

2019 UDOT RESEARCH PROBLEM STATEMENT

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

Title: Benefit / Cost Analysis of Using DSRC for Snow Plow Truck Preemption

No. (Office Use): 19.03.10

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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:

Cities with severe winter weather face the difficult task of clearing ice/snow from streets each year. Notably, winter road maintenance often involves problems that are complex, costly, and site-specific due to the variation of climatic conditions, demographics, economics, and technology. In states such as Utah, winter maintenance represents a large portion of total highway operations budget. Particularly, snow plowing plays an important role in winter maintenance. Hence, the operational efficiency of snow plowing service, in terms of the service duration, routing plans, and truck fleet utilization, can directly affect the total operational costs and road ice/snow performance.

With the deployment of connected vehicle (CV) technology on Redwood Road, UDOT has gained valuable experience on using DSRC vehicle to infrastructure (V2I) communications to support transit signal priority (TSP). The main logic is to provide signal priority (e.g., green extension and red truncation) to approaching buses if they are behind schedule. UDOT is now expanding that capability, on Redwood Road and several other corridors, to provide signal preemption to snow plows that are actually plowing snow. It is expected that such implementation can greatly help reduce the number of stops and travel time of those plow trucks along the signalized corridors. However, the activation of signal preemption may potentially bring negative impacts to the traffic from side streets. Hence, this project will focus on collecting data to conduct a comprehensive benefit / cost analysis of such deployment. In addition, we would work with UDOT to explore the possibility of re-optimizing the current operational plans in terms of signal coordination and truck routing.

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

Collect field data to study the benefits and costs of providing snow plow truck signal preemption and improve the current operational plan.

3. Explain why this research is important:

(In response, consider addressing specific UDOT goals, applicability in Utah or other states, etc.)

Although the benefits of providing signal preemption to snow plow trucks can be expected, there are likely some costs and negative impacts associated with such implementation. This research will assist UDOT to understand how signal preemption will affect the traffic from side streets when it is activated at different times of day and days of the week. In addition, this project will further explore solutions to reducing the negative traffic impacts to the intersections and work with UDOT by suggesting improvements to the current plow operations plan.

4. List the major tasks:

1. Collect data from multiple resources and conduct field trips when necessary;
2. Investigate the traffic impacts to intersections due to signal preemption;
3. Conduct benefit/cost analysis of the preemption implementation and work with the stakeholder group to determine potential sites for additional deployments;
4. Develop optimization models to improve the current operational plan including signal coordination settings and truck routing designs;
5. Prepare a final project report.

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

1. Summary of collected data from various resources;
2. Report of traffic impact analysis at intersections;
3. Report of B/C analysis and summary of recommendations from stakeholder group;
4. Optimization model for improving service quality and reducing negative impacts;
5. Final project report.

6. Describe how the research results will be implemented:

(In response, consider addressing UDOT leader support, process or standard improvement, etc.)

This research will collect field data from multiple resources including ATSPM, iPeMS, DSRC messages, and intersection surveillance videos. The collected data will help address UDOT's needs of understanding traffic impacts to intersections caused by the activation of signal preemption. The benefit/cost analysis will further motivate the efforts of evaluating the current operational plan including signal coordination settings and truck routing designs. The outcomes of this research would also assist UDOT to reoptimize the operational plan for reducing negative impact to side street traffic.

**7. Requested from UDOT: \$50,000
Cost: \$90,000
(or UTA for Public Transportation)**

Other/Matching Funds: \$40,000 (UTC funding)

Total

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

The schedule assumes an Oct 2019 start day and an 18-month project period:

- Oct 2019: project kick off meeting.
- Nov 2019 – Oct 2019: Task 1.
- Apr 2019 – Jun 2019: Task 2.
- July 2019 – Oct 2019: Task 3.
- Nov 2019 – Dec 2019: Task 5.
- Jan 2021 – Mar 2021: Final report preparation