INTRODUCTION

The use of Intelligent Transportation Systems (ITS) in work zones (WZ) in rural areas has become more common, but it is not a panacea. ITS has been shown to have positive impacts in the areas of mobility, safety, and cost savings. However, one question that has not been adequately addressed is when should ITS be used? Guidelines are needed to assist states in making decisions about how to make the most of every investment. Work zones account for approximately 25% of non-recurring congestion, including:

- Nearly 500 million hours of delay
- Over 1,000 fatalities
- More than 40,000 injuries
- 85% of fatalities are drivers/occupants

Understanding the Problem (Figure 1)

- Increased crashes
- Increased delay
- Loss of mobility
- Loss of capacity
- Safety compromised
- Decrease in travel time reliability

RESEARCH OBJECTIVES

- Identify ITS components to be considered for work zones
- Determine specific TxDOT needs and how ITS might address needs
- Develop guidelines for implementation of ITS in WZ
- Conduct proof-of-concept field-testing to validate system design
- Develop recommendations for operating WZ ITS with existing ITS

TXDOT WZ ITS NEEDS ASSESSMENT

- Not all districts expect benefits from additional ITS in WZ
- All districts currently use DMS and speed display trailers
- Real-time information threshold based on traffic volume only
- A few districts use web sites to disseminate WZ information
- Only one project used specific predicted delay or queueing
- One district uses dynamic merge control

ITS COMPONENTS FOR WORK ZONES

- Sensors (e.g., speed, volume, travel time)
- CCTV surveillance cameras
- Speed display trailers
- Portable signals
- Dynamic message signs (DMS)
- Roadside signs / devices (e.g., smart barrels, variable speed limits)
- Communications

Specific Treatment Categories

1. Real-time information
2. Dynamic merge control (Figure 2)
3. Dynamic queue warning (Figure 3)
4. Incident detection, response, and clearance
5. Speed management

[1] – Real-Time Information

- Encourage traffic diversion
- Alter route choice
- Anticipate problems

Non-Congested Traffic Conditions

Congested Traffic Conditions

Figure 2. Dynamic Merge Control – Congested & Non-Congested


Figure 3. Speed Profiles – Dynamic Queue Warning

Source: Ref. (2)


- Numerous implementation methods
  - Increase courtesy patrols
  - Towing services on station
  - Pre-positioned response teams
  - Temporary sensors / CCTV
  - Rural vs. urban differences

- Benefits
  - Reduction in crashes
  - Reduction in incident duration
  - Reduction in delay


- Portable field sensors (e.g., microwave) at ½ to 1 mile spacing
- Trailers with sensors, self-contained power, comm., displays
- Speed limit varied based on type of WZ activity
- Can be location-specific or controlled from central location
- Benefits
  - Increase in operating speed over time
  - More consistent speeds

SELECTED GUIDELINES FOR USE OF ITS IN WZ

- Consider ITS when:
  - Work zone is reasonably long (>0.8 km)
  - Flow exceeds capacity of open lane (queue forms)
  - No entry or exit ramps within 3 to 5 km w/in WZ (3)

- Consider real-time systems predicting delays & detour information when:
  - Traffic volumes consistently above 1500 vphpl
  - Where excessive queueing is predicted
  - Rural locations with recurring queue lengths (delays) exceeding 15 min
  - Rural or urban locations with
    - Infrequent queues resulting in delays greater than 30 minutes
    - Where route information is sparse but viable alternate routes exist (4)

NEXT STEPS

- Develop architecture for integrating WZ ITS into TMC
- Conduct proof-of-concept field testing in year 2 of the research
- Develop recommendations for operating WZ ITS with existing ITS

References

1. "Work Zone Safety for Drivers," Federal Highway Administration

