

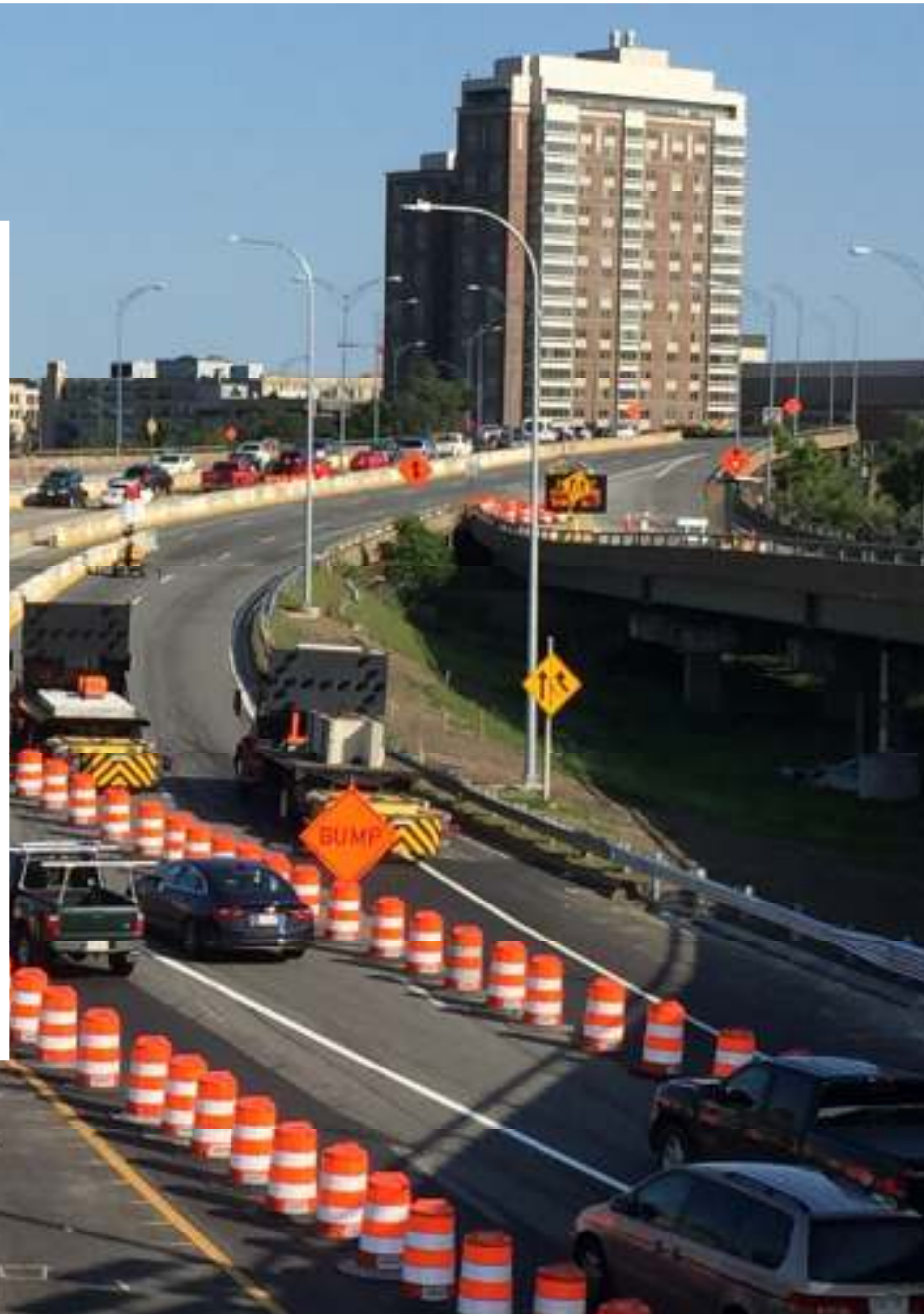


Work Zone Manager and WZDx Feed at MassDOT

Connected Work Zones Peer Exchange

College Station, Texas

November 16, 2022



Agenda

- MassDOT Smart Work Zone Manager Application
- Move towards Work Zone Data Exchange (WZDx)
- Developing a WZDx v4.0 Specification Feed
- Integration with “Planned Events” Data
- Putting the Logic to the Test
- Upgrade to WZDx 4.1 Specification
- Integration with Mass511
- Effort to Improve Data Quality



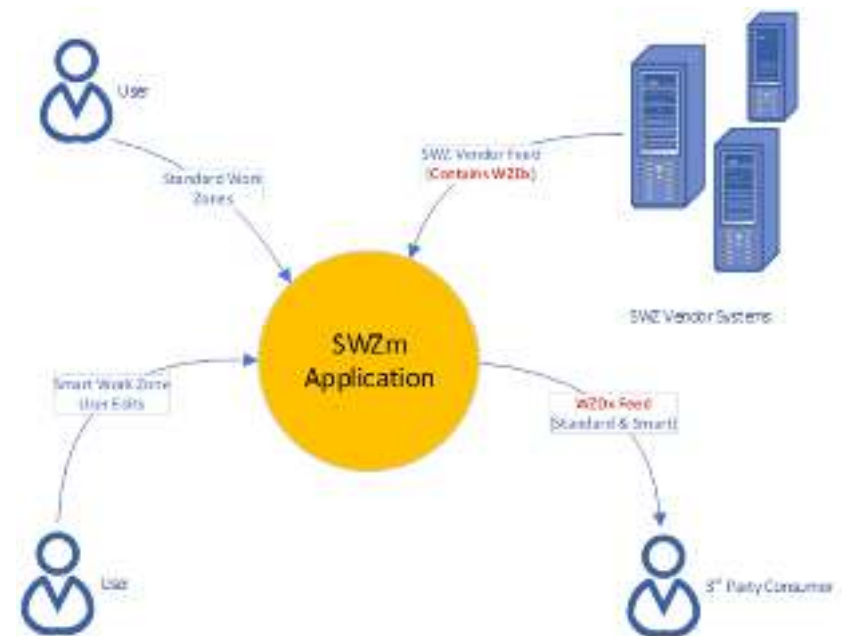
Smart Work Zones at MassDOT

- Several years back we initiated a project to standardize how we integrate with and capture “Smart Work Zone” deployments
- The goal of this effort was to provide an easy-to-use, real-time overview of SWZ conditions across the state
- Ultimately, we want to add all static work zone deployments through use of our “planned events” feed & push to consumers



Migration to Work Zone Data Initiative

- MassDOT's SWZM Application was well almost fully developed when WZDi was released
- Project put on hold – need to update to meet Work Zone Data Dictionary terminology
- Development team asked to participate in the WZDx effort
- Modification to ConOps was required to adapt to FHWA approach



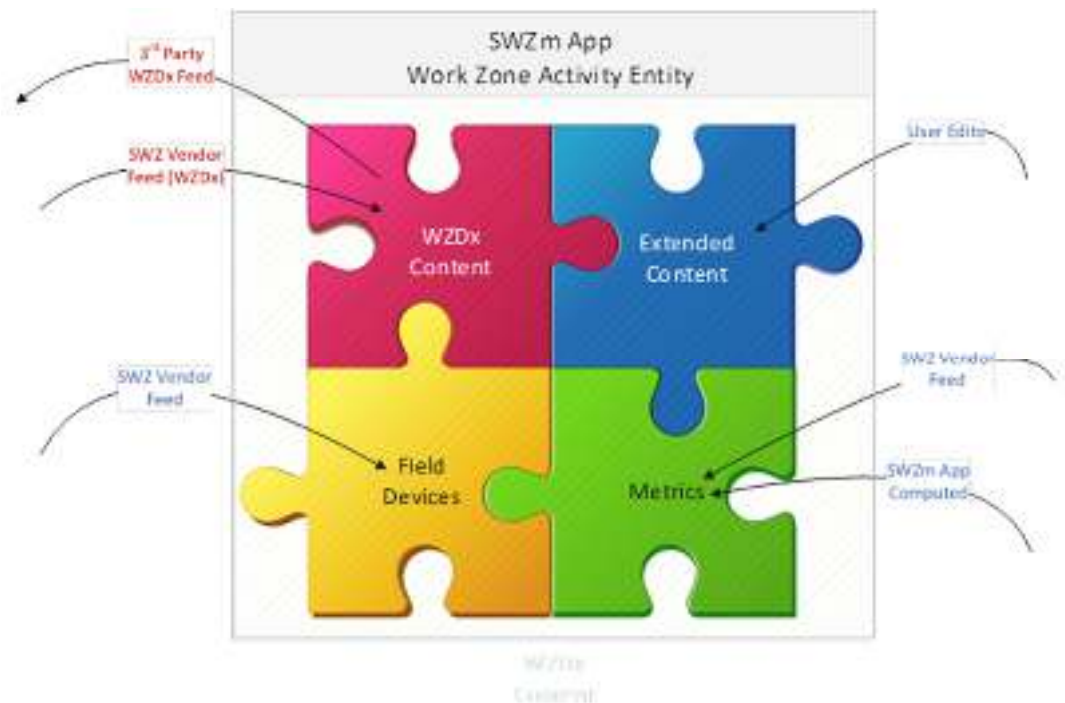
MassDOT's Focus on Work Zone ITS Devices

Work Zone Activity Data

Dynamic Capture of "Smart Data" from the field devices*

- Traffic Sensors
- Dynamic Message Signs
- PTZ Cameras

**Initial focus of project*



MassDOT SWZ Specification

The RTTM software shall provide a U.S. Department of Transportation [Work Zone Data Exchange \(WZDx\) DeviceFeed](#) data feed. The feed shall be accessible by the MassDOT Work Zone Manager (WZM) via HTTP across the internet. The WZDx [DeviceFeed](#) shall be compatible with the latest version of WZDx at the time of project notice to proceed. See [the documentation for Creating a WZDx Feed](#) for more information.



Evolution of MassDOT WZDx Compliant Feed

v4.0 Specification

4.4. WZDxFeed (Work Zone Road Events)

The API shall offer an endpoint that provides the details of all work zone road events (i.e. work zone segments) in the vendor system. The response to this request is a valid [WZDxFeed](#) object as defined by the [WZDx v4.0 Specification](#). The WZDx documentation provides a [JSON Schema](#) to facilitate validating the conformance of the response to this endpoint.

Function	WZDxFeed Request
Endpoint	/wzd/feed
HTTP Method	GET
Headers	Authorization: Basic base64(username:password) Accept: application/json
URL	na
Parameters	na
Request Data	na
Response Object	WZDxFeed
Sample call	<pre>\$ curl -X 'Authorization: Basic dXNlbnRlcjpwYXN0cm9udA==' -X 'Accept: application/json' https://(root)/api/v4.0/wzd/feed</pre>
Success Response	code: 200, content (json): { See WZDxFeed }
Error Response	Code: 401 UNAUTHORIZED, Content (json): { "error": "Invalid User Credentials" }



Traffic Sensor



Portable Message Sign



PTZ Camera



Connected Arrow Board



Variable Speed Limit



Flashing Beacon Sign

4.5. SwzDeviceFeed (Field Devices)

The API shall offer an endpoint that provides the configuration and operational status details of all field devices in the vendor system. The response to this request is a valid [SwzDeviceFeed](#) object as defined in the [WZDx v4.0 Specification](#). The WZDx documentation provides a [JSON Schema](#) to facilitate validating the conformance of the response to this endpoint.

Function	SwzDeviceFeed Request
Endpoint	/swz/device/feed
HTTP Method	GET
Headers	Authorization: Basic base64(username:password) Accept: application/json
URL Parameters	na
Request Data	na
Response Object	SwzDeviceFeed
Sample call	<pre>\$ curl -X 'Authorization: Basic dXNlbnRlcjpwYXN0cm9udA==' -X 'Accept: application/json' https://(root)/api/v4.0/swz/device/feed</pre>
Success Response	Code: 200, Content (json): { See SwzDeviceFeed }
Error Response	Code: 401 UNAUTHORIZED, Content (json): { "error": "Invalid User Credentials" }

***Integrate Static Work Zone Data with Dynamic Work Zone ITS Devices = ROBUST REAL-TIME FEED**

Work Zone “Road Event” Page

2128-185972 **2128-185986** /

Core Details

Start Date	2020-08-18 20:32 (Estimated)
End Date	2020-12-25 20:32 (Estimated)
Work Type	Surface Work
Length	3.09 mi (calculated)
Creation Date	2020-08-21 16:58:17
Update Date	2022-05-10 16:32:18

Location

	Start	End
Road	I-90, Westbound	
Coordinates	42.3445905, -71.0613300 (Estimated)	42.3552700, -71.1184800 (Estimated)
Milepost	134.18	131.1

Impact

Left Lane	Middle Lane	Right Lane	Right Lane
Open	Open	Open	Open

Westbound

Dynamic Data

Level of Service	—
Travel Time	5 min
Speed	43 mph
Volume	4138 vph
Occupancy	11 %

Schedule

No Work Hours Provided

Additional Information

Free Flow	5 min, 34 mph
Reduced Speed Limit (mph)	55 mph

Work Zone Project Details

Project ID: 2128

District: 6

Description: 0-SW2 - MA - I-90 Parcel 12 RTM (2020-2021) NET

Start Date: 2020-08-18

End Date: 2020-12-25

Contractor: Suffolk
Matthew Lerner
MLerner@suffolk.com
617-517-4286

Documents: [Upload Document](#)

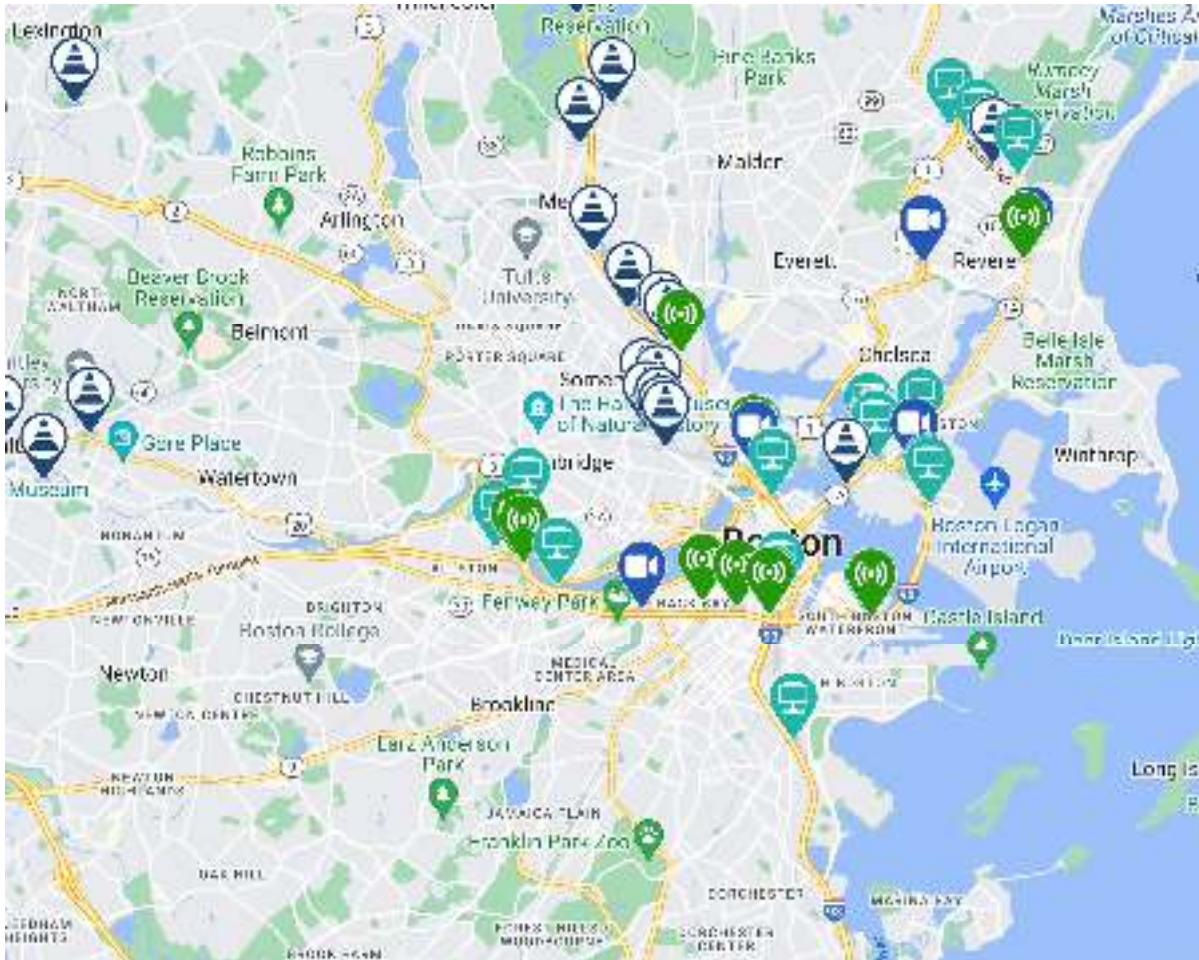
Map **Satellite**

Map showing the work zone location in Boston, near Central Square and South End.

Integration with MassDOT's Planned Event System

- MassDOT uses the Everbridge platform to track all the “planned events” which include temporary traffic control for road work zones
- This past summer our consultant, IBI Group, focused on bringing in these “planned events” into WZM so that we could capture the data elements needed to populate the WZDx feed
- The upgrade was completed on August 16th – however for this first data capture from Everbridge – there is no ability to edit/update the attributes in WZM
- Identified the need to improve the data integrity from what we are getting from the Everbridge XML feed





WZM Circa Summer 2022

MassDOT's Work Zone Manager

- Compliant WZDx 4.0 Feed for Planned Events and Smart Work Zone (Device) Data
- Working on update to system to produce a WZDx v4.1 Feed
- Adding functionality to be able to incorporate “unassociated” field devices captured in Device Feed to the Road Events feed
- Incorporating “edit functionality” to planned events to improve location accuracy



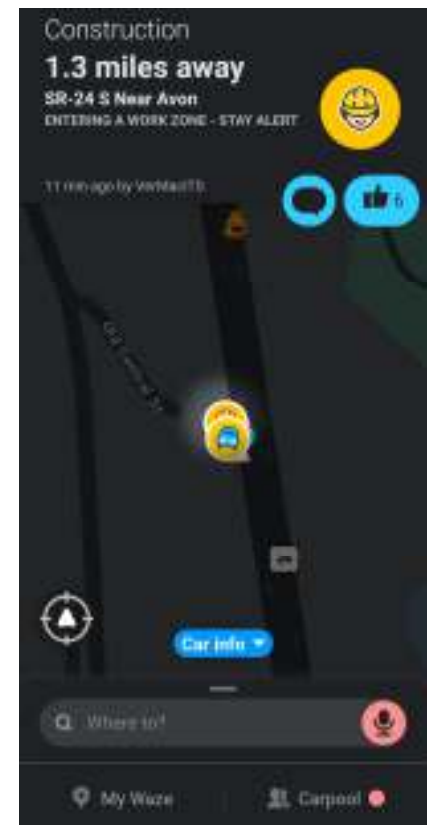
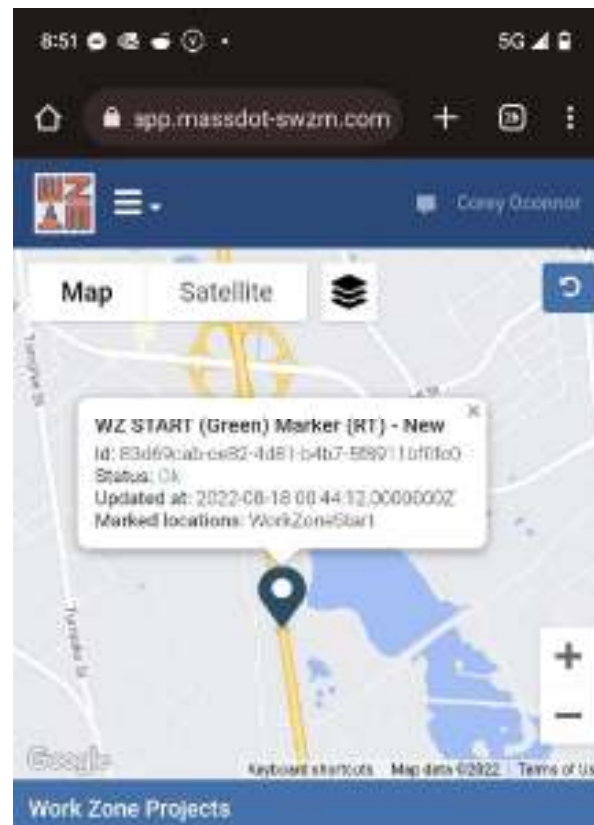
Testing the WZM Logic

Pilot Test of Smart Work Zone Field Devices

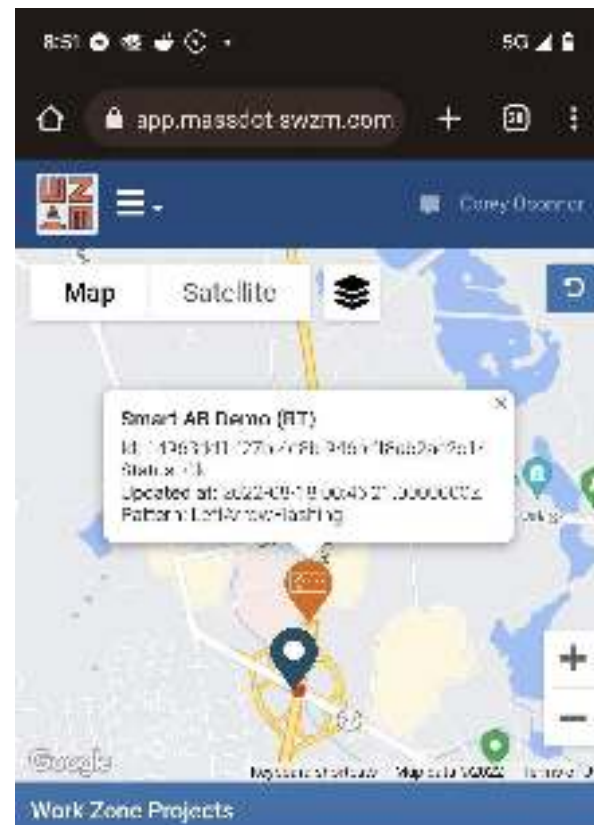
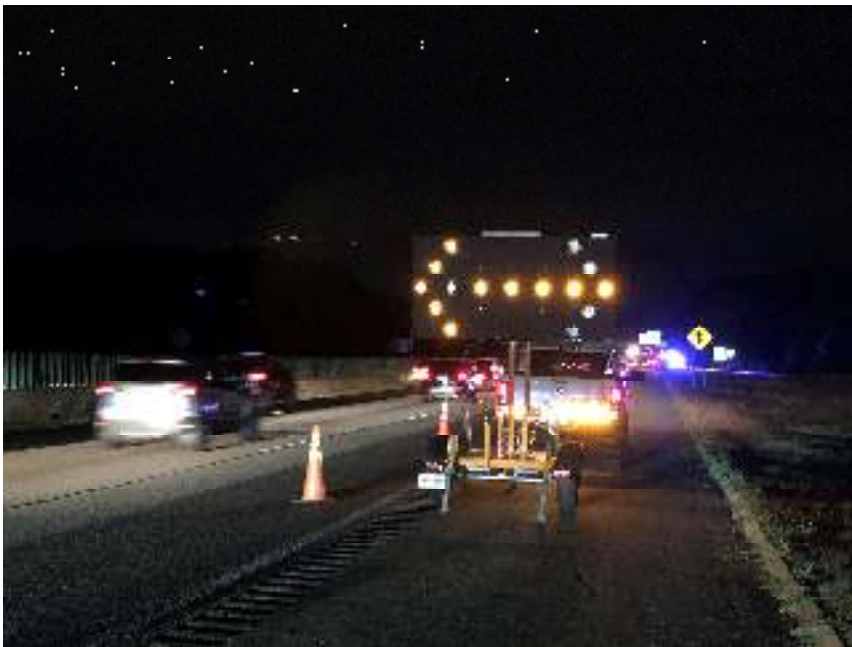
- MassDOT is initiating a series of pilot tests to evaluate the ability to capture field devices deployed in an active work zone into the WZM Tool
- Goal is to associate the WZ ITS Devices to an existing “planned road event” to create that synergy between the WZDx v4.0 Feed and the Device Feed
- Testing out the capture of the field devices and associated functionality that is pushed to mapping service providers
- Evaluate timeliness of connectivity and accuracy of location markers
- Pilot Test Location – Brockton, MA: Route 24 Southbound for short bridge inspection TTC setup (*August 17, 2022*)



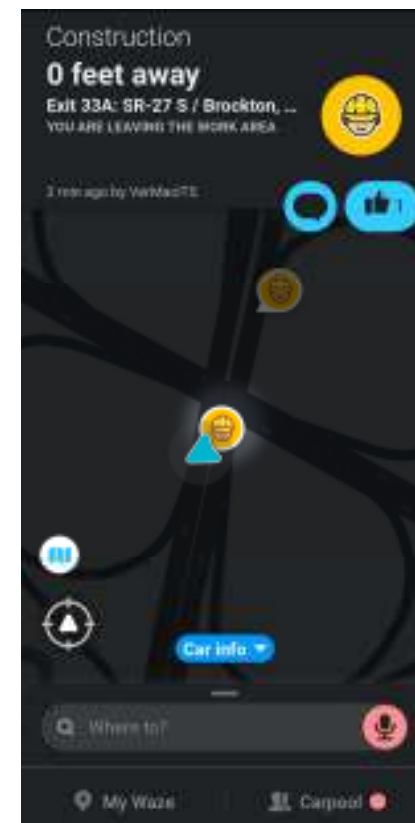
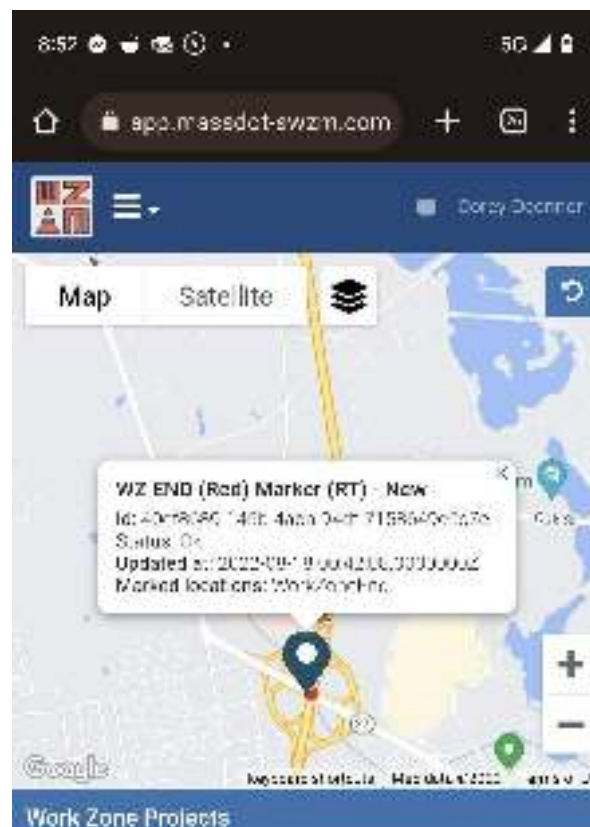
Location Marker – Start of Work Zone



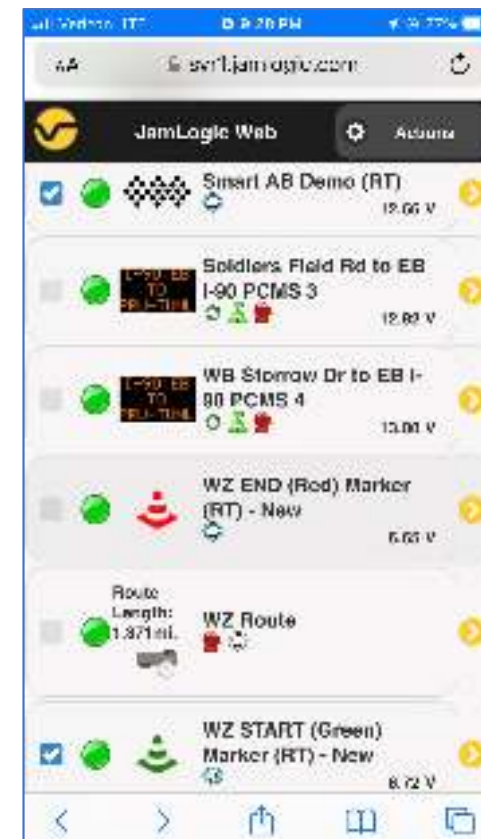
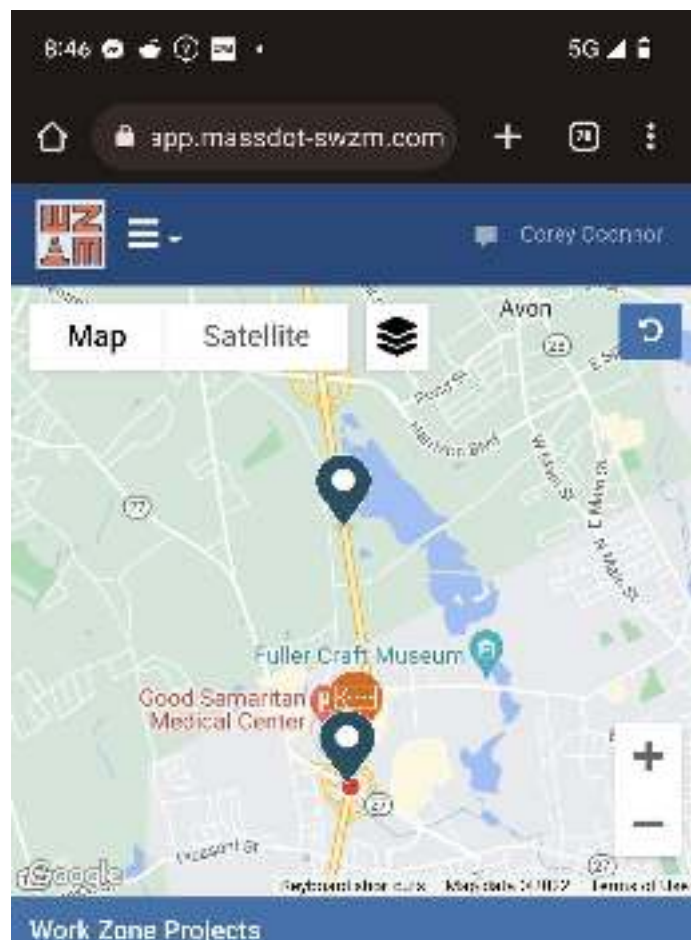
Location Marker – Smart Arrow Board



Location Marker – End of Work Zone



Overview of Work Zone Layout



Back End WZM App - Device Details

Meets the WZDx
Device Feed
Specification –

- Unique ID
- Road Event
(not defined as
the pilot was
not linked to a
planned event

Id	Name	Road Event	Type
83c89cab-c082-4d81-b4b7-5f5911a0f6c0	WZ START (Green) Marker (RT) - New	Unassociated	Location Marker
40c78689-145b-4aba-94df-7f58849c5c7a	WZ END (Red) Marker (RT) - New	Unassociated	Location Marker
14963dd1-127b-4e8b-946b-ff8ab2ac2c14	Smart AB Demo (RT)	Unassociated	Arrow Board

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Meets the WZDx
Device Feed
Specification –

- Device Type
- Device State
(function)
- Roadway
Location

Type	Device State	Roadway	Direction
Location Marker	WorkZoneStart	SR 24 S	Unknown
Location Marker	WorkZoneEnd	Exit 33A: SR- 27 S / Brockton	Unknown
Arrow Board	LeftArrowFlashing		Unknown

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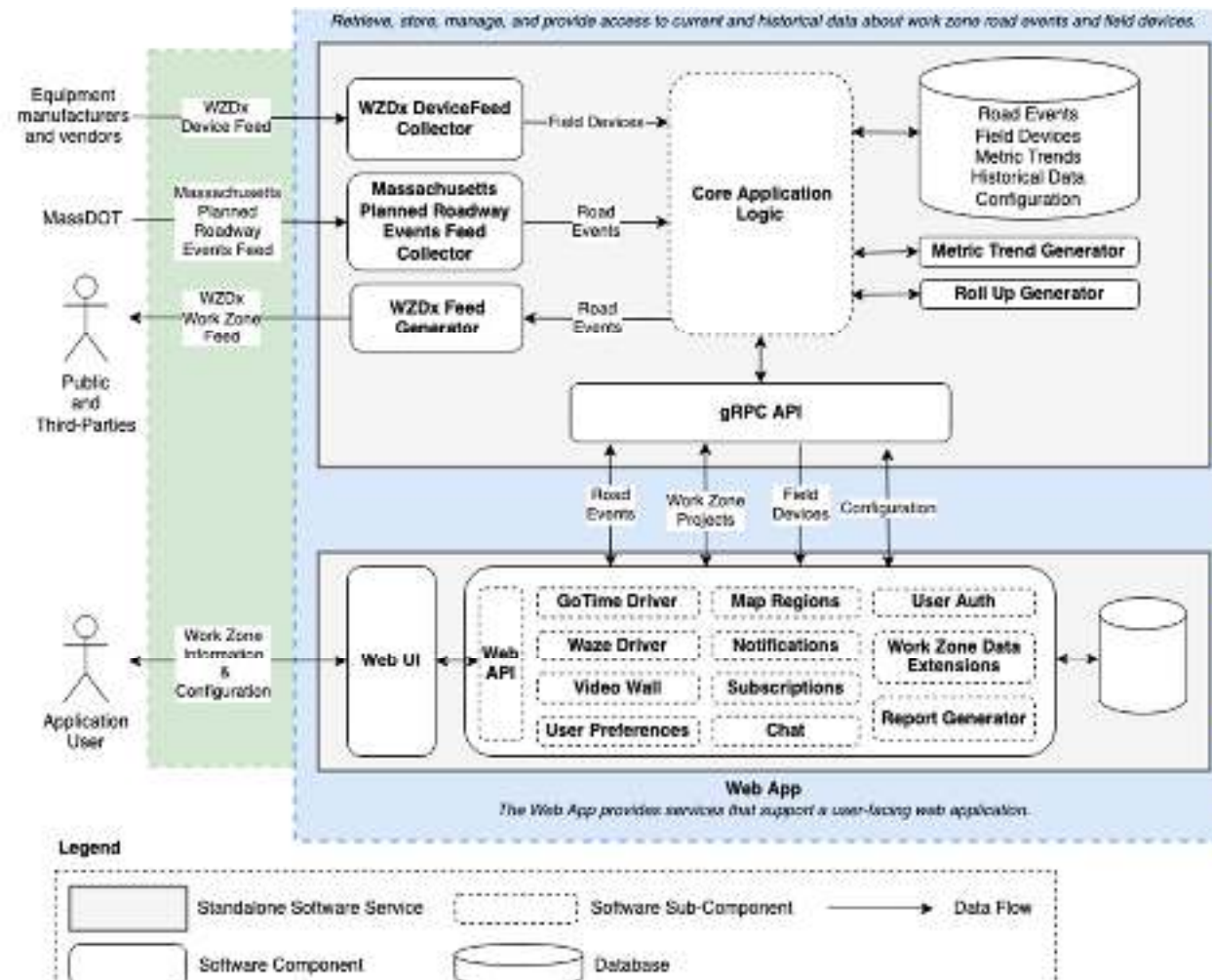
**Moving WZM
to WZDx v4.1**

Advancing Functionality of MassDOT's WZM

October 25th Update:

- Output a WZDx v4.1 Work Zone Feed
- Process text schedule from MassDOT Roadway Events and display on Web UI
- Ignore events from MassDOT Events Feed that do not have a road name
- Use WZDx v4.1 enumerated types
- Add documents table to project details page
- Allow editing the visibility of an existing document

***Note** that the feed generation software does not yet use the event schedule from the Everbridge events to create specific road events for each occurrence of work, which is the recommended technique. The development to use the schedule when building the feed is still ongoing and will be deployed for the next release.







WZM System Architecture

- The architecture for our Work Zone Manager focuses on “data capture” to stress the need for accuracy over entry of the *bare minimum* data
- The system is set up to accept data from both the MassDOT Everbridge Event Reporting System or via real-time devices in the field
- The Work Zone Manager (WZM) tool will work seamlessly to not only to capture and process the data from all the “active” work zones, but to push this information out to WZDx and other 3rd Party Consumers

MassDOT Customer Facing Information

- The end goal for MassDOT is to provide our customers with timely, accurate and detailed information about what is happening out on the State Highway network
- Focus on pushing “planned” and “active” events for work zone temporary traffic control to **Mass511** and to the National **WZDxFEED** including the **DeviceFeed**
- Work with Castle Rock to ensure that we use the WZDxFEED to supply Mass511 moving forward for consistency

Mass511 – Planned Event List (Details)

<div>  <div> Map View Help </div> </div>						
<div> Event List Camera List Go Time Boards List </div>						
<div> <input type="text" value="Perform a search"/> <input type="button" value="Filter"/> <div> 1-25 of 97 <div> 25 < 1 2 3 4 > </div> </div> </div>						
Type	Roadway	Description	Restrictions	Begin date	Last updated	
 Roadwork	RT-1A	<p>STARTS WEDNESDAY. RT-1A in both directions: Roadwork. Between I-95 and RT-122 (Attleboro). Roadwork From 7:00AM EST to 3:00PM EST on Thursday and Friday. Starting Wednesday at 7:00AM EST until Wednesday, at about 3:00PM EST.</p> <p>View on Map</p>		November 16, 2022	November 10, 2022	
 Roadway Reduced To One Lane	US-1	<p>US-1 northbound: Roadway reduced to one lane. Between RT-27 and Exit 29: I-95 (Norwood). The roadway is reduced to one lane because of roadwork. From 7:00PM EST to 3:00AM EST on weekdays and Sunday. Until Friday, at about 12:00AM EST.</p> <p>View on Map</p>		November 13, 2022	November 10, 2022	
 Roadway Reduced To Three Lanes	US-1	<p>US-1 in both directions: Roadway reduced to three lanes. Between I-95 and RT-114 (Peabody). The roadway is reduced to three lanes because of roadwork. From 10:00PM EST to 5:00AM EST on weekdays and Sunday. Until Friday, at about 5:00AM EST.</p> <p>View on Map</p>		November 13, 2022	November 10, 2022	

Mass511 – Planned Event List (Map View)

Mass511 More Search Criteria Use dropdown to change search type

Clear Details Statewide Boston Metro

STARTS WEDNESDAY, I-93 northbound: Roadway reduced to three lanes.
Updated Tuesday at 10:45 PM EST

Between Exit 10 and Exit 31 (Woburn), Roadway reduced to three lanes because of roadwork. From 10:00AM EST to 11:00AM EST on Wednesday. Starting Wednesday at 10:00AM EST until Wednesday, at about 11:00AM EST.

9 Nearby Events

- RT-28 southbound: Road closed. In North Reading
- STARTS NOVEMBER 21, RT-28 southbound: Roadway reduced... In North Reading
- STARTS WEDNESDAY, RT-62: Roadway reduced to three lanes.

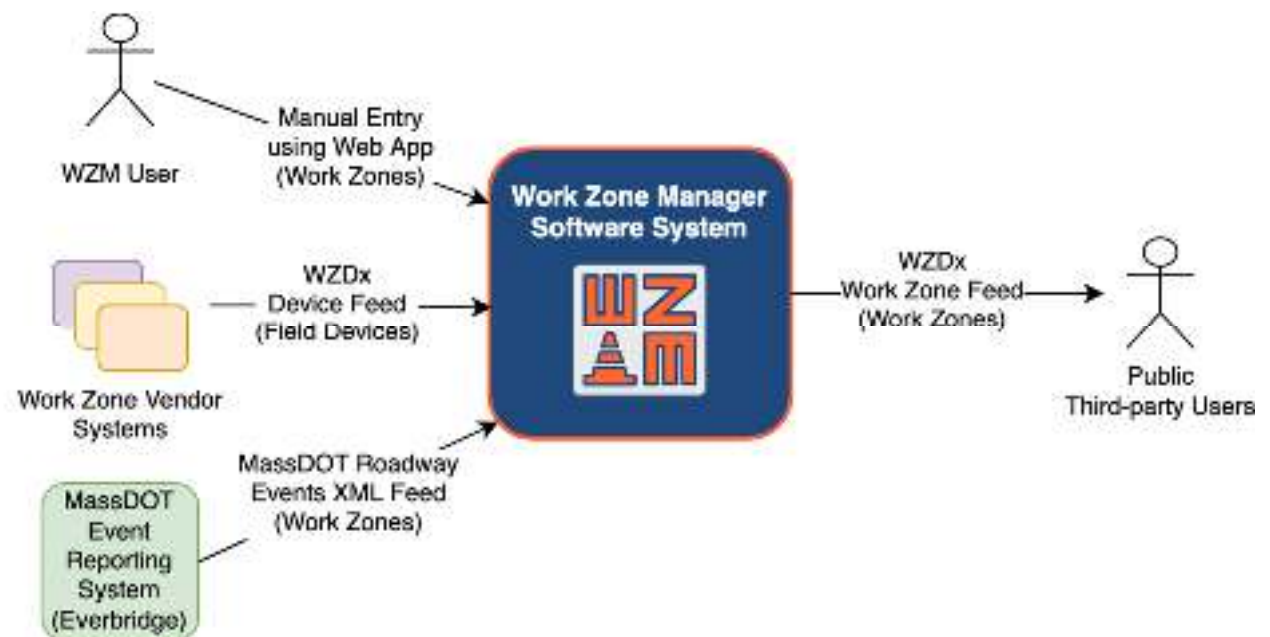
Map View Satellite

Legend: Select: Default / None

- ☐ Accidents
- ☒ Construction
- ☒ Future Construction
- ☐ Closures
- ☐ Get Time Boards
- ☐ Traffic Conditions
- ☐ Miss Messages
- ☐ Weather Alerts
- ☐ Weather Radar
- ☐ Restrictions
- ☐ Commercial Selection

Work Zone Event Capture

- **Traditional** – District staff enter planned events into Everbridge Event Reporting System
- **Technology** – Work Zone ITS vendors document work zone elements through field devices
- **Manual** – Filed Staff or Office Engineers create a “planned” work zone event through manual entry into WZM



Updated Data Entry for WZM

The screenshot displays the WZM application interface for project 'Test321-1'. The interface is divided into several sections:

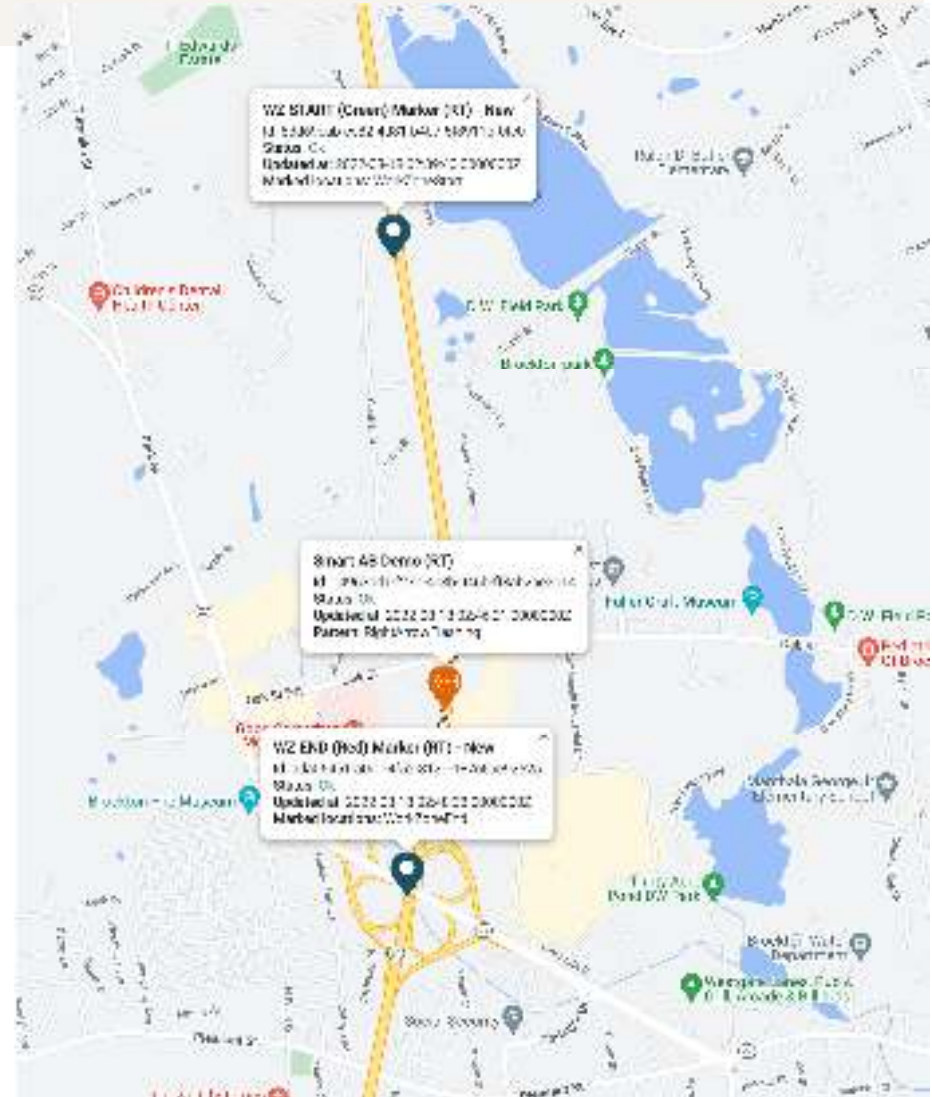
- Core Details:** Includes fields for Start Date, End Date, Description, and Work Types. There are checkboxes for 'Verified' and 'Calculate automatically using path'.
- Impact:** Includes a radio button for 'High level impact' and a text field for 'Vehicle Impact'.
- Schedule:** Includes a button for 'Add Work Occurrence'.
- Additional Information:** Includes fields for Free Flow Speed (mph), Free Flow Travel Time (min), Capacity (veh per hour), Detour Information, and Reduced Speed Limit (mph).
- Location:** Includes fields for Road Name and Direction.
- Work Zone Project Details:** A summary table showing Project ID (Test321), District (1), Description (Lane Closure I-95 NB, Springfield), Start Date (2022-06-01), End Date (2022-06-30), Contractor (RETA), and a button for 'Upload Document'.
- Map:** A map of Massachusetts showing the project location. It includes a 'Map' button, a 'Satellite' button, and a 'Select Start' button.

- MassDOT District staff are used to entering project data and work zone lane/shoulder impact schedules into Everbridge
- Goal is to introduce the new WZM Application and encourage transfer to this “new” mechanism to track planned work
- GUI must be “user friendly” to get buy-in

Work Zone Manager Recap

PC / Laptop Application

- MassDOT's Work Zone Manager was developed and continues to be supported by the IBI Group
- Features a fully functioning desktop application that is web-based and password protected
- Mobile App works on Smart Phone and Tablet and provides the same functionality, but limited display width on mapping graphics





Thank You

Neil Boudreau, MassDOT Highway Division

Email: neil.Boudreau@dot.state.ma.us

