Work Zone Management: Traffic Critical Projects
National Work Zone Management Conference
September 2018
Skylar Knickerbocker
Have used google maps and sheets

Easy to use

Access for all stakeholders

But…

Tracking Work Zones and Devices
Moving to ArcGIS Online

- Database
- Single location
- Integration
- Mobile Application
- REST Service
- Other services
TCP Management Layer

TCP Management Layer for DEVICE

Collect
Start collecting data

Inbox
Edit existing survey data

Sent
Review sent survey data
Upper Management
Work Zone Performance

Iowa State University
Institute for Transportation

IOWA DOT
Started Performance Monitoring in 2014
Turning data...
Big Data Pipeline

- Streaming Sensor Data
  - Local Text
    - Every 20s

- Hadoop Distributed File System (HDFS)

- Column-Oriented Database
  - Daily
  - Daily & Weekly
  - Interactively

- Tableau Online

- PDF Document Created by Matlab
  - Weekly
Web Based Visualization Tool

• Work Zone Map
• Weekly Performance
• Daily Performance
• Speed Heatmap
• Hourly Volume
• More added as needed
Work Zone Map

Interactive Tool

Overview of all Intelligent Work Zones across the state

Map shows location of all IWZ work zones

List on the side shows the project TCP number. Hovering over the project number will highlight the project on the map (see next slide)
Weekly and Daily Performance

WEEKLY PERFORMANCE
WORK ZONE 1am

CURRENT WEEK: August 28, 2018 to September 2, 2018

- Average Queue Length
- Maximum Queue Length
- Average Duration of Traffic Queuing Events
- Maximum Duration of Traffic Queuing Events
- Total Vehicles
- Number of Traffic Slowdowns
- Average Delay
- Maximum Delay

Last Updated: 9/10/2018 8:02:33 PM
The queue exceeded the farthest traffic sensor (around 3.7 miles) twice. From 11:10 am to 11:55am and from 2:45pm to 3:55pm.
The queue exceeded the farthest traffic sensor (around 3.7 miles) twice. From 11:10 am to 11:55 am and from 2:45 pm to 3:55 pm.
Speed Heatmaps
Hourly Volume

WORK ZONE 1am

Northbound

Southbound

Last Updated: 9/10/2018 8:02:33 PM

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IOWADOT
IOWA STATE UNIVERSITY
Alerting
Alerting

- Machine Learning to identify slow and stopped conditions
- Alert DOT for significant events and minimize false calls
Alerting

Event classification has improved performance measures.

Data feed to TMC with both slow and stop conditions.

Text Alerting to DOT Staff.
Alerting

Work Zone Congestion Alert
I-80/35 WB @ MM 128.4 - 129.1
Began: 6/19/2018 10:18 AM
Current Speeds: 15 mph
Project Name: Project 1j
EventID: 1416

Congestion Cleared
I-80/35 WB
Duration: 34 minutes
Project Name: Project 1j
EventID: 1416
Crash Performance Monitoring

Work Zone Locations
Need for improved work zone information
511 data for work zone
IA 22 in both directions: Alternating lane closures. Between IA 1 and US 218 (Riverside). There are alternating lane closures due to road construction work. There is a width limit in effect. Width limit 12'0". From 6:00AM CDT to 7:00PM CDT on weekdays. Until August 13, 2018 at about 2:00PM CDT.
IA 22 in both directions: Alternating lane closures.

Between IA 1 and US 218 (Riverside). There are alternating lane closures due to road construction work. There is a width limit in effect. Width limit 12'0". From 6:00AM CDT to 7:00PM CDT on weekdays. Until August 13, 2018 at about 2:00PM CDT.

Comment: Mount Pleasant RCE (800-224-6021)
- Washington County

Last updated May 31 by Iowa DOT
Issues

Location
Time
Lane
Length
Accuracy
Does not change with:
- weather impacts
- equipment delays
- work delays
**Interruption Lane Closures**

**I-80 in both directions: Intermittent lane closure.**

Between Exit 110: US 169; US 6 (De Soto) and Exit 117: County Road R22 (near Van Meter). A lane is closed intermittently due to road construction work. From 9:00AM CDT to 3:00PM CDT on weekdays. Until July 27, 2018 at about 3:00PM CDT.

**Comment:** Dallas County

Last updated May 10 by Iowa DOT
Duplicate Lane Closures

Four lane closures at this location

- Two lane closures for left lane closed in both directions
- Two lane closure for the shoulder closed in both directions
Inaccuracies

I-74 in both directions: Roadway reduced to one lane

Between Exit 2: US 6; Spruce Hills Drive; Kimberly Road and Exit 4: US 67; Grant Street and State Street (near Bettendorf). The roadway is reduced to one lane because of night time construction work. From 9:00PM CDT to 6:00AM CDT on Sunday and from 7:00PM CDT to 6:00AM CDT on Monday, Tuesday, Wednesday and Thursday. Until November 1, 2018 at about 6:00AM CDT.

Comment: Davenport RCE (800-262-5145) - Scott County

Last updated April 11 by Iowa DOT
14 Different Closures
Work Zone Extents

I-35 northbound: Expect changing traffic patterns.

Between Exit 102: IA 210 (near Huxley) and Exit 111: US 30 (Ames). Expect changing traffic patterns due to bridge construction work. Until November 20, 2018 at about 5:00PM CDT.

Comment: Jefferson RCE (800-251-2705) - Story County

Last updated March 13 by Iowa DOT
Need for Work Zone Activity Data

• Benefits of knowing where work zones located
  • Operational performance
  • Safety performance (CMF’s)
  • Comparing work zone configuration
  • Impacts on reliability for planning

• Limitation
  • Staff are already overloaded (low priority)
  • Need automated systems
  • Must be simple to use
  • Data is not organized
Proof of Concept (Fall 2018)

**Planned**

- Work Zone Data

Planned events entered into database

**Actual**

- Field Data

Confirmation from the field through two (or more) "field devices" ID’s associated to the lane closure or other means of input (like an app)

511

**Work Zone Data Feed**

Real time feed generated when “devices” are active during a corresponding planned events (based on spatial and temporal extents)
How to Achieve This?

I am: ID# 77
I am: HERE (GPS)
I am: ON

2.68
Express.com

$2.50
Express.com

$329.95
migpsstore.com

$56.24
Google Express

$9.17
Newark
Arrow Boards

Quality checks
Lacks Context
• Speed limit
• Length
• Type of Lane Closure
• Expected end time

Other Work Zone Initiatives at InTrans
InTrans “GO Team” Initiative

Concept:

• Characterize work zone related crash by type, location, conditions
• Provide standard data per crash
• MOU
• Next steps
Guidance on Active Work Zone Data Archival
Smart Work Zone Deployment Initiative (SWZDI)
SWZDI Project

Objectives:

• Investigate current data collection techniques used on highway construction and maintenance sites;

• Examine methods by which agencies collect and disseminate data regarding lane closures and other pertinent information to the traveling public;

• Assess the degree to which various data streams can be integrated and identify potential obstacles to data utilization from the perspective of state DOTs; and

• Design a conceptual prototype tool based on effective recordkeeping practices and recommendations that can be used to measure work zone performances and evaluate strategies to address the safety and operational impacts of work zones.
**SWZDI Project**

**Work Plan**

**Salient Issues and Concerns:**

- Define WZ data archival requirements
  - Agency near-term reporting
  - Agency long-term analysis
  - WZ performance research
- Determine scopeSCALE (state DOTs only?)
- Identify relationships to agency business processes
- Identify possible automated data sources
- Identify relevant existing standards/protocols
- Determine required database fields
- Develop conceptual prototype
Next Steps for TCP

• Institutionalize Standards, Guidelines and Procedures

• Increased use of IWZ
  – Speed Harmonization
  – Merge Assist
  – Travel Time

• Including Connected and Autonomous Vehicle Technologies
Contact Information

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