

Overview of ITS in Work Zones



**ITS in Work Zones Workshop
September 12-13, 2005**

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Presentation Outline

- What is Work Zone ITS?
- Why Use It?
- Examples of Applications
- FHWA WZ ITS Activities
- WZ ITS and the Revised WZ Rule



What is *Work Zone* ITS?

- Use of technology to support effective work zone management and operations
- Used both in and around work zones
- Can have a safety or mobility main focus, but often supports *both*
- Portable and temporary in *most* cases
- May be leased or purchased



What is *Work Zone ITS*?

Includes some combination of:

- Input devices: Sensors, cameras
- Automated analysis of data
- Output to: VMS, websites, highway advisory radio, pagers, 511, a TMC
- Via a local PC, a virtual TMC, or a TMC



What is *Work Zone* ITS?

Users of information may include:

- DOTs
- Public and road users
- Media outlets
- Contractors
- Trucking companies
- Emergency services providers
- Motorist assistance patrols
- Third party traveler information providers



Why Use Work Zone ITS?

- The effects of road work on road users and workers are increasing.
- We are seeing:
 - More congestion on our roads
 - More work zones
 - More lost lives
 - Growing exposure
 - Growing public frustration



Why Use Work Zone ITS?

Because it can help:

- Improve safety, mobility, traveler satisfaction, incident response, relationship with emergency responders

Or stated another way...

- Reduce congestion, crashes, secondary crashes, complaints from the public



ITS Applications in Work Zones

- Traffic monitoring and management
- Traveler information
- Incident management
- Tracking and evaluation of contract incentive/disincentives
- Worker safety/protection
- Speed management and enforcement



Example ITS Work Zone Applications

- Traffic monitoring and management
 - Sensors, queue detectors, counters, cameras and VMS
 - Dynamic “no passing zone” at taper based on traffic conditions
- Traveler information
 - Alternate route information
 - Estimated delay (time, distance)
 - Notification of stopped/slowed traffic



Dynamic Lane Merge

Creates a dynamic no-passing zone based on detected traffic volume and back-ups



- Sensors detect traffic conditions
- Next upstream sign activated when traffic threshold met
- “Do Not Pass When Flashing”
- Signs are regulatory and enforceable



Interstate North of Detroit, Michigan

- Used to improve traffic flow, prevent dangerous merging
- System reduced travel time delays, number of crashes, aggressive driving during AM and PM peak periods

- Study found the system effective for roads with moderate traffic volumes

*\$120,000 cost
for system*



Traveler Information

- Sensors to monitor real-time traffic conditions
- Data used to calculate delay/speed/travel time
- Info automatically displayed on CMS's and website (map, CMS messages)
- Info can also be distributed via HAR
- Cameras to gather additional condition info



Traveler Information

North Carolina I-95 Workzone - Main Map Page

Click on signs from and speed indicators (green, yellow, red heads) for more information.

Legend

I-95 Traffic Speed



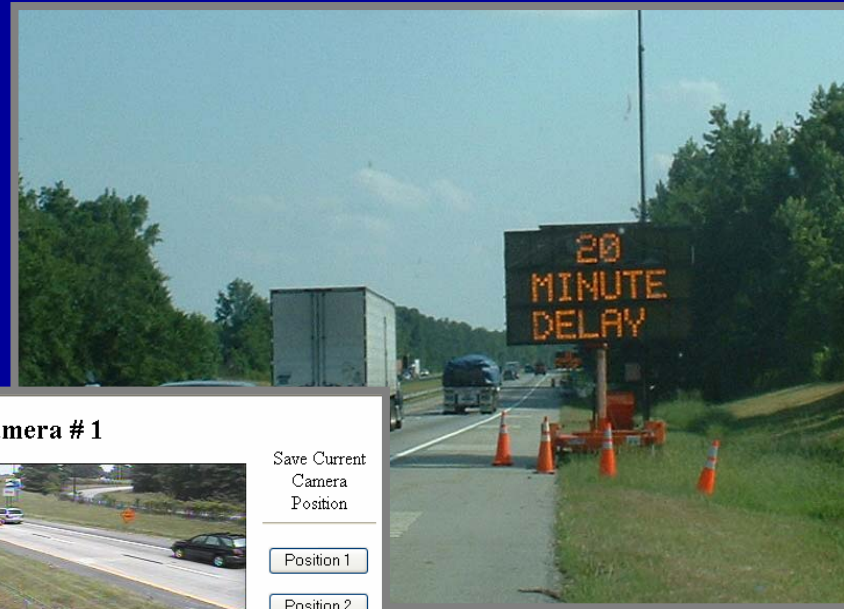
Alternate Routes



Highway Indicators



Icons



Camera # 1



Save Current Camera Position

Position 1

Position 2

Position 3

Position 4

Position 5

Position 2

Position 3

Position 4

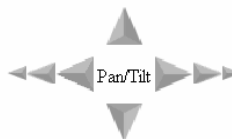
Position 5

Image Archive

Start

Auto Archive On

Stop



Close

Zoom In

Zoom Out

Wiper Control

Activate



I-95 Outside of Fayetteville, NC

- Deployed May 2002
- 6 sensors to monitor real-time traffic conditions
- Data used to calculate delay
- Delay info automatically displayed on CMSs and website (map, CMS messages)
- 6 cameras to gather additional condition info, verify system CMS messages

I-95 Outside of Fayetteville, NC

- When delay $>$ threshold, alternate route info also given on CMS
- Traffic signal added to alternate route to handle increased flow during diversions
- Results
 - Before: NB Queues of 3.5 to 4 mi
SB Queues of 2.5 to 3 mi
during lane closures
 - After: Queues 1 mi or less
 - *ITS considered major contributing factor*

Work Zone Incident Management

Albuquerque Big I

- Cameras, some detectors
- Temporary TMC co-located with police substation
- HELP trucks patrolling, wrecker on call

Used to:

- Quickly detect incidents, call for appropriate, efficient response
- Guide drivers through work zone and detours



Coordination with Emergency Services



Smart Work Stations



Big "I" Construction

Intelligent Transportation System

ITS Control Center



H.E.L.P. Patrols



Benefits of Using ITS at the Big I

- **Mobility**
 - Incident clear time reduced from 45 minutes in past to 25 minutes in work zone
- **Safety**
 - Less incidents than expected (7% increase during WZ)
- **Cost savings**
 - Help ensure response is commensurate with incident to save costs and avoid clogging roadway
 - Automation
- **Improved relations** with incident response community
- **Better public relations/better informed public**



Tracking and Evaluation of Contract Incentive/Disincentives

Arizona SR 68 travel time system



Rural corridor:
Major route for
commuting
casino workers,
recreational
users, trucks



Arizona State Route 68

Why use ITS?

- Lengthy delays during past projects significantly impacted the public
- No viable alternate routes, so ADOT focused on reducing travel time in WZ
- To assess contractor compliance with travel time incentive/disincentive

Arizona State Route 68

- Avg travel time before WZ = 17 minutes
- Contractor required to keep average travel time to < 27 minutes
 - Otherwise \$400k incentive pool reduced
- License plate reader system used to measure travel times



Arizona State Route 68 - Results

- Greater contractor participation in and commitment to keeping traffic moving
 - Limited number of flagging stations
 - Scheduled work to reduce impacts to travelers
- Incentive pool only charged about \$15,000
 - System helped keep traffic moving
 - Contractor received most of the possible \$400k incentive



Worker Safety/Protection

Work space intrusion alarms

- Detect vehicles entering buffer area between work crews and passing vehicles
- Sound a warning alarm to alert workers and drivers
- Not extensively used to date
- Some deployments:
 - During rehab of 8 miles of U.S. Rte 22 in Pennsylvania
 - Some projects on I-64 in West Virginia



Speed Management and Enforcement

- Variable speed limits
- Automated enforcement



Variable Speed Limits in Work Zones

- Enables an agency to automatically adjust speed limit based on changing conditions
 - Whether workers are present
 - As traffic flow changes
 - Weather (fog, rain, ice)
- May result in
 - More credibility of speed limits
 - Increased compliance
 - Improved safety
 - Improved traffic flow



Automated Enforcement

- Help address limited space in WZs
- Move enforcement activity outside the WZ
- May require changes to law
- Need to overcome public/political opposition



FHWA ITS in WZ Activities

- Cross-Cutting Study
- Case Studies
- Implementation Guide
- VSL Field Operational Test
- Assessment of Effectiveness



WZ ITS Cross-Cutting Study

- 4 sites
 - Albuquerque, NM Big I (I-40 & I-25)
 - Lansing, MI I-496
 - Springfield, IL I-55
 - West Memphis, AR I-40 near I-55
- Additional research/information gathering on other applications
- Brochure and Report developed



Challenges/Lessons Learned

- Communications must be reliable
- Allow start-up time
- Need to develop public awareness
- Information must be accurate (public credibility)
- Involve partners early
- Carefully gauge amount of information delivered
- Portability can be key
- Systems must be maintained
- Lack of data analysis done to quantify benefits



Benefits

- Improved mobility and traffic management
- More informed public
- Quicker incident response
- Greater safety of workers and travelers
- Better PR and relationships with other stakeholders
- Enhanced speed management
- Potential for cost savings
- Better understanding of traffic conditions



WZ ITS Case Studies

- Highlight 4 successful applications
 - Incident Mgmt System, Albuquerque
 - Traffic Mgmt & Traveler Info System, Springfield, IL
 - Contract Incentive Monitoring, Arizona
 - Dynamic Lane Merge, Detroit
- Provide more detailed information
- 4 individual reports, about 15 pages each

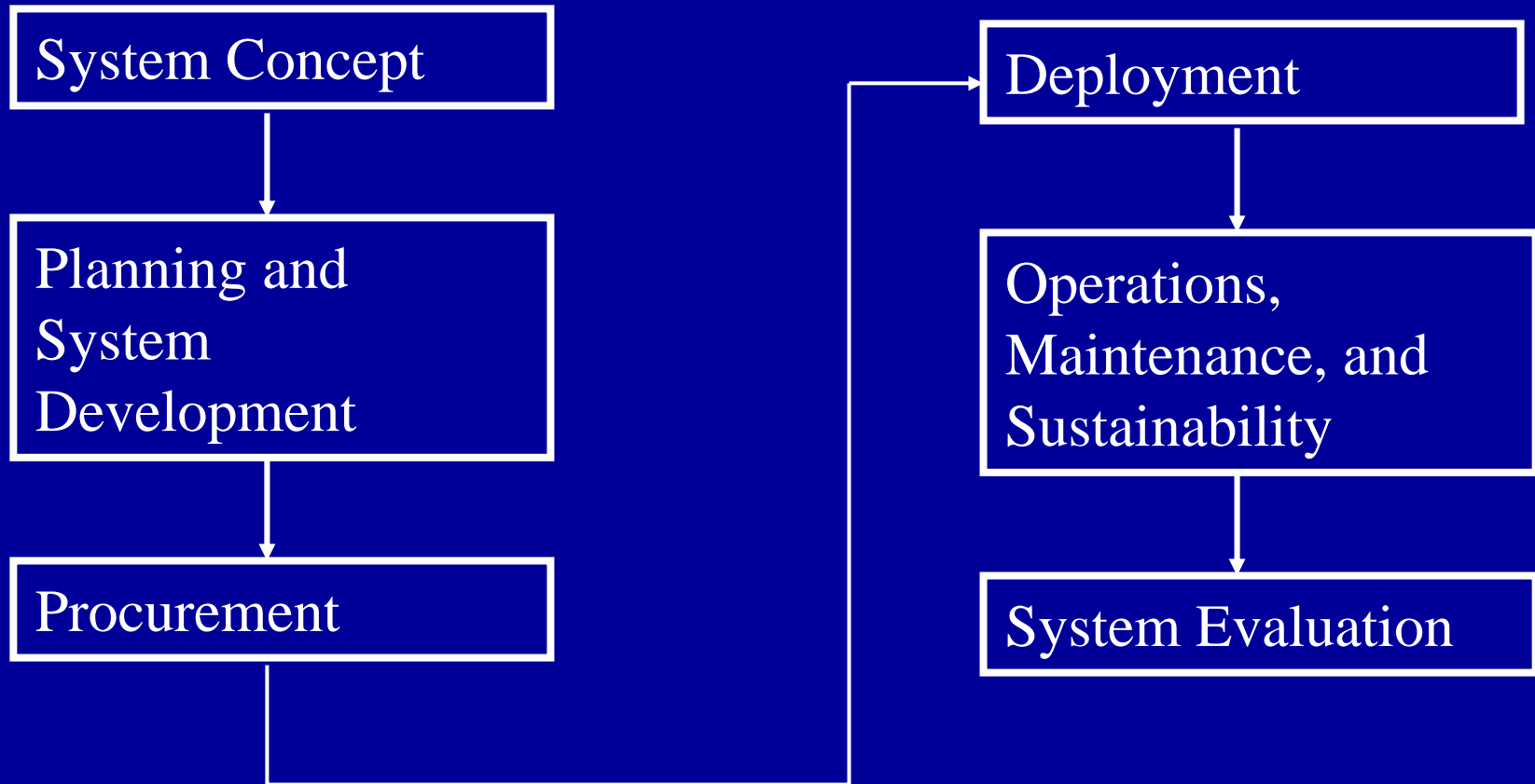


Implementation Guide

- Provide guidance for implementing ITS in work zones
- Share knowledge and lessons learned from those experienced with ITS in work zones
- Available in late 2005



Implementation Guide



VSL Field Operational Test

- State self-evaluations, independent national evaluation
- Evaluate effectiveness and benefits
- Locations
 - Michigan (completed)
 - Maryland (about to deploy)
 - Possibly a 3rd site



Assessment of Effectiveness

- Gather quantifiable results on effectiveness of ITS in work zones
- Look at mobility and safety measures, delivery of traveler info, reliability
- 5 or 6 sites where ITS is deployed in a work zone
 - NC site (I-40 in Winston-Salem)
 - AR site (I-30 between Benton and Little Rock)
 - MI site (US 131 in Kalamazoo)
 - Selection of other sites in process



WZ ITS and the Revised WZ Rule

- ITS not required by the Rule
- How does it relate?
 - May be an element of some Transportation Management Plans (TMPs)
 - Source of information for the data provision of the Rule
 - To manage project impacts during implementation
 - To improve processes and procedures (multi-project)
 - Support process reviews
 - Support WZ impacts assessment

For further Information/Resources:

<http://tig.transportation.org>

www.fhwa.dot.gov/workzones

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