



TECHNICAL MEMORANDUM 1

DATE: May 13, 2021

TO: Don Morehouse | ODOT

FROM: John Bosket | DKS Associates

SUBJECT: US 97 Baker Road IAMP
Project Definition and Background

Project #20020-006

This memorandum introduces the US 97 Baker Road Interchange Area Management Plan (IAMP) project by explaining the problem and purpose, describing the area involved, and outlining the IAMP goals, objectives, and evaluation criteria that will be used to guide project decisions and select a preferred set of improvements and management actions. The appendix of this memorandum also includes a review of relevant policies and planning documents (Appendix A) as well as a memorandum documenting key methods and assumptions to be applied to the analysis of transportation conditions (Appendix B).

PROJECT PROBLEM AND PURPOSE

The Oregon Department of Transportation (ODOT) is preparing an IAMP for the US 97/Baker Road interchange, which is located in Deschutes County and approximately ½-mile south of the southern urban growth boundary (UGB) of Bend, Oregon. The purpose of IAMPs is to establish an agreement with local governments about what transportation solutions or land use/policy actions are needed in an interchange area and how to best implement those in a way that protects the intended function of the interchange and extends the life of significant investments in new transportation infrastructure.

The US 97/Baker Road interchange was constructed in the early 1990's. At that time, its intended function was to serve the sparsely developed rural lands south of Bend and accommodate truck freight traffic passing between US 97 to the south and US 20 to the east via Knott Road and SE 27th Street. The City of Bend's population is now nearly four times greater than it was when this interchange was constructed and the UGB has not only become much closer to the interchange but it anticipated to abut it within the next 20 years.

Over time, this increasing urban growth has resulted in congestion and safety problems in the US 97/Baker Road interchange area. The unsignalized ramp terminals on Baker Road and Knott Road experience excessive delays during peak travel periods. This congestion can get much worse when the nearby railroad crossing is closed for a passing train, with queues of vehicles observed backing

down the ramps and into the highway. The closely spaced intersections of the southbound ramp terminal, Baker Court, and Cinder Butte Road, which surround the railroad crossing, create confusion and conflicts that have contributed to a high number of crashes. Additional safety problems have arisen from high-speed traffic approaching the interchange from Knott Road and there are limited accommodations for people walking or biking through the area. These problems are only anticipated to worsen in the future as housing and employment growth in Bend approaches the interchange over the next 20 years.

In light of these problems, the purposes of the US 97 Baker Road IAMP are to:

- Ensure the safe and efficient operation of the interchange area for all modes of travel through the 20-year planning horizon.
- Identify transportation improvements, management strategies, and land use/policy actions needed to support planned development.

DEFINITION OF PROJECT AREA

There are three different types of “project areas” defined for the US 97 Baker IAMP, each with a different purpose.

The **Study Area** is defined as the area within which changes in land use would have measurable effects on traffic volumes at the US 97/Baker Road interchange. A map of the Study Area is provided in Figure 1. The Study Area is much larger than the other project areas described below, as the boundaries were influenced by the proximity of the interchange to areas where significant future housing and employment growth are expected, the locations of likely origins and destinations for trips associated with those areas, and the street network available to serve them. Future growth immediately to the northeast and further east out to SE 27th Street is expected to have the greatest impact.

The **Area of Potential Impact (API)**, shown in Figure 2, is defined as the area within which transportation improvements proposed through the IAMP are located. This could include a reconfigured interchange or new streets in the surrounding area to improve connectivity such that local east-west trips would not have to drive through the interchange.

The **Area of Social Impact (ASI)**, also shown in Figure 2, is defined as the area within which live the people who will be most affected by transportation improvements and management strategies proposed through the IAMP. Characteristics of the people within this area will be further described in Technical Memorandum #2.

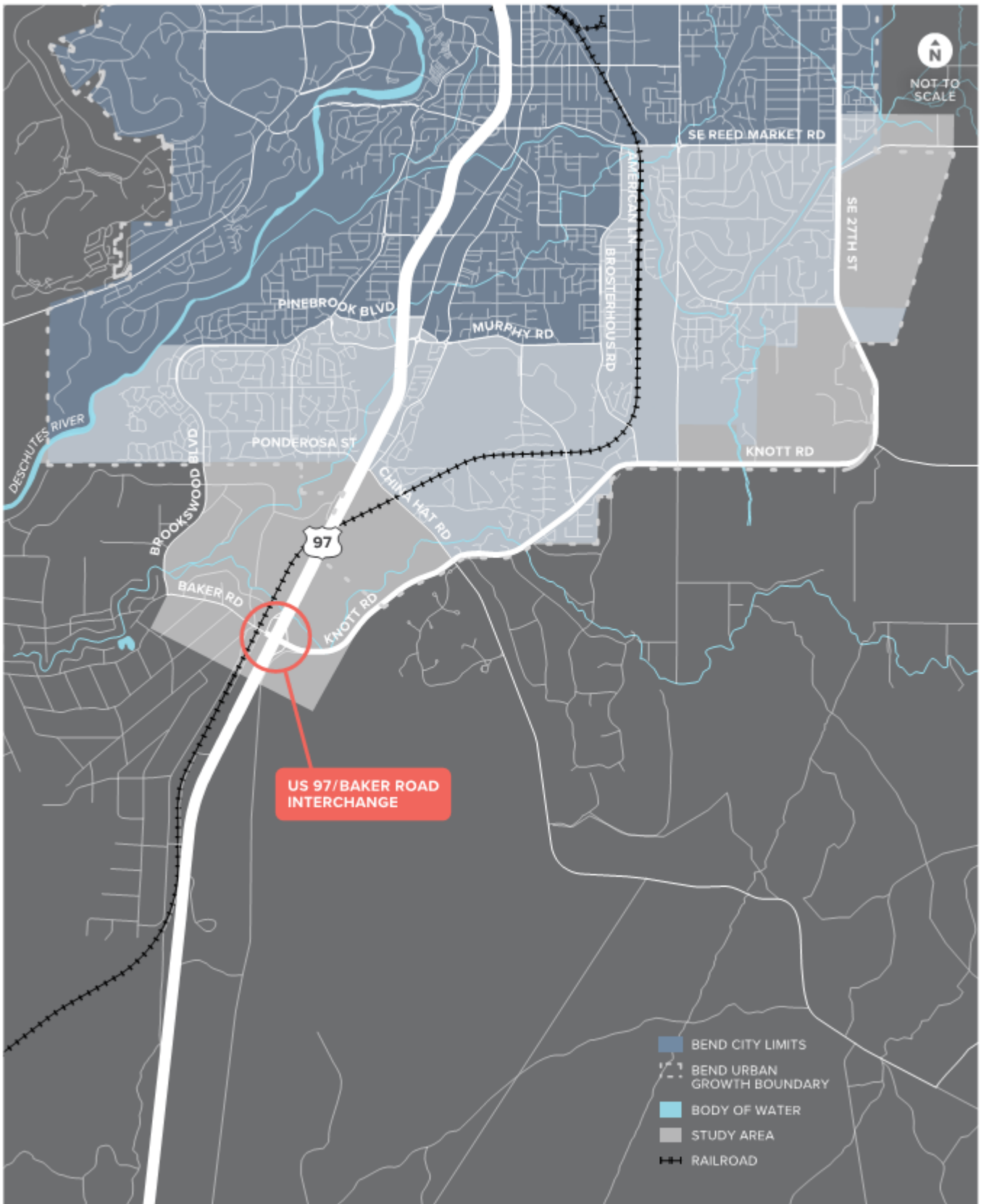


FIGURE 1: STUDY AREA

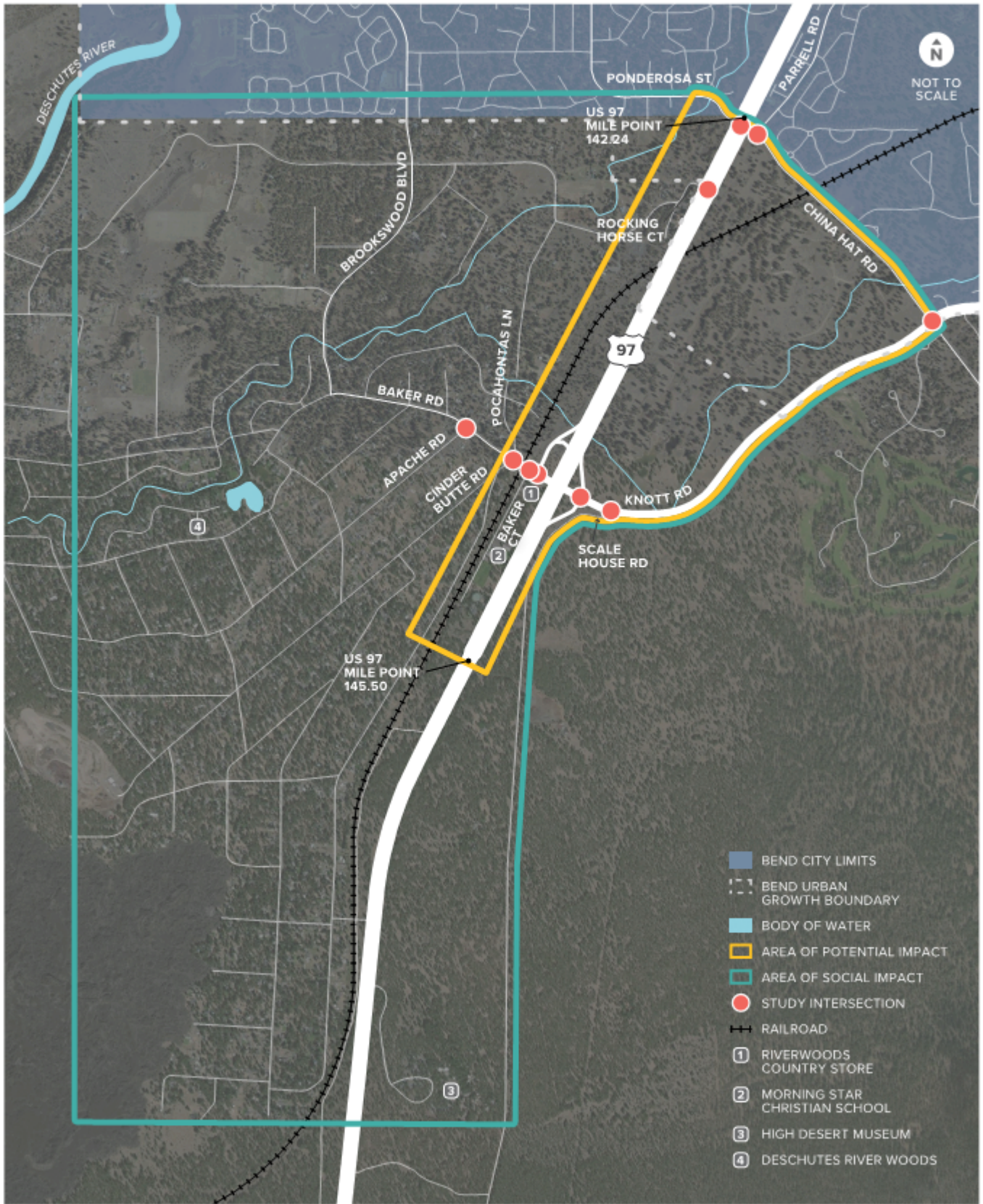


FIGURE 2: AREA OF POTENTIAL IMPACT AND AREA OF SOCIAL IMPACT

INTERCHANGE FUNCTION

Through the interchange area, US 97 is classified by ODOT as a Statewide Highway and is further designated as an expressway, state freight route, reduction review route, and high clearance route. Therefore, the primary functions of US 97 is to provide safe and efficient, high-speed and high-volume traffic movement, inter-urban and inter-regional mobility, connections to larger urban areas and major recreation areas not directly served by an Interstate Highway, facilitate efficient and reliable interstate, intrastate, and regional truck movement, and provide adequate vertical clearance for oversize loads.

Baker Road and Knott Road are classified as Rural Arterials by Deschutes County (Knott Road is also classified as a minor arterial by Bend within the UGB). The intended function of Rural Arterials is to provide links to cities and other major traffic generators, as well as interregional and intercounty service. Rural arterials serve the more important intra-county travel corridors and are secondary routes for the movement of goods and services.

As mentioned previously, the US 97/Baker Road interchange was designed to serve a rural environment, but is increasingly serving urban land uses. Most of the area surrounding the interchange is zoned by Deschutes County as Rural Residential (RR10). There is small area in the southwest quadrant of the interchange zoned Rural Commercial (RC), which is developed with the Riverwoods Country Store and includes a convenience store, gas station, espresso stand, and restaurants. Just south of this commercial development, but also accessed via Baker Court, is Morning Star Christian School. However, the Bend UGB is less than a mile north of the interchange and the City anticipates a significant amount of future residential, industrial, and commercial growth over the next 20 years.

To the west, the US 97/Baker Road interchange primarily serves a significant amount of rural residential development, including the Deschutes River Woods neighborhood. The Deschutes River is about 2 miles to the west and limits regional connectivity, but Baker Road does provide access to the south end of Bend, primarily via Brookwood Boulevard.

Connectivity to the east is far more extensive, with Knott Road providing access to recreational areas via China Hat Road and much of southeast Bend via SE 15th Street and SE 27th Street. Knott Road and SE 27th Street also provide direct access to several areas that have been identified for future incorporation into the city limits, where a substantial amount of urban growth would occur. Furthermore, Knott Road and SE 27th Street are commonly used by truck traffic driving between US 97 to the south and US 20 to the east in an attempt to bypass congestion on US 97 north of the interchange.

Currently, the US 97/Baker Road interchange provides the only crossing of US 97 for about 2 miles (Murphy Road provides the next crossing to the north). Considering the residential development to the west and the mix of existing and future land uses to the east, another important function of this interchange is to provide east-west connectivity for the surrounding area.

GOALS, OBJECTIVES, AND EVALUATION CRITERIA

A draft set of project goals, objectives, and evaluation criteria is provided in Table 1. A goal is an overarching principle or a broad statement of intent that informs the range of possible transportation solutions and guides decision-making. Objectives are more specific and relevant steps that are taken to meet the goal, while the evaluation criteria assess how well those objectives would be met by the alternatives considered.

This initial set of goals, objectives, and evaluation criteria were developed with consideration to the project problem, purpose, and interchange function previously described, as well as the goals, objectives, and evaluation criteria from other similar projects in the area such as the US 97 Parkway Plan and the US 97 Bend North Interchange Study. As a next step, they will be refined through discussions with the Project Advisory Committee and Executive Steering Committee. The resulting goals, objectives, and evaluation criteria for the US 97 Baker Road IAMP will guide the development of solutions for the interchange area and will be used to demonstrate how well improvement alternatives considered meet the purpose of the project and stakeholder values.

The goals and objectives have been numbered to facilitate referencing, but no weighting has been applied and the order is not an indication of relative importance.

TABLE 1: US 97 BAKER ROAD IAMP GOALS, OBJECTIVES, AND EVALUATION CRITERIA

GOALS	OBJECTIVES	EVALUATION CRITERIA
<p>1. Provide for efficient travel through the interchange area based on existing and planned land uses in the area.</p>	<p>a. Provide for efficient travel for regional through traffic along US 97.</p>	<p>Meets ODOT’s adopted mobility standards for US 97 through the planning horizon.</p>
	<p>b. Provide for efficient travel on the local roadway system in the interchange area.</p>	<p>Meets ODOT’s adopted mobility standards at the US 97 ramp terminals with Baker Road and Knott Road through the planning horizon.</p>
	<p>b. Provide for efficient travel on the local roadway system in the interchange area.</p>	<p>Meets Deschutes County and City of Bend mobility standards for local system study intersections through the planning horizon.</p>
<p>2. Improve safety for all modes of travel.</p>	<p>a. Reduce the frequency and severity of crashes for all modes with an emphasis on severe and fatal injuries.</p>	<p>Reduces the frequency and severity of crashes, as assessed through analysis of crash data and use of Crash Modification Factors.</p>
		<p>Minimizes conflicts and risk factors that could lead to crashes.</p>
		<p>Enhances safety for vehicular and non-motorized modes of transportation at rail crossings.</p>
<p>b. Move in the direction of meeting ODOT’s adopted access spacing standards along US 97, Baker Road, and Knott Road, or meet the standards where feasible.</p>	<p>Meets or improves access spacing pursuant to ODOT’s adopted access spacing standards.</p>	

GOALS	OBJECTIVES	EVALUATION CRITERIA
3. Support regional and local economic development.	a. Maintain access to properties along Baker Road and Knott Road in a manner that supports the economic development objectives of existing and future businesses consistent with the Deschutes County and Bend Comprehensive Plans.	Maintains accessibility to properties consistent with the documented needs of existing land uses and anticipated potential needs of future uses based on Comprehensive Plan designations.
	b. Develop an interchange design that facilitates truck freight movement along US 97 and to and from destinations to the east.	Proposed interchange geometry, such as curves, clearances, and grades, accommodates trucks and oversize vehicles.
	c. Allow for safe and uninterrupted service on the Burlington Northern Santa Fe railroad.	Based on qualitative criteria, reduces potential conflicts with the rail crossing on Baker Road.
4. Facilitate the use of multimodal travel options.	a. Provide low-stress walking and biking facilities that create east-west connectivity through the interchange area.	Based on qualitative criteria, enhances the quality of walking and biking facilities.
		Reduces the level of traffic stress for people walking and biking.
		Increases the number of grade-separated US 97 crossings provided in the Area of Potential Impact for people walking and biking.
	b. Identify where planned trails in the interchange area can be safely connected and accessed.	Based on qualitative criteria, enhances trail system completeness and quality of connections.

GOALS	OBJECTIVES	EVALUATION CRITERIA
	c. Accommodate long-term connectivity to the south.	Incorporates the alignment of the proposed US 97: Baker/Knott Road to Lava Butte Multi-Use Path and connects it to the walking and biking network in the interchange area.
	d. Support future enhancements to Cascades East Transit service.	Can accommodate planned transit service improvements and expansions. Provides safe walking and biking access to transit.
5. Develop the project to support the community's value of equity.	a. Provide an equitable decision-making process that encourages participation by all.	Historically underrepresented community members within the Area of Social Impact were invited to participate in the project. (This will be used to evaluate the project process, but not individual alternatives.) Feedback from historically underrepresented community members indicates they were able to participate in the process. (This will be used to evaluate the project process, but not individual alternatives.)
	b. Achieve a just allocation of burdens and benefits among community members.	Impacts to properties owned, used by, or accessed by historically underrepresented community members are proportionate to those of other populations.
6. Practice good stewardship of the environment.	a. Reduce vehicle emissions through reduction of vehicular delay, improved connections in the local system, and the use of alternative travel modes.	Assessment of reductions in vehicular delay and vehicle-miles traveled, as well as improvements supporting walking, biking, and use of transit.
	b. Minimize impacts on resource lands.	Minimizes impacts on land designated for natural resources, scenic and historic areas, and open spaces.

GOALS	OBJECTIVES	EVALUATION CRITERIA
	c. Minimize adverse impacts on wildlife.	Recommendations minimize or avoid impacts to wildlife habitat and safety.
7. Develop solutions that are consistent with the established shared corridor vision and adopted state and local plans.	a. Create a US 97 corridor that is compatible with the recommendations from the US 97 Parkway Plan and Bend to Lava Butte Refinement Plan.	Recommendations are compatible with those from the US 97 Parkway Plan and Bend to Lava Butte Refinement Plan.
	b. Ensure compatibility with future planned growth in Bend’s opportunity areas and expansion areas.	Traffic forecasts and connectivity improvements in the Area of Potential Impact account for the impact of housing and employment growth in Bend’s opportunity areas and expansion areas.
	c. Consider the visual sequence of project elements as an entry/exit node to the City of Bend.	Can accommodate or does not compete with visual and physical gateway elements to south Bend.
	d. Support the action plan in the Greater Bend Community Wildfire Protection Plan to enhance community safety.	Recommendations maintain or enhance access and evacuation routes for the Southwest and Southeast Communities.
8. Develop implementable solutions for the interchange area.	a. Minimize impacts on resource lands.	Minimizes impacts on land designated for natural resources, scenic and historic areas, and open spaces.
	b. Ensure public funds are invested efficiently and effectively, and solutions are fiscally responsible.	Based on qualitative criteria, solutions are effective at addressing goals and objectives compared to costs and would reasonably fit within funding expectations for project partners.
	c. Develop solutions that can be implemented in phases.	Solutions can be implemented incrementally in functional phases.

GOALS	OBJECTIVES	EVALUATION CRITERIA
	d. Develop a design that is constructable and could be reasonably maintained.	<p>Minimizes the number of potential design exceptions.</p> <hr/> <p>Is easily constructable with regard to rail impacts and ability to maintain traffic.</p> <hr/> <p>Does not create maintenance challenges.</p>



APPENDIX A

DATE: February 2, 2021

TO: Don Morehouse | ODOT

FROM: John Bosket, PE and Kamilah Buker, EI | DKS Associates
Darci Rudzinski, AICP and Emma Porricolo | Angelo Planning Group

SUBJECT: US 97 Baker Road IAMP Project #20020-006
Appendix A - Plans and Policy Review

This memorandum summarizes plans, policies, targets, and standards applicable to the US 97 Baker Road Interchange Area Management Plan (IAMP). There are a number of state, regional, and local documents containing policies and regulations relevant to developing a plan for transportation improvements in the vicinity of Baker Road/Knott Road and US 97, specifically when exploring improvements to a grade-separated interchange at this location. Relevant policies, projects, and design elements will need to be considered in the development of the US 97 Baker Road IAMP and, where appropriate, the Plan will identify where adopted plans should be amended to reflect new recommendations to ensure consistency.

Table 1 provides a list of the planning documents and policies that were reviewed and indicates how each is relevant to planning for transportation improvements and the US 97 Baker Road IAMP, using three general categories:

- *Policies*: Indicates that the document contains policies which will need to be reflected and inform the Plan.
- *Design standards*: Indicates that the document includes design standards for transportation facilities (e.g., street cross sections).
- *Project list*: Indicates that the document includes a list of specific planned projects which may be located in the Area of Potential Impact, Area of Social Impact or Study Area (defined in Technical Memorandum #1 Project Definition and Background) and should be incorporated or considered in the development of the Plan.

TABLE 1: PLANS AND POLICY REVIEW

DOCUMENT	PURPOSE AND SUMMARY	POLICIES	DESIGN STANDARDS	PROJECT LIST	RELEVANCE/ACTION ITEMS
<p>OREGON STATEWIDE PLANNING GOALS</p>	<p>The Statewide Planning Goals set a framework for planning in Oregon. Each goal has policies and guidelines related to their objective. The goals most relevant to the IAMP are:</p> <ul style="list-style-type: none"> • Goal 1, Citizen Involvement • Goal 2, Land Use Planning • Goal 6, Air, Water and Land Resources Quality • Goal 9, Economic Development • Goal 11, Public Facilities Planning • Goal 12, Transportation • Goal 14, Urbanization 	<p>X</p>			<ul style="list-style-type: none"> • Goal 1. Public involvement activities for the IAMP will be guided by and assessed according to Goal 1. • Goal 2. Existing and future land use needs will influence recommended transportation improvements; plan recommendations will be coordinated and considered for their effect on future use and operations in the Study Area according to Goal 2. • Goal 6. The IAMP will consider the protection of air, water, and land resources in the vicinity of the interchange. • Goal 9. The IAMP will demonstrate the ways in which the preferred alternative selected for future improvements to the interchange supports this goal and the economic development policies adopted in the Deschutes County Comprehensive Plan. • Goal 11. Consideration of standards for existing and future public facilities will be included in the development of the IAMP. • Goal 12. State transportation policy will guide the IAMP objectives, design, and development. Goal 12 policies are implemented by the Transportation Planning Rule (OAR 660-012). • Goal 14. The interchange is located in Deschutes County near the City of Bend’s south urban growth boundary (UGB). The project will consider growth expectations, including growth in City expansion areas, and related agreements between the two jurisdictions.
<p>TRANSPORTATION PLANNING RULE (OAR 660-012)</p>	<p>The Transportation Planning Rule (TPR) implements Statewide Planning Goal 12. The TPR provides the connection between local development codes and access management, coordinated land use review procedures, and other standards, allowances, and requirements to protect road operations and safety. Key sections are:</p> <ul style="list-style-type: none"> • Section -0045 – Describes the requirements for local governments to amend land use regulations to implement their Transportation System Plans (TSP) to ensure consistency with applicable federal and state requirements. • Section -0060 – Describes what may be relied upon as a planned improvement, for purposes of determining whether an amendment to a functional plan, an acknowledged comprehensive plan, or a land use regulation significantly effects an existing or planned transportation facility. • Section -0065 – Describes transportation improvements, facilities, and services permitted on rural lands. Replacement of an intersection with an interchange is permitted, as is realignment of existing roads and new access roads and collectors within a built or committed exception area, or in other areas where the function of the road is to reduce local access to, or local traffic on, a state highway. • Section -0070 – Describes the process and requirements for transportation facilities and improvements on rural lands that do not meet -0065 requirements, therefore requiring a goal exception. 	<p>X</p>			<p>Preferred IAMP improvements may entail local policy and code amendments to ensure consistency with IAMP recommendations; code amendments must comply with TPR Section -0045. Improvements included in an adopted IAMP are considered planned improvements for purposes of complying with Section -0060.</p> <p>A new interchange that replaces an existing intersection (or in this case the modification of an existing interchange) is permitted within the Study Area, including related improvements on rural lands. Any new access roads or collectors that are proposed outside of the UGB must be limited to two travel lanes to be consistent with the TPR. A Goal 12 Goal Exception is not expected to be necessary for improvements within the Study Area.</p>

DOCUMENT	PURPOSE AND SUMMARY	POLICIES	DESIGN STANDARDS	PROJECT LIST	RELEVANCE/ACTION ITEMS
<p>STATE COORDINATION RULES (OAR 731-15)</p>	<p>The provisions of OAR 731-015 establish the procedures for Oregon Department of Transportation (ODOT) to implement the requirements of the State Agency Coordination Program when undertaking activities which significantly impact land use. The program assures that ODOT land use programs are in compliance with the statewide planning goals and are consistent with applicable comprehensive plans.</p> <p>Interchange area management plans qualify as a transportation facility plan, which is subject to State Coordination rules per OAR 731-015-0025(3).</p> <p>Section -0065 describes required coordination for adopting final facility plans, such as IAMPs. Procedural requirements for ODOT include, but are not limited to:</p> <ul style="list-style-type: none"> • Notify all affected cities, counties, and metropolitan planning associations (MPO); • Provide findings for the adopted final facility plans; • Provide adopted plan and findings to DLCD, to affected MPOs, cities, counties, state and federal agencies, special districts and to others who request to receive a copy. <p>The section also described the process to resolve conflicts with statewide planning goals.</p>	X			<p>Developing the IAMP will require coordination with affected cities, counties, and MPOs. For the US 97 Baker Road IAMP this includes involvement by the City of Bend, Deschutes County, and the Bend MPO. The project includes tasks and strategies addressing communication with the affected jurisdictions during plan development.</p>
<p>OREGON TRANSPORTATION PLAN (2006)</p>	<p>The Oregon Transportation Plan (OTP) is a comprehensive plan that addresses the future transportation needs of the State of Oregon through the year 2030. The primary function of the OTP is to establish goals, policies, strategies, and initiatives that guide the development of the State's transportation modal plans, such as the Oregon Highway Plan and Oregon Bike and Pedestrian Plan. The OTP emphasizes several key initiatives for implementation, which are:</p> <ul style="list-style-type: none"> • Maintaining and maximizing the assets in place; • Optimizing the performance of the existing system through technology; • Integrating transportation, land use, economic development and the environment; • Integrating the transportation system across jurisdictions, ownerships and modes; • Creating sustainable funding; and • Investing in strategic capacity enhancements. 	X			<p>The OTP sets policy that directs the State to maximize performance of the existing transportation system-- for example, through the use of technology and system management--before considering larger and costlier additions to the system. Pursuant to the OTP, this Plan will need to implement the OTP and the applicable modal/topic plan goals, policies, implementation and broad investment scenarios. Its development must provide opportunities for public review in accordance with the State Agency Coordination Program and federal requirements.</p>
<p>STATE MODAL PLANS (BICYCLE AND PEDESTRIAN, RAIL, FREIGHT, PUBLIC TRANSPORTATION)</p>	<p>Mode and topic plans are statewide plans that are part of the Oregon Transportation Plan. These plans refine and apply OTP policy to specific modes and guide state, regional, and local investment decisions for the parts of the transportation system that they address.</p>	X			<p>The policies, in each modal plan must be implemented into the IAMP taking into consideration the appropriateness of context in which they may apply.</p>

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<p>1999 OREGON HIGHWAY PLAN (AS AMENDED MAY 2015)</p>	<p>The Oregon Highway Plan (OHP) is a modal plan of the OTP that guides ODOT’s Highway Division in planning, operations, and financing. Several key policies which will inform the IAMP are:</p> <ul style="list-style-type: none"> • Policy 1A: State Highway Classification System. Classifies state highways into four levels of importance. • Policy 1B: Land Use and Transportation. Describes how ODOT will work with local governments and others to link land use and transportation in transportation plans. • Policy 1C: State Highway Freight System. Describes the State Highway Freight System to design an efficient and reliable system for freight. It also designates “Reduction Review Routes.” • Policy 1F: Highway Mobility Policy. Sets mobility targets for the state highway system. • Policy 1G: Major Improvements. Establishes policies for maintaining performance and improving safety on the highway system. • Policy 2B: Off-System Improvements. The policy recognizes that the state may provide financial assistance to local jurisdictions if the improvements provide a cost-effective means of improving operations of the state highway system. • Policy 3A: Classification and Spacing Standards. Designates access spacing standards for state highways, found in Appendix C of the OHP. • Policy 3C: Interchange Access Management Areas. Addresses management of grade-separated interchange areas to ensure safe and efficient operation between connecting roadways. 	X	X		<p>US 97 is currently classified as a highway of statewide significance; it is designated as an expressway and as a freight route on the National Highway System.</p> <p>Appendix C of the OHP lists spacing standards for freeways, state highways, and interchanges, which regulates US 97.</p> <p>It is expected that the Plan will comply with safety, access, and mobility targets found in the OHP; findings of compliance will support Oregon Transportation Commission adoption of the Plan as an amendment to the OHP. If adopted, it will be one of the many special facility plans that have amended the OHP over the years.</p>
<p>ODOT BLUEPRINT FOR URBAN DESIGN</p>	<p>The Blueprint for Urban Design (BUD) encompasses the revised ODOT urban design criteria. It follows federal guidelines and principles utilizing a performance based, context sensitive, practical design approach to provide flexibility where warranted to produce appropriate designs to accommodate all modes of transportation affecting all urban roadway users. The Blueprint for Urban Design provides information and criteria to aid project teams to make appropriate choices when developing final project designs to meet established project goals and create the expected outcomes. Every urban project has unique opportunities and the six urban contexts portrayed in the Blueprint for Urban Design, along with their respective design criteria, will allow project teams to better align ODOTs transportation needs with local community aspirations.</p>		X		<p>The policies and standards in the BUD will be considered in the development of the Plan.</p>
<p>OREGON HIGHWAY DESIGN MANUAL</p>	<p>The Highway Design Manual (HDM) includes ODOT standards and procedures for the location and design of new construction, major reconstruction, and resurfacing, restoration or rehabilitation (3R) projects. The manual is used for all projects that are located on state highways. Design standards for state highways are dependent on the highway’s functional classification and the project type.</p> <p>Chapter 9 of the HDM addresses interchange design, including design standards, guidelines, and processes for designing interchanges for State Highways. ODOT, through the Engineering Services Unit, and FHWA must approve the reconstruction of an interchange on the Interstate system.</p>	X	X		<p>The Plan alternatives will be developed to be consistent with the applicable HDM Standards for interchanges. Any proposed bicycle or pedestrian improvements associated with the preferred alternatives will also need to be consistent with the HDM (and associated Blueprint for Urban Design).</p> <p>Note that HDM mobility thresholds are generally more restrictive than the OHP mobility targets to ensure a useful design life for the improvement being made; however, there is a design exception process that allows variation from the HDM when appropriate.</p> <p>In addition to the standards listed in the HDM, there are many other ODOT design guides and policies that may be applicable to the project, such as the ODOT Traffic Manual, Traffic Signal Policy and Guidelines, Traffic Line Manual, and ODOT Statewide Operations and TSMO Plans. Such documents will also considered where appropriate.</p>

DOCUMENT	PURPOSE AND SUMMARY	POLICIES	DESIGN STANDARDS	PROJECT LIST	RELEVANCE/ACTION ITEMS
ACCESS MANAGEMENT RULE (OAR 734-051)	<p>Oregon Administrative Rule (OAR) 734-051 defines the State’s role in managing access to highway facilities in order to maintain functional use and safety and to preserve public investment. The rule includes spacing standards for varying types of state roadways and criteria for granting right of access and approach locations onto state highway facilities. The Rule attempts to balance the safety and mobility needs of travelers along state highways with the access needs of property and business owners. Key sections of the Access Management Rule for the US 97 Baker Road IAMP are:</p> <ul style="list-style-type: none"> • OAR 734-051-4020 (Standards and Criteria for Approval of Private Approaches) • OAR 734-051-7010 (Access Management in Highway Facility Plans) • OAR 734-051-5120 (Access Management in Project Delivery) 	X	X		<p>The Plan must comply with Division 51 spacing standards (see OHP Appendix C, Table 12 Interchange Spacing; Table 14 Access Management Spacing Standards for Statewide Highways with Annual Average Daily Traffic (AADT) of More Than 5,000 Vehicles). It must also comply with the applicable criteria for facility plans and the project delivery rule, which includes the acknowledgement of property impacts in the evaluation of preferred alternatives.</p> <p>Specifically, the Plan must comply with OAR 734-051-7010, which describes considerations that must be given to property impacts associated with changes in access when developing a Facility Plan, requirements for developing the key principles and methodology that describe how decisions related to access will be made, and requirements for involving property owners in the process.</p>
SENATE BILL 408	<p>Senate Bill 408 relates to highway access management and establishes presumption that certain existing unpermitted approach roads have ODOT’s written permission. It changes Oregon law concerning management of access (private driveways) onto state highways, which are captured in OAR 734-051-0710 and OAR 734-051-5120 described above.</p>	X			<p>See relevance/action items described above for OAR 734-051-7010.</p>
REDUCTION IN CAPACITY (ORS 366.215)	<p>ORS 366.215 states the Oregon Transportation Commission may not permanently reduce the vehicle-carrying capacity of an identified freight route. Specific exceptions to this prohibition are allowed by statute.</p>	X			<p>Because US 97 is designated as a Reduction Review Route, the Plan must demonstrate that the vehicle-carrying capacity (e.g., ability to accommodate over-dimension freight) of US 97 would not be reduced with the proposed improvements in place.</p>
ORS 366.514 (BIKE BILL)	<p>The law requires that reasonable amounts of State Highway Funds be expended by the Department of Transportation, counties, and cities to provide walkways and bikeways. Reasonable amounts are related to the need for bikeways and walkways; if there is a need, the governing jurisdiction shall expend a reasonable amount to construct the needed facilities.</p> <p>The law requires the Department of Transportation, counties, and cities to provide walkways and bikeways on all roadway construction, reconstruction, or relocation projects. The funding source or amount are not the determining factors; what is important is that pedestrian and bicycle facilities be provided as part of road improvements.</p>	X			<p>Improvements recommended in the Plan must include walkways and bikeways in all transportation corridors.</p>
DESCHUTES COUNTY COMPREHENSIVE PLAN AND TRANSPORTATION SYSTEM PLAN	<p>The purpose of the Deschutes County Comprehensive Plan is to provide a blueprint for land use conservation and development. This is accomplished through goals and policies that tell a cohesive story of where and how development should occur and what places should remain undeveloped. The Plan provides a legal framework for establishing more specific land use actions and regulations such as zoning. The goals and policies are based on existing conditions and trends, community values and the statewide planning system. It should be noted that Deschutes County anticipates updating the Comprehensive Plan in Fall 2021.</p> <p>The Transportation System Plan (TSP) provides a roadmap to meet the needs of air, automobile, bicycle, freight, pedestrian, rail, transit, and other modes of transportation in the County. The TSP includes policies, standards, and projects for the County transportation system. Chapter 5.3 discusses planned improvements and policies related to functional classifications, proposed road network, performance standards, and more. Chapter 5.5 has bike and pedestrian requirements and route selections. Chapter 6 discusses the transportation finance plan.</p>	X	X	X	<p>The policies, standards, and projects in the TSP will be considered in the development of the Plan. Before OTC adoption as an amendment to the OHP, the IAMP will need to be adopted as an amendment to the Deschutes County TSP; therefore, it will need to be found consistent with or modify the standards and policies in the TSP.</p> <p>The needs analysis in Chapter 4 discusses need for the replacement of the at-grade crossing of the Burlington Northern Santa Fe railroad at Baker Road and the complications that will need to be addressed at the Baker Road interchange.</p> <p>Proposed projects listed in the County TSP, Chapter 5, in the vicinity of the interchange include:</p> <ul style="list-style-type: none"> • A roundabout at the intersection of Baker Road and Cinder Butte Road • Widening/overlay of China Hat Road • Widening/overlay of Cinder Butte Road

DOCUMENT	PURPOSE AND SUMMARY	POLICIES	DESIGN STANDARDS	PROJECT LIST	RELEVANCE/ACTION ITEMS
<p>CITY OF BEND COMPREHENSIVE PLAN (UPDATED 2016)</p> <p>Bend’s Transportation System Plan (TSP) describes the City’s transportation policies and investment priorities to address its needs and fulfill its visions for an economically vital, healthy, and equitable community. To support how people and goods move within and through the city and complement Bend’s land use and growth management strategies, the TSP establishes a system of transportation facilities, programs, and policies that will guide transportation infrastructure development over the next 20 years. The TSP is the transportation element of Bend’s Comprehensive Plan. Key chapters of the TSP regarding IAMP decisions are:</p> <ul style="list-style-type: none"> • <i>Chapter 2: Goals, Policies & Actions:</i> This chapter of the TSP defines the desired outcomes from the TSP. The Goals shaped and guided development of the policies, actions, projects, and programs in the TSP and guide its projects and programs. The public policies in the TSP form the long-term foundation for the City of Bend’s transportation system. They provide a consistent course of action to move the community toward the goals of the TSP. These policies are used to evaluate any proposed changes to the Bend Development Code and Bend Comprehensive Plan, of which the TSP is an element, and other regulatory documents. • <i>Chapter 5: Transportation Projects & Programs.</i> This chapter of the TSP provides an overview of a set of coordinated transportation investments that address transportation needs within the City of Bend over the next 20 years, including planning level cost estimates. Projects within the study area include: <ul style="list-style-type: none"> ◦ Widening of the Knott Road Canal to accommodate multimodal facilities ◦ Knott Road rural road upgrade south of China Hat Road ◦ Two new Roads in the Thumb Urban Growth Boundary (UGB) expansion area ◦ China Hat Road rural road upgrade north of Knott Road ◦ China Hat Road canal bridge widening <p>The Bend Comprehensive Plan includes goals and policies that provide a framework for decisions to ensure they are consistent with the physical characteristics, goals, and resources of the community. The extensive document provides adopted goals and policies regarding land use and transportation, which establish a framework upon which the City bases its decisions and actions. Key chapters of the Comprehensive Plan regarding IAMP decisions are:</p> <ul style="list-style-type: none"> • <i>Chapter 7: Transportation Systems.</i> This chapter provides objectives and policies for transportation in the community. Policy 7-11 requires the City and County to coordinate their TSPs to encourage continuity in roadway classification design standards outside the UGB and in the urban reserve. For roadways located in the urban reserve areas, Bend must seek approval from the County for the improvement of facilities to meet urban standards (Policy 7-15). Further, transportation facilities currently located on rural lands (outside UGBs) may not be constructed to an urban standard until the area is brought into the UGB (Policy 7-16). • <i>Chapter 11: Growth Management.</i> This chapter addresses urban development within the Urban Growth Boundary and includes opportunity areas to promote efficient use of existing land. <p>The Thumb is an expansion area that is in the UGB but has not been annexed into the City. Urbanization of the Thumb requires master planning and must be consistent with both the master plan standards in the development code and policies 11-86 through 11-91 (11-85).</p>	<p>X</p>	<p></p>	<p>X</p>	<p>The Plan should be consistent with goals and polices of the Comprehensive Plan, especially those related to transportation and urbanization objectives for the Study Area.</p> <p>The transportation policies stress the importance of bicycle and pedestrian infrastructure, including construction of bike lanes and sidewalks on arterials and major collectors. They also establish the Bend trail system locations, which are governed by the Bend Urban Area Bicycle and Pedestrian System Plan. The importance of and approach to access control is also found in Comprehensive Plan policies. In accordance with Comprehensive Plan policies road, bicycle, and pedestrian projects in urban reserve areas are governed by the County’s road and street standards, and the standards are coordinated between the two jurisdictions.</p> <p>Plan area recommendations may ultimately need to be considered and reflected in concept planning for the Thumb as part of a future Master Plan.</p> <p>Ultimately, the Plan would be adopted as a TSP amendment; the TSP is the transportation element of the Comprehensive Plan. If City goals and policies are not consistent with recommended Plan implementation measures, additions or amendments to the Comprehensive Plan may be prepared and proposed as a part of the Plan adoption.</p>	

DOCUMENT	PURPOSE AND SUMMARY	POLICIES	DESIGN STANDARDS	PROJECT LIST	RELEVANCE/ACTION ITEMS
<p>2040 METROPOLITAN TRANSPORTATION PLAN (MTP)</p>	<p>The MTP includes provisions for meeting the transportation needs of residents over a 20-year planning horizon while addressing transportation issues and making changes that can contribute to improvements in the region's quality of life and economic vitality.</p> <p>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.</p>	X		X	<p>The policies and projects in the MTP will be considered in the development of the Plan. The Plan will incorporate local needs with the pending regional strategies, and coordinate project completion with other affected agencies.</p>
<p>DESCHUTES COUNTY LAND DEVELOPMENT CODE</p>	<p>The Deschutes County Code (DCC) regulates development within unincorporated Deschutes County and implements the long-range land use vision embodied in the Comprehensive Plan and TSP. The code contains requirements that address the relationship between land use development and transportation system development.</p> <p>Requirements in Title 22 Procedures Ordinance, Title 18 County Zoning, and Title 17 Subdivisions all have a bearing on how the transportation system is implemented through future development approval.</p> <p>The Subdivision ordinance includes design standards for transportation facilities. They include:</p> <ul style="list-style-type: none"> • Minimum right-of-way and road widths are provided in DCC 17.36.060. • Road development standards are in DCC 17.48.160, and requirements for partitions are in DCC 17.48.170. • Requirements for frontage roads are in DCC 17.36.100. • Sidewalk requirements for areas outside of urban areas are found in DCC 17.48.175. • DCC 17.36.150. defines block lengths, requiring block are no longer than 1,200 ft. Special provisions for blocks over 800 feet are provided in DCC 17.36.140. • Minimum design standards for bikeways, roads, and structures are found in DCC 17.48. • Road dedication procedures and approval criteria are described in DCC 17.52. • Design standards for bicycle, pedestrian, and transit requirements are found in DCC 17.36.140. • Access requirements are found in DCC 17.48.210. The provisions restrict creation of access onto arterials and collectors unless there are no other possible means of accessing a parcel. <p>Title 18, County Zoning, includes specific provisions for certain zones as well as supplementary provisions for development in unincorporated areas outside of UGBs. The study area zoning includes Rural Residential 10 acre Minimum (RR-10), DCC 18.60, and Rural Commercial (RC), DCC 18.74.</p> <p>Title 19A contains the provisions for the Bend Urbanizable District (UA) District, land within the City's UGB but not yet annexed, and recognizes the City's area and master plan authority in this area. Allowed and conditional uses (Table 19A 01.020) are largely limited to single-family residential and farm-related uses.</p>	X	X		<p>The DCC contains land-use approval processes, requirements and local roadway standards that apply to the US 97 Baker Road interchange and the development of transportation improvements in the area.</p> <p>A possible outcome of the US 97 Baker Road IAMP planning process is the need to update local development requirements to preserve the function and capacity of the interchange and ensure the safety of those who use the facility. This could include modifications to roadway standards within the study area and access management requirements or strategies.</p>

DOCUMENT	PURPOSE AND SUMMARY	POLICIES	DESIGN STANDARDS	PROJECT LIST	RELEVANCE/ACTION ITEMS
CITY OF BEND DEVELOPMENT CODES	<p>The Bend Development Code (BDC) regulates all land development within Bend. There is a Bend expansion area just north of the IAMP Study Area referred to as "The Thumb." Urbanizable Area (UA) (BDC 2.8) is the current zoning designation for this area. The UA zone is intended to preserve large areas of undeveloped or rural land for future urban development prior to annexation. The City of Bend requires that expansion areas have an adopted area plan prior to annexation.¹</p> <p>Prior to annexation, the UA standards and requirements govern development in the zone. Permitted uses are largely limited to single-family residential and farm uses. Frontage improvements in the zone must be built to City of Bend standards and specifications.</p> <p>Transportation-related standards in the BDC govern roadway improvement in the vicinity of the Study Area, within the Bend UGB. If transportation improvements occur in Bend, they are subject to the following standards:</p> <ul style="list-style-type: none"> • 3.1.300: Multimodal access and circulation • 3.1.400: Vehicle access management • 3.4.200: Transportation Improvement Standards 	X	X		<p>Future growth in the interchange's vicinity will be based on zoning and development standards associated with county zone districts. The most notable urban development will be in Bend's "Thumb," located just north of the interchange. This is an area that will be urbanized following the development of an area plan and annexation. The City of Bend requires that expansion areas have an adopted area plan prior to annexation. Development standards and requirements are discussed in more detail in Technical Memorandum #2.</p> <p>If new transportation facilities (e.g., access or frontage roads) within the City of Bend are recommended as a result of the IAMP planning process, they must be consistent with city standards, including those in BDC 3.4.200, Transportation Improvement Standards. Alternatively, and only if necessary to ensure consistency between the facility plan and local plans, Bend could adopt the IAMP as a legislative amendment to the Transportation System Plan (TSP).</p>
DESCHUTES COUNTY TRANSPORTATION SAFETY ACTION PLAN (TSAP)	<p>The Deschutes County TSAP focuses on the rural areas of the County including the area within the Bend MPO. The simultaneous development of the County and City/MPO TSAPs allowed for coordination between the two jurisdictions and an understanding of City-specific safety performance. The TSAP developed a comprehensive safety program that systematically identifies and prioritizes safety projects and establishes a proactive approach to reducing crashes.</p>			X	<p>Identify and implement safety strategies identified in the TSAP into the IAMP. The Plan should be consistent with goals of the TSAP, especially those related to the Study Area. Once a specific location is identified for safety treatments, the toolboxes provided in the TSAP can be used to guide the implementation of systemic solutions.</p>
CITY OF BEND TRANSPORTATION SAFETY ACTION PLAN (TSAP)	<p>The Bend Area TSAP focuses on the area within the Bend UGB. Simultaneously developing the County and City/MPO TSAPs allowed for coordination between the two jurisdictions and an understanding of City-specific safety performance. The TSAP developed a comprehensive safety program that systematically identifies and prioritizes safety projects and establishes a proactive approach to reducing crashes.</p>			X	<p>Identify and implement safety strategies identified in the TSAP into the IAMP. The Plan should be consistent with goals of the TSAP, especially those related to the Study Area. Once a specific location is identified for safety treatments, the toolboxes provided in the TSAP can be used to guide the implementation of systemic solutions.</p>
2021-2024 STATEWIDE TRANSPORTATION IMPROVEMENT PROGRAM ("STIP")	<p>The Statewide Transportation Improvement Program (STIP) details the full list of funded projects on ODOT's facilities. The list below includes the STIP projects in the vicinity of the Area of Potential Impact (between mile posts 142.24 and 145.50).</p> <ul style="list-style-type: none"> • US 97: Multi-Use Trail (Baker Rd. – Lava Butte) (143.45 to 149.58) – includes funding for design and construction • US 97 Road Weather Management (143.68 to 164.17) 			X	<p>The Plan should assume that funded STIP projects would be completed before the 20-year planning horizon and any improvements recommended as part of the IAMP must be coordinated with those STIP projects.</p>
DESCHUTES COUNTY CAPITAL IMPROVEMENT PLAN (CIP)	<p>The Deschutes County Road CIP summarizes planned and funded improvements for fiscal years 2021-2025. The projects in the CIP include intersection and corridor improvements, major pavement preservation, bridge replacement and rehabilitation, and other project types to modernize, maintain, and increase safety on the County road system. This report includes the summary, justification, scope of work, budget, anticipated schedule, and map for each project.</p>			X	<p>The Plan should assume that funded CIP projects would be completed before the 20-year planning horizon and any improvements recommended as part of the IAMP must be coordinated with those CIP projects.</p>

¹ Bend expansion areas are intended to be planned through a City-initiated area plan. Annexation can occur once a plan is completed. However, Bend Comprehensive Plan Policy 11-122 allows annexations that are a minimum of 40 contiguous acres to be approved prior to the completion of an Area Plan, if a master plan (property owner-initiated) is developed for the area proposed to be annexed.

DOCUMENT	PURPOSE AND SUMMARY	POLICIES	DESIGN STANDARDS	PROJECT LIST	RELEVANCE/ACTION ITEMS
2020-2024 BEND CAPITAL IMPROVEMENT PLAN	The Capital Improvement Program (CIP) identifies infrastructure improvement projects within a 5-year time period that are necessary to enhance service levels, address existing deficiencies, and provide for future growth. The 5-year CIP is updated annually, along with the biennial budget, and is coordinated with departments within the City.			X	The Plan should assume that funded CIP projects would be completed before the 20-year planning horizon and any improvements recommended as part of the IAMP must be coordinated with those CIP projects.
DESCHUTES COUNTY ITS PLAN	<p>The Deschutes County Intelligent Transportation Systems (ITS) Plan was originally developed in 2005 and updated in 2020</p> <p>The plan was developed to identify innovative tools to address increasing traffic congestion and safety issues that affect traveler mobility within Deschutes County. ITS is defined as a system of “advanced technologies and management techniques to relieve congestion, enhance safety, provide services to travelers, and assist transportation system operators in implementing suitable traffic management strategies.” ITS projects have been instrumental in other ODOT regions by providing lower cost options that improve the safety and efficiency of the transportation network in a relatively short implementation timeframe without major capital infrastructure investment. This plan details a 20-year deployment plan of ITS projects. The investments range from CCTV cameras, variable message or speed limit signs, to count stations and weather stations. A number of these investments have been identified for installation on the Bend Parkway and some of the adjacent roadways.</p>			X	<p>The themes for the corridor projects were to establish safe and smart conditions along the congested or unsafe segments of the corridor. The ITS infrastructure and equipment needed for these projects fell mainly into the categories of Transportation Operations and Management, Traveler Information, and Data Management and Performance Measures.</p> <p>Of the proposed projects listed in the ITS Plan, only the US 97 Safe and Smart Corridor are located within the study area.</p>
CASCADES EAST TRANSIT MASTER PLAN	The 2040 Cascades East Transit (CET) Transit Master Plan (TMP) outlines a framework for providing transit and related services to Central Oregon for the next 20 years. It will be used by CET to identify new services, further policy discussions, inform how Statewide Transportation Improvement Funds (STIF) transit funds are spent, and monitor future funding needs and opportunities	X		X	<p>Coordination with CET is required for the provision of transit stop improvements along existing and planned transit routes.</p> <p>Route 30, which provides service between La Pine and Bend, is the only fixed-route transit within the API. Modifications recommended for Route 30 include identifying an improved/more efficient stop for Deschutes River Woods (e.g., Riverwoods County Store) or alternative way to serve Deschutes River Woods; re-routing with Bend to provide more direct service to downtown.</p>
BEND METRO PARK AND RECREATION DEPARTMENT MASTER PLAN	The Bend Park and Recreation District’s Comprehensive Plan is the guiding document for the next ten years of parks and recreation in Bend. The plan addresses the rapid growth in Bend by planning for more parks, trails, amenities and another indoor recreation facility.	X		X	The Arnold Canal Trail and the Rail with Trail Corridor have been identified as projects located within the study area. The Arnold Canal Trail, which was identified as a high priority project, would run parallel to the Arnold Irrigation Canal Trail through southeastern Bend. The trail would start at US 97 near the Baker Road/Knott Road interchange and connect to the 15 th Street Trail Connector at the intersection of 15 th Street and Knott Road. The Rail with Trail project, which runs parallel to the railroad through the entirety of Bend, is located outside of the City of Bend jurisdiction and will be constructed and maintained by other agencies.
US 97 BEND TO LAVA BUTTE REFINEMENT PLAN	The US 97 Bend to Lava Butte Refinement Plan was developed by ODOT to address safety and operations on US 97 between Baker Road and Lava Butte. The Refinement Plan recommended a multiuse path connection between Baker Road and Lava Lands Visitor Center to create a parallel facility to US 97. The Refinement Plan also recommended a grade-separated partial interchange to access the High Desert Museum to provide a safer direct access point from US 97, as well as the completion of an IAMP for the Baker Road interchange.			X	The multiuse path alignment must be accommodated in improvement concepts and potential impacts to the Baker Road and Knott Road area from changes in access to the High Desert Museum should be considered. This project is the outcome of the recommendation to complete an IAMP for the Baker Road interchange.



APPENDIX B

DATE: February 2, 2021

TO: Don Morehouse| ODOT

FROM: John Bosket, PE; Aaron Berger, PE (WA); Kayla Fleskes, EI | DKS Associates

SUBJECT: US 97 Baker Road IAMP

Project #20020-006

Appendix B - Methodology Memorandum

This memorandum documents the methodology and key assumptions to be used in generating the existing and future conditions traffic analysis for the US 97 Baker Road Interchange Area Management Plan (IAMP) in Bend, Oregon. This includes a description of the study intersections and the proposed methodology for system inventory, volume development, traffic operations analysis, and safety analysis.

SYSTEM INVENTORY

An inventory of existing conditions and transportation facilities within the Area of Potential Impact (API) will be conducted. The inventory will include existing land uses, street network, bicycle/pedestrian network and public transit inventory. The inventory will utilize data collected from previous field visits, aerial imagery, and existing databases from Deschutes County, City of Bend, and the Oregon Department of Transportation (ODOT), among others. The inventory and data source/methodology are listed in Table 1.

TABLE 1: SYSTEM INVENTORY DATA SOURCES AND METHODOLOGY

INVENTORY	PARAMETERS	DATA SOURCE/METHODOLOGY
STREET NETWORK DESCRIPTION	Location, jurisdiction responsibility, roadway functional classification, freight routes, National Highway System facilities	ODOT TransGIS, City of Bend Transportation System Plan (TSP), Deschutes County TSP
INTERSECTION / ROADWAY GEOMETRY	Traffic control devices, posted speed limits, intersection lane configuration, number of lanes, lane width, storage bay lengths, bike lane configurations For collector roadways and above: Pavement/shoulder and right-of-way width, pavement type and condition, median type and width, on-street parking locations, public and private approaches and access to interchange, cross streets within the API	Field visits from previous projects, aerial imagery, Google Streetview, ODOT Highway Inventory Report, ODOT Digital Video Log, ODOT TransGIS
	For collector roadways and above: Americans with Disabilities Act (ADA) compliance (qualitative)	Visual inspection only
	For collector roadways and above: Bridges and culverts	ODOT Bridge Management System, ODOT TransGIS
BICYCLE AND PEDESTRIAN NETWORK	Bicycle and pedestrian facility types, locations, gaps, activity centers, width, surface type, geometry and conditions, crosswalk locations and conditions	Field visits from previous projects, aerial imagery, Google Streetview, ODOT Highway Inventory Report, ODOT Digital Video Log, ODOT TransGIS, Bend TSP, Deschutes County TSP
	ADA-accessible public sidewalk impediments (qualitative)	Visual inspection only
	Programmed pedestrian and bicycle facilities	ODOT STIP, Bend TSP and CIP, Deschutes County TSP and CIP
PUBLIC TRANSIT SERVICES	Existing and programmed public transportation facilities and services, transit stops, fixed-routes	Cascades East Transit 2040 Master Plan, aerial imagery, Google Streetview
AREA OF POTENTIAL IMPACT (API) POPULATIONS	Summary of populations in the API which are protected by Title VI of the Civil Rights Act of 1964, the ADA, federal Environmental Justice policies and Policy 1.2, Equity, Efficiency and Travel Choices of the Oregon Transportation Plan	U.S. Census Data, U.S. EPA Environmental Justice Screening and Mapping Tool

INVENTORY	PARAMETERS	DATA SOURCE/METHODOLOGY
ENVIRON- MENTAL CONSTRAINTS	Historic, archaeological and natural resources	Oregon Historic Sites Database, National Register of Historic Places, U.S. Fish and Wildlife Service Information for Planning and Consulting, City and County Comprehensive Plans
	Wetlands and floodplains	100-year Federal Emergency Management Agency floodplain boundaries as documented on Flood Insurance Rate Maps, National Wetland Inventory

STUDY AREA AND INTERSECTIONS

The project Study Area, Area of Potential Impact, and Area of Social Impact were shown in Figures 1 and 2 in the main memorandum. The study intersections for existing system operations include (shown in Figure 2):

1. Baker Road and US 97 Southbound Ramps
2. Knott Road and US 97 Northbound Ramps
3. Knott Road and China Hat Road
4. China Hat Road and Parrell Road
5. China Hat Road/Ponderosa Street and US 97
6. Baker Road and Apache Road
7. Baker Road and Cinder Butte Road/Pocahontas Lane
8. Baker Road and Baker Court
9. Knott Road and Scale House Road
10. US 97 and Rocking Horse Road

VOLUME DEVELOPMENT

Traffic operations will be analyzed at study intersections using estimated conditions with the 30th highest annual hour traffic volumes (30 HV). Due to impacts from COVID-19, study intersections will use historical traffic counts from the US 97 Parkway Plan (collected April 2017) and the Bend Transportation System Plan (collected April 2018), which represent pre-COVID Average Weekday conditions in Bend. These traffic counts will be seasonally factored using the methodology from the ODOT Analysis Procedures Manual (APM)² to represent 30 HV conditions, which occur in July. Counts tied to US 97 will use nearby Automatic Traffic Recorder (ATR) data from 2019 to develop 30 HV seasonal factors, as summarized in Table 2, while the remaining counts will use ODOT’s seasonal trend tables³.

TABLE 2: STUDY INTERSECTION TRAFFIC COUNT DATA SUMMARY

MONTH	RATIO OF MONTHLY TO ANNUAL AVERAGE WEEKDAY TRAFFIC			30 HV SEASONAL FACTOR
	US 97 SOUTH OF CHINA HAT RD (ATR 09-003)	US 97 SOUTH OF BADGER RD (ATR 09-025)	AVERAGE	
APRIL (COUNT MONTH)	1.00	1.01	1.01	1.27
JULY (PEAK 30 HV)	1.28	1.28	1.28	1.00

Bold and gold indicates seasonal factor used for US 97 counts.

Study intersections 6-10 will require new traffic counts. New traffic counts will be collected in January of 2021. A seasonal factor will be applied using the methodology from the ODOT APM to represent 30 HV conditions (using the commuter trend from the seasonal trend table). The new traffic counts will be balanced to the previous counts to account for changes in traffic volumes related to COVID-19. As the Morningstar School on Baker Court is currently not operating at full on-site capacity, the count for intersection 8 will be supplemented with an ITE trip generation estimation based on served land uses (school, gas station, and retail)⁴. The ITE trip generation estimate will be compared to the January 2021 count, and the higher numbers will be used for the analysis.

In summary, the study intersection counts will be estimated as described in Table 3.

² *Analysis and Procedures Manual Version 2*, Chapter 5, Oregon Department of Transportation, October 2020

³ 2019 Seasonal Trend Table: <https://www.oregon.gov/ODOT/Planning/Pages/APM.aspx>

⁴ *Trip Generation Manual*, 10th Edition, Institute of Transportation Engineers

TABLE 3: STUDY INTERSECTION TRAFFIC COUNT DATA SUMMARY

ID	INTERSECTION NAME	COUNT DATE	METHOD	30 HV FACTOR
1	Baker Road and US 97 Southbound Ramps	April 2017	ATR / Seasonal Trend Table	1.27 – Ramp movements / 1.04 – Other movements
2	Knott Road and US 97 Northbound Ramps	April 2017	ATR / Seasonal Trend Table	1.27 – Ramp movements / 1.04 – Other movements
3	Knott Road and China Hat Road	April 2018	Seasonal Trend Table	1.04
4	China Hat Road and Parrell Road	April 2017	ATR / Seasonal Trend Table	1.27 – To/from US 97 movements / 1.04 – Other movements
5	China Hat Road/Ponderosa Street and US 97	April 2017	ATR	1.27
6	Baker Road and Apache Road	January 2021	Seasonal Trend Table	1.16
7	Baker Road and Cinder Butte Road/Pocahontas Lane	January 2021	Seasonal Trend Table	1.16
8	Baker Road and Baker Court	January 2021 with ITE Estimation	Seasonal Trend Table	1.16
9	Knott Road and Scale House Road	January 2021	Seasonal Trend Table	1.16
10	US 97 and Rocking Horse Road	January 2021	ATR	1.49

FUTURE TRAFFIC SCENARIO ASSUMPTIONS

A Future Baseline (No-Build) scenario will be run in the Bend Redmond Regional Travel Demand Model (BRM) tool (in EMME software platform). This scenario will use the 2040 land use assumptions developed for the most recent Bend TSP Update, which includes full build out of the “Thumb” area. This scenario will be used as the basis to estimate year 2040 traffic growth at all study intersections, using the calibrated base year (2010) model and 2040 scenario. Raw link level volumes from the BRM will be post-processed using methods consistent with the ODOT APM. This approach is derived from methodologies outlined in the National Cooperative Highway Research Program (NCHRP) Report 765 *Analytical Travel Forecasting Approaches for Project-Level Planning and Design*.

2040 BASELINE SCENARIO ASSUMPTIONS

The 2040 Baseline scenario will utilize the same land use assumptions as the recently completed City of Bend Transportation System Plan (TSP). The network will be based on financially constrained projects listed in the Statewide Transportation Improvement Program and City and County plans, which are listed in Table 4.

TABLE 4: BASELINE SCENARIO TRANSPORTATION NETWORK ASSUMPTIONS

PROJECT	SOURCE	PROJECT NUMBER
MURPHY RD EXTENSION (FROM BROSTERHOUS RD TO 15 TH ST)	Bend Capital Improvement Program	-
NEW COLLECTOR ROADS (IN THE THUMB)	Bend Metropolitan Transportation Plan (MTP)	228/229
US 97/MURPHY RD INTERCHANGE RAMPS	Bend MTP	26
US 97 FRONTAGE ROADS (NEAR MURPHY RD)	Bend MTP	18/19
CHINA HAT RD (WIDEN TO 3-LANE COLLECTOR)	Bend MTP	S-1
US 97/CHINA HAT RD OVERCROSSING	Bend TSP Long-Term	C-58
CLOSE US 97 RIGHT-IN, RIGHT-OUTS	Bend TSP Mid-Term	C-42

FUTURE TRAFFIC SENSITIVITY TESTING

In addition to the future baseline scenario described, up to two sensitivity tests will be conducted to look at either different levels of land use growth or different combinations of projects with significant impacts to the interchange, namely the right-in, right-out closures at Ponderosa Road/China Hat Road and an overcrossing at China Hat Road.

SYSTEM OPERATIONS ANALYSIS

Intersection operations will be reported for typical 30 HV conditions at each of the 10 study intersections for existing and future year 2040. Intersection analysis will be performed using Synchro analysis software and *Highway Capacity Manual 6th Edition*⁵ procedures. Results will be reported as volume-to-capacity ratios, level of service, and seconds of delay. Operations analysis will also include merge, diverge, weaving, and mainline analysis for US 97 segments north,

⁵ *Highway Capacity Manual 6th Edition: A Guide to Multimodal Mobility Analysis*, Transportation Research Board, 2016

between and south of the interchange ramps. Segment analysis will be performed with Highway Capacity Software (HCS).

CRASH ANALYSIS

Crash data for the most recent 5-years of available data from ODOT's Crash Data and Reporting Unit will be used to perform crash analysis for state and non-state roadways in the API. Locations ranked within the top ten percent of Safety Priority Index System (SPIS) sites will be reported. Highway Safety Manual (HSM) Part B Network Screening Critical Rate method will be used for the 10 study intersections to determine steps to take to monitor and reduce crash frequency and severity on existing roadways.

Each intersection will be grouped into a reference population based on intersection control. The crash rates (crashes per million entering vehicles) for each intersection will be compared to three different standards: a critical crash rate which compares performance to other similar intersections being studied in the project area, the statewide mean crash rate (obtained from ODOT's Analysis Procedures Manual Exhibit 4-1), and a 90th percentile crash rate which is based on similar intersections throughout the state (obtained from ODOT's Analysis Procedures Manual Exhibit 4-1). Reference populations require at least five intersections. If there are not enough sites for a particular population, then the observed crash rate is just compared to the statewide mean and the 90th percentile crash rates. Intersections that have observed crash rates greater than either the critical or 90th percentile crash rate will be flagged as safety focus areas for further consideration.

The excess proportion of specific crash types analysis looks at the proportion of crash types for each intersection and compares it with the average for the reference population to determine if certain types of crashes are more prevalent than should be expected. Each reference population must contain five intersections to be valid.

Segment data will be compared with official published crash rates (ODOT Crash Tables – Table II) for similar facilities. For segments that exceed the published crash rate and intersections that exceed the identified critical crash rate, crash patterns, evaluation of causes and potential countermeasures will be identified for each site.

ACTIVE TRANSPORTATION

An inventory of existing active transportation facilities will be documented as discussed in Table 1. In addition to the inventory, bicycle and pedestrian level of traffic stress will be evaluated for existing and future conditions using the methodology from the ODOT APM⁶.

⁶ *Analysis and Procedures Manual Version 2*, Chapter 14, Oregon Department of Transportation, October 2020