Research Stage 1 Problem Statement

PROPOSED TITLE: **Developing a Network-Level Framework for Evaluating Guardrail Needs and Cost-Effective Placement in Oregon**

1. Concisely describe the transportation issue (including problems, improvements, or untested solutions) that Oregon needs to research.

ODOT currently relies on location-specific engineering judgment and crash history to determine where guardrail is warranted. However, no consistent, data-driven framework exists for network-level identification of cost-effective guardrail locations statewide. This limits ODOT's ability to prioritize installations with the highest safety return on investment. This is of critical importance as ODOT seeks to expand its 1R program efforts off the Interstate system and seeks to determine where to prioritize safety investments. With a high number of departure crashes in Oregon, guardrail can be an effective, albeit expensive, countermeasure yet effectively assessing prioritized needs is complex. Research is needed to determine how ODOT can systematically evaluate guardrail needs at the network level, balancing safety benefits, costs, and environmental impacts.

2. What final product or information needs to be produced to enable this research to be implemented?

- A network-level guardrail evaluation framework integrating crash data, crash risk (including roadside hazard indexing which could draw on existing guardrail inventories and LiDAR developed cross sections), and benefit-cost analysis.
- A prioritization tool or decision support process for selecting candidate segments for guardrail installation or retrofit.
- Implementation guidance integrated into the 1R program safety and investment analysis including evaluating whether the current "hardware contribution" should be adjusted.
- Implementation guidance into Highway Design Manual, ODOT safety countermeasures list, and project identification processes.

The findings would allow ODOT to update current roadside safety evaluation practices, moving from reactive to proactive, data-driven identification of guardrail needs.

3. (Optional) Are there any individuals in Oregon who will be instrumental to the success of implementing any solution that is identified by this research? If so, please list them below.

Name	Title	Email	Phone

Heidi Shoblom	State Roadway Engineer	Heidi.e.shoblom@odot.oregon.gov	503-689-2957
Christopher Henson	Senior Roadway/Roadside Design Engineer	Christopher.S.Henson@odot.oregon.gov	

4. Other comments:

This work can build of research from other States and countries that has sought to develop broad criteria suitable to network level decisions as well as to draw from advanced risk profiles and roadside cross section data to better identify promising segments where barrier is needed and identify likely cost drivers based on roadside topography.

5. State of Oregon Decision Making Lenses

State decision making lenses are a part of the state of Oregon's policy structure. State policy and federal policy are not always aligned. The state will prioritize research according to state policy, however ODOT may be required to skip prioritized proposals based on constraints placed on the use of federal funds. If state funds are available ODOT will attempt to fund prioritized research that is deemed ineligible for federal funding.

Please complete the following three sections. Your answers to these questions will be applied on a programmatic basis to support agency decisions. Answering yes to the questions below is not required. Resolving a narrowly focused technical research problem may meet agency needs without answering yes to any of the following questions. The ODOT Research Section will seek a balanced portfolio some projects will answer yes to one of the three categories below (e.g. climate, equity, and/ or safety) and other projects in a different category.

We are looking for an overall program balance and no one project is expected to balance all categories. Generally, a research problem statement is expected to be able to answer yes with clear and verifiable information in only one of the three categories below, some projects may be able to answer yes in two or even three categories. Some projects (i.e. needs focused on specific elements of infrastructure design), may have no 'yes' answers but may still be a high value research need.

Climate

Oregon recognizes the climate crisis and makes systemic changes to reduce emissions caused by travel. To that end, we seek research that reduces carbon emissions from construction activities and materials, and from maintenance equipment and operations. Oregon envisions a transportation system that is resilient, this means a system that is durable in the face of seismic events and extreme weather to avoid negative impacts, withstand them or bounce back quickly to resume system function. We seek research that improves the ability of the transportation system to adapt or cope with more frequent and extreme weather events. This may include innovations in data and data sharing, construction materials and project design, communication, emergency planning and response, and more. Similarly, we seek research that avoids negative impacts on key habitats and ecosystems that can buffer or reduce damage to infrastructure and improve environmental conditions for wildlife and native vegetation. For definitions and details please review the equity vision, goals, and objectives of the ODOT Strategic Action Plan and Oregon Transportation Plan.

5a. Will addressing the transportation issue identified as a need in Question 1 develop, or **validate methods for the estimation, measurement, or monitoring** of transportation generated greenhouse gases (GHG)?

☐Yes ☒No ☐Unsure

5b. If climate or GHG is not the focus of this **transportation issue** identified in this problem statement, will the research apply a GHG analysis to transportation infrastructure, planning, operations, maintenance, or materials?

☐Yes ☒No ☐Unsure

5c. Will addressing the **transportation issue** include development or testing of construction practices, methods, or materials to establish potential reductions in greenhouse gas emissions?

☐Yes ☒No ☐Unsure

5d. Will solving the **transportation issue** in question 1 study or support the reduction of vehicle miles traveled and single occupancy vehicle travel or support transition to electric vehicles (or other types of zero emission vehicles) or low-carbon alternative fuels?

☐Yes ☒No ☐Unsure

5e. Will the solving the **transportation issue** in question 1 lead to work that will support, measure, or monitor, transportation system resilience in response to expected climate events, effects, or natural disasters in general?

☐Yes ☐No ☒Unsure

5f. Will solving the **transportation issue** in question 1 lead to work that may result in better environmental conditions for wildlife and native vegetation?

☐Yes ☐No ☒Unsure

5g. If you answered yes to any of the climate questions above or can provide alternative details related to climate, please provide additional information:

Equity

Equity can have many dimensions and impacts relating to communities and transportation. It is important that problem statement proposals clearly explain the equity dimensions or impacts being examined. Oregon commits to social equity in the OTP, specifically to *improve access to safe and affordable transportation for all, recognizing the unmet mobility needs of people who have been systemically excluded and underserved. Create an equitable and transparent engagement and communications decision-making structure that builds public trust*. We seek research that studies elements of this goal or applies analysis to specific transportation topics to ensure the resulting research recommendation is consistent with agency equity goals. For definitions and details please review the equity vision, goals, and objectives of the ODOT Strategic Action Plan and Oregon Transportation Plan.

5h. Is the **transportation issue** identified as a need in Question 1 specifically focused on transportation equity?

☐Yes ☐No ☒Unsure

5i. If the **transportation issue** is not focused on transportation equity, will the primary topic be assessed for equity benefits or impacts within the research project?

☐Yes ☐No ☒Unsure

5j. Is the implementation of potential findings from this research likely to directly involve participation from an identified group that would benefit from an equitable process or outcome?

☐Yes ☐No ☒Unsure

5k. Is the intended final product or information expected to support ODOT's equity efforts (Including but not limited to supporting one of the equity related objectives of the ODOT's Strategic Action Plan or Oregon Transportation Plan) ?

☐Yes ☐No ☒Unsure

5l. If you answered yes to any of the equity questions above or can provide alternative details related to equity, please provide additional information:

While equity is not the focus of this project the project is designed to assure that safety issues are identified that assure equitable outcomes – equity criteria can be integrated into or added into the investment criteria to address disproportionate impacts of roadway departure crashes.

Safety

Research outcomes may include interventions and countermeasures to prevent or reduce the frequency of crashes or other causes of transportation-related injury or death; or may include measures to reduce severity of injury (including prevention of death) after a crash or other injurious event. For definitions and details please review the equity vision, goals, and objectives of the ODOT Strategic Action Plan, Oregon Transportation Safety Action Plan and Oregon Transportation Plan.

5m. Will solving the **transportation issue** in question 1 support improving **safety culture** for either transportation workers or the traveling public?

☒Yes ☐No ☐Unsure

5n. Will the solving the **transportation issue** support improving safety through **healthy and livable communities**?

☐Yes ☐No ☒Unsure

5o. Will solving the **transportation issue** support improving safety through using **best available technologies**?

☒Yes ☐No ☐Unsure

5p. Will solving the **transportation issue** support improving safety through **communication and collaboration**?

☐Yes ☐No ☒Unsure

5q. Will solving the **transportation issue** support improving safety through **investing strategically**?

☒Yes ☐No ☐Unsure

5r. If you answered yes to any of the safety questions above or can provide alternative details related to safety, please provide additional information:

This research is inherently safety oriented and directly supports Oregon's Transportation Safety Action Plan goals by identifying cost-effective roadside hardware countermeasures to prevent fatalities and serious injuries. It leverages advanced data and technologies, enhances collaboration between safety, maintenance, and design units, and guides strategic investment based on quantitative safety performance.

6. Corresponding Submitter's Contact Information:

Name:	Nick Fortey
Title:	Safety and Operations Engineer
Affiliation:	FHWA Oregon
Telephone:	503-316-2565
Email:	

7. ODOT Sponsor Contact Information (Required if Submitter is not an ODOT employee)

Name:	Heidi Shoblom and Christopher Henson (emailed 11/13 and previously discussed but no formal feedback by deadline for submission)
Title:	See optional section above for contact information
Crew Number:	
Telephone:	
Email:	

This form is not a grant application or contract document. Please do not include proprietary information on this form. Once this form is received ODOT may revise and publish the problem statement. If selected, ODOT will assign investigator(s) of the department's choosing to conduct research.

Disclosure: This proposal was developed using Chat GPT as drafting support and using Consensus AI for gathering and evaluating pertinent research.