# AIM Innovation Showcase Application

## Sponsor

**Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation.** If selected, the sponsoring DOT will be asked to present the innovation at the Innovation Showcase during the AASHTO Spring Meeting.

1. Sponsoring DOT (State): Utah Department of Transportation (UDOT)

2. Name and Title: Abdul Wakil, P.E., Asset Engineer for Maintenance

Organization: Utah Department of Transportation (UDOT)

Street Address: 4501 South 2700 West

City: Taylorsville

State: Utah

Zip Code: 84129

Email: awakil@utah.gov

Phone: 385-267-9060

## Innovation Description (30 points)

The term “innovation” may include processes, products, techniques, procedures, and practices.

3. Name of the innovation:

**Mobile Pavement Markings Wet-Retroreflectivity Data Collection**

**4. Please describe the innovation.**

Mobile dry retroreflectivity testing has been around for some time now. However mobile wet retroreflectivity testing is a recent innovation. A new mobile testing method allows for the mobile collection of wet retroreflectivity of pavement markings condition data using two moving vehicles. The vehicle in front is equipped with water sprayers to wet the pavement markings. The second vehicle, equipped with Laserlux sensors to measure retroreflectivity, follows immediately behind at the same speed and a fixed distance.

The paired vehicles can travel at a speed of 50 mph while conducting the data collection, and can complete about 250 miles of collection per day. All is done in a rolling operation so no lane closure, traffic control, or Utah Highway Patrol assistance is needed.

**5. What is the existing baseline practice that the innovation intends to replace/improve?**

Existing baseline practice for data collection of wet pavement marking retroreflectivity required the closing of two lanes and a ramp of traffic and setting up traffic control, involving two Utah Highway Patrol (UHP), two traffic control crews, and impacts to travelers. This method was also establishing work zone areas in 5 locations alongside Interstate 15 South Bound by right edge lines and also the yellow left edge line next to the HOV lanes. This method was slow and time consuming and required the closing of lanes in various locations and crews were exposed to fast moving traffic so conditions were very dangerous.

**6. What problems associated with the baseline practice does the innovation propose to solve?**

Process improvement for wet retroreflectivity data collection since personnel safety was at stake. Collection was on a high volume and high speed interstate road. Also existing baseline practice for data collection on wet pavement marking reflectivity was very time consuming and dangerous. UDOT and contractor personnel were exposed to high traffic volume, poor lighting conditions, and high vehicle speeds while working on foot to collect this data. The risk of being struck and injured was very high.

In addition, the previous method required the closing of two lanes of traffic. The time and cost of setting up traffic control, involving Utah Highway Patrol (UHP), and impacts to travelers were also very legitimate concerns.

**7. Briefly describe the history of its development.**

Beck Enterprises have been conducting static wet testing in lane closures since around 2005 using our mobile retroreflectometers and a rain box (old method). Over the years, Beck became more and more hesitant to expose the team to the inherent dangers associated with standing in a lane closure on interstates, especially at night. They had so many close calls that during the spring of 2019, they said enough is enough and started the design process to create a method to provide the service in the same manner we do mobile retroreflectivity testing.

The development process took roughly a year and a half to produce our first production mobile wet truck utilizing a platform that was relatively easy to mobilize and could also blend into traffic during data collection. The benefits of the new platform were immediately recognized.

- No boots on the ground increasing the safety factor.

- No need for traffic control or lane closure reducing the total cost of data collection.

- Dramatically greater area of data collection coverage.

- Increased efficiency of data collection reducing time on project site.

**8. What resources—such as technical specifications, training materials, and user guides—have you developed to assist with the deployment effort? If appropriate, please attach or provide web links to reports, videos, photographs, diagrams, or other images illustrating the appearance or functionality of the innovation below (if electronic, please provide a separate file). Please list your attachments or web links here.**

Beck Enterprises developed the systems so they do not sell this system but provide it as a service. Therefore all of the technical specifications, training manuals, etc are proprietary information.

https://sites.google.com/utah.gov/udot-i/c/20240058

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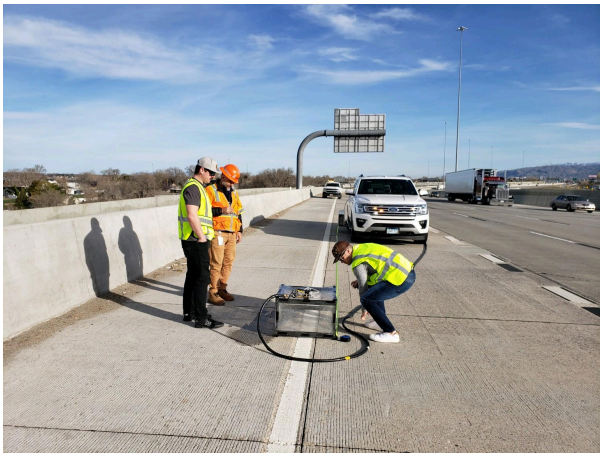
|  |  |

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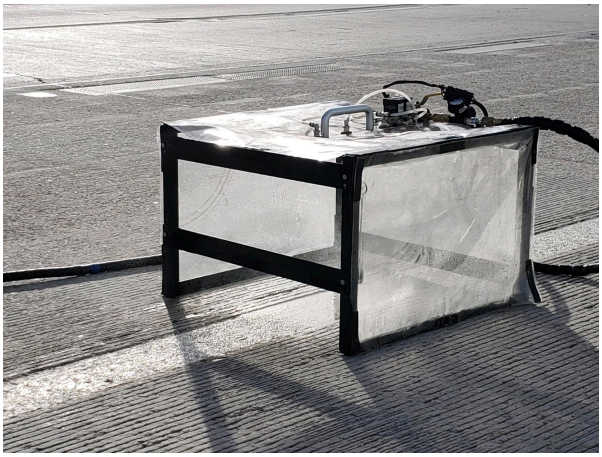

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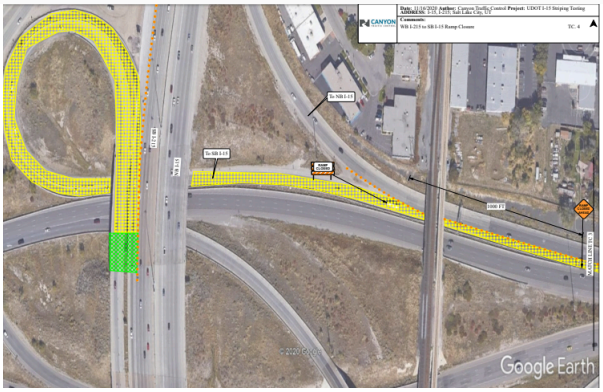


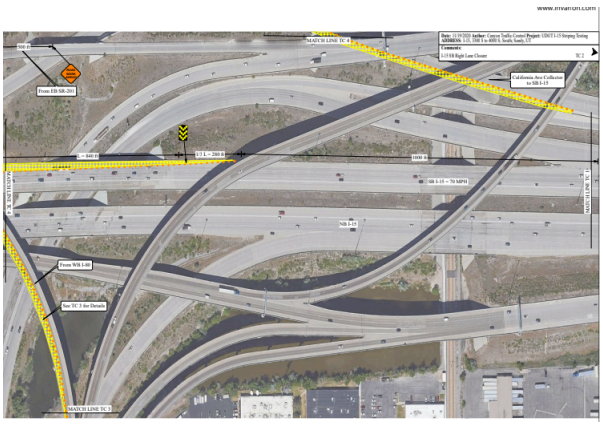


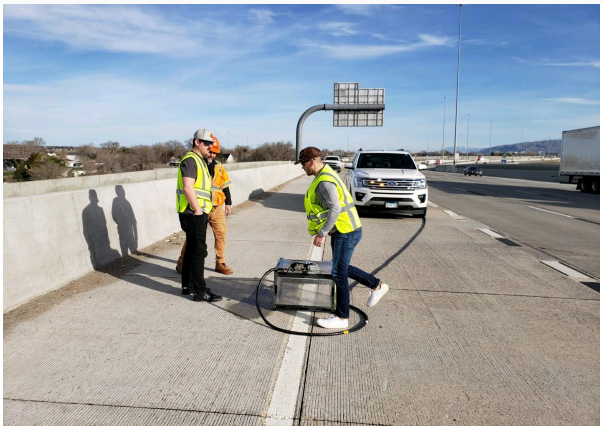

## State of Development (10 points)

Innovations must be successfully deployed in at least one State DOT. The AIM selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

**9. How ready is this innovation for implementation in an operational environment? Please select from the following options. Please describe.**

☐ Innovation is fully functional and yet to be piloted.

■ Innovation has been piloted successfully in an operational environment.

☐ Innovation has been deployed multiple times in an operational environment.

☐ Innovation is ready for full-scale implementation.

10. What additional development is necessary to enable implementation of the innovation for routine use?

This system has been already successfully implemented in Utah, Minnesota,  and Kansas.

11.  Do you have knowledge of other organizations using, currently developing, or showing interest in this innovation? ■ Yes ☐ No

Yes, Minnesota Department of Transportation and  Kansas Department of Transportation

| Organization | Name | Phone | Email |
|---|---|---|---|
| Minnesota DOT | Ethan Peterson | 651-234-7380 | ethan.peterson@state.mn.us |
| Kansas DOT | Jonny Madrid | 785-296-7432 | jonny.madrid@ks.gov |

## Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over baseline practice.

12. Identify the top three benefits your DOT has realized from using this innovation. Describe the type and scale of benefits of using this innovation over baseline practice. Provide additional information, if available, using quantitative metrics, to describe the benefits.

| Benefit Types | Please describe: |
|---|---|
| Improved Safety | Over the years, the crew became more and more hesitant to expose the team to the inherent dangers associated with standing in a lane closure on interstates, and especially at night. It warranted a design process to create a safer method to provide data collection in the same manner via mobile retroreflectivity testing.<br><br>Personnel in work zones are no longer exposed to traffic. needed and the safety of two vendor personnel, two UDOT personnels, and two traffic crew personnels  less since with |

| | |
|---|---|
| | the new mobile method, there is no need to be out there on site in the work zone conducting this operation. |
| Improved Operation | With the previous method, we had to close two lanes and a ramp of a major freeway in 5 locations from 7:00 a.m. to 5:00 pm. A huge challenge for everyone involved with this project. We also called Utah Highway Patrol (UHP) to help out since it was a high volume and high speed roadway. It used to take us about 9-10 hours to establish the operation and get the data collected. With the new method, it takes less than 4 hours but in a much safer way. |
| Cost Savings and more data | Eliminated Highway Patrol and Traffic Control involvement of about $23,000 annually. It is $20,000 in Traffic Control Cost, and $3,000 in Utah Highway Patrol Cost. Another notable benefit of the mobile collection is the increase in data that can be collected. Instead of testing four small spots in each of the five testing zones, UDOT is sampling the entire 1,000 foot segment on each line type through the testing zones. This yields roughly 1.9 million data points for each test section rather than one small area. This allows for a more thorough analysis of pavement markings.<br><br>Finally, there is a cost reduction in personnel time, traffic control set-up and removal, and Highway Patrol time. Not needing to close a lane of traffic reduces negative impacts to the traveling public. |

## Deployability (30 points)

The AIM selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

**13. What challenges and/or lessons learned should other organizations be aware of before adopting this innovation?**

our Incident Management Team (IMT) to help out just in case anything goes wrong. But in the long run and moving forward, it seems that it is no longer needed in this type of moving operation. This system also uses more water and produces more data points so frequent water and more space for the data.

**14. Please provide details of cost, effort, and length of time expended to deploy the innovation in your organization.**

**Cost**: $18,000 (Data Collection Service Cost).

Beck Enterprises does not sell this system therefore all of the cost of this system and technical specifications, training manuals, etc are proprietary information. Service cost us about $18,000 to collect this data.

**Level of Effort**: Several functional units within UDOT contributed to the success of this project. Two data collection vehicles (a water sprayer and laserlux vehicle) and our IMT vehicle

**Time**: About 4 hours to complete data collection

**15. To what extent might implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.**

Data collection is done by the vendor, Beck Enterprises, the developer of this system. This implementation brought an improvement to our existing data collection operation. We have analyzed the collected data by the University of Utah and the data from this method vs. the old method was acceptable. State DOTs and Consultants analyze the collected data. So it is a joint effort to improve the collection process with this new and innovative data collection method.

https://sites.google.com/utah.gov/udot-i/c/20240058

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# INNOVATION MANAGEMENT

## Mobile Pavement Marking Data Collection Made Safer

Item #: 20240058

UDOT INNOVATION of the YEAR FINALIST 2024

CONTACTS | STATUS | APPLIES TO

### PROBLEM

Previous methods of data collection on wet pavement marking reflectivity was very dangerous. UDOT and contractor personnel were exposed to high traffic volume, poor lighting conditions, and high vehicle speeds while working on foot to collect data on roadways. The risk of being struck and injured was very high.

In addition, the previous method was time consuming and required the closing of a lane of traffic. The cost of setting up traffic control, involving Utah Highway Patrol, and impacts to travelers were also concerns.


### CHANGE

A new mobile testing method allows for the collection of data of wet reflectivity of markings using two moving vehicles. The vehicle in front is equipped with water sprayers to wet the pavement markings. The second vehicle, equipped with sensors to measure reflectivity, follows immediately behind. The paired vehicles can travel of a speed of 50 mph while conducting the data collection, and can complete about 250 miles of collection per day. No lane closure or Utah Highway Patrol assistance is needed.

### RESULT

The most significant benefit of this collection method is the improvement in safety. UDOT and contractors are able to work inside vehicles and are no longer exposed to the hazards of being on the ground next to high speed traffic.

Another notable benefit of the mobile collection is the increase in data that can be collected. Instead of testing four small spots in each of the five testing zones, UDOT is sampling the entire 1,000 foot segment on each line type through the testing zones. This yields roughly 1.9 million data points for each test section rather than one small area. This allows for a more thorough analysis of pavement markings.

Finally, there is a cost reduction in personnel time, traffic control set-up and removal, and Highway Patrol time. Not needing to close a lane of traffic reduces negative impacts to the traveling public.


### LINKS

- Mobile Data Collection_video 1
- Mobile Data Collection_video 2
- Mobile Data Collection_video 3

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# INNOVATION MANAGEMENT

## IMPACT

### BETTER MOBILITY

- VIsible markings help drivers stay in their lane
- More testing helps UDOT prioritize re-painting
- No lane closure required

### GOOD HEALTH

- Keeps workers inside vehicle and away from fast moving traffic
- Important to keep markings visible even when wet

### CONNECTED COMMUNITIES

- Safe road help keep Utah moving

### STRONG ECONOMY

- Data collection helps determine the correct time for re-stripping
- Mobile collection cost less than stationary site testing

## EFFICIENCIES*

- Cost Avoidance: Eliminated Traffic Control and Highway Patrol involvement of $23,000 annually, resulting in $460,000 avoided over 20 years

**Benefits are estimated net of initial and ongoing expenses. Savings are averaged over the expected benefit life of the innovation. See details.*