Work Zone Data Exchange Workshop

Summary Report

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Final Report – January 16, 2020
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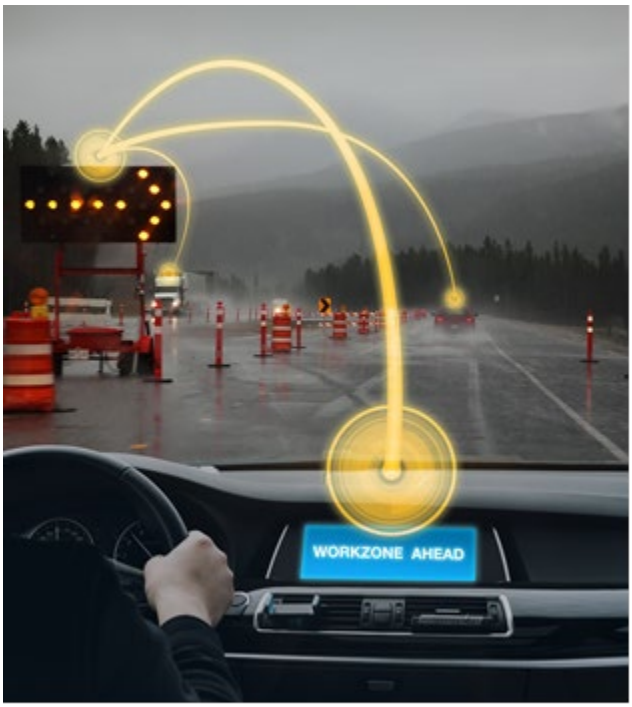

U.S. Department of Transportation

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15. Supplementary Notes

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16. Abstract

The objective of the Work Zone Data Exchange (WZDx) Specification is to enable infrastructure owners and operators (IOOs) to make harmonized work zone data available for third party use. The project aims to get data on work zones into vehicles to help automated driving systems (ADS) and human drivers navigate more safely.

The main objectives of the *Work Zone Data Exchange Workshop* that took place in April of 2019 were threefold. The first goal was to explore lessons learned from the first year of the WZDx project, including technical and institutional challenges and opportunities. The second objective was to identify next steps to accelerate the adoption of a common work zone data specification that can expand over time to meet emerging needs of automated driving systems (ADS). The third and final objective was to clarify the roles and needs of infrastructure owners and operators (IOOs) who produce these data, developers of ADS-ready digital maps that consume these data, and other key stakeholders.

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Executive Summary

On April 4, 2019, the U.S. Department of Transportation (U.S. DOT) hosted a Work Zone Data Exchange (WZDx) Workshop, where participants engaged with a diverse set of peers who share the vision of making access to work zone data ubiquitous. The Workshop included over 50 work zone data producers, users, and brokers. The main objectives of the Workshop[1] were to:

- Explore lessons learned from the first year of the WZDx Project, including technical and institutional challenges and opportunities.
- Identify next steps to accelerate the adoption of a common work zone data specification that can expand over time to meet emerging needs of automated driving systems (ADS).
- Clarify roles and needs of infrastructure owners and operators (IOOs) who produce these data, developers of ADS-ready digital maps that consume these data, and other key stakeholders.

The WZDx Workshop combined presentations from stakeholders in state and local government and the private sector with interactive working sessions, which engaged participants for their input on challenges of work zone data exchange and potential paths forward. This report summarizes key takeaways from the day's work in three sections:

- Lessons Learned from Implementation
- Value Propositions for Work Zone Data Exchange
- Potential Next Steps for Work Zone Data Exchange

The WZDx Workshop validated the U.S. DOT's motivation for the WZDx Project: The belief that ***a simple, open specification for work zone data, broadly adopted, can save lives*** (see Figure 1). This report captures the diverse expertise and insights from participants that can help translate this principle into practice.

[1] The Workshop was held under the Chatham House Rule, which specifies that anyone who attends is free to use information from the discussions but is not allowed to reveal who made any specific comment.

Figure 1. Work Zone Data Exchange (WZDx) Value Proposition

Source: U.S. DOT ITS JPO, 2019

Introduction and Background

The U.S. DOT launched the WZDx Project in March 2018, following a December 2017 Roundtable on Data for Automated Vehicle (AV) Safety that highlighted opportunities to facilitate the exchange and use of work zone data.Since then, the U.S. DOT and several state and local governments around the country have begun developing a WZDx specification, both to enable the safe integration of automated vehicles in the future and to improve road safety today. The Federal Highway Administration (FHWA) and Intelligent Transportation Systems Joint Program Office (ITS JPO) at the U.S. DOT are co-leading the early stages of the WZDx Project. Together, they held a WZDx Workshop on April 4, 2019 to help advance the project's vision.

Work Zone Data Exchange

The WZDx specification enables IOOs to make harmonized work zone data available for third party use. In enabling ubiquitous access to data on work zone activity, the specification aims to make travel on public roads safer and more efficient. Specifically, the project aims to get data about the location and characteristics of work zones into vehicles so that both automated driving systems (ADS) and human drivers are able to navigate more safely.

Inspired by the General Transit Feed Specification (GTFS), U.S. DOT launched WZDx to jumpstart the voluntary adoption of a basic work zone data specification through collaboration with data producers and data users. Through this project, U.S. DOT aims to identify a repeatable approach to accelerate harmonization of local data sources that can improve roadway safety and efficiency.

Work Zone Data Initiative

The FHWA's broader Work Zone Data Initiative (WZDI) seeks to develop a recommended practice for managing work zone activity data (WZAD) throughout its lifecycle and across different use cases, and to create a consistent language for doing so through the development of a data dictionary and supporting implementation documents. The WZDI promotes a stakeholder- and systems-driven perspective for WZAD that allows for a better understanding of user needs from the practitioners' perspective and ultimately, a better approach to collecting national WZAD.

The WZDI and WZDx projects are complementary. For example, the WZAD data dictionary can serve as a backlog of data elements to add to the WZDx specification over time. The WZDI stakeholder community, which includes construction and maintenance contractors, utilities, and government agencies, among others, can also help support the vision of the WZDx Project. These stakeholders stand to benefit from broad adoption of the WZDx specification, which can inform real-time operations and make it easier to analyze performance and safety throughout the entire work zone lifecycle.

Highlights of the Workshop

On April 4, 2019, the WZDx Workshop (see Appendix B. Workshop Agenda) brought together over 50 participants from industry and multiple levels of government to break down silos and share diverse perspectives on producing and ingesting work zone data. Participants represented work zone data producers, users, and brokers who share the vision of making access to work zone data ubiquitous (see Appendix C. Workshop Participating Organizations).

The day began with an executive welcome from Finch Fulton, Deputy Assistant Secretary for Transportation Policy at U.S. DOT. Ariel Gold, the U.S. DOT ITS JPO Data Program Manager, and Todd Peterson, U.S. DOT FHWA Project Manager, then described the goals and structure of the day. The Workshop combined a panel discussion and brief presentations with interactive, small group working sessions designed to help participants unpack the Workshop's overarching questions through facilitated discussion.

The panel participants and lightning talk speakers offered a range of perspectives on ongoing activities to advance the use of work zone data. The two panelists, Charles Meyer of the Colorado DOT and Craig Moore of the Seattle DOT, shared their experiences from a state and city perspective. In lightning talks, SharedStreets Co-Founder Kevin Webb described how the nonprofit organization created a common language for representing and sharing location data that is map agnostic and not reliant on proprietary formats; Aaron Antrim, Co-Director of the transportation company Trillium, described how the GTFS became successful using a light-weight specification coupled tightly with implementation; and General Motors Technical Fellow Curtis Hay shared a data user's perspective on how work zone data can support ADS navigation and help AVs recognize when they are outside of their operational design domain.

Beyond these presentations, the Workshop included highly interactive working sessions focused on the following key issues and questions:

- **Value Propositions.** Participants discussed the value of harmonized work zone data feeds, their experiences in communicating that value, and how to articulate these value propositions to different audiences.

- **Lessons Learned from Implementation.** This working session focused on lessons learned from year 1 of the WZDx Project, challenges and successes, and replicable models and partnerships that have brought similar data exchange visions forward.

- **Clarifying Roles and Next Steps.** In this session, participants discussed potential next steps that U.S. DOT and stakeholders could take as part of their roles in helping make the vision of ubiquitous work zone data a reality.

At the end of the day, each table crafted an "elevator pitch" that succinctly captured the value of work zone data exchange, which they then presented to a group of U.S. DOT leadership. This exercise was designed to enable Workshop participants to report back to their respective organizations and clearly articulate the value of this work at the executive level.

Lessons Learned from Implementation

Workshop participants shared lessons learned from their own experiences implementing work zone and other related data exchanges that can inform the WZDx vision going forward. Highlights included the following:

- **Workshop participants supported the idea that a simple, open specification for work zone data, broadly adopted, can save lives.** Mapping active work zones can improve safety. Construction workers in particular can benefit from data that puts them "on the map," making them visible in work zones, which can be high-risk environments. In addition, participants noted that these workers can provide real-time, on-the-ground information to make work zone data more complete and useful as a tool for improving safety. Incorporating this information about work zones into navigation apps and consumer maps can alert drivers to reduce speed and signal to AVs to transfer control to a human driver ahead of time.

- **Work zone data exchange can improve safety on the roads today and support the safe integration of ADS tomorrow.** While some Workshop participants have been able to communicate the value of ubiquitous work zone data by focusing on the development of ADS, others have highlighted more immediate benefits related to safety and mobility. For example, work zone data exchange can improve worker safety and enhance navigation and routing, among other benefits.

- **Many workshop participants expressed a strong preference for a free, open, non-proprietary common work zone data specification.** Some participants identified legal, political, and financial constraints with using proprietary data specifications. Several noted that the GTFS, including its governance and norms, is a valuable model for the WZDx community. Experiences with GTFS validated the importance of starting with a clear use case that could be quickly implemented. Workshop participants also noted that a simple specification like GTFS can help lower the barriers to participation for resource-constrained agencies and be built out over time.

- **Workshop participants described the need to broaden the scope of engaged stakeholders.** Some participants noted that U.S. DOT had not yet fully tapped into the work zone ecosystem, which includes stakeholders ranging from construction workers to procurement and permitting offices. Culture changes are needed across this entire ecosystem to implement the WZDx vision successfully.

- **Work zone data exchange should be embraced as a community-based effort.** Workshop participants outlined specific opportunities to promote the WZDx vision within their own organizations and communities, from engaging in public-private collaboration to hosting similar workshop-style convenings focused on local implementation.

- **There are a number of opportunities for U.S. DOT to play a role.** Participants appreciated U.S. DOT's current convening and facilitation role, and expressed a desire for this to continue. Participants also saw opportunities for U.S. DOT to help meet the needs of local and state governments. Local and state governments, for example, would like to see the Department

identify funding opportunities. States voiced a specific need for additional communications, outreach, and education support.

- **Targeted value propositions can convey the value of work zone data exchange for different stakeholder groups.** Stakeholders who stand to benefit from ubiquitous work zone data include IOOs in cities and states, data brokers, map developers, and construction workers, among others. Each of these groups has a specific perspective and set of priorities that must be addressed through tailored messaging in order to effectively communicate the WZDx project's value.

Value Propositions for Work Zone Data Exchange

Workshop participants recognized the need to develop clear value propositions targeted towards specific stakeholder groups involved in work zone data exchange. Based on initial value propositions developed at the Workshop and feedback following the event, the table below presents examples of value propositions directed towards state and local government departments and offices, hardware vendors, map developers, data brokers, AV developers, work zone workers and managers, the traveling public, and U.S. DOT.

Table 1. Value Propositions

Stakeholders	Work Zone Data Exchange Can Help Stakeholders…
State/Local Department of Transportation (DOT)	Reduce traffic by informing travelers about work zones and identifying alternate routes Achieve Vision Zero and other road safety initiatives faster
State/Local DOT Procurement Offices	Improve contract performance in terms of safety, quality, delivery time, social and economic impact, public perception, and life-cycle costs
State/Local DOT Permitting Office	Reduce the number of required on-site work zone inspections through timely performance data
State/Local Geospatial Management Office	Enrich the inventory of open transportation data, which can attract the development community to collaborate and contribute to open source APIs and other tools to improve government services
Governor, Mayor, County Exec (with AV Testing)	Provide data to help fuel innovation and encourage job growth Help government leaders understand the safety impacts and performance of AVs near work zones
Governor, Mayor, County Exec (with no AV Testing)	Understand and respond to the travel impacts of work zones to reduce traffic while improving worker safety

Stakeholders	Work Zone Data Exchange Can Help Stakeholders…
Hardware Vendors	Create a new business opportunity to sell hardware solutions to a wider national customer base
Consumer Digital Map Developers	Design better routing and navigation apps for consumers through improved data timeliness, accuracy, and relevance
High-Definition (HD) Map Developers	Easily and inexpensively understand where they need to remap due to changes in roadway geometry
Data Brokers	Leverage public sector data to increase usage of their platforms
AV Developers	Better understand where vehicles can/cannot operate today Access more granular data so future systems can navigate safely around work zone workers
Work Zone Workers & Managers	Put work zone workers on the map to avoid accidents and get the job done
Traveling Public	Receive up-to-date information on travel conditions so drivers can select the quickest route Alert drivers to work zones so they can reduce the risk of accidents
U.S. DOT	Make travel on public roads safer and more efficient Prepare for an automated future Access data to improve public safety and mobility analysis

Source: U.S. DOT: Work Zone Data Exchange April 2019 Workshop

Potential Next Steps for Work Zone Data Exchange

As part of the day's conversations, participants discussed roles and actionable next steps that U.S. DOT and stakeholders at the Workshop could take to help make the vision of work zone data exchange a reality. Potential next steps were identified for the following groups:

State and Local Governments

- **Institutionalize a business process for collecting and updating data.** Workshop participants noted opportunities for IOOs to broaden the scope of work zone data collection and institutionalize this as part of standard business processes. For example, the Seattle DOT has engaged entities like utility companies to help generate relevant data. Some Workshop participants also suggested making data collection contractually obligated for construction management and inspection companies.

- **Define a "common core" of data elements and update regularly to ensure uniformity.** Given the many different kinds of data elements involved in work zone data, identifying a "common core" of the most important ones to standardize can make the goals of the WZDx much more achievable. State and local governments should help prioritize these common core data elements. Once those priorities are drawn from state and local experience, Workshop participants noted that they can be codified on a national level in a similar way to how the Manual on Uniform Traffic Control Devices (MUTCD) ensures uniformity of traffic signals.

- **Improve data availability and data quality by leveraging partnerships and technology**. Innovative state and local governments can go beyond their traditional ways of collecting and managing planned road closure data by working with industry and leveraging innovative technologies. For example, several Workshop participants mentioned the potential of the dynamic work zone planning equipment that can transmit data on work zone conditions in real time. Colorado DOT's RoadX Program, among others, is demonstrating how these technologies can improve the timeliness and accuracy of work zone data.

- **Build on the value of existing traffic data programs.** A number of states have developed systems that already collect and publish traffic data for public use, such as Vermont's VTrans Traffic Data Management System and the Kansas DOT Crash Data Intelligence Unit. There may be ways to leverage existing data programs such as these to make work zone data more universally accessible.

- **Emphasize benefits for safety and mobility today.** State and local governments can help accelerate work zone data exchange by highlighting benefits for public safety and traffic management. Workshop participants suggested linking work zone data to road safety initiatives

like Vision Zero. That program, with the goal of eliminating traffic fatalities and promoting safe mobility, began in Europe in the 1990s and is now taking hold in several U.S. cities. Government leaders can leverage the momentum behind Vision Zero and other road safety initiatives to advance the message of the WZDx.

Private Sector

Business and Nonprofits

- **Implement pilot projects in collaboration with other stakeholders.** The private sector can play a leading role in testing new ideas and enabling innovation. Workshop participants discussed several potential pilot opportunities, such as sharing Light Detection and Ranging (LiDAR) point cloud data between industry and IOOs at the city and state levels in order to reduce duplicative data collection.

- **Set up real-time, public-private feedback loops.** Workshop participants noted opportunities for the private sector to leverage mobile-ready technologies and help establish public-private feedback loops with IOOs. Two-way feedback loops can improve the accuracy and reliability of data, and ultimately help deliver products and services that meet consumer needs. The Waze Connected Citizens Program offers one possible model for this type of real-time feedback.

- **Make data from existing sources more interoperable.** Participants at the Workshop recognized a continuing role for the private sector to help connect diverse sources of data. The nonprofit organization SharedStreets, for example, can bring different sources of information together regardless of whether data is linked to OpenStreetMap, public geographic information systems, or commercial base maps.

- **Help coordinate stakeholders to achieve widespread use.** A number of industry standards setting organizations have an interest in supporting work zone data exchange and can serve as custodian for open standards and data exchange. Workshop participants highlighted the need to engage the geospatial standards community further as a next step to identify an appropriate steward.

Federal Government

The U.S. Department of Transportation

- **Accelerate development of consensus-based, voluntary standards for work zone data.** Many Workshop participants cited the GTFS as a potential model for open work zone data standards, and encouraged the U.S. DOT to help accelerate adoption of similar voluntary standards for work zone data. Several emphasized the advantages of the GTFS governance model, which restricts voting to the data producers and users who actually use the specification. They also noted that work zone data standardization presents challenges that GTFS did not face, such as the potential need for a single standard with two implementation tracks that are tailored to address differences at the city and state levels.

- **Use micro-grants to develop new work zone data feeds.** U.S. DOT could provide small grants to help local and state governments launch new data feeds. Industry partners using WZDx data require a critical mass of work zone data feeds from cities, counties, and states, many of which may lack the resources to provide those feeds. Through small grants, U.S. DOT could fund public roadway authorities to launch local data feeds both to begin to provide a critical mass of data to data users and to serve as models for other jurisdictions.

- **Encourage standards adoption through existing demonstration and grant programs.** U.S. DOT has a range of opportunities to advance the work zone data exchange through existing grant programs. The Department could add language designating the use of the WZDx specification as a qualifying innovation for some high-profile funding programs. As a result of the Workshop, U.S. DOT has already done this for the Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Grants Program. U.S. DOT can also explore ways to advance the WZDx vision through existing demonstration and grant programs such as the Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) Program, where awardees may have the capacity to implement an open work zone data feed into planned pilot activities.

- **Generate awareness and buy-in through targeted communications and promotional activities.** U.S. DOT's stakeholders have encouraged the Department to promote the life-saving potential of a simple, harmonized, and open specification for work zone data. Many participants emphasized the potential for promoting the goals of WZDx through targeted messages to specific audiences, for example, by helping construction workers realize the safety benefit of data that can "put them on the map." U.S. DOT can also work across the Department to identify different programs related to work zones and communicate a unified national vision. For example, work zone data may be relevant to the Traffic Incident Management (TIM) Program, the Crash Data Improvement Program (CDIP), and the Cooperative Automation Research Mobility Applications (CARMA) platform, as well as national campaigns like National Work Zone Awareness Week (NWZAW).

- **Continue to support regular stakeholder convenings and offer technical assistance.** Many participants encouraged U.S. DOT to continue bringing together stakeholders for in-person working sessions like this Workshop. While U.S. DOT plays a unique role as a national convener, the Department can also encourage stakeholders to hold similar sessions in their own organizations and communities. Participants also voiced a need for U.S. DOT to provide technical assistance to public agencies, either through convenings, on-site consultation, or in other ways, to help achieve the WZDx vision.

- **Aggregate and analyze work zone data.** U.S. DOT has an opportunity to help drive the use of work zone data inside and outside of the Department by providing capacity for data aggregation and analysis. Workshop participants noted that aggregating data from early adopters of the WZDx specification could help establish the value of work zone data, and allow them to champion the project to executives and peers in industry and local government.

Conclusion

The WZDx Workshop offered participants an opportunity to engage with a diverse set of peers. Their feedback suggested that the Workshop helped them develop a more comprehensive understanding of both the challenges of work zone data exchange and possible solutions. Results from a feedback form administered at the Workshop showed that participants found it a unique and productive forum, and many encouraged U.S. DOT leadership to convene similar events in the future.

The Workshop validated a central premise of WZDx: ***A simple, open specification for work zone data, broadly adopted, can save lives.***

The U.S. DOT has already taken the lead in using insights from this Workshop to enable work zone data exchange. As a result of the Workshop, the U.S. DOT has now built an incentive for work zone data exchange into a major grant program. On April 22, 2019, the U.S. DOT released a Notice of Funding Opportunity (NOFO) for $900 million in grant funding through the BUILD Transportation Discretionary Grants Program. The NOFO references work zone data exchanges as a type of innovative technology that applicants are encouraged to include in their grant applications.

By working together, diverse stakeholders with an interest in work zone safety – the U.S. DOT, state and local governments, the private sector, and work zone workers themselves – can help ensure that reliable and widely accessible data will save lives today and help make automated vehicles safer in the future.

Appendix A. Acronyms

AASHTO - American Association of State Highway Transportation Officials
ADS - Automated Driving Systems
AV - Automated Vehicles
BTS - Bureau of Transportation Statistics
BUILD - Better Utilizing Investments to Leverage Development
CARMA - Cooperative Automation Research Mobility Applications
CDIP - Crash Data Improvement Program
DOT - Department of Transportation
FHWA - Federal Highway Administration
FMCSA - Federal Motor Carrier Safety Administration
FTA - Federal Transit Administration
GSA - General Services Administration
GTFS - General Transit Feed Specification
HD - High-Definition
IOO - Infrastructure Owners and Operators
ITE - Institute of Transportation Engineers
ITS JPO - Intelligent Transportation Systems Joint Program Office
LiDAR - Light Detection and Ranging
MUTCD - Manual on Uniform Traffic Control Devices
NHTSA - National Highway Traffic Safety Administration
NOFO - Notice of Funding Opportunity
NWZAW - National Work Zone Awareness Week
OCIO - Office of the Chief Information Officer
OEM - Original Equipment Manufacturer
TIM - Traffic Incident Management
U.S. DOT - U.S. Department of Transportation
WZAD - Work Zone Activity Data
WZDI - Work Zone Data Initiative

Appendix B. Workshop Agenda

Time	Activity
9:00 – 9:10	Executive Welcome
9:10 – 9:30	WZDx Team Introduction
9:30 – 10:00	Working Session 1: Group Introductions & Value Propositions • What do you see as the value of harmonized work zone data feeds? • What have been your experiences communicating the value of the WZDx Project or the Work Zone Data Initiative (WZDI) or similar activities? What has worked well? Where have you faced challenges?
10:00 - 10:25	Working Session 1: Report Out & Group Discussion
10:25 – 10:40	Networking Break
10:40 – 11:00	Panel: Lessons Learned from Work Zone Data Veterans
11:00 – 12:00	Working Session 2: Lessons Learned from Implementation • Based on lessons learned from year 1 of the WZDx Project and your own experiences, what are the main successes and challenges of making harmonized work zone data available? • What are examples of replicable models and partnerships that have brought similar data exchange visions forward?
12:00 – 12:15	Working Session 2: Report Out
12:15 – 1:00	Lunch and Networking Break
1:00– 1:10	Lightning Talks: Potential Ways Forward

Time	Activity

1:10 – 2:10	Working Session 3: Clarifying Roles & Next Steps
	
	• Considering that there are multiple starting points and venues for the community to collaborate, what are the most effective ways to implement the vision of ubiquitous access to work zone data?
	  ○ For example, what are possible next steps for accelerating adoption of a common work zone data specification that can improve roadway safety and efficiency today, and expand over time to meet the needs of automated driving systems (ADS)?
	• What are actionable next steps that stakeholders in this room can take to help make this vision possible?
	  ○ For example, what parts of your organization could be part of setting up and/or ingesting a feed, participating in specification development, or communicating the value of this activity to the broader community to drive adoption?
	• What are actionable next steps that U.S. DOT can take?

2:10 – 2:35	Working Session 3: Report Out & Group Discussion
2:35 – 2:50	Networking Break
2:50– 3:20	Working Session 4: Preparation for the Presentation of Highlights If you had three minutes with the top leadership of your organization (e.g. CEO, City Mayor, State Governor, U.S. DOT Secretary of Transportation), how would you summarize: 1. Value proposition for harmonized work zone data 2. Actionable next steps for taking the vision forward 3. Roles for your organization and other key stakeholders
3:20 – 3:50	Presentation of Highlights to U.S. DOT Leadership
3:50 – 4:00	Closing Remarks & Adjourn

Appendix C. Workshop Participating Organizations

AASHTO
Apple Inc
Austin Transportation
City of Detroit
City of Pittsburgh
City of Seattle
Colorado DOT
Esri
General Motors
Google Maps
GSA Technology Transformation Services
HERE
INRIX
ITE
Lyft
MapBox
Maricopa County DOT
New York City DOT
Panasonic
Seattle DOT
SharedStreets
Telenav
Texas DOT
Trillium Transit
Uber Advanced Technologies Group

U.S. DOT - BTS
U.S. DOT - FHWA
U.S. DOT - FMCSA
U.S. DOT - FTA
U.S. DOT - ITS JPO
U.S. DOT - NHTSA
U.S. DOT - OCIO
U.S. DOT - Volpe Center

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