Oregon Department of Transportation

2023 Stage 1 Research Problem Statement

Number*: 25-36*
Proposed Title: Evaluation of Timing Strategies to Improve Safety at Signalized Intersections

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

Traditional approaches to signal timing and phasing along arterial corridors includes the selection of a progression speed and at times may seek to optimize a green bandwidth such that platoons of vehicles can clear a sequence of intersections without stopping. The traditional approach optimizes vehicular throughput, but during unsaturated conditions can create long periods with green lights that present the opportunity for speeding that can adversely impact road safety. At uncoordinated intersections, resting in red is one approach that has been discussed to counter this same issue. Traditional signal timing settings do not directly account for the safety of road users and this project seeks to evaluate the potential for strategies to improve safety by reducing speeding at intersections with traffic signals.

To this end, traffic signal timing thought leaders in Oregon have collaborated on preparing a list of example timing strategies that engineering judgement suggests could result in speed reduction at isolated or coordinated signalized intersections:

- *Time of day schedule changes where progression speeds are set at or lower than the speed limit,*
- *Decouple the pedestrian phases from the vehicle phases in order to rest in walk without resting in green,*
- *Set passage, TBR, TTR, and min gap settings to capture fewer vehicles outside of a platoon*
    - *Then set radar settings so that the detection activates only if the vehicle is traveling some threshold above speed limit (i.e., 11mph or less above the speed limit) thereby removing the possibility of extension if the vehicle is speeding and sending the vehicle phase back to rest in red until the vehicle approaches the stop bar detection*
- *Set side street to coordinated phasing at certain intersections,*
- *Set main street to a floating FO and side street to fixed, and*
- *Set some intersections to half cycle, or free, during certain times of day.*

These signal timing techniques have not been robustly researched to validate their influence of vehicle speeds. This proposal will fill that gap in knowledge. This effort will help jurisdictions that are planning for safety with the new Bipartisan Infrastructure Law grant programs and implementing signal timing on an annual basis. The project will test timing alternatives in microsimulation and will then use rigorous before and after field studies with an aim to determine speed and crash reduction potential from signal timing strategies. There will be a special focus on night time operation and pedestrian safety. Because signal operations staff have questions about where to best to deploy these strategies, this project will also seek to develop guidance on the appropriate characteristics of the corridor that may lead to the most successful implementation.

2. Document how this **transportation issue** is important to Oregon and will support ODOT's **mission** and current Strategic Action Plan.

A central element of ODOT's mission is to provide for a safe and reliable multimodal transportation system. The proportion of fatal and serious injury crashes in Oregon is treading towards year over year increases as it is in the rest of the country. ODOT's latest Transportation Safety Action Plan (TSAP) noted that 24% of fatal and serious injury crashes involve speeding. By evaluating alternative strategies for improving safety at traffic

signals we will provide additional tools for transportation safety and operations engineers to operate coordinated or uncoordinated corridors that are optimized around reducing speeding opportunities, thereby increasing the safety and sustainability of surface transportation systems in Oregon.

This proposed project is directly supportive of ODOT's Strategic Action Plan's priority of a Modern Transportation System with an emphasis on promoting Safety and the use of Innovative Technologies.

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

This study will produce guidance via a final report on the speed reduction potential and other performance metrics from applying alternative traffic signal safety strategies in Oregon. Details about the relationships between strategies and safety outcomes will be produced in such a way that allows ODOT engineers to consider particular coordination strategies with confidence in their safety and operational outcomes. Additionally, guidance will be included on how to select corridors where implementation of these alternative control strategies are likely to be most successful. The recommendations will be prepared in a form that will allow for ease of adoption in the appropriate ODOT Design Manuals.

4. (Optional) If able, list the proposed scope of work tasks for this research project. This can include potential research, development, or technical transfer activity(ies) that may develop better understanding of the **transportation issue** and lead to an improvement in the Oregon's transportation infrastructure or services.

This study will include the following research tasks to achieve the stated research objectives.
Task 1: Briefly review the state of practice related to novel safety strategies at traffic signals
Task 2: Produce a description of optimal test sites
Task 3: Select test sites (e.g., 3-5 corridors) for field data collection
Task 4: Select test strategies (e.g., 3-5 strategies) for implementation
Task 5: Model test strategies in Synchro or VISSIM to confirm operational performance before field testing
Task 6: Conduct field data collection and analysis
Task 7: Development of guidance and final report

5. (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.

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6. Other comments:

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