Connected Vehicle Pilot Deployment Program Phase 3

Operational Capability Showcase Plan, – WYDOT

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Notice

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16. Abstract The Wyoming Department of Transportation's (WYDOT) Connected Vehicle (CV) Pilot Deployment Program is intended to develop a suite of applications that utilize vehicle to infrastructure (V2I) and vehicle to vehicle (V2V) communication technology to reduce the impact of adverse weather on truck travel in the I-80 corridor. These applications support a flexible range of services from advisories, roadside alerts, parking notifications and dynamic travel guidance. Information from these applications are made available directly to the equipped fleets or through data connections to fleet management centers (who will then communicate it to their trucks using their own systems). The pilot will be conducted in three Phases. Phase 1 includes the planning for the CV pilot including the concept of operations development. Phase 2 is the design, development, and testing phase. Phase 3 includes a real-world demonstration of the applications developed as part of this pilot. This document presents a plan to effectively execute an Operational Capability Showcase in Phase 3 to ensure that the media is made aware of the capabilities, intent, and value of this pilot, including the interoperability implications. The Showcase Plan identifies invited attendees and the showcase activities, to ensure successful execution of the Showcase.		
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1 Introduction

1.1 Project Scope

Wyoming Department of Transportation (WYDOT) is one of the Connected Vehicle (CV) Pilot sites selected to showcase the value of and spur the adoption of CV Technology in the United States. CV Technology is a broad term to describe the applications and the systems that take advantage of dedicated short-range communications (DSRC) between vehicle to vehicle (V2V) and vehicle to infrastructure (V2I) to improve safety, mobility and productivity of the users of the nation's transportation system.

As one of the three selected pilots, WYDOT is focusing on improving safety and mobility by creating new ways to communicate road and travel information to commercial truck drivers and fleet managers along the 402 miles of Interstate 80 (I-80 henceforth) in the State. For the pilot project, WYDOT worked in a planning phase, Phase 1. The deployment process will happen in Phase 2 (September 2016 – May 2019), followed by a demonstration period in Phase 3 (May 2019 – November 2020).

Outreach efforts will support Phases 2 and 3 by ensuring that the pilot project is promoted within the transportation community and the media, increasing awareness of the project within the public community, and eliciting buy-in for continued investments from a diverse set of stakeholders including the public and state/local decision makers.

1.2 System Overview

WYDOT is one of the CV Pilot sites selected to showcase the value of and spur the adoption of Connected Vehicle Technology in the United States. Connected Vehicle Technology is a broad term to describe the applications and the systems that take advantage of DSRC between V2V, V2I and infrastructure to vehicle (I2V) to improve safety, mobility and productivity of the users of the nation's transportation system.

As one of the three selected pilots, WYDOT is focusing on improving safety and mobility by creating new ways to communicate road and travel information to commercial truck drivers and fleet managers along the 402 miles of Interstate 80 (I-80 henceforth) in the State. At a very high level, the pilot scope includes the following implementation elements:

- **Deployment of about 75 roadside units (RSU)** that can receive and broadcast messages using DSRC along various sections on I-80.
- **Equip around 300 vehicles, a combination of fleet vehicles and commercial trucks, with on-board units (OBU).** Of the 400 vehicles, at least 150 would be heavy trucks. All vehicles are expected to be regular users of I-80. Several types of OBU are being procured as part of the pilot and differ based on their communication capabilities, ability to integrate with the in-vehicle network, and connectivity to ancillary devices and sensors. All OBUs will have the functionality to broadcast Basic Safety Messages (BSM) Part I and will include a human-machine interface (HMI) to share alerts and advisories to drivers of these vehicles.

- **Develop several V2V and V2I (and I2V) applications** that will enable communication with drivers for alerts and advisories regarding various road conditions. These applications include support for in-vehicle dissemination of advisories for collision avoidance, speed management, detours, parking, and presence of work zones and maintenance and emergency vehicles downstream of their current location.
- **Enable overall improvements in WYDOT's traffic management and traveler information practices** by using data collected from connected vehicles. Targeted improvements include better activation of variable speed limits (VSL) and improved road condition dissemination via 511, Dynamic Message Sings (DMS) and other WYDOT sources.

Systems and applications developed in the pilot will enable drivers of connected vehicles to have awareness of hazards and situations they cannot even see. The CV Pilot is considered a System of Systems, with two system of interest: The Vehicle System and the Wyoming CV System, see Figure 1-1. The *Vehicle System* includes four subsystems that represent the various vehicle and equipment types to be used in the pilot. These subsystems vary in their data collection and sharing capabilities. The *Wyoming CV System* includes the infrastructure used in the pilot and back-office systems in charge of the various processes that lead to the generation and distribution of advisories and alerts. Together, the Vehicle and Wyoming CV Systems support a variety of V2V and V2I applications. Both systems interface with external systems, including WYDOT, USDOT and the National Weather Service (NWS).

The CV Pilot Project will, at its core, provide key information to the drivers through five on-board applications: i) Forward Collision Warning (FCW); ii) I2V Situational Awareness (SA); iii) Distress Notification (DN); iv) Work Zone Warning (WZW); and v) Spot Weather Impact Warning (SWIW). In addition, the CV Pilot project will support overall traffic management and traveler information services offered by WYDOT. Through them, WYDOT hopes to improve operations on the corridor especially during periods of adverse weather and when work zones are present. By means of the anticipated outcomes of the pilot, fleet managers will be able to make better decisions regarding their freight operations on I-80, truckers will be made aware of downstream conditions and provided guidance on parking options as they travel the corridor, and automobile travelers will receive improved road condition and incident information through various existing, improved and new information outlets.

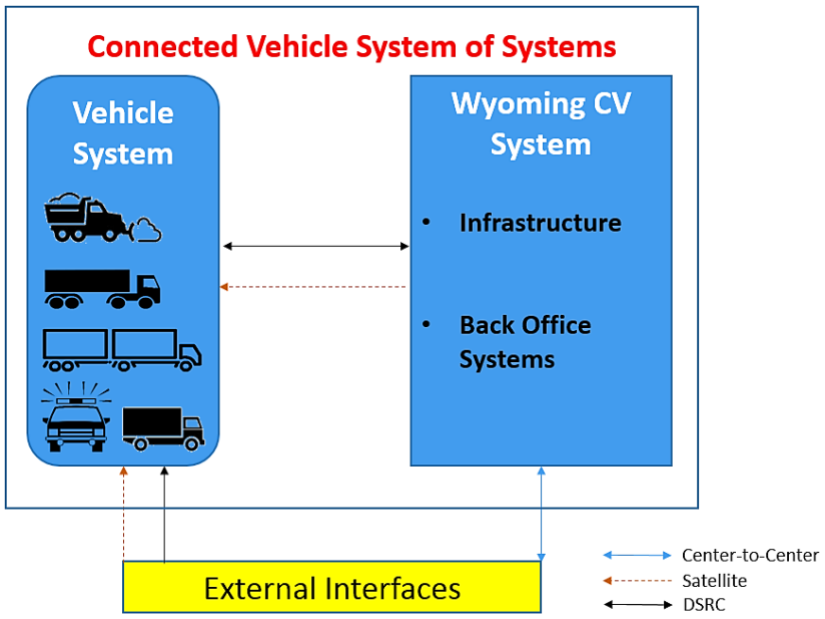

Figure 1-1 Wyoming CV Pilot System of Systems (Source: WYDOT)

A detailed explanation of the Wyoming CV Pilot project can be found in *Connected Vehicle Pilot Deployment Program Phase I, Concept of Operations (ConOps)*.

1.3 Purpose of the Operational Capability Showcase Plan

This Operational Capability Showcase Plan (OCSP) guides the development of the Operational Capability Showcase.

1.4 Organization of the Report

The Outreach Plan consists of the following sections:

2 – References

3 – Acronym List

4 – Operational Capability Showcase

5 – Structure of the Operational Capability Showcase

6 – Resources Developed for the Operational Capability Showcase

7 – Engagement with Media

8 – Post- Operational Capability Showcase Activity

2 References

The following table lists the documents, sources and tools used to develop the concepts in this document.

Table 2-1. References.

#	Documents, Sources Referenced
1	Deepak Gopalakrishna, et al. (2015). *Connected Vehicle Pilot Deployment Program Phase I, Concept of Operations (ConOps), ICF/Wyoming*. U.S Department of Transportation.

3 Acronym List

Table 3-1 provides a list of the acronyms used on this document.

Table 3-1. Acronym List.

Acronym	Definition
A/V	audio/video
BSM	Basic Safety Messages
ConOps	Concept of Operations
CV	Connected Vehicle
DMS	Dynamic Message Sings
DN	Distress Notification
DSRC	Dedicated short-range communications
FCW	Forward Collision Warning
HMI	Human-Machine Interface
I2V	Infrastructure to Vehicle
I-80	Interstate 80
NWS	National Weather Service
OBU	Onboard Unit
OCS or Showcase	Operational Capability Showcase
OCSP	Operational Capability Showcase Plan
OCSS	Operational Capability Showcase Summary
RSU	Roadside Unit
SA	Situational Awareness
SUV	sport utility vehicles
SWIW	Spot Weather Impact Warning
TIM	traveler information message
TMC	Transportation Management Center
V2I	Vehicle to Infrastructure
V2V	Vehicle to Vehicle
VSL	variable speed limits
WYDOT	Wyoming Department of Transportation
WZW	Work Zone Warning

4 Operational Capability Showcase

4.1 Objective of the OCS

The Operational Capability Showcase (OCS or Showcase) will show the media, along with other invited attendees, the capabilities, intent, and value of this pilot. The intent of the Showcase is for the media to grasp the importance of this project, not just for Wyoming, WYDOT, or the trucking industry, but for the general public and for future interoperability efforts with other connected vehicles around the country. The Showcase will also include an interoperability activity, which touches on a key goal of the CV Pilots program itself from a national perspective. The media should come away understanding how this pilot will impact WYDOT's Transportation Management Center (TMC), commercial vehicle operators driving on I-80, as well as all other drivers traveling on I-80 and accessing WYDOT's traveling information resources.

4.2 Core Operational Capability Elements

The Operational Capability Showcase will be a test of the performance of the CV system. Participants of the showcase will be able to see successful deployment of the five V2V, V2I, and I2V applications that will enable communication with drivers for alerts and advisories through the HMIs, OBUs, and antennas outfitted on the vehicles and the RSUs deployed on the roadways. These applications will be: FCW, WZW, DN, SA, and SWIW. The WZW, SA, and SWIW applications will involve Traveler Information Messages (TIMs) for I2V capabilities. The FCW and DN applications will show V2V capabilities. TIMs will be sent via RSUs and satellite.

4.3 Anticipated Outcomes of OCS

Following the OCS, the media in attendance will ideally produce media segments or written articles that are shared with the public either through televised segments, magazine articles, or newspaper articles. This could lead to an increase in visitors to FHWA's Connected Vehicle website, the WYDOT CV Pilot website, or the Wyoming DOT Facebook page, which includes posts about the CV Pilot. This type of attention could also encourage some local trucking companies to reach out to WYDOT and inquire how they can become involved in the pilot.

The secondary vision for the OCS is for the media audience to understand that an ultimate goal of the CV Pilots is to support CV interoperability success and standardization, whereby connected vehicles, devices, infrastructure, and applications can communicate with other parts of the CV system, regardless of when or where the connectivity equipment was built. This understanding could be passed on to the public to help them better understand how they can benefit from the CV Pilot.

5 Structure of the Operational Capability Showcase

5.1 OCS Location Details

The showcase will be conducted on Tuesday, October 30, 2018 and will consist of two major elements: a presentation and the field demonstration.

5.1.1 Auditorium

The presentation portion will take place at WYDOT's Auditorium at 5300 Bishop Boulevard, Cheyenne, WY. The auditorium is spacious enough to hold at least 100 people. With video monitors mounted throughout the auditorium and a speaker system, the auditorium's audio/visual (A/V) capabilities will ensure that the speakers and the videos played during the presentation can be seen and heard by all audience members, no matter where they are sitting—see Figure 5-1.

Figure 5-1. WYDOT's Auditorium on Cheyenne, WY (Source: WYDOT).

The lobby of the auditorium has open space and a video monitor and it will be utilized for displaying posters and a video explaining the project. The posters will cover the five applications, an illustration of the CV system, and statistics highlighting the safety issues on I-80. The video will be the first CV video created to explain the project.

5.1.2 Field Demonstration Location

The field demonstration will take place on I-80 and at the Archer Complex. The Archer Complex is an open road loop that is lightly traveled, so it will allow the demonstration vehicles to safely pull over on the side of the road to demonstrate Distress Notification or to set up appropriately to demonstrate FCW without interfering with regular travelers. To be most efficient with time, the three applications

involving TIMs will be demonstrated on I-80, en route to the Archer Complex—see Figure 5-2 for an illustration of the route taken to the Archer complex.

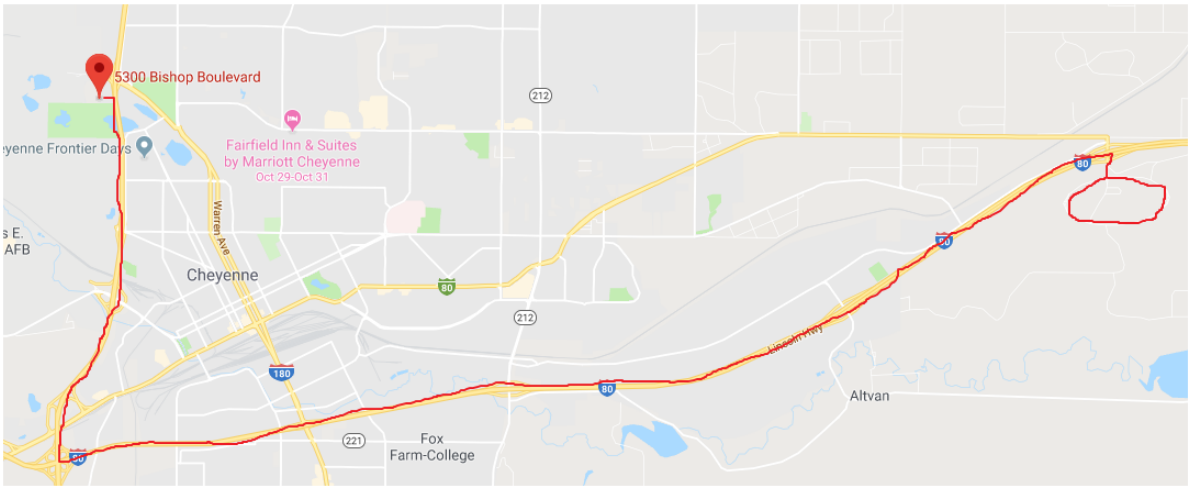

Figure 5-2. On-road demonstration route from WYDOT offices to Archer Complex (Source: Google Maps)

During the demonstration, the passengers of the Showcase vehicles will be able to view the messages on the human-machine interface (HMI). The driver of the vehicle will explain what is happening and what is being displayed on the HMI. The passengers will see all five applications: FCW, WZW, DN, SA, and SWIW.

5.2 Demonstration Elements

5.2.1 Presentation Activity

For the first hour of the Showcase, the WYDOT CVP team will provide an overview and update of the project to the Showcase attendees. The intent of these presentations is to give a broad overview of the importance of this pilot for the travelers of I-80 and WYDOT's TMC and discuss the activities that have taken place and the activities to come, as well as discuss the notion of interoperability and integration.

In the Project Overview and Update, WYDOT's Vince Garcia and Ali Ragan will provide the impetus for the pilot, the project team members and current status, explain the concept of connected vehicles, and describe the impact of the pilot on the TMC and the public. The presentation will include videos where applicable, particularly in showing conditions drivers currently face on I-80, and a description of how data flows through the system from connected vehicles, to the TMC, and back out to the roadside.

During the Pilot Participant Remarks, representatives from WYDOT District 1, Wyoming Highway Patrol, and from two fleet partners, Tryihydro and Dooley Oil, will talk about why they are participating in the pilot and how they anticipate the pilot will affect their operations.

Then, during the Next Steps and Interoperability, System Development Lead Tony English will provide an overview of Phase 3 activities, a discussion about the Interoperability testing, and review what interoperability testing means for the future of connected vehicles.

5.2.2 Ribbon-cutting Event

After the presentation portion of the showcase, WYDOT Executive staff and all of the pilot project team members will stand alongside FHWA staff and in front of two snow plows, which will have a ribbon tied between them. The staff will use large shears to cut the ribbon, celebrating the Showcase and ushering forth the on-road demonstration portion of the Showcase.

5.2.3 On-Road Demonstration

This demonstration will utilize four vehicles: the two WYDOT sport utility vehicles (SUVs), one WYDOT pickup and one Trihydro pickup. These vehicles will be outfitted with HMI, OBUs, and antennas. Snow plows and heavy trucks will not be used for the demonstration because of limited seating in each vehicle.

Showcase attendees will be driven from the WYDOT offices to the Archer Complex via I-80 (see Figure 5-2). While driving along I-80, the vehicles will receive TIMs. While the vehicles are driving around the Archer Complex, the team will demonstration the Forward Collision Warning and Distress Notification. The vehicles will then return to the WYDOT offices via I-80, where they will receive TIM messages again from the reverse direction.

One loop of the demonstration may take about 40 minutes.

5.2.4 Vehicles for Presentation

The following vehicles will be outfitted with HMI, OBUs, and antennas and available for the showcase attendees to view.

- 2 snow plows
- 1 Semi-trailer truck
- 1 Wyoming Highway Patrol cruiser
- 2 WYDOT SUVs
- 1 WYDOT pickup
- 1 Trihydro pickup

5.3 Roles and Responsibilities

5.3.1 Showcase Organization

The WYDOT CV Pilot team members WYDOT (Ali Ragan) and ICF (Eva Hsu) are responsible for the ultimate execution of the Showcase, which will include the preparation activities of securing the Showcase location(s), developing the agenda and structure of the OCS, creating the invitation, and identifying invitees. They will assign the presentation speaking roles and secure the appropriate speakers for each section.

5.3.2 WYDOT CV Pilot Team Speakers

The following WYDOT CV Pilot Team members will be speaking during the presentation:

- Vince Garcia, WYDOT

- Ali Ragan, WYDOT
- Tony English, Trihydro

5.3.3 Additional Speakers

The WYDOT CV Pilot team will request the participation of representatives from Wyoming field personnel, Wyoming Highway Patrol, Dooley Oil, and Trihydro Corporation to provide remarks on why they are involved in the pilot.

USDOT's Division Administrator from FHWA's Wyoming Division Office will conduct the welcome remarks to the Showcase audience.

5.3.4 WYDOT CV Pilot Team Demonstration Drivers

The following staff will be driving the demonstration vehicles and providing commentary to explain the applications:

- Vince Garcia, WYDOT
- Brian Peel, WYDOT
- Trenton Rawlinson, WYDOT
- Rick Smith, Trihydro

5.4 Final Agenda

Table 5-1. Agenda

Time	Activity
8:30 – 8:35	Welcome by USDOT
8:35 – 8:40	Welcome by WYDOT Executive Staff
8:40 – 9:00	Project Overview and Update
9:00 – 9:15	Pilot Participant Remarks
9:15 – 9:30	Next Steps and Interoperability
9:30	Ribbon-cutting by WYDOT Executive Staff and USDOT
10:00	1) On-road demonstrations by WYDOT CVP Team 2) Media Recording and Interview time

5.5 Invited Non-Media Attendees

The following non-media attendees will be invited as either speakers representing their agency or company or as participants to the OCS:

- Bryan Cawley, FHWA Wyoming Division Administrator
- Pat Lewis, WYDOT Chief Technology Officer
- John Dooley, Dooley Oil
- Jack Bedessem, Trihydro Corporation
- Tom DeHoff, WYDOT District 1 District Engineer
- Keith Compton, WYDOT District 3 District Engineer
- Col. Kebin Haller, WYDOT Highway Patrol Administrator
- WYDOT District 1 personnel
- Wyoming Highway Patrol officers

6 Resources Developed for the Operational Capability Showcase

6.1 Presentation

The final slides for the presentation will be provided in the OCS Summary (described in further detail in Section 8). The presentation will introduce the WYDOT CV Pilot team members, give an overview of the I-80 corridor, explain the concept of connected vehicles (particularly emphasizing the distinction from autonomous vehicles), illustrate the system's data management, security, and privacy considerations, and highlight the important of interoperability.

6.2 Videos

The following videos will be shown during the OCS:

- Original WYDOT CV Pilot explainer video: to be displayed in the lobby of the auditorium
- New WYDOT CV Pilot explainer video: to be embedded into the presentation
- I-80 multi-vehicle crash video: to be embedded into the presentation
- Interoperability testing video created by USDOT from the Phase 2 Interoperability Testing Activity: to be embedded into the presentation

6.3 Others

The following posters will be on display during the OCS:

- Illustration of Forward Collision Warning (FCW)
- Illustration of Situational Awareness (SA)
- Illustration of Distress Notification (DN)
- Illustration of Work Zone Warning (WZW)
- Illustration Spot Weather Impact Warning (SWIW)
- Statistics of crash impacts on I-80
- Illustration of the entire WYDOT CV system

7 Engagement with Media

7.1 Invitations

The media outlets will be sent two invitations to the Showcase, one on October 24 and another on October 29. The invitation will include the Who, What, Where, When, and Whys of the Showcase and will have a subject line that draws their attention. A copy of the invitation will be included in the OCS Summary (described in further detail in Section 8).

7.2 Engagement Activities

During the Showcase, the media will be invited to record any part of the Showcase presentation and field demonstration and have access to any WYDOT CV Pilot team member for an interview. Following the Showcase, WYDOT's Public Affairs office will release a press release to all invited media outlets. A copy of the press release will be included in the OCS Summary.

WYDOT's Public Affairs office will send invitations to the showcase to the following media outlets. These media outlets were targeted because of their local presence. In the invitation, Public Affairs will indicate that the topic of this showcase will be to demonstrate new safety communication technology on I-80, to garner the appropriate attention on the event.

7.3 Invited Media

The following are the media outlets we intend to invite to attend the Showcase.

Afton KRSV

Afton Star Valley Independent

Associated Press

Big Horn Radio Network

Billings Gazette

Bob Ruwart

Buffalo Bulletin

Casper Journal

Casper KCWY-13

Casper KTWO

Casper Star Tribune

Cheyenne - KGWN TV5

Cheyenne - KRRR

Cheyenne - Wyoming Tribune Eagle

Cody - KODI/KTAG Radio

Cody Enterprise

County 10.com

Daily Rocket-Miner

Dubois Frontier

Gillette KXXL

Gillette News-Record

Green River Star

Greybull Standard

Guernsey Gazette

High Plains Sentinel

Jackson Hole News and Guide

Jackson Hole Radio
Jackson KUWJ
KASL Radio
KASS, KQLT, KHOC, KMLD KVOC-AM
KBBS radio
Kemmerer Gazette
KFBC-AM
KGTA radio Saratoga
KLMI
KMER radio
KOTA
KOTA-TV Gillette/Sheridan
KPOW
KQSW radio
KRAE Radio
KTWO-TV Casper
KWOR radio
Lander Journal
Lander KDLY KOVE
Landline Magazine
Laramie Boomerang
Laramie News
Lovell Chronicle
Lusk Herald
Lyman - Bridger Valley Pioneer
M.J. Clark/Wyoming Business Report
Moorcroft Leader
Newcastle News Letter Journal
Pine Bluffs Post
Pinedale KPIN
Pinedale Online
Pinedale Roundup
Planet Jackson Hole
Powell Tribune
Rawlins Daily Times
Rawlins KIQZ/KRAL
Riverton KVOW/KTAK
Riverton Ranger
Saratoga KTGA
Saratoga Sun
Sheridan KROE KYTI KWYO KZWY
Sheridan KSGW TV
Sheridan Press
Sublette Examiner
Sundance Times
SVI
Thermopolis Independent Record
Torrington Telegram
Weston County Gazette
Wheatland Platte County Record Times
Worland (Northern Wyoming Daily News)
Wyoming News Network
Wyoming Public Radio

8 Post- Operational Capability Showcase Activity

8.1 OCS Summary

Following the Operational Capability Showcase, the observations and results of the Showcase will be documented in an Operational Capability Showcase Summary (OCSS). This summary will include the following:

- Final documents from the Showcase, including the final slides of the Presentation, media invitations, and media press releases.
- A list of final Showcase attendees,
- Comments and questions raised by the attendees and action items from these comments and questions, if any,
- Results and comments from the on-road demonstration,
- A list of any media segments or articles that were produced following the OCS.

The OCSS will summarize and lessons learned about conducting a field demonstration, about interfacing with the media on this topic, and about engaging with stakeholders to participate in such an activity.

8.2 Continued Engagement

To capitalize on the momentum gained by the OCS, WYDOT will post videos and pictures from the OCS to the Wyoming Department of Transportation Facebook page. If possible, WYDOT will also cross-post any articles, photos, or videos that are shared on other media outlets' social media.

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