018 Annual Oregon Population Report Tables, 2019.

[32] American Community Survey, 2012, (Table ACS12:C05002)

attractive location for retirees. Between 2000 and 2010, this age group grew by approximately 50% in Deschutes County (from 15,089 people to 23,491 people). In Bend, the 65 and over group comprises 12.5% of the population as of 2010.[33]

County Population Forecasts to 2040

In 2018, the Population Research Center at Portland State University (PSU) released their long-term (50-year) population forecasts for Deschutes County. These forecasts use a model to forecast natural increase (births minus deaths) and net migration (in-migration minus out-migration). Table 5.3 summarizes the PSU population forecast by 5-year increments out to the year 2068.

Table 5-3: Deschutes County 2018-2068 PSU Population Forecast

Year	Bend UGB	La Pine UGB	Redmond UGB	Sisters UGB	Unincorporated County	Total County
2018	91,373	1,833	29,364	2,691	62,360	187,621
2020	98,205	2,081	30,812	3,018	65,677	199,793
2025	109,338	2,304	33,839	3,340	71,887	220,708
2030	123,574	2,670	38,524	3,889	75,362	244,018
2035	138,587	3,023	43,473	4,384	77,373	266,840
2040	153,696	3,386	48,575	4,867	78,702	289,225
2045	168,364	3,739	53,750	5,380	79,593	310,827
2050	184,754	4,145	59,179	5,954	80,010	334,042
2055	203,718	4,625	65,515	6,631	78,501	358,991
2060	222,590	5,091	71,765	7,291	79,067	385,803
2065	242,149	5,568	78,213	7,968	80,719	414,618
2068	255,291	5,894	82,575	8,431	80,739	432,930

The Table 5-4 summarizes the 2014-2040 updated population forecast from the PSU Population Research Center. These projections are used by BMPO and the City of Bend:

Table 5-4: Bend UGB 2014-2040 Population Forecast

Year	Bend UGB	Pop. Growth	%Pop. Growth
2014	76,639		
2028	115,000	38,361	50.1%
2040	153,700	77,061	100.6%

Employment Trends

In recent years, the central Oregon region has undergone a dramatic shift in its economic structure. Due to a reduction in commercial timber available from federal lands, employment in the lumber industry has declined sharply. The region, however,

[33] Source: US Census Bureau (data for 2000 and 2010)

has seen a sizable increase in overall employment. The employment base has greatly diversified over the past 10 years.

Growth in tourism has had a significant impact on both the statewide and local economies. Central Oregon is a major tourist destination. In 2004, Deschutes County ranked fifth in the state for total travel expenditures. Because of its central location to many cultural and recreational activities, the MPO area frequently serves as the home base for tourists during their stay in Central Oregon.

Structural changes in the local economy impact the demand placed on the transportation system. For example, industrial employment generates very few trips per employee while retail employment generates a large number of trips per employee. If, for example, 100 industrial employees are shifted to new retail sector positions, there would be a large increase in trips placed on the transportation system.

In addition, the geographic distribution of retail and service employment is typically more dispersed than traditional, large industrial sites. Because of these factors, future travel demand will change significantly as the economy continues to grow and evolve.

The updated Economic Opportunities Analysis (EOA), released by OEA in 2008, also forecasted employment growth. In this update, the EOA concluded that job growth in Deschutes County would be some of the highest in the state over the next 10 years. Bend is well positioned to grow employment in its targeted economic sectors including: hospitality, higher education, health care, secondary wood products, renewable energy resources, aviation, recreational equipment manufacturing, specialty manufacturing, and information technologies. Threats to Bend's economic success include high housing costs and a lack of workforce housing.

Growth in total employment within the Bend urbanized area is forecast to increase steadily over the next 30 years. Much of this growth is expected to occur in the trade and service sectors. Employment in retail trade is expected to triple and growth in wholesale trade is expected to more than double by 2040 (over 2010 conditions). Service industry employment is projected to grow by 83%. Additionally, manufacturing employment is forecast to grow 68% and F.I.R.E. (Finance, Insurance, Real Estate) is forecast to grow 172%. The long-range employment forecasts are shown in Table 5-5.

Table 5-5: Regional Employment Projections (Bend MPO Area)

Year	Agriculture/ Forestry	Mining	Construction	Manufacturing	Transportation, Communications, Utilities	Wholesale Trade
2010	391	27	1,922	3,089	1,281	944
2040	499	93	6,792	6,633	2,147	2,366
Change	+108	+66	+4,870	+3,544	+866	+1,422

(cont)

Retail Trade	FIRE	Service	Government	Total Employment
6,261	2,255	22,193	1,555	39,918

19,324	6,135	37,323	3,622	84,934
+13,063	+3,880	+15,130	+2,067	+45,016

Source: 2010 data from Oregon Department of Transportation (ODOT)

Vehicular Travel Demand

Locations with high traffic volumes today are expected to be the locations with the highest traffic volumes in the future. The highest traffic volumes in the region are forecast to occur on US 97 (the Parkway). High traffic-volumes are also expected on US 20 (3rd Street/Greenwood Avenue), Reed Market Road, 18th Street, O.B. Riley Road, Empire Avenue, and 27th Street. Vehicle miles of travel (VMT) in the MPO in 2010 were estimated to be approximately 108,000 miles during the PM peak hour. By 2040, PM peak hour VMT within the MPO is expected to be approximately 206,000 miles (a 91 percent increase).

Trends in population and employment in the Bend area mirror those of the nation. A variety of societal changes has had a significant impact on transportation demand. These changes contribute to increased demands on the transportation system. National statistics from the Census indicate that over the last 30 years, many transportation-related factors have grown much more rapidly than has the nation's population. Some of those factors include significant increases in the number of vehicles per household, changing labor force participation rates (particularly women), and decreasing numbers of persons per household.

Chapter 6: Motor Vehicles

Introduction

Motor vehicles remain the highest volume mode for transporting goods and people within the BMPO planning area. The physical roadway infrastructure and the motor vehicles it supports play a vital role in the BMPO planning area's social and economic livelihood. Efficient movement of motor vehicles supports the economic vitality of the region and maintains the mobility of its residents. Identifying needs and deficiencies in the roadway system is an important step in maintaining and improving the flow of motor vehicles. Most new motor vehicle projects also have provisions for bicycle and pedestrian facilities that enhance the multi-modal transportation system and create travel options to reduce reliance on single-occupancy vehicle trips.

Three different future transportation network scenarios were evaluated:

- 2040 Committed
- 2040 Financially Constrained
- 2040 Aspirational

The Metropolitan Transportation Plan (MTP) is a financially constrained plan; the Financially Constrained scenario includes projects recommended for implementation that can be funded with existing and anticipated funding resources over the planning period. The Financially Constrained scenario identifies regionally significant projects, primarily on arterial road segments and generally excludes local and collector streets. Some collector street projects have been included due to their impacts on the regional transportation system, particularly in currently undeveloped portions of the City of Bend brought into the UGB in 2016. Other collector street deficiencies that were identified and corresponding improvement projects will be addressed in the ongoing Bend Transportation System Plan (TSP) Update.

As part of this MTP update, the future network scenarios were evaluated with a link-based system analysis (demand-to-capacity). Other local agency efforts identified system deficiencies at both the link and intersection level. The 2040 Bend-Redmond Model (BRM) was used to identify the system link deficiencies. Key intersection improvement projects identified in the previous MTP Financially Constrained scenario (adopted in 2014) and the Bend UGB expansion work (completed in 2016) were included in the Financially Constrained project list for this MTP update.

While many projects included within this plan have funding sources, some additional projects are identified that go beyond the immediate availability of known funding trends. These projects ("Aspirational") address capacity, connectivity, and safety issues that were not addressed in the Financially Constrained scenario. The designation and inclusion of these extra projects are important to future planning efforts, as they allow right-of-way to be preserved. They also allow opportunities for new funding that becomes available to be applied to projects that have been already been identified as

addressing future deficiencies in the regional transportation network. These extra roadway projects are included in an “Aspirational” list near the end of the chapter.

Several other planning studies are underway that will influence the expected transportation solutions in the greater Bend Planning Area. These studies include:

- Bend Transportation System Plan Update
- US 97 Parkway Plan
- US 97 Bend North Corridor Study
- Deschutes County ITS Plan
- Bend Transportation Safety Action Plan
- Cascades East Transit Plan

Findings and recommendations that result from these ongoing planning efforts will be amended into the Bend MTP and incorporated into Phase 2 of the MTP update.

Goals and Policies

The goals and policies of the Bend MTP were developed based on a review of the existing goals outlined in other regional and local plans. The Oregon Highway Plan provides guidance on the standards of performance necessary for motor vehicles on the state highway facilities. The region also has specific goals and policies outlined within the local transportation plans (City of Bend Comprehensive Plan, Deschutes County Transportation System Plan, and the on-going City of Bend Transportation System Plan Update) that are specifically related to motor vehicles. The goals that were created and adopted will help guide the future development of the roadway network and select specific projects for implementation. The motor-vehicle goals and objectives are included in Chapter 4 of this plan.

Performance Standards

A variety of performance measures have been developed and adopted by governing jurisdictions to evaluate how well the transportation system operates under existing and future conditions. This plan focuses on link demand/capacity (d/c) ratios from the BRM at the corridor level, along with travel time reliability measures generated by the ODOT HERS-ST tool and system VMT by functional classification. For future MTP Updates, further model refinement and post-processing may be used to incorporate intersection level of service measures into the analysis.

Forecasts and Needs

The existing conditions analysis (discussed in Chapter 3 and summarized in Appendix B) identified a series of transportation needs and existing deficiencies. These needs, along with the adopted goals and policies developed for the future direction of the transportation network, provide the starting point for the future year analysis.

Forecasted Land Use

Land use is a key factor in developing a functional transportation system. The amount of land that is planned to be developed, the type of land uses and how the land uses are mixed together have a direct relationship to expected demands on the transportation system. Understanding the amount and type of land use is critical to taking actions to manage, maintain or enhance transportation system operation.

The BRM was developed by the Transportation Planning Analysis Unit (TPAU) at Oregon Department of Transportation (ODOT). The BRM includes the Bend MPO area, the City of Redmond, and much of the surrounding unincorporated areas of Deschutes County. The travel demand model was used to estimate traffic demand within the study area for 2040.

For transportation forecasting, the land use data is stratified into geographical areas called transportation analysis zones (TAZs), which represent the sources of vehicle trip generation. There are 423 TAZs within the BMPO planning area; each TAZ represents land use and the access to the transportation system within the planning area. Complete land use data sets were developed by MPO, City, County, school district, and college staff and TPAU. This land use database includes the population, the number of residential dwelling units (households), and employees within specific TAZs. The totals that were assumed for each category based on the UGB expansion work and the latest PSU population forecasts are summarized in Table 6-1.

Table 6-1: Land Use Summary (Bend UGB)

Land Use	2014	2040	Increase	Percent Increase
Population	84,000	153,700	69,700	83%
Employees	43,000	88,100	45,100	105%

In Table 6-1, the employee category only includes the total number of employees, though the travel demand model utilizes a range of employment types (e.g. retail, service, industrial, and other). Also note that the travel demand model converts part time employees to full time equivalent employees, so the total employment recognized by the travel demand model is lower than the total in Table 6-1. All employment category areas exhibit significant growth during the planning horizon. This growth was converted to forecasted travel demand and then applied to the existing transportation network to determine the future deficiencies of the motor vehicle system, as explained in the next section. Further detail on the land use forecasts and allocations are included in Chapter 5.

Forecasted Travel Demand

The determination of future transportation needs in the BMPO planning area requires the ability to accurately forecast travel demand resulting from estimates of future population and employment. The objective of the transportation planning process is to provide the information necessary for making decisions on when and where improvements should be made to the transportation system to meet the forecasted travel demand.

Traffic forecasting can be divided into several distinct but integrated components that represent the logical sequence of travel behavior. These components and their general order in the traffic forecasting process are as follows:

- **Trip Generation**- The trip generation process translates land use quantities (number of dwelling units, number of employees) into vehicle trip ends (number of vehicles entering or leaving a TAZ).
- **Trip Distribution**- This step estimates how many trips travel from one zone (TAZ) in the model to any other zone. Distribution is based on the number of trip ends generated in each zone pair and on factors that relate the likelihood of travel between any two zones to the travel time between zones.
- **Mode Choice**- This step determines how many trips will be made by various modes (single-occupant vehicle, transit, carpool, etc.).
- **Traffic Assignment**-This step assigns trips between an origin and destination by mode to a route, where each traveler is assigned to the path with the shortest travel time.

The initial roadway network used in the traffic model includes the streets and roadways identified in the existing conditions chapter (Chapter 3) of this plan. A future 2040 Committed scenario (projects was analyzed as a base case to identify existing deficiencies and motor vehicle infrastructure needs. The Committed scenario assumes that the BMPO planning area will experience its projected growth in population and employment and the demand for the transportation facilities will increase accordingly. The Committed street network includes projects identified in the adopted plan that have committed/programmed funding to construct, either through the City of Bend's Capital Improvement Program (CIP), the Oregon Statewide Transportation Improvement Program (STIP), or other privately funded road improvements. The transportation improvements assumed for this scenario are shown in Figure 6-1 and listed in Table 6-2. This scenario serves as the basis of comparison for the other future year (2040) scenarios that will be evaluated.

Figure 6-1: Committed Projects

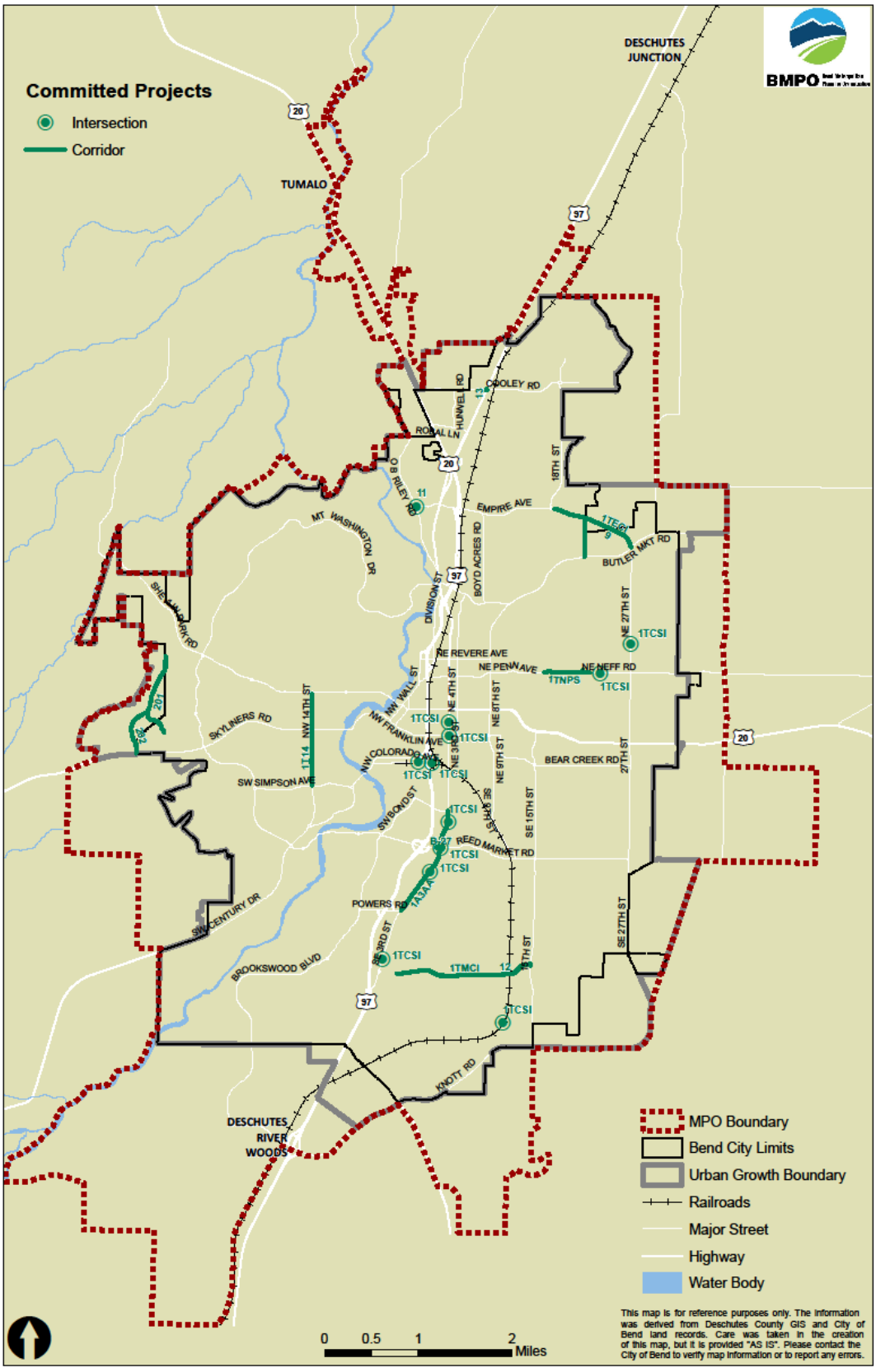


Table 6-2: Committed Project List

Project #	Project Name	Location	Project Description	Project Priority	Planning Level Cost ($1,000s)
201	Skyline Ranch Road	Shevlin Park to NW Xing	New collector	Short	Funded
202	Crossing Drive Extension	Skyline Ranch Road to Crosby Drive	New collector	Short	Funded
9	Empire Avenue Extension	Purcell Boulevard to 27th Street	Includes three lane extension to 27th Street, maintaining ROW for a five-lane section, and multi-lane roundabout at Butler Market Road	Short	Funded
13	US 97/Cooley Road Area	Cooley Road	Construct intersection control improvements, includes interim Cooley Road Improvements	Short	Funded
	Undetermined Phase of the FEIS			Short	Funded[34]
12	Murphy Road Extension	Brosterhous Road to 15th Street	Includes a bridge to cross the railroad and a roundabout at Murphy Road/15th Street.	Short	Funded
1TMCI	Murphy Road Corridor safety and capacity improvements	Parrell Road to Brosterhous Road	Includes roundabouts at Country Club Drive and Brosterhous Road. Includes upgrade to three lane collector	Short	Funded
1TNPS	Neff Road / Purcell Boulevard intersection capacity and safety improvements	Neff Road at Purcell Boulevard	Intersection control improvements to be determined, including sidewalks along the north side of Neff Road	Short	Funded
B-27	Reed Market Road / 3rd Street intersection safety and capacity improvements	Reed Market Road at 3rd Street	Intersection capacity and safety improvements to be determined	Short	Funded
1TCSI	Citywide safety improvements	Throughout Bend	Includes 3rd/Hawthorne, 3rd/COID Canal, 3rd/Pinebrook, Brosterhous/Railroad bridge, and Colorado Ave/US 97 improvements	Short	Funded

Note: This list of improvements is intended to focus on regionally significant improvements and there may be other committed local City projects that are not listed here.

[34] On July 25, 2019, ODOT was awarded an INFRA Grant by FHWA. This grant is intended for a portion of the US 97 North Corridor FEIS. The scope and extents of this project will be determined at a later date.

The BRM is a useful tool for determining future deficiencies in the transportation network. The model was created using average annual weekday daily traffic volumes. These volumes reflect average conditions (spring and fall) but neglect the seasonal variations that are characteristic of the area. Typically, adjustments for the 30th Highest Hour or other correctional factors are applied to traffic counts on state highways (US 20 and US 97) to reflect the higher traffic volumes that are exhibited during the summer months. The counts are adjusted based on data from Automatic Traffic Recording (ATR) devices maintained on state facilities. The travel demand model does not account for these adjustments. Based on the travel characteristics within and through the BMPO planning area, seasonal variation has a significant impact on the existing and future traffic operations and it should be noted that the model generally underestimates the future forecast traffic volumes for certain peak months throughout the year.

Future Corridor Deficiencies

Figure 6-2 shows the forecasted demand to capacity ratio on roadways within the planning area for the 2040 Committed scenario. The demand-to-capacity ratios illustrated here are based on raw model outputs that serve as a general guide to identify needs and differ from the volume/capacity (v/c) ratios that are calculated using post-processed traffic volumes and the *Highway Capacity Manual Methodology*[35]. As shown, the Committed Scenario transportation system does not have adequate roadway connectivity or capacity to serve expected future travel needs.

[35] *2000 Highway Capacity Manual*, Transportation Research Board, 2000, Chapter 27.

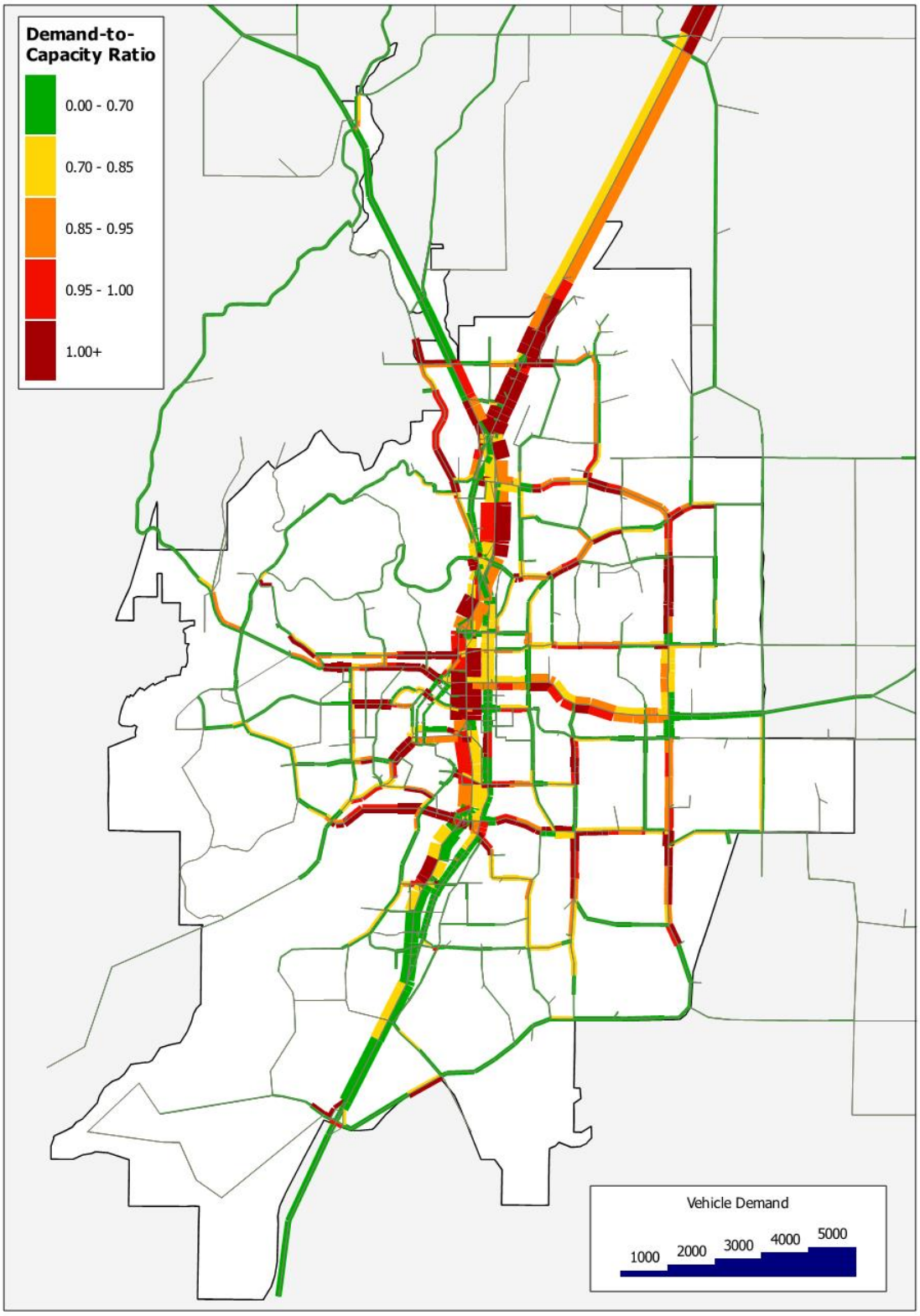


Figure 6-2: 2040 Committed Scenario System Performance Plot

Dark red roadway segments in Figure 6-2 indicate roadway segments where the demand exceeds the capacity and intersections key intersections on the corridor are not likely to meet the City or ODOT traffic operating standards, typically intersection v/c of 0.85 for ODOT facilities and v/c of 1.0 for City facilities within the MPO area. Key corridors (arterials and collectors) with demand to capacity ratio exceeds 1.0 in the study area include the following:

ODOT Facilities:

- US 20
    - *North of Empire Avenue*
        - between Cooley Road and Empire Avenue
    - *3rd Street from Empire Avenue to Greenwood Avenue*
        - between Mt Washington Drive and Division Street
    - *Greenwood Avenue*
        - between 8th Street and Purcell Boulevard
- US 97
    - between Bowery Lane and Colorado Avenue
    - between Reed Lane and Powers Road

City/County Facilities:

- OB Riley Road (between Cooley Road and Archie Briggs Road)
- Wall Street (between Revere Avenue and Newport/Greenwood Ave)
- 3rd Street (south of Greenwood Avenue)
    - between Dekalb Ave and Miller Avenue (two-lane segment at rail undercrossing)
- 15th Street
    - Between Bear Creek Road and Wilson Road
    - between Reed Market Road and Ferguson Road
- 27th Street
    - between Butler Market Road and Neff Road
    - between Bear Creek Road and Rickard Road
- Cooley Road (between O.B. Riley Road and Boyd Acres Road)
- Empire Avenue (includes extension to Butler Market Road/27th Street)
    - between US 20 and US 97

    - between 18th Street and Purcell Boulevard
- Butler Market Road (between 8th Street and Purcell Boulevard)
    - between 3rd Street (US 20) and US 97
    - between Studio Road and Eagle Road
- Portland Avenue (between NW 9th Street and Wall Street)
- Newport Avenue (between College Way and Wall Street)
- Franklin Avenue
    - between Broadway Street and Bond Street
    - between 4th Street and 8th Street
- Galveston/Tumalo Avenue (between NW 14th Street and Broadway Street)
- Colorado Avenue
    - between Columbia Street and Industrial Way
    - between Sisemore Street and US 97 northbound ramps
- Wilson Avenue (between Bond Street and 9th Street)
- Reed Market Road
    - between Brookswood Boulevard and Division Street
    - between 4th and Pettigrew Road[36]

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- Baker/Knott Road (between Brookswood Boulevard and China Hat Road)

In addition to the dark red segments shown in Figure 6-2, the light red and orange segments of US 97 and US 20 could potentially also fall below the jurisdictional standards, particularly during peak seasonal demand. The most congested area on US 20 is generally concentrated between 8th Street and Purcell Boulevard and likely does not meet operational standards for a significant portion of the corridor. US 97 also exhibits high congestion levels and likely does not meet standards for the majority of the corridor between Tumalo Road and Powers Road under the 2040 Committed scenario demand conditions.

Future Intersection Capacity Analysis

The current analysis focuses on applying the travel model to extract system measures such as link capacity and demand. The Bend UGB Expansion work identified several intersection capacity enhancement projects. The on-going Bend TSP update, US 97 Bend Parkway Study, and the US 97 Bend North Corridor Project will include forecasts

[36] City of Bend TSP street policy #19 prohibits widening Reed Market Road from Century Drive to Bond Street.

of future demand at study intersections within the MPO and refined project information regarding intersection capacity enhancement, which will inform Phase 2 of the MTP update.

Scenario Development

As summarized in the previous section, the Committed scenario has significant roadway system capacity deficiencies in the future year (2040). Addressing the system deficiencies requires a balanced investment approach to both upgrades roadways and implement improvements and measures for other modes (transit, bicycle/pedestrian improvements, and traffic demand management policies) that are not completely captured in the travel demand model. Future MTP updates will provide more comprehensive motor vehicle analysis including transit, bicycle/pedestrian, and travel demand management policy impacts.

-

One Financially Constrained scenario was developed for this MTP Update. The scenario is based on the project list of the previous (2014 MTP Update) Financially Constrained 2040 scenario with several refinements to address new system deficiencies caused by updated 2040 population projections combined with projects identified during the City of Bend UGB expansion. The result is a Financially Constrained scenario intended to address the highest priority system deficiencies within current funding constraints.

A funding analysis (see Chapter 16) was conducted to determine the available funding resources for transportation capital projects and public transportation operations in the Bend MPO area over the planning period for the MTP (2019-2040). Several road-related funding sources were identified at the federal, state, and local level for the planning period. Total available transportation revenue for non-transit projects and programs is $355.9 million (YOE $), or $260.1 million (constant 2018 $).

Evaluation Process

Performance measures help guide the selection of future roadway projects within the BMPO planning area and provide qualitative and quantitative measures for each goal category developed at the onset of the planning process. As discussed in Chapter 4, the goals and performance measures from the previous MTP update were the basis for developing the Financially Constrained scenario projects. The goals and performance measures approved as part of the ongoing City of Bend TSP update and Bend MPO MTP update were used to develop the additional Aspirational scenario projects.

This section describes the motor vehicle system performance measures used to evaluate the different scenarios and presents the results of the overall system wide performance evaluation. For comparison purposes, the updated performance measures developed for the on-going plan updates, as listed in Chapter 18, were applied to both the Financially Constrained and Aspirational scenarios.

Financially Constrained Scenario

The Financially Constrained scenario includes a list of projects that were prioritized to fit within the projected available funding. The project list includes projects from the previous MTP Financially Constrained scenario, the required Bend UGB expansion projects, as well as new projects that were identified as a high priority for near-term implementation to meet system needs. As mentioned previously, the project list only includes projects that have regional significance.

Table 6-3 summarizes the recommended roadway improvement projects. For most projects, the location includes a street segment defined by the street name with the project limits. This list is based on planning-level analysis and the specific limits and project details may be refined as further analysis is conducted and more information is obtained before construction occurs. All of the projects identified in the Financially Constrained scenario have a project number that is mapped on Figure 6-3.

The projects were selected and prioritized based on funding availability, the established performance measures, and the impact of the projects within the BMPO planning area. Table 6-3 places the prioritized projects into two categories, short-term and long term. The short-term projects include committed projects that are already funded to address needs identified through previous planning and analysis and are expected to occur within the next five years. The long-term projects include projects that will likely occur more than five years after the plan has been adopted. Prioritization of the projects will be refined through the Bend TSP update process, which would then incorporated into the Phase 2 MTP Update.

The project priority listed in the table serves only as a guide for implementation. Changes in development patterns, funding availability and other factors may influence the order that projects are constructed throughout the BMPO planning area. Note that all projects with committed funding are included in Table 6-3, as these projects are also part of the Financially Constrained Scenario.

Figure 6-3: Financially Constrained Projects

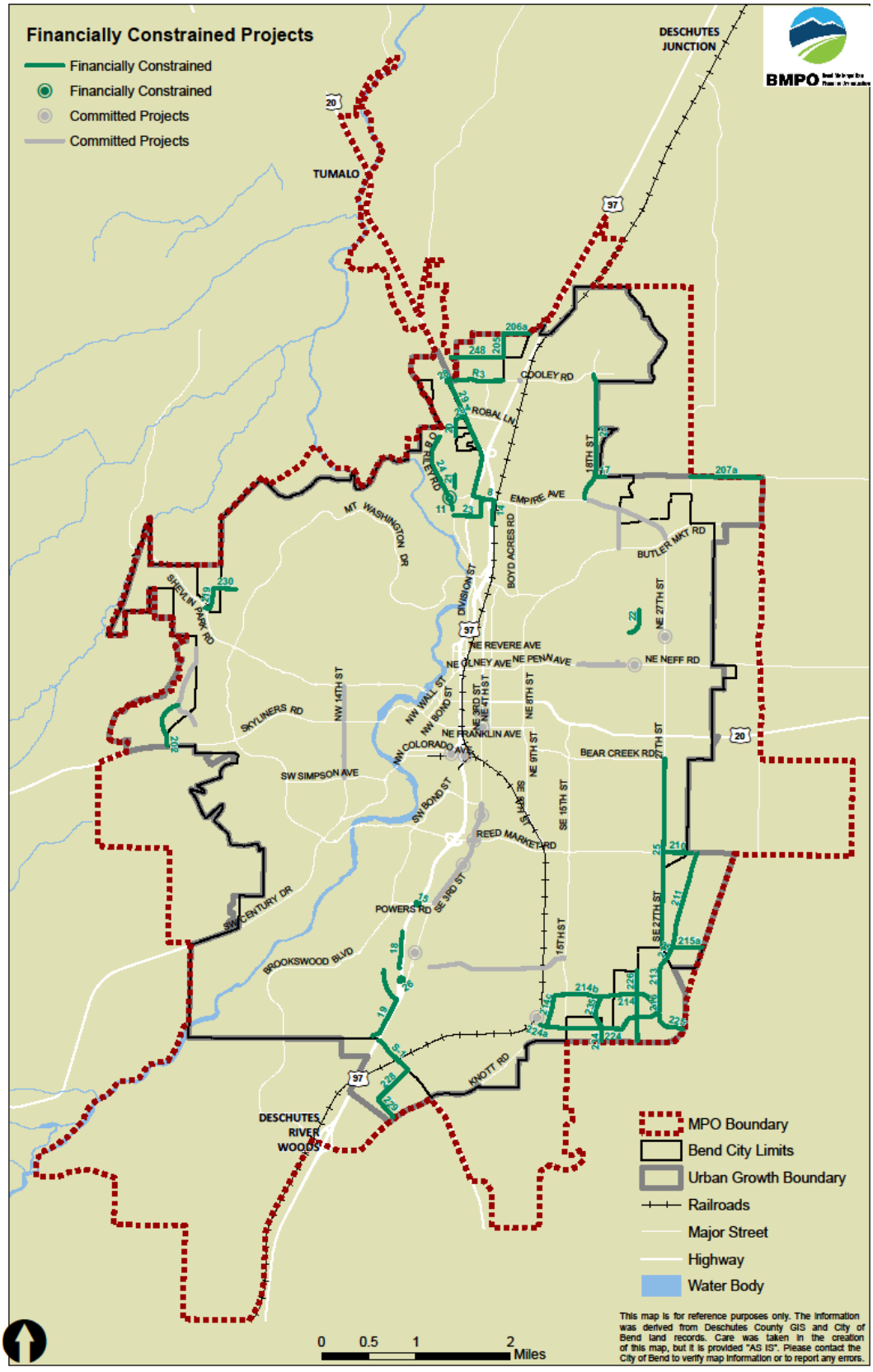

Table 6-3: Committed / Financially Constrained Scenario Project List

Project #	Project Name	Location	Project Description	Project Priority	Planning Level Cost ($1,000s)
			Committed Projects		
201	Skyline Ranch Road	Shevlin Park to NW Xing	New collector	Short	Funded
202	Crossing Drive Extension	Skyline Ranch Road to Crosby Drive	New collector	Short	Funded
9	Empire Avenue Extension	Purcell Boulevard to 27th Street	Includes three lane extension to 27th Street, maintaining ROW for a five-lane section, and multi-lane roundabout at Butler Market Road	Short	Funded
13	US 97/Cooley Road Area	Cooley Road	Construct intersection control improvements, includes interim Cooley Road Improvements	Short	Funded
	Undetermined Phase of the FEIS			Short	Funded[38]
12	Murphy Road Extension	Brosterhous Road to 15th Street	Includes a bridge to cross the railroad and a roundabout at Murphy Road/15th Street.	Short	Funded
1TMCI	Murphy Road Corridor safety and capacity improvements	Parrell Road to Brosterhous Road	Includes roundabouts at Country Club Drive and Brosterhous Road. Includes upgrade to three lane collector	Short	Funded
1TNPS	Neff Road / Purcell Boulevard intersection capacity and safety improvements	Neff Road at Purcell Boulevard	Intersection control improvements to be determined, including sidewalks along the north side of Neff Road	Short	Funded
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[38] On July 25, 2019, ODOT was awarded an INFRA Grant by FHWA. This grant is intended for a portion of the US 97 North Corridor FEIS. The scope and extents of this project will be determined at a later date.

Project #	Project Name	Location	Project Description	Project Priority	Planning Level Cost ($1,000s)
				Total Short-Term Project Cost: Funded	
			Other Financially Constrained Projects		
8	Empire Avenue widening to five lanes	From US 20 to US 97 northbound ramp	Widen Empire to 5 lanes (near interchange) and install traffic signal at SB ramps.	Long	$2,900
11	O.B. Riley Road intersection safety and capacity improvements	From Old Bend-Redmond Hwy to 3rd Street	Improvements at key intersections such as Mervin Sampels, Archie Briggs Road, Halfway Road and Glen Vista/Hardy Road	Long	$1,900
14	US 97 / Empire Avenue northbound off ramp widening	US 97 at Empire Boulevard	US 97/Empire Avenue northbound off ramp widening to two lanes	Long	$1,800
15	Powers Road / US 97 preliminary engineering and ROW acquisition for Interchange	Powers Road at US 97	May include interchange or overcrossing, pending outcome of the Parkway Study	Long	$6,500
17	Yeoman Road extension	From 18th Street to western terminus	Includes two lane extension and bridge to cross canal	Long	$1,009
18	New North Frontage Road	Near Murphy Road	Improvements to be determined	Long	$5,400
19	New South Frontage Road	Near Murphy Road	Improvements to be determined	Long	$13,800
20	Britta Street extension (north section)	From Hardy Road to Robal Road	Includes two lane extension	Long	$2,000
21	Britta Street extension	From Halfway Road to Ellie Lane	Includes two lane extension	Long	$1,000
22	Purcell Boulevard extension	From Full Moon Drive to Jackson Avenue	Includes two lane extension	Long	$2,288
23	Mervin Sampels Road / Sherman Road Collector Corridor upgrade	From O.B. Riley Road to Empire Boulevard	Includes upgrade to two lane collector roadway and a traffic signal at US 20	Long	$6,100
24	O.B. Riley Road Arterial Corridor upgrade	From Hardy Road to US 20	Includes upgrade to three lane arterial with curb, sidewalk and bike lane improvements	Long	$6,700

Project #	Project Name	Location	Project Description	Project Priority	Planning Level Cost ($1,000s)
25	27th Street Arterial Corridor upgrade	From Bear Creek Road to Ferguson Road	Includes upgrade to three lane arterial and intersection improvements at Ferguson Road	Long	$8,600
26	US 97 northbound on ramp and southbound off ramp at Murphy Road	US 97 at Murphy Road	US 97 northbound on ramp and southbound off ramp at Murphy Road	Long	$6,100
27	18th Street Arterial Corridor upgrade	From Cooley Road to Butler Market Road	Includes upgrade to three lane arterial	Long	$7,800
28	US 20 intersection safety and capacity improvements	From Robal Road to Old Bend-Redmond Hwy	Intersection control improvements to be determined.	Long	$20,000
29	US 20 southbound Roadway widening	From Cooley Road to Empire Avenue	US 20 southbound widening to two lanes	Long	$4,800
R3	Cooley Road rural Road upgrade	From US 20 to Hunnell Road	Includes curb and sidewalk on north side, bike lanes both directions, and an intersection improvement at Cooley Road/Hunnell Road	Long	$1,100
204	New Road	From O.B. Riley to Robal Road	Two lane collector roadway	Long	$2,700
205	Hunnell Road extension	Triangle UGB expansion area	Two lane collector roadway	Long	$2,400
206a	New Road	Triangle UGB expansion area	Two lane collector roadway	Long	$2,500
207a	Yeoman Road extension	From Deschutes Market Road to Hamehook Rd	Two lane collector roadway	Long	$10,900
210	New Road to Stevens	DSL UGB expansion area	Two lane collector roadway	Long	$6,600
211	New Road	DSL UGB expansion area	Two lane collector roadway	Long	$9,500
212	New Road	DSL UGB expansion area	Two lane collector roadway	Long	$1,100
213	New Road	Elbow UGB expansion area	Two lane collector roadway	Long	$4,000
214	New Road	Elbow UGB expansion area	Two lane collector roadway	Long	$5,800
214b	New Road	Southeast Bend UGB	Two lane collector roadway	Long	$4,500

Project #	Project Name	Location	Project Description	Project Priority	Planning Level Cost ($1,000s)
214c	New Road	Southeast Bend UGB	Two lane collector roadway	Long	$4,600
215a	New Road	DSL UGB expansion area	Two lane collector roadway	Long	$3,900
216	New Road	Elbow UGB expansion area	Two lane collector roadway	Long	$1,500
219	Skyline Ranch Road	Shevlin UGB expansion area	Two lane collector roadway	Long	$2,700
224	New Road	Elbow UGB expansion area	Two lane collector roadway	Long	$10,200
224a	New Road	Southeast Bend UGB	Two lane collector roadway	Long	$2,600
225	New Road	Elbow UGB expansion area	Two lane collector roadway	Long	$3,000
226	New Road	Elbow UGB expansion area	Two lane collector roadway	Long	$7,100
228	New Road	Thumb UGB expansion area	Two lane collector roadway	Long	$4,300
229	New Road	Thumb UGB expansion area	Two lane collector roadway	Long	$2,500
230	New Road	Shevlin UGB expansion area	Two lane collector roadway	Long	$2,300
234	Raintree Court extension	Elbow UGB expansion area	Two lane collector roadway	Long	$2,400
235	Raintree Court extension north	Southeast Bend UGB	Two lane collector roadway	Long	$2,400
248	Loco Road extension	Triangle UGB expansion area	Two lane collector roadway	Long	$5,300
S-1	China Hat Road widen to three lane Collector	From US 97 to new road	Widen from two lanes to three lanes	Long	$2,500
All other UGB Expansion rural to urban upgrades (detailed provided in City of Bend TSP documentation)				Long	$24,500
Bicycle and Pedestrian projects				Long	$10,000
				Total Long-Term Project Cost: $242 million	

**The project cost estimates include right-of-way costs.*

Note that most of the projects identified by the UGB Expansion work (projects R3, 204-248, and S-1) will likely be development driven and funded. Of the total Financially Constrained project costs, $33.1 million is assumed to be stated funded, with the remainder being either City or developer funded.

Aspirational Project List

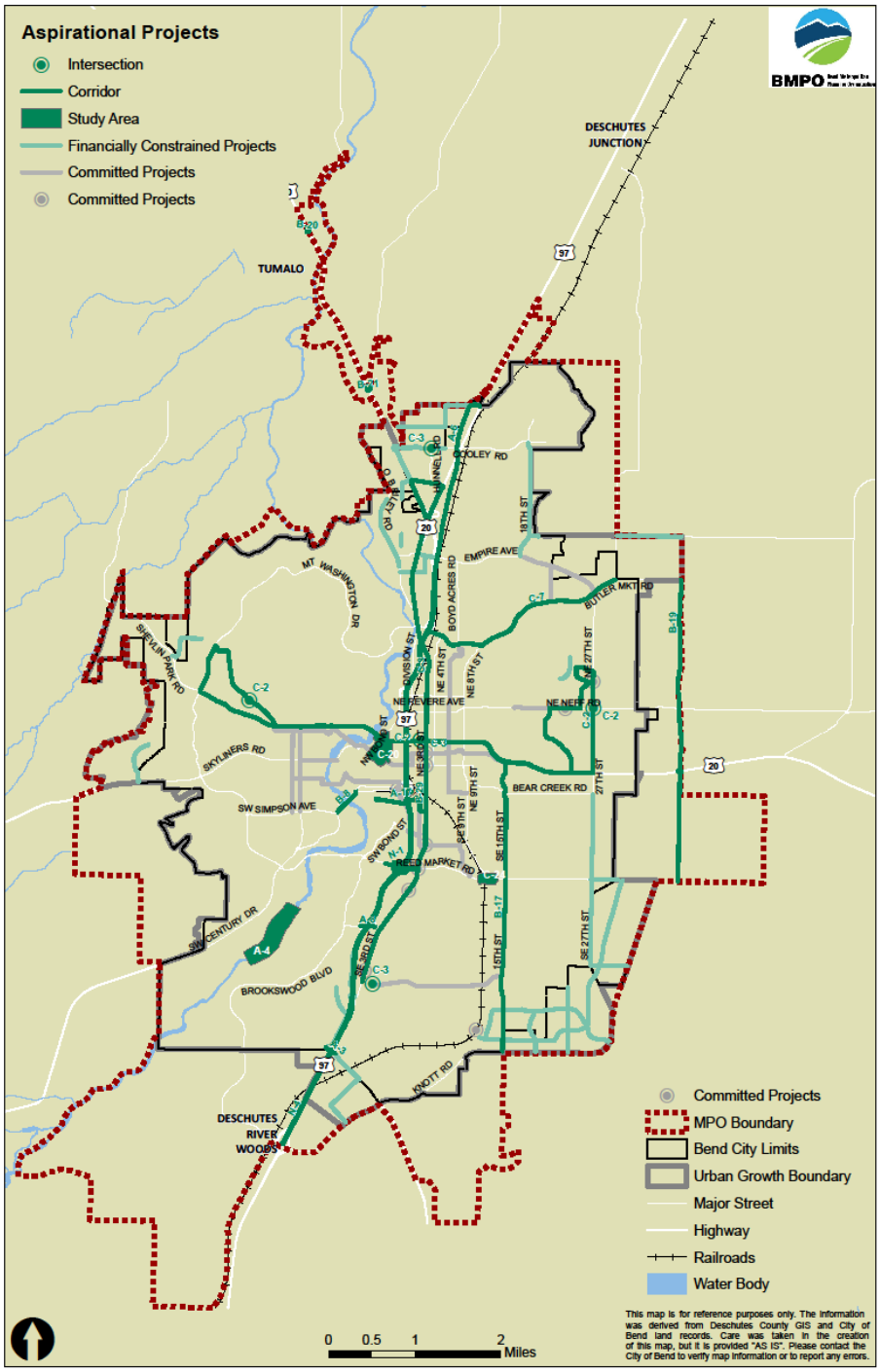
Although the majority of projects included within this plan have reasonable potential for future funding, some additional projects of regional significance were identified to

address more motor vehicle deficiencies on the BMPO planning area system. The long-term facility needs for several sections along both US 97 and US 20 have been a focus of past and ongoing planning studies. Outcomes from these studies include projects (not yet funded) to improve highway operations within the Bend MPO.

An aspirational list of potential new state facility projects was developed, as shown in Figure 6-4 and summarized in Table 6-4, that will serve as placeholders until the various planning studies and environmental reviews have been completed to provide better definition of the scope and scale of anticipated projects. As more funding becomes available, the Bend MPO would consider implementation of these projects.

In 2007, ODOT and FHWA began the Environmental Impact Statement (EIS) for the US 97 Bend North Corridor Project to provide and plan for a safe, affordable, long term traffic solution for US 97 at the north end of Bend. The Record of Decision approving the EIS was issued in September 2014. Project improvements in the vicinity of Empire Avenue have identified funding and are currently listed in Table 6-4. Other improvements associated with the US 97 Bend North Corridor Project, including the extension of 3rd Street, do not have identified funding and are included in the Aspirational Project List shown in Figure 6-4 and Table 6-4. Note that additional projects, particularly intersection capacity enhancement projects, are still being identified as part of the on-going Bend TSP update work program. These additional projects will be included in the Bend MTP update in 2020.

Figure 6-4: Aspirational Projects



Given current funding trends for state facility improvements, any new state funded projects would require a fundamental change in funding opportunities and priorities. The cost of these added improvements on state facilities are very significant and it is expected that they will require some form of a local match to implement. Moving projects to the Financially Constrained list over time and the impact on the MTP budget will need to be addressed through future plan amendments.

Table 6-4: Aspirational Project List for State Facilities

Project #	Project Name	Location	Project Description	Planning Level Cost ($1,000s)
A-6	US 97 North Parkway extension	From Grandview Drive to Butler Market Road	Includes all improvements in the US 97 Bend North Corridor Project FEIS	$300,000
A-8	Powers Road interchange	Powers Road at US 97	Grade separated interchange or overcrossing of US 97 (pending Parkway Study)	$20,000
B-20	US 20 / Cook Avenue intersection safety and capacity improvements	US 20 at Cook Avenue	Includes intersection safety and capacity improvements (may include roundabout or signal).	$13,000
B-21	US 20 / Old Bend-Redmond Highway intersection safety and capacity improvements	US 20 at Old Bend-Redmond Highway	Includes intersection safety and capacity improvements (may include roundabout or signal).	$8,800
C-9	Colorado Avenue / US 97 Northbound ramp intersection safety and capacity improvements	Colorado Avenue at US 97 Northbound ramp	Includes traffic signal or roundabout.	$4,300
C-19 (Not Mapped)	Traffic Signal Coordination improvements along signalized corridors, including freight and transit Signal Priority	Throughout Bend	Includes US 97 (mainline and ramp terminals), 3rd Street, 27th Street, Colorado/Arizona couplet, and US 20 (3rd Street and Greenwood) corridors	TBD
N-1	Reed Market Road Interchange improvements	Reed Market Road at US 97	Reed Market Road interchange improvements as defined by the Parkway Study	$50,000
N-4	US 97 operational and safety management improvements and associated City street improvements	US 97 within Bend MPO boundary	Includes potential recommended Parkway Plan projects such as RI/RO Access Modifications/Closures, Ramp Meters, Butler Market Interchange Improvements, Revere Ave Lane Re-allocation, US 97 Auxiliary Lanes, Baker/Knott Interchange ramp terminal improvements, etc.	TBD
			Total State Facility Aspirational Projects Cost: >380[39] million	

[39] The cost estimate for project C-19 will be informed by the on-going Deschutes County ITS plan, and the estimate for project N-4 will be informed by the on-going US 97 Bend Parkway Study

Additional City projects of regional significance were identified but were not included in the Financially Constrained scenario due to funding constraints. Some of these projects still provide regional connectivity and in some cases congestion relief either by adding lanes or providing alternate routes. Therefore, the project list provided in Table 6-5 summarizes these projects, providing additional guidance to the MPO should more funding become available over the next 20 years. These projects are also shown in Figure 6-4.

Table 6-5: Additional Aspirational Projects

Project #	Project Name	Location	Project Description	Planning Level Cost ($1,000s)
A-3	Ponderosa Street / China Hat Road overcrossing	Ponderosa Street/China Hat at US 97	Vehicle, pedestrian and bicycle access over US 97 at Ponderosa Street/China Hat Road. Includes intersection improvement at Parrell Road/China Hat Road.	$15,000
A-4	Study for southern river crossing	Between Powers Road and Murphy Road	Study to identify new river crossing location between Powers Road and Murphy Road, connecting Century Drive to US 97 or 3rd Street	$200
A-17	Aune Road extension	From Bond Street to 3rd Street	Two lane extension of Aune Road to connect 3rd Street and Bond Street. Includes intersection improvement at 3rd Street and a RAB at the intersection of Bond St and Industrial Way.	$13,500
B-8	Colorado Avenue corridor capacity improvements	From Simpson Avenue to Arizona Avenue	Includes incremental approach for Colorado Avenue widening, including right-of-way acquisition and monitoring for if/when widening is appropriate. Implement alternate mobility targets and identify smaller projects to incrementally improve mobility, reliability and safety. Includes intersection capacity improvements at Colorado Avenue/Simpson Avenue roundabout and Colorado Avenue/Industrial Way. Includes complete streets upgrade.	$21,000
B-17	15th Street Corridor safety and capacity improvements	From US 20 to Knott Road	Includes roundabouts at key intersections, including Wilson Avenue, Ferguson Road, and Knott Road.	$54,000
B-19	Hamby Road Corridor safety improvements	From Ward Road/Stevens Road to Hamby Road/Butler Market Road	Includes shoulder widening for safety and bicycle facilities. Includes a roundabout at US 20 and safety improvements at key intersections, including Neff Road and Butler Market Road	$51,000
B-29	3rd Street railroad undercrossing widening	From Emerson Avenue to Miller Avenue	Widen 3rd Street to 4-lanes under the railroad, including complete street design.	$13,700
C-2	Newport Avenue / Greenwood Avenue corridor	Mt Washington	Includes HCT transit service connecting COCC to downtown to St. Charles Area. Includes improved transit connections from	$1,000

Project #	Project Name	Location	Project Description	Planning Level Cost ($1,000s)
	high-capacity transit and mobility hubs	Drive to 27th Street	neighborhoods to HCT stops. Includes mobility hubs at west end, east end, and in central Bend.	
C-3	3rd Street corridor high-capacity transit and mobility hubs	Murphy Road to near Robal Road	Includes HCT transit service connecting northern Bend (the Triangle) to southern Bend. Includes improved transit connections from neighborhoods to HCT stops. Includes mobility hubs at north end, south end, and in central Bend.	$1,000
C-7	Butler Market Road intersection safety and capacity improvements	From US 97 to 27th Street	Includes roundabouts or traffic signals at 4th Street, Brinson Boulevard, and Purcell Boulevard. Wells Acres Road roundabout as a separate baseline project	$7,000
C-16 (Not Mapped)	TDM Program for major employers and institutions	Throughout Bend	TDM program for major employers and institutions	TBD
C-20	Parking pricing and management in downtown Bend	Downtown Bend	Implement the 2017 Downtown Parking Plan	TBD
C-24	Study of at-grade railroad crossing solutions near Reed Market Road	Near Reed Market Road and railroad crossing	Study the cost and feasibility of relocating the BNSF switchyards compared to a Reed Market Road overcrossing of the railroad	$200
N-5	Empire Boulevard / 27th Street Corridor capacity improvements	From Boyd Acres Road to Reed Market Road	Includes incremental approach for Empire Boulevard/27th Street widening, including right-of-way acquisition and monitoring for if/when widening is appropriate. Implement alternate mobility targets and identify smaller projects to incrementally improve mobility, reliability and safety. Includes complete streets upgrade.	$61,500
Completion of key Bike/Ped corridors on the Low Stress Network				$50,000
			Total Additional Aspirational Projects Cost: ~$290 million	

Scenario Evaluation

A system-wide evaluation for the future year (2040) of the BMPO planning area was conducted using the model data for the motor vehicle performance measures, which are a subset of the performance measures described in Chapter 18. The Financially Constrained and Aspirational scenarios were modeled to evaluate the impacts of the scenarios on the regional transportation system. The performance measures and results are discussed below.

- **Demand/Capacity (D/C) Ratio** -- The measure of congestion can be measured by the demand/capacity ratio which determines the ratio of vehicles over the capacity of a roadway. The travel demand model has the capacity of evaluating the overall flow of traffic over the length of a specified corridor. D/C ratios that are higher than 0.80 affect driving decisions due to the presence of other vehicles. A D/C ratio of 1.0 indicates significant congestion.
- **Arterial Lane Miles with Demand/Capacity Ratio Deficiencies during the PM peak hour** -- Congestion on the roadway network is defined by a threshold of the demand over capacity ratio. The number and percentage of arterial lane miles that operate with a D/C ratio over 1.0 are considered over capacity and congested.
- **Vehicle Hours of Delay during the PM peak hour** -- This measure evaluates the total hours of delay for all vehicles over the entire system within the MPO boundary during the PM peak hour.
- **Percent of Collector Roads with an ADT above 4,000 vehicles** -- Modeling the traffic shifts on collector roadways can serve as a proxy for diversion onto local streets. This can also serve as an indicator of increased traffic on roadways that were not designed for high volume traffic. This measure seeks to quantify the change in demand volume on collector routes between scenarios to identify the potential for traffic volume increase on adjacent local streets.
- **Total Lane Miles** -- This measure evaluates the length of driving lanes multiplied by the number of driving lanes for the total transportation roadway network within the MPO boundary.
- **Daily vehicle Miles Traveled (VMT) per capita** -- This measure evaluates the total daily vehicle miles traveled by all vehicles making a trip that starts and ends within the MPO boundary, divided by the total population with the MPO.
- **VMT on Rural Facilities during the PM peak hour** -- This measure evaluates the total vehicle miles traveled by all vehicles on rural facilities (outside the UGB boundary, within one mile) during the PM peak hour and can be a measure of diversion on rural facilities due to congestion.
- **Mode Split** -- Mode split provides a quantitative measure of how each project shifts trips between walking, biking, transit, and auto trips. A higher percent of non-single occupancy vehicle (non-SOV) trips also has the potential to reduce congestion, improve air quality and the livability of the BMPO area.
- **Travel time reliability** --- Travel- time reliability is a measure of the day-to-day consistency in travel times for motor vehicles over a corridor. Essentially, it predicts the extent of unexpected delays. If travel times can be confidently predicted, then drivers can plan their trips to arrive on time.

Figure 6-5 shows the forecasted demand to capacity ratio on roadways within the planning area for the 2040 Financially Constrained Scenario while Figure 6-6 shows the 2040 Aspirational Scenario.

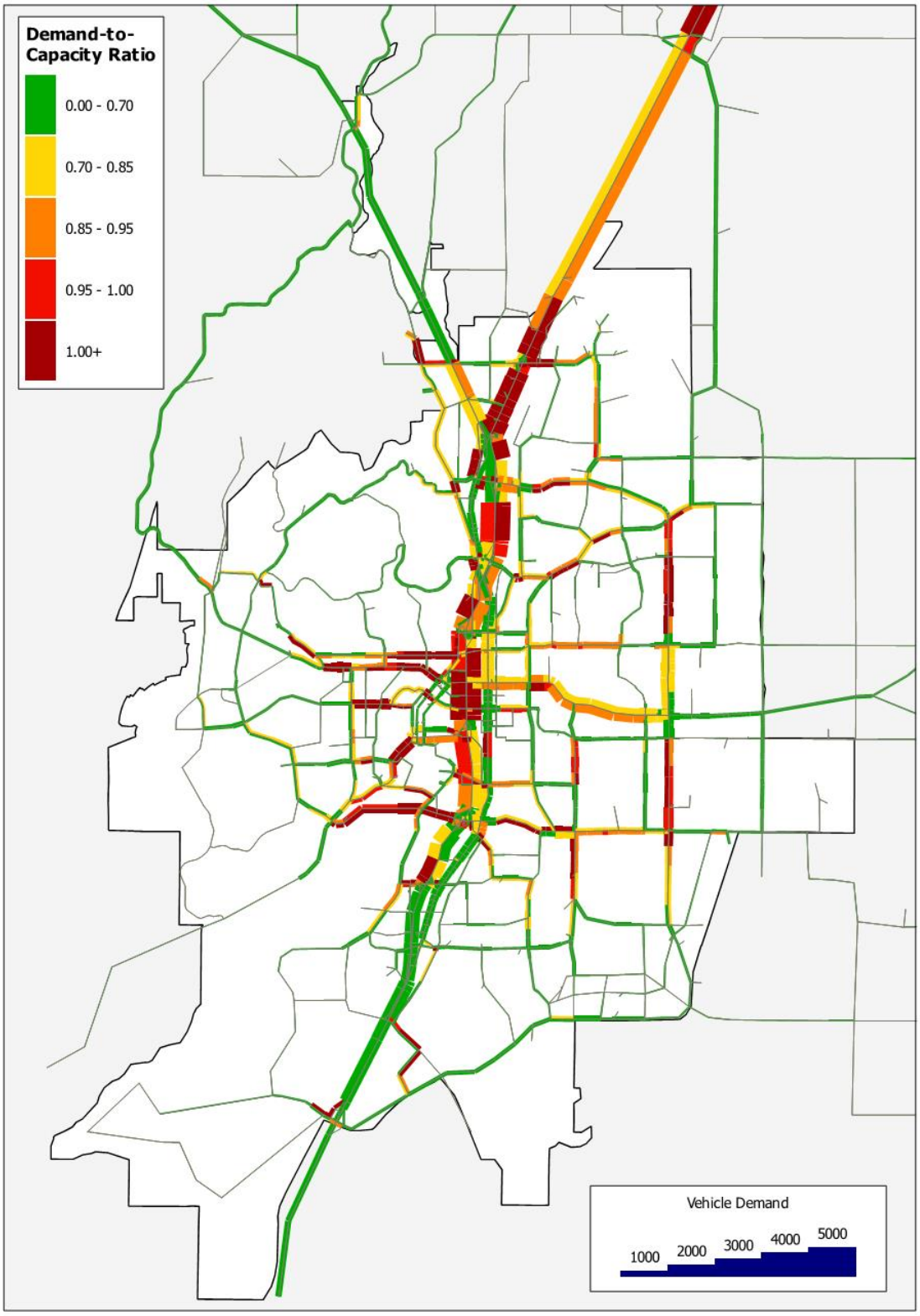


Figure 6-5: 2040 Financially Constrained Scenario System Performance Plot

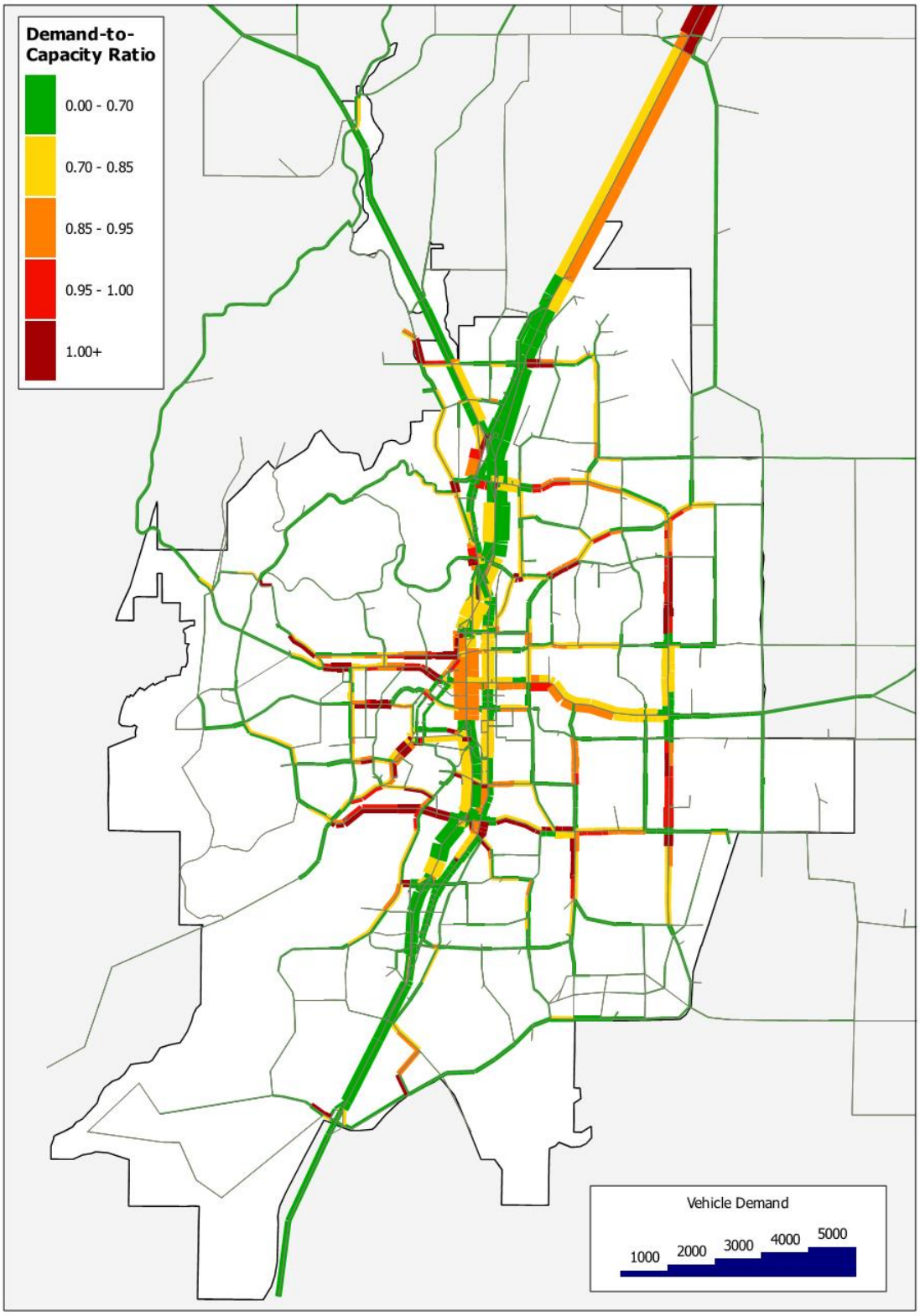


Figure 6-6: 2040 Aspirational Scenario System Performance Plot

Based on the travel demand model demand to capacity analysis, conditions in the Aspirational and Financially Constrained scenarios were compared against the Committed (Future No-Build) system conditions. Projects were identified that provided either full (demand less than capacity) or partial (demand exceeds capacity over a smaller portion of the segment) relief to the Committed Scenario identified system bottlenecks, as shown in Table 6-6. Note that additional projects are being identified through the TSP Update process for many of the locations shown with a capacity need in the Aspirational scenario. These projects will be incorporated into either the Financially Constrained or Aspirational project list during the MTP Update in 2020.

Table 6-6: Demand/Capacity Impacts by Scenario

Roadway	Segment Location	Financially Constrained		Aspirational	
		Addressed? (Yes/No/ Partially)	*Projects with Benefits*	*Addressed? (Yes/No/ Partially)*	*Projects with Benefits*
		ODOT Facilities			
US 20	Cooley Road to Empire Avenue	Partially	29	Yes	29, A-6
	Mt Washington Drive to Division Street	No		Partially	N-4
	8th Street to Purcell Boulevard	No		Yes	C-2
US 97	Bowery Lane to Colorado Avenue	No		Yes	N-4
	Reed Lane to Powers Road	No		Yes	N-4, A-8
		City/County Facilities			
O.B. Riley Road	Cooley Road to Archie Briggs Road	Yes	11	Yes	11
Wall Street	Revere Avenue to Newport/Greenwood Ave	No		No	
3rd Street	Dekalb Ave to Miller Avenue	No		Yes	B-29
15th Street	Bear Creek Road to Wilson Road	No		Yes	B-17
	Reed Market Road to Ferguson Road	No		Partially	B-17
27th Street	Butler Market Road to Neff Road	Partially	25	Partially	25, N-5, C-16
	Bear Creek Road and Rickard Road	Partially	25, UGB Elbow & DSL Exp. Projects	Partially	25, Elbow & DSL Exp. Projects
Cooley Road	O.B. Riley Road and Boyd Acres Road	Partially	204, 205, 206	Partially	204, 205, 206
Empire Avenue	US 20 to US 97	Partially	9	Partially	9, A-6
	18th Street to Purcell Boulevard	Partially	17. 207a	Yes	17, 207a, N-5
Butler Market Road	3rd Street (US 20) to US 97	No		Yes	N-4, A-6
	Studio Road to Eagle Road	Partially	207a	Partially	207a, C-7
Portland Avenue	NW 9th Street to Wall Street	No		No	
Newport Avenue	College Way to Wall Street	No		No	
Franklin Avenue	Broadway Street to Bond Street	No		Yes	C-2, B-8
	4th Street to 8th Street	No		Yes	C-2, A-17
Galveston/ Tumalo Avenue	NW 14th Street to Broadway Street	No		Partially	C-2, B-8
Colorado Avenue	Columbia Street to Industrial Way	No		Partially	B-8
	Sisemore Street to US 97 northbound ramps	No		Partially	A-17, C-9
Wilson Avenue	Bond Street to 9th Street	No		Partially	A-17
Reed Market Road	Brookswood Boulevard to Division Street	No		Partially	N-1
	4th to Pettigrew Road	No		No	

Roadway	Segment Location	Financially Constrained		Aspirational	
		Addressed? (Yes/No/ Partially)	*Projects with Benefits*	*Addressed? (Yes/No/ Partially)*	*Projects with Benefits*
Baker/Knott Road	Brookswood Boulevard to China Hat Road	Partially	19	Yes	19, A-3, N-4

The following tables (Table 6-7 thru Table 6-10) compare the performance measures that were calculated from the base year (2010) and future year (2040) scenario outputs. Note that all measures are calculated for the roadway system within the MPO boundary.

Table 6-7: MPO System-Wide Performance Measures

System-Wide Performance Measures	Base Year (2010)	Committed (2040)	Financially Constrained (2040)	Aspirational (2040)
Total (All Facilities)				
Daily Vehicle Miles Traveled (per Capita)	9.47	10.11	9.88	9.52
Percent change in VMT per Capita from Base Year	-	*6.8%*	*4.3%*	*0.5%*
Vehicle Hours of Delay (PM Peak Hour)	180	1179	1010	806
City of Bend Facilities				
Vehicle Hours of Delay (PM Peak Hour)	154	849	728	623
Deschutes County Facilities				
Vehicle Hours of Delay (PM Peak Hour)	3	18	12	10
ODOT Facilities				
Vehicle Hours of Delay (PM Peak Hour)	24	313	270	173

Note: the U.S. was in the midst of the Great Recession in 2010, which greatly impacted transportation system use and demand.

Table 6-7 outlines critical system-wide performance measures such as the vehicle miles traveled and vehicle hours of delay. Vehicle hours of delay is also shown for City of Bend, Deschutes County and ODOT facilities. These measures are quantitative measures that are typically used to evaluate the transportation network and effectively indicate future travel patterns compared to the base year (2010). The Financially Constrained scenario (2040) improves system-wide operations by improving (decreasing) VHT by over 14% from the Committed scenario while slightly decreasing the daily miles travelled per capita (2% difference). Most of these benefits can be

attributed to better connectivity in the Financially Constrained Scenario, particularly in the UGB Expansion areas, as well as the completion of the Murphy interchange. The Aspirational scenario continues to decrease the vehicle hours of delay (32% over the Financially Constrained scenario) and makes a significant improvement in vehicle miles travelled (6% difference from the Committed scenario), due mainly to impacts of high capacity transit lines coupled with mobility hubs and TDM strategies.

Table 6-8 illustrates a similar trend of evaluation results; the Financially Constrained scenario improves upon the Committed scenario while the Aspirational scenario has the most significant effects on the future roadway network. There are more total lane miles due to the number of roadway extension and expansion projects, but the percentage of over-capacity arterial lane miles decreases with the Financially Constrained scenario improvements, and decreases even further with the Aspirational scenario improvements. There is also a decrease in the percent of collectors with an ADT greater than 4,000 vehicles over the Committed scenario in both the Financially Constrained and Aspirational scenarios, indicating a reduction in peak hour diversion onto local streets.

Table 6-8: Arterial and Collector System Measures

	Base Year (2010)	Committed (2040)	Financially Constrained (2040)	Aspirational (2040)
City of Bend Facilities				
Total Lane Miles	270	284	309	311
Arterial Lane Miles with D/C Ratio Deficiencies (%)	0.7%	11.3%	9.2%	6.7%
Collectors with ADT > 4,000 vehs (%)	7%	35%	29%	29%
Deschutes County Facilities				
Total Lane Miles	45	45	47	47
Arterial Lane Miles with D/C Ratio Deficiencies	0.0%	0.0%	0.0%	0.0%
Collectors with ADT > 4,000 vehs (%)	1%	5%	3%	1%
ODOT Facilities				
Total Lane Miles	83	85	87	95
Arterial Lane Miles with D/C Ratio Deficiencies	0.0%	4.8%	4.2%	0.6%
Collectors with ADT > 4,000 vehs (%)	N/A	N/A	N/A	N/A
Total (All Facilities)				
Total Lane Miles	398	416	444	454
Arterial Lane Miles with D/C Ratio Deficiencies	0.7%	10.8%	8.7%	6.3%
Collectors with ADT > 4,000 vehs (%)	5%	26%	23%	22%

Note: Deficiencies defined as model links with demand/capacity ratio ≥ 1.0
ODOT operational standard: v/c = 0.80

Table 6-9 and Table 6-10 provide a summary of future year (2040) average weekday congested conditions. D/C ratios that are greater than 1.0 indicate congested conditions on the roadway network. The City of Bend maintains the highest percentage of roadway facilities within the BMPO planning area.

Table 6-9: Percentage of Total Lane Miles by Demand/Capacity Ratio (PM Peak Hour)

Demand/ Capacity Ratio	Base Year (2010)		Committed (2040)		Financially Constrained (2040)		Aspirational (2040)	
	Lane Miles	%	Lane Miles	%	Lane Miles	%	Lane Miles	%
City of Bend Facilities								
0.0-0.59	243	90%	173	61%	205	66%	207	67%
0.60-0.69	11	4%	28	10%	28	9%	31	10%
0.70-0.79	10	4%	24	8%	26	8%	32	10%
0.80-0.89	3	1%	20	7%	20	6%	16	5%
0.90-0.99	2	1%	18	6%	12	4%	12	4%
≥1.0	1	0%	21	7%	18	6%	13	4%
Total	270	100%	284	100%	309	100%	311	100%
Deschutes County Facilities								
0.0-0.59	45	100%	45	96%	47	98%	47	98%
0.60-0.69	0	0%	1	2%	1	2%	1	2%
0.70-0.79	0	0%	0	0%	0	0%	0	0%
0.80-0.89	0	0%	1	2%	0	0%	0	0%
0.90-0.99	0	0%	0	0%	0	0%	0	0%
≥1.0	0	0%	0	0%	0	0%	0	0%
Total	45	100%	47	100%	48	100%	48	100%
ODOT Facilities								
0.0-0.59	65	78%	28	33%	32	37%	47	49%
0.60-0.69	12	14%	12	14%	12	14%	18	19%
0.70-0.79	5	6%	11	13%	12	14%	11	12%
0.80-0.89	1	1%	11	13%	10	11%	14	15%
0.90-0.99	0	0%	11	13%	10	11%	5	5%
≥1.0	0	0%	12	14%	11	13%	0	0%
Total	83	100%	85	100%	87	100%	95	100%
Total (All) Facilities								
0.0-0.59	353	89%	246	59%	284	64%	301	66%
0.60-0.69	23	6%	41	10%	41	9%	50	11%
0.70-0.79	15	4%	35	8%	38	9%	43	9%
0.80-0.89	4	1%	32	8%	30	7%	30	7%
0.90-0.99	2	1%	29	7%	22	5%	17	4%
≥1.0	1	0%	33	8%	29	7%	13	3%
Total	398	100%	416	100%	444	100%	454	100%

Table 6-10: Percentage of VMT by Demand/Capacity Ratio (PM Peak Hour)

Demand/ Capacity Ratio	Base Year (2010)		Committed (2040)		Financially Constrained (2040)		Aspirational (2040)	
	VMT	%	VMT	%	VMT	%	VMT	%
City of Bend Facilities								
0.0-0.59	50,313	75%	54,476	42%	58,465	46%	57,953	46%
0.60-0.69	5,904	9%	14,141	11%	14,198	11%	15,909	13%
0.70-0.79	6,343	9%	14,130	11%	15,374	12%	19,512	16%
0.80-0.89	1,859	3%	13,963	11%	13,449	11%	10,697	9%
0.90-0.99	1,588	2%	13,874	11%	9,523	7%	9,982	8%
≥1.0	1,227	2%	19,589	15%	16,239	13%	11,566	9%
Total	67,234	100%	130,173	100%	127,248	100%	125,619	100%
Deschutes County Facilities								
0.0-0.59	4,423	95%	7,238	79%	7,215	86%	7,016	87%
0.60-0.69	37	1%	565	6%	602	7%	642	8%
0.70-0.79	0	0%	320	3%	27	0%	193	2%
0.80-0.89	0	0%	692	8%	349	4%	65	1%
0.90-0.99	112	2%	127	1%	0	0%	0	0%
≥1.0	63	1%	201	2%	203	2%	192	2%
Total	4,635	100%	9,143	100%	8,396	100%	8,108	100%
ODOT Facilities								
0.0-0.59	29,699	66%	11,988	16%	13,272	19%	22,823	34%
0.60-0.69	9,088	20%	9,242	13%	9,957	14%	15,178	23%
0.70-0.79	4,879	11%	10,231	14%	9,773	14%	8,951	13%
0.80-0.89	1,316	3%	12,144	17%	10,992	16%	14,350	21%
0.90-0.99	327	1%	12,953	18%	11,697	17%	4,915	7%
≥1.0	0	0%	16,110	22%	14,804	21%	675	1%
Total	45,309	100%	72,668	100%	70,495	100%	66,892	100%
Total (All) Facilities								
0.0-0.59	84,435	72%	73,702	35%	78,952	38%	87,792	44%
0.60-0.69	15,029	13%	23,948	11%	24,757	12%	31,729	16%
0.70-0.79	11,222	10%	24,681	12%	25,174	12%	28,656	14%
0.80-0.89	3,175	3%	26,799	13%	24,790	12%	25,112	13%
0.90-0.99	2,027	2%	26,954	13%	21,220	10%	14,897	7%
≥1.0	1,290	1%	35,900	17%	31,246	15%	12,433	6%
Total	117,178	100%	211,984	100%	206,139	100%	200,619	100%

As shown in Table 6-10, ODOT facilities exhibit a higher percentage of congested roadway conditions for the PM peak hour for each of the future year (2040) scenarios (indicated by D/C ratios greater than 0.80). According to the model analysis, the Financially Constrained scenario provides congestion improvement over the Committed

scenario on both City and State facilities. The Financially Constrained scenario congestion mitigations are especially effective on City facilities, decreasing congested lane-miles from 20% to 16%. Some key projects on the US 97 Parkway such as ramp metering, coupled with the US 97 North Corridor FEIS and some interchange improvements reduce PM peak hour demand below capacity on this ODOT facility.

As noted previously, the Financially Constrained Scenario has a higher number of total lane miles due mainly to roadway projects in the UGB expansion area, but it still yields a lower percentage of congested vehicle miles traveled compared to the Committed Scenario.

Table 6-11 shows the system measure of PM peak hour VMT on rural facilities.

Table 6-11: VMT on Rural Facilities (PM Peak Hour)

VMT on Rural Facilities	Committed (2040)	Financially Constrained (2040)	Aspirational (2040)
VMT	35,370	33,060	30,430
Change from Financially Constrained (%)	-	-6.5%	-14.0%

The Financially Constrained Scenario reduces rural VMT mainly through improved connectivity in the City of Bend UGB expansion areas. The Aspirational Scenario further decreases rural VMT through improved capacity on key arterial and highway corridors, chiefly 27th Street and US 97. These reductions in rural VMT indicate potential safety benefits in the future due to reduced traffic on facilities not intended for urban travel.

Table 6-12 shows the daily mode split, broken out by SOV versus non-SOV travel, while Table 6-13 shows daily mode split for auto, transit, bike, and walk trips. Note that all measures in Tables 6-12 and 6-1313 are based on trips that start and end within the MPO boundary (not all trips within the full geographic extent of the BRM).

Table 6-12: Mode Split (Daily SOV vs Non-SOV)

Mode Split	Committed (2040)	Financially Constrained (2040)	Aspirational (2040)
Single Occupancy Vehicle (SOV) Trips	46.4%	46.1%	43.4%
Non-SOV Trips	53.6%	53.9%	56.6%

Table 6-13: Mode Split (Daily by mode)

Mode Split	Committed (2040)	Financially Constrained (2040)	Aspirational (2040)
Auto Trips	83.7%	83.3%	80.4%
Transit Person Trips	0.8%	0.8%	2.6%
Bike Trips	3.8%	3.8%	4.5%
Non-SOV Trips	11.7%	12.2%	12.5%

As shown in Tables 6-12 and 6-13, there is no significant change in mode split between the Committed and Financially Constrained scenarios, an expected result due to the auto-oriented nature of most of the Financially Constrained projects. The Aspirational Scenario more than triples transit travel due mainly to projects C-2 and C-3, the high capacity transit corridors with mobility hubs, and C-16 and C-24, travel demand management projects effecting key activity areas across the City. The reductions in auto travel for the Aspirational scenario can be linked to the lower VMT per capita shown in Table 6-7.

PM peak hour travel time reliability was analyzed using HERS-ST (an ODOT travel time reliability measurement tool) delay measures. Travel time reliability is a measure of the day-to-day consistency in travel times for motor vehicles over a corridor. Essentially, it predicts the extent of unexpected delays. If travel times can be confidently predicted, then drivers can plan their trips to arrive on time. However, where travel times are less reliable, unexpected delays can make trip planning a frustrating experience. Because the input data are not calibrated to Bend's local conditions, the results of this metric are useful for comparing the impacts of different scenarios but they are not intended to be accurate measures of the system in Bend as a whole.

Travel time reliability was analyzed by using a planning time index (PTI) for specific corridors throughout Bend. The Federal Highway Administration (FHWA) defines PTI as 95th percentile travel time divided by the free-flow travel time, indicating the time a driver should allow to traverse the corridor segment while remaining on schedule 95% of the time. The planning time index represents the total travel time that should be planned for, including both typical and unexpected delay. For example, a PTI of 1.50 means that for a trip that takes 20 minutes in light traffic, a traveler should budget a total of 30 minutes to ensure on-time arrival 95 percent of the time. The higher the index, the less reliable the segment.

Figures 6-7 through 6-9 show the PTI across the MPO system for each scenario.

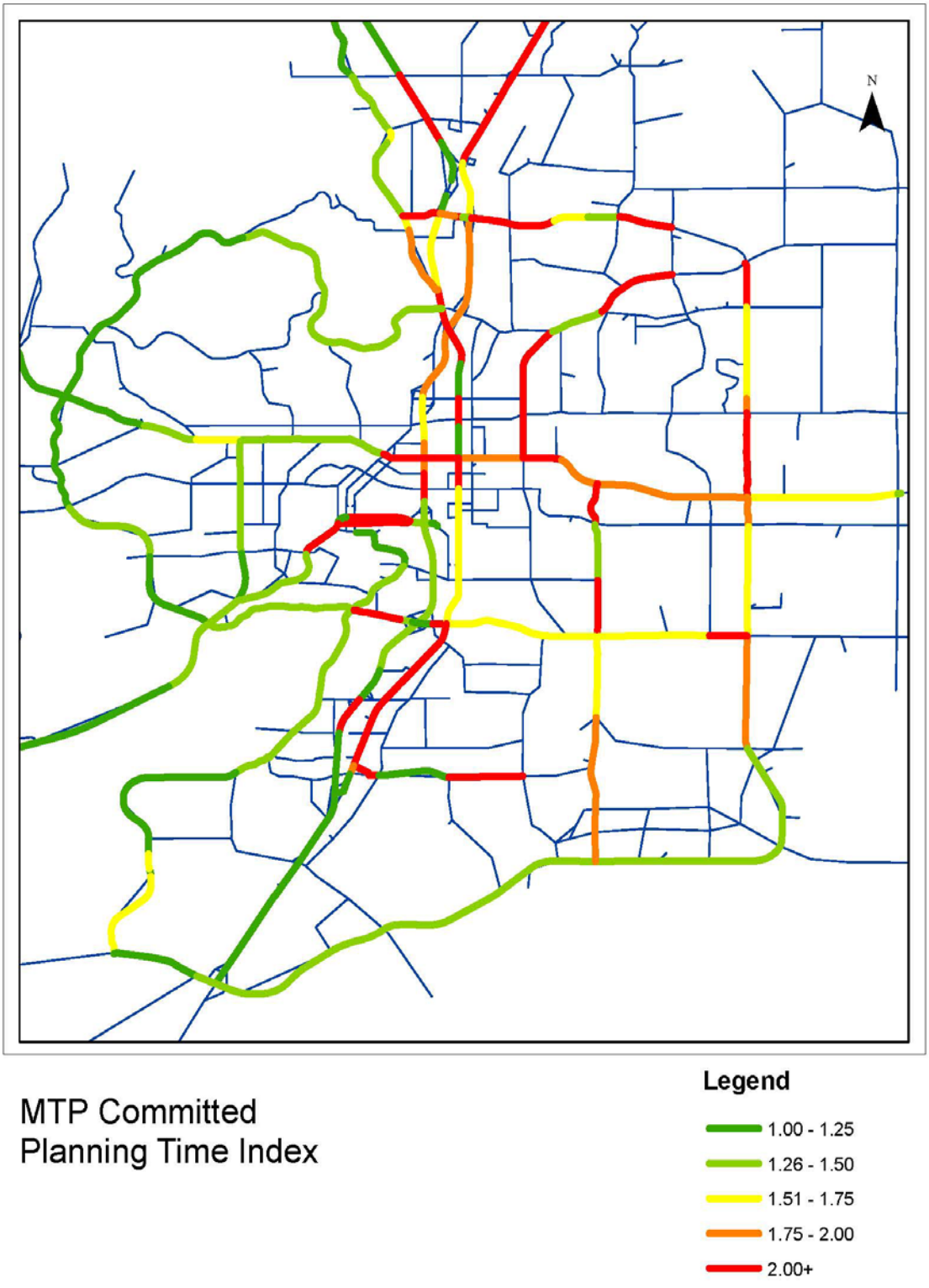


Figure 6-7: 2040 Committed Scenario Travel Time Reliability

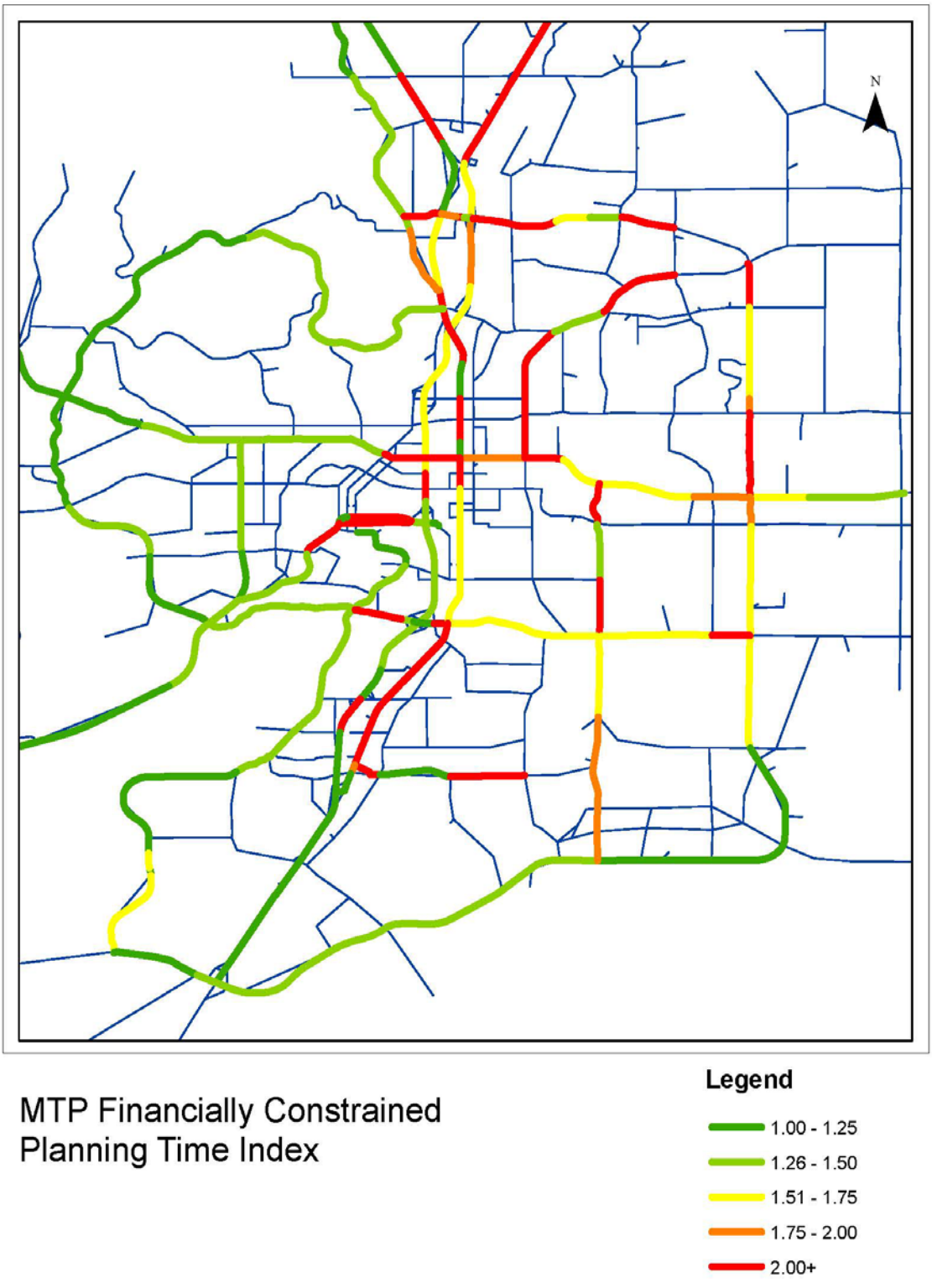


Figure 6-8: 2040 Financially Constrained Scenario Travel Time Reliability

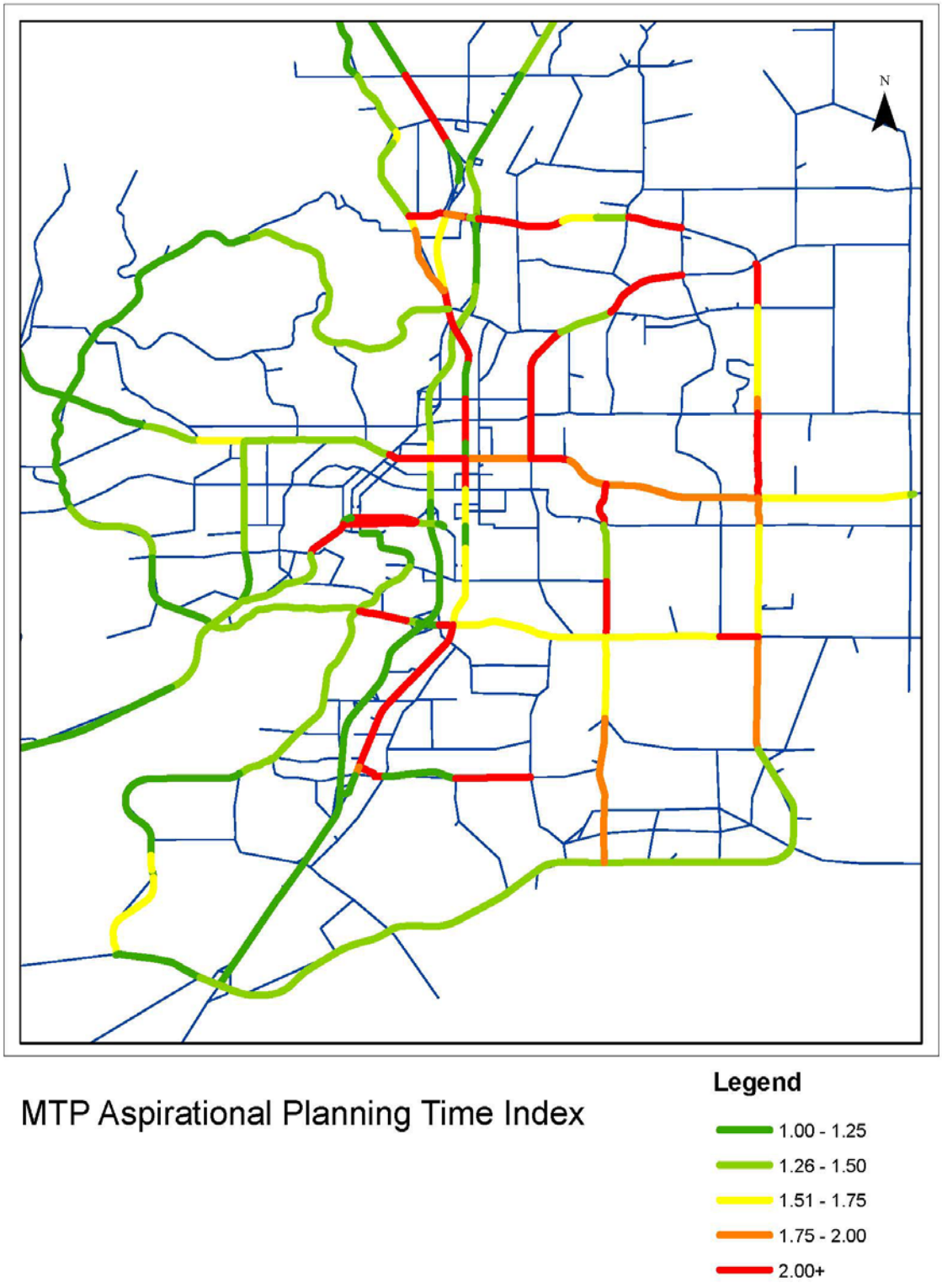


Figure 6-9: 2040 Aspirational Scenario Travel Time Reliability

As shown in Figures 6-7 and 6-8, travel time reliability benefits from the Financially Constrained Scenario are mainly limited to 27th Street (due to project 25). Figure 6-9 shows that the Aspirational Scenarios significantly improves travel time reliability, particularly on US 97 due to the North Corridor FEIS (project A-6) and the US 97 Bend Parkway projects (project N-4).

Table 6-14 provides system wide results of miles of modeled roads with a PTI greater than 1.5. The results reflect the trends shown in Figures 6-7 through 6-9.

Table 6-14: Travel Time Reliability

Planning Time Index (PTI)	Committed (2040)	Financially Constrained (2040)	Aspirational (2040)
PTI of 1.5 – 2.0 (miles / %)	23 / 30%	22 / 28%	21 / 26%
PTI of 2.0+ (miles / %)	16 / 20%	16 / 20%	13 / 16%

Further Study/Additional Analysis

The projects listed in Table 6-3 address some of the corridor deficiencies that were identified for the future year (2040) within the Bend MPO planning area. Some of the identified deficiencies were either not addressed or not completely resolved with the Financially Constrained Scenario project list. The following corridors still contain highly congested (D/C>1.0) segments in the Financially Constrained Scenario that exceed the likely peak hour capacity on those corridors.

- US 20 – partially improved
- US 97 – not improved

Several of the aspirational projects address the issues on these corridors, either by moving demand to alternate routes or improving capacity on existing routes. Future updates to the MTP may refine the corridor analysis based on analysis ongoing studies such as the US 97 Bend North Corridor Study, US 97 Bend Parkway Study, and Bend TSP Update, using intersection operational measures to better capture project impacts and determine if additional corridor capacity is justified.

Chapter 7: Pedestrian and Bicycle System

Introduction

Pedestrian and bicycle facilities are integral elements of the transportation system that connect people to places, services, recreation, transit and jobs. The MPO area includes the City of Bend, Tumalo, and Deschutes River Woods. Each area is covered by different transportation system plans. There are overarching themes of each Plan which are similar, such as including a desire to provide balanced and safe transportation systems while increasing transportation choices for everyone.

Active Transportation: Bend, Tumalo, & Deschutes River Woods

City of Bend

The City of Bend is planning a low-stress bicycle network (LSN) (Figure 7.1). The LSN will provide coverage with routes located within ¼ mile of most resident's homes. The Key Routes network is a subset of the LSN network and will provide coverage with routes located within ½ mile of most resident's homes.

The City plans to implement these networks with a multi-pronged approach by including planned facilities with new construction projects, roadway modernization projects, and pavement preservation projects. In addition, planned facilities will also be constructed through partnerships with local agencies such as the Oregon Department of Transportation, Deschutes County, the Bend Park and Recreation District and the Bend La Pine School District.

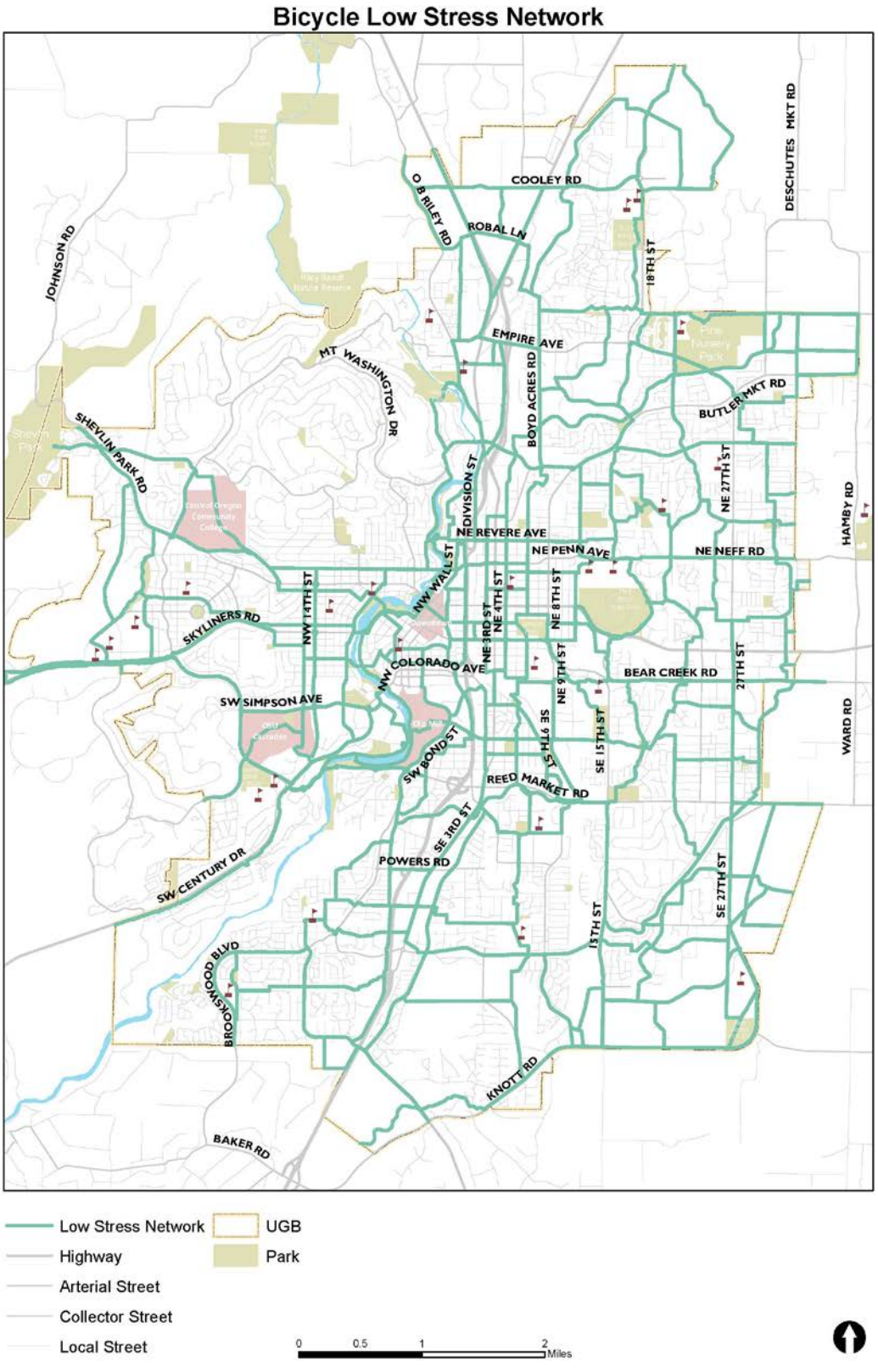


Figure 7.1 Bend's Planned Low Stress Network Map

A Bikeway Design Guide (BDG) has been drafted to help implement the LSN. The LSN will be comprised of a variety of facility types, linked into continuous corridors, including local residential streets prioritized for bicycling and walking (neighborhood greenways), off-street trails, separated shared-use pathways along busier streets, protected/separated bike lanes, buffered bike lanes, and basic bike lanes. The focus of the LSN is that facilities be usable by a wide range of bike riders, from experienced commuters to new riders and children. In addition, enhanced crossings, overpasses, and underpasses are incorporated into the LSN to facilitate route continuity and provide help crossing the busiest roadways.

The City identified missing pedestrian facilities on arterials and collectors. Matching these missing facilities with corridors on the LSN allowed the identification of Key Walking and Biking Routes (Key Routes; Figure 7.2). The Key Routes encompass a subset of the LSN and will provide east-west and north-south travel across the City for people walking and biking as well as for more localized walking. The Key Routes provide the foundation of a connected walking and biking network and allows the City to focus construction, operations, and maintenance efforts on a smaller initial network of critical walkway and bikeway needs.

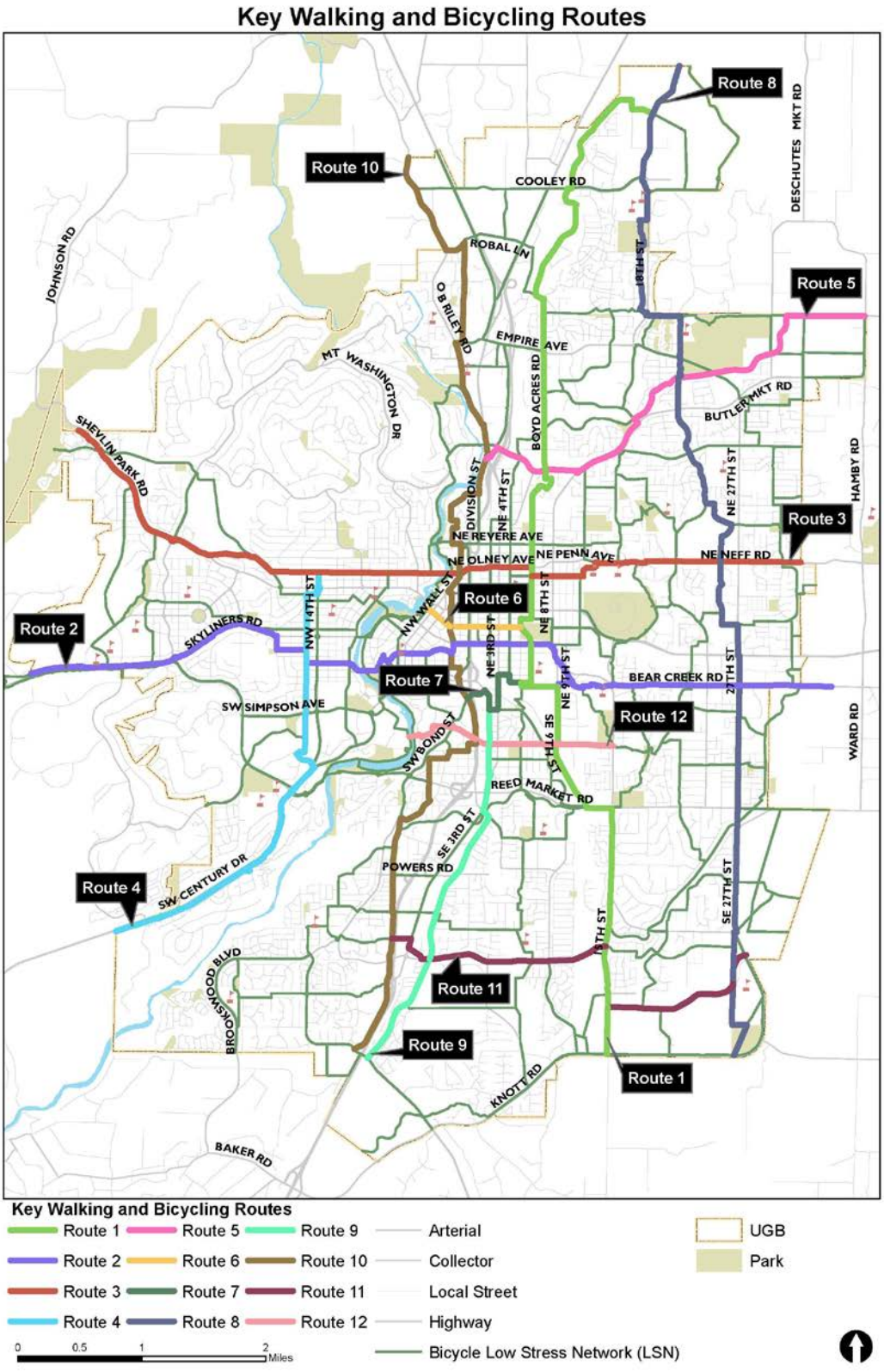


Figure 7.2 Bend's Planned Key Walking/Bicycling Routes Map

Bend Pedestrian and Bicycle Policies:

1) In collaboration with the City of Bend, the MPO's policy is "complete streets." A complete street is one that is designed to allow everyone to travel safely and comfortably along and across the street, by all travel modes. Arterials, collectors, and most local streets will have buffered sidewalks. Arterials, collectors, and select local streets will have bikeways in compliance with the Low Stress Network.

2) In collaboration with the City of Bend, the MPO will support a Low Stress Network of interconnected bikeway facilities, classified as Level of Traffic Stress 1 and 2. Within a short distance of their home, people can access a network of low-stress bikeways. The City uses the following definitions of bicycle Level of Traffic Stress 1 and 2:

a) Level of Traffic Stress 1 facilities are designed so those with limited experience riding a bicycle in traffic can readily use them. Typically, Level of Traffic Stress 1 bikeways are trails, separated paths, shared sidewalks, protected bike lanes, wide bike lanes on slow speed streets and neighborhood greenways.

b) Level of Traffic Stress 2 bicycle facilities are designed for use by the majority of mature riders and youth with adult supervision; they offer a suitable level of comfort by providing separation between bicyclists and motor vehicle traffic. Typically, Level of Traffic Stress 2 facilities are located along lower speed roadways using basic bike lanes and buffered bike lanes, as well as shared streets in low-speed downtown urban areas.

3) In collaboration with the City of Bend, the MPO will support a pedestrian network of interconnected walkway facilities, including crossings, which provide at least a minimum pedestrian level of traffic stress 1 in priority areas of the city including, but not limited to downtown and other urban commercial districts, safe routes to schools (SRTS) corridors, and access to parks and transit stops. The City will require pedestrian level of traffic stress 2 at a minimum for all other new and reconstructed sidewalks and crosswalks. The City uses the following definitions for pedestrian level of traffic stress 1 and 2:

a. Pedestrian Level of Traffic Stress 1 facilities are designed to be suitable for all users, including children 10 years of age or younger, and people using wheeled mobility devices. Pedestrian Level of Traffic Stress 1 facilities are generally buffered, along lower speed roadways and have suitable crosswalk facilities such as safety islands.

b. Pedestrian Level of Traffic Stress 2 facilities are not suitable for children under 10 without supervision as more attention to traffic is required. Pedestrian Level

of Traffic Stress 2 facilities are also generally buffered, but traffic speeds may be as high as 35 mph.

4) In collaboration with the City of Bend, the MPO recognizes the Bend Park and Recreation District Trail Plan as an element of the transportation system, and coordinates City bikeway and pedestrian facility planning with the District.

5) In collaboration with the City of Bend, the MPO recognizes the importance of providing students with safe and comfortable walking and biking routes to school.

6) In collaboration with the City of Bend, the MPO will require enhanced crosswalks at key intervals across arterial and collector roadways to complete the walking and bicycling networks, including school and trail crossings. Enhanced means that there are additional treatments including, but not limited to striping, safety islands, and flashing beacons where warranted for multi-lane roadways or higher speed roadways.

7) In collaboration with the City of Bend, the MPO recognizes the importance of maintaining the walking and biking system for year-round use.

Tumalo

Tumalo is an unincorporated community in Deschutes County that is part of the Bend MPO area. Tumalo used a Health Impact Assessment to help develop their section of the Deschutes County Comprehensive Plan. By screening transportation facility options with a health impact lens, safety in transportation as well as active transportation elements were highlighted and incorporated into the plan. The plan improves access to parks, recreation facilities and sites, and identifies a multi-modal trail system. Several projects have been completed from this plan:

- A safe crosswalk of Hwy 20 at Bailey Road which connects people across the highway.

- Extension of the Deschutes River Trail from Bend to Tumalo State Park. Connecting Tumalo State Park to the rest of the Tumalo Community is in the planning stages, as shown in Figure 7.3. This trail project is also included in the Deschutes County TSP.

- A number of sidewalk projects listed in the Deschutes County TSP for Tumalo including sidewalk in the main commercial area (7th Street, 4th Street, and 5th Street) as shown in Figure 7.4.

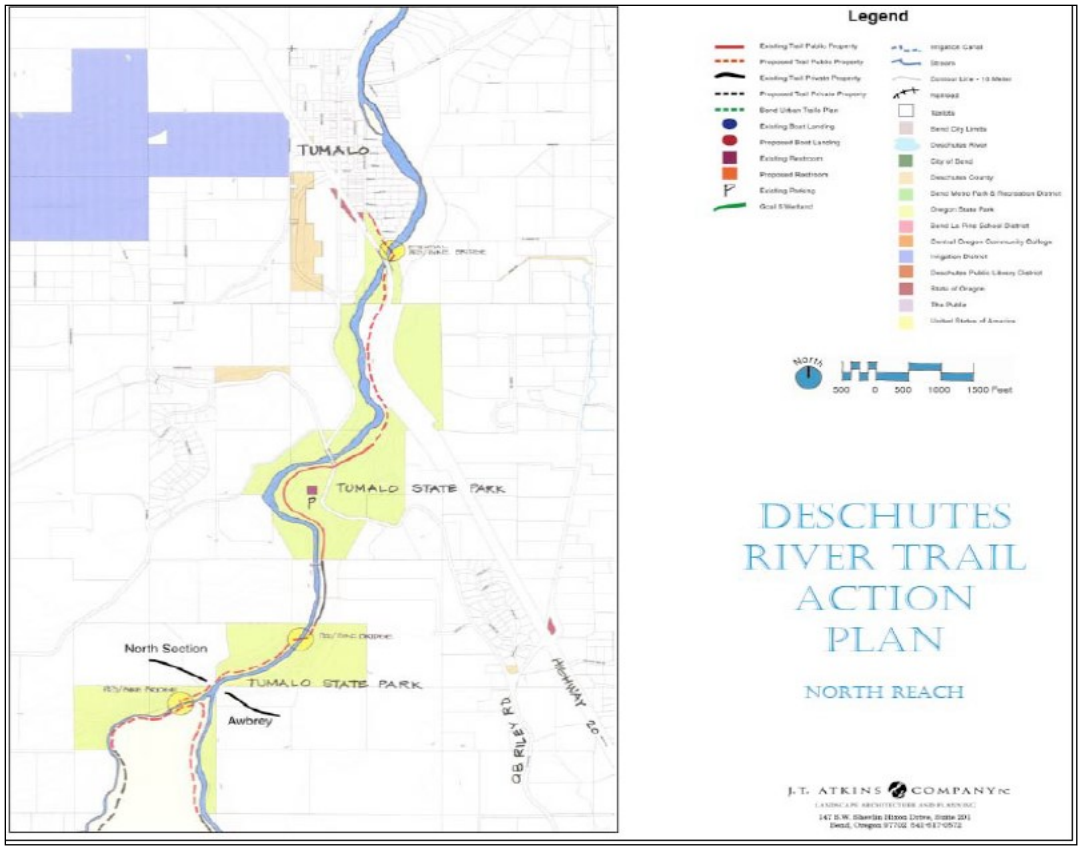


Figure 7.3 Tumalo Planned Trail Extension Map

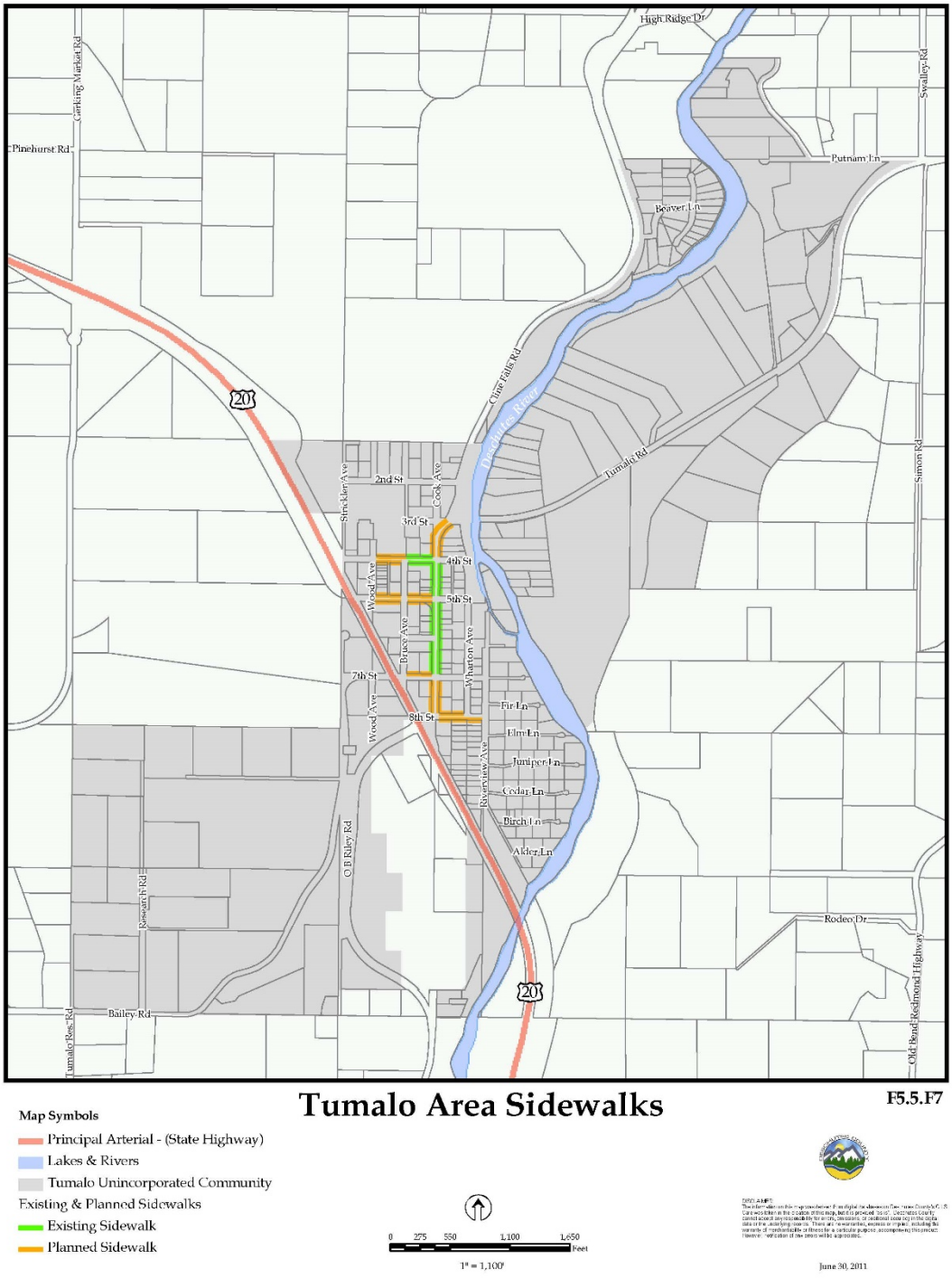


Figure 7.4 Tumalo Planned Sidewalks Map

Tumalo is also connected to Bend by Statewide Scenic Bikeways. The Scenic Bikeways program benefits small and rural communities by creating connections between nearby communities, increasing tourism revenue, and providing options for improving health. The Twin Bridges Loop connects Bend and Tumalo with a bike route along lower volume roads with shoulders. Figure 7.5 shows the route and how it connects Tumalo to Bend.

ODOT Region 4 is currently updating the Environmental Assessment for the US20/Cook Avenue intersection in Tumalo. That process includes a detailed assessment of improving bicycle and pedestrian crossings of US20 to better connect the west and east sections of the community.

Tumalo Policies:

Chapter 1: Support the development of a trails and recreation master plan.

Chapter 2: Support efforts by Deschutes County to enhance bicycle facilities connecting Bend to Tumalo.

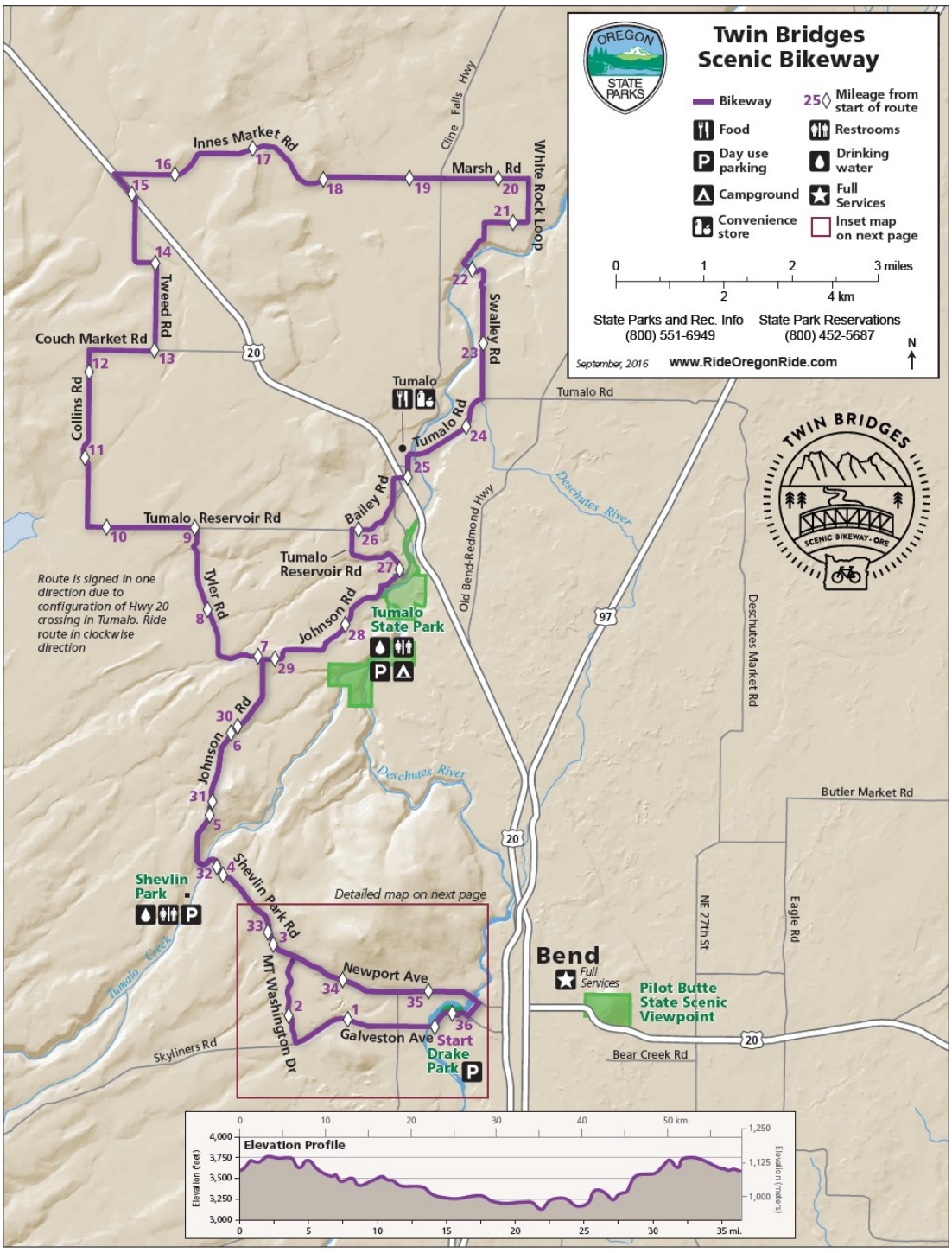


Figure 7.5 Twin Bridges Scenic Existing Bikeway Map

Deschutes River Woods

Deschutes River Woods (DRW) is a rural subdivision located directly south of Bend in Deschutes County. There is one arterial (Baker Road) and one collector loop (River Woods Drive) serving DRW. Baker/Brookswood is classified as a County Bikeway and has wide paved shoulders. There are no sidewalks within Deschutes River Woods. Residents in the area share the roadway for walking, bicycling and driving. Other than Baker/Brookswood bikeway shoulder there are no paved shoulders and people walking or biking do so along the edges of paved roads or along gravel shoulders.

Community Benefits of Walking and Bicycling

Travel on bicycle and foot has potential to continue to grow and contain a greater share of travel as the communities within the Bend MPO add network coverage/mileage and improve the comfort and attractiveness of walking and biking facilities.

Throughout the MPO area, travel time to work by all modes was less than fifteen minutes for about 47% of all workers, less than ten minutes for 23% of all workers, and less than five minutes for 5% of all workers. Short trip lengths and travel times are part of the equation for encouraging non-auto trips. A complete and safe network of trails, sidewalks and bicycle facilities will facilitate these trips.

Ongoing Plans and Programs

The following is a summary of bicycle-specific plans and programs that are ongoing in the Bend MPO area.

Strategic Implementation Plan for Walking and Biking Infrastructure

The City of Bend and Bend MPO are in the process of developing this plan. When completed, it will outline a strategy for incorporating bicycle and pedestrian focused projects into the City's Capital Improvements Plan (CIP). To date, the effort has identified guiding principles, project delivery strategies, a phasing approach, and a series of priority corridors and critical gap closure projects.

Chapter 8: Public Transportation System

Introduction

The Bend area has experienced rapid population growth in the last decade, reaching approximately 90,000 residents, and that growth is expected to continue to approximately 155,000 residents by 2040. The area's rapid housing and employment development brings with it an increasing need for expanded public transportation services. The Bend MPO, Cascades East Transit, and the City of Bend have developed various public transportation plans that can be used to provide guidance on how to accommodate on-going growth on the area's public transportation systems.

Public transportation is an important element of multi-modal transportation planning and provides mobility options for the traveling public. Providing transportation options is important for all people and it is essential for those who are unable to drive motor vehicles. There are many segments of the population that are unable to drive or do not have a vehicle available. People may not be able to drive due to age or health. School age children, especially youths aged 10-17, seniors (aged 65 or above), and persons with a disability may not be able to legally and safely operate motor vehicles. Other people may not own cars for financial reasons or individual preference. Many low-income households do not own private motor vehicles. Public transit allows this wide range of people the opportunity to travel for a variety of purposes.

Public transportation also provides a valuable alternative to travel by single-occupancy vehicle and potentially reduces motor vehicle demand on roadways. Public transportation can improve the efficiency of highways and arterial streets. It can reduce the need for costly capacity expansion projects, as fewer vehicles are required on the road to serve the same number of people. It can improve congestion by providing for people who would otherwise be putting additional vehicles on area roadways. Improvements to air quality can also be achieved by the net reduction of motor vehicle emissions. Public transportation may also play an important role in reducing congestion and parking requirements in high demand areas such as downtown.

Planning Context

Several studies are in process at the time of this update.

- 2040 Cascades East Transit Master Plan
  - The purpose of this plan is to update CET's 2013 Regional Transit Master Plan.
  - This plan is expected to be adopted by the COIC board in Spring 2020
- Bend Public Transit Plan Update
  - This is a component of the Master Plan. The purpose of this plan is to provide a deeper examination into the transit needs of Bend.
  - This plan is expected to be adopted by the Bend MPO Policy Board as part of phase 2 of the MTP update in Spring/summer 2020.

Three past studies have identified issues and strategies toward improving transit services in Central Oregon:

- BMPO Public Transit Plan and Corridor Land Use Assessment (PTP)[40]
- Central Oregon Regional Transit Master Plan (RTMP)[41]
- Central Oregon Strategic Transportation Options Plan (COTOP)[42]

The PTP is the current Public Transit Plan for the Bend MPO and was adopted as a component of the 2014 Metropolitan Transportation Plan (MTP).

The RTMP identifies where future transit services can support regional transportation and sustainability goals. The Plan provides a 20-year vision for the Central Oregon Intergovernmental Council (COIC), identifying needed improvements and funding strategies to effectively provide transit services for the region.

The COTOP was developed for the COIC to analyze transportation options for inter-city travel programs that include transit and carpool/vanpool services, bus and commuter rail. The Plan identifies cost-effective investments to support long-term inter-community travel demand in Central Oregon.

The following sections summarize existing services and the key policies, findings and identified improvement strategies from each of the studies discussed above. The PTP is emphasized, as it is the Plan specifically applicable to the BMPO. The relevant elements of other regional studies are also identified.

Existing Transit Services

The primary transit service provider for the Bend MPO is Cascades East Transit (CET). CET provides local (City) fixed-route service, regional (intercity) fixed-route service, and flexible demand-responsive service. The CET services are supplemented by other intercity transit providers. The following sections provide an overview of CET and other providers in the Bend MPO area.

Cascades East Transit

The CET local transit service includes nine routes within Bend. The routes are designed to radiate from Hawthorne Station, the main transit center in the Bend transit system, in a system design referred to as “hub-and-spoke”. Hawthorne Station is located between 3rd Street and 4th Street on Hawthorne Avenue. The fixed route transit services are illustrated in Figure 1. Most of the routes provide drop-off and pick-up every 30 - 45 minutes on weekdays from between 6:00 a.m. and 7:30 p.m. and every 60 minutes from approximately 8:00 a.m. to 5:30 p.m. on Saturdays. Full price fare within Bend is currently $1.50 for one-way travel, with day passes available for $2.50.

[40] Public Transit Plan and Transit Corridor Land Use Assessment, Bend Metropolitan Planning Organization, March 2013

[41] Central Oregon Regional Transit Master Plan, Central Oregon Intergovernmental Council, June 2013

[42] Central Oregon Strategic Transportation Options Plan, Central Oregon Intergovernmental Council, July 2013

CET also operates the Community Connector service which provides direct regional connections between Bend, La Pine, Redmond, and Sisters. From Redmond, additional connections are available to Prineville, Madras, Terrebonne, Culver and Metolius, and the Warm Springs Reservation. The fixed route intercity transit services are illustrated in Figure 2. Regional service routes generally operate on weekdays during a.m. and p.m. peak commute hours. Seasonal service to Mt. Bachelor (winter), Lava Butte within the Newberry National Volcanic Monument (summer), and the Ride the River route (summer) in Bend are also provided.

CET's demand-responsive service is Bend Dial-A-Ride, providing shared-ride service to people with disabilities and low-income seniors who do not live near fixed-route service. One-way fares are $2.50, with half price discounts available to low-income riders.

Key service characteristics for CET are summarized in Table 8-1. Funding for the transit system comes primarily from federal assistance and local sources. The City of Bend provides approximately $1 million annually from its general fund to meet local matching requirements for federal funding. Fare collection generally covers about 14 percent of operating expenses[43].

Table 8-1. Bend Area Transit Service Characteristics – 2010 and 2017

Bend Area Transit Service Characteristics	2010	2017
Annual Passenger Trips (Unlinked)	175,000	353,251
Average Weekday Trips (Unlinked)	1,400	2,393
Fare Revenues	$250,000	$739,239
Operating Expenditures	$2,500,000	$6,227,334
Capital Expenditures	$450,000	$352,106
Buses – Total (Fixed Route/Demand Response)	23 (10/13)	30 (17/13)

Source: 2010 & 2017 National Transit Database

[43] National Transit Database,

Figure 8-2. CET Local Fixed-Route Service

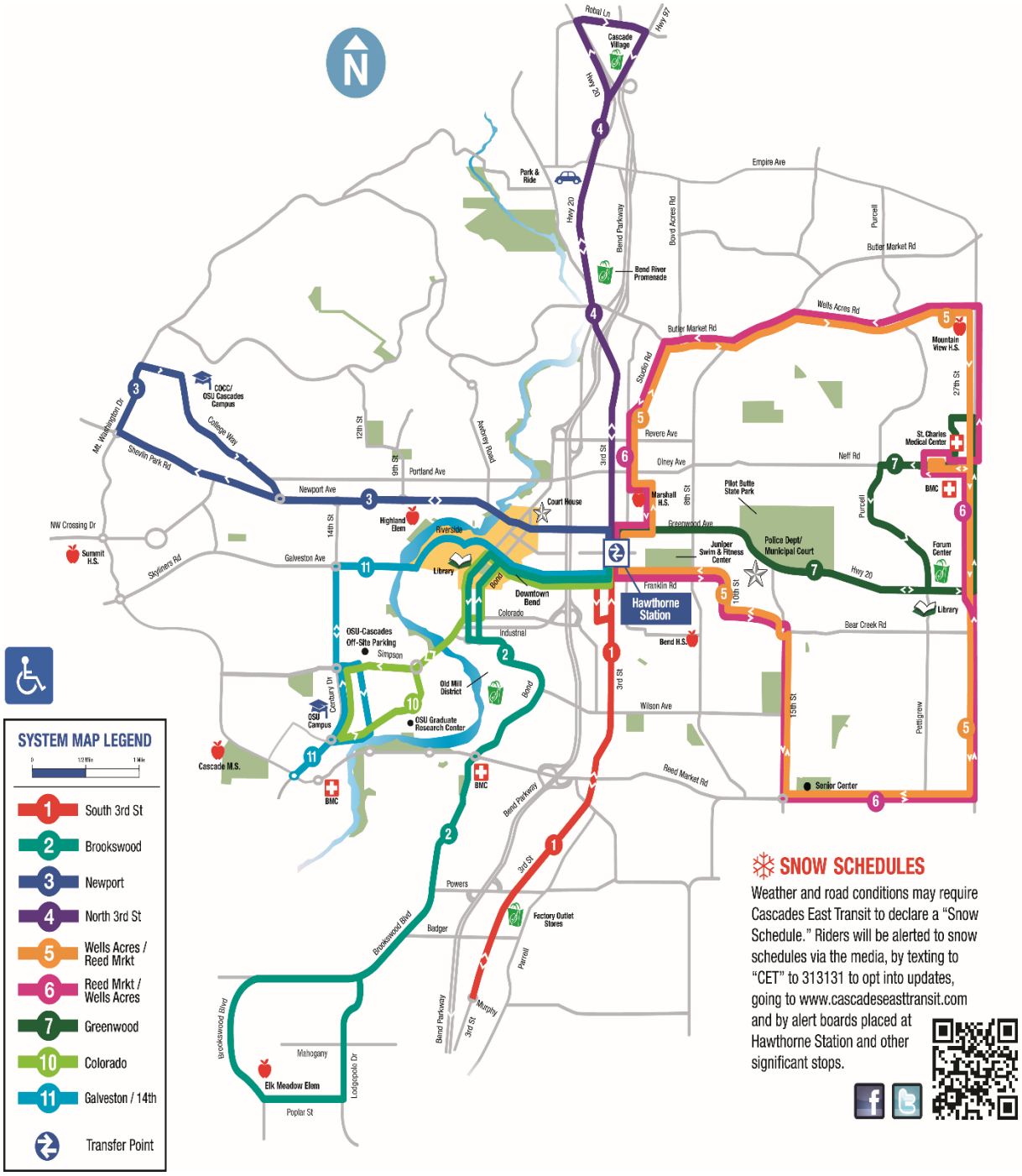
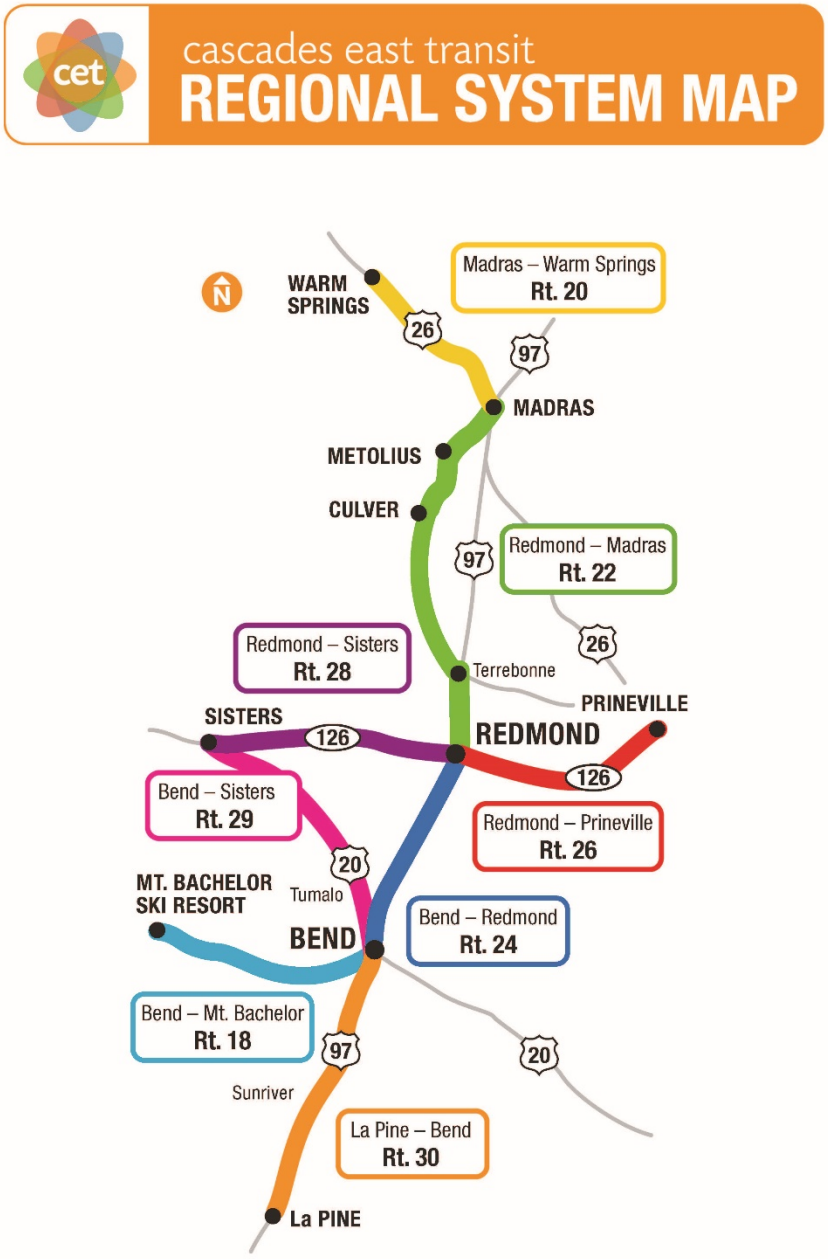


Figure 8-3. CET Regional (Intercity) Fixed-Route Service



Source: Cascades East Transit (http://www.cascadeseasttransit.com/routes-schedules/city-service/city-service.html)
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Other Intercity Bus Services

The following bus services provide intercity travel options in the Bend MPO area:

- *Central Oregon Breeze*, operated by CAC transportation, provides daily bus service between Central Oregon and the Portland area. Central Oregon stops include the Sugarloaf Mountain Hotel in Bend, Redmond Airport, Redmond Transit Hub and Madras. Portland Area stops include Union Station, Portland International Airport (PDX), and the Cleveland MAX stop in Gresham.
- *Shuttle Oregon*, provides daily bus service between Central Oregon and the Portland area. Central Oregon stops include Redmond, Bend and Sisters. It includes a stop in Salem, and Portland area stops include Union Station, PDX, and the Clackamas Town Center.
- *Amtrak* provides daily shuttle bus service called High Desert Point (between Chemult and Redmond), Eastern Point (between Ontario and Bend) and Eugene to Bend (between Eugene and Bend). These bus services provide connections to Amtrak's national passenger rail network.
- *The Point* provides shuttle service between Bend and Newport, Corvallis, Albany, and Salem. This service currently stops at the Hawthorne Station in Bend, Oregon.
- *The People Mover* provides shuttle bus services three days per week between Prairie City (Grant County) and Bend.
- *Greyhound* provides intercity bus service connecting to a nationwide network of routes. Ticket sales for Greyhound are sold at the Hawthorne Station in Bend, Oregon.

Project Name	Project Type	Recommended funding	Funding Source
Cascade East Transit (CET) Community Connector Service	Project Administration	$ 83,179	2019-21 FTA Section 5311(f) Fund
CET Community Connector Service	Operating	$ 192,612	2019-21 FTA Section 5311(f) Fund
Hawthorne Station Renovation	Facility Purchase/Renovation	$ 112,365	2019-21 FTA Section 5311(f) Fund
Planning Feasibility Study from Klamath Falls, OR to Redmond, OR	Planning	$ 16,000	2019-21 FTA Section 5311(f) Fund
Planning Feasibility Study from Klamath Falls, OR to Redmond, OR	Project Administration	$ 4,000	2019-21 FTA Section 5311(f) Fund

Identified Needs

Below is a summary of the identified needs and planned improvements identified in existing plans. As the planning efforts for the 2040 Cascades East Transit Master Plan and Bend Public Transit Plan Update are finalized, this section will be updated.

CET Transit Service - RTMP

The Regional Transit Master Plan (RTMP) highlights general needs for supplying transit services in the region:

- Maintain regional transit service (provided by CET) to take advantage of the benefits of an integrated, coordinated, and unified transit system.
- Focus on service improvements to attract "choice" riders that have other transportation options.
- Improve and maintain primary transit facilities and access for bikes and pedestrians.
- Maintain or improve the condition of the vehicle fleet and other equipment and capital investments.
- Improve awareness of the CET transit services

CET Transit Service - PTP

Major needs for CET transit services were identified and prioritized as part of the PTP. The highest priority needs related to expanding the service frequency and operating hours of existing services. The lowest priority needs were expanding the service coverage area and providing faster or more direct service. The prioritized needs for CET services are summarized in Table 8-7.

Table 8-7 Prioritized Transit Needs

Expressed Major Service Needs	Overall Priority
Early Evening Service Hours (6:00 – 8:00 p.m.)	High
Increase Saturday Frequency	High
Provide Sunday Service	High
Increase Weekday Frequency	High
Later Evening Service Hours (8:00 – 10:00 p.m.)	Medium
Expand Saturday Hours	Medium
Early Morning Service Hours (Start at 5:00 a.m.)	Medium
Provide Faster, More Direct Service	Low-Medium
Expand Service Coverage	Low-Medium

Source: Bend MPO Public Transit Plan, Figure 5-1

The desire to expanding service coverage within Bend and improving regional connections were also identified. Additional details of the existing conditions needs assessment and key findings are available in Chapter 5 of the PTP.

Intercity Transit

The COTOP analyzed intercity transportation in Central Oregon, focusing on the corridors that connect Bend, Redmond, Sisters, Prineville, Madras, La Pine, and Culver/Metolius. The COTOP analyzed a variety of strategies to provide intercity travel options including commuter rail, vehicle-mile-traveled (VMT) pricing, transit enhancements and vanpool enhancements. The costs and benefits were evaluated for providing these alternative strategies on each of the key corridors that connect these communities.

The overall conclusion of the COTOP is that, although transit investments are difficult to justify on the basis of reducing capacity constraints on intercity corridors, providing lower cost mobility options has significant user and societal benefits.

Key findings of the study are summarized below:

- There is relatively little congestion through 2030 on the highway corridors that provide the majority of intercity connections in Central Oregon.
- Shifting intercommunity trips has relatively little impact on congestion on the intercity highway corridors, as the majority of trips have origins and/or destinations outside of the Central Oregon communities analyzed.
- Reducing VMT is the most significant benefit of providing improved intercity transit services, as a result of shifting demand away from single-occupancy vehicle travel on longer-distance trips.
- Transit investments on the Redmond-Bend corridor are the most cost-effective due to demand between the communities. A market assessment found the Redmond-Bend corridor to have the highest potential for transit investments in the region. Bend-Sisters and Bend-La Pine were considered to have moderate market potential, based on the criteria of the report
- Transit investments are not warranted between some of the smaller communities, based on low demand for travel between them, even through 2030.
- Community Connector fares are not competitive on shorter-distance intercity trips such as those between Culver and Metolius (when compared to driving).
- Although it would produce benefits where implemented, a number of significant challenges exist for Commuter Rail service. These challenges include high capital and operating costs, freight-owned right-of-way, limited coverage with the region (i.e., the US 97 corridor), and poor alignment with supportive land uses on the proposed alignment.
- Pricing strategies (e.g., VMT-based driving fee) could be effective as a complement to intercity transit investments. However, high quality alternatives must be in place to result in significant vehicle trip reductions.
- Local transit services and connections are critical for intercommunity transit effectiveness. The quality of local transit service, how accessible the transit stops are for people who walk and bike, and the degree to which land use strategies support transit and may significantly affect ridership potential of intercity transit services.

- Intercity vanpool and transit investments have the ability to impact local traffic operations within communities, particularly at so-called “first intersections” near the end points of intercity transit services.

Land Use Organization

Developing supportive land uses is an important strategy for effective transit systems. Land uses that include high-density residential, mixed-use, entertainment and employment concentrations support transit route ridership. Bend’s Comprehensive Plan designates the types of land uses; high-density, mixed-use and commercial activities, along the arterial and collector street system that is likely to have transit service.

Site design elements such as building layouts that site structures in close proximity to the street and provides convenient pedestrian access also promote transit trip activity. The City of Bend Development Code incorporates the transit friendly site design objectives of the State Transportation Planning Rule (OAR 660-012).

The Complete Transit System is identified in the PTP as a unifying concept for complementary transit service quality and land use elements. The concept describes land use policies functioning together with non-service elements such as pedestrian and bicycle access and transit facilities. Coordinated development of these elements provides the foundation for improving transit service in Bend.

Planned Improvements

The PTP identifies a robust plan for the CET transit system including short-term, mid-term, and long-term improvements. Improvements are identified for service quality and non-service elements such as facilities, amenities, access, and marketing.

Service Quality

Short-term improvements are focused on addressing the most pressing operational issues without increasing operating costs. Mid-term and long-term improvements are built around developing primary transit corridors and restructuring the transit system into a more flexible and scalable model that will support continued growth. The cost of the initial restructuring in the mid-term is financially constrained, based on evaluation of peer systems. The long-term concept is not financially constrained, but has funding levels within the range of peer systems.

The following summarizes the timeline and key developments for PTP’s proposed service concepts:

- **Short-term** (Years 1 to 3): Address the most pressing operational issues; including enabling Route 5 (Wells Acres) to run within a 40-minute schedule all day by restructuring it to interline with Route 6 (Bear Creek). [These changes have been implemented.]

- **Near Mid-Term** (Year 4): Routing modifications for Route 3 (Newport to COCC) and Route 11 (Galveston), with additional service on Route 11 to support the planned OSU facility on SW Century Drive. Also, one additional evening run should be provided on all routes, extending service until nearly 7:00 p.m. on weekdays. Stop infrastructure would be required for the proposed route redesigns. [These changes have been implemented.]
- **Mid-Term** (Years 5 to 10): An initial implementation of the restructured system, providing more frequent service (every 30 minutes) for several routes on primary transit corridors. Other routes with less demand would run hourly. Users could make transfers more easily and the system would be more flexible and scalable over time. Several routes would be modified and a new route (Greenwood to Forum Shopping Center and St. Charles Medical Center) would be added. Transit service hours would be expanded to early evenings on weekdays (until 8 p.m.) Two additional vehicles would be required along with stop infrastructure related to route redesign. [Most of these changes have been implemented.]
- **Long-Term** (up to 20 years). A set of flexible service options can be implemented in phases, linked to available funding and criteria for service expansion. The concepts include expanding service hours on weekdays and Saturdays, implementing Sunday services, and expanding service in NE and SE Bend, if warranted by development characteristics in those areas. Significant operating and capital improvement funds would be needed for the proposed increases in frequency and additional routes. [Many of these changes will be implemented with funding from the new STIF funding program (additional information provided further in the chapter).]

The service characteristics over time are summarized in Table 8-8

Table 8-8 Recommended Service Characteristics

Time Frame	Short-term	Near Mid-Term	Mid-Term	Long Term
	Years 1-3	Year 4	5-10 Years	up to 20 Years
Weekday Service Hours	6:15 AM – 6:15 PM Route 11 runs only 6 hours per day	6:15 AM – 7:00 PM (one additional trip) Route 11 runs all day	6:00 AM – 8:00 PM	5:00 AM – 10:00 PM 60 minute service after 8:00 PM
Weekday Headways	40 minutes	40 minutes 60 min. on Route 11	30 or 60 minutes	15, 30 or 60 minutes (variable by route and time of day)
Saturday Service Hours	7:00/8:00 AM – 4:00/ 5:00 PM No Route 11 service	No Change Saturday Service on Route 11	8:00 AM – 5:00 PM	7:00 AM – 7:00 PM
Saturday Headways	80 minutes	No Change	60 minutes 1	30-60 minutes
Sunday Service Hours	None	None	None	8:00 AM – 5:00 PM
Sunday Headways	N/A	N/A	N/A	60 minutes
# of Routes	7	7	8	9
# of Peak Buses	7	7	9	20

Source: Bend MPO Public Transit Plan, Figures 7-13 and 9-3

Service design guidelines and performance standards are also suggested in the PTP, to aid in the effective management and timely implementation of improvements to the transit system. The system-level performance standards are related to efficiency, service quality and reliability. The route-specific performance standards include passenger per revenue hour, passengers per revenue mile, on-time performance, and passenger loading measures. The PTP recommends more periodic reporting on boardings and adding system and route-level measures to the CET Monthly Management Report. Additional details of the recommended service improvements and performance standards are available in Chapter 8 of the PTP and the associated cost estimates are identified in Chapter 9.

Non-Service Elements

Enhanced transit services are supported by non-service elements that better meet the needs of the public. The PTP describes a set of recommendations to non-service elements of the transportation system:

- **Stop Amenities**: may include route/time information, seating, shelters and trash receptacles.
- **Major Transit Stops**: are high demand transit stops where enhanced stop amenities such as real-time bus arrival information and bicycle parking should be

provided. The major transit stops may function as secondary transit hubs where convenient transfers occur. Recommended major transit stops are identified in the east (at St. Charles Medical Center) and west (COCC). Other major transit stops may be supported in the north (Cascade Village), and south (location TBD) as development occurs.

- **Park & Ride Connections**: are parking facilities with convenient connections to transit. There are several locations proposed, primarily to serve longer-distance trips within the BMPO.
- **Pedestrian & Bicycle Access Improvements**: create safe, comfortable, direct pedestrian and bicycle facilities that connect to transit stops. Sidewalks should be well-lit and barrier-free. Intersections should have curb ramps for people with mobility impairments. Crossing opportunities should be nearby and comfortable for all users. Low-stress and high visibility bicycle facilities can significantly extend the range of transit users. Specific locations where these improvements should be considered include Greenwood Avenue, 3rd Street and Hawthorne Station.
- **Transportation Demand Management**: is a general term for strategies that reduce reliance on single-occupancy motor vehicle trips. Some of these strategies, such as subsidized transit passes, Guaranteed Ride Home programs, ride-sharing and vanpool options can provide complementary options to increase the use of transit.
- **Transportation Management Associations**: are member-based organizations that support transit operations through a variety of community outreach efforts that make it easier for people to use transit. Examples include providing information on transit programs and services, coordinating with employers or large organizations, and facilitating ridesharing. Many of these functions are currently performed by CET and Commute Options.
- **Branding**: recommendations include fully transitioning from remnants of the defunct Bend Area Transit to the CET brand, to raise awareness of the services that are currently available.
- **Printed Marketing**: includes brochures, maps, and fliers. The recommended enhancements to existing materials including more Dial-A-Ride information, color-coded routes, and consistent naming conventions and descriptions.
- **Electronic Marketing**: includes online information at www.cascadeseasttransit.com. Possible improvements include links to other regional transportation providers and more information regarding planning and travel training. Establishing a social media presence via platforms such as Facebook and Twitter may also be pursued to enhance awareness and online accessibility.

Additional details of the recommended non-service element enhancements are available in Chapter 8 of the PTP.

Implementation Actions

Implementation Actions were identified to phase in the recommendations of the PTP. Each action is associated with one of the four goals of the PTP. The PTP identifies a detailed phasing timeframe for each action; near short-term (first year), short-term (1-3 years), mid-term (4-10 years) and long-term (ongoing/monitor). For the RTP, the implementation actions are divided into short-term (0-5 years) and long-term (5 years or more) timeframes. The implementation actions are listed in Table 8-9 (modified from Figure 9-7 of the PTP).

Specific implementation actions for intercity transit service were recommended in the COTOP. These recommendations are summarized below:

- Transit and vanpool investments should be considered as part of any potential capacity-increasing projects on the Bend-Redmond corridor, as improving transit options on the corridor has the potential to significantly reduce motor vehicle demand.
- Strategic investments in marketing and incentives to expand intercity vanpool services should be considered, as they appear to be underutilized in the region.
- The interaction between Community Connector and local CET services should be considered in future transit system investments.
- CET should consider moving service on the Sisters-Redmond corridor to Sisters-Bend, where there is more travel demand potential. (Also recommended in the RTMP)
- Investment should be increased in the Get There program to expand outreach for intercity travelers.
- Consider agency support of VMT-based pricing as an alternative to the gas tax, to make intercity transit travel more cost-effective compared to motor vehicle travel.

Table 8-9 PTP Implementation Actions

Action #	Recommended Actions	Lead Implementer(s)	Short-Term	Long-Term
1.1	Ensure that local funding for Bend Dial-A-Ride service is maintained beyond the City of Bend's current funding commitment (through September 2015).	BMPO[1], CET[1], City of Bend[1]	✓	✓
	Goal 1: Develop public transportation services for the transportation disadvantaged			
1.2	Acquire low-floor buses as part of new/replacement vehicle purchases and prioritize on routes with high levels of wheelchair boardings and/or ridership.	CET[1]	✓	✓
1.3	Assess balance between fixed-route and Dial-A-Ride services on a periodic basis, based on available financial resources and as fixed-route service is enhanced in the future. This could include evaluation of the costs and cost-effectiveness of providing Dial-A-Ride service that exceeds ADA requirements in terms of: (1) geographic coverage beyond the required ¾ distance from fixed-route service (currently anywhere within city limits); (2) service at days and times when fixed-route service does not operate (e.g., on Sundays); (3) eligibility for low-income seniors.	CET[1], City of Bend[2]	✓	✓
	Goal 2: Reduce reliance on automobiles and develop public transportation facilities			
	Funding			
2.1	Identify a source(s) for local matching funds (as needed) to secure additional transit funding under MAP-21. This could include assessment of City of Bend's willingness to increase its funding commitment	CET[1], BMPO[2], City of Bend[2]	✓	
2.2	Ensure that local funding for fixed-route transit is maintained beyond the City of Bend's funding commitment (through September 2015). Develop local funding sources sufficient to support the mid-term service improvements recommended in the PTP.	BMPO[1], CET[1], City of Bend[1]	✓	✓
2.3	Renegotiate terms of the bulk ticket discount program with COCC, with the aim of developing a group pass program. Demand for the existing program has exceeded the levels for which it was designed/intended.	CET[1], COCC[2]	✓	

Responsibility: 1 = Lead, 2=Support

Table 8-9 PTP Implementation Actions (Continued)

Action #	Recommended Actions	Lead Implementer(s)	Short-Term	Long-Term
	Facilities & Infrastructure			
2.4	Adopt bus stop amenity design standards, e.g., based on PTP Figure 8-4. This should include standards for new bus shelters that enhance transit visibility and meet passenger needs for weather protection. This could also be addressed in the community-oriented design process described in item 2.4 (below). Pursue opportunities to integrate advertising or sponsorships as part of the funding package for shelters or other stop enhancements.	CET[1], City of Bend[2], BMPO[2]	✓	
2.5	Develop specifications for new/replacement vehicles that modernize the fleet in order to be more appealing and attractive to a broad range of users and align vehicle capacity to passenger demand/needs on each route. This could include transit signal priority, real-time passenger information, and other ITS capabilities, e.g., automated passenger counters (APCs). In the mid-term time frame (or beyond) this could include a community-oriented process to design vehicles (and other system elements) to community specifications (e.g., similar to Boulder, where such a process was embraced in development of the Hop, Skip, Jump, etc., local transit services; see PTP for details).	CET[1]		✓
2.6	Develop a program of transit-supportive capital improvements. This program should be coordinated with the City's Capital Improvement Plan (CIP), to identify and prioritize transit-supportive capital improvements around major transit nodes, primary transit corridors, and planned routes including: Bus stops at major intersections (both sides of the street) and amenities at the most highly used stops (using stop amenity thresholds in Figure 8-1 as a guideline). Bicycle/pedestrian improvements (e.g., street crossings serving stops and activity centers along arterial transit streets such as 3rd Street and Greenwood Ave.) • Transit signal priority to allow buses to better maintain schedule on congested corridors.	City of Bend[1], CET[1], BMPO[2], ODOT[2]	✓	Review/ update every 2 years
2.7	Develop a sidewalk repair and infill program, with a specific emphasis on access to transit facilities.	City of Bend[1], BMPO[2], CET[2]	✓	✓

Responsibility: 1 = Lead, 2=Support

Table 8-9 PTP Implementation Actions (Continued)

Action #	Recommended Actions	Lead Implementer(s)	Short-Term	Long-Term
2.8	**Evaluate pedestrian safety and transit operational improvements for the on-street bus transfer facility at Hawthorne Station. This could include consideration of:** (1) converting Hawthorne Avenue to exclusive transit and pedestrian use between 3rd and 4th Avenue, e.g., east of the Safeway driveway; (2) providing a mid-block crossing for use by passengers (e.g., raised pavement surface, pedestrian-activated lighting, etc.). A "neck-down" could be included in the design of the mid-block crossing, assuming it does not impact bus movements; (3) on-street parking on 4th Avenue between Hawthorne and Greenwood, given current and future transit operations.	City of Bend[1], CET[2], , BMPO[2]	✓	✓
2.9	**Evaluate locations and opportunities for major transit stops in north and south Bend, at existing or future stop locations.** These locations may serve as secondary transit hubs, facilitating connections between local or regional routes (based on future service enhancements identified in this plan or the RTMP), as well as ride sharing. See Figure 8-1 and Figure 8-2 for locations and potential stop features.	CET[1], City of Bend[2], BMPO[2]	✓	✓
2.10	**Develop bike parking facilities, preferably covered, at secondary hub locations and other outlying stop locations.** Recommended locations are identified in Figure 8-2.	CET[1], BMPO[2], City of Bend[2], ODOT[2], Commute Options[2]	✓	✓
2.11	**Evaluate feasibility of a bicycle-sharing program.** Implement as feasible (based on an appropriate service model, partnerships, etc.). Bicycle sharing can serve "last-mile" connections to destinations beyond walking distance of transit stops and relieve capacity limitations for transporting bicycles in racks on buses.	BMPO[1], City of Bend[2], Commute Options[2]		✓
2.12	**Implement speed & reliability improvements on 3rd Street.** Such investments could include signal timing, transit signal priority, and evaluating stop placement to minimize delay to buses. Bus routes on 3rd should be able to complete a round trip within the scheduled time (currently 40 minutes; in the mid-term time frame, 30 minutes for south 3rd Street [Route 1] and 60 minutes for north 3rd Street [Route 4]).	City of Bend[1], ODOT[1], BMPO[2], CET[2]		✓

Responsibility: 1 = Lead, 2=Support

Table 8-9 PTP Implementation Actions (Continued)

Action #	Recommended Actions	Lead Implementer(s)	Short-Term	Long-Term
	Service or Service-Related			
2.13	**Implement short-term service improvements to Routes 4, 5, and 6.** Conduct additional outreach to Route 5 and 6 passengers who will be affected by the changes. Create a temporary stop for outbound Route 6/inbound Route 5 on eastbound Greenwood at Purcell. Add this stop and existing temporary stops on 5th Street to the program for developing permanent stops.	CET[1]	✓	
2.14	**Implement near mid-term service and infrastructure improvements on Routes 3 and 11, timed with and contingent on a new OSU facility on SW Colorado with a projected enrollment of 5,000 students within the next several years.** Pursue partnerships with OSU (and/or others) to fund the increase in operating costs for all-day Route 11 service as well as additional early-evening service.	OSU[1], COCC[1], CET[2], City of Bend[2]		✓
2.15	**Secure funding for and implement pedestrian access corridors from Bear Creek Road to Greenwood Avenue to support implementation of Route 7.** This should include required traffic signals and/or protected pedestrian crossings (e.g., rapid flashing beacon) to connect access corridors to future stop locations. A map of existing/planned accessways is provided in Appendix B, Figure B-16.	City of Bend[1], ODOT[2], CET[2]		✓
2.16	**Review priorities for eliminating at-grade railroad crossings including consideration of when transit service on a corridor may be feasible/likely and whether the potential for delay at railroad crossings could preclude future transit service.** For example, Cooley Road in northeast Bend and Reed Market Road in southeast Bend; the COACT Report on Central Oregon Rail Planning (2009) prioritized both the Cooley and Reed Market Road crossings as "High."	City of Bend[1], CET[2], BMPO[2]	✓	

Responsibility: 1 = Lead, 2=Support

Table 8-9 PTP Implementation Actions (Continued)

Action #	Recommended Actions	Lead Implementer(s)	Short-Term	Long-Term
	Goal 3: Increase mobility, accessibility, and visibility of transit throughout the urban area			
	Regional Service Enhancements			
3.1	**Utilize the Bend-La Pine Community Connector (Route 30) to provide a stop in Deschutes River Woods.** Identify potential locations (e.g., Riverwoods Baptist Church initially and/or Riverwoods Country Store in longer-term) amenable to a stop location, assess feasibility, and negotiate a joint-use agreement. Secure funding for any infrastructure improvements needed at the Riverwoods Country Store (e.g., pave rear portion of parking lot) if this location is pursued in the longer-term. Note: Service to Riverwoods Baptist Church started on 11/26/2012.	CET[1], BMPO[2]	✓	✓
3.2	**Evaluate a Bend-Redmond Community Connector (Route 24) stop in the north part of Bend.** An initial location could be the ODOT Park & Ride near the DMV office on 3rd Street. In the longer-term, the stop could be co-located with a future major transit hub / secondary hub location in north Bend (see 2.9).	CET[1], BMPO[2]	✓	✓
3.3	**Evaluate a Bend-La Pine Community Connector (Route 30) stop in the south part of Bend.** An initial location could be the existing Route 1 stops near Walmart. In the longer-term, the stop could be co-located with a future major transit hub / secondary hub location in south Bend (see 2.9).	CET[1], BMPO[2]	✓	✓
3.4	**Promote vanpools to dispersed employment sites.** Identify opportunities for promoting vanpools to employment sites not currently served by the fixed-route system or located outside of Bend city limits (e.g., Bend Municipal Airport). Assess demand for such vanpools to serve regional demand in coordination with Community Connector routes as well as local demand.	Commute Options[1], CET[2], BMPO[2]	✓	
3.5	**Develop a region-wide volunteer driver program to fill a need for transportation connections not served by transit, i.e., outside service area or service days/times.**	Commute Options[1], CET[2]	✓	
	Marketing and Branding			
3.6	**Market regular interlining of routes to passengers as a convenience feature.** Initially, this item refers to marketing existing route interlining practices (e.g., route 1-3, 2-4, 5-6).	CET[1]	✓	✓

Responsibility: 1 = Lead, 2=Support

Table 8-9 PTP Implementation Actions (Continued)

Action #	Recommended Actions	Lead Implementer(s)	Short-Term	Mid-Term
3.7	**Build upon the "open" transit data published in Google Transit.** Make trip planning capabilities available on the CET, City of Bend, and Commute Options websites. Provide real-time transit arrival information including on mobile devices (when available). Market enhancements to online trip planning and real-time information to current and potential riders.	CET[1], City of Bend[2], BMPO[2], Commute Options[2]	✓	✓
3.6	Develop capabilities for targeted communication with customers including on their mobile devices (via text messages, e-mail, social media, etc.), such as to provide updates on delays or snow routes.	CET[1]	✓	
3.7	Develop a plan to complete the transition from BAT to CET in all system branding, including vehicles and stops.	CET[1], City of Bend[2]	✓	
3.8	Conduct a comprehensive assessment of CET's marketing and branding and develop action plan. This could include an assessment and update of the Rider Guide, website, social media, bus stop materials, etc.	CET[1], BMPO[2]	✓	
3.9	Review / update marketing materials on a regular basis. This could include recommended improvements outlined in the Marketing and Branding section of Chapter 8, such as enhancements of the Rider Guide and increased development of social media (assuming staff is able to monitor and keep sites up-to-date). In addition, consider marketing regular interlining of routes to passengers as a convenience feature.	CET[1], Commute Options[1]		Every 2 years
3.10	Develop marketing materials for service between Bend and Redmond Airport. Coordinate service with major flight departure/arrival times to the extent possible and place marketing materials at strategic locations.	CET[1]	✓	Annually
	Performance Standards			
3.11	▪ Evaluate use of automatic passenger counters (APCs) to enhance data collection capabilities. Based on outcome of evaluation, include APC technology in new vehicle acquisitions.	CET[1]	✓	✓
3.12	Develop strategies to reduce the high rate of cancellations (potentially related to the large number of subscription trips).	CET[1]	✓	

Responsibility: 1 = Lead, 2=Support

Table 8-9 PTP Implementation Actions (Continued)

Action #	Recommended Actions	Lead Implementer(s)	Short-Term	Long-Term
	Goal 4: Provide infrastructure and land use planning to support transit			
4.1	**Adopt a Primary Transit Corridors policy.** This policy should identify corridors with the highest potential ridership (see Primary Transit Corridors map, Figure 7-4) where the City, BMPO, and CET will prioritize the highest level of transit service over time and where major transit-supportive land uses are encouraged to locate. This policy should be reviewed periodically to ensure the primary transit corridors reflect current and planned land use intensity.	City of Bend[1], BMPO[2], CET[2]	✓	Every 5 years
4.2	**Develop a transit overlay zoning ordinance and adopt it around primary transit corridors and/or major transit nodes (e.g., Hawthorne Station).** The Future Opportunities memo provides a more in-depth discussion of elements that could be addressed in such an ordinance and other opportunities to incorporate transit-supportive elements into the existing City code.	City of Bend[1], BMPO[2]	✓	
4.3	**Require review of transit service needs as part of the development review process.** Develop a protocol for integrating assessment of transit requirements (including involvement of CET staff, and funding contribution for staff time) into early review of development/land use proposals, particularly those with potentially significant impact on transit ridership and/or where the proposed use is located away from transit.	City of Bend[1], BMPO[2], CET[2]	✓	
4.4	**Coordinate public facility master plans (e.g., sewer, water, etc.) with priorities/opportunities for intensifying land use along primary transit corridors.** In particular, consider prioritizing facility upgrades that would relieve capacity constraints and enable development.	City of Bend[1], BMPO[2], CET[2]	✓	
4.5	**Evaluate a mechanism to formalize developer contributions to funding for transit infrastructure.**	City of Bend[1], BMPO[2]	✓	

Responsibility: 1 = Lead, 2=Support

Current Programs

Statewide Transportation Improvement Fund (STIF)

On July 1, 2018, the State of Oregon, under authority from House Bill 2017, implemented its first payroll tax dedicated to transit expansion. Distribution of the funding is administered through the STIF program. STIF funds are distributed through a formula program and through two discretionary grant programs. In Central Oregon, funding from the program will be used to implement components of the RTMP and the PTP that enhance public transportation services to access jobs and community services and improve mobility.

Crook, Jefferson, and Deschutes Counties and the Confederated Tribes of Warm Springs delegated STIF administrative activities to the Central Oregon Intergovernmental Council (COIC) and created advisory committees to help prioritize projects and services for the formula funds. The STIF advisory committees met throughout spring 2019. COIC and the advisory committees developed plans for each area and submitted applications to ODOT. Needs for CET transit service were identified in the STIF process include the following:

- First/Last Mile Connections
- Mobility Hubs
- Updated Bus Stop Infrastructure
- Real-Time Signage and Information
- Making transit convenient and attractive
- Prioritize high transit capacity corridors

One May 1, 2019, Deschutes County submitted its first STIF plan, with a list of projects addressing service needs mentioned in the PTP. At the time of this update, the STIF formula projects were pending approval. A list of approved projects will be added to this section in the next update. STIF Formula approval is expected in fall 2019. Below is a list of the STIF-formula project applications:

- Increased frequency on Route 1, Route 4, Route 7, and parts of Route 3.
- Introducing fixed route services to the northeast and southeast neighborhoods of Bend.
- Introducing weekend service to La Pine and Redmond from Bend.
- Implementing a reduced fare program to low-income individuals in the City of Bend.
- Updating software systems to allow for better dispatching of dial-a-ride services and microtransit.

ODOT coordinated a separate process to distribute STIF discretionary funds and FTA Section 5311(f) funds for fiscal years 2019-2020 and 2020-2021. .Projects selected for funding in the Bend area are listed on Table 8-10.

Table 8-10 STIF Discretionary Projects

Project Name	Project Type	Funding
CET Community Connector Service	Operations & Administration	$275,791
Hawthorne Station Renovation	Facility Renovation	$112,365
Planning Feasibility Study for service from Klamath Falls to Redmond	Planning & Administration	$20,000

Ride Bend

A pilot microtransit project was launched in Bend on July 1, 2019. The free, on-demand, curb-to-curb service will serve an area surrounding downtown and the Old Mill District through Labor Day. Beginning September 2, Ride Bend will serve OSU-Cascades and Central Oregon Community College students in an area west of Northwest 14th Street, an area which had previously been served by the discontinued CET route 12. The program is sponsored by the City of Bend, Visit Bend, The Downtown Bend Business Association, the Bend MPO, St. Charles Health Systems, CET, OSU-Cascades and Bend 2030. The fleet includes two 12-passenger vans and a wheelchair accessible van. The findings of the Ride Bend pilot study will be used to help inform future public transportation investments by the City of Bend and CET.

Policies

The goals and objectives for the public transportation system are a collaborated effort between Cascades East Transit, Bend MPO, and the City of Bend.

- Goal 1: Develop and maintain a public transportation system that is well integrated with local communities, planning documents, and partner agencies.
- Goal 2: Provide convenient and attractive public transportation choices for users throughout Central Oregon both within and between communities.
- Goal 3: Make riding easy and comfortable with improved stop amenities and information about how to ride readily available to residents, employees, and visitors.
- Goal 4: Enhance transit options to provide a time and cost competitive alternative to traveling by automobile and increase transit ridership while reducing automobile dependency.
- Goal 5: Evaluate emerging technologies and transit service models and how they might be used to support transportation options in Central Oregon.

Objectives are defined to guide and support implementation of strategies that achieve progress towards the goals of the PTP.

- Objectives 1.A: Preserve and improve the existing Dial-A-Ride service.
- Objective 1.B: Equitably provide transit services throughout the city, including to areas with high concentrations of low-income households, households without a vehicle, seniors, and people with disabilities.

- Objective 1.C: Provide transit service to all middle and high schools, as well as higher education facilities.
- Objective 2.A: Support and promote expansion of a reliable public transportation system that makes transit an attractive travel choice for Bend residents and visitors in order to reduce reliance on the automobile. Over time, the best transit service in Bend (highest frequency, most reliable, longest service span, etc.) should be provided in "primary transit corridors," as presented in the Public Transit Plan.
- Objective 2.B: Work with other governmental agencies to support implementation of a 20-year Public Transit Plan. Ordinances shall be adopted that implement the Public Transit Plan.
- Objective 3.A: Work with COIC, Central Oregon communities, and the State to maintain or improve connections between local Bend transit services and inter-urban public transportation services. Priority shall be given to high-ridership corridors and connections.
- Objective 3.B: Coordinate with the Central Oregon Intergovernmental Council (COIC), the State, and other jurisdictions to evaluate funding alternatives and seek appropriate resources to preserve and support future expansion of the public transportation system. Effort should be made to evaluate creative funding techniques that may include the combination of public and private transportation resources in coordination with other agencies and transportation providers.
- Objective 3.C: Continue to partner with local organizations, businesses and agencies to enhance the image of transit throughout the community.
- Objective 4.A: Implement land use ordinances and other regulations that establish pedestrian and transit-friendly design along potential or existing transit routes, to improve access to the fixed-route transit system.
- Objective 4.B: Encourage new development requiring transit service, such as schools, hospitals, clinics, high-density housing, etc., to locate along an existing transit route. Encourage the highest-intensity uses to locate along primary transit corridors, which would offer the highest level of transit service.
- Objective 4.C: Support implementation and/or improvement of secondary transit hubs including the Central Oregon Community College, the St. Charles Medical Center, and sites on the north and south reaches of Bend, including land acquisition and other infrastructure.
- Objective 4.D: Acquire properties (or secure joint use agreements) for Park-n-Ride lots at strategically located sites throughout the urban area. These locations may be co-located with secondary transit hubs or other major stops (see also Objective 4.C).

Chapter 9: Transportation Systems Management

Introduction

There are several planning activities that are expected to influence this chapter of the MTP. Specifically, ODOT Region 4 has initiated an update to the Deschutes County Intelligent Transportation Systems (ITS) Plan, and ODOT Region 4 is studying management solutions for the Bend Parkway (US 97) and other sections of US97 just outside the MPO. The Bend Parkway plan is expected to include a variety of new operational solutions, which could include right-turn only at-grade ramp closures and installation of ramp meters at full access interchanges.

The Oregon Transportation Planning Rule defines transportation systems management (TSM) as the use of "techniques for increasing the efficiency, safety, capacity or level of service of a transportation facility without increasing its size." Examples of TSM include physical roadway improvements (e.g. access management and channelization), operational improvements (e.g. traffic signal coordination and ramp metering), and the use of intelligent transportation systems.

This chapter includes goals and policies, forecasts and future needs, and strategies for applying transportation systems management to the Bend MPO. ITS plays a large role in TSM and a separate planning effort was undertaken as part of the *Deschutes County ITS Plan Update*[44] to develop a 20-year deployment plan of ITS projects that improve the operations and management of the transportation network in Deschutes County with a focus on the cities of Bend and Redmond. In addition to ITS other TSM strategies discussed in this chapter include access management, parking management, traffic signal management and operations, speed management, geometric improvements, value engineering, systems engineering, and asset management.

TSM Policies

The policies for transportation system management were developed based on a review of existing policies in other state, regional, and local plans such as the *Oregon Transportation Plan*, *Deschutes County Transportation System Plan*, *Deschutes County ITS Plan*, and *City of Bend Transportation System Plan*. These policies will help guide the future development and management of the transportation system.

1. Support the access management policies of the Oregon Department of Transportation along state highways.
2. Work with member jurisdictions and agencies to adopt legislation that protects the integrity of regional roadways by managing public and private accesses.
3. Work with member jurisdictions and agencies to develop parking regulations that support land use and travel demand and that also encourage the use of alternate

[44] *Deschutes County ITS Plan Update*. Prepared for ODOT by DKS Associates and IBI Group, June 2011

modes.

4. Work with member jurisdictions and agencies to implement a comprehensive intelligent transportation system program per the *Deschutes County ITS Plan Update*.
5. Support efforts of member jurisdictions and agencies to update traffic signal and traffic signal control system hardware and software and implement signal timing strategies to optimize system efficiency and safety for all modes.
6. Support efforts of member jurisdictions and agencies to remove traffic signals where an engineering study (based on *MUTCD* guidelines) demonstrates they are no longer warranted based on land use changes that have resulted in decreased travel demand.
7. Support efforts of member jurisdictions and agencies to install new traffic signals where an engineering study (based on *MUTCD* guidelines) shows they are warranted to support land use changes that have resulted in increased travel demand.
8. Work with member jurisdictions and agencies to investigate the feasibility of utilizing automated speed and red-light enforcement at high crash locations to improve safety and reduce the staffing needed by law enforcement and work to enact legislation as needed.
9. Support efforts of member jurisdictions and agencies to utilize traffic calming techniques to reduce travel speeds and cut-through traffic on roadways where traffic conditions do not match the intended design of the roadway.
10. Encourage member jurisdictions and agencies to consider geometric improvements to enhance efficiency and provide safety for motorists, pedestrians, and bicycles.
11. Encourage member jurisdictions and agencies to consider using value engineering or systems engineering to deliver transportation projects more efficiently and cost-effectively.
12. Promote new technologies and strategies to effectively manage transportation assets including roadway pavement, bridges, right-of-way, public transportation facilities, traffic signals, ITS field devices, and other infrastructure to maximize functionality and prolong the lifetime of the transportation system.

Forecasts and Future Needs

Traffic congestion coupled with a large expected growth in population and travel demand (see Motor Vehicle chapter) impacts the mobility of travelers and freight throughout the Bend MPO. Congestion results in travel delay, reduced productivity, and a frustrated driving public. Over half of congestion is caused by non-recurring events as shown in Figure 9.1. TSM strategies are needed to reduce non-recurring congestion, and its negative impacts, to optimize systems operations and maximize the available capacity of the existing transportation infrastructure. During the development of the *Deschutes County ITS Plan Update* an extensive needs assessment was conducted through stakeholder interviews, questionnaires, and a workshop to identify regional needs in the following areas of interest:

- Travel and Traffic Management
- Public Transportation Management

- Emergency Management
- Information Management
- Maintenance and Construction Management

Although these needs were ultimately used to develop a phased implementation of ITS projects, the user needs identified were very broad and may also be addressed by TSM strategies other than ITS.

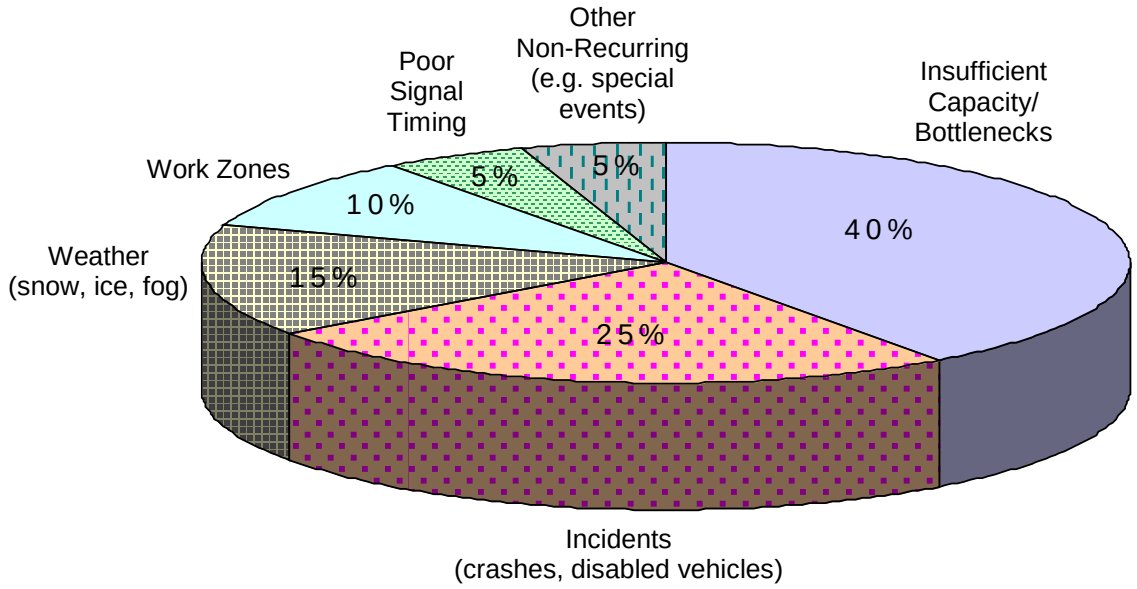


Figure 9-1 Causes of Congestion[45]

TSM Strategies

This section includes an overview of the strategies that may be used in the Bend MPO to support the transportation system management goals and policies listed earlier in this chapter. These strategies are discussed in the following management/operational areas: intelligent transportation systems, access management, parking management, traffic signal management and operations, speed management, geometric improvements, value engineering and systems engineering, and asset management.

Intelligent Transportation Systems

ITS involves the application of advanced technologies and proven management techniques to relieve congestion, enhance safety, provide services to travelers, and assist transportation system operators in implementing suitable traffic management strategies. ITS focuses on increasing the efficiency of existing transportation infrastructure, which enhances the overall system performance and reduces the need to

[45] *Congestion Mitigation*. Office of Operations, Federal Highway Administration. http://www.ops.fhwa.dot.gov/aboutus/opstory.htm. Accessed June 26, 2014.

add capacity (e.g., travel lanes). Efficiency is achieved by providing services and information to travelers so they can (and will) make better travel decisions and to transportation system operators so they can better manage the system. ITS technologies are used by agencies in the Bend MPO today and plans are in place to expand the use of ITS applications in the future.

In 2011, the Bend MPO, Oregon Department of Transportation (ODOT), Deschutes County, City of Bend, City of Redmond, Deschutes County 911, the Oregon State Police, and the Federal Highway Administration collectively developed the *Deschutes County ITS Plan Update* with input from other regional stakeholders. The mission of the plan is "to improve the safety, security and movement of goods, people, and services for all modes of the transportation network by using advanced technologies, establishing agency coordination, utilizing existing system capacity and infrastructure, and providing real time traveler information." The outcome of the plan is a phased 20-year deployment plan of ITS projects, a regional ITS architecture, and regional operational concept that all meet federal ITS requirements. Additionally, this effort is consistent with plans put together statewide and in other regions of Oregon to ensure that ITS strategies are integrated and complementary.

Benefits of ITS

ITS projects are aimed at improving the safety and operational efficiency of the existing transportation infrastructure by:

- Reducing vehicle delays related to recurrent and non-recurrent congestion
- Reducing collisions and incident response times
- Providing travelers with real-time information to make informed route and mode choice decisions.

Quantifiable benefits resulting from intelligent transportation systems include:

- Reduced vehicle delays
- Reduced number of collisions
- Improved air quality
- Reduced fuel consumption
- Improved travel times

Other accrued benefits, which are more difficult to quantify, include improved travel time reliability, reduced driver frustration, and reduced driver anxiety from having real-time travel information. Additionally, improved efficiency due to coordinated and cooperative agency actions can produce long term savings, particularly in relation to coordinating regional projects and a coordinated regional response to incidents. ITS deployments around the state of Oregon have yielded many of these; some of these benefits are highlighted herein.

ODOT Region 2 Incident Management Program
- 15-percent reduction in average incident duration
- 35-percent reduction in vehicle-hours incident delay

Traveler Information
- 7- to 12-percent reduction in travel time
- Up to 33-percent reduction in emissions

ITS Projects for Bend MPO

A list of ITS projects was developed to meet the regional needs and then phased based on a scoring exercise (criteria included items such as safety, congestion mitigation, and key traveler decision points), cost, expected benefits, technical and institutional feasibility, relativity to other planned projects, input from the Steering Committee, and equitable distribution. The resulting deployment plan includes the following phases:

- 2014 – 2018: 0 – 5 Year Plan (Short-term)
- 2019+: 5+ Year Plan (Long-term)

Table 9.1 lists the projects that fall within the Bend MPO and are anticipated to be feasible within projected funding levels. Table 9.2 lists additional aspirational projects that have been identified in the Deschutes County ITS Plan, but are not anticipated to be achievable under projected funding sources. A map illustrating the phased ITS infrastructure deployment locations for many of the ITS projects is located in Appendix E. Many of the projects will be implemented by multiple jurisdictions and several projects will deploy systems that will be shared beyond the Bend MPO. ODOT plans to pursue a number of statewide ITS initiatives that may be applied to the Bend area and will support some of the projects included in Table 9.1[46].

The ITS projects included in Table 9.1 utilize the following general strategies to improve the operational efficiency and management of the Bend area transportation network:

- Corridor management on key corridors that includes traffic signal coordination, remote monitoring, and traveler information dissemination
- Rail warning systems
- Parking management
- Transit system management
- Multi-jurisdictional programs for traffic management, incident response, emergency management, and maintenance and construction management
- Regional traveler information dissemination

[46] *Oregon Statewide ITS Architecture and Operational Concept Plan.* Prepared for ODOT by DKS Associates, May 2012.

Table 9-2 ITS Deployment Projects for Bend MPO

#/Title	Description (*stakeholders listed at end*)	Status
2014 – 2018 (0 – 5 Year Plan, Short-term)		
DC-TM-02A: Region 4 TOC to 3rd St RWIS	● Install fiber optic cable along 3rd Street/The Dalles-California Highway between Region 4 TOC and Division Street, use existing conduit between OB Riley Road and the RWIS near the Bend Parkway ● Upgrade traffic signal controllers at: 1. 3rd Street/The Dalles-California Highway/NE Bend River Mall Drive 2. 3rd Street/The Dalles-California Highway/OB Riley Road 3. 3rd Street/The Dalles-California Highway/Mt Washington Drive/Butler Market Road 4. 3rd Street/The Dalles-California Highway/Division Street ● Connect to existing cameras as 3rd Street/The Dalles-California Highway/Mt Washington Drive/Butler Market Road *(ODOT, Bend)*	Comm started. Funding programmed in 2018-2021 STIP.
DC-TM-02B: Bend Pkwy and 3rd St: Reed Market Rd to Murphy Rd (Stage 1)	● Subscribe to leased services between ODOT Region 4 TOC and communications hub TBD between Reed Market Road and Murphy Road ● Install VDSL in existing conduit and existing aerial route along 3rd Street/The Dalles-California Highway between Reed Market Road and Power Road ● Install fiber optic cable in existing conduit along Powers Road between 3rd Street/The Dalles-California Highway Bend Parkway ● Install fiber optic cable in existing conduit along Bend Parkway between Powers Road and Murphy Road ● Upgrade traffic signal controllers at: 1. Bend Parkway/Powers Road 2. Bend Parkway/Pinebrook Boulevard 3. Bend Parkway/3rd Street/The Dalles-California Highway ● Install PTZ cameras at 1. Bend Parkway/Powers Road 2. Bend Parkway/3rd Street/The Dalles-California Highway *(ODOT, Bend)*	Comm started. Funding programmed in 2018-2021 STIP.
DC-TM-19A: Advanced Rail Warning System - Reed Market Road	Bend (Reed Market Road at 3rd Street, Railroad crossing, and 15th Street). Includes transmitting advanced crossing occupancy information to the public via message signs or in-vehicle navigation systems. (*ODOT, Bend, Redmond, Deschutes County, 911 Center*)	Partially complete. System installed on Reed Market Road at 15th Street and American Lane.
DC-TM-28: City of Bend Traffic Data Collection	Deploy video traffic counting stations at bottleneck locations (e.g. Portland Street Bridge) to monitor traffic and collect traffic volume data. (*Bend*)	Partially complete. 5 permanent counters installed. Annual temporary count program established. Bicycle and pedestrian data collection effort also underway in partnership with ODOT Research Unit.

#/Title	Description (*stakeholders listed at end*)	Status
DC-TM-29: Revere Ave and Wall St to 3rd St and Greenwood Ave (Hwy 20)	● Subscribe to leased services between ODOT Region 4 TOC and new communications hub at NW Revere Avenue/NW Wall Street ● Install fiber optic cable: 1. Use existing conduit along Revere Avenue between NE Wall Street and 3rd Street/The Dalles-California Highway 2. On existing aerial route along 3rd Street/The Dalles-California Highway between Revere Avenue and Greenwood Avenue ● Connect to existing interconnect to: 1. NE Wall Street/NW Portland Avenue/NW Olney Avenue 2. 3rd Street/The Dalles-California Highway/Franklin Avenue ● Upgrade traffic signal controllers at: 1. NW Revere Avenue/NW Wall Street/Bend Parkway southbound ramps 2. NW Revere Avenue/NE Division Street/Bend Parkway northbound ramps 3. 3rd Street/The Dalles-California Highway/Olney Avenue ● Install PTZ cameras at: 1. 3rd Street/The Dalles-California Highway/Olney Avenue 2. 3rd Street/The Dalles-California Highway/Greenwood Avenue (*ODOT, Bend*)	Complete. System to be upgraded as part of US20 project in 2018-2021 STIP.
DC-PTM-01: Automated Vehicle Location (AVL)/Computer Aided Dispatch (CAD) Transit Management System	Install an automated vehicle location (AVL) system on the CET fleet and replace existing computer aided dispatch (CAD) system. (*CET*)	AVL complete. Upgrade to new CAD system programmed.
DC-PTM-03: Real-Time Customer Information	Disseminate transit traveler info to internet and personal user devices. Deploy real-time dynamic message signs at key locations such as transit centers and bus stops where multiple routes pass through, and at stops with large bus headways. (*CET.*)	Partially complete. Real time travel information available through smart phone app. DMS installed at Hawthorne Station.
DC-PTM-06: Automated Passenger Counting	Install an automated passenger counting system that electronically records boardings and alightings at each transit stop (*CET*)	Funding programmed for APC installation on fixed-route buses in Bend.
DC-EM-01A: Coordinated Emergency Response - Radio System Link	Provide a two-way information flow (i.e.. CCTV camera images, congestion flow map, emergency calls) between transportation management systems and the 911 and emergency dispatch centers. This project will integrate the transportation information with existing computer aided dispatch systems and the emergency data with traffic management systems. (Oregon Interoperability Service (OIS) is currently underway). (*ODOT, Bend, Redmond, Deschutes County, Deschutes County 911, US Forest Service*)	Installed but only partially connected to CAD.

#/Title	Description (*stakeholders listed at end*)	Status
DC-EM-02: Coordinated Emergency Response - Radio System Link	Deploy a common communication interface between stakeholders responsible for emergency management. This project supports coordinated emergency response for evacuation routes and disaster response. (*ODOT, Bend, Redmond, Deschutes County, Deschutes County 911, US Forest Service*)	Funded by Reg. Comm. Consortium
DC-MC-02: Work Zone Management and Safety Monitoring Systems	Deploy work zone safety enhancements and management techniques including variable speed limits, incident detection and management, lane merge controls, travel time estimates and queue detection with electronic feedback signs. (*ODOT*)	Funded with construction projects
DC-PP-06: Roundabout Preemption (previously DC-EM-10)	Implement an emergency vehicle preemption system for roundabouts located on primary response routes. ● Priority at Reed Market Road/SE 15th Street (where the existing signal will be reconstructed as a roundabout with an upcoming City Project) is high (*Bend*)	Partially complete. Train notification installed at RAB, but no emergency preemption.
DC-PP-07: Automatic Vehicle Location Equipment Pilot Project (snowplows)	Test the use of automatic vehicle location devices on snowplows in District 10.	Partially complete
	Capital Cost for 2014 – 2018	***$3,220,000 to $3,800,000***
2019 + (5+ Year Plan, Long-term)		
DC-TM-02D: Hwy 97 Business (3rd Street) - Travel Time Performance Measurements	This project will deploy devices to measure travel times for traveler information and performance measurement assessment. (*ODOT, Bend*)	Potentially part of ODOT project programmed in 2018-2021 STIP.
DC-TM-07A: Hwy 20/Greenwood from 15th St to Purcell Blvd	● Subscribe to leased services between ODOT Region 4 TOC and new communications hub at Greenwood Avenue/SE 15th Street ● Install fiber optic cable along Greenwood Avenue between 15th Street and Purcell Boulevard ● Upgrade traffic signal controller at Greenwood Avenue/15th Street ● Possible inter-agency communications with Bend Area Transit, Bend Police, and City of Bend Public Works (*ODOT, Bend*)	Partially complete. Additional component to be completed as part of US20 project in 2018-2021 STIP.
DC-TM-07D: Hwy 20/Greenwood/Newport - Travel Time Performance Measurements	This project will deploy devices to measure travel times for traveler information and performance measurement assessment. (*ODOT, Bend*)	Not started
DC-TM-08E: Hwy 97 (Bend Parkway) - Travel Time Performance Measurements	This project will deploy devices to measure travel times for traveler information and performance measurement assessment. (*ODOT, Bend*)	Not started
DC-TM-09: Century Drive (to Mt. Bachelor) Safety and Efficiency Improvements	This project will deploy video, electronic message signs, weather stations, dynamic speed limit signs, and speed photo enforcement on Century Drive between Bend and Mt. Bachelor (*ODOT, Bend, Mt. Bachelor Inc.*)	Not started, but regional discussions on-going.

#/Title	Description (*stakeholders listed at end*)	Status
DC-TM-10: Incident Response Program - Staff and Vehicles	Develop a multi-jurisdictional regional incident response program to support emergency management agencies with incident management on state, county, and city roadways. This program includes vehicles, personnel, and dispatch. This program will coordinate with ODOT maintenance crew incident responders to maximize efficiency and pool resources. (*ODOT, Bend, Redmond, Deschutes County*)	Regional TIM team formed.
DC-TM-11B: Hwy 97 (Bend to Redmond) Safety and Efficiency Improvements	This project will deploy video to support incident management and traveler information. (*ODOT*)	Ongoing PTZ/TripCheck/ Cameleon integration.
DC-TM-12A: Hwy 97 (South of Bend) Safety and Efficiency Improvements	This project will deploy a video, electronic message signs, and weather stations. (*ODOT*)	Partially complete. Additional components scheduled for implementation in 2021 using FHWA ATCMTD grant funding.
DC-TM-12B: Hwy 97 (South of Bend) Safety and Efficiency Improvements	This project will deploy a variable speed limit system. (*ODOT*)	Partially complete. Full design to DAP. FHWA ATCMTD grrant to fund up to 7 sites in 2021.
DC-TM-13A: 27th/Empire/Knott Safety and Efficiency Improvements	This project will deploy video monitoring cameras with pan-tilt-zoom control, count stations, and advanced signal timing improvements. (*ODOT, Bend*)	Partially complete
DC-TM-14: ODOT Region 4 TOC Upgrade	Expand/upgrade the existing TOC facility and equipment. (*ODOT*)	Partially complete
DC-TM-19B: Advanced Rail Warning System - Bend and Redmond locations	Bend (County Club Rd, Olney Ave, Revere Ave, Wilson Avenue), Redmond (Airport Way, Sisters Ave, Antler Ave) (*ODOT, Bend, Redmond, Deschutes County, 911 Center*)	Not started
DC-TM-34: Franklin Avenue: 3rd Street to Bond Street	● Install fiber optic cable on Franklin Avenue between 3rd Street and NW Wall Street ● Possible inter-agency communications with Bend City Hall (*Bend*)	Partially complete using wireless connections instead of fiber.
DC-TM-35: 27th Street Corridor Upgrade	● Install fiber optic cable in existing conduit along 27th Street between Bear Creek Road and Neff Road ● Install fiber optic cable in existing conduit along Neff Road between 27th Street and Purcell Boulevard (may need to install conduit between Medical Center Drive and Purcell Boulevard). (*Bend*)	Not started
DC-TM-36: Wall Street: Greenwood Avenue to Portland Ave/Olney Ave	● Install fiber optic cable along NW Wall Street between NW Portland Ave/NW Olney Ave and Greenwood Ave (*Bend*)	Complete. System to be upgrade as part of US20 project in 2018-2021 STIP.
DC-TM-37: Remaining 170 to 2070 upgrades	● Upgrade traffic signal controllers at: 1. NE Butler Market Road/NE Boyd Acres Road 2. NE 8th Street/NE Penn Avenue (*Bend*)	Complete. All controllers in ODOT Region 4 operate on 2070 controllers or ATC controllers.

#/Title	Description (*stakeholders listed at end*)	Status
DC-TM-38: Wall Street: Revere Avenue to Portland Ave/Olney Ave	● Install fiber optic cable in existing conduit along NW Wall Street between NW Revere Avenue and NW Portland Avenue/NW Olney Avenue ● Upgrade traffic signal controller at NW Wall Street/NW Portland Avenue/NW Olney Avenue (*Bend*)	Complete. Installed as wireless, not fiber.
DC-TM-40: Count Stations - Bridges	Install count stations at several of the bridge over the Deschutes River: ● Reed Market Road ● Colorado Avenue ● Columbia Street ● Galveston Avenue ● Newport Avenue ● Mt Washington Drive ● Archie Briggs Road Count stations should collect the following data: vehicle volumes, vehicle classifications, and vehicle speeds. (*Bend*)	Partially complete. Five permanent counters installed. Additional permanent counters may be installed in 2019-2021 City of Bend buget cycle.
DC-TM-41: Count Stations - City Outskirts	Install count stations that support locations near Bend city limits in the travel demand model: ● Powell Butte Highway ● Century Drive ● Shevlin Park Road ● Skyliners Road ● Cline Falls Highway ● Old Bend-Redmond Highway ● Knott Road Count stations should collect the following data: vehicle volumes, vehicle classifications, and vehicle speeds. (*Bend*)	Partially complete. 2 locations installed (Powell Butte and Shevlin Park).
DC-PTM-02: Maintenance Management System	Upgrade the existing fleet maintenance system to expand functionality and meet FTA requirements. (*CET*)	Unknown
DC-PTM-07: Electronic Fare System linked to Smart Cards	Install an electronic fare collection system that includes Smart Card support (linked to Bend Parking Garage Smart Cards). (*CET, Bend*)	Electronic fare system to be available on Bend fixed route system in 2019.
DC-EM-03: Real-Time Information to mobile data devices	Provide real-time traffic information to emergency responders' mobile data devices. (*ODOT, Bend, Redmond, Deschutes County, Deschutes County 911, Oregon State Police*)	ODOT Region 4 TOC has call-out system.
DC-EM-06: Provide Traffic Management System Information at EOCs	Provide an interface between the TOC and/or other traffic management systems and each of the emergency operations centers to allow access to traffic control devices during emergency situations at the EOCs as well as to share information between agencies. This would include workstations, monitors, and a communications interface at EOCs. (*ODOT, Bend, Redmond, Deschutes County, Deschutes County 911*)	Not started

#/Title	Description (*stakeholders listed at end*)	Status
DC-IM-01: Regional Data Management System	Implement a data management system for archiving data, collecting real-time data, and accessing data. The system should have geospatial capabilities and data should include at a minimum traffic counts, speed data, accidents (vehicles, pedestrians, and bicycles), traffic enforcement data, incident information, and transit information. (*ODOT, Deschutes County, Bend, Redmond*)	Alternatives analysis and framework complete. Steering Team being established to guide implementation of the project.
DC-MC-03: Roadway Automated Treatment	Includes environmental sensors and automated treatment (de-icing) at the planned US 97/S. Century Drive interchange. (*ODOT*)	Funded with STIP
	Capital Cost for 2018+	***$7,585,000 to $8,830,000***

Source: *Deschutes County ITS Plan Update*

Table 9-3 ITS Aspirational Projects (Beyond Projected Funding Levels) for Bend MPO

#/Title	Description (*stakeholders listed at end*)	Capital Cost
No Implementation Target Identified (Beyond Projected Funding Levels)		
DC-TM-02C: Bend Pkwy and 3rd St: Reed Market Rd to Murphy Rd (Stage 2)	● Install fiber optic cable in existing conduit and existing aerial route along 3rd Street/The Dalles-California Highway between Reed Market Road and Powers Road ● Install fiber optic cable in existing conduit along Powers Road between 3rd Street/The Dalles-California Highway Bend Parkway ● Install fiber optic cable in existing conduit along Bend Parkway between Powers Road and Murphy Road ● Salvage removed VDSL equipment from 3rd Street/The Dalles-California Highway, Powers Road, and Bend Parkway for use on State Highway 372/Colorado-Arizona Couplet (*ODOT, Bend*)	Partially complete. Additional work programmed for 2021 using FHWA ATCMTD grant funding.
DC-TM-02E: Hwy 97 Business (3rd Street) - Dynamic Message Signs	This project will deploy dynamic message signs. (*ODOT, Bend)*	Not started
DC-TM-06: Downtown Bend Parking Management System	This project would monitor parking garage occupancy to alert travelers if the garage is full and provide guidance to alternate available parking. (*Bend)*)	Not started
DC-TM-07B: Hwy 20/Greenwood Ave from 3rd St to 8th St	● Install wireless along NE Greenwood Avenue between 3rd Street/The Dalles-California Highway and 8th Street ● Upgrade traffic signal controller at NE Greenwood Avenue/8th Street ● Install PTZ camera at NE Greenwood Avenue/8th Street (*ODOT, Bend*)	Partially complete. Additional work may be funded as part of US20 project in 2018-201 STIP.
DC-TM-07C: Hwy 20/Greenwood from Purcell to 27th Ave	● Install fiber optic cable in existing conduit along Greenwood Avenue between Purcell Boulevard and 27th Street ● Connect to existing interconnect along 27th Street ● Install PTZ cameras at: 1. Greenwood Avenue/15th Street 2. Greenwood Avenue/Purcell Blvd 3. Greenwood Avenue/27th Street (*ODOT, Bend*)	Funding programed in 2018-2021 STIP for partial implementation.
DC-TM-07E: Hwy 20/Greenwood - Dynamic Message Signs	This project will deploy dynamic message signs. (*ODOT, Bend*)	Not started
DC-TM-08A: Bend Pkwy from Hwy 372/Colorado Ave to Reed Market Rd	● Install fiber optic cable along Bend Parkway between Colorado Avenue/State Highway 372 and Reed Market Road ● Install PTZ camera on Bend Parkway north of Reed Market Road ● Connect to existing PTZ camera near Colorado Avenue/State Highway 372 (*ODOT, Bend*)	Funding programmed in 2018-201 STIP for partial implementation.
DC-TM-08B: VMS: Bend Parkway northbound at Empire	● Install variable message sign on Bend Parkway northbound at Empire Boulevard (*ODOT, Bend*)	Funding identified in draft 2021-2024 STIP.
DC-TM-08C: Bend Parkway: Revere Avenue to Franklin Avenue	● Install fiber optic cable along Bend Parkway between hub at Revere Avenue/Wall Street and Franklin Avenue (*ODOT, Bend*)	Not started

#/Title	Description (*stakeholders listed at end*)	Capital Cost
DC-TM-08D: Bend Parkway: Empire Avenue to Cooley Road	● Install fiber optic cable along Bend Parkway between Empire Ave and Cooley Ave ● Connect to existing interconnect along Robal Road ● Upgrade traffic signal controller at Robal Road/Berg Lane *(ODOT, Bend*)	Partially complete. Full implementation expected as part of US97 North Corridor project.
DC-TM-11C: Hwy 97 (Bend to Redmond) Safety and Efficiency Improvements	This project will deploy electronic message signs to support incident management and traveler information. (*ODOT*)	Not started.
DC-TM-11D: VMS: The Dalles-California Highway northbound at Cooley	● Install variable message sign on The Dalles-California-Highway northbound at Cooley Road ● On hold pending US 97 Bend North Corridor EIS (*ODOT, Bend*)	Not started. May be component of US97 North Corridor project.
DC-TM-12C: Hwy 97 (South of Bend) Safety and Efficiency Improvements	This project will deploy video monitoring camera(s) with pan-tilt-zoom control near the ODOT weigh in motion station south of Bend. (*ODOT*)	Complete
DC-TM-13B: Northeast Ring: 27th to Empire	● Install fiber optic cable along NE 27th Street between NE Neff Road and NE Butler Market Road ● Install fiber optic cable along Empire Avenue between Region 4 TOC and NE Purcell Boulevard ● Install fiber optic cable along future Empire Avenue extension between NE Purcell Boulevard and NE 27th Street ● Install fiber optic cable along NE Purcell Boulevard between Empire Avenue and NE Butler Market Road traffic signal ● Project provides a redundant path back to the ODOT Region 4 TOC and communications for future traffic signals (*ODOT, Bend*)	Partially complete
DC-TM-16: Hwy 20 (Bend to Sisters) Safety and Efficiency Improvements	Hwy 20 (Bend to Sisters) Safety and Efficiency Improvements (*ODOT*)	Not started
DC-TM-17A: Reed Market Road from Bend Pkwy to 3rd St	● Install fiber optic cable along Reed Market Road between Bend Parkway southbound ramps traffic signal and 3rd Street/The Dalles-California Highway ● Upgrade traffic signal controller at Reed Market Road/Bend Parkway southbound ramps ● Connect to existing interconnect along 3rd Street/The Dalles-California Highway to Wilson Avenue ● Install PTZ camera on Bend Parkway south of Reed Market Road ● Install wireless communications to PTZ camera (*ODOT, Bend*)	Partially complete
DC-TM-17B: Reed Market Road: 3rd Street to 27th Street	● Install fiber optic cable along Reed Market Road between 3rd Street and 27th Street ● Project provides a redundant path and communications to traffic signals at: 1. Reed Market Road/SE 9th Street 2. Reed Market Road/SE 27th Street 3. Reed Market Road/SE 15th Street (*Bend*)	Not started
DC-TM-17C: Reed Market Road - Travel Time Performance Measurements	This project will deploy devices to measure travel times for traveler information and performance measurement assessment. (*ODOT, Bend*)	Not started

#/Title	Description (*stakeholders listed at end*)	Capital Cost
DC-TM-18: Expand the Incident Response Program - Plans	This project supports incident management in Deschutes County and includes identification of detour routes, management of traffic on Highway 97 and Highway 20 through Bend and Redmond to support the movement of north-south and east-west freight through Oregon. The program will include incident signal timing plans, electronic message signs, and congestion monitoring to support the incident responders and management of the roadway network during incidents. (*ODOT, Bend, Redmond, Deschutes County*)	Partially complete. Have Regional TIM team and connected 911 systems.
DC-TM-19C: Advanced Rail Warning System - Additional Bend and Redmond locations	Bend (China Hat Road, Brosterhous Rd, Cooley Rd), Redmond (Hemlock Ave, King Way) (*ODOT, Bend, Redmond, Deschutes County, 911 Center*)	Not started
DC-TM-19D: Advanced Rail Warning System - Message signs and in-vehicle communications	Transmit advanced crossing occupancy information to the public via message signs or in-vehicle navigation systems (assumes 12 VMS signs and 12 local transmission devices for in-vehicle navigation). (*ODOT, Bend, Redmond, Deschutes County, 911 Center*)	Not started
DC-TM-30: State Highway 372/Colorado-Arizona Couplet	● Install fiber optic cable between Bend Parkway and traffic signal at Colorado Avenue/State Highway 372/Bend Parkway southbound ramps ● Install VDSL on existing twisted pair to traffic signals along Colorado-Arizona Couplet ● Upgrade traffic signal controllers at: 1. NW Colorado Avenue/State Highway 372/Bend Parkway southbound ramps 2. NW Colorado Avenue/State Highway 372/NW Bond Street 3. NW Colorado Avenue/State Highway 372/NW Wall Street 4. NW Colorado Avenue/State Highway 372/SW Industrial Way 5. NW Arizona Avenue/State Highway 372/NW Wall Street 6. NW Arizona Avenue/State Highway 372/NW Bond Street (*ODOT, Bend*)	Project programmed in 2018-2021 STIP using FHWA ATCMTD grant.
DC-TM-31: VMS: McKenzie-Bend Highway westbound at Cooley	● Install variable message sign on McKenzie-Bend Highway westbound at Cooley (*ODOT, Bend*)	Not started
DC-TM-32: Communications to Remote Traffic Signals	● Install communications to: 1. Existing traffic signal at NE Butler Market Road/NE Boyd Acres Road 2. Existing traffic signal at NE 8th Street/NE Penn Avenue 3. Possible future traffic signal at NE Butler Market Road/NE 4th Street 4. Possible future traffic signal at SE Wilson Avenue/SE 9th Street. (*Bend*)	Partially complete. Funding programmed for RAB at Wilson/9th instead of traffic signal.

#/Title	Description (*stakeholders listed at end*)	Capital Cost
DC-TM-33: Wall Street and Bond Street Wireless	● Install wireless on NW Wall Street and NW Bond Street between Greenwood Avenue and Franklin Avenue ● Upgrade traffic signal controllers at: 1. NW Wall Street/Greenwood Avenue 2. NW Wall Street/NW Oregon Avenue 3. NW Wall Street/Franklin Avenue 4. NW Bond Street/Greenwood Avenue 5. NW Bond Street/NW Oregon Avenue 6. NW Bond Street/Franklin Avenue ● Possible inter-agency communications with Bend City Hall (*Bend)*	Wireless/celluar connection to be installed in 2019.
DC-TM-42: Speed Photo Enforcement	Install speed photo enforcement at the following locations: ● Mt Washington Drive, south of Simpson ● Empire Avenue, east of Boyd Acres ● Brookswood Boulevard, south of Powers Road (*Bend*)	Not started
DC-TM-45: Red Light Cameras	Install red light cameras at the following locations: ● 3rd Street/Reed Market Road ● 3rd Street/Franklin ● 3rd Street/Greenwood ● 3rd Street/Empire ● Powers Road/US 97 (*Bend*)	Not started
DC-EM-01B: Deschutes County 911 Communications	● Install fiber optic cable along 3rd Street/The Dalles-California Highway and Jamison Road or McKenzie-Bend Highway between Empire Avenue and Deschutes County 911 facility ● Connect to Deschutes County 911 ● Connect to existing PTZ camera near Bend Parkway/Highway 20 interchange ● Possible inter-agency communications with Bend Fire Department, Deschutes County Sherriff, and Oregon State Police (*Deschutes County)*	Not started
DC-EM-05: Traffic Adaptive Emergency Response	Deploy an integrated emergency response system that provides for pre-trip planning, en-route guidance (static route plan), and dynamic route guidance (traffic-adaptive route plan) for emergency vehicles. (*ODOT, Bend, Redmond, Deschutes County, Deschutes County 911*)	Not started
DC-EM-07: Responder Video System	Provide emergency responders with video cell phones and develop a link to the TOC to link video to other agencies. (*ODOT, Bend, Redmond, Deschutes Co., OSP*)	Not started
DC-EM-09: Advanced Emergency Vehicle Routing	Provide emergency vehicle priority between St. Charles Hospital and the Bend Airport. (*ODOT, Bend, Redmond, Deschutes County*)	Not started
DC-IM-01: Regional Data Management System	Implement a data management system for archiving data, collecting real-time data, and accessing data. The system should have geospatial capabilities and data should include at a minimum traffic counts, speed data, accidents (vehicles, pedestrians, and bicycles), traffic enforcement data, incident information, and transit information. (*ODOT, Bend, Redmond, Deschutes County*)	Alternatives analysis and Framework complete. Steering Team to be formed to guide implemention.
DC-MC-04: Portable Construction Zone Equipment	Deploy moveable dynamic message signs and variable speed limit signs for use in work zones. (*ODOT, Bend, Redmond, Deschutes County*)	Not started

#/Title	Description (*stakeholders listed at end*)	Capital Cost
DC-MC-05: Maintenance Vehicle Tracking	Deploy GPS/AVL equipment in maintenance vehicles (e.g. snow plows). Provide route information for coordinating maintenance between agencies. Additional functionality could include environmental sensors (e.g. road temperature) (*ODOT, Bend, Redmond, Deschutes County*)	Partially complete
DC-MC-06: Automated Maintenance Logging System	Implement a system to automate coding of maintenance needs (e.g. potholes, wildlife removal, damaged signs) from vehicles. (*ODOT, Bend, Redmond, Deschutes County*)	Not started
DC-MC-07: Portable Sidewalk Closure Message System	Develop and deploy a sidewalk closure audible message system to re-route pedestrians and meet ADA requirements. (*Bend*)	Not started
DC-PP-01: Road Weather Conditions (previously DC-AVS-01)	Install short-range communications equipment at weather stations to transmit road conditions (pavement temperature) to vehicles. (*ODOT, Deschutes County*)	Not started
DC-PP-02: Congestion Warning System (previously DC-AVS-02)	Deploy warning systems devices at entry points into urban areas to warn drivers of upcoming signals/queues. (*ODOT*)	Not started
DC-PP-03: Intersection Collision Avoidance (previously DC-AVS-03)	Install short-range communications to transmit traffic controller information to in-vehicle collision avoidance systems. (*ODOT, Bend, Redmond*)	Not started
DC-PP-04: Wildlife Detection (previously DC-AVS-04)	Deploy wildlife detection equipment and short-range communications to transmit warnings to in-vehicle systems. (*ODOT, Deschutes County*)	Not started
DC-PP-05: Ambulance-Hospital Information System (previously DC-EM-04)	Enable the exchange of real-time information (video, audio, and data) between first responders and hospitals through the regional communication network (St. Charles micro-wave communication system). (*St. Charles Hospital, Deschutes County, Bend, Redmond*)	Funded by St. Charles and Deschutes County
	Capital Cost for Aspirational Projects	***$14,180,000 to $21,155,000***

Source: *Deschutes County ITS Plan Update*

Access Management

The two main functions of a roadway are to:

1) provide access to adjacent properties, and

2) provide mobility to travelers.

Access management is the practice of balancing access and mobility based on a roadway's functional classification while also preserving the safety and efficiency of the transportation system. For instance, few access points are provided along interstate freeways to provide for high-speed travel while numerous access points are provided on local streets as entry points to residential properties. Research has shown that effective access management can provide the following benefits[47]:

- Up to 50-percent reduction of crashes
- 23- to 45-percent increase in roadway capacity
- 40- to 60-percent reduction in travel time and delay

Jurisdictions within the Bend MPO should adopt access management standards and develop access management plans along arterial and collector roadways that include some of the following strategies:

- Regulate access spacing minimums based on functional classification: between public roadways, between private approaches, and between public roadways and private approaches.
- Regulate spacing between traffic signals.
- Limit the number of approaches per property frontage based on development type and size.
- Regulate the width, apron size, radii, and vertical geometry of approaches based on development type.
- Limit access to the lower functionally classified roadway for properties that abut more than one roadway.
- Require developers to provide site designs with adequate internal circulation.
- Provide incentives for adjacent properties to share access points and provide circulation between properties.
- Develop guidelines for the use of median treatments: continuous two-way left turn lanes and non-traversable medians

At a minimum ODOT's access management policies should be met along state highways. More stringent standards may be developed if deemed applicable by the local jurisdiction.

Access management plans for implementation along specific corridors should include both short-term and long-term strategies. Since strict adherence to the adopted access management standards may adversely affect or limit access to existing land uses (particularly businesses), it is extremely important to work individually with each property owner to meet their access needs. The short-term access management plan

[47] *Access Management Manual*. Transportation Research Board, National Academy of Sciences, 2003.

should include strategies for improving approach locations and circulation for the existing properties along a corridor while also working towards the adopted access management standards, improved safety, and better efficiency. The long-term access management plan should include strategies for access and circulation that may be applied if and when new development or redevelopment occurs in the future so that the plan may be used to gradually improve safety and roadway operations as opportunities arise.

Parking Management

Parking, whether on-street (curbside) or off-street (parking lots and garages), is an important aspect of the transportation system because motorists must physically store their vehicles somewhere in between trips. The management of parking can have significant impacts on the safety and efficiency of the transportation network. Although on-street parking often provides convenient access to adjacent land uses it is responsible for approximately one out of every five non-freeway accidents in cities every year[48]. It also reduces the capacity of the roadway by approximately one-third because the act of parking a vehicle and the presence of vehicle passengers in the roadway before and after parking physically restricts other vehicular movements, particularly in the lane adjacent to the on-street parking. When located too close to an intersection on-street parking may also reduce intersection sight distance.

Effective parking management can help balance mobility and safety with parking demand. The following parking management strategies should be considered for the Bend MPO:

- Allow or prohibit on-street parking based on functional classification.
- In core urban areas develop parking zoning as appropriate: short-term, long-term, no parking, no stopping or standing, loading, taxi, bus, permits, and public agency.
- Establish a minimum distance from intersections for no-parking zones based on functional classification and traffic control (e.g. stop control vs. traffic signal).
- Prohibit on-street parking adjacent to bicycle lanes where possible to reduce conflicts. Use parking bays or other designs from the *Oregon Bicycle and Pedestrian Plan* when both bicycle lanes and on-street parking need to be accommodated.
- Regularly monitor and update off-street parking requirements for private developments.
- Provide incentives for shared parking at commercial and retail developments.
- Establish thresholds for constructing public agency managed off-street parking facilities.
- Adhere to adopted access management standards for the location and design of approaches to off-street parking facilities.

[48] *Traffic Engineering Handbook, 5th ed*. Institute of Transportation Engineers, 1999.

Parking may also be managed using the following transportation demand management strategies, which are aimed at altering travel behavior by reducing the demand on the roadway network particularly during peak periods:

- Reduce the availability of long-term parking in downtown and other core urban areas.
- Develop pricing strategies that charge the true cost of parking or that vary by time of day (e.g. higher prices during peak periods).
- Develop parking fines that discourage violation of parking time limits.
- Expand parking enforcement activities.
- Provide incentives for constructing park and ride facilities outside the core urban area for use with employer ride-share programs or a public transportation system.

The *Deschutes County ITS Plan Update* includes a Long-term timeframe project for a downtown Bend parking management system (DC-TM-06) that monitors occupancy in the parking garage, alerts travelers if the garage is full, and provides guidance to alternate available parking.

Traffic Signal Management and Operations

Approximately 60 traffic signals are used to control vehicular and pedestrian traffic in the Bend MPO and as many as 10 may be installed during the next 20 years. Traffic signals are primarily used to control the movement of traffic in an orderly manner at intersections with high volumes of vehicular traffic. They may also be used at locations with high pedestrian volumes, at school crossings, or at locations with crash histories that may benefit from a traffic signal. The management and operation of traffic signals greatly impacts the efficiency of the transportation network. It is estimated that poor signal timing accounts for five to ten percent of all traffic delay, but the good news is that traffic signal timing optimization projects typically have a 40:1 benefit-to-cost ratio[49]. Coordinated signal timing projects in Oregon have yielded the following benefits:

- 10- to 40-percent reduction in stops
- 15- to 45-percent reduction in delay
- 5- to 25-percent reduction in travel time
- Up to 15-percent increase in corridor travel speeds
- Up to 15-percent reduction in fuel consumption

To optimize system efficiency the Bend MPO should implement the following traffic signal management and operations strategies:

- Remove unnecessary traffic signals. Changes in land use, reduced travel demand, or geometric improvements may eliminate the need for a traffic signal that was once warranted. An engineering study should be conducted based on *MUTCD*[50] guidelines to determine whether a traffic signal should be removed and the

[49] *National Traffic Signal Report Card, Executive Summary*. National Transportation Operations Coalition, 2012.

[50] *Manual on Uniform Traffic Control Devices, 2009 Edition*. U.S. Department of Transportation, Federal Highway Administration, 2009.

appropriate traffic control that should be used in its place.

- Install new traffic signals when warranted. Intersections should be evaluated using the *MUTCD* traffic signal warrants to determine if and when new traffic signals should be installed. Most often new traffic signals will be warranted due to changes in land use that result in increased travel demand.
- Utilize traffic signal hardware and software that support desired functionality. Advances in technology in the past few years have led to the availability of traffic signal hardware and software with more options available than ever before. The *Deschutes County ITS Plan Update* identified the following key features of a traffic signal system that will help optimize traffic signal operations in the Bend MPO: remote control and monitoring capability, controller error processing, and report generation. The recent completion of the Central Signal System Project in Bend addressed these key features.
- Implement traffic signal preemption/priority. "Preemption" causes a traffic signal to switch from normal operations to a special mode to allow passage of a vehicle class (e.g. emergency vehicles, trains) and "priority" is the preferential treatment of a vehicle class (e.g. transit) by a traffic signal that may occur if it does not disrupt normal operations. Preemption is currently used at the majority of the traffic signals in the Bend MPO for emergency vehicles (except police) but there is room for enhancements. Preemption techniques should be used in the Bend MPO to enhance emergency vehicle operations and priority techniques should be used to enhance transit operations.
- Implement coordinated signal timing where applicable. Various signal timing methods are available for optimizing the operations of closely spaced traffic signals. Traditional time-of-day coordination uses pre-set timing plans that are activated at certain times of the day (e.g. AM peak, midday, PM peak). Traffic responsive coordination uses real-time traffic volumes to select pre-set timing plans based on volume thresholds. Traffic adaptive coordination uses advanced signal controller technology to adjust signal timings in real-time based on real-time traffic volumes. Although traffic responsive and adaptive coordination are relatively new, all methods strive to provide continuous green time to heavy volumes on the mainline while also serving side street traffic in a timely manner.
- Periodically update signal timing. National guidelines recommend updating traffic signal timing regularly to accommodate growth and traffic pattern changes[51]. This includes updating timings for both coordinated and isolated traffic signals.
- Investigate the use of automated stop enforcement. Technology is available to detect when vehicles run a red light, to document this violation using cameras, and to automatically issue a ticket to offenders. The Bend MPO should evaluate the effectiveness of automated stop enforcement in other metropolitan areas in Oregon (e.g. Beaverton, Medford) and determine its applicability to Bend. The use of automated stop enforcement in Bend would require the adoption of supporting legislation.

[51] *National Traffic Signal Report Card, Executive Summary*. National Transportation Operations Coalition, 2012.

The *Deschutes County ITS Plan Update* includes the following projects that support traffic signal management and operations (see Table 9.1 for more details):

- Preemption/priority for emergency vehicles, transit, and roundabouts (Projects DC-EM-01B and DC-EM-09)
- Advanced signal timing improvements on Hwy 97 Business (3rd), Hwy 20, Greenwood, Newport, 27th, Empire, Knott, and Reed Market (Projects DC-TM-02A, DC-TM-02B, DC-TM-07A, DC-TM-07C, DC-TM-13B, and DC-TM-17A, DC-TM-17B)

Additional projects or programs may be needed to review warrants for removing or installing traffic signals and for performing periodic traffic signal timing updates.

Speed Management

Uniform travel speeds consistent with a roadway's design provide for the safest and most efficient transportation system operation. Posted speeds are used to supply guidance to drivers in unfamiliar locations, discourage unreasonable driving behavior, and provide law enforcement with a means to identify excessive speeds. In 2012 travel speeds too fast for roadway conditions contributed to approximately 12 percent of all crashes in the Bend area and were also a contributing factor in one of the area's three fatalities[52]. Speeding traffic can also erode the livability of neighborhood streets. The following speed management strategies should be considered for use in the Bend MPO to reduce speed-related crashes:

- Driver Feedback Speed Signs: Driver feedback speed signs provide drivers with the speed limit (static information) and the driver's actual speed (real-time information) based on radar detection or other measurement methods. These signs have proven effective in reducing speeds because often drivers are not aware they are speeding until they see their actual speed. Driver feedback speed signs can be installed permanently or can be moved around on a temporary basis using trailers.
- Variable Speed Limit Systems: Variable speed limit systems use sensors to monitor real-time traffic conditions (e.g. prevailing travel speeds and volumes) and/or weather conditions and post appropriate enforceable speeds on dynamic message signs. Speeds may also be set manually based on other factors such as work zone activity. ODOT has successfully been using variable speed limit signs throughout Oregon to reduce travel speeds in work zones during lane restrictions and working hours.
- Automated Speed Enforcement: Technology is available to detect vehicles traveling faster than the posted speed and to automatically issue a ticket to offenders. The Bend MPO should evaluate the effectiveness of automated speed enforcement in other areas of Oregon and determine its applicability to Bend. The use of automated speed enforcement in Bend would require the adoption of supporting legislation.
- Traffic Calming: Numerous traffic calming techniques are available and have proven effective in reducing travel speeds and cut-through traffic on collectors and local

[52] *2012 Oregon Traffic Crash Summary*. Oregon Department of Transportation, Transportation Data Section, Crash Analysis and Reporting Unit, September 2013.

roadways. Techniques include speed humps, traffic circles, traffic barriers, narrowed travel lanes/roadway cross-sections, wider sidewalks, curb extensions, pedestrian refuge islands, planted medians, turn restrictions, or a combination of these techniques. Area wide traffic calming treatments are often needed to ensure traffic problems on one roadway are not shifted to an adjacent roadway. The use of traffic calming elements in the design of new roadways can minimize the need for future enhancements.

The *Deschutes County ITS Plan Update* includes speed management strategies within three of the projects. The Speed Photo Enforcement project (DC-TM-42) incorporates speed photo enforcement on Mt Washington Drive, Empire Avenue, and Brookswood Boulevard, and the Century Drive Safety and Efficiency Improvements project (DC-TM-09) includes both variable speed limit signs and speed photo enforcement on Century Drive and the Portable Work Zone Equipment project (DC-MC-04) includes the use of variable speed limit signs in work zones.

Geometric Improvements

Often geometric improvements can be a cost-effective means of improving the safety and efficiency of the existing transportation system. Changing traffic conditions and piecemeal development often impact the operation of existing roadways and intersections. The Bend MPO should consider the use of the following strategies for improving geometric design based on site specific engineering evaluations:

- Realign roadways to enhance sight distance and reduce skew at intersections.
- Trim vegetation to enhance sight distance.
- Provide channelization for left turn movements, right turn movements, and bus movements. Channelization may be provided using striping, medians, islands, and pullouts.
- Consider lane use restrictions during peak periods. For example, the prohibition of left turns when suitable alternate routes are available may improve safety and reduce travel delay at some intersections.
- Re-stripe travel lane widths.
- Add or enhance destination signing at activity centers and intersections.
- Improve or remove modal crossings (e.g. at-grade rail crossings).

Geometric improvements are included in a number of projects in the Motor Vehicles chapter and the *Deschutes County ITS Plan Update* includes four advanced rail warning system project (DC-TM-19A, DC-TM-19B, DC-TM-19C, and DC-TM-19D) to deploy railroad crossing train detection and warning systems.

Value Engineering and Systems Engineering

Both value engineering and systems engineering are methodical processes used during project development and design to ensure the final product effectively meets user needs in a cost-efficient means. Value engineering is "the systematic application of recognized

techniques by a multi-disciplined team which identifies the function of a product or service; establishes a worth for that function; generates alternatives through the use of creative thinking; and provides the needed functions, reliably, at the lowest overall cost.[53]" The FHWA requires a value engineering assessment on all federal-aid transportation projects with a cost greater than $25 million and have found that value engineering provided a return on investment ranging from 80:1 to 146:1 for fiscal years 2009 through 201244. Systems engineering is an offshoot of value engineering that focuses on projects that include technology. The FHWA requires a systems engineering analysis commensurate with the project scope for all ITS projects that use federal funds. Research has shown that projects that utilize systems engineering improve overall project cost performance (actual cost versus planned cost) whereas the actual costs on projects that do not use a systems engineering approach are 50 percent over planned costs on average[54].

The following strategies should be used for efficient and cost-effective transportation project delivery in the Bend MPO:

- Use value engineering or systems engineering per FHWA guidelines on all federal-aid projects.
- Develop thresholds (e.g. overall project cost) and criteria for determining when to use a full value engineering or systems engineering approach on a project.
- Develop scaled-back value engineering and systems engineering approaches for smaller projects.
- Utilize the "ITS Systems Engineering and Architecture Compliance Checklist" that ODOT developed for use on ITS projects deployed in Oregon.

Asset Management

Asset management is a systematic process of maintaining, upgrading, and operating physical assets cost-effectively. It combines engineering principles with sound business practices and economic theory, and it provides tools to facilitate a more organized, logical approach to decision-making.[55]" Although not a new concept, asset management has become increasingly important because today's transportation system is characterized by a combination of aging infrastructure and new technologies, high system user demand, tight budgets, limited agency resources, and public accountability. The Bend MPO should utilize the following asset management strategies to maximize the functionality and prolong the life of the MPO's assets:

- Perform preventative maintenance to prolong the life of existing infrastructure.
- Use life-cycle cost analysis to determine the useful life span of infrastructure based on all associated costs (initial, operations, maintenance) and salvage values.

[53] *Value Engineering*. U.S. Department of Transportation, Federal Highway Administration. http://www.fhwa.dot.gov/ve/. Accessed July 3, 2014.

[54] Eric Honour, "Understanding the Value of Systems Engineering", 2004.

[55] *Asset Management: Advancing the State of the Art into the 21st Century Through Public-Private Dialogue.* Federal Highway Administration and the American Association of State Highway and Transportation Officials, 1996.

- Utilize tools used at the state and federal level such as FHWA's Highway Economic Requirements System (HERS) software.
- Develop asset management programs for major infrastructure such as pavement, bridges, traffic signals, and ITS field devices.

Many of the projects included in the Deschutes County ITS Plan Update include aspects that help improve asset management such as remote monitoring and surveillance capabilities and automated systems (e.g. roadway treatment in winter, speed enforcement). The following *Deschutes County ITS Plan Update* projects focus specifically on asset management:

- Maintenance Vehicle Tracking (DC-MC-05)
- Automated Maintenance Logging System (DC-MC-06)
- AVL/CAD Transit Management System (DC-PTM-01)

Chapter 10: Transportation Demand Management

Introduction & Overview

Transportation Demand Management (TDM) is a strategy to maximize the efficiency of the urban transportation system by discouraging unnecessary private vehicle use, managing the use of the existing system more efficiently, and promoting alternatives to the single occupant motor vehicle. TDM strategies can be more cost-effective than capital investments in new roads or parking lots.

TDM strategies focus on changing travel behavior – trip rates, trip length, travel mode, time-of-day, etc. – generally in order to reduce traffic during congested (peak) periods. TDM strategies generally focus on reducing travel in automobiles and light-duty trucks. The Federal Highway Administration has conducted studies that demonstrate the effectiveness of various TDM strategies.[56]

Some TDM measures require large-scale system changes (e.g., new transit routes), while others can be implemented on a local or site-by-site basis. When TDM is implemented on a site-by-site basis through land use and zoning, the focus is typically on creating supportive infrastructure or employer-based incentives. In the Bend MPO, some aspects of TDM are already required by the Bend Development Code, such as minimum bicycle parking, and others are encouraged by providing incentives such as trip or parking reduction in exchange for the provision of showers, locker, carpool parking and extra bicycle parking.

Because the land use process usually involves a one-time decision, it lends itself more easily to reviewing these types of built improvements. Programmatic TDM measures that require ongoing monitoring are more challenging to implement through land use review. TDM strategies can vary from voluntary to regulatory programs and can be focused on specific areas such as institutions or office parks.

Table 10-1 Examples of Development-Related TDM Measures

TDM-Supportive Infrastructure	**Programmatic TDM**
Pedestrian or transit oriented design	Subsidized transit passes for employees
Parking maximums (discussed in Ch. 14)	Parking pricing
Minimum bicycle parking standards	Provision of emergency rides home
Mobility Hubs	Car-sharing programs
Transit amenities (bus shelters, etc.)	Rewards for non-auto trips

[56] http://www.fhwa.dot.gov/environment/air_quality/conformity/research/mpe_benefits/mpe03.cfm

TDM Strategies for VMT Reduction

The MPO modeled the effects of the following TDM strategies:

- TDM programs in key areas/institutions (Juniper Ridge, Central Oregon Community College, OSU Cascades, Downtown Central Business District, Central Area, and Medical Overlay District/St. Charles)
- High capacity transit routes on 3rd Street and Highway 20/Greenwood
- Introduction of Mobility Hubs[57] in all 4 quadrants of the City
- Parking pricing in Downtown (see Chapter 14)

All of these strategies showed a significant contribution to managing MPO-wide VMT per capita, helping projections of future VMT per capita stay below a 5% increase over 2010 levels to meet State planning regulations.

Existing Transportation Demand Management Programs

Commute Options is the region's primary TDM program. Commute Options is a non-profit agency that supports and coordinates a variety of TDM strategies and programs. It facilitates vanpools, carpools, park and ride lot development, bike corrals, pedestrian facilities and marketing for transit. It administers the Get There program and commute options partner and rewards programs. It also delivers the educational components of the Safe Routes to Schools program.

- Get There is an online rideshare and TDM tracking program in Oregon, Idaho, and Washington. It provides a tool to aid in organizing carpools and identifying other bike riders. It provides estimated cost savings that result for traveling by a mode other than single-occupancy motor vehicles.
- Commute Options Partners is a program that organizes employers to participate in TDM activities. Transportation Coordinators are designated at the member business or organization to facilitate employee participation in Get There.
- Commute Options Reward Program offers reward to employees of organization that are registered in the Commute Options Partners program.

[57] Mobility hubs are physical locations where people can make seamless connections between public transit and other travel options such as ride-share, bicycle/scooter rentals, etc. Each mobility hub can be designed specifically for the surrounding community it serves, ultimately making it easier for residents, employees, and visitors to use transit to travel from home to work and a wide variety of destinations in between. A mobility hub area includes not just the transit station itself but all those services and destinations that are accessible within a 5-min walk, bike, or drive to/from high-frequency transit.

Policies

The region has specific goals and policies outlined within the local transportation plans that are specifically related to TDM. The following polices are applicable to the Bend Metropolitan planning area.

1. In coordination with the City of Bend, the MPO will develop a program to require larger institutions and businesses to implement and track a TDM plan that outlines targets, strategies, and evaluation measures to reduce vehicle miles traveled and reduce single-occupancy vehicle trips, particularly at peak hours.

2. In coordination with the City of Bend, the MPO will establish Mobility Hubs in all four quadrants of the City, in the core, and in regional centers to improve the accessibility of all forms of transportation and transportation technologies.

3. In order to increase transportation options and support existing and planned land uses, in coordination with the City of Bend, the MPO will work with Cascades East Transit to improve the efficiency and effectiveness of existing services in Bend, expansion of services to underserved areas and support for regional systems that encourage residents of nearby communities to travel to Bend by public transit.

4. In coordination with the City of Bend, the MPO will plan, prioritize, and implement needed improvements on corridors identified for high-capacity transit, including complete street elements and signal prioritization

Chapter 11: Truck Freight Systems

Introduction

Truck freight systems serve a vital role in the economy of Bend's Metropolitan planning area. The majority of movement of raw and finished goods is moved via truck, and efficient truck mobility is crucial to the economy of the region.

Facilities and Designations

Freight routes and networks are designated on a number of different levels, such as federal, state, and local, and are based on characteristics such as annual truck tonnages and connectivity (to other routes, local land uses, and significant freight generating areas). The designation of a freight route at any level generally has implications for roadway design and mobility standards.

There are currently two designated state freight routes within the Bend MPO area: U.S. 97 and U.S. 20, also referred to as "freight strategic corridors" in the Oregon Freight Plan. These corridors carry moderate freight volumes as compared to interstate highways within Oregon, but the Oregon Freight Plan identifies them as critical and strategic because they provide redundancy in the freight system, acting as secondary north-south and east-west cross-state highways. U.S. 20 is a significant secondary corridor for most industries in terms of tonnage shipped over relatively long distances, while the U.S. 97 corridor carries relatively high-value products in the Agriculture, Forestry and Fishing industry group and the Food Manufacturing industry group.

Designated federal truck routes in the MPO include the Bend Parkway portion of Highway 97 (MP 130 to MP 144) and Highway 20 (through the entire MPO area). Additionally, Century Drive is identified in the City of Bend's TSP (2001) as a designated truck route. No roadways in the Bend MPO area are part of the National Highway Freight Network, although Critical Urban Freight Corridors (CUFCs) have recently been designated due to their importance in providing access and connection to the national network (see Critical Urban Freight Corridors, page 11-3).

In regards to local truck route designations, it should be noted that in the mid-2000's a freight advisory committee was formed and had identified freight-related issues and developed local and future local route designations for the Bend MPO area. The routes were never formally adopted, however; but it is expected that this work will be used in Phase 2 of this MTP update to establish local truck routes for both the final MTP and the City of Bend TSP update that is currently underway as of July 2019. The benefit of local truck route designations is related to the potential design and operations considerations to accommodate large vehicles (e.g. turning radii and grades). The local freight routes and potential future local freight routes would tie into the regional system and provide additional connections, primarily on arterial roadways. Figure 11-1 on the following page

is from 2007 identifying the regional, and proposed local and future local freight routes at that time.

Figure 11-1: Designated and Proposed Freight Routes in 2007

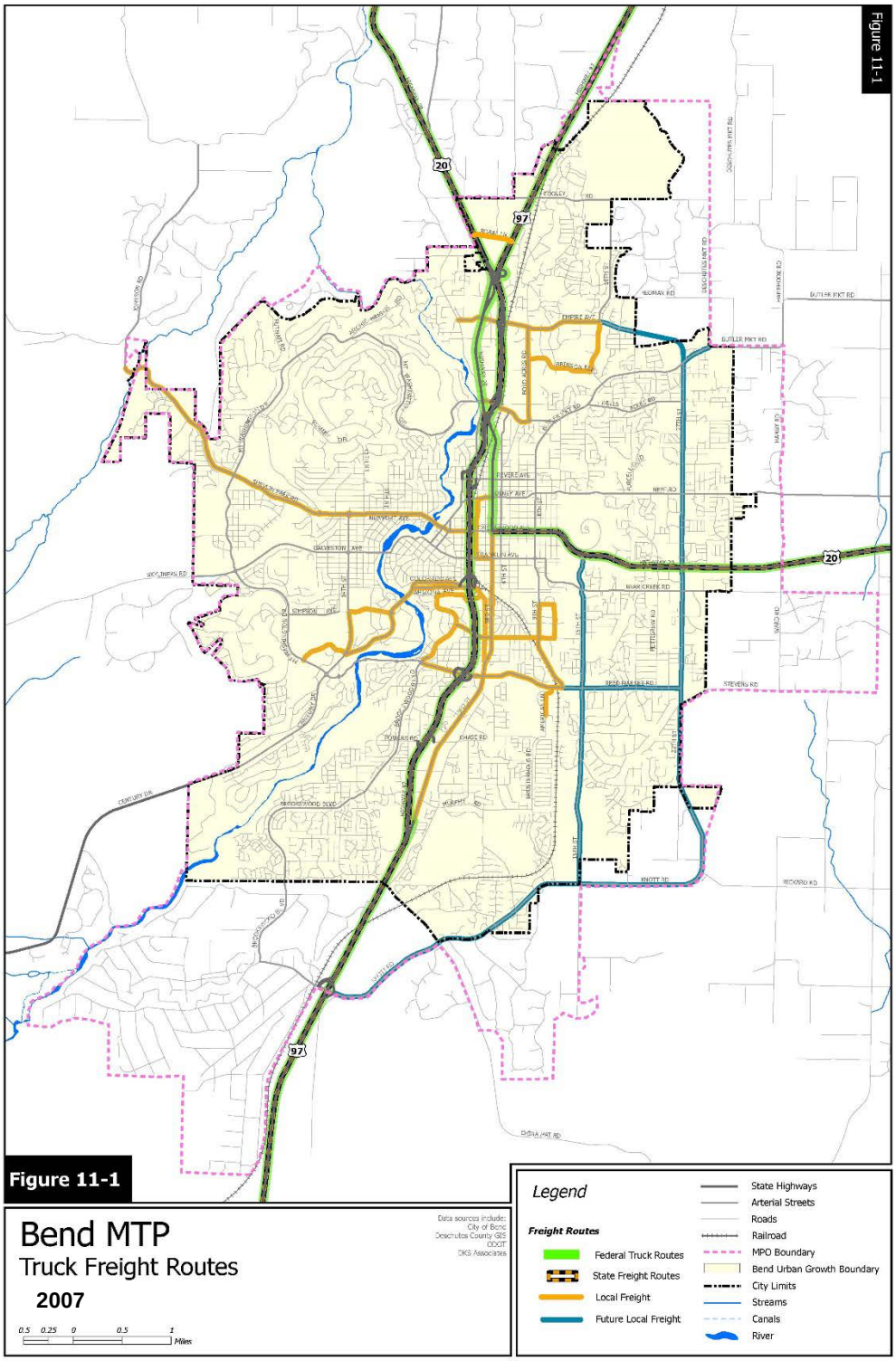


Table 11-1 summarizes available 2017 truck traffic data as a percentage of annual average daily traffic (AADT) at several ODOT automatic traffic recorder stations within the City of Bend. Within the MPO boundary, three recorder stations are located on Highway 97 and two along Highway 20.

Table 11-1: Existing Truck Volumes

Route	Automatic Traffic Recorder Location	2017 Average Annual Daily Traffic (AADT)	Truck %
Highway 97	.30 mile north of Empire Avenue	41,500	4.3
Highway 97	.23 mile south of Revere Avenue	52,800	4.3
Highway 97	.17 mile south of China Hat Road	16,200	10.1
Highway 20	.20 mile west of 27th Street	18,100	16.8
Highway 20	.10 mile east of Powell Butte Road	3,800	26.5

Source: ODOT Traffic Counting, Traffic Volume Table for State Highways 2017

Freight Generators and Receivers

The main truck freight generators in Bend are manufacturing firms that ship their products throughout the region or cross country. A few regional trucking and delivery firms are based in the city. The majority of Bend's existing manufacturing and shipping areas are within 1 ½ miles of US 97 or US 20. The local arterial street system links these areas to the highways to provide movement of freight goods through the City of Bend and onto the state highway system.

Bend's population and role as a regional center has generated the development of large retailers-including supermarkets, vehicle sales, and restaurants—that receive all of their goods by truck. The large retailers are primarily located along US 97 and US 20. Other retailers and service providers that receive large or frequent truck deliveries are on local arterial streets that connect to state highways to prevent heavy vehicle from using neighborhoods routes.

Critical Urban Freight Corridors

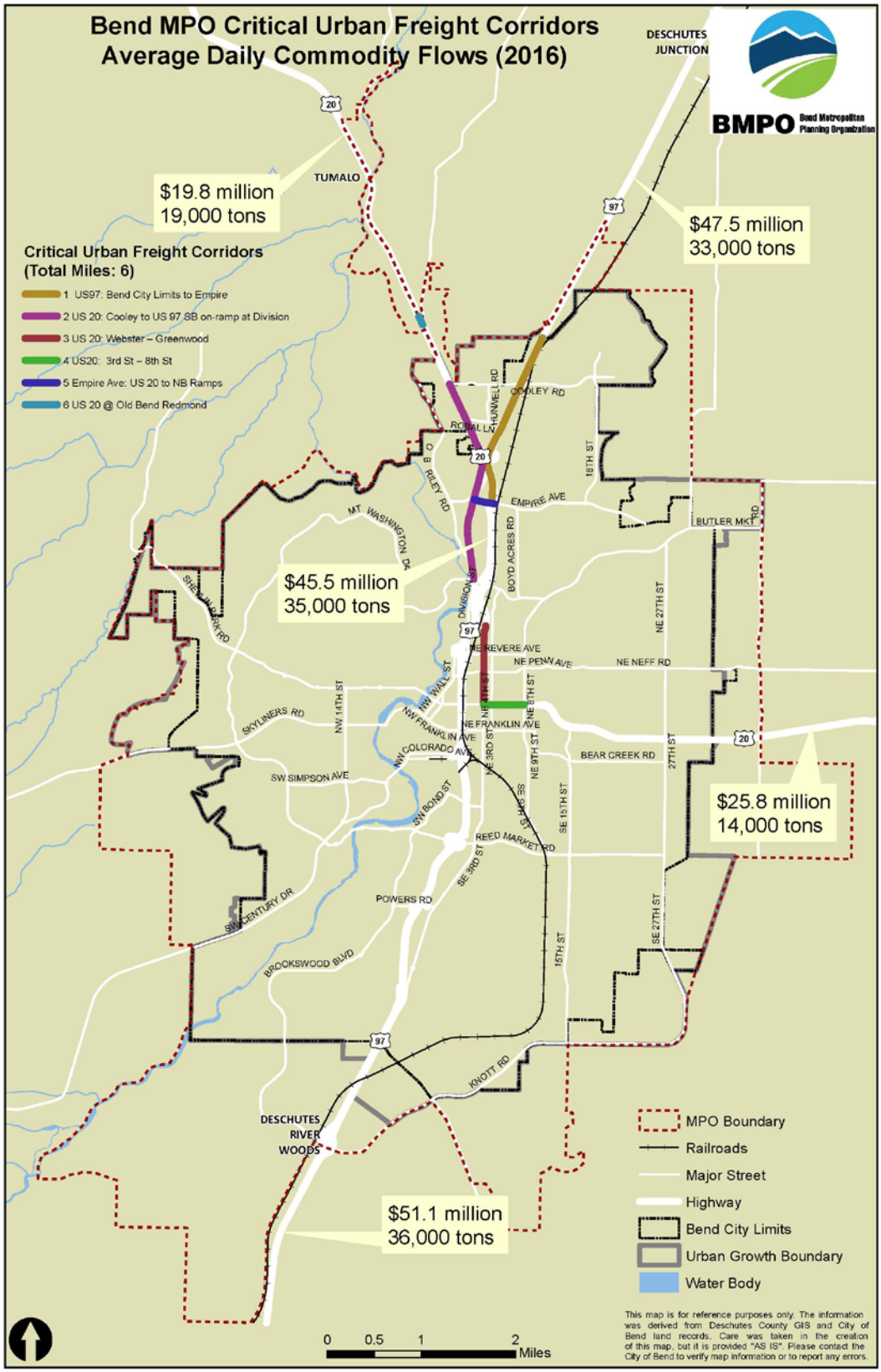
Critical Urban Freight Corridors (CUFCs) are public roads in urbanized (MPO) areas (more than 50,000 population), which provide important connections to the National Highway Freight Network (NHFN). Adding mileage for CUFCs to the state's NHFN allows expanded use of freight-specific federal funding sources for projects that support the national highway and multimodal freight system goals. In 2017, six miles of roadway within the Bend MPO were designated as CUFCs. Table 11-2 lists the Bend MPO CUFCs and includes a description of importance. Figure 11-2 delineates the CUFCs within the Bend MPO and also provides information on average daily commodity flows for Highway 97 and Highway 20, the two designated state freight routes within the Bend MPO area.

Table 11-2: Critical Urban Freight Corridors, 2017

State	Route	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	U.S. 97	Bend north City Limits (MP 133.39)	Empire Ave (MP 135.46)	2.07	Important segment of the U.S. 97 Statewide freight corridor on the north end of Bend that connects U.S. 97 to the City's largest industrial area on Empire Ave. This area experiences congestion, delay and safety issues.
OR	Empire Avenue	U.S. 20 Connection	U.S. 97 NB ramps	0.25	Important freight corridor that connects U.S. 20 and U.S. 97 to the largest concentration of industrial land in Bend. This is a key first/last mile connection to distribution and industrial facilities.
OR	U.S. 20	Cooley Road (MP 17.40)	U.S. 97 SB on-ramp at Division (MP 19.76)	2.36	Important segment of the U.S. 20 Statewide freight corridor. Important connection to distribution and industrial facilities along Empire Ave in Bend. Additionally, there will be significant land use development (light industrial and mixed employment) along this highway segment.
OR	U.S. 20	Webster Street (MP 20.19)	Greenwood Ave (MP 20.99)	0.80	Important segment of the U.S. 20 Statewide freight corridor that experiences congestion and delay.
OR	U.S. 20	3rd Street (MP 0.51)	8th Street (MP 0.94)	0.43	Important segment of the U.S. 20 Statewide freight corridor that experiences congestion and delay.
OR	U.S. 20	Old Bend-Redmond Highway	Old Bend-Redmond Highway	0.09	Important segment of the U.S. 20 Statewide freight corridor that experiences safety and congestion

Source: Oregon Freight Plan, 2017

Figure 11-2: Critical Urban Freight Corridors, 2017



Forecasts and Future Needs

The majority of the truck traffic through the Bend Metropolitan planning area is served by the state highway system. Highway 97 and 20, and 3rd Street (Business 97) are expected to continue to serve as the desired through freight truck routes in the community for the foreseeable future. ODOT is currently developing the U.S. 97 Bend Parkway Plan, which has identified current sections of poor travel time reliability, most notably within the north end of the Bend UGB. Future conditions for the Bend Parkway are that mainline peak hour demand will exceed capacity. Once completed, the U.S. 97 Parkway Plan will be used to inform Phase 2 of this MTP update.

Additionally, the completion of the City's arterial street system will improve the local movement of goods to commercial areas within the City and provide an efficient system of roads to ship products from Bend. The completion of Empire Avenue and planned improvements to Reed Market Road will particularly benefit the major industrial areas in the Bend Metropolitan planning area.

Chapter 12: Transportation Safety

Introduction

Reducing the risk of transportation-related crashes for all users of the system is an important element of the planning process and development of the Bend Metropolitan Transportation Plan. The purpose of this chapter is to identify programs and plans directed at improving transportation safety in the Bend MPO.

Improved safety and security can be achieved by supporting public education, providing response and incident management, monitoring high-risk environments, and help to ensure local jurisdictions use engineering practices on the transportation system that reduce modal conflicts between users.

Transportation Safety Action Plans (TSAPs) were developed in 2019 to study crash trends within the Bend Urban Growth Boundary (UGB) and Deschutes County. These plans are available online[58]. The goals, polices, projects and actions items identified in the TSAPs are incorporated into the Bend MPO MTP, City of Bend TSP and Deschutes County TSP.

Safety Background Information

The purpose of this section is to provide background information on the regulations and policies that guide transportation safety planning and programming within the Bend MPO.

Summary of Federal Requirements

Federal transportation safety MPO-specific regulations are as follows:

- 23 CFR 490.209(c). The MPOs shall establish performance targets for each of the measures identified in §490.207(a) (see Performance Measures, below).
- 23 CFR 490.209(d)(1). The State DOT and relevant MPOs shall coordinate on the establishment of targets in accordance with 23 CFR Part 450 to ensure consistency, to the maximum extent practicable.

[58] http://www.bendoregon.gov/transportationsafety

Performance Measures

To be reported on annually as required for state DOTs and MPOs:

1. Fatalities
2. Fatality Rate (Fatalities/100M Vehicle Miles Traveled)
3. Serious Injuries
4. Serious Injury Rate (Serious Injuries/100M Vehicle Miles Traveled)
5. Nonmotorized Fatalities and Serious Injuries

Note that more detailed information on ODOT performance measures and targets is provided in the 2016 Oregon Transportation Safety Action Plan.

Performance Targets

MPOs can use the state established targets or establish targets specifically for the planning area for performance measures listed above. The Bend MPO is currently using ODOTs established targets, which are based on an S-curve forecast trend using five-year averages to achieve the vision of zero fatalities and life-changing injuries by 2035. The targets are applicable to all public roads in the MPO and must be reported annually. For reference, Table 12-1 below identifies each target baseline and five-year average target for the five performance measures out to 2017-2021 for the entire state of Oregon.

Table 12-1: ODOT Performance Targets (Five-Year Average)[1]

Base Period	Fatalities (People) (2011-2015)	Fatality Rate (People per 100 Million VMT)	Serious Injury (People) (2010-2014)	Serious Injury Rate (People per 100 Million VMT)	Non-motorized Fatalities and Serious Injuries
Baseline	357	1.04	1,491	4.42	234
2013-2017	357	0.94	1,491	4.42	234
2014-2018[a]	350	0.89	1,461	4.33	229
2015-2019	343	0.83	1,432	4.24	225
2016-2020	328	0.78	1,368	4.06	215
2017-2021	306	0.73	1,274	3.78	200

[1]2014-2018 is the first period that targets must be established for the HSIP Program.

Summary of State Requirements

Although the state does not have regulations specific to MPO safety planning, there are requirements related to plan consistency. For example, the Oregon Transportation Plan and its mode, topic, and facility plans, comprise the adopted state transportation systems plan, whereby regional and local TSPs must be consistent with the OTP, including ODOT's 2016 TSAP.

The state has recently updated the Transportation System Plan (TSP) Guidelines where safety is noted as a recommended topic area and goal statement, as well as noting that the road plan element of a TSP ***should*** include a safety analysis. These guidelines apply to the BMPO's federally required Regional Transportation Plan, as it serves as the state required Regional TSP.

Federal and State Safety Legislation

Federal Transportation Safety Requirements

In 1998, the Federal Government passed the Transportation Equity Act for the 21st Century (TEA-21) which focused on programs for highway safety in planning efforts throughout major metropolitan areas. This transportation bill was followed by the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005, which identified the need for each state to develop a Strategic Highway Safety Plan (SHSP) to address fatalities and serious injury crashes on *all* public roads. The SHSP is a major component and requirement of the Highway Safety Improvement Program (HSIP), which is a federal-aid program originally deemed a core program under SAFETEA-LU and continued in the 2012 Moving Ahead for Progress in the 21st Century (MAP-21) Act and the 2015 Fixing America's Surface Transportation (FAST) Act. The HSIP requires all states to develop, implement, evaluate and update an SHSP that identifies and analyzes highway safety problems to guide investment decisions toward strategies and countermeasures with the most potential to save lives and prevent injuries.

Additionally, the FAST Act increased HSIP funding to be administered by state DOTs. ODOT developed and refined a jurisdictionally-blind process called the All Roads Transportation Safety (ARTS) program to make HSIP funding available for *all* public roads, regardless of jurisdiction, using a data-driven approach.

Oregon Transportation Safety Requirements

Oregon's statewide planning goals established state policies in 19 different areas. The Transportation Planning Rule (TPR) implements Goal 12 (Transportation). Goal 12 requires ODOT to prepare a TSP to identify transportation facilities and services to meet statewide needs. The Oregon Transportation Plan and adopted multimodal, mode, topic, and facility plans serve as the state TSP. The TPR requires jurisdictions within MPOs and certain counties to

prepare regional TSPs consistent with the adopted state TSP. Cities and counties must prepare local TSPs that are consistent with the state TSP and applicable regional TSPs. Regional and local TSPs must be consistent with the OTP, including ODOTs 2016 TSAP. The TSAP serves as ODOT's federally required Strategic Highway Safety Plan (SHSP) and provides long-term goals, policies, strategies, and actions to achieve the vision of no deaths or life changing injuries on Oregon's transportation system by 2035.

BMPO Safety Goals and Policies

In addition to the goals outlined in the new federal legislation, the Bend MPO has set goals and polices that emphasize the importance of building, maintaining and operating a regional transportation system (regardless of mode) that is safe for all users. The goals and policies of the Bend MTP were developed based on a review of the existing goals from other regional and local plans (e.g. Oregon Highway Plan, Deschutes County TSP, and City of Bend TSP) and are listed in Chapter 4. The goals were created to guide the future development of roadway network, address safety concerns, and to help select specific projects to address identified safety issues. Stemming from the goals and polices, a series of evaluation criteria have been developed to rank potential projects for the regional transportation system. Evaluation criteria include the ability of a project to address existing safety deficiencies and the ability to support TSM/ITS strategies.

The preliminary safety policies and action items as identified in the City of Bend TSP update process are listed below. These policies have not been adopted at the time of this plan update. This section will be updated to reflect the City of Bend and applicable Deschutes County Goals, Policies and action items as they are adopted through their respective TSP processes.

Draft City of Bend Policies and Action Items

Policy: The City will balance safety, connectivity, and travel time reliability for all modes of transportation in design and construction of transportation projects and in transportation program implementation.

Actions:

- Adopt and implement the 2019 TSAP, including mapping identified emphasis areas.
- Amend the Bend Development Code to ensure that safety mitigation is included as part of development.

Policy: The City will balance safety, connectivity, and travel time reliability for all modes of transportation in design and construction of transportation projects and in transportation program implementation.

Action:

- Adopt and implement the 2019 TSAP, including mapping identified emphasis areas.
- Amend the Bend Development Code to ensure that safety mitigation is included as part of development

Policy: The City aspires to have no transportation-related fatalities or serious injuries by reducing the number and severity of crashes through design, operations, maintenance, and enforcement.

Action:

- By 2021, the City will develop and adopt an action plan to move the City towards zero traffic deaths or serious injuries (e.g. Vision Zero). The plan will set a clear goal of eliminating traffic deaths and serious injuries among all road users within an explicit timeframe (i.e. 10 years) and actively engage key City departments.

Policy: The City will consider the needs and safety for all users in transportation projects, programs, and funding decisions, to improve safety for vulnerable users. Vulnerable users are transportation system users most at risk in traffic, such as pedestrians, cyclists, and public transportation users – children, older people, and disabled people may be in this category.

Actions:

- The City will plan for, design, construct, and/or reconstruct streets to achieve consistency between motorists' speeds and target speed limits, and prioritize speeding and reckless driving enforcement programs on problematic routes.
- Identify, prioritize, and/or allocate funding for projects and programs to improve safety for vulnerable users.

Policy: The City will consider the needs and safety for all users in transportation projects, programs, and funding decisions, to improve safety for vulnerable users. Vulnerable users are transportation system users most at risk in traffic, such as pedestrians, cyclists, and public transportation users – children, older people, and disabled people may be in this category.

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Actions:

- The City will plan for, design, construct, and/or reconstruct streets to achieve consistency between motorists' speeds and target speed limits, and prioritize speeding and reckless driving enforcement programs on problematic routes.
- Identify, prioritize, and/or allocate funding for projects and programs to improve safety for vulnerable users.

Policy: The City will provide transparent, easy to understand, and effective communication programs to encourage safe travel on the transportation system.

Action:

– Develop a comprehensive public dashboard of data to capture the user experience of the City's Transportation System in a system that integrates data from existing sources, not limited to crash data, with data from new and emerging street monitoring technology and public input.

State of Safety in the Bend MPO

This section summarizes reported crash data (ODOT database) for the Bend UGB and Deschutes County for the period of January 1, 2012 through December 31, 2016. A map of these crash locations is included in Chapter 3 (Existing Conditions) and in the full TSAP posted online. Reported crashes include those resulting in an injury or fatality, as well as those resulting in over $1,500 of property damage. ODOT's crash database provides reported crash characteristics such as date, time, crash type, and roadway conditions. The crashes and characteristics were analyzed and documented in the TSAP.

Crashes are assigned one of five severity levels based on the most severe injury associated with that crash:

- Fatal
- Incapacitating injury (Injury A)
- Moderate Injury (Injury B)
- Possible Injury (Injury C)
- Property damage only (PDO)

Table 12-2 Bend UGB and Bend MPO Crash Rates 2012-2016

Base Period	Fatalities (People)	Fatality Rate (People per 100 Million VMT)	Serious Injuries (People)	Serious Injury Rate (People per 100 Million VMT)	Non-motorized Fatalities and Serious Injuries
Bend UGB Area					
2012-2016	12	0.45	88	3.31	19
Bend MPO Area					
2012-2016	13	0.49	102	3.84	20

Table 12-3 Bend UGB Crash Data 2012-2016

	Fatal	Injury A	Injury B	Injury C	PDO	Total
Count	11	81	518	1,249	2,641	**4,500**
Share	<1%	2%	12%	28%	59%	**100%**

Table 12-4 Deschutes County Crash Data 2012-2016 (Does not include Bend UGB)

	Fatal	Injury A	Injury B	Injury C	PDO	Total
Count	12	65	354	298	790	**1,519**
Share	<1%	4%	23%	20%	52%	**100%**

Crash Analysis in the Bend MPO

The TSAP crash analysis identified several emphasis areas. These emphasis areas reflect the crash characteristics, such as crash type, behavior, or infrastructure, that were associated with fatal and incapacitating injury crashes. By addressing these emphasis areas, the City of Bend, Deschutes County and ODOT have the greatest potential to reduce fatal and incapacitating crashes. The emphasis areas are summarized below.

Bend UGB Safety Emphasis Areas 2019 Draft TSAP

The five crash types most frequently associated with fatal or incapacitating outcomes inside the Bend UGB include:

- Intersections (Arterials, two way stop controlled intersection, signals, 5-lane roads)
- Roadway Segments (Fixed Object, Sideswipe, Head-on, Overturn, Arterials, 5-lane roads)
- Road User Behavior (Speed, Impaired Driving
- Vulnerable Users (Bicyclists, Pedestrians, 5-lane roads, night-time)
- Roadway Conditions (Lighting)

Deschutes County Safety Emphasis Areas 2019 Draft TSAP

The five crash types most frequently associated with fatal or incapacitating outcomes in Deschutes County include:

- Roadway Segments (Fixed Object, Overturn, Animal, Sideswipe, and Head-on)
- Intersection
- Road User Behavior (Speed, impaired driving)
- Road Conditions (night, snow/ice)

- Vulnerable Users (Motorcyclists, Pedestrians, Bicyclists)

The Bend Area TSAP performed a network screening of crashes from 2012-2016 to identify and rank locations that would benefit from safety countermeasures. The study used two network screening performance measures to identify locations, as described below. The performance measures identified locations with high collision frequency and severity (equivalent property damage only [EPDO]) and locations with a high concentration of particular collision types (excess proportions of specific crash types screening).

EPDO Screening

The EPDO performance measure assigns weighting factors to collisions by severity. The weighting factors generally reflect an order of magnitude difference between societal costs of fatal and incapacitating collisions versus less severe injury collisions. The weighting factors, shown below, are based on the Oregon Safety Priority Index System (SPIS) scoring method, which assigns scores of 100 to fatal and incapacitating collisions, 10 to Injury B and C collisions, and one to property damage only (PDO) collisions.

The Bend Area TSAP used EPDO as the primary performance measure to prioritize site-specific recommendations to capture the overall frequency and severity of collisions. The identified intersections with the highest EPDO scores are shown in Table 12-5.

Table 12-5 Location Specific Sites based on EPDO Network Screening

	Top 25 EPDO Intersection Locations (Bend UGB)	**ODOT Facility?**	**Number of Reported Crashes, 2012-2016**	**EPDO Score**
1	Highway 20 & 27th Street	Yes	61	87.8
2	Highway 20 & 8th Street	Yes	37	77.6
3	Purcell Blvd/Pettigrew Rd & Bear Creek Rd	No	32	71.2
4	NE 3rd & Butler Market Rd & Mt Washington Dr	Yes	36	66.6
5	NE 3rd Street & NE Olney Avenue	Yes	41	65.8
6	SE 3rd Street & Reed Market Road	No	56	63.4
7	Highway 97 & Powers Road	Yes	47	59.8
8	NE 3rd Street & NE Franklin Avenue	No	47	58.0
9	Highway 20 & NE Purcell Boulevard	Yes	21	56.4
10	SE Wilson Avenue & SE Third Street	No	45	55.8
11	3rd Street & Powers Road	No	25	55.4
12	Miller Avenue & 3rd Street	No	14	53.2
13	Neff Road & Purcell Boulevard	No	50	53.2
14	NW Greenwood Avenue & NW Hill Street	No	17	50.2
15	2nd Street & Franklin Avenue	No	9	48.6
16	NE 27th Street & Neff Road	No	37	47.0
17	Highway 97 & Robal Lane	Yes	42	46.2
18	NE 15th Street & Highway 20	Yes	25	42.8

19	Highway 97 & Cooley Road	Yes	43	39.2
20	3rd/Pinebrook Blvd	No	17	37.6
21	NE Medical Center Drive & NE Neff Road	No	17	37.6
22	Highway 20 & NE 10th Street	Yes	16	37.4
23	SW Columbia Street & SW Colorado Street	No	15	37.2
24	Cooley Road & Highway 20	Yes	11	36.4
25	Highway 97 & Division Street/NE Revere Ave	Yes	28	36.2

Excess Proportion Screening

The second screening analyzed the excess proportion performance measure quantifies, for a given location, the difference between the observed proportion of a specific collision type and the proportion among the relevant reference population (e.g. all intersections). The excess proportion is the difference between a site's proportion and the chosen threshold. For example, if 40 percent of reported intersection collisions are angle collisions, a site with 70 percent angle collisions would represent a 30 percent excess proportion. The excess proportion screening helps to identify locations that would benefit from a particular countermeasure or suite of treatments (e.g., system locations with a high incidence of run-off road collisions would benefit from similar treatments).

This analysis is intended to help the various roadway operators identify priority locations for implementation of systemic improvements, and to identify focus areas for non-infrastructure programs such as enforcement and education. Analysis results from the Drat 2019 TSAP identified the following safety emphasis areas to be associated with increased risk of severe outcomes and were used for the excess proportion analysis:

- Aggressive driving collisions
- Dark, with no street lights present:
- Angle collisions (includes angle and turning movement collisions)[59]:
- Rear-end collisions[59]:
- Head-on collisions[60]:
- Roadway departure (includes fixed object and non-collisions)[60]:
- Alcohol/drug involvement:
- Pedestrian and Bicycle crashes

Safety Programs in the Bend MPO

In addition to the plans described above, there are a number of prior and ongoing transportation safety-focused programs in the Bend MPO. Key programs are described below.

[59] This collision characteristic was only screened at intersection locations

[60] This collision characteristic was only screened along segments

Road User Safety Task Force

Initially formed to improve road safety for people on bicycles, the road user safety task force expanded its focuses on reducing crashes between motor vehicles and bicycles and motor vehicles and pedestrians. Many of the task force's efforts were aimed at educating road users. Notable projects the group took on included media campaigns, obtaining a proclamation from the Bend City Council of a road safety week each year, and a bicycle and pedestrian counting program. With staff changes, this group stopped meeting in 2015. With the completion of the Bend TSP, this group or some version of this group may be restarted.

Traffic Safety Advisory Committee

The City of Bend's Traffic Safety Advisory Committee was both an interagency and citizen group made up of representatives from several City of Bend departments, ODOT Region 4, Bend La Pine Schools, Deschutes County Road Department, and five local residents. This committee was responsible for overseeing safety-related projects and programs in Bend and ensuring interagency/department coordination. It provided a forum for public comment on transportation safety matters, advised other committees, and promoted awareness of safety programs and issues. The City of Bend City Council disbanded this committee in 2017. In 2017, the Bend City Council established a 25 member Citywide Transportation Advisory Committee to guide the TSP update. At the completion of the Bend TSP, it is expected that a transportation committee will be created to advise the City on all aspects of the transportation system, including safety.

Bicycle Diversion Program

The mission of the bicycle diversion program was "education through enforcement." Under this program, people who were cited for bicycle-related traffic infractions were given the option to have their fine reduced by taking an educational course. The program was a collaborative effort of the City of Bend and Commute Options. This program was ended in 2017 due to staff changes.

Shared Future Coalition

The Shared Future Coalition is a Deschutes County group formed to reduce underage and binge drinking by young adults. ODOT and the City of Bend are members of this group. The group is focused on community engagement to educate and reduce environmental influences.

Safety Strategies for Bend MPO

The efforts described above contain a number of strategies related to engineering, education, enforcement, and policy development to reduce crashes in the Bend MPO. There are several opportunities for safety-related policy development, including:

- Supporting the City of Bend and ODOT with implementing the projects and programs identified in their safety plans, including support in the development of application materials for the All Roads Transportation Safety (ARTS) program.

- Working with the City of Bend, Deschutes County, and ODOT to coordinate network screening and safety planning efforts within the MPO region, including expanding the City's screening methods to the unincorporated areas in the MPO region.

- Continuing Intelligent Transportation Systems planning and project programming, paying special attention to investments that will enhance safety.

- Continue refining safety criteria for project scoring, selection, and implementation.

- Identifying additional transportation funding sources that are specifically targeted at safety projects to supplement the limited funds from conventional transportation sources.

- Continuing to stay informed of national and state-level research on transportation safety and seeking out best practices that can be applied within the Bend MPO.

A number of safety projects have been identified and included in the project lists in Chapter 6 of this plan. The purpose of these projects is to reduce the potential for injuries and fatalities using a variety of countermeasures. With limited resources, focusing improvements on corridors and implementing systemic improvements have emerged as the best ways to improve system safety.

Ensuring the Bend MPO has a transportation system that is safe to use is a complex task. Several strategies are recommended to improve the safety for all modes of travel; however, additional data and analysis are required to better inform how limited funds can provide the best return on investment.

Safety Planning in the Bend MPO

ODOT and the City of Bend have existing processes for performing detailed network screening and plans that include specific safety-related recommendations in the Bend MPO. In 2017, ODOT awarded the City of Bend and Deschutes County safety funding to develop TSAPs. The City of Bend also performed safety evaluations to identify priorities for transportation safety countermeasures prior to the current TSAP project. The main outcomes of those studies are summarized in the paragraphs below and the projects are summarized in Table 12-6 below.

2012 Multimodal Safety Plan

In 2012, the City completed a multimodal traffic safety plan that identified several focus areas for the City including alcohol-involved crashes, speed-involved crashes, roadway departure crashes, fatal and injury crashes, and pedestrian and bicycle crashes. The 2012 multimodal traffic safety plan led to several grant applications, programs and projects.

Bend Safety Implementation Plan, June 2015

This report includes conceptual design of safety solutions at four priority corridors:

- 3rd Street between Greenwood Ave and Murphy Rd
- Colorado Avenue between US97 and Bond St
- Greenwood Ave between 3rd St and Awbrey Rd
- Greenwood Ave between 3rd St and 12th St

Bend Roadway Departure Report, February 2015

This report describes the conditions and potential improvements at four locations:

- Mt. Washington Drive east of Archie Briggs Road
- Mt. Washington Drive west of Archie Briggs Road
- Brookswood Boulevard south of Reed Market Road
- Brosterhous Road at the BNSF Railroad Overcrossing

Citywide Safety Improvements Report, April 2017

This report summarizes projects completed to date and proposed downtown area safety improvements.

Strategic Implementation Plan for Pedestrian and Bike Infrastructure, August 2015

This report summarizes projects identified for a connected pedestrian and biking transportation system.

Bend Roundabout Assessment for 15th Street and Reed Market, March 2017

This report presents the evaluation results of crash data collected before and after a roundabout was constructed at the intersection of 15th Street and Reed Market Road. The analysis showed an 84% reduction in the total reported collisions at the intersection.

All Roads Transportation Safety Grant Proposals, May 2018

The City of Bend submitted several applications for ARTS funding, including:

- Neighborhood Greenways
- Butler Market Corridor
- 3rd Street and Hwy 20 enhanced crossings
- Franklin Avenue lighting improvements
- Signal and sign improvements at several locations

Each of these plans includes proposed projects. The proposed projects are listed in Table 12-6, including the status of each project. Many improvements are planned or partially completed.

Major projects with a safety component that were not identified in the safety studies are included in the following table. Project codes with #1XXXX are Capital Improvement Project codes from the City of Bend.

Cascades East Transit Safety Action Plan, fall 2019

A consultant is currently developing a safety action plan for Cascades East Transit. That plan is scheduled for completion in late fall 2019. Relevant findings from that plan will be incorporated in future updates of this plan.

Table 12-6 Identified Safety Projects – Current & Past Studies (2010-2019)

Safety Project Location	2019 TSAP[61]	2012 Multimodal Traffic Safety Plan[62]	Project Status
14th Street Reconstruction (Simpson to Newport)			Completed
27th St at Butler Market Rd		X	Planned CIP
27th St at Reed Market Rd		X	Not Completed
NE 27th Street & NE Conners Ave			Completed
27th St & Neff Rd	x		Not Planned
3rd St & Franklin ARTS Grant			Planned CIP
3rd St & COID Canal		X	In Design
3rd St & Pinebrook Blvd		X	In Design
3rd St & NE Franklin Ave		X	In Design
3rd St & NE Hawthorne Ave		X	In Design
3rd St & Brosterhous Rd		X	Not Completed
3rd St & Franklin Ave	x	X	Planned CIP
3rd St & Powers Rd	x	X	Planned CIP
3rd St & Reed Market Rd	x	X	Not Completed
3rd St & SE Roosevelt Ave		X	Completed
3rd St Pedestrian Improvements		X	Completed
3rd St & Olney	x	ODOT	ODOT Project
Hwy 20 Mt. Washington/Butler Market	x	ODOT	ODOT Project
3rd St & Wilson	x		Not Planned
3rd St & Miller			Not Planned
Arizona Ave at Wall Street		x	Partial Completion
Bond St at Colorado Ave		x	Partial Completion
Colorado and Arizona Ave Corridor Improvements	x	x	Partial Completion
NW Colorado Ave & US 97		x	In Design
Bear Creek Rd at Pettigrew Rd	x	x	Partial Completion
Brookswood Blvd at Pinebrook Blvd		x	Completed
Brookswood Blvd S of Reed Market Rd		x	Not Completed
Powers and Brookswood RAB 1XGOB			Completed
Brosterhous Rd @ BNSF RR Crossing 1TCSI		x	Planned CIP
Butler Market Rd (4th St to Deschutes Mkt Rd)			In Design

The referenced documents are available in the Important Documents section of the transportation safety webpage as "Bend2019TSAP_Appendix3_Summary of City and BMPO Safety Work".

[61] EPDO Locations – Equivalent Property Damage Only (EPDO) Crash Analysis performance measure assigns weighting factors to collisions by severity

[62] Bend Multimodal Traffic Safety Plan assessment was limited to City of Bend Arterials and Collector roadways. Assessment for ODOT facilities was not part of the analysis. Projects populated with ODOT in this column are on ODOT Facilities.

Chapter 13: Security and Emergency Planning

Introduction

States and MPOs have been encouraged to incorporate safety and security into planning documents since 1998 with the passage of the Transportation Efficiency Act for the 21st Century (TEA-21) and after the terrorist events of September 11, 2001. In 2005, the transportation bill "SAFETEA-LU" required MPOs to consider security as a distinct planning factor separate from safety, which was carried over into current legislation (the "FAST Act"). The FAST Act also expands the scope of consideration of the MPO planning process to include improving the resiliency and reliability of the transportation system from emergency events such as natural disasters or extreme weather events. While a "security event" and an "emergency event" can be individually defined as having different causes and intent, both involve the need to address resiliency and preparedness of transportation systems for disasters (natural and human-caused), as well as safeguarding the personal security of all motorized and non-motorized users.

The push for security planning, and more recently for emergency planning, is due to the increase in the frequency and ferocity of natural disasters or other threats (e.g., wildland urban interface fires, severe storms, terrorist attacks) to U.S. cities over the past decade. During these times of crisis transportation networks can be particularly vulnerable and are pertinent to moving people, supplies, and emergency responders. While work in this area has generally been limited to state DOTs and large MPOs, there is an important role that all MPOs can play in promoting coordinated planning in anticipation of unexpected events or natural disasters.

This chapter discusses the following:

- National scope of security and emergency planning, and emergency management;
- Potential roles for MPOs in security and emergency planning; and
- Current efforts in the Bend MPO area in emergency planning and management.

Definitions

Safety and security, often used in combination, are distinct in that safety issues are unpremeditated unfortunate events caused by instances such as driver error, adverse weather, poor infrastructure, or vehicle design. **Security** events on transportation systems, however, always include a negative intention with an individual or group planning to do harm to the system and its users. **Emergency** events are generally all-encompassing including natural and man-made events, but are most notably associated with natural disasters such as wildfires, earthquakes, and severe storms. **Resiliency**, specifically in the context of transportation, is defined as a system's ability to continue to

function at an acceptable level of efficiency in the face of disruptive or unexpected conditions. When steps are taken to reduce the impact of security events on our transportation infrastructure, these measures may also act to mitigate the effects of a natural disaster. This is the connected relationship between security and emergency planning.

National Scope

Department of Homeland Security

The Department of Homeland Security (DHS) established the National Infrastructure Protection Program (NIPP). It outlines how government and private sector participants in the critical infrastructure community can work together to manage risk and achieve security and resilience outcomes to provide a clear call to action to leverage partnerships, innovate for risk management, and focus on outcomes. It guides national efforts, drives progress, and engages the broader community about the importance of critical infrastructure security and resilience.

One of the DHS's goals is ensuring that the security of drivers and cargo on the highway system are not compromised. Officials with the Federal Motor Carrier Safety Administration (FMCSA) are charged with reviewing security measures with motor carriers and shippers that may be the target of a terrorist attack. Its mission is to increase the level of awareness of hazardous materials carriers to security threats.

Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) maintains two programs:

- The National Incident Management System (NIMS)
- The National Response Framework (NRF)

NIMS identifies concepts and principles that answer how to manage emergencies from preparedness to recovery regardless of their cause, size, location, or complexity. It provides a consistent, nationwide approach and vocabulary for multiple agencies or jurisdictions to work together to build, sustain, and deliver the core capabilities needed to achieve security and resiliency.

The NRF provides the context for how a community can work together and how response efforts relate to other parts of national preparedness. It is one of five documents in a suite of National Planning Frameworks. Each Framework covers one preparedness mission area: Prevention, Protection, Mitigation, Response, and Recovery.

The Federal Highway Administration (FHWA) follows NIMS and NRF in its guidance on emergency planning and management. Additionally, ODOT, Deschutes County and other local entities have maintained consistency with NRF and utilized NIMS in many of their emergency planning and management efforts.

Potential MPO Roles

The planning for, and actual response to, emergency situations in a metropolitan area is the primary responsibility of the emergency response/public safety and operations agencies in the region, which are discussed in the following section. However, because MPOs provide a forum for cooperative decision making and have the responsibility of allocating financial resources to improving the performance of the transportation system, they can play important roles in security and emergency planning.

A report on the role of MPOs in preparing for emergency incidents and response[63] notes that MPO strengths include technical analysis and transportation planning, and therefore the most appropriate actions for MPOs to undertake in the context of disaster planning include the following:

- Conducting **vulnerability analyses** on regional transportation facilities and services.
- **Analyzing transportation network for redundancies** in moving large numbers of people (e.g., modeling person and vehicle flows with major lines/facilities removed or reversed, accommodating street closures, adaptive signal control strategies, impact of traveler information system), and strategies for dealing with choke points.
- Analyzing the transportation network for **emergency route planning** and identifying gaps in the network.

Table 13-1 includes an expansive list of possible roles an MPO can take in various stages of an emergency incident.

[63] Georgia Institute of Technology. *The Role of the Metropolitan Planning Organization (MPO) In Preparing for Security Incidents and Transportation System Response*, Michael D. Meyer, Ph.D., P.E., 2004.

Table 13-1: Potential MPO Roles in Security and Emergency Planning

Stage of Incident	Possible MPO Role
Prevention and Preparedness	• Funding new strategies/technologies/projects that can help prevent events • Conducting vulnerability analyses on regional transportation facilities and services • Secure management of data and information on transportation system vulnerabilities • Providing a forum for security/safety agencies to coordinate surveillance, prevention, and preparedness strategies • Funding and coordinating regional transportation surveillance system that can identify potential danger prior to its occurring • Coordinating drills and exercises among transportation providers to practice emergency plans • Involving incident management/emergency response entities in planning processes • Coordinating with security officials in development of prevention and preparedness strategies • Hazardous route planning • Analyzing transportation network for redundancies in moving large numbers of people (e.g., modeling person and vehicle flows with major links removed or reversed, accommodating street closures, adaptive signal control strategies, impact of traveler information systems), strategies for dealing with "choke" points such as toll booths) • Analyzing transportation network for emergency route planning/strategic gaps in network • Providing a forum for discussions on coordinating emergency response • Disseminating best practices in incident-specific engineering design and emergency response to agencies • Disseminating public information on options available for possible response • Funding communications systems and other technology to speed response to incidents
Monitoring	• Coordinating public information dissemination strategies • Funding communications systems for emergency response teams and agencies
Recovery	• Conducting transportation network analyses to determine the most effective recovery investment strategies • Acting as a forum for developing appropriate recovery strategies • Funding recovery strategies
Investigation	• Providing any data collected as part of surveillance/monitoring that might be useful for the investigation
Institutional Learning	• Acting as a forum for regional assessment of organizational and transportation systems response • Conducting targeted studies on identified deficiencies and recommending corrective action • Coordinating changes to multi-agency actions that will improve future responses • Funding new strategies/technologies/projects that will better prepare the region for the next event

Source (modified): Georgia Institute of Technology. *The Role of the Metropolitan Planning Organization (MPO) In Preparing for Security Incidents and Transportation System Response*, Michael D. Meyer, Ph.D., P.E., 2004.

Current Efforts Applicable to Bend MPO Area

As mentioned previously, local police, fire and other public safety and first responders play a lead role in disaster planning and emergency management in metropolitan areas. Applicable to the Bend MPO area, the following security/emergency planning efforts and programs which focus on, or include, transportation have been developed:

Deschutes County Natural Hazard Mitigation Plan, City of Bend Addendum (2014)

The Deschutes County Natural Hazard Mitigation Plan includes an addendum specific to the City of Bend. This document includes a list of potential action items based on identified risks and hazards. Action items that have some relation to transportation are listed in Table 13-2, below, including implementation status.

Table 13-2: City of Bend Addendum of the Deschutes County Natural Hazard Mitigation Plan (2015), Transportation-Related Action Items

Action (transportation-related)	Partner Organizations	Status
Develop and implement, or enhance, strategies for debris management for natural hazard (winter storm, wind, flood, etc.) events.	City: Police, Fire, Public Works External: Deschutes County Emergency Services, Road Dept; ODOT, Redmond Fire Dept	To Begin in 2020*
Seismically retrofit vulnerable facilities and infrastructure to increase their resiliency to seismic hazards. Consider both structural and non-structural retrofit options.	City: Community Development, Engineering and Infrastructure Planning, Public Works External: Deschutes County Community Development; Bend Park and Recreation Dist, Bend La Pine Schools, Deschutes County Library	Not Currently Prioritized for Transportation**
Identify critical public infrastructure and facilities located in flood hazard areas and implement mitigation and preparedness measures for those facilities.	City: Public Works, Engineering and Infrastructure Planning External: Deschutes County Community Development, Emergency Services, Road Dept; ODOT	Not Currently Prioritized for Transportation***
Identify floodway obstructions and implement mitigation measures to remove obstructions.	City: Public Works, Engineering and Infrastructure Planning External: Deschutes County Community Development, Emergency Services, Road Dept; ODOT	Initiated, but Pending Further Study*
Identify critical facilities and industries that may be affected by ash fall and develop and implement ash fall emergency response and mitigation projects.	City: Engineering and Infrastructure Planning, Utilities, Streets External: Deschutes County Community Development, Emergency Services	Postponed*
Encourage creation and adoption of wildland-urban interface maps to direct development requirements that assist wildfire mitigation.	City: Fire Department, Community Development, Information Technology (GIS) External: Deschutes County Forester, Community Development, Emergency Services, 911; Project Wildfire	In Process*

***Per Deschutes County Emergency Manager, 4/15/19. **Per ODOT Region 4, due recent build of most transportation facilities in Bend, 4/16/19. ***Per City of Bend Streets and Operations, 4/17/19 (note: FEMA flood maps show minimal roadway in .2% Annual Chance Flood Hazard Areas, none in Special Flood Hazard Areas).**

Greater Bend Community Wildfire Protection Plan (2016)

This plan contains risk assessments and recommendations, as well as an action plan and implementation. The area's transportation system is one of the first mentions in the Background Information section due to the importance of fire evacuation routes. The Structural Vulnerability section of the plan identifies "insufficient access and evacuation routes" as a primary hazard for seven of the eight geographic areas of the plan. The Action Plan and Implementation section states that existing transportation and evacuation routes will be identified and mapped. While Deschutes County 9-1-1 produces up-to-date public safety maps for use by emergency service providers, at the time this MTP chapter was updated, work on identifying and mapping evacuation routes for the Bend area had not yet begun.

Table 13-3: Greater Bend Community Wildfire Protection Plan (2016), Transportation-Related Action Items

Action	Partner Organizations	Status
Steering Committee will work with partner organizations to identify and map existing transportation and evacuation routes in each Community at Risk.	Bend Fire and Rescue, Deschutes County Rural Fire Protection District 2, Deschutes County, ODOT	Uninitiated*
Steering Committee will assist in conducting further assessments to determine the evacuation needs of each Community at Risk and identify potential projects developing new routes and/or improving existing routes.	Bend Fire and Rescue, Deschutes County Rural Fire Protection District 2, Deschutes County, ODOT	Uninitiated*

***Per ODOT Region 4, 4/10/19.**

Deschutes County Emergency Operations Plan (2015)

This is an all-hazard emergency management plan describing how Deschutes County will work to organize and respond to emergency events. For the Bend MPO area, public safety and security roles apply directly to the City of Bend Police Department and Deschutes County Sheriff's Office. Their tasks include such actions as: public warnings, coordinating evacuations, and participation in county-wide emergency training activities. In this plan transportation is identified as an Emergency Support Function (ESF) where primary, supporting, and adjunct agencies have been assigned responsibility for monitoring transportation infrastructure in the event of an emergency, assessing damage, restoring it, identifying alternative routes, evacuating the population, and identifying and coordinating transportation resources useful to other ESFs.

Deschutes County Intelligent Transportations Systems Plan (2011)

A key component of security and emergency management is the use of Intelligent Transportation Systems (ITS). ITS technology can be used to improve how communities and the nation handle natural disasters and terrorism. Investments in information technology by federal, state, and local agencies with disaster management

responsibilities significantly improve the exchange of critical information and better engage the public in disaster response and recovery. ITS projects and investments in the Bend metropolitan area are identified in the MTP and are an integral part of the ODOT State ITS architecture. It is important to note that the update process for the 2011 ITS Plan began in 2019 and should finish in 2020.

ODOT Emergency Operations Plan (2014)

Although this is a statewide-level plan, it contains useful information applicable to the Bend MPO area regarding ODOT's processes for preparedness and response to emergencies that affect the state transportation system and other modal facilities. The plan also describes ODOTs role in coordination and assistance to other agencies. The plan includes:

- Information on ODOT's legal responsibilities to emergency preparedness and response
- ODOT's role in disaster coordination and assistance for *all* transportation systems (roads, air, rail, pipelines, transit)
- Information on potential man-made and natural hazards that could affect the state's transportation system
    - *Seismic Lifeline Routes: Highway 97 identified as "Tier 1" (highest priority)*
- ODOT's overall approach to emergency situations (Incident Command System), including such efforts as notifications, alternate route planning, support and coordination with other agencies, and recovery planning
- Responsibilities by division, branch, section, and unit within ODOT
    - *Notes preparedness duties of Transportation Development Division: "to conduct vulnerability assessments of the transportation systems to assist in the establishment of priorities for improving the systems resiliency"*
- Responsibilities of emergency response partners: roles of local, federal, private, and other state agencies
- An inventory of ODOT facilities, equipment, and other resources that can be used for emergency purposes
    - *Includes resources at and abilities of the Region 4 Bend Transportation Operations Center*

Oregon Resilience Plan (2013)

This state-wide level plan provides an assessment of and recommendations for infrastructure resiliency related to a Cascadia 9.0 earthquake event. A key section of the plan is Transportation, where the following is provided specific to central Oregon: determinations on likely impacts, estimated timeframes to restore functions, and

practice and policy recommendations to reach resilience targets. The following points apply to the Bend MPO area:

- Highway 97 will be a critical facility in the event that I-5 is not operational
- The Redmond Municipal Airport is a FEMA staging site and considered highest priority to short-term mobility for the entire state after an event
- Rail lines through central Oregon considered highest priority
- Recovery targets and estimated recovery time given current conditions are provided for Highways 97 and 20, Redmond Municipal Airport, Chemult to Redmond BNSF rail line, and Cascades East Transit

Cascades East Transit Contingency Plan (2014)

This plan documents the periodic need and justification to reserve inactive-contingency reserve buses for future emergency use in lieu of selling them.

Oregon Oil Train Safety Regulations (Pending)

At the time of this writing, Oregon lawmakers are considering and expected to pass a bill regulating the transport of oil by rail through the state. The bill puts railroads hauling crude oil or liquefied natural gas under the purview of the state's oil spill planning program, which is meant to ensure adequate preparations are in place to prevent and respond to oil spilling from derailed and punctured tank cars. The bill also establishes fees on railroads for the purpose of funding the work needed to prepare for oil moving throughout the state – such has along the Deschutes River – where it hasn't previously.

Chapter 14: Parking

Introduction & Overview

The supply and use of parking are influenced by — and have influences on — development practices, local policies, economic impacts on builders and households, and community goals. The supply and price of parking also have direct relationships with travel behavior. Too much parking correlates with more automobile ownership, more vehicle miles traveled, more congestion, and higher housing costs. In addition, excess parking interferes with the efficient development of urban land, which presents barriers to creating an efficient transit system or increasing land use density and diversity. Parking supply and pricing often have a direct impact on the ability to create compact and complete communities.[64]

Vehicle miles traveled (VMT) per capita has been demonstrated to be strongly related to measures of accessibility to destinations, particularly the supply of parking.[65] Parking strategies such as establishing maximums and pricing, when combined with mode split goals, tend to decrease VMT per capita.

Parking Management is a general term for strategies that encourage more efficient use of existing parking facilities. This reduces total parking demand, shifts travel to other modes, reduces VMT per capita and ensures a minimum number of parking spots are always available, avoiding the "circling" problem that adds to congestion. Managing parking helps to reduce the undesirable impacts of parking demand on local and regional traffic levels and the resulting impacts on community livability and design. Parking management can be particularly effective when used in specific areas, such as downtowns or complete neighborhoods. The most effective parking strategies are those that link parking rates more directly to demand or provide financial incentives and/or prime parking spaces to preferred markets such as carpools, vanpools and short term parkers in commercial areas[66].

Policies

The region has specific goals and policies outlined within the local transportation plans that are specifically related to parking management. The following polices are applicable to the Bend Metropolitan planning area.

[64] Urban Land Institute Northwest, "Right Size Parking," 2013

[65] Ewing R, Cervero R. (2010). Travel and the built environment. Journal of the American Planning Association 76(3): 265–294.

[66] Best Practices Transportation Demand Management (TDM), Seattle Urban Mobility Plan, January 2008.

1. In coordination with the City of Bend, the MPO will manage the curb zone area of the right of way to ensure flexibility and adaptability as parking and mobility technologies change. Adjacent land use will be utilized to determine the appropriate curb use (e.g., on-street parking, pick-up/drop off of passengers or freight, Shared Active Transportation facilities, bikeways, transit stops, and enhanced transit stops).

2. In coordination with the City of Bend, the MPO will adopt the use of parking management and enforcement technologies to optimize use of existing public and private parking supply, to reduce conflicts, and to reduce the share of land occupied by parking.

3. In coordination with the City of Bend, the MPO will enable the creation of parking districts in areas where residents or stakeholders have identified an issue that could be resolved by parking management, and/or in locations where data supports the development of a parking district.

4. In coordination with the City of Bend, the MPO will regularly monitor and update parking requirements to allow for adjustments based on changes in behavior and parking demand over time.

Chapter 15: Air, Rail, Waterways and Pipelines

Air Transport

Airport planning is generally conducted at three levels. Individual airports do Master Plans and Airport Layout Plans under Federal Aviation Administration (FAA) guidance that address 20-year needs. States do airport system planning by establishing a hierarchy of public use airports within the state, setting priorities for investment and management based on different goals and policies. The FAA also does its own airport-related planning through a number of documents, including the National Plan of Integrated Airport Systems.

Individual airports and local jurisdictions have their own policies, goals and objectives but are also guided by seven statewide aviation goals. New in the 2018 update of the Oregon Aviation Plan, the Oregon Transportation Plan (OTP) goals have been integrated for purposes of providing a consistent foundation to evaluate and improve aviation infrastructure.

Table 15-1: Oregon Aviation Plan v6.0 Goals: Integrated from Oregon Transportation Plan

Goal 1: Mobility and Accessibility	To enhance Oregon's quality of life and economic vitality by providing a balanced, efficient, cost-effective and integrated multimodal transportation system that ensures appropriate access to all areas of the state, the nation and the world, with connectivity among modes and places.
Goal 2: Management of the System	To improve the efficiency of the transportation system by optimizing the existing transportation infrastructure capacity with improved operations and management.
Goal 3: Economic Vitality	To promote the expansion and diversification of Oregon's economy through the efficient and effective movement of people, goods, services and information in a safe, energy-efficient and environmentally sound manner.
Goal 4: Sustainability	To provide a transportation system that meets present needs without compromising the ability of future generations to meet their needs from the joint perspective of environmental, economic and community objectives. This system is consistent with, yet recognizes differences in, local and regional land use and economic development plans. It is efficient and offers choices among transportation modes. It distributes benefits and burdens fairly and is operated, maintained and improved to be sensitive to both the natural and built environment.
Goal 5: Safety and Security	To plan, build, operate and maintain the transportation system so that it is safe and secure.
Goal 6: Funding the Transportation System	To create a transportation funding structure that will support a viable transportation system to achieve state and local goals today and in the future.
Goal 7: Coordination, Communication, and Cooperation	To pursue coordination, communication and cooperation among transportation users, providers and those most affected by transportation activities to align interests, remove barriers and bring innovative solutions so that transportation system functions as one system.

Facilities

Bend Municipal Airport

The Bend Municipal Airport is located approximately three miles east of the Bend Metropolitan planning area. It is a non-towered airport and classified as a Category 2 – Urban General Aviation Airport with no scheduled passenger service. The single asphalt runway is 75 feet wide and 5,260 feet in length serving approximately 160,000 annual aircraft operations (departures and arrivals) with an approximate average of 438 operations per day, thus making it the third busiest airport in the state[67]. The existing asphalt runway is in good condition. Approximately 250 aircraft in combination with 16 aviation type businesses are currently based at the airport. The airport was established in the late 1930's and was used in support of World War II training efforts.

Redmond Municipal Airport - Roberts Field

Passenger and cargo air service is provided to the Central Oregon area at the Redmond Municipal Airport (RDM), located approximately sixteen miles north of Bend. The Redmond airport is designated as a Category I Commercial Service Airport and is currently served by four commercial carriers: Alaska, United, Delta, and American, with Allegiant expected to begin commercial service in September 2019. Ameriflight and Empire provide cargo service on behalf of United Postal Service (UPS) and FedEx, and the airport is also home to a United States Forest Service (USFS) Air Tanker Base, in addition to regularly accommodating air ambulance activity. There are two active runways, the primary being 7,040 feet long and 150 feet wide, and the secondary being 7,006 feet long and 100 feet wide.[68]

The Bend Municipal Airport, owned by the City of Bend, and Redmond Municipal Airport, owned by the City of Redmond, are outside of the Bend Metropolitan planning area. Deschutes County regulations and County TSP policies govern land use issues that are associated with the use and operation of the Bend airport. Key goals outlined in the Deschutes County TSP are related to the protection of public-use airports through the development of land use regulations based upon the adopted airport master plans. The purpose of these regulations is to prevent the installation of airspace obstruction, additional airport hazards and to ensure the safety of the public and guide compatible land use.

Forecasts and Future Needs

The 2018 update of the Oregon State Aviation System Plan discusses trends that will continue aviation activity growth in the state and within the Bend Metropolitan region including:

- Migration to Oregon;

[67] Gary Judd, Bend Airport Manager, email correspondence 7/10/2019

[68] Oregon Aviation Plan v6.0, Redmond Municipal Airport Summary, 2018

- Growth in high-tech and export-oriented industries;
- Growth in tourism;
- Increase in air travel by general population; and
- Increase in number of retirees with high discretionary incomes.

Bend Municipal Airport
An update to the City of Bend Municipal Airport Master Plan is now in progress and annual operations are surpassing forecasts in the 2018 Oregon Aviation Plan update. Traffic has increased to 168,913 operations in 2018 and is expected to reach 304,800 in 2038. By 2020 the airport is forecast to reach runway operational capacity without changes in the current configuration. Additionally, aircraft based at the Bend Airport are forecast to increase from 244 in 2018 to 303 by 2038. Bend's paved tie-down areas and hangars are at full capacity and more facilities will be needed to accommodate demand for both covered and tie down aircraft storage.

As of 2018, the Bend Municipal Airport generates $21 million in on airport payrolls and an estimated $174.5 million in economic benefits to the region.

The 2018 Oregon Aviation Plan identified several needs that have been implemented with a security fence and taxiway lighting still remaining. In addition, the Airport Master Plan update, based on the forecast increase in operations, may show need for an Air Traffic Control Tower and runway extension/re-configuration for the Bend airport in order to preserve airport capacity over the next twenty years.

Redmond Municipal Airport
According to the Oregon Aviation Plan v6.0 (OAP), 445,698 persons were enplaned at the Redmond Airport in 2018, a significant increase from 298,322 in 2016. By 2036, the OAP has forecasted enplanements to reach 680,750. This growth in passenger activity corresponds with increasing seat capacity on carriers, and this trend of using larger aircraft at Redmond is planned to continue. While commercial service is expected to continue to grow, driven by an increasing population and a growing tourist demand, other services at Redmond have decreased and are expected to remain flat. Air cargo volume has seen a large decline due to electronic mail, higher fuel prices, and increased screening pushing cargo to trucks. Also, some general aviation demand and flight training have moved to the Bend Airport. As a result, Redmond, with its airport traffic control tower, instrument landing system, and two fixed base operators, will continue to be the primary regional airport for jet traffic.

Table 15-2: Redmond Airport Forecast Summary

Category	2006	2016	2036	CAGR 2016-2036
Enplanements	**197,223**	**298,322**	**680,750**	**4.2%**
Air Cargo (Tons)	**1,612.8**	**970.1**	**1,000**	**0.2%**
Aircraft Operations	**68,388**	**40,162**	**47,740**	**0.9%**
Itinerant Operations				
Air Carrier	1,433	5,127	13,140	4.8%
Commuter / Air Taxi	16,803	6,340	2,100	-5.4%
General Aviation	22,170	10,985	14,000	1.2%
Military	366	341	300	-0.6%
Local Operations				
General Aviation	27,376	16,829	18,900	0.6%
Military	240	540	500	-0.4%
Based Aircraft	**129**	**80**	**127**	**2.3%**
Single-Engine Piston	92	64	78	1.0%
Multi-Engine Piston	31	6	2	-5.3%
Jet & Turbo-Prop	3	4	30	10.6%
Helicopter	3	6	12	3.5%
Other	0	0	5	N/A

Year corresponds to FAA Fiscal Year, October to September. Airport was closed for three weeks in 2016 for construction. 2016: Enplanements and Air Cargo – RDM Monthly Report and RDM Performance Metrics, Aircraft Operations – Terminal Area Forecast 2016, Based Aircraft – Airport Management Records 2016, CAGR: Compound Annual Growth Rate

Source: Redmond Airport Master Plan, 2018

The Redmond Airport Master Plan identifies operational, design, and facility needs to accommodate existing and projected aviation demand over the next 20-years, which are provided in a series of alternatives. Key needs include:

- Runway extension and taxiway geometry improvements
- Development of aircraft storage hangars to accommodate 33 aircraft; site future hangars
- Expand passenger terminal apron; site TNC drop-off/pick-up; evaluate sites for off-site rental car service center
- Parking lot expansion (1,100 spaces/500 employee and tenant spaces)
- Various terminal expansion and reconfiguration improvements; identify storage areas for response to Cascadia Subduction event; relocate and expand snow removal equipment building
- Upgrade 10th Street, Sisters Avenue, and Ochoco Way to local industrial standards; upgrade Veterans Way to major collector standards; construct new streets at North Development Parcel Subarea with new waterline system; various sidewalk improvements

Rail Service

Rail service in the Bend metropolitan planning area serves an important role to the regional transportation system moving freight north and south through the study area and serving regional connections within the State of Oregon and beyond.

In 2009, a multi-agency team completed the *Report on Central Oregon Rail Planning*. The report addresses various rail related safety, congestion, freight mobility, and economic development issues for Central Oregon. The report contains findings, recommendations, and costs for rail grade separations thru the Bend metropolitan area.

Facilities

Freight Rail

BNSF Railway Co. (BNSF) operates and maintains the rail line passing through Bend, which is the Oregon Trunk Subdivision of BNSF's Northwest Division. The subdivision extends about 220 miles from a junction with a BNSF mainline at Wishram, Washington, to a junction with Union Pacific Railroad's (UP) main north/south rail corridor at Chemult, Oregon. UP has shared use of the Oregon Trunk but in recent years has relied upon BNSF to provide service to local industries on UP's behalf. During 2018, BNSF completed installation of Centralized Traffic Control (CTC) from Wishram to a point south of Lava siding, approximately 20 miles south of Bend. CTC permits dispatchers in the railroad's dispatching center at Fort Worth, Texas to monitor train movements on a computer screen track diagram and remotely control switches and signals along the subdivision to route trains into and out of sidings. A new safety system, Positive Train Control (PTC), overlays the CTC territory to insure trains comply with speed restrictions and wayside signal indications. Long-range plans call for extension of CTC and PTC over the 55 miles from the Lava siding to Chemult.

Railroad operation and maintenance protocols are heavily regulated by the Federal Railroad Administration (FRA). FRA inspectors, proficient in various rail industry regimens, regularly inspect rail facilities as do state inspectors who are empowered to enforce federal regulations. The state inspectors are employed by the Rail and Public Transit Division of Oregon's Department of Transportation. There are no weight limitations for freight movements through the study area but there are vertical restrictions imposed by several tunnels north of Madras. As a result, double-stacked containers cannot travel the route but the line can handle much heavier loads as well as longer loads than those normally permitted on highways. A modern rail car can handle the same cargo that would require three to four semi-trucks to handle.

In 2019, BNSF was operating approximately 10 to 12 trains per day through the study area. This count includes movements of resident local freight crews who service local businesses within the greater Bend area. The majority of freight being transported through the study area consists of various forest products, cement, diesel fuel, liquefied petroleum gas, wallboard, crude oil, feed grains, and other construction supplies.

Passenger Rail

There is currently no passenger rail service in the Bend Metropolitan planning area. The nearest connection to passenger rail service in central Oregon is in the town of Chemult, which is located about 65 miles south of Bend. Chemult has daily service provided by Amtrak's northbound and southbound *Coast Starlight*, a long-distance train operating between Los Angeles and Seattle. The feasibility of extending Amtrak service to the Bend area was analyzed during the development of the 1992 Oregon Rail Passenger Policy Plan. The study concluded it would be impractical to provide passenger service to Bend. In 2000, the state began funding a twice-daily bus service from Redmond and Bend that connects with the *Starlight* trains at Chemult. This service is jointly branded as Amtrak *Thruway* and High Desert POINT (Public Oregon Intercity Transit). ODOT will end financial support of this service starting October 1, 2019; however, Amtrak and the local provider have agreed upon an arrangement to continue the service. ODOT also funds Eastern POINT co-branded Amtrak *Thruway*, which is a daily bus service between Bend and Ontario. A daily bus service also links Bend with Eugene and Coos Bay. Although this service is not subsidized by the state it is marketed by Amtrak under its *Thruway* brand and facilitates passenger rail connections at Eugene. The 2014 Oregon Rail Plan does not currently identify any future plans for passenger rail service serving the Bend Metropolitan planning area.

At-Grade Rail Crossings

The majority of the rail crossings within the study area are at grade. There are seventeen total crossings over the freight rail line traversing the study area. Ten of the crossings are at grade and utilize active traffic control devices; the remaining crossings are over grade or under grade.

Forecasts and Future Needs

Overall, rail freight in Oregon is projected to be the second fasted growing mode of transportation behind vehicle travel. Rail freight volumes, as well as truck freight volumes are forecast to significantly increase by 2035 in the state of Oregon and nationally. No regional rail forecasts for the Bend Metropolitan planning area are available.

Throughout the 20-year planning period, the railroad line through the study area will continue to haul freight. The existing local railroad switching yard, depot, weigh station and sidings are expected to remain unchanged and there are no planned changes to the existing pattern of short spur rail lines that serve local freight rail users.

The Bend Transportation System Plan is currently being updated and contains three recommended rail-related projects: road widening at the 3rd Street rail undercrossing; a study of at-grade railroad crossing solutions near Reed Market Road; and rail signal improvements as part of the US 97 NB Off-ramp/Revere Avenue reconfiguration project.

Other train crossings in the Bend area contribute to increased traffic interruptions as traffic continues to increase. Potential solutions include coordination with railroad authorities to minimize crossings during peak driving periods or grade separation.

Waterways

The Deschutes River is the only navigable waterway within the Bend MPO planning area. The river is used for active and passive recreation within the MPO boundary and is not used for commercial navigation.

Transmission Pipelines

Two major natural gas transmission lines serve the Bend Metropolitan area. Gas Transmission Northwest Corporation (TC Energy) currently operates high-pressure natural gas pipelines that run near Bend city limits. These pipelines extend between Kingsgate, British Columbia and Malin, Oregon traversing a distance of 612 miles before passing through the southeast corner of Bend city limits. They consist of 36-inch and 42-inch diameter pipelines capable of delivering up to 1 billion cubic feet (BCF) of gas per day to the Pacific Northwest; however typical daily operations are in the range of 600-700 million cubic feet per day.[69]

There are two TC Energy pipeline meter stations located in Bend; one on Knott Road and the other near the Bend Airport. These stations provide measurement and change of custody points for gas service to the Bend area. TC Energy monitors, inspects, and maintains the stations and transmission pipelines.

From the meter stations, Cascade Natural Gas Corporation (CNGC) holds the role of distributing natural gas to the City of Bend through a system consisting of main and service pipelines ranging in sizes from ½" to 12". These pipelines are made of steel and plastic, and meet federal requirements (49 CFR Part 192). The highest maximum allowable operating pressure (MOAP) for this CNGC system is 500 pounds per square inch.

CNGC notes that current and future capacity constraints are evaluated annually through engineering reviews and planning. Based on findings, CNGC develops projects to add new facilities or upgrade existing infrastructure to address needs.[70]

[69] Per email from Loren Locher, Regional Specialist, TC Energy, 7/17/2019.

[70] Per email from Cody Cox, District Operations Manager, Cascade Natural Gas Corporation, 7/17/19.

Chapter 16: Environmental Considerations

Introduction

Consideration of environmental factors is a requirement of federal legislation (MAP-21) that calls for discussion of existing environmental features, comparison of proposed transportation projects to identify potential conflicts, and identification of potential mitigation as needed. Such consideration, however, is not expected to be at the same level of detail as may be required by the National Environmental Policy Act (NEPA). It is important to note that a NEPA process is required for any transportation project having a federal nexus. A project has a federal nexus if it involves federal funding, a federal permit or approval, use of federal lands, or a federal program.

This chapter is a map-based product and should to be used as a starting point for analyzing the environmental consequences of transportation projects. When projects are proposed, this chapter should be reviewed to determine if there are potential environmental conflicts. If potential conflicts are identified, further information will be needed and further consultations with agencies with jurisdiction may be required.

Previous and Current Coordination

The initial development of the Environmental Considerations Chapter was in 2007, in coordination with numerous agencies involving consultations and meetings, contact via email, phone or letter, website database searches, or presentations to the agencies listed in the table below. This resulted in the content of the 2007 chapter to being extensive and detailed.

Table 16-1: 2007 Agency Consultation

Bureau of Land Management (BLM)	Oregon Department of Land and Conservation (DLCD)
Burns-Paiute Tribe* and Klamath Tribe*	Oregon Department Of State Lands (DSL)
City of Bend	Oregon Department of Transportation (ODOT)
Confederated Tribes of Warm Springs	Oregon State Historic Preservation Office (SHPO)
Deschutes County	U.S. Army Corps of Engineers (USACE)
U.S. Forest Service, Deschutes National Forest	U.S. Department of Commerce, National Marine Fisheries Service (NMFS)
Oregon Department of Environmental Quality (DEQ)	U.S. Department of Transportation Federal Highway Administration (FHWA)
Oregon Department of Fish and Wildlife (ODFW)	U.S. Environmental Protection Agency (EPA)
U.S. Fish and Wildlife Service (USFWS)	Upper Deschutes Watershed Council (UDWC)

*no response received (2007)

For Phase I of the 2019 update to the content of the Environmental Considerations chapter, consultation with agency staff in the form of phone conversations and email correspondence occurred with the agencies listed in Table 16-2. Content was also obtained from information and documents available from a number of agency websites, as noted in each section of this chapter.

It should be noted that the main, potential environmental conflicts found in the intensive 2007 outreach and analysis for the Bend MPO area were associated with stormwater runoff (impacting fish, wildlife, water quality, roadway flooding), wildlife crossing, air quality, climate change, and restricted lands. At that time, recommendations to avoid, reduce or mitigate identified conflicts included employing the best management practices in the City of Bend Integrated Stormwater Management Plan and the Stormwater Master Plan (since updated), maintaining wildlife linkages, adopting the transportation actions identified in the Oregon Strategy for Greenhouse Gas Reduction, and identifying all 4(f) and 6(f)(3) properties prior to pursuing transportation projects. With these past findings in mind, the sections on stormwater management and water quality, threatened/endangered species and critical habitat, air quality, and restricted lands have all been updated in consultation with the appropriate entities.

Table 16-2: 2019 Agency Consultation

Bureau of Land Management (BLM)	Central Oregon Irrigation District (COID)
City of Bend Planning/Historic Preservation	Oregon Department of Transportation (ODOT)
City of Bend Utility Department	Oregon Department of Fish and Wildlife (ODFW)
Oregon Department of Environmental Quality (DEQ)	

Water Resources

Wetlands

The City of Bend completed a Local Wetlands Inventory (LWI) in 2002, which replaced the National Wetland Inventory map for the Bend area in 2016 when it was approved by the Oregon Department of State Lands (DSL). The inventory revealed no known significant wetland resources (as defined in Oregon Statewide Planning Goal 5) outside of the riparian corridor of the Deschutes River within the Bend UGB, as shown in Figure 16-1: Water Resources Map. The entirety of the Deschutes River within the UGB was evaluated as a single wetland system, and within it a total of ten significant wetland units were identified. The City must meet state requirements for protecting these wetland units.

For areas outside of the Bend UGB, the USFWS National Wetlands Inventory has identified areas of freshwater forested/shrub wetlands along the Deschutes River north of the Bend UGB. This includes wetland areas along the west side of the river just south

of the Bend Airport, and continuously along the river from Tumalo State Park to the extent of the BMPO boundary through the community of Tumalo. These mapped wetlands are subject to county, state, and federal fill and removal regulations.

Flood Plains

The Federal Emergency Management Agency (FEMA) updated the delineation of the 100-Year Flood Plain in 2007, as shown in Figure 16-1: Water Resources Map. Within the Bend MPO area, a 100-year flood plain exists only along the Deschutes River. For the Bend MPO area, only a very small section of existing residential roadway within the community of Tumalo appears to lie within the mapped 100-Year Flood Plain.

Stormwater Management

The City of Bend adopted a Stormwater Master Plan in 2014. The purpose of this plan is to evaluate the city's stormwater drainage needs within the 2007 urban growth boundary (UGB), and to meet increasingly stringent regulations governing stormwater. It currently serves as the oversight plan for addressing stormwater quantity and quality issues. In addition to providing an overall strategy for addressing stormwater concerns, it provides a delineation of drainage areas and runoff quantities throughout Bend, and programmatic goals for addressing quantity and quality concerns.

Contents of the plan include detailed information on area land use, development patterns, and environmental characteristics; identification of existing drainage system and drainage problems; includes a hydrologic and hydraulic analysis to estimate runoff; contains goals, policies, ordinances, and standards for stormwater management; provides a funding evaluation; includes stormwater infrastructure improvement options; and contains a recommended stormwater management strategy.

According to the Bend Stormwater Master Plan, the stormwater challenges the city faces over the next several years are categorized as follows:

1. Complying with water quality requirements mandated by state and federal laws.
2. Improving the collection and conveyance of stormwater so that the regulatory requirements can be met.
3. Reducing flooding to protect property and public safety.
4. Determining the vulnerability and susceptibility of groundwater to contamination from injected stormwater. A Risk Evaluation has been completed.
5. Determining if and how stormwater discharged to the Deschutes River may be interfering with the river's beneficial uses and affecting compliance with receiving water quality standards.
6. Ensuring that limited stormwater funds are spent on projects that are most likely to provide demonstrable benefits.

For stormwater quality, the City implements a more specific Integrated Stormwater Management Plan that is necessary for meeting municipal stormwater permits requirements. The Integrated Stormwater Management Plan has multiple components including Construction Site Activities, Post-Construction Controls, Municipal Maintenance, and Monitoring that may influence transportation planning. Focus on low impact development site design concepts and adherence to City Standards and Specifications and Bend Code Title 16 in transportation design planning will be sufficient to meet these plan requirements.
The Integrated Stormwater Management Plan and Stormwater Master Plan are implemented by the City of Bend Utility, and Engineering and Infrastructure Planning Departments, and includes coordination with a number of other departments and outside entities, including transportation entities and irrigation districts. The City of Bend Utility Department is responsible for City-owned or operated storm drainage facilities, while drainage and maintenance for the three highways that run though Bend are the responsibility of the Oregon Department of Transportation (ODOT).

Water Quality

Water quality problems in the Deschutes River result primarily from untreated stormwater discharges, impoundments, and summer low-flows due to irrigation diversions. Within the BMPO, the Upper Deschutes River is currently listed on the Oregon Department of Environmental Quality 303(d) list because portions of the river do not meet state water quality criteria for temperature, pH, dissolved oxygen, sediment and/or turbidity, and chlorophyll-a or algae. The Upper Deschutes Watershed Council monitors the Deschutes River water quality for the city to provide data on the presence or absence of stormwater pollutants and to help the City of Bend comply with Clean Water Act regulations.

Because the Deschutes River is 303(d) listed for impaired water quality, the Oregon Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency to develop Total Maximum Daily Load (TMDL) plans demonstrating what needs to happen in order for the Deschutes River to meet water quality standards. As part of this process, DEQ will identify organizations or agencies that have legal authority over a sector or source that could be contributing pollutants. These entities will be identified as Designated Management Agencies (DMAs) and will be required to develop a plan identifying specific management strategies that will be implemented to help meet water quality standards. Because the Deschutes River flows through the Urban Growth Boundary, the City of Bend will likely be identified as a DMA by DEQ once TMDLs have been completed. As of July 2019, DEQ work in developing TMDLs for the rivers and streams in the Upper Deschutes continues to be on hold due to pending litigation about DEQ's temperature standard.

Tumalo Creek is located at the north end of the Bend MPO boundary and is listed on the DEQ 303(d) list. This is due to portions of the creek not meeting state water quality criteria for temperature. Water quality concerns in Tumalo Creek are concentrated in the reach below the Tumalo Feed Canal diversion. Stream flow and water quality within Tumalo Creek are critically important for the health of the middle Deschutes River

because Tumalo Creek is the only tributary along 36 miles of the Deschutes River between the City of Bend and Whychus Creek.

Collaborative efforts to improve streamflow and water quality in the Deschutes Basin have been undertaken by the Deschutes River Conservancy, a local non-profit entity made up stakeholders from tribal, state and federal agencies, irrigation districts, and groups with recreation and other natural resources interests. The organization has implemented innovative methods, such as irrigation season leasing, water rights transfers and conservation projects, and has recently adopted a strategic plan to address water management challenges in the Deschutes Basin.

Drinking Water

Drinking water sources for the city of Bend include surface water from Bridge Creek, a tributary of Tumalo Creek, and production from 22 wells that draw water from the productive aquifer that lies beneath the city. The City routinely monitors regulated and unregulated contaminants from both surface water and groundwater sources. As a proactive measure to manage its groundwater resource, the City completed a Source Water Assessment (SWA) for their wells in 2013. A SWA for surface water was completed in 2013. A SWA identifies potential contamination sources associated with existing land uses and ranks them according to their potential threat. From these results, the Utility Department develops and implements management strategies to protect and manage areas identified as higher risk.

The groundwater SWA includes compiling a potential contamination sources inventory within the recently updated delineations of the wellhead protection areas (WHPAs) for City of Bend wells. The WHPA delineation identifies the land area around the well that overlies that part of the aquifer that supplies groundwater to the well. These areas are where a contaminant, if released on the ground, may migrate straight down, reach the aquifer and move directly to the well. Within the WHPAs, the sensitivity of the aquifer to contamination is evaluated. The WHPA delineations and aquifer sensitivity information are combined to assess and rank the susceptibility of the aquifer to contamination from existing land use activities, (e.g., residential, commercial, agricultural or industrial properties).

The City of Bend produces an Annual Water Quality Report which includes information on how Bend's drinking water complies with and exceeds state and federal requirements.

Underground Tanks

According to the Oregon Department of Environmental Quality's database for Leaky Underground Storage Tanks (LUST), accessed on July 16, 2019, there are no active sites in Bend that pose a threat to groundwater.

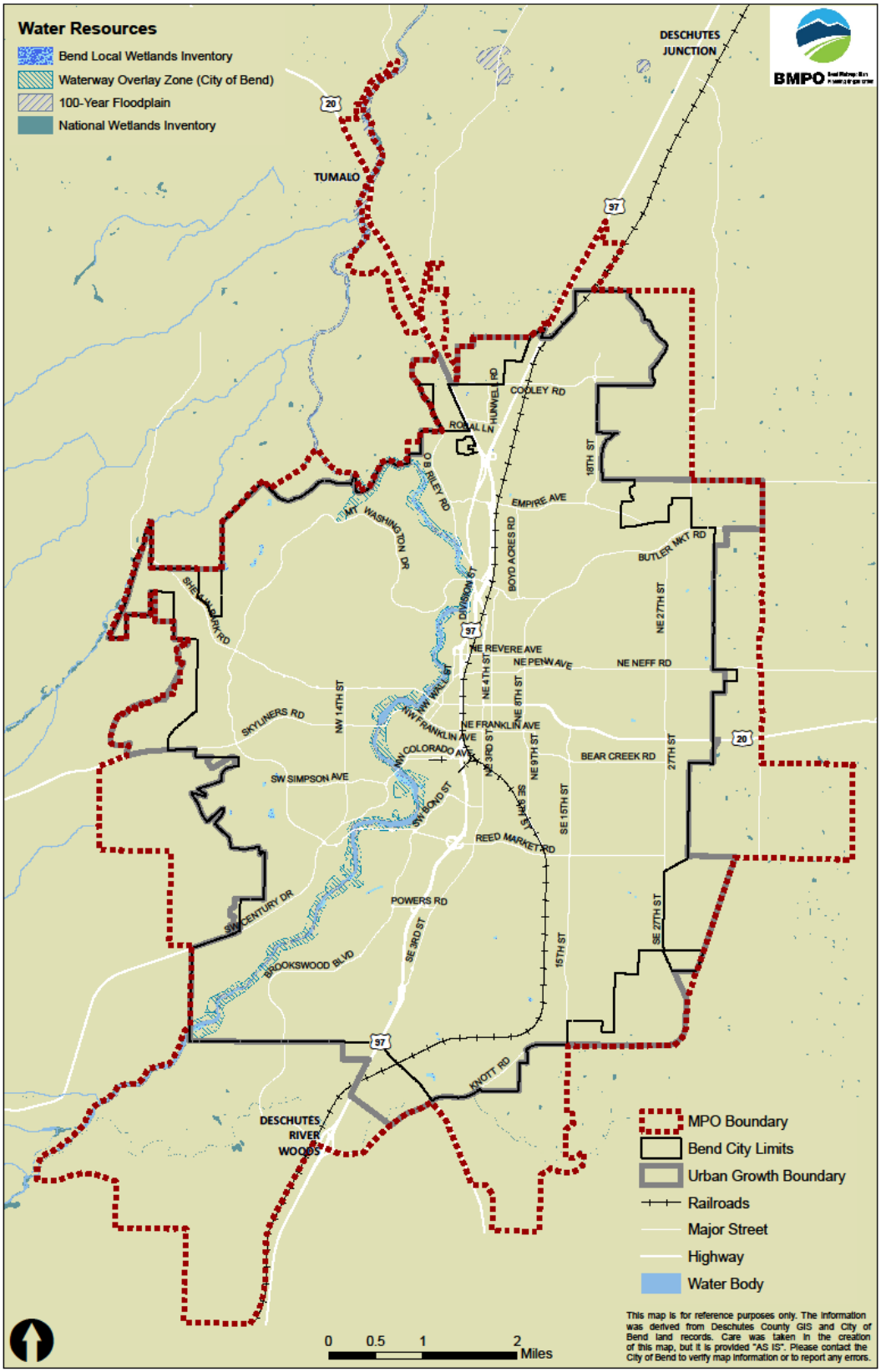


Figure 16-1: Water Resources Map

Best Management Practices

Separate from the Stormwater Master Plan, the City of Bend adopted an Integrated Stormwater Management Plan (ISMP) in 2006 which addresses in detail stormwater quality issues and provides methods to manage the pollutants that are carried by stormwater. The purpose of this plan is to meet federal clean water requirements for both the Deschutes River and groundwater through Bend and to protect the quality of Bend's water resources. It consists of several components required by federal law and is a part of the NPDES Phase II Stormwater Permit. These include actions to keep the public informed and involved, to reduce the amounts of pollutants from homes and businesses to the storm drain system, to improve municipal operations, and to lessen the impacts of development on water quality. The plan also addresses drinking water protection areas and underground injection controls. An update to the 2006 ISMP to cover stormwater quality activities through June 2023 is currently being reviewed for approval by Oregon Department of Environmental Quality.

The Central Oregon Stormwater Manual was last updated in 2010 and was developed as a collaborative effort between Central Oregon cities, counties, and the Central Oregon Intergovernmental Council. The manual uses the best available stormwater management guidance from Oregon and Eastern Washington to create a reference for engineers, builders, and local government staff on the design and construction of runoff treatment and flow control facilities. The Best Management Practices (BMPs) that make up the core of the manual are intended to comply with all federal and state regulations, are suitable to the unique climatic and hydro-geologic conditions of the region, and will protect both water quality and natural runoff patterns. In contrast to historic practice, non-underground injection methods of managing stormwater are encouraged and pre-treatment is required for water that is injected underground.

Recommendations

To mitigate potential stormwater and other impacts to water quality from roadway projects, it is recommended that the best management practices contained in the City of Bend ISMP and Stormwater Master Plan, as well as the Central Oregon Stormwater Manual be used.

Fish, Wildlife & Habitat Resources

Threatened and Endangered Species, and Critical Habitat

Under federal law, the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and
Atmospheric Administration (NOAA) share responsibility for implementing the federal Endangered Species Act (ESA) of 1973 (Public Law 93-205, 16 United States Code ([USC[) § 1531), as amended. In general, USFWS has oversight for land and freshwater species and NOAA for marine and anadromous fish species. In addition to information about listed species, the USFWS Oregon Field Office maintains a list of Species of Concern.

Once a species is listed as a threatened or endangered (T&E) species, it is afforded the full range of protections available under the ESA, including prohibitions on killing, harming or otherwise “taking” a species. A species is listed as one of two categories, endangered or threatened, depending on its status and the degree of threat it faces. An “endangered species” is one that is in danger of extinction throughout all or a significant portion of its range. A “threatened species” is one that is likely to become endangered in the foreseeable future throughout all or a significant portion of its range. In some cases, plants and animals may be placed on a candidate list as a “candidate species”. This occurs when the USFWS has information on biological status and threats sufficient enough to propose the species as endangered or threatened under the ESA, but a proposed listing regulation is precluded by other higher priority listing activities.

Under state law (Oregon Revised Statutes 496.171 to 496.192) the Fish and Wildlife Commission, through the Oregon Department of Fish and Wildlife (ODFW), maintains the list of native wildlife species in Oregon that have been determined to be either threatened or endangered according to criteria set forth by rule (Oregon Administrative Rule [OAR] 635-100-0105). Plant listings are handled through the Oregon Department of Agriculture. Most invertebrate listings are conducted through the Oregon Natural Heritage Program.

Under Oregon’s Sensitive Species Rule (OAR 635-100-040), a “sensitive” species classification was created that focuses fish and wildlife management and research activities on species that need conservation attention. “Sensitive” refers to naturally reproducing fish and wildlife species, subspecies, or populations that are facing one or more threats to their populations and/or habitats. Although the intent of the Sensitive Species list is to prevent species from declining to the point of qualifying as threatened or endangered, this list is not used as a "candidate" list for species to be considered for listing under the Oregon Threatened and Endangered Species rules.

Sensitive species are assigned one of two subcategories. “Critical” sensitive species are imperiled with extirpation from a specific geographical area of the state because of small population sizes, habitat loss or degradation, and/or immediate threats. Critical sensitive species may decline to the point of qualifying for threatened or endangered status if conservation actions are not taken. “Vulnerable” sensitive species are facing one or more threats to their populations and/or habitats. Although not currently imperiled with extirpation from a specific geographical area of the state, vulnerable species could, however, become so with continued or increased threats to populations and/or habitats.

The U.S. Fish and Wildlife Service (USFWS) maintains “IPaC” (Information for Planning and Consulting), an on-line project planning tool that identifies the location of federally listed species and other resources such as critical habitat which could potentially be affected by various types of activities, including transportation projects. Table X below contains federal and state status information specific to Bend and the surrounding area for listed species. Federal status information was generated from IPaC and state status obtained from ODFW.

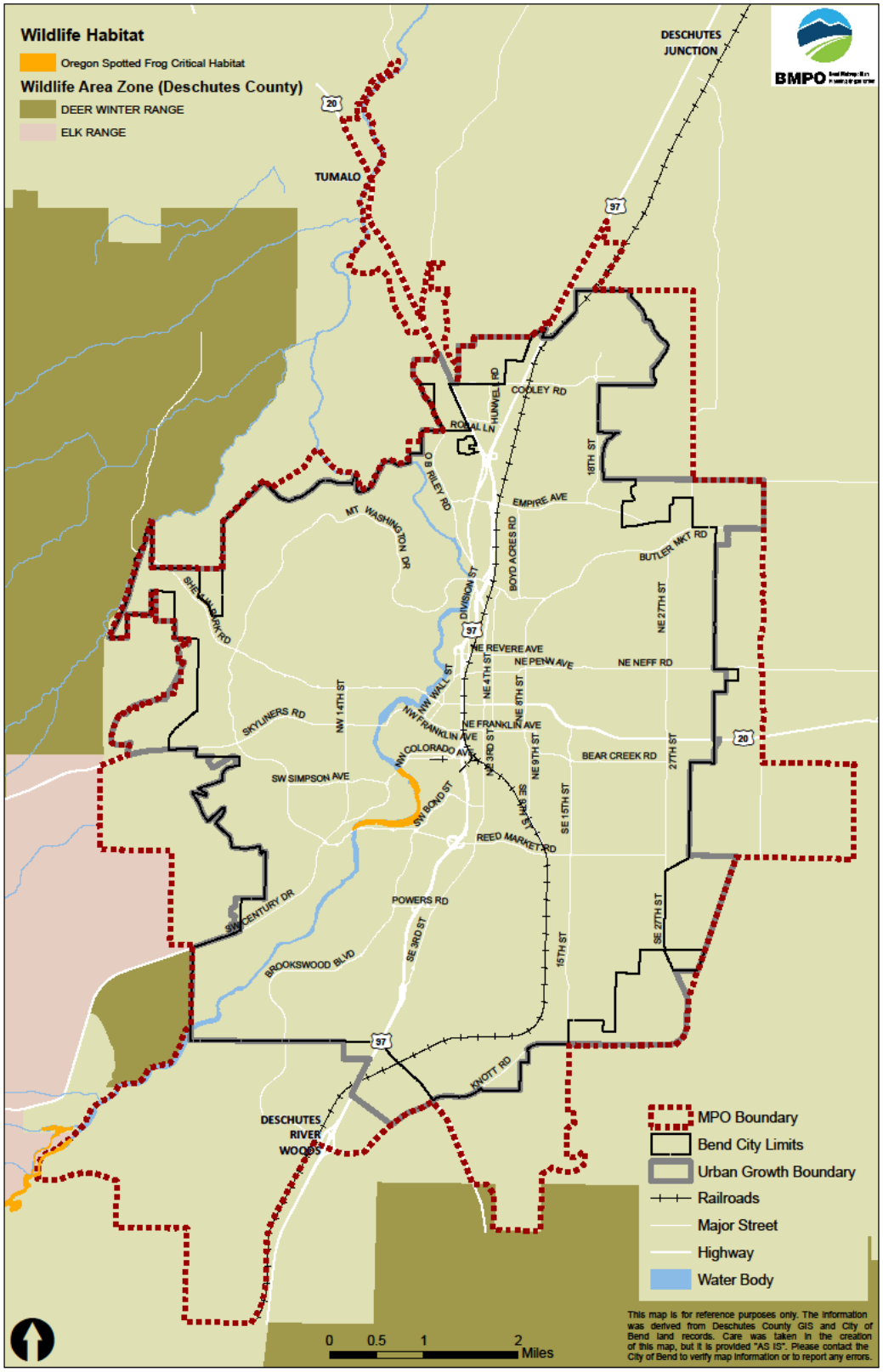


Figure 16-2: Wildlife Habitat Map

Table 16-3: Fish and Wildlife: Threatened, Endangered, and Sensitive Species within or near BMPO

Common Name	Category	Federal Status	State Status	Special Needs	Limiting Factors
Fisher	Mammal	Proposed Threatened	Sensitive	Specialized habitats	Extensive home ranges, low reproduction
Gray Wolf	Mammal	Endangered	Delisted	Contained in Oregon Wolf Conservation and Management Plan	Availability of disturbance-free areas
Yellow-billed Cuckoo	Bird	Threatened	Candidate	Riparian habitat	Overgrazing, river flow management
Oregon Spotted Frog	Amphibian	Threatened	Sensitive-Critical	Perennial water bodies with good breeding and overwintering conditions	Predation, competition
Bull Trout	Fish	Threatened	Sensitive	Cool Temps, channel complexity, migratory corridors	Connectivity
Great Basin Redband Trout	Fish	Species of Concern	Sensitive	Migratory corridors, pool habitats	Channelization, water withdrawal, riparian conditions

Source: IPaC, www.oregonconservationstrategy.org, and www.fws.gov/oregonfwo/, accessed July 2019.

Listed Plants

According to Oregon Department of Agriculture mapping, two plant species may be found within the Bend MPO that are listed as federal and state Species of Concern. This includes Howell's thelypody (federal Species of Concern) found in lower elevation river valleys, and Peck's milkvetch (state Species of Concern) found in sage/juniper environments.

Critical Habitat

In 2016, the USFWS designated critical habitat for the Oregon Spotted Frog under the Endangered Species Act. In total, approximately 65,038 acres and 20.3 river miles in many Washington and Oregon counties, including Deschutes County, fall within the boundaries of this designation. Figure 16-2: Wildlife Habitat Map shows the designated critical habitat for the Oregon Spotted Frog along the Deschutes River within the city of Bend, and further south.

Fish Passage

For Oregon's native migratory fish, connectivity between aquatic habitats is an important part of garnering successful and healthy populations. Without habitat connectivity, resident or river-dwelling fish species become isolated, leading to reduced levels of genetic diversity and fitness. Currently, many miles of stream habitat in Oregon are not producing fish because of passage barriers.

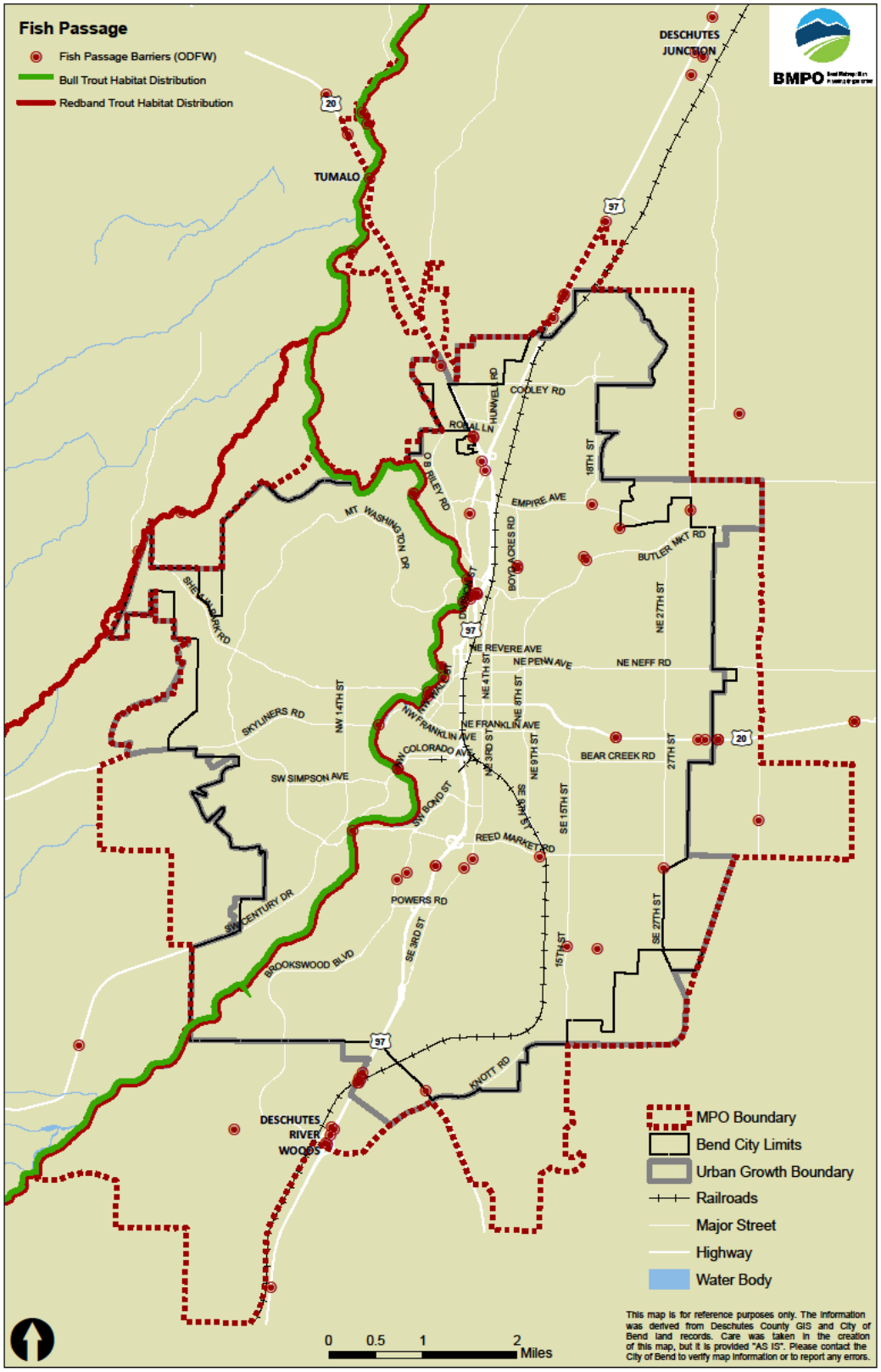


Figure 16-3: Fish Passage Barriers Map

The tables below identify existing dams and diversions within the Bend MPO area, and Figure 16-3: Fish Passage Barriers Map shows barriers to fish passage as identified by the Oregon Department of Fish and Wildlife (ODFW).

Table 16-4: Dams within the BMPO

Dam Name	Location / Pond Name	Built	Operator	Fish Ladder
Bend Hydroelectric Project	Just north of Newport Bridge / creates Mirror Pond.	1910	Pacific Power	No.
Steidl Dam (a.k.a.: First Street Rapids Dam)	Above 1st Street rapids / creates unnamed pond adjacent to Pioneer Park.	1922	Tumalo Irrigation Dist.	Yes.
North Canal Dam	South of Mt. Washington Blvd. / creates "Swan Pond" in front of Riverview Park.	1912	Jointly managed by COID & Swalley Irrigation Dist.	Yes. Installed in 2017.

Source: Bend Riverway 1999; updated July 2019 from operator websites.

Table 16-1: Diversions within the BMPO

Diversion Name	Diversion Location	Fish Screen
Central Oregon Canal	East side of river ¼ mile north of River Rim development	Yes
Bend Feed Canal (Tumalo Irrigation Dist.)	West side of river at 1st Street Rapids	Yes
Swalley Irrigation Canal	East side of river at North Canal Dam	Yes
North Canal or Pilot Butte Canal	East side of river at North Canal Dam	Yes
North Unit Main Canal	East side of river at North Canal Dam	Yes

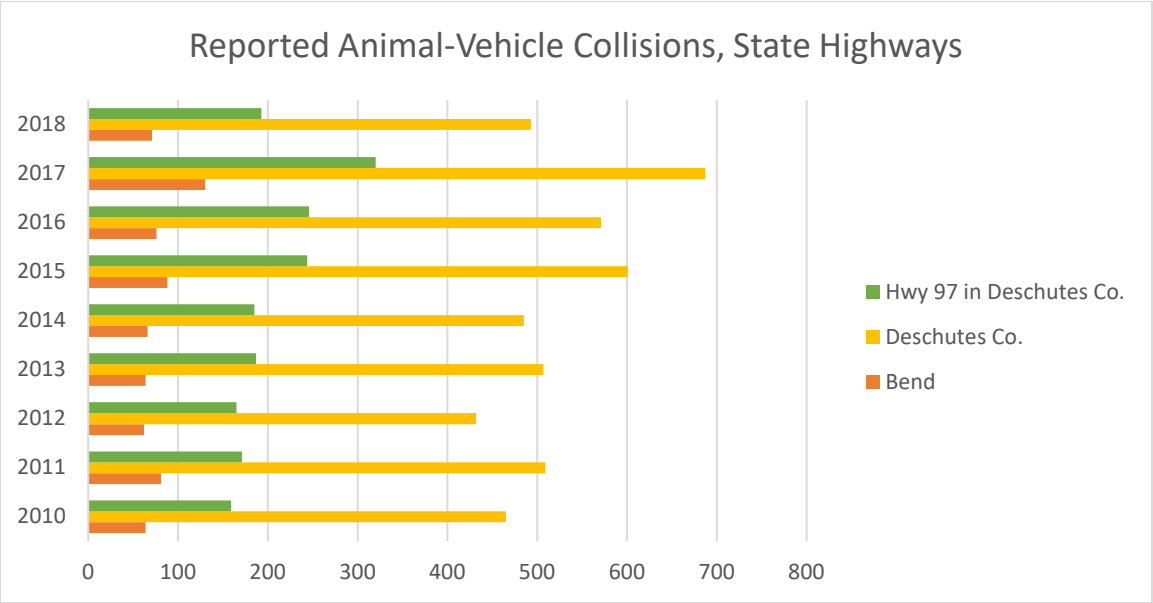
Source: Bend Riverway 1999; updated via personal communication Central Oregon Irrigation District July 2019.

Wildlife Crossing

Roads pose several threats to wildlife including habitat fragmentation and crossing concerns. Wildlife-vehicle collisions are not only deadly for animals, but also cause personal injuries and fatalities for humans, and include significant financial costs and property damage. Figure 16-2 Wildlife Habitat Map included earlier in this chapter, delineates Deschutes County data for deer and elk range.

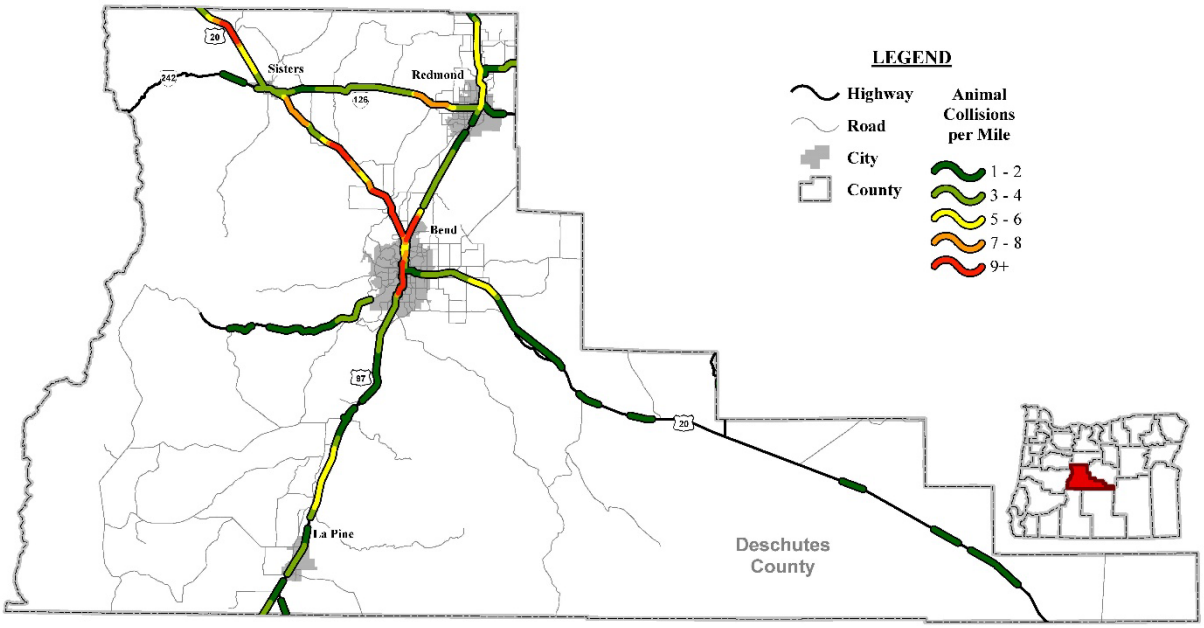
Figure 16-4 represents the number of reported animal-vehicle collisions from 2010 thru 2018 for state highways within the city of Bend and Deschutes County, and along Highway 97, only. Figure 16-5 identifies animal-vehicle collision densities, also known as hot spots, along state highways within Deschutes County. Note that according to these datasets, on average, over 90% of the animals struck were deer.

Figure 16-4: Animal-Vehicle Collision Counts, 2010-2018



Source: ODOT GIS Unit, July 2019

Figure 16-5: Deschutes Co. Animal-Vehicle Collision Densities, 2018 (>90% Deer)



Source: ODOT GIS Unit, July 2019

Highway 97 through Deschutes County and Bend includes 50-miles of roadway with portions having been identified as barriers to migrating deer and elk. In 2018, 193 animals (171 deer) were reported killed along this stretch of highway. A recent local study, *Identifying Migration Corridors of Mule Deer Threatened by Highway Development* (Coe et al, 2015) found that mule deer migration corridors are the strongest predictor of deer-vehicle collisions along the Highway 97 corridor from Bend to Chiloquin, and therefore should be used to locate wildlife crossings. The same study also notes that wildlife crossings placed under or over highways have been shown to reduce wildlife-vehicle collisions by approximately 80%.

Collaborative efforts between ODOT and the Oregon Department of Fish and Wildlife (ODFW) have resulted in the 2012 construction of wildlife passage structures under Highway 97 in conjunction with an ODOT highway capacity project located just a few miles south of Bend. Discussions between ODOT and ODFW to incorporate wildlife habitat connectivity into future transportation projects within and near the Bend MPO area are currently in process.

The Oregon Conservation Strategy, the overarching state strategy for conserving fish and wildlife, includes species-specific responses for different types of animals to different types of barriers, such as connectivity needs for amphibians and reptiles, in addition to mammals.

Invasive species

Non-native, invasive plants and animals disrupt native communities, diminish populations of at-risk native species, and threaten the economic productivity of resource lands. The table below includes documented non-native invasive fish and wildlife species within the East Cascades.

Table 16-4: Non-Native Invasive Fish and Wildlife Species, East Cascades

American Bullfrog	Brown Rat & Black Rat	Eurasian Collared Dove	Fathead Minnow
Asian Clam	Chinese Mysterysnail	European Ear Snail	Feral Horse
Virginia Opossum	Common Carp	European Starling	Feral Sheep
Feral Swine	Golden Shiner	Goldfish	Grass Carp
House Sparrow	Mute Swan	New Zealand Mudsnail	Nutria
Red Eared Slider	Red Swamp Crayfish	Ringed Crayfish	Rock Pigeon

Source: www.oregonconservationstrategy.org, accessed July 2019.

The Oregon Conservation Strategy provides recommendations for the East Cascades region to prevent, assess, detect and control new invasive species from becoming fully established, and strategies to control those that currently exist.

Protected Areas

City of Bend protects water resources under Chapter 2.7.600 of the City Code in a zone called the Waterway Overlay Zone (WOZ), as shown on Figure 16-1: Water Resources

Map earlier in this chapter. The code states “The Deschutes River and Tumalo Creek stream corridors within the urban growth boundary of the City of Bend are valuable economic, recreational, scenic and natural resources for the community. The WOZ is intended to conserve and enhance the natural resource values of areas along the Deschutes River and Tumalo Creek within the city.”

The WOZ includes the following sub-zones, which provide various types of protection:

- *Riparian Corridor* – defines minimum setbacks from Deschutes River and Tumalo Creek and significant wetlands.
- *Deschutes River Corridor Design Review* – design review for building within 100 feet of the river; criteria and process to determine setbacks.
- *River Corridor Areas of Special Interest* – unique areas (primarily rimrock and canyons) with protection criteria.
- *Flood Plain* – criteria and process for development in the floodplain.

The purpose of the Open Space and Conservation Zone (Chapter 18.48 of the Deschutes County Code) is to protect designated areas of scenic and natural resources; to restrict development in areas with fragile, unusual or unique qualities; to protect and improve the quality of the air, water and land resources and to plan development that will conserve open space.

The purpose of the Wildlife Area Combining Zone (Chapter 18.88) is to “conserve important wildlife areas in Deschutes County; to protect an important environmental, social and economic element of the area; and to permit development compatible with the protection of the wildlife resource.” This zone provides protection for migrating elk and deer primarily through the type and density of allowed uses. This zone is shown on Figure 16-2: Wildlife Habitat Map as deer and elk range, and migration corridors.

State and Federal Wild and Scenic Rivers are also protected. Please see the section Scenic Resources in this chapter for more information.

Recommendations

Habitat: Design transportation projects to avoid and minimize the impacts to habitat wherever possible.

Bull trout, redband trout, and Oregon Spotted frog: Identify and explore methods to protect, restore, and maintain suitable habitat conditions for bull trout, redband trout, and Oregon spotted frog for all transportation projects, especially those near the Deschutes River or Tumalo Creek, including the following:

- Maintain or improve water quality.
- Stabilize roads, crossings, and other sources of sediment delivery.
- Identify barriers or sites of entrainment and implement tasks to provide passage and eliminate entrainment.
- Screen water diversions and irrigation ditches.

- Restore connectivity and opportunities for migration by securing instream flows and/or water rights.

Invasive species: Develop measures that prevent invasive species from entering the area on cars, trucks, boats, boat trailers or other vehicles. Design transportation projects to prevent the spread of noxious weed species.

Wildlife Linkages: The design of new transportation projects and the retrofit of existing projects shall include the identification of any wildlife movement issues and a review of best management practices to facilitate wildlife movement to improve human and wildlife safety, decrease habitat fragmentation and property damage. Include mapped wildlife movement areas of concern.

Air Quality

According to the 2016 Oregon Air Quality Data Summaries from the Oregon Department of Environmental Quality (DEQ), the air pollutants of greatest concern in Oregon are:

- fine particulate matter (mostly from wood smoke, other combustion sources, cars and dust) known as PM2.5 (2.5 micrometers and smaller diameter)
- hazardous air pollutants (also called Air Toxics)
- ground-level ozone, commonly known as smog
- Greenhouse gas (GHG) emissions and global climate change are also concerns in Oregon.

The U.S. Environmental Protection Agency (EPA) identifies transportation (fossil fuel combustion) as the largest source of GHG pollutants, and is one of the greatest contributors to smog (ozone-causing pollution).

National Ambient Air Quality Standards

Under the Clean Air Act, the EPA sets air quality standards and periodically updates the standards to ensure that they are continuously protective of public health. Based on new health information, the EPA has proposed to tighten the fine particulate standard and is beginning review of the ozone standard. State and local agencies are required to monitor air quality within their jurisdictions and to use their monitoring data as the basis to classify areas as “attainment” (meeting the standards), “nonattainment” (not meeting the standards), or “unclassifiable” (not enough information to classify). DEQ operates a statewide monitoring network to address this requirement. The Bend MPO is classified as an “attainment” area, as it continues to meet air quality standards.

Air Quality Index

The Air Quality Index (AQI) is a health index which converts concentrations of pollutants into health levels and is based on data collected from the Oregon Department of Environmental Quality's air monitors. Table 18-4 shows the AQI for years 2014-2018 for the BMPO area, based on fine particulate matter (PM2.5) and including subtotals for poor AQI days due to wildfires.

Table 16-5: 2014-2018 Bend Air Quality Index (based on PM2.5)

All Days	Good	Moderate	Unhealthy for Sensitive Groups (USG)	Unhealthy	Very Unhealthy	Missing	Total	USG or worse (annual total)	USG or worse from wildfires (annual total)
2014	338	26	1	0	0	0	365	1	1
2015	335	27	2	1	0	0	365	3	3
2016	335	5	1	0	0	25	366	1	0
2017	291	48	4	8	3	11	365	15	15
2018	307	47	5	4	0	0	363	9	8

Source: Anthony Barnack, DEQ staff, Email 7/5/2019

According to DEQ data for PM2.5 and ozone in the Bend area, there has been a general downward trend of PM 2.5 since 1999, but ozone has had an overall increasing trend (based on available 2011 – 2015 data). No exceedances, or near-exceedances of federal standards have occurred, however.

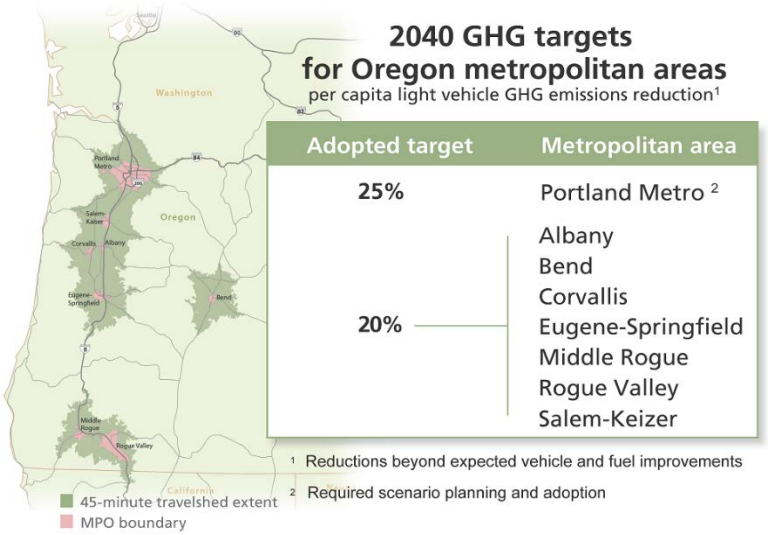
Oregon Greenhouse Gas Targets

In 2011, the Land Conservation and Development Commission (LCDC) adopted rules (OAR 660-044) setting targets to guide long range planning for Oregon's largest urban areas to reduce greenhouse gas pollution (GHG) from auto travel. In addition to reductions from technology and state and federal actions, the rules called for local planners to explore ways to reduce pollution from auto and light truck travel by 17 percent to 21 percent per person by the year 2035. In May 2015, LCDC completed a required review of the rules. It approved the staff report and agreed that the rules should be updated to incorporate new information and to set targets for the years beyond 2035.

In January 2017, LCDC adopted amendments to the GHG reduction target rules that guide scenario planning by the state's metropolitan areas. The rules ask metropolitan areas to evaluate what changes to local and regional land use and transportation plans and programs, would be needed to reduce GHG emissions, from light vehicle travel per capita by 2040. (The year 2040 is the planning limit for most regional transportation

plans.) The 2040 per capita GHG reduction target for the Bend MPO is 20% below 1990 levels, as shown in Figure 16-6.

Figure 16-6: Greenhouse Gas Reduction Targets for Oregon Metropolitan Areas



Source: www.oregon.gov, DLCD Climate Change webpage, accessed July 2019.

Regional and local actions that reduce GHG emissions typically do so by reducing VMT per capita. In Oregon, the Transportation Planning Rule (TPR) requires MPOs to "adopt standards to demonstrate progress towards increasing transportation choices and reducing automobile reliance." This includes a requirement that metropolitan areas (such as the Bend MPO) demonstrate that vehicle miles traveled (VMT) per capita will decline by five percent over the 20-year transportation plan horizon. As an increase in VMT (of less than 5%) was anticipated in the 2012 MPO plan update, the city of Bend, as required by the TPR, developed and adopted the Bend Integrated Land Use and Transportation Plan (2016).

The ILUTP sets standards and policy direction for the Bend area to reduce VMT, including associated vehicle emissions. Such measures and strategies contained in the ILUTP to reduce VMT (and GHG) include:

- Allowing for additional mixed use development and up-zoning for infill development
- Expanding opportunities for walking and cycling
- Implement complete street improvements
- Managing parking more efficiently
- Transit improvements

Scenic Resources

There are significant scenic resources within the BMPO. Views of Three Sisters, Mt. Bachelor, Tumalo Mountain and Broken Top along with the Deschutes River are all visible and prominent from the BMPO. Numerous protections exist for scenic resources including:

- County Landscape Management zones
- Cascade Lakes National Scenic Byway
- State Scenic Waterway designation
- Federal Wild and Scenic River designation

These are all protected resources with varying levels of requirements that must be taken into account in all transportation projects. Areas are identified on Figure 16-7: Scenic and Cultural Resources Map and described below.

County Landscape Management Combining Zone

The purposes of Deschutes County's Landscape Management Combining Zone are to maintain scenic and natural resources of the designated areas and to maintain and enhance scenic vistas and natural landscapes as seen from designated roads, rivers or streams[71]. To implement the zone, the County regulates new structures and landscaping to avoid impacts to scenic views from roads, on rimrock and near rivers. The zone applies to all areas within ¼ mile of the roads in the zone and in State Scenic Waterway and the Federal Wild and Scenic River corridor and all areas within 660 feet of rivers and streams otherwise identified as landscape management corridors in the comprehensive plan and the County Zoning Map.

National Scenic Byway

The route on Forest Highway 46 between Bend and Highway 58 is designated as the Cascade Lakes National Scenic Byway. It begins with the Tour Route in Drake Park and follows Galveston to 14th Street. The Byway begins at edge of the Urban Growth Boundary on the way to Mt. Bachelor at the Deschutes National Forest boundary, travels through the Cascade Lakes recreation area adjacent to the Three Sisters Wilderness, and ends at the junction of Road 61 and Highway 58 close to Crescent Lake. There are numerous goals and site design guidelines for the Byway that are contained in the 2018 Corridor Management and Interpretive Plan. It is important to note that the 2018 plan update incorporated elements of the Bend 2030 Community Vision and Action Plan. This resulted in inclusion of goals and strategies for multi-modal connectivity, stewardship and conservation education through partnerships and dialogue-based collaborative processes, and cultural tourism events with community partners.

[71] See Deschutes County Code (DCC) Chapter 18.84.

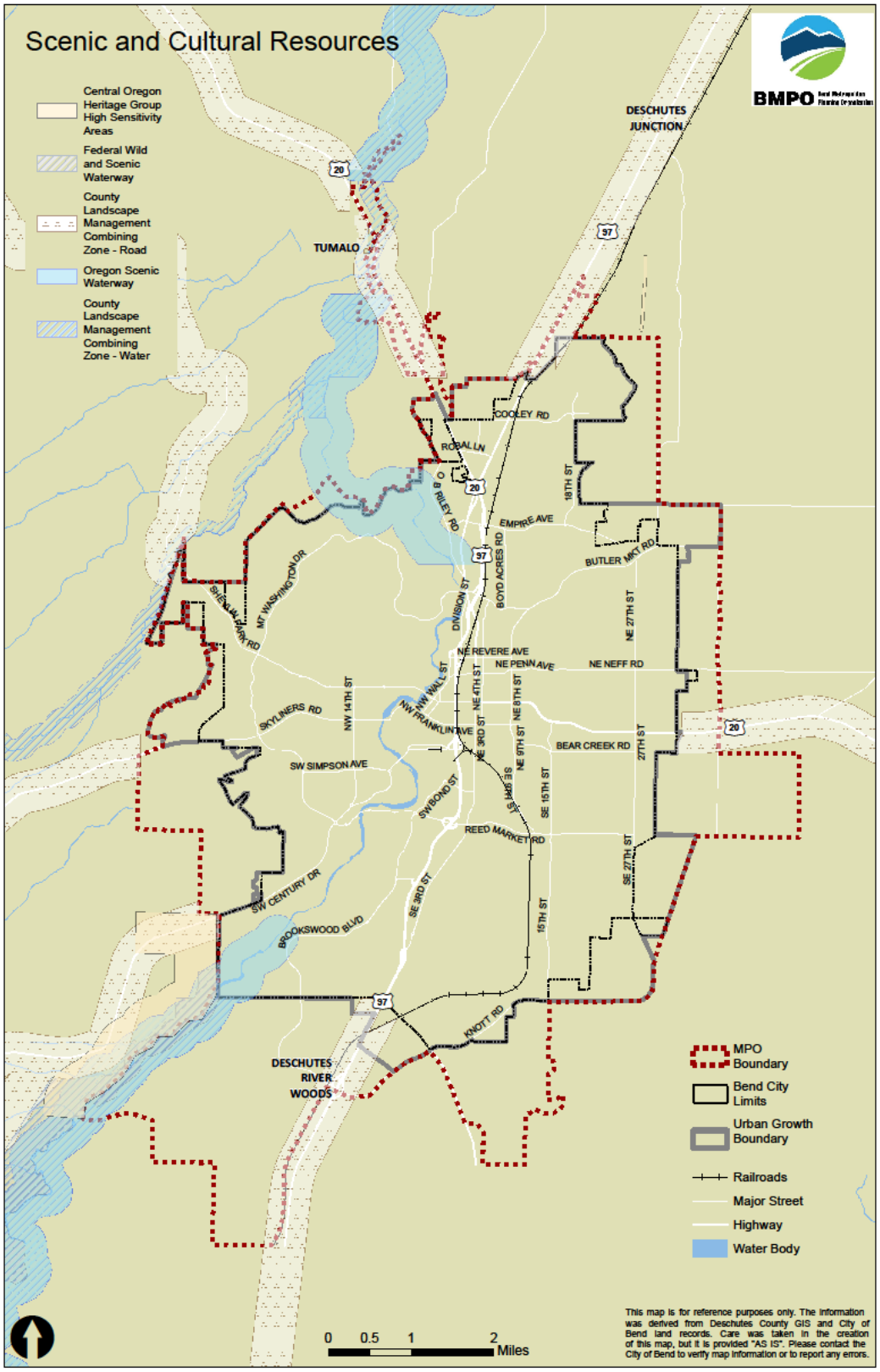


Figure 16-7: Scenic and Cultural Resources Map

While there are no specific regulations are associated with the Byway, it is a nationally and regionally recognized resource as well as a part of Oregon's state scenic byways program. The U.S. Forest Service administers the program and the Federal Highway Administration (FHWA) administers grant programs for which projects associated with the Byway are eligible. Such funds have been secured in the past for projects along the Cascade Lakes National Scenic Byway; most recently in 2014 for construction funds for the Welcome Station and Multi-Use Path Undercrossing, Trail Connectors projects. A list of priority projects are provided in the 2018 Corridor Management and Interpretive Plan.

Scenic Waterways and Wild and Scenic River Designation

Of the approximately 14 miles of river within the BMPO, about 10.8 miles are designated scenic. There are two sections of State Scenic Waterway in the BMPO – one in the north and the other at the south end of the BMPO, encompassing a total of 8.4 miles (Figure 16-7: Scenic and Cultural Resources Map). The south section enters the BMPO's southern boundary and ends at the Central Oregon Irrigation District diversion. The north section starts just below the North Unit Dam (near Mt. Washington Drive) and continues through the BMPO to the north. Oregon State rules govern the Scenic Waterway program and The Upper Deschutes Wild and Scenic River and State Scenic Waterway Comprehensive Management Plan contains specific rules that address setbacks, building color, vegetation retention, river crossings, screening and timber harvest for the southern section within a ¼ mile of the designated river sections. Oregon Park and Recreation Department administers the program.

There is one stretch of National Wild and Scenic River within the BMPO that begins just outside the City of Bend city limits and is about 2.4 miles long within the BMPO. Protection for federal scenic rivers is focused on the "outstandingly remarkable values" that have been identified for the river including geologic, hydrologic, fishery, vegetative, wildlife, cultural, recreational and scenic values. The Upper Deschutes Wild and Scenic River and State Scenic Waterway Comprehensive Management Plan (1996) identifies goals, standards and guidelines for each of the values. This program has similar goals to the state program but differs in the type of protection offered. The U.S. Forest Service administers this program.

Recommendations

Potential conflicts from transportation to the Deschutes River scenic resource could come from the building or rebuilding of bridges near the designated scenic sections or building roads within a quarter to a half-mile of designated resources. For all transportation projects, reference the Scenic Resources map to identify potential conflicts.

Historic and Cultural Preservation

Historic Resources

Based on the Historic Sites Database from the Oregon State Historic Preservation Office data, there are two National Register of Historic Places Historic Districts in the BMPO (Drake Park Historic District and Old Town Historic District), 409 properties that are listed on the National Register of Historic Places as part of these two historic districts, and 27 individually listed properties (including the two historic districts). There are also numerous individually designated historic and cultural buildings and sites.

In addition to the listings on the National Register, Bend City Council adopted a list of historic and cultural resources that has been approved by Oregon Land Conservation and Development Commission. Any land use action or building modification to the historic structures on the approved list must be reviewed and approved by the Bend Landmarks Commission. These properties may also be protected by Section 4(f) for transportation projects. Additionally, the Craftsman bungalows identified as potentially eligible for the National Register may also be 4(f) properties.

The Bend Landmarks Commission is the review body for projects that may affect a designated cultural or historical site within the City of Bend. The City of Bend maintains a Historic Sites webpage where details of historic districts and places on the National Register can be found. Additionally, an interactive map of historic places is provided on the City's Historic Preservation webpage.

Cultural Resources

There are three tribal nations that may consider the area where the BMPO is today their usual and accustomed summer camps, and hunting and gathering areas. They are the Confederated Tribes of Warm Springs, the Burns Paiute Tribe and the Klamath Tribe. Each Tribe should be contacted on a case-by-case basis as transportation projects move forward. The Oregon State Historic Preservation Office (SHPO) maintains a statewide archaeological inventory database, however due to the sensitivity of the information, access to these records is restricted. A request for review by SHPO would be necessary on a case-by-case basis when specific transportation projects are funded. Figure 16-7: Scenic and Cultural Resources Map delineates areas of known 'high sensitivity' for archaeological sites identified by the BLM's Prineville Office.

Section 4(f)

Section 4(f) refers to the original section within the U.S. Department of Transportation Act of 1966 which provided for consideration of park and recreation lands, wildlife and waterfowl refuges, and historic sites during transportation project development. The law, now codified in 49 U.S.C. §303 and 23 U.S.C. §138, applies only to the U.S. Department of Transportation (U.S. DOT) and is implemented by the Federal Highway Administration (FHWA) and the Federal Transit Administration through the regulation 23 Code of Federal Regulations (CFR) 774.

Section 4(f) properties include significant publicly owned public parks, recreation areas, and wildlife or waterfowl refuges, or any publicly or privately owned historic site listed or eligible for listing on the National Register of Historic Places. Section 4(f) applies to projects that receive funding from or require approval by an agency of the U.S. DOT. Before approving a project that uses Section 4(f) property, FHWA must determine that there is no feasible and prudent alternative that avoids the Section 4(f) properties and that the project includes all possible planning to minimize harm to the Section 4(f) properties; or, FHWA makes a finding that the project has a de minimis impact on the Section 4(f) property. Public lands and trails are included in Figure 16-8: Public Lands and Trails Map, and the City of Bend maintains an interactive Historic Resources Map. No state or federal wildlife or waterfowl refuges exist within the Bend MPO area.

Recommendations

Cross-reference locations and potential impacts from transportation projects to the City's Historic Resources Map. Consultation with the Bend Landmarks Commission, the State Historic Preservation Office, and the tribes on a case-by-case basis for each proposed transportation project may be needed to determine if there is the presence of any historical or archeological resources or Section 4 (f) property.

For any Section 4(f) property identified, property boundaries shall be defined and jurisdictional responsibilities identified. The BMPO shall work with the responsible jurisdiction to avoid impacts to the 4(f) lands according to federal requirements.

Recreation Resources

This section is related to the sections on Historic and Cultural Resources and Fish and Wildlife Resources because all are provided some protection under Section 4(f) of the U.S. Department of Transportation Act. There are significant recreation resources within the BMPO and they are shown on Figure 16-8: Public Lands and Trails Map.

The BMPO benefits from an abundance of parks and trails. Numerous agencies provide park land and facilities in the area including Oregon Parks and Recreation Department, Deschutes County, and the City of Bend; but the primary provider of parks and trails is the Bend Parks and Recreation District which is a separate jurisdiction from the city. The District currently manages 81 parks and open spaces, and 70 miles of trail within the BMPO. In addition to all of the recreation land and facilities within the BMPO, the area is surrounded by thousands of acres of lands managed by the Bureau of Land Management (BLM) and the Deschutes National Forest. The Forest/Urban interface lands on Bend's west side are receiving increasing recreation use from Bend's population growth and increasing tourism.

There are two federal acts that provide protection to recreational lands under certain conditions. The provisions for protection are in Section 6(f)(3) of the Land and Water Conservation Fund (LWCF) and in Section 4(f) of the U.S. Department of Transportation Act 1966.

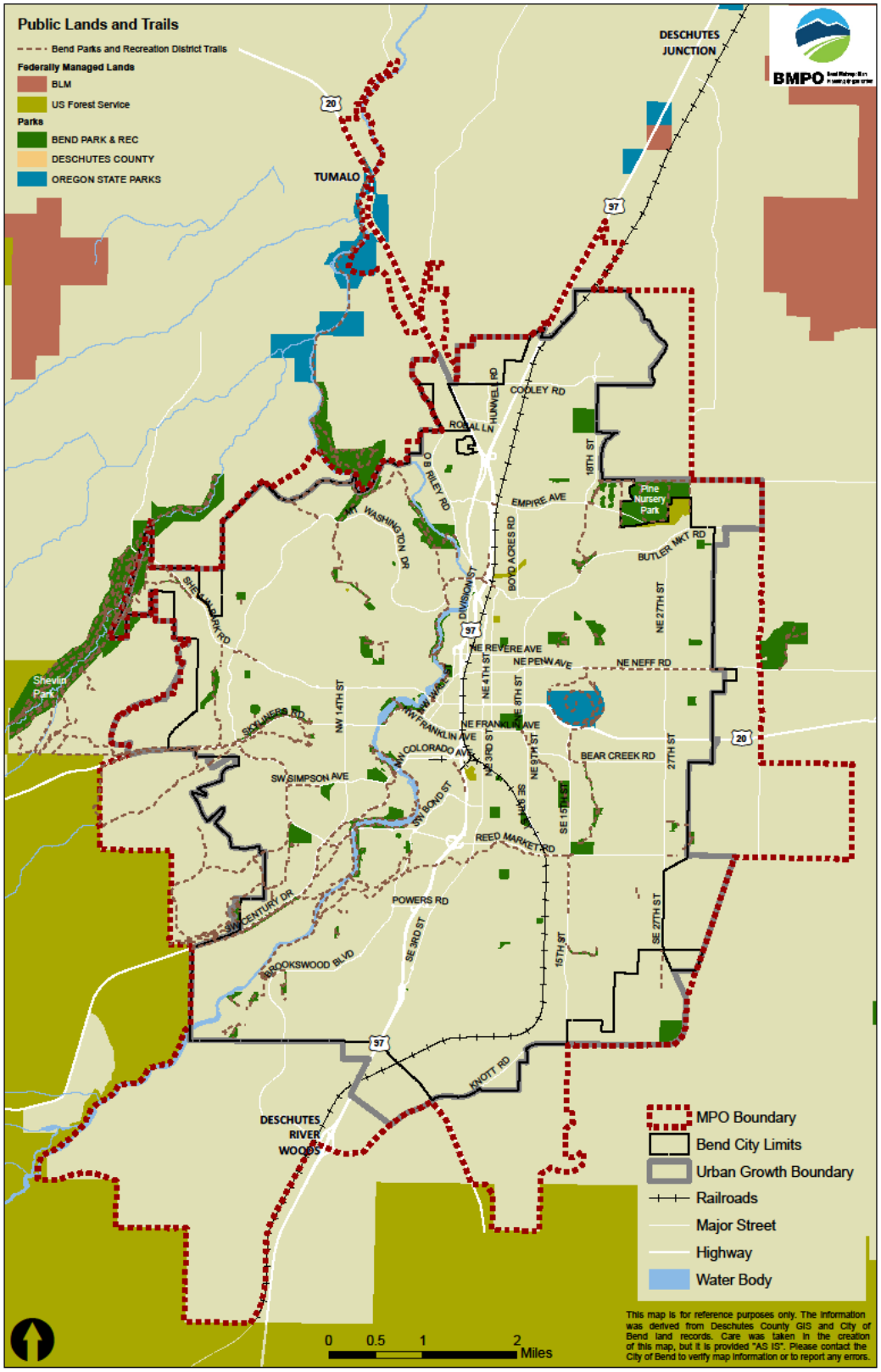


Figure 16-8: Public Lands and Trails Map

Section 6(f)(3) of the LWCF Act states “No property acquired or developed with assistance under this section shall, without the approval of the Secretary, be converted to other than public outdoor recreation uses. The Secretary shall approve such conversion only if he finds it to be in accord with the then existing comprehensive statewide outdoor recreation plan and only upon such conditions as he deems necessary to assure the substitution of other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location.” This "anti-conversion" requirement applies to all parks and other sites that have been the subject of Land and Water grants of any type, whether for acquisition of parkland, development or rehabilitation of facilities.

There are numerous recreation facilities within the BMPO that have been supported by LWCF monies over the years including the Juniper Swim and Fitness Center, Skyline Sport Park, and Hollinshead Historical Park as well as a number of smaller community and neighborhood park projects. The LWCF program provides matching grants to States and local governments for the acquisition and development of public outdoor recreation areas and facilities. As of July 2019, the LWCF website lists 20 projects within the BMPO area that have been awarded approximately $1,330,000 since 1966.

Section 4(f) of the US Department of Transportation Act (described earlier in this section) also provides protection to recreation lands from transportation projects. Federal Highway Administration projects are prohibited from using land from a publicly owned park or recreation area unless there is no feasible and prudent alternative to the use of land. Section 4(f) does not apply to planned trails if the land for the planned trail is not currently publicly owned. Additional criteria would need to be met for Section 4(f) to apply to any planned trail on publicly owned land.

Recommendations

Conflicts that could potentially result from transportation projects include crossing recreational trails and other impacts to recreational lands and facilities. In the early stages of planning for transportation projects in the BMPO, a survey should be conducted to identify all 4(f) and 6(f)(3) properties in the vicinity of the proposed project. Property boundaries defined and jurisdictional responsibilities should be identified. The BMPO should work with the responsible jurisdiction to avoid, reduce or minimize impacts to the 4(f) or 6(f)(3) properties consistent with requirements outlined in the respective regulations. Avoiding impacts to parks and trails consistent with federal and state law is required.

Environmental Justice

Environmental justice in transportation planning, as required by Executive Order 12898, seeks to avoid, minimize, or mitigate disproportionately high or adverse human health and environmental effects, including social and economic effects, on minority and low-income populations that could potentially result from transportation projects. This includes disproportionately high and adverse effects on human and environmental

health, including social and economic effects for those populations. The Bend MPO addresses environmental justice in the BMPO Title VI and Environmental Justice Plan (2013). Note that at the time of this writing this plan was undergoing an update. The contents of the draft BMPO Title VI Plan are suitable for referencing general environmental justice information for the BMPO, however, and include current mapping.

Chapter 17: Financial Analysis

Introduction

The Bend Metropolitan Planning Organization (BMPO) is responsible for preparing a long-range regional transportation plan for the Bend metropolitan area. That plan is called the Metropolitan Transportation Plan (MTP). The MTP takes a “big-picture” look at future demand for all modes of transportation in the Bend area and how that demand might be managed and accommodated by investments in programs, services and infrastructure. The MTP is an initial step in developing the region's network of transportation facilities and services, and serves as a framework for more detailed project planning.

The rules of the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) require the MTP to be “fiscally constrained,” meaning that the cost of projects included in the MTP cannot exceed the capacity of the region to fund the projects. This chapter estimates the level of transportation-related funding that jurisdictions in the Bend MPO can reasonably expect to have available over the planning period. This report provides a basis for making decisions about the amount of revenue available over the next 20 years to fund regional transportation improvements.

The purpose of this chapter is to provide the financial context for the discussion and evaluation of projects. This chapter presents an analysis of funding resources that the BMPO can reasonably expect to fund the projects in the Plan and to support operations and maintenance of the transportation system. This report summarizes research on reasonably available funding resources, and compares those resources to estimated project costs, to help generate the fiscally constrained project list.

This chapter focuses on estimating revenues that will be available over the next 20 years for transportation improvements in the region. Other parts of the plan discuss potential projects, their benefits, and their costs. A subsequent and critical step in the planning process is the comparison of the revenue estimates in this report to project performance measures and costs in other reports to decide on the best package of transportation improvements that can be assembled within the agreed upon revenue constraints.

This MTP addresses only the regional transportation system. Regional facilities include all state transportation facilities, major arterials and minor arterials, and some major collectors. Local facilities (the remainder of the collector system and local roads) are not addressed in the plan.

Framework

Context

Legislative framework

The vast majority of people and freight using the transportation system are traveling on roads in cars, trucks, and buses. In addition, the roadway system includes walkways and bicycle facilities. The roadway system in the United States is primarily owned and operated by the public sector. While the system of freeways, highways, and streets function as a single system, it is the joint responsibility of federal, state, and local governments to build and maintain this system.

Road systems in urban areas are extensive and may cross many jurisdictions. Efficiently building and maintaining such a complex system requires planning to coordinate the investments of multiple jurisdictions. Large urban areas are required by federal and Oregon law to coordinate plans for transportation improvements at a regional level. The MTP serves this function by considering long-run transportation needs at a regional level and identifying policies, programs, and projects to meet these needs. The plans of local jurisdictions responsible for the transportation system in the Bend metropolitan area must be consistent with the policies, programs, and projects identified in the MTP.

While measures in an MTP can include policies, strategies, and programs, the focus of an MTP is usually on capital investments to improve safety, improve existing roadways, construct new roadways, improve transit service, and improve and construct key bicycling and walking facilities. A key requirement for regional transportation plans is that they be fiscally constrained—the cost of actions identified in the MTP cannot exceed the level of funding considered reasonably available in the region. In addition, projects must be in the MTP to be eligible for most federal and state funding programs. ODOT, Deschutes County, the City of Bend, and Cascades East Transit (CET) each prepare short-term capital improvement programs that identify projects that will be funded in the near future, typically the next three to five years. Programs, services and projects built and operated by jurisdictions in the BMPO area must be consistent with the MTP in order to be eligible for federal funding.

The cost of all programs, services and projects in a region that could contribute to system improvements almost always exceed the financial resources considered reasonably available to pay for the projects. For these reasons, the biggest and defining task of a metropolitan transportation plan is to select and prioritize projects within the constraint of available funding. A metropolitan transportation plan also describes projects beyond those that fall within whatever definition of fiscal constraint that a region ultimately chooses. These projects are considered aspirational: they could be included in the fiscally constrained set of programs and projects if new funding sources are found. Moreover, even if they are not part of the fiscally-constrained set of programs and projects, they are potentially part of a longer-term transportation plan, and give local

governments some ability to conduct certain planning studies that might be necessary given the long time it takes for project development.

Transportation Funding Principles

Projects to improve the transportation system are funded through a mix of federal, state, and local revenues distributed through a variety of funding programs that dictate how this revenue can be spent. In addition to revenue generation and spending by multiple jurisdictions, revenue sharing among jurisdictions and cooperation among multiple jurisdictions on individual projects makes describing transportation funding complicated.

To organize this review of available transportation funding in the Bend metropolitan area, the chapter focuses on the sources of public funding for transportation and how those funds are spent.

There is a distinction between the terms "funding" and "financing," which often get used interchangeably. Providing transportation facilities and services costs money, and somebody has to pay for these costs. The ultimate source of revenue for these costs is funding. When the funds for transportation costs are borrowed and paid back over time, then these costs have been financed. Public agencies finance costs for the same reasons as households and businesses—to reduce the current out-of-pocket costs by spreading out payments over time.

Definitions

Revenue sources:

- ***State Highway Fund (SHF)*** *is composed of several major funding sources: Motor Vehicle Registration and Title Fees, Driver License Fees, Motor Vehicle Fuel Taxes, and Weight-Mile Tax. The SHF funds are apportioned to ODOT, Counties and Cities.*
- ***Statewide Transportation Improvement Program (STIP)*** *is Oregon's four-year transportation capital improvement program. This program defines which projects will be funded by what amount of money throughout the planned four-year program period. Projects at all jurisdiction levels are included in the program; Federal, state, county, and city.*
- ***Surface Transportation Block Grant Program (STBG)*** *is a major federal transportation program to provide "flexible" funds for transportation projects at the state and local levels. Funds are "flexible" in that they can be spent on a variety of transportation related projects (e.g. roads, mass transit, bike facilities).*
- ***System Development Charges (SDC)*** *are fees collected when new development occurs within the City of Bend and in unincorporated Deschutes County. These fees are then used to partially fund capital improvements, such as new streets within the city.*

Other key terms and acronyms:

- ***Peak Hour Trips (PHTs)*** *are those trips made during the busiest hour within the morning and evening peak traffic flow periods. In this report PHTs are used to forecast SDC revenue arising from future, new development.*
- ***Fiscal Year End (FYE)*** *denotes the completion of a one-year, or 12-month, accounting period. For example, FYE 2019 refers to the 2018-19 fiscal year, ending June 30, 2019.*
- ***Year of Expenditure (YOE)*** *denotes that dollar values are reported as nominal values, which increase over time due to assumed inflation rates.*
- ***Constant 2018 $*** *denotes that dollar values are reported in constant terms based on FYE 2018 values. These values remain constant over time, and do not reflect changes in value due to inflation.*

Methods

To complete this chapter, the following steps were followed:

- ***Reviewed existing data and previous studies.*** *Primary documents reviewed included ODOT's June 2018 Revenue Forecast and the Bend Transportation System Plan. Also reviewed were:*
  - City of Bend Adopted Biennial Budgets, 2017-2019 and 2015-2017
  - ODOT Fund Apportionments, Receipt Distribution for FY 2018-2019
  - City of Bend Transportation Operations Forecast
  - ODOT Statewide Transportation Improvement Program 2018-2021
  - Deschutes County Budgets, FY2017 and FY2019
  - Bend MPO Peak Hour Trip (PHT) Forecast, DKS Associates
- ***Conferred with staff from relevant State and local agencies.*** *Discussions with staff from agencies that provide transportation services to gain insight into local transportation funding plans and policies.*

Assumptions

The MTP relies upon numerous assumptions to forecast future revenues and expenditures. Throughout this chapter, we identify the assumptions used in the analysis. However, there are a few key assumptions applied to numerous calculations throughout the analysis. Those assumptions are the future inflation rate, and the pace of future development, as measured by Peak Hour Trips (PHT). Table 17-1 shows the assumed inflation rate of 3.1 percent, which is the same rate used by ODOT in their most recent long-range revenue forecast. Table 17-2 shows the assumed phasing of new PHTs, based on projections from DKS Associates.

Table 17-1. Assumed inflation index used in this analysis, FYE 2015 to 2040

FYE	Index
2018	1.0000
2019	1.0310
2020	1.0630
2021	1.0960
2022	1.1300
2023	1.1650
2024	1.2011
2025	1.2383
2026	1.2767
2027	1.3163
2028	1.3571
2029	1.3992
2030	1.4426
2031	1.4873
2032	1.5334
2033	1.5809
2034	1.6299
2035	1.6804
2036	1.7325
2037	1.7862
2038	1.8416
2039	1.8987
2040	1.9576

Source: ODOT

Table 17-2. Forecast growth in Peak Hour Trips, BMPO, FYE 2015 to 2040

FYE	PHT	Total PHT
2018	796	59,628
2019	807	60,435
2020	818	61,253
2021	829	62,082
2022	840	62,922
2023	851	63,773
2024	863	64,636
2025	874	65,510
2026	886	66,396
2027	898	67,294
2028	910	68,204
2029	923	69,127
2030	935	70,062
2031	948	71,010
2032	961	71,971
2033	974	72,945
2034	987	73,932
2035	1,000	74,932
2036	1,014	75,946
2037	1,027	76,973
2038	1,041	78,014
2039	1,055	79,069
2040	1,071	80,140

Source: PHT forecast provided by DKS

Organization of this chapter

The remainder of this chapter describes future revenue forecasts. It is organized first by jurisdiction, including separate sections for the City of Bend, Oregon Department of Revenue, Deschutes County, and Cascades East Transit. Within each of those sections, we first describe revenues for operations, maintenance, and administration, and then describe revenues available for capital projects. All forecasts are shown in both Constant 2018 dollars as well as Year of Expenditure dollars.

Revenue forecasts

The revenue forecasts in this chapter are organized first by the entity receiving the revenue (City, County, ODOT, and CET), and then by the purpose of the revenue (operations and maintenance and administration versus capital projects). We provide recent historical data on these revenues, and then long-term forecasts.

City of Bend

The City of Bend owns and maintains the vast majority of the roadway network in the BMPO. Thus, the City of Bend has primary responsibility for funding transportation operations and maintenance and new capital projects in the BMPO. As such, the majority of our analysis focuses on these City of Bend revenue sources.

Operations and maintenance and administration

The City of Bend's budget is biennial; revenue amounts for the three most recent biennia are reported below in Table 17-3. The City's total resources for transportation operations and maintenance have grown over this time period, exceeding $35 million in available funds in the 2017-19 biennium. The City's general fund is the largest source of revenue for transportation operations, maintenance and administration, accounting for about 37% of all revenue. Intergovernmental revenues (primarily allocations of State Highway Fund revenue) is the second largest revenue source, accounting for about 32% of all revenue.

Table 17-3. Historical transportation revenues for operations, maintenance and administration, City of Bend, Biennium 2013-15 to 2017-19 (YOE dollars)

Resources	Actuals 2013-2015	Adjusted 2015-2017	Adopted 2017-2019
Beginning working capital	2,685,268	3,160,100	6,254,187
Franchise Fees	1,056,800	1,111,100	2,994,100
Intergovernmental Revenues	10,931,191	10,691,900	11,180,237
General fund subsidy	5,450,000	10,924,833	13,099,500
Licenses and permits	305,818	297,100	-
Sale of capital assets	304,233	-	-
Interfund charges	934,302	518,000	496,000
Interfund transfers	1,014	197,770	62,268
Investment income	35,788	37,100	128,600
Miscellaneous	71,732	35,200	44,000
Issuance of long-term debt	-	-	1,273,800
Total Resources	**$21,776,146**	**$26,973,103**	**$35,532,692**

Source: City of Bend, Oregon 2017-2019 Adopted Biennial Budget, Streets and Operations Fund, Page 231.

Table17-4 shows ODOT forecasts for total State Highway Fund (SHF) revenues. ODOT forecasts steady growth in total SHF revenue through 2040, but the rate of growth less than the anticipated rate of inflation, resulting in declining annual funding after 2023 as measured in constant 2018 dollars. SHF revenues have several major sources: Motor Vehicle Registration and Title Fees, Driver License Fees, Motor Vehicle Fuel Taxes, and Weight-Mile Tax. Note that the forecast of SHF revenue is divided into two categories: “current law” reflects revenues from these sources according to the rates in place prior to 2018, and “additional” revenue reflects increases in certain State taxes and fees that began taking effect in FYE 2018.

Table17-4. Projected State Highway Fund revenues, State of Oregon, FYE 2020 to 2040 (millions)

	YOE $			Constant 2018 $		
FYE	"Current Law"	"Additional"	Total SHF Revenue	"Current Law"	"Additional"	Total SHF Revenue
2020	1,335	-	1,335	1,256	-	1,256
2021	1,386	-	1,386	1,265	-	1,265
2022	1,439	-	1,439	1,274	-	1,274
2023	1,484	-	1,484	1,274	-	1,274
2024	1,513	-	1,513	1,259	-	1,259
2025	1,538	-	1,538	1,242	-	1,242
2026	1,533	-	1,533	1,201	-	1,201
2027	1,531	-	1,531	1,163	-	1,163
2028	1,534	44	1,578	1,130	33	1,163
2029	1,537	93	1,630	1,098	67	1,165
2030	1,540	144	1,684	1,067	100	1,167
2031	1,543	197	1,740	1,037	132	1,170
2032	1,546	251	1,797	1,008	164	1,172
2033	1,549	308	1,857	980	195	1,174
2034	1,552	366	1,918	952	225	1,177
2035	1,555	426	1,982	926	254	1,179
2036	1,558	489	2,047	899	282	1,182
2037	1,561	553	2,115	874	310	1,184
2038	1,565	620	2,185	850	337	1,186
2039	1,568	689	2,257	826	363	1,189
2040	1,571	761	2,332	802	389	1,191

Source: ODOT Long-Range Revenue Tables

SHF revenue is allocated to three jurisdiction levels: State, Counties, and Cities. Table17-5 reflects these allocations.

Table17-5. Allocation of projected State Highway Fund revenues, State of Oregon, FYE 2020 to 2040 (millions)

FYE	YOE $				Constant 2018 $			
	State Share	County Share	City Share	Total	State Share	County Share	City Share	Total
2020	749	352	234	1,335	704	331	220	1,256
2021	777	366	243	1,386	709	334	221	1,265
2022	807	380	252	1,439	714	336	223	1,274
2023	833	392	260	1,484	715	336	223	1,274
2024	849	399	265	1,513	707	332	220	1,259
2025	863	406	269	1,538	697	328	217	1,242
2026	860	405	268	1,533	674	317	210	1,201
2027	859	404	268	1,531	652	307	203	1,163
2028	883	418	277	1,578	650	308	204	1,163
2029	909	434	288	1,630	650	310	206	1,165
2030	936	450	298	1,684	649	312	207	1,167
2031	964	466	309	1,740	648	314	208	1,170
2032	993	484	321	1,797	648	315	209	1,172
2033	1,023	501	333	1,857	647	317	210	1,174
2034	1,054	520	345	1,918	647	319	212	1,177
2035	1,086	538	357	1,982	646	320	213	1,179
2036	1,119	558	370	2,047	646	322	214	1,182
2037	1,153	578	384	2,115	645	324	215	1,184
2038	1,188	599	398	2,185	645	325	216	1,186
2039	1,224	621	412	2,257	645	327	217	1,189
2040	1,262	643	427	2,332	644	328	218	1,191

Source: ODOT Long-Range Revenue Tables

Cities share of SHF revenue is allocated to individual cities based on population. In FYE 2019, the City of Bend received approximately 3.1% of the total cities share of SHF revenue. We assume Bend continues to receive this same percentage of the city share of SHF revenues through the 2040 forecast horizon. To the extent that the City of Bend's population growth outpaces the growth of other cities statewide, the City could receive an increasing share of SHF revenue.

Table17-6 shows the projected allocation of SHF revenue to the City of Bend. Of the projected $234 million in SHF revenue allocated to Oregon cities in FYE 2020, the City of Bend is forecast to receive approximately $7.3 million. This is forecast to grow to nearly $13.3 million in 2040, but in constant 2018 dollars the City of Bend's allocation of SHF money is anticipated to experience modest growth through 2023, begin declining in 2024, and then slowly start increasing in 2030.

Table17-6. Allocation of projected State Highway Fund revenues to the City of Bend, State of Oregon, FYE 2020 to 2040

FYE	Allocation to City of Bend	
	YOE $	Constant 2018 $
2020	7,258,761	6,828,562
2021	7,537,777	6,877,534
2022	7,827,127	6,926,661
2023	8,072,965	6,929,584
2024	8,227,430	6,849,913
2025	8,363,403	6,753,939
2026	8,336,752	6,529,922
2027	8,324,787	6,324,384
2028	8,617,343	6,349,822
2029	8,939,265	6,388,840
2030	9,271,903	6,427,217
2031	9,615,614	6,465,148
2032	9,970,762	6,502,388
2033	10,337,727	6,539,140
2034	10,716,899	6,575,188
2035	11,108,682	6,610,737
2036	11,513,493	6,645,595
2037	11,931,763	6,679,970
2038	12,363,937	6,713,693
2039	12,810,475	6,746,972
2040	13,271,852	6,779,655

Source: ODOT Long-Range Revenue Tables

In addition to SHF allocations, the City has additional revenue sources used for operations, maintenance, and administration of the transportation system. These revenue sources include an allocation from the City's general fund, and the City's franchise fees from garbage collection. The City provides a short-term (five-year) forecast of revenues and expenditures for transportation operations that is updated on an annual basis. The most recent update forecasts general fund revenues to increase slightly each year through the planning horizon (YOE dollars). The forecast shows franchise fees nearly doubling over the planning horizon (YOE dollars).

Other funding sources for operations, maintenance and administration include interfund charges and transfers, investment income, licenses and permits, charges for services and other miscellaneous sources. While a relatively minor component of O&M funding, we forecast that these sources will increase over time.

Table 17-7 shows the forecast of City revenues for transportation operations, maintenance and administration in constant 2018 dollars. Total revenues are expected to decrease from $12.6 million per year in FYE 2020 to $11.9.3 million per year in FYE 2040. This decrease is due to stagnation or slight declines from all funding sources.

Table 17-7. Projected annual revenue sources available for transportation operation and maintenance and administration, City of Bend, FYE 2020 to 2040 (Constant 2018 $)

	Revenue for O&M and Administration				
FYE	State Highway Fund	General Fund	Garbage Franchise Fees	Other	Total for O&M and admin
2020	6,828,562	4,916,007	810,343	94,073	12,648,985
2021	6,877,534	4,863,348	785,944	93,978	12,620,804
2022	6,926,661	4,811,358	762,296	93,885	12,594,200
2023	6,929,584	4,760,147	739,394	93,796	12,522,922
2024	6,849,913	4,755,589	717,171	93,707	12,416,380
2025	6,753,939	4,751,107	695,627	93,618	12,294,291
2026	6,529,922	4,746,452	674,704	93,526	12,044,604
2027	6,324,384	4,741,768	654,406	93,434	11,813,992
2028	6,349,822	4,737,187	634,732	93,344	11,815,085
2029	6,388,840	4,732,491	615,634	93,251	11,830,216
2030	6,427,217	4,727,820	597,113	93,159	11,845,309
2031	6,465,148	4,723,300	579,167	93,070	11,860,684
2032	6,502,388	4,718,738	561,755	92,980	11,875,861
2033	6,539,140	4,714,266	544,876	92,892	11,891,175
2034	6,575,188	4,709,717	528,495	92,803	11,906,203
2035	6,610,737	4,705,224	512,613	92,714	11,921,288
2036	6,645,595	4,700,640	497,197	92,624	11,936,056
2037	6,679,970	4,696,100	482,250	92,534	11,950,854
2038	6,713,693	4,691,474	467,742	92,443	11,965,353
2039	6,746,972	4,686,898	453,676	92,353	11,979,899
2040	6,779,655	4,682,256	440,026	92,262	11,994,198

Source: ODOT and City of Bend Long-Range Revenue Tables

Table 17-8 shows the same long-term forecast of City revenues for transportation operations, maintenance and administration, but in nominal YOE dollars.

Table 17-8. Projected annual revenue sources available for transportation operation and maintenance and administration, City of Bend, FYE 2020 to 2040 (YOE $)

	Revenue for O&M and administration				
FYE	State Highway Fund	General Fund	Garbage franchise fees	Other	Total for O&M and admin
2020	7,258,761	5,225,715	861,395	100,000	13,445,871
2021	7,537,777	5,330,229	887,236	103,000	13,858,242
2022	7,827,127	5,436,834	913,854	106,090	14,283,905
2023	8,072,965	5,545,571	941,269	109,273	14,669,078
2024	8,227,430	5,711,938	969,507	112,551	15,021,426
2025	8,363,403	5,883,296	998,592	115,927	15,361,219
2026	8,336,752	6,059,795	1,028,550	119,405	15,544,503
2027	8,324,787	6,241,589	1,059,407	122,987	15,748,770
2028	8,617,343	6,428,837	1,091,189	126,677	16,264,046
2029	8,939,265	6,621,702	1,123,925	130,477	16,815,369
2030	9,271,903	6,820,353	1,157,642	134,392	17,384,290
2031	9,615,614	7,024,963	1,192,372	138,423	17,971,372
2032	9,970,762	7,235,712	1,228,143	142,576	18,577,193
2033	10,337,727	7,452,784	1,264,987	146,853	19,202,351
2034	10,716,899	7,676,367	1,302,937	151,259	19,847,462
2035	11,108,682	7,906,658	1,342,025	155,797	20,513,162
2036	11,513,493	8,143,858	1,382,285	160,471	21,200,107
2037	11,931,763	8,388,174	1,423,754	165,285	21,908,975
2038	12,363,937	8,639,819	1,466,467	170,243	22,640,466
2039	12,810,475	8,899,013	1,510,461	175,351	23,395,300
2040	13,271,852	9,165,984	1,555,774	180,611	24,174,221

Source: ODOT and City of Bend Long-Range Revenue Tables

It is important to compare the forecast of City revenues for operations, maintenance and administration to a forecast of expenditures in these areas. The City of Bend spent $12.5 million on transportation operations, maintenance and administration in FYE 2018. The City's short-term forecast of expenditures for transportation operations show small increases in planned annual expenditures over the next four years. These projections are shown in Table 17-9.

Table 17-9. Projected annual expenditures for transportation operations and maintenance and administration, City of Bend, FYE 2018 to 2022

	Projection				
	2017-18	2018-19	2019-20	2020-21	2021-22
Personnel Services	$ 3,837,648	$ 3,914,401	$ 3,992,689	$ 4,072,543	$ 4,153,994
Materials & Services and debt	$ 3,057,478	$ 3,118,627	$ 3,181,000	$ 3,244,620	$ 3,309,512
Capital	$ 3,715,453	$ 3,789,762	$ 3,865,557	$ 3,942,868	$ 4,021,726
Interfund transfers	$ 1,907,339	$ 2,002,706	$ 2,102,841	$ 2,207,983	$ 2,318,382
Total Expenditures	**$ 12,517,917**	**$ 12,825,496**	**$ 13,142,087**	**$ 13,468,014**	**$ 13,803,614**

Source: City of Bend Transportation Operations Forecast, January 2014.

Table 17-10 compares annual revenues with expenditures for the City of Bend for transportation operations, maintenance and administration. Beginning in 2026, the City is forecast to not have enough revenue to cover the anticipated expenditures. For all future years, annual expenditures are expected to remain virtually constant in constant 2018 dollars, with growth equal to the anticipated rate of inflation.

Table 17-10. Projected annual revenues and expenditures for transportation operations and maintenance and administration, City of Bend, FYE 2020 to 2040

	YOE $			Constant 2018 $		
FYE	Revenues	Expenditures	Surplus (Deficit)	Revenues	Expenditures	Surplus (Deficit)
2020	13,445,871	$ 13,142,087	$ 303,784	12,648,985	$ 12,363,205	$ 285,780
2021	13,858,242	$ 13,468,014	$ 390,229	12,620,804	$ 12,288,334	$ 332,470
2022	14,283,905	$ 13,803,614	$ 480,291	12,594,200	$ 12,215,587	$ 378,612
2023	14,669,078	$ 14,231,526	$ 437,552	12,522,922	$ 12,215,902	$ 307,019
2024	15,021,426	$ 14,672,703	$ 348,723	12,416,380	$ 12,216,054	$ 200,326
2025	15,361,219	$ 15,127,557	$ 233,662	12,294,291	$ 12,216,391	$ 77,900
2026	15,544,503	$ 15,596,511	$ (52,008)	12,044,604	$ 12,216,269	$ (171,665)
2027	15,748,770	$ 16,080,003	$ (331,233)	11,813,992	$ 12,216,062	$ (402,070)
2028	16,264,046	$ 16,578,483	$ (314,437)	11,815,085	$ 12,216,110	$ (401,025)
2029	16,815,369	$ 17,092,416	$ (277,047)	11,830,216	$ 12,215,849	$ (385,633)
2030	17,384,290	$ 17,622,281	$ (237,991)	11,845,309	$ 12,215,639	$ (370,330)
2031	17,971,372	$ 18,168,572	$ (197,200)	11,860,684	$ 12,215,809	$ (355,124)
2032	18,577,193	$ 18,731,798	$ (154,605)	11,875,861	$ 12,215,859	$ (339,998)
2033	19,202,351	$ 19,312,484	$ (110,133)	11,891,175	$ 12,216,133	$ (324,958)
2034	19,847,462	$ 19,911,171	$ (63,709)	11,906,203	$ 12,216,192	$ (309,989)
2035	20,513,162	$ 20,528,417	$ (15,255)	11,921,288	$ 12,216,387	$ (295,099)
2036	21,200,107	$ 21,164,798	$ 35,309	11,936,056	$ 12,216,334	$ (280,278)
2037	21,908,975	$ 21,820,907	$ 88,068	11,950,854	$ 12,216,385	$ (265,531)
2038	22,640,466	$ 22,497,355	$ 143,111	11,965,353	$ 12,216,201	$ (250,848)
2039	23,395,300	$ 23,194,773	$ 200,527	11,979,899	$ 12,216,134	$ (236,235)
2040	24,174,221	$ 23,913,811	$ 260,410	11,994,198	$ 12,215,882	$ (221,684)

Source: ODOT and City of Bend Long-Range Revenue Tables

Capital projects

The revenue available to the City of Bend for transportation capital projects has varied over the past three most recent biennia, as shown in Table 17-11. Total resources dropped from $21.2 million in 2013-15 to $16.3 million in 2015-2017, and then increased to $27.3 million in 2017-2019. The largest source of revenue has been

Systems Development Charges (SDCs), accounting for anywhere from about one-fourth to almost ninety percent of revenue, excluding beginning working capital (i.e. carryover from previous years). Other notable funding sources for transportation capital projects include long-term debt and water/sewer franchise fees.

Table 17-11. Historical transportation capital revenue sources for the City of Bend, Biennium 2013-15 to 2017-19 (YOE dollars)

Resources	Actuals 2013-2015	Adjusted 2015-2017	Adopted 2017-2019
Beginning working capital	$ 7,926,361	$ 6,722,800	$ 8,338,923
Franchise Fees	$ 1,313,890	$ 1,311,600	
Charges for Services			
Intergovernmental Revenues	$ 967,593	$ 77,800	
Interfund Charges	$ 113,367	$ 231,100	$ 34,289
Transfer from SDC fund	$ 3,583,484	$ 7,279,800	$ 17,358,691
Interfund Transfers	$ 14,059		$ 1,360,000
Contributions	$ 521,451		
Investment Income	$ 116,442	$ 132,000	$ 197,500
Rent Revenues	$ 25,911	$ 10,400	
Miscellaneaous	$ 103,591	$ 155,500	
Sale of capital assets	$ 230,069	$ 389,600	
Issuance of long-term debt	$ 6,283,391		
Loan repayments	$ 6,869		
Total Resources	**$ 21,206,478**	**$ 16,310,600**	**$ 27,289,403**

Sources: City of Bend, Oregon 2017-2019 Adopted Biennial Budget, Page 239

In FYE 2020, the BMPO is expected to receive approximately $1.2 million in STBG revenue. Total federal highway funds going to Oregon are expected to grow over the forecast period and subsequently so is the amount of federal funds allocated to the BMPO, as shown in Table 17-12. However, this growth is not anticipated to keep pace with inflation, resulting in declining revenues as measured in constant 2018 dollars.

Table 17-12. Projected annual allocation of STBG revenues to the Bend MPO, FYE 2020 to 2040

FYE	YOE $			Constant 2018 $		
	Total Federal Hwy Funds to Oregon	STBG Allocation to Small Cities	STBG to Bend MPO	Total Federal Hwy Funds to Oregon	STBG Allocation to Small Cities	STBG to Bend MPO
2020	561,844,000	12,169,000	1,134,570	528,545,626	11,447,789	1,067,328
2021	574,205,000	12,437,000	1,159,530	523,909,672	11,347,628	1,057,965
2022	586,837,000	12,710,000	1,185,040	519,324,779	11,247,788	1,048,708
2023	599,748,000	12,990,000	1,211,111	514,805,150	11,150,215	1,039,580
2024	612,942,000	13,276,000	1,237,755	510,317,209	11,053,201	1,030,518
2025	626,427,000	13,568,000	1,264,986	505,876,605	10,956,957	1,021,550
2026	640,208,000	13,866,000	1,292,815	501,455,314	10,860,813	1,012,623
2027	654,293,000	14,171,000	1,321,257	497,069,817	10,765,783	1,003,766
2028	668,687,000	14,483,000	1,350,325	492,732,297	10,672,021	995,008
2029	683,398,000	14,802,000	1,380,032	488,420,526	10,578,902	986,301
2030	698,433,000	15,127,000	1,410,393	484,148,759	10,485,928	977,674
2031	713,799,000	15,460,000	1,441,421	479,929,402	10,394,675	969,153
2032	729,502,000	15,800,000	1,473,133	475,741,490	10,303,900	960,697
2033	745,551,000	16,148,000	1,763,546	471,599,089	10,214,435	1,115,533
2034	761,953,000	16,503,000	1,802,344	467,484,508	10,125,161	1,105,801
2035	778,716,000	16,866,000	1,841,996	463,411,093	10,036,896	1,096,165
2036	795,848,000	17,237,000	1,882,520	459,363,925	9,949,206	1,086,591
2037	813,357,000	17,617,000	1,923,935	455,356,063	9,862,837	1,077,111
2038	831,251,000	18,004,000	1,966,262	451,374,348	9,776,281	1,067,692
2039	849,538,000	18,400,000	2,009,520	447,431,400	9,690,841	1,058,366
2040	868,228,000	18,805,000	2,053,729	443,516,551	9,606,150	1,049,106

Source: ODOT Long-Range Revenue Tables

Table17-13 shows a forecast of future transportation SDC revenues for the City of Bend. SDC rates per peak hour trip (PHT) are forecast to increase over time. The rates were developed for the City of Bend's Transportation System Plan (TSP) update. SDC revenues are forecast to increase from $6.5 million in FYE 2020 to $8.6 million in FYE 2040 (YOE $). After adjusting for inflation and presenting the numbers in constant 2018 dollars, SDC revenues are expected to decrease by almost 28% over the forecast period.

Table 17-13. Projected annual transportation SDC revenue, City of Bend, FYE 2020 to 2040

	YOE $			Constant 2018 $		
FYE	SDC ($/PHT)	PHT	SDC Revenue	SDC ($/PHT)	PHT	SDC Revenue
2020	8,000	818	6,544,000	7,526	818	6,156,162
2021	8,000	829	6,632,000	7,299	829	6,051,095
2022	8,000	840	6,720,000	7,080	840	5,946,903
2023	8,000	851	6,808,000	6,867	851	5,843,777
2024	8,000	863	6,904,000	6,661	863	5,748,064
2025	8,000	874	6,992,000	6,460	874	5,646,451
2026	8,000	886	7,088,000	6,266	886	5,551,813
2027	8,000	898	7,184,000	6,078	898	5,457,722
2028	8,000	910	7,280,000	5,895	910	5,364,380
2029	8,000	923	7,384,000	5,718	923	5,277,301
2030	8,000	935	7,480,000	5,546	935	5,185,082
2031	8,000	948	7,584,000	5,379	948	5,099,173
2032	8,000	961	7,688,000	5,217	961	5,013,695
2033	8,000	974	7,792,000	5,060	974	4,928,838
2034	8,000	987	7,896,000	4,908	987	4,844,469
2035	8,000	1,000	8,000,000	4,761	1,000	4,760,771
2036	8,000	1,014	8,112,000	4,618	1,014	4,682,251
2037	8,000	1,027	8,216,000	4,479	1,027	4,599,709
2038	8,000	1,041	8,328,000	4,344	1,041	4,522,155
2039	8,000	1,055	8,440,000	4,213	1,055	4,445,147
2040	8,000	1,071	8,568,000	4,087	1,071	4,376,788

Source: PHT Forecast from DKS and City of Bend proposed new SDC rate

Note: PHT refers to “Peak Hour Trips”

Table 17-14 shows a forecast of annual water/sewer franchise fee revenues for the City of Bend. Historically, 100% of these revenues were allocated to transportation capital projects. In recent years, however, the City has allocated some of these revenues to accessibility projects.

The City’s TSP revenue forecasts, updated in 2018, project future rate increases for water/sewer customers, as well as future changes in consumption. Ultimately, this long-term forecast results in small annual fluctuations, but almost no long-term change in annual funding in constant 2018 dollars. Annual water/sewer franchise fee revenues are expected to remain at approximately $1.1 million (constant 2018 $) for the duration of the forecast period.

Table 17-14. Projected annual water/sewer franchise fee revenue available for transportation projects, City of Bend, FYE 2015 to 2040

	Water/sewer franchise fees	
FYE	Constant $	YOE $
2020	1,152,681	1,225,300
2021	1,151,551	1,262,100
2022	1,150,442	1,300,000
2023	1,149,356	1,339,000
2024	1,148,281	1,379,200
2025	1,147,218	1,420,600
2026	1,146,080	1,463,200
2027	1,144,952	1,507,100
2028	1,143,836	1,552,300
2029	1,142,724	1,598,900
2030	1,141,619	1,646,900
2031	1,140,523	1,696,300
2032	1,139,429	1,747,200
2033	1,138,339	1,799,600
2034	1,137,248	1,853,600
2035	1,136,158	1,909,200
2036	1,135,065	1,966,500
2037	1,133,972	2,025,500
2038	1,132,874	2,086,300
2039	1,131,774	2,148,900
2040	1,130,670	2,213,400

Source: City of Bend

Other funding sources for the City of Bend's transportation capital projects include:

- ***Private contributions*** *from developers for non-creditable improvements. These contributions fluctuate significantly over time, but are forecast in the City's TSP revenue projections to stay at a constant level of $50,000 per year. Conversations with City staff indicate that this $50,000 per year funding level should be considered in constant 2018 dollars, recognizing that the actual funding amount in nominal YOE dollars will increase over time with inflation. Note that this funding level appears to be conservative based on a review of historical revenue amounts.*
- ***General obligation (GO) bonds*** *are one-time sources of additional revenue for transportation projects, approved by voters and repaid through property taxes. The City has a history of successfully passing GO bonds to pay for transportation projects, including most recently in 2012. The 2013 bonds are set to expire in 2032, at which time the City could ask voters to approve a new set of GO bond projects. The timing of the bonds are important to maximize voter support, as the*

new bonds can be framed as replacing the old bonds, resulting in no change in the property tax rate. The current revenue forecast does not assume any new bond funding. The City, however, is updating its TSP and is assessing a range of funding tools, including bonds, to implement the priority programs and projects.

- ***Urban renewal** is a form of tax increment financing in which property tax revenues within a specified area are diverted to specific improvements in the area, instead of being allocated to other taxing districts. The City has two urban renewal plans in place that identify specific transportation capital projects to receive urban renewal funding. Given the uncertainty of this source, the current revenue forecast does not assume any urban renewal funding for transportation projects. The City is updating both plans, and future forecasts may include some level of urban renewal funding.*
- ***Other** smaller revenue sources include investment income, sale of capital assets, interfund transfers, loan repayments, and other miscellaneous sources. These other sources are projected to total $100,000 in FYE 2020. These sources are forecast to decrease slightly over time (YOE $).*

Table 17-15 shows the forecast of all City funding sources for transportation capital projects through 2040, in constant 2018 dollars. Total revenues are expected to decrease over time from $10.1 million per year in FYE 2020 to $9.6 million per year in FYE 2040.

Table 17-16 shows the same long-term forecast of City revenues for transportation capital projects, but in nominal YOE dollars.

Table 17-15. Projected annual revenue sources available for transportation capital projects, City of Bend, FYE 2020 to 2040 (Constant 2018 $)

FYE	Revenue for capital projects					
	SDCs	Water/sewer franchise fees	STBG	Private Contributions	Other	Total for Capital
2020	7,761,761	1,152,681	1,067,328	50,000	100,000	10,131,770
2021	7,740,214	1,151,551	1,057,965	50,000	103,000	10,102,731
2022	7,719,268	1,150,442	1,048,708	50,000	106,090	10,074,508
2023	7,441,593	1,149,356	1,039,580	50,000	109,273	9,789,802
2024	7,262,959	1,148,281	1,030,518	50,000	112,551	9,604,308
2025	7,256,114	1,147,218	1,021,550	50,000	115,927	9,590,810
2026	7,249,004	1,146,080	1,012,623	50,000	119,405	9,577,112
2027	7,241,850	1,144,952	1,003,766	50,000	122,987	9,563,556
2028	7,234,855	1,143,836	995,008	50,000	126,677	9,550,375
2029	7,227,683	1,142,724	986,301	50,000	130,477	9,537,185
2030	7,220,548	1,141,619	977,674	50,000	134,392	9,524,233
2031	7,213,645	1,140,523	969,153	50,000	138,423	9,511,744
2032	7,206,678	1,139,429	960,697	50,000	142,576	9,499,379
2033	7,199,849	1,138,339	1,115,533	50,000	146,853	9,650,574
2034	7,192,900	1,137,248	1,105,801	50,000	151,259	9,637,208
2035	7,186,039	1,136,158	1,096,165	50,000	155,797	9,624,159
2036	7,179,037	1,135,065	1,086,591	50,000	160,471	9,611,164
2037	7,172,104	1,133,972	1,077,111	50,000	165,285	9,598,471
2038	7,165,040	1,132,874	1,067,692	50,000	170,243	9,585,849
2039	7,158,051	1,131,774	1,058,366	50,000	175,351	9,573,542
2040	7,150,961	1,130,670	1,049,106	50,000	180,611	9,561,348

Sources: ODOT Long-Range Revenue Tables and City of Bend

Table 17-16. Projected annual revenue sources available for transportation capital projects, City of Bend, FYE 2020 to 2040 (YOE $)

FYE	Revenue for capital projects					
	SDCs	Water/sewer franchise fees	STBGP	Private Contributions	Other	Total for Capital
2020	5,733,800	1,225,300	1,134,570	53,150	94,073	8,240,893
2021	9,025,002	1,262,100	1,159,530	54,800	93,978	11,595,410
2022	8,250,752	1,300,000	1,185,040	56,500	93,885	10,886,177
2023	8,483,275	1,339,000	1,211,111	58,250	93,796	11,185,432
2024	8,722,773	1,379,200	1,237,755	60,055	93,707	11,493,490
2025	8,669,456	1,420,600	1,264,986	61,915	93,618	11,510,575
2026	8,723,540	1,463,200	1,292,815	63,835	93,526	11,636,917
2027	8,985,246	1,507,100	1,321,257	65,815	93,434	11,972,853
2028	9,254,804	1,552,300	1,350,325	67,855	93,344	12,318,627
2029	9,532,448	1,598,900	1,380,032	69,960	93,251	12,674,591
2030	9,818,421	1,646,900	1,410,393	72,130	93,159	13,041,003
2031	10,112,974	1,696,300	1,441,421	74,365	93,070	13,418,130
2032	10,416,363	1,747,200	1,473,133	76,670	92,980	13,806,346
2033	10,728,854	1,799,600	1,763,546	79,045	92,892	14,463,937
2034	11,050,719	1,853,600	1,802,344	81,495	92,803	14,880,961
2035	11,382,241	1,909,200	1,841,996	84,020	92,714	15,310,171
2036	11,723,708	1,966,500	1,882,520	86,625	92,624	15,751,977
2037	12,075,420	2,025,500	1,923,935	89,310	92,534	16,206,699
2038	12,437,682	2,086,300	1,966,262	92,080	92,443	16,674,767
2039	12,810,813	2,148,900	2,009,520	94,935	92,353	17,156,520
2040	13,195,137	2,213,400	2,053,729	97,880	92,262	17,652,407

Source: ODOT Long-Range Revenue Tables and City of Bend

Summary of City revenue projections

Today, City revenues for transportation operations, maintenance, and administration ($12.6 million in FYE 2020) exceed revenues for capital projects ($10.1 million in FYE 2020). Over time, funding for operations, maintenance, and administration is expected to decrease, as the various funds for transportation operations experience slow growth. Funding for transportation capital projects is also forecast to decrease slightly over time. These summary numbers are shown in Table 17-17 in constant 2018 dollars.

Table 17-17. Summary of projected annual revenue sources available for transportation, City of Bend, FYE 2020 to 2040 (Constant 2018 $)

FYE	O&M and administration	Capital	Total
2020	$ 12,648,985	$ 10,131,770	$ 22,780,755
2021	$ 12,620,804	$ 10,102,731	$ 22,723,534
2022	$ 12,594,200	$ 10,074,508	$ 22,668,708
2023	$ 12,522,922	$ 9,789,802	$ 22,312,724
2024	$ 12,416,380	$ 9,604,308	$ 22,020,689
2025	$ 12,294,291	$ 9,590,810	$ 21,885,101
2026	$ 12,044,604	$ 9,577,112	$ 21,621,716
2027	$ 11,813,992	$ 9,563,556	$ 21,377,548
2028	$ 11,815,085	$ 9,550,375	$ 21,365,460
2029	$ 11,830,216	$ 9,537,185	$ 21,367,402
2030	$ 11,845,309	$ 9,524,233	$ 21,369,542
2031	$ 11,860,684	$ 9,511,744	$ 21,372,429
2032	$ 11,875,861	$ 9,499,379	$ 21,375,240
2033	$ 11,891,175	$ 9,650,574	$ 21,541,749
2034	$ 11,906,203	$ 9,637,208	$ 21,543,410
2035	$ 11,921,288	$ 9,624,159	$ 21,545,446
2036	$ 11,936,056	$ 9,611,164	$ 21,547,220
2037	$ 11,950,854	$ 9,598,471	$ 21,549,325
2038	$ 11,965,353	$ 9,585,849	$ 21,551,201
2039	$ 11,979,899	$ 9,573,542	$ 21,553,441
2040	$ 11,994,198	$ 9,561,348	$ 21,555,546

Source: ODOT Long-Range Revenue Tables and City of Bend

Table 17-18 shows the same summary forecast of City revenues for transportation, but in nominal YOE dollars.

Table 17-18. Summary of projected annual revenue sources available for transportation, City of Bend, FYE 2020 to 2040 (YOE $)

FYE	O&M and administration	Capital	Total
2020	$ 13,445,871	$ 8,240,893	$ 21,686,763
2021	$ 13,858,242	$ 11,595,410	$ 25,453,653
2022	$ 14,283,905	$ 10,886,177	$ 25,170,081
2023	$ 14,669,078	$ 11,185,432	$ 25,854,510
2024	$ 15,021,426	$ 11,493,490	$ 26,514,916
2025	$ 15,361,219	$ 11,510,575	$ 26,871,794
2026	$ 15,544,503	$ 11,636,917	$ 27,181,419
2027	$ 15,748,770	$ 11,972,853	$ 27,721,623
2028	$ 16,264,046	$ 12,318,627	$ 28,582,673
2029	$ 16,815,369	$ 12,674,591	$ 29,489,960
2030	$ 17,384,290	$ 13,041,003	$ 30,425,293
2031	$ 17,971,372	$ 13,418,130	$ 31,389,503
2032	$ 18,577,193	$ 13,806,346	$ 32,383,539
2033	$ 19,202,351	$ 14,463,937	$ 33,666,288
2034	$ 19,847,462	$ 14,880,961	$ 34,728,423
2035	$ 20,513,162	$ 15,310,171	$ 35,823,333
2036	$ 21,200,107	$ 15,751,977	$ 36,952,084
2037	$ 21,908,975	$ 16,206,699	$ 38,115,674
2038	$ 22,640,466	$ 16,674,767	$ 39,315,233
2039	$ 23,395,300	$ 17,156,520	$ 40,551,820
2040	$ 24,174,221	$ 17,652,407	$ 41,826,629

Source: ODOT Long-Range Revenue Tables and City of Bend

Oregon Department of Transportation

The State of Oregon provides substantial funding for transportation through the Oregon Department of Transportation (ODOT). Much of the State funding for transportation is allocated to local jurisdictions to be spent by cities and counties on transportation projects. These allocations to local jurisdictions are captured under the subsections of this chapter for the City of Bend and Deschutes County, and we do not show these pass-through revenues here, to avoid double counting. Instead, we only describe those State revenues that are spent directly by the State on transportation projects.

Exhibit 19 shows ODOT projections for total revenue available for highway projects, including both capital projects as well as operations, maintenance and administration. The projections in Table 17-19 are net of any federal or State revenues that are passed

through to local municipalities. Total revenues are projected to total $1.2 billion in FYE 2020, and grow to $1.9 billion in FYE 2040 (YOE $). In constant 2018 dollars, however, this forecast shows a decline in total funding, as revenue growth is not projected to keep pace with inflation.

Table 17-19. Projected statewide annual revenue available for highway projects, ODOT, FYE 2015 to 2040 (millions)

FYE	YOE $			Constant 2018 $		
	State share of SHF	Federal Hwy funds available to State	Total Hwy funds available to State	State share of SHF	Federal Hwy funds available to State	Total Hwy funds available to State
2020	790	374	1,164	743	352	1,095
2021	820	383	1,203	749	349	1,098
2022	852	391	1,243	754	346	1,100
2023	879	400	1,278	754	343	1,097
2024	896	408	1,304	746	340	1,086
2025	910	417	1,328	735	337	1,072
2026	907	427	1,334	711	334	1,045
2027	906	436	1,342	688	331	1,020
2028	930	446	1,376	685	328	1,014
2029	956	455	1,412	684	325	1,009
2030	984	465	1,449	682	323	1,004
2031	1,012	476	1,487	680	320	1,000
2032	1,041	482	1,523	679	314	993
2033	1,071	493	1,564	677	312	989
2034	1,102	504	1,606	676	309	985
2035	1,134	515	1,649	675	306	981
2036	1,167	526	1,693	674	304	977
2037	1,201	538	1,739	672	301	973
2038	1,236	549	1,786	671	298	970
2039	1,273	562	1,834	670	296	966
2040	1,310	574	1,884	669	293	963

Source: ODOT Long-Range Revenue Tables

Operations and maintenance and administration

The State of Oregon is responsible for operations and maintenance of state highways. Table 17-20 shows the State forecast for these costs through FYE 2040. The exhibit lists preservation, maintenance, traditional operations, central services (i.e., administration), safety, ITS, and Bridge programs, as well as non-modernization related debt service, and a few other smaller programs. In total, the State forecasts $1.1 billion in annual operating costs for FYE 2020, with small annual average growth each year.

Table 17-20. Projected annual costs for ODOT non-modernization highway uses, FYE 2020 to 2040, millions (YOE $)

FYE	Preservation	Maintenance	Safety Construction	Traditional Operations	ITS	Bridge	Non-Mod DS	Central Services	Other	Scenario 3	Total Non-Mod Hwy Programs
2020	148	262	38	32	6	113	69	79	235	97	1,079
2021	152	271	39	32	6	117	71	82	242	100	1,112
2022	157	279	40	34	6	121	85	84	250	103	1,159
2023	162	288	41	35	7	124	85	87	258	106	1,192
2024	167	296	42	36	7	128	85	90	266	110	1,226
2025	172	306	44	37	7	132	85	92	274	113	1,262
2026	178	315	45	38	7	136	91	95	282	116	1,304
2027	183	325	46	39	7	140	91	98	291	120	1,342
2028	189	335	48	40	8	145	91	101	300	124	1,381
2029	195	345	49	41	8	149	91	104	310	128	1,421
2030	201	356	51	43	8	154	91	108	319	132	1,462
2031	207	367	52	44	8	159	102	111	329	136	1,515
2032	213	378	54	45	9	164	102	114	339	140	1,559
2033	220	390	56	47	9	169	102	118	350	144	1,604
2034	227	402	58	48	9	174	102	122	361	149	1,651
2035	234	415	59	50	9	179	102	125	372	153	1,699
2036	241	428	61	51	10	185	36	129	383	158	1,682
2037	248	441	63	53	10	191	36	133	395	163	1,733
2038	256	455	65	55	10	196	36	137	407	168	1,786
2039	264	469	67	56	11	203	36	142	420	173	1,840
2040	272	483	69	58	11	209	32	146	433	179	1,892

Source: ODOT Long-Range Revenue Tables

Table 17-21 shows the same long-term State forecast for operating costs, but is presented in constant 2018 dollars. This table shows that total costs for non-modernization highway programs (i.e., ODOT expenditures on everything other than capital projects) are expected to increase at a rate that is less than the anticipated rate of inflation. However, this is somewhat misleading as virtually all of the State's categories of operating expenses (Preservation, maintenance, traditional operations, central services, etc.) are expected to remain flat in constant 2018 dollars, growing at a rate equal to assumed inflation.

Table 17-21. Projected annual costs for ODOT non-modernization highway uses, FYE 2020 to 2040, millions (Constant 2018 $)

FYE	Preservation	Maintenance	Safety Construction	Traditional Operations	ITS	Bridge	Central Services	Other	Scenario 3	Total Non-Mod Hwy Programs (Excluding Debt Service)
2020	139	247	35	30	6	107	75	221	91	950
2021	139	247	35	30	6	107	75	221	91	950
2022	139	247	35	30	6	107	75	221	91	950
2023	139	247	35	30	6	107	75	221	91	950
2024	139	247	35	30	6	107	75	221	91	950
2025	139	247	35	30	6	107	75	221	91	950
2026	139	247	35	30	6	107	75	221	91	950
2027	139	247	35	30	6	107	75	221	91	950
2028	139	247	35	30	6	107	75	221	91	950
2029	139	247	35	30	6	107	75	221	91	950
2030	139	247	35	30	6	107	75	221	91	950
2031	139	247	35	30	6	107	75	221	91	950
2032	139	247	35	30	6	107	75	221	91	950
2033	139	247	35	30	6	107	75	221	91	950
2034	139	247	35	30	6	107	75	221	91	950
2035	139	247	35	30	6	107	75	221	91	950
2036	139	247	35	30	6	107	75	221	91	950
2037	139	247	35	30	6	107	75	221	91	950
2038	139	247	35	30	6	107	75	221	91	950
2039	139	247	35	30	6	107	75	221	91	950
2040	139	247	35	30	6	107	75	221	91	950

Source: ODOT Long-Range Revenue Tables

Table 17-22 compares projected ODOT costs for non-modernization highway uses (i.e., operations, maintenance, and administration) with projected ODOT revenues available for those uses. State policy generally requires operations and maintenance to be fully funded, before spending resources on capital projects. However, given the high costs for operations and maintenance and the relatively low level of revenues, this policy would result in virtually no resources available for capital projects statewide. Thus, ORS 366.507 requires that a certain portion of revenues be set aside to fund debt service and modernization projects, regardless of whether State highway funds are sufficient to cover all operations and maintenance needs. This results in a gap for non-modernization highway uses. For FYE 2020, this gap is projected to be $15 million, which means that State highway operations and maintenance efforts are about 98% funded. Over the forecast period, this gap as a percentage of annual non-modernization needs is expected to increase to about 95%.

Table 17-22. Projected annual ODOT funding deficit for non-modernization highway uses, FYE 2020 to 2040, millions (YOE $)

FYE	Total Hwy Revenue Available for State	Hwy Revenue Reserved for D/S and Modernization	Remaining Hwy Revenue Available for Non-Modernization	Non-Modernization State Needs	Non-Modernization Gap
2020	1,164	100	1,064	1,079	(15)
2021	1,203	101	1,102	1,112	(10)
2022	1,243	101	1,142	1,159	(17)
2023	1,278	101	1,177	1,192	(15)
2024	1,304	101	1,203	1,226	(24)
2025	1,328	101	1,226	1,262	(35)
2026	1,334	103	1,231	1,304	(73)
2027	1,342	103	1,239	1,342	(103)
2028	1,376	103	1,273	1,381	(108)
2029	1,412	103	1,309	1,421	(112)
2030	1,449	103	1,346	1,462	(116)
2031	1,487	106	1,382	1,515	(134)
2032	1,523	106	1,417	1,559	(142)
2033	1,564	106	1,458	1,604	(147)
2034	1,606	106	1,499	1,651	(152)
2035	1,649	106	1,542	1,699	(157)
2036	1,693	94	1,599	1,682	(84)
2037	1,739	94	1,644	1,733	(89)
2038	1,786	94	1,691	1,786	(95)
2039	1,834	95	1,740	1,840	(101)
2040	1,884	88	1,796	1,892	(96)

Source: ODOT Long-Range Revenue Tables

Table 17-23 shows the same information as Exhibit 22, but in constant 2018 dollars. The gap fluctuates over the 20-year forecast period, when measured in constant 2018 dollars.

Table 17-23. Projected annual ODOT funding deficit for non-modernization highway uses, FYE 2020 to 2040, millions (Constant 2018 $)

FYE	Total Hwy Revenue Available for State	Hwy Revenue Reserved for D/S and Modernization	Remaining Hwy Revenue Available for Non-Modernization	Non-Modernization State Needs	Non-Modernization Gap
2020	1,095	94	1,001	1,015	(14)
2021	1,098	92	1,005	1,015	(9)
2022	1,100	89	1,011	1,025	(15)
2023	1,097	87	1,010	1,023	(13)
2024	1,086	84	1,001	1,021	(20)
2025	1,072	82	990	1,019	(29)
2026	1,045	80	964	1,022	(57)
2027	1,020	78	941	1,019	(78)
2028	1,014	76	938	1,017	(80)
2029	1,009	74	935	1,015	(80)
2030	1,004	72	933	1,013	(80)
2031	1,000	71	929	1,019	(90)
2032	993	69	924	1,017	(93)
2033	989	67	922	1,015	(93)
2034	985	65	920	1,013	(93)
2035	981	63	918	1,011	(93)
2036	977	54	923	971	(48)
2037	973	53	921	970	(50)
2038	970	51	918	970	(51)
2039	966	50	916	969	(53)
2040	963	45	918	967	(49)

Source: ODOT Long-Range Revenue Tables

ODOT does not track state expenditures on operations and maintenance at the local level, and therefore we have no forecast for the amount of State expenditures for operations and maintenance of state highways within the BMPO. Based on the Statewide analysis shown in Table 17-22 and Table 17-23, it is reasonable to assume that the State will have funding to cover at least 90% of the need for highway operations and maintenance in the BMPO, and that annual funding for operations and maintenance should remain fairly stable (in constant 2018 dollars) over the forecast period.

Capital projects

Table 17-24 shows ODOT's projected revenues for modernization under ORS 366.507. In FYE 2020, 19% of State revenue for modernization is dedicated to pay debt service on previous bonds for transportation projects. These debt service payments continue through FYE 2039. In FYE 2020, ODOT forecasts $58.6 million in revenue for modernization projects net of debt service and federal match (i.e., revenue that ODOT can spend on new capital projects). This level of funding is forecast to fluctuate slightly over time, but will generally remain stable in constant 2018 dollars.

Table 17-24. Projected statewide annual revenue available for transportation modernization projects, ODOT, FYE 2015 to 2040 (millions)

	YOE $				Constant 2018 $			
FYE	Funds for Hwy modernization ORS 366.507	Funds reserved for debt service	Funds for fed modernization projects	Funds net of debt service & federal match	Funds for Hwy modernization ORS 366.507	Funds reserved for debt service	Funds for fed modernization projects	Funds net of debt service & federal match
2020	84.5	15.9	10.0	58.6	79.5	15.0	9.4	55.1
2021	84.8	16.3	10.2	58.3	77.4	14.9	9.3	53.2
2022	85.0	15.9	10.4	58.6	75.2	14.1	9.2	51.9
2023	85.1	15.9	10.7	58.5	73.1	13.7	9.2	50.2
2024	85.3	15.9	10.9	58.5	71.0	13.3	9.1	48.7
2025	85.5	15.9	11.1	58.4	69.0	12.9	9.0	47.2
2026	85.7	17.1	11.4	57.2	67.1	13.4	8.9	44.8
2027	85.8	17.1	11.6	57.1	65.2	13.0	8.8	43.4
2028	86.0	17.1	11.9	57.0	63.4	12.6	8.8	42.0
2029	86.2	17.1	12.2	56.9	61.6	12.2	8.7	40.7
2030	86.3	17.1	12.4	56.9	59.8	11.8	8.6	39.4
2031	86.5	19.1	12.7	54.7	58.2	12.9	8.5	36.8
2032	86.7	19.1	13.0	54.6	56.5	12.5	8.5	35.6
2033	86.9	19.1	13.3	54.5	54.9	12.1	8.4	34.4
2034	87.0	19.1	13.6	54.3	53.4	11.7	8.3	33.3
2035	87.2	19.1	13.8	54.2	51.9	11.4	8.2	32.3
2036	87.4	6.8	14.2	66.5	50.4	3.9	8.2	38.4
2037	87.6	6.8	14.5	66.3	49.0	3.8	8.1	37.1
2038	87.7	6.8	14.8	66.2	47.6	3.7	8.0	35.9
2039	87.9	6.8	15.1	66.0	46.3	3.6	8.0	34.8
2040	88.1	-	15.4	72.6	45.0	-	7.9	37.1

Source: ODOT Long-Range Revenue Tables

ODOT uses an agreed upon formula to allocate modernization revenues to each of the five ODOT regions across the State. The formula is based on population, vehicle miles traveled (VMT), ton miles traveled, vehicle registrations, and revenue estimates. The BMPO is located in Region 4. Table 17-25 shows the ODOT calculation of Region 4's share of total ODOT revenue for modernization projects, resulting in Region 4 receiving 9.9% of the State's revenues.

Table 17-25. ODOT Region 4 share of State revenue for transportation modernization projects

County	Population (2011)	VMT (2011)	Ton Miles Traveled (2011)	Vehicle Registration (2011)	Projected Revenue (1999-2001)	Modernization Needs (1999)
Crook	20,855	90,031,740	302,815,362	31,946	15,016,000	
Deschutes	158,875	627,627,967	3,683,820,392	198,008	81,945,000	
Gilliam	1,880	146,396,755	1,795,009,114	3,678	21,211,000	
Jefferson	21,845	185,522,456	1,152,991,696	26,304	24,980,000	
Klamath	66,580	423,596,334	3,144,659,132	84,857	71,971,000	
Lake	7,885	67,348,669	387,085,234	13,113	14,863,000	
Sherman	1,765	111,043,950	1,227,350,708	3,725	16,956,000	
Wasco	25,300	325,122,035	2,667,279,490	31,775	44,629,000	
Wheeler	1,435	20,055,692	136,859,258	2,431	5,921,000	
Region 4 Total	306,420	1,996,745,598	14,497,870,386	395,837	297,492,000	
Statewide Total	3,857,625	19,426,126,596	109,029,809,309	4,062,873	2,698,465,000	
Region 4 % of State	7.94%	10.28%	13.30%	9.74%	11.02%	9.90%

Source: ODOT Long-Range Revenue Tables 2013 v3. Summarized by ECONorthwest.

There is no agreed upon formula for how Region 4 allocates ODOT revenue for modernization projects in different municipalities within the Region. Instead, it is a political process, where local representatives meet with ODOT Region 4 staff to discuss modernization needs. Funding decisions are ultimately made by the three Area Commissions on Transportation (ACTs) with Region 4. Through discussions with staff from ODOT Region 4 and the BMPO, it was decided that the same formula (population, VMT, etc.) could be used to estimate the likely allocation of funds between Region 4 counties. The analysis assumes that 50% of funding for projects in Deschutes County would likely be allocated to projects in the BMPO, as the BMPO area has a little more than 50% of the total County population. Based on these assumptions, it is estimated that the BMPO would receive a 1.93% share of future State revenue for modernization. Table 17-26 shows these revenue forecasts, which result in roughly $1 million per year in constant 2018 dollars early in the planning horizon. The forecast then shows decreases, with some fluctuations, through the planning horizon.

Table 17-26. Projected annual allocation of revenue to the BMPO for transportation modernization projects, FYE 2020 to 2040

	YOE $			Constant 2018 $		
FYE	Funds net of debt service & federal match	BMPO Share	State modernization funds for BMPO	Funds net of debt service & federal match	BMPO Share	State modernization funds for BMPO
2020	58,607,640	1.93%	1,131,395	55,134,186	1.93%	1,064,341
2021	58,287,808	1.93%	1,125,221	53,182,307	1.93%	1,026,661
2022	58,595,240	1.93%	1,131,156	51,854,195	1.93%	1,001,023
2023	58,535,569	1.93%	1,130,004	50,245,124	1.93%	969,960
2024	58,471,185	1.93%	1,128,761	48,681,363	1.93%	939,772
2025	58,401,980	1.93%	1,127,425	47,163,030	1.93%	910,462
2026	57,202,840	1.93%	1,104,276	44,805,232	1.93%	864,945
2027	57,123,649	1.93%	1,102,747	43,397,135	1.93%	837,763
2028	57,039,291	1.93%	1,101,119	42,030,279	1.93%	811,376
2029	56,949,643	1.93%	1,099,388	40,701,574	1.93%	785,726
2030	56,854,583	1.93%	1,097,553	39,411,190	1.93%	760,816
2031	54,672,736	1.93%	1,055,433	36,759,723	1.93%	709,630
2032	54,566,472	1.93%	1,053,382	35,585,282	1.93%	686,958
2033	54,454,409	1.93%	1,051,219	34,445,195	1.93%	664,949
2034	54,336,414	1.93%	1,048,941	33,337,269	1.93%	643,561
2035	54,212,349	1.93%	1,046,546	32,261,574	1.93%	622,796
2036	66,457,072	1.93%	1,282,925	38,359,060	1.93%	740,505
2037	66,320,442	1.93%	1,280,287	37,129,348	1.93%	716,766
2038	66,177,310	1.93%	1,277,524	35,934,682	1.93%	693,703
2039	66,027,528	1.93%	1,274,633	34,775,124	1.93%	671,319
2040	72,639,691	1.93%	1,402,277	37,106,503	1.93%	716,325

Source: ODOT Long-Range Revenue Tables

Table 17-27 shows all projects in the current STIP (FYE 2018 to 2021) that are located in the BMPO. These projects combine for a total cost of $49.1 million, using a combination of state and federal funding. The revenue amounts in Exhibit 27 include funding from previous years for projects that spanned multiple STIP programming cycles. Given the relatively small geographic size of the Bend MPO, programmed STIP funding can vary significantly from one STIP to another. For example, the current STIP includes three large preservation/operations/safety projects. Those projects account for almost 44% of programmed funding.

Table 17-27. Projected State funding for STIP projects in BMPO, FYE 2015 to 2018

Route	Description	Funding
US 97	Bend North Corridor Project	8,244,001
US 20	US 20 @ Cook Avenue (Tumalo)	2,200,000
Various	ARTS projects in Bend	1,408,000
US 20	Deschutes River Bridge to Robal Rd	3,071,000
US 97	Bowery Lane to Romaine Village Way	4,350,000
Various	ARTS projects in Bend	701,000
US 20	Empire to Greenwood	13,965,739
US 97	Multi-use trail study	270,000
US 20	US 20 @ Cooley Rd	1,750,000
US 97	US 97 @ Cooley Rd	13,000,000
Various	Deschutes ITS Plan	149,000
	Total	49,108,740

Source: ODOT Statewide Transportation Improvement Plan 2018-2021

In addition to the projected revenue sources shown in Exhibit 26 and Exhibit 27, there are two large funding commitments from the State and Federal government for the US 97 Bend North Corridor project. Oregon HB 2017 will provide $50 million for that project. Federal INFRA grant funds totaling approximately $60 million have also been awarded for that project. Table 17-28 shows the forecast of total ODOT spending on transportation capital projects in the BMPO from FYE 2020 to 2040.

Table 17-28. Projected State funding for capital projects in BMPO, FYE 2020 to 2040

	Annual Funding	
FYE	YOE $	Constant 2018 $
2020	1,131,395	1,064,341
2021	61,525,221	56,136,150
2022	1,131,156	1,001,023
2023	1,130,004	969,960
2024	1,128,761	939,772
2025	51,127,425	41,288,399
2026	1,104,276	864,945
2027	1,102,747	837,763
2028	1,101,119	811,376
2029	1,099,388	785,726
2030	1,097,553	760,816
2031	1,055,433	709,630
2032	1,053,382	686,958
2033	1,051,219	664,949
2034	1,048,941	643,561
2035	1,046,546	622,796
2036	1,282,925	740,505
2037	1,280,287	716,766
2038	1,277,524	693,703
2039	1,274,633	671,319
2040	1,402,277	716,325
Total	$134,452,212	$112,326,783
Average	$6,402,486	$5,348,894

Source: ODOT Long-Range Revenue Tables

Deschutes County

Deschutes County is responsible for building and maintaining an extensive roadway network. The vast majority of the County road network is in unincorporated areas of the County. Only a small portion of the BMPO is in unincorporated Deschutes County, with the bulk of the BMPO located within the city limits of Bend. Thus, only a small fraction of the County's transportation expenditures occur within the BMPO, and those expenditures are focused on the unincorporated areas of the BMPO, which are generally located east and south of the City of the Bend.

The Deschutes County budget does not show a distinction between expenditures in the BMPO and expenditures elsewhere in the County. Therefore, our analysis needed to estimate the portion of the County's transportation expenditures occurring in the BMPO. For operations and maintenance, we based this estimate off of the number of lane miles of County-owned roads in the BMPO, shown in Table 17-29. In total, the County owns 137.4 lane miles within the BMPO.

Table 17-29. Summary of Deschutes County-owned roadway lane miles, 2019

Road Type	Lane Miles
Arterials	23.6
Collectors	30.0
Local roads	80.3
Forest highway	3.5
Total	**137.4**

Source: Deschutes County, 2019

Operations, maintenance and administration

Table 17-30 shows historical budget information for Deschutes County on revenues for transportation operations, maintenance and administration. Annual average revenues (excluding beginning working capital) were $19.3 million over this six-year period.

Table 17-30. Historical transportation revenues for operations, maintenance and administration, Deschutes County, FYE 2014 to 2019 (YOE dollars)

	FYE 2014 Actual	FYE 2015 Actual	FYE 2016 Actual	FYE 2017 Actual	FYE 2018 Budget	FYE 2019 Adopted
Resources						
Beginning working capital	6,846,576	10,022,703	11,706,673	14,840,939	8,684,589	8,693,653
Federal payments	2,529,829	2,640,751	2,696,522	1,888,210	3,153,549	3,582,410
State payments	11,895,861	12,129,166	13,090,735	13,524,639	13,911,213	16,974,660
Local payments	1,097,444	664,062	728,980	488,114	710,000	635,000
Interfund charges/transfers	1,132,543	2,234,005	2,468,646	1,429,571	1,501,525	1,044,353
Sale of assets, land, or equipment	275,086	300,151	335,483	272,165	381,900	365,000
Other	181,688	292,349	345,337	249,916	219,092	275,000
Total revenues	*23,959,027*	*28,283,187*	*31,372,376*	*32,693,554*	*28,561,868*	*31,570,076*

Sources: Deschutes County, Oregon Proposed Budget Fiscal Year 2015, Pages 152.
Deschutes County, Oregon Adopted Budget Fiscal Year 2017; Page 149.
Deschutes County, Oregon Adopted Budget Fiscal Year 2019; Page 178.

Capital projects

Table 17-31 shows historical annual revenues for Deschutes County transportation capital projects. Excluding beginning working capital, annual revenues have averaged $5.2 million over the six-year period. Interfund transfers are the largest revenue source, accounting for 57% of total revenue over this period of time.

Table 17- 31. Historical transportation revenues for capital projects, Deschutes County, FYE 2014 to 2019 (YOE dollars)

	FYE 2014 Budget	FYE 2015 Proposed	FYE 2016 Actual	FYE 2017 Actual	FYE 2018 Budget	FYE 2019 Adopted
Resources						
Beginning working capital	2,525,909	3,198,221	-	-	6,255,424	7,687,037
Licenses & permits	325,000	425,000	-	-	-	-
Interfund transfers	607,380	835,060	-	8,617,443	5,275,400	13,811,725
Other	12,850	8,100	-	79,157	125,000	959,104
Total resources	*3,471,139*	*4,466,381*	*-*	*8,696,600*	*11,655,824*	*22,457,866*

Source: Deschutes County, Oregon Adopted Program Budget, Fiscal Year 2019; Page 152.

Note: Revenues are budgeted from Fund 465, newly implemented as of the FY2019 Adopted Budget. Revenues were previously budgeted through Fund 325. Because of this difference, historical revenues from FYE 2010-2015 rely on information outlined in previous MTP.

The County CIP shows planned funding for capital projects for the next five years. There are several projects programmed within the BMPO. Historically, there has been no significant capital funding within the Bend MPO. This current analysis assumes no future funding from Deschutes County for capital projects in the BMPO. As part of Phase 2, the funding analysis will be reviewed and updated as necessary to reflect changes in Deschutes County revenue forecasts and expenditures.

Cascades East Transit (CET)

Cascades East Transit (CET) is the public transportation service provider for Central Oregon. CET is administered by the Central Oregon Intergovernmental Council (COIC). CET provides transportation services for people across the three Central Oregon counties of Deschutes, Jefferson, and Crook and for the Warm Springs Reservation.

2007 was the first year in which fixed-route transit service operated in the City of Bend. In addition to serving the City of Bend, CET provides regional transit services, connecting Bend with neighboring cities like Madras, Sisters, Redmond, Prineville, and La Pine. CET also operates seasonal recreation-based services including Ride the River, Lava Butte shuttle and the Mt. Bachelor Ski Resort shuttle. In addition, Dial-a-Ride (curb-to-burb) service is available to persons with disabilities and low-income seniors within Bend city limits.

<<<<The remainder of the CET information on the following pages has not been updated from the 2014 MTP. CET is currently updating its long-range plan. If updated information becomes available, it will be incorporated before Policy Board adoption. Otherwise, it will be updated as part of Phase 2.>>>>

CET's budget is divided into two geographies: The "urban" service area includes transit service within the BMPO, and the "rural" service area includes transit service elsewhere in CET's tri-county service area. Throughout this report, we refer to the urban service portion of CET's budget, unless otherwise stated.

The 2013 Bend Transit Plan recommends strategies to coordinate future transit investments with transit-supportive land uses. The Plan identified four sets of service options, outlining different improvements that could be made to CET service to achieve different levels of transit ridership. Input from staff at the BMPO and CET indicate that the most likely scenario that will be implemented going forward is the "mid-term" scenario, which calls for increasing total annual fixed-route vehicle revenue hours from 20,700 in 2011 to 32,900, and increasing the number of buses operating during peak hours from seven to nine.

Table 17-32 shows the historical annual revenues and expenditures for CET urban service area, including actual revenues for FYE 2012 to 2013. Note that we were unable to obtain budget information for more recent years. Also note that CET historical budget documents do not separate operating, maintenance and administration from capital expenditures, as reflected in Table 17-32.

Table 17-32. Historical annual transit revenues and expenditures, Cascade East Transit - urban service area, FYE 2012 to 2013 (YOE $)

		FYE 2012	FYE 2013
Resources			
Federal Funds	$	705,913	707,376
ODOT Funds	$	379,817	257,404
City of Bend	$	1,205,218	962,743
Deschutes County	$	114,947	139,582
Bus Fares	$	293,938	275,988
Advertising	$	20,000	20,000
Other	$	34,334	62,995
Total Revenue	$	2,754,167	2,426,087
Expenditures			
Administration	$	60,306	84,246
Personal Service	$	259,442	327,270
Materials and Services	$	2,171,457	1,999,518
Capital Expenditures	$	265,244	-
Total Expenditures	$	2,756,450	2,411,035
Annual Surplus (Deficit)	$	(2,282)	15,053

Source: COIC Income Statements, 485-Bend Area Transit Admin, and 486-Bend Area Transit Program, for 12 Periods Ended 6/20/12 and 6/30/13.

Revenue sources for CET

Funding for operations, maintenance, and administration of CET comes from federal, state, and local sources, as well as revenue derived from CET operations (i.e., fares, public-private partnerships, and other sources). Federal sources include FTA Section 5307 (Urbanized Area Formula Program) and FTA Section 5310 (Enhanced Mobility for Seniors and Individuals with Disabilities Program). State funding sources include the Special Transportation Fund, and Oregon Lottery. The largest single source of revenue for CET operations is an allocation from the City of Bend, agreed upon in a multi-year

agreement with COIC that runs through September 1, 2015, with the potential to be extended for additional years.

Table 17-33 shows projected annual revenues for transit operations, maintenance and administration, and capital projects for CET. Projections for FYE 2015 to FYE 2022 were provided by the BMPO in the Bend Transit Plan. Projections for future years were calculated by ECONorthwest.

Total revenue is projected to grow from just over three million to more than seven million in 2040 (Table 17-33). Federal funds are the largest source of revenue, with funds from the City of Bend being the second largest source of revenue.

Table 17-33. Projected annual revenues for transit operations, maintenance and administration, and capital projects, Cascades East Transit – urban service area, FYE 2015 to 2040 (YOE $)

FYE	Fare Revenue	Intergovernmental Revenue			Other Revenue	Total Revenue
		Federal	State	City		
2015	$ 453,389	$ 1,454,069	$ 126,368	$ 1,079,675	$ 38,463	$ 3,151,964
2016	$ 512,937	$ 1,497,690	$ 130,159	$ 1,106,667	$ 42,076	$ 3,289,529
2017	$ 557,539	$ 1,542,621	$ 134,063	$ 1,134,333	$ 43,155	$ 3,411,711
2018	$ 694,809	$ 1,588,900	$ 138,085	$ 1,162,692	$ 55,299	$ 3,639,785
2019	$ 755,956	$ 1,636,566	$ 142,228	$ 1,191,759	$ 56,710	$ 3,783,219
2020	$ 822,361	$ 1,685,664	$ 146,495	$ 1,221,553	$ 58,156	$ 3,934,229
2021	$ 892,099	$ 1,736,234	$ 150,890	$ 1,252,092	$ 59,640	$ 4,090,955
2022	$ 967,591	$ 1,788,321	$ 155,416	$ 1,283,394	$ 61,162	$ 4,255,884
2023	$ 997,586	$ 1,843,759	$ 160,234	$ 1,323,179	$ 63,058	$ 4,387,816
2024	$ 1,028,511	$ 1,900,915	$ 165,201	$ 1,364,198	$ 65,013	$ 4,523,839
2025	$ 1,060,395	$ 1,959,844	$ 170,322	$ 1,406,488	$ 67,028	$ 4,664,078
2026	$ 1,093,268	$ 2,020,599	$ 175,602	$ 1,450,089	$ 69,106	$ 4,808,664
2027	$ 1,127,159	$ 2,083,238	$ 181,046	$ 1,495,042	$ 71,248	$ 4,957,733
2028	$ 1,162,101	$ 2,147,818	$ 186,658	$ 1,541,388	$ 73,457	$ 5,111,422
2029	$ 1,198,126	$ 2,214,400	$ 192,445	$ 1,589,171	$ 75,734	$ 5,269,877
2030	$ 1,235,268	$ 2,283,047	$ 198,411	$ 1,638,435	$ 78,082	$ 5,433,243
2031	$ 1,273,561	$ 2,353,821	$ 204,561	$ 1,689,227	$ 80,503	$ 5,601,673
2032	$ 1,313,042	$ 2,426,790	$ 210,903	$ 1,741,593	$ 82,998	$ 5,775,325
2033	$ 1,353,746	$ 2,502,020	$ 217,441	$ 1,795,582	$ 85,571	$ 5,954,360
2034	$ 1,395,712	$ 2,579,583	$ 224,181	$ 1,851,245	$ 88,224	$ 6,138,945
2035	$ 1,438,979	$ 2,659,550	$ 231,131	$ 1,908,634	$ 90,959	$ 6,329,253
2036	$ 1,483,587	$ 2,741,996	$ 238,296	$ 1,967,802	$ 93,778	$ 6,525,459
2037	$ 1,529,579	$ 2,826,998	$ 245,683	$ 2,028,803	$ 96,686	$ 6,727,749
2038	$ 1,576,996	$ 2,914,635	$ 253,300	$ 2,091,696	$ 99,683	$ 6,936,309
2039	$ 1,352,882	$ 3,004,988	$ 261,152	$ 2,156,539	$ 102,773	$ 7,151,334
2040	$ 1,676,285	$ 3,098,143	$ 269,248	$ 2,223,392	$ 105,959	$ 7,373,026

Source: Calculated by ECONorthwest, based on 2013 City of Bend Transportation System Plan

Table 17-34 shows the same financial projections as Table 17-33, but adjusted for inflation and presented in constant 2015 dollars.

Table 17-34 Projected annual revenues for transit operations, maintenance and administration, and capital projects, Cascades East Transit – urban service area, FYE 2015 to 2040 (Constant 2015 $)

FYE	Fare Revenue	Intergovernmental Revenue			Other Revenue	Total Revenue
		Federal	State	City		
2015	$ 453,389	$ 1,454,389	$ 126,368	$ 1,079,675	$ 38,463	$ 3,151,964
2016	$ 497,514	$ 1,452,658	$ 126,245	$ 1,073,392	$ 40,811	$ 3,190,620
2017	$ 524,496	$ 1,451,196	$ 126,118	$ 40,597	$ 40,597	$ 3,209,512
2018	$ 633,950	$ 1,449,726	$ 125,990	$ 1,060,850	$ 50,455	$ 3,320,972
2019	$ 668,988	$ 1,448,288	$ 125,865	$ 1,054,654	$ 50,186	$ 3,347,981
2020	$ 705,889	$ 1,446,922	$ 125,747	$ 1,048,543	$ 49,919	$ 3,377,021
2021	$ 742,735	$ 1,445,537	$ 125,627	$ 1,042,454	$ 49,654	$ 3,406,007
2022	$ 781,387	$ 1,444,174	$ 125,508	$ 1,036,416	$ 49,392	$ 3,436,876
2023	$ 781,379	$ 1,444,160	$ 125,506	$ 1,036,406	$ 49,391	$ 3,436,842
2024	$ 781,366	$ 1,444,135	$ 125,504	$ 1,036,388	$ 49,391	$ 3,436,784
2025	$ 781,369	$ 1,444,141	$ 125,505	$ 1,036,392	$ 49,391	$ 3,436,797
2026	$ 781,352	$ 1,444,110	$ 125,502	$ 1,036,370	$ 49,390	$ 3,436,724
2027	$ 781,338	$ 1,444,085	$ 125,500	$ 1,036,352	$ 49,389	$ 3,436,665
2028	$ 781,349	$ 1,444,105	$ 125,502	$ 1,036,367	$ 49,390	$ 3,436,712
2029	$ 781,353	$ 1,444,111	$ 125,502	$ 1,036,371	$ 49,390	$ 3,436,727
2030	$ 781,370	$ 1,444,144	$ 125,505	$ 1,036,394	$ 49,391	$ 3,436,804
2031	$ 781,374	$ 1,444,151	$ 125,505	$ 1,036,399	$ 49,391	$ 3,436,820
2032	$ 781,386	$ 1,444,174	$ 125,508	$ 1,036,416	$ 49,392	$ 3,436,875
2033	$ 781,383	$ 1,444,167	$ 125,507	$ 1,036,411	$ 49,392	$ 3,436,860
2034	$ 781,386	$ 1,444,174	$ 125,507	$ 1,036,416	$ 49,392	$ 3,436,875
2035	$ 781,374	$ 1,444,152	$ 125,506	$ 1,036,400	$ 49,391	$ 3,436,823
2036	$ 781,370	$ 1,444,144	$ 125,505	$ 1,036,394	$ 49,391	$ 3,436,804
2037	$ 781,354	$ 1,444,114	$ 125,502	$ 1,036,373	$ 49,390	$ 3,436,733
2038	$ 781,348	$ 1,444,104	$ 125,501	$ 1,036,365	$ 49,389	$ 3,436,709
2039	$ 781,336	$ 1,444,081	$ 125,499	$ 1,036,349	$ 49,389	$ 3,436,655
2040	$ 781,339	$ 1,444,086	$ 125,499	$ 1,036,353	$ 49,389	$ 3,436,667

Source: Calculated by ECONorthwest, based on 2013 City of Bend Transportation System Plan

The proposed transit-service improvements in the mid-term scenario identified in the Bend Transit Plan are projected to increase annual operating expenses for fixed-route operating costs from approximately $1.5 million per year to $2.4 million per year (constant dollars, unadjusted for inflation), an increase of $880,000. Additionally, this increased level of service is estimated to increase the cost of Dial-a-Ride service by 10%, from $1.0 million to $1.1 million per year.

Table 17- 35 shows projected annual expenditures for transit operations, maintenance and administration, and capital projects for CET, as well as the projected revenue streams to fund these operations and capital projects. Projections for FYE 2015 to FYE 2022 were provided by the BMPO in the Bend Transit Plan. Projections for future years were calculated by ECONorthwest, assuming FYE 2022 levels of expenditures are maintained through FYE 2040, increasing annually at a pace equal to the rate of inflation.

Total expenditures for CET are projected to grow from just under three million dollars in 2015 to more than eight million dollars in 2040. Beginning in 2016, CET is expected to experience an operating deficit that will be sustained for the remainder of the forecast period. This annual deficit is projected to grow to more than $850,000 in 2040 (YOE $).

Table 17- 35. Projected total annual revenues and expenditures for transit operations, maintenance and administration, and capital projects, Cascades East Transit – urban service area, FYE 2015 to 2040 (YOE $)

FYE	Total Revenue	Expenditures			Funding Gap
		Operations	Capital	Total Expenditures	
2015	$ 3,151,964	$ 2,519,615	$ 344,412	$ 2,864,027	$ 287,937
2016	$ 3,289,529	$ 2,851,570	$ 495,658	$ 3,347,228	$ (57,699)
2017	$ 3,411,711	$ 2,935,700	$ 623,673	$ 3,559,373	$ (147,662)
2018	$ 3,639,785	$ 3,768,913	$ 773,848	$ 4,542,761	$ (902,976)
2019	$ 3,783,219	$ 3,884,252	$ 461,023	$ 4,345,275	$ (562,056)
2020	$ 3,934,229	$ 4,003,297	$ 468,266	$ 4,471,563	$ (537,334)
2021	$ 4,090,955	$ 4,126,170	$ 475,790	$ 4,601,960	$ (511,005)
2022	$ 4,255,884	$ 4,252,998	$ 496,784	$ 4,749,782	$ (493,898)
2023	$ 4,387,816	$ 4,384,841	$ 512,184	$ 4,897,025	$ (509,209)
2024	$ 4,523,839	$ 4,520,771	$ 528,062	$ 5,048,833	$ (524,994)
2025	$ 4,664,078	$ 4,660,915	$ 544,432	$ 5,205,347	$ (541,269)
2026	$ 4,808,664	$ 4,805,403	$ 561,309	$ 5,366,713	$ (558,048)
2027	$ 4,957,733	$ 4,954,371	$ 578,710	$ 5,533,081	$ (575,348)
2028	$ 5,111,422	$ 5,107,956	$ 596,650	$ 5,704,606	$ (593,184)
2029	$ 5,269,877	$ 5,266,303	$ 615,146	$ 5,881,449	$ (611,572)
2030	$ 5,433,243	$ 5,429,558	$ 634,216	$ 6,063,774	$ (630,531)
2031	$ 5,601,673	$ 5,597,875	$ 653,876	$ 6,251,751	$ (650,078)
2032	$ 5,775,325	$ 5,771,409	$ 674,146	$ 6,445,555	$ (670,230)
2033	$ 5,954,360	$ 5,950,322	$ 695,045	$ 6,645,367	$ (691,007)
2034	$ 6,138,945	$ 6,134,782	$ 716,591	$ 6,851,374	$ (712,428)
2035	$ 6,329,253	$ 6,324,961	$ 738,806	$ 7,063,766	$ (734,514)
2036	$ 6,525,459	$ 6,521,034	$ 761,709	$ 7,282,743	$ (757,284)
2037	$ 6,727,749	$ 6,723,186	$ 785,322	$ 7,508,508	$ (780,759)
2038	$ 6,936,309	$ 6,931,605	$ 809,667	$ 7,741,272	$ (804,963)
2039	$ 7,151,334	$ 7,146,485	$ 834,766	$ 7,981,251	$ (829,917)
2040	$ 7,373,026	$ 7,368,026	$ 860,644	$ 8,228,670	$ (855,644)

Source: Calculated by ECONorthwest, based on 2013 City of Bend Transportation System Plan

Table 17-36 shows the same financial projections as Table 17- 35, but adjusted for inflation and presented in constant 2015 dollars. Note that the annual funding deficit is expected to stabilize at approximately $400,000 per year beginning in FYE 2022.

Table 17-36. Projected annual revenues and expenditures for transit operations, maintenance and administration, and capital projects, Cascades East Transit – urban service area, FYE 2015 to 2040 (Constant 2015 $)

FYE	Total Revenue	Expenditures			Funding Gap
		Operations	Capital	Total Expenditures	
2015	$ 3,151,964	$ 2,519,615	$ 344,412	$ 2,864,027	$ 287,937
2016	$ 3,190,620	$ 2,765,829	$ 480,755	$ 3,246,584	$ (55,964)
2017	$ 3,209,512	$ 2,761,712	$ 586,710	$ 3,348,422	$ (138,910)
2018	$ 3,320,972	$ 3,438,789	$ 706,066	$ 4,144,855	$ (823,883)
2019	$ 3,347,981	$ 3,437,391	$ 407,985	$ 3,845,376	$ (497,395)
2020	$ 3,377,021	$ 3,436,306	$ 401,945	$ 3,838,252	$ (461,231)
2021	$ 3,406,007	$ 3,435,326	$ 396,129	$ 3,831,455	$ (425,448)
2022	$ 3,436,876	$ 3,434,546	$ 401,182	$ 3,835,728	$ (398,852)
2023	$ 3,436,842	$ 3,434,512	$ 401,178	$ 3,835,690	$ (398,848)
2024	$ 3,436,784	$ 3,434,453	$ 401,171	$ 3,835,561	$ (398,841)
2025	$ 3,436,797	$ 3,434,467	$ 401,173	$ 3,835,640	$ (398,843)
2026	$ 3,436,724	$ 3,434,393	$ 401,176	$ 3,835,558	$ (398,834)
2027	$ 3,436,665	$ 3,434,334	$ 401,158	$ 3,835,492	$ (398,827)
2028	$ 3,436,860	$ 3,434,382	$ 401,163	$ 3,835,545	$ (398,833)
2029	$ 3,436,727	$ 3,434,396	$ 401,165	$ 3,835,561	$ (398,834)
2030	$ 3,436,804	$ 3,434,473	$ 401,174	$ 3,835,647	$ (398,843)
2031	$ 3,436,820	$ 3,434,490	$ 401,176	$ 3,835,665	$ (398.845)
2032	$ 3,436,875	$ 3,434,545	$ 401,182	$ 3,835,727	$ (398,852)
2033	$ 3,436,860	$ 3,434,530	$ 401,180	$ 3,835,710	$ (398,850)
2034	$ 3,436,875	$ 3,434,544	$ 401,182	$ 3,835,726	$ (398,851)
2035	$ 3,436,823	$ 3,434,492	$ 401,176	$ 3,835,668	$ (398,845)
2036	$ 3,436,804	$ 3,434,473	$ 401,174	$ 3,835,647	$ (398,843)
2037	$ 3,436,733	$ 3,434,406	$ 401,166	$ 3,835,480	$ (398,835)
2038	$ 3,436,709	$ 3,434,378	$ 401,163	$ 3,835,541	$ (398,832)
2039	$ 3,436,655	$ 3,434,324	$ 401,156	$ 3,835,480	$ (398,825)
2040	$ 3,436,997	$ 3,434,337	$ 401,158	$ 3,835,495	$ (398,828)

Source: Calculated by ECONorthwest, based on 2013 City of Bend Transportation System Plan

The projections of revenue and expenditures for CET reflect the relatively short operating history for this public agency, as well as the uncertainty regarding future level of service and future funding sources. CET only began providing public transit service for the BMPO in 2010. Development in the CET service area has been rapid in recent years, making demand for transit service difficult to predict. Future projections for population growth indicate that demand may increase significantly over time, requiring significant changes for the level of service provided by CET.

Funding for CET has always relied on local contributions from cities and counties to provide the local match for State and Federal grants. But these local contributions are impermanent and unpredictable, creating uncertainty regarding future funding levels. For those reasons, COIC and CET have been exploring potential long-term, stable, local funding sources.

In January 2014, a CET Local Dedicated Public Funding Subcommittee, appointed by the COIC Board, made recommendations on local public funding options for CET. These recommendations included a two-phased approach, where CET would continue to rely on agreements with cities and counties to provide funding for a base level of service in the short-term (0-3 years). In phase 2 (3-5 years), CET should develop a dedicated, local, publicly-funded tool to achieve sustainable and convenient service levels across the region. The preferred funding tool would be a region-wide property tax, but that other tools may ultimately prove more feasible or desirable. This proposed, new, dedicated funding source would either replace existing contributions from local jurisdictions, or would enhance the level of service in jurisdictions that choose to continue providing additional funding.

CET is currently developing a new Regional Transit Master Plan (RTMP). The RTMP will include an assessment of funding sources, including the new Statewide Transportation Improvement Fund (STIF) approved as part of Oregon HB2017. Additionally, CET is part of the Tier II Transit Asset Management Group Plan prepared by ODOT. That plan will help guide management and investment in CET's assets.

Conclusions

Unfunded maintenance

It is typical for all types of infrastructure and all levels of government to have insufficient funding to address 100% of their maintenance needs. This is certainly the case in the BMPO as well. As shown earlier in Table 17- 22, the State of Oregon only has sufficient revenues to address 95% of their estimated needs for maintenance and preservation.

The City and County do not quantify their long-term maintenance needs in the same way as the State, but conversations with staff at both jurisdictions indicates that there is a long-term challenge in securing sufficient revenues to fully fund maintenance of the transportation system. As an example, work completed for the City of Bend TSP updates documents a significant backlog of preservation needs (almost $80 million). A majority of that backlog are streets that are beyond preservation and will require complete reconstruction. The City of Bend has significantly increased funding for preservation activities over the past few years. The TSP update process documents the need for even greater resources in the future and throughout the planning horizon. Through the TSP update process, an advisory committee is working to identify a range of suitable funding options for both maintenance and capital projects.

Summary of revenue for roadway capital projects

Table 17- 37 shows the total forecast revenues for transportation capital projects from each jurisdiction. Revenues are expected to increase from $9.3 million in FYE 2020 to $19.1 million in FYE 2040. Total revenues are expected to be $356 million over the forecast period, with average annual revenues equal to $19.8 million.

Table 17-37. Projected revenue available for transportation capital projects in BMPO, FYE 2020 to 2040 (YOE $)

FYE	City	ODOT	County	Total
2020	8,240,893	1,131,395	-	**9,372,288**
2021	11,595,410	61,525,221		**73,120,631**
2022	10,886,177	1,131,156	-	**12,017,333**
2023	11,185,432	1,130,004	-	**12,315,436**
2024	11,493,490	1,128,761	-	**12,622,251**
2025	11,510,575	51,127,425	-	**62,638,000**
2026	11,636,917	1,104,276	-	**12,741,193**
2027	11,972,853	1,102,747	-	**13,075,600**
2028	12,318,627	1,101,119	-	**13,419,746**
2029	12,674,591	1,099,388	-	**13,773,979**
2030	13,041,003	1,097,553	-	**14,138,556**
2031	13,418,130	1,055,433	-	**14,473,563**
2032	13,806,346	1,053,382	-	**14,859,728**
2033	14,463,937	1,051,219	-	**15,515,156**
2034	14,880,961	1,048,941	-	**15,929,902**
2035	15,310,171	1,046,546	-	**16,356,717**
2036	15,751,977	1,282,925	-	**17,034,902**
2037	16,206,699	1,280,287	-	**17,486,986**
2038	16,674,767	1,277,524	-	**17,952,291**
2039	17,156,520	1,274,633	-	**18,431,153**
2040	17,652,407	1,402,277	-	**19,054,684**
Total	**$281,877,885**	**$134,452,212**	**$0**	**$416,330,097**
Average	**$13,422,756**	**$6,402,486**	**$0**	**$19,825,243**

Sources: ODOT Long-Range Revenue Tables & City of Bend

Because the timing of future capital improvements is uncertain, it is difficult to take current cost estimates and adjust them for inflation in the future to show them in YOE dollars. Thus, when comparing future project costs with available revenues, it is helpful to focus on the revenue projections in constant 2018 dollars.

Table 17-38 shows the same forecast of revenues for capital projects in the BMPO, but in constant 2018 dollars. City revenues are expected to slowly decline over the forecast period. ODOT revenues are expected to decline more rapidly over the forecast period. In total, the forecast shows $315.2 million in revenue (constant 2018 $) will be available for capital projects between FYE 2020 and 2040.

Table 17-38. Projected revenue available for transportation capital projects in BMPO, FYE 2020 to 2040 (Constant 2018 $)

FYE	City	ODOT	County	Total
2020	10,131,770	1,064,341	-	11,196,111
2021	10,102,731	56,136,150	-	66,238,881
2022	10,074,508	1,001,023	-	11,075,531
2023	9,789,802	969,960	-	10,759,762
2024	9,604,308	939,772	-	10,544,080
2025	9,590,810	41,288,399	-	50,879,209
2026	9,577,112	864,945	-	10,442,057
2027	9,563,556	837,763	-	10,401,319
2028	9,550,375	811,376	-	10,361,751
2029	9,537,185	785,726	-	10,322,911
2030	9,524,233	760,816	-	10,285,049
2031	9,511,744	709,630	-	10,221,374
2032	9,499,379	686,958	-	10,186,337
2033	9,650,574	664,949	-	10,315,523
2034	9,637,208	643,561	-	10,280,769
2035	9,624,159	622,796	-	10,246,955
2036	9,611,164	740,505	-	10,351,669
2037	9,598,471	716,766	-	10,315,237
2038	9,585,849	693,703	-	10,279,552
2039	9,573,542	671,319	-	10,244,861
2040	9,561,348	716,325	-	10,277,673
Total	$202,899,829	$112,326,783	$0	$315,226,612
Average	$9,661,897	$5,348,894	$0	$15,010,791

Sources: ODOT Long-Range Revenue Tables & City of Bend

Note that not all of the revenues presented in Table 17- 38 will be available for capital projects on the MTP preferred projects list. There are other projects in the region that are eligible to receive funding from these sources, including local improvements not in the MTP, Intelligent Transportation Systems (ITS) projects, safety improvements, and bicycle and pedestrian projects. The City's Transportation SDC analyses identify tens of millions of dollars in SDC funding that is needed for projects that are not included in the MTP. Additionally, The Deschutes County ITS Plan and local bicycle and pedestrian planning efforts identify millions of dollar of projects that would need to be funded by the City and/or ODOT.

Transit service

Since its inception in 2007, there has significant uncertainty regarding long-term projections for transit funding and expenditures. That changed, however, with the passage of Oregon HB 2017. That legislation created the Statewide Transportation Improvement Fund (STIF) to provide stable, long-term funding for public transportation services throughout Oregon. CET recently submitted the necessary planning documents and funding application documents for service and capital projects

throughout their service area. The planning documents and funding applications are scheduled for review and possibly approval by the Oregon Transportation Commission in either August or September (2019). If approved, those funds will be available January 1, 2020.

In late 2018, CET initiated an update to its long-range plan. Work on the plan will continue through 2019 with completion expected in spring 2020. That plan will include detailed revenue forecasts and service and capital costs. Phase 2 of the MTP will incorporate the outcomes of that planning process.

Chapter 18: Performance Measures

Introduction

This chapter lays out the process and methods used by the Bend Metropolitan Planning Organization (BMPO) to measure transportation system performance and manage congestion developing the MTP. Future work programs will address annual performance monitoring and reporting of system performance. Congestion management is the application of strategies to improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods. The BMPO transportation performance measures are an important component of a technical framework used to assess travel conditions, support the selection of management strategies, and to guide investments in the transportation system.

Larger MPOs are required by FHWA to have a formal Congestion Management Process (CMP) that serves as a systematic and regionally-accepted approach for managing congestion. The federal CMP provides accurate, up-to-date information on transportation system performance and is used to assess alternative strategies that meet state and local needs. The BMPO has the discretion to utilize a CMP-style process for its planning purposes without having to comply with the reporting requirements that are imposed on larger MPOs. This approach allows the BMPO to leverage recent strategic advances that are applied by other MPOs and to better align their measurable policies to be consistent with federal goals. The next sections outline the typical CMP process and highlights how the performance measures fit into the overall planning program.

Overview of a CMP

The overall intent of the CMP process is to reflect the community goals and policies that influence the types of solutions and investment priorities for managing congestion. The CMP diagram above illustrates the eight action steps recommended by the latest FHWA guidebook for Congestion Management Plans (2011).

The diagram in Figure 18-1 shows a progression of planning activities and the iterative nature of the on-going MPO regional planning process. BMPO has the freedom to vary the level of effort for each of the action areas, depending on the available funding for data collection, and the extent and depth of analysis that might be required to inform key strategy decisions.

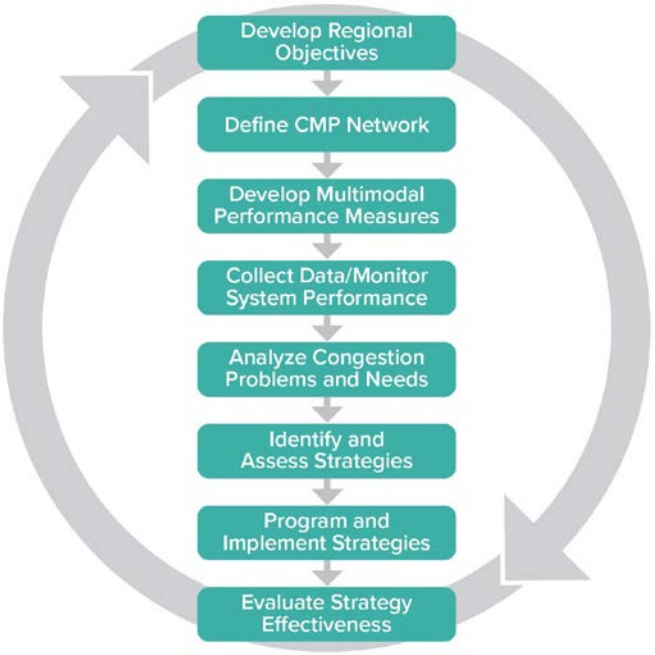


Figure 18-1 Progression of planning activities

How the CMP Fits into the Overall Regional Planning Process

The CMP is a core part of the metropolitan transportation planning process, as illustrated in the graphic in Figure 18-2 in the process column. On the right side are key regional planning products that are developed by BMPO that either are informed by the CMP or feedback into key CMP action steps.

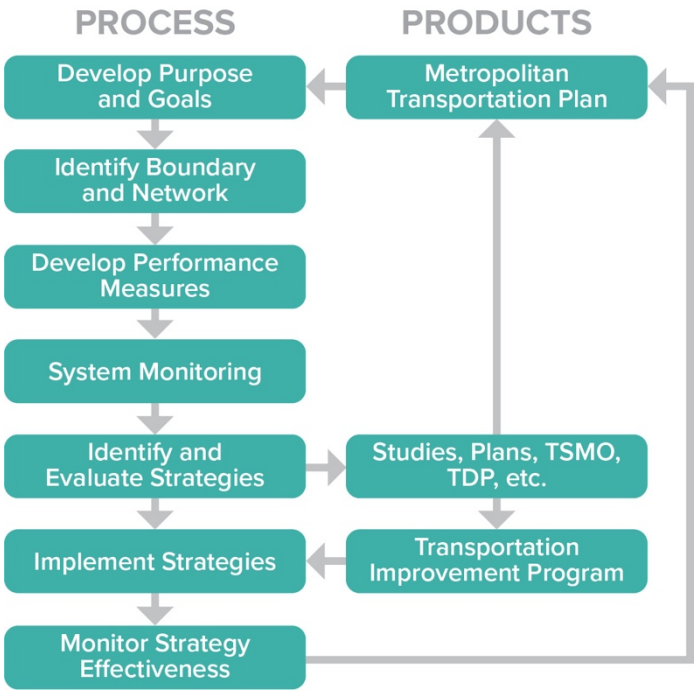


Figure 18-2 Process and products of regional planning

As shown, the goals and objectives of the Metropolitan Transportation Plan inform and update the CMP purpose and goals, which in turn govern the underlying performance measures and reporting tools. The choice of performance measures influences the resulting types of strategies to be considered and can govern the resulting investment priorities throughout the CMP. As noted by the cyclical flow of the diagram, performances measures should be reviewed periodically to ensure that they are representative of regional policies. The Bend MPO may consider some components of the CMP as part of the next MTP update or in development of the performance monitoring program.

Federal Performance Measures for Bend MPO

MAP-21 established a performance-based planning framework intended to improve transparency and hold state transportation departments, transit agencies and metropolitan planning organizations (MPOs) accountable for the effectiveness of their transportation planning and investment choices. That framework was continued in the FAST Act. The objective of the new framework is to ensure States and MPOs invest federal resources in projects that collectively will make progress toward the achievement of the national goals identified in the FAST Act.

The federal goal areas that are applicable to the Bend MPO include Safety, Infrastructure Conditions and System Reliability. Table 18-1 on the following page summarizes the performance measures for each federal goal area (source: Bend MPO Federal Performance Measures, September 2018). In several cases, the Bend MPO has opted to support the Oregon DOT methods and targets used to assess Infrastructure Conditions and System Reliability. Refer to the Key Performance Measure Definitions section at the end of the chapter for more information about performance measure.

Table 18-1: Federal Performance Measures for Bend MPO

GOAL AREA	PERFORMANCE MEASURES AND TARGETS
Safety To achieve a significant reduction in traffic fatalities and serious injuries on all public roads	Number of fatalities
	Rate of fatalities per 100 million Vehicle Miles Traveled (VMT)
	Number of serious injuries
	Rate of Serious Injuries per 100 million VMT
	Number of Non-Motorized Fatalities and Non-Motorized Serious Injuries
Infrastructure Conditions To maintain the highway infrastructure asset system in a state of good repair.	Pavement (Oregon DOT 4-year target) • 50% of non-interstate NHS pavement in Good Condition • 10% of non-interstate NHS pavement in Poor Condition
	Bridges (Oregon DOT 4-year target) • 10% of NHS Bridges in Good Condition • 3% of NHS Bridges in Poor Condition
	Transit Asset Management • The Group Transit Asset Management (TAM) Plan establishes targets for 10 asset categories for all Tier II transit providers in Oregon (including CET). The targets are available on the following site: https://www.oregon.gov/ODOT/RPTD/Pages/Transit-Asset-Management.aspx
System Reliability To improve the efficiency of the surface transportation system.	Travel time reliability measure (Oregon DOT) • 78% of person-miles traveled on non-interstate NHS that are reliable (2022 performance target)
	Bend MPO has US 97, Hwy 20 and major arterials such as: 3rd Street, Reed Market Avenue, Empire Avenue, 27th Street that will be assessed for travel time reliability
Transit Safety Implement a safety management system	Development of the CET safety plan is expected in late fall 2019.

Source: Bend MPO Federal Performance Measures, September 2018

Regional Transportation Plan Goals and Objectives

In addition to the federal requirements, the Bend MPO has developed a complimentary set of transportation goals, objectives, and performance measures to be applied for the regional Metropolitan Transportation Plan and the City of Bend's Transportation System Plan, as listed in Table 18-2. These local transportation goals and performance measures are designed to address a broader range of community goals such as non-motor vehicle systems, economic development, and equity. For each goal area, the MTP identifies a series of specific objectives and measures that were applied to system evaluation and scenario analysis to develop the plan. In future work programs that

establish a monitoring and reporting program for the MPO, targets could be set for these objectives and measures to allow the City of Bend and Bend MPO to track progress toward achieving the goals over time. In a few cases, the performance measures are tied back to those required for Federal reporting, as indicated with an asterisk (*).

Table 18-2: Regional Transportation Goals and Objectives (Bend MTP)

PROJECT GOALS	SYSTEM EVALUATION PERFORMANCE MEASURES
Increase System Capacity, Quality, and Connectivity for All Users	Demand to Capacity Ratio (congestion)*
	Sidewalk System Completeness
	Bicycle System Level of Traffic Stress
	Completeness of low-stress network
Ensure Safety for All Users	Reported fatal and injury crashes*
	Reported Crashes by Mode
	Qualitative Assessment of Predicted Crash Rates
Facilitate Housing Supply, Job Creation, and Economic Development to Meet Demand/Growth	Vehicle Hours of Delay*
	Peak Hour Vehicle Miles Travelled on Rural Facilities (diversion)
	Travel Time Reliability* (Application requires scope of work modification)
Protect Livability and Ensure Equity and Access	Measure performance through equity lens such as poverty, race, age, and disability
	Percentage of vulnerable populations within ¼ mile of sidewalks, bicycle facilities, or transit
	Employment accessibility (ex. Number of jobs that the majority of Bend residents can reach, within a reasonable timeframe. This is calculated for each mode.)
	Percentage of collector roads with an ADT above 4,000
Steward the Environment	Vehicle Miles Traveled Per Capita*
Have a Regional Outlook and Future Focus	Arterial Roadway Miles with Demand to Capacity Ratio Deficiencies
	Potential for alternative funding sources
	Mode Split*
Implement a Comprehensive Funding and Implementation Plan	Cost
	Roadway Lane miles

*Recommended measures that are part of MPO planning requirements

Chapter 19: Outstanding Issues

Introduction

This MTP update is intended to conform with state and federal requirements; to reflect changes to the MPO's transportation network; and update existing and planned future land uses and socioeconomic characteristics that have occurred since the adoption of the previous plan in 2014. It also integrates the recently completed Transportation Safety Action Plan. It has produced a new financially constrained project list that is based on updated travel demand projections as well as an updated revenue and financial forecast for what transportation funding is expected to be available over the planning horizon.

This update is not intended to be an intensive update of all elements of the plan. This update represents Phase 1 of a two phase update process. Phase 1 provides an update of the prior plan based on a new 2040 land use scenario that incorporates the City of Bend's urban growth boundary expansion that was completed in 2016. It also includes an updated revenue forecast.

Numerous planning studies are underway that will directly impact the MTP. These planning efforts will not conclude until after the deadline for completing Phase 1 of the MTP. Those studies include:

- City of Bend TSP update
- Deschutes County Intelligent Transportation Systems (ITS) Plan update
- US97 Bend Parkway Facility Plan
- Cascades East Transit (CET) Regional Transit Master Plan (RTMP) update

Each of those planning efforts will identify projects, programs, policies and potential funding sources that will significantly impact the regional transportation system. Once those plans are complete, a comprehensive Phase 2 update of the MTP will be completed to be consistent with those plans.

Phase 1 is a focused update of the current MTP to conform with federal requirements, reflect changes and work completed since the current plan's adoption, and, to the extent possible, incorporate goals of current federal transportation legislation (FAST Act). This Phase 1 update is critical to maintain federal funding eligibility.
The plan update is for a horizon year of 2040.

Phase 2 *MTP* Development

The Phase 2 update will begin in late 2019 and conclude in spring/summer 2020. Phase 2 will:

- Incorporate the findings from the City of Bend TSP

- Incorporate the findings from the Deschutes County ITS Plan
- Incorporate the findings from the US97 Parkway Facility Plan
- Incorporate the findings from the CET RTMP
- Incorporate the findings of the updated Environmental Assessment for the US20/Cook Avenue intersection area in Tumalo
- Incorporate the findings of other planning and project development efforts (e.g. US20 intersection analysis)
- Incorporate the findings of the Southeast Area Plan
- Incorporate the findings of the Core Area Project
- Incorporate the findings from various land use master plans
- Reassess the findings and projects outlined in Phase I based on the above listed plans and make updates as needed
- Update the overall format of the MTP to make it more user-friendly and accessible
- Identify a schedule and process to address additional concepts desired by the partnering agencies such as Alternate Mobility Standards and development of a detailed Pedestrian System Plan in the BMPO area (see next section).

Key Outstanding Issues for Future Planning

The improvements, funded and unfunded, called for in this Plan do not solve all of the identified transportation issues. In fact, some of the more obvious issues are not fully addressed by the improvements identified in this Plan. The reasons for this are:

1) The nature of these issues is very complex and further analysis is required to adequately understand the underlying travel demand contributing to the issues;
2) Several potential approaches might be useful, either alone or in combination, to address these issues;
3) The lack of funding available to implement the solutions, or restrictions on the funds available that preclude their use in being applied toward a particular issue;
4) No consensus solutions are currently identified to address these issues, and additional public deliberation and input is required before a preferred alternative can be selected and included in the Plan; and
5) Several of these issues are the subjects of current ongoing planning studies and as such do not have any recommended solutions at this time.

This chapter summarizes the outstanding issues that were identified in the preceding chapters, along with some broader issues facing the region. In addition to those outstanding issues discussed below, other problem areas will likely be the subject of further study as part of the development of local Transportation System Plans by jurisdictions in the region, or as part of specific study processes associated with updating local comprehensive land use plans.

Although interrelated packages of improvements for each of these outstanding issues will likely be identified as a result of the ongoing planning studies, there may be

instances where specific projects or actions to preserve right(s)-of-way for eventual improvements are warranted prior to the completion of the entire study. If such actions can successfully demonstrate consensus support and operational separability (i.e., the action or improvement is warranted on its own merits and will not preclude elements of a comprehensive solution), then they may be advanced individually and remain consistent with this Plan without being specifically identified in it.

Funding Issues

The region, like nearly all areas of the US, is facing a shortfall in revenues to implement all of the programs and projects identified in the plan. This shortfall impacts all aspects of the transportation system, from roads and highways, to the operation of bus service. Through the City of Bend TSP update process, expanded and new revenue sources are being considered for the local system. Potential outcomes of that effort could include increases to existing local revenue sources (e.g. SDCs) and new local revenue sources (e.g. utility fee, bond measure). Any increase in existing sources will require City Council approval. Any new revenue sources will require City Council approval or approval by voters through a ballot process. The timing of these potential votes is not yet determined and may not occur until after completion of Phase 2.

Also of concern is funding over the planning horizon for maintenance and improvements to the ODOT highway system in the MPO and throughout Central Oregon. Significant population and employment growth is forecast in Bend and throughout Central Oregon. Travel between the region's communities occurs primarily on the state highway system. Addressing increases in highway system demand will require greater resources for maintenance, operations, and capital improvements. The Oregon Legislature approved a large transportation funding package in 2017. While that package includes significant new revenue for maintenance and operations, it includes limited funding for capital improvements. The legislation includes a capital earmark for improvements to US97 in Bend. Beyond that earmark, the ODOT programming cycles (2021-2024 and 2024-2027) will include almost no funding for capital projects. With no solution to the dilemma of decreasing capital resources, the ODOT system will likely continue to see increasing levels of congestion.

As shown in the financial chapter of this Plan, there is a considerable difference between the amount of revenues that will be available to the region during the plan horizon and the costs of the programs and improvements necessary to address all the issues that face the transportation system. The financially constrained selection of projects presented in the previous chapters addresses the federal planning requirements related to financial constraint.

Alternate Mobility Standards/Performance Measures

Current policies of the City of Bend and ODOT use traditional traffic operations performance measures (delay and volume-to-capacity ratios) to evaluate system

performance. In recent years, many agencies (including those in central Oregon) have expressed interest in evolving the manner in which the transportation system performance is measured and evaluated. The main goal of this evolution is capture the needs of the broad range of transportation users (drivers, cyclists, pedestrians, transit riders, freight) and to capture other priorities, such as safety, and incorporate these in the performance evaluation. Recent planning efforts in central Oregon, such as TRIP97, have taken initial steps in assessing alternate standards and performance measure that will allow stakeholders to more effectively monitor, plan for, and invest in the transportation system. It's the MPO's goal to continue this discussion among MPO partners to establish a more holistic set of transportation performance measure for the MPO area that are reflective of the communities goals and priorities.

As of the writing of this update, the City of Bend is considering options to temporarily modify or suspend its mobility standards to help foster development of affordable housing. A schedule and strategy for a more comprehensive overhaul of the City's mobility standards is not yet available.

The US97 Bend Parkway Facility Plan will include a strategy for potentially modifying the mobility standards on US97. There is currently no funding for the planning work necessary to implement alternate mobility standards.

Rail

Rail issues include the safety of railroad crossings, traffic congestion associated with rail crossing closures, and at-grade rail crossing impacts on emergency services. Forecast increases in travel demand will only exacerbate these issues.

The City of Bend TSP update will identify the need to address the at-grade rail crossing on Reed Market Road. Reed Market Road is a major arterial, and train traffic causes significant disruptions to travel flow. The TSP will recommend further analysis to determine if relocating the nearby switching yard is a viable option. It will also recommend further analysis to assess the feasibility of grade separating the road from the railroad. The timing of this follow-up work is not determined.

Other outstanding issues that cannot be fully addressed by this document include: 1) the preservation of land that is currently capable of being served by rail, and 2) noise associated with the trains.

Roads

As outlined in the Motor Vehicles chapter, there is limited funding to address all of the roadway system needs identified. A prioritized list of reasonably funded projects had to be developed with the remaining needs outlined on an aspirational (but unfunded list). That is not to say that these needs are not important; they are captured in the

aspirational list so that they can be addressed as additional funding or funding partnerships become available or if priorities of which projects should be on the funded list evolve. Key areas of note that still remain on the unfunded needs are:

- US 97 at the north end of Bend (only partial funding is available for improvements identified in the US 97 North Corridor EIS)
- US 97 at Murphy Road. A partial interchange was constructed at this location, but funding may not be available to complete it.
- US 97 at Powers Road. The Parkway Plan will assess and identify an improvement for this intersection (overpass or interchange), but funding may not be available to design and construct it.
- US 97. The Parkway Plan will identify improvements and modifications for other sections of US 97, but funding may not be available to fund the projects.
- US 20 outside the Bend city limits. ODOT is evaluating several intersections on US 20 in the unincorporated areas of the MPO. There are safety issues at all of these intersections, with at least one considered a high crash location. Improvements for these intersections could range from channelization to roundabouts. Funding may not be available to construct the improvements.
- Southern crossing of the Deschutes River. The City of Bend TSP will include a recommendation to evaluate a new crossing of the Deschutes River (in the Powers Road to Murphy Road area). The TSP analysis shows the need for a new crossing in the latter years of the planning horizon. There is currently no funding or a schedule to complete this planning project.
-

Pedestrian and Bicycle Projects

The City of Bend TSP update process has included a significant focus on development of a low-stress bicycle network (LSN) and the identification key bicycling and walking routes (a sub-set of the LSN). The Key Routes provide the foundation of a connected walking and biking network and allows the City to focus construction, operations, and maintenance efforts on a smaller initial network of critical walkway and bikeway needs. Completion of the key routes and the larger LSN will require the City to develop a program to prioritize and incrementally fund construction of the system.

The TSP will also include a recommendation to develop a Pedestrian System Plan (PSP). This plan will identify projects beyond those identified in the key routes. A schedule and funding to develop the PSP has not been identified. Implementation of the PSP will require the City to develop a program to prioritize and incrementally fund construction of the system.

Increasing Reliance on Non-Automobile Modes

The Oregon Transportation Planning Rule (TPR) requires the local jurisdictions within the MPO to develop measures and benchmarks that will demonstrate that the Bend area is reducing its reliance on single occupant vehicles. Land use changes will be

required in order to facilitate this change. Through its urban growth boundary expansion and associated Comprehensive Plan update, the City of Bend adopted an integrated land use and transportation plan (ILUTP). The ILUTP and Comprehensive Plan identify mixed land use centers, corridors, and other methods for reducing automobile reliance. This MTP updates reflects these land use assumptions and policies.

Appendix A: FAST Act Matrix

<<<<To be completed in Phase 2 of the plan update >>>>

Appendix B: Existing Conditions & Needs

Existing Conditions Report dated 2018. To view the full report use this link
https://www.bendoregon.gov/Home/ShowDocument?id=37163

Existing Conditions and Needs

July 25, 2018 (Draft)

Appendix C: Land Use Data

Land Use Assumptions for Transportation Modeling 2018. To view the full report use this link: https://www.bendoregon.gov/Home/ShowDocument?id=35985

Updated Land Use Assumptions for Bend's Transportation Plan

PREPARED FOR: Steering Committee
COPY TO: Citywide Transportation Advisory Committee
PREPARED BY: Becky Hewitt, Angelo Planning Group
DATE: April 26, 2018

Introduction and Overview

The purpose of this memorandum is to describe the land use assumptions that are proposed for use in creating Bend's Transportation Plan.[1]

Transportation modeling and analysis begins with assumptions about land use and demographics, along with other inputs. The City and the Bend Metropolitan Planning Organization (BMPO)[2] must use 20-year growth estimates when their transportation plans are updated.[3] To accommodate this 20-year timeline, the transportation modeling will look ahead to 2040. Portland State University (PSU) recently released draft population projections for Bend and Deschutes County. The projection for 2040 is significantly higher for Bend than previous 2040 population projections. Because the City is required to use the most recent available official projection in evaluating future transportation needs, the land use inputs must account for the additional population growth. In addition, because job growth generally tends to track population growth, additional population growth likely means additional employment growth, which must also be accounted for in the land use assumptions.

The Urban Growth Boundary (UGB) planning and analysis was based on a future year of 2028. The land use assumptions for Bend's Transportation Plan will extend to 2040 and be broadly consistent with the land use designations, policies and strategies that emerged from the UGB process and are adopted in the City's Comprehensive Plan and Integrated Land Use and Transportation Plan (ILUTP).[4] This could mean assuming more infill and redevelopment in the core of the City, more compact and efficient development on vacant land throughout the UGB, as well as some additional expansion on the periphery in locations that were evaluated as part of the UGB process.[5] It is important to note that the land use assumptions for the Transportation

[1] This memorandum is an update of a memorandum titled "Proposed Land Use Assumptions for Bend's Transportation Plan," dated February 12, 2018. It has been updated to reflect updated population forecasts released in March 2018, and refinements to land use assumptions to respond to the updated projections.

[2] The Bend Metropolitan Planning Organization is the lead agency for regional transportation planning and the decision-making body for federal and state transportation funding for the Bend Area.

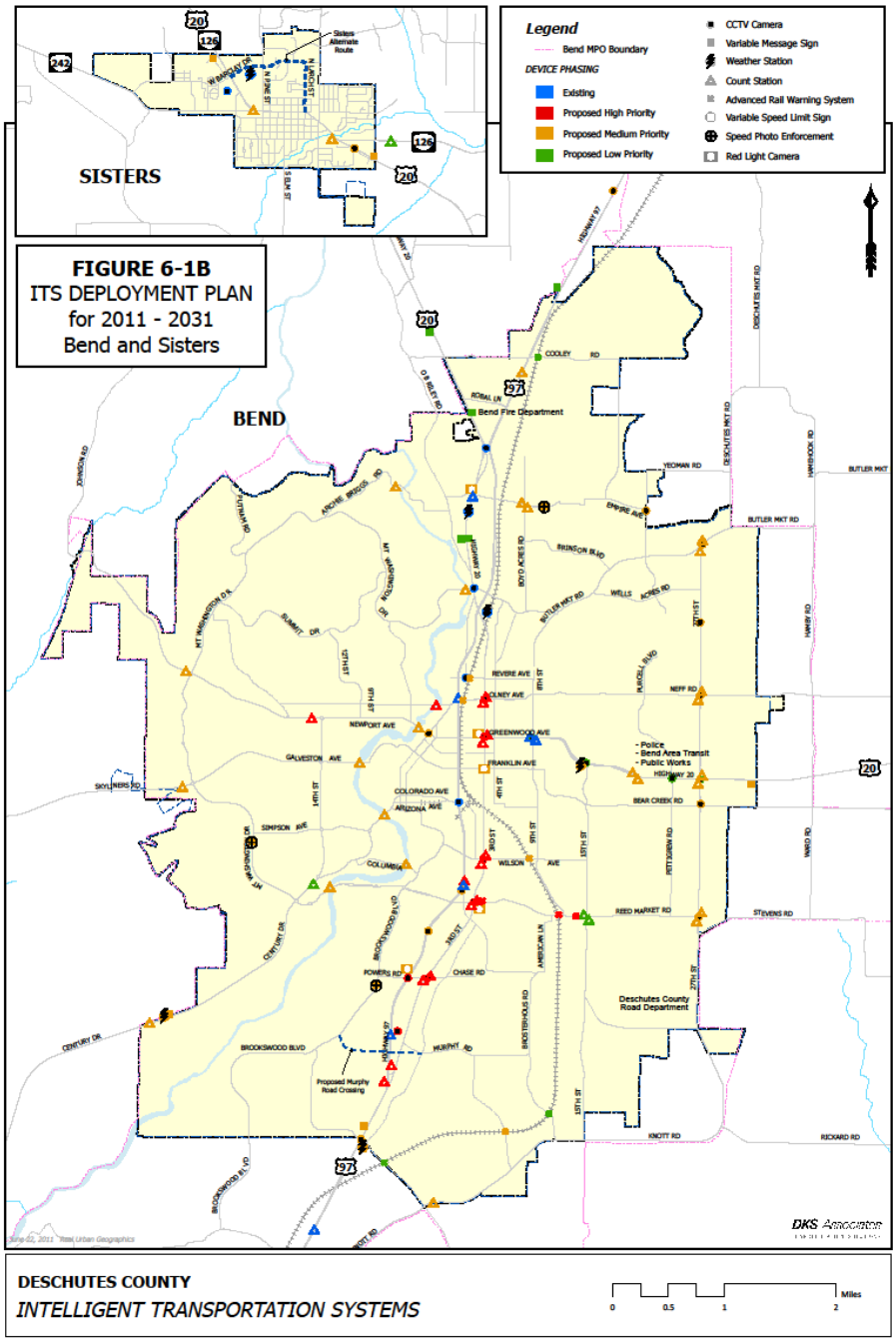
[3] The BMPO must update its plan every five years, and at the time of adoption, it must look out at least 20 years.

[4] As part of the City's UGB expansion planning process in 2014-2016, advisory committees and elected officials considered and adopted the Integrated Land Use and Transportation Plan, which contains strategies to provide more transportation choices, as required by state law. These included looking at how future growth patterns will affect people's transportation choices, and their ability to walk, bike, use transit, or make shorter trips.

[5] The areas outside the UGB that are identified as accommodating some of the projected 2040 growth were considered in some of the UGB scenarios but did not get included in the final approved UGB expansion.

Appendix D: ITS Plan maps

Deschutes County Intelligent Transportation System Plan update 2011. Click on the document below to enlarge the map or visit http://www.bendoregon.gov/home/showdocument?id=4544 (Map located on page 119. Figure 6-1B - ITS Deployment Plan)



Appendix E: Environmental Considerations

Use this link to view the 2007 Environmental Considerations Appendix.
https://www.bendoregon.gov/Home/ShowDocument?id=18145

APPENDIX E

Environmental Considerations

The Environmental Considerations Chapter (16) was revised as part of the MTP update Phase 1, but this appendix has not been revised. It reflects information developed for the 2007 MTP and 2014 MTP. This appendix will be revised as part of the Phase 2 update.

Appendix F: Plan Update Process

Plan Updates

As required by the code of federal regulations, the Metropolitan Transportation Plan (MTP) must be updated every five years. The scope and schedule of the MTP will be determined by the MPO committees and Policy Board in consultation with FHWA and FTA.

Metropolitan Transportation Plan Amendment Process

The Metropolitan Transportation Plan (MTP) establishes a comprehensive policy direction for the regional transportation system and recommends a balanced program of transportation investments to implement that policy direction. The MTP is updated every five years, as required by federal law. In between full updates to the MTP, it may be necessary to amend the plan in response to changing local conditions and newly adopted plans. To be eligible to build a project with federal funds the project must first be amended into the MTP.

The recommended investments in the MTP do not solve all transportation problems and are not intended to be the definitive capital improvement program on the local transportation system for the next 20 years. Rather, the MTP identifies the projects, programs or further refinement studies required to adequately meet regional transportation system needs during the planning period. Local conditions are addressed through city and county TSPs, and will require additional analysis and improvements to provide an adequate transportation system. The MTP anticipates such refinements. Refinements to the RTP may also result from ongoing corridor refinement plans, NEPA studies or other area studies.

Major Amendments

These are amendments that come from NEPA processes, Corridor Refinement Plans or other studies and involve additions or deletions of projects or a significant change in scope of the project location or function. The amendment will be accompanied by a demonstration of consistency with the MTP. The amount of information required to demonstrate consistency with the MTP shall be commensurate with the scope of the project.

The following process will be used for Major Amendments to the MTP:

1) Bend MPO Technical Advisory Committee (TAC) and Policy Board review of proposed amendments
2) 25-day public comment period
3) Staff compiles comment report and distributes to TAC and Policy Board
4) Bend MPO TAC review of comments and recommendation to Policy Board
5) Policy Board public hearing, deliberation and adoption

Minor Amendments

Other amendments resulting from local TSPs: new roadway, transit, bikeway, pedestrian, freight and demand management projects necessary to meet the objectives of the MTP shall be accompanied by an demonstration of consistency with the MTP.

The amount of information required to demonstrate consistency with the MTP shall be commensurate with the scope of the project.

The following process will be used for Minor Amendments to the MTP:

1) Bend MPO TAC review of proposed amendments and recommendation to Policy Board
2) Policy Board review of proposed amendments, receive public comment, deliberation and adoption

Operations, Maintenance and Safety Project Amendments

Operations, maintenance and safety improvements are deemed consistent with the policy intent of the MTP if (a) they are needed to serve the travel demand associated with the MPO area's adopted population and employment forecasts, and (b) they are consistent with affected jurisdictional plans.

Operations, Maintenance, and Safety Projects Amendments to the MTP will be reviewed by the Bend MPO TAC.

Modifications to the Illustrative Project List

A formal amendment process is not required for changes to projects that are included only for illustrative purposes.

Modifications to the Illustrative Project list will be reviewed by the Bend MPO TAC. The TAC will determine if the Policy Board should be consulted about the proposed changes.

Public Notification

Information about proposed amendments and ability for public review and comment will use one or more of the following methods: media releases, BMPO webpage, BMPO e-mail lists, and other communication methods and opportunities as appropriate.

Appendix G: Public Comment Period - Comments Received

The public comment period began on August 21, 2019 and was advertised as a news item on the City of Bend website at bendoregon.gov and on the Bend MPO webpage at www.bendoregon.gov. An email was sent to Bend MPO agenda group emails lists.

Public Comment Period Open 8/21/19 for the
Bend MPO 2040 Metropolitan Transportation Plan Update

The public is invited to review and comment on draft 2040 Metropolitan Transportation Plan (MTP). This plan will be reviewed and considered for adoption by the Bend MPO Policy Board on September 17, 2019 at the Deschutes Services Building, 1300 NW Wall Street, Bend, Oregon from 12:00 pm to 1:30 pm in the DeArmond Meeting Room.

The draft MTP document is available online. You can comment by phone at (541) 693-2113, with written comment by mail with attention to Bend MPO at 710 NW Wall Street, Bend Oregon 97703, e-mail to tdeke@bendoregon.gov, or in person at the public meeting on 9/17/19 as listed above.

Note that this is Phase One of our MTP update.

This is a two phase plan update. As several planning projects are in process at the time of this update, a second update will be done in 2020-2021 to consolidate those findings into a complete update. Plans in process:
Bend Transportation System Plan
ODOT Parkway Study
Transit Plan Update
Safety Action Plan

Accessible Meeting/Alternate Format Notification

This meeting event/location is accessible. Sign or other language interpreter service, assistive listening devices, materials in alternate format, such as Braille, large print, electronic formats, or any other accommodations are available upon advance request at no cost. Please contact Jovita Anderson no later than 24 hours in advance of the meeting at (541) 693-2122, or janderson@bendoregon.gov. Providing at least 2 days-notice prior to the event will help ensure availability.

In accordance with 23 CFR 450.316, a metropolitan planning organization (MPO) is required to engage in a metropolitan planning process that creates opportunities for public involvement, participation, and consultation throughout the development of the Metropolitan Transportation Plan (MTP). Under this requirement, MPOs must allow for adequate public notice of public participation activities. We welcome your comments.

Public comments received are listed below and on the following pages, and include the response provided.

COMMENT #1

Good Morning,

I reviewed the MTP Updates and love most of what I see. There are a few other areas that I think should at least be on the radar and explored by the committee as you continue to plan for Bend's future growth.

1.) Railway - has anyone done any assessment/feasibility study to explore moving the railroad line east of town. It seems a rail park to the east that could allow the incoming freight to be easier loaded/unloaded and delivered locally as well as moving the main line to the east of town could make way for great future growth potential. The existing line through town could be used for light rail or converted to bike/pedestrian paths.

2.) In conjunction with the above is there a feasible route to build an eastern bypass for highway 97? It seems options should be being explored to examine if there is a route that the rail and roadways could follow that would take through traffic around Bend to the east to pull congestion away from the core of the city. On a grand scale an interstate 7 could be built to connect roughly from the Hermiston area on I-84 to Klamath Falls bypassing Bend just to the East.

3.) Canals - as the irrigation canals will continue to be piped for water conservation I think a partnership should be developed to turn all those areas into linear trails to connect bikers and pedestrians to the river trails. It is a natural way to allow many parts of the city to be easily and safely connected to the core of our city.

Hopefully this input is helpful.
Thanks!
Randy Broadbent

RESPONSE TO COMMENT #1:

Randy,

Thank you for your comments. Below are responses to the questions you raise.

1) Railway. ODOT and the cities and counties in Central Oregon partnered to develop a regional rail study about 10 years ago (project report: https://www.bendoregon.gov/Home/ShowDocument?id=31906). That study evaluated the possibility of relocating the rail line east of Bend and Redmond. The cost of doing so was shown to be prohibitively expensive. To help address current railroad/city street congestion issues, the City of Bend is doing a couple of things: a) constructing the Murphy Road extension which will go over the railroad and provide a direct connection from US97 to SE Bend; and b) identifying funding to evaluate options for improving the Reed Market Road/RR crossing. Options to be evaluated include grade separating Reed Mkt Rd over the RR and possibly moving the RR switching yard further south to help reduce delays at that crossing.

2) US97 eastern bypass. ODOT has completed a number of studies over the past 20+ years evaluating traffic patterns in Central Oregon. Their studies have shown that there is not much need for a new corridor east of Bend. The data support this conclusion. Below are average daily traffic volumes at various locations along US97. The volumes do fluctuate significantly across the year (e.g. summer volumes are much higher in some locations), but these averages show that much of the volume on US97 is traffic moving around Central Oregon, with most trips beginning and ending within the area.

2014 Average Annual Daily Traffic on US97:

- Just north of Biggs Junction = 2,181
- Madras = 9,285
- Redmond = 23,345
- Bend = 30,190
- Rural area near Chiloquin = 4,884
- Segment between Klamath and CA border = 3,735

Additionally, volumes on US20 are quite low. Average daily volumes just east of Powell Butte Hwy were 2,961 in 2016.

With this information, ODOT is doing a lot of work to improve US97 in Central Oregon (e.g. improving US97 at the north end of Bend; evaluating options for the southern section of US97 in Redmond; implementing technologies to improve traffic flows between Bend and La Pine and between Bend and Redmond). Additionally, they have identified several locations in the rural parts of the corridor to construct passing lanes. I believe one of those projects is being constructed in Klamath County.
Bend's transportation plan includes a series of projects to help insure a well-connected network of roads, trails, and bicycle facilities will serve new growth areas.

3) Canals. The Bend Park and Recreation District adopted a new long-range plan last year. City of Bend staff worked closely with them on the trails component of that plan. I'm not fully familiar with that plan, but believe it identifies a series of trails throughout the Bend area that follow the canal system. Some of those connections exist today, but I believe the plan calls for a significant expansion of that trail system.

I'm assuming you saw our public notice. In the notice, we mention that we are updating this plan in two phases. We have a federal deadline to complete an update next month. The draft plan (phase 1) includes mostly minor updates to the plan developed in 2014. Phase 2 will begin later this year and will incorporate the findings of the following planning efforts:

1) City of Bend Transportation System Plan update;
2) Deschutes County Intelligent Transportation Systems Plan update;
3) US97 Bend Parkway Study;
4) US97 Bend North Corridor project;
5) Cascades East Transit Master Plan update;
6) Bend area Transportation Safety Action Plan;
7) Deschutes County Transportation Safety Action Plan; and
8) several local transportation project development efforts.

When phase 2 is complete, we will have a robust and well-rounded plan that identifies projects and programs out through 2040. Please let me know if you have any questions or would like additional information.

Tyler

--

Tyler Deke
Bend Metropolitan Planning Organization
709 NW Wall Street, Suite 102
Bend, OR 97703
541-693-2113

COMMENT #2

Thanks Tyler. Do you have a version of that shows what has changed from the current plan?

Moey Newbold *she/her*
Director of Urban Planning
Central Oregon LandWatch

RESPONSE TO COMMENT #2

Hi Moey.

We do not have a red-line version. This current update (phase 1) is fairly minor and is being completed to meet a federal deadline. We will begin a much bigger update of the plan (phase 2) later this year. That update will consider the outcomes of the following efforts:

1) City of Bend Transportation System Plan update
2) Deschutes County Intelligent Transportation Systems Plan update
3) US97 Bend Parkway Study
4) US97 Bend North Corridor project
5) Cascades East Transit Master Plan update
6) Bend area Transportation Safety Action Plan
7) Deschutes County Transportation Safety Action Plan
8) several local transportation project development efforts

Synthesizing the information from those efforts into a single long-range plan will be exciting and challenging. Your engagement in that process would be greatly appreciated. We haven't yet developed our scope of work and schedule for phase 2, but my current thinking is that it will be finished in fall 2020.

Tyler

COMMENT #3

Greetings Tyler Deke,

Word is you are seeking public comment on the plan. Yet the document is a tome.
There is simply no way an average (concerned) citizen is going to read all of that under any circumstance and provide valuable feedback. Developers with high paid attorneys shall (of course).
So my formal comment is as follows:
"The document's level of detail and length (some 300 pages) appears specifically designed to prevent and avoid general public comment, not foster it. It's format is targeted for big business and government elites who have deep financial and/or political concerns in the outcome. BMPO's comment request in this format is simply going through a motion for appearances, not for practical lay-person feedback."

With Best Regards,

Jean
--
Jean George, PhD
President
Open Sky Software, Inc.
https://nam03.safelinks.protection.outlook.com/?url=www.openskysoftware.com&data=02%7C01%7Ctdeke%40bendoregon.gov%7Ceb5d51b5de784075950708d72bdd1969%7C1c15334815ef4708aebf1e25e57dc400%7C0%7C1%7C637026100947666053&sdata=TzTDdYdJrAEL21L4goNPeMckrtYmaErAjwmtfqInvM8%3D&reserved=0
Bend, OR

RESPONSE TO COMMENT #3

Mr. George,

Thank you for your comment. I agree that the current plan is voluminous. We are updating the plan in two phases. This current update (phase 1) is fairly minor and is being completed to meet a federal deadline. We will begin a much bigger update of the plan (phase 2) later this year. That update will incorporate the outcomes of the following studies and projects:

1) City of Bend Transportation System Plan update (completion scheduled late spring 2020)
2) Deschutes County Intelligent Transportation Systems Plan update (completion scheduled early spring 2020)
3) US97 Bend Parkway Study (completion scheduled early spring 2020)
4) US97 Bend North Corridor project (timing TBD)
5) Cascades East Transit Master Plan update (completion scheduled spring 2020)
6) Bend area Transportation Safety Action Plan (completion scheduled late fall 2019)

7) Deschutes County Transportation Safety Action Plan (completion scheduled late fall 2019)
8) several local transportation project development efforts (varying timelines)

Synthesizing the information from those efforts into a single long-range plan will be exciting and challenging. In phase 2, we also plan to completely revise the format of the plan. The revised format will be much shorter and user friendly, with an interactive on-line version. We will also develop an executive summary. We haven't yet developed our scope of work and schedule for phase 2, but we plan to start that work in October or early November.

We would greatly appreciate your engagement in that process.

--

Tyler Deke
Bend Metropolitan Planning Organization
709 NW Wall Street, Suite 102
Bend, OR 97703 541-693-2113

COMMENT #4 (includes responses in italics)

Tyler, thank you for the opportunity to review the draft Bend Metropolitan Transportation Plan. Please accept this as public comment and share with MPO board and technical advisory committee members. Here are some quick comments based on a quick scan and I apologize if I missed details.

I understand the reason for the page numbering but it is a little strange. Should the footnote be Chapter __ Overall page number __?

Response: The plan will be updated two phases. Phase 1 is a minor update to the existing plan. Phase 2 will start in fall 2019, and will include a significant update to the document format. Changes to page numbering will be addressed at that time.

Table 3.3 -- need explanation of Level of Service codes?

Response: Level of service is described in the text on 3-33.

Page 3-36 The street segments listed seem overcapacity at peak travel today. What about 8th & Greenwood, Neff & Purcell (when school and hospital traffic)?

Response: As noted in the first paragraph on page 3-14, the data presented in Chapter 3 are from the 2014 plan. Updated data are included in Appendix B.

Safety -- Table 3-4, I missed mention of Neff and Purcell but saw it in later safety tables.

Response: Not applicable

Page 7-99 -- Are Butler Market and parts of 27th St. not included in the bicycle low stress network? I use them for direct access.
Response: Parts of both corridors are included on the bicycle LSN. Both of those carry significant traffic volumes. Where feasible, alternate routes are identified on the LSN. Both Butler Market Road and 27th Street will continue to have striped bicycle facilities, but the LSN may be located on parallel corridors.

The 1992 passenger rail extension study is old since Bend's population was much smaller then. I think it should be looked into again. Did the 2014 Oregon plan do this? I would like to see future passenger rail line from La Pine to Madras, and eventually connections to Chemult and Portland.

Response: Commuter rail was assessed in the Central Oregon Strategic Transportation Operations Plan (July 2013) and the Report on Central Oregon Rail Planning (November 2009). Both plans concluded that commuter rail services were not warranted within the horizon of either plan.

p. 16-206 the fish barriers map is odd. Are these barriers along canals? The document later states there are fish screens at canal intakes. I would delete this map and reduce it to paragraph with specifics related to transportation.

Response: The data shown on the map were provided by the Oregon Department of Fish and Wildlife (ODFW). As part of Phase 2, we will provide additional updates to the Environmental Considerations chapter, including further discussions with ODFW to clarify the data contained on the map.

Looking at the deer collision map I think we should be doing more to reduce those collisions given their hazard, property damage, and declining local mule deer populations. Maybe that is more a state hwy responsibility, unless the problems also exists on city and county roads but is just not mapped?

Response: The animal-vehicle collision data shown on Figure 16-5 is for the state highway system only. ODOT and ODFW have focused their efforts over the past 10 years to address animal collisions on US97 south of the MPO area. A wildlife specific undercrossing was constructed and a wildlife-human undercrossing constructed. Additionally, four miles of exclusion fencing was installed on both sides of US97 to minimize wildlife entries onto the highway. The fencing includes four jump-out escape ramps to allow animals that entered the Highway corridor to escape without having to cross US97. That project has significantly reduced animal-vehicle collisions along that segment of US97. Planning is currently underway to install an additional five miles of fencing on both sides of US97 south of the currently fenced segment.

The map does show a large number of animal-vehicle collisions within the MPO boundary. Staff is not aware of any identified mitigation efforts to reduce the number of collisions. As part of Phase 2, staff will engage ODOT and ODFW in a discussion about this issue, including identification of possible mitigation strategies.

This Plan should have a more pro-active action plan to reduce greenhouse gas emissions.

Response: While GHG emissions are not explicitly considered in the plan, it includes plans and projects that will reduce GHGs. The plan includes the City of Bend's bicycle low stress network (LSN). The LSN is intended to provide a city-wide network of bicycle corridors that are accessible and usable by all ages and abilities. The first components of that system are currently being constructed (e.g. neighborhood greenways and safe crossing projects). The draft City of Bend Transportation System Plan (TSP) includes a subset of the LSN as priority walking and biking corridors. The Citywide Transportation Advisory Committee (CTAC) is recommending those priority corridors be constructed in the near-term, and that the entire LSN be constructed within the 20-year horizon of the TSP. The travel demand model incorporates all of the land use assumptions contained in the City of Bend Comprehensive Plan. That plan assumes development of multiple mixed use centers throughout the City. Reducing vehicle miles traveled (VMT) is one of the primary goals for implementing those centers. VMT can serve as a proxy for GHG. Reducing VMT should result in lower levels of GHGs. Phase 2 of the plan update will include additional projects, programs and measures to improve public transportation services, improve system management, and manage transportation demand. Modeling completed to date has shown that a combination of those measures and projects can reduce congestion and VMT.

While there are a lot of details, including many tables, addressing funding, I felt there could have more specifics in the conclusion for somebody not reading all the details and understanding each table.

Response: Phase 2 of the plan update will include a concise summary of funding assumptions.

Is ODOT funding adjusted to today's $ projected to go down in the future, even with the dramatic projected population increase in Deschutes County and Bend?

Response: As shown in Table 17-4, ODOT funding is predicted to decline in constant 2018 dollars. This is primarily a result of assumptions about vehicle fuel efficiencies (miles/gallon) and increases in the number of electric or other alternately powered (e.g. hydrogen, CNG) vehicles. The gains in fuel efficiency and greater numbers of electric vehicles are expected to off-set any changes associated with increased population. The state's MPOs work with ODOT every 3-4 years to update the long-range forecasts for federal and state funding. We can provide the results of the most current update.

Is Bend city funding likely to go up in the future with many more taxpayers?

Response: The funding analysis considers funding for: 1) operation and maintenance (O & M) of the existing system, and 2) capital projects (new facilities, expanded facilities). Revenue projections for O & M are shown in Table 17-7 and 17-8. In constant 2018 dollars, funding for O & M are forecast to decline slightly (about 5%) over the planning horizon. This reduction is the result of the following assumptions: 1) a small reduction in state funding (as discussed above), 2) a small reduction in City of Bend general funding, and 3) and reductions in City of Bend

garbage franchise fees. The combination of these reductions leads to the small reduction in O & M funding available over the life of the plan.

I think congestion pricing for roads and parking should be introduced and looked into as a future option. It would be less expensive and could provide needed revenue. People who create congestion should have a greater share of the financial burden to mitigating it.

Response: The City of Bend Funding Work Group (FWG), a subgroup of the CTAC, is considering multiple new funding sources. Their initial assessment included a wide range of revenue sources, including congestion pricing. The FWG opted to not pursue that funding option for several reasons, including regulatory concerns. Future updates of this plan and the City TSP may consider congestion pricing as a funding tool.

Robin Vora
1679 NE Daphne Ct.
Bend, OR 97701

COMMENT #5 (includes responses in the table)

Jovi,

Please find attached FTA's comments on the draft 2040 Bend MPO MTP. Overall, the document is very well organized and comprehensive. Your agency did a thorough job of explaining existing conditions in the UZA for the transportation system, economy, and environment.

One area I would suggest tightening up is the future conditions for the transportation system as a whole, and the aggregate impacts to the communities in the UZA, and the broader built and natural environment. Also, please be sure to provide a summary of the public outreach and engagement process for the document, any comments received, and how the input was incorporated into the plan. Otherwise, great job on the draft document, and keep up the excellent work.

Let me know if you have any questions about my comments. I look forward to seeing the final product.

Best regards,

Jeremy Borrego, AICP
Transportation Program Specialist
Federal Transit Administration
Region 10 - Seattle, WA
Phone: 206.220.7956

Summary of FTA MTP Document Mark-up Comments

Page	Comment
15	A new plan is created every five years, whether it is an update or not. If the planning assumptions for the region have not changed drastically or there haven't been significant changes to the region, then a

	more minor update may be warranted. Response: As discussed in the UPWP and through conversations with FHWA, FTA and ODOT staff, the plan will be updated in two phases. Phase 1 is a minor update to meet the 5-year update requirement. Phase 2 will begin in October 2019 and will incorporate the findings of multiple transportation planning efforts underway within the MPO area (e.g. US97 Parkway Study, Cascades East Transit Master Plan update). Incorporation of the findings from those plans will constitute a major update to the plan.
16	Highlight Response: Not applicable
19	Is there a place in the document where you can read about the BRM assumptions? Response: Addressed through separate correspondence. Additionally, ODOT is completing the report for the Bend Redmond model. That report should be available by September 30, 2019.
23	Where is Appendix H? Response: The draft plan should have reverenced Appendix B, not Appendix H. The plan has been modified to include the correct reference.
61	In 23 CFR § 450.306 Scope of the metropolitan transportation planning process, the following planning factors apply to the metro transportation planning process: (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; (9) Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation; Please ensure your goals and objectives clearly cover all areas of the environmental planning factors, and other planning factors. Response: We believe the goals and objectives as written cover the planning factors. In phase 2, we will review the goals and objectives to insure the federal planning factors are clearly incorporated. The goals and objectives will also be updated to incorporate the relevant outcomes of the CTAC developed goals.
62	Please provide a clearer description of what your current goals and objectives are for this plan. Are the aspirational goals the current ones? If so, put the others in the appendix, or combine with the previous ones to show the current goals and objectives. Response: The language has been clarified to clearly identify the current goals and policies.
70	Does this distinction only apply to regionally significant projects? A federally-funded project on a local, collector, or arterial should be included in this plan. Response: Very few projects on the local system (City or County arterial, collector and local street systems) typically include federal funding, but any project with federal funding will be listed in the MTP.
72	The increase is 45,100, which is approximately a 105% increase. Response: This error has been corrected.
73	Great explanation of travel demand forecasting. Response: Not applicable
78	It appears congestion will be a serious issue on major roadways in 2040. Response: Current forecasts show significant congestion in 2040. The City of Bend Transportation System Plan (TSP) update process is evaluating a range of projects and programs to improve the

	transportation system. When combined, some of those projects and programs and several Parkway Study
79	This is good to know and look for in phase II of the MTP update. Response: Not applicable.
81	I often see MTP projects broken into banded years for the plan (e.g. first ten years and second ten years). Response: As discussed in the UPWP and through conversations with FHWA, FTA and ODOT staff, the plan will be updated in two phases. Phase 1 is a minor update to meet the 5-year update requirement. Phase 2 will begin in October 2019 and will incorporate the findings of multiple transportation planning efforts underway within the MPO area (e.g. US97 Parkway Study, Cascades East Transit Master Plan update). Each of these studies will include detailed summaries of projects by time frame (e.g. 0-5 years, 6-10 years). That information will be considered and incorporated in phase 2 of the MTP update.
102	Does this take into account plans COIC/CET has for STIF-funded projects? Response: The transportation model scenarios for the committed and financially constrained networks do not include the new STIF funded services. Those new services will be added to the transportation model as part of Phase 2. The aspirational scenario does not include the new STIF funded services, but it does include significant improvements to the public transportation system, including reduced headways on major corridors and implementation of mobility hubs at various locations on the public transportation system.
117	There seems to be gaps in the bicycle and pedestrian network for the urbanized area. Do you have a map of existing facilities, and gaps and needs for the UZA networks? Response: Appendix H includes maps showing gaps in the pedestrian and bicycle systems on the arterial and collector networks. The plan includes the City of Bend's bicycle low stress network (LSN). The LSN is intended to provide a city-wide network of bicycle corridors that are accessible and usable by all ages and abilities. The first components of that system are currently being constructed (e.g. neighborhood greenways and safe crossing projects). The draft City of Bend Transportation System Plan (TSP) includes a subset of the LSN as priority walking and biking corridors. The Citywide Transportation Advisory Committee (CTAC) is recommending those priority corridors be constructed in the near-term, and that the entire LSN be constructed within the 20-year horizon of the TSP. Additionally, the TSP will likely include a recommendation to complete a detailed pedestrian system plan. Development of that plan is expected to be a high priority project.
118	Very well documented existing conditions public transportation system section. The reader can see the close coordination between the MPO and the transit agencies. I would suggest a future conditions map to close the loop on the project list. Response: CET is currently developing a new Regional Transit Master Plan (RTMP). That plan is considering is considering a range of new services, including ideas identified through the City Bend TSP update. The RTMP update is expected to be complete in spring 2020. Phase 2 of the MTP update will incorporate the findings of the RTMP, including a future system map(s).
121	Please add a more readable map to the plan. This one is difficult to read. Response: The image was replaced with a slightly higher resolution service map. Staff will work with CET to develop a better map during the phase 2 update process.
124	Text crossed out. I don't see these issue specifically called out in Table 8-7, Prioritized Transit Needs. I would suggest disaggregating expressed major service needs into a bulleted list, if it includes projects like this in the narrative or reference service quality on pg. 8-117. Response: Noted – we will delete this text.

184	I'm curious if CET has any part in these safety planning efforts. Also, transit often has a much lower crash rate than automobiles, which might be interesting to cite. Response: The MPO Technical Advisory Committee (TAC) oversaw development of the TSAP. CET is represented on the TAC and participated in meetings related to development of the TSAP. Additionally, a consultant is currently developing a Safety Plan for CET. That plan will comply with federal requirements, and should be complete in late fall 2019. The relevant findings from that plan will be incorporated in phase 2 of the plan update. A reference to the safety was added to this plan.
195	Transit agency buses can also be used during a disaster or emergency declaration. See the following link for more information: https:// www.transit.dot.gov/funding/grant-programs/emergency-relief-program/fta-hurricane-natural-disaster-response Response: Noted.
210	I would suggest adding an aquifer outline to this map, if the data layer is available, given it's cited in the narrative. Response: An aquifer layer is available and will be added to the map during the phase 2 work.
269	Did this deficit materialize? If so, what is being done to address this deficit? Please update this section with this information to explain how transit service operations will be sustainable and fiscally constrained in the future. Response: The CET financial data included in the plan has not been updated and represents data from the 2014 plan. As noted earlier, CET is developing a new RTMP. That plan will include detailed revenue forecasts, including data for the new Oregon STIF program. The RTMP is scheduled for completion in spring 2020. The updated revenues forecasts will be included in phase 2 of the MTP update.
271	What about maintenance to a state of good repair/transit asset management costs? Response: The sentence referenced is a carry-over from the prior plan. CET is part of the Tier II Transit Asset Management Group Plan prepared by the Oregon Department of Transportation. That plan includes prioritized investments and will help guide future investments by CET. Additionally, CET is developing a new RTMP. That plan will include detailed revenue, operating cost, and capital cost forecasts. The RTMP is scheduled for completion in spring 2020. The updated revenue, operating and capital forecasts will be included in phase 2 of the MTP update.
278	What about transit asset management? Response: As noted above, CET is part of the Tier II Transit Asset Management Group Plan prepared by the Oregon Department of Transportation. That plan will be referenced in Table 18-1.

Additional Response to COMMENT #5

Jeremy (and group),

In a quick review of your comments, I wanted to send you the BRM Assumptions, referenced on Page 19 of the draft MTP and Appendix H, Page 23 (Existing Conditions) as additional reference documents from your comments.

We did not send these in the original request for review.
Link to the Existing Conditions Report from
2018. https://www.bendoregon.gov/Home/ShowDocument?id=37163
Attached is the Appendix C with the land use data for the BRM Assumptions.

Thanks so much for your review and comments.

Best,

Jovi Anderson

Jovi Anderson
Bend Metropolitan Planning Organization
City of Bend - Growth Management Department
www.bendmpo.org
office: (541) 693-2122

COMMENT #6

Cascade Village Shopping Center
63455 North Highway 97
Bend, Oregon 97703

September 13, 2019

Via Email (tdeke@bendoregon.gov) and U.S. Mail

Mr. Tyler Deke
Bend MPO
710 NW Wall Street
Bend, OR 97703

Re: 2040 Bend Metropolitan Transportation Plan (Draft September 11, 2019)

Dear MPO,

On behalf of the ownership of the Cascade Village Shopping Center located at 63455 North Highway 97, Bend, OR 97703, please include our comments on the 2040 Bend Metropolitan Transportation Plan (Draft September 11, 2019) into the record.

Cascade Village previously raised concerns about reduced access to the Bend Parkway. Not only will reduced access negatively impact existing businesses, it will create significant problems for the adjacent City street system. DKS Engineering's analysis of existing conditions reveals that roughly 90% of Parkway trips either originate or terminate within the City of Bend. Any reduction in Parkway access means that these users must navigate the City system to reach an alternative access to the Parkway.[1] The trips do not simply disappear.

This reality is exemplified in the North Corridor, which includes more than 1,000,000 square feet of commercial business, several hundred residences (with more planned in UGB expansion areas), and Juniper Ridge. The FEIS Preferred Alternative will cut off existing direct access at Cooley Road and Robal Road, leaving a significant gap for southbound travels. Without these connections, users must navigate to the Empire Avenue corridor in order to access the Parkway. This problem (and a potential solution) is diagramed in the attached Exhibit A.

The draft MTP shows that the Empire/US 20 intersection is already failing, particularly for southbound left-turns that want to access the parkway. Improvements currently planned to address existing deficiencies assume that the Robal and Cooley connections to US 97 will be retained. Thus, any planned improvements will all be for naught because the loss of these connections will force additional trips into the Empire Corridor and restore the failing conditions. To avoid this problem, while preserving the benefits of the FEIS Preferred Alternative for traffic moving through the North Corridor, it is imperative that Robal Road connect to the FEIS Preferred Alternative alignment and any interim phasing options.

The City of Bend and ODOT recognized the significance of this connection when they adopted Policy #33 to the City's TSP, which provides as follows:

> 33. The City accepts the findings of US 97 Bend North Corridor Project Preferred EIS Alternative. Prior to design and construction, the City and ODOT will coordinate to conduct two independent project development plans/designs within the study area of the preferred alternative to verify the construction meets the then current needs of both the City and ODOT. One plan development and design will be for the study and analysis, including the impact on any business, of a possible Robal Road connection to the ODOT Preferred Alternative to be completed prior to entering into an intergovernmental agreement (IGA) for implementation of the US 97 phase of the Preferred Alternative. The other development and design will be for the Empire interchange area to be completed prior to entering into the intergovernmental agreement (IGA) for implementing the phase of work that would impact any business, public street, or private driveway access onto Empire Avenue. The final redevelopment of the transportation system at Robal and Empire and the ODOT Preferred Alternative may include some or all of the changes determined in the final design to improve the transportation system and meet the City's transportation needs. The IGAs will conform with the studies and analyses.

ODOT and the City will soon initiate the analysis required under TSP Policy #33, which will include identification of a preferred design of a Robal Road connection to the FEIS Preferred Alternative. Given this existing policy, and the effort to be undertaken by the City and ODOT, the updated MTP, City's TSP, and the Parkway Plan should plan and account for a connection to the Parkway at Robal Road. If this connection is omitted, then these planning documents must properly account for the consequences to the City's transportation system of removing the existing direct access to the Parkway at Robal Road and Cooley Road.

Thank you for the opportunity to comment. We hope to see a Robal Road connection added to the "Plans in process" for the second update of the MTP the following studies. Cascade Village remains committed to resolving transportation problems in the North Corridor.

Sincerely,

Kevin J. Burnes

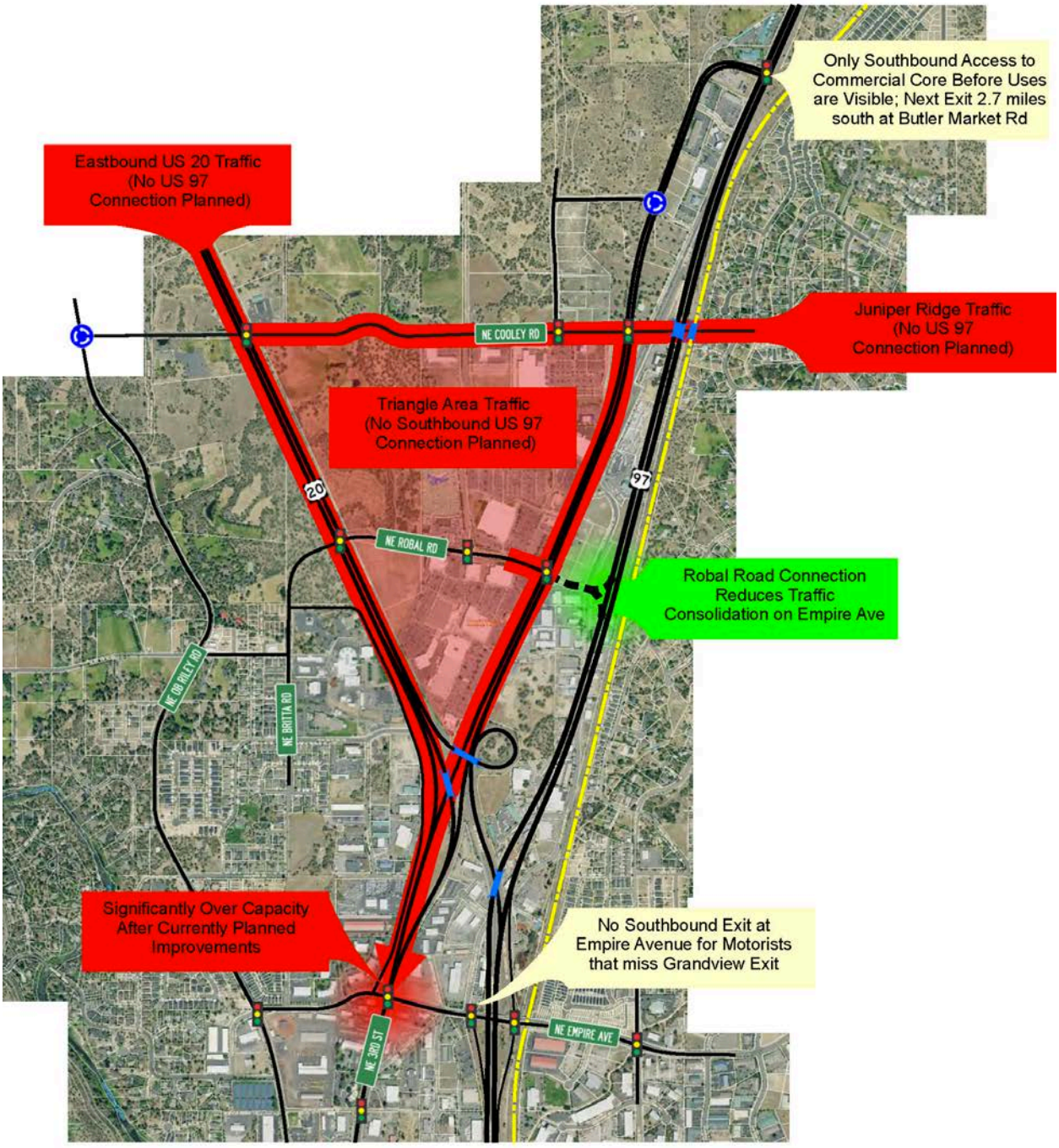
Kevin J. Burnes

President

SIMA Management Corporation

[1] Cascade Village continues to have concerns that analyses conducted as part of the MTP, City TSP, and the Parkway Plan are too narrowly focused on the in-line performance of the Parkway. These analyses need to take a more comprehensive view and examine the impacts to the adjacent City transportation systems when access to the Parkway is altered or reduced in order to improve the in-line performance of the Parkway. As identified above, increased usage of the City's transportation is an inherent consequence of reduced Parkway access.

{10319052-01110235;4}


Only Southbound Access to Commercial Core Before Uses are Visible; Next Exit 2.7 miles south at Butler Market Rd
Eastbound US 20 Traffic (No US 97 Connection Planned)
Juniper Ridge Traffic (No US 97 Connection Planned)
NE COOLEY RD
Triangle Area Traffic (No Southbound US 97 Connection Planned)
20
97
NE ROBAL RD
Robal Road Connection Reduces Traffic Consolidation on Empire Ave
NE OB RILEY RD
NE BRITTA RD
Significantly Over Capacity After Currently Planned Improvements
No Southbound Exit at Empire Avenue for Motorists that miss Grandview Exit
NE EMPIRE AVE
NE 3RD ST

Response: As noted in the MTP (the plan), the plan will be updated in two phases. This current effort (phase 1) includes minor updates to several sections of the plan. As the phase 1 plan was being drafted, the only known funding for improvements on US97 in north Bend was from Oregon HB 2017. That funding total ($50 million) would allow for implementation of a smaller “mid-term” improvement at the US97/Cooley Road intersection. The travel model includes the “mid-term” project as defined in prior planning studies. The project list references the “mid-term” project and an “Undetermined Phase of the FEIS”.

On July 25, 2019, the USDOT announced that the US97 Bend North Corridor Project was selected to receive federal INFRA grant funding of approximately $60 million. The combined HB2017 and INFRA funding ($110 million) represent less than half of the funding needed to fully implement the projects identified in the US97 Bend North Corridor Project FEIS. ODOT has a consultant team evaluating options to best utilize the funds within the context of the FEIS. The process to select a final option will occur in 2020. The travel demand model and the plan (phase 2) will be updated to incorporate the outcomes of that process.

As noted in your letter, ODOT will soon initiate a planning effort to address City of Bend TSP Policy #33. That planning process is expected to begin in late 2019 and conclude in 2020. The travel demand model and the plan (phase 2) will be updated, as necessary, to incorporate the outcomes of that planning effort.