

Fiscal 2026 – 2027  
BIENNIAL WORK PROGRAM  
STATE PLANNING AND RESEARCH

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SUBPART B – RESEARCH

Original Submission: April 17, 2025

**Research Section**  
**In cooperation with the**  
**Federal Highway Administration**

▪ OREGON DEPARTMENT OF TRANSPORTATION ▪

### **ODOT POLICY STATEMENT - TITLE VI OF THE CIVIL RIGHTS ACT**

The Oregon Department of Transportation ensures compliance with Title VI of the Civil Rights Act of 1964; 49 CFR, Subpart B1; related statutes and regulations to the end that no person shall be excluded from participation in or be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance from the U.S. Department of Transportation on the grounds of race, color, sex, or national origin.



# Oregon

Kate Brown, Governor

**Department of Transportation**

555 13th Street NE, Ste 1

Salem, OR 97301-6867

Phone: (503) 986-2700

## Section 23 CFR 420.209(c) Certification

April 17, 2025

I, Michael Bufalino, Research Manager of the State of Oregon, do hereby certify that the State is in compliance with all requirements of 23 U.S.C. 505 and its implementing regulations with respect to the research, development, and technology transfer program, and contemplate no changes in statutes, regulations, or administrative procedures which would affect such compliance.

Appendix A of the Fiscal 2026 – 2027 Biennial Work Program contains a summary of SPR Subpart B program compliance requirement and Oregon's compliance mechanisms.

Michael Bufalino, Research Manager



U.S. Department  
of Transportation  
**Federal Highway  
Administration**

**Oregon Division**

April 17, 2025

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In Reply Refer To:  
740.000

Ms. Amanda Pietz, Division Administrator  
Transportation Development Division  
Oregon Department of Transportation  
555 13<sup>th</sup> St. NE, Suite 2  
Salem, OR 97301

Dear Ms. Pietz,

The Federal Highway Administration (FHWA) approves the Oregon Department of Transportation's (ODOT) State Fiscal Years (SFY) 2026–2027 State Planning and Research (SPR) Planning Work Program (Subpart B), submitted via email on April 17, 2025. This approval is effective from July 1, 2025, through June 30, 2026, at the following funding amounts:

Federal	Non-Federal Match	Total
\$6,698,605	\$1,674,651	\$8,373,256

This approval does not constitute an obligation of Federal funds. The authorization is subject to the availability of funds. The ODOT may request funding obligation in accordance with established procedures. ODOT shall administer the subaward in accordance with the provisions of 2 CFR 200, 23 CFR Part 420, and 49 CFR Part 18. All work must be eligible under 23 U.S.C. 135 and 505, the provisions of 23 CFR 420 and 23 CFR 450, and funding program eligibilities.

If you have any questions, please contact me at (503) 316-2561.

Sincerely,

**JASMINE  
MARIE HARRIS**

Digitally signed by  
JASMINE MARIE HARRIS  
Date: 2025.04.17  
13:46:39 -07'00'

Jasmine Marie Harris  
Transportation Planner

cc:

ODOT: Michael Bufalino, Research Section Manager  
Arlene Santana, SPR Program Manager  
Jeff Flowers, Statewide Investments Management Section Manager  
Katie Parlette, Federal Aid Funding Manager

**FY 2027 FEDERAL APPROVAL LETTER PAGE**  
*(anticipated June 2026)*

**BIENNIAL WORK PROGRAM**

**FOR**

**STATE PLANNING AND RESEARCH SUBPART B (RESEARCH)**

**April 2025**

**Prepared by**

**Oregon Department of Transportation**

**In Cooperation With**

**FEDERAL HIGHWAY ADMINISTRATION**

Oregon Fiscal Years 2026 and 2027

July 1, 2025 to June 30, 2027

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**BIENNIAL WORK PROGRAM**  
**FOR STATE PLANNING AND RESEARCH (SPR)**  
**SUBPART B – RESEARCH**  
**July 1, 2025 to June 30, 2027**

**INTRODUCTION**

An effective transportation research and development program serves a vital role in improving the efficiency and effectiveness of the transportation system. Properly organized and executed research and development activities can help the Oregon Department of Transportation (ODOT) achieve its strategic vision for the transportation system by developing the necessary supporting technology. In the private sector, an effective research effort has long been recognized as a requisite for keeping products and techniques competitive in the marketplace. To enhance the cost-effective use of public funds, research is also needed in the public sector. ODOT established the Research program to administer this work that is funded in part by the Federal Highway Administration's (FHWA) State Planning and Research (SPR) program.

In summary, this work program documents \$8,373,256 for a two-year program with an overall SPR research funding provided by FHWA of \$6,698,605 and a Non-Federal Match from ODOT of \$1,674,652. This programmatic funding for the ODOT research covers the period of the State Fiscal Years 2026 and 2027 (July 1, 2025, through June 30, 2027). In addition to SPR research, this work program documents \$1,119,491 for a two-year period of PROTECT-Planning funds provided by FHWA of \$1,007,542 and a Non-Federal Match from ODOT of \$111,949. See Table 1 for a summary of spending.

Pooled funds and transfers out of Oregon are not included in this table and are documented in this work program for reference. Pooled fund transfers out of Oregon will be made through the FHWA Financial Management Information System (FMIS). Pooled fund transfers into Oregon will be made through the FMIS to separate projects identified in the Oregon Statewide Transportation Improvement Program (STIP).

Table 1 Summary of Work Program Budget for FY'26 and FY'27

<b>Funding Sources</b>	<b>FY'26</b>	<b>FY'27</b>	<b>Total</b>
SPR Research Appropriation	\$3,349,302	\$3,349,302	\$ 6,698,605
State Match SPR Research	\$837,326	\$837,326	\$ 1,674,651
PROTECT Planning (Research)	\$491,842	\$515,700	1,007,542
State Match PROTECT Planning (Research)	\$54,649	\$57,300	\$111,949
<i>SUBTOTAL FUNDING</i>	<i>\$4,733,119</i>	<i>\$4,759,628</i>	<i>\$9,492,747</i>
<b>Excluded from SPR (FMIS transfers and pooled funds)</b>			
NCHRP and TRB SPR Research Assessments	\$221,296	\$221,296	\$ 442,592
SPR Contributions to Cooperative Research	\$100,000	\$100,000	\$ 200,000
Research Led Pooled Funds	\$210,000	\$210,000	\$ 420,000
<i>SUBTOTAL EXCLUSIONS</i>	<i>\$ 531,296</i>	<i>\$ 531,296</i>	<i>\$1,062,592</i>
<b>TOTAL ANTICIPATED EXPENDITURES FOR WORK PROGRAM</b>	<b>\$4,201,823</b>	<b>\$4,228,332</b>	<b>\$8,430,155</b>

The **Infrastructure Investment and Jobs Act (IIJA) (Public Law 117-58)** requires that states set aside two percent of the apportionments they receive from four of the core Federal-aid programs for “State Planning and Research” activities. Pursuant to 23 CFR 420.107, states must allocate 25 percent of this amount for research, development, and technology transfer. The allocation for research, development, and technology is referred to as SPR Subpart B (\$3,349,302 in FY’26, and \$3,349,302 in FY’27).<sup>1</sup> Additionally, this work program documents research conducted under the IIJA approved PROTECT-Planning program.

The Federal Research spending documented in this work plan is summarized in Table 2. The state matching level varies by program and is documented starting on page 3.

Table 2 Anticipated Federal SPR Research Budget

	FY 26	FY 27
SPR Research Appropriation (25% of 2% of core Federal-aid programs*)	\$3,349,302	\$3,349,302
State Match FY'26/FY'27	\$837,326	\$837,326
Pooled Fund Transfers into Oregon (separate STIP project)	\$180,000	\$180,000
<b>TOTAL Funding</b>	<b>\$4,366,628</b>	<b>\$4,366,628</b>

The total combined FY’25 and FY’27 federal portion of the SPR Part B fund expenditure (not including pooled funds) is anticipated to be .

Details regarding expenditures may be found in the following pages. Cooperative research (e.g. Pooled Funds, TRB and NCHRP) is documented starting on page 5, and the core SPR research program administered by the Research Section is documented starting on page 3. The available funds documented above in Table 2 are anticipated to be expended in the activities shown in Table 3 below.

Table 3 Anticipated Federal SPR Research Expenditure

	FY’26	FY’27
NCHRP and TRB SPR Research Assessments (Table 4)	\$221,296	\$221,296
SPR Contributions to Cooperative Research (Table 5)	\$100,000	\$100,000
Oregon Led Pooled Funds (SPR-B) (Table 8) (separate STIP project)	\$210,000	\$210,000
Research Projects for FY’26 and FY’27	\$3,092,266	\$3,092,266
<b>Anticipated Federal Portion of SPR and TPF Research Program Expenditures</b>	<b>\$3,623,562</b>	<b>\$3,623,562</b>

*State matching contributions are documented in the text with the appropriate programs.*

The Oregon SPR Subpart B program is administered by the Research Section of the Transportation Development Division of ODOT. The primary objectives for this program at ODOT are to:

- Coordinate, administer, and supervise research activities within the agency.
- Conduct research projects.
- Assure the use of proper research methods.

<sup>1</sup> IIJA Act core SPR Subpart B Federal-aid values for FY’26 and FY’27 are estimated based on 23 USC 104.

- Prevent duplication of effort.
- Cooperate and communicate with other agencies doing transportation research.
- Assist other transportation providers by sharing and disseminating new technology and research findings.
- Serve as an information source.
- Promote the implementation of research findings.

Amendments to this work program will be developed and submitted for FHWA approval to document major changes to anticipated research work. Major changes include the addition of a new major project, pooled fund hosted by Oregon.

## **RESEARCH SECTION RESPONSIBILITIES**

The Research Section coordinates research activities and maintains continuing monitoring on transportation-related research throughout the nation. The Section functions with the guidance of a Research Advisory Committee supported by Expert Task Groups. Specific responsibilities of the Section are to:

- Solicit transportation users for research needs.
- Develop strategic direction that identifies the State's transportation research priorities.
- Review all research problem statements and obtain the information necessary to formulate a research program.
- Chair Expert Task Groups in order to recommend promising research projects to the ODOT Research Advisory Committee consideration.
- Select principal investigators and Technical Advisory Committee members for each project.
- Conduct literature research as required.
- Review and determine cost eligibility of research activities and equipment purchase.
- In some cases, conduct research projects.
- Assist in the preparation of reports covering the results of research and make recommendations for application into policies, procedures, standards, and other guides governing the activities of ODOT.
- Promote the implementation of the research findings through distribution of research results to appropriate persons for their consideration and use.
- Provide expertise for ODOT in specialty areas pertaining to research and technology.
- Participate in federal and state-sponsored seminars and training meetings to help implement new research findings.
- Provide a liaison with FHWA, universities, consultants, and other agencies conducting and supporting research for ODOT.
- Provide a continuous liaison and surveillance of progress and expenditures for all research projects.
- Provide liaison with the Transportation Research Board and the Cooperative Research Programs.

- Prepare annual and biennial budgets for research activities.
- Conduct periodic Peer Exchanges.

The research portion of the SPR Program aids in the achievement of the above-named objectives. The research is directed toward the solution of local problems, conditions and materials that prevail in Oregon. The Research Section develops or assists in the development of research study proposals and acts as a coordinator during the projects. The project work may be contracted, conducted by the operating section that has the concern and expertise for the particular program, or carried out by Research Section staff. The Research Section coordinates and maintains oversight of the projects to minimize duplication of effort and to broaden the scope of projects.

Research needs are identified through formal inquiry and through annual solicitation of ideas for State, SPR, multi-state, and national projects. Needs are also identified by the Expert Task Groups and/or the ODOT Research Advisory Committee. Informal identification of research needs is an ongoing activity, and the annual solicitation for ideas takes place in the fall with review continuing through the winter. Topics are reviewed by Expert Task Groups to determine those for consideration by the Research Advisory Committee. The Research Advisory Committee then evaluates the proposals for merit, assigns priorities, and recommends funding.

Funds are budgeted for projects by fiscal year based on forecasted tasks for research project work. Estimates are based on anticipated material, contract labor, and staff-time needs. These estimates are based on “Stage 2 Research Problem Statements” and then refined in individual project “Work Plans”. Due to the typically fixed costs of the research process, estimated research project costs are relatively accurate. Overall research project cost estimates involve little risk. Project timing of university led research is sometimes highly variable, and project schedules must be flexible. The variability of schedule necessitates the revision of project budgets during the preparation of this Research Work Program to move project funds between fiscal years based on actual expenditures.

The implementation of research varies with the nature of the project. To the extent required, research findings are transmitted to concerned individuals for their consideration and appropriate action by additional means, including implementation workshops, conferences, and articles in the agency-wide “inside-ODOT” newsletter. The implementation budget in the SPR Work Program provides for preparation of various materials and the conduct of activities to expedite the implementation of research.

## **OTHER RESEARCH SECTION ACTIVITIES**

Research activities in addition to those specifically funded by the SPR Program include the following:

**A. The Oregon Technology Transfer (T2) Center** provides transportation-related information to local government agencies throughout Oregon. The Center is jointly funded by FHWA, the counties and cities of Oregon, and ODOT. The T2 Center is one of 49 such centers across the country (one in nearly every state and Puerto Rico). These centers are a key part of FHWA's Local Technical Assistance Program (LTAP). The FY'24 budget for the T2 Center is approved under a separate work program.

The Technology Transfer Center is housed with the Research Section. The T2 Director, an assistant, and three part-time “Circuit Riders” are supervised by the Research Manager.

T2 provides the following services at no cost to client agencies:

1. A lending library of audio/visual materials.
2. A lending library of technical publications.
3. Sponsorship and delivery of training courses, workshops, seminars, etc., including a “Roads Scholar” program.
4. On-site informational presentations.
5. Response to information requests.
6. A quarterly newsletter of information on transportation related topics.

As its name suggests, the T2 Center strives to make each local public agency in the state aware of the latest and most effective transportation technologies. T2 does this by acting as an information resource and encouraging and strengthening communications between government agencies at all levels.

**B. A State-funded Indirect Account** Approximately \$1,254,474 for the 2026-2027 biennium covers agency staff work, employee training, some travel, office services and supplies, data and word processing, capital outlay, and miscellaneous other services needed to support the Research Section.

## **COLLABORATIVE RESEARCH**

ODOT Research participates in several collaborative research programs using a mix of SPR and other funds. These programs include:

**A. Support for the National Cooperative Highway Research Program (NCHRP)** utilized 5.5% of the SPR allocation. The anticipated total annual support for FY’26 is anticipated to be \$738,718, and support for FY’27 is anticipated to be \$738,718. Oregon funds NCHRP using a blend of SPR Part A and Part B funding; with 75 percent from SPR Subpart A and 25 percent from SPR Subpart B. The SPR Subpart B contribution for the NCHRP program is anticipated to be \$184,679 for FY’26 and \$184,679 for FY’27.

NCHRP is also supported through submittal of problem statements, coordination of ODOT balloting, and service on NCHRP panels. These activities cost approximately \$10,000 per year, mainly in staff time. See Table 4 NCHRP and TRB SPR Research Assessments

**B. The Transportation Research Board (TRB)** subscription fee covers the cost of all publications, information service retrievals, registration, and related services provided to the State by TRB. The fee is expected to be \$184,679 for FY’26, and \$184,679 for FY’27. As with NCHRP, Oregon’s TRB subscription is shared 75-25 percent between Subpart A and Subpart B. The SPR Subpart B TRB contribution is anticipated to be \$36,617 for FY’26 and \$36,617 for FY’27. (see Table 4)

Table 4 NCHRP and TRB SPR Research Assessments

Title	FY’26	FY’27
Contributions to TRB (25% of assessment)	\$36,617	\$36,617
NCHRP Contributions (25% of assessment)	\$184,679	\$184,679
<b>Total NCHRP and TRB SPR Subpart B (This work program)</b>	<b>\$221,296</b>	<b>\$221,296</b>

*Beginning in FY’06 ODOT Research and ODOT Planning agreed to share the cost of the NCHRP and TRB assessments.*

**C. Transportation Pooled Fund Projects** Oregon will contribute SPR funds to at least four Pooled Fund projects in FY'26 and FY'27. For each fiscal year funds are set aside for unidentified projects that could benefit ODOT. The SPR funded cooperative research pooled funds are summarized in Table 5.

Table 5 SPR Contributions to Cooperative Research

Study No.	Title	FY'26	FY'27
TPF-5(479)	Clear Roads Winter Highway Operations Phase III Pooled Fund	\$25,000	\$0
TPF-5(485)	Consequences-Based Analysis of Undrained Shear Behavior of Soils and Liquefaction Hazards, Phase 1: Filling the Data Gaps	\$20,000	\$20,000
TPF-5(524)	Stormwater Management to Address Highway Runoff Toxicity Due to 6PPD-Quinone from Tire Rubber (Oregon Led)	\$30,000	\$30,000
TBD	Uncrewed Aircraft Systems (UAS) Standardization	\$25,000	\$25,000
	Currently Uncommitted	\$0	\$25,000
	<b>Subtotal for SPR Part B Pooled Fund Projects</b>	<b>\$100,000</b>	<b>\$100,000</b>

In addition to SPR B funds, the Research Section facilitates the investment of State funds or SPR A funds in cooperative research. These fund contributions are provided under the budgets of the sponsoring ODOT unit. See Table 6 for a summary of the current State funded cooperative research.

Table 6 State Funded Cooperative Research (not a part of the SPR program)

Study No.	Title	FY'26	FY'27
TPF-5(554)	Traffic Control Devices Pooled Fund Study	\$15,000	\$15,000

*Note these projects are not funded with SPR Part B funds and are not a part of this work program.*

ODOT continues to monitor all open pooled funds that have received a contribution of funds from Oregon. These projects are still active but will not receive new funds in FY'26 or FY'27. These projects are listed in Table 7. ODOT is the lead state for three pooled fund projects. TPF-5(524) is administered by the Research Section. TPF-5(288) and TPF-5(451) are being administered by other ODOT units with research staff assistance. Table 8 includes anticipated expenditure on Oregon Research led pooled funds.

Table 7 Continuing Projects with Previous FY Contributions

Number	Title	Status
TPF-5(178)	Implementation of the Asphalt Mixture Performance Tester (AMPT) for Superpave Validation	Cleared by FHWA
TPF-5(195)	Core Program Services for a Highway RD&T Program - FFY 2009 (TRB FY 2010)	Contract signed
TPF-5(241)	Western States Rural Transportation Consortium (WSRTC)	Objectives fulfilled
TPF-5(255)	Highway Safety Manual Implementation	Cleared by FHWA
TPF-5(260)	Next-Generation Transportation Construction Management	Objectives fulfilled
TPF-5(264)	Passive Force-Displacement Relationships for Skewed Abutments	Contract signed
<b>TPF-5(288)</b>	<b>Western Road Usage Charging Consortium</b>	Cleared by FHWA
TPF-5(299)	Improving The Quality of Pavement Surface Distress And Transverse Profile Data Collection And Analysis	Cleared by FHWA
TPF-5(316)	Traffic Control Device (TCD) Consortium	Cleared by FHWA
TPF-5(343)	Roadside Safety Research for MASH Implementation	Cleared by FHWA
TPF-5(350)	Development of Next Generation Liquefaction (NGL) Database for Liquefaction-Induced Lateral Spread	Contract signed

TPF-5(357)	Connecting the DOTs: Implementing ShakeCast Across Multiple State Departments of Transportation for Rapid Post-Earthquake Response	Objectives fulfilled
TPF-5(358)	Wildlife Vehicle Collision Reduction and Habitat Connectivity	Objectives fulfilled
TPF-5(367)	Evaluation and Full Scale Testing of Concrete Prefabricated Bridge Rails	Objectives fulfilled
TPF-5(369)	Collaborative Development of New Strategic Planning Models	Objectives fulfilled
TPF-5(378)	TRB Core Program Services for a Highway RD&T Program - FFY 2018	Cleared by FHWA
TPF-5(384)	Exploring Non-Traditional Methods to Obtain Vehicle Volume and Class Data	Cleared by FHWA
TPF-5(386)	Gravel-Bed River Assessment Tool for Improved Resiliency of Engineering Design	Cleared by FHWA
TPF-5(398)	Moving Forward with the Next Generation Travel Behavior Data Collection and Processing	Cleared by FHWA
TPF-5(399)	Improve pavement surface distress and transverse profile data collection and analysis, Phase II	Cleared by FHWA
TPF-5(433)	Behavior of Reinforced and Unreinforced Lightweight Cellular Concrete for Retaining Walls	Contract signed
TPF-5(437)	Technology Transfer Concrete Consortium (FY20-FY24)	Contract signed
TPF-5(440)	Support for Urban Mobility Analyses	Objectives fulfilled
TPF-5(442)	Transportation Research and Connectivity(librarian toolkit / knowledge networking / information condition / analysis of resources / digitization efforts / ADA support)	Cleared by FHWA
TPF-5(447)	Traffic Control Device (TCD) Consortium (3)	Cleared by FHWA
<b>TPF-5(451)</b>	<b>Road Usage Charge (RUC) America</b>	Cleared by FHWA
TPF-5(456)	EconWorks - Improved Economic Insight	Cleared by FHWA
TPF-5(470)	Traffic Signal Change and Clearance Interval Pooled Fund Study	Cleared by FHWA
TPF-5(478)	Demonstration to Advance New Pavement Technologies Pooled Fund	Cleared by FHWA
TPF-5(479)	Clear Roads Winter Highway Operations Phase III Pooled Fund	Cleared by FHWA
TPF-5(485)	Consequences-Based Analysis of Undrained Shear Behavior of Soils and Liquefaction Hazards, Phase 1: Filling the Data Gaps	Cleared by FHWA
TPF-5(501)	Roadside Safety Pooled Fund - Phase 3	Cleared by FHWA
TPF-5(511)	TRB Core Program Services for a Highway RD&T Program – Federal Fiscal Year 2023/TRB (State DOTs) Fiscal Year 2024	Cleared by FHWA
<b>TPF-5(524)</b>	<b>Stormwater Management to Address Highway Runoff Toxicity Due to 6PPD-Quinone from Tire Rubber</b>	Cleared by FHWA
TPF-5(528)	Extending and Sharing Benefits of Strategic Planning Models	Cleared by FHWA
TPF-5(534)	Mobility Analysis and System Transportation Efficiency Research (MASTER)	Cleared by FHWA
TPF-5(554)	Traffic Control Device (TCD) Consortium (4)	Cleared by FHWA
Solicitation 1620	Uncrewed Aircraft Systems (UAS) Standardization	Solicitation posted

Table 8 Oregon Led Pooled Funds

Project #	Name	FY'26	FY'27
<b>TPF-5(288)</b>	Western Road Usage Charging Consortium	State funded	State funded
<b>TPF-5(451)</b>	RUC West	State funded	State funded
<b>TPF-5(524)</b>	Stormwater Management to Address Highway Runoff Toxicity Due to 6PPD-Quinone from Tire Rubber	<b>\$210,000</b>	<b>\$210,000</b>

Additional information about the Transportation Pooled Fund Program and individual pooled fund projects may be found online at: <http://www.pooledfund.org/>.

## **CORE RESEARCH PROGRAM FUNDING SUMMARY**

Table 9 documents the core of the SPR research program. The details of each project can be found on the following pages.

Table 9 Research Projects for Fiscal 2024 and 2025

<b>Project #</b>	<b>Name</b>	<b>FY'24</b>	<b>FY'25</b>
301	SPR PROJECT DEVELOPMENT	\$185,000	\$170,000
302	IMPLEMENTATION	\$105,500	\$70,000
302-200	LIBRARY	\$90,000	\$100,000
303	UNALLOCATED FUNDS (Allocated to FY'25 projects through Amendment 2)	\$0	\$1,160,995
304	RESEARCH DISCRETIONARY FUND	\$98,020	\$150,000
TNI	Transportation Needs and Issues Survey	\$48,000	\$132,000
836	Prioritizing Wildlife Collision Mitigation Zones for Long Range Planning Efforts	\$49,549	\$-
852	Implementation of Balanced Mix Design Methods in Oregon to Meet Long-Term Performance Goals	\$6,000	\$-
853	Predicting Near Real-Time Post-Fire Landslide Debris Flows Along ODOT Corridors	\$95,837	\$-
859	Real-Time Continuous Bridge Scour Monitoring for Improved Safety and Cost Savings	\$62,000	\$108,500
861	Signal-Controller-in-the-Loop Simulation for Testing and Deploying Advanced Signal Operations on Arterial Roadways	\$8,867	\$-
862	Increasing Asphalt Recycling to Reduce Paving Costs, Improve Pavement Longevity, and Reduce Environmental Impact	\$25,178	\$-
864	Phase 2: Quantitative Evaluation Process for Improved Rockslope Safety and Reduced Maintenance	\$103,955	\$-
865	Low-Carbon Ultra-High Performance Concrete for Use in Highway Infrastructure	\$82,398	\$-
867	Automated Wildlife Detection for Wildlife Vehicle Collision Reduction	\$97,000	\$89,122
870	Placement Options for In-street Pedestrian Crossing Signs (R1-6a)	\$69,860	\$-
874	New Methods for Improving Load Rating of Existing Steel Bridges	\$107,604	\$-
875	Analysis of the Potential Revenue and Community Impacts of an E-commerce Household Delivery Fee in Oregon	\$82,200	\$-
876	Implementation Requirements for Work Zone Intrusion Technologies to Reduce Fatalities	\$64,232	\$-
877	Developing Guidance on Leading Pedestrian Intervals and Curb Extensions to Improve Pedestrian Safety at Signalized Intersections	\$66,000	\$-
878	Real-Time Landslide Surface Monitoring for Improved Safety, Response, and Repair	\$118,000	\$135,000
879	Phase II: Method Development for Construction Design in Diatomaceous Soils	\$404,395	\$121,350
880	An Innovative Technology to Prevent Wind-Induced Fatigue Cracks in the Astoria-Megler Bridge.	\$203,810	\$83,090
881	Landslide Prioritization, Planning, and Management Tool	\$171,000	\$172,000
882	Benefit-Cost Analysis of Roundabouts to Support Long Range Investment Policy	\$86,669	\$19,206
883	Advancing pedestrian safety at intersections: Temporal modeling of pedestrian crash frequency and severity	\$90,500	\$35,000
884	Developing Next-Generation of Bridge Fragility Models for Oregon's Transportation Network	\$202,000	\$99,000
885	Increasing Infrastructure Longevity and Durability during Potential Emergency Flooding Scenarios	\$-	\$-
886	Mobile Lidar Evaluation of Road Marking Condition for Federal Reporting	\$138,240	\$54,900

<b>Project #</b>	<b>Name</b>	<b>FY'24</b>	<b>FY'25</b>
887	Increasing Asphalt Recycling in Oregon through Improvements in Cold and Hot Mix Asphalt Production Processes	\$157,508	\$148,069
888	Evaluation of the relationship between near misses and crash outcomes at intersections in Oregon	\$161,250	\$36,500
889	" Evaluating Mowing Practices for Pollinator Habitat Enhancement: Highway Vegetation	\$50,000	\$90,000
890	Updating Streamflow Statistics for Central and Eastern Oregon to Reduce Flooding Risk	\$98,000	\$120,000
891	Impact Study on Increasing Truck Permit Weight Limits	\$100,000	\$125,000
892	Phase III Wickiup Junction: Diatomaceous Soil Numerical Modeling to Support Design, Performance, and Feasibility	\$115,000	\$143,500
893	Development of Methods to Produce High-Quality 'Household-Based' VMT Dataset	\$56,000	\$65,000
894	Design Guidelines for Bridge Pile Foundations Subjected to Combined Inertial and LiquefactionInduced Lateral Spreading Loads	\$98,000	\$221,000
895	Develop Guidance on the Safety Performance of Edge Line Pavement Markers and Guardrail Delineations on Rural Oregon Roads	\$68,000	\$80,000
896	The Potential of Using Crack-Attenuating Asphalt Mixtures in Oregon to Combat Long-Term Durability Issues	\$100,000	\$131,000
	<b>Federal Total</b>	<b>\$3,092,266</b>	<b>\$3,092,266</b>
	<b>State Total</b>	<b>\$773,066</b>	<b>\$773,066</b>
	<b>TOTAL SPR Research Projects</b>	<b>\$3,865,332</b>	<b>\$3,865,332</b>

## **301 PROJECT DEVELOPMENT**

### **OVERVIEW AND OBJECTIVES**

Funds are not available for individual research studies until a study work plan has been developed and approved. Funds budgeted under this item will be used to develop or assist in the development of SPR projects.

In the fall of each year the Research Program issues an open call for research ideas, or research problem statements. Participation is open to literally anyone. Historically, up to 100 or more new problem statements are received every year. For the most part, problem statements are prepared by ODOT employees, university researchers, other state and local transportation agencies, other research organizations, and consultants emphasizing the “bottom up” approach.

The money will cover the costs of soliciting new projects, organizing and facilitating expert task groups, developing stage 1 and stage 2 problem statements, identifying potential investigators, preparing work plans and executing agreements (if any) to carry out the research.

### **ACCOMPLISHMENTS**

The Research Section selects between eight and twelve new research projects each year. The intensive project development and selection process helps identify research with a high potential to produce a benefit to the State’s efforts to provide for transportation within Oregon. This process includes coordination with experts throughout the agency and with University Transportation Centers. In FY’26 the Section will start eight new projects and will set aside funds in for future selection of projects to start in FY’27.

### **RESPONSIBLE PARTIES**

Responsibility for this activity rests with Research staff and with members of Technical Advisory Committees (TAC). TAC membership is drawn from ODOT professional, technical and operational units, Oregon universities, other transportation agencies, resource agencies and the FHWA.

### **COST INFORMATION**

<b>SPR 301</b>	<b>FY’20</b>	<b>FY’21</b>	<b>FY’22</b>	<b>FY’23</b>	<b>FY’24</b>	<b>FY’25</b>	<b>FY’26</b>	<b>FY’27</b>
BUDGET	\$250,000	\$250,000	\$233,084	\$263,000	\$360,000	\$360,000	\$185,000	\$170,000
SPENT TO DATE	\$393,118	\$386,900	\$353,678	\$330,866	\$237,766	\$74,820		
REVISED BUDGET	<b>\$393,118</b>	<b>\$386,900</b>	<b>\$353,678</b>	<b>\$330,866</b>	<b>\$237,766</b>	<b>\$170,000</b>		

*FY’18 through FY’23 expenditure values are actual. FY’24 expenditures are recorded through January of 2025. FY’25 Budget values are estimated based on forecasted project work.*

**OVERVIEW AND OBJECTIVES**

Technology transfer means those activities that lead to the adoption of a new technique or product by users and involves dissemination, demonstration, training, and other activities that lead to eventual innovation.

When a project ends and the report is published the project budget is no longer available for continuing activities related to dissemination and technology transfer of results. These funds combine implementation activities across projects. The objective is to provide a resource for more effective, ongoing implementation of research findings and to ensure research is focused on high priority projects.

**RELATIONSHIP OF OBJECTIVES TO OVERALL PROGRAM**

Research findings have no practical value until they are implemented. Design and operations offices and other ODOT programs are concerned with keeping abreast of new technology, but time restraints prohibit review of many research reports. This budget item will be utilized to more effectively inform potential users of promising research results. Interaction with maintenance and construction employees will bring new issues to light, as well as facilitating sharing of potential solutions and ideas developed by staff.

**PROPOSED MAJOR ACTIVITIES**

Research Notes will be distributed widely to management and maintenance crew leaders. Research will use electronic media and ODOT Internet to make updates and research information more accessible. Research Notes on project progress will be developed for major projects of interest. Implementation Guides will be developed, if appropriate, and distributed to those who would use the research findings.

As in the past, research results will be available on the Transportation Research Information Database (TRID) maintained by the Transportation Research Board (TRB) and the Bureau of Transportation Statistics (BTS). Investigators are also encouraged to present ODOT results at regional, national, and international conferences, and to publish ODOT supported work in engineering and scientific journals.

Finally, as in the past, on a project by project basis, specific implementation efforts will be identified and carried out as needed to assure that key implementation agents within ODOT have the information and the means to make optimal use of implementable research results.

Tech Transfer activities should focus on the implementation of the findings from completed research into practice. Expected actions include:

- Training classes based on research findings
- Workshops
- Based on completed research reports support the development of ODOT documentation (e.g. policy, procedures, specifications, or other implementation documents) to integrate research findings into practice.

- Support development of new state statutes or administrative rules, or the revision of existing statutes and ruled.
- Distribution and documentation to inform the efforts national partners such as AASHTO, FHWA, to update national standards or guidance.
- Support the development of a new program, intuitive, position, or organizational unit within ODOT to implement the research findings.

The primary focus of these funds is to support the transfer of ODOT sponsored SPR research. In rare cases the transfer of research findings completed by outside entities (e.g. FHWA, AASHTO, TRB or a UTC) may be supported by these funds if it fulfills an identified need of the agency.

### **Sub-projects**

Sub-projects under Project 302 include research efforts and research functions that are scoped to support technology transfer or to support the implementation of past research. Current and planned sub-projects include:

#### **302-011 SPR-864 IMPLEMENTATION/TECH TRANSFER (PROTECT)**

Applying Rockfall Activity Model to High-Risk Rock Slopes for Safe and Effective Slope Mitigation. This project implements research-based advances in risk detection. The proposed work enhances safety for travelers and DOT personnel, reduces emergency recovery costs and travel disruption through rockfall detection and mitigation prioritization.

#### **302-021 SPR 857 IMPLEMENTATION/TECH TRANSFER**

Working with partners from the Portland Metro region this project will support the development of a dashboard that would ingest, QA/QC, and present the signal push button data with adjusted count using the methods from SPR 857. This final product development and technology transfer will move the research directly to practice.

## **ACCOMPLISHMENTS**

On numerous occasions, the Research Section has recommended the implementation of promising research findings. The implementation item in the SPR Work Program will permit this activity to be accomplished more thoroughly, and in some cases, more formally.

### **Projects**

Twelve major projects were completed in FY'24 and FY'25. Fifteen additional projects are expected to be completed by the end of FY'25 with publication in June or July of 2025. When a project moves into final stages, the Technical Advisory Committee discusses implementation issues and proposes an implementation strategy, which may or may not entail specific, post-publication efforts from the Research Section. The FY'26 budget will be used to support research staff time, follow-up analysis, and technology transfer activities for the following projects ending in FY'25 or in early FY'26 (Bold indicates a project published prior to April 2025):

SPR 807	SPR 834	<b>SPR 842</b>
<b>SPR 820</b>	<b>SPR 839</b>	<b>SPR 843</b>
<b>SPR 830</b>	SPR 841	<b>SPR 844</b>

SPR 846	SPR 854	SPR 863
SPR 847	<b>SPR 855</b>	SPR 866
<b>SPR 848</b>	SPR 856	SPR 868
<b>SPR 849</b>	<b>SPR 857</b>	<b>SPR 869</b>
SPR 850	<b>SPR 858</b>	SPR 871
SPR 851	SPR 860	SPR 873

Note that the four yet to be published projects will be monitored until they are completed. If necessary, technology transfer funds will support the dissemination of results.

## **METHODOLOGY**

A cornerstone of our implementation effort is to include key agents of implementation from within ODOT on the project Technical Advisory Committee. These individuals are expected to carry the majority of the responsibility for keeping the project focused on implementable objectives, making sure information is delivered into the right hands, and to identify key steps in implementation such as revision of standards and specifications, incorporation into procedures and best practices manuals and guidebooks, etc.

It is not feasible from the standpoint of staff and time to expect operations staff to review all available research reports, but studies identified as being of major importance will be distributed to appropriate offices. In particular, reports generated from research projects conducted in Oregon will be reviewed for implementable findings and brief reports presenting suggested implementation procedures will be circulated to potential users.

SPR funds must be focused on the process of turning research into practice. SPR funds, expenditures on materials, equipment, and construction activities, planning activities, are not permitted. Funding materials, equipment, and construction activities must be the responsibility of the implementation champion or other partner.

## **RESPONSIBLE PARTIES**

Implementation is the responsibility of primary users of the research in ODOT Divisions and Regions, with the support and assistance of the Research Section. In order to facilitate the most seamless research implementation, key users are engaged in research project development, management, and review, by participation on project Technical Advisory Committees.

The use of SPR Technology Transfer funds will be approved by the Research Section Manager based on one of the following conditions:

- Identified need documented in an SPR research project implementation memo
- Stage 1 or Stage 2 research problem statements where ODOT discovers a previously researched solution already exists, implementation has strong agency support, and the agency needs some research support to transfer existing research into practice
- Or to address an identified need of the agency that is solved by an established body of research, implementation has strong agency support, and the agency needs some support to transfer existing research into practice

## COST INFORMATION

<b>SPR 302</b>	<b>FY'20</b>	<b>FY'21</b>	<b>FY'22</b>	<b>FY'23</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>
BUDGET	\$62,917	\$65,000	\$10,000	\$10,000	\$50,000	\$68,228	\$150,500	\$70,000
SPENT TO DATE	\$26,087	\$31,046	\$53,043	\$18,999	\$47,014	\$16,519		
<b>REVISED BUDGET</b>	<b>\$26,087</b>	<b>\$31,046</b>	<b>\$53,043</b>	<b>\$18,999</b>	<b>\$65,000</b>	<b>\$65,000</b>		

*FY'18 through FY'24 expenditure values are actual. FY'25 expenditures are recorded through January of 2025. FY'25 Revised Budget values are estimated based on forecasted project work.*

## **302-200 LIBRARY LITERATURE REVIEWS AND TECH TRANSFER SUPPORT**

### **OVERVIEW**

The Oregon Department of Transportation Library serves as a technical information resource for our agency, as well as providing services to other state, county and local government agencies, and the general public.

One of the goals of ODOT is to deliver a modern transportation. ODOT employs over 4,000 employees who need access to the most recent literature to modernize our processes and infrastructure. When the Department initiates a new program that is focused on modernization a comprehensive review is necessary to compile the relevant literature and present it to our professional staff. This is an essential part of insuring that our modernization efforts are based on the most recent research in the field. This project will provide valuable technology transfer services to ODOT by gathering the research completed by the 50 states, AASHTO, TRB, various industry standards organizations, and academic sources.

### **OBJECTIVES**

Conduct professional reference interviews with individual customers (including Department employees, other state and federal agencies, outside organizations, and members of the public) to determine information needs. Using research skills and knowledge of information resources and technology locate resources and provide information or materials within requested time frames.

### **PROPOSED ACTIVITIES**

Staff Time; Literature Review; Presentations, Publication of Reports.

### **ACCOMPLISHMENTS**

Once it begins, accomplishments will be reported in the program annual report, and in subsequent work programs.

### **RESPONSIBLE PARTIES**

ODOT Research Section

### **COST INFORMATION**

<b>SPR 302-200</b>	<b>FY'26</b>	<b>FY'27</b>	<b>TOTAL</b>
BUDGET	\$90,000	\$100,000	\$190,000
SPENT TO DATE			
<b>REVISED BUDGET</b>			

*Budget values are estimated based on forecasted project work.*

### **303 FUNDS RESERVED FOR NEW PROJECTS STARTING IN FY'27**

This two-year work program estimates work for both FY'26 and FY'27. In the fall of 2025 the Section plans to conduct a solicitation for ideas for new research projects that will start in FY'27. In March of 2026 the ODOT Research Advisory Committee will meet and prioritize the proposed projects. An amendment to this work program is anticipated in June of 2026 and will document projects selected to start in FY'27.

## **304 SMALL PROJECTS DISCRETIONARY FUND**

### **OVERVIEW AND OBJECTIVES**

Through the course of the fiscal year the Research Section receives requests for information and a variety of other requests to perform research typically related to evaluation of new products and methods. These projects typically require a quick response from the Research Section because someone in the organization has made a commitment to the application of an innovation that could benefit from monitoring and evaluation but will go forward whether Research Section participates or not. The discretionary fund gives us greater funding flexibility to participate when these opportunities arise.

Similar opportunities arise when universities and other organizations propose small projects involving cost sharing. In the past a number of projects have been undertaken when a medium priority project could be launched because the cost was small, raising the benefit-cost ratio. Many such projects have been, or will be, funded partially by one of five University Transportation Centers in the region. In addition, projects that would previously have been funded under the “Experimental Features” program will draw on the Research Discretionary Fund. Evaluations of experimental features will continue as appropriate, but combining the funds into a single pool simplifies administration. This fund provides a means of evaluating innovative products or non-standard methods and materials on an experimental basis. It also provides the flexibility to respond quickly to other research needs that emerge through the fiscal year, and to commit to small projects without specific approval from the Research Advisory Committee.

This work program anticipates an expansion of these projects as the pace of innovation accelerates. An increase in budget has been set aside for these projects.

### **ACCOMPLISHMENTS**

In FY’25 the Research Section managed several sub-projects under project 304, and in March of Ongoing work included TRB Liaison and NCHRP Activity, supporting the AASHTO Technology Implementation Group, and Multi-State Research Coordination.

### **PROPOSED ACTIVITIES**

Project 304 allows for a limited number of discretionary transportation research projects.

Expected activities include:

- ODOT staff time.
- Consultant payments.
- ODOT Staff travel.
- Equipment for the exclusive use of the defined discretionary research project. This allows the purchase of specialized research equipment.
- Other activities that are necessary and reasonable for proper and efficient accomplishments of the identified transportation research.

Small projects limited to the above activities may be conducted without amendments to this work program. All discretionary transportation research project activities funded under Project 304 will be limited to activities that are necessary and reasonable pursuant to 23 CFR 420.113(a) (3).

### **Sub-projects**

Sub-projects under Project 304 include discrete research efforts and research functions that occur continuously, or cyclically. The current sub-projects are listed below, with the balance of funds to be spent on yet to be identified FY'20 and FY'21 research projects. Current and planned sub-projects include:

- **304/421 Liaison and NCHRP Activity.** This covers coordination of annual NCHRP balloting, coordination of problem statement submittal and panel participation. Provide support for multi-state research coordination, including response to other states' requests and support of the AASHTO Research Advisory Committee and Transportation Research Board (status is ongoing).
- **304/481 AASHTO Technology Implementation Group (TIG).** TIG identifies useful and implementable new technologies and invests in their deployment through various means. TIG is supported through an assessment on member Departments. This year ODOT paid our \$6,000 TIG assessment using the Research Discretionary Fund (status is *ongoing*).
- **304/401 Northwest Transportation Conference** Funds are set aside for speakers, staff time and other conference expenses for the Northwest Transportation Conference, which is held biennially during even numbered years. The conference is described more fully under on research implementation above and is intended as a major part of the Section's technology transfer efforts (status is *ongoing*).
- **304/951 Hazard Alert System Prototype for Tractor Mowers** Develop and test machine learning algorithms to support automated hazard detection while mowing.
- **304/971 Stormwater Management Methods for improving resiliency through BMP amendments.** The objective of this small bench-scale project is to identify and test an effective, low-impact, and cost-efficient biochar amended media mixture capable of remediating stormwater runoff toxicity to salmonid species.
- **304/981 Assess stormwater BMP performance at high flooding risk location of interest for Oregon rural community partner.** Project aims to inform stormwater BMP selection and prioritization, with a focus on improving flood risk mitigation and associated water quality through assessment of BMP performance under high frequency, high intensity precipitation events. Objective is to improve technical capacity to address concerns regarding stormwater BMP efficacy.

### **RESPONSIBLE PARTIES**

This activity is the responsibility of the ODOT Research Section, as well as members of the technical advisory committee formed to manage each project.

**COST INFORMATION**

<b>SPR 304</b>	<b>FY'20</b>	<b>FY'21</b>	<b>FY'22</b>	<b>FY'23</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>
ORIGINAL BUDGET	\$160,000	\$175,000	\$34,500	\$36,500	\$98,280	\$102,695	\$98,020	\$150,000
SPENT TO DATE	\$136,364	\$120,435	\$147,336	\$49,511	<b>\$119,378</b>	\$22,036		
<b>REVISED BUDGET</b>	<b>\$136,364</b>	<b>\$120,435</b>	<b>\$147,336</b>	<b>\$49,511</b>	<b>\$119,378</b>	<b>\$100,000</b>		

*FY'20 through FY'24 expenditure values are actual. FY'25 expenditures are recorded through January of 2025. FY'26 Revised Budget values are estimated based on forecasted project work.*

## **TNIS TRANSPORTATION NEEDS AND ISSUES SURVEY**

### **OVERVIEW**

In spring and summer of 2024, the Transportation Needs and Issues Survey randomly samples Oregon residents and their opinions on a number of issues related to transportation.

### **OBJECTIVES**

This survey continues to provide data on transportation issues for research and planning purposes to many parts of ODOT.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/odot/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Funds will be used to pay for staff time; consultants and professional services; travel expenses; and other services and supplies.

These activities will result in:

- Literature review.
- Methods for analysis and design.
- Survey
- Data.
- Reporting.

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

### **ACCOMPLISHMENTS**

The research program has produced the Transportation Needs and Issues Survey every two years since 1996. The most recent report having been published in January 2025.

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

### **RESPONSIBLE PARTIES**

ODOT Research Section

**COST INFORMATION**

<b>TNIS</b>	<b>FY'24</b>	<b>FY'25</b>	<b>TOTAL</b>
ORIGIONAL BUDGET	\$48,000	\$132,000	\$180,000
SPENT TO DATE			
<b>REVISED BUDGET</b>			

*FY'26 and FY'27 Budget values are estimated based on forecasted project work.*

## **836 INTEGRATING WILDLIFE CORRIDOR MAPPING WITH COLLISION HOTSPOT DATA TO PRIORITIZE CROSSING PROJECTS**

### **OVERVIEW**

Large mammals cross highways to access core habitat areas, presenting significant safety hazards for Oregon drivers. In 2017, more than 7,400 wildlife-vehicle collisions resulting in more than 700 serious injuries and two fatalities occurred throughout ODOT's highway system. Though ODOT has documented progressively increasing animal-vehicle collisions over several years, ODOT lacks a statewide, science-based approach for identifying and prioritizing the most effective project sites for wildlife collision mitigation. Instead, crossing sites are considered on a project-by-project basis, risking both effectiveness for the traveling public and inefficient use of public funds. For migratory animals such as mule deer and elk, current and future projections of road crossing zones can be approximated through computational modeling of movement between core habitats. Using wildlife collision data, telemetry data, and available high resolution spatial data together with recent advancements in statistical methods for connectivity assessment, this research aims to develop landscape-scale habitat connectivity maps for highway corridor project planning.

### **OBJECTIVES**

For effective crossing site project prioritization, integrating collision mapping data together with wildlife corridor models, predicted traffic models, and fire hazard. The specific aim of this research work is the delivery of wildlife corridor maps statewide that consider future traffic scenarios and fire risk, with the ability to highlight priority zones along highways.

More detailed information regarding the project and its objectives can be found at the link below: <https://www.oregon.gov/odot/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Funds will be used to pay for the following: staff time, consultants and professional services, travel expenses, and other services and supplies. Funds will be used to pay for Technical Equipment required to conduct the research. These activities will result in:

- Targeted literature review
  - Identification and transformation of available datasets
  - Generation and validation of corridor models
  - Development of wildlife crossing prioritization maps
  - Assessment/Validation of high value crossing locations using genetic and camera trap data.
- 
- Distribution of results across ODOT

Phase I project completed. Post-research implementation will continue. Phase 2 will be completed by the end of FY25, with publication in FY26. For Phase 3 (Assessment/Validation of high value crossing locations using genetic and camera trap data) information on proposed activities can be found on the ODOT active research project webpage link above.

## ACCOMPLISHMENTS

Phase 1 Project Complete and published. Phase 2 will be completed by the end of FY25, with publication in FY26.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Environmental Section

ODOT Regions

Oregon Department of Fish and Wildlife. Agreement for \$180,000 ending December 2022 with \$180,000 transferred to ODFW as of May 2023 with ODFW subcontract to Portland State University.

Phase 2 of project contract to Oregon State University. Agreement for \$157,000 ending September 30, 2024. With \$78,918.37 expended through January 2025.

## COST INFORMATION

<b>SPR 836</b>	<b>FY'20</b>	<b>FY'21</b>	<b>FY'22</b>	<b>FY'23</b>
STAGE 2 BUDGET	\$-	\$64,500	\$86,000	\$64,500
WORK PLAN BUDGET	\$-	\$80,842	\$63,253	\$79,905
SPENT TO DATE	\$1,058	\$73,574	\$67,630	\$66,852
<b>REVISED BUDGET</b>	<b>\$1,058</b>	<b>\$73,574</b>	<b>\$67,630</b>	<b>\$66,852</b>

<b>SPR 836</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$-	\$-	\$-	\$215,000
WORK PLAN BUDGET	\$-	\$-	\$-	\$224,000
SPENT TO DATE	\$34,746	\$57,833	\$-	\$216,862
<b>REVISED BUDGET</b>	<b>\$34,746</b>	<b>\$103,000</b>	<b>\$49,549</b>	<b>\$396,409</b>

*FY'20 through FY'24 expenditure values are actual. FY'24 expenditures are recorded through January of 2025. FY'25 and FY'26 Revised Budget values are estimated based on forecasted project work.*

## **852 IMPLEMENTATION OF BALANCED MIX DESIGN METHODS IN OREGON TO MEET LONG-TERM PERFORMANCE GOALS**

### **OVERVIEW**

In Oregon, asphalt cracking is the major distress mode, necessitating costly rehabilitation and maintenance at intervals of less than half of the intended design lives in some cases. It is one of the main reasons for large road maintenance and rehabilitation expenditures, as well as reduced user comfort and increased fuel consumption due to high road roughness. The resistance of the pavement to this distress mechanism is dependent upon the ductility of the asphalt pavement mixture. The increased use of recycled asphalt materials with high binder replacement rates results in a significant reduction in ductility of the asphalt mixtures used in construction, which causes a significant reduction in the fatigue life of the pavement in many cases. Results of rutting (permanent deformation on highways) performance tests conducted in the ODOT SPR801 project showed that Oregon mixes are highly deformation resistant and it is possible to significantly increase cracking resistance by increasing the asphalt binder content and/or incorporating warm-mix additives to improve ductility. According to the 2020 ODOT Pavement Condition Report, current ODOT pavement program is underfunded, which is expected to result in a decline in pavement conditions in Oregon within the next 4 years. An estimated \$220 million a year funding level is needed to repair pavements that are in poor condition, while providing timely preventive preservation and maintenance on roads in fair-or-better condition. However, pavement program funding levels after 2021 are planned to be around \$107 million (expected 21-24 annual STIP funding) per year according to the report (almost half of the needed funding level). For this reason, implementing innovative strategies for asphalt mixture design is critical to improving long-term pavement performance in Oregon.

### **OBJECTIVES**

The major objective of this research project is to implement the BMD process by developing the following products:

- detailed guidelines and specifications for ODOT to implement BMD procedures in Oregon;
- software packages to automatically perform balanced asphalt mix design without requiring any complicated and detailed analysis;
- a comprehensive ODOT asphalt materials database to be used for future performance evaluation and monitoring; and
- a detailed BMD training process with related documentation and training videos.

More detailed information regarding the project and its objectives can be found at the link below: <https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Pavement Unit

Oregon State University: Erdem Coleri as principal investigator. (Agreement for \$315,000 ending September, 2025. Approximately \$285,718.56 expended through April 2025.)

## COST INFORMATION

<b>SPR 852</b>	<b>FY'22</b>	<b>FY'23</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'25</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$94,000	\$77,000	\$77,000	\$86,000	\$-	\$334,000
WORK PLAN BUDGET	\$42,987	\$142,211	\$146,400	\$12,402	\$-	\$344,000
SPENT TO DATE	\$64,485	\$163,128	\$127,514	\$9,197		\$315,679
<b>REVISED BUDGET</b>	<b>\$64,485</b>	<b>\$163,128</b>	<b>\$127,514</b>	<b>\$40,281</b>	<b>\$6,000</b>	<b>\$401,408</b>

*FY'22 through FY'24 expenditures are actual. FY'25 expenditures are recorded through January of 2025. FY'25 and FY'26 Revised Budget values are estimated based on forecasted project work.*

## **853 PREDICTING NEAR REAL-TIME POST-FIRE LANDSLIDE DEBRIS FLOWS ALONG ODOT CORRIDORS**

### **OVERVIEW**

Debris flows are hazardous landslides that can travel for miles, carry boulders and trees, and rapidly move up to 40 mph with the density of concrete. As a result, debris flows pose significant safety risks to ODOT infrastructure and motorists. Debris flows are activated by rainfall events and exacerbated by burned hillslope conditions. Winter events have already resulted in multiple debris flows in Regions 1 and 2 with significant and devastating impacts to our travelling public. Unfortunately, available predictive assessment tools for debris flows are not tailored for conditions relevant to Oregon, are too coarse for quantitative risk analysis and prioritization, and are not informed by active monitoring. Development of predictive tools that can be proactively informed by ground surface movement and weather monitoring is critical for mitigating the economic and safety impacts of debris flows.

### **OBJECTIVES**

The main objective of this research is to develop tools that can be used to actively assess and address the potential for debris flows along ODOT corridors in near-real time. This research will utilize landslide susceptibility modeling and ground surface monitoring research from SPR807, SPR808, as well as ODOT's 2019 Surface Monitoring STIC grant project which successfully developed a field validated surface monitoring station prototype for active landslides.

### **PROTECT-PLANNING OBJECTIVES**

PROTECT-Planning funds are used to supplement this project. The added tasks enhance safety with early detection of debris flows, informs DOT of priority maintenance locations for debris flow mitigation (decreases travel disruption and prevents higher recover costs), and informs DOT of potential road clearing equipment stockpiling needs to enhance post-event recovery. The deliverables will likely be of high value to rural communities with higher post-fire debris flow risk and lower detour options for alternative travel or reasonable detour durations.

More detailed information regarding the project and its objectives can be found at the link below: <https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Funds will be used to pay for staff time; consultants and professional services; computational needs; travel expenses; and other services and supplies. Funds will be used to pay for Technical Equipment required to conduct the research.

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Geo Section

ODOT Regions 1, 2, and 3

Oregon State University: Dr. Ben A. Leshchinsky as principal investigator. (Agreement for \$543,000.00 ending July 2026. Approximately \$403,112.16. expended through April 2025.)

## COST INFORMATION

<b>SPR 853</b>	<b>FY'22</b>	<b>FY'23</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$102,000	\$153,000	\$134,000	\$51,000		\$440,000
WORK PLAN BUDGET	\$102,000	\$154,000	\$133,000	\$68,000		\$457,000
SPENT TO DATE	\$84,705	\$149,049	\$124,813	\$34,614		\$320,315
<b>REVISED SPR BUDGET</b>	<b>\$84,705</b>	<b>\$149,049</b>	<b>\$124,813</b>	<b>\$60,609</b>	<b>\$95,837</b>	<b>\$515,013</b>
REVISED PROTECT- PLANNING BUDGET	\$-	\$-	\$-	\$30,000	\$25,000	\$55,000
REVISED TOTAL PROJECT	\$84,705	\$149,049	\$124,813	\$90,609	\$120,837	\$570,013

*FY'22 through FY'24 expenditures are actual. FY'25 expenditures are recorded through January of 2025. FY'25 and FY '26 Revised Budget values are estimated based on forecasted project work.*

## **859 REAL-TIME CONTINUOUS BRIDGE SCOUR MONITORING FOR IMPROVED SAFETY AND COST SAVINGS**

### **OVERVIEW**

Bridge structures disrupt natural streamflow, which increases turbulence and flow velocities, potentially leading to dangerous scour conditions. Scour is the erosion of stabilizing materials around bridge foundations and is the leading cause of bridge failure in the United States—oftentimes resulting in catastrophic loss of property, life, or both. The State of Oregon owns approximately 900 bridges that are scour critical. The FHWA requires ODOT to address bridge scour, and monitoring is an approved countermeasure used extensively by ODOT. However, current ODOT methods for monitoring bridge scour are time-consuming, labor intensive, not always accurate, very dangerous to perform during extreme storm events, and unrealistic to apply to 900 bridges. Development of a deployable remote real-time monitoring system could alleviate these issues as well as provide an early warning system for our Region and District personnel. To capitalize on the benefits of available real-time scour monitoring technologies, ODOT must develop methodologies and science-informed strategies for use and deployment.

### **OBJECTIVES**

The main objective of this research is to enable the incorporation of continuous real-time scour monitoring into ODOT's general practice by developing standardized methods and a statewide deployment strategy. A secondary objective is to use the data obtained from this continuous scour monitoring to assess the design performance of ODOT's current scour equations, which may then lead to more cost-effective bridge design. This research effort builds on a 2-year multi-site real-time pilot monitoring investment by ODOT in collaboration with the USGS.

More detailed information regarding the project and its objectives can be found at the link below: <https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Funds will be used to pay for the following: staff time, consultants and professional services, travel expenses, computational needs, and other services and supplies. Funds will be used to pay for Technical Equipment required to conduct the research.

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

### **ACCOMPLISHMENTS**

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

### **RESPONSIBLE PARTIES**

ODOT Research Section

ODOT Bridge Section

ODOT Env/Hydro Section

ODOT Maintenance and Operations Branch, United States Geological Survey (USGS): Greg Lind as principal investigator. (Agreement for \$43,000 ending October 2021 completed and partially applied to SPR859 for \$21,000. Continuing with second USGS contract for \$275,000 with Greg Lind as principal investigator. Approximately \$106,000 expended through May 20243.) Note the USGS will contribute \$110,070 of additional USGS funds toward this project.

#### **COST INFORMATION**

<b>SPR 859</b>	<b>FY'22</b>	<b>FY'23</b>	<b>FY'24</b>	<b>FY'25</b>
STAGE 2 BUDGET	\$78,000	\$92,500	\$111,000	\$96,500
WORK PLAN BUDGET	\$53,000	\$105,000	\$143,500	\$108,500
SPENT TO DATE	\$31,700	\$58,333	\$37,688	\$-
REVISED SPR BUDGET	<b>\$31,700</b>	<b>\$58,333</b>	<b>\$92,000</b>	<b>\$41,000</b>
REVISED USGS BUDGET	\$-	\$24,000	\$28,875	\$31,620
REVISED TOTAL PROJECT	\$31,700	\$82,332	\$91,101	\$172,620

<b>SPR 859</b>	<b>FY'26</b>	<b>FY'27</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$-	\$-	\$378,000
WORK PLAN BUDGET	\$-	\$-	\$410,000
SPENT TO DATE	\$-	\$-	\$127,721
<b>REVISED SPR BUDGET</b>	<b>\$51,000</b>	<b>\$110,500</b>	<b>\$384,533</b>
REVISED USGS	\$10,575	\$15,000	\$110,070
REVISED TOTAL PROJECT	\$72,575	\$123,500	\$573,828

*FY'22 through FY'24 expenditures actual. FY'25 expenditures are recorded through January of 2025. FY'25 through FY'27 Revised Budget values are estimated based on forecasted project work.*

## **861 SIGNAL-CONTROLLER-IN-THE-LOOP SIMULATION FOR TESTING AND DEPLOYING ADVANCED SIGNAL OPERATIONS ON ARTERIAL ROADWAYS**

### **OVERVIEW**

Good signal timing is crucial to improve the traffic operations and safety of arterial corridors where it is particularly challenging to reduce delay, enhance safety, and improve travel time reliability. Advanced signal operations, such as adaptive signal control, could be developed and deployed more frequently to achieve better operations, but the technology remains novel and complicated. Signal-controller-in-the-loop simulation can bring real-world traffic conditions and control strategies programmed in actual controllers together to obtain optimal signal control parameters that could be directly deployed in the field by signal timers in ODOT Regions. The proposed simulation platform can also be used to assist decision making to select appropriate signal control types, such as adaptive signal control, because adaptive signal control may require more complex configurations of detector and communication equipment.

In addition, ODOT tests and approves the new versions of traffic signal control software. Currently the testing is conducted with one signal controller in the absence of real-world traffic conditions, but software using multiple controllers, such as MaxAdapt, cannot be tested. The proposed simulation platform can use multiple signal controllers and real-world traffic conditions to test the signal control software before approval for statewide use, saving agency costs and improving outcomes.

### **OBJECTIVES**

The research goal is to develop a Signal-Controller-in-the-Loop Simulation platform for ODOT to testing and deploying advanced signal operations. The specific research objectives are:

- Developing the Signal-Controller-in-the-Loop Simulation platform;
- Using the simulation platform and multiple controllers to test the signal control software to support approvals for statewide use; and
- Using the simulation platform to test advanced traffic signal control strategies and obtain the best parameters' values deployable in the field.

More detailed information regarding the project and its objectives can be found at the link below: <https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

Equipment Purchase: Purchase of traffic-signal controllers with an estimated value less than \$5,000. per unit.

Equipment Purchase: Custom built PASS system hardware/software interface for approximately \$35,000

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Traffic and Roadway Section

Oregon State University Dr. David Hurwitz as principal investigator. (Agreement for \$210,000 ending April 2025. Approximately \$194,496.48 expended through April 2024.)

## COST INFORMATION

<b>SPR 861</b>	<b>FY'23</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$80,000	\$105,720	\$71,575	\$-	\$244,300
WORK PLAN BUDGET	\$79,000	120,720	\$37,575	\$-	\$237,295
SPENT TO DATE	\$96,516	\$101,563	\$34,504	\$-	\$129,181
<b>REVISED BUDGET</b>	<b>\$96,516</b>	<b>101,563</b>	<b>\$49,000</b>	<b>\$8,867</b>	<b>\$255,946</b>

*FY'23 and FY'24 expenditures are actual. FY'25 expenditures are recorded through January of 2025. FY'25 through FY'26 Revised Budget values are estimated based on forecasted project work.*

## **862 INCREASING ASPHALT RECYCLING TO REDUCE PAVING COSTS, IMPROVE PAVEMENT LONGEVITY, AND REDUCE ENVIRONMENTAL IMPACT**

### **OVERVIEW**

Usage of recycled asphalt pavements (RAP) is beneficial in many aspects, however the primary concern when using mixes with high RAP content is its long-term durability. Aged binder in RAP is less ductile than virgin binder and can lead to premature failure under repeated high axle loads and thermal effects. For this reason, in Oregon, the use of RAP in asphalt mixes is limited to 30% by weight of the mix.

Asphalt rejuvenators and asphalt warm mix additives (WMA) can restore the physical and chemical properties of aged binder and make the mix softer by reducing the viscosity of the mix, leading to durable pavements. However, selecting the most effective rejuvenators and WMA technologies for Oregon requires an investigation which studies their performance under Oregon weather using Oregon-sourced materials. Furthermore, it is also necessary to investigate the impact of RAP pile management practices in the durability of high-RAP pavements using rejuvenators and WMA to enable rapid implementation in Oregon. Developing better RAP management procedures combined with adequate selection rejuvenator and WMA is expected to allow significant increases in the RAP content of asphalt mixtures in Oregon while ensuring long-term durability of pavements.

### **OBJECTIVES**

This research has five major objectives: i) quantify the impact of using rejuvenators and WMA additives on cracking and rutting resistance of high RAP asphalt mixes; ii) determine the increase in RAP content that can be created by using rejuvenators, and WMA additives; iii) determine the impact of increased RAP content and cracking resistance on life-cycle costs and air pollutants ; iv) determine the impact of implementing RAP stockpile best management practices on long-term pavement performance; and v) develop guidelines and methods to incorporate rejuvenators, WMA additives, and RAP stockpile management practices into ODOT processes.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

Oregon State University Dr. Erdem Coleri as principal investigator. (Agreement for \$325,000 ending August 2025. Approximately \$258,382 expended through April 2025.)

## COST INFORMATION

<b>SPR 862</b>	<b>FY'23</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$61,024	\$134,205	\$128,362	\$28,129	<b>\$351,720</b>
WORK PLAN BUDGET	\$61,024	\$134,205	\$128,362	\$28,129	\$351,720
SPENT TO DATE	\$119,718	\$106,402	\$80,846	\$-	\$306,966
<b>REVISED BUDGET</b>	<b>\$119,718</b>	<b>\$106,402</b>	<b>\$132,512</b>	<b>\$25,178</b>	<b>\$383,810</b>

*FY'23 and FY'24 expenditures are actual. FY'25 expenditures are recorded through January 2025. FY'25 through FY'26 Revised Budget values are estimated based on forecasted project work.*

## **864 PHASE 2: QUANTITATIVE EVALUATION PROCESS FOR IMPROVED ROCKSLOPE SAFETY AND REDUCED MAINTENANCE**

### **OVERVIEW**

Thousands of problematic rockslopes adversely impact ODOT's infrastructure and will soon require substantial mitigation as Oregon's highway rockcuts near the end of their respective design life. Many short-term mitigation techniques such as scaling or blasting are very expensive and dangerous as these techniques require personnel to physically scale the cliff. It is also uncertain how long—and how effective—mitigation efforts actually are, particularly with respect to the longevity of scaling before the eroding slopes return to a similar or even more precarious state. Quantitative, objective methods that better inform successful rockfall mitigation techniques, maintenance strategies, and overall asset management is needed. Recently, ODOT Research invested in the development of a series of Lidar-based tools for quick assessment and monitoring of rockfall events (SPR809). Specifically, SPR809 refined the Rockfall Activity Index (RAI) hazard screening tool, analyzed seismic hazards, and developed a user-friendly Graphical User Interface (GUI) for implementation. RAI is a point cloud-derived, high-resolution, low-cost, morphology-based, objective approach for assessing rockslopes that can objectively and efficiently analyze large geographic regions. RAI may also be used to identify specific locations to target for mitigation by identifying rapidly eroding areas of the slope and precarious overhangs. This proposed research leverages these recently developed tools to further develop a new methodology for verifying rockfall mitigation effectiveness that can also be used to direct future mitigation and maintenance efforts.

### **OBJECTIVES**

The goal of this research is to provide tools for quantitative, objective characterization of rockslopes for directed, effective mitigation efforts that optimize funding investments to improve safety through mountainous lifeline corridors. Leveraging research products and Lidar data delivered from ODOT's SPR809 investment, analytic tools and methods will be developed that 1) enable selective targeting of local mitigation areas across large rockslopes; 2) enable verification and efficacy of slope mitigation efforts; 3) evaluate the effectiveness of mitigation techniques, and 4) provide guidance for future mitigation efforts.

More detailed information regarding the project and its objectives can be found at the link below: <https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Funds will be used to pay for staff time; consultants and professional services; computational needs; travel expenses; and other services and supplies. Funds will be used to pay for technical and capital UAS/UAV components and equipment required to conduct the research.

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Geo Section

ODOT Regions 1, 2, and 3

Oregon State University (OSU): Dr. Michael J. Olsen (OSU) as principal investigator, Dr. Ben A. Leshchinsky (OSU) and Dr. Joe Wartman (University of Washington) as Associate Investigators. (Agreement for \$368,000 ending June 2026. Approximately \$186,129 expended through May 2024.)

## COST INFORMATION

<b>SPR 864</b>	<b>FY'23</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$72,460	\$116,190	\$101,825	\$96,825	\$387,300
WORK PLAN BUDGET	\$84,460	\$103,190	\$98,825	\$108,825	\$395,300
SPENT TO DATE	\$98,235	\$102,012	\$17,787	\$-	\$218,034
REVISED SPR BUDGET	<b>\$98,235</b>	<b>\$102,012</b>	<b>\$108,000</b>	<b>\$103,955</b>	<b>\$412,202</b>
REVISED TOTAL BUDGET	\$98,235	\$102,012	\$148,000	\$108,955	\$457,202

*FY'23 and FY'24 expenditures are actual. FY'25 expenditures are recorded through January of 2025. FY'25 through FY'26 Revised Budget values are estimated based on forecasted project work.*

## **865 LOW-CARBON ULTRA-HIGH-PERFORMANCE CONCRETE FOR USE IN HIGHWAY INFRASTRUCTURE**

### **OVERVIEW**

As the State of Oregon seeks to reduce its carbon footprint and phase in lower-carbon materials, low-carbon ultra-high-performance concrete (UHPC) is an advanced construction material that offers new opportunities for the future of highway infrastructure. The use of UHPC is reported to eliminate the cracking and leakage that occurs when conventional concretes or grouts are used. At the same time, the use of UHPC can enable the deployment of simplified connection details with shorter discrete reinforcement splice lengths and a reduced number of conflict points, which are beneficial for both new bridge constructions and repair, retrofit, or rehabilitation of existing bridges. However, proprietary UHPC solutions are costly, and thus there is increasing interest in developing non-proprietary UHPC mixtures. The Federal Highway Administration (FHWA) UHPC research and development program has produced a range of publications on the performance and use of UHPC. FHWA recently developed the FHWA 13100 Technical Brief, which includes minimum requirements for non-proprietary UHPCs. However, the research performed by FHWA has failed to address the use of low-carbon materials. While research has shown success in implementing low-carbon solutions for normal strength concretes by reducing Portland cement by 15%, to date, limited to no research exists on developing low-carbon UHPCs for bridge applications, such as those that address reductions in Portland cement by 10% or even 15%. Currently, the lack of non-proprietary low-carbon UHPC mixture designs, lack of non-proprietary on-site mixing methods and equipment, and absence of general QA/QC and material testing specifications are gaps that need to be addressed to allow for the State of Oregon to meet their phased implementation of lower carbon materials.

### **OBJECTIVES**

This research aims to develop a low-carbon UHPC mixture design that can be readily produced in Oregon for ODOT maintenance crews and contractors. This research will develop data to support the hypothesis that low-carbon UHPC can be produced using locally available materials in Oregon and meet the performance and cost requirements established in this research project. The eventual result is the commoditization of low-carbon UHPC with a commensurate price reduction using local Oregon materials.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Mix Design and Specification Development; Structural Testing; Data Analysis; TAC Presentations, Final Report; and Travel.

These activities will result in:

- Literature Review
- Mixture Design(s) and Specifications
- Final Report

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Bridge Section

Oregon State University Dr. Jason Ideker and Dr. Andre Barbosa as principal investigators.  
(Agreement for \$385,000 ending August of 2025. Approximately \$307,797.44 expended through April 2025.)

## COST INFORMATION

<b>SPR 865</b>	<b>FY'23</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$122,750	\$181,000	\$104,250	\$-	\$408,000
WORK PLAN BUDGET	\$117,500	\$230,000	\$62,500	\$-	\$410,000
SPENT TO DATE	\$118,758	\$165,462	\$30,485	\$-	\$314,705
<b>REVISED BUDGET</b>	<b>\$118,758</b>	<b>\$165,461</b>	<b>\$92,000</b>	<b>\$82,398</b>	<b>\$458,617</b>

*FY'23 and Fy'245 expenditures are actual. FY'25 expenditures are recorded through January of 2025. FY'25 through FY'26 Revised Budget values are estimated based on forecasted project work.*

## **867 AUTOMATED WILDLIFE DETECTION FOR VEHICLE COLLISION REDUCTION**

### **OVERVIEW**

ODOT has been tasked with developing a program to reduce wildlife-vehicle collisions in areas that intersect with wildlife corridors (ORS 496.272). To initiate this process, ODOT recently invested in research for the development of wildlife corridor maps to aid in site prioritization along our highway network as a part of Oregon's "Wildlife Corridor and Safe Road Action Plan" in coordination with the Oregon Department of Fish and Wildlife (ODFW). While ODOT has already invested in costly wildlife crossing structures to reduce wildlife vehicle collisions, the predicted wildlife corridor intersections anticipated from ODFW's mapping efforts will likely prompt the need for substantially more wildlife crossing infrastructure investment and development. Further complicating future funding decisions is the likelihood that wildlife crossings and corridor routes are changing as Oregon's population changes. To reduce collisions and protect wildlife, as well as to ensure effective investment of public funds, these predicted wildlife corridor intersections and the technologies used for mitigation must be monitored and validated. ODOT also needs to address roadside areas where wildlife commonly cross highways but wildlife passage features are not feasible, which is common along rural routes. Recent advancements in the fields of image recognition, machine learning, and communications allow for automated solutions that can efficiently assess, quantify, and track wildlife activity, which may also assist with development of more reliable Active Wildlife Detection Systems for ODOT.

### **OBJECTIVES**

Automated wildlife detection systems tailored for Oregon conditions will enable ODOT to efficiently assess the performance of constructed wildlife passage features, validate predicted wildlife crossing locations, monitor changes in the timing and location of crossing patterns as t populations change, provide cost-effective detection systems for the many areas where crossing structures are not feasible, and most importantly reduce wildlife vehicle collisions. Objectives include:

- To develop a tailored, automated wildlife detection tool that can rapidly identify Oregon wildlife that can be used in conjunction with simple camera systems by leveraging open-source Artificial Intelligence (AI) based image recognition tools and training data.
- To develop a prototype that integrates the developed AI wildlife detection tool (Objective 1) with other common AWDS detection technologies (ex. night vision) to provide a new AWDS capable of coping with the broad range of Oregon's highway environments (forested, winding, mountainous terrain, weather extremes, and urbanized enclaves).

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Funds will be used to pay for staff time; consultants and professional services; computational needs; travel expenses; and other services and supplies. Funds will be used to pay for Technical Equipment required to conduct the research.

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Environmental Section

All ODOT Regions

Oregon State University Dr. Yué Zhang as principal investigators. (Agreement for \$445,000 ending June of 2027. Approximately \$ \$211,151 expended through January 2025.)

## COST INFORMATION

<b>SPR 867</b>	<b>FY'23</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$91,020	120,025	\$77,015	\$96,020	\$96,020	\$480,100
WORK PLAN BUDGET	\$88,775	\$122,775	\$102,265	\$98,020	\$80,520	\$495,580
SPENT TO DATE	\$111,359	\$95,529	\$27,794	\$-	\$-	\$234,682
<b>REVISED BUDGET</b>	<b>\$111,360</b>	<b>\$95,530</b>	<b>\$103,000</b>	<b>\$97,000</b>	<b>\$89,122</b>	<b>\$496,012</b>

*FY'23 and FY'24 expenditures are actual. FY'25 expenditures are recorded through January of 2025. FY'25 through FY'27 Revised Budget values are estimated based on forecasted project work.*

## **870 PLACEMENT OPTIONS FOR IN-STREET PEDESTRIAN CROSSING SIGNS (R1-6A)**

### **OVERVIEW**

Currently, pedestrian fatalities in the U.S. are at an all-time high and represent an increasing share of the total traffic fatalities (1). Specifically, in Oregon, pedestrian fatalities increased 57% between 2009 and 2019 (2). An analysis of U.S. pedestrian fatality trends between 1977 to 2016 found that pedestrian fatalities are more common in urban areas on arterial roadways, where vehicles are traveling at higher speeds and drivers fail to yield to pedestrians (3). To achieve a safe transportation system, it is critical to improve pedestrian safety by installing treatments that encourage greater rates of drivers yielding to people walking. One such treatment is the R1-6a in-street pedestrian crossing signs installed in a gateway configuration. FHWA has identified the R1-6a sign as a highly effective, low-cost engineering countermeasure that can be used to improve pedestrian safety in a proactive and systemic manner.

### **OBJECTIVES**

This research will evaluate various R1-6a installation configurations to help support the process for these configurations to be accepted into the MUTCD for more widespread use. Additional objectives include evaluation of maintenance costs and durability of the signs over times as well as how signs handle winter maintenance.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

### **ACCOMPLISHMENTS**

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

### **RESPONSIBLE PARTIES**

ODOT Research Section

ODOT Traffic and Roadway Section

Portland State University Dr. Sirisha Kothuri as principal investigators. (Agreement for \$185,000 ending June of 2026. Approximately \$\$92,229 expended through January 2025.)

**COST INFORMATION**

<b>SPR 870</b>	<b>FY'23</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$77,625	\$81,938	\$53,188	\$-	\$212,751
WORK PLAN BUDGET	\$46,000	\$115,000	\$24,000	\$-	\$46,000
SPENT TO DATE	\$31,319	\$45,568	\$23,263	\$-	\$100,150
<b>REVISED BUDGET</b>	\$31,319	\$45,568	\$77,000	\$69,860	\$223,747

*FY'23 and FY'24 expenditures are actual. FY'25 expenditures are recorded through January of 2025. FY'25 through FY'25 and FY'26 Revised Budget values are estimated based on forecasted project work.*

## **874 NEW METHODS FOR IMPROVING LOAD RATING OF EXISTING STEEL BRIDGES**

### **OVERVIEW**

There are hundreds of steel bridges in Oregon that are in good condition and have performed well over extended lives. However, newly implemented rating checks for lateral-torsional buckling are now resulting in low rating factors that could require load posting for hundreds of bridges. Most of these steel bridges are simply supported steel stringers with either timber or corrugated metal decks and the bridges are located throughout the state. These bridges rated adequately using prior load rating methods, but recent updating of the load ratings using LRFR now produces very low rating factors for positive moment at mid-span. The main difference between the old and new methods is that lateral torsional buckling (LTB) controls the moment capacity and this was not checked in the old rating. There are cases where the rating factor is zero meaning the bridge cannot carry any truck load.

A key component of safety is bridge load-rating that accurately reflects the controlling limits such as moment capacity in steel bridges that could be affected by lateral torsional buckling. Newly applied rating methods are now showing low load ratings for hundreds of Oregon bridges that are in good condition and carried loads for many years. By calculation, these bridges now require load-posting in many cases. More accurate bridge rating methods may produce outcomes that prevent bridges from being needlessly posted with low capacities. Bridge posting is contrary to ODOT's mission to connect people and help Oregon's communities and economy thrive.

### **OBJECTIVES**

The objectives of this research are to answer two questions. First, is it legitimate that lateral torsional buckling (LTB) should control the moment capacity for simply supported steel bridges that were never designed for this failure mode in the new LRFR load ratings? If so, then a clear explanation to bridge owners and the public is needed as to why this is so and why these bridges have not experienced such failures in practice. Second, given that LTB is a failure mode that is required to be checked in LRFR, is there some other mechanism acting in these older bridges that provides sufficient bracing to resist LTB and that has allowed them to perform so well in service for decades? If so, analysis and rating methods that account for this system mechanism in the load rating process is needed.

More detailed information regarding the project and its objectives can be found at the link below: <https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Database Compilation; Data Acquisition (Lab and In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel.

These activities will result in:

- Literature Review
- Database of Lateral Torsional Buckling Controlled Bridges

- Rating and Retrofit Guidance
- Final Report

More information on proposed activities can be found in the [Project Work Plan](#) at the link above.

## ACCOMPLISHMENTS

This project has produced a draft literature review and database of lateral torsional buckling controlled bridges. Further details of accomplishments may be viewed by selecting [Quarterly Reports](#) at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Bridge Section

Oregon State University: Chris Higgins as principal investigator. (Agreement for \$359,880 ending June of 2026, with approximately \$104,765 expended through January 2025.

## COST INFORMATION

<b>SPR 874</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$100,000	\$177,857	\$115,000	\$-	\$392,857
WORK PLAN BUDGET	\$129,305	\$209,155	\$54,420	\$0	\$392,880
SPENT TO DATE	\$78,487	\$45,293	\$-	\$-	\$123,781
<b>REVISED BUDGET</b>	\$78,488	\$209,155	\$107,604	\$-	\$395,247

*FY'24 expenditures are actual. FY'25 expenditures are recorded through January of 2025.*

*FY'25 through FY'26 Revised Budget values are estimated based on forecasted project work.*

## **875 ANALYSIS OF THE POTENTIAL REVENUE AND COMMUNITY IMPACTS OF AN E-COMMERCE HOUSEHOLD DELIVERY FEE IN OREGON**

### **OVERVIEW**

ODOT faces a combination of declining revenues from traditional sources like fuel taxes due to EV adoption, fuel-efficient vehicles, and potential travel pattern changes (e.g., telecommuting). In addition, maintenance and operation costs have seen large increases due to inflationary pressures. In this context, ODOT needs to innovate its revenue models to ensure the long-term sustainability of the transportation system. A potential innovation is the introduction of an e-commerce delivery fee. This type of fee could be a long-term source of revenue because:

- (a) The last two decades saw a rapid growth of e-commerce sales, both in the US and Oregon. This trend gained further momentum during the global pandemic. According to e-commerce sales reports released by the US Department of Commerce, e-commerce sales accounted for approximately 7% of total retail sales in 2015 and 16% of total retail sales in 2024
- (b) Long-term growth is expected to remain strong due to demographic changes, new generations will be more used to online-shopping, and also because retailers are continuously expanding their online offerings and products.

Although an e-commerce delivery fee may seem appealing there is no study or data available that can assess the financial impact for households and potential community implications.

The lack of data and studies in this area prompts several questions, including: What type of households across the state are likely to pay more e-commerce delivery fees? For households, how significant will the fees be in relation to the value of the products being delivered or other transportation related fees? How would this fee impact households across the state, i.e. in rural vs urban areas? What is the potential community impact of this fee for lower income households?

This project is a necessary first step that will provide valuable insights to understand the impacts of an e-commerce delivery fee in terms of community impacts and potential revenue at the household level.

### **OBJECTIVES**

Oregon Department of Transportation (ODOT) revenues, like those of many transportation agencies, are primarily derived from fuel taxes, vehicle registration fees, and other road usage charges. As new vehicle types and travel patterns change ODOT's revenues are likely to be negatively impacted. The ultimate research goal of this project is to better understand the potential implications of a household e-commerce delivery fee. To achieve this goal the project has the following objectives: Data Collection: develop a survey to gather a dataset that allows the study of the potential implications of a household e-commerce delivery fee. Analysis: use the survey data to understand the factors affecting the magnitude and relative size of the household e-commerce delivery fee in Oregon and its community impact implications.

Data Evaluation: evaluate how different datasets can be utilized in the future to identify and report key delivery fee patterns related to geographic location and household attributes. In addition, it will be valuable to make recommendations to improve future e-commerce delivery fee data collection efforts.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

## PROPOSED ACTIVITIES

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition; Data Analysis; TAC Presentations, and Final Report

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Transportation Planning Analysis Unit

Portland State University Dr Miguel Figliozi as principal investigators. (Agreement for \$185,000 ending June of 2026. Approximately \$78,784.44 expended through January 2025.)

## COST INFORMATION

<b>SPR 875</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$62,000	\$106,000	\$19,000	\$-	\$187,000
WORK PLAN BUDGET	\$50,000	\$89,000	\$48,000	\$0	\$187,000
SPENT TO DATE	\$60,192	\$89,000	\$64,232	\$-	\$213,424
<b>REVISED BUDGET</b>	<b>\$50,000</b>	<b>\$89,000</b>	<b>\$48,000</b>	<b>\$-</b>	<b>\$187,000</b>

*FY'24 expenditures are actual. FY'25 expenditures are recorded through January 2025. FY'25 through FY'26 Revised Budget values are estimated based on forecasted project work.*

## **876 IMPLEMENTATION REQUIREMENTS FOR WORK ZONE INTRUSION TECHNOLOGIES TO REDUCE FATALITIES**

### **OVERVIEW**

The latest information published by ODOT on fatal crashes shows alarming trends<sup>1</sup>. In 2022, there were 605 fatalities, in 2021, 599, and in 2020, 460. These values represent three consecutive years of ODOT's highest recorded values, as reported over a 10 year period (Oregon DOT Crash Analysis Unit, 2020). Across the U.S., roadway workers on foot being struck by vehicles (both construction equipment and travelling public) was the most prevalent cause of highway worker fatalities (2017-2019) and accounted for 53% of worker fatalities in 2020 (ARTBA, 2022). Preventing intrusions, and protecting workers, is a high priority for both ODOT and contractors. ODOT has an immediate need to address this safety aspect, as identified by near misses in the month of February 2023 from Administrator Lynde's recent all-ODOT email (Lynde, 2023). This research will focus on work zone intrusion technologies, which may also have application in other areas of roadway safety.

ODOT's mission includes safety and economy as two of its core values. Focusing on work zone intrusions, including near misses, is important to help ODOT improve while delivering on safety, specifically focused for temporary work zones. Additionally, safety and mobility affect both ODOT's financial standing and the state's economy. The need to address work zone intrusions is especially important given the increase in work that will occur as a result of funding from the Transportation Investment Act.

### **OBJECTIVES**

The goal of this research is to develop additional knowledge and practices related to the implementation of new work zone intrusion technologies to improve safety. The research plan will review current technologies (and other innovations) to compare with user needs and ease of implementation. The output will be a report comparing aspects of current leading technologies, presented as a list of attributes, and a guidance document for their implementation in practice. Data to compare these aspects will involve literature, user engagement, demonstrations, and to the extent possible, limited in-field experimentation. Improved safety with ease of implementation are primary motivations, however, other value-add aspects (e.g., cost, data logging/recording, availability, etc.) will be reviewed.

More detailed information regarding the project and its objectives can be found at the link below: <https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel. \$10,000.00 is budgeted for equipment leases/purchases.

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Construction Section

Oregon State University Dr. John Gambatese as principal investigators. (Agreement for \$206,000.00 ending June 30, 2026. Approximately \$ \$94,270 expended through January 2025.)

## COST INFORMATION

<b>SPR876</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$62,000	\$106,000	\$82,200	\$-	\$250,200
WORK PLAN BUDGET	\$71,000	\$128,000	\$31,000	\$-	\$230,000
SPENT TO DATE	\$83,185	\$27,794	\$-	\$-	\$110,978
<b>REVISED BUDGET</b>	<b>\$83,185</b>	<b>\$75,969</b>	<b>\$82,200</b>	<b>\$-</b>	<b>\$241,354</b>

*FY'24 expenditures are actual. FY'25 expenditures are recorded through January 2025. FY'25 through FY'26 Revised Budget values are estimated based on forecasted project work.*

## **877 DEVELOPING GUIDANCE ON LEADING PEDESTRIAN INTERVALS AND CURB EXTENSIONS TO IMPROVE PEDESTRIAN SAFETY AT SIGNALIZED INTERSECTIONS**

### **OVERVIEW**

Improving pedestrian safety continues to be critically important to ODOT's mission to provide a safe and reliable multimodal transportation system. Approximately 920 pedestrians were injured, and 78 pedestrians were killed in Oregon each year between 2016 - 2020. Some of these pedestrian-vehicle crashes occur at intersections, where agencies have installed either geometric or operational countermeasures to improve pedestrian safety. LPIs allow pedestrians to start their crossing prior to conflicting vehicles. Curb extensions improve the visibility of pedestrians to drivers, shorten the crossing distance, and slow turning vehicles. ODOT uses both options to improve pedestrian safety but guidance in lacking to optimally select these options. ODOT

This study will produce guidance on LPI and curb extensions. The research will identify the improvement in pedestrian safety when these countermeasures are used individually and when they are used conjunction with other countermeasures to improve pedestrian safety. Tradeoffs for their application will be considered. These findings will be developed in a form that can be easily integrated into agency design and practice documents. The results of scaled adoption will be enhanced pedestrian safety at signalized intersections and improved return on the investments.

### **OBJECTIVES**

Developing enhanced guidance on when and where to implement LPIs either solely or in conjunction with curb extensions, no turn on red, or other changes will provide ODOT with refined tools to improve pedestrian safety at intersections. The proposed research will support the ODOT Strategic Action Plan's priority of a modern transportation system and the Strategic Action Plan's goal of safety.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

### **ACCOMPLISHMENTS**

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Traffic and Roadway Section

Oregon State University: Dr. David Hurwitz as principal investigator. (Agreement for \$120,000 ending June 2026. Approximately \$60,365 expended through January 2025.)

Portland State University: Dr. Chris Monsere as principal investigator. (Agreement for \$90,000 ending June 2026. Approximately \$75,178.89 expended through January 2025.)

## COST INFORMATION

<b>SPR 877</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$62,000	\$106,000	\$66,000	\$-	\$234,000
WORK PLAN BUDGET	\$65,000	\$106,000	\$66,000	\$-	\$237,000
SPENT TO DATE	\$98,527	\$31,040	\$-	\$-	\$129,566
<b>REVISED BUDGET</b>	<b>\$98,527</b>	<b>\$70,274</b>	<b>\$66,000</b>	<b>\$-</b>	<b>\$234,801</b>

*FY'24 expenditures are actual. FY'25 are recorded through January 2025. FY'25 through FY'26 Revised Budget values are estimated based on forecasted project work.*

## **878 REAL-TIME LANDSLIDE SURFACE MONITORING FOR IMPROVED SAFETY, RESPONSE, AND REPAIR**

### **OVERVIEW**

The recent, rapid, and overwhelming movement of the Hooskanaden landslide in 2019 and the Arizona Inn landslide in early 2023 greatly disrupted traffic along US 101 with several days of full road closure followed by prolonged reduced capacity and weeks of traffic control for repairs. Alarming, numerous precarious landslides exist throughout the state that can result in similar consequences, triggered by precipitation or erosion. Real-time, on-site instrumentation is essential to characterize landslide kinematics as well as detect and predict movements that can disrupt the highway system. Real-time, on-site instrumentation can also help inform the timing of repair and estimation of material needs, improving both on-site safety and maintenance costs associated with repair. However, the standard methodology for landslide instrumentation requires costly drilling beneath the earth's surface—which is frequently unsafe, costly, and infeasible on an active landslide. Further, drilled subsurface instrumentation is oftentimes destroyed with landslide movement, providing only short-term usefulness for obtaining active landslide data. This project will develop and deploy low-cost surface monitoring strategies to monitor landslide movements, leveraging ODOT's recent proof-of-concept success using real-time kinematic global navigation satellite systems (RTK-GNSS) to monitor the Arizona Inn landslide failure, which enabled real-time delivery of critical information to help inform closure actions and repairs. Further development and establishment of surface monitoring methods will also inform statewide characterization of active slides that impact ODOT infrastructure where drilling is cost prohibitive, unsafe, or impossible.

The hundreds of actively moving landslides on Oregon's highways pose an ongoing threat to the connectivity of communities and economies statewide. These precarious conditions threaten the agency's mission as landslides are 1) a significant risk to user safety, 2) impose inefficiencies by delaying traffic after failure or for repair, and 3) impose economic strain as the cost of traffic delays impacts the cost of goods and services that rely on our roads. Real-time landslide surface movement data can help with emergency response by predicting the amount of material needed for repair, identifying when to close a road for safety, and determining when repairs can safely begin as the movement subsides. Further, surface monitoring is less environmentally intrusive than drilling and safer to instrument, with superior long-term monitoring potential for active slides.

### **OBJECTIVES**

The Objectives of this project include:

1. Analyze monitoring data (RTK GNSS) from past landslide events to determine warning thresholds.
2. Deploy additional RTK GNSS systems, repeat unmanned aircraft system (UAS) surveys, and evaluate the utility of incorporating ODOT's interferometric synthetic aperture radar (InSAR) surface data.
3. Develop techniques to identify the shear surface and landslide features (e.g., distinct blocks).

4. Implement a systematic surface monitoring program and procedures for active ODOT landslides.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

## **PROTECT OBJECTIVE**

GPS surface monitoring systems are currently providing real-time movements on eleven, active landslides impacting roads. This monitoring has enabled preliminary modeling of the relationship between landslide movement to rainfall—with the aim of providing professionals a tool for predicting when ground movement might occur based on simple precipitation data. Expanding this GPS system to additional landslides will provide ODOT with data and tools to make decisions regarding maintenance, road closures, reopening, and prioritization requiring significantly less effort than current methods.

## **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Technical and Capital Equipment Purchase (UAV lidar system); Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## **ACCOMPLISHMENTS**

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## **RESPONSIBLE PARTIES**

ODOT Research Section

ODOT Geo Environmental

Oregon State University Dr. Ben Leshchinsky as principal investigator. (Agreement for \$465,000 ending August of 2027. Pending Amendment for \$75,491 for new total of \$540,491. Approximately \$142,912 expended through January 2025.)

## COST INFORMATION

<b>SPR 878</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>TOTAL</b>
STAGE 2 SPR BUDGET	\$100,460	\$150,690	\$125,575	\$125,575	\$-	\$251,150
WORK PLAN BUDGET	\$79,000	\$146,000	\$121,000	\$138,000	\$26,000	\$285,000
SPR SPENT TO DATE	\$41,156	\$30,185	\$-	\$-	\$-	
PROTECT SPENT TO DATE	\$-	\$-	\$-	\$-	\$-	
<b>REVISED SPR BUDGET</b>	<b>\$41,156</b>	<b>\$146,000</b>	<b>\$118,000</b>	<b>\$135,000</b>	<b>\$60,706</b>	<b>\$313,706</b>
<b>REVISED PROTECT BUDGET</b>	<b>\$-</b>	<b>\$-</b>	<b>\$75,491</b>	<b>\$-</b>	<b>\$-</b>	<b>\$75,491</b>
REVISED TOTAL BUDGET	\$41,156	\$146,000	\$118,000	\$210,491	\$60,706	\$389,197

*FY'24 expenditures are actual. FY'25 recorded through April of 2025. FY'25 through FY'28 Revised Budget values are estimated based on forecasted project work.*

## **879 PHASE II: METHOD DEVELOPMENT FOR CONSTRUCTION DESIGN IN DIATOMACEOUS SOILS**

### **OVERVIEW**

Diatomaceous soils, which contain silica frustules from ancient algae blooms, are prevalent in eastern and central Oregon, including in areas of ODOT right-of-way. For engineering projects built on top of or in these deposits, problems such as excessive settlement of embankments, slope instability, and construction difficulties with drilled shafts and driven piles have been observed (ex. Wickiup Junction, Buck Creek Bridge). Lack of a robust understanding of the behavior of diatomaceous soils is often cited as the reason for this poor design performance. Complicating matters further, relatively little is documented in the literature regarding the performance of piles in diatomaceous soils. To begin to understand the behavior of diatomaceous soils, ODOT recently invested in a research program (SPR820) to develop predictive estimating models for geotechnical properties of Oregon's diatomaceous silt, leveraging available data from existing ODOT diatomaceous projects together with targeted field-directed geotechnical testing including an array of in-situ tests at select sites in diatomaceous deposits. These materials have been further characterized through an extensive laboratory testing program. A full-scale field test is now required to develop and validate necessary empirical design methods for deep foundations in diatomaceous silt.

The rich dataset that will be produced in an actual operational environment through this well-instrumented and robust full-scale pile test program will provide ODOT geologists and engineers with actionable data that can be applied directly to future ODOT design and construction projects in diatomaceous deposits. The field program, as envisioned, will result in the following new, actionable data and tools: (1) quantitative (rather than anecdotal) information about the difficulties encountered during pile driving, how these difficulties may be anticipated based on site investigation data, and the potential mechanisms underlying them, thereby informing potential mitigation measures; (2) field-data-informed methods to predict static bearing capacity of a driven pile in diatomaceous deposits; and (3) approaches to estimate the stresses and excess pore water pressures developed during pile driving based on documented data. Further, this proposed project will support ODOT's Strategic Action Plan and Mission by enabling ODOT to reliably design transportation infrastructure in diatomaceous soils, thereby improving transportation reliability within our rural communities and supporting these resource dependent economies where ODOT service is essential.

### **OBJECTIVES**

A full-scale, field-testing program to develop empirical design methods using ODOT's new diatomaceous soil models developed from SPR820 is proposed. This work will leverage existing geotechnical investigation(s) within ODOT right-of-way. The envisioned work products include development of an empirical design methodology for deep foundations in diatomaceous silts, spreadsheet tools for design, and a short-course reviewing the results of this research project.

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Drilling, Pile Driving, Sampling, Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Geo Environmental

Oregon State University Dr. T. Matthew Evans as principal investigator. (Agreement for \$350,805 ending June of 2027. Approximately \$58,332 expended through January 2025.)

## COST INFORMATION

<b>SPR 879</b>	<b>FY'24</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$72,000	\$244,000	\$144,000	\$109,000	\$49,000	\$618,000
WORK PLAN BUDGET	\$78,520	\$397,291	\$149,395	\$61,870	\$0	\$687,076
SPENT TO DATE	\$33,514	\$51,731	\$-	\$-	\$-	\$85,245
<b>REVISED BUDGET</b>	<b>\$33,514</b>	<b>\$137,291</b>	<b>\$404,395</b>	<b>\$121,350</b>	<b>\$-</b>	<b>\$696,550</b>

*FY'24 expenditures are actual. FY'25 expenditures are recorded through January 2025. FY'25 through FY'28 Revised Budget values are estimated based on forecasted project work.*

## **880 AN INNOVATIVE TECHNOLOGY TO PREVENT WIND-INDUCED FATIGUE CRACKS IN THE ASTORIA-MEGLER BRIDGE**

### **OVERVIEW**

The Astoria-Megler Bridge is a 4.1-mile-long river crossing over the Columbia River between Washington and Oregon. It is the longest continuous truss bridge in North America. The nearest alternative river crossing is approximately 50 miles away at Rainier, OR. The bridge was opened in 1966 and has experienced fatigue cracks in many of the long vertical members of the truss. These cracks required expensive remediation. ODOT has made repeated attempts over the decades to stiffen the structural members to prevent additional cracks from forming. A research study conducted previously by OSU captured wind-induced torsional vibrations of the bridge members. This study showed that the bridge members can accumulate large numbers of stress cycles during certain wind events and fatigue cracking would be expected at high stress ranges. In the most recent bridge inspection (2023), many cracks were again observed in truss members. Considering that the continued safe operation of the bridge is essential to Oregon, research is proposed to develop an innovative remediation technology that can eliminate the torsional responses that are causing the cracking by providing both additional damping and altering the wind-flow separation around the truss members.

### **OBJECTIVES**

The final product would be creation of a new device that would be attached to the truss members. The device would both provide damping and alter the cross-section profile and surface roughness thereby reducing or eliminating wind-induced torsional response of the bridge members. This would reduce the magnitude and amplitude of stresses in the bridge members and prevent wind-induced fatigue cracking of the bridge verticals, providing a long-term and economical solution to the repeated cracking observed in the bridge.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Lab-Scale Specification Development; Equipment Purchase; Dynamic Lab Testing; Wind-Lab Testing, Field Testing; Data Analysis; TAC Presentations, Final Report; and Travel.

These activities will result in:

- Literature Review
- Design and Specifications for Damping System for Astoria-Megler Bridge
- Final Report

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Bridge Section

ODOT Maintenance and Operations Branch

Oregon State University: Chris Higgins as principal investigator. (Agreement for \$340,900 ending December of 2026, with approximately \$0 expended through January 2025.

## COST INFORMATION

<b>SPR 880</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$124,775	\$142,600	\$89,125		
WORK PLAN BUDGET	\$155,690	\$203,810	\$9,000	\$-	\$368,500
SPENT TO DATE					
<b>REVISED BUDGET</b>	<b>\$81,600</b>	<b>\$203,810</b>	<b>\$83,090</b>	<b>\$-</b>	<b>\$368,500</b>

*FY'25 expenditures are recorded through January 2025. FY'25 through FY'27 Revised Budget values are estimated based on forecasted project work.*

## **881 LANDSLIDE HOTSPOT PRIORITIZATION, PLANNING, AND MANAGEMENT TOOL**

### **OVERVIEW**

Landslides are frequent hazards that affect Oregon highway infrastructure, resulting in negative economic, environmental, and social impacts for Oregon communities. Goals from the Oregon Transportation Plan (OTP) include proactive preparation of lifeline routes to reduce possible hazards before events occur, starting with the strategy to map and assess multi-hazard threats to the transportation system. A higher resolution analysis to prioritize between sites along these corridors is needed for development of compelling business cases for investment and competitive funding opportunities. ODOT is already under financial strain reacting to landslide hazards as they happen. Reactive approaches for returning to site functionality will exacerbate ODOT's fiscally constrained reality. High resolution landslide hazard site vulnerability analysis followed by site prioritization will provide planning and management teams practical science-based investment strategies aimed at improving safety, ensuring working emergency lifeline routes, preventing community isolation, and reducing rising maintenance costs for hazard removal.

### **OBJECTIVES**

This research will develop a corridor-wide landslide prioritization tool for optimized site selection for proactive intervention and investment, focusing on ODOT's corridors. The prioritization matrix will include rainfall-driven landslide hazard and vulnerability assessments that incorporate economic criteria, together with pre-disaster mitigation options to enable feasible management strategies. This work will leverage SPR808, which established a framework for evaluation of landslide susceptibility, hazard, and risk at large spatial scales under extreme events (seismicity and heavy precipitation), as well as SPR843, which developed a highway hazard vulnerability matrix for site prioritization. Tools from SPR808/SPR843 as well as landslide monitoring data from SPR807/SPR878 make validation and projections of landslide activity with variable precipitation achievable through complementary modeling. Expected deliverables include: prioritization matrix and corridor site scores, interactive webGIS planning maps, and economic analyses of top sites.

### **PROTECT-PLANNING OBJECTIVES**

PROTECT-Planning funds have been used to add scope to this project. The supplemental funds will modify the project to improve landslide mitigation detection with significant cost saves from recovery maintenance costs, safety improvements for the traveling public, and improved capacity to stockpile recovery resources in higher risk areas to enhance recovery operations after landslide events. The PROTECT funded tasks improve prevention, response and recovery from landslide events with potential for region-wide relevance.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

## PROPOSED ACTIVITIES

Funds will be used to pay for staff time; consultants and professional services; computational needs; travel expenses; and other services and supplies. Funds will be used to pay for Technical and Capital Equipment (ring shear apparatus and components) required to conduct the research, data acquisition, data analysis for multiple sites, TAC presentations, literature review, final report.

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

Oregon State University: Ben Leshchinsky as principal investigator. (Agreement for \$590,000 ending September 2028), with approximately \$0 expended through January 2025. Drilling for project will be contracted by ODOT.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Geo Section

ODOT Regions 1, 2, 3, and 4

## COST INFORMATION

<b>SPR 881</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>FY'29</b>	<b>TOTAL</b>
STAGE 2 SPR BUDGET	\$100,460	\$150,690	\$125,575	\$125,575	\$-	\$502,300
WORK PLAN BUDGET	\$109,693	\$171,000	\$172,000	\$151,000	\$7,000	\$610,693
SPR SPENT TO DATE	\$2,307	\$-	\$-	\$-	\$-	\$2,307
PROTECT SPENT TO DATE	\$-	\$-	\$-	\$-	\$-	\$-
<b>REVISED SPR BUDGET</b>	<b>\$112,000</b>	<b>\$171,000</b>	<b>\$172,000</b>	<b>\$151,000</b>	<b>\$-</b>	<b>\$606,000</b>
<b>REVISED PROTECT BUDGET</b>	<b>\$25,000</b>	<b>\$50,000</b>	<b>\$-</b>	<b>\$-</b>	<b>\$-</b>	<b>\$75,000</b>
REVISED TOTAL BUDGET	\$137,000	\$221,000	\$172,000	\$151,000	\$-	\$681,000

*FY'25 expenditures are recorded through January 2025. FY'25 through FY'29 Revised Budget values are estimated based on forecasted project work.*

## **882 BENEFIT-COST ANALYSIS OF ROUNDABOUTS TO SUPPORT LONG RANGE INVESTMENT POLICY**

### **OVERVIEW**

Despite significant investments and successful use of roundabouts throughout the state, Oregon currently lacks clear evaluation of the benefits and costs of roundabouts tailored to the state's needs. The states of New York and Virginia have adopted a "roundabout first" policy, identifying roundabouts as the preferred design for intersections where feasible because of benefits to lifecycle system cost, safety, and traffic flow with smog generation reduction benefits. However, Oregon lacks a systematic evaluation including community concerns to support policy development.

In the past there has been very little information available for ODOT to adequately represent roundabouts in cost benefit analysis. However, more and more agencies across the nation are seeing results from roundabouts. For example, a recent white paper documenting the benefits of roundabouts in the state of Illinois provides a list of benefits, including reduced lifecycle costs and reduced crashes and severity (Burns & McDonnell, 2023). The paper noted that the states of New York and Virginia have adopted "roundabout first" policies identifying roundabouts the preferred design for intersections when feasible. Widespread implementation of roundabouts in Carmel, Indiana reduced injury crashes by 47% (Wang & Cicchino, 2022). A recent review of previous research suggests implementation of roundabouts significantly reduce fuel use and carbon dioxide emissions, reduce traffic delay and queuing, but that they may be less effective than signal-controlled intersections with higher traffic volumes (Claros, et al., 2021). Single-lane roundabouts can cost roughly \$1-2 million, while multilane roundabouts cost more (ASCE, 2021). Replacing freeway ramp terminals with roundabouts can cost less than \$1.9 million at stop-controlled ramps, and less than \$5.1 million at signal-controlled terminals, using 2019 dollars (Claros, et al., 2021). However, there is no comprehensive review of benefits and costs of roundabouts in Oregon.

### **OBJECTIVES**

The primary research objective is (1) Review existing studies and Oregon-specific data on benefits and costs of roundabouts for both new intersections and retrofitting of existing intersections. (2) Calculate the most cost-effective long-range investment decision that meets the broad range of ODOT goals and objectives, emphasizing safety, long-range costs, and return on investment to the agency and public. And (3) Evaluate integration of the new information from this study to update the ODOT Traffic Roadway intersection control design tool, currently in beta development.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Data Acquisition; Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Safety Division

Portland State University, Dr. Jason Anderson as principal investigator. (Agreement for \$175,500 ending December. Approximately \$8,196 expended through January 2025.)

## COST INFORMATION

<b>SPR 882</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$78,750	\$78,750	\$-	\$-	\$157,500
WORK PLAN BUDGET	\$71,625	\$86,669	\$19,206	\$-	\$177,500
SPENT TO DATE	\$9,029	\$-	\$-	\$-	\$9,029
<b>REVISED BUDGET</b>	<b>\$71,625</b>	<b>\$86,669</b>	<b>\$19,206</b>	<b>\$-</b>	<b>\$177,500</b>

*FY'25 expenditures are recorded through January 2025. FY'25 through FY'27 Revised Budget values are estimated based on forecasted project work.*

## **883    ADVANCING SAFETY AT INTERSECTIONS: MEASURING THE EFFECTIVENESS OF TRAFFIC SIGNAL STRATEGIES FOR SPEED MANAGEMENT ON OPERATIONS AND SAFETY**

### **OVERVIEW**

Many states are adopting the Safe System approach (USDOT, 2022) to improve traffic safety. As the role of speed in injury severity is becoming increasingly clear, one of the key elements of a Safe System approach is Safer Speeds. Specifically, higher motor vehicle speeds lead to higher injury severity during a collision, especially for nonmotorized users (Rosén and Sander 2009; Tefft 2013) who are the most vulnerable users in the transportation system. Most pedestrian crashes occur on higher-speed, higher-volume multi-lane arterials (Schneider, 2020) that tend to be optimized—via geometric design and traffic signal operations—for motor vehicle flow. Managing speed to promote safety

is a paradigm shift for many agencies, however many agencies still own facilities that promote higher speeds (Sanders et al., 2019). An emerging strategy is to use traffic signals for speed management. Traditional traffic signal timing strategies at signalized intersections along arterial corridors have prioritized vehicle throughput at the expense of other users such as pedestrians, and do not directly account for the safety of road users. Traffic signal control strategies to improve the operational experience for pedestrians (in addition to pedestrian safety) include reducing cycle lengths, changing operations from fixed to free, time of day schedule changes where progression speeds are set at or lower than the speed limit, resting in red, etc. Many of these strategies are targeted at reducing motor vehicle speeds, but few have been evaluated for their effectiveness in the field. This study proposes to evaluate the effectiveness of traffic signal control strategies for speed management on safety-related and operational indicators at multiple Oregon intersections.

### **OBJECTIVES**

The primary research objectives for this project are to: Evaluate the effectiveness of traffic signal control strategies for speed management on safety-related and operational indicators at multiple Oregon intersections. Develop guidance for ODOT and other agencies on the use of traffic signals to manage speeds.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section,

ODOT Engineering and Tech Services Branch,

ODOT Construction Section & Materials Lab,

ODOT Maintenance & Operations Branch,

ODOT Data Solutions Office, Support Services Division.

Portland State University, Dr. Sirisha Kothuri as principal investigator. (Agreement for \$117,500 ending June of 2029. Approximately \$0 expended through January 2025.)

Utah State University, Dr. Patrick A. Singleton as principal investigator. (Agreement for \$92,500 ending June of 2029. Approximately \$0 expended through January 2025.)

## COST INFORMATION

<b>SPR 883</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>FY'29</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$78,960	\$90,240	\$56,400	\$-	\$-	\$225,600
WORK PLAN BUDGET	\$66,500	\$90,500	\$35,000	\$14,600	\$47,600	\$254,200
SPENT TO DATE	\$435	\$-	\$-	\$-	\$-	\$435
<b>REVISED BUDGET</b>	<b>\$66,500</b>	<b>\$90,500</b>	<b>\$35,000</b>	<b>\$14,600</b>	<b>\$47,600</b>	<b>\$254,200</b>

*FY'25 expenditures are recorded through January 2025. FY'25 through FY'29 Revised Budget values are estimated based on forecasted project work.*

## **884 DEVELOPING NEXT-GENERATION OF BRIDGE FRAGILITY MODELS FOR OREGON'S TRANSPORTATION NETWORK**

### **OVERVIEW**

After a major earthquake, ODOT emergency managers would require immediate understanding of field conditions to coordinate responses and dispatch bridge inspection resources. The ShakeCast alerting system utilizes real-time ground-shaking maps from the United States Geological Survey and precalculated bridge fragility relationships to rapidly estimate bridge damage. The limitations of the current fragility models for Oregon's bridge infrastructure will reduce the value of the results. Existing models are both obsolete and a poor match for Oregon's bridge inventory. This may result in unrealistic estimations of regional seismic vulnerability. Addressing these limitations will enhance post-earthquake emergency response, restoration of network mobility, and capital resource allocation for seismic safety improvements. Developing next-generation parametrized fragility models tailored to Oregon's unique infrastructure is important to a quick and efficient response after a major seismic event, like a Cascadia Subduction Zone Earthquake.

### **OBJECTIVES**

The final product will consist of an updated set of parametrized fragility models specifically designed for the diverse array of bridge classes in Oregon. These fragility models will incorporate recent advances in seismic design philosophy, accounting for a range of bridge attributes. Parameterized models offer flexibility by accommodating variation in design details within a portfolio, enabling efficient uncertainty propagation. Moreover, the final product will provide detailed seismic damage state definitions that are explicitly linked to post-earthquake response and recovery.

The research will also produce detailed documentation, guidelines, and tools for the utilization of the results within the existing alerting and response system. The documentation and tools would facilitate easy access and utilization of the models by State agencies, emergency responders, engineers, and researchers.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Compilation of Oregon Bridge Parameters, Development of Fragility Models; Non-Linear Time-History Analysis, Development of Ground Motions and Finite Element Bridge Models, Development of Machine-Learning Based Multi-Parameter Models; TAC Presentations, Final Report; and Travel.

These activities will result in:

- Literature Review
- Bridge Fragility Models Suitable for Implementation in ShakeCast
- Final Report

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Bridge Section

ODOT Maintenance and Operations Branch

Oregon State University, Dr. Farahnaz Soleimani as principal investigator. (Agreement for \$398,000 ending June of 2029. Approximately \$0 expended through January 2025.)

## COST INFORMATION

<b>SPR 884</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$127,960	\$146,240	\$91,400	\$-	\$365,600
WORK PLAN BUDGET	\$124,000	\$202,000	\$99,000	\$-	\$425,000
SPENT TO DATE					
<b>REVISED BUDGET</b>	124,000	202,000	\$99,000	\$-	\$425,000

*FY'25 expenditures are recorded through January 2025. FY'25 through FY'27 Revised Budget values are estimated based on forecasted project work.*

## **886 MOBILE LIDAR EVALUATION OF ROAD MARKING CONDITION FOR FEDERAL REPORTING**

### **OVERVIEW**

New FHWA regulations require states to report methodology and values for keeping minimum retro-reflectivity standards on pavement markings (PM). ODOT's past research found using Lidar data can substitute for reflectometer readings. ODOT purchased new equipment for both reflectometer and mobile lidar scanning. The need is to compare new and old equipment to meet FHWA requirements. Conducting this work through research, allows for discovery, better optimization, long-term data collection, multiple methods to report with confidence, supports ODOT's choice for its own timeframe to implement, and helps to determine PM's lifespan.

### **OBJECTIVES**

Compare and calibrate the two mobile lidar systems, and mobile & handheld retro-reflectometers. Develop a workflow and reporting methodology that meets FHWA reporting requirement while minimizing the in-field effort and manual processing. Provide recommendations to meet the FHWA required reporting, create a transition plan to full mobile system reporting in 5 years, and identify long-term software needed for operation.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

### **ACCOMPLISHMENTS**

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

### **RESPONSIBLE PARTIES**

ODOT Research Section,  
ODOT Engineering and Tech Services Branch,  
ODOT Construction Section & Materials Lab,  
ODOT Maintenance & Operations Branch,

ODOT Data Solutions Office, Support Services Division.

Oregon State University, Dr. Erzhua Che as principal investigator. (Agreement for \$280,000 ending June of 2029. Approximately \$9,765.00 expended through January 2025.)

#### **COST INFORMATION**

<b>SPR 886</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$103,460	\$118,240	\$73,900	\$-	\$295,600
WORK PLAN BUDGET	\$105,000	\$138,000	\$60,000	\$-	\$303,000
SPENT TO DATE	\$9,765	\$-	\$-	\$-	\$9,765.00
<b>REVISED BUDGET</b>	<b>\$105,000</b>	<b>\$138,000</b>	<b>\$60,000</b>	<b>\$-</b>	<b>\$303,000</b>

*FY'25 expenditures are recorded through January 2025. FY'25 through FY'27 Revised Budget values are estimated based on forecasted project work.*

## **887 INCREASING ASPHALT RECYCLING IN OREGON THROUGH IMPROVEMENTS IN COLD AND HOT MIX ASPHALT PRODUCTION PROCESSES**

### **OVERVIEW**

Increasing reclaimed asphalt pavement (RAP) content in Oregon poses several challenges related to the operational capabilities of the asphalt plants and the inadequacy of the current standard plant procedures for high RAP asphalt mixture production using both, hot and cold mix technology.

Cold mix asphalt concrete, also known as Emulsified Asphalt Concrete (EAC) has been used in Oregon for road construction, especially in colder regions. However, although comprehensive design and performance testing methods are currently being implemented and used by ODOT for hot mix and chip seals, performance testing methods specifically for cold mix asphalt currently do not exist in Oregon. Since the material properties of cold mixtures are significantly different from other road construction materials, unique test and rapid quality assurance methods, specifications, and new strategies are to be developed and implemented to achieve high-performance cold mix asphalts with high RAP contents as part of this research.

Hot mix asphalt concrete currently employs up to 30% RAP material. This recycled material is generally indirectly heated by mixing it with the superheated aggregates. This approach for heating RAP material indirectly is problematic as it does not permit accurate temperature control of the RAP material and also because this process results in virgin aggregates not being heated to the required temperature for mixing. These effects combined result in reduced blending of the RAP and virgin binders and impacts the performance of the mixture. For this reason, alternative heating processes and new technologies for heating and processing RAP are to be evaluated as part of this research.

### **OBJECTIVES**

This research has five major objectives: i) identify most suitable processes and technologies for producing high-performance HMA and EAC; ii) develop guidelines regarding the use of rejuvenators, new emulsion types, and other additives to improve EAC and HMA performance and increase the RAP content; iii) identify and address plant-related constraints that limit the amount of RAP that can be incorporated into HMA production; iv) the most suitable laboratory and field quality assurance test methods for evaluating the fatigue cracking, deformation, raveling, and thermal cracking performance of EAC mixtures v) develop rapid field quality assurance and product acceptance tests for the measurement of in-situ EAC moisture content, evaporation rate, curing time (to determine when to start compacting and open to traffic), density, penetration resistance, and shear resistance;

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

## PROPOSED ACTIVITIES

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

Oregon State University Dr. Erdem Coleri as principal investigator. (Agreement for \$385,000 ending August 2028. \$0 expended through January 2025.)

## COST INFORMATION

<b>SPR 887</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$86,171	\$151,508	\$142,069	\$5,252	<b>\$385,000</b>
WORK PLAN BUDGET	\$92,171	\$157,508	\$148,069	\$10,652	\$408,400
SPENT TO DATE	\$4,702	\$-	\$-	\$-	\$4,702
<b>REVISED BUDGET</b>	<b>\$92,171</b>	<b>\$157,508</b>	<b>\$148,069</b>	<b>\$10,652</b>	<b>\$408,400</b>

*FY'25 expenditures are recorded through January 2025. FY'25 through FY'28 Revised Budget values are estimated based on forecasted project work.*

## **888 EVALUATION OF THE RELATIONSHIP BETWEEN NEAR MISSES AND CRASH OUTCOMES AT INTERSECTIONS IN OREGON**

### **OVERVIEW**

The overrepresentation of crashes at signalized intersections is a persistent problem in Oregon. Crash analysis is a useful tool for characterizing the safety of a system, then refining the system's design. However, assessing the safety of novel transportation designs or existing facilities using real crash data may not be feasible because of the long observational periods and low numbers of crashes. Typically, three years of before and after data is required to produce statistically significant quantities of data. Significant advances have been made in our ability to characterize transportation system safety with tools such as the Highway Safety Manual (HSM) predictive methods, however these tools require that crash modification factors (CMFs) have been produced for the infrastructure treatments in question, and for those models to have been calibrated for use in Oregon.

Surrogate Safety Measures (SSM), or leading indicators such as near miss events, allow for the comparison of safety-related events by acting as proxies for likely crash outcomes. Because they are based on observable events, they can often capture multiple safety-related issues rather than being limited to a single aspect and offer the opportunity to include important factors that can contribute to crashes and severe outcomes, yet are not included in current crash databases. The promise of leading indicator analysis, such as SSM, has yet to be robustly correlated with real crash data across a wide variety of crash topologies. Recently, multiple vendors have entered this space, driving down cost - both for one-off studies and ongoing installations – increasing our need for defensible guidance when using this data. What little work that has been done in this space has not been calibrated to an Oregon Context.

### **OBJECTIVES**

This project will determine the efficacy of leading indicator analysis in Oregon, including the following research tasks:

Task 1: Briefly review the state of practice related to near miss leading indicators (e.g., post encroachment time) at intersections in transportation. Additionally, this review will consider how leading indicators have been used for supporting funding/programming requests.

Task 2: Produce a prioritized list of crash scenarios (e.g., overtaking, left turn across path) that would benefit from validated leading indicators

Task 3: Select test sites (e.g., 30) for video data collection

Task 4: Conduct video and crash data collection

Task 5: Conduct video data reduction and crash data preparation

Task 6: Perform robust data analysis on video and crash data

Task 7: Development of guidance and final report

## PROPOSED ACTIVITIES

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

More information on proposed activities can be found in the ODOT active research projects webpage at the link above.

## ACCOMPLISHMENTS

Information on accomplishments may be viewed by selecting ODOT active research projects webpage at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

ODOT Traffic Engineering Unit

Oregon State University: Dr. David Hurwitz as principal investigator.

## COST INFORMATION

<b>SPR 888</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$84,000	\$126,000	\$-	\$-	\$210,000
WORK PLAN BUDGET	\$62,250	\$161,250	\$16,500	\$-	\$240,000
SPENT TO DATE	\$3,918	\$-	\$-	\$-	\$3,918
<b>REVISED BUDGET</b>	<b>\$42,250</b>	<b>\$161,250</b>	<b>\$36,500</b>	<b>\$-</b>	<b>\$240,000</b>

*FY'25 expenditures are recorded through January 2025. FY'25 through FY'27 Revised Budget values are estimated based on forecasted project work.*

## **889 EVALUATING MOWING PRACTICES FOR POLLINATOR HABITAT ENHANCEMENT: HIGHWAY VEGETATION MANAGEMENT AND ITS IMPACT ON ENDANGERED POLLINATORS**

### **OVERVIEW**

ORS 634.045 requires several state agencies, including ODOT, to maintain and revise a bee pollinator safety plan to educate the public and increase pollinator habitat. It is not clear to ODOT how to document habitat on their properties, if current mowing practices enhance or reduce pollinator habitat, and how to prioritize areas for compliance of conservation practices. The US DOT has guidelines for vegetation management for right-of-ways (ROWs), but there have been contrasting results for key practices, such as mowing and efforts at establishing pollinator-attractive plants have not resulted in long lasting habitat and may result in costly landscaping. Finally, there are concerns that the habitats near roadway locations with vehicles and environmental pollutants may result low mortality rates to pollinators. Consequently, it is unclear how ODOT routine mowing practices, which covers an estimated 20,000 acres annually, enhances the vegetation that is important to threatened or endangered pollinators. This research seeks to identify mowing practices that encourage these plants and to help meet protection targets without increased costs.

### **OBJECTIVES**

The research will study pollinator activity in three geographic regions and develop “high benefit” pollinator vegetation management practices with a neutral (or lessened) cost to ODOT. The research will be conducted over three seasons and have three parts:

- In-field vegetation documentation using new app and method analysis;
- Cost-Benefit Analysis; and
- Feasibility analysis.

The in-field tasks include selecting 27 site locations on ODOT secondary or tertiary roads, with appropriate ROWs, across three ODOT regions (i.e., 9 per region). The study will have three levels of mowing intensity: high (at least once per year), medium (once every other year) and low (less than once every two years). Each location will be monitored for plant diversity and density and bee pollinator activity during the appropriate seasons – with particular measurement directly before and after mowing. The research will determine if mowing intensity and date of mowing influences the density of plants of highest value to pollinators by: 1) relating plants found to Melittflora records filtered for the region (e.g., Figure 1); and 2) calculating the richness of bee species found at each site. The research will also use historic estimates of average seasonal traffic volume at each site as a covariate to investigate the impact of traffic on the diversity of the bee community for a given plant community. Site characteristics will also be documented (e.g. distance from the roadway). The cost-benefit analysis will focus on detailing normal vs pollinator staff/resource costs, timing for mowing, and comparing to outcomes of high pollinator activity. The feasibility analysis will compare normal maintenance resource availability and use compared to recommended optimal mowing for pollinator benefits.

Finally, the project would result in a regional pocket guide of the most important plants for pollinators that vegetation management crews will encounter, as well as new continuing education trainings for vegetation management staff. This information could be used in future construction (or Maintenance) locations to identify plant species that are both of high value to

pollinators and known to persist under ROW conditions that could help inform how to modify seed blends following road construction.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

## PROPOSED ACTIVITIES

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

This project is under development. Once it begins, more information on proposed activities can be found in the Project Work Plan at the link above.

## ACCOMPLISHMENTS

This project is under development in April of 2025. Once it begins, accomplishments may be viewed by selecting Quarterly Reports at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

## COST INFORMATION

<b>SPR 889</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>FY'29</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$50,000	\$90,000	\$80,000	\$83,400	\$303,400
WORK PLAN BUDGET					
SPENT TO DATE					
<b>REVISED BUDGET</b>					

*Budget values are estimated based on forecasted project work.*

## **890    UPDATING STREAMFLOW STATISTICS FOR CENTRAL AND EASTERN OREGON TO REDUCE FLOODING RISK**

### **OVERVIEW**

Regional flood frequency equations are needed to plan, maintain, and protect critical infrastructure against flood risks across Oregon. When designing and maintaining hydraulic infrastructure in central and eastern Oregon, ODOT professionals face persistent challenges of sparse streamflow data, highly variable precipitation, diverse geologic and topographic features, and irregularities due to large water withdrawals for agriculture. While reliable streamflow statistics can be obtained for western Oregon locations using the ODOT funded USGS StreamStats tool, the current accuracy of the underlying regression equations for locations in central and eastern Oregon are much less reliable, and in some cases not available. Further, though the StreamStats tool may be helpful for some central and eastern Oregon locations, these regression equations—now more than 20 years old—may not accurately reflect present-day conditions, particularly where basins have experienced significant shifts in long-term precipitation and temperature patterns, land use, or water withdrawals. Accurate streamflow statistics are essential for sizing bridges, culverts, and roadside drainage, ensuring infrastructure longevity through variable flow conditions and extreme weather events.

### **OBJECTIVES**

The objective of this research is to update Oregon streamflow statistics and the heavily used StreamStats tool so that this tool can be relied upon for ODOT hydraulic design in central and eastern Oregon. This update process will employ new machine-learning and refined statistical approaches, together with more expansive data from states that share central and eastern Oregon’s hydraulic and hydrologic characteristics. Specifically, this research aims to: 1) enhance design accuracy, 2) support infrastructure longevity under future conditions, 3) optimize resource allocation, 4) improve planning and reduce maintenance, and 5) facilitate regulatory compliance and environmental stewardship with effective fish passage design and habitat protection.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Funds will be used to pay for staff time; consultants and professional services; computational needs; travel expenses; and other services and supplies. Funds will be used to pay for Technical Equipment required to conduct the research, data acquisition, data analysis, TAC presentations, literature review, final report, workshops, training.

This project is under development. Once it begins, more information on proposed activities can be found in the Project Work Plan at the link above.

### **ACCOMPLISHMENTS**

This project is under development in April of 2025. Once it begins, accomplishments may be viewed by selecting Quarterly Reports at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

## COST INFORMATION

<b>SPR 890</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>FY'29</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$98,000	120,000	\$76,500		\$294,500
WORK PLAN BUDGET					
SPENT TO DATE					
<b>REVISED BUDGET</b>					

*Budget values are estimated based on forecasted project work.*

## **891 IMPACT STUDY ON INCREASING TRUCK PERMIT WEIGHT LIMITS: INFRASTRUCTURE & ECONOMIC CONSIDERATIONS**

### **OVERVIEW**

Oregon's current weight restrictions (105,500 lbs.) for divisible loads are less than neighboring states like Idaho and Nevada, which permit up to 129,900 lbs. In response to industry requests for alignment with these states, ODOT needs a comprehensive impact assessment of what raising the weight limits will mean in terms of sustaining the current operational infrastructure its charged with maintaining. This study will evaluate infrastructure effects, highway safety, and maintenance costs, along with the implications for adaptation and community impacts. With neighboring states already designating heavier freight routes, increasing Oregon's truck permit weight limits may support freight fleet electrification and promote regional integration of the shipping network while assessing the costs to maintain and manage this increased infrastructural burden that's on ODOT's horizon. This feasibility and impact study will assess selective extended weight designations in Oregon and survey existing programs nationwide while evaluating potential risks to structural integrity (pavement and bridges), traffic safety impacts, as well as community and environmental considerations. The findings will provide ODOT with data-driven insights to guide policy decisions. This study will also examine vehicle configurations and length factors necessary to maintain legal axle weights in Weight Tables 1 and 2 at a gross weight of 129,900 and determine if those lengths are consistent with the lengths allowed by the LCV (Longer Combination Vehicle) freeze in federal law.

### **OBJECTIVE**

A comprehensive report containing recommendations to support an informed evaluation of increasing weight limits for divisible loads, including an infrastructure impact assessment detailing the effects of heavier loads on bridges, pavements, and highway safety, with a focus on high-frequency freight routes in Oregon. 2) An economic impact assessment will quantify the contributions of oversized freight to Oregon's economy, balancing potential economic gains from increased freight capacity with the costs of infrastructure maintenance and safety considerations. 3) A strategic implementation plan will outline a phased approach to applying these findings, allowing ODOT to prioritize investments to engage communities and the public effectively.

More detailed information regarding the project and its objectives can be found at the link below: <https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Funds will be used to pay for staff time; consultants and professional services; computational needs; travel expenses; and other services and supplies. Funds will be used to pay for Technical Equipment required to conduct the research, data acquisition, data analysis, tool development, TAC presentations, literature review, final report, workshops, training.

This project is under development. Once it begins, more information on proposed activities can be found in the Project Work Plan at the link above.

## ACCOMPLISHMENTS

This project is under development in April 2025. Once it begins, accomplishments may be viewed by selecting [Quarterly Reports](#) at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

## COST INFORMATION

<b>SPR 891</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>FY'29</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$100,000	\$125,000	\$85,600	\$-	\$310,600
WORK PLAN BUDGET					
SPENT TO DATE					
<b>REVISED BUDGET</b>					

*Budget values are estimated based on forecasted project work.*

## **892 PHASE III WICKIUP JUNCTION: DIATOMACEOUS SOIL NUMERICAL MODELING TO SUPPORT DESIGN, PERFORMANCE, AND FEASIBILITY**

### **OVERVIEW**

Diatomaceous soils exist at many ODOT projects in Oregon, including the Wickiup Junction overpass site. Construction challenges have been encountered for ODOT projects on and in diatomaceous soils, including pile freeze, overlength piles, and excessive settlement. Ongoing Wickiup Junction embankment monitoring indicates that these embankments are undergoing continuous settlement at about 1.75 inches per year. Recently, a consultant's feasibility study estimated that settlement mitigation for future overpass construction will cost \$47M to \$63M. This high mitigation cost is attributable to extensive deposits of soft and compressible diatomaceous soils that underlay the site. Considering that diatomaceous soils are non-standard geomaterials, limited literature, standards, or case histories exist to guide design and construction in these materials. However, this Wickiup Junction location may provide a prime translational research opportunity to improve engineering practice through development of a case history report with associated design charts for diatomaceous soils.

### **OBJECTIVES**

This highly applied research proposal will investigate the recently released design options at Wickiup Junction using advanced soil numerical modeling as a case study for design in diatomaceous material. This work will build on previous ODOT diatomaceous soil research to develop design tools that can be applied for construction in and on these deposits. Specific objectives include: 1) develop settlement model of the Wickiup Junction Overpass, and 2) develop design charts for diatomaceous soils.

More detailed information regarding the project and its objectives can be found at the link below: <https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

This project is under development. Once it begins, more information on proposed activities can be found in the Project Work Plan at the link above.

### **ACCOMPLISHMENTS**

This project is under development in April of 2025. Once it begins, accomplishments may be viewed by selecting Quarterly Reports at the link above.

### **RESPONSIBLE PARTIES**

ODOT Research Section

**COST INFORMATION**

<b>SPR 892</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>FY'29</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$115,000	\$143,500	\$86,000	\$-	\$344,500
WORK PLAN BUDGET					
SPENT TO DATE					
<b>REVISED BUDGET</b>					

*Budget values are estimated based on forecasted project work.*

## **893 DEVELOPMENT OF METHODS TO PRODUCE HIGH-QUALITY 'HOUSEHOLD-BASED' VMT DATASET**

### **OVERVIEW**

Household-based Vehicle Miles Traveled (VMT) is essential for ODOT's strategic initiatives. Traditionally, ODOT has reported on-road VMT to FHWA by monitoring traffic on public roads, but new planning and modeling requirements now emphasize household-based, light vehicle VMT—tracking passenger vehicle travel by Oregon residents, regardless of location. A variety of policy actions may have an impact on resident-generated VMT. Accurate household-based VMT data is critical as ODOT implements new local and metropolitan reporting requirements, tracks VMT per capita as a Key Performance Target in the 2022 Oregon Transportation Plan, and reports vehicle type VMT to the legislature. Without this research, the agency lacks an empirical method for measuring household-based VMT.

### **OBJECTIVES**

The research will establish a framework for developing a high-quality household-based VMT measurements by integrating available empirical data and evaluating each dataset's strengths and weaknesses for monitoring household-based. This research will leverage Oregon's 2023-2024 household travel survey, which collected 1- to 7-day travel diaries from 22,000 households—a rare opportunity, as such surveys occur only about every 13 years. Additional VMT data sources include DMV and DEQ odometer readings, which require evaluation for completeness, privacy, and accuracy; ODOT's OreGO program, which provides high-quality VMT data but has limited participation and self-selection bias; and third-party data vendors, which have been used by other state DOTs but remain untested for accuracy in Oregon. This research will assess the strengths and limitations of these data sources and develop a methodology for integrating reliable household-based VMT data. If critical flaws are identified, it will provide recommendations to improve VMT measurement through future data collection and administrative processes.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

This project is under development. Once it begins, more information on proposed activities can be found in the Project Work Plan at the link above.

### **ACCOMPLISHMENTS**

This project is under development in April of 2025. Once it begins, accomplishments may be viewed by selecting Quarterly Reports at the link above.

**RESPONSIBLE PARTIES**

ODOT Research Section

**COST INFORMATION**

<b>SPR 893</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>FY'29</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$56,000	\$65,000	\$39,600		\$160,600
WORK PLAN BUDGET					
SPENT TO DATE					
<b>REVISED BUDGET</b>					

*Budget values are estimated based on forecasted project work.*

## **894 DESIGN GUIDELINES FOR BRIDGE PILE FOUNDATIONS SUBJECTED TO COMBINED INERTIAL AND LIQUEFACTION INDUCED LATERAL SPREADING LOADS**

### **OVERVIEW**

Earthquake induced soil liquefaction can result in significant displacements in sloping ground. This type of displacement is referred to as lateral spreading and is considered a substantial hazard to Oregon bridges. One current challenge facing bridge foundation design is the knowledge gap regarding appropriate selection of load factors for combining lateral spreading loads (kinematic) and superstructure inertial loads (inertia). Unfortunately, there is no consensus in design codes for how to combine inertial and kinematic loads. Failure to address this knowledge gap presents challenges for ODOT engineers and designers. If lateral spreading and superstructure inertial loads interact during an earthquake, neglecting their combined effects could lead to inadequate and unsafe designs. Conversely, overconservatively combining these loads may result in costly, non-constructible foundations, particularly for piles passing through stiff, non-liquefiable crusts overlying deep liquefiable soils on sloped grounds.

### **OBJECTIVES**

The primary objective of this research is to solidify ODOT's design guidelines for combining superstructure inertial and lateral spreading loads in a pseudo-static analysis. The inertial and kinematic load interaction factors will be characterized by accounting for differences in seismicity in Eastern and Western Oregon, foundation types, and the complexity levels of design methods utilized in various ODOT projects. The proposed methodology for combining superstructure inertial and lateral spreading loads in a pseudo-static analysis will be detailed in a practice-ready recommended amendment to the ODOT Geotechnical Design Manual (GDM) and ODOT Bridge Design Manual (BDM).

More detailed information regarding the project and its objectives can be found at the link below: <https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

This project is under development. Once it begins, more information on proposed activities can be found in the Project Work Plan at the link above.

### **ACCOMPLISHMENTS**

This project is under development in April of 2025. Once it begins, accomplishments may be viewed by selecting Quarterly Reports at the link above.

### **RESPONSIBLE PARTIES**

ODOT Research Section

**COST INFORMATION**

<b>SPR 894</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>FY'29</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$98,000	\$221,000	\$172,000	\$136,000	\$627,000
WORK PLAN BUDGET					
SPENT TO DATE					
<b>REVISED BUDGET</b>					

*Budget values are estimated based on forecasted project work.*

## **895 DEVELOP GUIDANCE ON THE SAFETY PERFORMANCE OF EDGE LINE PAVEMENT MARKERS AND GUARDRAIL DELINEATIONS ON RURAL OREGON ROADS**

### **OVERVIEW**

Despite Oregon's efforts to reduce fatalities and serious injuries, crashes along curves (statewide) continue to be high-risk locations, particularly those involving roadway departures. Contributing factors such as speed, visibility, pavement quality, limited delineation, and adverse weather conditions exacerbate these risks. While Oregon incorporates edge line pavement markers and guardrail delineations, there is limited research on their safety performance on Oregon specific rural roads. It will also investigate whether combining edge line pavement markers with guardrail and barrier delineations as part of a systemic safety countermeasure strategy provides greater safety benefits than applying treatments individually.

### **OBJECTIVES**

This research will produce a guidance document outlining recommendations for the use of edge line pavement markers and guardrail delineations on rural curves. The document will provide:

- criteria for identifying high-risk curves where these treatments will be most effective, considering factors such as crash history, speed, curve geometry, and environmental conditions;
- guidance on combining edge line pavement markers with guardrail and barrier delineations as a systemic safety countermeasure strategy to achieve greater safety benefits;
- scalable solutions tailored to rural curves that address Oregon's unique roadway environments and crash patterns; and
- performance evaluation framework for ongoing assessment and monitoring of these countermeasures.

More detailed information regarding the project and its objectives can be found at the link below: <https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

This project is under development. Once it begins, more information on proposed activities can be found in the Project Work Plan at the link above.

### **ACCOMPLISHMENTS**

This project is under development in April of 2025. Once it begins, accomplishments may be viewed by selecting Quarterly Reports at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

## COST INFORMATION

<b>SPR 895</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>FY'29</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$68,000	\$80,000	\$47,600	\$-	\$195,600
WORK PLAN BUDGET					
SPENT TO DATE					
<b>REVISED BUDGET</b>					

*Budget values are estimated based on forecasted project work.*

## **896 THE POTENTIAL OF USING CRACK-ATTENUATING ASPHALT MIXTURES IN OREGON TO COMBAT LONG-TERM DURABILITY ISSUES**

### **OVERVIEW**

Reflection pavement cracking occurs in Oregon when load-related surface level shear stress or underlying cracks in asphalt or concrete propagate to surface. A successful approach to mitigate this problem is to construct a highly flexible thin asphalt layer underneath fresh asphalt pavement that can absorb displacement and impede cracking from propagating through and reaching the surface. While this approach has been successful in nearby states, there is no experience applying it in Oregon and this research project seeks to determine the optimum parameters (aggregate size, layer thickness, binder content, etc) for its successful application in Oregon roads.

### **OBJECTIVES**

The major objectives of this research study are to:

- **Develop and Optimize Crack Attenuating Mix Designs:** Design and test asphalt mixtures with various material combinations to enhance crack resistance and durability, including HiMA and traditional CAM surface and base mixtures.
- **Evaluate Performance and Cost-Effectiveness:** Assess crack attenuating layers through laboratory testing, field implementation, and life-cycle cost analysis (LCCA) compared to traditional interlayers and current conventional paving strategies.
- **Establish Construction Guidelines and Specifications:** Develop best practices for mix design, placement, and construction to ensure successful implementation in Oregon.
- **Monitor Long-Term Performance and Structural Compatibility:** Conduct field trials, assess bonding strength, and track pavement performance using Automated Pavement Condition Surveys (APCS).
- **Support ODOT's Material Selection and Standardization:** Identify high-performing materials for inclusion in ODOT's materials specifications to guide future pavement strategies.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Consultant Payments; Staff Time; Literature Review; Pilot Testing; Equipment Purchase; Data Acquisition (In-Field); Data Analysis for Multiple Sites; TAC Presentations, Final Report; and Travel;

This project is under development. Once it begins, more information on proposed activities can be found in the Project Work Plan at the link above.

## ACCOMPLISHMENTS

This project is under development in April of 2025. Once it begins, accomplishments may be viewed by selecting [Quarterly Reports](#) at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

## COST INFORMATION

<b>SPR 896</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>FY'29</b>	<b>TOTAL</b>
STAGE 2 BUDGET	\$100,000	\$131,000	\$88,000		\$319,000
WORK PLAN BUDGET					
SPENT TO DATE					
<b>REVISED BUDGET</b>					

*Budget values are estimated based on forecasted project work.*

## **PROTECT-PLANNING FUNDED RESEARCH**

In addition to the SPR funds this work program documents research conducted under the IIJA approved PROTECT-Planning program. The Infrastructure Investment and Jobs Act (IIJA) established the Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program to help make surface transportation more resilient to current and future weather events, natural disasters, and changing conditions. Planning activities (23 U.S.C. § 176(c)(2) and 176(d)(3)) are included in the PROTECT program including the specific activities of:

*Technical capacity building to facilitate the ability of the eligible entity to assess the vulnerabilities of its surface transportation assets and community response strategies under current conditions and a range of potential future condition. (from FHWA website)*

Research development and technology transfer activities that meet this purpose and use PROTECT-Planning funds are discussed in this section. This work program documents \$1,119,491 for a two-year period of PROTECT-Planning funds provided by FHWA of \$1,007,542 and a Non-Federal Match from ODOT of \$111,949. This programmatic funding for the ODOT research covers the period of the State Fiscal Years 2026 and 2027.

The Federal share of the cost of a project carried out using PROTECT Formula Program funds is governed by 23 U.S.C. 176(c)(3)(D). ODOT has an FHWA approved Resilience Improvement Plan (RIP) and it was integrated into ODOT's long-range plan, the Oregon Transportation Plan. As a result, ODOT projects included in the approved the RIP are eligible for a 10% match reduction. These research efforts are a part of "Implementation Actions 2.1 that includes "Expand participation in and advancement of state and national research activities".

Table 10 Summary of PROTECT-Planning Funded Research for FY'26 and FY'27

PROJECT Projects	FY'26	FY'27
SPR 302-011 Tech Transfer	\$20,000	\$-
304/981 Small project	\$60,000	\$-
SPR 853 Supplemental Tasks	\$25,000	\$-
SPR 881 Supplemental Tasks	\$25,000	\$50,000
SPR 878 Supplemental Tasks	\$75,491	\$-
PROTECT 885	\$134,000	\$148,000
PROTECT 897	\$100,000	\$200,000
PROTECT 898	\$107,000	\$175,000
<b>PROTECT-Planning Project Costs</b>	<b>\$546,491</b>	<b>\$573,000</b>

Table 11 Summary of PROTECT-Planning Cost Responsibility for FY'26 and FY'27

<b>PROTECT Planning Funds</b>	<b>FY'26</b>	<b>FY'27</b>	<b>Total</b>
Federal PROTECT Planning (Research) (90%)	\$491,842	\$515,700	\$1,007,542
State Match PROTECT Planning (Research)(%10)	\$54,649	\$57,300	\$111,949
<b>TOTALS</b>	<b>\$546,491</b>	<b>\$573,000</b>	<b>\$ 1,119,491</b>

## **PROTECT SUPPLEMENTAL TASKS TO SPR PROJECTS**

Several of Oregon's existing research projects have research objectives that are closely related to the PROTECT program and benefit from the addition of tasks that will build capacity and will use PROTECT funds for this purpose. These include SPR 302-011, SPR 853, Tasks, SPR 881 Supplemental Tasks, SPR 864 Supplemental Tasks. These are noted for funding purposes on this page and detailed as tasks in the Respective SPR project.

## **PROTECT-PLANNING RESEARCH PROJECTS**

The following pages document research projects are initiated primarily using PROTECT-Planning formula funds.

## **PROTECT 885      INCREASING INFRASTRUCTURE LONGEVITY AND DURABILITY DURING POTENTIAL EMERGENCY FLOODING SCENARIOS**

### **OVERVIEW**

ODOT has a substantial number of vulnerable assets including hundreds of scour critical bridges, thousands of culverts rated in poor or critical condition, and an unknown number of stream and riverbanks at risk of future destabilization. While ODOT's Hydraulic Engineers are responsible for the design of these hydraulic structures, ODOT lacks standard methods for how to integrate extreme flooding and uncertain post-wildfire flooding scenarios that also consider multiple geographic zones and site conditions. This research will enhance DOT capacity to design durable, high-longevity infrastructure and select materials to withstand both near-term and future changes in hydrology. (e.g., extreme precipitation events & wildfire). Potential for region-wide relevance, at minimum.

### **OBJECTIVES**

- Develop a decision-making framework and flowchart for designers that navigates when and how to incorporate extreme weather flooding into hydrologic and hydraulic design.
- Develop user-friendly GIS tools for incorporating needed datasets.
- Develop criteria and tools for assessing quality and limitations of analysis.
- Build library of case studies to improve future work.
- Develop site prioritization index and process to assess, inform, and implement a programmatic approach by hydrologic geographic regions.
- Provide workshop, guidance, tools, and process for evaluation and update

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Funds will be used to pay for staff time; consultants and professional services; computational needs; travel expenses; and other services and supplies. Funds will be used to pay for Technical Equipment required to conduct the research, data acquisition, data analysis, tool development, TAC presentations, literature review, final report, workshops, training.

This project is under development. Once it begins, more information on proposed activities can be found in the Project Work Plan at the link above.

### **ACCOMPLISHMENTS**

This project is under development in April of 2025. Once it begins, accomplishments may be viewed by selecting Quarterly Reports at the link above.

### **RESPONSIBLE PARTIES**

ODOT Research Section

## COST INFORMATION

<b>PROTECT 885</b>	<b>FY'25</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>TOTAL</b>
INITIAL PROTECT BUDGET	\$94,460	\$141,690	\$118,075	\$118,075	\$472,300
WORK PLAN BUDGET					
SPR SPENT TO DATE					
PROTECT SPENT TO DATE					
<b>REVISED SPR BUDGET</b>	<b>\$-</b>	<b>\$-</b>	<b>\$-</b>	<b>\$62,000</b>	<b>\$62,000</b>
<b>REVISED PROTECT BUDGET</b>	<b>\$134,000</b>	<b>\$148,000</b>	<b>\$140,000</b>	<b>\$-</b>	<b>\$422,000</b>
REVISED TOTAL BUDGET	\$134,000	\$148,000	\$140,000	\$62,000	\$484,000

*Budget values are estimated based on forecasted project work*

## **PROTECT 897      SUBSURFACE ANALYSIS PLANNING TOOL FOR DRILLING COST REDUCTION, RAPID EMERGENCY EVALUATION, AND DATA SUPPORT FOR RURAL SERVICE AREAS**

### **OVERVIEW**

Transportation professionals often make important decisions about system longevity, durability, project design, and emergency response with limited time and data. This is particularly true as it relates to the underlying soil, rock, and groundwater conditions that directly affect the design and repair of critical infrastructure. Typically, planners and engineers rely on drilling boreholes and performing in-situ tests to characterize subsurface conditions and associated problems for applications ranging from bridges to roadways to stream crossings to landslides. Unfortunately, these exploration techniques are expensive, time-consuming, inherently risky, and often accompanied by significant lead times. Further, the complex nature of this data can be very difficult to interpret and the uncertainty difficult to quantify. This research will expand the Georeferenced Oregon Soil Engineering Properties (GOSEP) Database, which is a clearinghouse for subsurface groundwater and soil data collected from previous State projects, as well as refine models for predicting subsurface information to reduce project cost with reduced boreholes as well as provide emergency preliminary subsurface estimations for rapid repair and response.

### **OBJECTIVES**

- Expand borehole database.
- Refine preliminary models and tools for estimating subsurface information.
- Provide interactive GIS tools
- 
- Provide interactive workshops for implementation.

More detailed information regarding the project and its objectives can be found at the link below:  
<https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Funds will be used to pay for staff time; consultants and professional services; computational needs; travel expenses; and other services and supplies. Funds will be used to pay for Technical Equipment required to conduct the research, data acquisition, data analysis, TAC presentations, literature review, final report, workshops, training.

This project is under development. Once it begins, more information on proposed activities can be found in the Project Work Plan at the link above.

### **ACCOMPLISHMENTS**

This project is under development in April 2025. Once it begins, accomplishments may be viewed by selecting Quarterly Reports at the link above.

## RESPONSIBLE PARTIES

ODOT Research Section

## COST INFORMATION

<b>PROTECT 897</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>FY'29</b>	<b>TOTAL</b>
PROTECTBUDGET	\$150,000	\$150,000	\$100,000		\$400,000
WORK PLAN BUDGET					
SPENT TO DATE					
<b>REVISED BUDGET</b>					

*Budget values are estimated based on forecasted project work.*

## **PROTECT 898      EMPIRICAL MODELING FOR IMPROVED GROUND FAILURE ANALYSIS PLANNING**

### **OVERVIEW**

Numerous bridge approaches and substructures, highway and railway embankments, and particularly roads in low-lying areas adjacent to rivers and their corresponding traffic sign and signal poles are underlain by the silt soils of the Willamette and Columbia River Valleys and below our coastal communities. These soils are susceptible to liquefaction or cyclic softening during earthquakes and will produce varying degrees of severity in the consequences such as lateral spreading displacement, global instability, and settlement. Settlement of soils will produce drag loads to bridge and traffic sign and signal pole foundations. Such damage has the potential to severely impact our critical surface transportation lifelines and reduce the efficacy of emergency responders and reduce the rate of economic recovery. The risk of seismic ground failure is exacerbated by groundwater table rise. Application of ground failure models to silty soils that were developed based on the responses of sandy soils can result in over-conservative estimates of the effects seismic ground failure and lead to inefficient use of limited resources as Oregon strives to maintain and improve its current durability given the multitude of natural hazards. This research aims to develop the types of empirical relationships that the geotechnical community are well-familiar with but geared towards transitional silty soils, which can exhibit differing behaviors from the soils which are presently represented in available models.

### **OBJECTIVES**

The objectives of this research are to produce specific design guidance, models, and spreadsheet-based tools to: (1) account for the effects of sloping ground on the calculation of the factor of safety against liquefaction/cyclic softening during earthquakes, (2) compute lateral displacements of sloping ground, and (3) calculate vertical settlements of level and sloping ground and any foundations buried within, to (4) culminate in a decision matrix for ODOT engineers and their consultants to guide the selection of a particular model when assessing the seismic vulnerabilities of existing surface transportation infrastructure. This project is feasible owing to the ability to leverage a significant amount of laboratory data generated and collected by the proposer through other research projects. The decision matrix and specific guidelines for conducting cyclic failure analyses and simplified displacement estimates will guide cost-effective measures to assess and improve existing surface transportation infrastructure and improve community and enhance infrastructure longevity to increasingly combined natural hazards.

More detailed information regarding the project and its objectives can be found at the link below: <https://www.oregon.gov/ODOT/Programs/Pages/Active-Research-Projects.aspx>

### **PROPOSED ACTIVITIES**

Funds will be used to pay for staff time; consultants and professional services; computational needs; travel expenses; and other services and supplies. Funds will be used to pay for Technical Equipment required to conduct the research, data acquisition, data analysis, TAC presentations, literature review, final report, workshops, training.

This project is under development. Once it begins, more information on proposed activities can be found in the [Project Work Plan](#) at the link above.

### ACCOMPLISHMENTS

This project is under development in April of 2025. Once it begins, accomplishments may be viewed by selecting [Quarterly Reports](#) at the link above.

### RESPONSIBLE PARTIES

ODOT Research Section

### COST INFORMATION

<b>PROTECT 898</b>	<b>FY'26</b>	<b>FY'27</b>	<b>FY'28</b>	<b>FY'29</b>	<b>TOTAL</b>
PROTECTBUDGET	\$107,000	\$175,000	\$31,000		\$313,000
WORK PLAN BUDGET					
SPENT TO DATE					
<b>REVISED BUDGET</b>					

*Budget values are estimated based on forecasted project work.*



## **APPENDIX A - SPR SUBPART B PROGRAM COMPLIANCE**

<b>Regulatory Basis</b>	<b>SPR Subpart B Program compliance requirement</b>	<b>Compliance Mechanism</b>
23 CFR 420.117 and 420.205	The Program must be implemented in compliance with its approved work program.	TEAMS accounting system Program Oversight by ODOT management
23 CFR 420.111, 23 CFR 420.115, 23 CFR 420.209	Annual approval of State DOT Research and Development Work Program.	FHWA Division Office Approval
23 CFR 420.115, 23 CFR 420.209	Documentation that describes the State DOT's management process and the procedures for selecting and implementing RD&T activities must be developed by the State DOT and submitted to the FHWA Division office for approval. Significant changes in the management process must be submitted by the State DOT to the FHWA for approval.	ODOT Research Procedures Manual Approval: March 2010
23 CFR 420.209	Periodic reviews of the State DOT's Management Process of the RD&T.	FHWA Division Office participation in the November 2020 Research Peer Exchange and other oversight of work program
23 CFR 420.207	The State DOT's RD&T work program must, as a minimum, consist of a description of RD&T activities to be accomplished during the program period, estimated costs for each eligible activity, and a description of any cooperative activities including the State DOT's participation in any transportation pooled fund studies and the NCHRP. The State DOT's work program should include a list of the major items with a cost estimate for each item. The work program should also include any study funded under a previous work program until final report has been completed for the study.	Work Program Contents
23 CFR 420.207	The State DOT's RD&T work program must include financial summaries showing the funding levels and share (Federal, State, and other	Work Program Contents

<b>Regulatory Basis</b>	<b>SPR Subpart B Program compliance requirement</b>	<b>Compliance Mechanism</b>
	sources) for RD&T activities for the program year.	
23 CFR 420.209 (a)(1)	The State must use an interactive process for identification and prioritization of RD&T activities for inclusion in an RD&T work program.	Annual project solicitation, expert task group and research advisory committee review.
23 CFR 420.209 (a)(2)	The State must use all FHWA planning and research funds set aside for RD&T activities... to the maximum extent possible.	Work Program Budget and Active project management
23 CFR 420.209 (a)(3)	The State must have procedures for tracking program activities, schedules, accomplishments, and fiscal commitments.	Budget tracking spreadsheet, TEAMS system and project quarterly reports.
23 CFR 420.209 (a)(4)	The State must use support and use of the TRIS database for program development, reporting of active RD&T activities, and input of the final report information.	ODOT Research Procedures Manual, and administrative staff Desk Manual
23 CFR 420.209 (a)(5)	The State must have procedures to determine the effectiveness of the State DOT's management process in implementing the RD&T program, to determine the utilization of the State DOT's RD&T outputs, and to facilitate peer exchanges of its RD&T Program on a periodic basis.	Program Performance Measures, RD&T implementation program, Research Annual Report contents
23 CFR 420.209 (a)(6)	The State must have procedures for documenting RD&T activities through the preparation of final reports. As a minimum, the documentation must include the data collected, analyses performed, conclusions, and recommendation. The State DOT must actively implement appropriate research findings and should document benefits.	Publication of research reports, Research Notes, and Annual Report
23 CFR 420.209 (a)(7)	The State must participate in peer exchanges of its RD&T management process and other State DOTs' programs on a periodic basis. Note:	November 2020, Oregon Research Peer Exchange.

<b>Regulatory Basis</b>	<b>SPR Subpart B Program compliance requirement</b>	<b>Compliance Mechanism</b>
	FHWA has guidance defining "period" as at least once every 5 years for a minimum of 2-3 days.	
23 CFR 420.209	The State DOT must include a certification that it is in full compliance with the requirements of this subpart in each RD&T work program. Note, the language to be used for this certification is specified in the regulation.	Work Program transmittal letter
23 CFR 420.117 (e)	Suitable reports that document the results of activities performed with FHWA planning and research funds must be prepared by the State DOT or subrecipient and submitted for approval by the FHWA Division Administrator prior to publication. The FHWA Division Administrator may waive this requirement for prior approval.	March 2015 Division Prior Approval Waiver Letter
23 CFR 420.117 (e)	The FHWA's approval of reports constitutes acceptance of such reports as evidence of work performed but does not imply endorsement of a report's findings or recommendations. Reports prepared for FHWA-funded work must include appropriate credit references and disclaimer statements.	March 2015 Division Prior Approval Waiver Letter, Report disclaimer
23 CFR 420.121(c)	The State DOT must administer the RD&T program consistent with their overall efforts to implement 49 CFR Subpart B6 regarding disadvantaged business enterprises.	ODOT procurement and contracting process.
23 CFR 420.121(h)	The nondiscrimination provisions of 23 CFR 200 etc. with respect to Title VI of the Civil Rights Act of 1964 and the Civil Rights Restoration Act of 1987 apply to all programs and activities of recipients, subrecipients, and contractors receiving FHWA research funds, whether or not those programs or activities are federally funded.	Annual Title VI reporting,
23 CFR 420.121(j)	Procedures for the procurement of property and services with FHWA research funds must be in accordance with 49 CFR and/or other applicable regulations.	ODOT Research Procedures Manual , TEAMS accounting system, Program Oversight by

<b>Regulatory Basis</b>	<b>SPR Subpart B Program compliance requirement</b>	<b>Compliance Mechanism</b>
		ODOT management
23 CFR 420.113	(a) Costs are eligible for FHWA participation provided that the costs: 1) are for work performed for activities eligible under the Section of title 23 applicable to the class of funds, 2) are verifiable from the State DOT's or the subrecipient's records, 3) are necessary and reasonable for the proper and efficient to accomplish of project objectives and meet the other criteria for allowable costs in the applicable cost principles, 4) are included in the approved budget or amendments thereto, 5) were not incurred prior to FHWA authorization, and (B) indirect costs are allowable if supported by a cost allocation plan and indirect cost proposal prepared, submitted and approved as required.	ODOT Research Procedures Manual TEAMS accounting system Program Oversight by ODOT management
23 CFR 420.117 (b)	The State DOT must submit performance and expenditure reports, including a report from each subrecipient, that contain as a minimum: (i) Comparison of actual performance with established goals; (ii) Progress in meeting schedules; (iii) Status of expenditures in a format compatible with the work program, including a comparison of budgeted (approved) amounts and actual costs incurred; (iv) cost overruns or underfunds; (v) Approved work program revisions; and (vi) other pertinent supporting data.	Project Quarterly Reports Annual Work Program Research Annual Report contents

