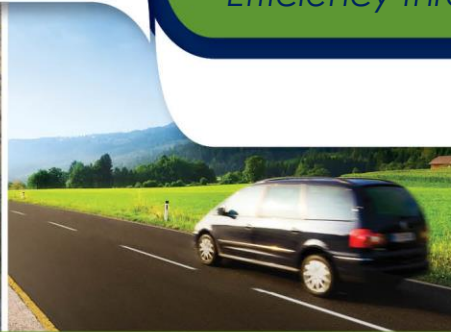


# Every Day Counts: Smarter Work Zones

Presentation to  
Penn State Transportation Engineering & Safety  
Conference  
December 11, 2014

*Efficiency through technology and collaboration*



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

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# Work Zone Management State of the Practice

## Design

- MUTCD Part 6

## Planning & Operations

- Rule on Work Zone Safety & Mobility (CFR 630 Subpart j)
  - Transportation Management Plans
  - Transportation Operations Management
  - Public Information and Outreach



# Why are 'Smarter Work Zones' Necessary?

## *Improve work zone safety and mobility*

- **Work Zone related injuries:**
  - Occur every 14 minutes (96 injuries/day)
  - Over 20,000 workers injured annually
  - 32,000 injuries in 2012
- **Work Zone traffic-related fatalities:**
  - Occur every 15 hours (1.6 fatalities/day)
  - 609 traffic-related fatalities in 2012 (includes 130 worker fatalities)
- **Work Zone related mobility issues:**
  - 24% of non-recurring delay
  - 10% of all congestion
  - NHS capacity loss ~180mil vehicle-miles/day



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## Do you know this person?



Source: <http://www.quickmeme.com/meme/3umlo3>



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# What makes a Smarter Work Zone?

## 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

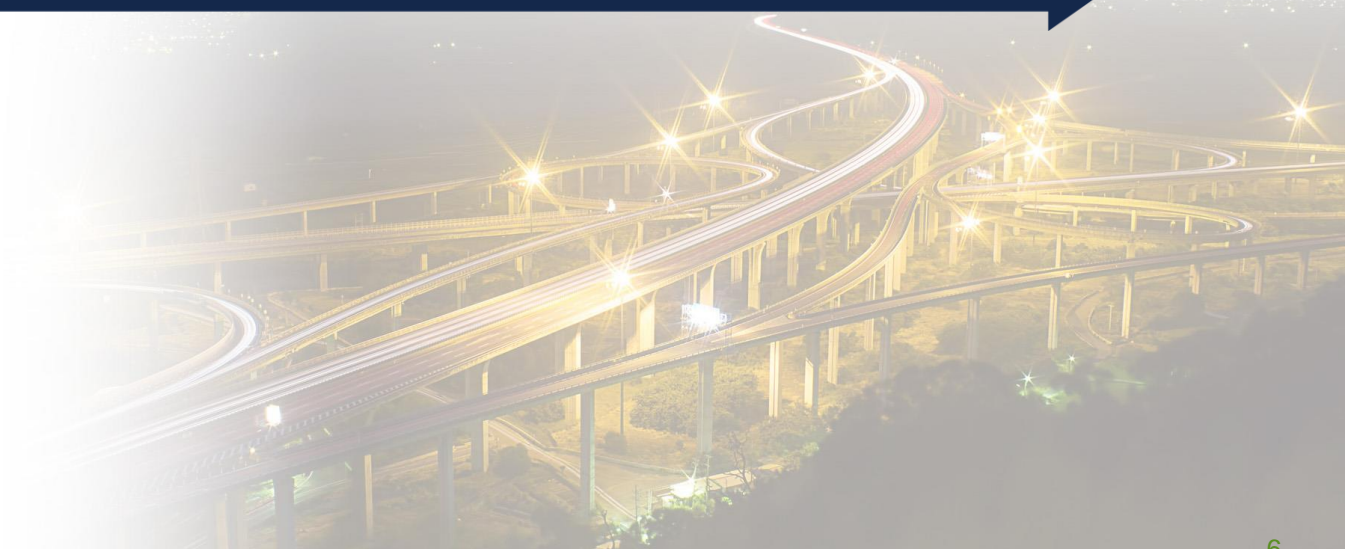
Deployment of Intelligent Transportation Systems (ITS) for dynamic management of work zone traffic impacts, such as queue and speed management



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# Smarter Work Zones

## PROJECT COORDINATION



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# Project Coordination Philosophy

- **“Get in, get out, stay out”**
- Proactive consideration of work zone impacts
- Intra-agency coordination
- Inter-agency coordination
- Corridor vs. Network management
- Data-driven



# Project Coordination – Example #1

## Software-based systems used to coordinate right-of-way construction activities

### Baltimore, MD

Online mapping tool used to track capital and maintenance/utility activities

- Real-time information across city
- Accessible to all stakeholders
- Earlier awareness of project conflicts/impacts and enhanced TMPs

### Washington, DC

WZ Project Management System

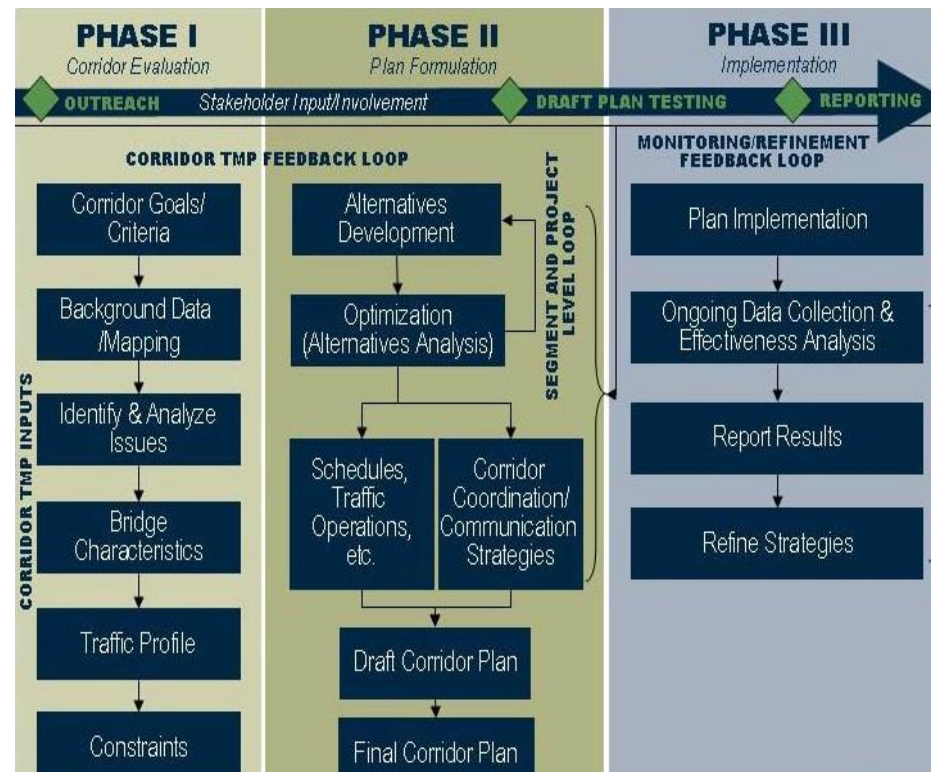
- System includes:
  - DDOT, Developer, Utility WZ Projects
  - Work Zone Tracking Tool
  - Traffic Analysis Tool
- Used to develop annual citywide TMP
- Tracks performance measurement



# Project Coordination – Example #2

## Corridor-level Traffic Management Plans (TMP) used to address work zone impacts (Oregon)

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



Source: ODOT



# Project Coordination – Example #3

## Work Zone Implementation Strategies Estimator (WISE) Tool

- Product of SHRP2 R11 Project  
(<http://www.trb.org/Main/Blurbs/168143.aspx>)
- WISE proactively reduces work zone impacts:
  - Effective project coordination upfront in planning/programming
  - Carrying coordination through to project planning/design decisions

### WISE includes 2 modules:

#### Planning Module

- Optimized sequencing of renewal projects

#### Operations Module

- DynusT platform evaluates impact of individual strategies at project level

Source: WSDOT



# Project Coordination – Example #4

## MIDOT I-94 Corridor

### I-94 Fast Facts

- 3 Regions
- 9 Transportation Service Centers
- 9 Counties
- 275 miles



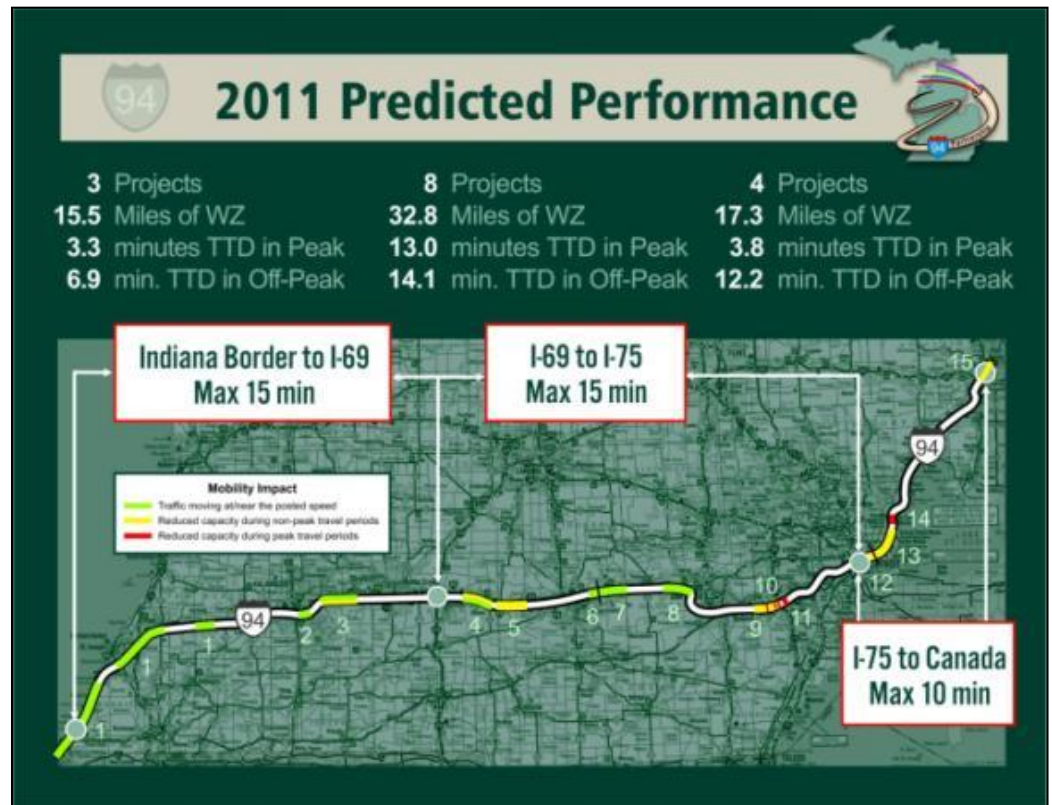
# I-94 Corridor Case Study – Objectives

I-94 Corridor Operation Partnership (COP) Mission: “Improve traffic operations and system reliability along the I-94 corridor statewide.”



## I-94 COP Objectives

- Unification of the I-94 corridor with one focus
- Travel Reliability: 40 min delay max for entire corridor



# I-94 Corridor Case Study – Performance Measures

## Cost Performance Measure

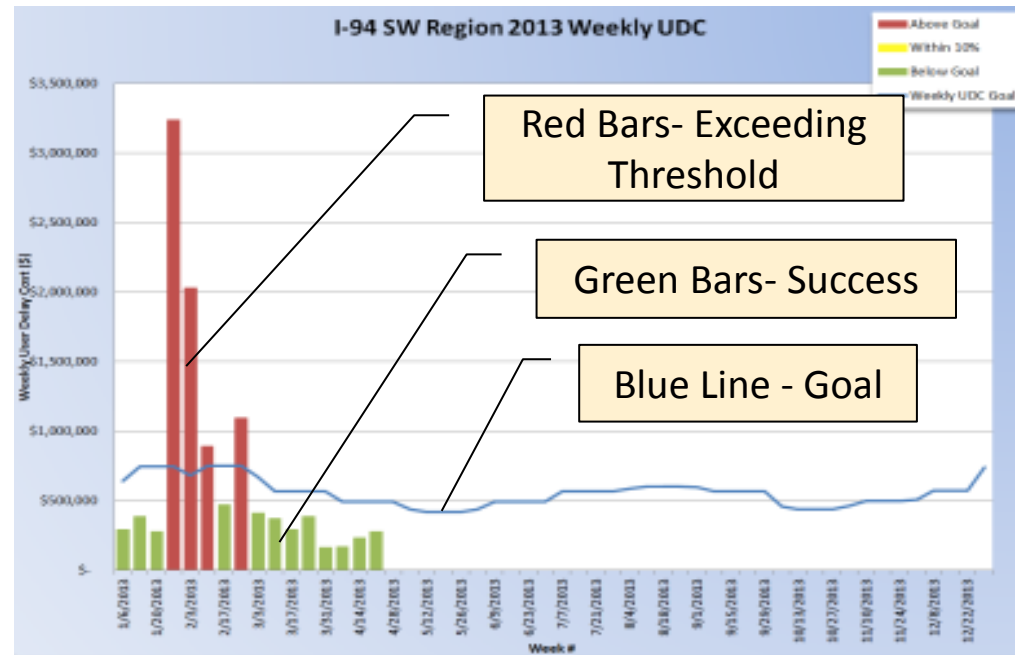
- Limit the 2013 user delay cost (UDC) on the I-94 corridor to \$108 million.

## Delay Performance Measure

- Maintain a maximum of **40 minutes** travel time delay for the I-94 corridor

## Communication Performance Measure

- Perform maintenance of traffic huddles for 90% of weeks with active work zones.



Weekly UDC vs Goal



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# I-94 Corridor Case Study – Lessons Learned

- Change in behavior/culture
  - Process requires full support from top management
  - Support for the added time and effort for coordination
- Change from a construction based approach to operations view
- Project development is key to success
  - Lane restrictions and work operations based on past experience
- Testing cultural change to measure communication



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# Project Coordination – Wrap Up

## Benefits of institutionalized Project Coordination:

- Identify operational “fatal flaws” in project development
- Enhance agency ability to reduce and manage traffic disruptions from road work
- Improved communications within and across agencies
- Dynamic adjustments to project schedule
- Reduce work zone exposure
- Better quality road surfaces
- Cost savings
- Increased customer satisfaction

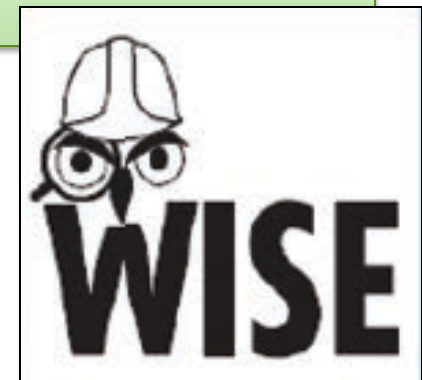


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## Project Coordination - Goals

By December 2016, **20 State DOTs** have incorporated work zone project coordination strategies into agency documentation and business processes for improving safety and reducing work zone delays

By December 2016, **five State DOTs** have volunteered to pilot the WISE (Work Zone Impact & Strategy Estimator) software application.



Source: TRB



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# Smarter Work Zones

## TECHNOLOGY APPLICATION



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## 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.*



Are We  
There Yet?



# Technology Application – Why bother?

## Carnage on I-57

AT LEAST TWO DIE IN FIERY, SEVEN-VEHICLE CRASH



Tweet 0

+1 0

Pin it

Share

Print

Email

July 16, 2010 1:00 am • BY STEPHEN RICKERL THE SOUTHERN

(0) Comments



ALAN ROGERS / THE SOUTHERN An accident involving three semi trucks and

A seven-vehicle fiery crash on Interstate 57 on Thursday afternoon claimed the lives of two people, caused a third victim to be airlifted to a hospital and closed the highway for about five hours.

Two other crash victims were taken to Franklin Hospital in Benton after the crash just after 2 p.m. in Franklin County just north of West Frankfort.

Hazmat teams were called out, as four of the vehicles involved were semitrailers, two carrying loads of asphalt and another carrying a load of vehicle batteries. Fuel and vehicle batteries were exploding in the fire, challenging firefighters to keep the fire in check.

Trooper David Sneed of Illinois State Police District 13 said

Source: [http://thesouthern.com/news/local/article\\_d2ba9b7a-9090-11df-b22a-001cc4c002e0.html?mode=image](http://thesouthern.com/news/local/article_d2ba9b7a-9090-11df-b22a-001cc4c002e0.html?mode=image)



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# Technology Application – Objectives

- **Safety**

- Improved driver awareness of downstream congestion related to work zones
- Dynamic guidance to improve driver responsiveness to changes in traffic patterns
- Enhanced tools for on-site traffic management

- **Mobility**

- Facilitate real-time decision-making and trip planning so drivers can divert trips to avoid adding to work zone congestion
- Enhanced transportation management facilitated by real-time data flows
- Increased customer satisfaction



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# Technology Application – System Components

## Infrastructure:

- Sensors
- Connected traffic control devices (e.g., signals, PCMS)
- Communications
- Data processing / archival

## National ITS Architecture

<http://www.iteris.com/itsarch/>

## Business Processes:

- Assessment of need
- Understanding of regulatory requirements (i.e. System Engineering)
- Coordination with external stakeholders
- System design / specification
- Procurement / contracting mechanisms



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# Technology Application – Basic Criteria

## Work Zone Technology Applications:

- Are **traffic responsive** – incorporate real-time data collection
- Provide **enhanced information delivery** to drivers
  - (1) Increase awareness of changes to traffic conditions arising from construction activity
  - (2) Enhance compliance with static traffic controls
  - (3) Facilitate improved decision-making by drivers approaching work zones
- Functions are **automated** and **dynamic**
- Complement static traffic controls
- Information delivery does not require special action on the part of drivers



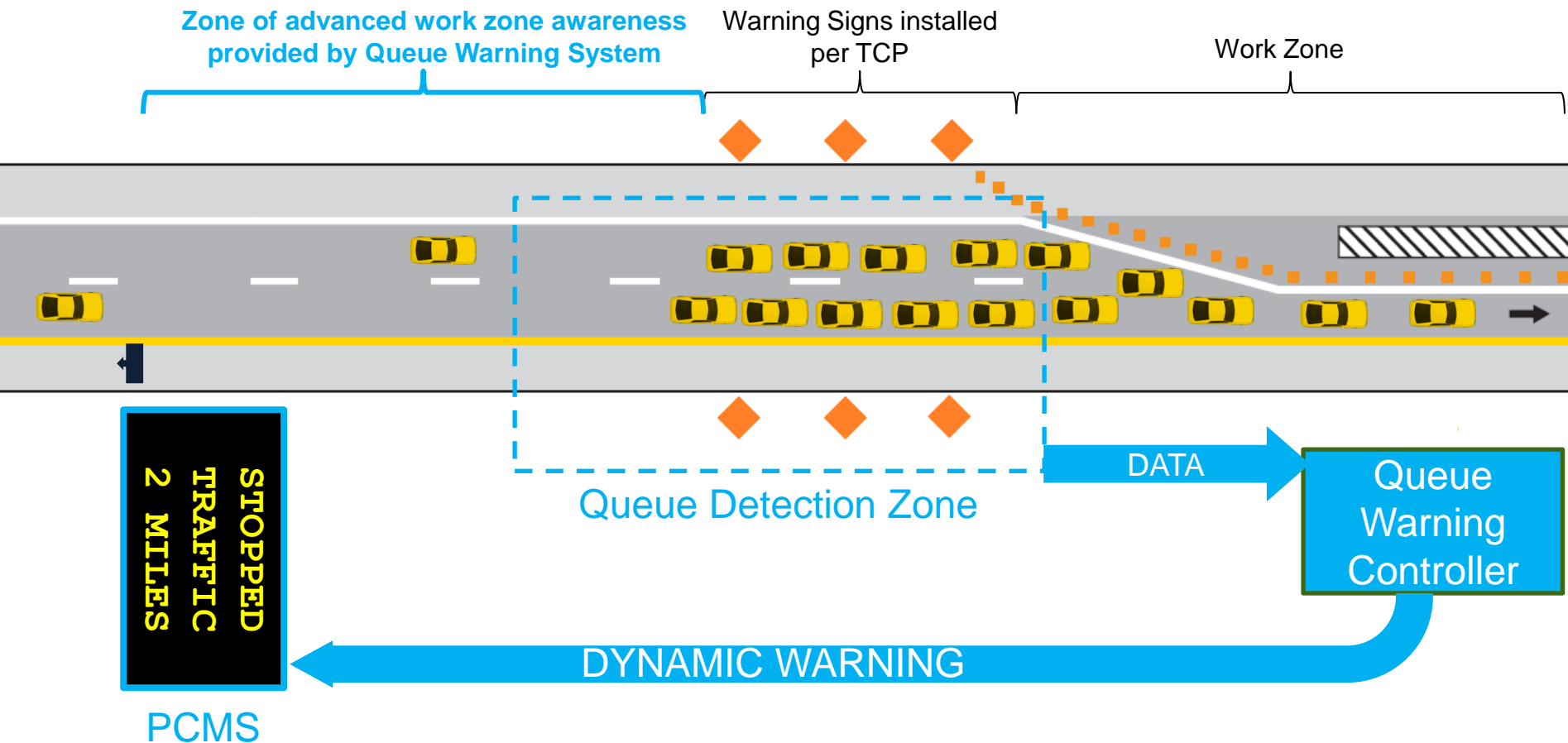
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# Technology Application – Basic Criteria

- Locally focused
- System solution
- May arise from maturation of agency practices using existing hardware
- Includes off-the-shelf systems as well as systems developed to agency specifications



# 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](http://www.michigan.gov/documents/mdot/MDOT_Research_Report_RC1467_200924_7.pdf)



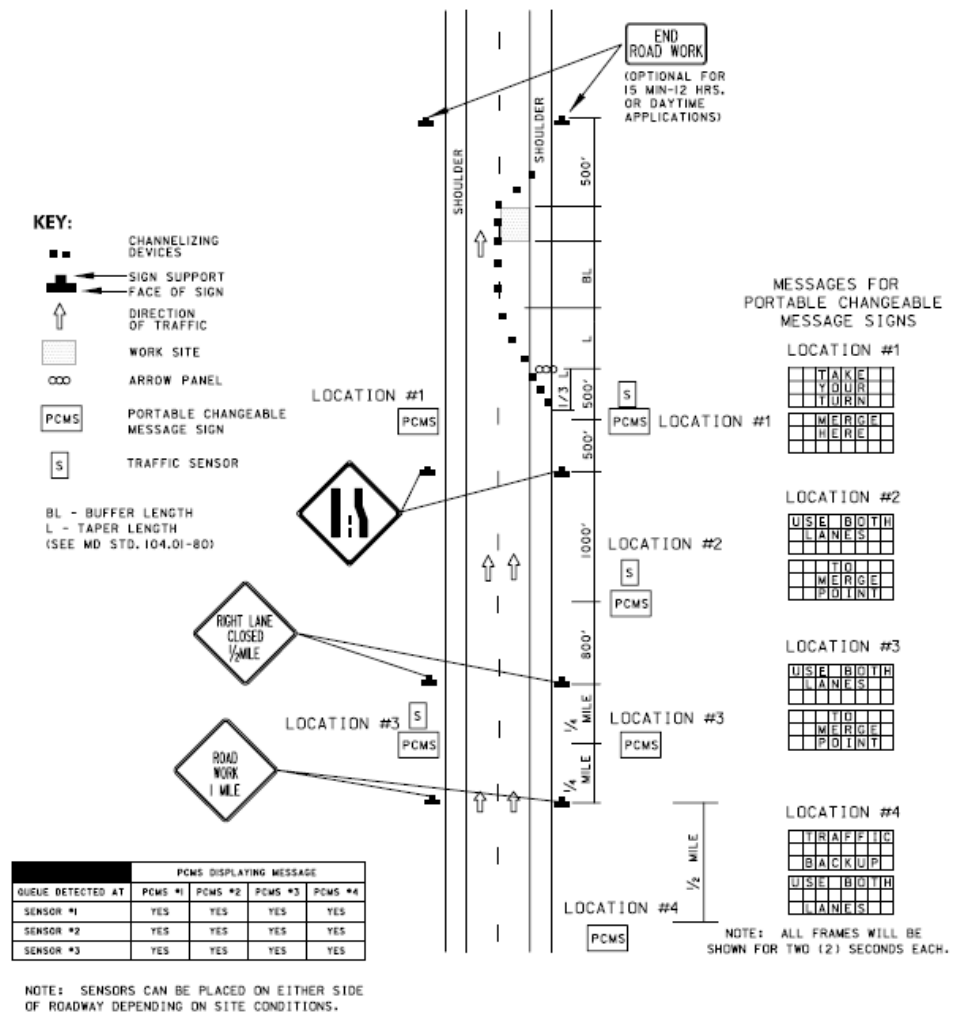
# Technology Application Example: Dynamic Lane Merge

## Early Merge

In low-volume conditions reduces the occurrence of high-speed merging at the point of lane closure.

## Late Merge

In high-volume conditions reduces the length of the queue.



Source: Maryland State Highway Administration



# Technology Application Example #1

## Texas I-35 Widening Project

- TxDOT widening 96 miles of I-35 between Austin and DFW
- High traffic volumes
- Major freight corridor
- I-35 “Traveler Information During Construction” implements enhanced data collection



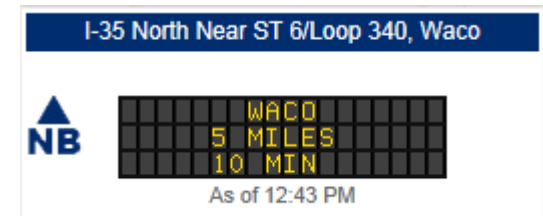
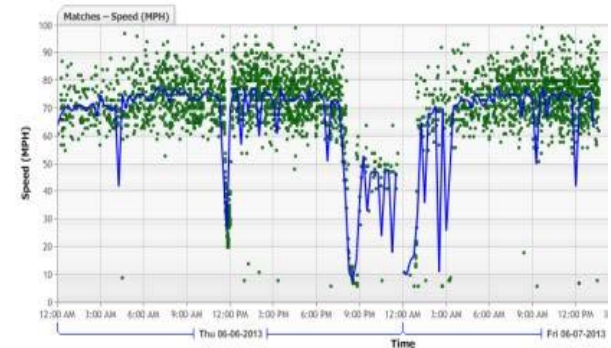
# I-35 Traveler Information During Construction (I35TIDC)

- Provide **advance** notification of planned lane closures and their anticipated impacts
- Provide travelers with **predicted** delays for construction closures
- Provide **real-time** traveler information
  - Travel time
  - Delays
  - Queues



# I-35 Traveler Information During Construction (I35TIDC)

- Bluetooth monitoring of 100 miles of I-35 at 2-3 mile spacing
- 17 spot speed & volume sensors
- 7 digital cameras
- 21 portable DMS
- Delivers travel time & delay between major destinations
- Web app <http://i35-maps.tti.tamu.edu/>



# Technology Application Example #2

## Illinois I-55/ I-57 Delay

- Queue warning system with speed detectors imbedded in channelizing drums
- Upstream PCMS relayed message relevant to current traffic
- Despite 24% increase in vehicle exposure work zones experienced a 13.8% decrease in queue crashes



52	EB I-270 at MM 12.2			
53	Speed <40 mph	Delay	Max Delay	PTS Sensor A: AS
54	STOPPED TRAFFIC AHEAD	XX MIN DELAY	MAJOR DELAY NB I-55	PTS Sensor B: AS
55				Route: AS
56				Max Delay Trigger: 23 min
57	PREPARE TO STOP	NB I-55 FOR 14 MILES	CONSIDER ALT ROUTE	
58				
59				
60				
61				
62	Alt Route	23 min	18.3 miles	
63				
64	Norm Route	15 min	13.8 miles	
65				
66	Sensors	NB 10 - NB 23		
67				



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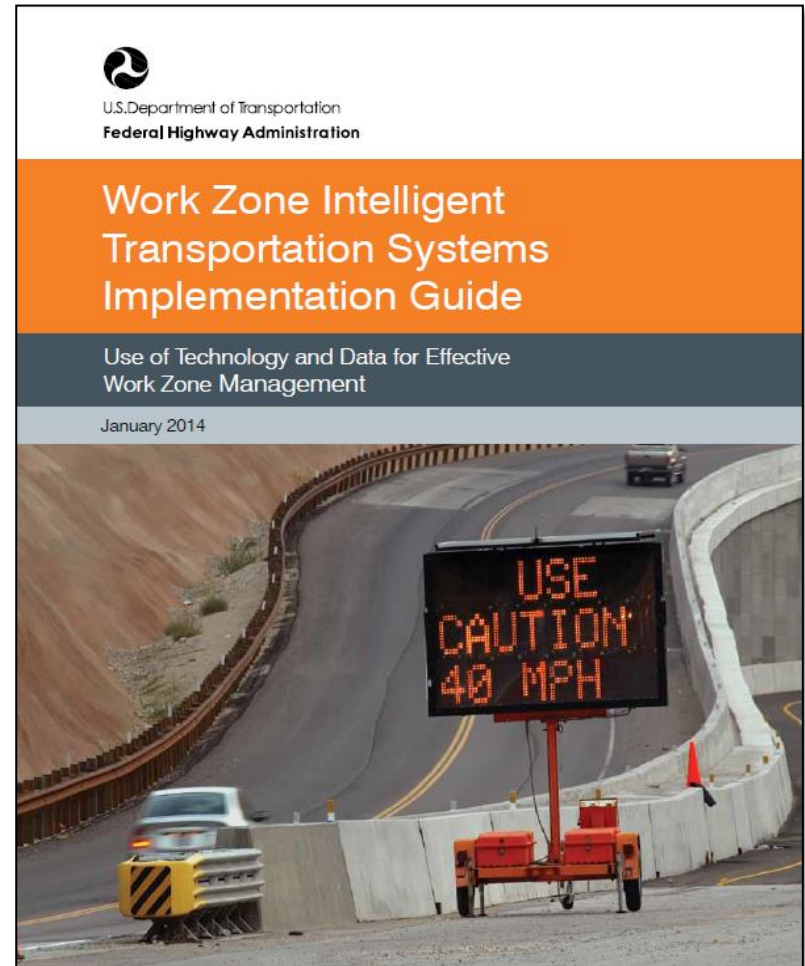
# Technology Application – Barriers and Challenges

- **Benefit / Cost**
  - System cost vs. agency budget constraints
  - Lack of understanding of benefits (and how that offsets the cost)
- **No “one size fits all” approach**
  - Lack of standard procedures, specifications, etc. for implementation at state level
  - Lack of practitioner knowledge (design, construction)
  - Procurement challenges
- **Third-party issues**
  - Legislative requirements
  - Stakeholder resistance to change (law enforcement, public, industry partners)



# FHWA's Work Zone ITS Implementation Guide

*FHWA published guidance on process for implementing Work Zone ITS, along with Case Studies*



Source: FHWA



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# Technology Application - Goals

By December 2016, **35 State DOTs** have:

- Implemented business processes for planning, design, procurement, operation, and evaluation of 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 such as speed and queue management.

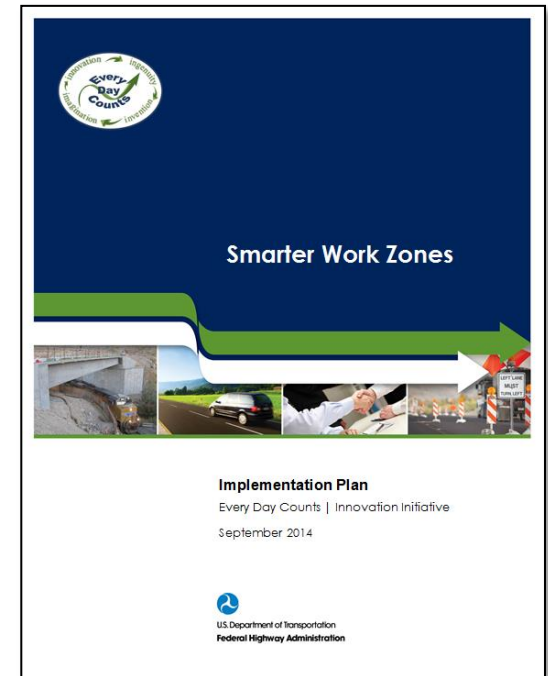


# How will the SWZ Initiatives be mainstreamed?

- Implementation Plan: States will work towards vision and mission through established goals (complete January 2015)

**Vision**: Better managed work zones through innovative strategies that optimize safety and mobility.

**Mission**: Provide tools, technical assistance, and outreach that will accelerate the adoption of Smarter Work Zone strategies.



Source: FHWA



# Support Provided by FHWA

- **Technical Assistance**

- Examples include training, workshops, webinars, peer exchanges, fact sheets, brochures etc.

- **Funding**

STIC Incentive Program	AID Demonstration Program	MAP-21 Section 1304
<ul style="list-style-type: none"><li>• Up to <b>\$100,000 available</b> annually per STIC</li><li>• Funds activities with statewide impact on turning innovation into standard practice</li></ul>	<ul style="list-style-type: none"><li>• Incentive funding to offset risk of using an innovation</li><li>• Award up to full cost of innovation (<b>max of \$1,000,000</b>)</li><li>• Eligible projects - all aspects of highway transportation</li></ul>	<ul style="list-style-type: none"><li>• <b>Increase of federal share</b> on a project by <b>up to 5%</b></li><li>• Restricted to NHPP, STP and PL funding categories</li></ul>



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# Questions?

**For further information, contact FHWA SWZ  
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