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TRB TRANSPORTATION RESEARCH BOARD

TRB Webinar: Using Smart WorkZone Technologies to Improve Safety

February 7, 2023

11:30 – 1:00 PM

NOVEMBER 2022 UPDATE

PDH Certification Information

1.5 Professional Development Hours (PDH) – see follow-up email

You must attend the entire webinar.

Questions? Contact Beth Ewoldsen at TRBwebinar@nas.edu

The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Providers Program. Credit earned on completion of this program will be reported to RCEP. A certificate of completion will be issued to participants that have registered and attended the entire session. As such, it does not include content that may be deemed or construed to be an approval or endorsement by RCEP.

REGISTERED CONTINUING EDUCATION PROGRAM

AICP Credit Information

1.5 American Institute of Certified Planners Certification Maintenance Credits

You must attend the entire webinar

Log into the American Planning Association website to claim your credits

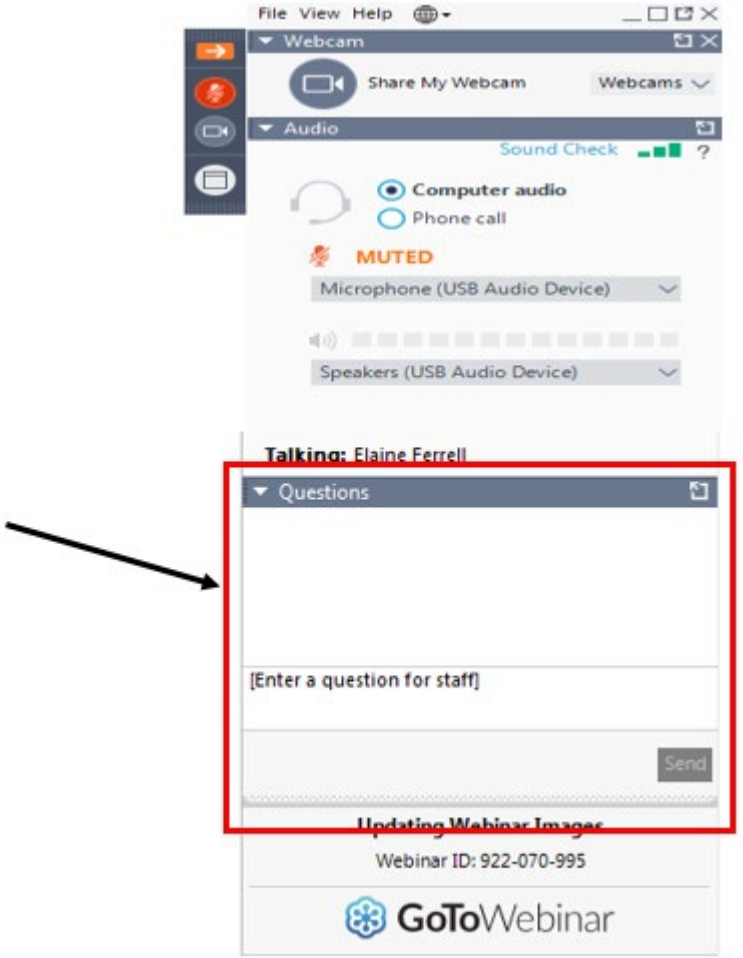
Contact AICP, not TRB, with questions

Learning Objectives

- Describe general DOT practices for smart work zone technologies
- Identify available tools to support implementation of smart work zone technologies
- Identify emerging smart work zone technologies

Questions and Answers

- Please type your questions into your webinar control panel
- We will read your questions out loud, and answer as many as time allows



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Overview of DOT Practices for Smart Work Zone Technologies

TRB Webinar
February 7, 2023

Henry Brown, P.E.
Research Engineer
Praveen Edara, Ph.D., P.E., P.T.O.E.
Professor
University of Missouri
NCHRP Synthesis Report 587 (2022)

(Courtesy of Minnesota DOT)

Have you ever wondered?

- How extensively do DOTs use smart work zone technologies?
- Do smart work zone technologies improve work zone safety?
- What are the latest smart work zone technologies?

Presentation Outline

- Introduction
- Guidance and evaluation studies
- DOT policies and standards
- DOT practices
- Conclusion

Motivation, Objective, and Methodology

Motivation

- Growth in implementation of smart work zone technologies
- Need greater understanding of DOT practices

Objective

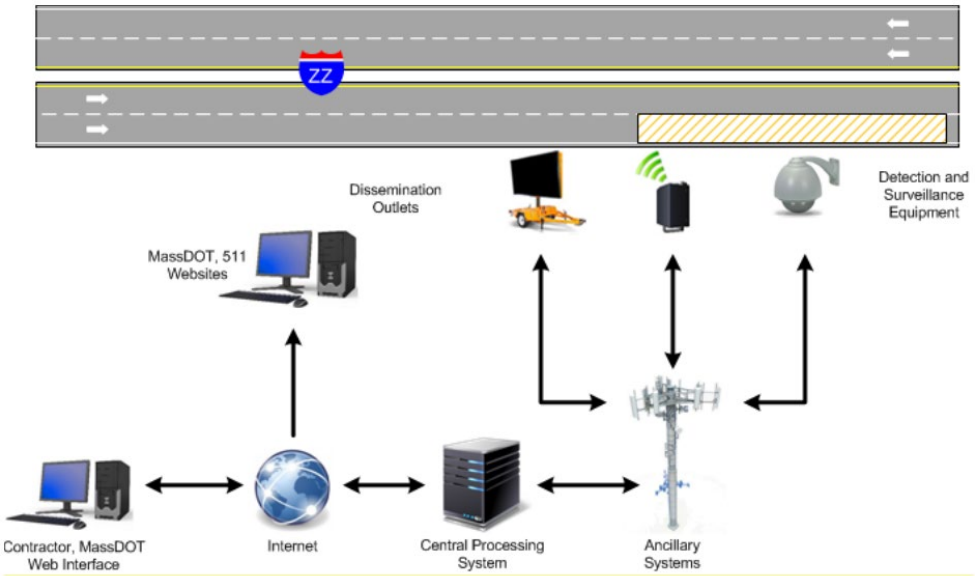
- Document DOT policies/procedures

Methodology

- Literature review
- DOT survey and case examples (interviews)

What are Smart Work Zone Technologies?

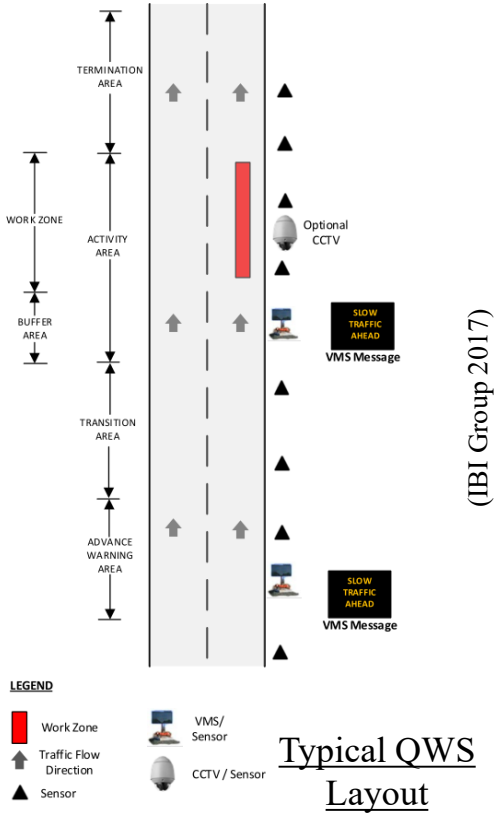
- Systems that use specialized components (e.g., sensors, communications, software, and electronic equipment) to manage traffic and operations and disseminate information to improve work zone safety and operations



(Massachusetts DOT 2016a)

Types of Smart Work Zone Technologies

- Traveler information systems (TIS)
- Queue warning systems (QWS)
- Dynamic lane merge systems
- Dynamic speed limit (variable speed limit) systems)
- Work zone data collection technologies
- Work zone location technologies
- Notification of construction equipment entering/exiting systems
- Other

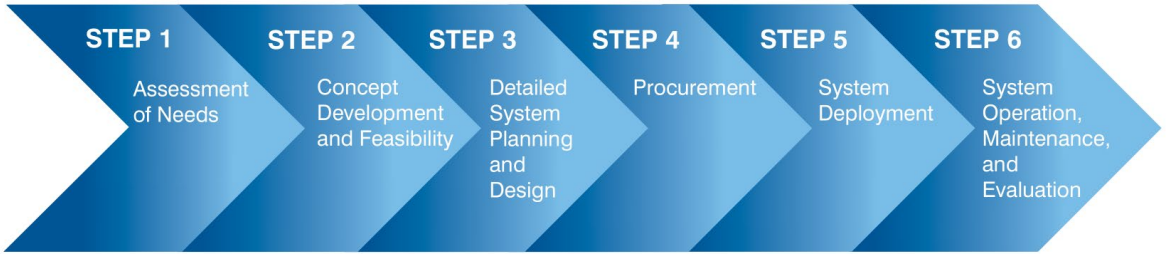


(IBI Group 2017)

Typical QWS Layout

General Resources for Smart Work Zone Technologies

- FHWA Work Zone ITS Implementation Guide and Tool (Ullman et al. 2014, Github 2020)
  - Key steps
  - Characteristics suitable for different technologies
- Framework to evaluate effectiveness (Edara et al. 2013a)
  - Five performance measures
  - Benefit-cost ratio 2.1:1 to 6.9:1



(Ullman et al. 2014)

Implementation Process for Smart Work Zone Technologies

DOT Resources for Smart Work Zone Technologies

- Toolboxes (e.g., New Hampshire DOT 2011)
- Scoring worksheets (e.g., Massachusetts DOT 2016b)
- Spreadsheet tools (e.g., Texas DOT 2020)
- Guides (e.g., IBI Group 2017 – Connecticut DOT)
- Standard operating procedures (e.g., Massachusetts DOT 2016a)
- Special provisions (e.g., Missouri DOT 2018)
- Typical applications (e.g., Minnesota DOT 2021)
- Standard drawings (e.g., Washington State DOT 2021)

Smart Work Zone
Go/No-Go Decision Tree - A criteria based tool for selecting Smart Work Zone Systems
Temporary Over-height Vehicle Warning System

Project Number:	
County:	
CSJ:	
Letting:	
Date Form Completed:	
Completed by:	

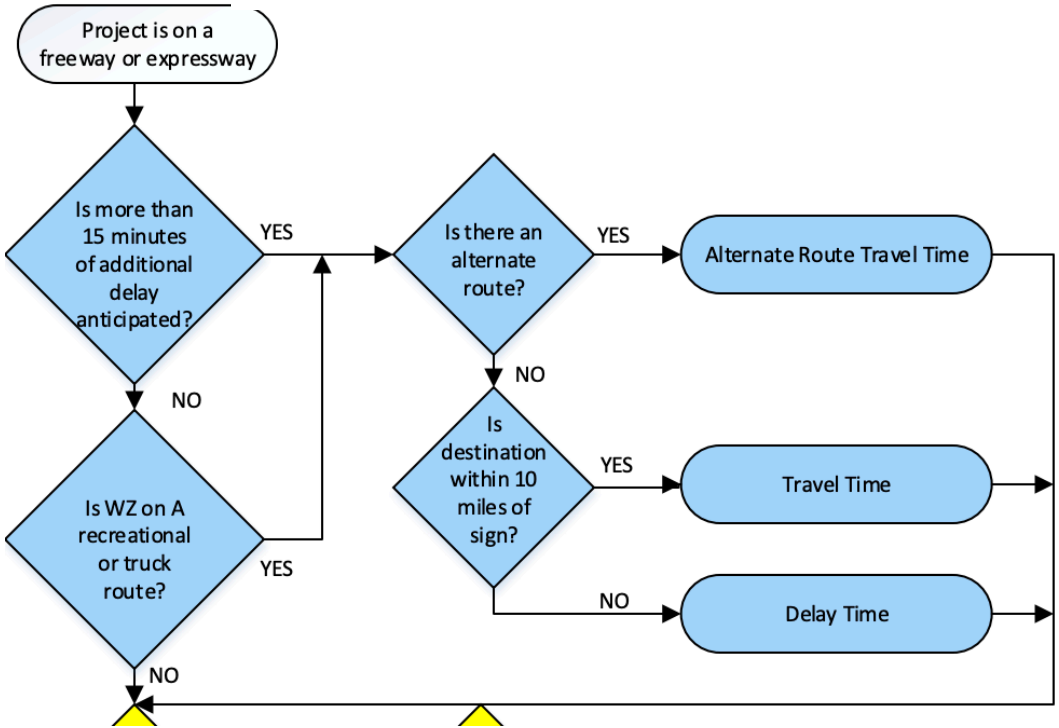
Scoring Factors	Scoring Range	Score
Over-height vehicle/Low Clearance Structure	Low structures are over mainline traffic **(100 points)** Low structures are located on adjoining roadways such as ramps **(75 points)** Low structures are located on nearby alternate routes (local or state owned) **(45 points)** There are no low structures **(0 points)**	
Raw Scores		0
Max Possible score		100
Normalized Scores (0 to 100)		0

* Normalized Score is calculated by Raw Scores*100/Max Possible Score

(Texas DOT 2018)

Go/No-Go Decision Tool for Texas DOT

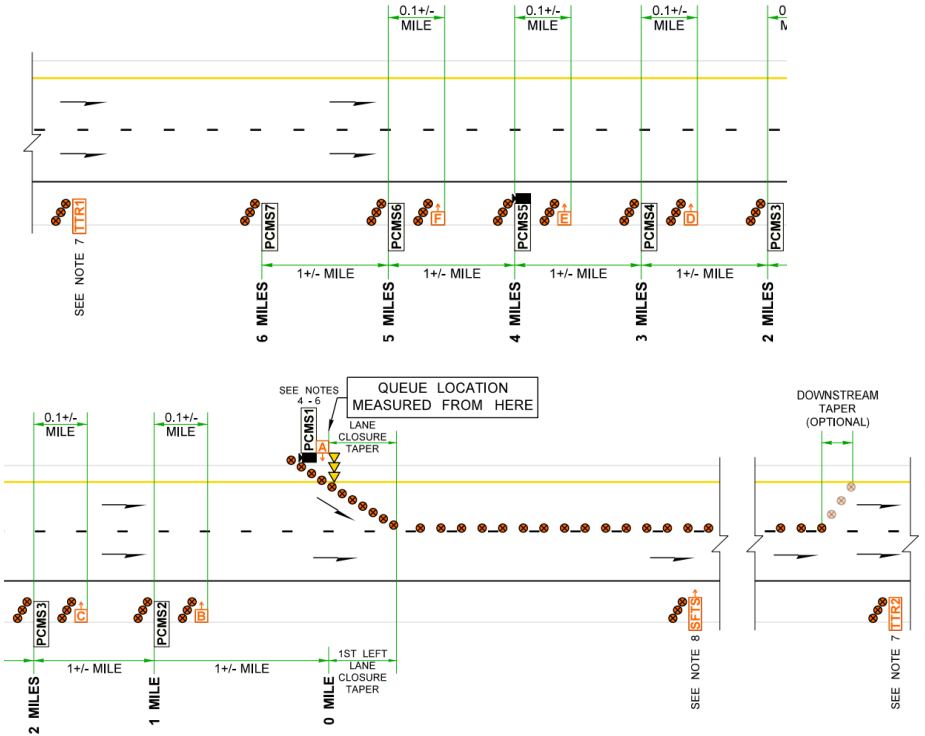
Example DOT Resource: Decision Tree



(Minnesota DOT 2019)

Smart Work Zone Decision Tree for Minnesota DOT

Example DOT Resource: Standards



(Washington State DOT 2021)

Standard Layout for Queue Warning System for Washington State DOT

Example Evaluations for Smart Work Zone Technologies

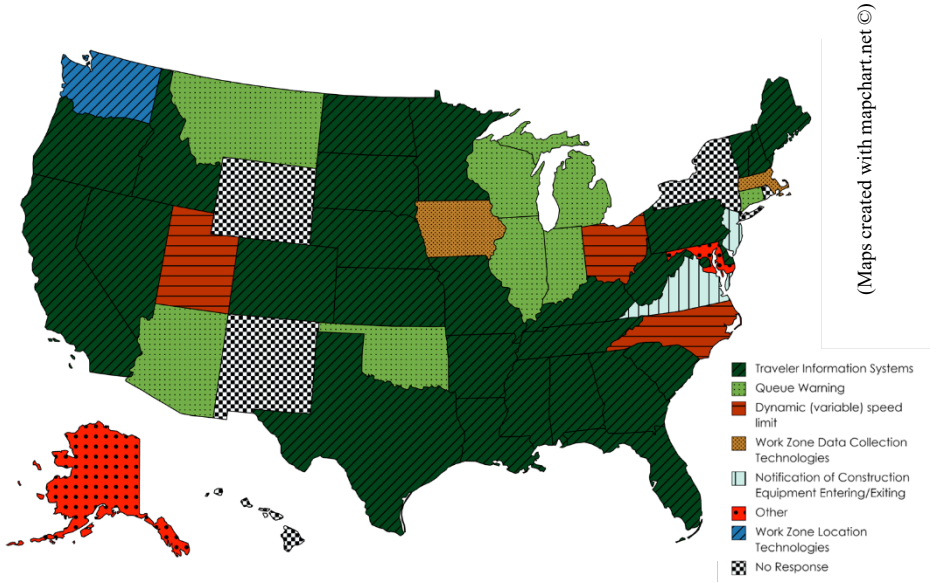
- Reduced vehicle speeds (1.25 mph to 3.64 mph for dynamic message signs (DMSs) (Edara et al. 2011)
- Crash Modification factors (CMFs) for nighttime lane closures with QWS and portable rumble strips: 0.717 (non-queuing conditions) and 0.468 (queueing conditions) (Ullman et al 2018)
- Dynamic lane merge: Maximum queue length reduced from 8 to 2 miles (North Carolina DOT 2019)
- Dynamic (variable) speed limit: Maximum reduction in mean speed of 4.7 mph (Mekker et al. 2016)
- Waze identified incidents 10 minutes earlier than traditional approaches (Amin-Naseri et al. 2018)

Survey Overview

- 18 questions
- Reviewed by topic panel
- Administered online (50 states + D.C.)
- Topics covered
  - Use of smart work zone technologies
  - Performance of smart work zone technologies
  - Components for smart work zone technologies
  - Implementation of smart work zone technologies
- 100 percent response rate

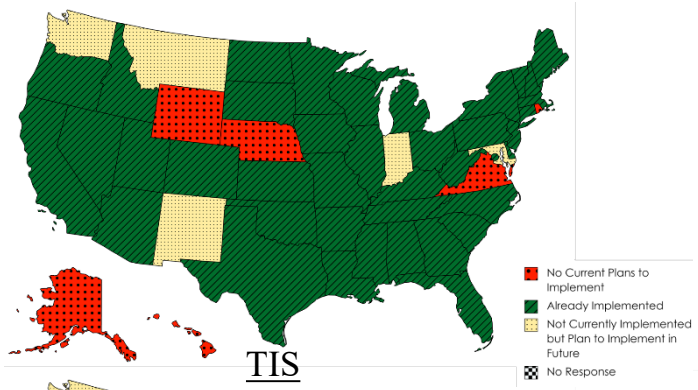
DOT Practices for Smart Work Zone Technologies

- Most frequently used
  - TIS
  - QWS
- Factors considered
  - Traffic volumes
  - Type of work
  - Duration/length of work zone
- Perceived performance
  - Highest: TIS, QWS
  - Lowest: Notification of equipment entering/exiting, work zone intrusion alarm

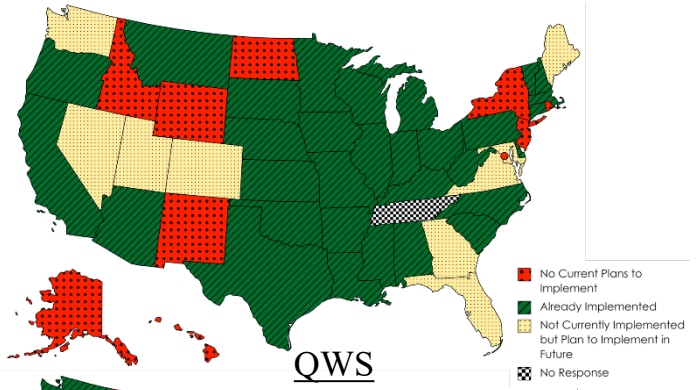


Most Frequently Used Technology by DOT

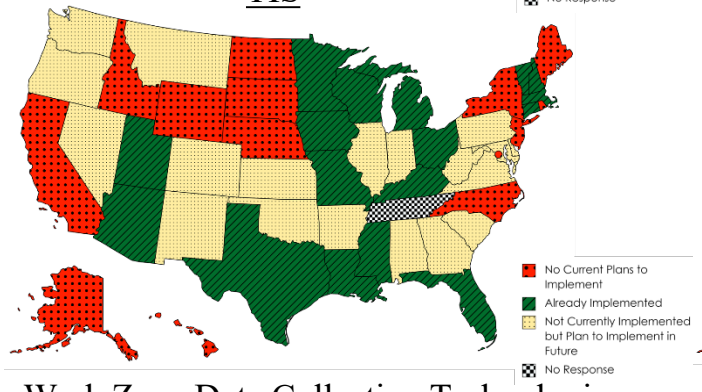
DOT Implementation of Smart Work Zone Technologies



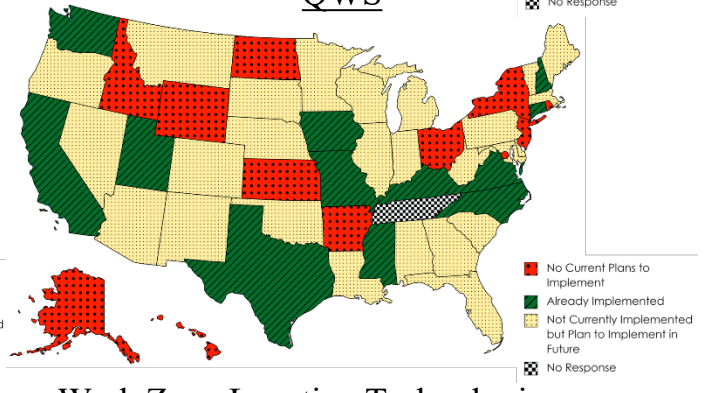
TIS



QWS



Work Zone Data Collection Technologies



Work Zone Location Technologies

(Mapss created with mapchart.net ©)

Other Survey Findings

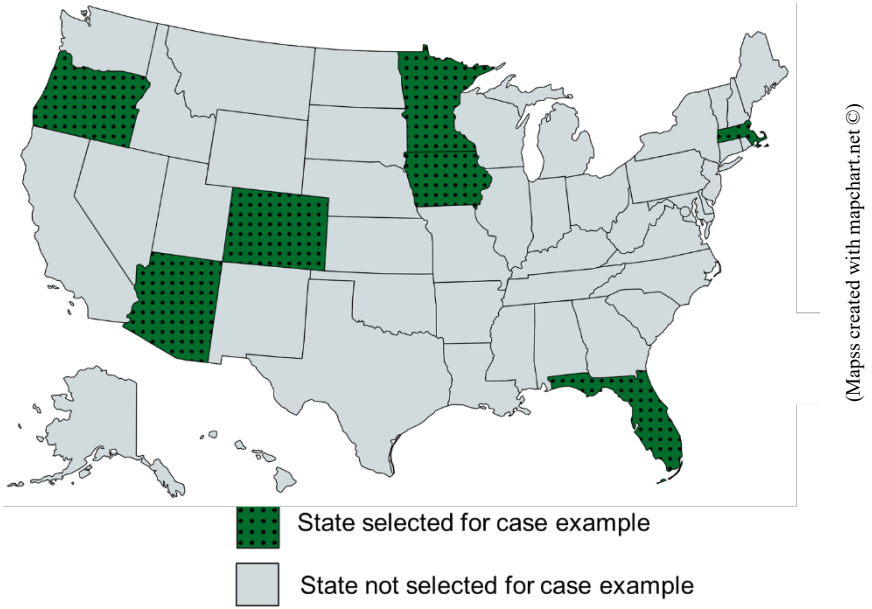
- Use of multiple technologies
- Evaluations completed by 6 DOTs
- Use of performance measures
  - Crash statistics
  - Queue length
- Dissemination of information: CMS
- Detection: cameras, sensors
- Use of crowdsourcing data
- Challenges
  - Funding constraints
  - Staffing shortages
- Use of contract special provisions

(Boudreau 2021a)

Use of Changeable Message Signs (CMSs)

Overview of Case Examples

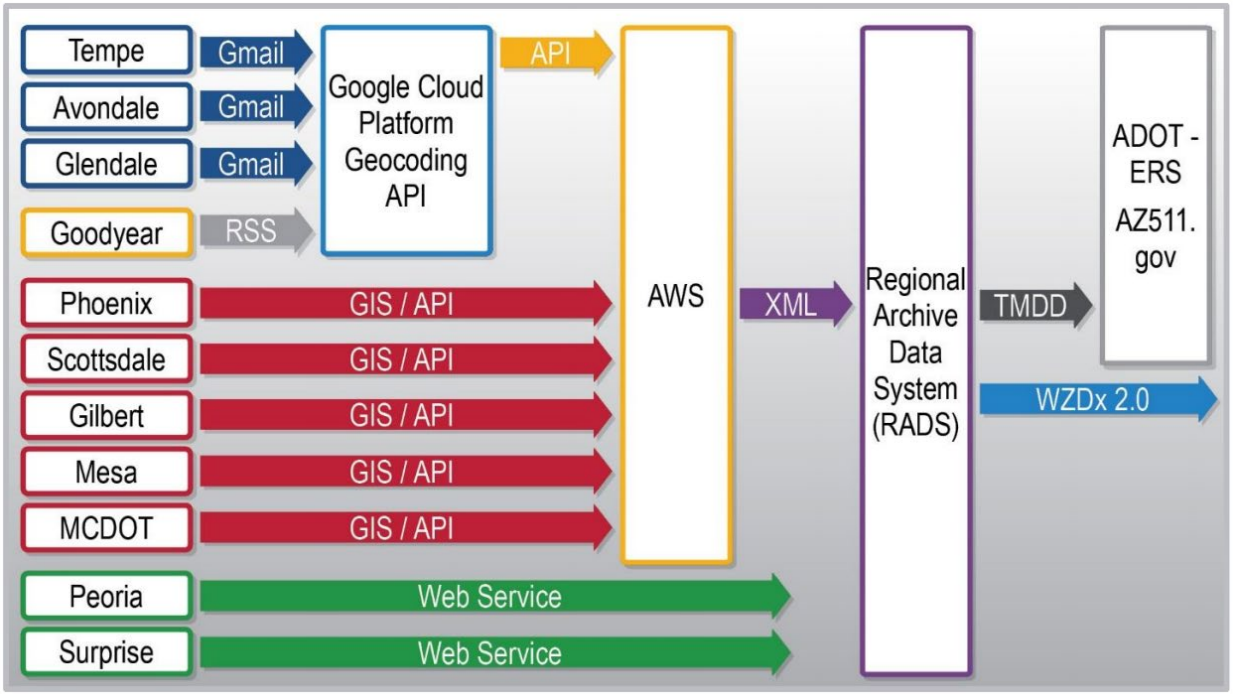
- Criteria for selection
  - Diversity (e.g., climate, level of experience)
  - Use of innovative technologies
  - Survey responses
  - Preference to panel member states
  - Willingness to participate
- Interview topics
  - General approach and experience
  - Development of implementation resources
  - Future plans
  - Implementation challenges
  - Project examples



Case Example Participation

Case Examples: Arizona DOT Partnerships

- Collaboration with Maricopa County DOT
- Integration of data sources
- Create county-wide WZDx feed



(Courtesy of Maricopa County DOT and Arizona DOT)

Case Examples: Colorado DOT Autonomous TMA

- Striping operations
- AADT < 5,000 vpd
- Regions 4 and 5

(Colorado DOT 2021)

Leader and Follower Vehicles for Autonomous TMA

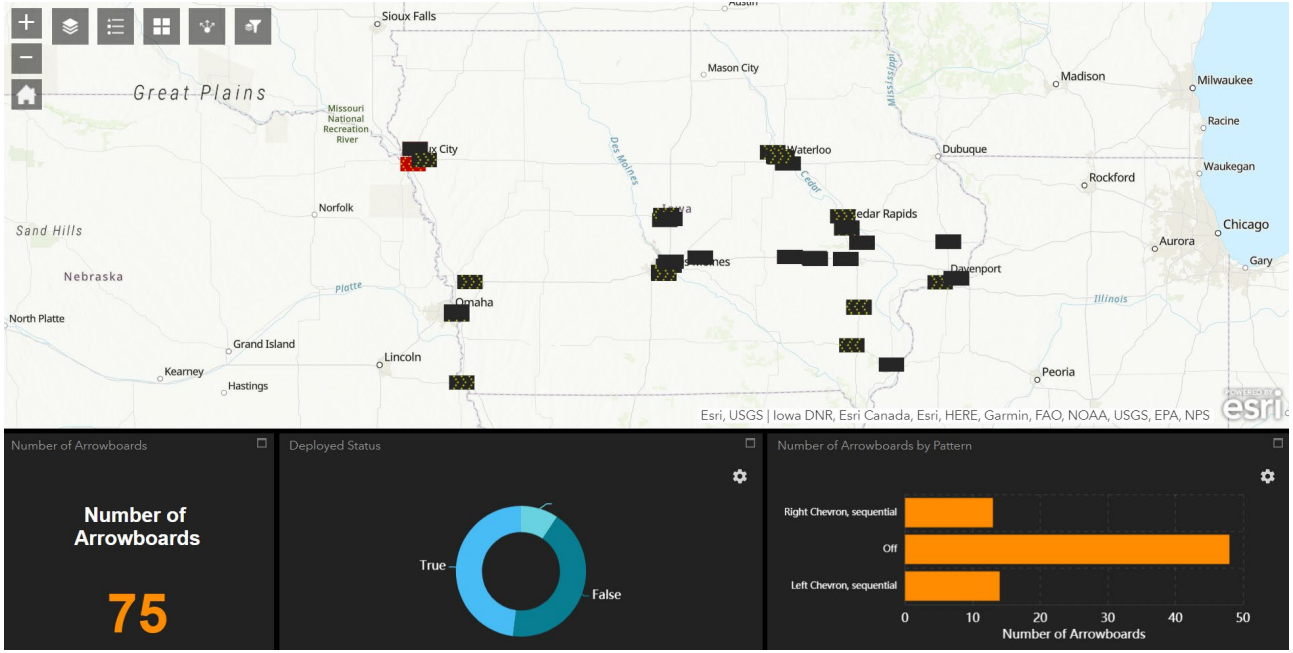
Case Examples: Florida DOT Queue Warning System (QWS)

(MVDS = microwave vehicle detection sensor)
(Florida DOT 2016)
(Map data © 2016 Google)

Device Layout for QWS at I-4 and I-95

Case Examples: Iowa DOT Smart Arrow Board

- Required for all Interstate lane closures
- Collect data for lane closures
- Retrofit to existing equipment
- Dashboard

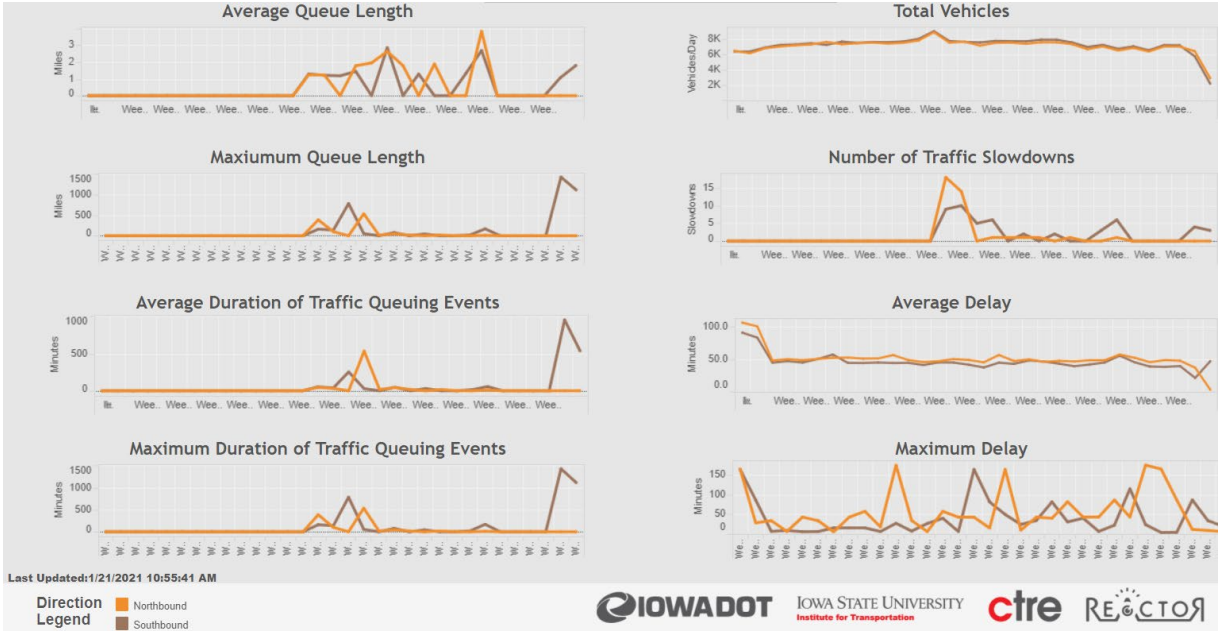


Dashboard for Smart Arrow Boards

(Iowa State University 2021a)

Case Examples : Iowa DOT Performance Dashboard

- Over 30 performance measures
- Eight published on dashboard
- Crashes within 500 feet of work zone

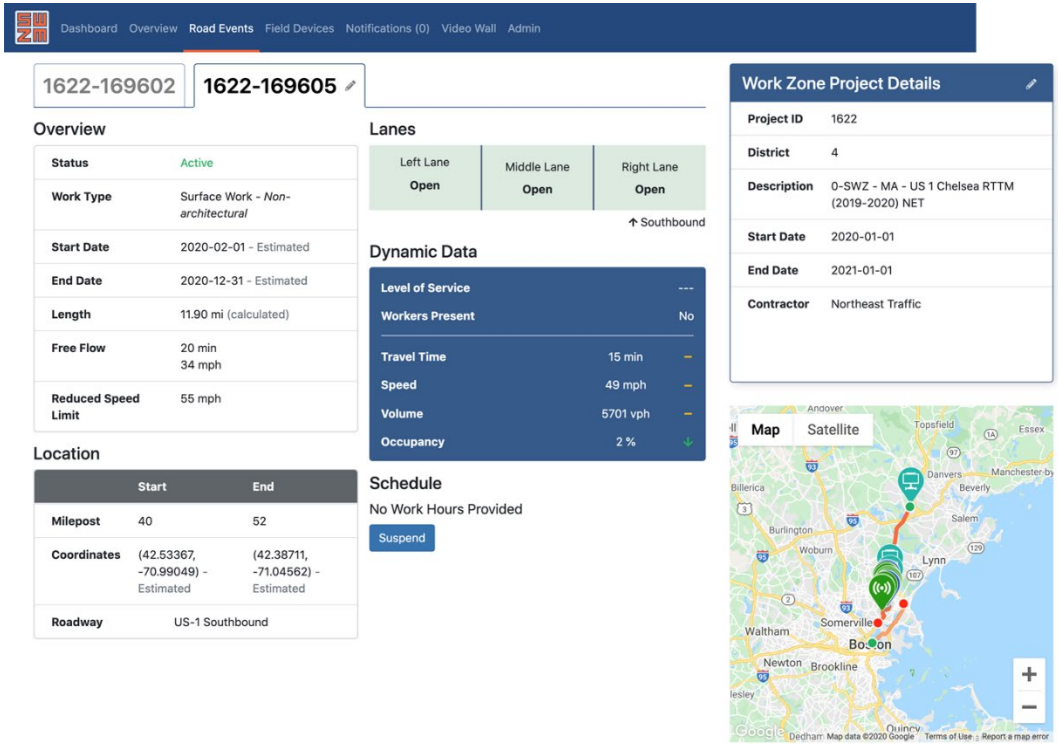


(Iowa State University 2021b)

Operational Dashboard Data

Case Examples : Massachusetts DOT SWZ Manager

- Interface between different vendor software
- Central control and monitoring
- Access to data feeds



(Courtesy of IBI Group and Massachusetts DOT)

Screenshot from SWZ Manager

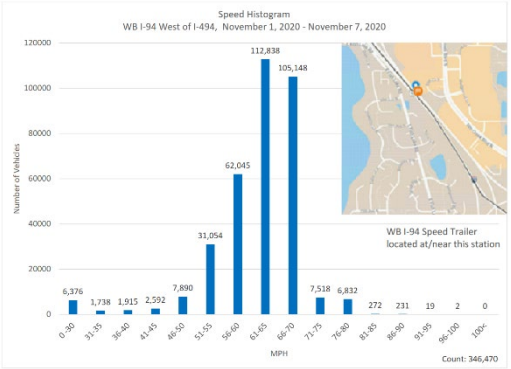
Case Examples: Massachusetts DOT Dynamic Ramp Meter

- Regulate traffic from mainline and ramp
- Components
  - Portable traffic signal
  - Temporary signs
  - Temporary pavement markings
  - Video camera image detection system
  - Portable changeable message signs (PCMSs)
  - Message board interface
  - Wait time display

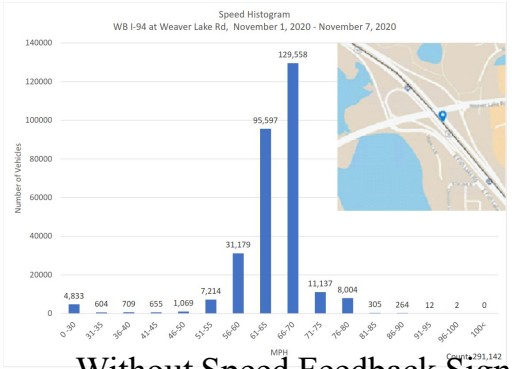
Dynamic Ramp Meter at Sagamore Bridge (Boudâreau 2021b)

Case Examples: Minnesota DOT Speed Feedback Signs

- I-94 (Maple Grove to Rogers)
- Locations: Two EB, Three WB
- Also QWS, TIS



With Speed Feedback Sign



Without Speed Feedback Sign

(Courtesy of Minnesota DOT, Map data © 2021 Google)

Case Examples: Oregon DOT Traveler Information System (TIS)

Road Camera

Detailed Information

I-5 **MP 163 - 154** I-5, 11 miles South of Cottage Grove	SB Estimated Delay 1 minutes. NB Estimated Delay 0 minutes. Construction Work

Lanes Affected: (Northbound) 2 Lanes (Southbound) 2 Lanes, Shoulder
Comments: Between milepoint 154-157 limited to one lane in each direction. Intermittent rolling slow downs. Exit 154 northbound closed until March. Expect rolling slow downs northbound and southbound during daylight hours. Lane closures and 19' width restrictions in both the northbound and southbound directions. Starting Wednesday February 10th the northbound on ramp at Exit 154 Elkhead Road will be closed for approximately 6

(Oregon DOT 2016)

Summary of Key Findings

- Varying levels of deployment
- Typically implemented at project level
- TIS most frequently used
- Best performance: TIS, QWS
- Growing use of work zone data collection technologies
- Data integration
- Challenges: funding constraints and staff shortages
- Smart work zone technologies improve safety

(Hourdos et al. 2017)

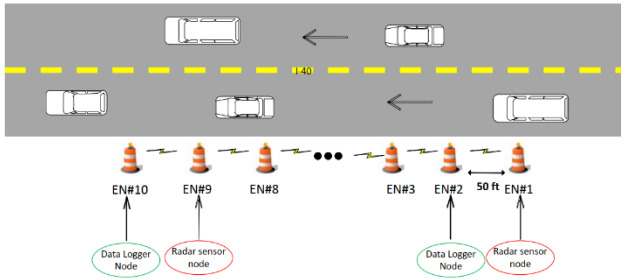
QWS on I-35W in Minnesota

Looking to the Future

- DOT interest in work zone location technologies
- DOT exploration of other technologies
  - License plate readers
  - Temporary overheight detection
  - Downstream speed notification
  - Electronic workers present speed limit
  - Connected traffic signals
  - Applications for CAVs and CVs
- Possible future technologies
  - Smartphone based alert systems
  - Connected vehicle applications
  - Proximity alert systems for construction equipment and workers
  - Automatic devices for cone placement

(Spregeler 2020)

Temporary Connected Traffic Signal



(Zhang et al. 2012)

Smart Barrel System for Monitoring Speeds

Challenges and Suggestions for Future Research

Challenges

- Funding constraints
- Staffing shortages
- Monitoring and maintenance
- Making equipment simple to use
- Building expertise
- Data on technology performance

Research Needs

- Performance evaluations and economic analysis
- Handbook on field implementation
- Research on supplemental warning systems
- Technologies for marking work zone locations
- Guidance on performance measures
- National clearinghouse with deployment data

(Edara et al. 2013b)

Variable Advisory Speed Limit Sign

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  - Dan Sprengeler (Iowa DOT)
  - Ken Thornewell (North Carolina DOT)
  - Hua Xiang (Maryland DOT)
  - James Bryant (TRB Liaison)

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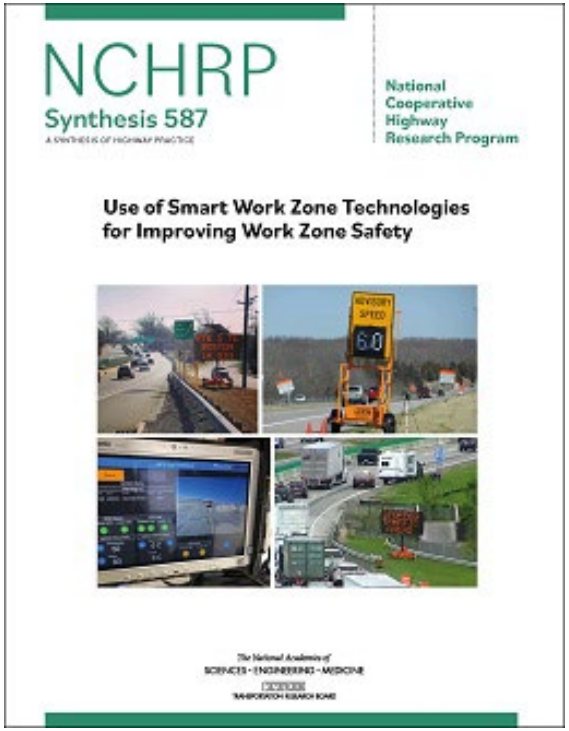
Thank you!



NCHRP Synthesis 587 Link: http://bitly.ws/tzuv

Smart Work Zone Devices- Iowa DOT

USING SMART WORK ZONE TECHNOLOGIES TO IMPROVE SAFETY

FEBRUARY 7, 2023

Intelligent Work Zones

Intelligent Work Zones– Using technology to improve safety or traveler awareness within or leading up to a work zone.

IWZ provides detailed traffic data near, within, and throughout a work zone area.

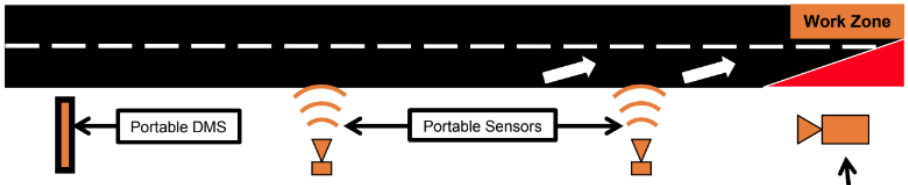
Iowa DOT procures IWZ systems through a single vendor to cover projects state-wide.

IWZ Team works with District Offices to determine appropriate IWZ deployment for each project.

Intelligent Work Zones Team

- DOT Personnel (Operations, Traffic & Safety, Construction)
- Traffic Management Center (TMC) Staff
- Consultant Support Staff
- System Integration Staff
- IWZ Vendor
- Permanent Devices ITS Maintenance Vendor
- University

Queue Warning System



Queue Detection System Process:

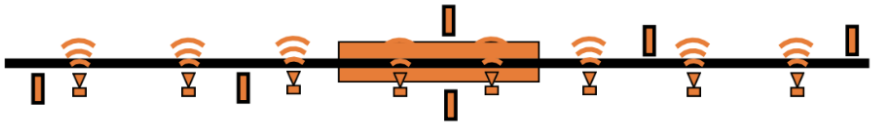
1) Sensors are placed at consistent intervals leading up to the work zone.
2) Signs are placed prior to points of low visibility (vertical and horizontal curves).
3) Optional camera is placed at merge point for additional monitoring
4) Sensors communicate to central server to look for queuing using programmed logic.
5) When slow speeds are detected, logic posts automated alert messages to portable DMS and sends alert e-mails and text messages to project stakeholders in addition to notifying the TMC.

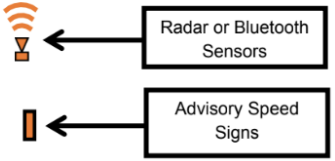
SLOW TRAFFIC AHEAD

STOPPED TRAFFIC AHEAD

Note:
Queue warning and work zone monitoring systems can make use of the same devices as the PDMS are connected to the TMC. The TMC will update the PDMS displays in the event of an incident.

Variable Advisory Speed System

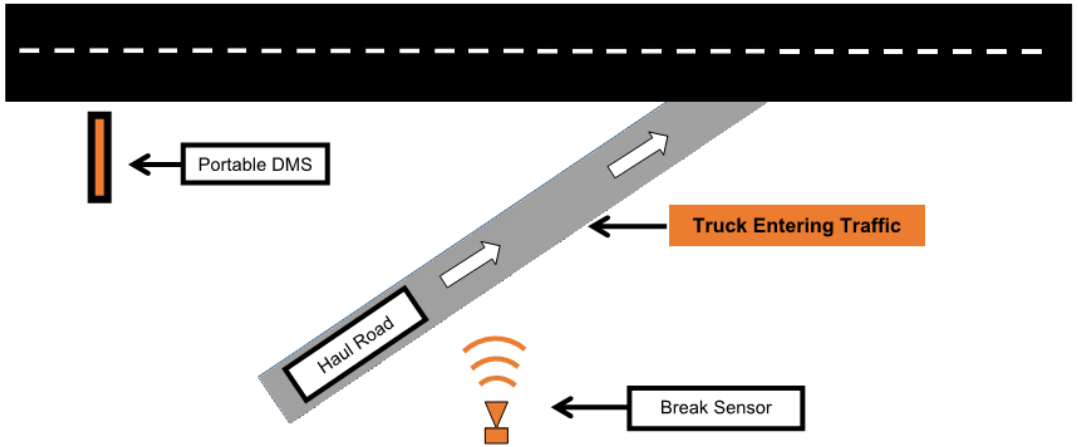




Variable Advisory Speed System Process:

1) Advisory speed signs are placed throughout (and beyond) the project limits.
2) Central logic collects traffic data from detectors.
3) Data can be analyzed automatically or manually to determine appropriate advisory speeds at different points throughout the work zone area.
4) Variable advisory speed signs are adjusted to harmonize speeds throughout the project area, limiting hard braking situations in and around the work zone.

Truck Entering Warning System



Truck Entering Traffic System Process:

1) Break sensor placed on truck hauling route close to the point where the truck is to enter traffic.
2) Sign is placed prior to point of truck entering.
3) If sensor detects a vehicle, a message is displayed on the PDMS warning traffic of slow moving truck entering.

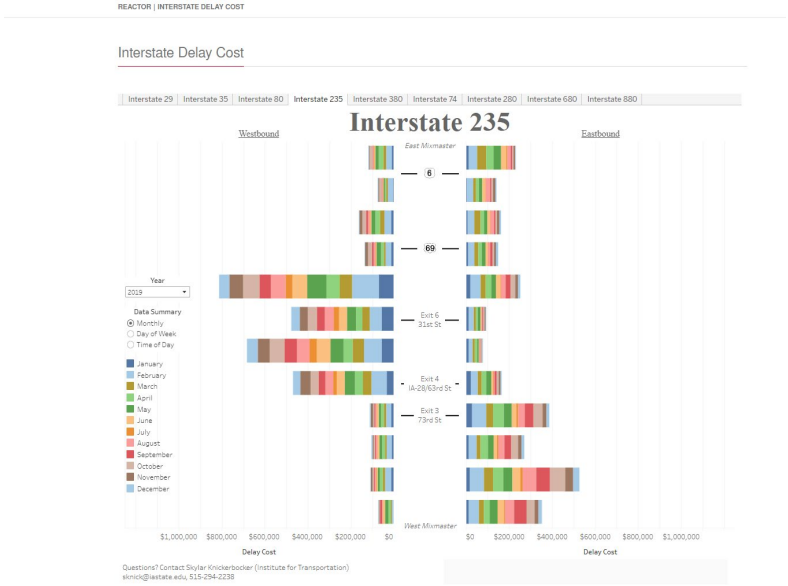
Work Zone Data Hub

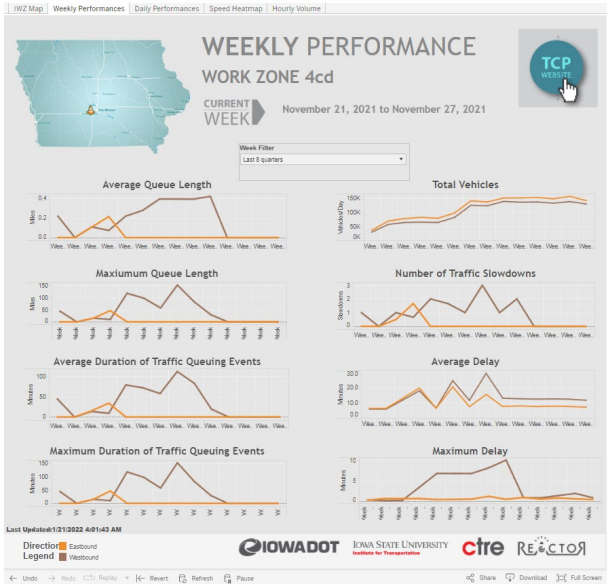
Iowa DOT actively collects WZ data from connected devices

- Smart Arrow Boards
- Permanent and IWZ Sensors
- Connected Temporary Traffic Signals
- Additional devices as they become available

Work Zone Data Hub

Institute for Transportation at Iowa State University works with Iowa DOT to collect and analyze work zone activity data

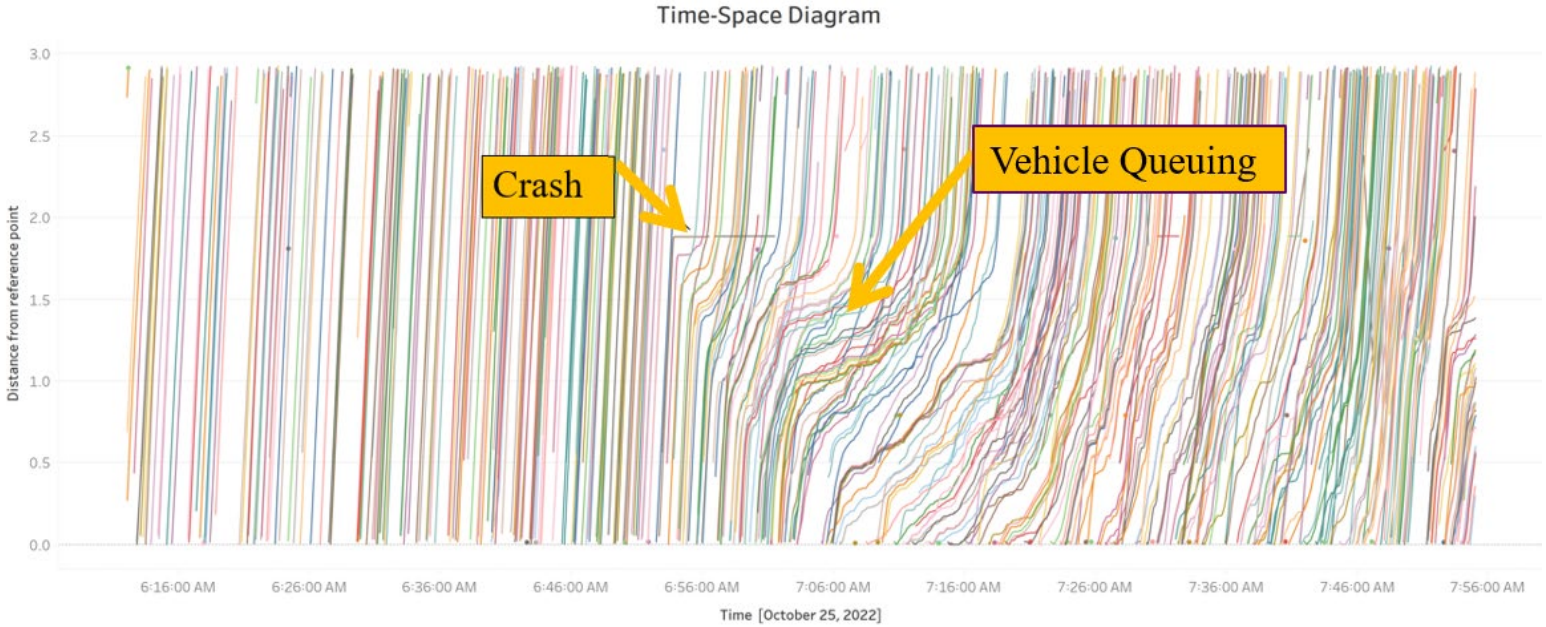




Connected Vehicle Data

Individual trajectories from the connected vehicle data.

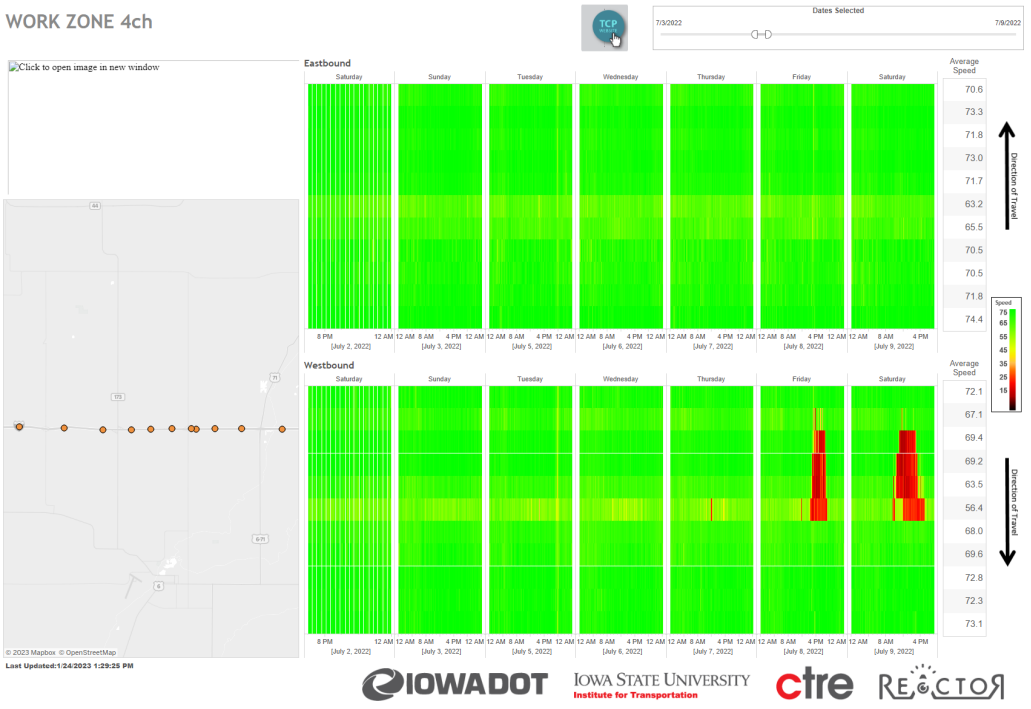
Allows precise location of the back of queue based on individual vehicle speeds.



Sensor Data

Speed heat-map using sensor data.

Limited by the number and spacing of sensors



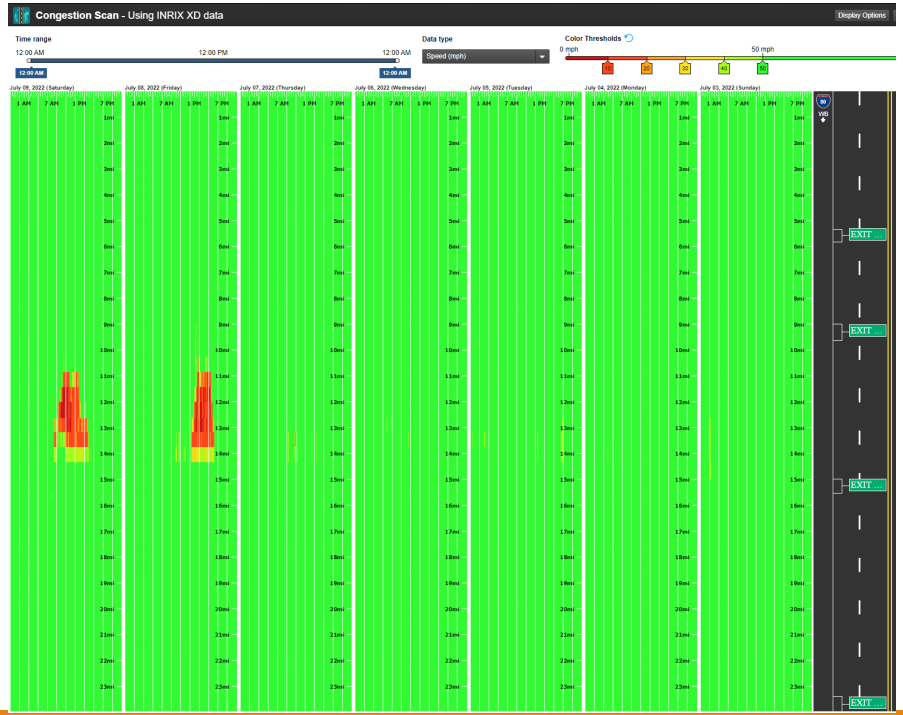
IOWADOT Iowa State University Institute for Transportation ctre REACTOR

Probe Data

Speed heat-map using probe data.

Limited based on the length of segments ~1 mile.

Average speeds of traffic flow.



Data-driven metrics

Use data to better analyze current and historical conditions

- Identify outlier projects that over/under perform

Iowa participated in FHWA Data-Driven Process Review

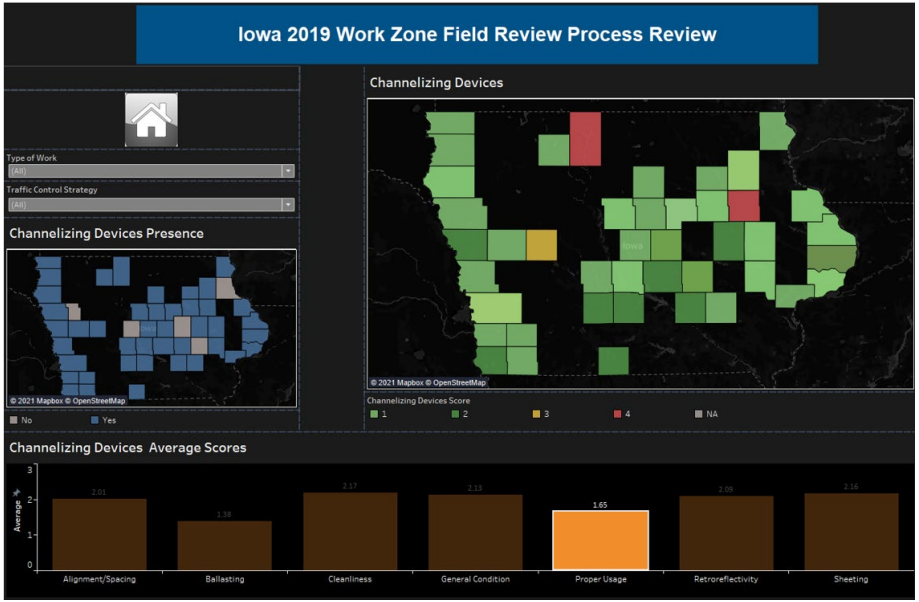
- Learned to integrate existing data sources
- Helped to identify data gaps

Work Zone Field Reviews

Continue work zone field reviews guided by data
- I.D. outlier projects

Electronic GIS-based evaluation form (Survey 1-2-3)

Develop new Dashboard to evaluate survey results



Connected Work Zone Devices

Smart Arrow Boards

Connected Temporary Traffic Signals

Other Connected Devices (experimental)

- Portable Rumble Strips
- Sequential Flashers
- Worker Presence

Smart Arrow Boards

Requirements

Functional without additional effort by workers

Able to modify older equipment to function as SAB

Simple communication protocol to minimize data stream

Smart Arrow Boards

Remote monitoring of

- Location,
- Orientation, and
- Operation mode

Two options for data communication

- Option 1 – data received from intermediary server
- Option 2 – data polled directly from Arrow Board

Smart Arrow Boards

Arrow board should update SABP on pattern change within 2 minutes

Device should update SABP within 2 minutes if moved 500’

Device should provide a health check every 30 minutes

SABP should contain all arrow boards that fall within the State of Iowa border including a 1 mile buffer.

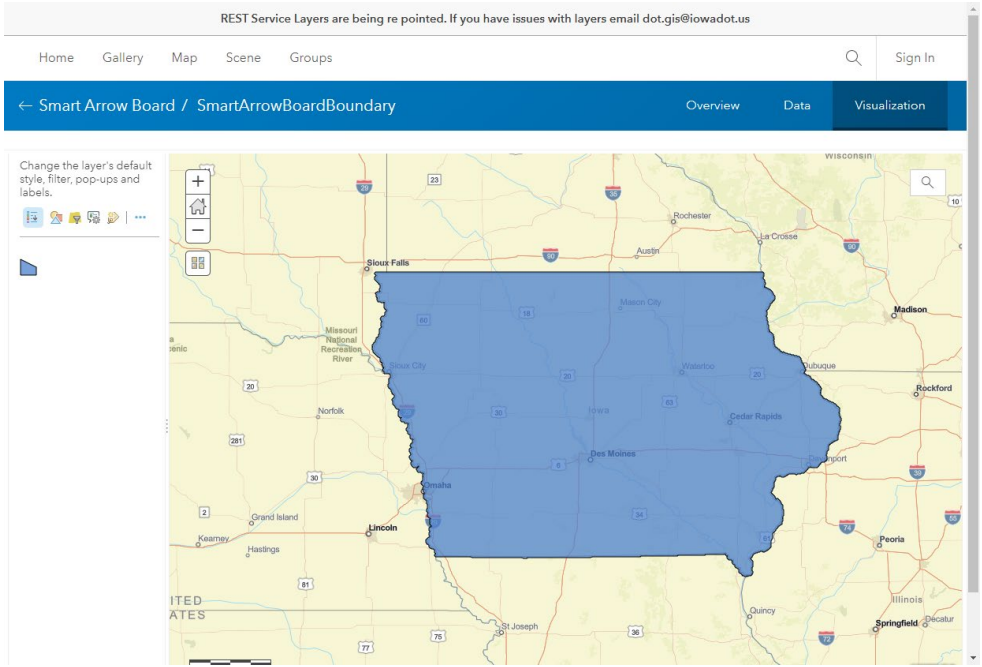
Smart Arrow Boards

Info at the Work Zone Reference Library

- https://iowadot.gov/workzonereferencelibrary
- https://iowadot.gov/workzonereferencelibrary/docs/Specifications-Requirements.pdf

Smart Arrow Boards

Smart Arrow Board Boundary



Smart Arrow Boards

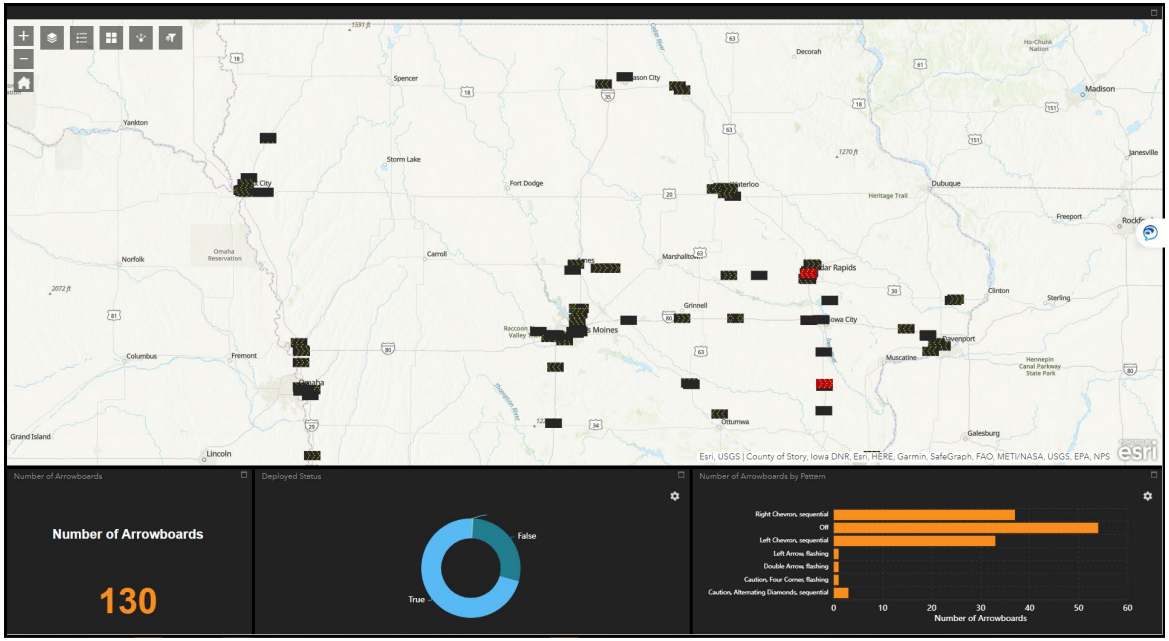
2021 require SAB on all interstate lane closures

2022 require SAB on all primary lane closures

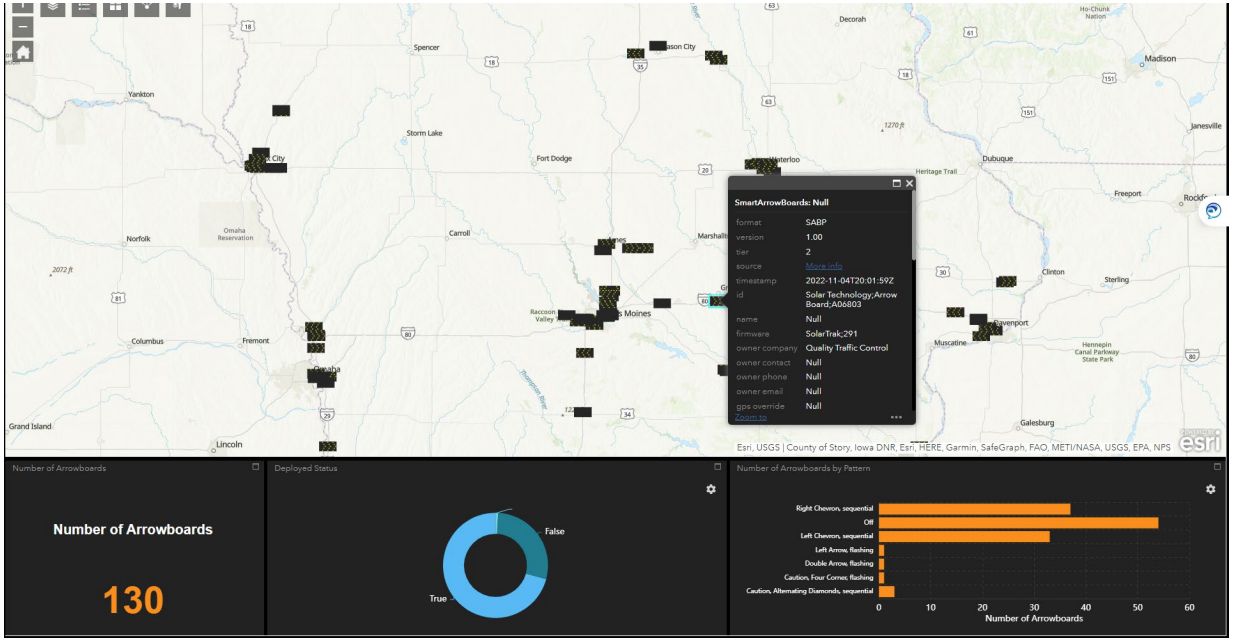
2023(?) convert all DOT Maintenance mobile units

- DOT chose to use existing AVL system to collect arrow board data

Smart Arrow Boards

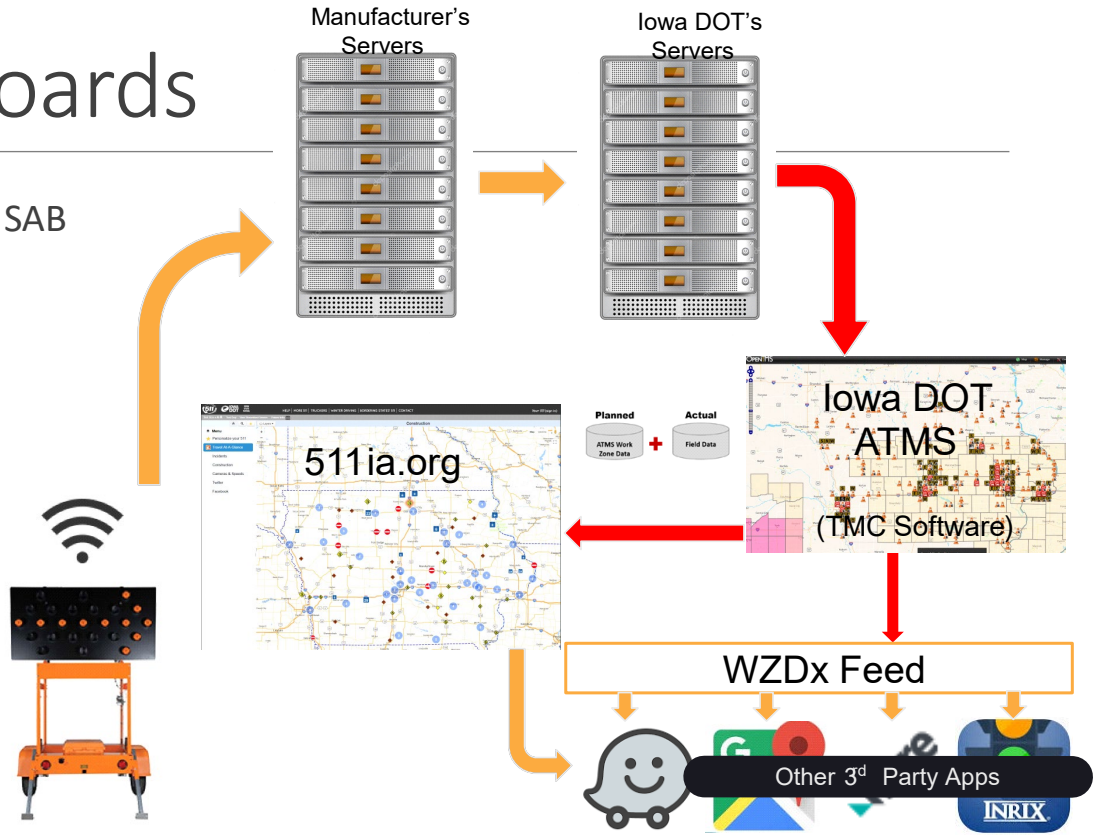


Smart Arrow Boards



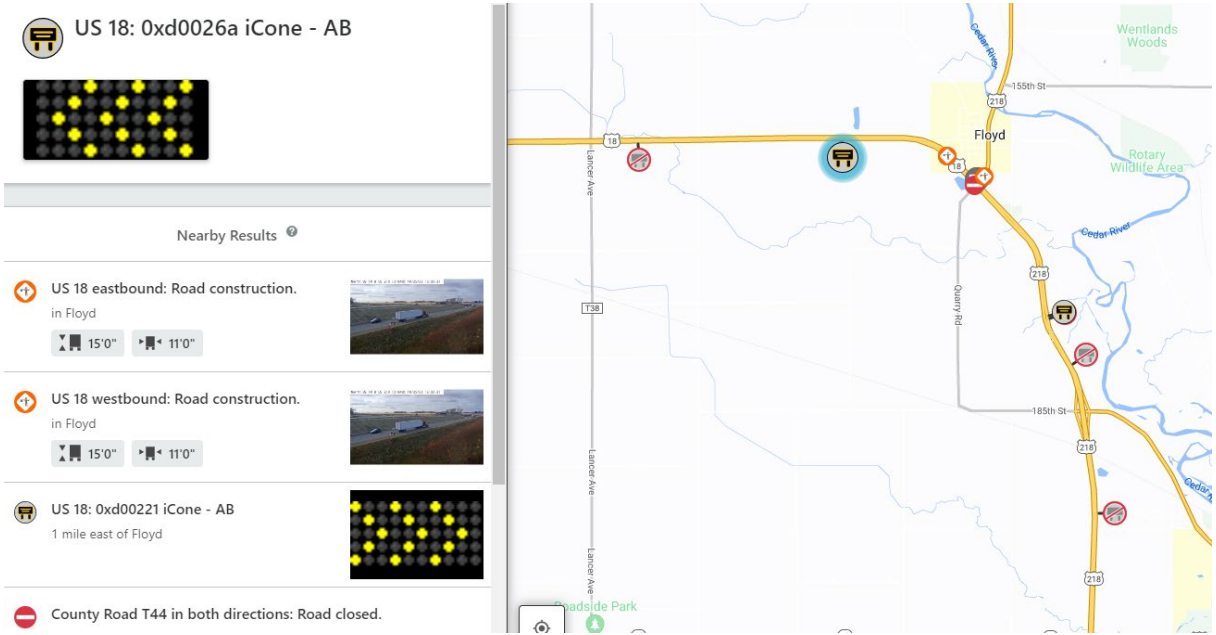
Smart Arrow Boards

Fall 2022 began integrating real-time SAB location into 511ia.



Smart Arrow Boards

511ia Screen Shot



Connected Temp Traffic Signals

Remote monitoring of:

- Location
- Orientation
- Traffic Signal Operation Mode

Connected Temp Traffic Signals

CTTS Deployment Schedule

Proposed Connected Temporary Traffic Signal Project Schedule

	Year	2023												2024											
	Month	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1	ATSSA Chapter																								
2	Midwest Roundtable																								
3	ATSSA Convention and EXPO																								
4	Manufacturers																								
5	Manufacturers Comments																								
6	Invitation for Evaluation																								
7	Select Manufacturers																								
8	Evaluation																								
9	CTTS Specifications																								
10	Construction Specifications																								
11	Supplemental Specifications																								
12	Establish MAPLE																								
13	Two Lane Deployment																								

Key for color code on schedule:

	Activity Period		Planned Completion		Final Submittal

Connected Temp Traffic Signals

2023

Draft new specification for temporary traffic signals

Assess existing contractor inventory

Ability to retrofit existing signals w/o communication capability

Develop approved products list for new signal systems and retrofit kits.

Connected AFAD's

Currently Iowa does not require AFAD's

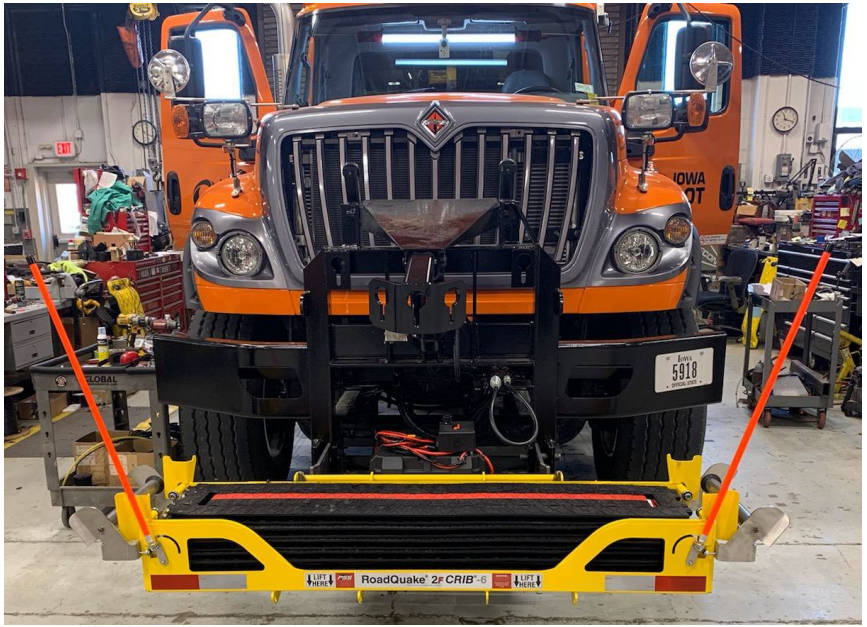
Reduce the use of flaggers

- Temporary Signals
- AFAD's to move flaggers off the roadway

When we start to require AFAD's then they will be connected

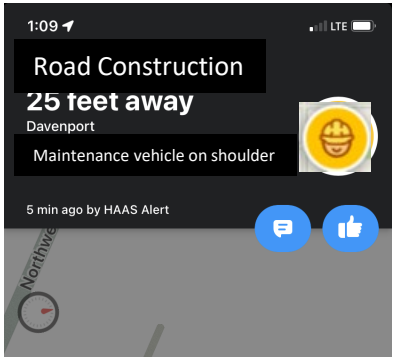
Other Connected Devices

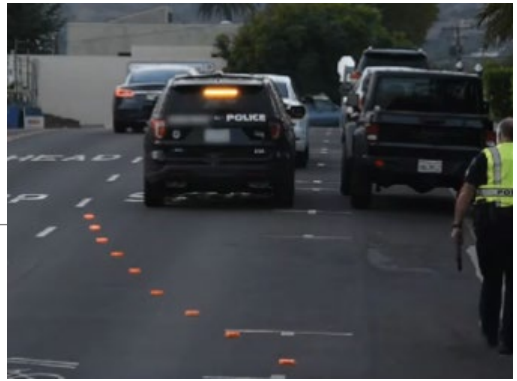
Portable Temporary Rumble Strips



Other Connected Devices

Sequential Flashers (Pi-Lit)





Other Connected Devices

VA Tech Worker Protection System

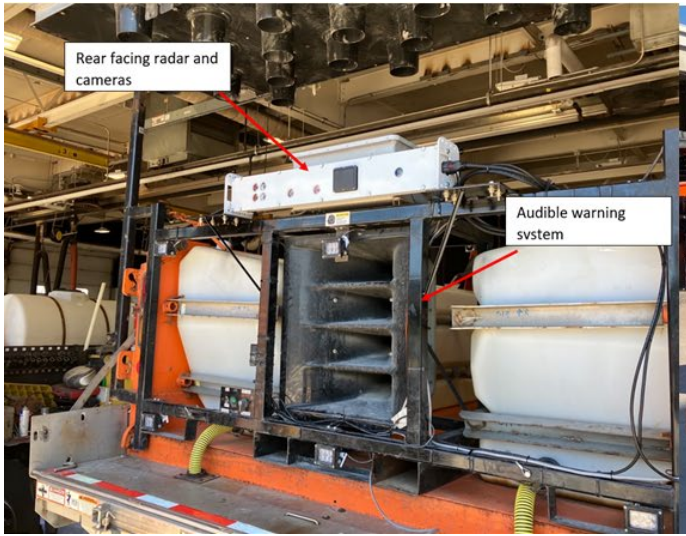
Other Connected Devices

Iowa DOT AVL Data

- Data feed into ATMS to notify the TMC when and where Maintenance Operations are occurring.

Other Connected Devices

Automated Audible Warning System



Other Connected Devices

Automated Audible Warning System

Thank You

Questions?

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Iowa Department of Transportation, Design Bureau
(515) 239-1823
Dan.Sprengeler@iowadot.us

Using Smart Work Zone Technologies to Improve Safety

Why?

FHWA Data Requirements (23 CFR 630.1012d2)

- Number of crashes within the work zone
- Speed
- Travel time through work zone
- Incident response and clearance criteria
- Queue length
- Traffic volume
- Delay
- Work duration criteria

ADOT Work Zone Policy

- Monitor and measure work zone impacts during construction and *take corrective action* to manage mobility and safety *based on criteria such as travel delay, queue lengths, and crash occurrences*.

Defined

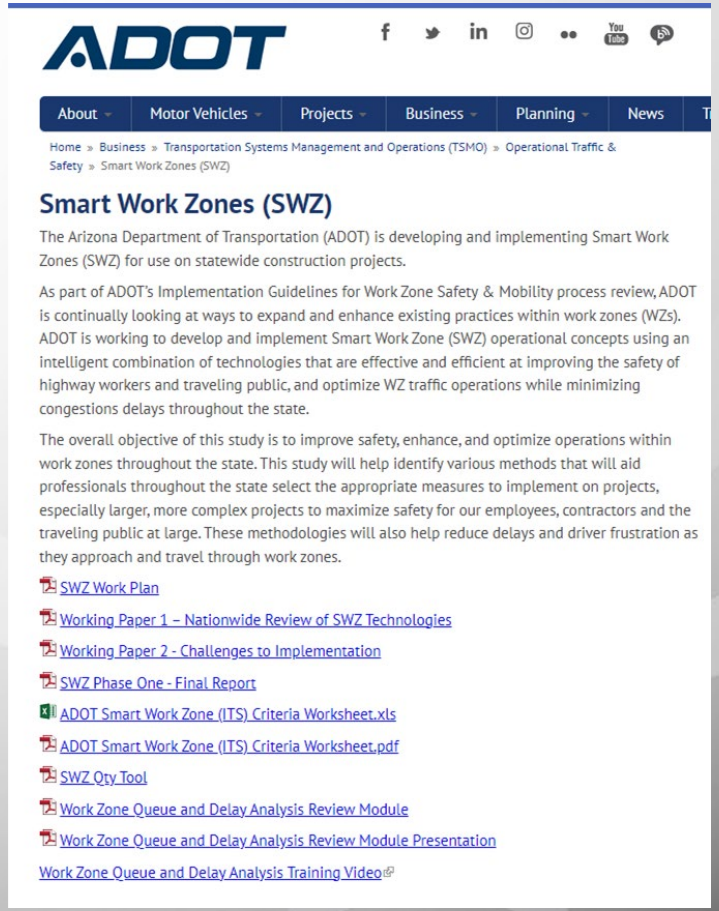
A "**smart work zone system**" is
a reliable automated application of real-time data, communications, and portable sensor technology.

Primary Types:

1. Travel Time /Delay
2. Queue Management
3. Variable Speed Limits
4. Work Zone Intrusion / Worker Protection
5. Asset Management / 3rd Party Data
6. Automation

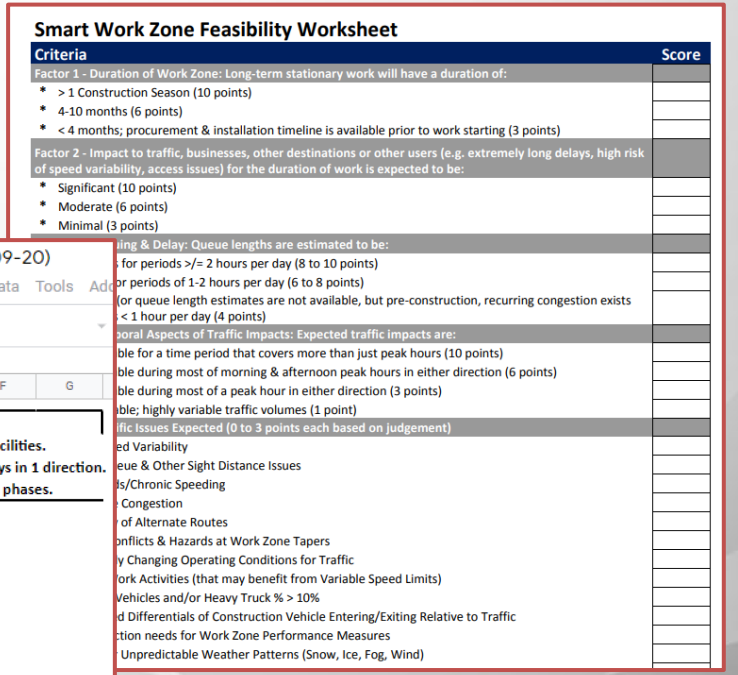
Just Google

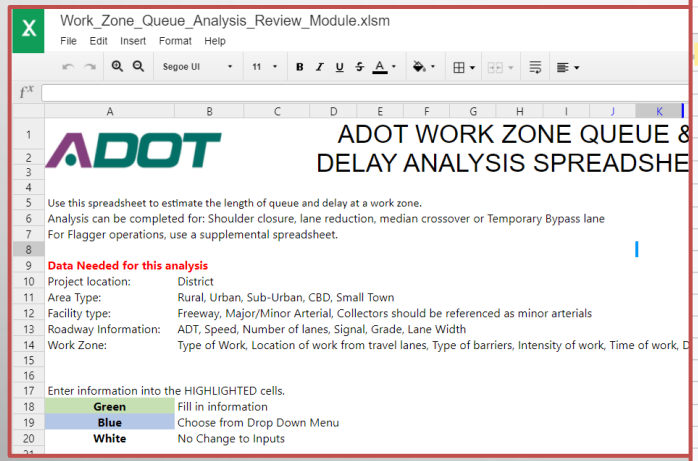
"ADOT Smart Work Zones"

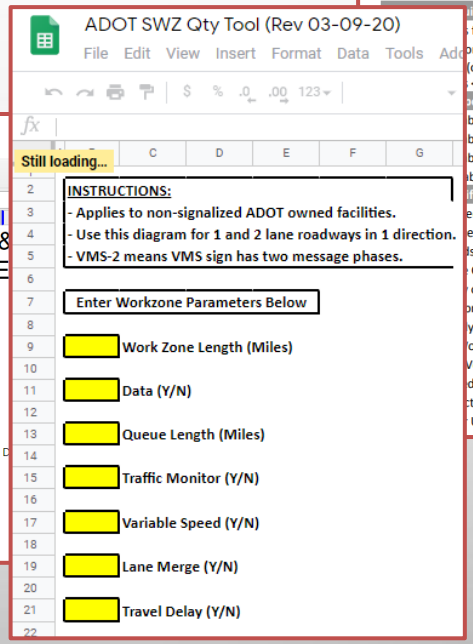


Tools available online

- SWZ Device Quantities & Locations Tool
- Work Zone Queue Analysis Tool
- Feasibility Worksheet





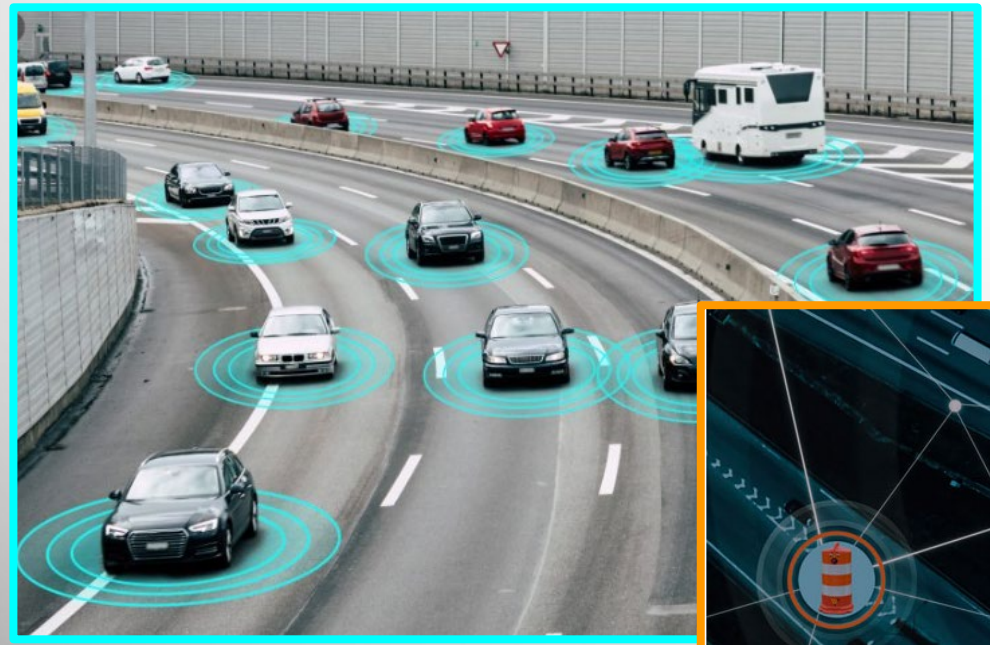


Data from Temporary Traffic Control Devices

Data from Permanent Traffic Control Devices

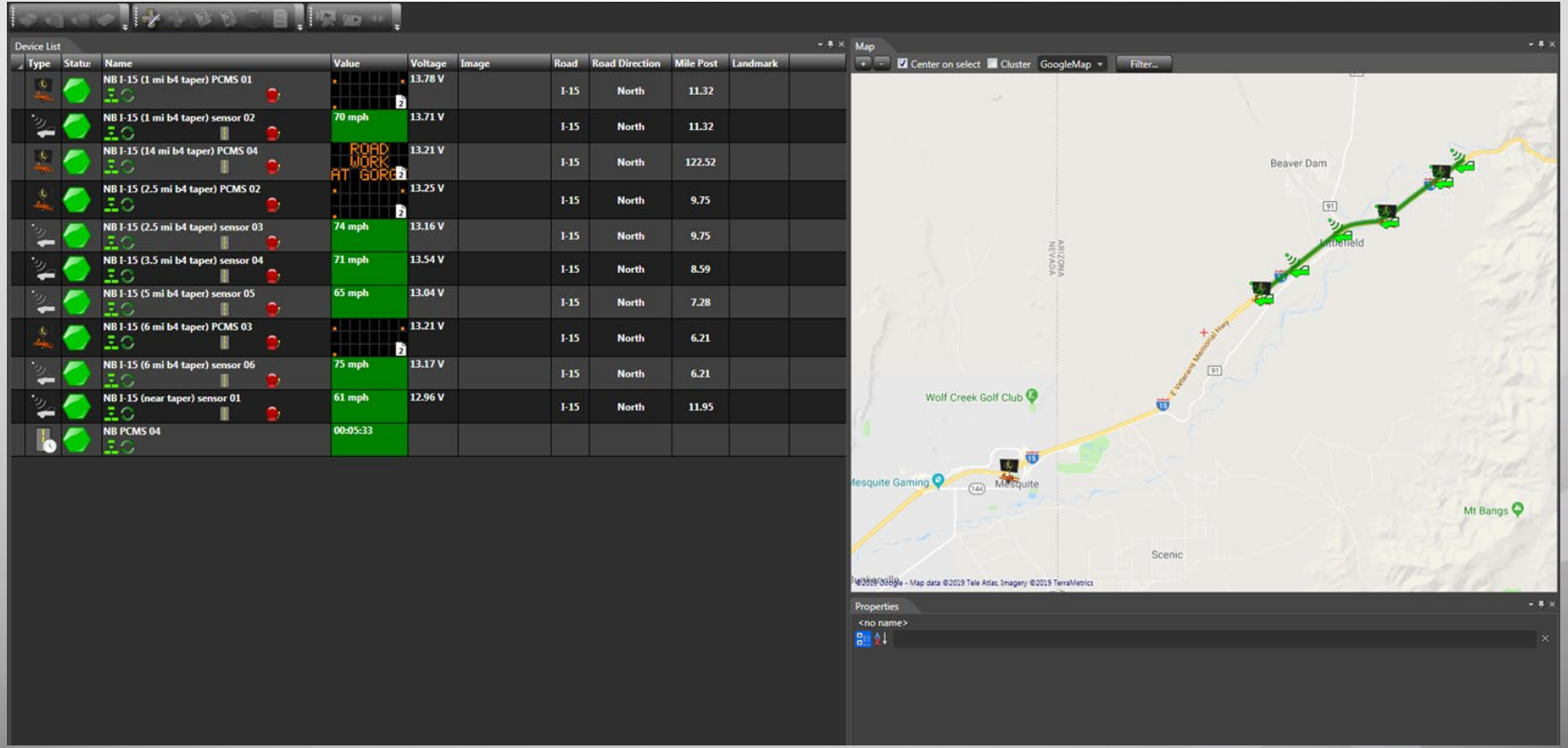
CV-AV & SWZs with WZDx

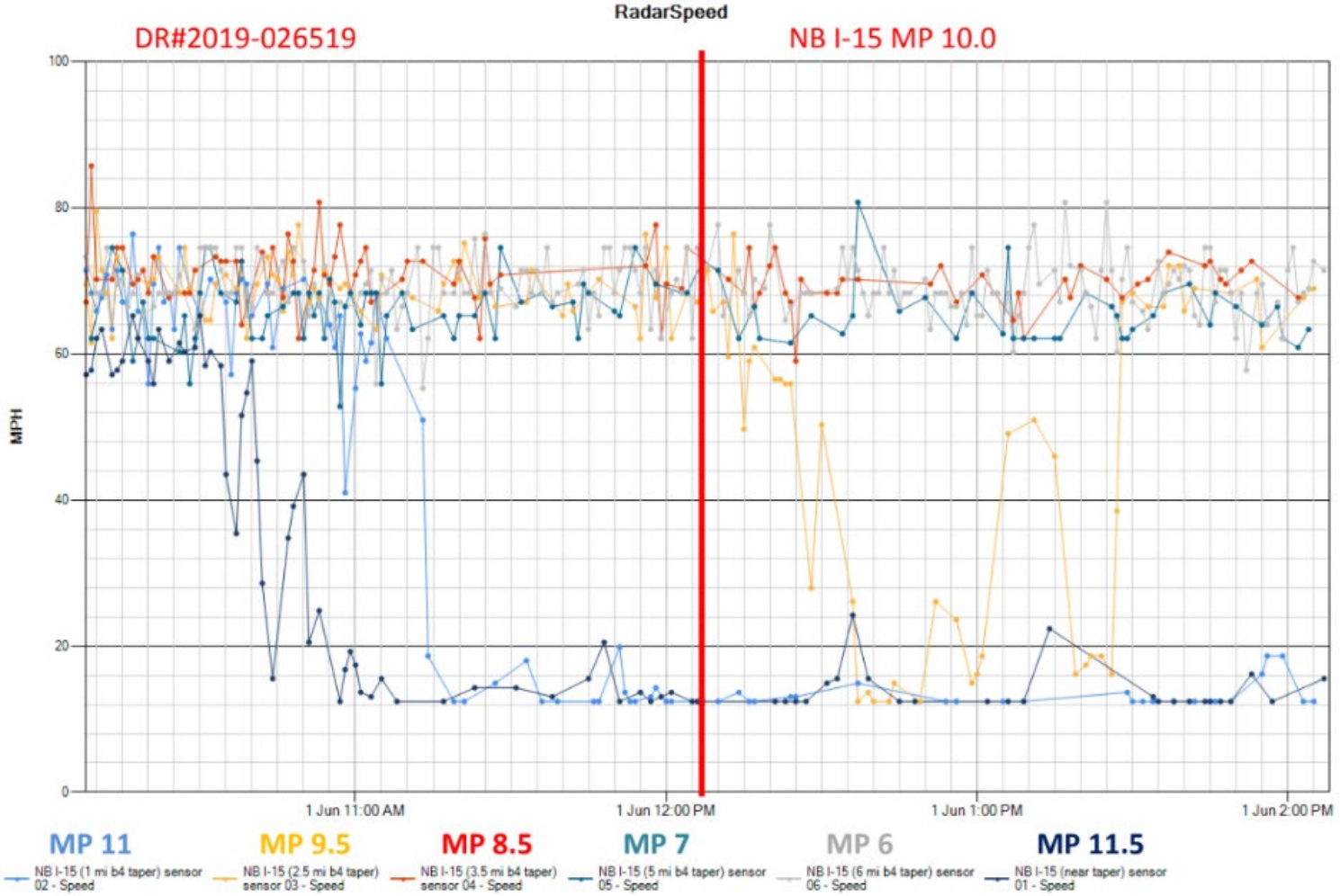
Connected and Autonomous Vehicles



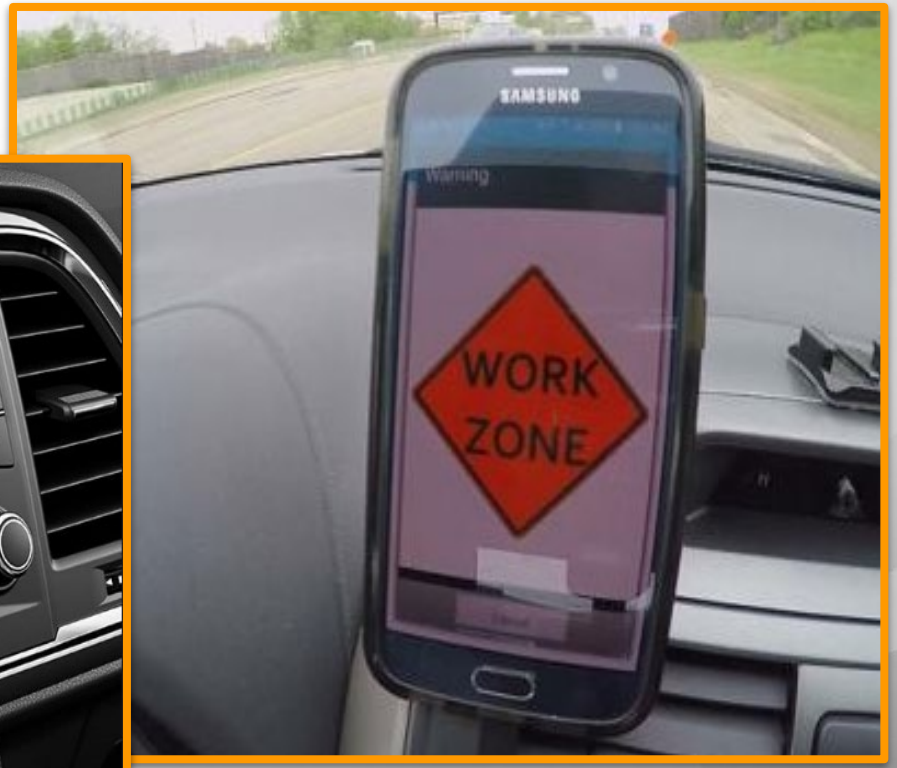
&

Smart Work Zones


Device List
Type
Status
Name
Value
Voltage
Image
Road
Road Direction
Mile Post
Landmark
NB I-15 (1 mi b4 taper) PCMS 01
13.78 V
I-15
North
11.32
NB I-15 (1 mi b4 taper) sensor 02
70 mph
13.71 V
I-15
North
11.32
NB I-15 (14 mi b4 taper) PCMS 04
ROAD WORK AT GORG
13.21 V
I-15
North
122.52
NB I-15 (2.5 mi b4 taper) PCMS 02
13.25 V
I-15
North
9.75
NB I-15 (2.5 mi b4 taper) sensor 03
74 mph
13.16 V
I-15
North
9.75
NB I-15 (3.5 mi b4 taper) sensor 04
71 mph
13.54 V
I-15
North
8.59
NB I-15 (5 mi b4 taper) sensor 05
65 mph
13.04 V
I-15
North
7.28
NB I-15 (6 mi b4 taper) PCMS 03
13.21 V
I-15
North
6.21
NB I-15 (6 mi b4 taper) sensor 06
75 mph
13.17 V
I-15
North
6.21
NB I-15 (near taper) sensor 01
61 mph
12.96 V
I-15
North
11.95
NB PCMS 04
00:05:33
Map
Center on select
Cluster
GoogleMap
Filter...
Beaver Dam
Littlefield
ARIZONA
NEVADA
E Veterans Memorial Hwy
Wolf Creek Golf Club
Mesquite Gaming
Mesquite
Mt Bangs
Scenic
Properties
<no name>


RadarSpeed
DR#2019-026519
NB I-15 MP 10.0
MPH
100
80
60
40
20
0
1 Jun 11:00 AM
1 Jun 12:00 PM
1 Jun 1:00 PM
1 Jun 2:00 PM
MP 11
MP 9.5
MP 8.5
MP 7
MP 6
MP 11.5
NB I-15 (1 mi b4 taper) sensor 02 - Speed
NB I-15 (2.5 mi b4 taper) sensor 03 - Speed
NB I-15 (3.5 mi b4 taper) sensor 04 - Speed
NB I-15 (5 mi b4 taper) sensor 05 - Speed
NB I-15 (6 mi b4 taper) sensor 06 - Speed
NB I-15 (near taper) sensor 01 - Speed

In cab notifications



TRANSPORTATION

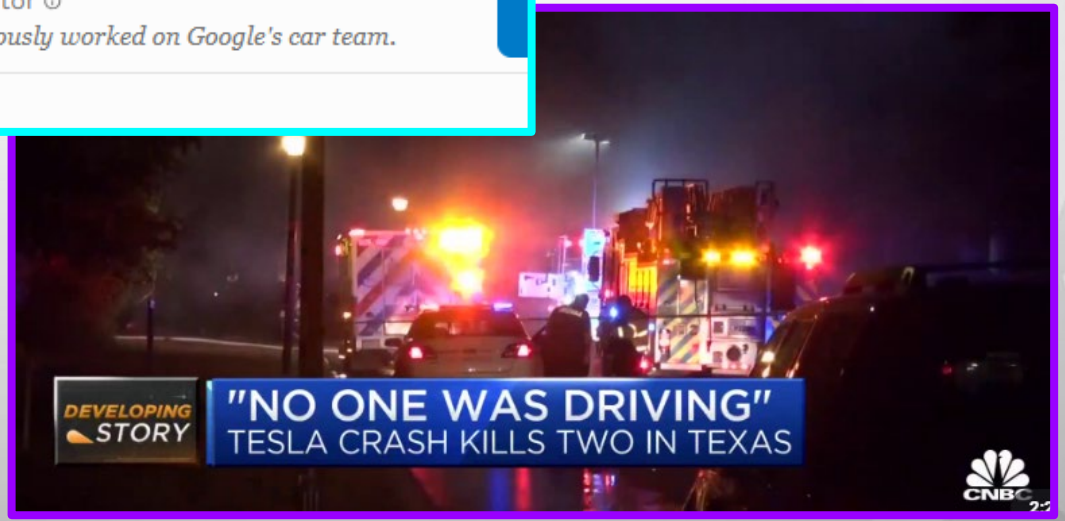
Waymo Peforms Embarrassingly In Construction Cone Situation

Brad Templeton Senior Contributor ⓘ

I cover robocar technology & previously worked on Google's car team.

May 14, 2021, 02:00pm EDT

Why work zones?



3 feeds w/ Version 4.0

WZDxFeed

High Level Roadway Event Info.

RoadRestrictionFeed

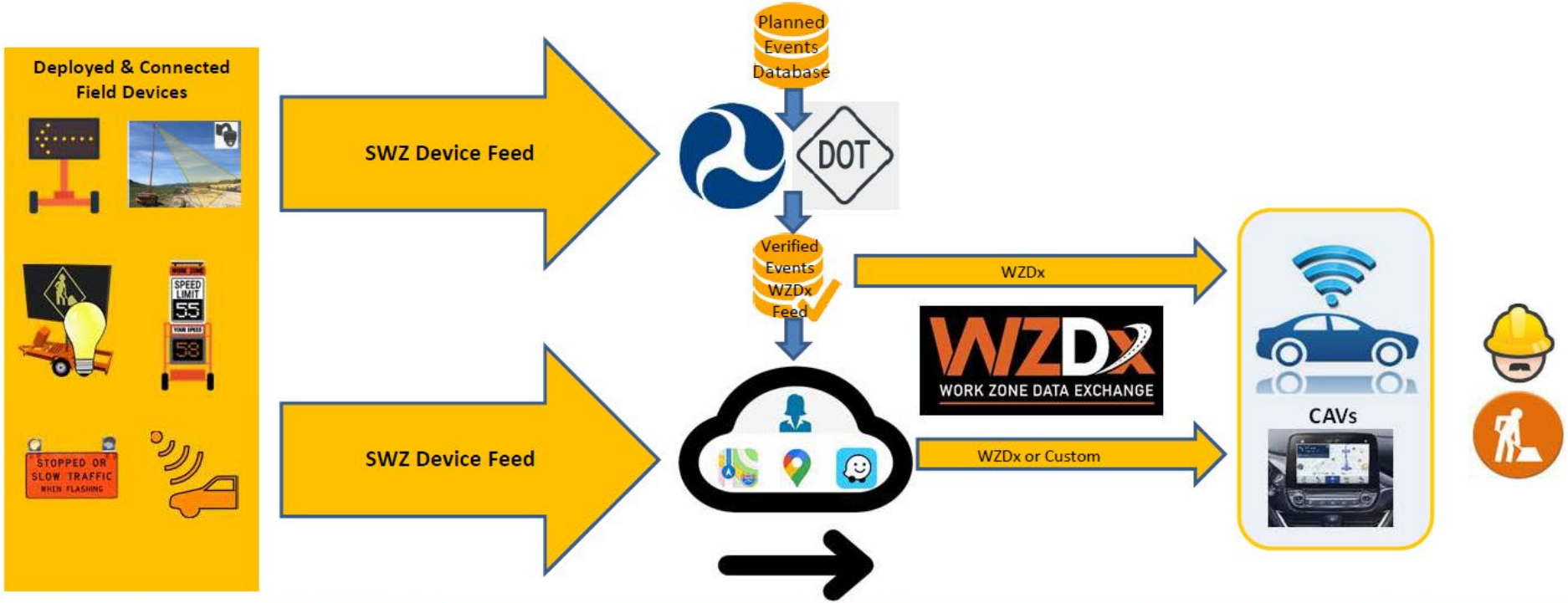
Roadway Segments with Restrictions (Height, width, etc)

SwzDeviceFeed

SWZ Field Device Data (Location, Status, Data Details)

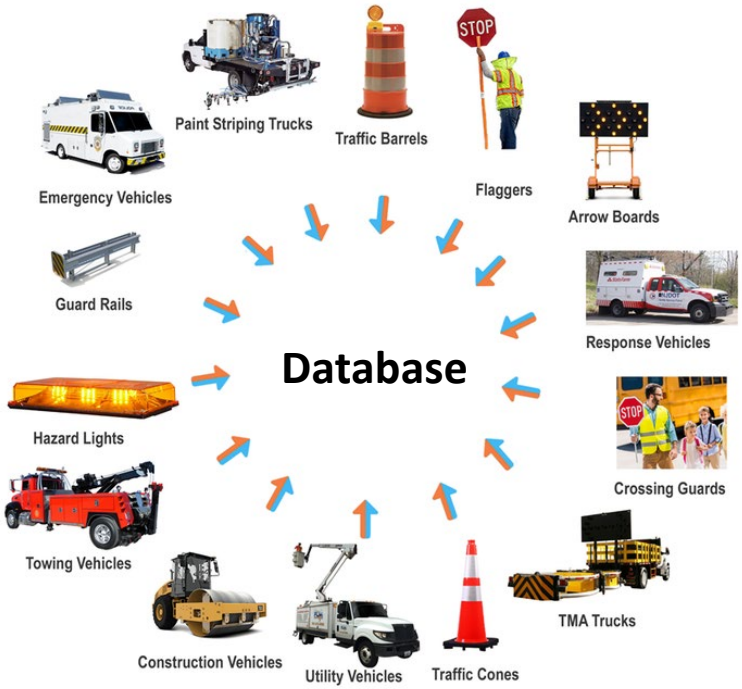
Existing 511 information

Current Focus


Deployed & Connected Field Devices
SWZ Device Feed
SWZ Device Feed
Planned Events Database
DOT
Verified Events WZDx Feed
WZDx
WZDx or Custom
WZDx
WORK ZONE DATA EXCHANGE
CAVs
SPEED LIMIT
55
STOPPED OR SLOW TRAFFIC
WHEN FLASHING

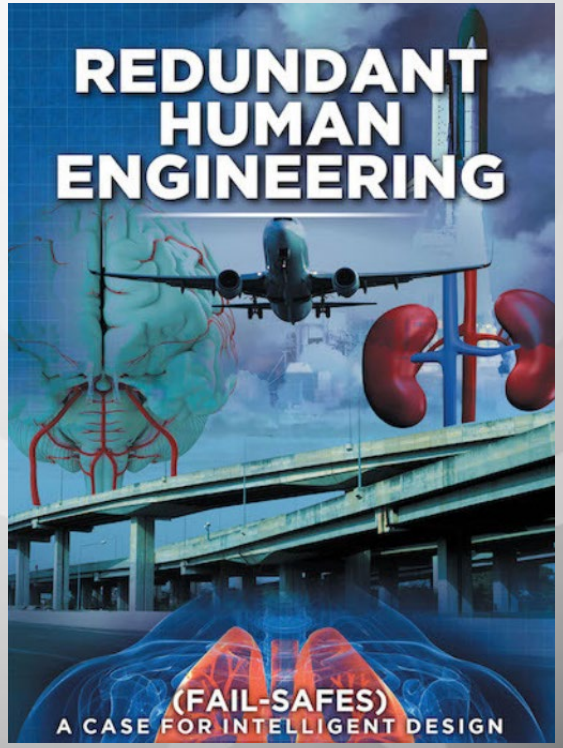
Next Steps

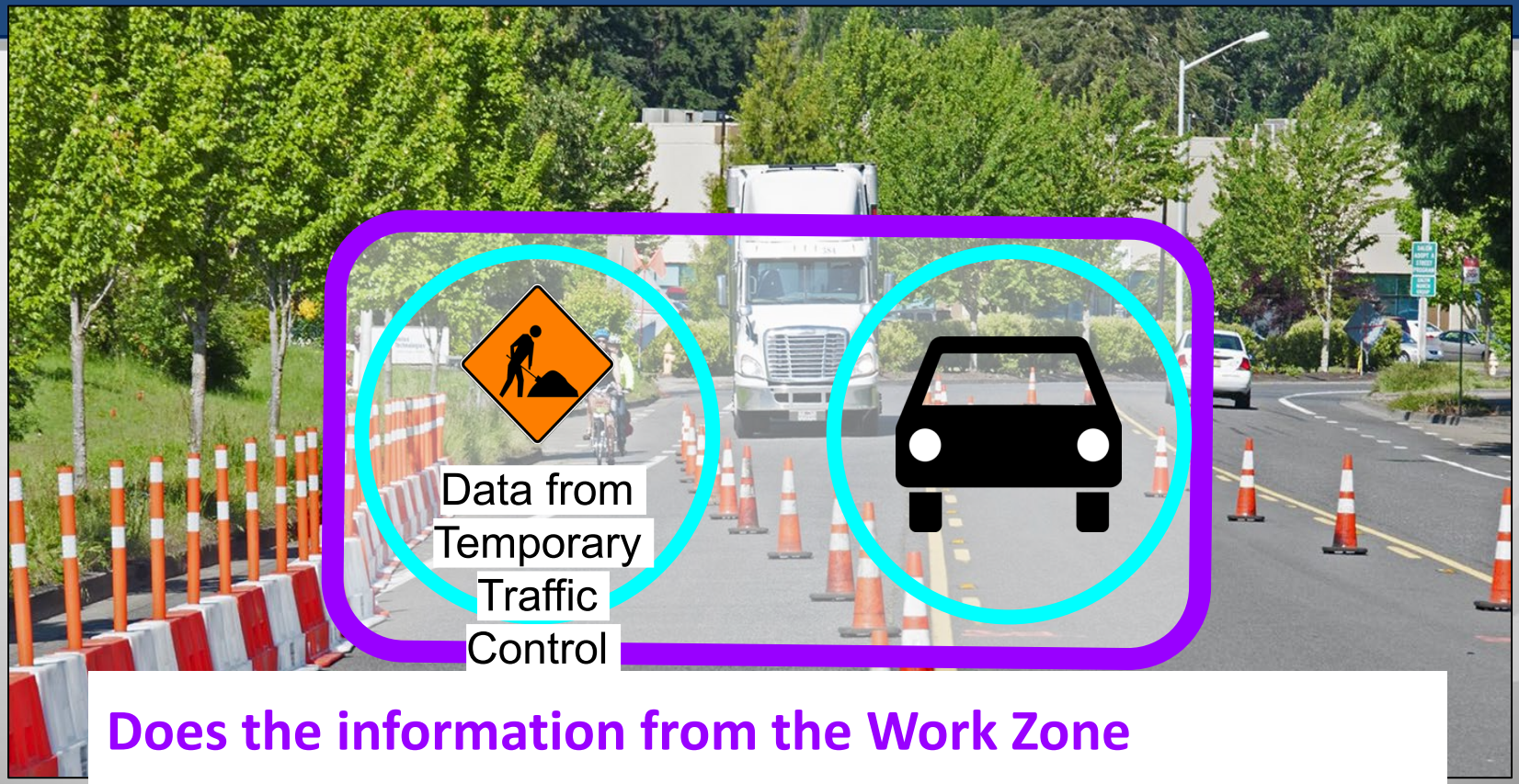
- Expanding Device Data



Smart Work Zones in Arizona and WZDx

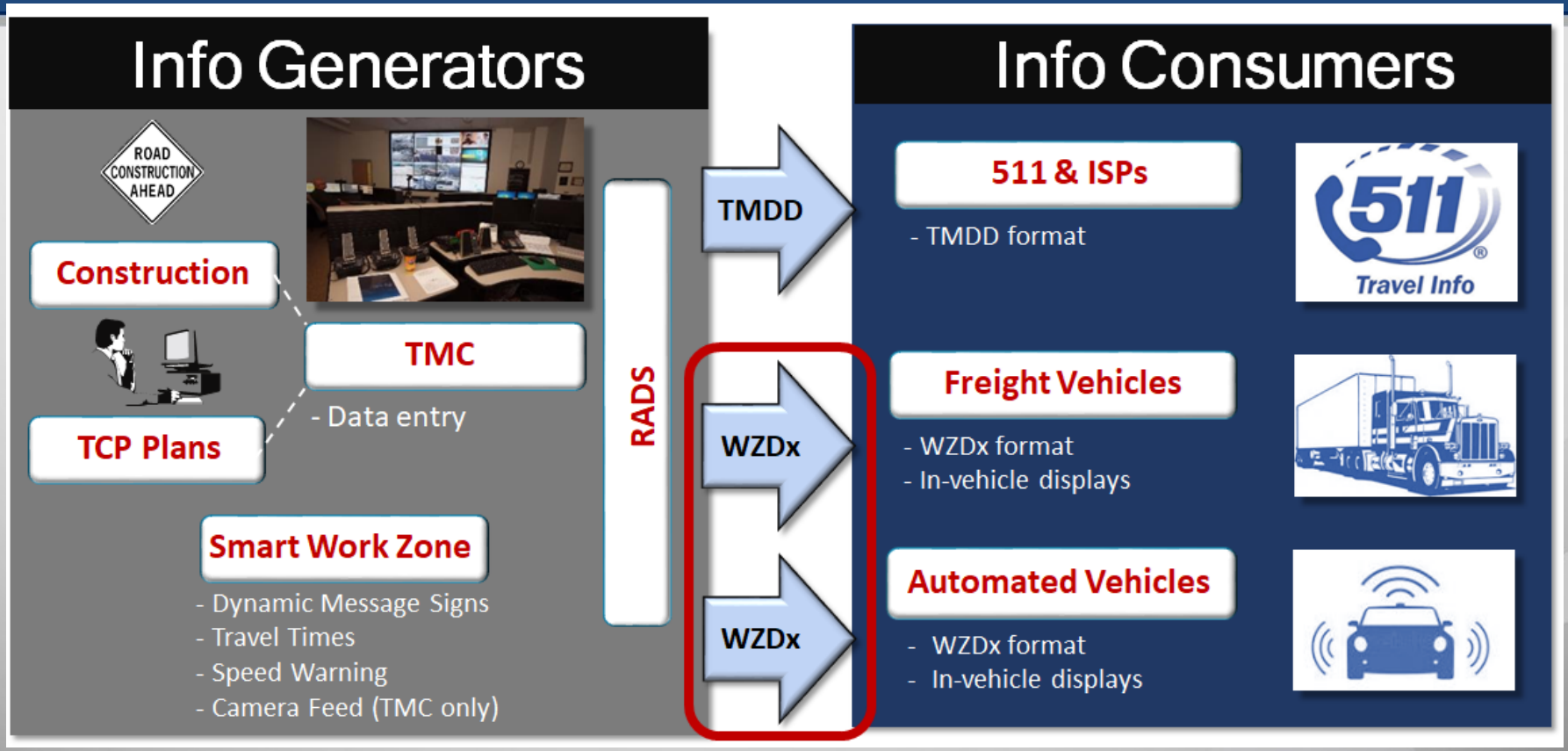
Help bridge the gap in levels of autonomy





Does the information from the Work Zone match what the car is detecting?

U.S. DOT Work Zone Data Exchange Demonstration Project



Smart Work Zones in Arizona and WZDx

Purpose: Effective coordination of work zone activities for enhanced mobility and safety.

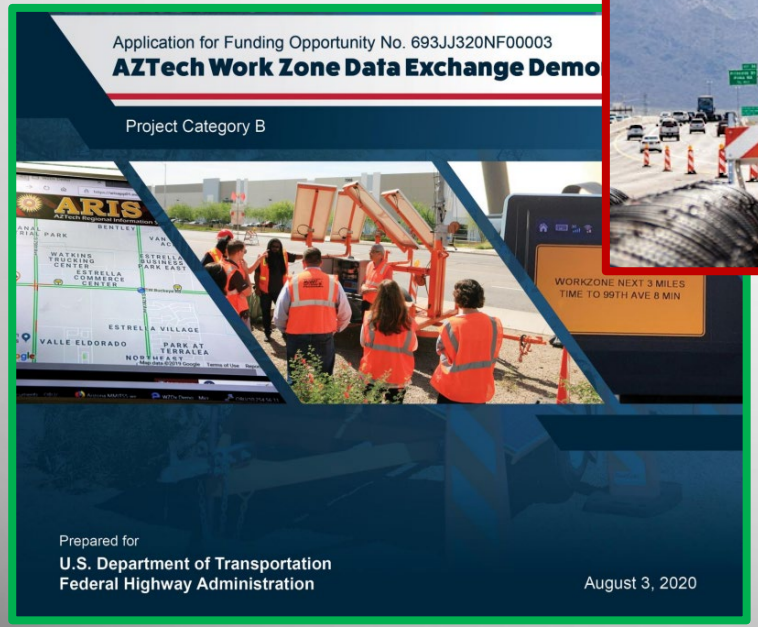
Development of a standardized approach for collecting, organizing, and sharing Work Zone Event Data (WZED).

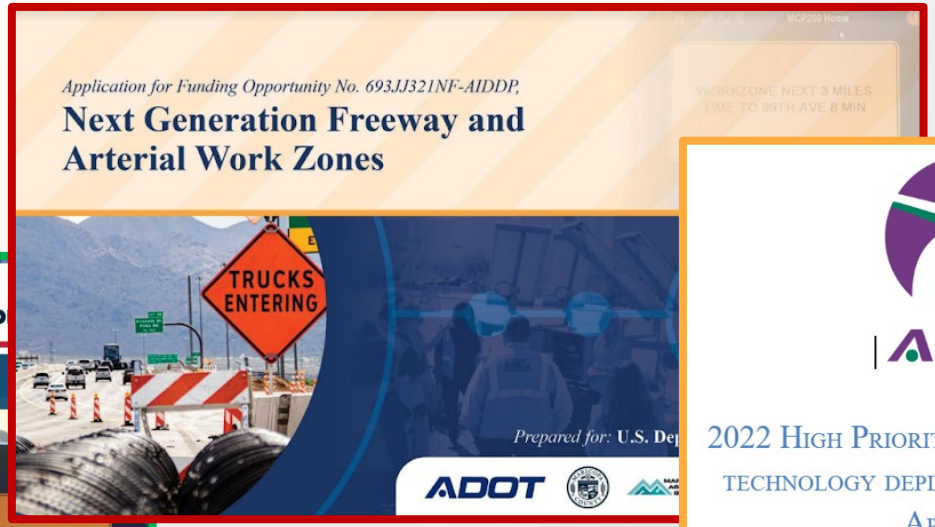
Challenges

- No Federal guidelines or framework for AV testing and/or deployment
- Each state approach is different
- How safe is safe?

Whats Next?

Grants





ADOT

2022 High Priority Program – innovative technology deployment (HP-ITD) Grant Application

for the Arizona Department of Transportation

Questions?

Adam D. Carreon PE, PTOE

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Adam Carreon
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Arizona Department of Transportation

Michelle Boucher
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IBI Group

Upcoming events for you

March 2, 2023

TRB Webinar: Strategies to Reduce Highway Traffic Noise

May 9-10, 2023

TRB's International Conference on Road Weather and Winter Maintenance

https://www.nationalacademies.org/trb/events

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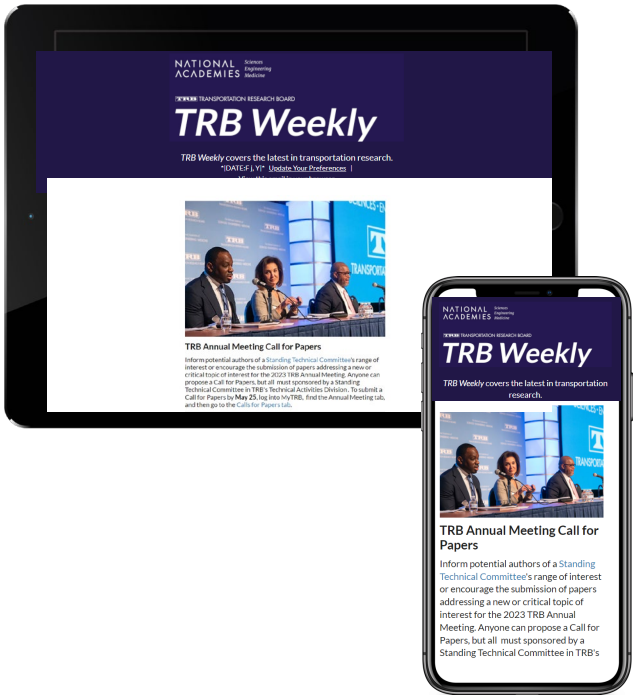

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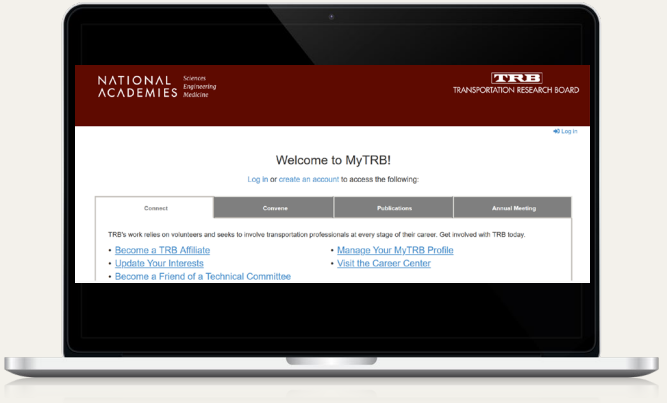

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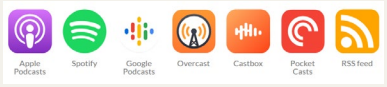

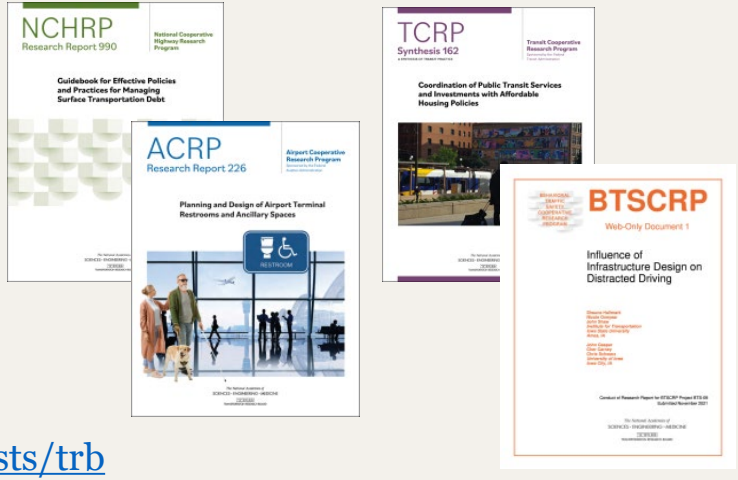

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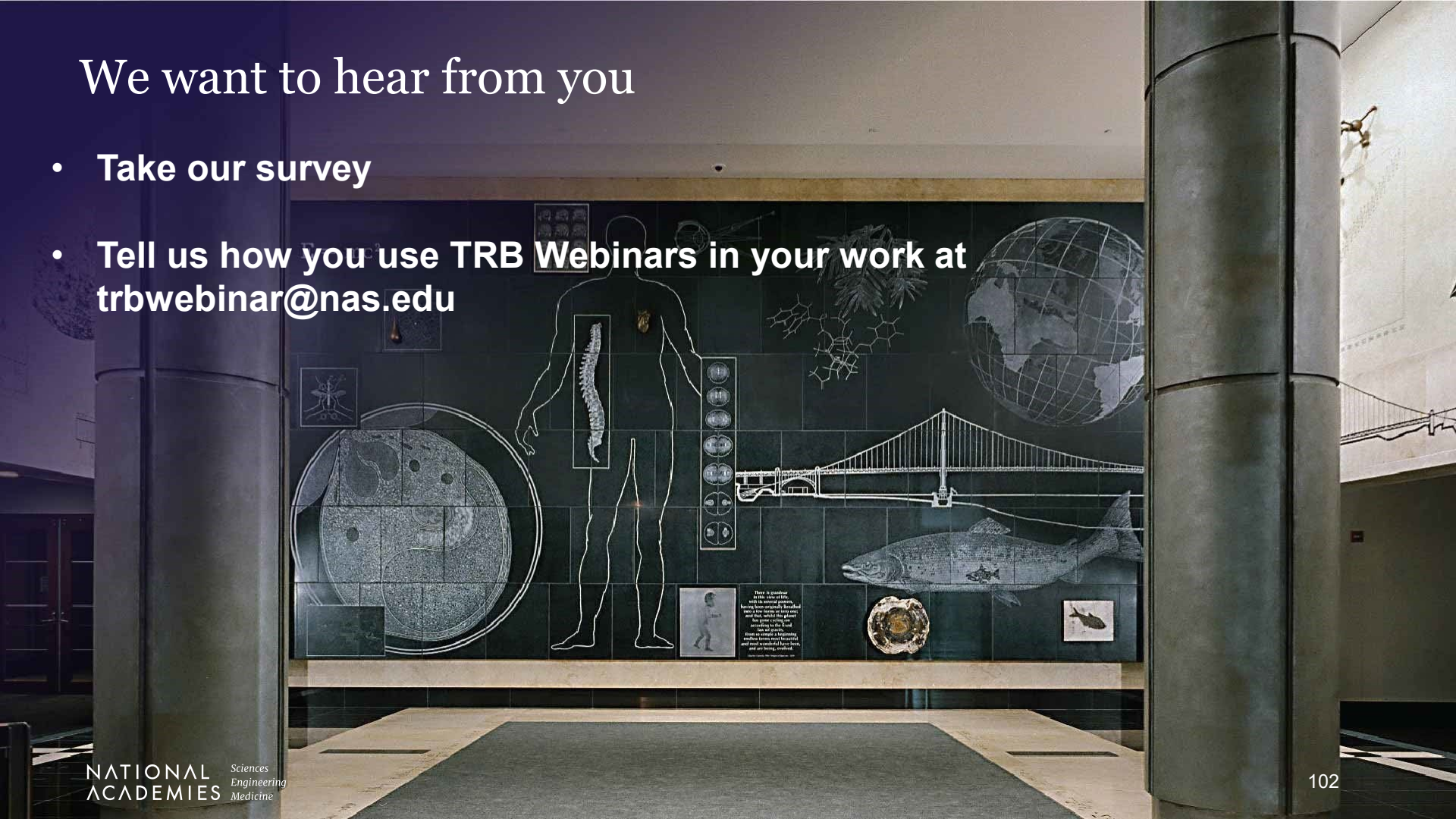

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