2019 UDOT RESEARCH PROBLEM STATEMENT

*** **Problem statement deadline is Feb. 6, 2019. Submit statements to UTRAC@utah.gov.** ***

Title: Methodology for evaluating intersection safety and operational performance with left-turn phasing **No. (Office Use):** 19.03.22

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Select ONE Subject Area ☐ Materials/Pavements ☐ Maintenance ☒ Traffic Mgmt/Safety ☐ Structures/Geotech ☐ Planning ☐ Perf Mgmt/Data Analytics ☐ Public Transportation ☐ Other

1. Describe the problem to be addressed:

According to the Federal Highway Administration, more than 20 percent of all traffic fatalities in the United States occurred at intersections and over 80 percent of intersection-related fatalities in rural areas occurred at unsignalized intersections. Although traffic signal control can help eliminate most conflict of points between different traffic streams, traffic crash risk remains exist in Utah due to the implementation of permitted left-turn phasing. Although it can be expected that replacing permitted left-turn phasing by protected phasing can greatly improve intersection safety performance, such action would inevitably increase the intersection delay at the same time. Hence, taking the tradeoff between safety and efficiency into account, there is an urgent need of developing a method that can evaluate intersection safety and operational performance before and after protected left-turn phasing is adopted.

There are several UDOT sponsored research projects regarding left-turn phasing, including UU's left turn safety analysis and BYU's left turn operational analysis. These projects have preliminary findings that indicate UDOT may be able to improve intersection safety but possibly at the expense of operations. Therefore, grounded on the intersection safety and operation analysis, it is also essential to develop a decision support tool to help UDOT judge safety vs. operations and address safety and operational issues discovered.

2. Write the project objective (25 words or less):

Use results of ongoing research projects on left-turn phasing to make better decisions to balance operations and safety at signalized intersections in Utah.

3. Explain why this research is important:
(In response, consider addressing specific UDOT goals, applicability in Utah or other states, etc.)

This research is intended to help resolve potential conflicts between UDOT's Zero Fatalities and Optimize Mobility goals with respect to traffic signal left-turn phasing. The outcome of this research will help UDOT assess the safety and operational impacts to signalized intersections if protected left-turn phasing is placing. It will also assist the decision-making process in terms of when (time of day, day of week), how (with specific traffic demand and speed level), and where (the intersection location) permitted left-turn phasing shall be replaced.

4. List the major tasks:

1. Conduct literature review to examine existing models, tools, and software that can assess the safety and operational performance of intersections under traffic signal control.
2. Determine if delay costs and safety costs are directly comparable – does a dollar of delay have the same societal cost as a dollar lost to crash costs. This is a policy decision for UDOT and will involve surveying UDOT senior leadership and/or public survey.
3. Case Studies – review specific locations identified through other ongoing research projects (Juan Medina with U of U's left turn safety analysis and BYU's left turn operational analysis) and provide full assessment of intersection operational and safety tradeoffs. We will also look at outliers from safety analysis and determine if other variables need to be added.
4. Propose methodology for UDOT to address left-turn safety and operational questions, likely consisting of policy statements, analysis procedures and funding mechanisms.

5. List the expected deliverables (reports, manual, specification, design method, training, etc.):

1. Report of literature review on the targeted research issue.
2. An internal understanding within UDOT on the relative value of crash costs vs. delay costs. The goal is to deliver a document to UDOT that explains this relationship.
3. Case Study report for up to 10 intersections analyzed
4. Methodology for weighing safety vs. operational benefits in left-turn signal phasing, and a method for reviewing existing intersections based on operational and safety data.

6. Describe how the research results will be implemented:
(In response, consider addressing UDOT leader support, process or standard improvement, etc.)

The first research item (crash vs. delay cost) is key – left turn phasing often pits operations vs. safety. If there is a clear direction on what that relationship should be, the TMD and Traffic and Safety can work together rather than in opposition on UDOT's respective primary goals. For that to happen, UDOT employees need clear direction from the leadership. Notably, one key deliverable is an actionable methodology for looking at high crash locations and determining appropriate methods.

The other key for implementing this research is that UDOT and UU have been experimenting with a concept where UU offers on-site support at UDOT. This will be key for getting good communication and buy-in from UDOT on policy and procedure proposals.

7. Requested from UDOT: $50,000 **Other/Matching Funds:** $ **Total Cost:** $50,000
(or UTA for Public Transportation)

8. Outline the proposed schedule, including start and major event dates:

The research is proposed to start at Sep. 2019 and last one-year long.

Month 1: project kick-off meeting;
Month 2-3: Task 1;
Month 4-6: Task 2;
Month 7-9: Task 3;
Month 10-11: Task 4;
Month 12: final report preparation.