## ITS Warrants and IWZ Research Project

<table>
<thead>
<tr>
<th>CCTV Warrants</th>
<th>RWiS Warrants</th>
<th>DMS Warrants</th>
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Work Zone ITS Peer Exchange  
May 21, 2013
Agenda

• ENTERPRISE Program
• ITS Warrants Project
• IWZ Research Project
ENTERPRISE Program

Evaluating New TEchnologies for Road PRogram Initiatives in Safety and Efficiency
ENTERPRISE Program

• Goals
  – Facilitate rapid progress in the development and deployment of ITS technologies
  – Accelerate the systematic advancement of selected ITS projects
    • Members carry out ITS projects and activities including fundamental research, technology development, demonstration, standardization and deployment
ENTERPRISE Program

Members

- Arizona DOT
- Georgia DOT
- Idaho Transportation Department
- Illinois DOT
- Iowa DOT
- Kansas DOT
- Maricopa County, Arizona
- **Michigan DOT***
- Minnesota DOT
- Mississippi DOT
- Oklahoma DOT
- Texas DOT
- Virginia DOT
- Washington State DOT
- Ontario Ministry of Transport
- Transport Canada
- Dutch Ministry of Transport
- FHWA

*Michigan DOT administers program and is a founding member*
ITS Warrants Project

• Project began in 2009
  – Need for an efficient and effective methodology to determine if ITS deployments are appropriate

• Goals
  – Assist agencies with decisions about where to deploy ITS devices
    • Is a device warranted at a specific location?
    • Should further considerations be performed?
    • Eliminate locations where a device is not warranted
  – Validate locations of existing ITS device deployments

ENTERPRISE
ITS Warrants Project

• Warrants have been developed for 10 devices
  • CCTV
  • Curve Warning System
  • DMS
  • Dynamic Speed Display Sign
  • HAR
  • Ramp Meter
  • RWIS
  • Variable Speed Limit
  • ITS Devices in Work Zones
  • ICWS (DRAFT)

• Gathered input from
  – Interactive Website
  – ENTERPRISE Member States and Non-Member States
  – ITE Mid-Year Meeting
  – ITS Canada Workshop
  – TRB, ITS World Congress, ITS America Sessions
Warrants Use

- This is one tool to use in the decision making process
- Series of ‘yes’ or ‘no’ questions that can be answered quickly, avoiding the complexity of collecting a lot of data before using the warrants
- Warrants have been used for real world decision for ITS deployments by: ND, KS, MN, VA
  - VDOT has used the warrants as an initial screening tool for selecting RWIS deployments
ITS Warrants Project

Warrants tested against deployments being considered, under development, or already developed in recent years

Purpose

2

Critical Factors:

• Average speed (85th percentile speed) compared to posted speed
• Speed transition difference
• Proximity to other DSDS

Dynamic Speed Display Sign Warrant Development Process

Step 1: Define purpose of device
• Purpose 1: Transition Zones
• Purpose 2: Posted Speed Adherence
• Purpose 3: Intelligent Work Zones

Step 2: Identify critical factors
Purpose 2 Critical Factors:
• Is the posted speed limit 35 mph or less?
• Are there any other DSDS within 5 miles in either direction?

Step 3: Develop preliminary warrant

Step 4: Testing and warrant adjustment

Step 4: Testing and warrant adjustment

ENTREPRISE
ITS Warrants Project

Dynamic Speed Display Sign
- Purpose 1: Transition Zones
- Purpose 2: Posted Speed Adherence
- **Purpose 3: Intelligent Work Zones**

Variable Speed Limits
- Purpose 1: Maximize Capacity
- Purpose 2: Safe Stopping Distances
- Purpose 3: Safe Travel Speeds for Conditions
- **Purpose 4: Work Zones**
DSDS Warrant 3: IWZ

Purpose: To promote speed limit adherence in locations where posted speed have temporarily been reduced for construction, maintenance or other traffic control.

Device is warranted if:

1. The work zone is currently in operation and observations suggest that the 85th percentile speed at a location within the work zone exceeds the posted speed limit by at least 5 mph.

OR

2. Workers will be located adjacent to the open traffic lane.

OR

3. Hazardous roadway conditions, such as a temporary unusually tight curve, or a rough road surface, requiring extra driving precaution.

Note: Signs tend to be most effective where there are two lanes or less in one direction of travel.
## ITS Warrants Project

### Intelligent Work Zone Warrants

Collection of devices that warn travelers of various hazards associated with work zones.

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| **DMS Warrant - 3:**  
*Changing Traffic Control or Conditions* | To notify drivers in advance of special changing traffic conditions and roadway configuration changes associated with road construction or maintenance in order to reduce driver confusion that could result in a crash. |
| **CCTV Warrant - 6:**  
*Intelligent Work Zone* | To allow travelers or transportation professions to understand construction or maintenance traffic delay by viewing images of the roadway remotely. |
| **HAR Warrant - 3:**  
*Changing Traffic Conditions* | To notify drivers in advance of special changing traffic conditions and roadway configurations associated with road construction or maintenance. |
| **VSL Warrant - 4:**  
*Work Zones* | To post varying speed limits for construction zones in order to only slow traffic when necessary or to maintain consistent speeds to promote safety. |
| **DSDS Warrant - 3:**  
*Intelligent Work Zone* | To promote speed limit adherence in locations where posted speeds have temporarily been reduced for construction, maintenance or other traffic control. |
| **Ramp Meter Warrant - 3:**  
*Ramp Metering During Work Zone Activity* | To meter on-ramp traffic during road work activities to improve safety and/or consistent traffic flow. |
ITS Warrants Project

enterprise.prog.org/itswarrants
IWZ Research Project

• Project Purpose
  – Document the best practices and lessons learned regarding IWZ technologies from various sources to draw conclusions about what approaches work best in what situations.

• Project Focus:
  – Dynamic Merge
  – End of queue warning systems
  – Alternate Routes
  – Variable Speed Limits
IWZ Research Project

• 2013 Work Zone Test Bed to track
  – Locations of signs and sensors
  – Messages used on signs
  – Thresholds used to active sign messages
  – Adjustments made to configurations
  – Public outreach approach
Minnesota Dynamic Late Merge System

**Congestion**
- Speeds < 20 mph (guide)
- Vol. < 1500 v/hr. (guide)
- Trend (reduced speeds & increased vol.)
- DLM Messages
- Late Merge Approach

**Merge Here**
/ TAKE TURNS

**Merge Ahead**
/ USE BOTH LANES

**Stopped Traffic Ahead**
/ USE BOTH LANES
Michigan Dynamic Late Merge System

**Congestion**
- Speeds < 45 MPH (35)
- DLM Messages
- Late Merge Approach

**Messages**
- **TAKE YOUR TURN**
  - **/ MERGE HERE**
- **USE BOTH LANES**
  - **/ STAY IN YOUR LANE**
- **STOPPED TRAFFIC AHEAD**
  - **/ USE BOTH LANES**
Dynamic Merge
- EB I-96 near MM 9 in Ottawa County (Michigan)
- MnDOT SP 2772-96 – Hwy 169 (Minnesota)

Queue Warning System
- End of Queue Warning System on I-35 (Texas)
- Congestion Warning Milwaukee Area (Wisconsin)
- Queue Warning in Jefferson County (Missouri)

Alternate Routes
- Travel Time System (Wisconsin)
- I-94 Travel Time System (Minnesota)
- Metro Wide Detection System (Minnesota)
- Travel Time and Alternate Route System – Effingham County (Illinois)

Variable Speed Limits
Contact

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