Smarter Work Zones
Overview of Queue Warning Systems

Efficiency through technology and collaboration

innovation ingenuity imagination invention
Every Day Counts

U.S. Department of Transportation
Federal Highway Administration

Smarter Work Zones
Overview

What are Smarter Work Zones?

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

What are Smarter Work Zones (cont.)?

Project Coordination

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

Technology Applications

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

Today's Focus

Types of Technology Applications Include…

- Real-Time Traveler Information
- Queue Warning
- Dynamic Lane Merge
- Incident Management
- Variable Speed Limits
- Automated Enforcement
- Entering/Exiting Construction Vehicle Notification
- Performance Measurement

For more information check out the SWZ TA website
https://www.workzonesafety.org/swz/swztechnology-application/types-of-applications/

Several States are already Utilizing SWZ!

- Over **40 states** have implemented technology applications, including:
  - Formalizing processes for planning and operating technology applications
  - Implementing "on-call" regional ITS SWZ contracts
  - Implementing steps towards institutionalizing technology:
    - Developing systems engineering documents
    - Developing specs to bid on technology
    - Piloting technology applications
    - Evaluating pilot to determine effectiveness for wider implementation
    - Fully implementing technology applications
    - Utilizing project funds to implement ITS – leading to institutionalization

Why Implement SWZ?
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

Why Implement SWZ?
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…

Smarter Work Zones
Queue Warning Systems

Queue Warning Systems (QWS)

- **What is it?**
  - Technology used to alert drivers to traffic conditions (e.g., stopped traffic, slowing traffic) ahead using automated work zone monitoring

- **How does it work?**
  - Uses technology (Sensors, Portable Changeable Message Signs (PCMS), Cameras, Rumble Strips) to:
    - Collect real-time vehicle data
    - Analyze data via software
    - Alert drivers of conditions (e.g., delay times, stopped traffic conditions, alternate route options)

- **End Result:**
  - Reduces the number and severity of rear-end crashes
  - eliminates driver surprise at stopped or slowing traffic

When is QWS Needed?

- Lack of driver awareness
  - Varying/temporary lane closure locations
  - Rural locations
- Increased severity risk
  - Locations with a high proportion of trucks
  - Work zones with loss of shoulders
- Others…

QWS Considerations

- **Project-Specific**
  - Estimated traffic volumes at location
  - Duration of delay due to project
- **Hardware/Software**
  - Sensor spacing
  - Sensor location
  - System update frequency
  - Logic thresholds for queue detection
- **Weather**
  - Equipment degradation due to inclement weather (precipitation, fog, darkness, dust, road debris)
- **Power and Communication**
  - Availability of power/alternate power sources (e.g., solar-powered)
  - Availability of communication (e.g., cellular, hardwired)

QWS Messaging

Sign Location

- Primary location should allow travelers to choose alternate route based on displayed information
- Additional locations could be added to provide road user addition information

Sign Message

- Alternating messaging when traffic slowed beyond specified threshold, for example:
  - "STOPPED TRAFFIC AHEAD / BE PREPARED TO STOP"
  - "STOPPED TRAFFIC / 8 MILES AHEAD"
- Anticipated delay times at approach to work zone and decision points

Examples of QWS Signage

Traffic Conditions	Phase I Message	Phase II Message
No Congestion	**NO DELAY TO US51**	**ROADWORK XX MILES AHEAD**
Speeds < XX mph	**SLOW SPEEDS AHEAD**	**PREPARE TO STOP**
Significant Delays	**XX MIN DELAY**	**NEXT XX MILES**
Even Greater Delays	**XX MIN DELAY**	**CONSIDER ALT ROUTE**
Delays > Threshold Value	**EXPECT MAJOR DELAYS**	**ALT ROUTE EXIT 163**

Source: http://www.ops.fhwa.dot.gov/publications/fhwahop14007/chap2.htm

Example QWS Messages

Additional QWS Resources

Guidelines and Training

- QWS Application Guidelines by MnDOT http://www.dot.state.mn.us/trafficeng/workzone/iwz/IWZ-CongestionWarningSystem-June2005.pdf
- End-of-Queue Training Module https://www.workzonesafety.org/training_courses/atssa_back_of_queue_training_module/player.html

Case Studies and Fact Sheets

- QWS in Texas https://www.workzonesafety.org/publication/innovative-end-of-queue-warning-system-reduces-crashes-up-to-45/
- QWS in Illinois http://www.ops.fhwa.dot.gov/publications/fhwahop14007/chap2.htm

Bid Specifications

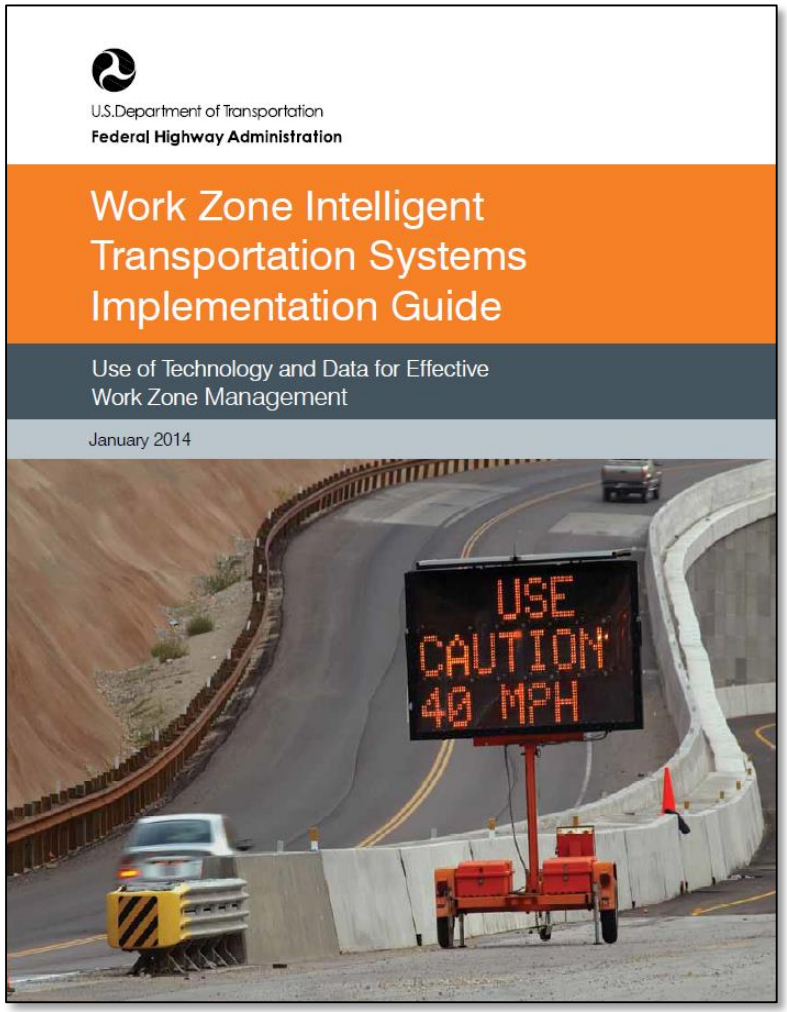
- QWS in Texas https://www.workzonesafety.org/files/documents/SWZ/special_specs6079.pdf
- QWS in Michigan https://www.workzonesafety.org/files/documents/SWZ/special_provision_12OF800%28A020%29_rev1_Michigan_0.pdf
- QWS in Illinois https://www.workzonesafety.org/files/documents/SWZ/bid_specs_D9-78450-147%20Illinois.pdf

Deployment Plans

- QWS in Texas https://www.workzonesafety.org/files/documents/SWZ/deployment_plans_Waco.pdf
- QWS in Pennsylvania https://www.workzonesafety.org/files/documents/SWZ/deployment_plans_PennDOT.pdf

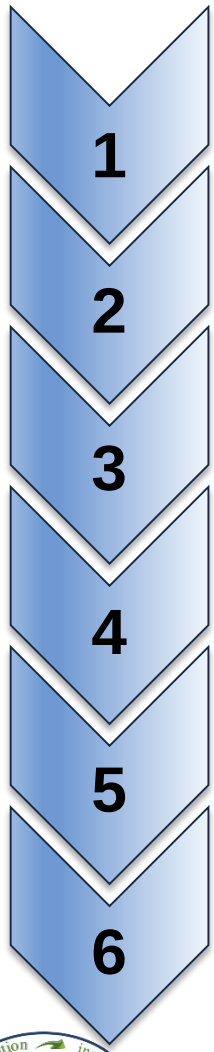
Implementation Guidance
Work Zone ITS Implementation Guide

- Provides guidance on implementing ITS in work zones to assist public agencies, design and construction firms, and industry stakeholders
- Presented through a 6-step Systems Engineering Approach to WZ ITS implementation
- Available for download at: http://www.ops.fhwa.dot.gov/publications/fhwahop14008/fhwahop14008.pdf



Source: FHWA

Implementation Guidance
Work Zone ITS Implementation Guide Steps



Assessment of Needs

Concept Development & Feasibility

Detailed System Planning & Design

Procurement

System Deployment

System Operation, Maintenance, and Evaluation

Applies to any WZ ITS deployment regardless of scale

Smarter Work Zones
Resources

Funding Opportunities

State Transportation Innovation Councils (STIC) Incentive Program	Accelerated Innovation Deployment (AID) Demonstration 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!	• 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.

www.fhwa.dot.gov/stic

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

Visit FHWA's SWZ Interactive Toolkit

https://www.workzonesafety.org/swz/

Utilize Various Learning Opportunities!

- In-Person Workshops
- Virtual Peer Exchanges
- In-Person Peer Exchanges
- Demonstration Site Visits

Free educational opportunities are available!

Contact Jawad Paracha for more information

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