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TECHNICAL MEMORANDUM

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Date:	November 25, 2020	Project #: 24113
To:	Devin Hearing, ODOT; Jeremy Morris, Klamath County; Mike Zarosinski, Klamath County	
From:	Kittelson & Associates and Angelo Planning Group	
Project:	Klamath County TSP Update	
Subject:	Final Technical Memorandum #4: Solutions Analysis and Funding Program	

INTRODUCTION

This memorandum presents draft solutions developed by the project team to address the existing and future transportation system gaps and deficiencies that were identified in *Technical Memorandum #3: Existing and Future Conditions Inventory and Analysis*. This memorandum also summarizes solutions identified by previous planning efforts that have not been implemented to date, including from the existing Klamath County Transportation System Plan (TSP). The solutions identified in this memorandum primarily consist of policies that will guide development of the transportation system over time, future planning efforts (areas for additional study), and transportation improvement projects. These solutions create a framework for the Klamath County TSP update and help satisfy Oregon Administrative Rule (OAR) 660-012-020 (Elements of Transportation System Plans) by establishing a coordinated network of transportation facilities to serve State, regional, and local transportation needs.

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TRANSPORTATION SYSTEM NEEDS

Potential solutions to address the transportation system needs are summarized herein by their project name and description, potential funding partners, draft priority, and planning-level cost estimates based on 2019 dollars. A three percent annual escalation factor was applied to historical cost estimate sources (i.e. projects carried over from the previous 2010 TSP or other planning documents).

These potential solutions are intended to address needs over the next 20 years for the following elements of the transportation system:

- Street System
  - Roadway
  - Safety
  - Intelligent Transportation System (ITS)
- Multimodal System
  - Pedestrian
  - Bicycle
  - Transit
- Bridge System
- Other Transportation Systems
  - Rail
  - Air
  - Marine
  - Pipeline

The Klamath County TSP goals and objectives that were established in *Tech Memo #2: Goals, Objectives, and Evaluation Criteria* advised the development of these solutions. With 'Equity' as a new key goal, these solutions aim to maximize the benefits of a sustainable transportation system for all users by considering the needs of underserved populations and highlighting routes and options that support Safe Routes to School (SRTS).

The design elements identified in this memorandum for State facilities are only presented for discussion and planning purposes to determine reasonable planning-level cost estimates. The actual design and permitting elements for any State facility are subject to change, will be determined through a preliminary and final design process, and are subject to approval by the Oregon Department of Transportation (ODOT).

PROJECT EVALUATION AND PRIORITIZATION

An evaluation matrix was established for prioritizing solutions and reflects the goals identified in *Tech Memo #2*. The evaluation criteria assess safety benefits, environmental impacts, economic development, equity, agency coordination and public outreach, the interaction between transportation and land use, and project implementation. These criteria are qualitative and provide for a high-level comparison of the solutions to determine which best fit with the TSP goals. Solutions were assigned a score of -1 through 2 based on how well they met the intent of each goal. The solutions resulting in higher scores were given highest priority, while the solutions resulting in lower scores were given lowest priority. Finally, the solutions were refined based on feedback received from the County, ODOT, and Project Advisory Committee (PAC). **Please note that cost estimates and County contributions and partnerships are for planning purposes only. All projects will be scoped separately and individually based on project needs.**

STREET SYSTEM SOLUTIONS

Streets serve most users across all travel modes within Klamath County. People driving, walking, biking, and taking transit all rely on the street network to access areas locally and regionally. The street system solutions presented in this section address roadway, freight, and safety needs.

ROADWAY SYSTEM

The solutions developed for the roadway plan pertain to the functional classification system, roadway design standards and improvements, traffic safety improvements, and Intelligent Transportation System (ITS) improvements. The solutions reflect previous planning efforts along with information obtained through the TSP update.

FUNCTIONAL CLASSIFICATION

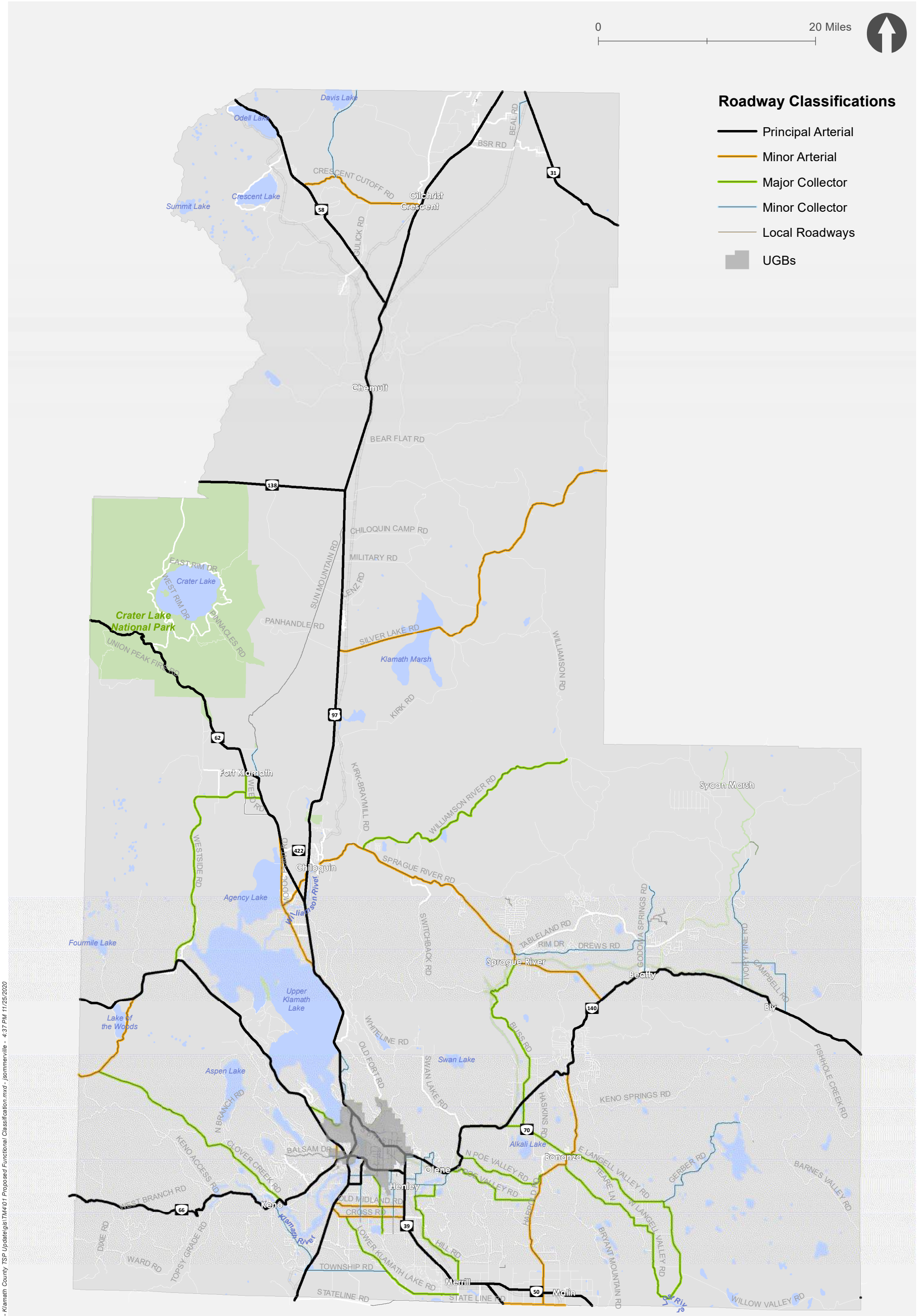
This section summarizes proposed changes to the County's functional classification system. The proposed functional classification system corresponds to Klamath County roadway design standards to provide a distinction between roads in the urban area and those in rural areas. Roadways within the Klamath Falls Urban Growth Boundary (UGB) are considered "urban" and roadways outside of the UGB are considered "rural." These designations allow the County to apply design standards that are appropriate for a roadway's urban or rural context. All County roads covered within this TSP are outside the UGB and therefore considered rural. Urban classifications will be covered in the Klamath Falls Urban Area TSP. The proposed functional classifications include the following designations as defined in the *DRAFT Chapter 2 – Road Types and Geometrics* currently being updated by County Staff. *The draft document is provided in Attachment A*.

- Rural Roads, outside of Urban Growth Boundaries:
  - Principal Arterials
  - Minor Arterials
  - Major Collectors
  - Minor Collectors

- Local Roadways, summarized in the following subcategories:
    1. Low Volume Collectors
    2. Standard Local Road
    3. User Maintained Public Road
    4. User Maintained Private Road

- Urban Roads, within Urban Growth Boundaries:
    - Major Arterial
    - Collector
    - Local Roadways

The proposed functional classification system for rural roads is shown in Figure 1. The County is in the process of defining Low Volume Collectors, within the Local Road category. These will be identified in *Technical Memorandum #5: Preferred Plan*. The County should coordinate with ODOT to verify this functional classification system aligns with ODOT and federal records.



*Areas within city limits (Klamath Falls, Merrill, Malin and Chiloquin) are not included in the County's TSP.

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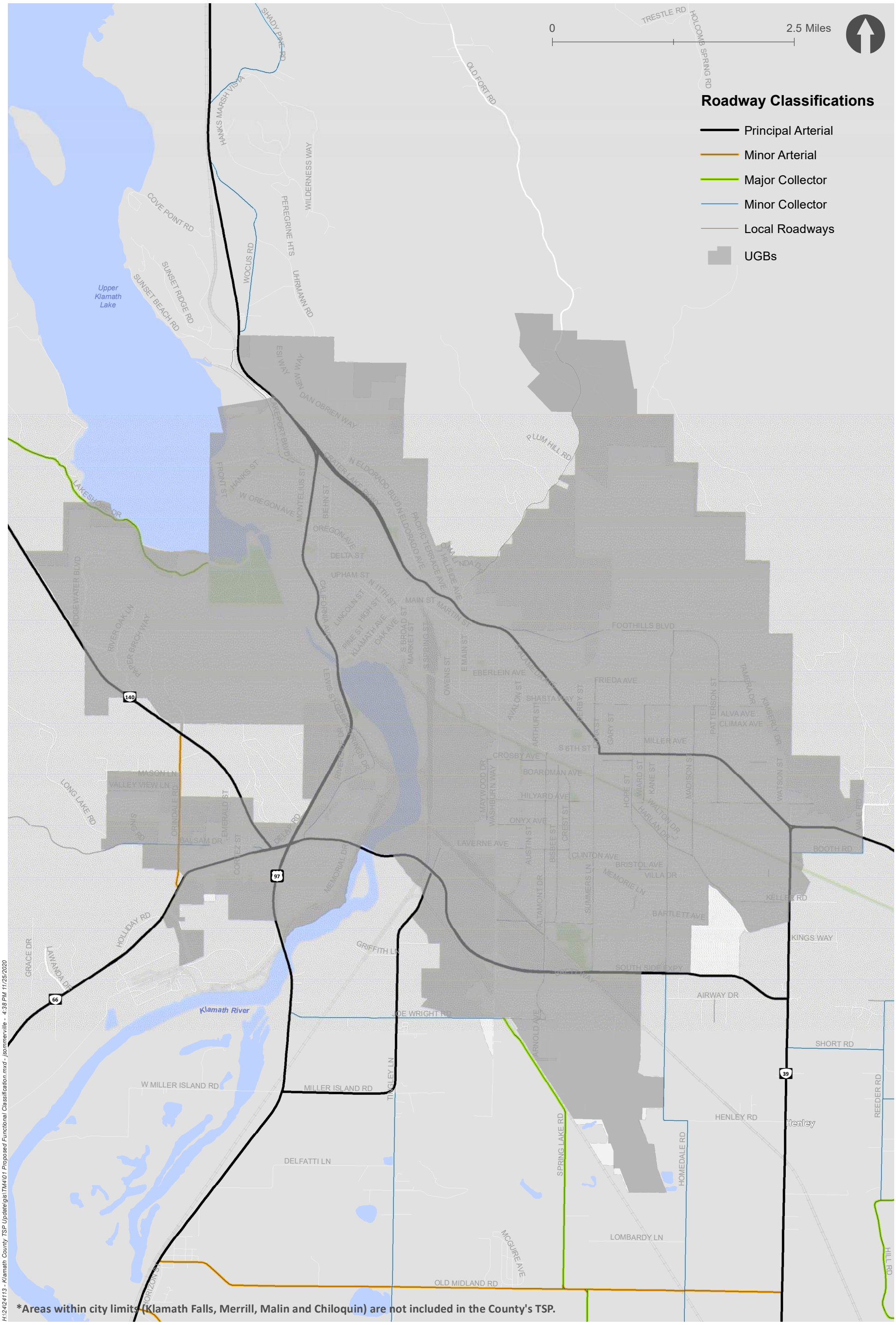
Proposed Functional Classification
Klamath County, Oregon

Figure **1A**

KITTELSON & ASSOCIATES

Coordinate System: NAD 1983 HARN StatePlane Oregon South FIPS 3602 Feet Intl



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Proposed Functional Classification
Klamath County, Oregon

Figure **1B**

KITTELSON & ASSOCIATES

Coordinate System: NAD 1983 HARN StatePlane Oregon South FIPS 3602 Feet Intl

ROADWAY DESIGN STANDARDS

In conjunction with updating its functional classification system, the County is in the process of updating its roadway design standards. Urban design standards apply to County roads within the Klamath Falls UGB, and outside Klamath Falls city limits, and are generally consistent with City standards; these will be presented in the Klamath Falls Urban Area TSP. This memorandum presents the rural roadway design standards. The final roadway design standards will be included in the amended *Public Works Department Development Standards*.

Table 1 and Table 2 summarize the County's proposed roadway design standards. All roads classified as principal arterials in Klamath County are State highways maintained by ODOT and all elements of road design shall be coordinated with ODOT; Klamath County Public Works does not have jurisdiction over any rural principal arterial roadways.

The following notable changes are proposed to the design standards in the current TSP and are bolded in Table 1 and Table 2:

- Minor collector travel lane width is decreased from 12 feet to 11 feet;
- Paved shoulder width on arterials and collectors is increased from 4 feet to 6 feet;
- Paved shoulder width on local roads is required with a minimum of 2 feet;
- Turn lane width is currently defined by a range of 10-14 feet. The updated standards designate 12-foot lanes for arterials and collectors and 10 feet for local roads.
- Right-of-Way standards updated from 80 feet for an arterial and 60 feet for a collector to a range between 64-76 feet.

Table 1. Rural Arterial and Collector Design Standards

Functional Classification	Minor Arterial	Major Collector	Minor Collector
Typical ADT, VPD	1500-2000	400-1500	400-1500
Design Speed, mph	60	55	50
Travel Lane Width, ft	12	12	**11**
Maximum Grade, %	6	6	6
Superelevation, %	6	6	6
Paved Shoulder, ft	**6**	**6**	**6**
Gravel Shoulder, ft	N/A	N/A	N/A
Turn Lane Width, ft	**12**	**12**	**12**
Multi-Use Path, ft	12	12	12
Number of Lanes	2-3	2-3	2-3
Right of way Width, ft	64-76	64-76	62-74

Table 2. Rural Local Roadway Design Standards

Functional Classification	Low Volume Collector	Standard Local	Minor Local
Typical ADT, VPD	>400	250-400	50-250
Dwelling Units Served	N/A	100	50
Design Speed, mph	45	30	25
Maximum Grade, %	10	10	10
Superelevation	6	Not Required	Not Required
Travel Lane Width, ft	**10**	**10**	**10**
Paved Shoulder, ft	**2**	**2**	**2**
Gravel Shoulder, ft	4	4	2
Multi-Use Path, ft	12	12	12
Number of Lanes	2	2	2
Right of way Width, ft	60	60	60

Additional notes associated with the rural standards are as follows:

- Design values shown are for typical 4R (New Construction/Reconstruction) design conditions and County Engineer may require further investigation and review prior to site specific design on existing roadways.
- Average Daily Traffic (ADT) is based on typical count data throughout County and shall be verified prior to design work.
- Design Speed is as recommended from AASHTO Greenbook, Chapters 6 and 7 (as appropriate for classification) for "Level" terrain and used as a basis for determining geometric elements and does not imply posted or legally permissible speed.
- Additional discussion related to superelevation and grade can be found in Section 2.04-B and 2.04-C of the *DRAFT Chapter 2 – Road Types and Geometrics guidance (see Appendix B)*.
- Shoulders shall be 2 feet wider (minimum) for guardrail installations per HDM 7.3.2.6. See AASHTO Roadside Design Guide Table 5-7 for additional barrier offset for requirements.
- Turn lane storage distance will be determined during development review or project development related to publicly funding projects.
- Multi-use path is discretionary in Rural Area.

ACCESS MANAGEMENT

Access spacing along roadways is the distance measured from centerline to centerline between conflict points, such as intersections and/or driveways. Along with updating the functional classification system and roadway standards, the County has updated its access management standards to differentiate between rural and urban roads. Table 3 summarizes the proposed access spacing standards for rural areas.

Table 3. Rural Area Access Management Standards

Functional Class	System Spacing[1]	Driveway/Access Spacing[2]	Corner Clearance
Minor Arterial	1 mile,	500 feet[1]	600 feet
Major Collector	1,320 feet	250 feet[1]	100 feet
Minor Collector	1,320 feet	250 feet[1]	50 feet
Local	400 feet	75 feet	25 feet

ROADWAY SYSTEM SOLUTIONS

Table 4 presents the proposed roadway system solutions based on needs identified through technical analyses and input from the County, ODOT, and the PAC. These solutions include passing lane studies, corridor extension projects, and intersection evaluation projects and are intended to improve the roadway system for all users. As identified in Technical Memorandum #3, no roadway or intersection capacity issues are expected within the study area through the planning horizon; therefore, the roadway system solutions focus on improving mobility and connectivity. Select projects are described further following Table 4. Figure 2 illustrates the locations of the proposed solutions at intersections and along roadways.

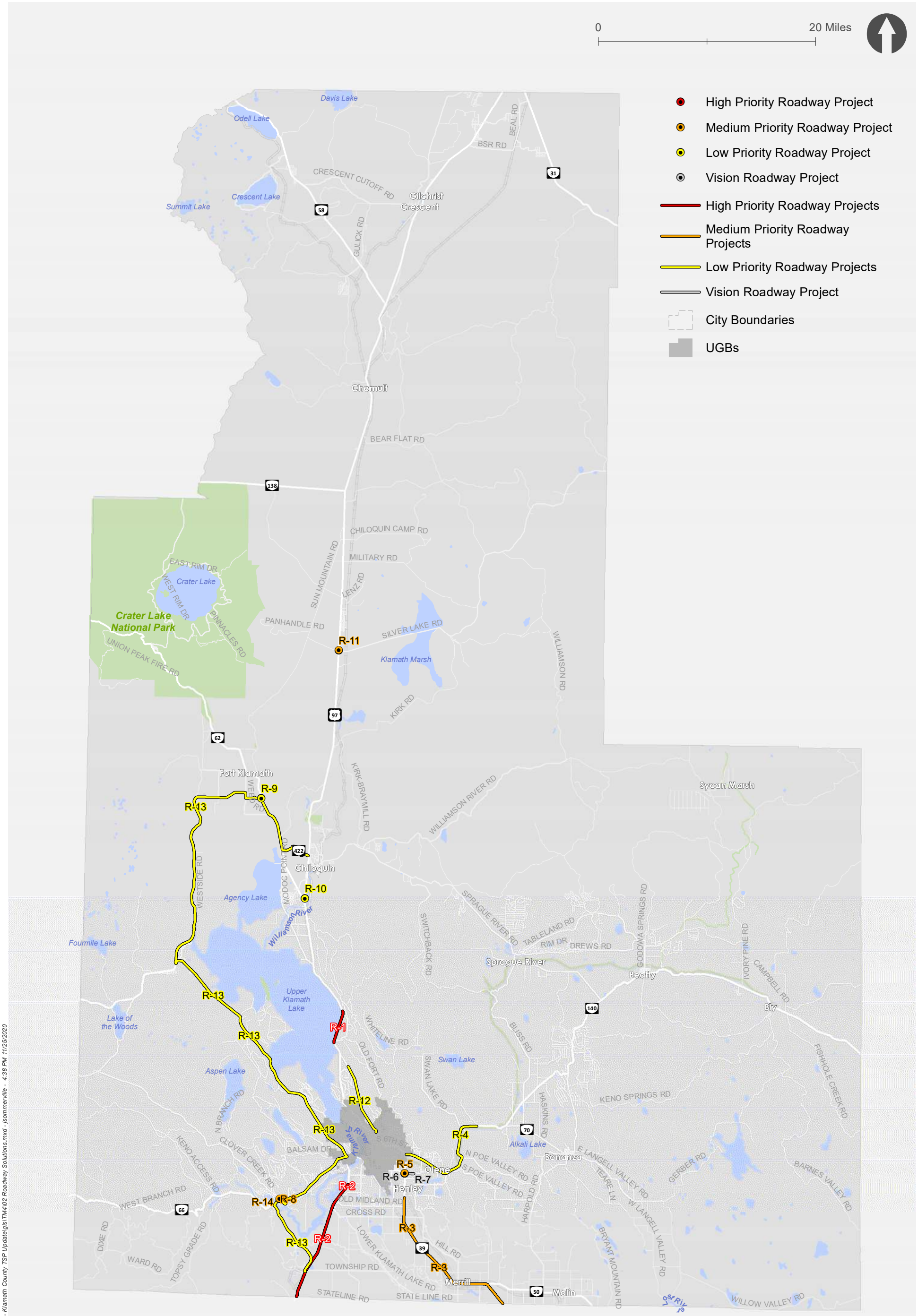
Table 4. Proposed Roadway Solutions

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
R-1	US97 North Passing Lane Study	Conduct a passing lane feasibility study for US97 between Algoma Road intersections to determine appropriate location for a passing lane.	$75,000	$0	ODOT	ODOT	High
R-2	US97 South Passing Lane Study	Conduct a passing lane feasibility study for US97 between Midland and California border to determine appropriate locations for passing lanes.	$75,000	$0	ODOT	ODOT	High
R-3	OR39 South Passing Lane Study	Conduct a passing lane feasibility study for OR39 south of Klamath Falls to California border to determine appropriate locations for passing lanes.	$75,000	$0	ODOT	ODOT	Medium
R-4	OR140 East Passing Lane Study	Conduct a passing lane feasibility study for OR140 east of Klamath Falls to County Line to determine appropriate location(s) for passing lanes.	$75,000	$0	ODOT	ODOT	Low
R-5	OR140/OR39 and Reeder Extension IAMP	Complete an Interchange Area Management Plan for OR140/OR39 including an extension of the Southside Expressway to the Klamath Falls-Lakeview Highway in Olene. Include evaluation of Henley School access.	$250,000	$0	ODOT	ODOT	Medium
R-6	OR140/OR39 Intersection Evaluation	Design and construct an intersection improvement as determined by IAMP (R-5).	-	$0	ODOT	ODOT	Vision
R-7	OR140 East Extension	Extend OR140 (Southside Expressway) to OR140 (Klamath Falls-Lakeview Hwy) in Olene as determined by IAMP (R-5). Should be coordinated with interchange (R-6).	-	$0	ODOT	ODOT	Vision
R-8	OR66 Curve Warning Enhancements (MP 51.2 to 51.5)	To improve safety on the horizontal curve, provide curve warning and visibility treatments such as advance curve warning flashers on existing curve signs (10% curve crash reduction); raised or recessed	$30,000	$0	ODOT	ODOT	Medium

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
		pavement markers (15% night crash reduction); frequent post-mounted delineators (30% curve crash reduction); guardrail (47% run-off-road crash reduction); chevron signs (16% run-off-road crash reduction); oversized, doubled up, and/or fluorescent yellow sheeting for advance curve warning signs (20% run-off-road crash reduction; and/or shoulder rumble strips (22% run-off-road crash reduction). Crash reduction estimates based on ODOT's approved CRF list.					
R-9	OR62/Loosley Road Left Turn Lane	Construct a dedicated northbound left-turn lane and widen shoulders at intersection to support as an alternate freight route to US97.	$590,000	$0	ODOT	ODOT	Low
R-10	US97/Kia-Mo-Ya Casino Access IAMP	Prepare an Interchange Area Management Plan (IAMP) to determine the appropriate intersection form.	$250,000	$0	ODOT, Klamath Tribe	ODOT	Low
R-11	US97/Silver Lake Road Left Turn Lane	Construct a dedicated northbound left-turn lane and widen shoulders at intersection to improve safety.	$1,000,000	$0	ODOT	ODOT	Medium
R-12	Northeast Passage Connection - Shady Pine to Foothills	Extend Foothills Blvd to Shady Pine Road. Includes access to OIT and Sky Lakes.	$26,000,000	$26,100,000	N/A	County	Low
R-13	Alternate Emergency Route to US97	Designate an alternate route for vehicles and freight on OR422, OR62, Westside Road, OR140, OR66, and Keno Worden Road in case of emergency closure or shut down of US97. Provide alternate route signage and designation. In cases of tight curves, curve treatments (signs, flashers, delineators, chevrons, guardrail, etc.) and "narrow road" warning signs may be needed.	$50,000	$25,000	ODOT	ODOT	Low

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
R-14	OR66/Clover Creek Road	Improve intersection sight distance and by realigning the intersection to reduce open pavement with a raised or striped median and tightening the turn radius, installing a second stop sign in the raised median, and installing "stop ahead" pavement markings.	$30,000	$3,000	ODOT	ODOT	Medium
		Total Cost for Low Priority Roadway Projects	$26,965,000	$26,125,000			
		Total Cost for Medium Priority Roadway Projects	$1,385,000	$3,000			
		Total Cost for High Priority Roadway Projects	$150,000	$0			
		Total Cost for Roadway Projects	**$28,500,000**	**$26,128,000**			

[1]Cost estimates do not include right-of-way or environmental impacts.
[2]For planning-level estimates only. Each project shall be individually scoped based on project variables.



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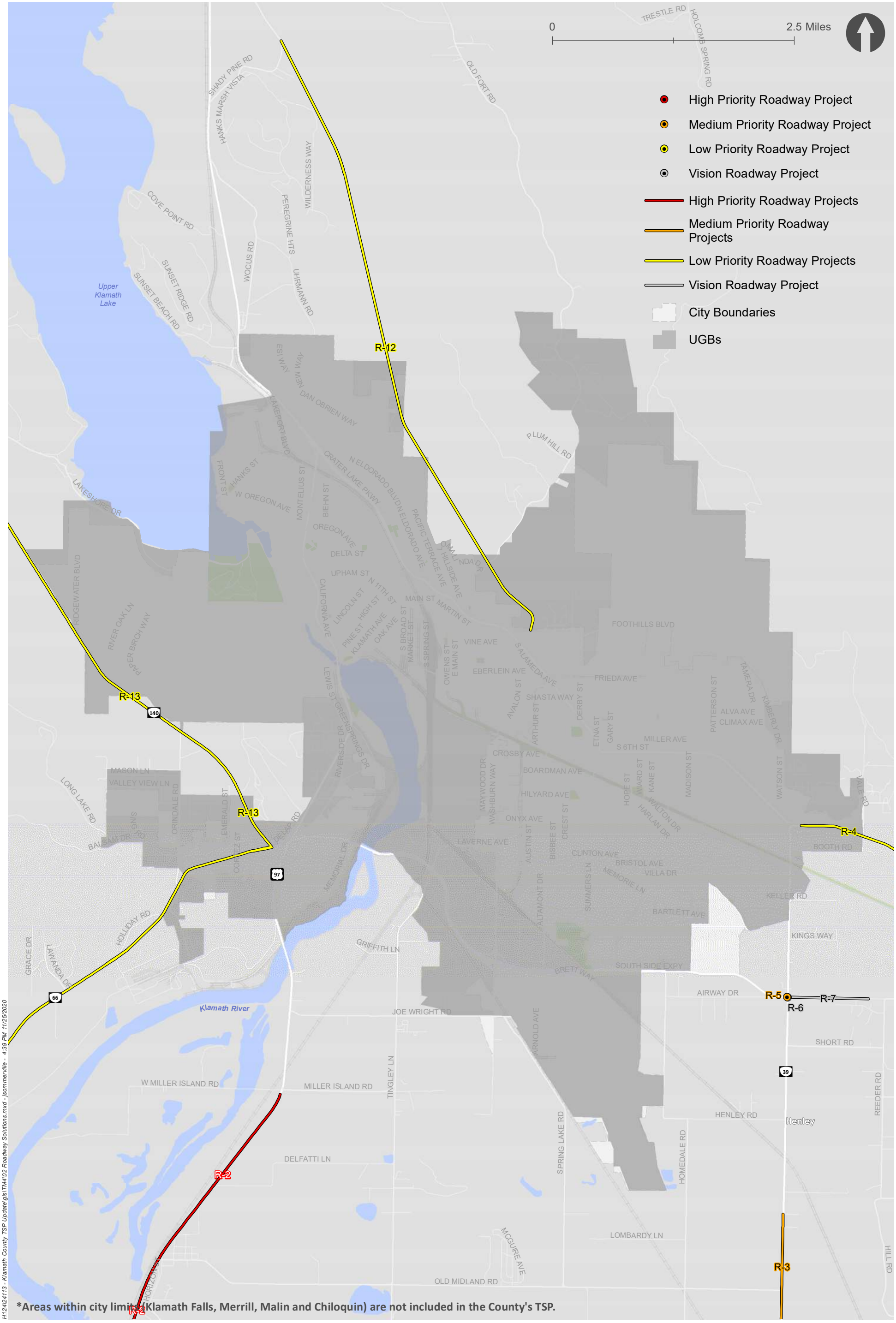
Roadway Solutions
Klamath County, Oregon

Figure
2A

KITTELSON & ASSOCIATES

Data Source: ODOT (Statewide Freight Routes)



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Roadway Solutions
Klamath County, Oregon

Figure **2B**

KITTELSON & ASSOCIATES

Data Source: ODOT (Statewide Freight Routes)

PASSING LANES (R-1, R-2, R-3, R-4)

Several passing lanes have recently been constructed along US97 in the northern area of the County; however, no passing lanes are present along State highways or freight routes south or east of Klamath Falls. As freight and recreational travel increases between Oregon and California, passing lane opportunities may improve both operations and safety on State highways within the County. Additional detailed analyses of available right-of-way, full corridor operations, environmental impacts, and design considerations are needed to determine the optimal location and lengths for these passing lanes. The studies identified are intended to help focus efforts on the locations identified by the PMT and PAC for consideration.

OR140/OR39 INTERSECTION EVAULATION AND EXTENSION (R-5, R-6, R-7)

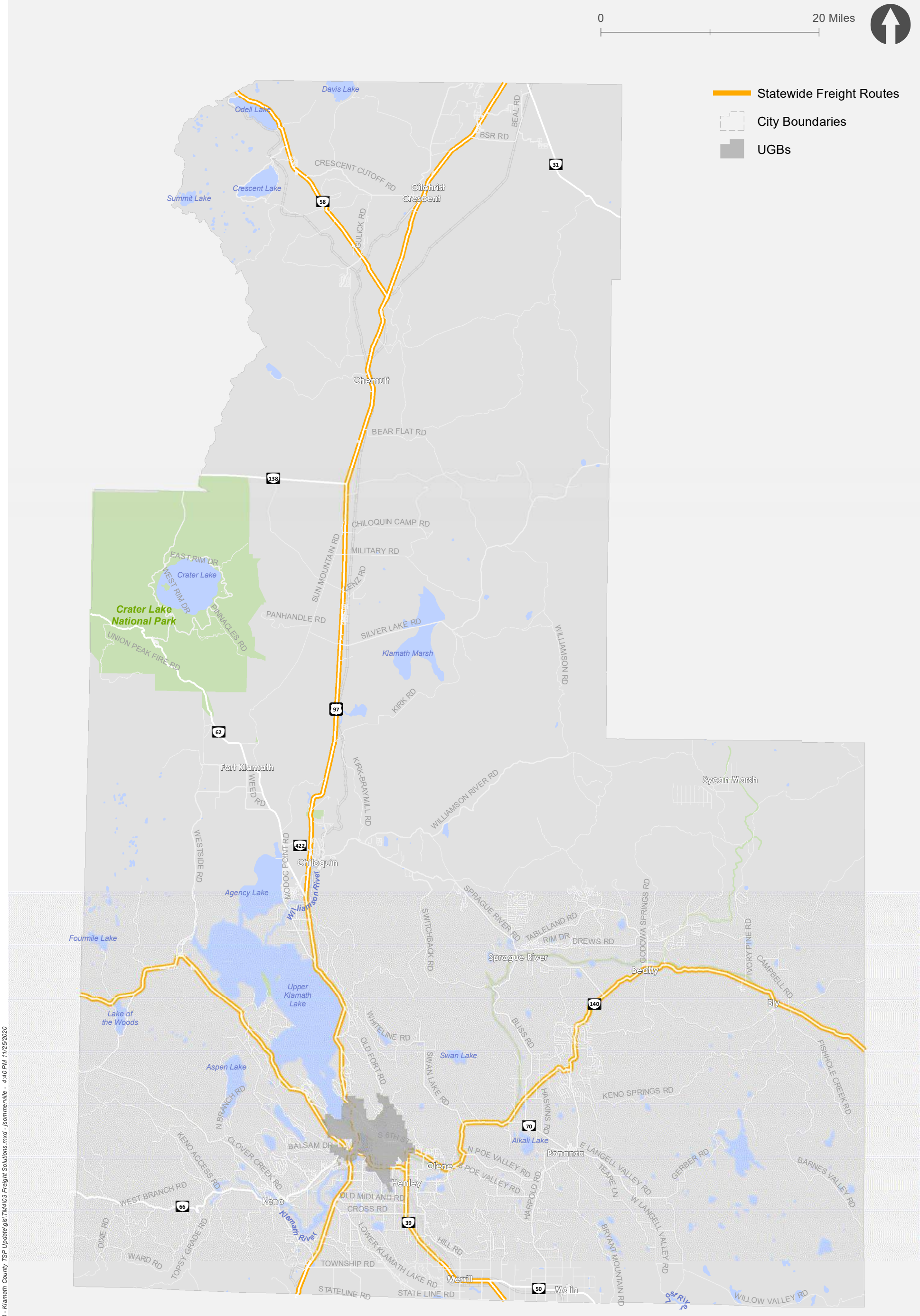
Carried forward from the existing TSP, the OR140/OR39 intersection evaluation and extension project would create an intersection improvement at OR140 (Southside Expressway)/OR39, including the new connection between OR 39 and OR140 (near MP 9.8), approximately 4 miles in length. This connection would provide a more direct connection to OR 140 in Olene, reducing travel time, providing route options for motorists and freight, and minimizing delay and potential conflicts at intersection. This connection would require the extension of Reeder Road, a new bridge over the Lost River canal, and a bridge over Bureau of Reclamation (BOR) B Canal. The new alignment would require a Goal Exception from the Department of Land Conservation and Development (DCLD) and OAR 734-051. Therefore, an Interchange Area Management Plan (IAMP) must be completed to develop an appropriate intersection configuration at OR140/OR39 and to refine the extension and connection to OR140.

NORTHERN PASSAGE CONNECTION (R-12)

The previous TSP identified a north-south connection north of Klamath Falls that would provide an alternate route and relieve congestion on the Crater Lake Parkway Corridor. This new road would extend from Foothills Boulevard to Shady Pine Road and provide connections to Old Fort Road, Oregon Tech (OIT) and Sky Lakes Medical Center. A corridor plan would be required to determine the alignment, evaluate intersections, and identify other local street connections. This project would further support the need for safety improvements at the US97/Shady Pine Road intersection, as identified in the Safety Solutions.

FREIGHT SOLUTIONS

Technical Memorandum #3 identified needs for existing freight routes along US97, OR39, OR140, and OR58, illustrated in Figure 3. As shown, the only north-south freight route through the County is US97; therefore, there are no alternate State highway routes for trucks in case of emergencies or road closures. An Alternative Emergency Route is included in Table 4 and shown in the Roadway Plan.



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Freight Solutions
Klamath County, Oregon

Figure **3A**

KITTELSON & ASSOCIATES

Data Source: ODOT (Statewide Freight Routes)

INTELLIGENT TRANSPORTATION SYSTEM SOLUTIONS

Intelligent Transportation System infrastructure enhances traffic flow and safety of a roadway through the application of technology. These facilities are a growing desire and need for many counties, particularly those with large rural areas such as Klamath County. Technical Memorandum #3 identified the need for more connected and reliable ITS infrastructure within the County to inform motorists about incidents, weather conditions, and congestion. The Klamath *County ITS Plan* (adopted 2016) addresses key needs and identifies solutions to increase the ITS presence within the County. Table 5 shows the solutions described in the ITS plan that relate to the needs of unincorporated Klamath County. In addition, the final recommendation in the table calls for an update to the ITS Plan to incorporate new technologies. The cost estimates shown in the table are obtained from the ITS Plan, adjusted for inflation, unless otherwise noted. Figure 4 is the existing infrastructure and proposed solutions map from the *Klamath County ITS Plan*.[1] Figure 4 and the accompanying table show specific locations of solutions from the plan.

[1] The full ITS Plan can be accessed at the following link: https://www.oregon.gov/odot/Maintenance/Pages/Plans,-Architectures-%26-Reports.aspx. The table in the TSP lists projects; the full ITS Plan provides a detailed analysis of ITS needs and broader recommendations.

Table 5. Proposed ITS Solutions from ITS Plan

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
I-1	Install communications and maintain up to date communications map.	Install roadside communication connections (as described in the communications plan in the Klamath County ITS Plan)	$50,000	$0	ODOT	ODOT	High
I-2	Install new PTZ cameras at select intersections and connect to TripCheck	Install at US97 Mile Post 271.2 (Truck Weigh Station)	$10,000[4]	$0	ODOT	ODOT	High
I-3	Install Variable Message Signs (VMS)	Install at a) SB US97 north of Crescent Cutoff Road b) NB US97 south of OR58 c)SB US97 MP 204 d)SB US97 north of OR138 e) NB and SB US97 at MP 223 f) NB US97 at Silver Lake Road g) NB US97 at MP 244 h) NB US97 at Sprague River Road i) SB US97 north of Klamath Falls UGB j) EB OR140 west of Westside Road k) NB OR62 near Crater Lake exit l) WB OR138 near Crater Lake exit	$6,000,000 (approx. $500,000 each) [4]	$0	ODOT	ODOT	High
I-4	Install cameras with live feed capabilities	Install at: a) Silver Lake Road MP 27 b) Dead Indian Road MP 30.6 c) Williamson River Road MP 17 d) OR140 near MP 20-24 e) OR39 near Merrill f) OR66 MP 43 g) OR62 MP 84	$280,000 (approx. $40,000 each) [4]	$28,000 (approx. $4,000 each)	ODOT	ODOT	High

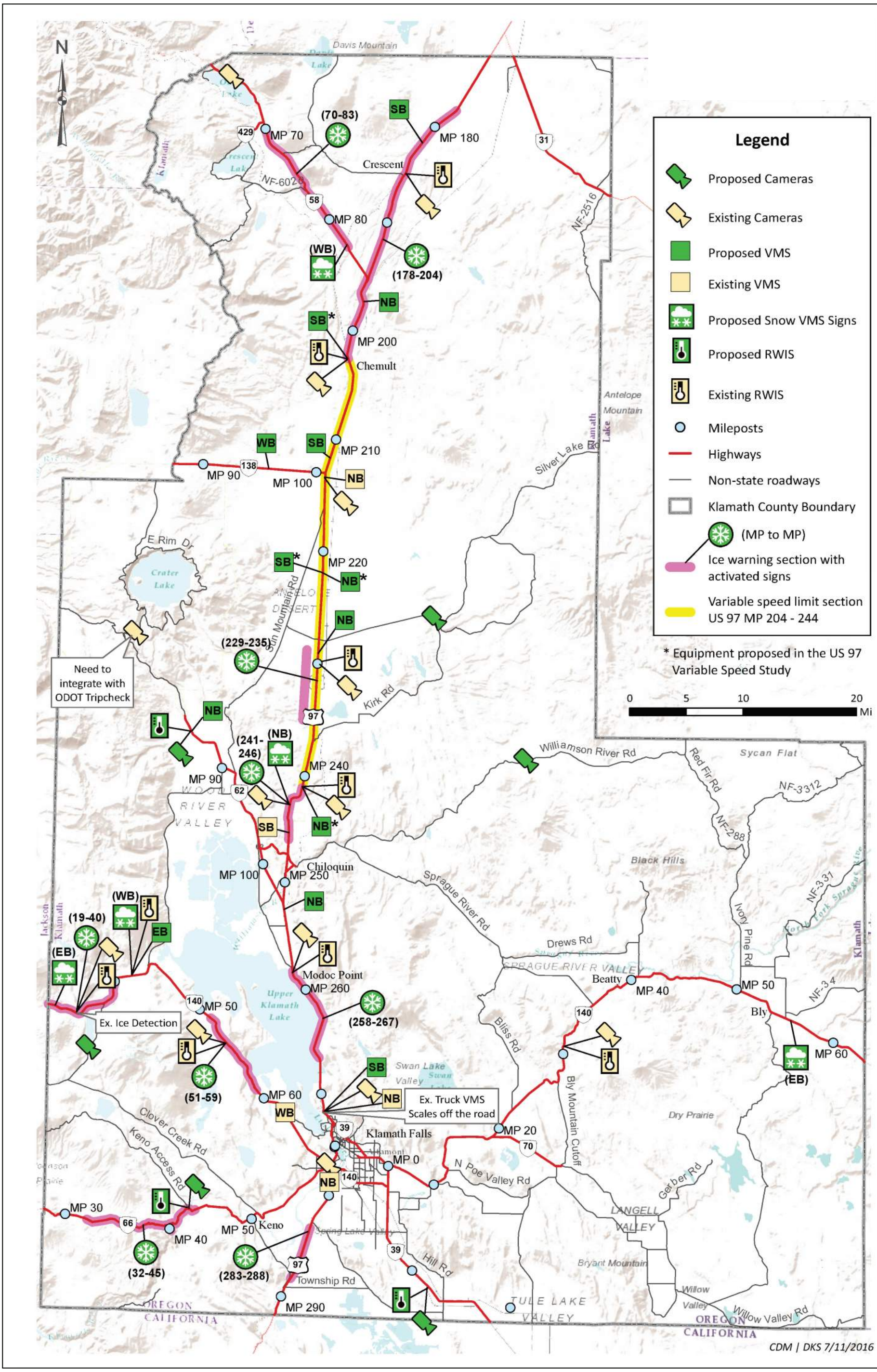
Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
I-5	Connect Crater Lake National Park camera to TripCheck and display snow zone and gas information	Connect camera on Munson Valley road at Park entrance to ODOT TripCheck System to display snow zone information and gas availability at the park.	$10,000	$1,000	ODOT, NPS	NPS	High
I-6	Implement weather responsive variable speed limits on US 97	Install between MP 204-244 and MP 143-164. (Note: ODOT plans for approximately 75% of MP 144-164 to be complete in 2021.)	$8,740,000[4]	$0	ODOT	ODOT	Medium
I-7	Create a Central data storage/sharing system	Create a central data storage system that can be shared between agencies. Data may include counts, video, speeds, travel time, etc.	$110,000	$11,000	ODOT	ODOT	Medium
I-8	Install wildlife detection system	Install at: a) US97 MP 174 b) US97 MP 190 c) US97 MP 206	$2,730,000 (approx. $910,000 each)	$0	ODOT	ODOT	Low
I-9	Install dynamic curve speed warning signs on OR66	Dynamic feedback signs can measure the speed of individual vehicles and post messages.	$140,000[4]	$0	ODOT	ODOT	Low
I-10[3]	Install Road Weather Information Systems (RWIS) with ice detection	Install at: a) OR140 MP 20-24 b) OR39 near Merrill c) OR66 MP 43 d) OR62 MP 84 e) weather station at Crater Lake	$220,000 (approx. $44,000 each)	$0	ODOT	ODOT	High
I-11[3]	Install activated ice warning signs	Install at: a) OR140 MP 19-40 b) OR140 MP 51-59 c) US97 MP 178-204 d) US97 MP 229-235 e) US97 MP 241-246 f) US97 MP 258-267 g) US97 MP 283-288 h) OR66 MP 32-45	$440,000 (approx. $49,000 each)	$0	ODOT		High

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
		i) OR58 MP 70-83					
I-12	Install automatic changeable snow zone and chain restriction signs	Install at: a) NB US97 near MP 240-243 b) WB OR140 MP 41 c) EB OR140 near MP 25-35 d) OR140 near MP 53-57 e) WB OR58 near Odell Butte	$550,000 (approx. $110,000 each)	$0)	ODOT	ODOT	High
I-13	Install sensors that automatically notify agencies and travelers when rock fall occur	Install at US97 near Upper Klamath Lake and add rockslide signs on OR140	$100,000[4]	$0	ODOT	ODOT	Medium
I-14	Variable Speed Limit Study at OR 140 near Lake of the Woods	Conduct a variable speed limit study along OR 140, the Lake of the Woods area.	$100,000[4]	$0	ODOT	ODOT	Low
I-15	Install Automated Vehicle Location (AVL) and logging capabilities (sanding, de-icing, and spraying) in maintenance and construction vehicles	Install AVL and activity logging capabilities in maintenance and construction vehicles and create an automated process for trucks to log sanding, deicing, and pesticide spray information.	$80,000	$8,000	ODOT, Klamath Falls	ODOT	High
I-16	Implement telematics technology on fleet vehicles	Telematics capabilities that can be used to track vehicle performance and vehicle maintenance.	$80,000	$8,000	ODOT, Klamath Falls	ODOT	High
I-17	Install Automated Asset Management Tool	Install for the following infrastructure: streetlights, cameras, VMS, and RWIS	$50,000	$5,000	ODOT, Klamath Falls	ODOT	Medium
I-18	Purchase software that optimizes snowplow routes and resources	During storm events or adverse weather conditions, software can help to optimize plow routes and distribution of limited resources.	$110,000	$11,000	ODOT, Klamath Falls	ODOT	Medium

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
I-19	Create 9-1-1 Dispatch Interconnect	Connect the 9-1-1 dispatch center with ODOT and OSP through a software update (no construction required). Note that the current BUS to connect such systems is set to be retired but may be joined with Portland system.	$0	$0	Klamath 9-1-1, OSP, ODOT	Klamath 9-1-1	High
I-20	Develop Traffic Incident Management (TIM) Team	Develop a TIM team for the Klamath County area that includes responders from ODOT, Fire, Tow (OTTA), Law Enforcement, County, Cities, and 911 dispatch. Establish regular meetings and communication with the TIM Team.	$660,000	$66,000	ODOT	ODOT	High
I-21	Integrate the Intterra Situational Awareness software during incident or emergency response	The software can track where each of the response agencies/vehicles is (en route, at the scene, and during clean up) and improve communication between responders.	$1,220,000	$0	Keno Fire Department, ODOT, OSP	ODOT	High
I-22	Purchase Portable Variable Message Signs (VMS).	Purchase additional portable VMS to use during events and incidents.	$50,000 (each)	$0	ODOT		High
I-23	Sharing On-Scene Photos and Video	Invest in technology that allows first responders to send and receive photos and video from an incident scene. This can currently be done, but systems should be maintained to stay current with the latest technology.	$10,000	$1,000	ODOT, OSP	ODOT	Medium
I-24	Install devices with Automated infrastructure integrity notification capabilities	Install devices that automatically notify responsible agency if infrastructure is damaged. As new infrastructure is built, this strategy should be evaluated on a case by case basis.	$50,000	$5,000	ODOT	ODOT	Low

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
I-25	Real-time transit information and notifications	Provide transit users with real-time information about next arrivals, significant delays, route changes, or other trip related information.	$90,000	$0	Basin Transit	Basin Transit	High
I-26	Automated transit vehicle on-board data tracking and logging	Install on-board devices to automatically track and log boarding's, de-boardings, use of lift, etc.	$40,000	$0	Basin Transit	Basin Transit	High
I-27	Provide automated push messages to truck drivers to alert drivers of restrictions (height, weight, length, and width) along route choices.	Such areas include: a) railroad structures on OR39 b) restricted width area on US97 near N Klamath interchange and between Algoma Road and Shady Pine Road.	$110,000	$0	ODOT Motor Carrier	ODOT	High
I-28	Invest in Real-time freight parking information	Consider the following areas: a) Chiloquin Casino b) rest area at Midland c) Pilot Travel center in Chemult	$110,000	$0	ODOT, private partnership	ODOT	High
I-29	Update Klamath County ITS Plan	Update the current ITS Plan to reflect new technologies and completed projects.	$100,000	$0	ODOT	ODOT	Medium
		Total Cost for Low Priority ITS Projects	$3,020,000	$5,000			
		Total Cost for Medium Priority ITS Projects	$9,220,000	$28,000			
		Total Cost for High Priority ITS Projects	$10,000,000	$111,000			
		Total Cost for ITS Projects	$22,240,000	$144,000			

[1]Cost estimates do not include right-of-way or environmental impacts.
[2]For planning level estimates only. Each project shall be individually scoped based on project variables.
[3]Some elements of these projects in I-10 and I-11 are identified in the Draft 2021-2024 Statewide Transportation Improvement Program (STIP).
[4]Costs revised based on ODOT comments received in Fall 2020.



Klamath County ITS Plan
Existing and Proposed ITS Equipment

Figure
4

Figure from Klamath County ITS Plan

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TRANSPORTATION SAFETY SOLUTIONS

The first goal of the TSP is to "provide a transportation system that is safe and secure for all transportation modes and for people of all abilities." Transportation safety needs were identified through Technical Memorandum #3 and the ongoing *Transportation Safety Action Plan (TSAP)* for Klamath County. These needs reflect locations identified based on crash history, geometric conditions that may be associated with crash risk, and perceived needs from public experience and near-misses. The PAC members and Project Management Team (PMT) provided input on locations throughout the County with perceived safety risks. This section summarizes proposed transportation safety solutions for County roadways.

Suggested Policy Considerations

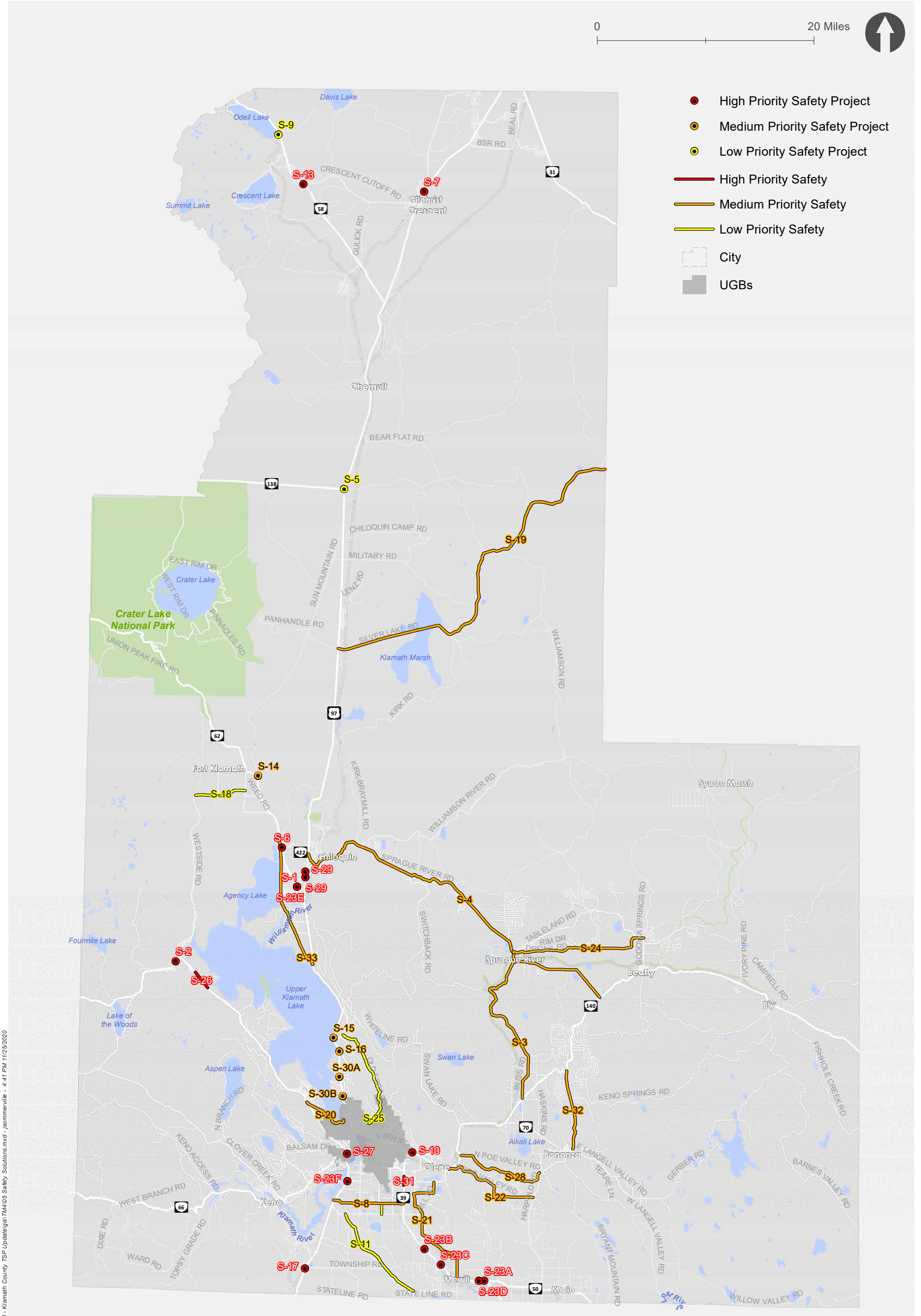
Several of the needs identified for the County reflect systemic conditions along its roadways and at its intersections. The County may consider adopting policies to require systemic treatments with the following considerations:

- ROADWAY SAFETY ELEMENTS - With new road construction and roadway maintenance projects, the County should consider the construction of shoulder and guardrails where appropriate, centerline and shoulder rumble strips, recessed or raised pavement markers, edgeline striping, and lane narrowing techniques at key locations along County arterials and collectors.
- SAFETY MONITORING - Klamath County should monitor and periodically analyze collision data and coordinate with City and State agencies as appropriate to address areas with crash rates exceeding commonly used cutoff values.
- SAFE ROUTES TO SCHOOL – Seek funding through the State's SRTS programming to fund projects that improve safety near schools and school routes and meet each program's criteria.
- HIGHER ORDER INTERSECTION SAFETY ELEMENTS - The County should implement a standard intersection safety enhancement standard for higher order intersections (collector/collector or collector/arterial). These should include, but are not limited, to elements such as advanced warning signs, reflective striping and signage, oversized stop signs, double stop signs, stop ahead pavement markers, rumble strips, and edgeline treatments.

SAFETY SOLUTIONS

Proposed solutions intended to reduce crash frequency, severity, and risk are summarized in Table 6 and illustrated in Figure 5. These locations were either supported by crash data, a review of current conditions at the site, or identified by members of the public as safety concerns. Several locations have near-, mid-, and/or long-term treatments. The locations with multiple treatments show the planning level cost and priority level associated with each treatment. In some cases, a low-cost treatment is suggested for near-term consideration, while a long-term, more expensive treatment is also suggested for consideration. The PMT and PAC will review the potential solutions and select/prioritize the treatment(s) that should be carried forward for review in the next memorandum: *Technical Memorandum #5 – Preferred and Cost-Constrained Alternatives.* The County has received funding to implement the following systemic improvements; therefore, these are not included in the project list:

- Clover Creek Road – Upgrade Curve Signing;
- Keno-Worden Road: Keno - US97 – Curve Signing and Delineation; and
- Lower Klamath Lake Road: Cross Road - Merrill Road – Centerline Rumble Strips.



*Areas within city limits (Klamath Falls, Merrill, Malin and Chiloquin) are not included in the County's TSP.

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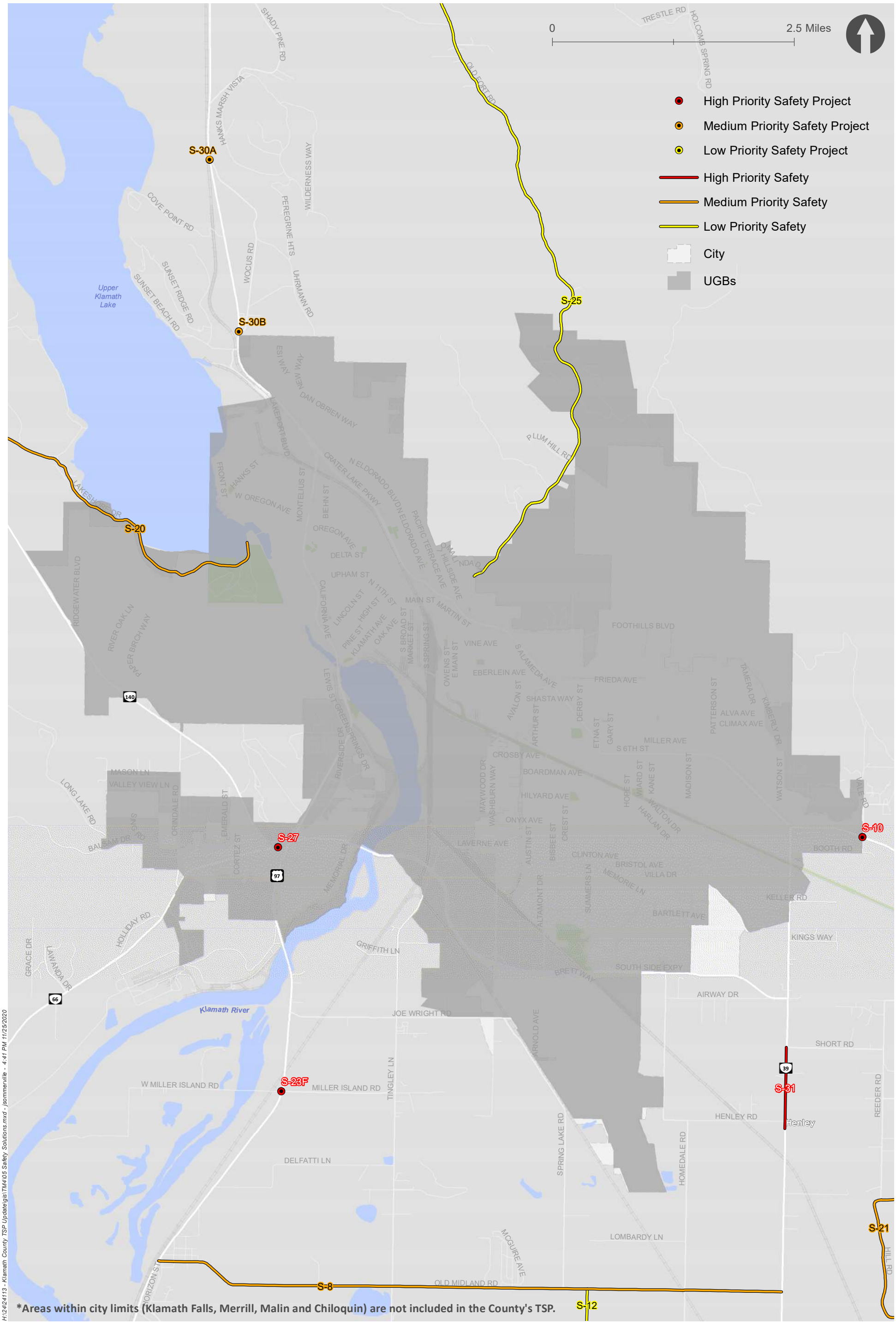
Safety Solutions
Klamath County, Oregon

Figure **6A**

KITTELSON & ASSOCIATES

Data Source: ODOT (Statewide Freight Routes)



*Areas within city limits (Klamath Falls, Merrill, Malin and Chiloquin) are not included in the County's TSP.

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Safety Solutions
Klamath County, Oregon

Figure **6B**

KITTELSON & ASSOCIATES

Data Source: ODOT (Statewide Freight Routes)

Table 6. Proposed Safety Solutions

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
S-1	OR62& Chiloquin Road Intersection Safety Improvement	Near-Term: Install systemic signage and striping enhancements to increase intersection visibility, including stop ahead signs, larger signs, additional stop signs, flashing warning signs, side-street center islands, and/or other intersection warning or regulatory signs. ODOT has planned implementation of these with ARTS funding. Medium-Term: Review sight distance to the north to confirm whether sag curve exists. Long-Term: Complete intersection control improvement to reduce angle and turning movement crashes and to slow speeds.	Funded $1,000 $3,000,000	$0 $0 $300,000	ODOT	ODOT	High
S-2	OR140 & Westside Rd Intersection Safety Improvement	Install systemic signage and striping enhancements to increase intersection visibility, including stop ahead signs, larger signs, additional stop signs, flashing warning signs, side-street center islands, and/or other intersection warning or regulatory signs.	$40,000 to $80,000	$0	ODOT	ODOT	High
S-3	Bliss Road Corridor Safety Improvement: OR140 to Sprague River Road	Widen roadway shoulders to at least 6 feet [cost for shoulders included in B-6]; Install shoulder rumble strips; Install speed feedback signs throughout key locations within corridor, including one at MP 13; Increase speed enforcement and outreach/education throughout corridor. Evaluate opportunities to improve visibility at intersections, driveways, and curves by increasing reflectivity. Install chevrons and delineators at curves.	$16,730,00 (shoulder widening from solution B-6) $80,250 (all other S-3 treatments)	$80,000	N/A	County	Medium
S-4	Sprague River Road Corridor	Widen roadway shoulders to at least 6 feet [cost for shoulders included in B-7]; Install	$26,570,000 (shoulder	$183,000	N/A	County	Medium

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
	Safety Improvement: OR140 to US97	shoulder rumble strips; Install speed feedback signs throughout key locations within corridor, including one at MP 13; Increase speed enforcement and outreach/education throughout corridor. Evaluate opportunities to improve visibility at intersections, driveways, and curves by increasing reflectivity. Install chevrons and delineators at curves.	widening from solution B-7) $183,000 (all other S-4 treatments)				
S-5	US97/OR138 Intersection Safety Improvement	Define access point(s) along eastern edge of intersection. Property is currently open which may be associated with unclear driver expectations	$100,000	$0	ODOT	ODOT	Low
S-6	OR62/OR422 Intersection Safety Improvement	Near-Term: Install systemic signage and striping enhancements to increase intersection visibility, including stop ahead signs, larger signs, additional stop signs, flashing warning signs, side-street center islands, and/or other intersection warning or regulatory signs. Evaluate intersection sight distance to determine if Crater Lake sign should be relocated to improve sight distance for westbound vehicles looking north. Medium-Term/Long-Term: Install left-turn lanes on all approaches OR Install roundabout. Note: roundabouts are more costly than constructing turn lanes.	Near-Term: $40,000 to $80,000 Long-Term (Roundabout): $1,500,000	$0	ODOT	ODOT	High
S-7	Mississippi Drive/US97 Intersection Safety Improvement	Install southbound left-turn lane; Consider gateway feature and/or cross-section changes, as well as extending the existing multi-use path along US 97 to Mississippi Drive to "urbanize" the corridor in the Gilchrist area. Features may include curb, raised median, landscaping, illumination, etc.	$300,000 for turn lane	$0	ODOT	ODOT	High
S-8	Old Midland Road	Install chevrons and delineators at curves between US 97 and OR 39.	$6,000	$6,000	-	County	Medium

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
S-9	East Odell Road/OR58 Intersection Safety Improvement	Evaluate curve for appropriate curve signage and delineation including chevrons, post delineators, and curve warning signs. Increase intersection awareness with signing and pavement markers.	$10,000	$0	ODOT	ODOT	Low
S-10	Vale Road & OR140 Intersection Safety Improvement	Increase sight distance for northbound vehicles to the west by removing tree. Increase intersection awareness with larger stop signs and pavement markings.	$10,000	$0	ODOT	ODOT	High
S-11	Lower Klamath Road between Cross Rd and Township Rd	Widen roadway shoulders to at least 6 feet; Install shoulder rumble strips; Install speed feedback signs; Increase speed enforcement and outreach/education throughout corridor.	$6,920,000	$6,920,000	N/A	County	Low
S-12	Spring Lake Road Corridor Safety Improvement: Old Midland Road to Cross Road	Install speed feedback signs and increase speed enforcement	$50,000	$50,000	N/A	County	Low
S-13	Crescent Cutoff Road/OR58 Intersection Safety Improvement	Near-Term: Install systemic signage and striping enhancements to increase intersection visibility, including stop ahead signs, larger signs, additional stop signs, flashing warning signs, side-street center islands, and/or other intersection warning or regulatory signs. Medium-Term: Conduct a corridor safety study for Crescent Cutoff Road to determine site-specific safety issues along the roadway.	Near-Term: $40,000 to $80,000 Medium-Term: $50,000	$0	ODOT	ODOT	High
S-14	Sun Mountain Road/OR62 Intersection	Install systemic signage and striping enhancements to increase intersection visibility, including stop ahead signs, larger signs, additional stop signs, flashing warning	$40,000 to $80,000	$0	ODOT	ODOT	Medium

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
	Safety Improvement	signs, side-street center islands, and/or other intersection warning or regulatory signs.					
S-15	US97/Algoma Rd Intersection Safety Improvement	Install flashing intersection ahead warning sign on US97, south of the southern intersection. Consider one that detects vehicles waiting on the side street approach.	$50,000	$0	ODOT	ODOT	Medium
S-16	US97/Shady Pine Road Intersection Safety Improvement	Realign northern intersection to reduce skew. Evaluate opportunities to improve sight distance at southern intersection.	$100,000	$0	ODOT	ODOT	Medium
S-17	US97/Keno Worden Rd Intersection Safety Improvement	Increase intersection awareness with signing and striping. Add northbound left-turn lane and eastbound right-turn acceleration lane to support freight route.	$340,000	$0	ODOT	ODOT	High
S-18	Seven Mile Road between Westside Road and Weed Road	Install recommended Chevron signs on horizontal curves; Install centerline rumble strips. Install speed feedback signs and increase speed enforcement1	$50,000	$50,000	N/A	County	Low
S-19	Silver Lake Road Corridor Safety Improvement	Install chevrons and delineators on curves from US97 to County Limits; Install speed feedback signs and increase speed enforcement	$210,000	$21,000	ODOT	ODOT	Medium
S-20	Lakeshore Drive Corridor Safety Improvement	Install chevrons and delineators on curves from OR140 to Klamath Falls UGB; Target winter maintenance at curves on hills where crashes occurred in snow/ice	$110,000	$110,000	N/A	County	Medium
S-21	Hill Road Corridor Safety Improvement	Install chevrons and delineators on curves from Crystal Springs Road to Merrill City Limits	$110,000	$11,000	ODOT	ODOT	Medium
S-22	S Poe Valley Rd Corridor Safety Improvement	Install chevrons and delineators on curves from Harpold Road to Crystal Springs Road	$110,000	$11,000	ODOT	ODOT	Medium
S-23	Intersection Systemic Sign Upgrades	Install systemic signage and striping enhancements to increase intersection visibility, including stop ahead signs, larger	$240,000 to $480,000 (approx.	$24,000 (approx. $4,000 each) to	ODOT	ODOT	High

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
		signs, additional stop signs, flashing warning signs, side-street center islands, and/or other intersection warning or regulatory signs. Part of an ODOT STIP Project including locations at: a) OR39/ Malin Highway b) OR39/ Chin Road c) OR39/ Merrill Pit Road d) OR39/ Malone Road e) OR62/ Chiloquin Road f) US97/ Sawmill Road	$40,000 to $80,000 each)	$48,000 (approx. $8,000 each)			
S-24	Drews Road Safety Improvements	Install chevrons and/or delineators along horizontal curves to address public concern with roadway safety.	$9,000	$9,000	-	County	Medium
S-25	Old Fort Road Safety Improvement	Install centerline rumble strips from Loma Linda Drive to the pavement end to reduce risk of crossing crashes.	$9,000	$9,000	-	County	Low
S-26	OR 140 Corridor Safety Improvement	Improve clear zone on OR140 from Mile Post 46.25 to 48.25	$520,000	$52,000	ODOT	ODOT	High
S-27	OR66 & Delap Rd Signal relocation	Part of Phase 1 of the Greensprings IAMP	$1,220,000	$122,000	ODOT	ODOT	High
S-28	North Poe Valley Road Safety Improvement	Install chevrons and/or delineators along horizontal curves with curves to address public concern with roadway safety.	$15,000	$15,000	-	County	Medium
S-29	S Chiloquin Road Curve Safety Improvement	Install guardrail on two curves just west of US97. Install chevrons and delineators on curves.	$93,000	$93,000		County	High
S-30	US97/Wocus Road Intersection Safety Improvement and Roadway Realignment	Convert both existing intersections to right-in, right-out only; Construct new roadway connection at Cove Point Road	$1,600,000	$0	ODOT	ODOT	Medium

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
S-31	Henley School Area Safety Improvements	Increase school zone awareness with flashing signs, updated pavement legends and pavement markings. Conduct a school circulation study including intersection evaluations at the school access points and OR39/Henley Road.	$100,000	$17,000	ODOT, Klamath County School District	ODOT	High
S-32	Bly Mountain Cut-off Road	Install chevrons and delineators at curves between OR 140 and McCartie Lane.	$14,000	$14,000	-	County	Medium
S-33	Modoc Point Road	Install chevrons and delineators at curves between OR 62 and US 97.	$8,000	$8,000	-	County	Medium
		Total Cost for Low Priority Safety Projects	$7,139,000	$7,029,000			
		Total Cost for Medium Priority Safety Projects	$2,645,000 to $2,685,000	$468,000			
		Total Cost for High Priority Safety Projects	$2,944,000 to $7,813,000	$308,000 to $632,000			
		Total Cost for Safety Projects	**$12,728,000 to $17,637,000**	**$7,805,000 to $8,129,000**			

[1]Cost estimates do not include right-of-way or environmental impacts.
[2]For planning level estimates only. Each project shall be individually scoped based on project variables.
[#]Cost estimate only includes speed feedback signs as location for curve improvements is unknown

Several projects in Table 6 indicate "systemic signage and striping enhancements." The Federal Highway Administration's (FHWA) *Low-Cost Safety Enhancements for Stop -Controlled and Signalized Intersections* report identifies treatment options that, when used together, help increase visibility and awareness of an intersection. Figure 6 shows an example of treatments that may be used together to increase visibility at stop-controlled intersections like those in rural Klamath County. These treatments may be supplemented with stop ahead pavement markings, rumble strips, oversized stop signs, and flashing beacons when appropriate.

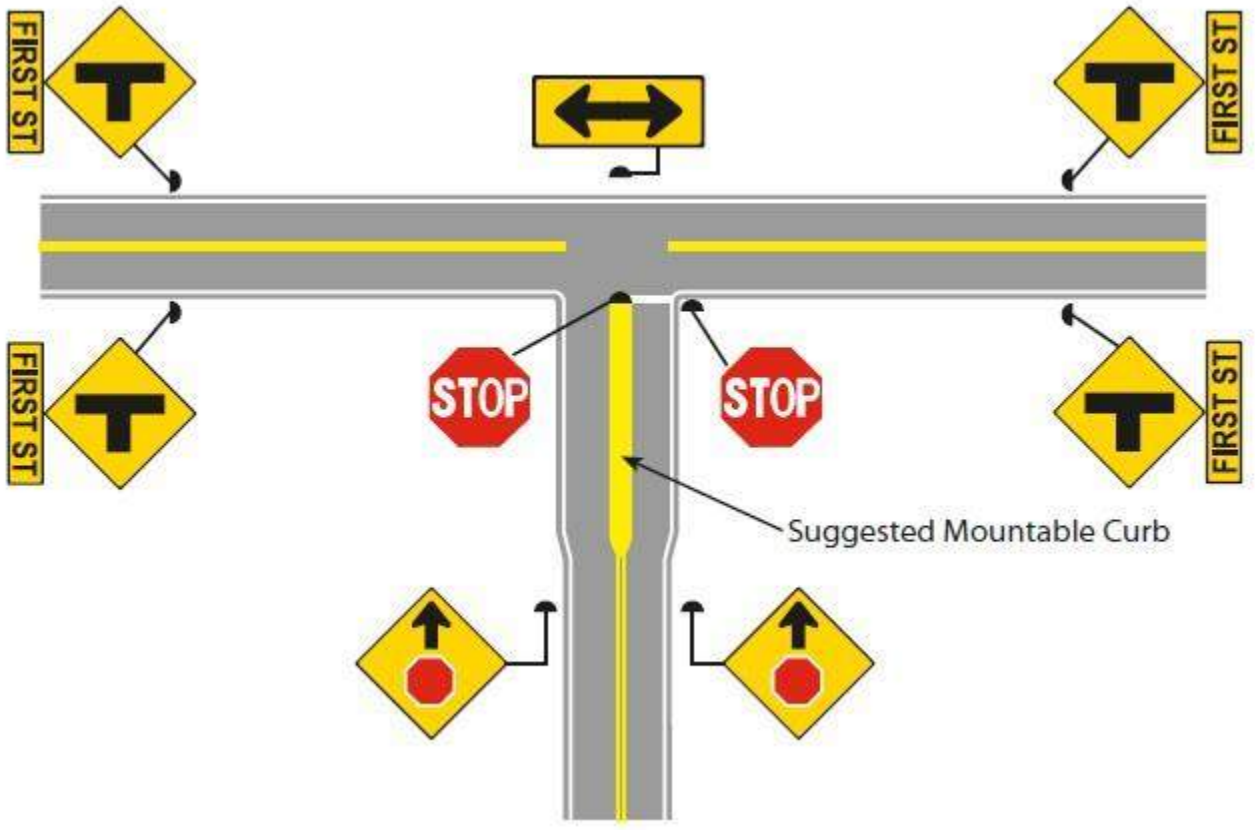


Figure 6. Example of Low-Cost Countermeasures for Stop-Controlled Intersections (FHWA)

MULTIMODAL SYSTEM SOLUTIONS

The draft solutions in this section address the existing gaps and future bicycle, pedestrian, and transit needs identified in Klamath County from the needs analysis conducted in Technical Memorandum #3.

PEDESTRIAN AND BICYCLE INFRASTRUCTURE

This section describes the draft pedestrian and bicycle solutions for facilities in the study area. In rural Klamath County, people walking and biking generally share the same facilities. Unlike urbanized areas – where people biking use designated lanes or wide shoulders, and people walking use sidewalks – rural facilities for non-motorized travel usually consist of wide shoulders and/or shared-use paths. As in most rural areas, the needs of people walking are similar to those of people biking. Facilities that are deficient

for one user are usually deficient for the other, thus similar recommended improvements can benefit both users.

A network of shoulders and shared-used paths, as well as sidewalks and bike lanes in more urbanized areas, can create a core walking and biking network in rural Klamath County and connect to urban unincorporated pockets of higher density development. This infrastructure allows people to reach jobs, shopping, and transit, and to use longer routes for recreation. The following recommended policies, programs, and projects apply to both the bicycle and pedestrian system.

Suggested Policy and Program Considerations

Suggested general policy and program considerations for improving bicycle and pedestrian access and circulation in rural Klamath County are provided below.

- ROADWAY STANDARDS - Klamath County should adopt the proposed roadway standards in the updated TSP, requiring bicycle lanes or shoulders on all new arterial or collector roadways or as part of all major reconstruction projects on arterials or collectors as conditions permit.
  - While providing shoulders consistent with County standards on all arterial and collector roads would contribute to an ideal bicycle/pedestrian environment, this may not be feasible due to constraints such as right-of-way, built or natural environments, high costs (as compared to similar facilities in other parts of the County), or other factors. The inclusion of amenities for people walking or biking on existing and new roads will not only expand the non-motorized transportation network but will also provide more travel options. The County's standards should identify a process for approving alternate options, such as shared-use paths, when these are appropriate in place of a shoulder, bike lane, or sidewalk. The County may also identify thresholds and characteristics where installing "Bikes on Roadway" signage along roadways that do not have wide shoulders or designated bicycle lanes would be appropriate.
  - Klamath County should consider designating a priority bicycle network of roadways with the greatest priority for multimodal improvements. The majority of existing roadways in the County lack paved shoulders. Widening all County roads to provide appropriate shoulders is costly and time-intensive. A priority bicycle network would assist the County in prioritizing improvements along key routes. Many of the multimodal system solutions proposed in Table 8 for the TSP largely represent the draft priority bicycle network.
  - The County should consider placing additional priority for widening paved shoulders at key curves, hill climbs, across bridges, and at other locations where people biking (sharing the road) may have increased risk from limited visibility (curves) or greater speed differentials (hill climbs).
  - The County should work closely with ODOT to improve facilities for people walking or biking on the State highway system. While bicycle and pedestrian facilities are fragmented on State highways in Klamath County, incremental improvements such as filling in gaps will enhance facilities.
- MONITORING SYSTEM - Klamath County should work to improve the bicycle and pedestrian system environment by implementing appropriate safety and operational improvements, as determined through ongoing data analysis.
  - The County should develop a process for collecting and maintaining bicycle and pedestrian volume and crash data and evaluate contributing causes to bicycle and pedestrian crashes. Keeping accurate record of this data is a first step toward implementing safety measures.

Evaluating the causes of bicycle and pedestrian crashes will enable the County to identify and prioritize road or intersection improvements that could decrease risk for potential safety issues such as limited sight distance or the lack of clear right-of-way.

- The County should refer to the ODOT Blueprint for Urban Design to assist with cross-section design and crossing expectations, particularly in unincorporated communities.

- SAFETY PROGRAM - Klamath County should coordinate with other agencies to encourage development and implementation of a countywide bicycle/pedestrian safety program.
  - Provide adequate training to Klamath County employees, particularly Sheriff's Department staff, regarding bicycle/pedestrian safety and enforcement issues.
  - Encourage and support efforts by County schools or other organizations to develop and use a bicycle/pedestrian safety curriculum for students, including coordinating with SRTS programs.
  - Consider installing signage along roadways where bicycle touring or other significant bicycling activity is expected that advises travelers about the "rules of the road" for motorists and non-motorists.
- MAINTENANCE - Klamath County should provide routine maintenance to ensure the long-term viability of the bicycle and pedestrian transportation system.
  - Establish a maintenance schedule and budget for roads with wide shoulders, designated bicycle lanes or facilities with higher bicycle/pedestrian traffic.

    Ongoing maintenance is important to maximize the investment in bicycle and pedestrian facilities. Maintenance should provide for periodic removal of debris including small branches and other roadside debris that could create safety hazards for a bicyclist or pedestrian. This also includes regular pruning of trees and shrubbery extending onto the roadway. Cracks and potholes impede safe non-motorized travel and should also be remedied promptly. Explore opportunities for coordination and cooperation with State and Federal agencies in examining innovative means of providing or funding pathways, trails, and equestrian facilities.
- RAIL TO TRAILS - Explore opportunities for development of non-motorized transportation facilities in the railroad right-of-way, or in abandoned railroad rights-of-way as these become available.
- INTERSECTION SAFETY - The County could require that all intersections – signalized, two-way stop-controlled, all-way stop-controlled, roundabouts, etc. –have adequate sight distance for pedestrians and bicyclists looking to cross roadways. Appropriate sight distance should be calculated according to AASHTO's *A Policy on Geometric Design of Highways and Streets*. Enhanced crossings at major intersections should be considered where appropriate (i.e. high pedestrian activity, pedestrian/bicycle related crash history).
- PEDESTRIAN AND BICYCLE (NON-VEHICULAR) ACCESS AND CIRCULATION – The County should consider improving existing design standards requiring new development to provide safe and convenient on-site access and circulation for pedestrians and bicyclists, as well as connections to adjacent sites where feasible.

PEDESTRIAN SOLUTIONS

Pedestrian facilities throughout the County are needed for recreational use and active transportation connections within and between communities.

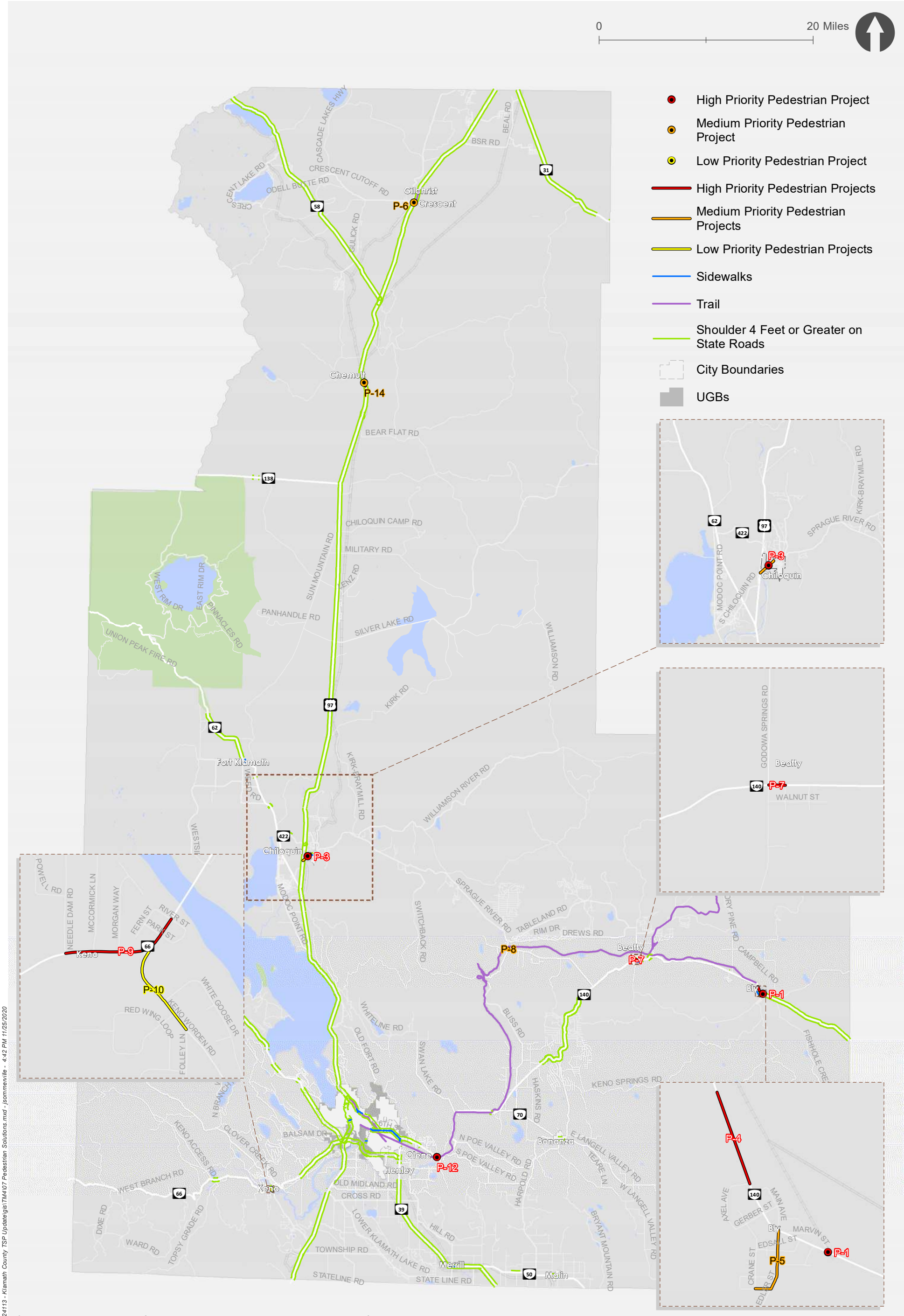
As identified in Technical Memorandum #3, there are several site-specific pedestrian needs throughout the County. Table 7 and Figure 7 identify proposed pedestrian solutions. Additional information on select projects is provided following Figure 7.

Table 7. Proposed Pedestrian Solutions

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
P-1	Enhanced crossing on OR140 at OC&E Trail – Bly	Near-Term: Install signage and striping enhancements to increase intersection visibility, including larger signs, crossing markings, additional trail ahead signs, and/or other intersection warning or regulatory signs. Medium-Term/Long-Term: Install an enhanced crossing.	$80,000	$0	ODOT	ODOT	High
P-2	Construct shared-use path on Chiloquin Hwy	Between US97 and OR422	$4,370,000	$437,000	Klamath Tribes	Klamath Tribes	Medium
P-3	Install mid-block crossing on Chiloquin Hwy	Install crossing between the Tribal Administration Building and the Wellness Center	$710,000	$71,000	Klamath Tribe	Klamath Tribes	High
P-4	Resurface shared-use path on OR140 in Bly	Resurface path from Fire Station to Edsall Street	$330,000	$0	ODOT	ODOT	High
P-5	Construct shared-use path from OR140 to Community School in Bly	Construct path on westside of the CR504 and Metler Street	$450,000	$45,000	ODOT	ODOT	Medium
P-7	Construct sidewalk on southside of OR140 in Beatty	Construct sidewalk on southside of OR140 between Yellow Jacket Springs Road and Hutchinson Road	$40,000	$0	ODOT	ODOT	High
P-8	Construct sidewalk in Sprague River	Construct sidewalk on both sides of Sprague River Road between Main Street (N) and Main Street (S)	$170,000	$170,000	N/A	County	Medium

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
P-9	Construct sidewalk on OR66 in Keno	Construct sidewalk on both sides of OR66 between Needle Dam Road and River Street	$460,000	$0	ODOT	ODOT	High
P-10	Construct sidewalk on Keno Worden Road	Construct sidewalk on both sides of Keno Worden Road between OR66 and Folley Lane	$370,000	$370,000	N/A	County	Low
P-11	Construct sidewalk on US97 in Chemult	Construct sidewalk on the west side of US97 between Fire Station and 900 feet south of 1st Street	$305,000	$0	ODOT	ODOT	High
P-12	Enhanced crossing on OR140 at OC&E Trail - Olene	Near-Term: Install signage and striping enhancements to increase intersection visibility, including larger signs, crossing markings, additional trail ahead signs, and/or other intersection warning or regulatory signs. Medium-Term/Long-Term: Install an enhanced crossing.	$80,000	$0	ODOT	ODOT	High
P-13	ADA ramp installation program	Program to install ADA ramps where they are missing or improve ramps where they are in poor condition	$200,000 ($10,000 annually)	$200,000 ($10,000 annually)	-	County	High
P-6	Enhanced crossing on US 97 in Crescent	Construct an enhanced pedestrian crossing in the vicinity of Crescent Road to increase crossing safety, visibility, and comfort for people walking.	$80,000	$0	ODOT	ODOT	Medium
P-14	Enhanced crossing on US 97 in Chemult	Construct an enhanced pedestrian crossing in the vicinity of 1st Street to increase crossing safety, visibility, and comfort for people walking.	$80,000	$0	ODOT	ODOT	Medium
		Total Cost for Low Priority Pedestrian Projects	$370,000	$370,000			
		Total Cost for Medium Priority Pedestrian Projects	$5,150,000	$652,000			
		Total Cost for High Priority Pedestrian Projects	$2,205,000	$271,000			
		Total Cost for Pedestrian Projects	**$7,725,000**	**$1,293,000**			

[1]Cost estimates do not include right-of-way or environmental impacts.
[2]For planning-level estimates only. Each project shall be individually scoped based on project variables.



*Areas within city limits (Klamath Falls, Merrill, Malin and Chiloquin) are not included in the County's TSP. Existing Facilities within the Klamath Falls UGB were not verified.

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Pedestrian Solutions
Klamath County, Oregon

Figure **7**

KITTELSON & ASSOCIATES

Enhanced OC&E Trail Crossings (P-1 & P-12)

The OC&E Woods Line State Trail is a historic shared-use bicycle and pedestrian facility in Klamath County and has both paved and unpaved sections. The Trail is a converted railroad corridor that runs from Klamath Falls through Olene, Dairy, Sprague River, Beatty, and Bly before terminating at Sycan Marsh. *Technical Memorandum #3* identified crossing improvement needs for the OC&E Trail, particularly where the trail crosses OR140 east of Klamath Falls. Two crossings in particular – Dairy and Bly – have a crossing sign but are otherwise unmarked. These locations are identified as multimodal gaps due to the highway speeds and volumes and minimal enhancements at the Trail crossings.

There are two improvement options identified in Table 7 to improve the crossings:

- Near term – Signing and striping improvements to improve the visibility at the crossings. This may include, but is not limited to, oversized signs (including trail ahead signs) and marked crossings.
- Medium term/Long term – install an enhanced crossing. An engineering study is necessary to determine the appropriate enhancement type and location.

Bly Shared-Use Path (P-5)

This project includes constructing a shared-use path from OR140 to the Community School in Bly by means of CR 504 and Metler Street. There are currently no sidewalks, bike lanes, or shoulders near the school to provide a dedicated area for students to walk to school. The identified route would connect to the existing sidewalks on OR140. There is also a marked crossing on the westside of the OR140/CR504 intersection. This project coincides with ODOT's "Safe Routes to School" initiative. "Safe Routes to School refers to efforts that improve, educate, or encourage children safely walking (by foot or mobility device) or biking to school"[2].

ADA Ramp Installation Program (P-13)

The American with Disabilities Act (ADA), established in 1990, prohibits the discrimination of individuals with disabilities. There has been a large push in the transportation field over the past 30 years to create a transportation system that provides equity to all users. ODOT, counties, and cities throughout the State are dedicated to improving pedestrian and walking facilities for individuals with disabilities, including the enhancement and replacement on curb ramps that do not meet ADA compliance. This program (P-13) is intended to provide yearly funds to upgrade curb ramps in the County that do not meet standards and to maintain curb ramps that do. There are several locations in unincorporated communities throughout the county with existing curb ramps including Beatty, Bly, Henley, and Crescent. A first step of the program will involve reviewing existing curb ramps to determine ADA compliance and identifying those that do not comply. In addition to upgrading existing curb ramps, ADA compliant curb ramps should be installed wherever new sidewalk is constructed.

2 https://www.oregon.gov/odot/Programs/Pages/SRTS.aspx#:~:text=%E2%80%9CSafe%20Routes%20to%20School%E2%80%9D%20refers,infrastructure%20grants%20and%20technical%20assistance.

BICYCLE SOLUTIONS

Like the pedestrian system, there are a lack of connected bicycle facilities throughout the County. The existing system includes a limited network of paved shoulders on County and State facilities. According to the updated County roadway standards, all rural arterials and collectors should include either a bicycle lane or minimum 6-foot wide shoulders.

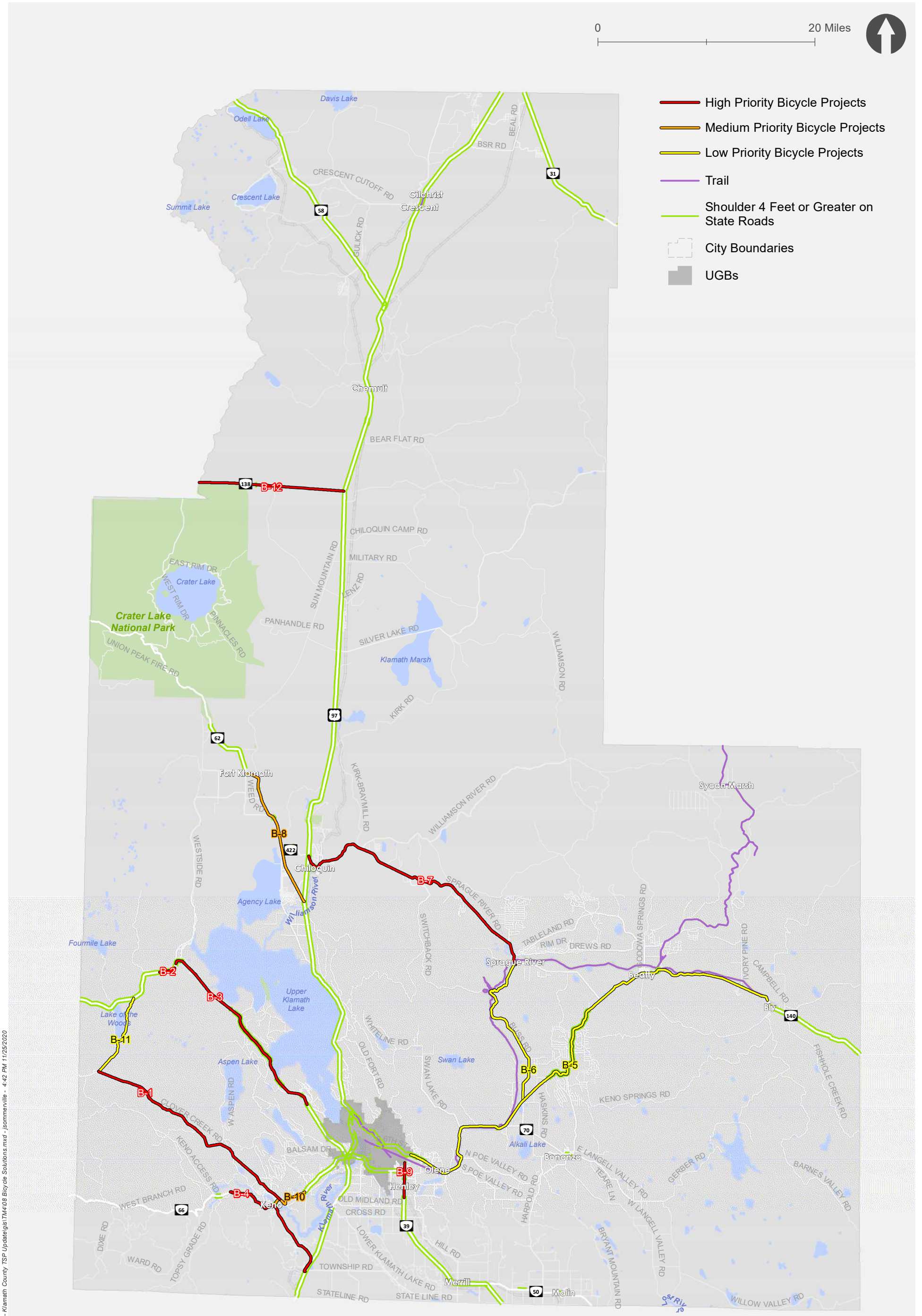
Table 8 summarizes the proposed bicycle solutions that were identified in the existing TSP and through the TSP update along roadway segments. The table includes the location, description, priority, and planning-level cost estimate of the solutions. Figure 8 illustrates the location of the solutions in the County and illustrates the location of existing shoulders along select State Highways and County Roadways to show how the bicycle solutions connect with the existing network. While County roadway standards would require shoulders on all new or reconstructed arterials or collectors, the intent of this network and project list is to develop a priority bicycle system of roads where investment into bicycle infrastructure could be focused to create a complete, connected network. The solutions are intended to be flexible and primarily used to identify the locations where dedicated facilities are needed. The County or ODOT will determine the ideal facility type (such as shoulder, bike lane, separated bike lane, shared-use path, etc.) during project design.

Table 8. Proposed Bicycle Solutions

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
B-1	Widen Shoulders on Clover Creek Road	Widen shoulders where they are less than 6 feet on Clover Creek Road between OR66 and Dead Indian Road	$21,470,000	$21,470,000	N/A	County	High
B-2	Widen Shoulders on OR140 west of Westside Road	Widen shoulders where they are less than 6 feet on OR140 between Greylock Way and FR 3610	$1,770,000	$0	ODOT	ODOT	High
B-3	Widen Shoulders on OR140 east of Westside Road	Widen shoulders where they are less than 6 feet on OR140 between Westside Road and Lakeshore Drive	$9,840,000	$0	ODOT	ODOT	High
B-4	Widen Shoulders on OR66 and Keno Worden Road	Widen shoulders where they are less than 6 feet on OR66 and Keno Worden Road between Bill Scholter Sportsman Park and US97	$12,990,000	$0	ODOT	ODOT	High
B-5	Widen Shoulders on OR140 east of Klamath Falls UGB	Widen shoulders where they are less than 6 feet on OR140 between Klamath Falls UGB and Bly	$36,450,000	$0	ODOT	ODOT	Low
B-6	Widen Shoulders on Bliss Road	Widen shoulders where they are less than 6 feet on Bliss Road between Sprague River Road and OR140	$16,730,000	$16,730,000	N/A	County	Low
B-7	Widen Shoulders on Sprague River Road	Widen shoulders where they are less than 6 feet on Sprague River Road between Bliss Road and US97	$26,570,000	$26,570,000	N/A	County	high

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
B-8	Widen Shoulders on OR62	Widen shoulders where they are less than 6 feet on OR62 between US97 and Fort Klamath	$13,780,000	$0	ODOT	ODOT	Medium
B-9	Widen Shoulders on OR39	Near-Term: Widen shoulders where they are less than 6 feet on OR39 Klamath Falls UGB and Roberta Drive Medium-Term: Install dedicated facility such as bike lanes, buffered bike lanes, or shared-use path.	Near-Term: $3,350,000 Medium-Term: $5,000,000 (Buffered Bike Lane Estimate)	$0	ODOT	ODOT	High
B-10	Widen Shoulders on OR66 and Keno Worden Road	Widen shoulders where they are less than 6 feet on OR66 between Kern Swamp Road and River Road	$3,740,000	$0	ODOT	ODOT	Medium
B-11	Widen Shoulders on Dead Indian Road	Widen shoulders where they are less than 6 feet on Dead Indian Road between Clover Creek Road and OR140	$8,460,000	$8,460,000	N/A	County	Low
B-12	Widen Shoulders on OR138	Widen shoulders on OR138 (Adventure Cycling Route) from US97 to County limit where paved shoulder width is less than 6 feet.	$10,410,000	$0	ODOT	ODOT	High
		Total Cost for Low Priority Bicycle Projects	$61,640,000	$25,190,000			
		Total Cost for Medium Priority Bicycle Projects	$17,520,000	$0			
		Total Cost for High Priority Bicycle Projects	$86,400,000 to $88,050,000	$48,040,000			
		Total Cost for Bicycle Projects	**$165,560,000 to $167,210,000**	**$73,230,000**			

[1]Cost estimates do not include right-of-way or environmental impacts.
[2]For planning-level estimates only. Each project shall be individually scoped based on project variables.



*Areas within city limits (Klamath Falls, Merrill, Malin and Chiloquin) are not included in the County's TSP. Existing Facilities within the Klamath Falls UGB were not verified.

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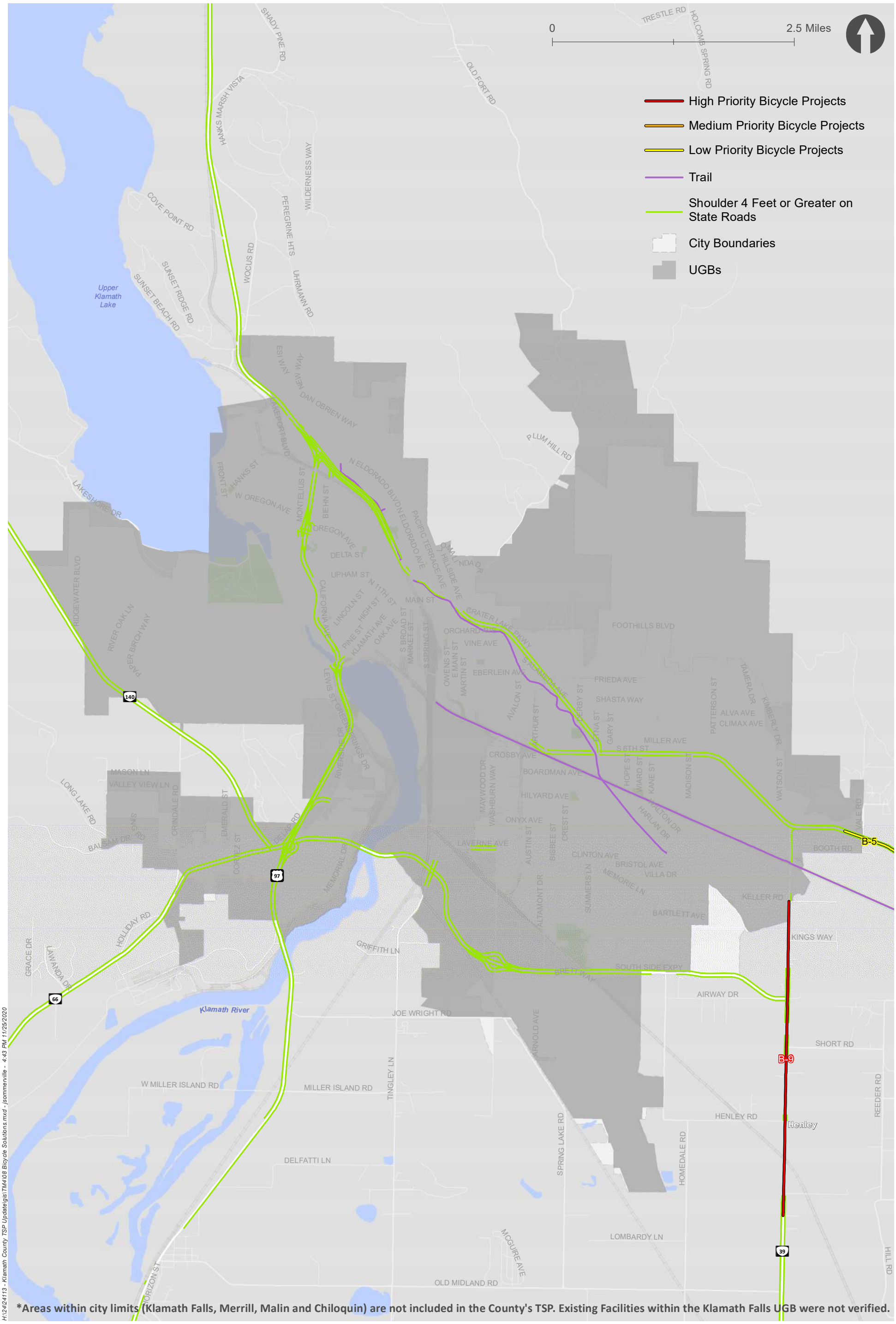
Bicycle Solutions
Klamath County, Oregon

Figure **8A**

KITTELSON & ASSOCIATES

Data Source: ODOT (Statewide Freight Routes)



*Areas within city limits (Klamath Falls, Merrill, Malin and Chiloquin) are not included in the County's TSP. Existing Facilities within the Klamath Falls UGB were not verified.

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Bicycle Solutions
Klamath County, Oregon

Figure **8B**

KITTELSON & ASSOCIATES

Data Source: ODOT (Statewide Freight Routes)

PUBLIC TRANSPORTATION SERVICES

This section summarizes the solutions considered within Klamath County to address existing and future needs in the transit system. Public transit can provide important connections to destinations for people that cannot afford or do not choose to drive or bike and can provide an additional option for all transportation system users. Public transit complements walking, bicycling, or driving trips: users typically need to use another mode for the "first and last mile" of their trip, the connections between their origin/transit stop and destination/transit stop. Users may walk to and from transit stops and their homes, shopping or work places; people may drive to park-and-ride locations to access a bus; or people may bring their bikes on transit vehicles and ride their bicycle from a transit stop to their final destination.

There are several transit agencies that operate in Klamath County as either intercounty/intercity routes or regional routes connecting Klamath County to other counties such as Deschutes County and Jackson County. The four transit agencies are listed below and described in further detail in *Technical Memorandum #3:*

- Basin Transit – includes fixed route services in Klamath Falls and a dial-a -ride service within the UGB
- Quail Trail Public Transit (operated by Klamath Tribes) – provides fixed routes between Chiloquin and other Cities/Communities such as Klamath Falls, Sprague River, Beatty, and Bonanza
- Amtrak Thruway (operated by Pacific Crest Bus lines)– provides service between Chemult and Deschutes County, as a connection to the Amtrak train station
- Amtrak Rail – provides passenger rail service and has two train stations in Klamath County: Chemult and Klamath Falls
- SouthWest POINT – (operated under contract by ODOT) provides intercity bus service west of Klamath Falls (identified as "Klamath Falls – West, just outside the UGB) and Klamath Falls and connects this area to Ashland and Medford

PUBLIC TRANSPORTATION SOLUTIONS

Table 9 summarizes the draft public transportation solutions that are identified through the TSP update. The table includes the location, description, priority, and planning-level cost estimate of each solution. In addition to these solutions, the County may consider adopting additional policy language to prioritize transit and improve coordination among different agencies within the County. Transit funding is expected to be provided by the transit agencies – therefore the County contribution to transit solutions is notably zero for all projects and programs. For additional transit needs and projects specific to Basin Transit, see the *2013 Basin Transit Service Development Plan*.

Suggested Policy and Program Considerations

- FUNDING - Establishment an additional[3] sustainable funding source for the operation of public transportation in the county.

[3] Basin Transit District has an existing, tax-based transit district

- CONNECTIVITIY - Improve intercity connections between Klamath County unincorporated communities and the Klamath Falls Urban Area.
  - Investigate opportunities for the planning and funding of new intercity services.
  - Investigate opportunities for better schedule coordination with private transit service providers.
- MAINTENANCE - Provide for the maintenance and enhancement of capital facilities and equipment required by transit agencies.
  - Review bus stop amenity needs and seek discretionary grant funding where required. Consider integrating Basin Transit in development review processes for opportunities for bus stop improvement
  - Develop a capital equipment replacement plan and seek discretionary grant funding where required.
- MOBILITY - Provide mobility options for those citizens who cannot, or choose not to, use private transportation due to age limitations, physical disabilities, economic circumstances, lack of access to private transportation, and/or transportation preferences.
  - Maintain existing services to those citizens with special mobility needs.
  - Further explore coordination opportunities with private and nonprofit providers to expand services where needed in the county.
- TECHNOLOGY – Evaluate the opportunity for implementing technology to improve the rider's experience with shared bus fare systems, travel time applications, and informational signs.

Table 9. Proposed Transit Solutions

Project ID	Project Name	Description	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Proposed Priority
T-1	Upgrade transit fleet vehicles	Upgrade with new technologies, bilingual message boards, and bike racks. Includes review of existing bus storage needs.	$250,000	$0	Basin Transit, Quail Trail, ODOT	Medium
T-2	Expansion of existing services to rural communities	Expand to rural communities, particularly those with underserved populations	$1,000,000	$0	Basin Transit, Quail Trail, ODOT	High
T-3	Program to create Periodic meetings amongst transit providers	Set up and conduct meetings with all local transit agencies to improve county transit coordination	$50,000	$0	Basin Transit, Quail Trail, Amtrak, SouthWest POINT, ODOT	High
T-4	Study to Develop/expand transit service in North Klamath County	A study to create a route between LaPine and Klamath County/Klamath Falls	$50,000	$0	Basin Transit, Quail Trail, ODOT, CET	High
T-5	Increasing Dial-A-Ride	Increase dial-a-ride service range to unincorporated communities and rural areas	$4,000,000	$0	Basin Transit, Quail Trail, ODOT	Medium
T-6	Development of public transportation education resources	Educate the community about connections available within the County to reach key destinations within and connecting to County communities.	$100,000	$0	Basin Transit, Quail Trail, ODOT	Medium
T-7	Update BTS Plan	Update the Basin Transit Service Transit Master Plan.	$100,000	$0	Basin Transit	Medium
		Total Cost for Medium Priority Transit Projects	$4,450,000	$0		
		Total Cost for High Priority Transit Projects	$1,100,000	$0		
		Total Cost for Transit Projects	**$5,550,000**	**$0**		

[1]Cost estimates do not include right-of-way or environmental impacts.
[2]For planning-level estimates only. Each project shall be individually scoped based on project variables.

OTHER TRANSPORTATION SYSTEM SOLUTIONS

Other transportation systems in the County include Air, Rail, Marine, Pipelines, and Bridges. Through the needs analysis, there were no projects, policies, or programs identified for the air, rail, marine, or pipeline system within the unincorporated County.

The Crater Lake-Klamath Regional Airport (LMT) is in the process of updating its Master Plan. LMT is located within the Klamath Falls UGB Area and therefore captured within the Klamath Falls Urban Area TSP. In addition, a Joint Land Use Study for Kingsley Field is currently underway. The Updated County TSP will include any relevant policies necessary to support the recommendations of these two plans.

One pipeline runs north-south through the County and closely follows US97. The pipeline is operated by TransCanada (TC) Energy. The second pipeline runs east-west through Keno and Klamath Falls and terminates in Bonanza. This pipeline is operated by Gas Transmission Northwest LLC. The existing TSP identifies several pipeline providers in Klamath County: Avista Utilities, Pacific Gas Transmission, Gas Transmission Northwest, Northwest Pipeline, Williams Gas Co., Pacific Gas & Electric, and Tuscarora Gas Transmission Company.

This section focused on the Bridge solutions identified for Klamath County.

BRIDGE SOLUTIONS

The bridge solutions were identified based on the existing conditions analysis and input from County staff. The County has an extensive bridge maintenance database detailing current bridge conditions and ratings as well as a 10-year bridge replacement and rehabilitation plan. Table 10 shows the bridge solution projects, which include bridge projects identified in the County's 10-year bridge plan and County owned bridges identified as structurally deficient. The TSP is a 20-year Plan, extending beyond the lifespan of the County's 10-year bridge replacement program. Therefore, the addition of structurally deficient bridges that may not be part of the County's current bridge program indicate bridge projects that are likely to follow the completion of the 10-year bridge program. The priorities of projects from the 10-year Bridge Program align with those of the program. For example, High Priority TSP projects reflect Tier 1 projects in the Bridge Program.

Table 10. Proposed Bridge Solutions

Project ID	Project Name	Bridge ID	Source	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
D-1	Bridge Rehabilitation at Matney Way (Lost River)	35C211	Structural Deficiency	$690,000	$690,000	N/A	County	High
D-2	Bridge Replacement at W Langell Valley Rd (Irrigation canal)	18C011	Structural Deficiency	$260,000	$260,000	N/A	County	High
D-3	Bridge Rehabilitation at Ivory Pine Rd (Meryl Creek)	35C223	Structural Deficiency	$280,000	$280,000	N/A	County	High
D-4	Bridge Rehabilitation at Dodds Hollow (Irrigation canal)	35C124	Structural Deficiency	$470,000	$470,000	N/A	County	Medium
D-5	Bridge Rehabilitation at I O O F Cemetery Rd (Irrigation canal)	35C145	Structural Deficiency	$390,000	$390,000	N/A	County	High
D-6	Bridge Rehabilitation at Washburn Way (Irrigation canal)	35C342	Structural Deficiency	$460,000	$460,000	N/A	County	Medium
D-7	Bridge Rehabilitation Study at Reeder Road (Lost River)	8105	10-year Bridge Rehab/ Replace Project List	$50,000	$50,000	N/A	County	High
D-8	Bridge Rehabilitation at Crescent Cutoff Road (Little Deschutes River)	9027	10-year Bridge Rehab/ Replace Project List	$110,000	$110,000	N/A	County	High
D-9	Bridge Rehabilitation at Gift Road (Lost River)	18C26A	10-year Bridge Rehab/ Replace Project List	$520,000	$520,000	N/A	County	High
D-10	Bridge Replacement at Cambell Road (Ditch)	35C117	10-year Bridge Rehab/ Replace Project List	$360,000	$360,000	N/A	County	High

Project ID	Project Name	Bridge ID	Source	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
D-11	Bridge Replacement at Swan Lake Road (Drainage Ditch)	35C197	10-year Bridge Rehab/ Replace Project List	$270,000	$270,000	N/A	County	High
D-12	Bridge Replacement at Ivory Pine Road (S Sprague River)	35C219	10-year Bridge Rehab/ Replace Project List	$1,070,000	$1,070,000	N/A	County	High
D-13	Bridge Replacement at Sprague River Road (Whiskey Creek)	18C009	10-year Bridge Rehab/ Replace Project List	$250,000	$250,000	N/A	County	Medium
D-14	Bridge Replacement at Langell Valley Road (Lost River)	18C017	10-year Bridge Rehab/ Replace Project List	$1,640,000	$1,640,000	N/A	County	Medium
D-15	Bridge Rehabilitation at Spring Lake Road (Drain Ditch)	18C020	10-year Bridge Rehab/ Replace Project List	$390,000	$390,000	N/A	County	Medium
D-16	Bridge Replacement at Homedale Road (Irrigation Canal)	35C143	10-year Bridge Rehab/ Replace Project List	$290,000	$290,000	N/A	County	Medium
D-17	Bridge Rehabilitation at McQuiston Road (Seven Mile Canal)	35C154	10-year Bridge Rehab/ Replace Project List	$760,000	$760,000	N/A	County	Medium
D-18	Bridge Replacement Matney Road (Irrigation Canal)	35C157	10-year Bridge Rehab/ Replace Project List	$380,000	$380,000	N/A	County	Medium
D-19	Bridge Replacement at Weed Road (Wood River)	35C206	10-year Bridge Rehab/ Replace Project List	$1,150,000	$1,150,000	N/A	County	Medium
D-20	Bridge Rehabilitation at Gerber Road (Irrigation Canal)	35C217	10-year Bridge Rehab/ Replace Project List	$100,000	$100,000	N/A	County	Medium

Project ID	Project Name	Bridge ID	Source	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
D-21	Bridge Replacement at Gerber Road (Ben Hall Creek)	35C218	10-year Bridge Rehab/ Replace Project List	$450,000	$450,000	N/A	County	Medium
D-22	Bridge Replacement at Langell Valley Road (Lost River)	8592	10-year Bridge Rehab/ Replace Project List	$1,540,000	$1,540,000	N/A	County	Low
D-23	Bridge Replacement at Short Road (Canal)	18C21A	10-year Bridge Rehab/ Replace Project List	$960,000	$960,000	N/A	County	Low
D-24	Bridge Rehabilitation at Anderson Road (Irrigation Canal)	35C146	10-year Bridge Rehab/ Replace Project List	$220,000	$220,000	N/A	County	Low
D-25	Bridge Replacement at Poe Valley Road (Harpold Dam-Lost River)	35C168	10-year Bridge Rehab/ Replace Project List	$870,000	$870,000	N/A	County	Low
D-26	Bridge Rehabilitation at Holl Road (Low Line Canal)	35C186	10-year Bridge Rehab/ Replace Project List	$80,000	$80,000	N/A	County	Low
D-27	Bridge Replacement at Stateline Road (J-11 Lateral)	35C193	10-year Bridge Rehab/ Replace Project List	$190,000	$190,000	N/A	County	Low
D-28	Bridge Replacement at Saddle Mount Pit Road (Sprague River)	35C225	10-year Bridge Rehab/ Replace Project List	$990,000	$990,000	N/A	County	Low
D-29	Bridge Replacement at Poe Valley Road (F Canal)	35C351	10-year Bridge Rehab/ Replace Project List	$130,000	$130,000	N/A	County	Low
D-30	Bridge Replacement at Silver Lake Road (Cattle Pass)	35C354	10-year Bridge Rehab/ Replace Project List	$160,000	$160,000	N/A	County	Low

Project ID	Project Name	Bridge ID	Source	Planning-Level Cost Estimate[1]	Expected County Contribution[2]	Funding Partner[2]	Lead Agency[2]	Proposed Priority
D-31	Bridge Replacement at Hill Road (Irrigation Canal)	35C138	10-year Bridge Rehab/ Replace Project List	$240,000	$240,000	N/A	County	High
D-32	Bridge Replacement at Joe Wright Road (A-3 Irrigation)	35C215	10-year Bridge Rehab/ Replace Project List	$250,000	$250,000	N/A	County	High
D-33	Bridge Replacement at OR58 (Railroad MP 82.4)	02452A	2010 Klamath County TSP	$6,820,000	$0	ODOT, Klamath Northern Rail	ODOT	High
Total Cost for Low Priority Bridge Projects				$5,140,000	$5,140,000			
Total Cost for Medium Priority Bridge Projects				$6,340,000	$6,340,000			
Total Cost for High Priority Bridge Projects				$11,310,000	$4,490,000			
Total Cost of Bridge Projects				**$22,790,000**	**$15,970,000**			

[1]Cost estimates do not include right-of-way or environmental impacts.
[2]For planning-level estimates only. Each project shall be individually scoped based on project variables.

FUNDING SOURCES

This section summarizes the total cost of the projects identified in this memorandum and compares these costs to the County's historic revenue and expenditures to identify funding needs for implementation. The solutions presented in this draft memorandum are limited to those outside the Klamath Falls UGB. County road projects within the Klamath Falls UGB are still funded by the County; however, these projects are listed in the Klamath Falls Urban Area TSP. The project list for urban area projects will be further refined as part of the next technical memorandum. For the purpose of this memorandum, the County provided a prioritized list of Urban County projects, including those in the Klamath Falls Urban Area TSP and those the County has identified since the Urban Area TSP was formally adopted in 2012. These projects have been updated to 2020 dollars. *A list of the project, priorities, and cost estimates is provided in Attachment B.*

Table 11 summarizes the total County cost by project type and priority for the solutions identified in this memorandum and those in the urban area. The estimated County cost of draft solutions identified in this memorandum is approximately $125 million, and the cost of *draft* urban TSP solutions is approximately $53 million. The grand total of county contributions is approximately $177 million. The next technical memorandum will compare this to existing and future funding sources to develop a Preferred Plan; some solutions in this memorandum may not be feasible within the 20 year horizon.

Table 11. Summary of County Contribution Costs by Priority and Plan Element

Project Type	High Priority	Medium Priority	Low Priority	Total
Roadway	$0	$3,000	$26,125,000	$26,128,000
ITS	$111,000	$28,000	$5,000	$144,000
Safety	$308,000 to $632,000	$468,000	$7,029,000	$7,805,000 to $8,129,000
Pedestrian	$271,000	$652,000	$370,000	$1,293,000
Bicycle	$48,040,000	$0	$25,190,000	$73,230,000
Transit	$0	$0	$0	$0
Bridge	$4,490,000	$6,340,000	$5,140,000	$15,970,000
Total	**$53,220,000 to $53,520,000**	**$7,491,000**	**$63,859,000**	**$124,570,000 to $124,894,000**
Estimated Urban TSP Cost	**$10,562,000**	**$18,137,000**	**$24,059,000**	**$52,758,000**
Grand Total	**$63,782,000 to $64,082,000**	**$25,628,000**	**$87,918,000**	**$177,328,000 to $177,652,000**

*Technical Memorandum #5 will present an overall total for the State projects, compared to State funding projections, as well.

As discussed in *Technical Memorandum #3*, the County has historically used the majority of its annual income to fund preservation and operation and maintenance of the existing system. Capital improvements have accounted for approximately $800,000 in annual funds. Table 12 summarizes the revenue, expenditures, and net income for transportation over the past ten years. *The historical revenue and expenditure data were provided by the County.*

Table 12. Transportation Revenue and Expenditures Summary

Revenue/ Expenditure Source	FY 2009-2010	FY 2010-2011	FY 2011-2012	FY 2012-2013	FY 2013-2014	FY 2014-2015	FY 2015-2016	FY 2016-2017	FY 2017-2018	FY 2018-2019	Average per Year
Revenue											
Motor Vehicle	$3,395,897	$4,043,723	$4,473,734	$4,464,251	$4,662,751	$4,749,059	$4,877,735	$4,901,117	$5,300,153	$6,051,560	**$4,691,998**
SRS	$8,883,833	$8,006,289	$5,764,505	$5,631,223	$5,503,455	$5,291,245	$4,839,771	$400,251	$4,505,769	$4,081,833	**$5,290,817**
STP	$0	$428,507	$0	$991,652	$606,095	$576,435	$0	$1,143,878	$599,651	$597,321	**$706,220**
Interest (Local)	$1,819,771	$309,301	$554,327	$284,297	$387,792	$271,746	$565,460	$158,034	$768,513	$1,531,539	**$665,078**
Other (Varies)[1]	$499,468	$195,805	$680,684	$626,651	$219,269	$242,377	$661,580	$1,722,519	$496,354	$686,080	**$603,079**
Total Revenue	$14,598,969	$12,983,625	$11,473,249	$11,998,073	$11,379,363	$11,130,863	$10,944,546	$8,325,798	$11,670,439	$12,948,333	**$11,745,326**
Expenditures											
Preservation[2]	$4,704,793	$2,629,067	$2,281,531	$2,887,174	$2,320,373	$4,401,682	$3,815,739	$3,662,450	$4,204,291	$4,204,291	**$3,511,139**
Operations and Maintenance[3]	$3,511,913	$3,993,752	$3,382,338	$3,235,229	$3,022,836	$3,914,832	$3,349,605	$3,959,887	$5,600,325	$5,600,325	**$3,957,104**
Capital Improvement[4]	$485,405	$1,023,916	$1,184,363	$1,183,517	$1,038,000	$753,882	$862,625	$1,417,148	$0	$0	**$794,886**
Bridge	$837,368	$39,865	$64,362	$3,109,894	$27,383	$2,544,956	$166,507	$56,921	$30,752	$0	**$687,801**
Admin & General Engineering	$2,926,278	$2,826,988	$2,820,985	$2,808,501	$2,606,253	$3,213,209	$3,221,113	$4,338,375	$3,242,284	$3,750,000	**$3,175,399**
Special Projects[5]	$3,864,030	$1,530,405	$1,334,680	$6,221,070	$2,150,000	$1,700,000	$850,000	$1,250,000	$2,000,000	$2,750,000	**$2,365,019**
Total Expenditure	$16,329,787	$12,043,993	$11,068,259	$19,445,385	$11,164,845	$16,528,561	$12,265,589	$14,684,781	$15,077,652	$16,304,616	**$14,491,347**
Net Income											
Revenue minus Expenses	($1,730,818)	$939,632	$404,990	($7,447,312)	$214,518	($5,397,698)	($1,321,043)	($6,358,984)	($3,407,212)	($3,356,283)	**($2,746,021)**

[1]Other revenues include Reimbursement for Services (RFS), Property Sales, Senate Bill (SB994), and grants
[2]Preservation includes chip seal, patching, overlay, fog seal
[3]Operations and Maintenance includes sign upgrades, roadside management, new equipment, equipment repair, etc.
[4]Capital Improvements includes bicycle/pedestrian improvements such as ADA ramps
[5]Special Projects include funds provided to Law Enforcement, City/County Schools, ODOT Matches, and City Roads

Key consistent funding sources that have contributed to transportation improvement projects within Klamath County over the last several years include Motor Vehicle Apportionment (MVA) and Secure Rural Schools (SRS) funding enacted through legislation. There is also a reserve fund that has been used to fund large, capital projects. The reserve fund produces annual interest of approximately $700,000. Additional revenue sources include Reimbursement for Services (RFS), property sales, and other State funding. The amount available varies by year based on fuel consumption and the number of registered vehicles in the County. The County currently receives approximately $12 million from these funding sources annually.

All of public works "primary" revenue sources (MVA and SRS) in the past two years has been utilized for operation and maintenance of the existing County transportation system. According to the 10-year expenditures data, the County typically spends approximately $800,000 on capital projects every year. Based on the table summary, the County is operating at a deficiency of approximately $2.7 million per year. This deficiency requires the County to use the reserve fund.

Given the limited funding available for capital improvements, the County will need to identify other potential revenue sources to fund transportation capital improvement projects. The cost of high priority projects are shown in Table 11 is approximately $53 million. **On average, the County would require approximately $5.2 million per year of additionally funding over the next 20 years to solely fund high priority projects and maintain the system[4].** The next technical memorandum will identify a Preferred Plan; some solutions in this memorandum set may not be feasible within the 20-year horizon.

Table 13 summarizes potential future funding sources and identifies the intended use of the funds and applicable TSP project types.

Table 13. Current and Potential Funding Source Summary

Funding Source	Intended Use	Applicable Project Types
Federal Sources		
Surface Transportation Program/ Surface Transportation Block Grant	Preserves and improves surface transportation investments from a flexible funding source	All project types
Secure Rural Schools Act	Replaces local timber revenues as a local funding source for schools and roads	All project types; however, the projects must support access to local schools
FAST Act	Dedicates funding to road, bridge, bicycling, and pedestrian improvements	All project types
Congestion Mitigation and Air Quality (CMAQ)	Supports programs that reduce emissions from transportation-related activities	All project types with an emphasis on projects within areas with poor air quality
Highway Safety Improvement Program	A safety program to provide improvements to areas in need of safety improvements.	Safety-related projects
Federal Lands Access Program (FLAP)	Provides funds to improve transportation facilities that provide access to, are adjacent to, or are located within Federal lands	All project types; however, projects must provide access to Federal lands

[4] Assumes maintaining an average yearly overall deficit of $2.8 million.

Funding Source	Intended Use	Applicable Project Types
State Source		
All Roads Transportation Safety	Uses limited funds to make the highest-impact safety improvements on roads and highways	Safety-related projects
State Highway Fund	Makes construction, maintenance, and operations improvements on roads and highways	All project types
Keep Oregon Moving (HB 2017)	Creates a steady funding stream for statewide transportation improvements	All project types
Connect Oregon	Invests in aviation, rail, and marine transportation system across Oregon	Aviation, Rail, and Marine-related projects
Multi-modal Active Transportation Fund	Invests in multimodal transportation infrastructure improvements across Oregon	Pedestrian and bicycle-related projects
Statewide Transportation Improvement Program	Establishes multi-year, statewide, intermodal program of transportation projects to fund	Sidewalks, bikeways, crossing improvements
Safe Routes to School	Focuses on infrastructure and non-infrastructure programs to improve access and safety for children to walk or bike to school	Pedestrian and bicycle-related projects within the vicinity of local schools
Local Sources		
System Development Charges	Uses money from local development projects to fund capital transportation improvements	All project types; however, the projects must be required to accommodate growth associated with new development
Economic Improvement Districts (EIDs)	Pools funds from area businesses to make improvements in the business district.	All project types; however, the projects must be located within the EID area
Local Improvement Districts (LIDs)	Pools funds from property owners to make local transportation improvements	All project types; however, the projects must be located within the LID area
Urban Renewal District / Tax Increment Financing	Raises revenue from increased property values in an area to fund localized improvements	All project types; however, the projects must be located within the Urban Renewal District area
Local Bond Measures	Asks voters for bond funding to finance a set list of infrastructure investments	All project types
Local Fuel Tax	Adds a tax on top of gasoline costs that support street operation, maintenance, and preservation	All project types
Fees from Timber Sales	A percentage of timber sales fees in Klamath County are provided to the County, with the remainder allocated to the Oregon Department of Forestry State Forests Division.	All project types
Street Utility Fee/Road Maintenance Fee	Calculates trips generated for land uses and charges owners a fee relative to the number of trips	All project types
Road District	Localizes road construction through finance from members within the local community	All project types

REGULATORY REVIEW

Angelo Planning Group (APG) completed a review and assessment of the County's Land Development Code (LDC) for compliance with the State of Oregon's Transportation Planning Rule (TPR), OAR 660 Division 12. The memorandum, provided in *Attachment C*, provides the intent, purpose, and requirements of the TPR, followed by a comprehensive review of the County's compliance.

The TPR requires that local governments revise their land use regulations to implement the TSP in the following manner:

- Amend land use regulations to reflect and implement the TSP.
- Clearly identify which transportation facilities, services, and improvements are allowed outright, and which will be conditionally permitted or permitted through other procedures.
- Adopt land use or subdivision ordinance measures, consistent with applicable Federal and State requirements, to protect transportation facilities, corridors, and sites for their identified functions, through:
  - access management and control;
  - protection of public use airports;
  - coordinated review of land use decisions potentially affecting transportation facilities;
  - conditions to minimize development impacts to transportation facilities;
  - regulations to provide notice to public agencies providing transportation facilities and services of land use applications that potentially affect transportation facilities; and
  - regulations ensuring that amendments to land use applications, densities, and design standards are consistent with the TSP.
- Adopt land use or subdivision regulations for urban areas and rural communities to provide safe and convenient pedestrian and bicycle circulation and bicycle parking, and to ensure that new development provides on-site streets and accessways that provide reasonably direct routes for pedestrian and bicycle travel.
- Establish street standards that minimize pavement width and total right-of-way.

The review identifies sections of the County's LDC that are recommended for changes to fully implement the TSP, including several of the solutions identified in this memorandum, and will bring the County's regulations in compliance with the TPR. Specific modifications to the LDC will be drafted as part of the implementing ordinance to adopt the TSP.

ATTACHMENT A

CHAPTER 2 – ROAD TYPES AND GEOMETRICS

2.01 Road Classifications

County roads are classified functionally as indicated in Sections 2.02 and 2.03 depending on the rural or urban characterization. Function is the controlling element for classification and shall govern right-of-way, road width and road geometric. Road classifications are based upon Federal Functional Classification guidelines (Highway Functional Classification Concepts, Criteria, and Procedures) in consultation with Oregon Department of Transportation (ODOT) staff. It is necessary to classify roads and streets for purposes of traffic operations, control, and enforcement. Typically, arterials will have higher speed limits and more stringent traffic control measures at intersections, (e.g., traffic signals or stop signs), than non-arterials. In addition, certain high-order roads are eligible for Federal Aid funding. In planning, functional classification establishes the hierarchy of roads and highways necessary for a complete transportation system that serves all types of travel needs. Each road has a specified function that produces a comprehensive network for travel and access throughout an area, when combined with the rest of the system.

Land Developments in Urban Areas. Land developments in urban areas as defined by the current Klamath County Comprehensive Plan and shall provide "curb" type road improvements unless otherwise specified in these Standards. A curb type road typically requires an underground pipe storm drainage system with curb, gutter, and sidewalks. Functional classification and geometric elements for these type of roadways have been developed in conjunction with the City of Klamath Falls and follow guidelines set forth in the Klamath Falls Urban Area Transportation System Plan. Exceptions to this may be approved by the County Engineer on residential access streets that are located in long-term, low-density neighborhoods and where a pattern of "shoulder" type roads is firmly established.

Land Developments in Rural Areas. The rural area is comprised of all lands in Klamath County outside of the designated Urban Growth Boundary (UGB); rural development can consist of a variety of uses that are consistent with the preservation of rural character and the requirements of the rural element. Rural development does not refer to agriculture or forestry activities that may be conducted in rural areas.

Land developments in rural areas as defined by the current Klamath County Comprehensive Plan shall provide "shoulder" type road improvements, unless otherwise specified by these Standards or approved by the County Engineer. Roadway geometrics in the rural areas follow Chapter 7 of the ODOT Highway Design Manual guidelines as well as AASHTO's *"A Policy on Geometric Design of Highways and Streets – 2011"* as interpreted for standard conditions by KCPW in accordance with ORS 368.036 (See HDM Table 1-1). Most rural development will only require the construction of local roads (typically non-County maintained), but in the event that new construction of a higher-order road, or modifications or reconstruction of an existing higher-order road is required it shall comply with the 4R (New Construction/Reconstruction)

requirements of Table 2.02(A). Certain exceptions to the "shoulder" type standard may apply within clustered housing developments and rural activity centers (unincorporated rural towns) where urban densities and uses may make a "curb" type road appropriate. Within these developments, the specifically authorized land uses or business district design guidelines may provide for either a "curb" or "shoulder" type road section.

Where rural development has minimal impact to adjacent higher order roads (example – access only) the County Engineer may utilize an exception from 4R standards and utilize 3R standards per HDM 7.6 in determining any required frontage improvements as required per the Klamath County Land Development Code Article 71.200-D-4.

Land Development in Resource Land Areas. Land development in resource land areas as defined by the current Klamath County Comprehensive Plan shall generally provide “shoulder” type road improvements. The actual land use and development proposal will ultimately define the roadway requirements.

2.02 Rural Roadway Types and Geometry

A. Rural Principal Arterial

Rural Principal Arterials provide links between cities and larger towns to form an integrated network providing interstate and inter-county services. They provide primary connections between rural areas and also distribute traffic between rural and all, or nearly all, urban areas. They provide the highest degree of mobility; therefore, direct access to abutting properties is very restricted. All roads classified as principal arterial in Klamath County are state highways maintained by ODOT and all elements of road design shall be coordinated with that agency; Klamath County Public Works does not have jurisdiction over any rural principal arterial roadways.

B. Rural Minor Arterial

Rural minor arterials interconnect with and augment the principal arterial system, normally for trips of moderate length and serving geographic areas that are smaller than their higher arterial counterparts.. They provide intra-community continuity connecting community centers and facilities. A rural minor arterial is typically a continuous road with a direct alignment. Access is partially restricted.

C. Rural Major Collector

Rural major collector arterials typically provide connections between higher-order roads to serve the most important intra-county travel corridors. They may also connect important traffic generators such as consolidated schools, shipping points, county parks, and important mining and agricultural areas. Access is partially restricted.

D. Rural Minor Collector

Minor collectors are similar to major except they are generally shorter in length, have lower AADT, and allows for greater access.

E. Rural Local Roadways

There are several roadway classifications for rural local roadways. Typically "shoulder" type road improvements are provided in the rural area unless otherwise approved by the County Engineer . Per Board Order XX-XX, newly constructed local may only be accepted into the County maintained road network upon petition to the Board of Commissioners and typical policy is to only accept roads constructed within the Klamath Falls Urban Growth Boundary as County maintained facilities. As such, roadways constructed within rural areas are most commonly User Maintained Roads. The complete rural local roadway classifications are listed below:

1. Low Volume Collectors

   Low volume collectors are the highest in the local roadway classification and provide local circulation between higher order roadways and are located mostly within agriculture and resource lands where residential and commercial uses are accessory uses within the zoning. These roadways have average daily traffic (ADT) of 400 or less with geometrics that accommodate a higher design speed then other local roads. In consideration of the type of lands served and design speed, driveway access is restricted..

2. Standard Local Road

   Standard local roads are the second highest in the local roadway classification hierarchy. They are typically two-lane asphalt roadways used within rural residential and commercial zones. They provide circulation within neighborhoods and typically connect to low volume roads or minor collectors. Although standard local roads typically allow direct driveway access there may be some project related exceptions.

3. Minor Local Road

   Minor local roads are permanent cul-de-sacs or short loops that connect to standard local roads. Minor local roads are not supportive of through traffic. They are typically internal rural residential roadways that provide circulation within a development. Direct driveway connections are allowed.

4. User Maintained Roads

User maintained roads can be in public right of way or private easements. Additional requirements regarding the construction and maintenance for these roads can be found in 2.06.

a. User Maintained Public Roads

User maintained public roads are the typical roadway facility constructed within rural residential developments and comply with the Standard Local Road requirements. User maintained public roads shall provide through access through residential development and connect to higher order streets and also serve private roads and access.

b. Private Roads

Private roads serve a maximum of 50 dwelling units within rural residential developments and shall comply with either Standard or Minor Local Road requirements as appropriate. Private Roads are not within a dedicated public right of way, but rather a private easement that allows for emergency and public service vehicle use.

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Table 2.02(A) Rural High Order Roadways (Shoulder Roadway Section)[1]

Functional Classification	Minor Arterial	Major Collector	Minor Collector
Typical ADT, VPD[2]	1500-2000	400-1500	400-1500
Design Speed, mph[3]	60	55	50
Travel Lane Width, ft	12	12	11
Maximum Grade, %[4]	6	6	6
Superelevation, %[4]	6	6	6
Paved Shoulder, ft	6	6	6
Gravel Shoulder, ft[5]	N/A	N/A	N/A
Turn Lane Width[6], ft	12	12	12
Multi-Use Path[7], ft	12	12	12
Number of Lanes	2-3	2-3	2-3
Right of way Width	64-76	64-76	62-74

Table 2.02(B) Rural Local Roadways (Shoulder Roadway Section)

Functional Classification	Low Volume Collector	Standard Local	Minor Local
Typical ADT, VPD[2]	>400	250-400	50-250
Dwelling Units Served	N/A	100	50
Design Speed, mph[3]	45	30	25
Maximum Grade, %[4]	10	10	10
Superelevation	6	Not Required	Not Required
Travel Lane Width, ft	10	10	10
Paved Shoulder, ft	2	2	2
Gravel Shoulder, ft[4]	4	4	2
Multi-Use Path[7], ft	12	12	12
Number of Lanes	2	2	2
Right of way Width	60	60	60

[1] Design values shown are for typical 4R design conditions and County Engineer may be require further investigation and review prior to site specific design on existing roadways.

[2] ADT is based on typical count data throughout County and shall be verified prior to design work.

[3] Design speed is as recommended from AASHTO Chapters 6 and 7 (as appropriate for classification) for "Level" terrain and used as a basis for determining geometric elements and does not imply posted or legally permissible speed.

[4] See Section 2.04-B for additional discussion regarding superelevation, 2.04-C for grade

[5] Shoulders shall be 2 feet wider (minimum) for guardrail installations per HDM 7.3.2.6. See AASHTO Roadside Design Guide Table 5-7 for additional barrier offset for requirements.

[6] Turn length need will be determined during development review.

[7] Multi-use path is discretionary in Rural Area; typically used on dedicated bicycle and pedestrian routes.

2.03 Urban Roadways

As noted previously, functional classification and geometric elements for urban roadways have been developed in conjunction with the City of Klamath Falls and follow guidelines set forth in the Klamath Falls Urban Area Transportation System Plan. A description of the functional classes of county maintained urban roadways is as follows:

A. Urban Major Arterial

Arterials connect the state highways (principal arterials) and link major, high concentration commercial, residential, industrial, and institutional areas. Major arterial streets are typically spaced to assure accessibility and reduce the incidence of longer distance trips using collectors and local streets in lieu of well-placed major arterials.

B. Urban Collector

Collector streets generally facilitate the movement of traffic within the urban area. Collectors provide for circulation and mobility for all users of the system. Collectors carry lower volumes than arterials and typically have facilities to accommodate a variety of travel modes. They serve as the primary routes into residential neighborhoods. Although they carry higher volumes than local streets, they are intended to provide direct access to adjacent land rather than serving through traffic.

C. Urban Local Roadways

Local Streets are primarily intended to provide access to abutting land uses. Local street facilities offer the lowest level of mobility and consequently tend to be short, low-speed facilities. As such, local streets should primarily serve passenger cars, pedestrians, and bicyclists; heavy truck traffic is discouraged. On-street parking is common. Sidewalks are typically present, though the relatively low travel speeds and traffic volumes allow bicycles to share the vehicle travel lanes.

Table 2.03(A) Urban Streets (Curb Roadway Section)

Functional Classification	Major Arterial	Collector	Local
Typical ADT, VPD	>7500	3000-7500	<3000
Design Speed, mph[1]	45	35	25
Maximum Grade, %	6	6	10
Superelevation, %	4	4	Not Required
Travel Lane Width, ft	11	11	10
Turn Lane Width, ft	14	12	N/A
Bike Lane, ft	6	6	N/A
Parking, ft	N/A	N/A	8
Sidewalk, ft	7	5	5
Multi-Use Path, ft[2]	12	12	N/A
Number of Lanes	4-5	3	2
Right of Way Width[3]	82-94	70	60

[1] Design speed is a basis for determining geometric elements and does not imply posted or legally permissible speed.

[2] Sidewalk shall be omitted on side with multi-use path. County Engineer may approve omitting sidewalk on both sides of road and use of shoulder and ditch section for urban roadway with multi-use path depending on location.

[3] Five (5) foot clear width is maintained beyond back of sidewalk for utility placement. Right of way may be reduced where PUE is provided on adjacent private property.

2.04 Roadway Design Values

The design values presented in these standards are taken from AASHTO's "A Policy on Geometric Design of Highways and Streets, 2011 edition" (AASHTO), which is the main reference that should be used for roadway design in Klamath County along with the Oregon Highway Design Manual (HDM). The purpose of the KCPW design standards is to provide a consistent policy under which the physical aspects of design and plan preparation are to be implemented. It is not intended that the following standards will address all conditions encountered as there will be unique situations that these standards will not apply. Also, these standards are not to unreasonably limit any innovative design. They are intended to assist but not to substitute for competent work by design professionals and the engineer is solely responsible for all design. The County's review and acceptance of the plans does not guarantee that all regulations and requirements have been met.

A. Vertical and Horizontal Curves

Table 2.04 Horizontal and Vertical Curve Design Values

Design Speed	25	35	45	50	55	60
Horizontal Curvature for 6% Super, Radius (ft)	144	340	643	833	1060	1330
Horizontal Curvature for 4% Super, Radius (ft)	154	250	711	-	-	-
Horizontal Curvature for Normal Crown, Radius (ft)	181	454	-	-	-	-
Stopping Site Distance (ft)[1]	155	250	360	425	495	570
Entering Site Distance (ft)	280	390	500	555	610	665
Sag Vertical Curve "K"	26	49	79	96	115	136
Crest Vertical Curve "K"						
Passing Site Distance (ft) for 2-Lane Road	-	550	700	800	900	1000

- Indicates non-standard design criteria. Verify with AASHTO if criteria is utilized.

- Notes on Table 2.04

1. The values shown in Tables 2.04 are minimum design values per Chapter 3 and Table 9-6 of AASHTO's "A Policy on Geometric Design of Highways and Streets, 2011 edition" (AASHTO).

2. Superelevation is standard for all roads with a design speed of 35 mph or greater. The typical superelevation in rural areas and urban arterials shall be 6%, but a maximum of eight percent superelevation may be used, upon approval of the County Engineer, for design of improvements to existing arterials, as necessary, to meet terrain and right-of-way conditions. Urban higher order

streets shall have a superelevation rate appropriate for the conditions, typically 4%, but not less than 2% without approval of the County Engineer. Superelevation run-off lengths shall be calculated in accordance with AASHTO.

3. Superelevation is not required in the design of horizontal curves for design speeds less than 35 mph; however, horizontal curves must be designed based on design speed and selected cross section as indicated in Table 2.04 (A). Urban collectors with the following exception:

    a. Local streets and urban collectors that serve primarily residential land uses, low speed/low volume rural local roads, or other areas with conditions resulting in a practical design speed less than standard, may use a horizontal curve without superelevation based on the Maximum Comfortable Speed criteria as follows:

        1) Urban Collector – 300 feet (30 mph)

        2) Local – 100 feet (20 mph)

4. Stopping Sight Distance

    a. Values in Table 2.04 are taken from AASHTO Table 3.1. Grade of the roadway has an effect on the vehicles stopping sight distance; see AASHTO Table 3.2 when evaluating sight distance.

5. Entering Sight Distance (ESD)

    a. Entering sight distance applies on driveways, roads and streets approaching intersections. Entering sight distance shown is for a stopped passenger vehicle to turn left onto a two-lane highway with no median and grades 3 percent or less. For other conditions the time gap must be adjusted and required sight distance recalculated. (See 2011 AASHTO – Intersection Control section).

    b. Where a significant number of trucks will be using the approach road, the County Engineer may increase the entering sight distance requirements by up to 30 percent for single-unit trucks and 70 percent for semi-trailer combinations.

6. Deviations from the design speeds and/or horizontal and vertical AASHTO standards may be allowed at the discretion of the County Engineer providing that:

    a. Conditions that make meeting the standard prohibitive are not created by a development layout that can be readily modified to meet standard;

    b. The non-conforming condition is delineated with the appropriate MUTCD warning and speed advisory signs;

c. When required headlight stopping site distance cannot be achieved for sag vertical curves, a street light shall be installed at the sag.

B. Vertical Grade, Transitions, and Cross-Slope

1. Maximum roadway grade as shown in 2.02 and 2.03 may be exceeded by 125% for short distances of 300 feet or less, upon showing that no practical alternative exists. Additionally, the maximum grade shall not exceed 12 percent unless verification is obtained from the Fire Marshal that additional fire protection requirements will be met and the applicant's engineer must demonstrate what method will be used to ensure drainage will be controlled.
2. Grade breaks may be used instead of vertical curves as follows:
   a. Design speed 35 mph – 0.6%
   b. Design speed 25 mph – 1.0%
      1) Allowed to be 1.25% where street longitudinal grade is in excess of 8%

C. Minimum Grade

1. Minimum tangent gutter grade shall be 0.50%

D. Cross-Slope

1. The standard cross-slope shall be 2% (crown section). Upon approval of the County Engineer, an increase to 4% may be improved when it materially improves access and/or service to abutting properties, or intersection grading.
2. Where natural grade exceeds 10% the street may utilize a 2% one-way cross-slope (shed section)

E. Intersections

1. The angle of the intersection measured at 10 feet beyond the road classification right of way shall be allowed to vary between 85 and 95 degrees.
2. Minimum curb and right of way radius:
   a. 35 feet for arterials and collectors
   b. 20 feet for local streets
3. Intersection Profile: On sloping approaches at an intersection, landings shall be provided with grade not to exceed one foot difference in elevation for a distance of 30 feet approaching an arterial or 20 feet approaching a residential or commercial street, measured from the future right-of-way line (intersected by an

imaginary two percent grade extended from crowned road to right-of-way line) of intersecting street. See figure 2-014.

4. Roundabout intersections taking the place of standard intersections shall be designed in accordance with current USDOT/FHWA guidelines.

5. Entering Sight Distance: See Sections 2.02 and 2.03 for design requirements. See Tables 2.05 for specific entering sight distance values based on required design speed.

6. Intersecting Stopping Sight Distance.

    a. Stopping sight distances for the design speeds of proposed local roads and arterials must be met when intersecting arterials.

    b. The minimum stopping sight distance on proposed intersection approaches for all other access to intersecting roadways shall be 125 feet.

7. Sidewalk Ramps

    a. Parallel ramped sections meeting the requirements of the 2011 Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way that facilitate passage of disabled persons shall be constructed through curb and sidewalk at street intersections per KCPW Standard Drawing 120a with the following modifications:

        1) Running slope of the curb ramp shall be in-line with the direction of sidewalk travel and shall be a maximum of 7.50%, but shall not require the ramp length to exceed 15 feet at a maximum slope of 15% (curb ramp length shall be a minimum of 6 feet). The running slope of the landing/turning space shall be 1.50% maximum; cross-slope anywhere on sidewalk shall not exceed 1.50%.

            i) Exception: At pedestrian street crossings without yield or stop control and mid-block crossings the cross-slope shall be permitted to equal the street grade.

    b. Where superelevation of streets is required to meet design constraints at intersections then the cross-slope shall not exceed normal crown. Runout and runoff lengths for transitions shall be provided that are appropriate for the design speeds and traffic volume. Construction drawings shall clearly detail superelevation transitions and curb ramp grading.

2.05 Access Management

Access standards are intended to maintain safety and overall traffic mobility. Numerous driveways or street intersections increase the number of conflicts and and potential for accidents, and decrease mobility and traffic flow. The standards given below apply to new development or re-development projects and not intended to eliminate existing intersections or driveways.

A. Rural Area

Table 2.02 (C) Rural Area Access Management Standard

Functional Class	System Spacing[1]	Driveway/Access Spacing[2]	Corner Clearance
Minor Arterial	1 mile,	500 feet[1]	600 feet
Major Collector	1,320 feet	250 feet[1]	100 feet
Minor Collector	1,320 feet	250 feet[1]	50 feet
Local	400 feet	75 feet	25 feet

[1] Turn length need will be determined during development review.

[2] Shared use access is encouraged; consolidation of existing driveways will be required f0r re-development projects in accordance with LDC Article 71.020.

B. Urban Area

Table 2.03 (B) Urban Area Access Management Standards

Urban area access management follows the recommendations provided in the urban area TSP Table 4-3 and re-printed below (see Chapter 4 of UA TSP for additional access management policies).

Functional Class	System Spacing[1]	Min. Driveway Access Spacing[2]	Residential Use	Employment Use
Major Arterial	1.320 ft	300 feet[1]	No Direct Access	Shared Access Encouraged[1]
Collector	1,320 feet	100 feet[1]	Shared Access Encouraged, New Development to Access Local Streets	Shared Access Encouraged[1]
Local	400 feet min, 600 feet max	None	50 feet Corner Clearance	50 feet Corner Clearance

[1] Turn length need will be determined during development review.

[2] Consolidation of existing driveways may be required for re-development projects in accordance with LDC Article 71.020.

2.06 Roadway Requirements

A. Access and Circulation Requirements

1. No residential street shall serve more than 100 lots or dwelling units unless the street is connected in at least two locations with another street that functions at a level consistent with Sections 2.02 or 2.03. Additionally, every effort shall be made to provide a second access through the building permit process.
2. The second access requirement may be satisfied through use of connecting a new street to an existing street in an adjacent neighborhood if:
    a. No other practical alternative exists, or
    b. Existing street was previously stubbed indicating intent for future access, or
    c. An easement has been recorded specifically for said purpose.
3. The second access requirement may cause the construction of an off-site road connecting the development to a suitable serving street.
4. These provisions are not intended to preclude the state statute on land locking.
5. This section does not preclude a non-residential project from gaining access through a residential development. Traffic impacts for such projects will be analyzed during the planning review process.

B. Frontage Improvements

1. All developments are responsible for full construction of the roadways fronting their properties with the following exceptions:
    a. Edge of property – Only ½ +12
    b. Existing street constructed with curb, gutter, and sidewalk – No improvements
    c. Shoulder section in existing urban area – widening
    d. Access only in rural area – may require turn lanes
2. Allowance for Deferred Improvement Agreement

C. One-Way Roads and Streets

1. Local roads and streets may be designated one-way upon a finding by the County Engineer that topography or other site features make two-way traffic impractical.

D. Private Access Road

1. A private access road is a private access road that may serve a maximum of three dwelling units.
2. The access shall conform with Appendix D of the Oregon Fire Code and have a minimum width of 20 feet within a 30 feet easement common to all properties served. Access shall be paved unless lot size served exceeds 5 acres.
3. The private access road shall meet the entering sight distance requirements at access to public roads as specified in Section 2.04 of these Standards

E. Bus Zones and Turn-Outs

1. During the design of arterials and collectors, the designer shall contact the transit agencies and the local school district to determine bus zone (stop) locations and other bus operation needs. The project shall provide wheelchair accessible landing pads at designated bus zones, and where required shall include turn-outs and shelter pads. Pedestrian and disabled access improvements within the right-of-way to and from the bus loading zone or turn-out from nearby businesses or residences shall also be provided as part of the road improvement.

F. Slope, Wall, and Drainage Easements and Right-of-Way Reduction

1. Either the functional classification or particular design features of a road may necessitate slope, sight distance, and wall or drainage easements beyond the right-of-way line. The County Engineer may require such easements in conjunction with dedication or acquisition of right-of-way. The design engineer must document there is sufficient right-of-way to include cuts and fills and necessary clear zone.

2.07 User Maintained Roads

Except in rare circumstances, development in the rural area of will require some type of user maintained roadway facility. Usually these are local roads, but in some cases may need to meet some higher order requirements. While public roads, owned and maintained by the county, usually best serve community road requirements, user maintained roads with construction and private maintenance that meets county standards are appropriate for some local access roads. The design shall meet the requirements of the applicable roadway classification. Additional Requirements for User Maintained Public Roads and Private Roads are as follows:

1. All User Maintained Roads shall be designed, inspected, and certified by a licensed Professional Engineer in the State of Oregon. All construction is subject to KCPW standards, general observation, and testing verification.
2. The county will not maintain roadways, signs, drainage conveyance improvements or other appurtenances on user maintained roads, unless otherwise specified. The maintenance responsibility shall be clearly noted on the face of the recorded plat, or binding site plan. The road shall be signed as a private road that is privately maintained.
3. A private maintenance covenant recorded with the Klamath County Recorder's Office will be required for any private road. Maintenance shall include, but not be limited to, road surfacing, shoulders, signs, storm drainage facilities and vegetation control. The covenant shall set out the distribution of expenses, remedies for noncompliance with the terms of the agreement, right of use easements and other considerations. It shall be recorded prior to final construction approval and meet the following terms:
    a. The covenant shall establish minimum annual assessments in an amount adequate to defray costs of ordinary maintenance and procedures for approval of additional needed assessments.
    b. The covenant shall include a periodic maintenance schedule.
    c. The covenant for maintenance shall be enforceable by any property owner served by the road.
    d. The covenant shall establish a formula for assessing maintenance and repair costs equitably to property owners served by the private road.
    e. The covenant shall provide provision for pedestrian access by the public when the private road and/or associated sidewalk or shoulder/walkway adjoins or is connected to a school or park.
    f. The covenant shall run with the land.

4. Private roads may be allowed to serve a maximum of 50 single family dwelling units when the entire length of the private road system to the nearest public maintained road is considered and when the County Engineer determines:
    a. There is no opportunity for connecting to neighboring parcels or developments, or
    b. When there are physical barriers, zoning regulations, legal constraints or any other applicable restrictions that prohibits the connection to road stub-outs, easements, neighboring parcel(s), public roads, or rights of way.
5. Additionally, all private roads shall adhere to the following criteria:
    a. Permanently established by, tract or easement with a minimum width of 60 feet, and
    b. They shall provide legal access to each affected lot, dwelling unit, or business, and
    c. Sufficient to accommodate required improvements to include provision for future use by adjacent property owners and connection to school pathways, trails or public sidewalks when applicable; and
    d. The improved surface width shall be the minimum required per the classification of the roadway. Private roadway width requirements may be increased at the discretion of the County Engineer if necessary for safe vehicle movement or to accommodate grading, utilities, on-street parking, turning movements or any related road or utility need.-
    e. Accessible at all times for emergency and public service vehicle use; and
    f. Not obstructing, or part of, the present or future public neighborhood circulation plan developed in processes such as the Klamath County Comprehensive Plan, Klamath County Transportation Plan, or Capital Improvement Program; and
    g. Not resulting in land locking of present or future parcels; and
    h. Not needed as public roads to meet the minimum road spacing requirements of these Standards.

2.08 Cul-de-sacs and Hammerheads

Whenever a permanent or temporary dead-end street serves or will serve more than six lots, or extends more than 150 feet from the centerline of accessing street to the farthest extent of surfaced traveled, a cul-de-sac or hammerhead turn-a-round shall be provided at the termination of the road that complies with Appendix D of the Oregon Fire Code.

A. Cul-de-sacs:

1. Minimum diameter of surfacing across bulb shall be 96 feet; distance may be taken to face of curb in urban areas. Surface material shall match typical road surfacing.
    a. Temporary cul-de-sacs are allowed to be crushed rock with section sufficient to support a fire apparatus weighing 60,000 pounds.
2. Minimum right of way diameter shall be 110 feet in an urban area with sidewalk and public utility easement placed on adjacent private property, 106 feet in rural areas with paved surfacing.
    a. Right of way in rural areas may be reduced in rural areas with gravel surfacing and utilities may be placed under the gravel surfacing.
    b. Temporary cul-de-sacs may be within a temporary easement; bulb area lying outside of the straight-street right-of-way may also be within a temporary easement pending forward extension of the street.
3. A cul-de-sac in rural areas shall not be longer than 700 feet measured from centerline of intersecting loop or through street to the center of the bulb section.
4. A cul-de-sac in urban areas cul-de-sacs shall not be longer than 500 feet or serve more than 18 dwelling units. The review body may require a pedestrian way or bikeway between the cul-de-sac and adjacent streets in order to enhance accessibility and connectivity. Pedestrian ways shall be no less than 10 feet in width with a paved surface no less than 8 feet in width and shall be dedicated to the public.
5. The County Engineer may require an emergency vehicle access and/or an off-street walkway to connect a cul- de-sac at its terminus with other roads, streets, parks, schools, bus stops, or other pedestrian traffic generators.
6. The maximum cross slope in a bulb shall not exceed six percent in any direction.
7. Temporary cul-de-sac easements are extinguished, when applicable, through the right-of-way vacation process in accordance with Klamath County Code XXXX.
8. A hammerhead may be used to satisfy the turnaround requirements where a private road or street serves or will serve six or fewer lots, or by approval of the County Engineer.

2.09 Pavemement Structural Design

ATTACHMENT B

Table 1: Klamath Falls Urban Area TSP – DRAFT Updated County Projects

ID	Project Name	Description	Source	Cost	Year of Estimate	Priority
Safety Projects						
SA6	Safety Improvements on Shasta Way from Washburn Way to Crater Lake Parkway (OR 39)	Conduct a focused safety study of the segment in conjunction with Project I4. Focus of study to identify contributing factors to crashes and determine potential countermeasures to reduce crashes.	TSP	$50,000	2012	Medium
SA7	Safety Improvements at Crater Lake Parkway (OR 39) & Eberlein Avenue	Conduct sight distance and speed studies to determine adequate sight distance for prevailing speeds. Consult and apply treatments from the Highway Safety Manual, NCHRP 613 Guidelines for Selection of Speed Reduction Treatments at High Speed Intersections and other similar resources as appropriate. Evaluate possible realignment options.	TSP	$30,000	2012	Low
Roadway Projects						
R5	Strickland Way	East/West new Road from Summers Lane northern extension to Homedale northern extension	County	$2,509,470	2020	Low
R6	Summers Ln Extension	New Road from Foothills Boulevard to UGB (North)	County	$2,916,667	2020	Low
R7	Maywood Dr Extension	New Road from Crosby Avenue to Main Street	County	$1,799,242	2020	Medium
R10	Hilyard Extension 1	Rebuild 1,050 ln. ft. of roadway between Patterson Street to dead end	County	$696,023	2020	Medium
R11	LaHabra Way	New Road from Verda Vista Drive to Hilyard Avenue	County	$1,041,667	2020	Medium
R12	Washburn Way Realignment	Would realign Washburn Way to connect with Joe Wright Road east of the railroad track alignment	TSP	$2,389,000	2012	Low
R13	Brett Way Extension			-	-	
R17	Orindale Road Upgrade	Would upgrade Orindale Road to an urban minor collector	TSP	-	-	Vision
R18	Balsam Drive Upgrade	Would upgrade Balsam Drive to an urban minor collector	TSP	-	-	Vision

ID	Project Name	Description	Source	Cost	Year of Estimate	Priority
R20	New Minor Collector Construction	Would construct a new minor collector between Emerald Street and planned roadway south of the OR 140/OR 66 intersection	TSP	-	-	Vision
R21	Anderson Avenue Extension	Would extend Anderson Avenue from Gettle Street to Glenwood Drive	TSP			Vision
R22	Laverne Ave Rebuild	Rebuild 1,300 ln. ft. of roadway between Altamont Drive and Crest Street	County	$861,742	2020	High
R23	Homedale Rd Rebuild 1	Rebuild 2,700 ln. ft. of roadway between Shasta Way and Shaylnn Drive	County	$1,789,773	2020	High
R24	Summers Ln Rebuild	Rebuild 1,300 ln. ft. of roadway between Frieda Avenue to Shasta Way	County	$861,742	2020	High
R25	Hilyard Ave Rebuild	Rebuild 2,000 ln. ft. of roadway between 6th Street and Siera Heights Drive	County	$1,325,758	2020	Medium
R26	Altamont Rebuild	Rebuild 4,050 ln. ft. of roadway between OR140 and Barry Avenue	County	$2,684,659	2020	Medium
R27	Homedale Rd Rebuild 2	Rebuild 1,400 ln. ft. of roadway between OR140 and Airway Drive	County	$928,030	2020	Medium
R28	Keller Rd Rebuild	Rebuild 2,800 ln. ft. of roadway between La Habra Way and OR39	County	$1,856,061	2020	Medium
R29	Maywood Dr Rebuild	Rebuild 2,200 ln. ft. of roadway between Crosby Avenue and Hilyard Avenue	County	$1,458,333	2020	Medium
R30	Shasta Way Rebuild	Rebuild 2,550 ln. ft. of roadway between Patterson Street and Kimberly Drive	County	$1,690,341	2020	Low
R31	Madison St Rebuild	Rebuild 1,800 ln. ft. of roadway between Shasta Way and dead end	County	$1,193,182	2020	Low
R32	Harlan / Homedale Inersection	Reconstruct intersection	County	$1,000,000	2020	High
R33	Degroot/Washburn Intersection	Reconstruct intersection	County	$1,000,000	2020	Medium
R34	Hilyard Ave Extension 2	New Road from Markgraf Lane to UGB	County	$923,295	2020	Low
R35	Summers Ln Extension	New Road from Marian Court to Foothills Boulevard	County	$1,486,742	2020	High
R36	GlennLee Ave	New Road from LaHabra Way to KCC	County	$710,227	2020	Medium
R37	Madison St Extension	New Road from Springcrest Way to existing roadway 1,400 feet south	County	$402,462	2020	Medium
R38	Sturdivant Extension	New Road from Lombardi Drive to Keller Road	County	$2,328,598	2020	Medium

ID	Project Name	Description	Source	Cost	Year of Estimate	Priority
R39	Homedale Rd Extension	New Road from Foothills Boulevard to Old Fort Road	County	$5,397,727	2020	Low
R40	Foothills Intersection Improvement	Intersection improvement at Summers lane extension and Foothills Boulevard	County	$1,000,000	2020	High
R41	Shasta View Blvd Intersection Improvement	Intersection improvement at Foothills Boulevard and Steen Sports Park entrance	County	$1,000,000	2020	High
R42	Eberlein Avenue Extension	New Road from 6th Street to Foothills Boulevard	County	$757,576	2020	Low
R43	Old Fort Road Improvements	New Road	County	$3,645,833	2020	Low
R44	Collman Dairy Extension	New Road	County	$1,041,667	2020	Low
R45	Algoma Re-alignment**	New Road	County	$710,227	2020	Medium
R46	Shady Pine Realignment**	New Road	County	$402,462	2020	Medium
		Intersection Projects				
I5	Eberlein Avenue/Crater Lake Parkway (OR 39) Intersection	Install traffic signal.	TSP	$507,000	2012	Low
I6	Crater Lake Parkway (OR 39)/Shasta Way Intersection	Modify signal phasing to provide protected/permitted phasing on Shasta Way.	TSP	$195,000	2012	Low
I7	Traffic Signal at Homedale Rd/Shasta Rd	Install traffic signal	County	$750,000	2020	Development Driven
I8	Homedale Road/S 6th Street (OR 39) Intersection	Construct eastbound right-turn lane. Would likely impact adjacent parking lot.	TSP	$743,000	2012	Medium
I11	Washburn Way/OR 140 Eastbound Ramps Intersection	Install traffic signal	TSP	$507,000	2012	High
I18	Greensprings Drive/Dover	Would reconstruct the existing 5-legged intersection	TSP	-	-	Vision

ID	Project Name	Description	Source	Cost	Year of Estimate	Priority
	Avenue/Riverside Drive Improvements					
I21	Orindale Road Interchange	Would construct an interchange at the Orindale Road/OR 140 intersection	TSP			Vision
Pedestrian Projects						
P5/6	Stearns Corridor / Clinton Ave Rebuild	Rebuild 3,100 ln. ft. of Crest Street between Hilyard Avenue and Clinton Avenue / Rebuild 1,300 ln. ft. of roadway between Crest Street and Summers Lane	County	$2,054,924 / $861,742	2020	High / Low

ATTACHMENT C

MEMORANDUM

Klamath County Regulatory Review

Klamath County Transportation System Plan Update

DATE	July 27, 2020
TO	Project Management Team
FROM	Darci Rudzinski, Clinton "CJ" Doxsee, and Courtney Simms, Angelo Planning Group
CC	FILE

INTRODUCTION

This memorandum presents a review of Klamath County's Land Development Code (LDC) for compliance with the State of Oregon's Transportation Planning Rule (TPR), OAR 660 Division 12. The memorandum provides the intent, purpose, and requirements of the TPR, followed by a comprehensive review in the subsequent table.

The purpose of the TPR is *"…to implement Statewide Planning Goal 12 (Transportation) and promote the development of safe, convenient and economic transportation systems that are designed to reduce reliance on the automobile so that the air pollution, traffic and other livability problems faced by urban areas in other parts of the country might be avoided."* The TPR also establishes requirements for coordination among affected levels of government for preparation, adoption, refinement, implementation, and amendment of transportation system plans.

Specifically, TPR requires counties with a population greater than 25,000 to prepare, adopt and implement a Transportation System Plan (TSP). Section -0045 of the TPR addresses implementation of the TSP. TPR Section -0060 (Plan and Land Use Regulation Amendments) specifies measures to be taken to ensure that allowed land uses are consistent with the identified function and capacity of existing and planned transportation facilities. Section -0060 establishes criteria for identifying the significant effects of plan or land use regulation amendments on transportation facilities, actions to be taken when a significant effect would occur, identification of planned facilities, and coordination with transportation facility providers.

In summary, the TPR requires that local governments revise their land use regulations to implement the TSP in the following manner:

- Amend land use regulations to reflect and implement the TSP.

- Clearly identify which transportation facilities, services, and improvements are allowed outright, and which will be conditionally permitted or permitted through other procedures.
- Adopt land use or subdivision ordinance measures, consistent with applicable federal and state requirements, to protect transportation facilities, corridors, and sites for their identified functions, through:
    - access management and control;
    - protection of public use airports;
    - coordinated review of land use decisions potentially affecting transportation facilities;
    - conditions to minimize development impacts to transportation facilities;
    - regulations to provide notice to public agencies providing transportation facilities and services of land use applications that potentially affect transportation facilities; and
    - regulations ensuring that amendments to land use applications, densities, and design standards are consistent with the TSP.
- Adopt land use or subdivision regulations for urban areas and rural communities to provide safe and convenient pedestrian and bicycle circulation and bicycle parking, and to ensure that new development provides on-site streets and accessways that provide reasonably direct routes for pedestrian and bicycle travel.
- Establish street standards that minimize pavement width and total right-of-way.

The following assessment of TPR compliance is based on the LDC. Table 1 lists TPR implementation requirements, an assessment of existing County code and regulatory provisions that meet the requirements, and recommendations for changes to the LDC that will likely be needed to fully implement the a new TSP and bring the County regulations in compliance with the TPR. Recommended changes to local regulatory documents are intended to provide guidance to project staff during the update of the TSP. In particular, modifications to the LDC will be drafted during the planning process and become implementation recommendations for inclusion in the draft TSP.

Table 1: Klamath County Land Development Code (LDC) Regulatory Review	
OAR 660-12-0045	
(1) Each local government shall amend its land use regulations to implement the TSP.	
(a) The following transportation facilities, services and improvements need not be subject to land use regulations except as necessary to implement the TSP and, under ordinary circumstances do not have a significant impact on land use: (A) Operation, maintenance, and repair of existing transportation facilities identified in the TSP, such as road, bicycle, pedestrian, port, airport and rail facilities, and major regional pipelines and terminals; (B) Dedication of right-of-way, authorization of construction and the construction of facilities and improvements, where the improvements are consistent with clear and objective dimensional standards; (C) Uses permitted outright under ORS 215.213(1)(j)–(m) and 215.283(1)(h)–(k), consistent with the provisions of OAR 660-012-0065; and (D) Changes in the frequency of transit, rail and airport services.	The LDC Section 50.040 lists the following transportation-related improvements and activities as essential services, which are permitted outright: 1. Normal operation, maintenance, repair, and preservation activities of existing transportation facilities. 2. Installation of culverts, pathways, medians, fencing, guardrails, lighting, and similar types of improvements within the existing right-of way. 3. Projects specifically identified in the Klamath Falls Urban Area Transportation System Plan and the County Wide Transportation System Plan. 4. Landscaping as part of a transportation facility. 5. Emergency measures necessary for the safety and protection of property. 6. Acquisition of right-of-way for public roads, highways, and other transportation improvements designated in the Urban Area Transportation System Plan, except for those that are located in exclusive farm use or forest zones. 7. Construction of a street or road as part of an approved subdivision or land partition approved that is consistent with the applicable land division regulations. If improvements such as construction, reconstruction, or widening of highways, roads, bridges, or other transportation projects are not considered part of the above activities, they are permitted conditionally in all County zones. Klamath County addresses EFU zones in Article 54. Uses listed in ORS 215 are permitted uses, subject to site plan review. **Recommendation:** Existing code provisions meet this TPR requirement. No further changes to the code are recommended.
(b) To the extent, if any, that a transportation facility, service or improvement concerns the application of a comprehensive plan provision or land use regulation, it may be allowed without further land use review if it is permitted outright or if it is subject to standards that do not require interpretation or the exercise of factual, policy or legal judgment;	The LDC Section 50.040 states that facilities, services, and improvements identified in the TSP are permitted outright or construction of streets or roads as part of an approved subdivision or land partition that are consistent with the applicable land division regulations. **Recommendation:** Existing code provisions meet the TPR requirement. No further changes to the code are recommended.
(c) In the event that a transportation facility, service or improvement is determined to have a significant impact on land use or to concern the application of a comprehensive plan or land use regulation and to be subject to standards that require interpretation or the exercise of factual, policy or legal judgment, the local government shall provide a review and approval	LDC 22.020.D (Rules of Procedure) allows applicants to submit required applications for a single development project as part of one submittal packet. LDC 22.040.A (Type II Review), 24.040 (Public Hearing and Notice) and 26.030 (Public Hearing and Notice) outline County public notice requirements. Article 32 addresses Public Notices, and, per 32.030.C.1.h or 32.030.D.1.h, notice to ODOT

Table 1: Klamath County Land Development Code (LDC) Regulatory Review	
process that is consistent with OAR 660-012-0050. To facilitate implementation of the TSP, each local government shall amend its land use regulations to provide for consolidated review of land use decisions required to permit a transportation project.	is required for application sites located adjacent to a state roadway or where proposals may have an impact on a state transportation facility. LDC 59.960 (OR 66 Green Springs HWY Interchange Area Management Plan (IAMP)) requires notice to the transit agency and all quasi-public agencies to address the IAMP overlay. **Recommendation:** Existing code provisions meet the TPR requirement. No further changes to the code are recommended.
(2) Local governments shall adopt land use or subdivision ordinance regulations, consistent with applicable federal and state requirements, to protect transportation facilities, corridors and sites for their identified functions. Such regulations shall include:	
(a) Access control measures, for example, driveway and public road spacing, median control and signal spacing standards, which are consistent with the functional classification of roads and consistent with limiting development on rural lands to rural uses and densities;	LDC 71 (Vehicular Access and Circulation) includes provisions and standards for streets. LDC 71.150 (Blocks) requires blocks to be limited to 1,320 feet for areas outside of the Urban Growth Area and limited to 600 feet inside the Urban Growth Area. LDC 71.020 (Access Standards) provides procedures and standards for granting vehicular access to public streets. Developments fronting an arterial or collector road may be required to provide a frontage or service road. New development inside the Urban Growth Area is subject to standards in Table 4-3 of the Urban Area Transportation System Plan. Improvements standards within the Klamath Falls Urban Area are included in LDC 71.050, and improvement standards for areas outside the Klamath Falls Urban Area are addressed in LDC 71.060. Street design standards are addressed in LDC 71.040 and provide design specifications based on the street's functional classification. Additional access management for the IAMP Overlay Zone is included in LDC 59.950 (Access Management). **Recommendation:** Existing code provisions meet the TPR requirement. Access standard provisions will need to be modified as necessary to be consistent with, and implement the updated TSP.
(b) Standards to protect future operation of roads, transitways and major transit corridors;	LDC 71.200 (Traffic Impact Study) requires a TIS if any development generates 50 or more peak-hour trips or 500 or more daily trips, is an access spacing exception generates half as many trips, impact an intersection, significantly impact adjacent roadways and intersections that have previously been identified as high crash locations or areas that contain a high concentration of pedestrians or bicyclists such as school zones, or might cause damage to infrastructure. All development within the IAMP Overlay Zone requires a TIS. In addition, the provisions include submittal requirements, review criteria, and conditions of approval. TIS provisions that refer to LDC 71.200 as needed are also found in LDC 41 (Site Plan Review), LDC 46 (Land Subdivision), and LDC 59 (OR 66 Green Springs Hwy Interchange Management Plan).

Table 1: Klamath County Land Development Code (LDC) Regulatory Review	
	LDC 58 (Airport Safety Overlay), and LDC 59.9 (OR 66 Green Springs HWY Interchange Area Management Plan (IAMP)) requires updates to the IAMP to be legislatively adopted as an amendment to the Klamath Falls Urban Area TSP and adopted by the OTC as an update to the Oregon Highway Plan. LDC Article 49 (Legislative Amendment to the Klamath County Comprehensive Plan, Land Development Code, or Zoning Map) provides decision criteria for amendments to the Comprehensive Plan – and by extension the TSP, which is an element of the Plan. Amendments that significantly affect a transportation facility are required to ensure the allowed land uses are consistent with the function, capacity, and level of service of the facility as identified in the TSP. It goes on to include methods by which consistency to policies of the Comprehensive Plan or Urban Area TSP can be determined. **Recommendation:** Existing code provisions meet the TPR requirement. No further changes to the code are recommended.
(c) Measures to protect public use airports by controlling land uses within airport noise corridors and imaginary surfaces, and by limiting physical hazards to air navigation;	The County regulates development in areas surrounding its various airports through the LDC 58 through 58.4. The provisions restrict or limit development that negatively affects the approach zone and the airport in any way. **Recommendation:** Current regulations are compliant with TPR provisions. No amendments are recommended.
(d) A process for coordinated review of future land use decisions affecting transportation facilities, corridors or sites;	See response to -0045(1)(c).
(e) A process to apply conditions to development proposals in order to minimize impacts and protect transportation facilities, corridors or sites;	LDC 20.040 (Conditions of Approval) gives the Review Body for development applications the general authority to impose conditions of approval directly related to the impacts of that development. It includes provisions that specifically call out transportation impacts and lists conditions that it may impose, but are not limited to access, right-of-way dedications, and half-street improvements. LDC 71.200.D (Conditions of Approval) for TIS states that for every land use action, Klamath County and the City of Klamath Falls, and ODOT (if access to a state roadway is proposed) will be required to identify conditions of approval needed to meet operations and safety standards and provide the necessary right-of-way and improvements to develop the future planned transportation system. **Recommendation:** Existing code provisions meet the TPR requirement. However, the County should consider identifying transportation-related improvements as potential conditions of approval, including specifically improvements that facilitate pedestrian and bicycle travel (see -0045(3)(c)).

Table 1: Klamath County Land Development Code (LDC) Regulatory Review	
(f) Regulations to provide notice to public agencies providing transportation facilities and services, MPOs, and ODOT of: (A) Land use applications that require public hearings; (B) Subdivision and partition applications; (C) Other applications which affect private access to roads; and (D) Other applications within airport noise corridors and imaginary surfaces which affect airport operations; and	See response to -0045(1)(c).
(g) Regulations assuring that amendments to land use designations, densities, and design standards are consistent with the functions, capacities and performance standards of facilities identified in the TSP.	See response to -0045(1)(b), 0045(2)(b) and -0060.
(3) Local governments shall adopt land use or subdivision regulations for urban areas and rural communities as set forth below. The purposes of this section are to provide for safe and convenient pedestrian, bicycle and vehicular circulation consistent with access management standards and the function of affected streets, to ensure that new development provides on-site streets and accessways that provide reasonably direct routes for pedestrian and bicycle travel in areas where pedestrian and bicycle travel is likely if connections are provided, and which avoids wherever possible levels of automobile traffic which might interfere with or discourage pedestrian or bicycle travel.	
(a) Bicycle parking facilities as part of new multi-family residential developments of four units or more, new retail, office and institutional developments, and all transit transfer stations and park-and-ride lots;	LDC 68.030.D (Bicycle Parking Standards) requires all uses that are required to provide off-street bicycle parking for all multi dwelling residential, institutional, commercial, and industrial uses in the Klamath Falls Urban Area. **Recommendation:** The County should consider requiring bicycle parking for all transit transfer stations or park-and-rides lots.
(b) On-site facilities shall be provided which accommodate safe and convenient pedestrian and bicycle access from within new subdivisions, multi-family developments, planned developments, shopping centers, and commercial districts to adjacent residential areas and transit stops, and to neighborhood activity centers within one-half mile of the development. Single-family residential developments shall generally include streets and accessways. Pedestrian circulation through parking lots should generally be provided in the form of accessways. (A) "Neighborhood activity centers" includes, but is not limited to, existing or planned schools, parks, shopping areas, transit stops or employment centers; (B) Bikeways shall be required along arterials and major collectors. Sidewalks shall be required along arterials, collectors and most local streets in urban areas, except that sidewalks are not required along controlled access roadways, such as freeways;	**On-site facilities.** LDC 71.190 (Non-Vehicular Access and Circulation) requires new commercial, light industrial, and multifamily residential developments provide internal pedestrian circulation, connecting building entrances and streets, minimizing driveway crossings, and connecting to neighboring developments. **Transit Access.** LDC 71.190.B (Transit Access) If commercial or light industrial sites are within 600 feet of a transit facility identified in the Urban Area TSP, pedestrian access to the transit must be provided. LDC 46.050 (Preliminary Subdivision Plat Requirements) requires propose development plans show any walkways and pedestrian connections and the relationship between a proposed site and any projected streets. **Parking Lots.** LDC 68.070 (Off-Street Parking Design Standards) requires off-street parking areas to construct wheel stops or curbing in all parking areas to prevent vehicles from obstructing access ways and rights-of-way. Other specific requirements related to pedestrian facilities in parking lots are not found.

Table 1: Klamath County Land Development Code (LDC) Regulatory Review	
(C) Cul-de-sacs and other dead-end streets may be used as part of a development plan, consistent with the purposes set forth in this section; (D) Local governments shall establish their own standards or criteria for providing streets and accessways consistent with the purposes of this section. Such measures may include but are not limited to: standards for spacing of streets or accessways; and standards for excessive out-of-direction travel; (E) Streets and accessways need not be required where one or more of the following conditions exist: (i) Physical or topographic conditions make a street or accessway connection impracticable. Such conditions include but are not limited to freeways, railroads, steep slopes, wetlands or other bodies of water where a connection could not reasonably be provided; (ii) Buildings or other existing development on adjacent lands physically preclude a connection now or in the future considering the potential for redevelopment; or (iii) Where streets or accessways would violate provisions of leases, easements, covenants, restrictions or other agreements existing as of May 1, 1995, which preclude a required street or accessway connection.	**Bikeways and Sidewalks.** LDC 71.050 (Improvements in the Klamath Falls Urban Area) requires that all roads classified as arterials or collectors provide sidewalks and bikeways on both sides of the roadway, except as determined by the Director of Public Works. Bike lanes and sidewalks are not required outside of the Klamath Falls Urban Area. **Cul-de-sacs.** LDC 71.100 (Cul-de-Sac) in urban areas requires cul-de-sacs not exceed 500 ft of length. In rural areas, cul-de-sacs may not exceed 700 feet of length. It states that the review body may require a pedestrian way or bikeway between the cul-de-sac and adjacent streets. **Exceptions.** LDC 71.190 (Non-Vehicular Access and Circulation): Where pedestrian connections are not possible to adjacent sites because of topography or existing development, exceptions to the pedestrian connections are allowed. If the site is adjacent to undeveloped or redevelopable streets, stubbed access for a future extension is required. LDC 71.050 (Improvements in the Klamath Falls Urban Area) allows the Director of Public Works to make an exception to the sidewalk and bikeway requirement for arterials and collectors in the Urban Area. **Recommendation:** The County should consider adding bicycle circulation to the existing pedestrian circulation standards in LDC 71.190. The County should add approval criteria for exceptions to sidewalk and bikeway requirements (LDC 71.050).
(c) Where off-site road improvements are otherwise required as a condition of development approval, they shall include facilities accommodating convenient pedestrian and bicycle travel, including bicycle ways along arterials and major collectors; *[Note: Subsection (d) defines safe and convenient]*	See response to Section -0045(2)(e).
(e) Internal pedestrian circulation within new office parks and commercial developments shall be provided through clustering of buildings, construction of accessways, walkways and similar techniques.	As noted in the review of -0045(3)(b) above, LDC 71.190 (Non-Vehicular Access and Circulation) requires new commercial, light industrial, and multifamily residential developments provide internal pedestrian circulation, connecting building entrances and streets, minimizing driveway crossings, and connecting to neighboring developments. **Recommendation:** The County should consider strengthening connectivity and circulation standards to encourage on-site pedestrian connections between buildings and to cluster buildings where feasible.
(4) To support transit in urban areas containing a population greater than 25,000, where the area is already served by a public transit system or where a determination has been made that a public transit system is feasible, local governments shall adopt land use and subdivision regulations as provided in (a)–(g) below:	
(a) Transit routes and transit facilities shall be designed to support transit use through provision of bus stops, pullouts and shelters, optimum road geometrics, on-	LDC 71.190.B (Transit Access) If commercial or light industrial sites are within 600 feet of a transit facility, pedestrian access to the transit must be provided. This includes walkways from

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road parking restrictions and similar facilities, as appropriate; (b) New retail, office and institutional buildings at or near major transit stops shall provide for convenient pedestrian access to transit through the measures listed in (A) and (B) below. (A) Walkways shall be provided connecting building entrances and streets adjoining the site; (B) Pedestrian connections to adjoining properties shall be provided except where such a connection is impracticable. Pedestrian connections shall connect the on site circulation system to existing or proposed streets, walkways, and driveways that abut the property. Where adjacent properties are undeveloped or have potential for redevelopment, streets, accessways and walkways on site shall be laid out or stubbed to allow for extension to the adjoining property; (C) In addition to (A) and (B) above, on sites at major transit stops provide the following: (i) Either locate buildings within 20 feet of the transit stop, a transit street or an intersecting street or provide a pedestrian plaza at the transit stop or a street intersection; (ii) A reasonably direct pedestrian connection between the transit stop and building entrances on the site; (iii) A transit passenger landing pad accessible to disabled persons; (iv) An easement or dedication for a passenger shelter if requested by the transit provider; and (v) Lighting at the transit stop. (c) Local governments may implement (4)(b)(A) and (B) above through the designation of pedestrian districts and adoption of appropriate implementing measures regulating development within pedestrian districts. Pedestrian districts must comply with the requirement of (4)(b)(C) above;	building entrances and the street adjacent to the site and connections to adjoining properties. Transit stop design standards are not included in the LDC. **Recommendation:** The County should add transit design standards for development proposals in the vicinity of transit stop or where the proposal includes or is adjacent to major transit stops, where these are identified in the updated TSP.
(d) Designated employee parking areas in new developments shall provide preferential parking for carpools and vanpools;	LDC 68.030.B (Carpool and Vanpool Parking) requires all employers with 50 or more employees working the same hours or shift to dedicate 10% of the required parking spaces for carpools and vanpools. **Recommendation:** Existing code provisions address this requirement. No changes to the code are recommended.

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(e) Existing development shall be allowed to redevelop a portion of existing parking areas for transit-oriented uses, including bus stops and pullouts, bus shelters, park and ride stations, transit-oriented developments, and similar facilities, where appropriate;	LDC 68.030.C (Transit-related parking reduction) reduces the minimum required parking spaces by 10% if transit-related amenities such as transit stops, pull-outs, shelters, park-and-ride lots, transit-oriented development, and transit service if the site is within ¼ mile of an existing or planned transit route. **Recommendation:** Existing code provisions address this requirement. No changes to the code are recommended.
(f) Road systems for new development shall be provided that can be adequately served by transit, including provision of pedestrian access to existing and identified future transit routes. This shall include, where appropriate, separate accessways to minimize travel distances;	The TSP update will identify existing and planned transit routes; the location and design of planned new roadways will be consistent with existing and planned transit service.
(g) Along existing or planned transit routes, designation of types and densities of land uses adequate to support transit.	When updating the transit element of the TSP, the County has the opportunity to review existing land uses and consider land use changes that would support the viability of transit on existing or planned routes.
(6) In developing a bicycle and pedestrian circulation plan as required by OAR 660-012-0020(2)(d), local governments shall identify improvements to facilitate bicycle and pedestrian trips to meet local travel needs in developed areas. Appropriate improvements should provide for more direct, convenient and safer bicycle or pedestrian travel within and between residential areas and neighborhood activity centers (i.e., schools, shopping, transit stops). Specific measures include, for example, constructing walkways between cul-de-sacs and adjacent roads, providing walkways between buildings, and providing direct access between adjacent uses.	The TSP update will make recommendations to the bicycle and pedestrian plan that are consistent with TPR -0020. This TPR requirements is currently addressed in the following areas: - Walkways between cul-de-sacs and adjacent roads – See response and recommendations in Section -0045(3)(b). - Walkways between buildings – See response and recommendations related to accessways in Section -0045(3)(b). - Access between adjacent uses – See response and recommendations related to accessways in Section -0045(3)(b). **Recommendation:** This requirement will be addressed by the TSP update planning process, which will identify pedestrian and bicycle improvements for inclusion in the TSP, and is met by requiring improvements in developing areas consistent with adopted code provisions.
(7) Local governments shall establish standards for local streets and accessways that minimize pavement width and total right-of-way consistent with the operational needs of the facility. The intent of this requirement is that local governments consider and reduce excessive standards for local streets and accessways in order to reduce the cost of construction, provide for more efficient use of urban land, provide for emergency vehicle access while discouraging inappropriate traffic volumes and speeds, and which accommodate convenient pedestrian and bicycle circulation. Not withstanding section (1) or (3) of this rule, local street standards adopted to meet this requirement need not be adopted as land use regulations.	Local street standards for width and right-of-way are found in LDC 71.040 (Minimum Right-of-Way Widths), including typical street cross-section standards for arterials, collectors, local streets, cul-de-sacs, and alleys. ROW standards for local streets and cul-de-sacs are 60 feet. Lane widths are 10-14 feet, depending on the roadway type. Requirements for the road depend on the road functional class and whether it is within the Klamath Falls Urban Area. Exceptions may be granted for street improvements by the Director of Public Works. No cross-section figures are provided within the LDC. **Recommendation:** The TSP update process will revisit adopted roadway cross-sections. Standards should be made consistent between the updated TSP and development code.

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Amendments to functional plans, acknowledged comprehensive plans, and land use regulations that significantly affect an existing or planned transportation facility shall assure that allowed land uses are consistent with the identified function, capacity, and performance standards of the facility.	Amendments to the Comprehensive Plan Designation (Article 48) or Zoning Map Designation (Article 47) are reviewed as a quasi-judicial procedure. Zone Changes are reviewed according to the Hearings Officer Review Procedure (Article 24); Comprehensive Plan Designation changes are jointly reviewed by the Planning Commission Review Procedure (Article 26) and the Board of County Commissioners Review Procedure (Article 28). Provisions for amendments to the Comprehensive Plan or Zoning Map designation changes in Articles 47 and 48 include review criteria that state the amendments must comply with the TPR and provide a TIS. Amendments to the Klamath County Comprehensive Plan, LDC, or Zoning Map are subject to the provisions in Article 49. The provisions for legislative amendments include review criteria that state the amendments must comply with the TPR and provide a TIS. As stated in LDC 47.030.B.3, LDC 48.030.B.3, and LDC 49.030.B.3 – Review Criteria, the changes must show compliance with OAR 660-012-0060. To document compliance with the TPR applicants must submit a TIS pursuant to Section 71.200. Exceptions to the Statewide Planning Goals, must be based upon Statewide Planning Goal 2, Part II (Exceptions) as interpreted by Oregon Administrative Rules (OAR Chapter 660, Division 4). **Recommendation:** Existing code provisions address this requirement. No additional changes to the code are recommended.