



Improving Work Zone Safety with the Work Zone Data Exchange

April 29, 2021, 12:00-1:30pm EDT



This presentation was created and is being presented by FHWA, USDOT Volpe Center, Wisconsin Department of Transportation, and the University of Wisconsin. The views and opinions expressed in this presentation are the presenters' and do not necessarily reflect those of FHWA or USDOT. The contents do not necessarily reflect the official policy of the Department of Transportation.

The contents of the FHWA presentations do not have the force and effect of law and are not meant to bind the public in any way. These presentation is intended only to provide clarity regarding existing requirements under the law or agency policies.





MARTHA C. KAPITANOV
FHWA Office of Operations



TODD PETERSON
FHWA Office of Operations



NATE DESHMUKH TOWERY
USDOT Volpe Center



ERIN SCHWARK
Wisconsin DOT



STEVEN PARKER
University of Wisconsin-Madison

Today's Webinar

National Work Zone Awareness Week and work zone safety data

Martha Kapitanov, FHWA

Improving your agency's work zone event data using the WZDI Framework

Todd Peterson, FHWA

Using WZDx to deliver work zone event data to vehicles

Nate Deshmukh Towery, USDOT Volpe Center

Adopting the WZDx specification at Wisconsin DOT

Erin Schwark, WisDOT
Steven Parker, University of Wisconsin

Help us get the word out and Put Work Zones on the Map

Martha Kapitanov, FHWA

National Work Zone Awareness Week and work zone safety data

Martha Kapitanov

Federal Highway Administration





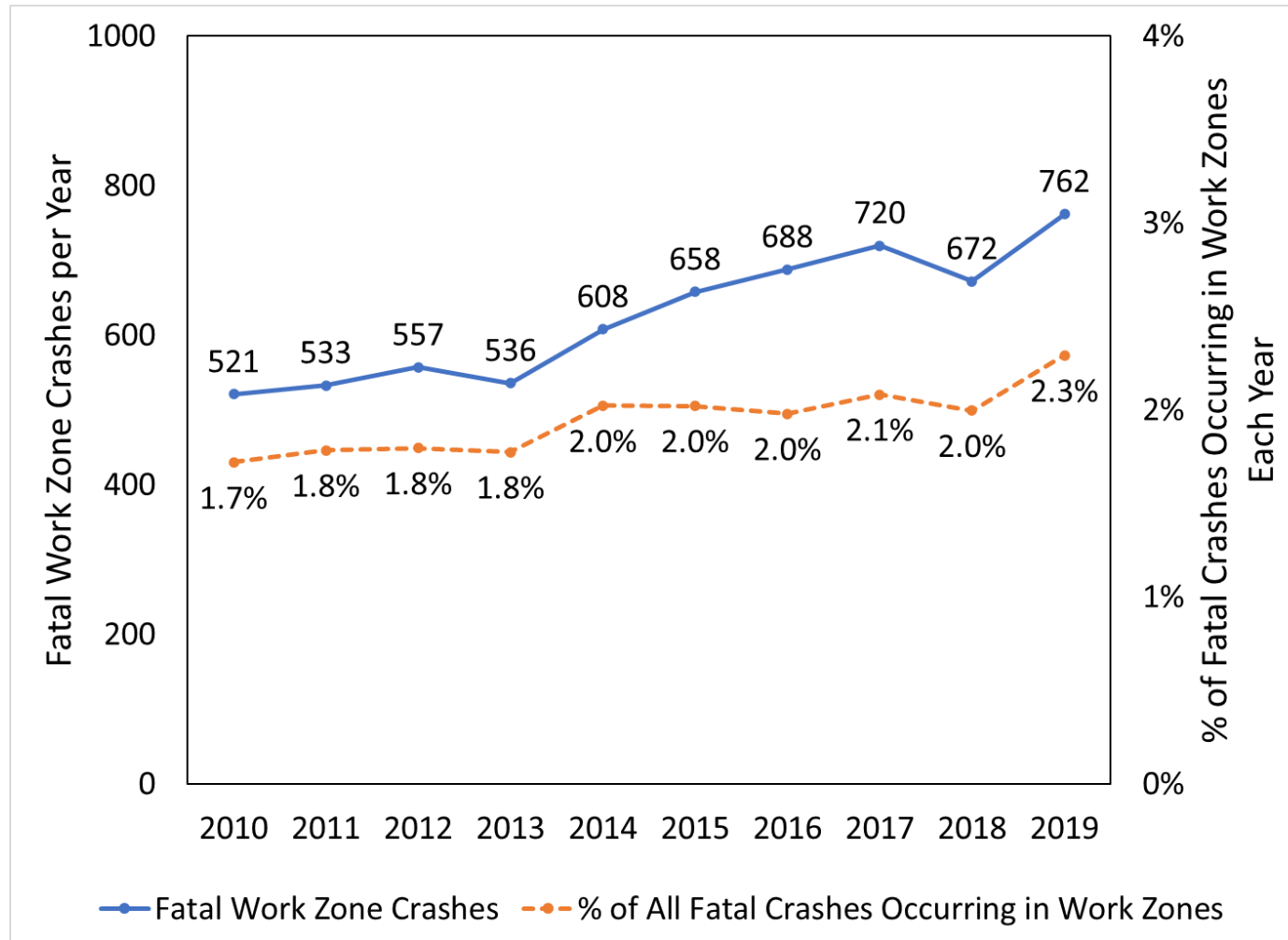
**Drive Safe.
Work Safe.
Save Lives.**

2021 National Work Zone Awareness Week (April 26-30)

Activities:

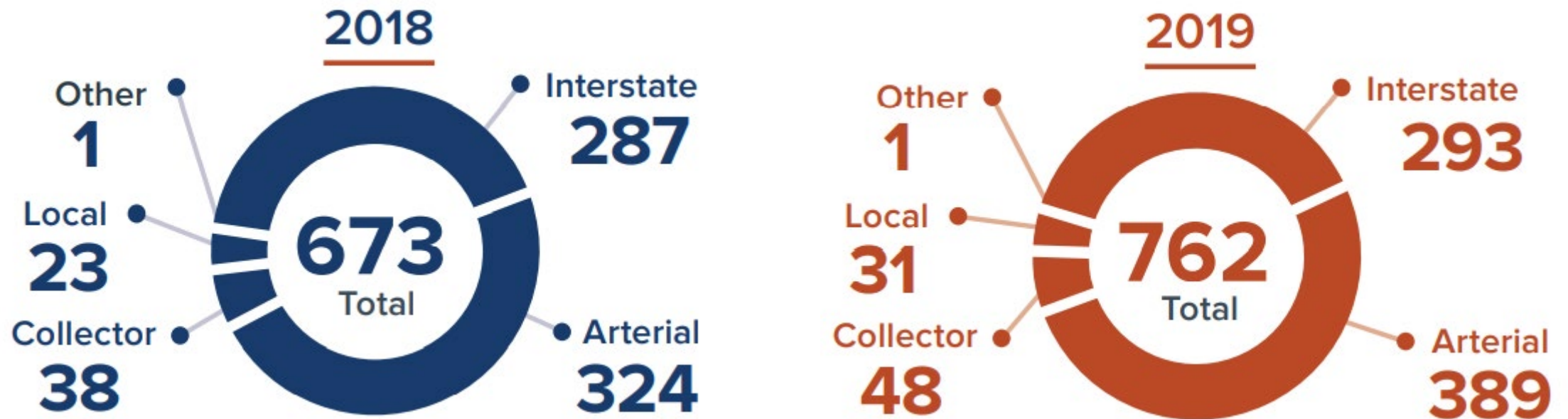
- **April 26**, *National Stand-Down to Prevent Struck-by Incidents* Webinars hosted by The Center for Construction and Training
- **April 27**, (11:00 a.m. ET) Kick-Off Event
- **April 28**, Orange for Safety
- **April 29** (12:00 - 1:30 p.m. ET), *Work Zone Data Exchange Project/Put Work Zones on the Map Campaign* Webinar

Fatal Work Zone Crashes and Percent of Fatal Crashes Occurring in Work Zones (2010-2019)



Source: National Work Zone Safety Information Clearinghouse

Total Work Zone Fatal Crashes by type of roadway



FARS 2018 Final File and 2019 Annual Report File, NHTSA. FARS data shown here are from the 50 States, the District of Columbia, and Puerto Rico.

Work Zone Fatal Crashes




the following types of crashes increased from 2018-2019

	<u>2018</u>	<u>2019</u>
• Involving a Rear-End Collision	141 21%	182 24%
• Involving a CMV	215 35%	250 33%
• Where Speeding Was a Factor	172 26%	239 31%

FARS 2018 Final File and 2019 Annual Report File, NHTSA. FARS data shown here are from the 50 States, the District of Columbia, and Puerto Rico.



Total Work Zone Fatalities by person type

	2018	2019
 Drivers and passengers	757	842
 Pedestrians and bicyclists	131	140
 Others Occupants of a non-motor vehicle transport device and persons on personal conveyances	5	12

FARS 2018 Final File and 2019 Annual Report File, NHTSA. FARS data shown here are from the 50 States, the District of Columbia, and Puerto Rico.

Work Zone Fatal Crashes worker fatalities by year

	<u>2018</u>	<u>2019</u>
Worker fatalities in road construction sites	124	135

2018 and 2019 Census of Fatal Occupational Injuries, U.S. Department of Labor, Bureau of Labor Statistics, in cooperation with States, New York City, the District of Columbia, and Federal agencies.

Safety in Work Zones

- In 2019, fatal work zone crashes involved:
 - 24% involved rear-end collisions
 - 31% noted speed as a contributing factor
 - 33% involved commercial motor vehicles
- Additionally,
 - 135 workers were killed in highway work zones

FARS 2018 Final File and 2019 Annual Report File, NHTSA. FARS data shown here are from the 50 States, the District of Columbia, and Puerto Rico.



Improving your agency's work zone event data using the WZDI Framework

Todd Peterson

Federal Highway Administration



Background

- Transportation operations is increasingly data-driven
 - Need for better coordination across regions to improve safety and mobility
 - Data important to both public agencies and external stakeholders
- Work zones present a complex data-sharing challenge
 - Highly variable
 - Subject to rapid change
 - Involve many stakeholders
- No national standard for communicating dynamic work zone event data

What is the Work Zone Data Initiative?

Response to the need for a reference guide on how to digitally describe dynamic work zone events on roads and highways

- Consistent language for communicating data across organizational boundaries and throughout project life cycles
- Local, regional and national data sharing
- Work Zone Event Data – the when, where, and how of work zone deployment

Benefits of standardizing data

Transportation Agencies:

- Enhance project prioritization and coordination
- Improve safety and mobility impact estimates
- Improve contractor compliance and asset mgmt.
- Enhance performance measurement

Public Entities:

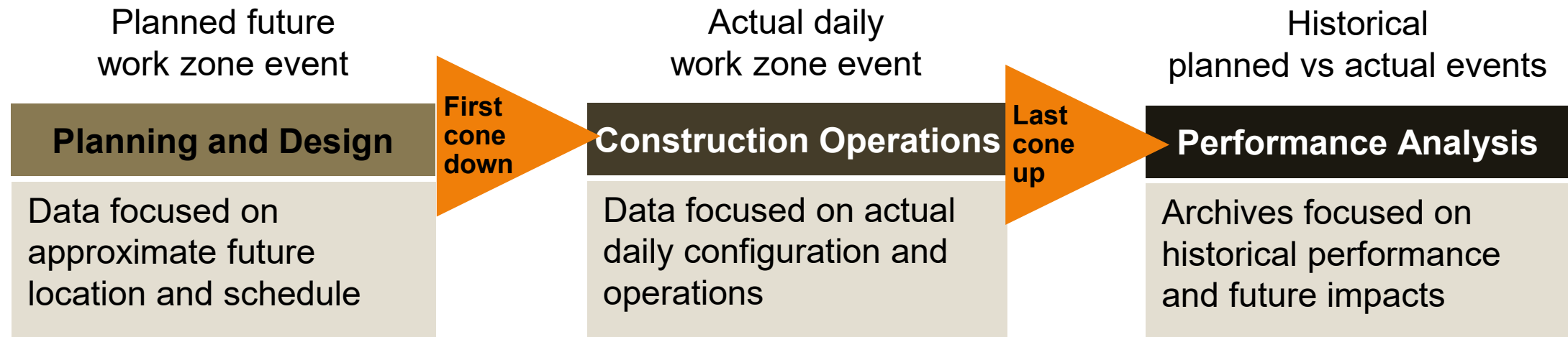
- Law Enforcement – improve dispatching and enforcement practices
- First Responders – modify trip routes

Traveling Public:

- Minimize cumulative impacts to motorists
- Accurate and verified real-time information for decision-making
- Verified source of information for CAVs (emerging need)

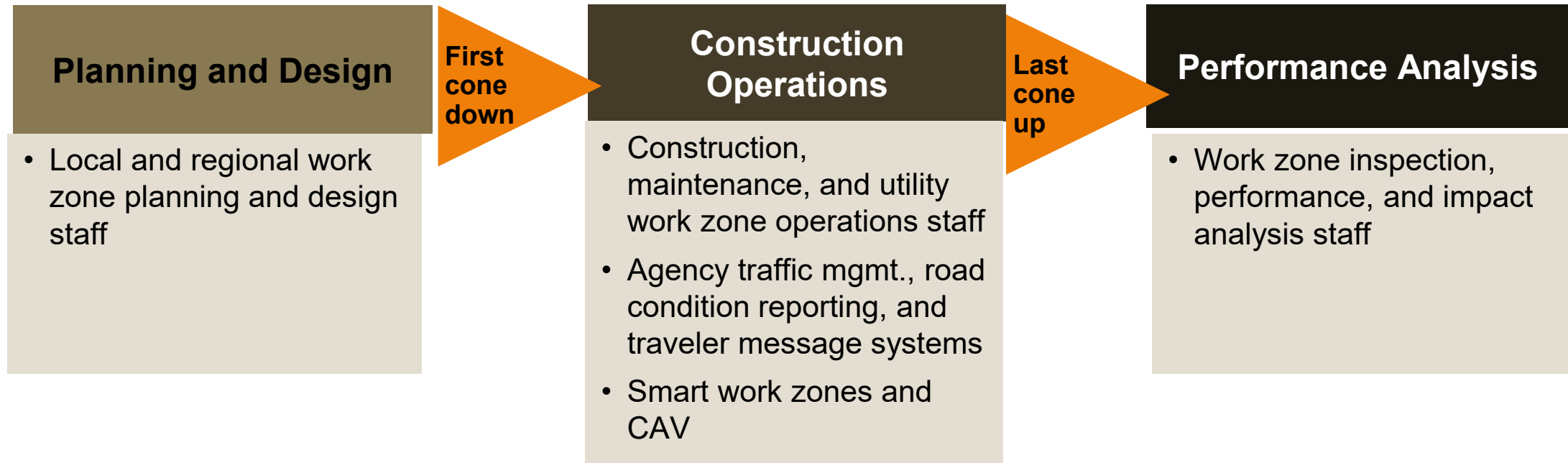
Work zone event data

- Work zones are dynamic
- Data describing them changes throughout work zone life cycle



Stakeholders

stakeholders are agency and non-agency individuals and groups who produce, maintain, or use work zone data



Consumers

- Law enforcement
- ATMS operator
- ITS, DMS, traveler info systems
- Agency congestion and performance manager
- Agency oversize/weight permitting

- 3rd party info providers
- Travelers
- CAVs
- Freight Haulers
- State and Fed transportation agencies

Collaborators


- Neighbor and regional partner agencies
- Utilities



Data uses (by category)

Based on stakeholder needs around data collection, storage, usage, and communication:

1. Work zone planning and project coordination
2. Work zone impact analyzes
3. Construction and maintenance contract monitoring
4. Real-time system management, traveler information provision
5. Safety and mobility performance measurement
6. Law enforcement and emergency service providers
7. Connected and automated vehicle hardware and system readiness

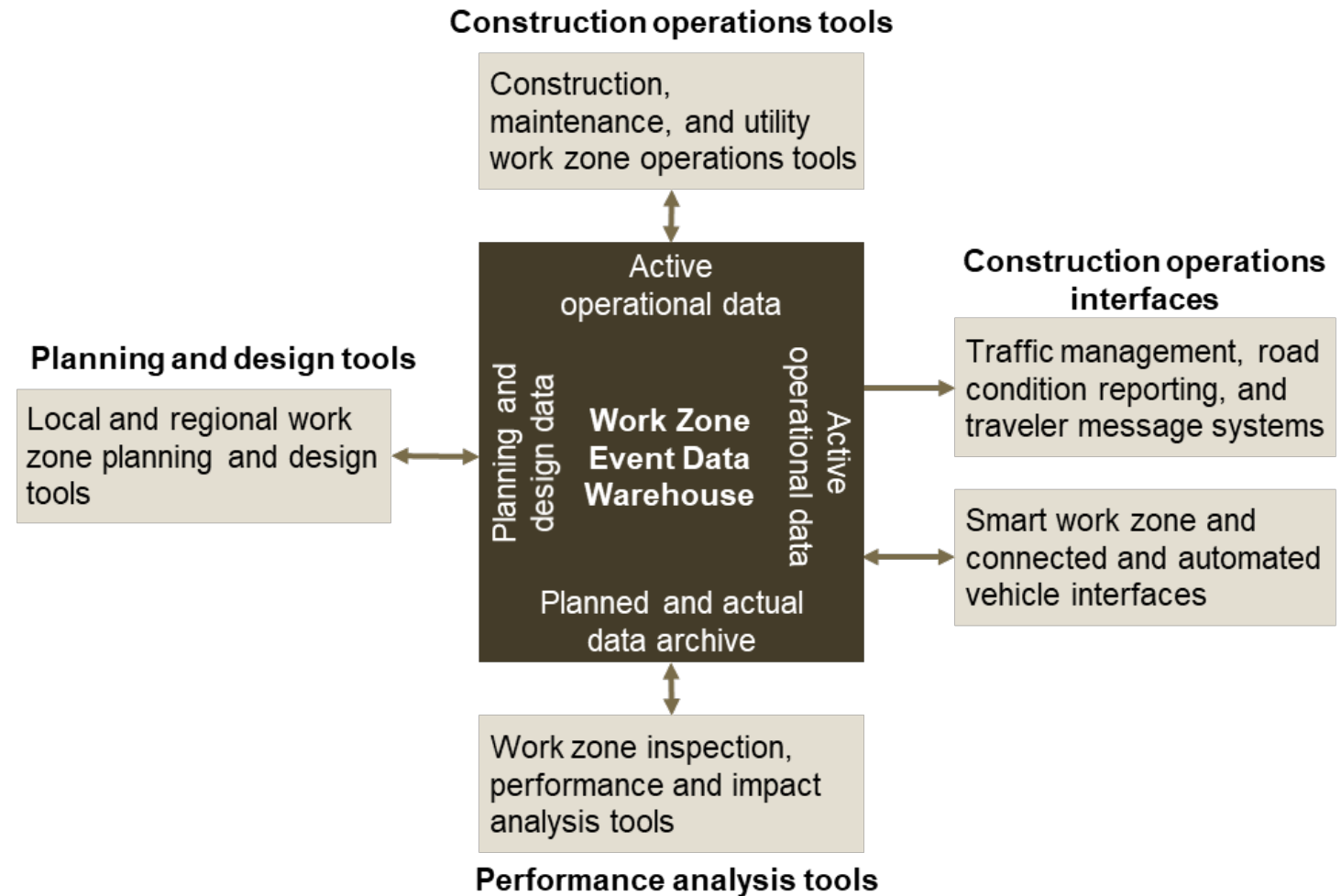


50 use cases
developed under
these seven
categories

Work zone data system structure

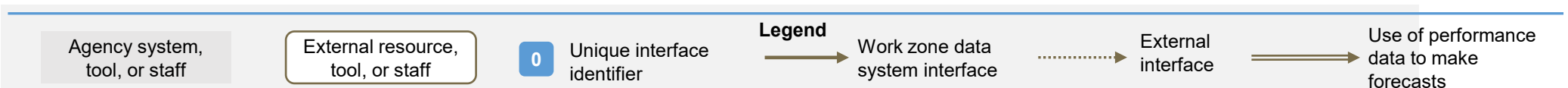
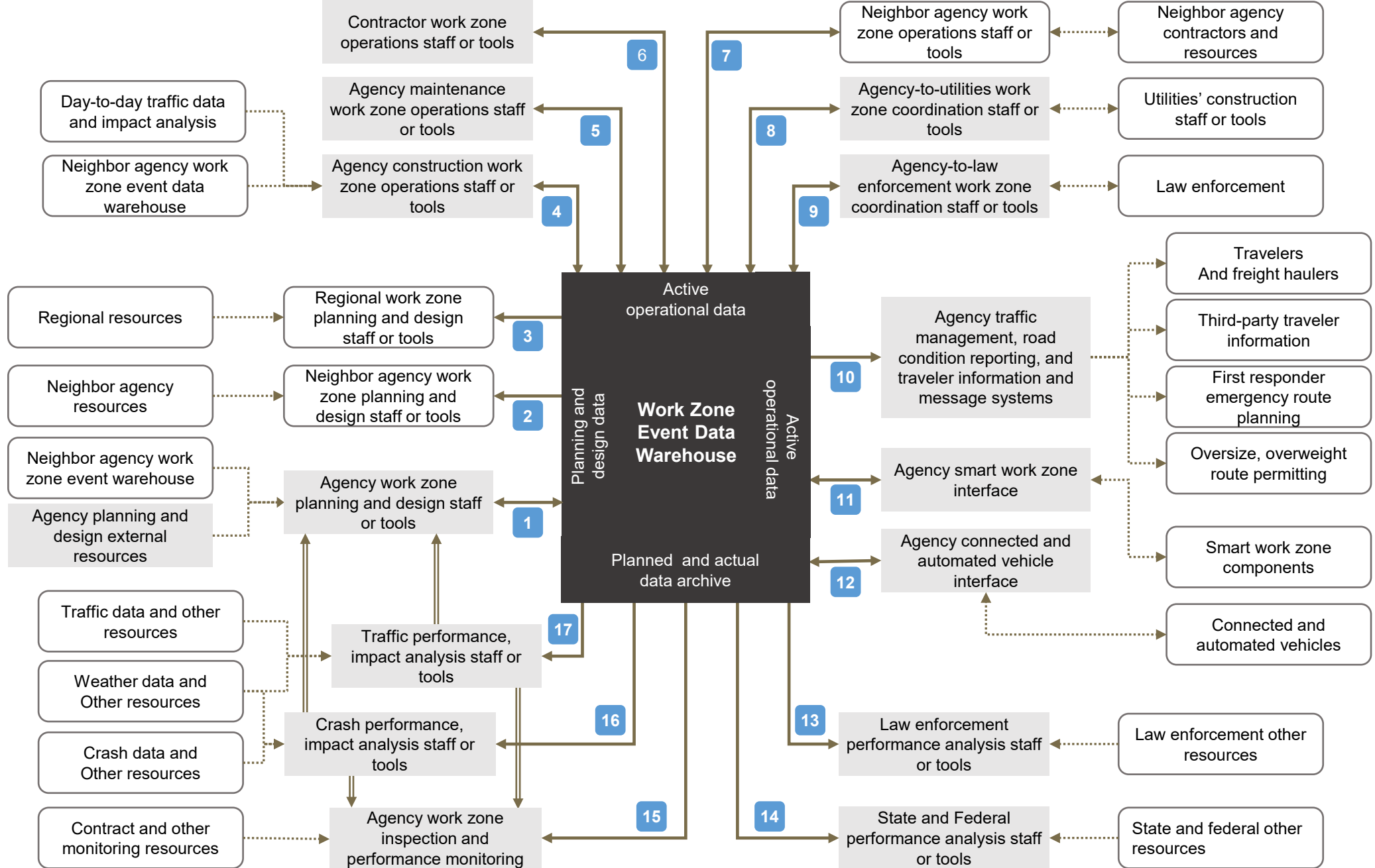
for communicating data clearly and consistently between stakeholders and data systems

- Based on stakeholders and use cases
- Includes entire work zone life cycle
- Focused on centralized data storage and mgmt.
- Stakeholders and tools interface with data warehouse to give and receive data as needed



WZDI Conceptual Architecture

Agencies can pick and choose what they do (don't need to do it all!)



WZDI resources

- Needs and Assessment Report (FHWA-HOP-20-018)
 - Describes state of the practice and user needs for existing and potential uses of work zone data
 - Covers work zone project life cycle
 - Based on discussions with over 60 public and private stakeholders across the country
- WZDI Framework (FHWA-HOP-20-019)
 - Concepts for structuring data and data systems to support agency needs
 - Identifies use cases and maps them to agency processes
 - Provides a “menu of resources” to pick from when creating data systems
- WZDI Data Dictionary (FHWA-HOP-20-020)
 - Specifies consistent data with respect to meaning and enumerated values
 - Serves as backlog of data elements to add to WZDx spec over time

The Work Zone Event Data Ecosystem



U.S. Department
of Transportation
**Federal Highway
Administration**

FHWA is working to improve work zone safety through new approaches to work zone data.

WZDI





FHWA's Work Zone Data Initiative provides a framework for communicating information on work zone activity across jurisdictional and organizational boundaries. Key elements include a data dictionary and supporting implementation documents.

WZDX
WORK ZONE DATA EXCHANGE

The Work Zone Data Exchange is a data specification that is:

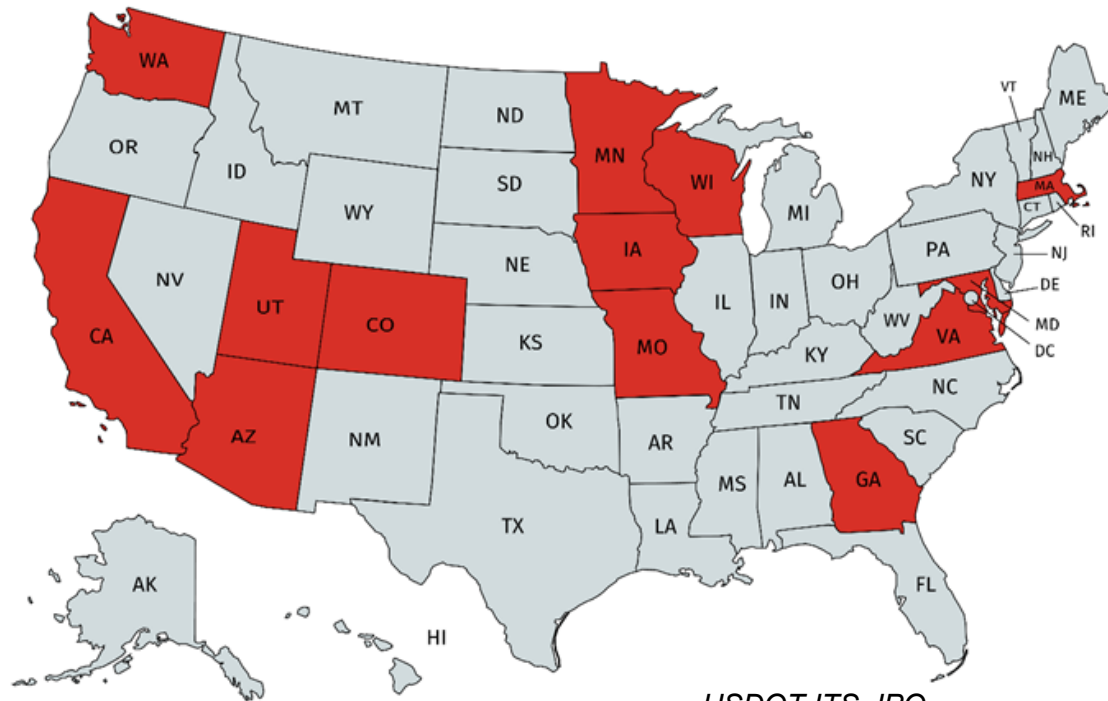
- Putting data on work zones into vehicles to help ADS and human drivers navigate more safely.
- Openly developed and free to use.
- Created to enable agencies to share harmonized work zone data for 3rd party use.

Work Zone Event Data is digital data on when, where, and how work zones are deployed, and includes:

-  Identification attributes
-  Location attributes
-  Time attributes
-  Impact attributes

Work Zone Data Exchange Demonstration Grants

USDOT offered a one-time grant opportunity in 2020 for public roadway operators such as state/local agencies to establish WZDx data feeds



USDOT ITS-JPO

Work Zone Data Exchange Grant Recipients:

- Maricopa County/Arizona DOT
- Metropolitan Transportation Commission (California – Bay Area)
- Colorado DOT
- Georgia DOT
- Iowa DOT
- Maryland State Highway Administration
- Massachusetts DOT
- Minnesota DOT
- St. Charles County (Missouri)
- Utah DOT
- Virginia DOT
- Washington State DOT
- Wisconsin DOT

Find more information at:

https://ops.fhwa.dot.gov/wz/wzdx/demonstration_grants.htm



Using WZDx to deliver work zone event data to vehicles

Nate Deshmukh Towery

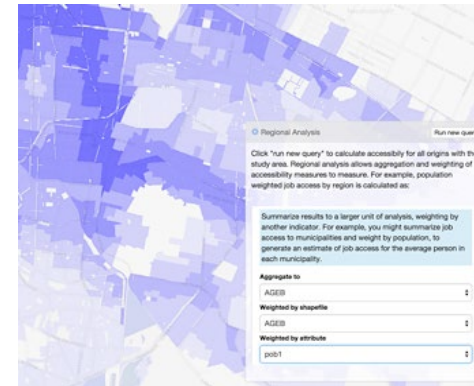
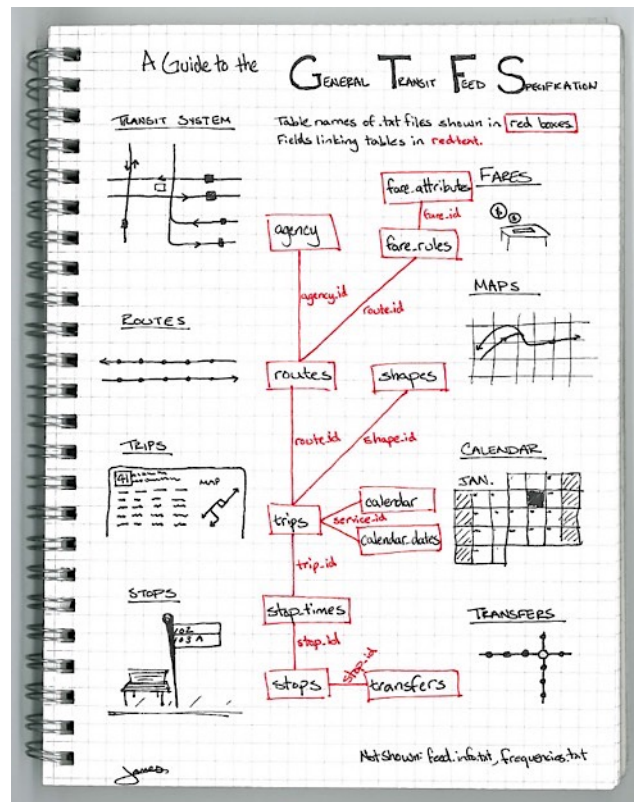
Volpe National Transportation Systems Center



What can we learn from the open transit data story?

A simple specification...

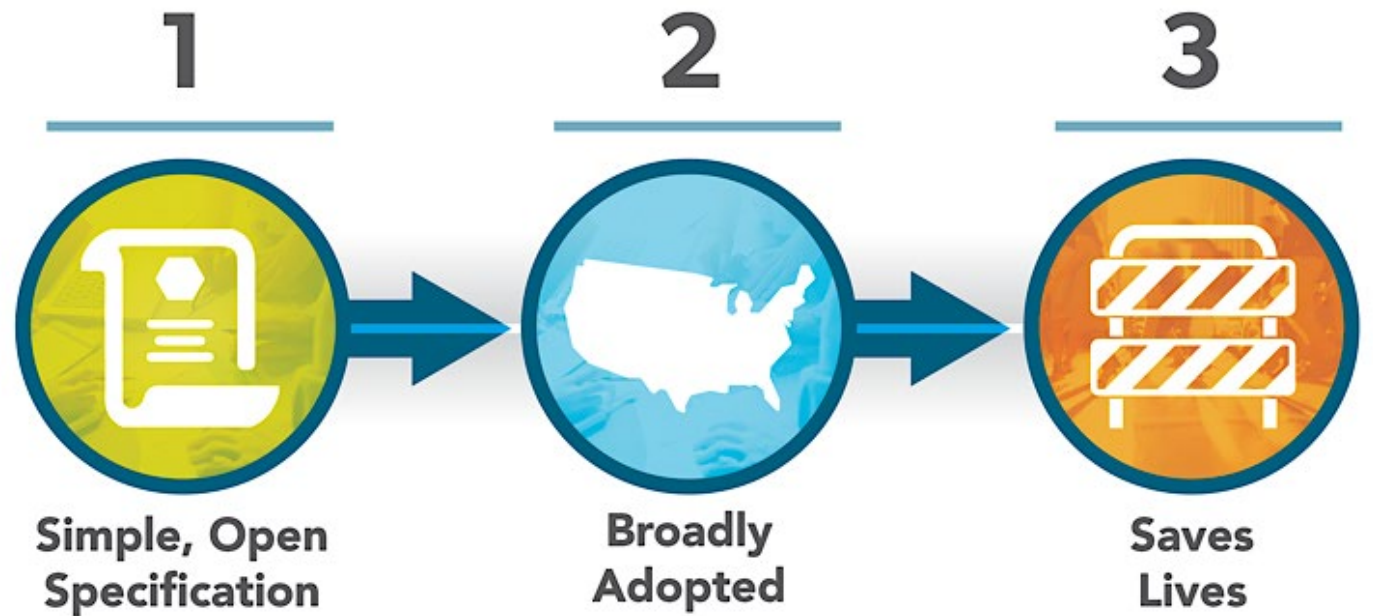
...with a wide range of uses



Line/Mode	Value
General Statistics	12 3
Line 1	3 6
Line 2	3 1
Line 3	3 1
Line 4	3 1
Line 5	3 1
Line 6	3 1
Line 7	3 1
Line 8	3 1
Line 9	3 1
Line 10	3 1
Line 11	3 1
Line 12	3 1
Line 13	3 1
Line 14	3 1
Line 15	3 1
Line 16	3 1
Line 17	3 1
Line 18	3 1
Line 19	3 1
Line 20	3 1
Line 21	3 1
Line 22	3 1
Line 23	3 1
Line 24	3 1
Line 25	3 1
Line 26	3 1
Line 27	3 1
Line 28	3 1
Line 29	3 1
Line 30	3 1
Line 31	3 1
Line 32	3 1
Line 33	3 1
Line 34	3 1
Line 35	3 1
Line 36	3 1
Line 37	3 1
Line 38	3 1
Line 39	3 1
Line 40	3 1
Line 41	3 1
Line 42	3 1
Line 43	3 1
Line 44	3 1
Line 45	3 1
Line 46	3 1
Line 47	3 1
Line 48	3 1
Line 49	3 1
Line 50	3 1



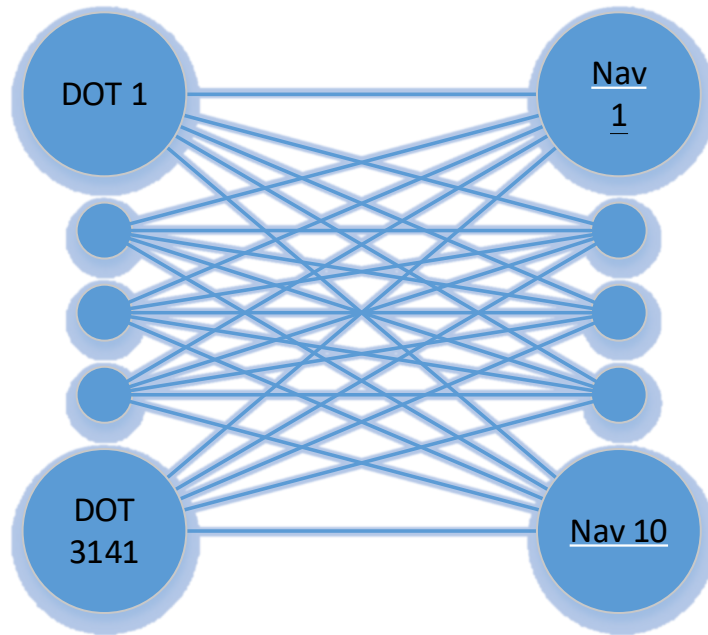
The Work Zone Data Exchange (WZDx)



USDOT ITS-JPO

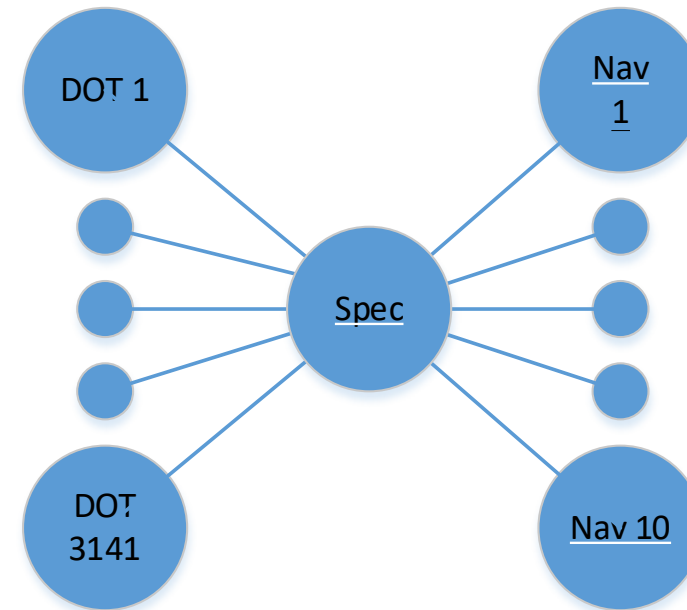
The Power of Data Standardization

Without a standard



31,410 translations

With a standard



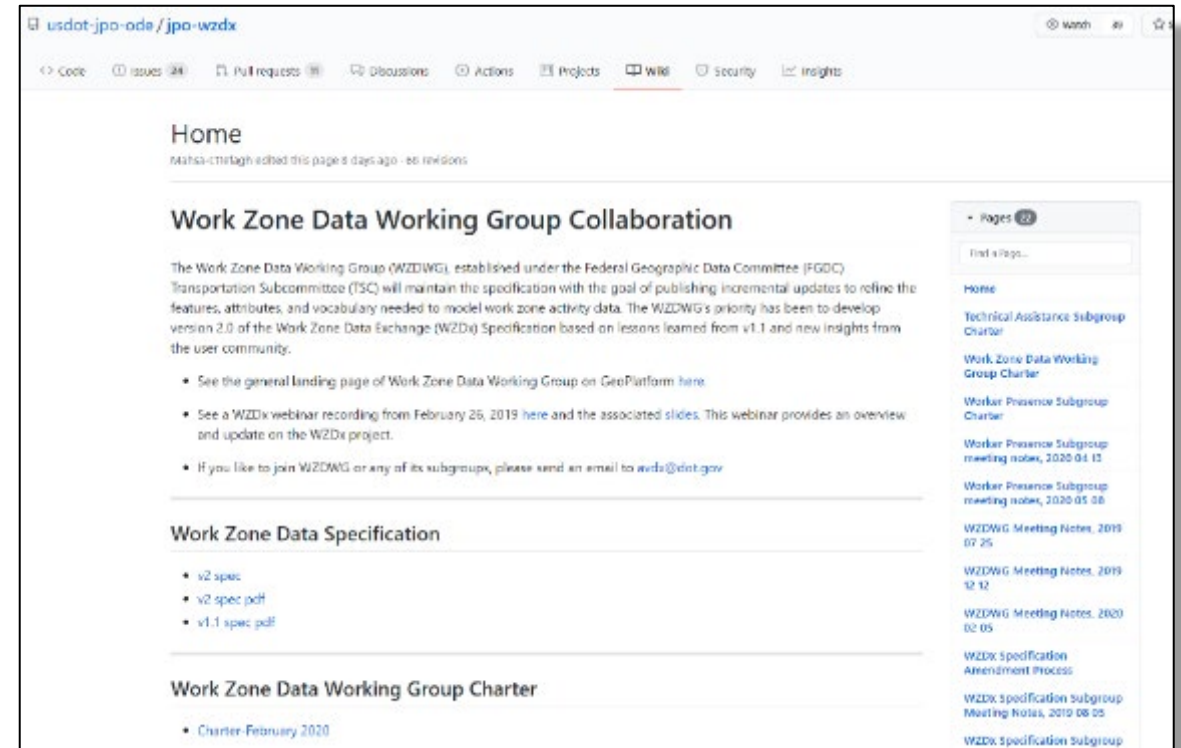
3,151 translations

USDOT - BTS

Work Zone Data Working Group

WZDWG objectives:

- Maintain the WZDx Specification
- Groom the backlog of potential future changes and sources of technical input
- Use open development methods to foster community involvement and support
- Identify and promote best practices for creating, publishing, consuming, mapping, and analyzing work zone activity data and the WZDx Specification



<https://github.com/usdot-jpo-ode/wzdx>

- WZDWG documents and meeting notes shared via [GitHub Wiki](#) page

Work Zone Data Working Group (cont.)

In January 2020, the WZDWG chartered three subgroups:

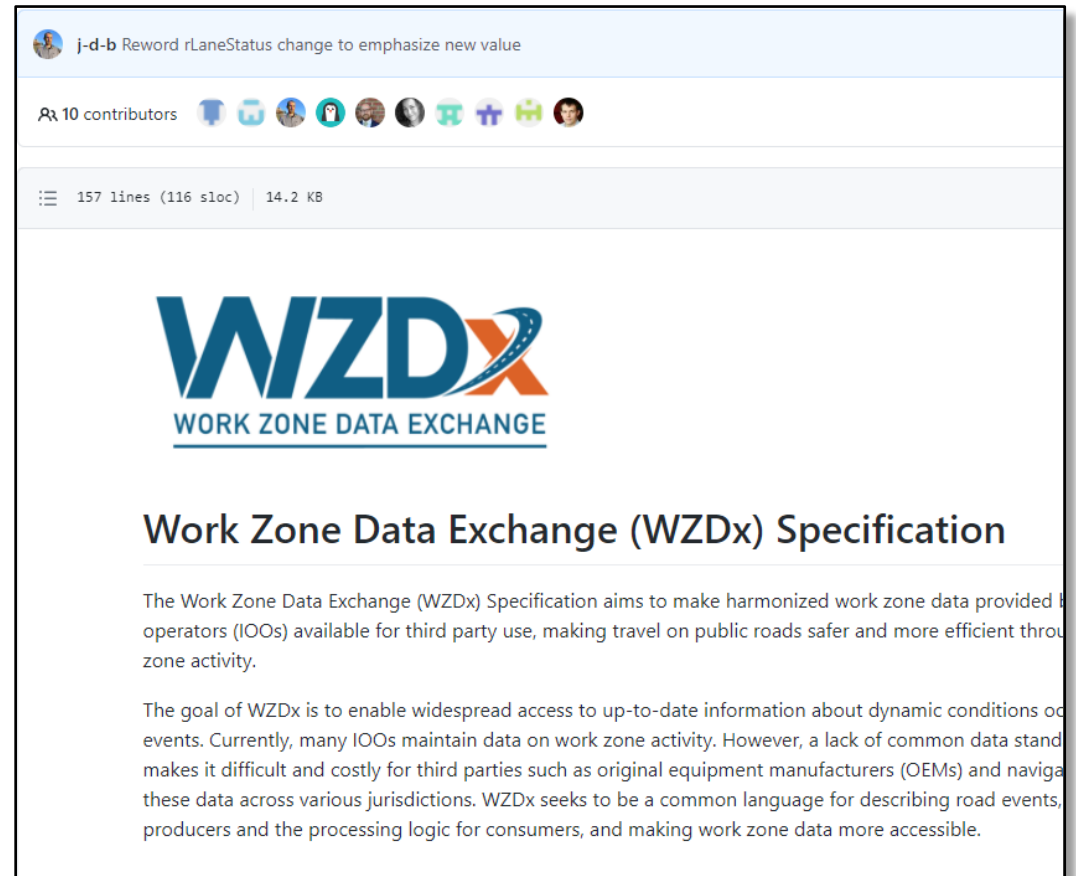
- **Specification Update Subgroup** to update the WZDx specification
- **Worker Presence Subgroup** to promote the inclusion of real-time information on the presence of workers in work zones
- **Technical Assistance Subgroup** to identify best practices in implementing feeds

In April 2021, the WZDWG chartered two new subgroups:

- **Smart Work Zone Devices Subgroup** to extend the specification to include real-time data from SWZ devices
- **Specification Extension Subgroup** to identify and draft extensions to the WZDx specification beyond work zones

WZDx Specification v3.1

- Version 3.1 of the Work Zone Data Exchange (WZDx) Specification was released on [GitHub](#) in April 2021
- Changes in v3.1:
 - Streamlined how road names are communicated
 - Created guidance for implementing a work zone data feed
 - Refined approach for providing lane level detail
 - Added implementation examples for common work zones
- WZDx v3.1 is a stable release, backwards compatible with v3.0



<https://github.com/usdot-jpo-ode/wzdx>

WZDx Example Use Case: Truck Operator Notification of Upcoming Work Zone

- Maricopa County (AZ) and Drivewyze demonstrated using WZDx to send work zone alerts to truck drivers via electronic logging devices
- WZDx feeds can include detour routes around a work zone
- Maricopa County and Arizona DOT will expand the scope of their WZDx feed with a WZDx Demonstration grant in 2021



<https://api.mcdot-its.com/WZDx/Activity/Get>

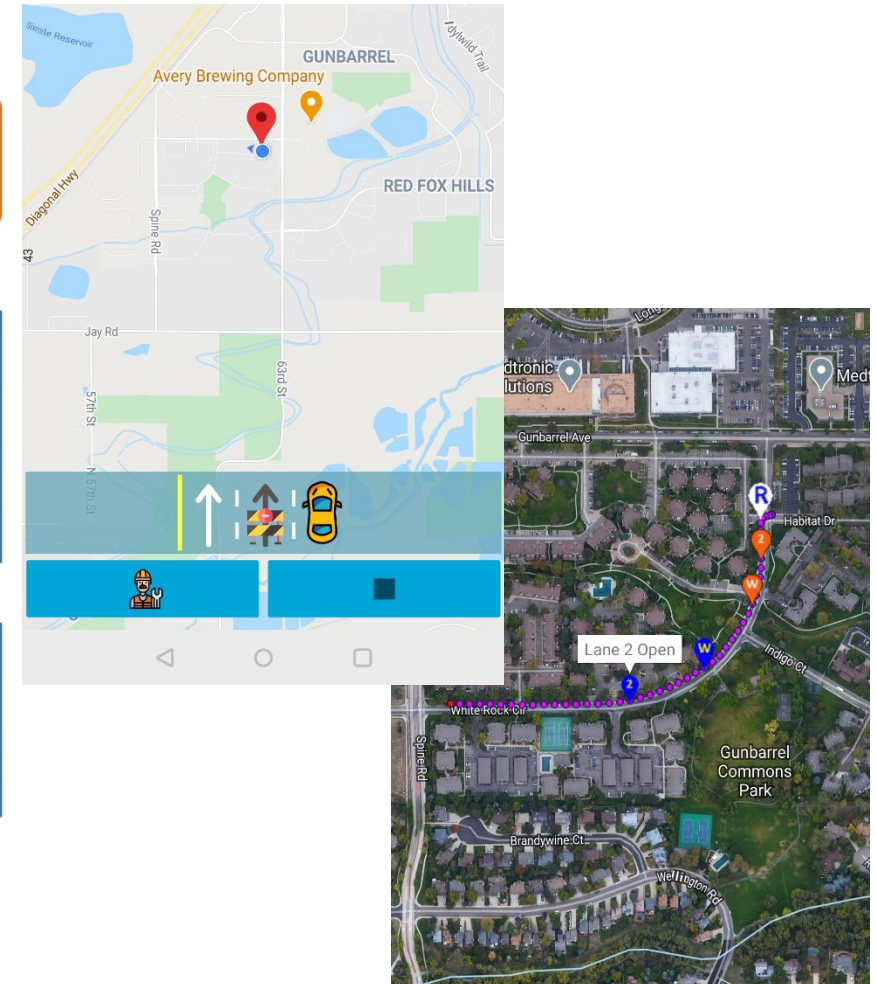
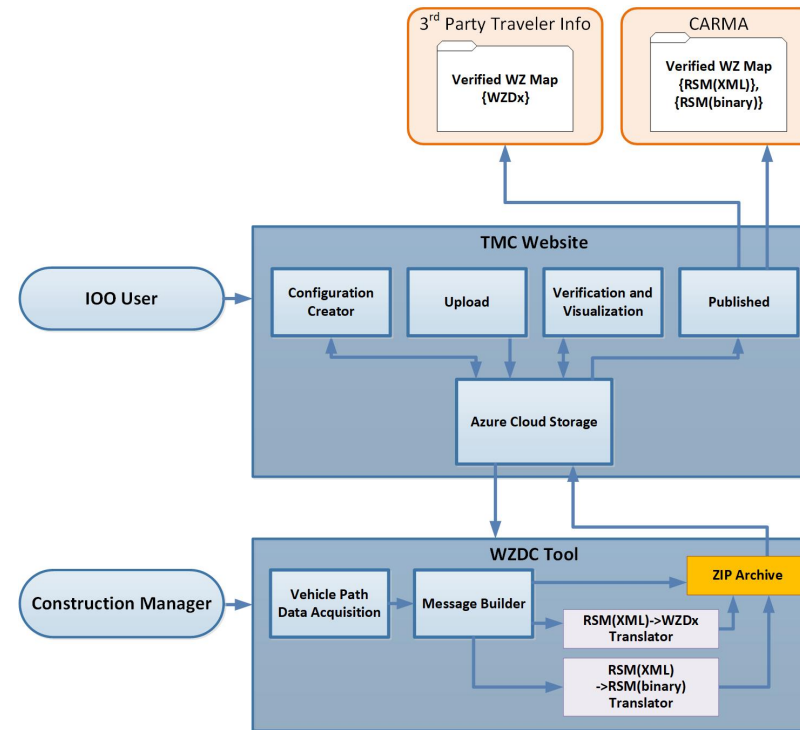


Source:
Maricopa County



WZDx Example Tool: Work Zone Data Collection Toolset

- Road owner enters basic information about work zone
- Construction site manager notes current state of road/work zone
- Received information is used to generate a WZDx feed with new geospatial details
- Repository available at https://github.com/TonyEnglish/Work_Zone_Data_Collection_Toolset



WZDx Feed Registry

- WZDx feeds are published and hosted by state/local roadway owners and operators
- USDOT is maintaining a directory of feeds so that data consumers can find an up-to-date list of active WZDx feeds
- Registered feeds will automatically be archived to ITS DataHub's raw data sandbox

The screenshot shows the Transportation.gov website header with the logo and "U.S. Department of Transportation". A "Menu" button is in the top right. The main heading is "Work Zone Data Exchange (WZDx) Feed Registry". Below it is a filter for "Roadways And Bridges". There are buttons for "View Data", "Visualize", "Export", and a more options menu. The main text describes the dataset as up-to-date metadata on Work Zone feeds registered with USDOT ITS DataHub, accessible via API or the ITS WorkZone Sandbox. It is dated "Updated February 27, 2020" and credits the "United States Department of Transportation Intelligent Transportation Systems Joint Program Office (JPO)".

<https://datahub.transportation.gov/Roadways-and-Bridges/Work-Zone-Data-Exchange-WZDx-Feed-Registry/69qe-yiui>

Adopting the WZDx specification in Wisconsin

Erin Schwark

Wisconsin DOT

Steven Parker

University of Wisconsin

Overview

- WisDOT Work Zone Program
- LCS 2.0
- WZDx Project
- Future

WisDOT Work Zone Program

- WisTransportal
 - Lane Closure System
 - Transportation Management Plans
 - Crashes
- Work Zone ITS
- Work Zone Safety Performance Measures
- Work Zone Policy, Standards and Specification Development



Wisconsin Traffic Operations and Safety Laboratory The WisTransPortal System

The WisTransPortal system serves the computing and data management needs of the [Wisconsin](#) archiving, real-time traffic information services, transportation operations applications, and t

Home > Web Applications

Home
Services
Products
Applications
Documents
Traffic Video
Resources

Web Applications

This page provides access to WisTransPortal systems and data organized by category.

Safety Data

- [Wisconsin Crash Data Analysis Tools](#)
Web-based query and analysis tools for Wisconsin police reported crash data and
- [Community Maps - TSC Crash Mapping](#)
Online crash map populated by county TSCs and local agencies. Based on Google

Work Zones

- [WisLCS Wisconsin Lane Closure System](#)
WisDOT lane and ramp closure request and acceptance system.
- [WisTMP Wisconsin TMP System](#)
WisDOT Transportation Management Plan (TMP) routing and approval system.

Current Wisconsin Lane Closure System

- Launched in 2008
- Supports scheduling, tracking, accepting and reporting of all estimated lane closures
- Provides data feeds to other systems
 - Wisconsin 511 Website
 - Wisconsin 511 Construction Projects Website
 - OSOW Superload Permitting System
- Data is currently archived at the TOPS Lab

LANE CLOSURE SYSTEM [Help](#) | [About](#) | [Contact](#) | [Exit WisLCS](#)

[Home](#) | [Request](#) | [Accept](#) | [Modify](#) | [Search](#) | [Reports](#) | [511 Local](#) | [Calendar](#) | [Email](#) | [Preferences](#) | [Admin](#)

Search

*Closure Status
 ALL
 ENTERED
 ACCEPTED
 CANCELED
 COMPLETED

Delay Information
 ?

*Closure Type
 ALL
 CONSTRUCTION
 BOTH
 LOCAL PROGRAM
 NOT LOCAL PROGRAM
 MAINTENANCE
 PERMIT
 EMERGENCY
 SPECIAL EVENT

*Region/County
 ALL
 Hwy

Date Range From
 04/10/2020 ?

Date Range To

Project ID

Closure ID

Above entries override ALL other search selections. ?

Order By
 BEGIN DATE Ascending

Results Per Page
 100

[Expand ALL](#) | [Printable ALL](#) | [CSV ALL: Summary](#) | | [LCS Map](#) | * 496 Closure Results Match Search Criteria

Show Search Details

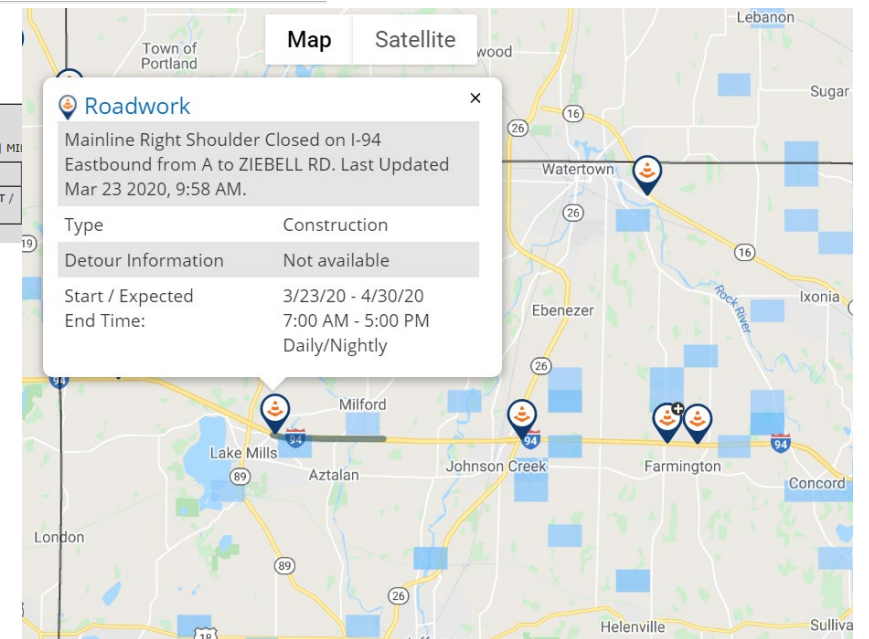
CLOSURE STATUS COLOR KEY:
 RED - Closure yet to be accepted and past start date
 ORANGE - Closure yet to be accepted and within 1 week of start date
 VIOLET - Long term closures yet to be completed and past end date
 BLACK - Closure has been accepted or is within normal parameters

[Expand](#) | [Printable](#) | [CSV](#) | [Capacity](#) | [Calendar](#) | [MakeLike](#)

RACINE: (1030-20-84) N-S Freeway | S Mke Rdwy / Mainline | Ih 94 Milwaukee County | MI

ID	HWY	FACILITY	DESCRIPTION
1	I-41 SB/I-94 EB/US 41 SB	RAMP	FULL CLOSURE at ON RAMP FROM S 27TH ST / WIS 241

Modified Date Modified By Status Applies To Comment



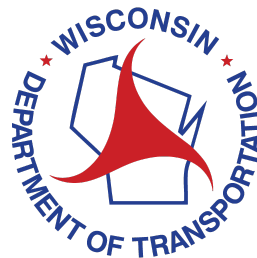
Images source:
Wisconsin DOT

Wisconsin Lane Closure System – 2.0

- Rollout March 2022
- Objectives
 - Incorporate lessons learned
 - Streamline existing work flows
 - Improve interoperability with external systems
 - Improve data quality and timeliness
 - Support for modern platforms
 - Update the 10-year old software platform
- Incorporate Work Zone Data Dictionary

WZDx Project

- Building on existing investments to publish a new WZDx-compliant data feed
- Create a program template that other agencies may follow in establishing their own WZDx data feeds
- Demonstrate a flow process to transform estimated to verified lane closure information from Smart Work Zone ITS Devices
- Work with both internal and external Stakeholders

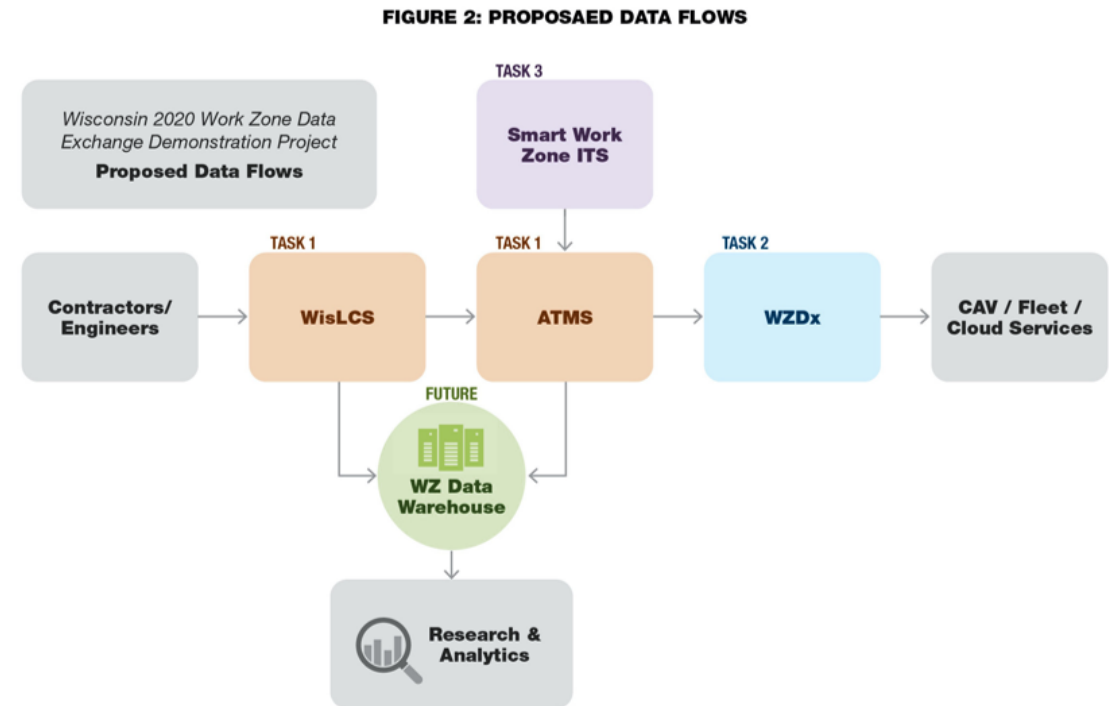


Stakeholders

- Collaborative effort between many:
 - UW TOPS Lab
 - IBI Group
 - County Highway Maintenance
 - Improvement Program – construction LET projects
 - Contractors and Project Staff
 - WisDOT Staff

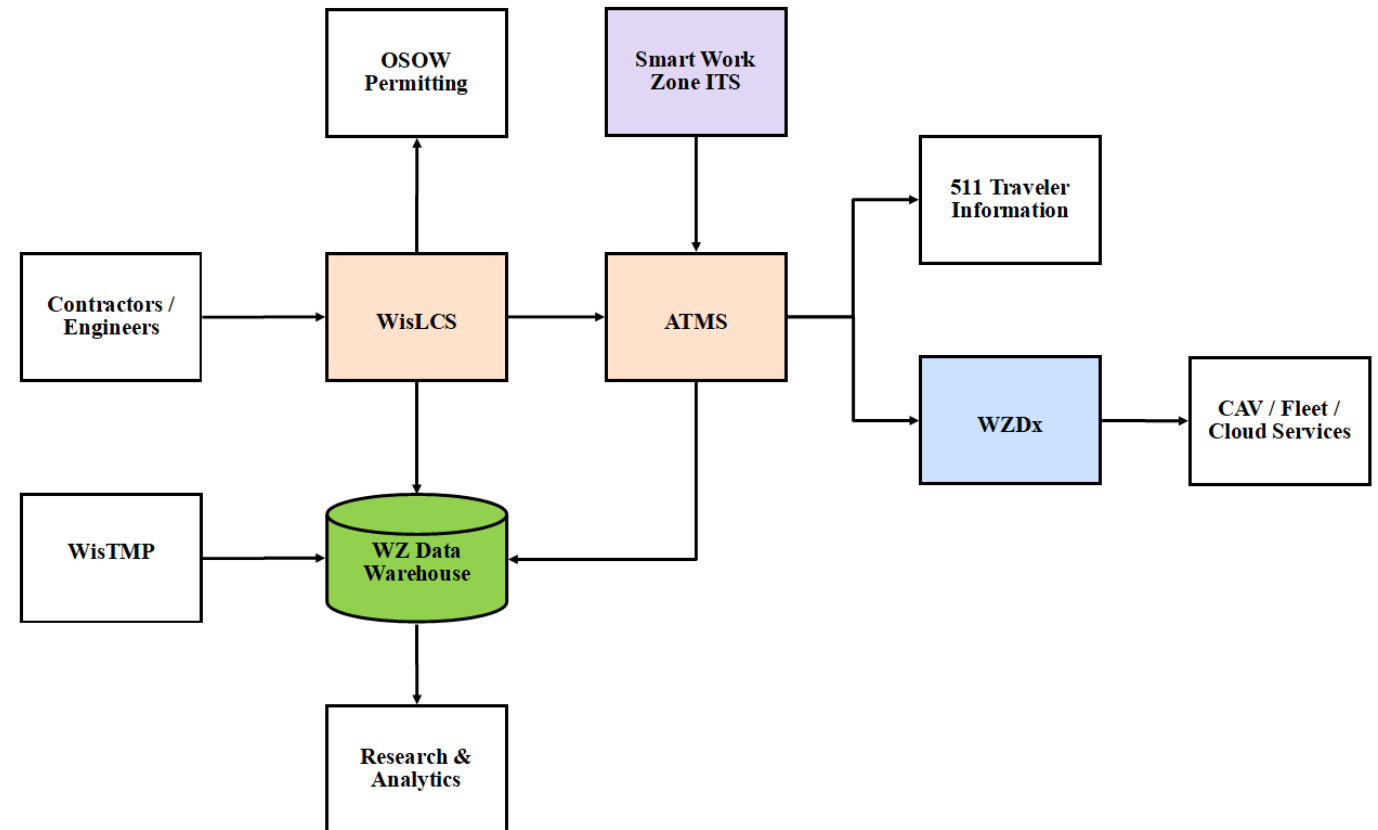
Project Work Plan

1. Develop an internal WZED data service between the WisLCS and ATMS
2. Provide a public facing WZDx compliant data feed as a component of the ATMS, and
3. Incorporate field verified WZED from Smart Work Zone ITS deployments.



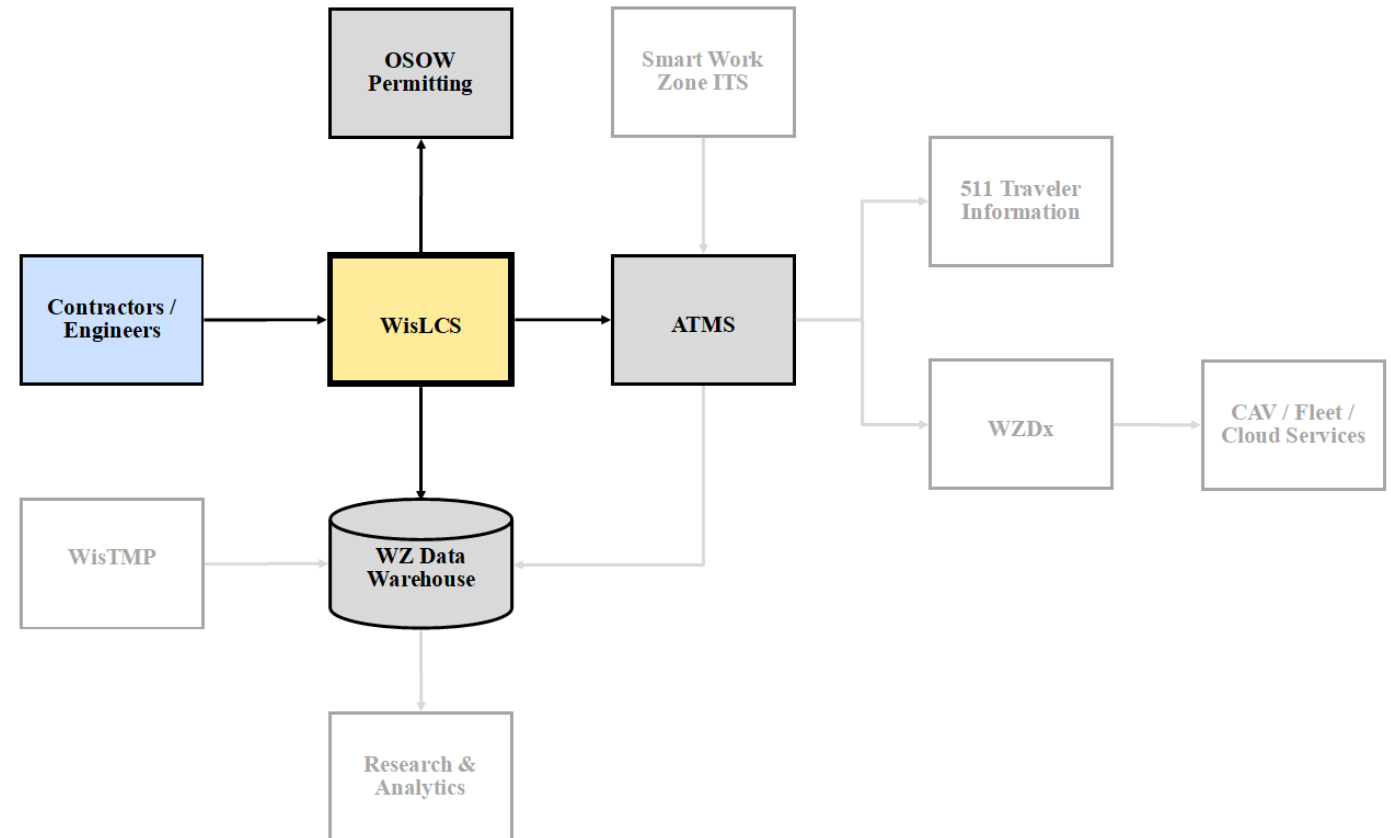
System Architecture – Design Principles

- Build on Existing Systems
 - Improve Interoperability
 - Enhance TMC Capabilities
- Service Oriented Architecture
 - Separation of Concerns
 - Extensible Design
- Data Harmonization
 - Modernize WZED Elements and Defi
 - Align to FHWA WZDI
- WZ Data Management
 - Separate Analytics from the Operatio
 - Broader Set of Use Cases



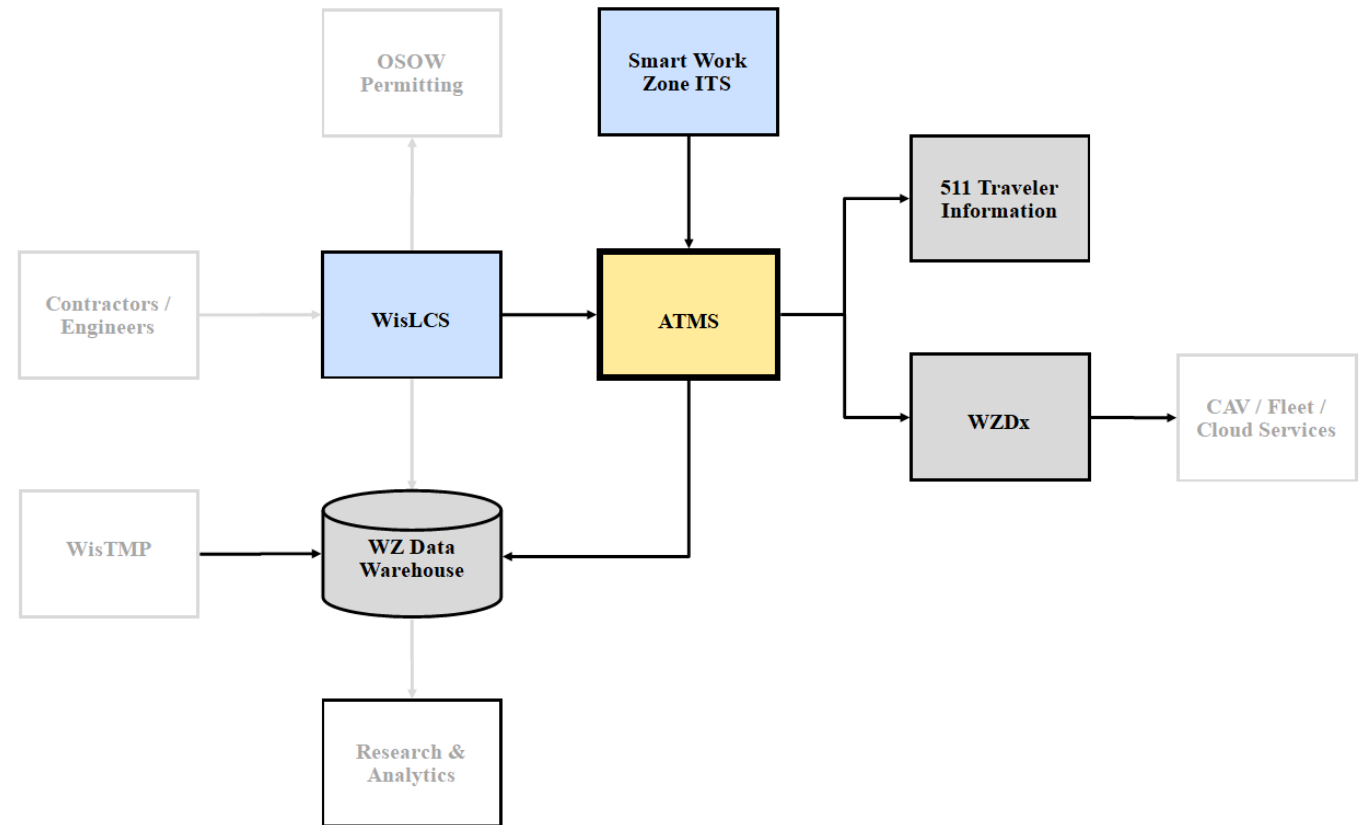
System Architecture – Key Components

- **Wisconsin Lane Closure System**
 - Scheduling and Acceptance
 - Traveler Information
 - OSOW Restrictions
 - Estimated Data
- WisDOT TMC ATMS
 - Statewide Traffic Management
 - Real-Time Data Sharing
 - ITS Device Integration
 - Verified Data
- Work Zone Data Warehouse
 - Research, Planning, Performance Me
 - Estimated + Verified Data



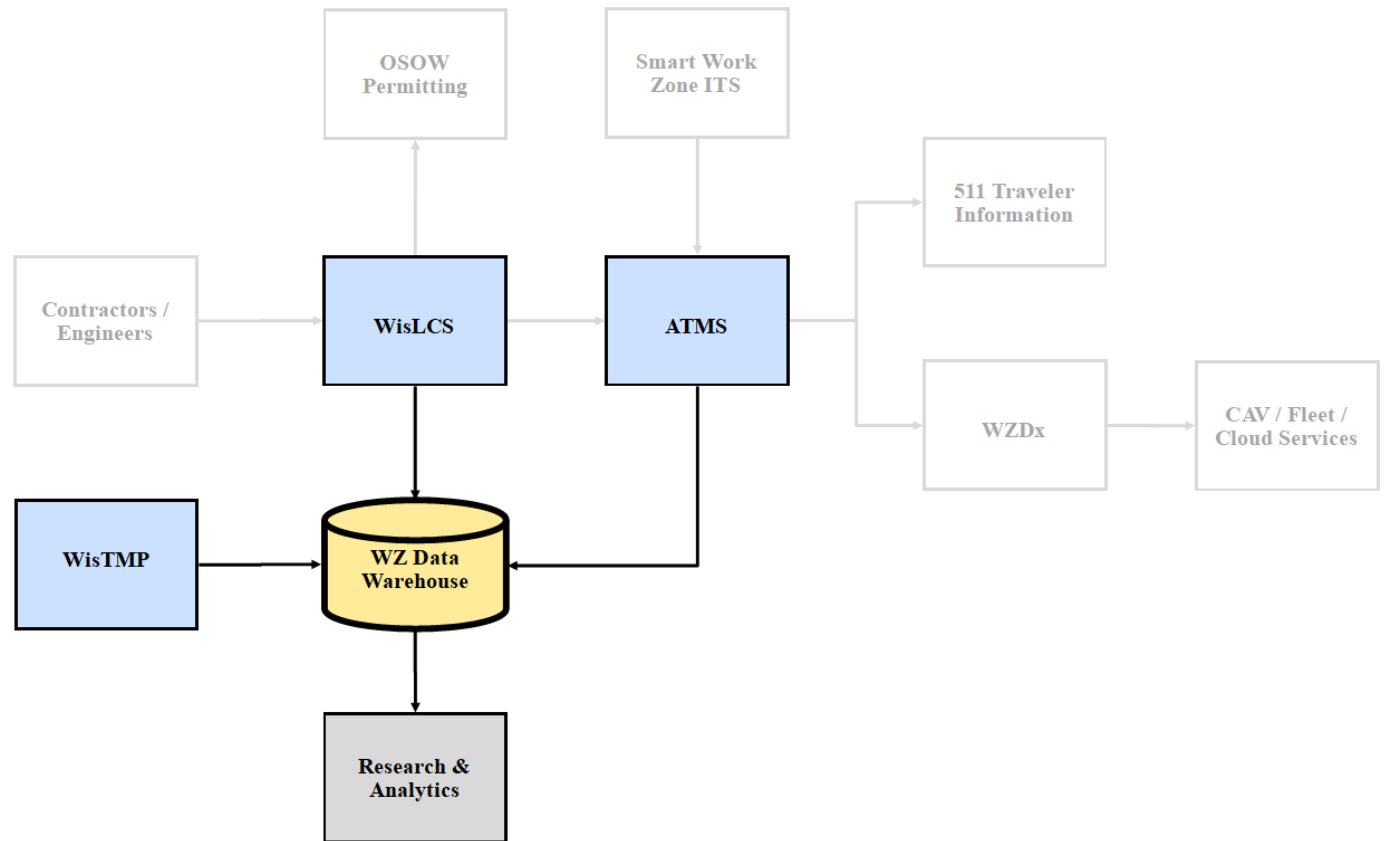
System Architecture – Key Components

- Wisconsin Lane Closure System
 - Scheduling and Acceptance
 - Traveler Information
 - OSOW Restrictions
 - Estimated Data
- **WisDOT ATMS**
 - **Statewide Traffic Management**
 - **Real-Time Data Sharing**
 - **ITS Device Integration**
 - **Verified Data**
- Work Zone Data Warehouse
 - Research, Planning, Performance
 - Estimated + Verified Data

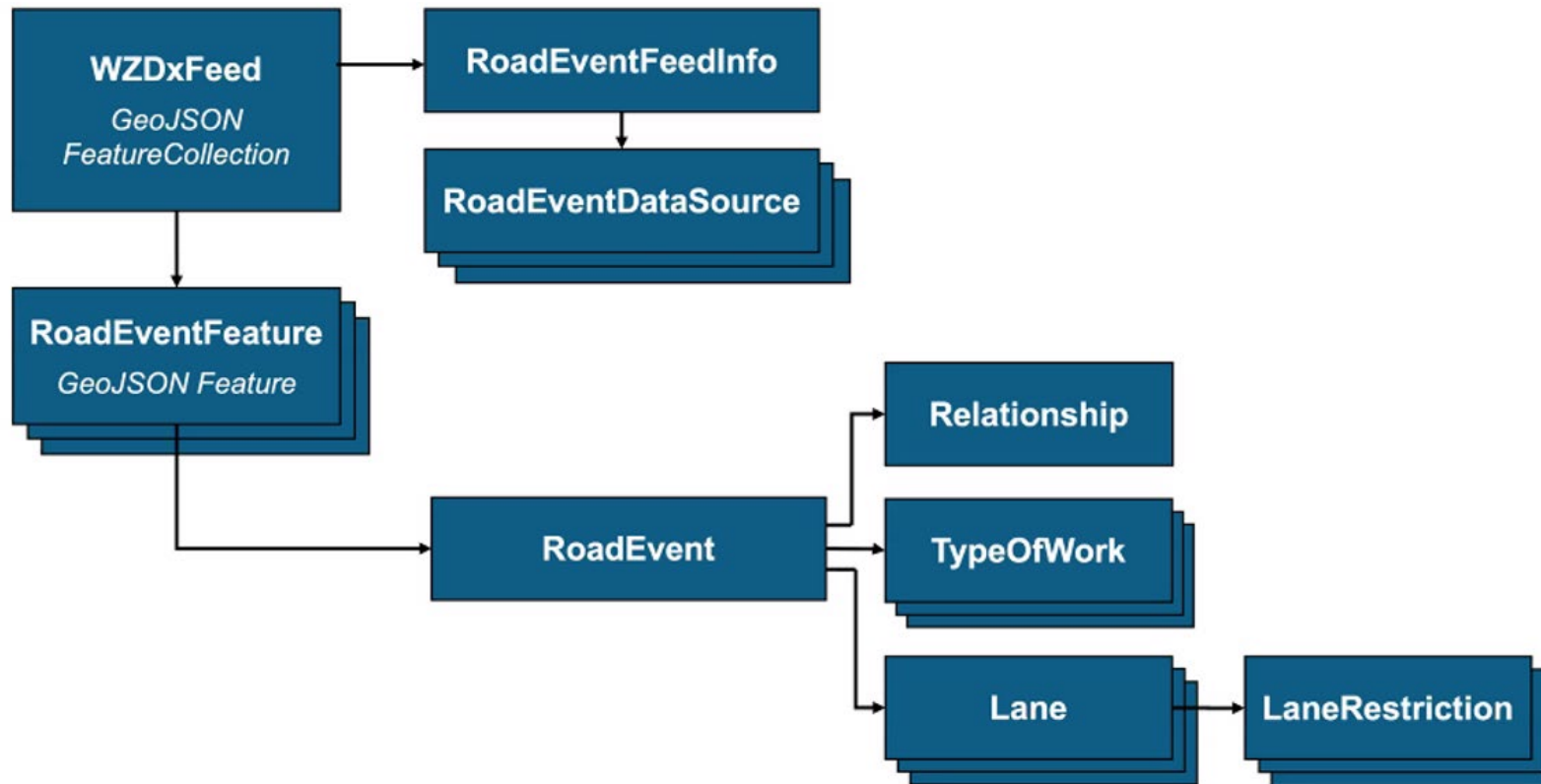


System Architecture – Key Components

- Wisconsin Lane Closure System
 - Scheduling and Acceptance
 - Traveler Information
 - OSOW Restrictions
 - Estimated Data
- WisDOT TMC ATMS
 - Statewide Traffic Management
 - Real-Time Data Sharing
 - ITS Device Integration
 - Verified Data
- **Work Zone Data Warehouse**
 - **Research, Planning, Performance M**
 - **Estimated + Verified Data**



WZDx 3.1 Specification Object Model

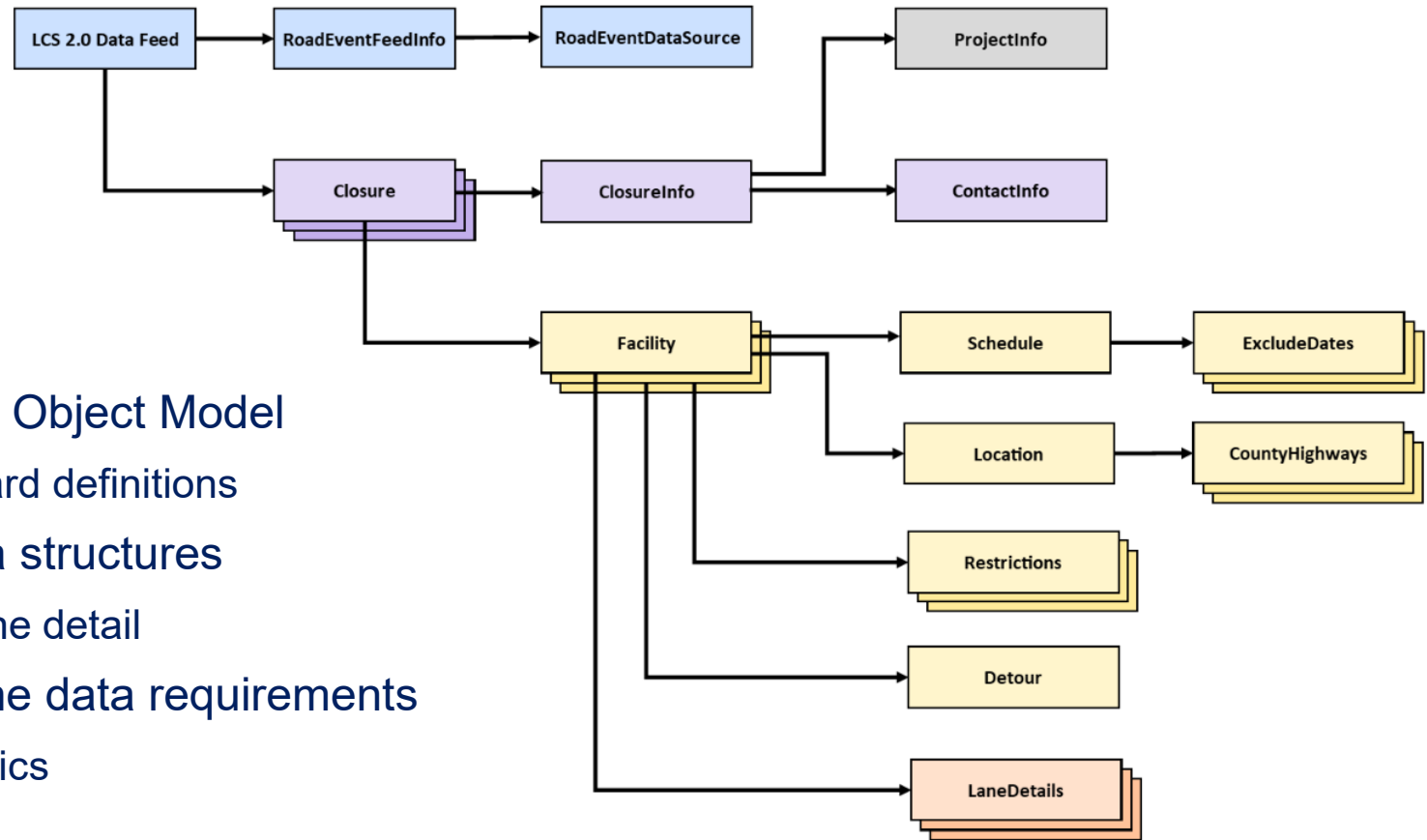


The WZDx Specification Object Model describes the high-level structure and content of a WZDx GeoJSON document.

Wisconsin Work Zone Data Model

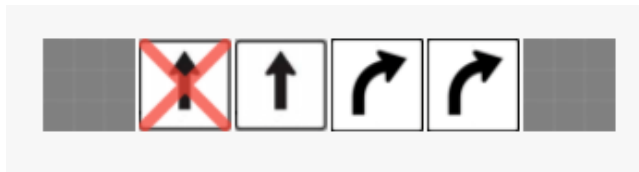
- Design Constraints:

- Compatibility with WZDx 3.1 Object Model
 - Required elements, standard definitions
- Retain existing WisLCS data structures
 - Project, closure, facility, lane detail
- Broader Wisconsin work zone data requirements
 - ATMS, OSOW, 511, Analytics

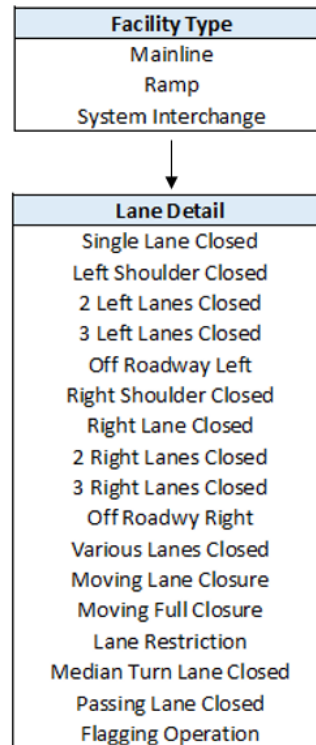


Data Improvements – Lane Details

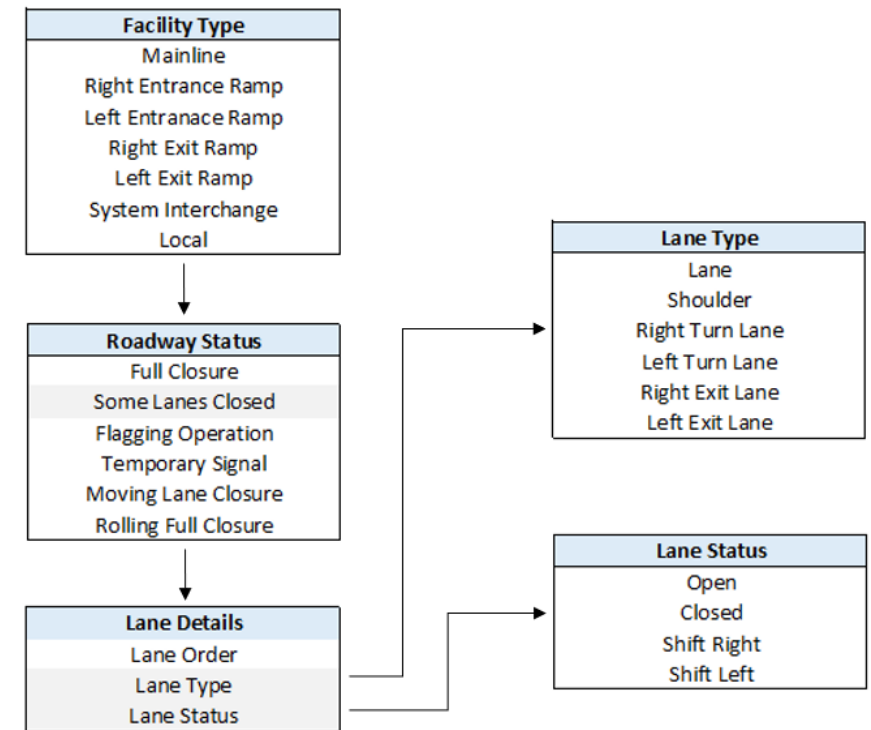
- WZDx 3.1 Lane-Level Precision with Flexible Adoption
- 1-1 Translations from WisLCS 2.0 to WZDx 3.1
- Richer Set of Localized Elements for Wisconsin
- Easy to Use UI Tools



WisLCS 1.0 (2008)

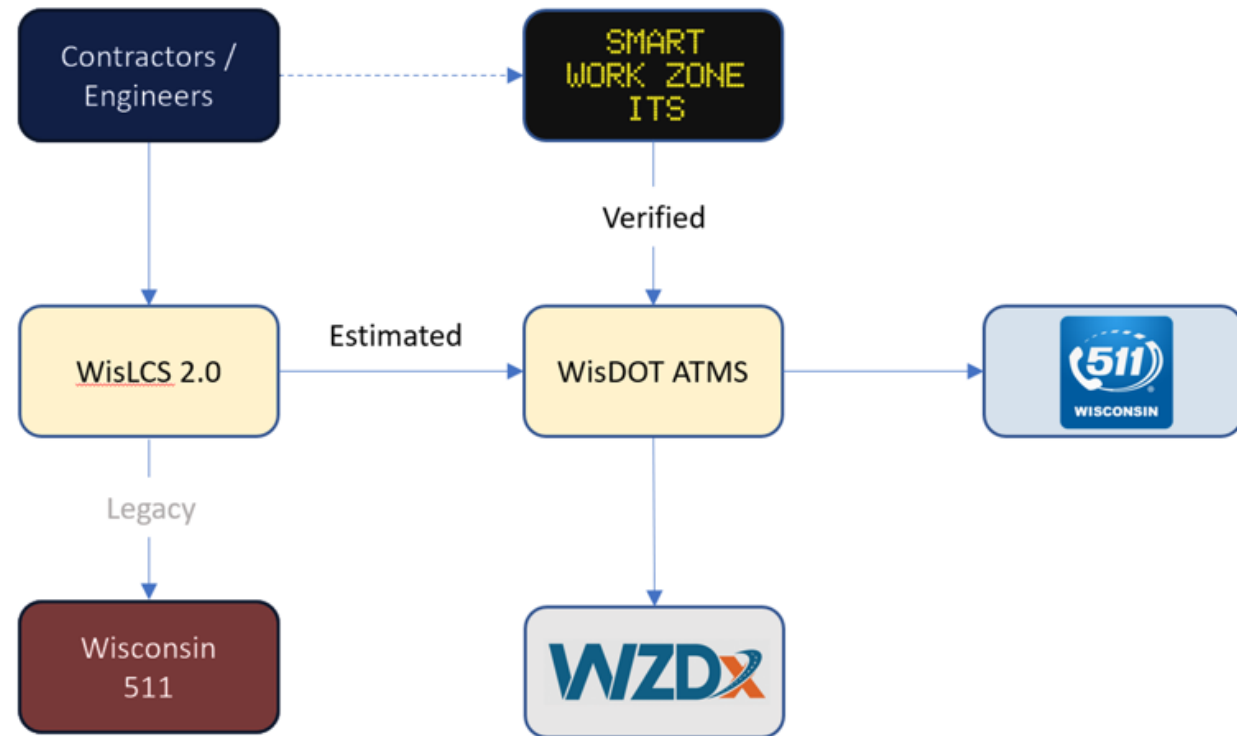


WisLCS 2.0 (2022)



Data Improvements –Time & Spatial Verification

- Road Event Accuracy Values
 - Estimated
 - Verified
- Time Verification
 - Start Date Accuracy
 - End Date Accuracy
- Spatial Verification
 - Beginning Accuracy
 - Ending Accuracy
- Wisconsin Prototype
 - Scalable with Additional ITS
 - Device IDs Entered into LCS



Data Improvements – Work Zone Mapping

- Location Improvements
 - Geo-Coordinates
 - Cumulative Mileages
 - Linear Referencing
 - Roadway Geometry
- WZDx Road Events
 - Road Event Geometry
 - LineString / MultiPoint
- Traffic Management
 - ATMS Event Plans
- Performance Measures
 - WZ Safety - Exposure
 - Work Zone Lane Miles

Add Location

Facility Type: Mainline

Begin County: DANE ✓

End County: DANE ✓

Highway: US 12 EB

Begin Landmark: MILE MARKER 257.0

Distance From: 0.02 miles

Direction From: Downstream

Latitude: 43.050175017

Longitude: -89.482190157

End Landmark:

Distance From: 0.0 miles

Direction From:

Latitude:

Confirm Cancel Reset

Select End Landmark:

- ON RAMP FROM FISH HATCHERY RD
- ON RAMP FROM COUNTY D
- MILE MARKER 261.2

delete Marker

Source: Wisconsin DOT

Future



Help us Put Work Zones On the Map

Martha Kapitanov

Federal Highway Administration



WORK ZONE DATA EXCHANGE



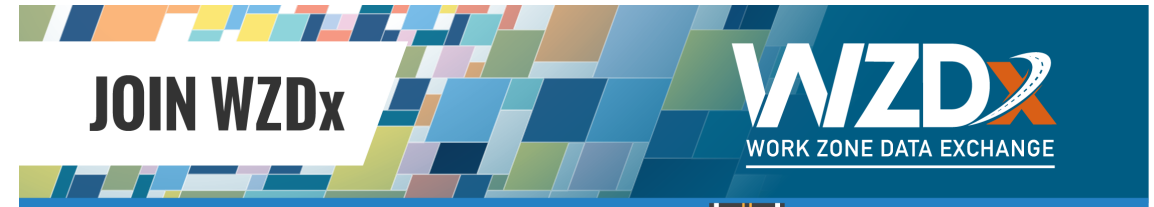
Put Work Zones on the Map is an awareness campaign to educate and engage current and potential partners on the capabilities, benefits, and progress of WZDx specification adoption.

- Goal: To increase voluntary adoption of the data specification.
- The focus of this campaign is on audiences who directly engage with work zones: infrastructure owner operators (IOOs), construction companies, mapping companies, and original equipment manufacturers (OEMs).



Put Work Zones on the Map will:

- Develop and distribute educational materials.
- Raise awareness for pilot projects.
- Increase involvement in the Work Zone Data Working Group.
- Generate excitement — to ultimately encourage and facilitate adoption of the WZDx specification.



Learn more and become involved
in the future of work zone management
<https://ops.fhwa.dot.gov/wz/wzdx/index.htm>

Sponsored by



U.S. Department of Transportation
Federal Highway Administration

Toolkit Resources:

Shareable Content

- Graphics
- Social media content
- Postcard
- Fact sheet-coming soon!

Educational Content

- Webinars

Social Media Toolkit:

- <https://ops.fhwa.dot.gov/wz/wzdx/toolkit/index.htm>



Source: FHWA

Partners Are Vital to the Success of WZDx

- Connect us with your communications staff/department
- Share materials, social media posts and graphics from our online toolkit
- Help direct people and organizations to our website to learn more
- Help us promote webinars and campaign news
- Collaborate on publicity efforts to generate awareness



More than 100 organizations involved.



Small Actions + Many Organizations = BIG Impact

Contacts

For more information on:

- **National Work Zone Awareness Week and Put Work Zones on the Map Campaigns:** Martha Kapitanov, martha.kapitanov@dot.gov
- **Work Zone Data Initiative:** Todd Peterson, todd.peterson@dot.gov
- **Work Zone Data Exchange:** Nate Deshmukh Towery, nate.deshmukh-towery@dot.gov
- **Wisconsin DOT:** Erin Schwark, erin.schwark@dot.wi.gov; Steven Parker, sparker@engr.wisc.edu

For more information on the WZDx project or anything else related to the Work Zone Data Working Group, contact AVDX@dot.gov.

Resources

To learn more and access available resources, please visit:

- [WZDx Version 3.1 Specification](#)
- [WZDx GitHub Wiki \(Day-to-Day Work Zone Data Working Group Activities\)](#)
- [WZDx Discussion Forum](#)
- [WZDx Technical Assistance Help Desk](#)
- [WZDx Data Feed Registry](#)
- [FHWA WZDI Data Dictionary and Framework](#)
- [Work Zone Data Collection Tool](#)
- [FHWA Work Zone Management](#)
- [National Work Zone Safety Information Clearinghouse](#)