



# WISE: Work Zone Impacts and Strategies Estimator Software Demonstration and Peer Exchange

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U.S. Department of Transportation  
Federal Highway Administration



TRANSPORTATION RESEARCH BOARD  
OF THE NATIONAL ACADEMIES



# This Session

- Welcome
  - Today's Agenda
- Overview and Background of WISE
  - Origins of WISE
  - WISE Product Description
  - Context in Work Zone Management



# Today's Workshop

- Demonstration and peer exchange on WISE and work zone project coordination
- Joint effort of SHRP2 and EDC
- Want this to be interactive - please speak up, ask questions, share your experiences
- Goals
  - Discuss best practices for work zone project coordination
  - Learn about new tools for analyzing multiple work zones in a corridor/region
  - Share knowledge on how to apply the new tools

# Workshop Agenda – Morning Session

9:00 – 9:30	Participant Introductions
9:30 – 10:00	WISE Software Proof-of-Concept in Maryland
10:00 – 10:15	Break
10:15 – 10:45	Maryland Software Demo
10:45 – 11:15	Integrating WISE into Agency Business Processes – <b>Group Discussion</b>
11:15 – 11:45	Tennessee Project Coordination Using WISE
11:45 – 12:15	Tennessee Software Demo
12:15	Lunch

# Workshop Agenda – Afternoon Session

1:15 – 1:45	Data Needed for WZ Project Coordination and WISE – <b>Group Discussion</b>
1:45 – 2:15	MetroPlan Orlando: WISE Implementation
2:15 – 2:45	AMBAG Monterey Region WISE Implementation
<b>2:45 – 3:00</b>	<b>Break</b>
3:00 – 3:45	AMBAG/MetroPlan Software Demo
3:45 – 4:15	Getting Started with WISE – <b>Group Discussion</b>
4:15 – 4:30	Open Q&A Roundtable

# EDC3: Smarter Work Zones



- Innovative strategies designed to optimize work zone safety and mobility → Project Coordination and Technology Applications

**Project Coordination:** Coordination within a single project and/or among multiple projects within a corridor, network, or region, and possibly across agency jurisdictions to minimize WZ traffic impacts.

- EDC3 Smarter Work Zones Nationwide

As of January 2017

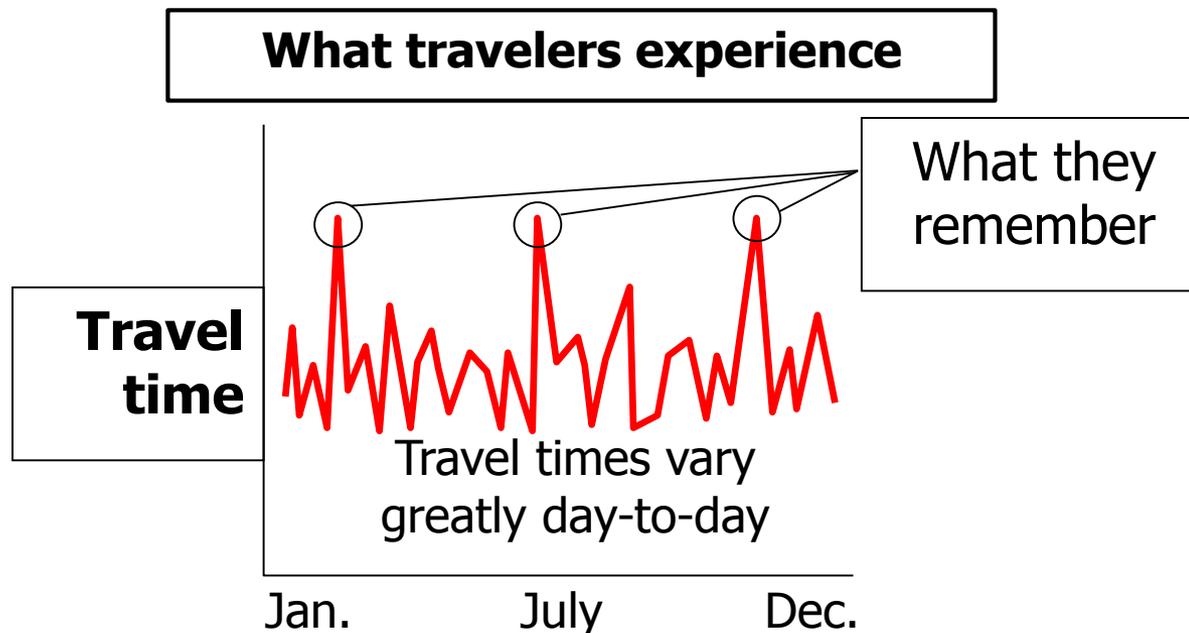
- **34 state DOTs implementing** WZ project coordination strategies into agency documentation and business processes for improving safety and reducing work zone delays.
- **4 state DOTs** volunteering to pilot the WISE software application.

# SHRP2 Reliability Focus Area Objective

***“To provide reliable travel times by preventing and reducing non-recurring congestion”***

# Travel-Time Reliability

Travel-time reliability describes the quality, consistency, timeliness, predictability, and dependability of travel times, from day-to-day or across different times of day.



# Travel-Time Reliability

## Challenge

- Increasing levels of congestion.
- More than half of congestion is due to non-recurring delays.
- Customers care about predictability of travel.
- Agencies need to be able to better understand and identify the issues and strategies to improve travel-time reliability.



# The Seven Causes of Unreliability

The Reliability Focus Area research attributed variability in travel time to seven primary causes:

1. Incidents
2. Weather
3. Work zones
4. Fluctuations in demand
5. Special events
6. Traffic control devices
7. Inadequate base capacity



# Work Zones and Reliability

## Challenge

- A primary cause of unexpected delays is work zones.
- Drivers believe that transportation agencies can better plan and schedule work zones.
- The accountability of agencies and the frustration of travelers are generally more intense in response to work zones.
- Work zones involving temporary lane closures can increase your probability of being involved in certain types of crashes.



# SHRP2 Reliability Focus Area



## Approach

*Develop processes and tools that help transportation agencies enhance*

- Organizational capabilities
- Decision making
- Practices
- Knowledge

*to reduce the variability of travel time and the underlying causes.*

# R11: Strategic Approaches at the Corridor and Network Levels to Minimize Disruption from the Renewal Process

- Multiple roadwork projects.
- How can they be coordinated to reduce the combined traffic impacts?
- What strategies can help?

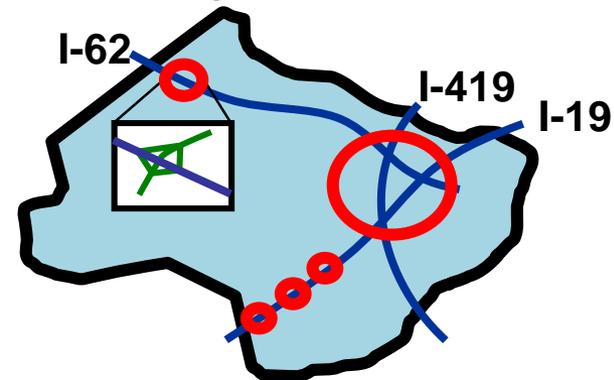


# Project Coordination

Seemed like there was a need for a tool that:

- Looks at a program of projects rather than individual conflicts
- Can be applied earlier to affect the process before many decisions are made
- Can be carried through from program planning to project level
- Recommends what to do (not just what to avoid)
- Supports better and more complex decision making

**Upcoming work zones – What sequencing is best for managing impacts?**



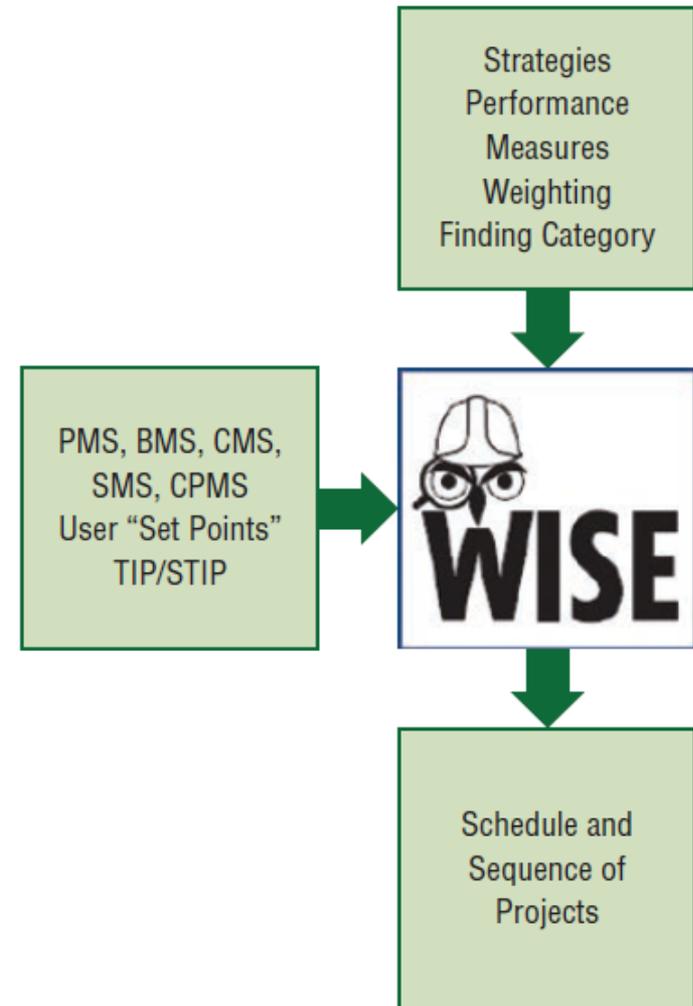
# WISE: Work Zone Impacts and Strategies Estimator Software

## Solution

- A decision support system for use by planners and engineers.
- Helps them:
  - Evaluate traffic impacts of combinations of work zones
  - Identify best sequencing to manage impacts

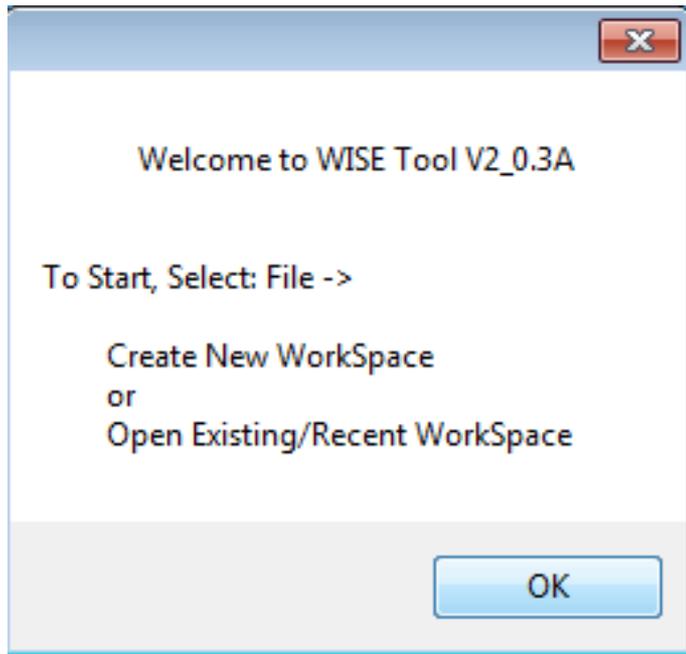
## Benefits

- Better coordinated and planned work zones.
- Reduced mobility, safety, and economic impacts of highway renewal activities.
- Increased public satisfaction.



# WISE: An Engine in Two Parts

1. Planning Module – (Project Sequencing Optimization Engine)
2. Operations Module – (Microsimulation)



- A converted network and data sets are the only pre-requisites.
- \* Microsimulation software can be used to create diversion estimates to feed back into the Planning Module.

# Planning Module: Data Requirements

- Link – node network with basic geometry
- Basic traffic flow numbers
- Project characteristics and constraints
- Mitigation strategies
  - Demand-based
  - Duration-based



# Operations Module: More Refined Diversion Analysis

- Microsimulation provides a more refined estimate of traffic diversion based upon:
  - Additional project information
  - What-if scenarios
  - Interactions with nearby links

# Field Validation and Calibration

- **Validation** - test in locations with completed projects
  - Des Moines, IA
  - Phoenix, AZ
- **Pilot tests** - test in locations with project plans
  - Orlando, FL
  - Worcester, MA
- Continued testing and code stabilization

# WISE Products

<http://www.trb.org/Main/Blurbs/168143.aspx>

- **Software tool**

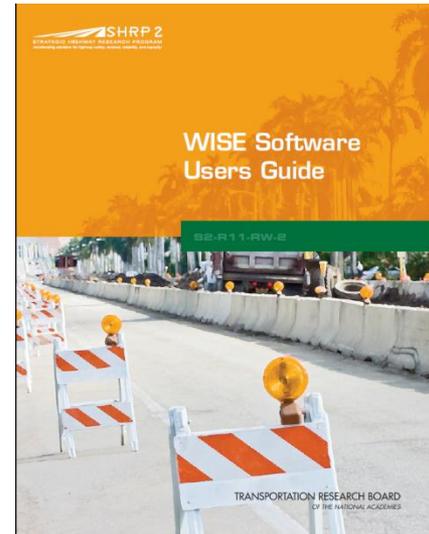
- Planning and Operations modules
- Use existing DynusT network or develop network in WISE

- **User guide**

- **Reports**

- **Target audience**

- DOT program managers in moderately and densely urbanized States, experiencing congestion, and with an active renewal program
- Planners and program managers in moderate and large MPOs, with an active renewal program



# Limitations of WISE

- Labor-intensive to enter a network if not already in NeXTA
- Limited number of work zones for an analysis
- Was not adequately sensitive to changes in inputs
- Results not always intuitive

WISE needed true pilot testing and improvements in user interface and algorithm

# WISE Implementation Plan

## Implementation Goals

1. Software enhancement and readiness
2. Software validation, demonstration, and application
3. Transportation community awareness and use
4. Institutionalization



## R11 Implementation Assistance Projects

- Identify, assess, and address software needs for refinements to address readiness
- Enable and expand software demonstration and application
- Build national work zone traffic analysis knowledge base

# SHRP2 Pilot Sites for WISE

- 2 State DOTs
  - Maryland
  - Tennessee
- 2 MPOs
  - AMBAG MPO – Monterey Bay, CA
  - Metroplan MPO – Orlando, FL
- Received funding from SHRP2 to test and deploy the software in their agencies
- Each has made significant enhancements to WISE

# WISE in the Context of a Work Zone Management Program

- Work Zone Safety & Mobility Rule (2004)
- Transportation Management Planning
- State-level work zone safety and mobility
  - Work Zone Delay Policy
  - Processes & Procedures
  - Work Zone Impacts Assessment & Management
- ...Project-specific Work Zone Transportation Management Plans
- Increasing number and impacts of highway work zones
- Need for corridor or network-level planning and coordination across multiple projects
- WISE supports the decision making “engine” in work zone transportation management planning



# How Travelers Experience Work Zones

**Washington State Department of Transportation**  
Statewide Interactive Map

**WSDOT PROJECTS**

- Click on orange marker to view active project information.
- Click green marker to view completed project information.
- Locate a project by clicking on the name in the list.

Project data from the Transportation Executive Information System. Map data ©2015 Google. Terms of Use Report a map error

I-405 - Concrete Pavement Rehabilitation - Complete September 2013  
 I-405 - NE 116th St Interchange and Street Improvement Project - Complet  
 I-405 - NE 132nd St. Interchange Improvements  
 I-405 - NE 8th St to SR 520 Braided Ramps - Interchange Improvements - C  
 I-405 - NE 44th to 112th Ave. SE Widening  
 I-405 - SB SE 8th St to Northrup Way Vic - Paving

M-6 and I-94.  
 Download the free Mi Drive app for up-to-date traffic information, or visit [www.michigan.gov/drive](http://www.michigan.gov/drive)

**2015 PAVING THE WAY Road Repair Projects**

**Map Explanation**

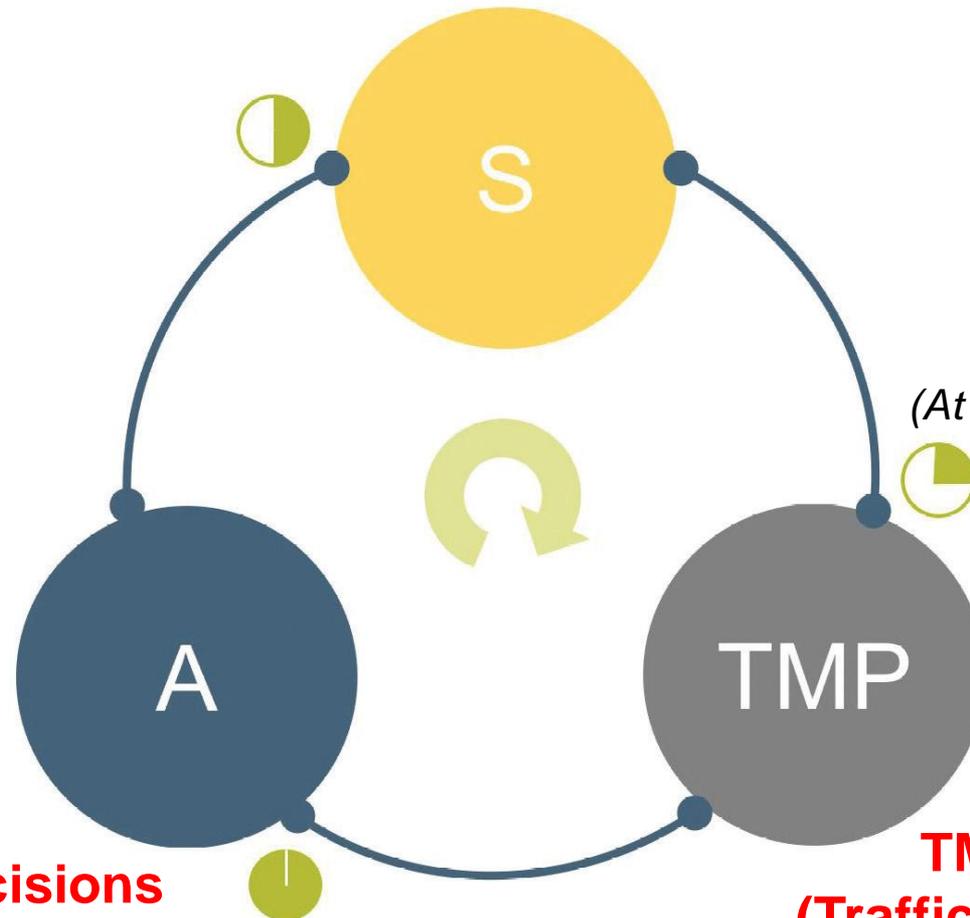
- FREEWAY
- PAVED (TWO OR MORE LANES) AND MULTI-LANE DIVIDED
- EATON
- COUNTY LINE AND NAME
- AREA OF CONSTRUCTION
- 36 CONSTRUCTION PROJECT
- 96 INTERSTATE ROUTE
- 94 INTERSTATE BUSINESS (LOOP OR SPUR)
- U.S. ROUTE OR B.R. (B.R. - BUSINESS ROUTE)
- 20 STATE ROUTE OR B.R. (B.R. - BUSINESS ROUTE)

**Grand Rapids Area**

- M-11 (Ironwood Dr/Remembrance Ave): Mar-Aug**  
Mill and resurface 2.2 miles from Hayes St to Wilson Ave, and construct a roundabout at M-11 and Remembrance Rd. 1 lane open in each direction. Wilson Ave: closed and detoured north of Remembrance Ave. Remembrance Ave: closed and detoured east of Wilson Ave.
- M-11 (Wilson Ave): June-Aug**  
Mill and resurface 4.1 miles from M-45 (Lake Michigan Dr) to I-196. Lane closures during off-peak hours.
- I-196: June-Sept**  
Repair bridges over M-11, service road (north of Ivarnes Ave), and Conrail Railroad (north of Byron Center Ave). Lane closures nights and weekends.
- M-11 (Wilson Ave/28th St): June-Sept**  
Reconstruct 0.2 miles from Indian Mounds Dr to Church Rd. 1 lane open in each direction.
- I-96: June-July**  
Mill and resurface 8.2 miles from the Grand River to Cascade Rd. Nightly lane closures.
- M-21 (Fulton St): June-Nov**  
Replace bridge deck and construct nonmotorized facility over GTW Railroad. 1 lane open in each direction.
- I-96: Aug 2015-Oct 2016**  
Replace bridge and reconfigure interchange at Cascade Rd. 1 lane open in each direction with a center turn lane. 2 short-term weekend closures for demolition and beam setting.
- M-11 (28th St): May-July**  
Mill and resurface 0.5 miles from Kalamazoo Ave to Breton Ave and construct 3 miles of sidewalk from Breton Ave to Patterson Ave. Lane closures at night and during off-peak hours.
- I-196: May**  
Repair eastbound bridge over 22nd Ave. 1 lane open at all times.

# Work Zone Decision Engine

## Scheduling Decisions

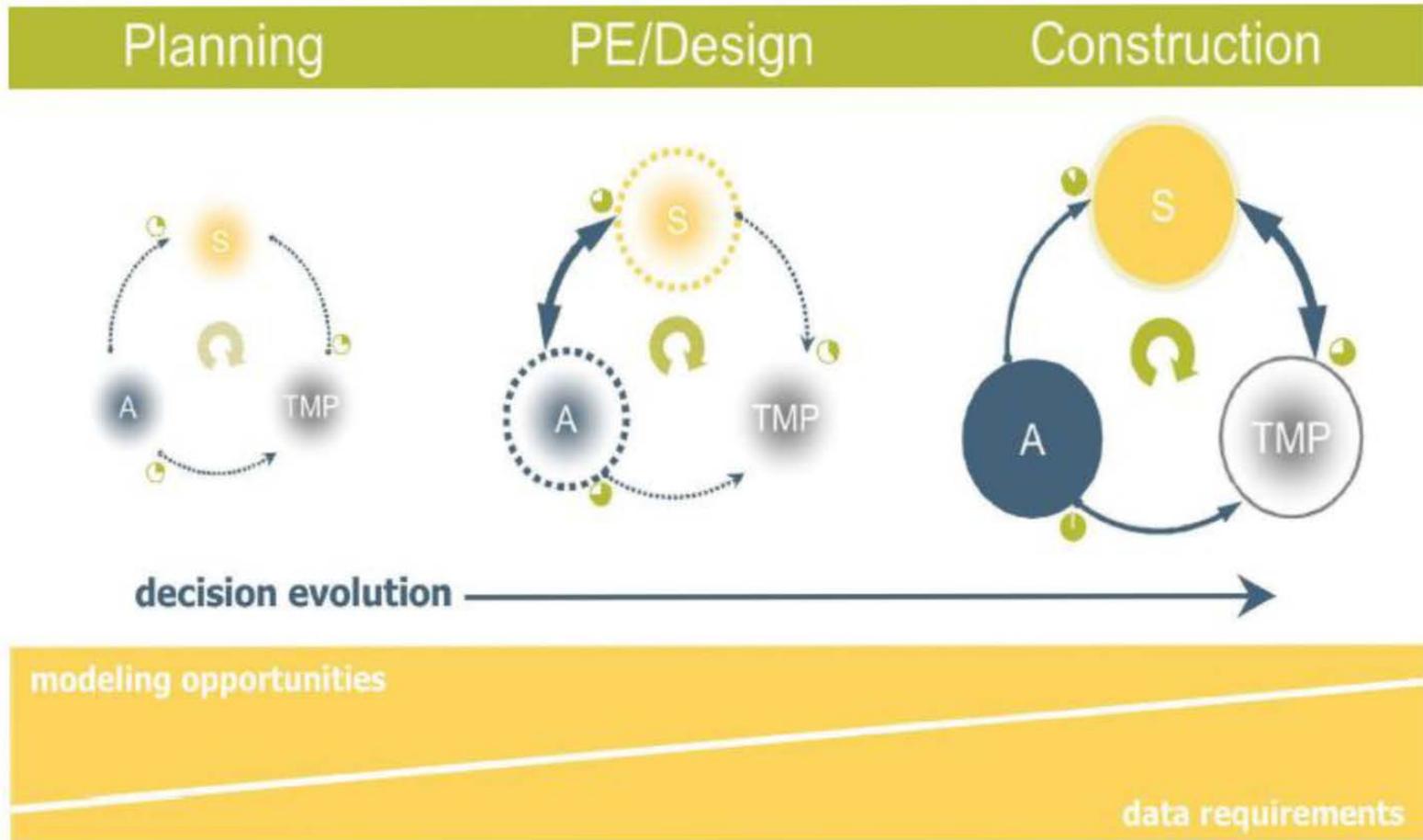


*Degree of "Finality"  
(At a point in the process)*

**Application Decisions  
(Construction Techniques)**

**TMP Decisions  
(Traffic Accommodation)**

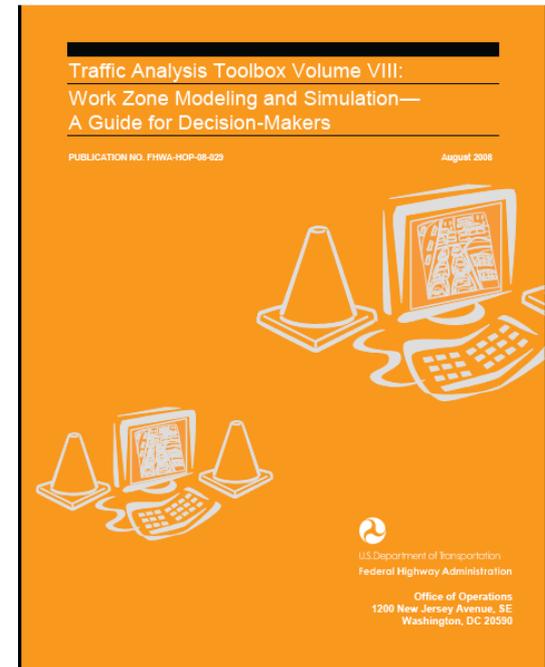
# Work Zone Decision-Making Process



# FHWA Work Zone Traffic Analysis Tools Guidance

- **Vol. VIII for Decision-Makers**
  - Guidance for engineers & reviewers
  - “Decision-Making Engine”
  - Selecting correct tools
- **Vol. IX for Analysts**
  - Guidance for analysts
  - Case studies
- **Vol. XII “Decision Framework”**
  - Maintenance of Traffic Alternatives Analysis (MOTAA)
  - Modeling tool selection framework
  - Model development and application process
  - Detailed case studies

<http://ops.fhwa.dot.gov/trafficanalysisitools/index.htm>



# Participant Introductions

- Name
- Agency
- Role
- Your agency's key work zone coordination efforts/issues