



Research Stage 1 Problem Statement

Number 26-16 – “Developing Methods and Technologies to More Accurately Quantify the Existing Performance of Asphalt Pavement Materials”

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

This research proposes a comprehensive testing program and improvements to current procedures and technologies to better characterize the physical properties of existing asphalt concrete surfaced pavements and the underlying unbound layers (base and subgrade) so that cost-effective treatment solutions can be developed and implemented with a higher degree of confidence. Oregon's current pavement design procedures have been developed through decades of experience and have provided reliable solutions. However, as pavement conditions decline with aging infrastructure and lack of funding, the existing asphalt pavement materials (sometimes with the underlying unbound layers) are decaying and do not behave or perform as new asphalt pavement. Current pavement design procedures are not intended to characterize these decaying existing pavement layers. Test methods to core the existing asphalt layers and conduct specialized laboratory assessments of physical properties and the remaining structural life of pavement layers are needed in order to provide cost-effective pavement design recommendations in today's environment with decreasing amounts of available funding for pavement maintenance.

The findings from this research will provide ODOT with pavement material condition assessment tools and methods that can be used to provide more cost-effective and reliable pavement treatment strategies that are expected to extend the service life of our pavements, even in today's environment with decreasing amounts of available funding for pavement preservation. This may also aid ODOT in the most sustainable, lowest emission strategies for repurposing the aging pavement in place. In the long-term, these findings may save ODOT a significant amount of funding and emissions and also improve the overall condition and performance of the Oregon roadway network. Improved pavement performance will lead to reduced life cycle costs, increased pavement condition ratings, reduced environmental impact (due to the reduced maintenance and rehabilitation cycles and reduced vehicle operating costs for the taxpayers), and reduced roughness for the Oregon roadway network. The developed process is also expected to identify the effectiveness of commonly used pavement preservation methods and strategies.

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

In this research study, new laboratory testing methods and a pavement materials condition quantification process will be developed. A process/tool suggesting pavement preservation strategies and designs, using the quantified existing condition as an input parameter for different roadway sections in Oregon, will be developed.

The research will also provide data from a variety of pavement types, conditions, and surface treatments. The long-term performance of pilot projects (sections designed and constructed with the developed process) will be monitored by ODOT's visual and automated pavement condition surveys. The collected data will assist in the development and modification (as needed) of current ODOT pavement design guidelines and practices.

The major deliverables of the project are a: i) literature review, ii) field data collection method, iii) pavement condition quantification process, and iv) structural pavement design process using the quantified performance as an input.

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
Timothy Earnest	Assist. Pavement Materials Engineer	Timothy.Earnest@odot.state.or.us	(503) 986-3079
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4. Decision making lenses

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 high value research need.

Climate

Oregon recognizes the climate crisis and makes systemic changes to reduce emissions caused by travel. Every mile driven in Oregon is powered by a clean source of fuel. We seek research that supports construction and maintenance operations are carbon neutral and investments in mobility that support travel by low and no emission modes. While every research project may not result in a reduction in emissions, transportation investments overall support emission reductions to achieve state goals. Oregon envisions a transportation system that is resilient in the face of seismic and climate events and impacts to the degradation of the natural environment are reduced. Our vision includes a transportation infrastructure is built in a way that avoids impacts on key habitat and results in better 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](#).

4f. 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 gasses (GHG)?

Yes

No

Unsure

4g. 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

4h. Will the 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

4i. Will the 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

4j. Will the solving the **transportation issue** in question 1 lead to work that will support, measure, monitor, transportation system resilience in response to expected climate events, effects, or natural disasters in general?

Yes

No

Unsure

4k. Will the 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

4l. If you answered yes to any of the climate questions above or can provide alternative details related to climate, please provide additional information:

The outcomes of this proposed research study are expected to improve the longevity of pavements through the improvement of the current pavement design and asset management practices. Improved pavement performance will lead to reduced life cycle costs, increased pavement condition ratings, reduced environmental impact (due to the reduced maintenance and rehabilitation cycles and reduced vehicle operating costs for the taxpayers), and reduced roughness for the Oregon roadway network.

According to an ODOT/FHWA research study (FHWA Climate Challenge) recently completed by the OSU-Asphalt Materials and Pavements (AMaP) research group, the cost of fuel and tire wear that can be saved by reducing current pavement roughness levels by 20% is around \$73 million/year for the road users. The associated annual emissions savings are around 193,000 MT CO₂/year, while ODOT's total annual emissions from all operations were calculated to be 182,592 MT CO₂/year (Proudfoot and Toney 2022). This important result shows that methods and strategies to improve long-term pavement performance are needed in this low paving budget environment to keep the roadway roughness and rolling resistance low to reduce GHG emissions and road user costs.

Equity

Equity can have many dimensions and impacts relating to communities, and transportation. It is important that problem statement proposals clearly explain in what capacities are equity dimensions or impacts being examined within problem statements. It is a goal of the OTP 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”. Proposed research may have the intent of studying elements of this goal or apply analysis to specific transportation topics to ensure the resulting research recommendations is consistent with our equity goals. For definitions and details please review the equity vision, goals, and objectives of the [ODOT Strategic Action Plan](#) and [Oregon Transportation Plan](#).

4a Is the **transportation issue** identified as a need in Question 1 specifically focused on transportation equity?

Yes No Unsure

4b 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

4c 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

4d 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

4e If you answered yes to any of the equity questions above or can provide alternative details related to equity, please provide additional information:

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](#).

4m. Will solving the **transportation issue** in question 1 support improving **safety culture** for either transportation workers or the traveling public?

Yes No Unsure

4n. Will the solving the **transportation issue** support improving safety through **healthy and livable communities**?

Yes No Unsure

4o. Will solving the **transportation issue** support improving safety through using **best available technologies**?

Yes No Unsure

4p. Will solving the **transportation issue** support improving safety through **communication and collaboration**?

Yes

No

Unsure

4q. Will the solving the **transportation issue** support improving safety through **investing strategically**?

Yes

No

Unsure

4r. If you answered yes to any of the safety questions above or can provide alternative details related to safety, please provide additional information:

5. Other comments:

6. Corresponding Submitter's Contact Information:

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