Connected Work Zones

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Technical Brief on Connected Work Zones

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Current Grant Resource

- First considered publication on Smart Work Zones
- Shifted focus and worked with one vendor
- Developed awareness-level publication under the Grant



Images Source: ATSSA

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Access the Current Publication

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Devices Highlighted

- Work zone start and end location markers
- Smart arrow board
- Digital speed limit trailer
- Speed feedback display

Reference: ITE Connected Work Zones Implementation Guide and Standard

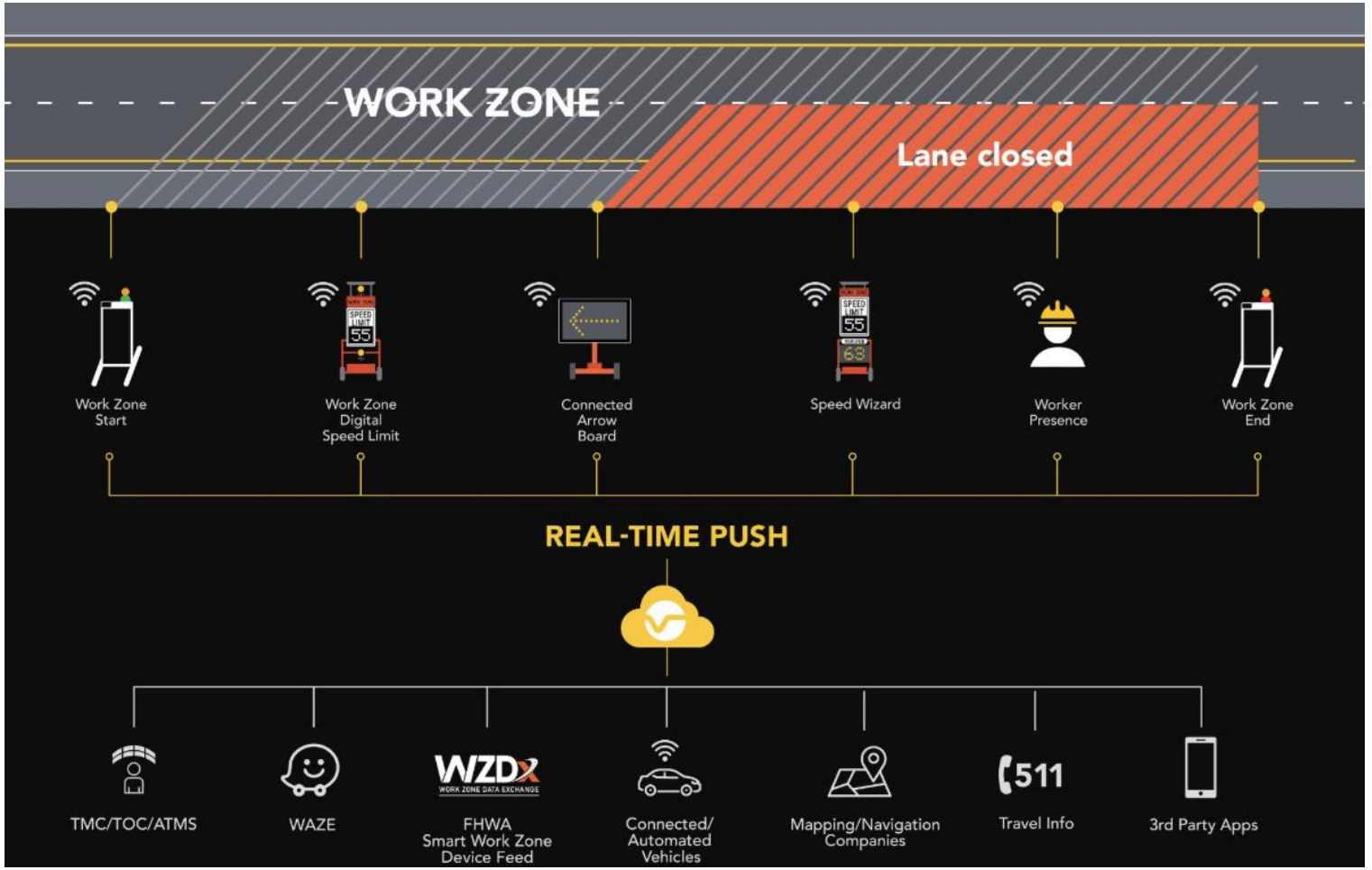


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ATSSA Product Demonstration Example



- Currently in use by DOTs and contractors in 11 states
- Uses a worker toggle feature in the app
- Drivers receive in-vehicle alerts

Image Source: ATSSA

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Report References and Highlights

- Iowa DOT Smart Arrow Board Guidance Document
- Wisconsin DOT Approved Products List – Arrow Board Retrofit Kits and Location Markers
- MassDOT Specification
- Michigan DOT Real-Time Alerts (App “Check in” and “Check out”
- Virginia DOT Work Zone Builder Application



Image Source: MDOT

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Thank You!

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Using Connected Devices to Verify Planned Work Zones

Confirming the location and status of planned work: the MassDOT CWZNS pilot

Presented by Chris Falcos

Agenda

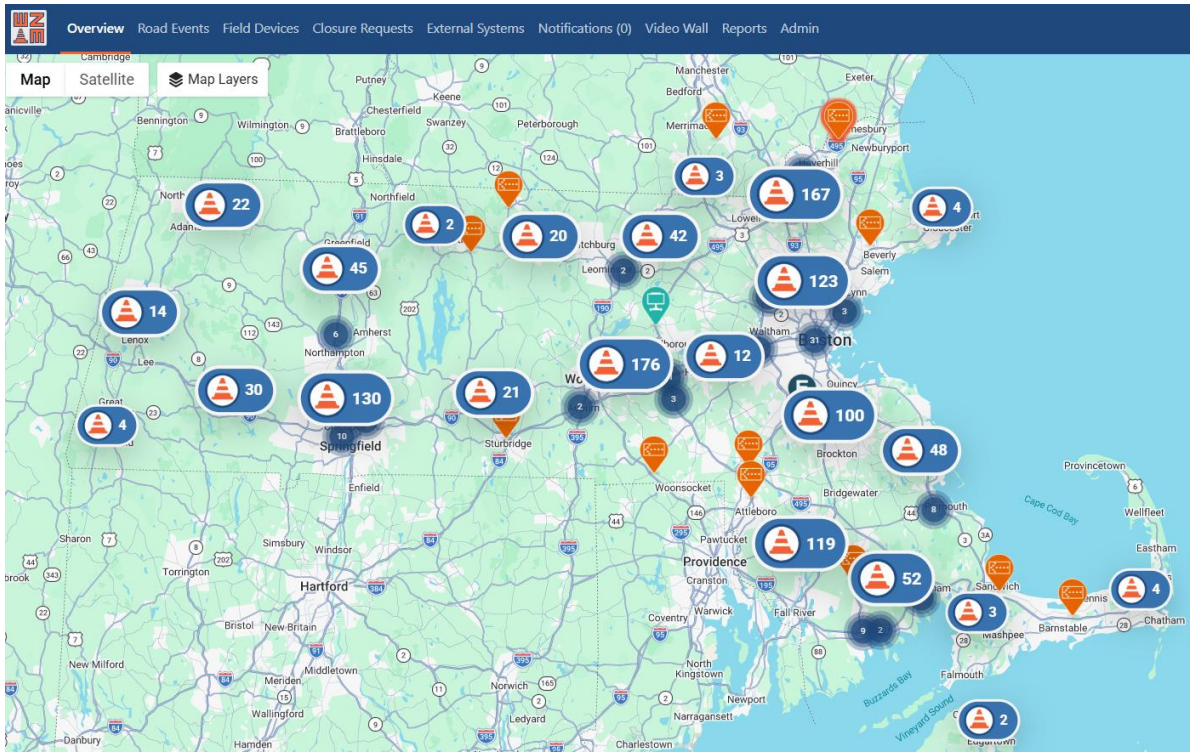
- Work Zone Manager software in Massachusetts
- The CWZNS pilot: background, goals, special provision and standard
- How the software automatically associates connected devices
- Key findings from the pilot
- Practical considerations for other agencies

What is Work Zone Manager

What is the Work Zone Manager Software?

One place for every piece of work zone information

- A single system of record for planned lane closures, detours, and work zone activity
- Replaces scattered spreadsheets, emails, and district-by-district recordkeeping
- Publishes closure information outward to the public, Mass511, and mapping providers (e.g. Waze, Apple)
- Connected device data flows in alongside the planned events



The Lane Closure Request Process

1. Request

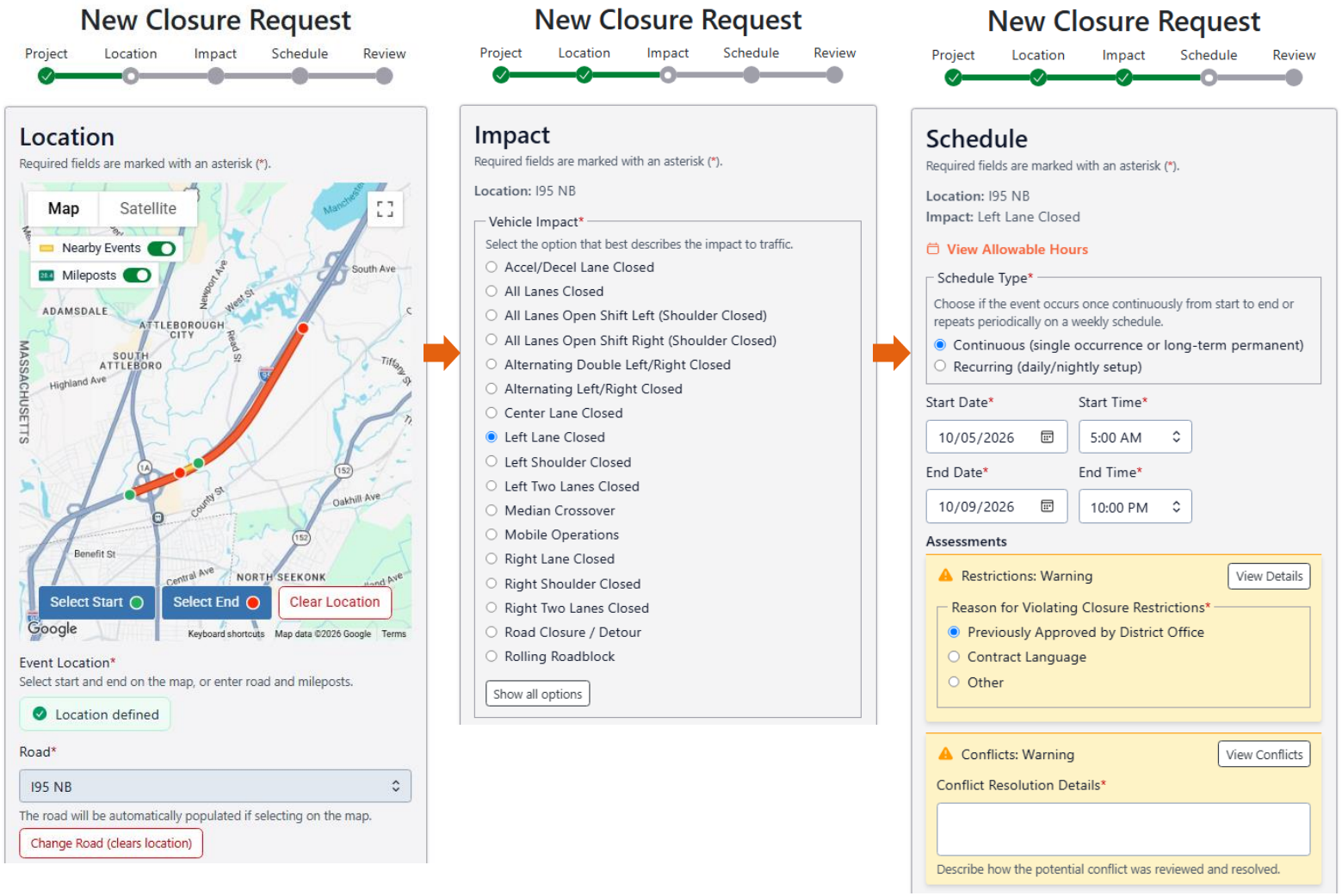
- MassDOT REs use the LCS to request planned work by end of day Wednesday

2. Review and approve

- MassDOT district operations review the request on Thursday and Friday

3. Publish

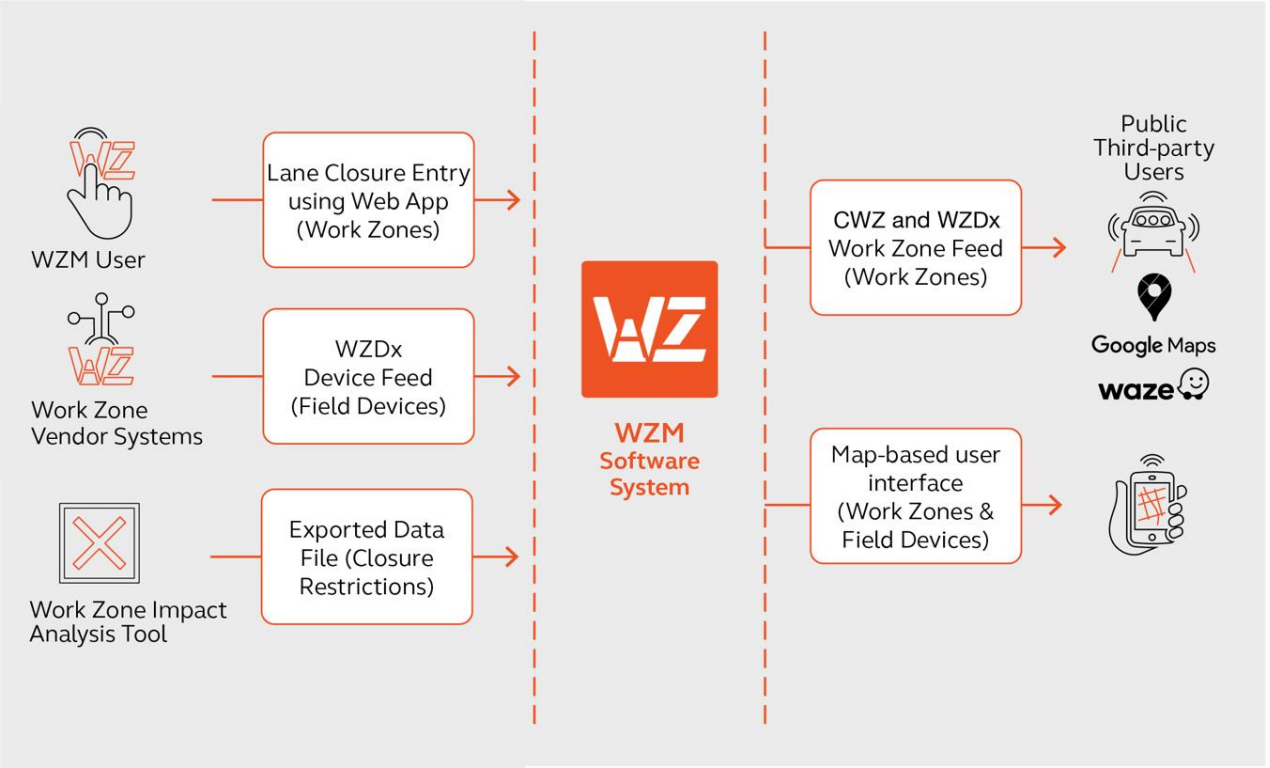
- Approved closures go out to the traveling public and to mapping and navigation providers.



Getting Device Data Into the System

Device data enters through a WZDx Device Feed

- Every major device vendor supports it today, so no custom integration is needed.



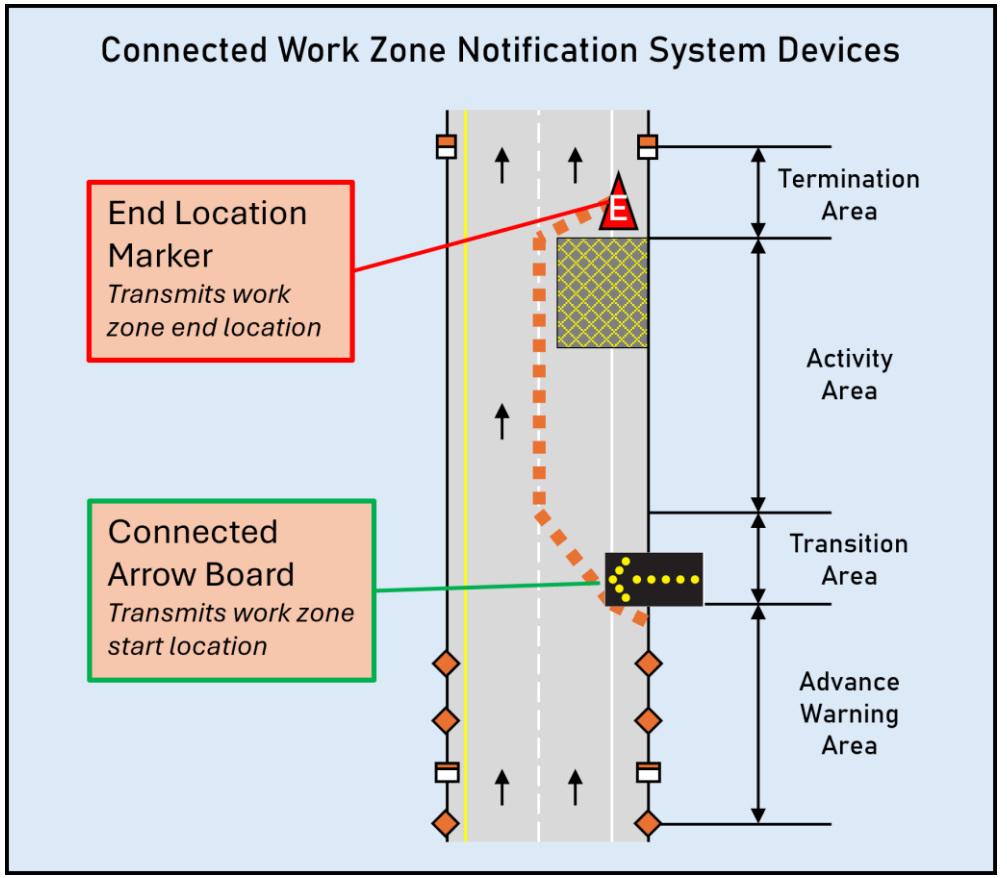
Pilot Program

Connected Work Zone Notification System (CWZNS)

Pilot Background and Goals

Get connected equipment into the field and prove the software can use it

- Volunteer-based — we asked for participants rather than mandating it, and eased into it
- **Improve worker safety**
- Only two connected devices are required per closure: an arrow board at the start, an end marker at the end
- Mapping providers asked for verified closures
- Thank you to volunteers: PJ Keating, JH Lynch, Palmer Paving, Eurovia Construction, and SPS New England.

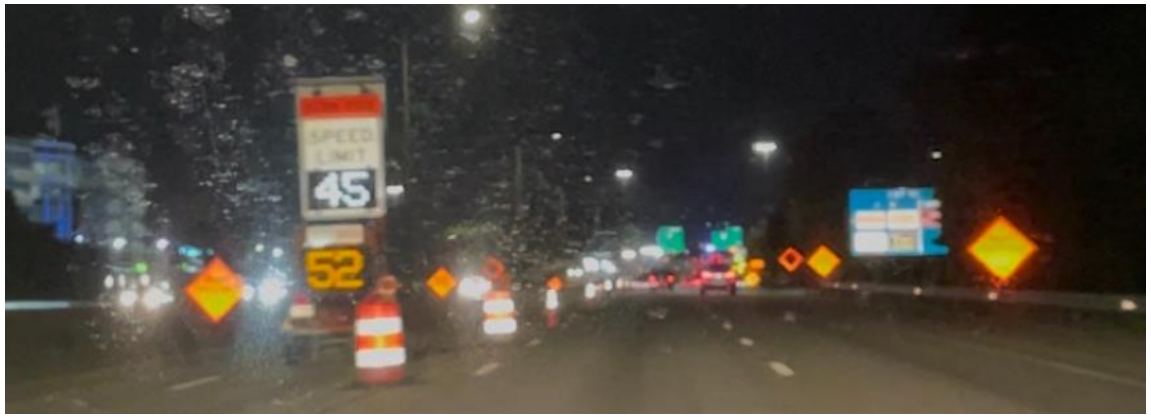


In the Field: The I-95 Pilot Deployment



Arrow board

A connected arrow board marks the start of the closure and a connected end location marker marks the end.



Work zone speed limit speed feedback sign

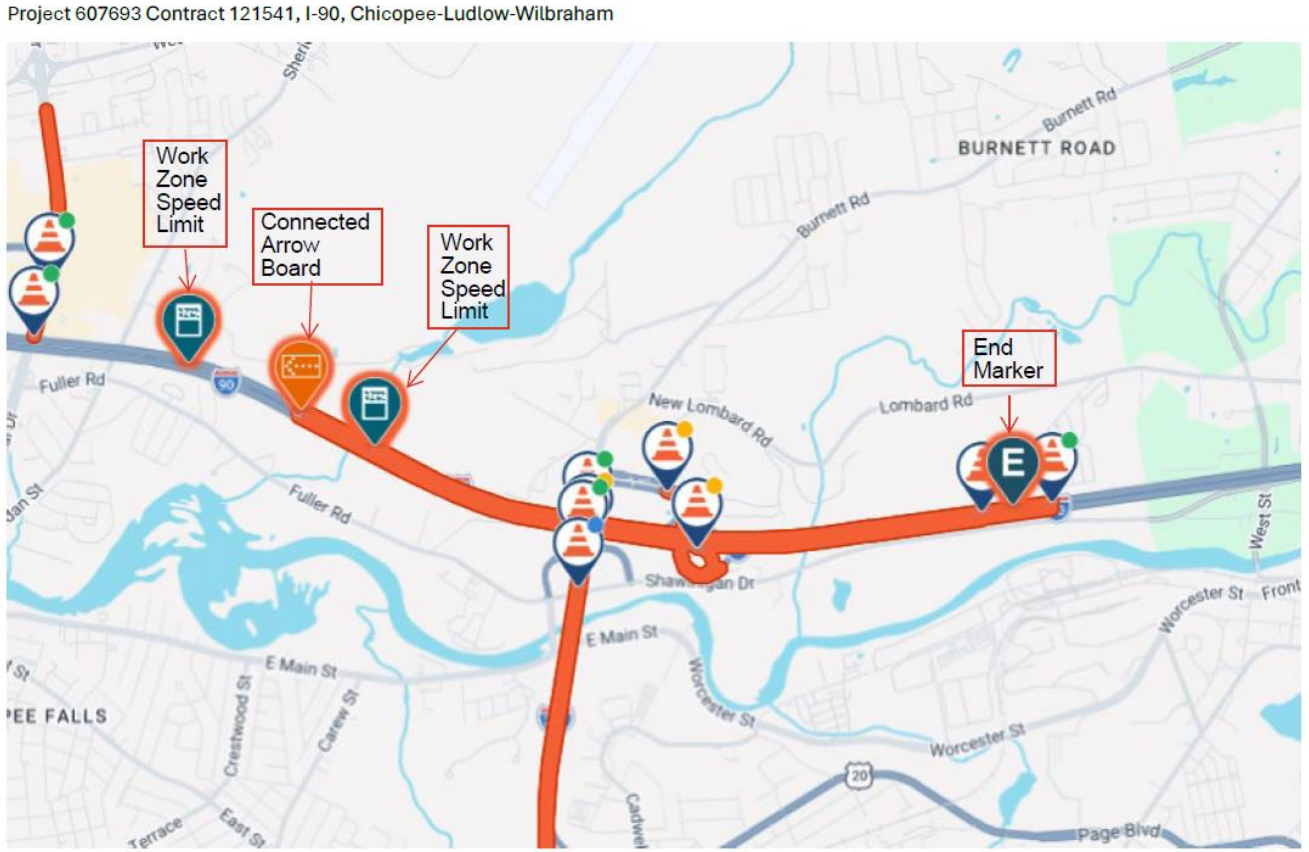


End location marker

Associating Devices to Planned Events

Many nearby events make simple matching unreliable

- WZDx Device Feed supplies devices. Closure requests supply planned events.
- A device needs to be associated with an event before it can verify the closure.
- Manual association cannot scale.
- Automatic association is not simple.



Scoring the Candidate Events

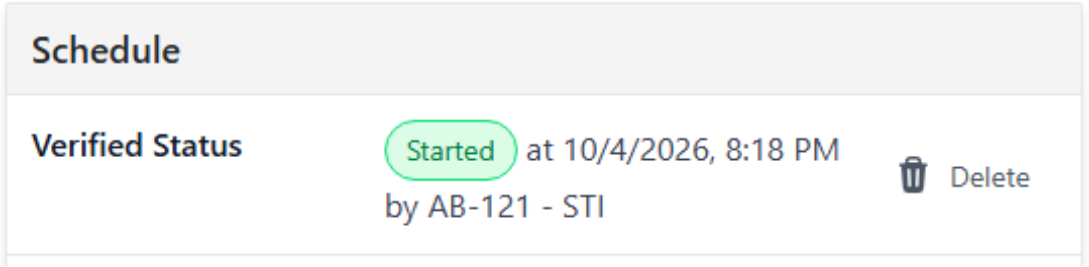
Every nearby event receives a score

- **Proximity**
- How close is the device to the event path?
- **Placement**
- Where does the device sit along the road relative to the event?
- **Automatic association**
- Thresholds determine whether the top candidate qualifies.
- **Manual fallback**
- A user chooses when the top scores are too similar.

Verifying the Closure

Associated devices confirm the start and update the geometry

- **Arrow board**
- Location marks the closure start. Blank-to-on time marks when it began.
- **End location marker**
- Location marks the closure end.



- WZM publishes updated geometry to consumers using those start and end locations.

Tuning the Association Logic

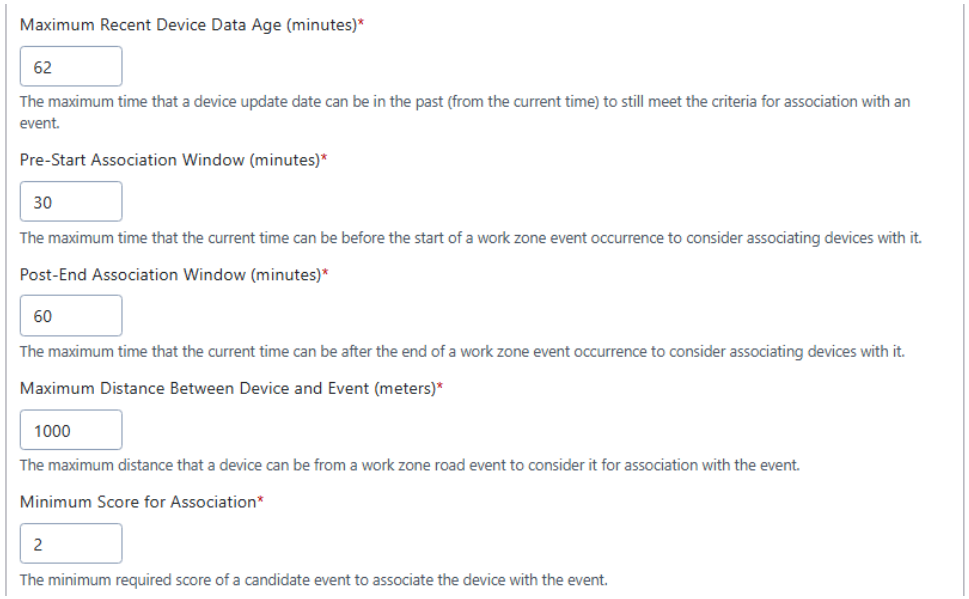
Review what the model did

- Looked at successful associations and at the scores for the failed ones.
- Drive through site or call RE to figure out what event the devices were really in.



Adjust the configuration

- Scoring weights and thresholds, expected device positions, and snapping distance



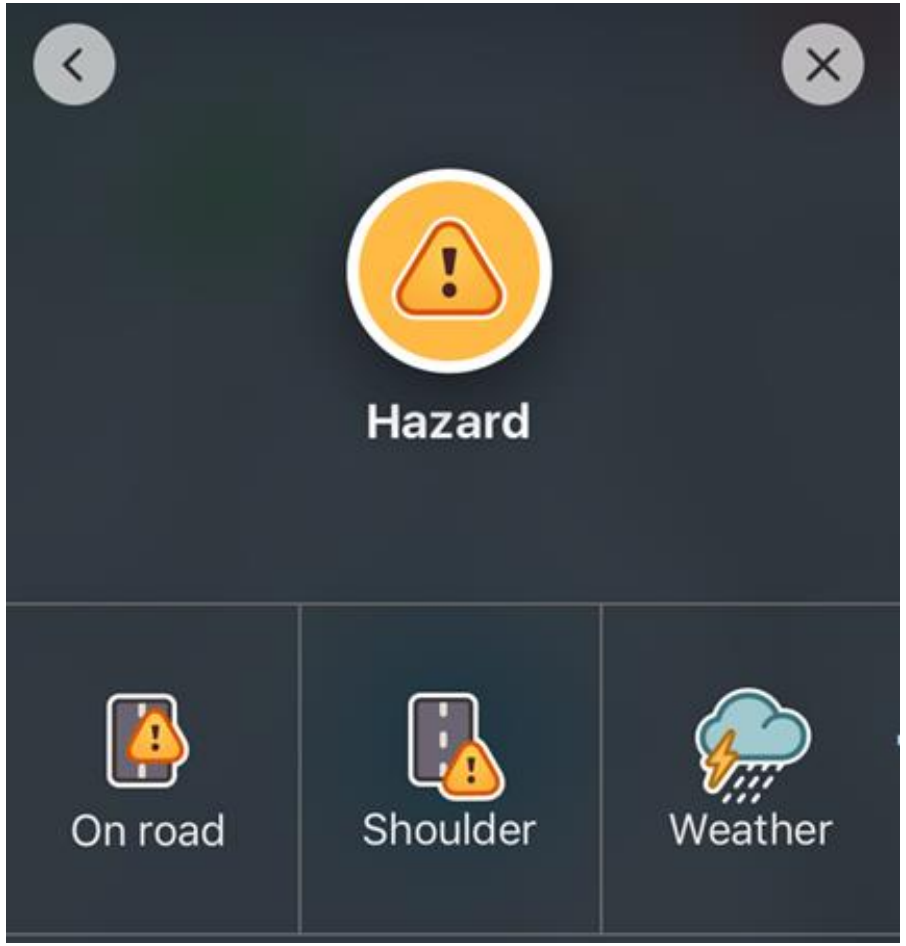
Why Verification Matters

Unverified closures erode trust

- Closures that are published but never happen teach drivers — and the mapping companies — to ignore the message.

Verification earns a consistent reaction

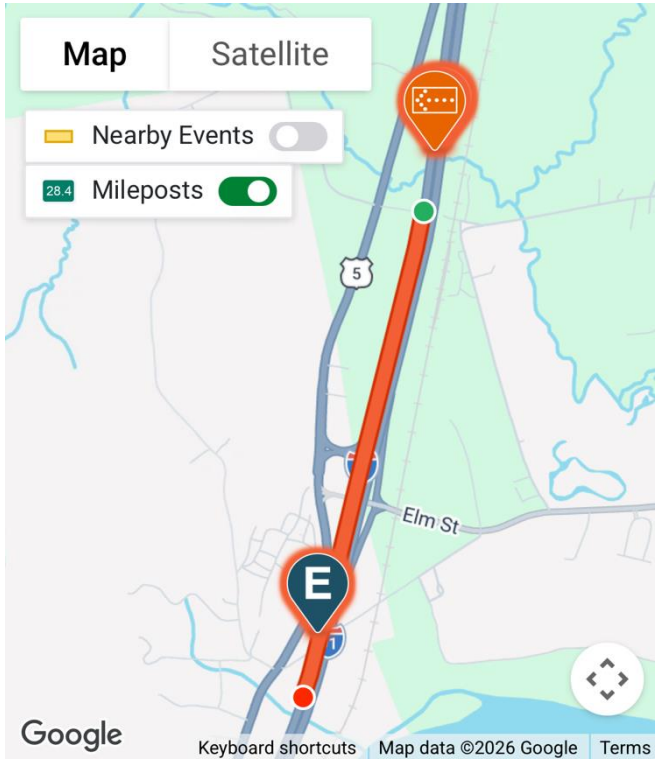
- When the public only sees closures that are real, confidence in the message rises and driver response becomes consistent. Verification is the answer to alert fatigue.



Key Findings

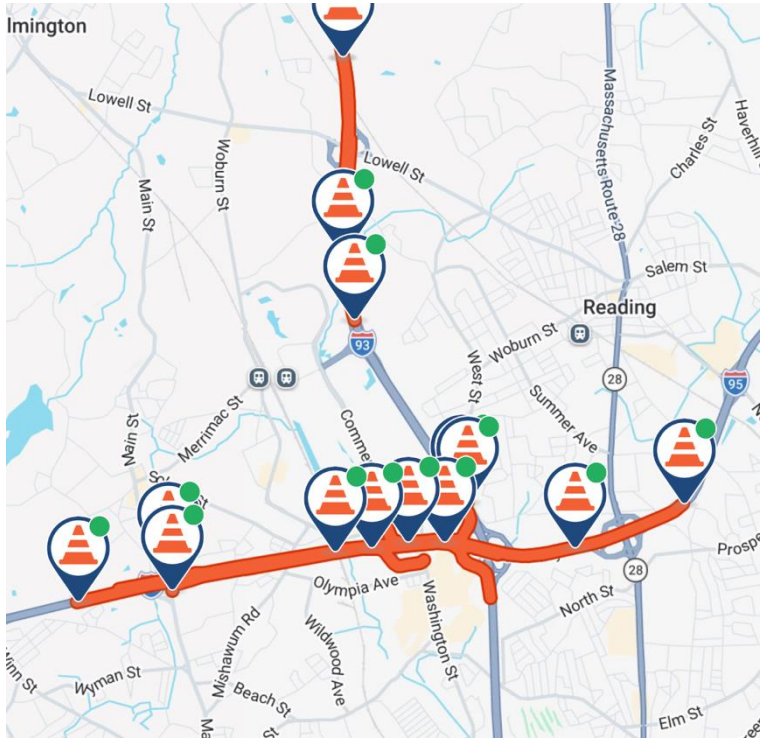
Quality of the Planned Data Matters

- [x] Where few events are nearby, the process works end to end with no human intervention



Associated arrow board and end marker

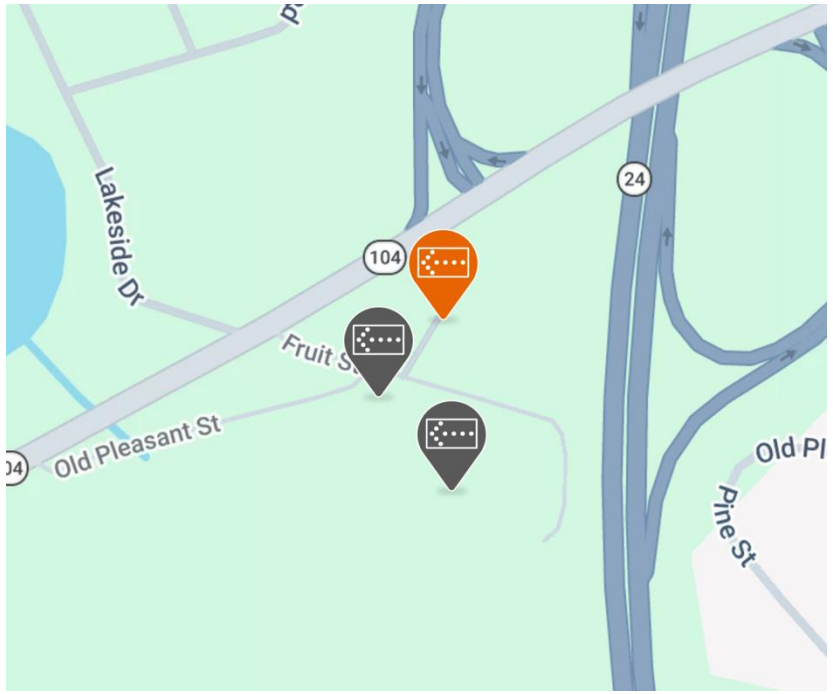
- Be precise about where the work is that week
- Shooting the moon clutters the map



Many events overlapping

How Devices are Used

- Devices driven while powered on
- End markers placed but not turned on
- Devices in laydown areas and maintenance yards were incorrectly associated
- A device might be used in a different event each shift



Devices in yard

Practical Considerations

Practical Considerations: Connected Devices: Feeds and Association

Require feeds by manufacturer, not by project

- A manufacturer-level feed allows for project agnostic devices, resulting in more flexibility
- A per-project feed is too complicated.

Required devices and their locations

- A separate start marker was tested during the pilot and found to be unnecessary. Fewer devices means less burden on the crew and fewer opportunities for error
- Use channel device method- recommended by CWZ. Timeliness of message is better for road user.

Scoring candidates

- The software has to stay defensive — crews will not always follow the SOP

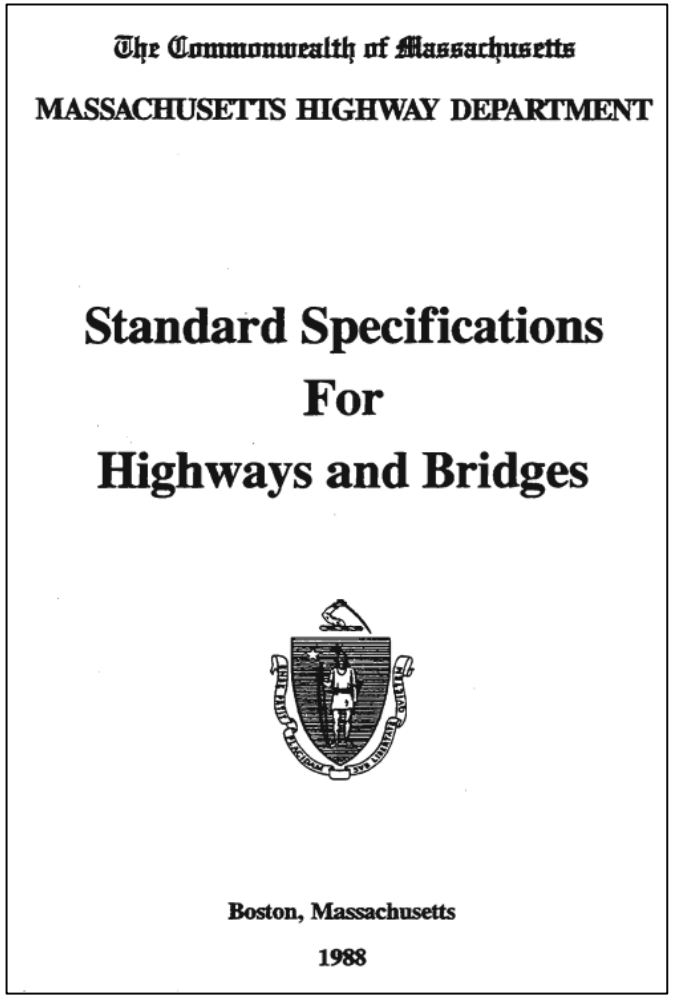
Practical Considerations: Training and Specifications

Train both ends of the process

- All MassDOT staff need training on how to use the software, and develop District specific SOPs
- Equipment providers need to train the traffic control crews running the devices in the field — some failures can be trace back to procedural errors.
- Regular internal check ins to discuss issues

Put it in the specifications

- Start as a special provision and move to a standard. Include deployment details, drawings, and where the devices belong within the work zone, much like a typical detail.



Thank You