

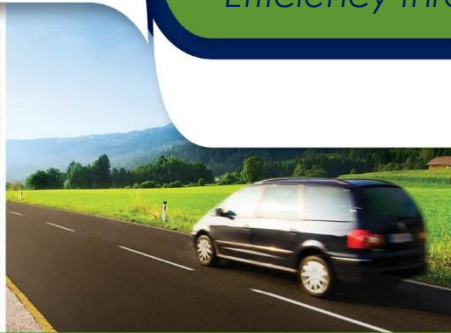
Smarter Work Zones Webinar Series

Webinar #1: Overview of the Smarter Work Zones Initiative

Jawad Paracha, Martha Kapitanov, Todd Peterson,
W.D. Baldwin, and Neil Boudreau

September 9, 2015
1:00-2:30pm EDT

Efficiency through technology and collaboration



U.S. Department of Transportation
Federal Highway Administration

Smarter Work Zones

INTRODUCTION AND TODAY'S SPEAKERS



Today's Speakers



Jawad Paracha
Work Zone Program Manager
FHWA Office of Operations



Martha C. Kapitanov
Transportation Specialist
FHWA Office of Operations



Todd Peterson, P.E., PTOE
Transportation Specialist
FHWA Office of Operations



W.D. Baldwin, P.E.
Northwest Region Traffic Leader
HDR



Neil Boudreau
Director of Traffic and Safety
Massachusetts DOT



Smarter Work Zones Webinar Series

- This is the first in a series of Smarter Work Zones webinars
- Topics based on **what matters most to you!**
- Upcoming webinars will be announced soon!
 - Information will be available on the Work Zone Safety Clearinghouse website,
<https://www.workzonesafety.org/SWZ>



Purpose of Today's Webinar

Provide a comprehensive overview of the Smarter Work Zones (SWZ) initiative to enable a common understanding of the program, its goals, and implementation

Topics include:

- SWZ initiative and its two strategies
- SWZ implementation plans & funding opportunities
- SWZ resources and technical assistance opportunities



Smarter Work Zones

OVERVIEW



What are Smarter Work Zones (SWZ)?

Innovative strategies designed to optimize work zone safety and mobility

- Policies and practices used to incrementally and continuously improve WZ operations
- Tools to reduce WZ crashes and delays
- Tools to enhance WZ management strategies



Two Identified SWZ Initiatives:

Project Coordination

Coordination within a single project and/or among multiple projects within a corridor, network, or region, and possibly across agency jurisdictions

Technology Application

Deployment of Intelligent Transportation Systems (ITS) for dynamic management of work zone traffic impacts, such as queue and speed management



SWZ Initiative Goals

- Project Coordination Goal #1
 - By December 2016, 25 State DOTs have incorporated work zone **project coordination strategies** into **agency documentation and business processes**
 - What does this mean?
 - Review of existing agency project coordination (PC) related policies and practices to identify strengths and weaknesses
 - Review of best practices of other agencies
 - Identification of strategies such as
 - software-based systems to coordinate right of way construction activities and minimize traffic impacts
 - Use of corridor-level transportation management plans (TMPs) to minimize traffic impacts
 - Implement PC strategy
 - Develop agency documentation and business processes



SWZ Initiative Goals

- Project Coordination Goal #2
 - By December 2016, 5 State DOTs have volunteered to **pilot** the **Work Zone Implementation Strategies Estimator (WISE)** software
 - What does this mean?
 - Use WISE tool to optimize project schedules and analyze mitigation strategies to minimize work zone traffic impacts
 - Pilot, evaluate, suggest enhancements, and demonstrate its value for work zone management



Source: TRB



SWZ Initiative Goals

- Technology Application Goal #1A
 - By December 2016, 35 State DOTs have implemented **business processes** for **work zone ITS technologies** as identified in the **Work Zone ITS Implementation Guide** and/or have utilized at least one work zone ITS technology application for dynamic management of work zone impacts
- What does this mean?
 - Well-documented agency policies and processes to streamline consideration and use of work zone ITS technologies to minimize traffic impacts



Source: Battelle



SWZ Initiative Goals

- Technology Application Goal #1B
 - By December 2016, 35 State DOTs have implemented business processes for work zone ITS technologies as identified in the Work Zone ITS Implementation Guide, and/or have utilized at least **one work zone ITS technology application** for **dynamic management** of work zone impacts
- What does this mean?
 - Consideration of the six step process explained in work zone ITS implementation guide to plan and implement ITS strategies
 - Identify and use ITS strategy such as speed and/or queue management on at least one project for dynamic management of work zone impacts



Smarter Work Zones

PROJECT COORDINATION



Project Coordination – What is it?

Coordination within a **single project and/or among multiple projects** within a **corridor, network, or region**, and **possibly across agency jurisdictions** to minimize work zone traffic impacts



Source: FHWA



Benefits of Project Coordination (1 of 2)

- Greater ability to reduce and manage traffic disruptions from road work
 - Set a maximum time delay for work zone area
 - Provide alternate routes for drivers
- Earlier identification of project impacts
 - Adjust schedule to stay on track or minimize completion delay
- Fewer number of work zones
- Dynamic adjustments to project schedule
- Improved communications within and across agencies



Benefits of Project Coordination (2 of 2)

- Reduced numbers of street cuts
- Better quality road surfaces
- Cost savings
- Increased customer satisfaction
 - Provide locations in which drivers can select an alternate route to exit work zone road.



Project Coordination Example #1

Software to coordinate right-of-way construction activities

- **Washington, DC: WZ Project Management System**
 - System includes:
 - DDOT, Developer, Utility WZ Projects
 - Work Zone Tracking Tool
 - Traffic Analysis Tool
 - Used to develop annual citywide TMP
 - Tracks performance measurement
 - Assists in transportation demand management strategies



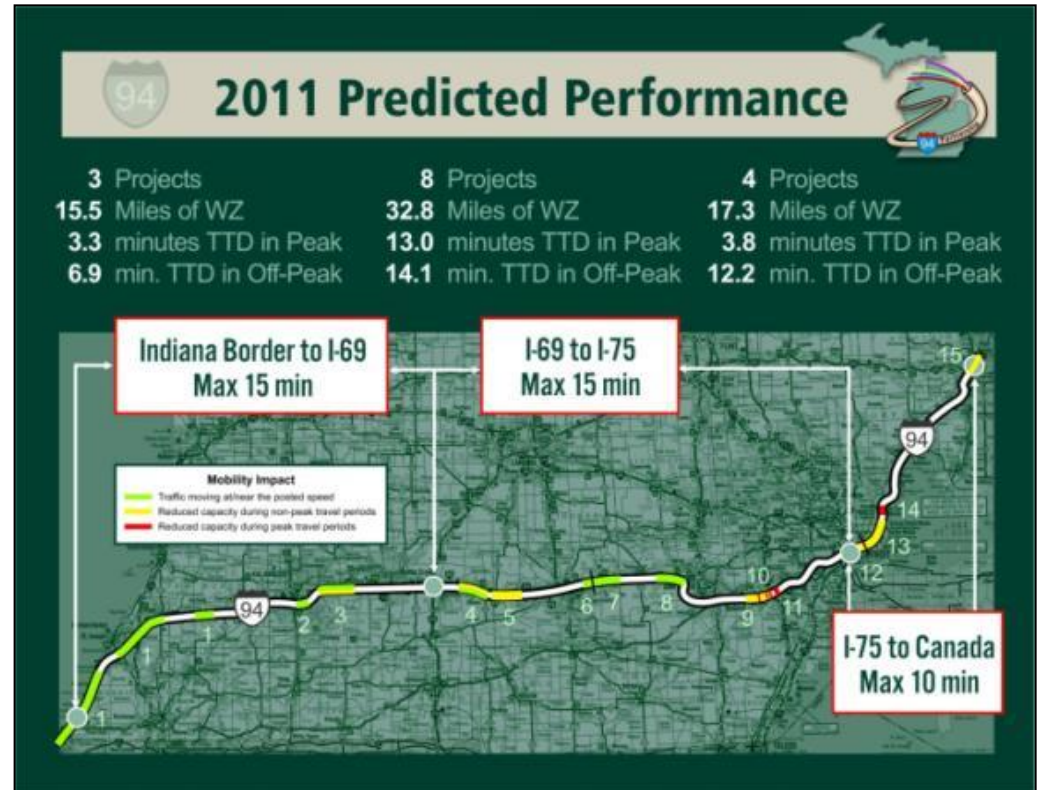
Source: DDOT

Project Coordination Example #2

Corridor-level TMPs to address traffic-related construction impacts

- **Michigan DOT I-94 Corridor**

- Significant construction
- Three corridors identified
- Corridor-Level TMPs
 - Assess corridor traffic impacts
 - Define corridor/segment delay thresholds
 - Suggest traffic mgmt. strategies
 - Discuss implementation plan



Source: Michigan DOT

Project Coordination Example #3

Multi-agency construction traffic management activities

- **Washington State DOT**
 - Collaborative, multi-agency construction traffic planning effort
 - Long-term, mid-term, and short-term information sharing
 - Construction Impact Analysis Tool, Maps, Gantt Charts
 - Hot Spots, Watch Lists



Source: WSDOT



Project Coordination Tool (1 of 2)

Work Zone Implementation Strategies Estimator (WISE)

- Developed under the SHRP2 R11 project
- Proactively reduces WZ impacts:
 - Effective project coordination upfront in planning/programming
 - Carrying coordination through to project planning/design decisions
- Made up of two modules:
 - Planning Module
 - Operation Module



Project Coordination Tool (2 of 2)

Work Zone Implementation Strategies Estimator (WISE)

- A grant to pilot the WISE tool was recently awarded to four states:
 - California – Association of Monterey Bay Area Governments MPO
 - Florida – MetroPlan Orlando MPO
 - Maryland DOT
 - Tennessee DOT
- Tool and documentation available at <http://www.trb.org/Main/Blurbs/168143.aspx>



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PROJECT COORDINATION:



CORRIDOR-BASED COORDINATION

**Lessons from Oregon DOT
OTIA III Statewide Bridge Program**

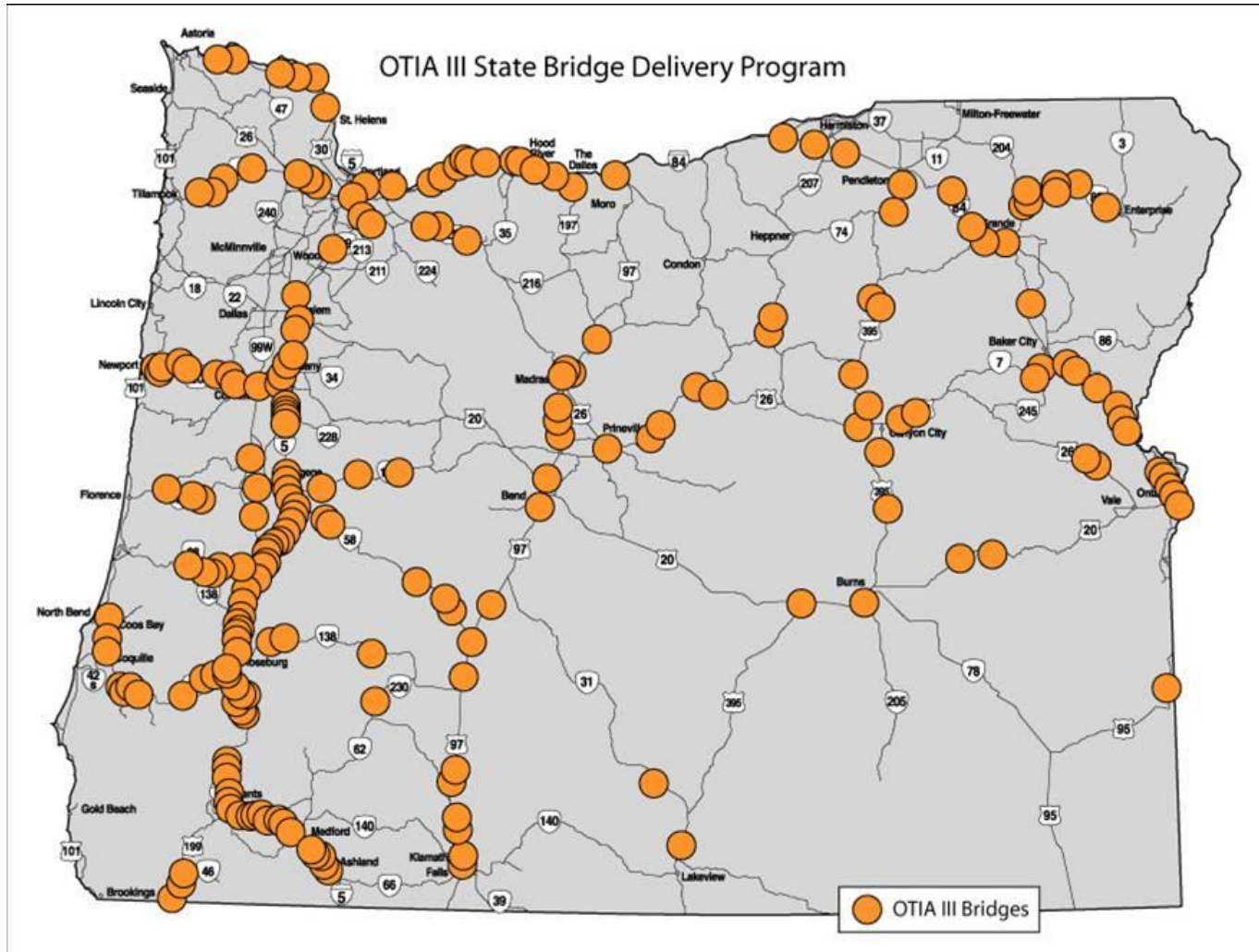


Program Coordination – Corridor-Based Coordination – Overview

- Establish the Vision for the Corridor
- Develop Details of How the Coordination Occurs
- Educate and Inform Personnel and Stakeholders
- Implement
- Refine the Process



OTIA III Repair and Replacement Bridges Locations



Establish the Vision for the Corridor or System

- Top Management Directive to Agency
- Buy-in of Stakeholders

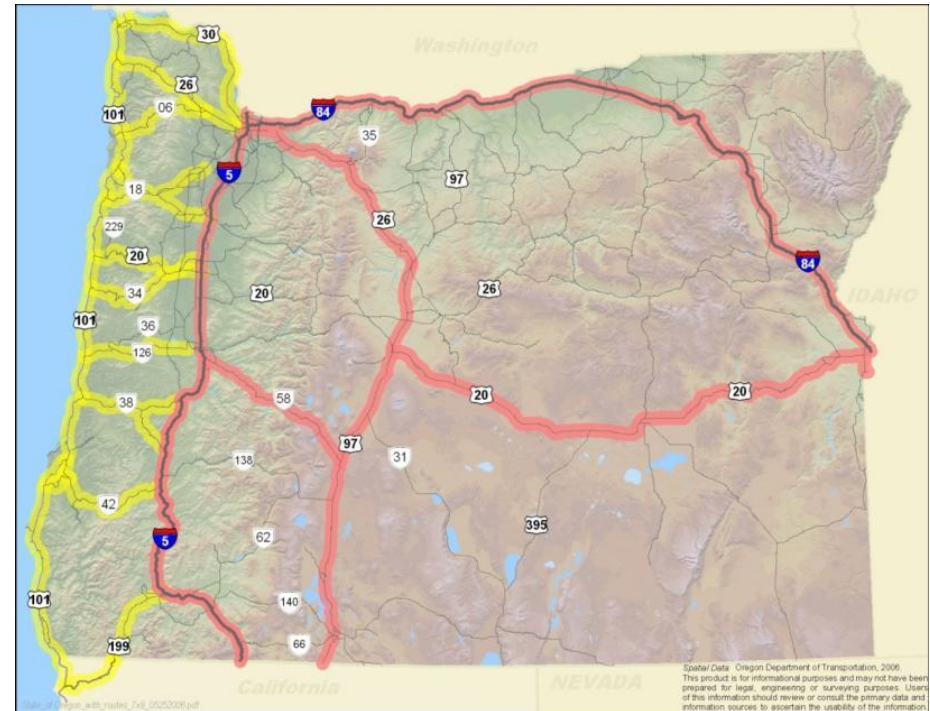


Mission: Keep Traffic Moving During Construction



Oregon's Key Mobility Corridors

- Identified critical routes
 - N/S, E/W
 - Complete one and save as unencumbered route.
 - Addressed freight movement.
- Work zone delays
 - “Up to 20 minutes” delay standard.
 - Result: Additional three hours from California to Portland on I-5.
 - Solution: Established delay thresholds.



Establish the Vision for the Corridor or System

- Overall Committee made up of decision-makers with authority to speak for those they represent
 - Construction, Maintenance, Design, Operations, Traffic, Contracting, PI
 - May need technical subcommittees to identify and solve issues
- Development of Overall Guide and Associated Memorandums



Developing Details of How the Coordination Occurs (1 of 2)

- Identify what needs to be managed in the Work Zones?
 - Travel Times
 - Traffic Volumes/Capacity
 - Load Sizes/Hole in the Air
- Develop Tools to Plan, Manage and Monitor



Develop Details of How the Coordination Occurs (2 of 2)

- Develop Guidance
 - Corridor-Level or Statewide Transportation Management Plan (TMP)
 - Project-Level TMP Guidance Document
 - Used to develop the individual Project-Level TMPs



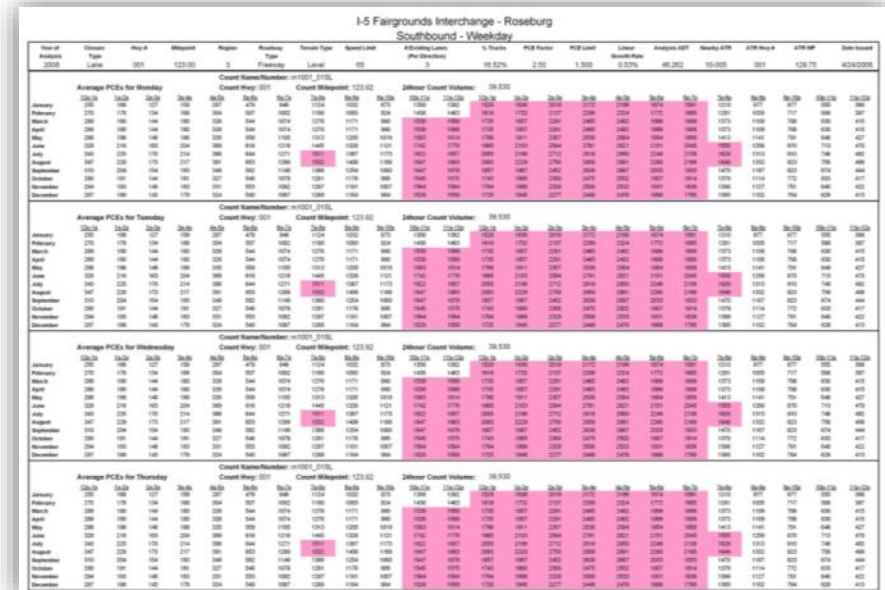
Delay Estimation Tool

- Delay Thresholds
- Segment 4-C
 - Length: 55 miles
 - Delay threshold: 7 minutes



Delay Estimation Tool

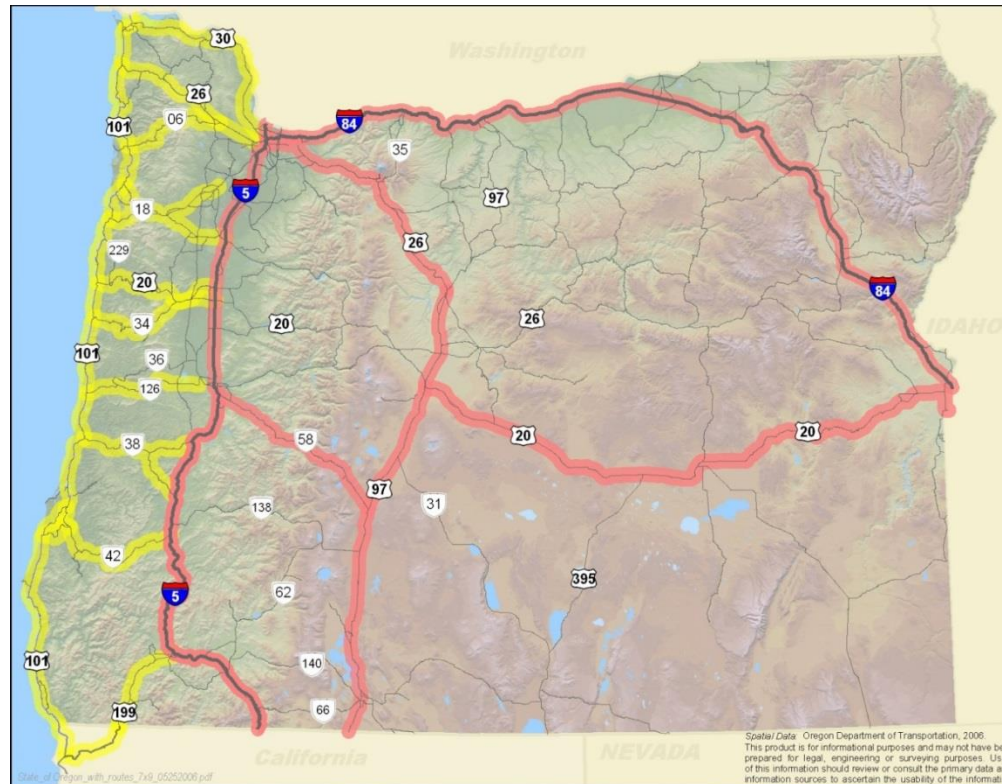
- Gather volume/count data
 - ODOT data: Multiple, robust sources
 - Automatic traffic recorders
 - Heavy vehicles
 - Seasonal variations
 - Day of week variations
 - Growth rates
- Identify free-flow threshold
 - Compare
 - Lane closure chart



Free Flow Threshold: The maximum sustainable volume that yields average travel speeds at or near free flow conditions.

Physical Restrictions

- Examples of detours of hundreds of miles
- Maintain access to regions of the state
 - E/W and N/S routes



Physical Restrictions

- Mandate covers width, height, length, and weight
- Oversize load examples
 - Manufactured housing
 - Windmill components



Educate and Inform Personnel and Stakeholders

- Important for Agency Staff
 - Know what is expected
 - Know what to do
 - Re-educate for updates and staff turnover
- Stakeholders Participation
 - Understand what to expect
 - Share their perspective
- Train
 - Importance of and how to use of tools
 - Importance of and how to develop Project-Level TMPs



Implement (1 of 3)

- Tools
- TMPs
- Coordination Meetings
 - Sharing information on Process Updates
 - Sharing project information between affected stakeholders (project scope, schedules)
 - Identify conflicts
 - Work to resolve conflicts
- Escalation Process



Implement (2 of 3)

- Coordination Meetings
 - Corridor/Regional Meetings of Affected Stakeholders in the trenches
 - Agency: planning, construction, maintenance, operations, permitting/development, public information
 - Other agencies with impacts/project activities
- Tracking Projects through their lives
 - Long term plans: general traffic impacts and schedule as known
 - Nearer term plans: refined traffic impacts/staging and schedule
 - Short term and current construction



Implement (3 of 3)

- Use and upkeep of tools, especially project tracking tools



Refine the Process

- During Early Development: from overall committee and technical subcommittee
- During Training: Participants spotting challenges
- During Implementation



Project Coordination – Corridor-Based Coordination

For Additional information:

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Smarter Work Zones

TECHNOLOGY APPLICATION



Technology Application – What is it?

Deployment of **Intelligent Transportation Systems (ITS)** for **dynamic management of work zone traffic impacts**, such as queue and speed management to provide **actionable information** to drivers and traffic managers.



Source: FHWA

Capabilities of Technology Application

- **Improved driver awareness**
 - Changing traffic patterns
 - Downstream congestion
 - Construction vehicle ingress/egress
 - Expected delay / travel time
- **Dynamic and actionable guidance to drivers**
 - “Road work ahead” vs “Traffic Stopped 1 mile ahead”
 - “Road work – expect delays” vs. “Road Work I-95 past Exit 52 Use Alternate Routes”
- **Enhanced tools for on-site traffic management**
 - Speed monitoring
 - Automated speed enforcement
 - Queue formation

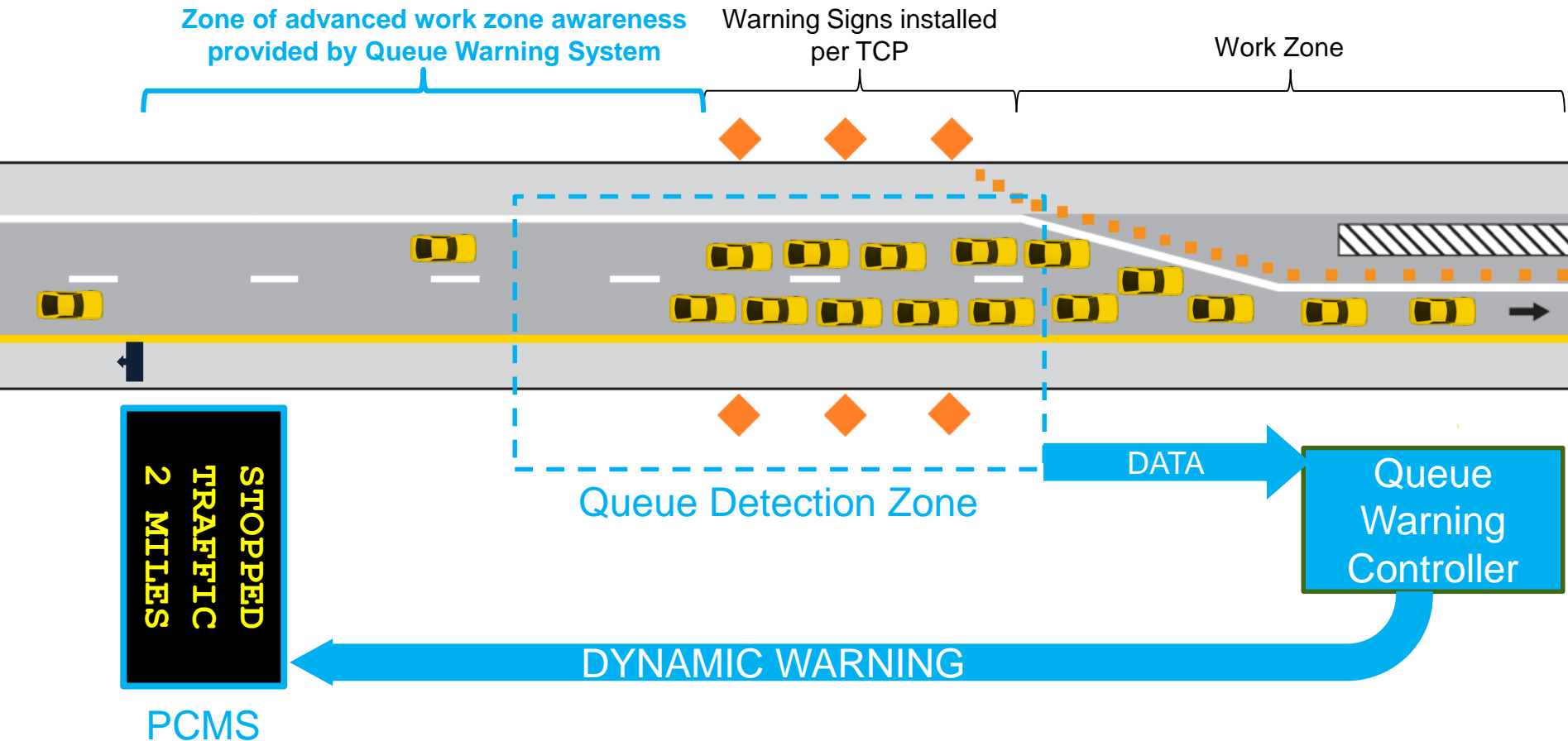


Benefits of Technology Application

- **Empowers drivers** to be proactive in responding to work zones
 - Awareness of downstream hazards
 - Facilitates real-time decision-making and trip planning
- **Streamlines traffic management functions** through partial automation
 - Speed enforcement
 - Data collection
 - Performance measurement
- **Information increases customer satisfaction**
 - The More you Know...



Technology Application Example: Queue Warning System (QWS)



Technology Application Example: Variable Speed Limits (VSL)

- Multiple speed trailers in & approaching work zone
- Each unit monitors prevailing speed – relays information to upstream units.
- Posted speed limit dynamically adjusted to reduce downstream speed differential



http://www.michigan.gov/documents/mdot/MDOT_Research_Report_RC1467_200924_7.pdf

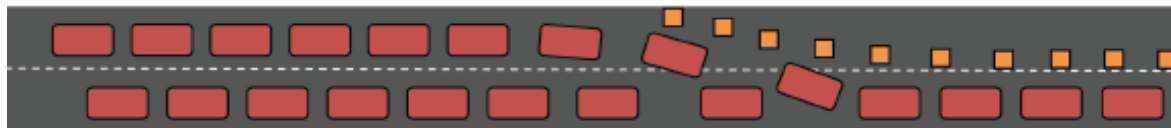
Technology Application Example: Dynamic Lane Merge

- Early Merge
 - In low-volume conditions, it reduces the occurrence of high-speed margining at the point of lane closure.



Source: https://www.workzonesafety.org/fhwa_wz_grant/atssa/atssa_dynamic_lane_merging

- Late Merge
 - In high-volume conditions, it reduces the length of the queue.

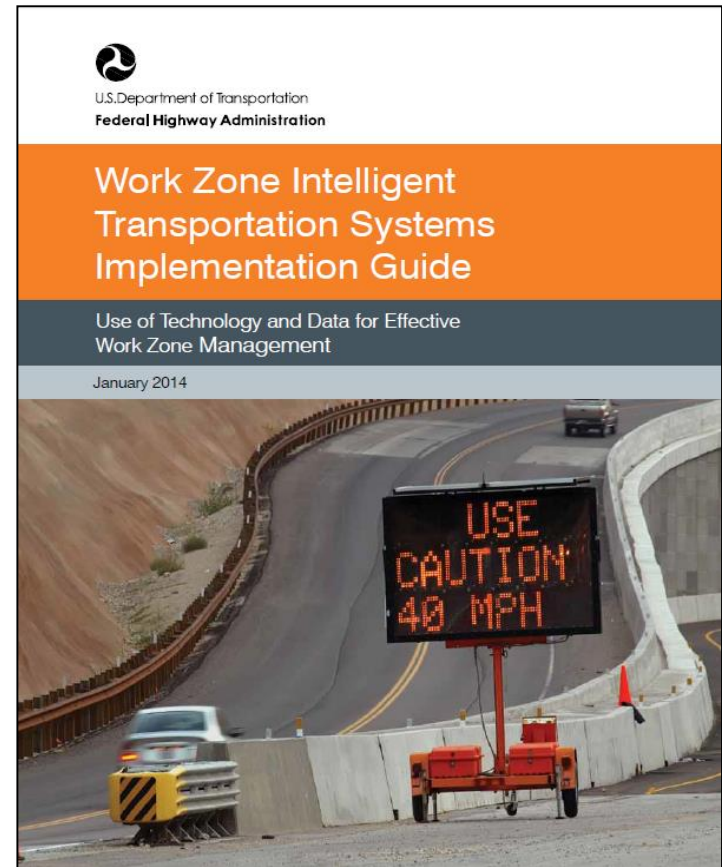


Source: https://www.workzonesafety.org/fhwa_wz_grant/atssa/atssa_dynamic_lane_merging

Work Zone ITS Implementation Guide

<http://ops.fhwa.dot.gov/publications/fhwahop14008/index.htm>

- STEP 1 – ASSESSMENT OF NEEDS**
- STEP 2 – CONCEPT OF OPERATIONS**
- STEP 3 – DETAILED SYSTEM PLANNING**
- STEP 4 – PROCUREMENT**
- STEP 5 – SYSTEM DEPLOYMENT**
- STEP 6 – SYSTEM OPERATION, MAINTENANCE, and EVALUATION**



Source: FHWA



Smarter Work Zones

TECHNOLOGY APPLICATION

CASE STUDY

Massachusetts's Callahan Tunnel Rehabilitation Project



Callahan Tunnel Rehabilitation Project



Source: MassDOT

Callahan Tunnel
Rehabilitation Project
www.mass.gov/massdot/CallahanTunnelRehab

Tunnel Closing on Dec. 27

December 2013 to March 2014



Assessment of Needs

In developing the Traffic Management Plan for the Callahan Tunnel Project, MassDOT identified a need to provide real-time traffic conditions to the DOT and our stakeholders in order to meet the stated goals:

- **Mobility:** minimize congestion through queue warning, providing travel/delay times and encouraging traffic diversion
- **Safety:** minimize the number and severity of traffic-related incidents, injuries and fatalities in the work zone
- **Planning and Monitoring:** collect operations data to develop performance reports, allocate enforcement patrols, refine allowable working hours, and evaluate throughput capacity



Boston Callahan Tunnel Traffic Management

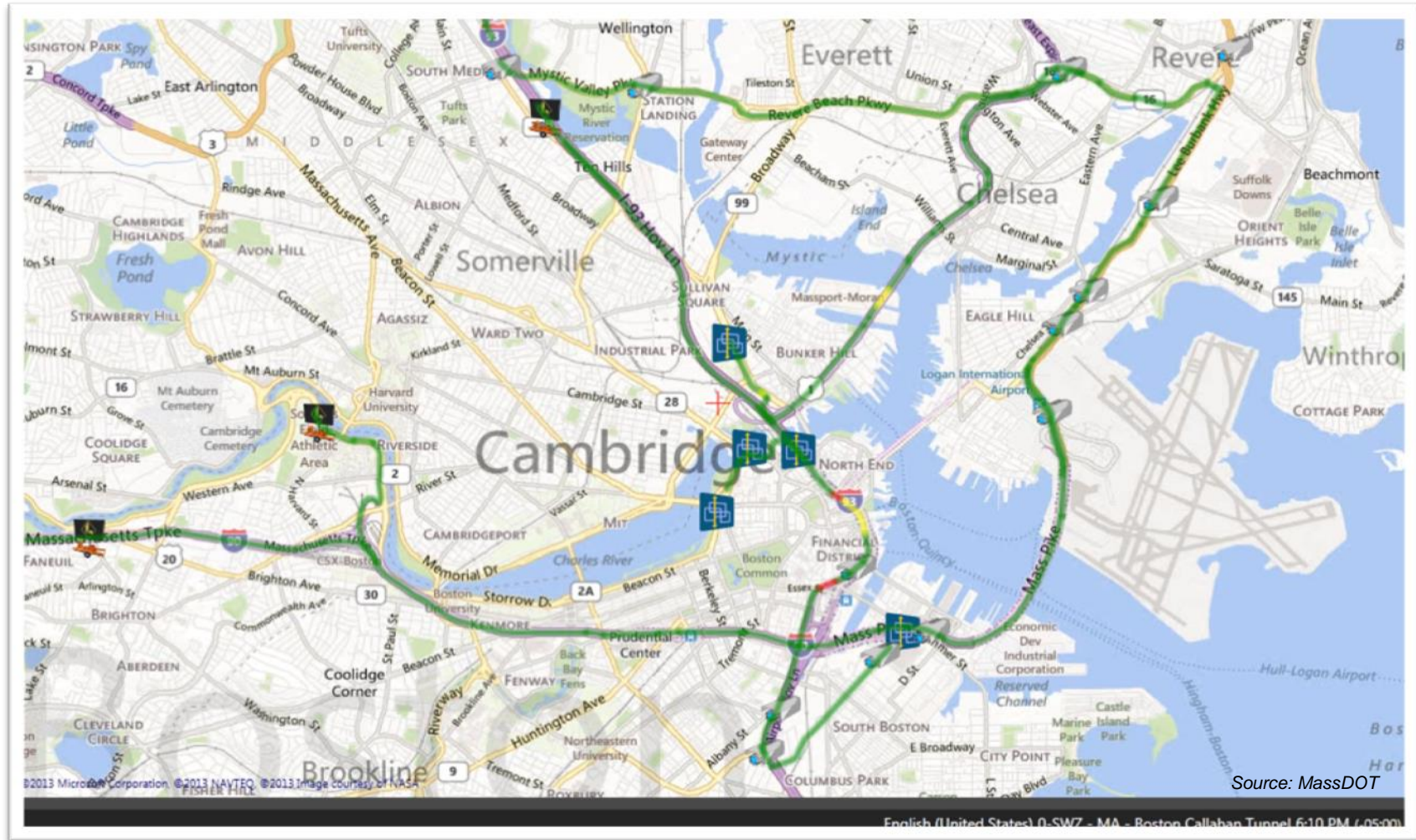


- Had **Early Action** item to remove median and realign travel lanes to address expected queues
- Upgrades to traffic signal equipment and timing plans for **traffic progression**
- SWZ system concept of operations identified a need to monitor and provide **Real-Time feedback** about alternate routes



Alternate Routes for Callahan Tunnel Closure

Smarter Work Zone System Design



“Real-Time” view of area traffic conditions



SWZ Traffic/Queue Management

PCMS 06-CP 6 on Nashua St

FREE FLOW	MODERATE	HEAVY
CALLAHAN TUNNEL CLOSED	CALLAHAN TUNNEL CLOSED	CALLAHAN TUNNEL CLOSED

USE I-93 SOUTH TO EXIT 18	EXPECT MODERATE DELAYS	EXPECT MAJOR DELAYS
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LOGIC & SENSORS

FREE FLOW = Travel Time for Route 6 = <13 MIN
MODERATE = Travel Time for Route 6 = 14-20 MIN
HEAVY = Travel Time for Route 6 = 21 MIN or More

<u>Route 6: PCMS 06-CP 6 to PCMS 07-CP 7 via EX18, Haul Rd Ramp A</u> = 5 MILES = 8 MINUTES IN FREE FLOW
--

PCMS 09-CP 9 (Storrow Dr at Longfellow Bridge)

FREE FLOW	MODERATE	HEAVY
CALLAHAN TUNNEL CLOSED	FOR LOGAN AIRPORT	FOR LOGAN AIRPORT

DETOUR USE EXIT 18	CONSIDER RTE 1 N TOBIN BR	USE RTE 1 N TOBIN BR
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LOGIC & SENSORS

FREE FLOW = Travel Time for Route 9 = <14 MIN
MODERATE = Travel Time for Route 9 = 15-20 MIN
HEAVY = Travel Time for Route 9 = 21 MIN or More

<u>Route 9: PCMS 09-CP 9 to CP 7 via I-93S, Exit 18 to Haul Road</u> = 5 MILES = 8 MINUTES IN FREE FLOW

**Message Boards driven by “Delay Threshold” logic
fed by probe vehicle data**



SWZ Traffic/Queue Management

LOGIC & SENSORS

FREE FLOW = Travel Time for Route 6 = <13 MIN

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HEAVY = Travel Time for Route 6 = 21 MIN or More

Route 6: PCMS 06-CP 6 to PCMS 07-CP 7 via EX18, Haul Rd Ramp A

= 5 MILES

= 8 MINUTES IN FREE FLOW

LOGIC & SENSORS

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Route 9: PCMS 09-CP 9 to CP 7 via I-93S, Exit 18 to Haul Road

= 5 MILES

= 8 MINUTES IN FREE FLOW



SWZ Traffic/Queue Management

PCMS 06-CP 6 on Nashua St

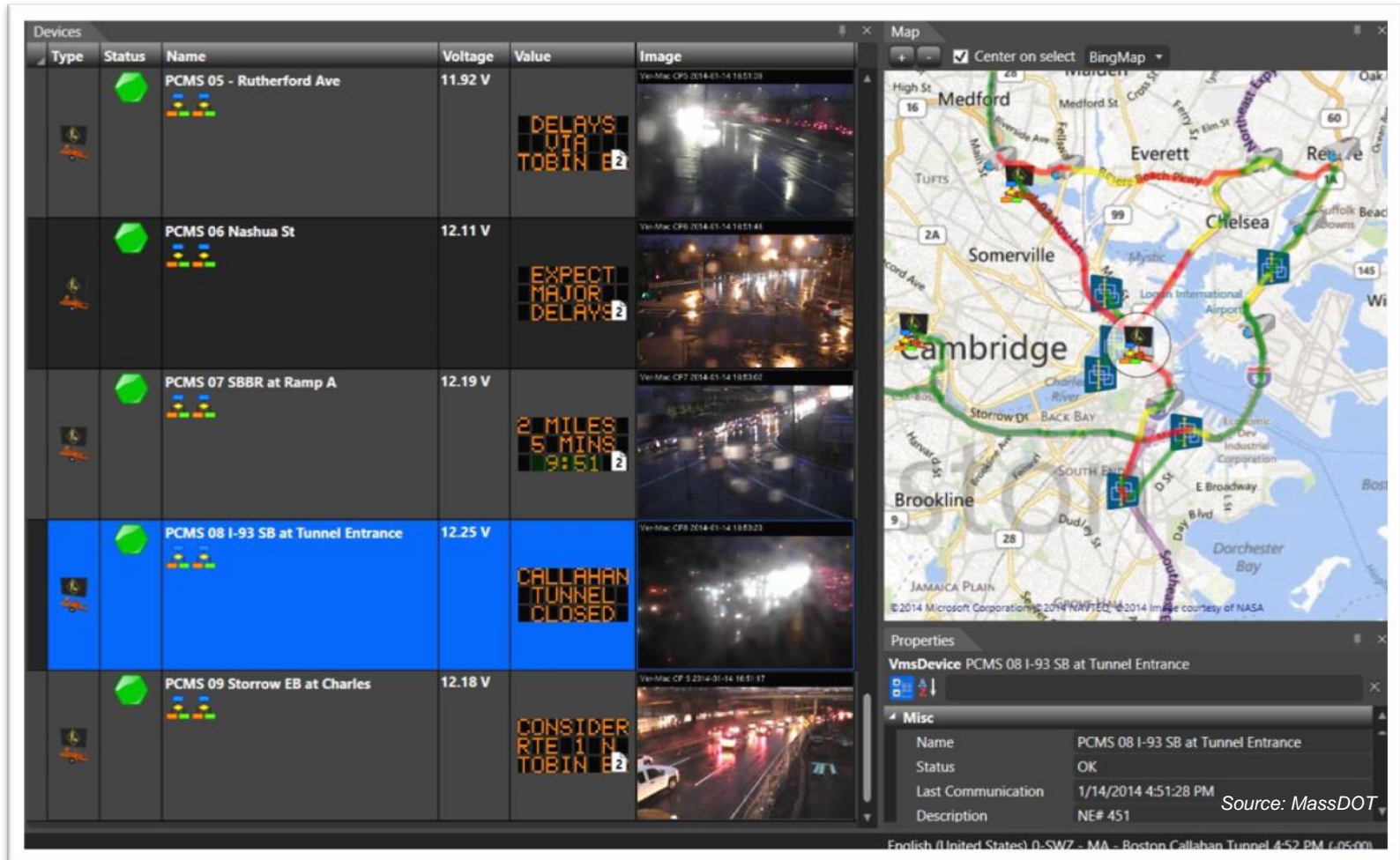
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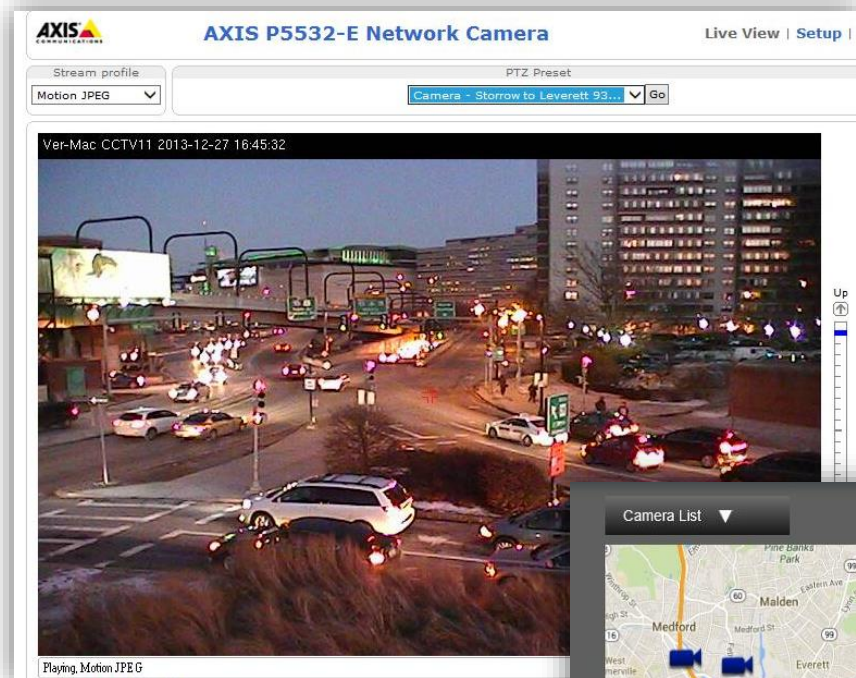
SWZ System Operations



SWZ message boards provide route choice suggestions based on “real time” traffic conditions



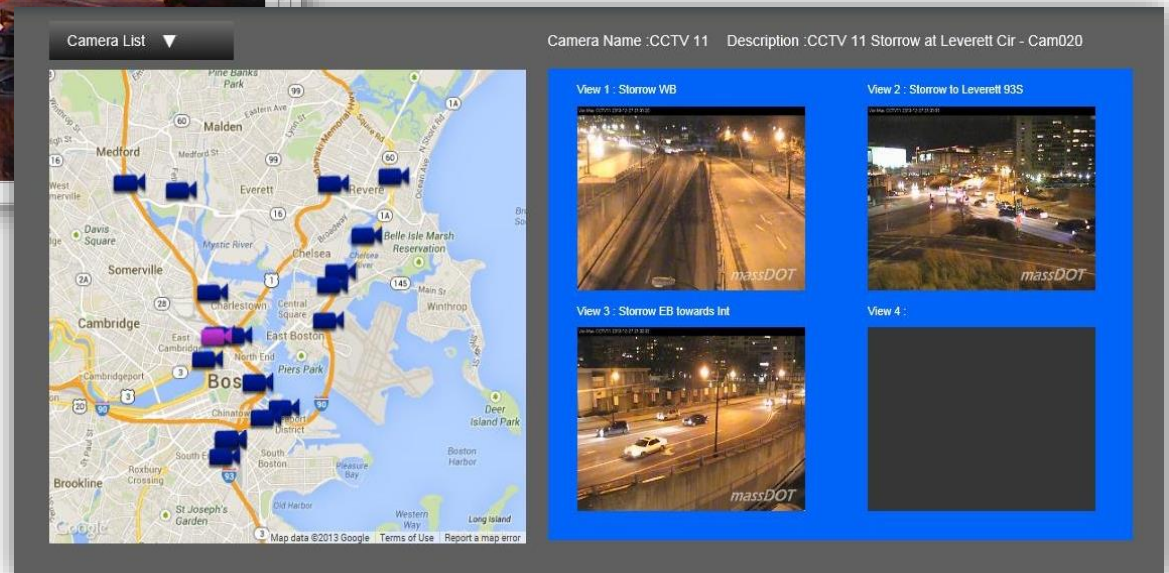
SWZ Monitoring Key Locations



Use SWZ technology to foster an Interagency Partnership through information sharing

Source: MassDOT

Monitor key
alternate route
decision points



Source: MassDOT



Evaluation of SWZ System

Enhanced messaging helps eliminate motorists frustration with construction delays

Stopped traffic notification helps alert motorists on back of queue and prevents crashes

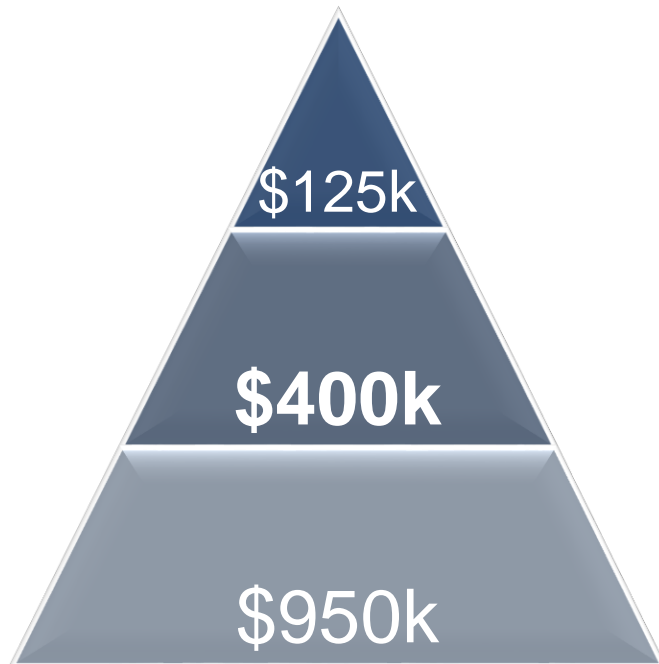
MassDOT construction staff benefit from allowing the SWZ system to manage traffic

Sharing SWZ system access/data with partner agencies helps improve network mobility



SWZ System Procurement

- Jobs are either bid as a “Lump Sum” or have a deployment cost and a per month rental cost



Portable
Message
Boards

- \$500 - \$750 month
- Solar with Remote Operation

Queue
Sensor
Trailer

- \$400 - \$700 month
- Lane-by-Lane Data Capture

Portable
Camera
Trailer

- \$1,000 - \$1,300 month
- w/Streaming Video

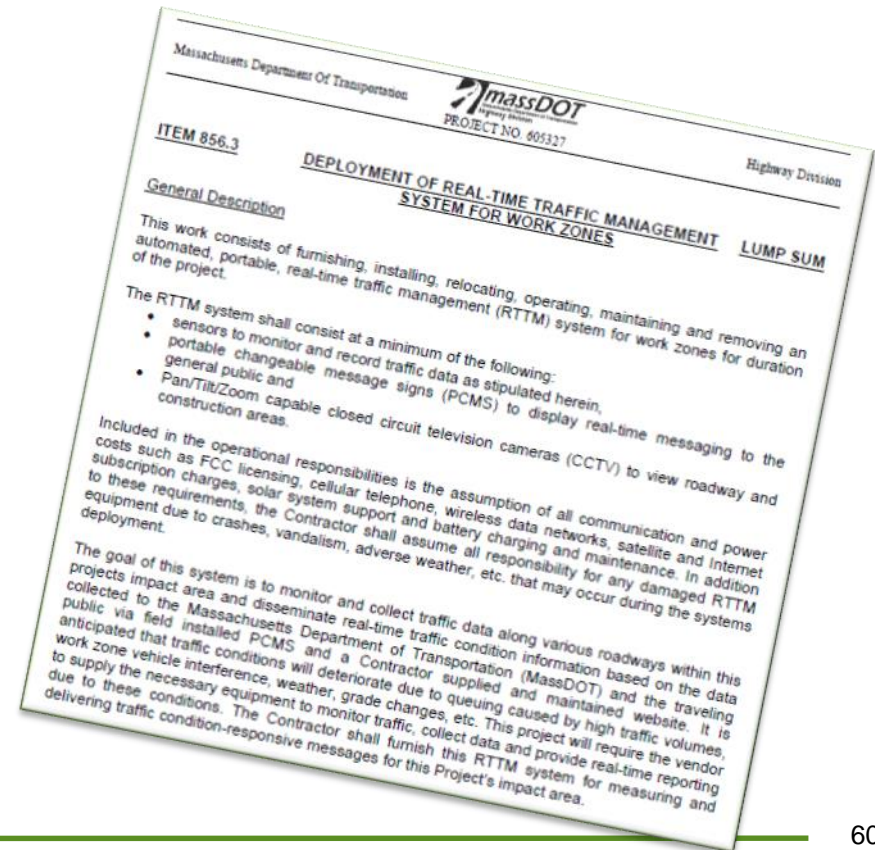
System
Operation

- \$2,500 - \$3,500 month
- Includes unlimited data plan



SWZ Lessons Learned


- Make use of ITS in work zones part of your traffic management mitigation strategies
- Start planning your Concept of Operations early in project development
- Prepare SWZ System Item Specifications that include detailed descriptions of the equipment, system operation and expected deliverables
- Capture traffic data to generate performance measures for SWZ



Callahan Tunnel Rehabilitation Project - Case Study

For Additional information:

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Smarter Work Zones

IMPLEMENTATION PLANS and FUNDING OPPORTUNITIES



SWZ State Implementation Plan

- Individual State Implementation Plans
 - Use as project management tool by listing activities and schedule to ensure successful implementation of SWZ initiative
 - Provides a way to better understand agency initiative, assess any technical assistance needs, and tracking progress

Innovation Deployment Stage	Jan 2015	June 2015	Dec 2015	June 2016	Goal
Opt-out: The State is not interested in pursuing <i>[tool or technology]</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Development Phase: Collect guidance and best practices, build support with partners and stakeholders, and develop a process necessary for implementation	✓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Demonstration Phase: Testing/piloting <i>[tool or technology]</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assessment Phase: Assess performance and the process for carrying out <i>[tool or technology]</i> . Make adjustments to prepare for full deployment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Institutionalized: <i>[Tool or technology]</i> is adopted by the State's highway construction industry and used regularly on projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	✓



SWZ State Implementation Plan (continued)

- Implementation Plan Activities
 - Provide a list of activities that are planned to progress from current implementation stage to goal implementation stage

Implementation Plan Activities			
Activity No.	Description of Activity	Target Completion Date	Schedule/Status
1			
2			
3			
4			



How can States fund these initiatives?

State Transportation Innovation Councils (STIC) Incentive Program

- Funds activities which turn innovations into standard practices
- All states are eligible
- Up to \$100,000 available to each STIC annually
- Can be used to fund multiple initiatives
- Use to pay consultants to develop standards, specifications, design manuals, evaluations, implementation plans, workshops, training, and more!

www.fhwa.dot.gov/stic



How can States fund these initiatives?

Accelerated Innovation Deployment (AID) Demonstration Program

- Projects may be any aspect of highway transportation
- Max of \$1,000,000 (up to full cost of project)
- Monitoring, assessment, and technology transfer commitments
- Current grants include ABC, high surface friction treatments, and ATMS/A.

<https://www.fhwa.dot.gov/accelerating/grants/>



Smarter Work Zones

FHWA RESOURCES AND OPPORTUNITIES



FHWA Resources and Opportunities

- **SWZ Outreach Materials**
 - Case studies
 - Fact Sheets
 - Resource Toolkit (online and via USB drive)
 - Guidelines, presentations, deployment strategies, procurement procedures, and more!
- **Virtual and In-person Training Opportunities**
 - Webinars
 - 1-2 day training workshops
- **Virtual and In-person Peer-to-Peer Exchanges**
 - Meet with agencies who have successfully adopted SWZ strategies



FHWA Resources and Opportunities

- **Regional Peer Exchange Workshops**
 - Four regional workshops to be attended by agency representatives and SMEs to discuss SWZ strategies and implementation
- **Demonstration Site Visits**
 - See SWZ deployments first-hand across the country.
- **Additional Resources**
 - Project Coordination-specific and Technology Application-specific lists of resources available to download.



SWZ Implementation Core Team

- **SWZ Initiative Leads**
 - **Paul Pisano**, Team Leader, FHWA Office of Operations
 - **Jawad Paracha**, Work Zone Program Manager, FHWA Office of Operations
- **FHWA Smarter Work Zones Team**
 - **Todd Peterson**, FHWA Office of Operations
 - **Martha Kapitanov**, FHWA Office of Operations
 - **Eric Ferron**, Lakewood, CO FHWA Resource Center
 - **Ken Wood**, Matteson, IL FHWA Resource Center
 - **Karen Gilbertson**, FHWA Kansas Division Office
- **SWZ Subject Matter Experts**
 - **Jerry Ullman**, Texas A&M Transportation Institute
 - **W.D. Baldwin**, HDR
- **State DOT SWZ Subject Matter Experts**
 - **Neil Boudreau**, Massachusetts DOT
 - **Chris Brookes**, Michigan DOT
 - **Scott McCanna**, Oregon DOT
 - **Michael Fontaine**, Virginia Center for Transportation Innovation and Research



Thank you for joining us!

- **Upcoming Events**

- Webinar #2: Implementing Technology Application Solutions
 - Tuesday, September 29, 2015 1:00-2:30pm EDT
- Regional Peer Exchanges

FHWA DFS Region	Location	Dates
North	University of Massachusetts, Springfield	Week of October 26-30 (exact dates TBD)
South	TBD	TBD
Mid-America	TBD	Week of October 19-22 (exact dates TBD)
West	TBD	TBD

- Check The National Work Zone Safety Information Clearinghouse website for updates
 - <https://www.workzonesafety.org/SWZ>

- **Questions or Comments?**

- Jawad Paracha (FHWA Operations, WZ Team)
 - Jawad.Paracha@dot.gov

