Smarter Work Zones Webinar Series

Webinar #15: Work Zone Impacts and Strategies Estimator (WISE) Software Pilot Sites

John Corbin, Subrat Mahapatra, Thomas Jacobs, Eric Hill, Bhupendra Patel, Paul Ricotta, Brad Freeze, and Sabya Mishra

October 11, 2016 1:00-2:30pm EDT

Efficiency through technology and collaboration

innovation ingenuity imagination invention Every Day Counts

SHRP2 SOLUTIONS
TOOLS FOR THE ROAD AHEAD

U.S. Department of Transportation
Federal Highway Administration

Smarter Work Zones

Introduction and Today's Speakers

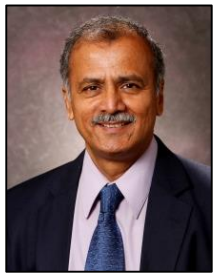
Today's Speakers

John Corbin
SHRP2 Reliability Specialist,
R11 Product Co-Lead
FHWA Resource Center

Subrat Mahapatra
Transportation Manager
Maryland SHA

Thomas Jacobs
Director, CATT
University of Maryland

Eric T. Hill
Director of Transportation System
Management and Operations
MetroPlan Orlando



Bhupendra Patel, Ph.D.
Director of Modeling
AMBAG

Paul Ricotta, P.E.
Principal Transportation Engineer
Caliper Corporation

Brad Freeze, P.E.
Traffic Operations Division, Director
Tennessee DOT

Sabya Mishra, Ph.D., P.E.
Assistant Professor
University of Memphis

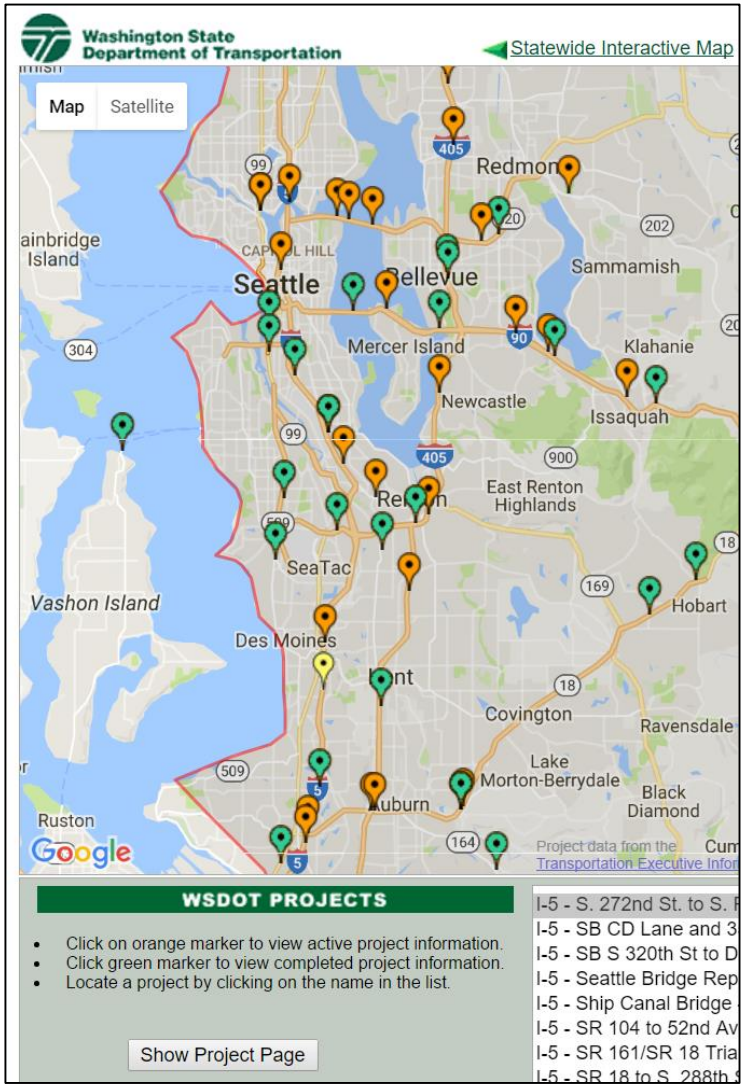
Smarter Work Zones
WISE Software and Project Coordination Overview

Webinar Overview

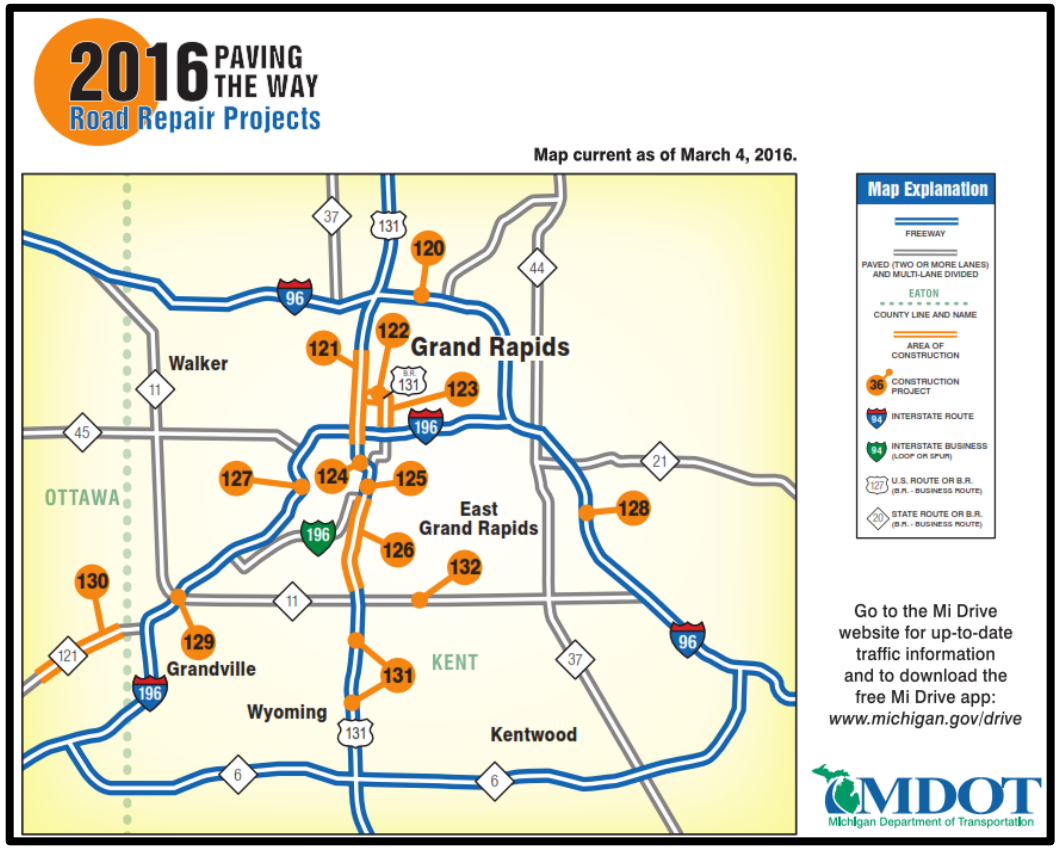
- Work Zone Traffic Analysis
- SHRP2 Summary
- Origins of the WISE Tool
- Status of WISE Implementation

Source: Georgia DOT

How Travelers Experience Work Zones



Source: Washington State DOT



Source: Michigan DOT

The Work Zone Management Program Context

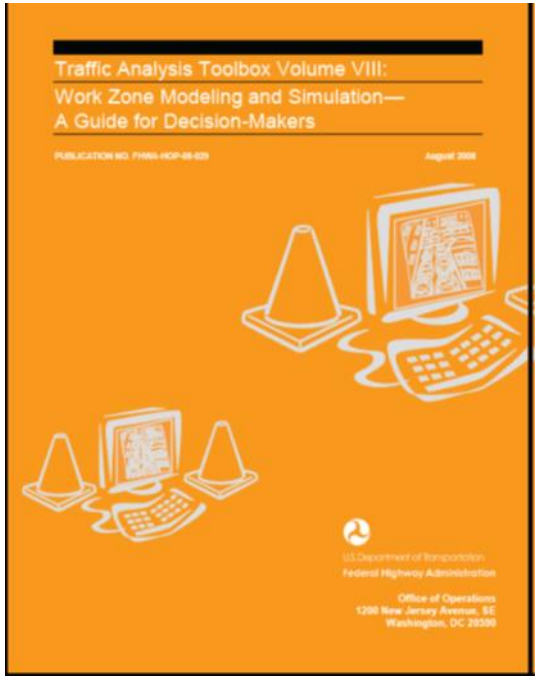
Source: FHWA

- Increasing number & impacts of work zones
- Need for corridor or network-level planning
- Work Zone Safety & Mobility Rule (2004)
- 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
- Transportation Management Plan**ning**

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

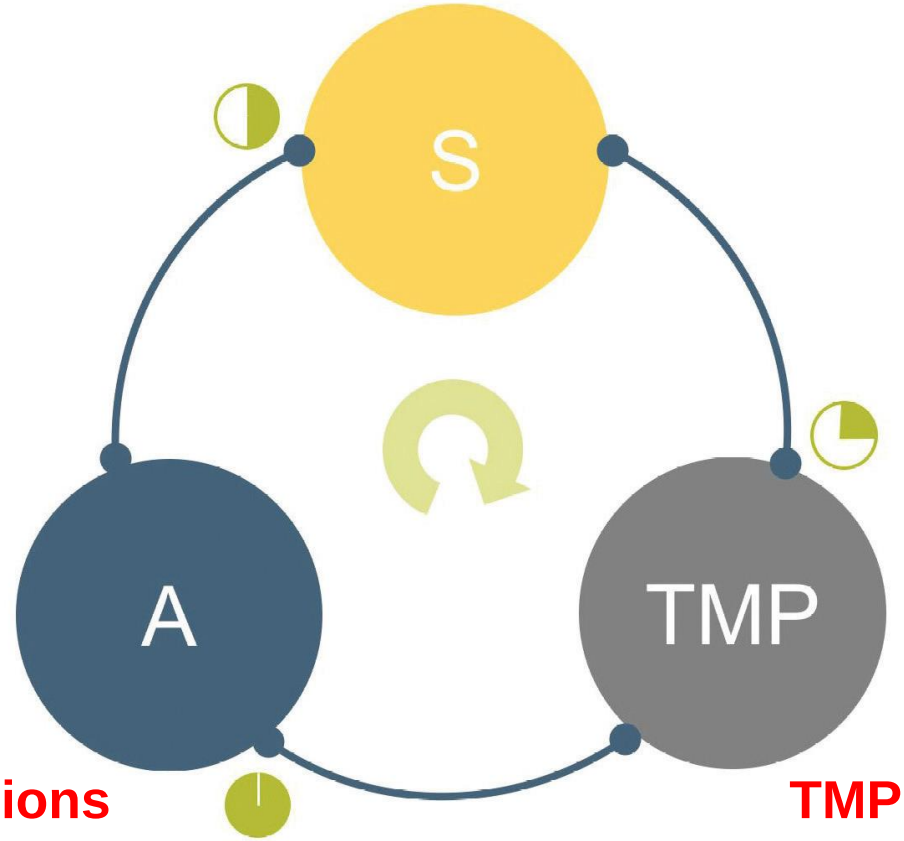


Source: FHWA

http://ops.fhwa.dot.gov/trafficanalysistools/index.htm

Work Zone Management Decision-Making Engine

Scheduling Decisions



Application Decisions (Construction Techniques)

TMP Decisions (Traffic Accommodation)

Strategic Highway Research Program Focus Areas

Safety: fostering safer driving through analysis of driver, roadway, and vehicle factors in crashes, near crashes, and ordinary driving

Reliability: reducing congestion and creating more predictable travel times through better operations

Capacity: planning and designing a highway system that offers minimum disruption and meets the environmental and economic needs of the community

Renewal: rapid maintenance and repair of the deteriorating infrastructure using already-available resources, innovations, and technologies

The Seven Causes of Unreliability

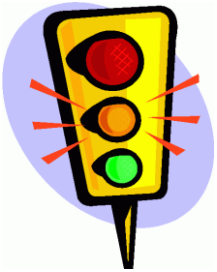
The Reliability Focus Area research has attributed variability in travel time to seven primary causes:

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

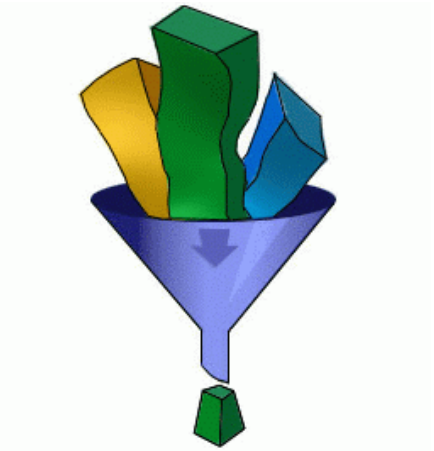
Source: FHWA

Source: FHWA

Reliability Product "Bundles"



Advanced Operations Strategies



Reliability Analysis Tools (TSMO Decision Support)

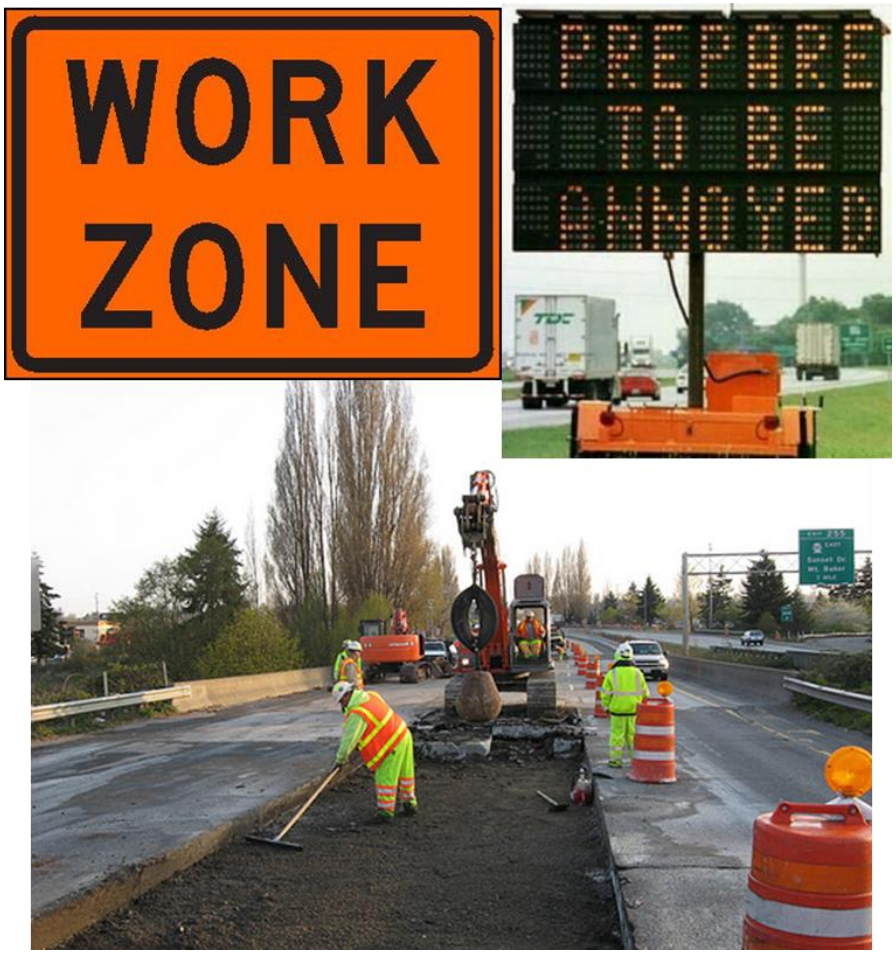
TSMO Organizational Capabilities

National TSMO Community

Source: All images from Google

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?



Source: FHWA

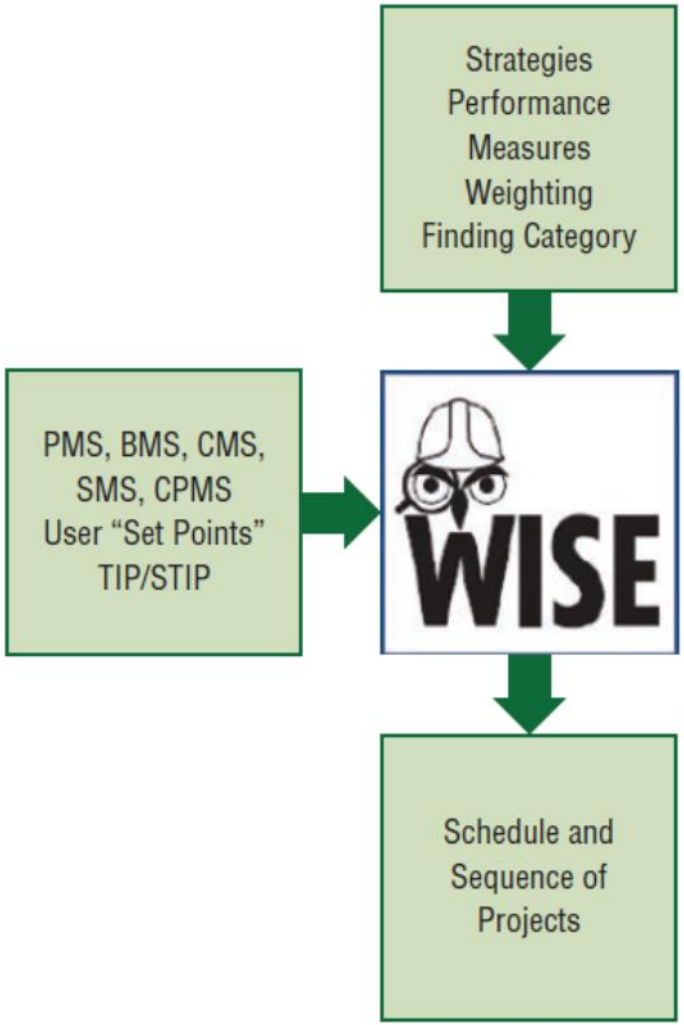
WISE: Work Zone Impacts and Strategies Estimator Software

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

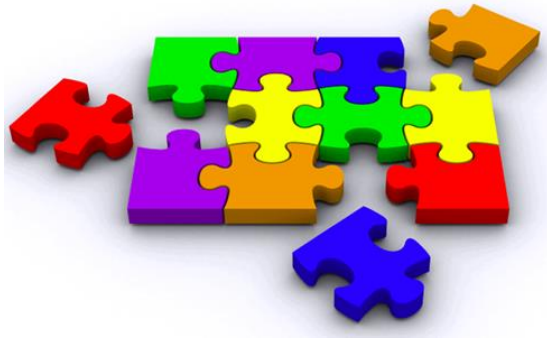
- Better coordinated and planned work zones.
- Reduced mobility, safety, and economic impacts of highway renewal activities.
- Increased public satisfaction.



Source: FHWA

WISE Implementation Plan

Implementation Plan Goals



Source: Google

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

R11 Implementation Assistance Opportunity

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

WISE SHRP Implementation Assistance Sites

Source: FHWA

What are Smarter Work Zones (SWZ)?

Innovative strategies designed to optimize work zone safety and mobility

- Policies and practices used to incrementally and continuously improve WZ operations
- Tools to reduce WZ crashes and delays
- Tools to enhance WZ management strategies

Smarter Work Zone Initiatives

- Project Coordination
- Technology Applications

Project Coordination Definition and Goals

- Coordination within a **single project and/or among multiple projects** within a **corridor, network, or region** and **possibly across agency jurisdictions** to minimize work zone traffic impacts

Goal 1

By December 2016, 25 State DOTs have incorporated work zone project coordination strategies into agency documentation and business processes.

Goal 2

By December 2016, 5 State DOTs have volunteered to pilot the Work Zone Impacts and Strategies Estimator (WISE) software.

For More Information:

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NOCoE

www.transportationops.org

www.fhwa.dot.gov/GoSHRP2

goSHRP2@dot.gov

Smarter Work Zones
WISE Software Proof-of-Concept (R11) in Maryland

SUBRAT MAHAPATRA — MARYLAND SHA
THOMAS JACOBS — UNIVERSITY OF MARYLAND

SHRP2 SOLUTIONS
TOOLS FOR THE ROAD AHEAD

Today's Agenda

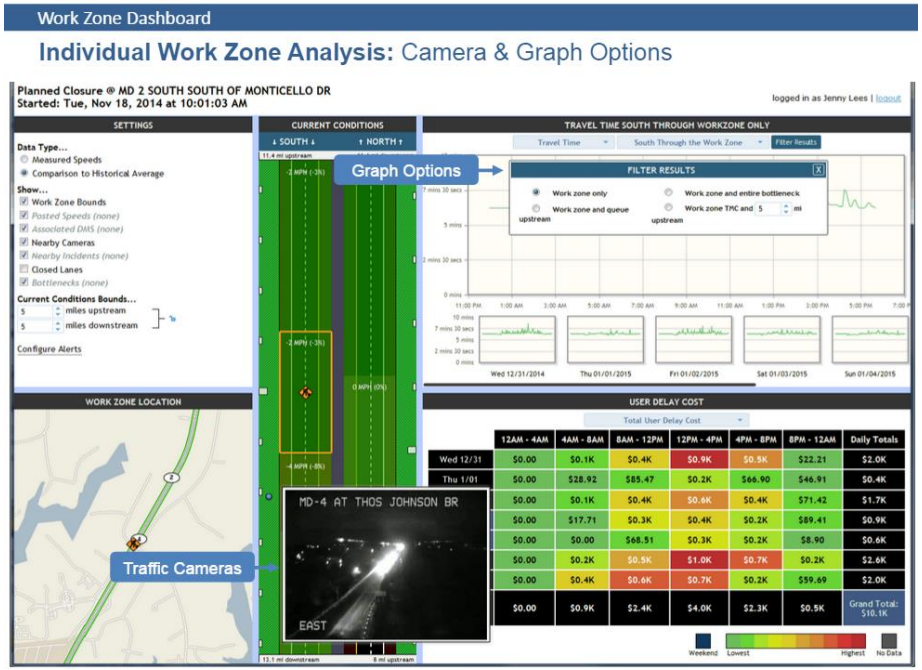
- Background - Maryland/ MATOC Work Zone Planning
- MD R11 Scope of Work & Status
- MD R11 WISE Testing Overview/ Next Steps

Maryland Work Zone Planning Motivation

MDOT State Highway Administration (SHA) TSM&O Plan recognizes **"Work Zone Management" as a key implementation strategy**

- Safety is #1 driver for WZ management with various tools like **Lane Closure Permitting System, WZ Performance Dashboard** etc. supporting agency operations
- **Solid data, analytical and institutional foundation** in place for Smarter Work Zone Initiatives at a **System/ Program level**
- WISE Tool Implementation hopes to build a **data driven WZ Planning framework**

TSM&O
Maryland Transportation Systems Management & Operations



Source: Maryland SHA

Maryland/MATOC WZ Planning

- Partnership of MDOT, VDOT, DDOT, WMATA
- Began in 2009
- Comprised of:
  - Steering Committee
  - Information Systems Committee
  - Operations Subcommittee
  - Severe Weather WG
  - **Regional Construction Coordination WG**

MATOC
Metropolitan Area Transportation Operations Coordination

Source: MATOC

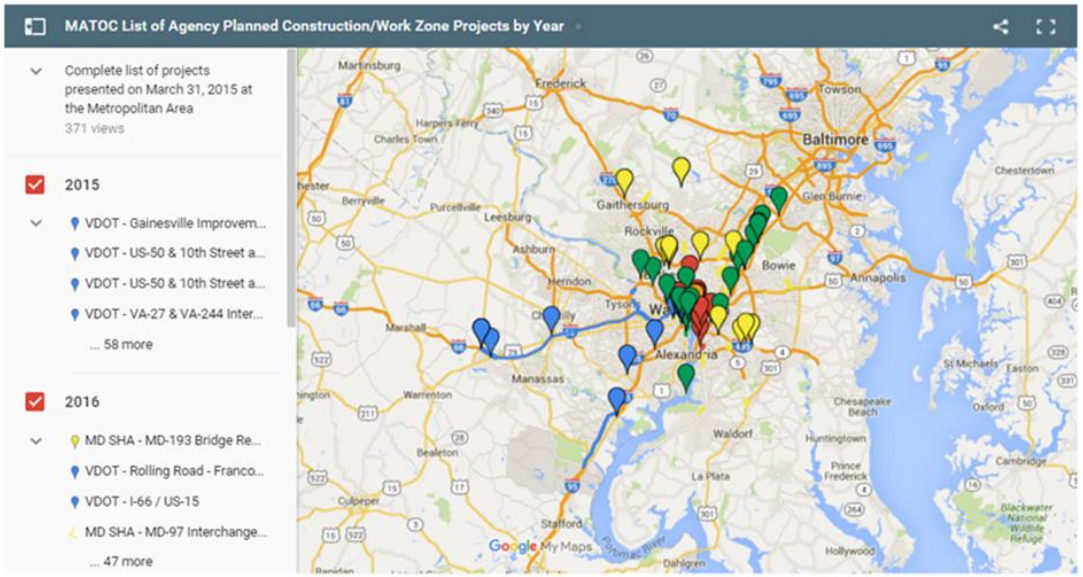
www.matoc.org

MATOC RCC WG Purpose

- Purpose:
  - *Within NCR, the MATOC Regional Construction Coordination Working Group will Work to:*
    - *Reduce potential for conflicting lane/road closures and special events*
    - *Schedule regular meetings for key personnel to discuss construction related lane closures and special events*
    - *Develop Enhanced Public Information Resources as well as Internal/External WZ Information Dissemination Capabilities*
    - *Share Agency Best Practices (e.g. WZ lane closure permitting systems)*

MATOC RCC WG Construction Coordination

MATOC Agency Construction Projects Map (Under Development)

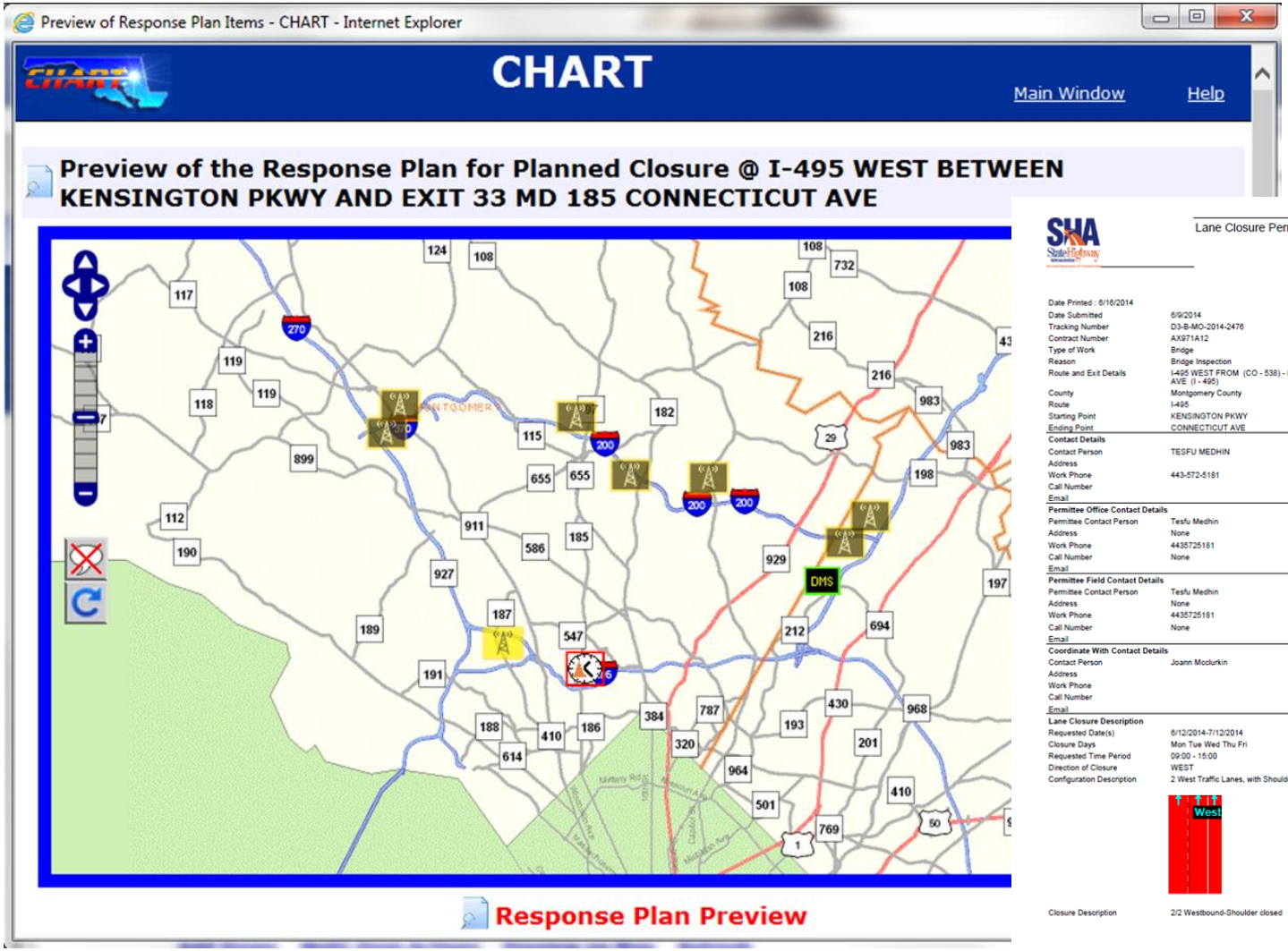


List of Agency Projects 2015 - 2020 : List of Projects Presented on March 31, 2015.

1/1/2015	7/1/2016	MDOT			US-50 Aspahlt Overlay	of Lottsford Vista Rd to Anne Arundel County Line	Asphalt overlay of existing concrete roadway with daytime & nighttime lane closures.
2/28/2015	6/21/2016	VDOT			US-1 & VA-123 Interchange	Prince William County	Widening US-1 from four to six lanes.
3/1/2015	9/21/2018	MDOT			MD-5 Interchange Construction	US-301 to North of MD-373	MD-373 and Brandywine Road Relocated - Phase 2
3/1/2015	5/1/2018	VDOT			VA-27 over VA-110	Arlington County	Modify and repair the VA-27 Bridge over VA-110.
3/21/2015	9/21/2017	VDOT			I-66 and US-15 Interchange Reconstruction	Prince William County	A diverging-diamond interchange (DDI) on US-15 & I-66
4/13/2015	10/1/2015	NPS			National Mall and Memorial Parks - Kutz Bridge Repair and Sidewalk Widening	Independence Avenue Eastbound at Kutz Bridge	Mill and overlay surface, repair expansion joints, bridge piers, railing etc., and widen sidewalk. Construction will begin after Cherry Blossom Festival and work hours outside of peak travel time.
5/1/2015	6/21/2016	MDOT			MD-193 Safety and Resurfacing	MD-193 from Campus Way to US-1	Safety and Resurfacing with daytime and nightime lane closures
6/1/2015	6/21/2018	MDOT			MD-210 Grade Separated Interchange	MD-210 from I-95/495 Interchange to Livingston Rd/Palmer Rd	Impact to Prince George's County roadways and WMATA bus services. Coordination has occured with both organizations to minimize impacts during construction.
6/21/2015	6/20/2017	DDOT			Key Bridge	Key Bridge over Potomac River between Rosslyn	Rehabilitation of the bridge. Off-peak daytime closures to single lanes

Source: MATOC

Lane Closure Permit Program



SHA

Lane Closure Permit /Schedule Summary

Date Printed : 6/16/2014

Date Submitted	6/9/2014	District 3	
Tracking Number	D3-B-MO-2014-2476		
Contract Number	AX871A12		
Type of Work	Bridge		
Reason	Bridge Inspection		
Route and Exit Details	I-495 WEST FROM (CO - 538) - KENSINGTON PKWY (I - 495) TO (MD - 185) - CONNECTICUT AVE (I - 495)		
County	Montgomery County		
Route	I-495		
Starting Point	KENSINGTON PKWY		
Ending Point	CONNECTICUT AVE		
Contact Details			
Contact Person	TESFU MEDHIN		
Address			
Work Phone	443-572-5181	Cell Phone	
Call Number		FAX Number	
Email		Pager	
Permittee Office Contact Details			
Permittee Contact Person	Tesfu Medhin		
Address	None		
Work Phone	4435725181	Cell Phone	
Call Number	None	FAX Number	None
Email		Pager	None
Permittee Field Contact Details			
Permittee Contact Person	Tesfu Medhin		
Address	None		
Work Phone	4435725181	Cell Phone	
Call Number	None	FAX Number	None
Email		Pager	None
Coordinate With Contact Details			
Contact Person	Joann Mcclurkin		
Address			
Work Phone		Cell Phone	301-513-7315
Call Number		FAX Number	
Email		Pager	
Lane Closure Description			
Requested Date(s)	6/12/2014-7/12/2014		
Closure Days	Mon Tue Wed Thu Fri		
Requested Time Period	09:00 - 15:00		
Direction of Closure	WEST		
Configuration Description	2 West Traffic Lanes, with Shoulder.		

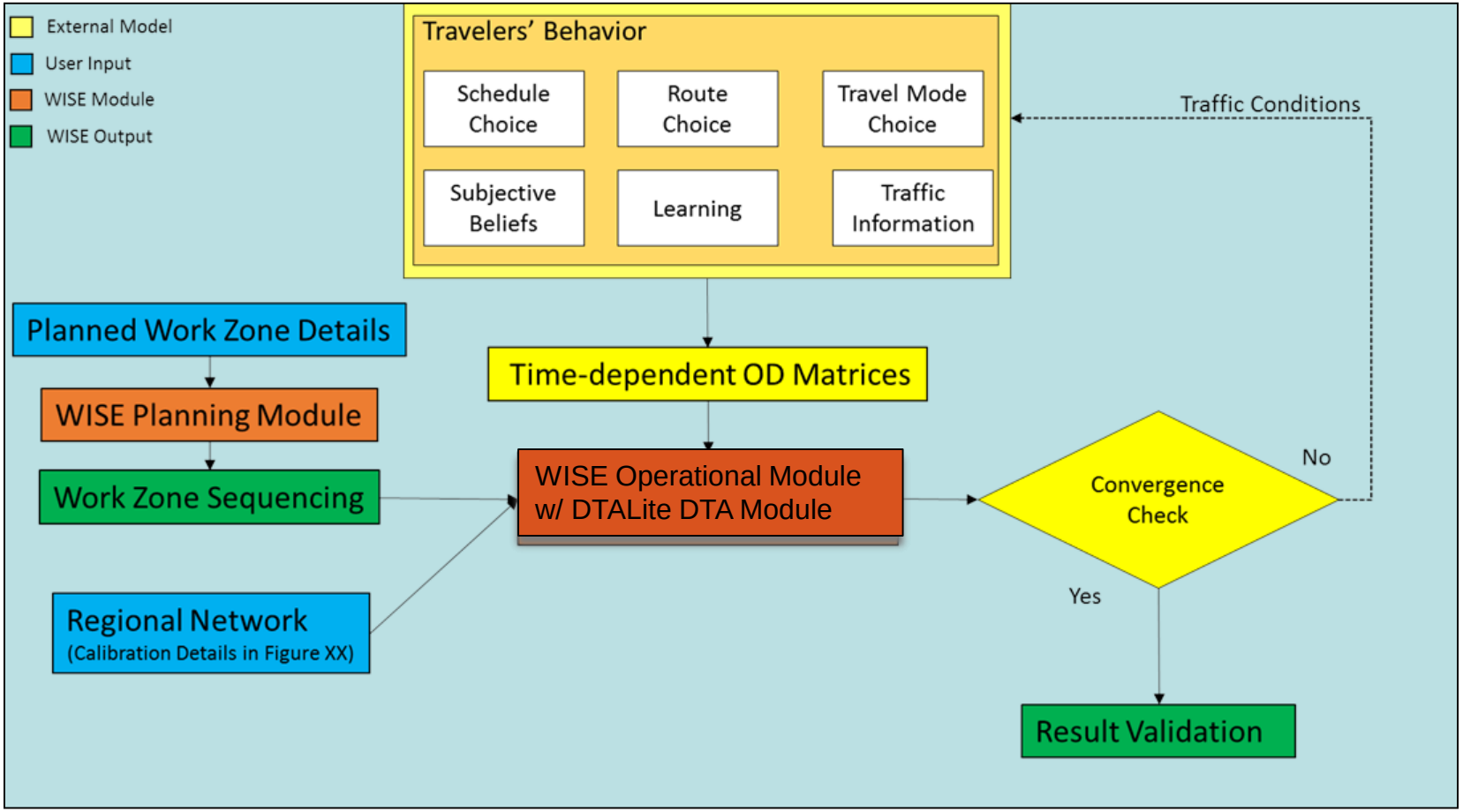
Closure Description: 2/2 Westbound-Shoulder closed

Source: Maryland SHA

MARYLAND R11 SOW Status

- Task 1 – Develop a calibration/re-calibration module for WISE (underway)
- Task 2 – Prepare list of long term planned work zone projects in the NCR (complete)
- Task 3 – Enhance the user demand and behavior inputs (underway)
- Task 4 – Validation
- Task 5 – Final Report

MARYLAND R11 – WISE Testing Overview



Source: Maryland SHA

MARYLAND R11 Next Steps

- **Technical**
  - Model Calibration
  - Interface Development
  - Scenario/ Sensitivity Testing
- **Institutional**
  - Making a business case for WISE Tool
    - Programmatic (across agencies/ asset/ funding categories)
    - Area wide/ Corridor Specific
  - Coordination and Communication
- **Performance Management**
  - TSM&O
  - FAST Act/ MAP-21/ MDOT Excellerator

For More Information:

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Smarter Work Zones

METROPLAN ORLANDO: SHRP2 WISE IMPLEMENTATION

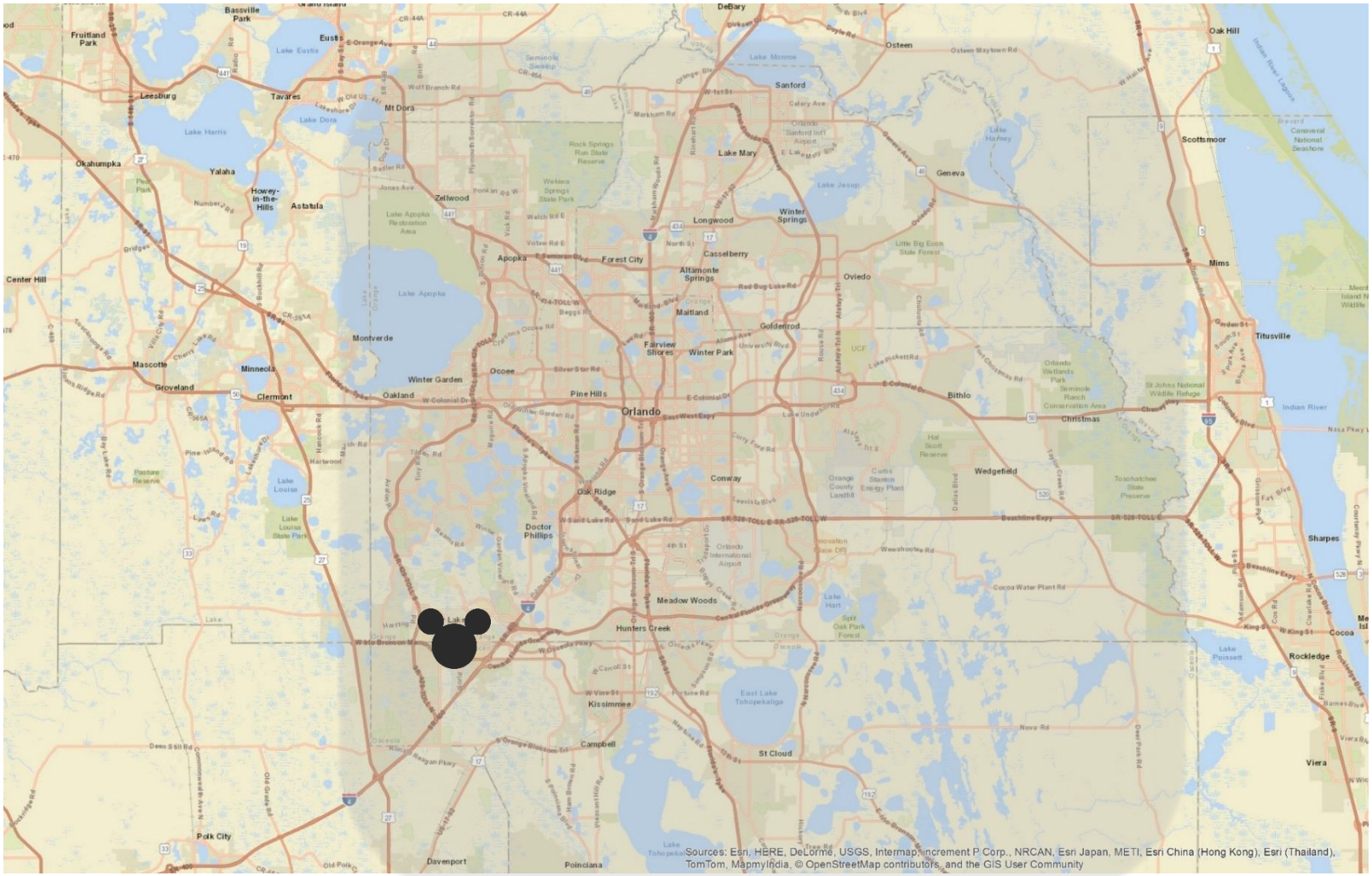
ERIC T. HILL METROPLAN ORLANDO

MetroPlan Orlando

metroplan orlando
A REGIONAL TRANSPORTATION PARTNERSHIP

Source: MetroPlan Orlando

MetroPlan Orlando Planning Area



Source: MetroPlan Orlando/Google

metroplan orlando

A REGIONAL TRANSPORTATION PARTNERSHIP

SHRP2 SOLUTIONS

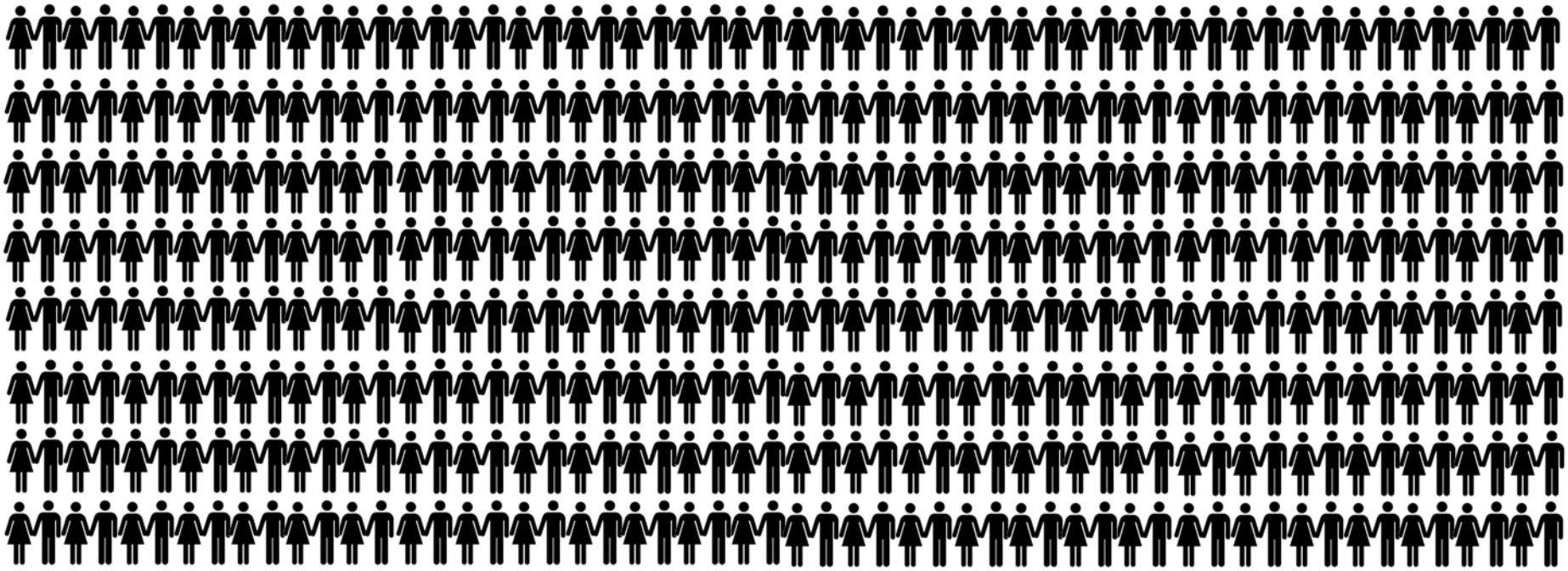
TOOLS FOR THE ROAD AHEAD

MetroPlan Orlando Role in the Project

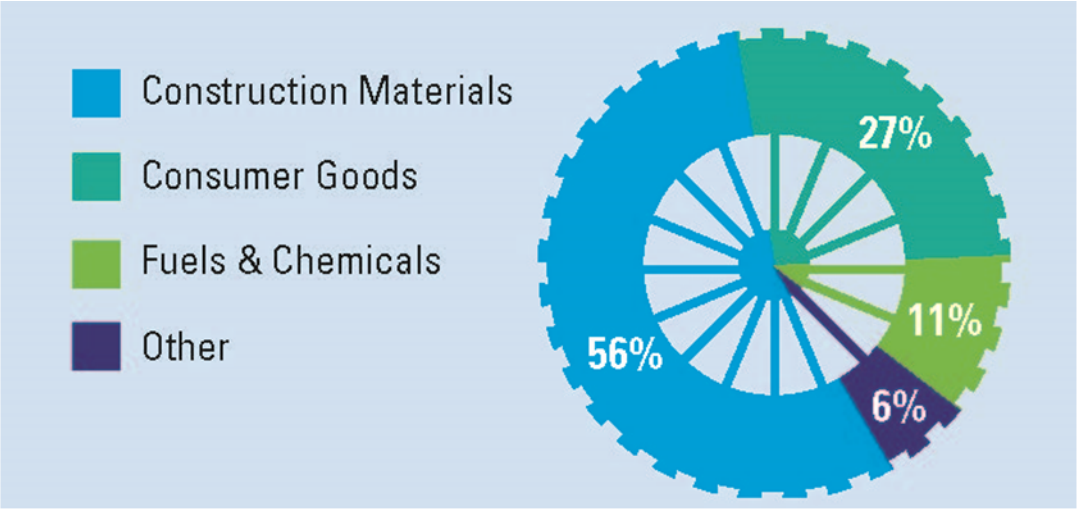
- Project Management
  - University of Central Florida
  - Caliper Corporation
- Liaison
- Technical assistance

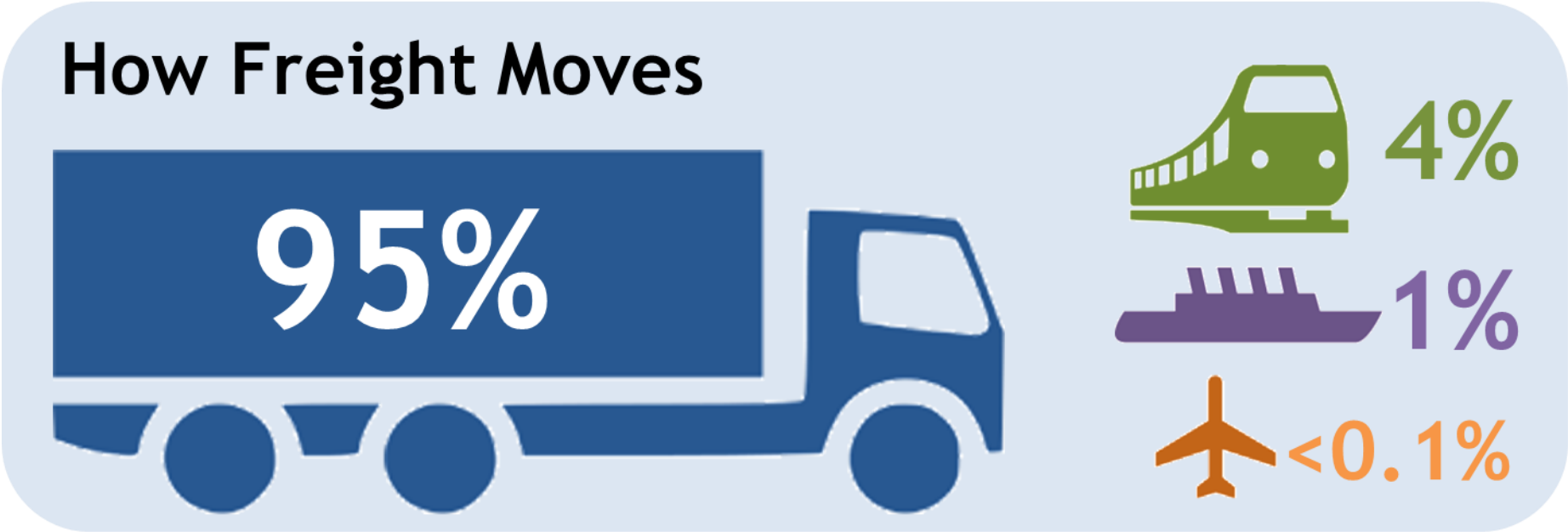
Two million people… and by 2040,

ONE MILLION MORE




WELCOME
TO
ORLANDO
THE CITY BEAUTIFUL
66.1 million
visitors in 2015
Source: Visit Orlando


Construction Materials
Consumer Goods
Fuels & Chemicals
Other
27%
11%
6%
56%


How Freight Moves
95%
4%
1%
<0.1%

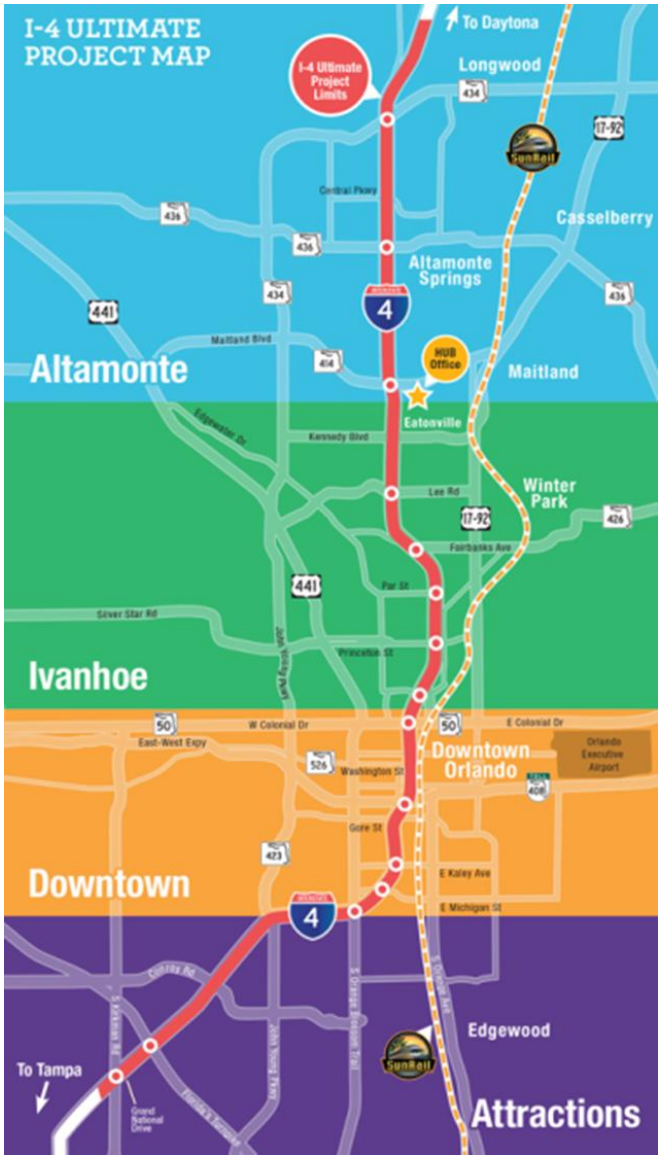
- I-4
- Wekiva Parkway
- SunRail
- Coast to Coast Trail

WISE Applications

I-4 ULTIMATE IMPROVEMENT PROJECT

What's next?

INTERSTATE 4 BEYOND the ULTIMATE



innovation ingenuity Every Day Counts imagination invention

SHRP2 SOLUTIONS
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Transportation Improvement Program (TIP)

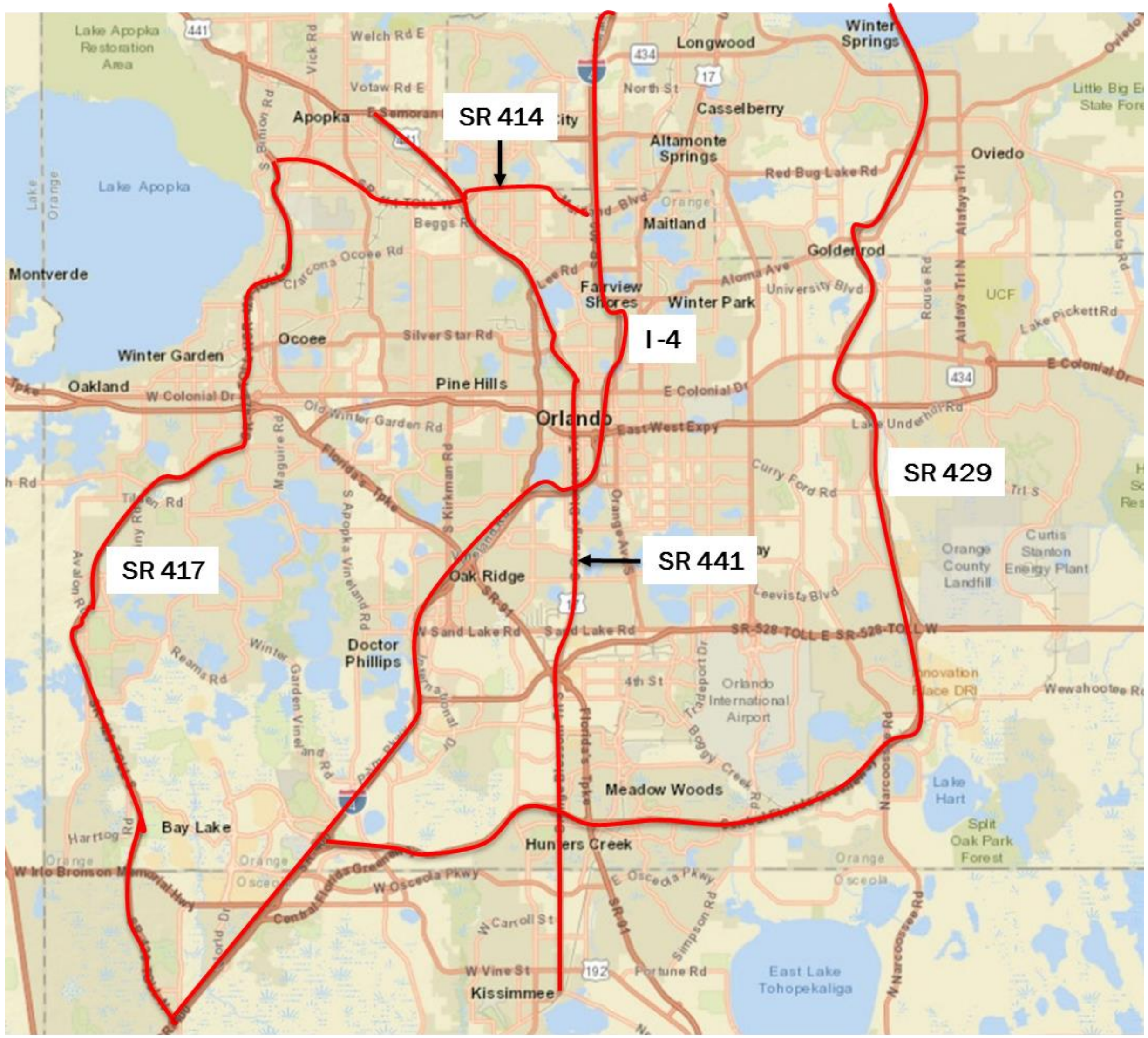
Federal & State Funds
2016/17 to 2020/21

	Totals ($000s)
Highway	1,653,981
TSMO	43,563
Bike/Ped	90,009
Transit	1,001,068
SunRail	83,708
Aviation	225,556
Total	3,097,885

More details on website

Transportation Systems Management and Operations

- TSMO Advisory Committee
- Traffic Incident Management (TIM)
- Safety
- Active Transportation Demand Management (ATDM)
- TIP


SR 414
I -4
SR 441
SR 429
SR 417
Apopka
Lake Apopka
Montverde
Winter Garden
Oakland
Ocoee
Pine Hills
Orlando
Longwood
Casselberry
Altamonte Springs
Maitland
Winter Springs
Oviedo
Winter Park
Fairview Shores
Oak Ridge
Doctor Phillips
Bay Lake
Meadow Woods
Hunters Creek
Kissimmee
Orlando International Airport
East Lake Tohopekaliga

Challenges and Solutions

- Operating WISE; rewriting code
- Functionality of DTA; reformulation
- Traffic counts; coordination with FDOT

For More Information:

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Director, Transportation Systems Management and Operations

MetroPlan Orlando

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Smarter Work Zones

Data Collection and Dynamic Traffic Assignment on Monterey Region

Bhupendra Patel, Ph.D. AMBAG

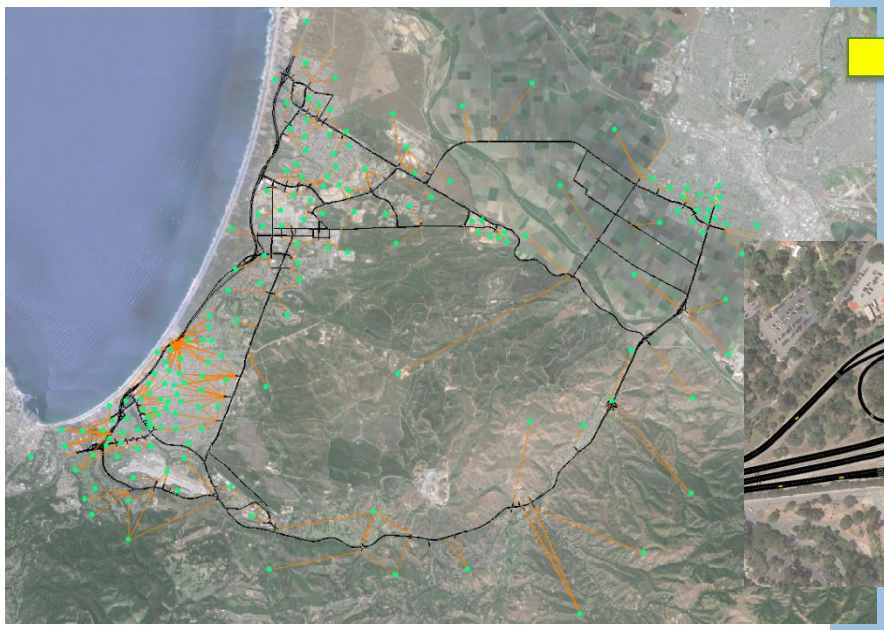
Paul Ricotta, P.E. Caliper Corporation

Project Outline

- Evaluation of the WISE and propose potential remedies to improve WISE
- Network coding for DTA in TransModeler
- Data collection for sub-area DTA
- WISE modifications
- DTA Model calibration and validation
- Coding of Construction Projects for WISE applications
- WISE applications (Planning and Operation)
- Webinar/training to increase awareness and use of WISE

AMBAG Region and Interests in WISE Pilot Testing

- Regional Challenges
- Evaluate impact of construction on travel time reliability
- Minimize travel delay
- Enhance safety
- Increase coordination and communication among agencies



Source: AMBAG

Evaluation of WISE Software

- Current implementation is cumbersome and difficult to use for most MPO or DOT staff.
- Extensive manipulation of network data is required to make it usable in WISE.
- Present traffic re-assignment calculation makes little sense for larger projects that impact route choices a the origin-destination level.
- Integration with travel models should allow user to input delay and/or diversion calculations directly without the need for ad hoc detour calculations in WISE.
- WISE not capable of properly handling complex sequencing of projects.
- No support for project phasing or for defining projects that span more than one link.

Potential Remedies to Improve WISE

- Streamline input process, bypass network importer, editor, and redefine how projects are defined.
- Provide additional guidance to WISE evaluation by including critical parameters such as seasonal traffic variation, work zone hours, project priority, and possible mitigation strategies.
- Allow modeling platform to define detours through static OR dynamic assignment.
- Completely bypass ad-hoc detour building in WISE which presently uses a myopic k-shortest path and buffering methodology.
- Inclusion of time of day-based input parameters to better capture travel behavior.
- Improve WISE reporting mechanisms so output is more easily understood.

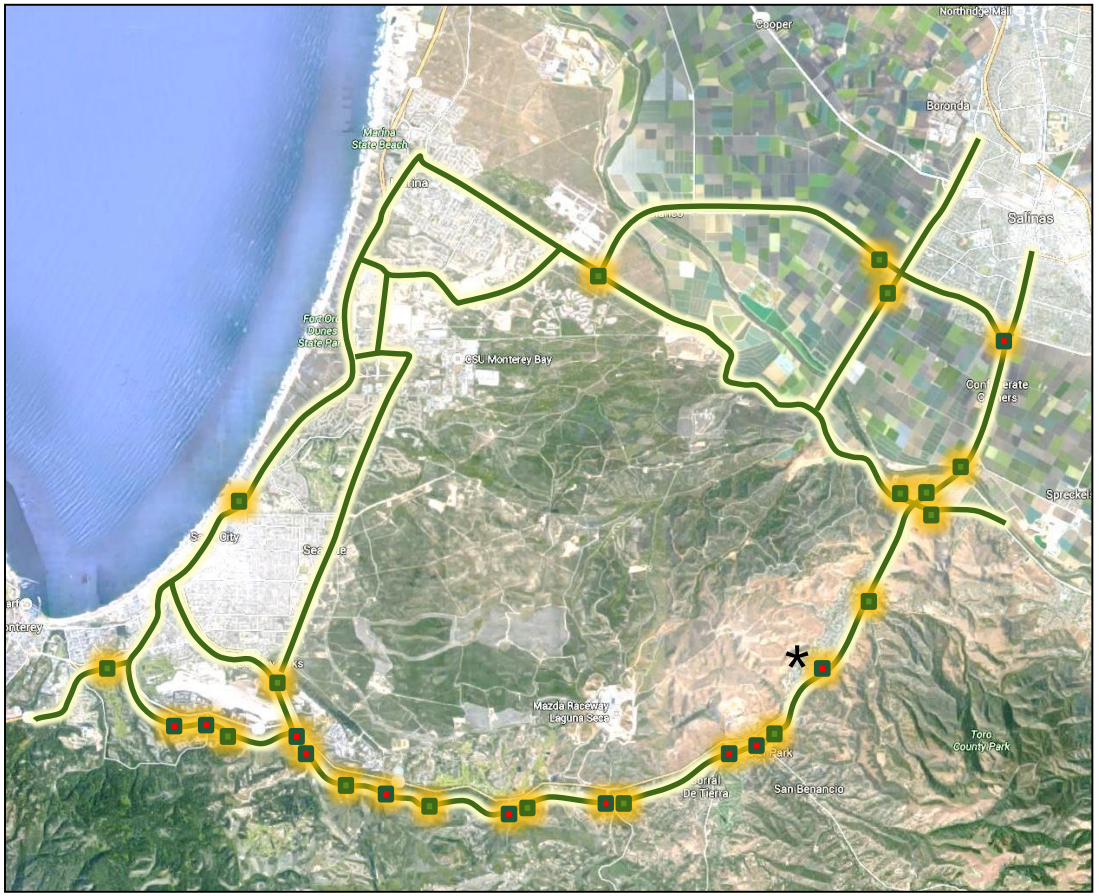
Data Collection

- Meso-Scopic Network in AMBAG Region: 100 Miles
  - Including California State Route (SR) 68,US HWY 1, and Local arterials
- 17 BlueMAC devices installed
  - Data Collection period: 2/18/2016 ~ 4/22/2016
- 11 video recorders installed for turning movement counts
  - Data Collection period: 2 weeks
- 17 Additional intersections for signal timing/turn movement
  - Data is provided by Caltrans and 3 Local Municipalities

Data Collection Sites and Devices

- Turning Movement Videos (11)

- BlueMAC Readers (17)

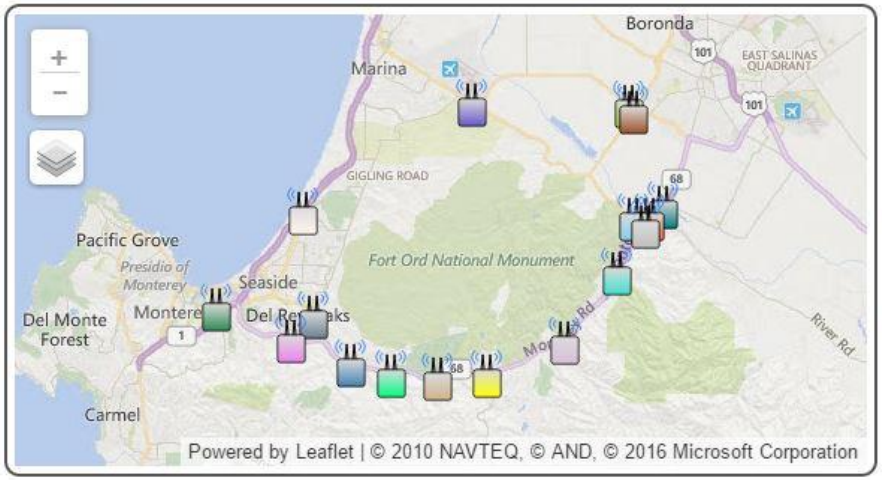


Source: AMBAG

BlueMAC device data (1 of 2)

Projects > Monterey Deployment

Hide Details



Overview

Status:	Complete
No of Locations/Devices:	17 x
Start Date/Time:	2/18/2016 12:00 AM (UTC-8)
End Date/Time:	4/22/2016 11:59 PM (UTC-8)

Description

Created by PRW 2/24/16

Travel Time Report | Origin-Destination Report

Overview

- Blanco @ S Davis (130)
- HWY 68 @ Laureles Grade (3)
- HWY 68 @ Olmsted (96)
- HWY 68 @ Portola (127)
- HWY 68 @ Reservation (77)

Overview

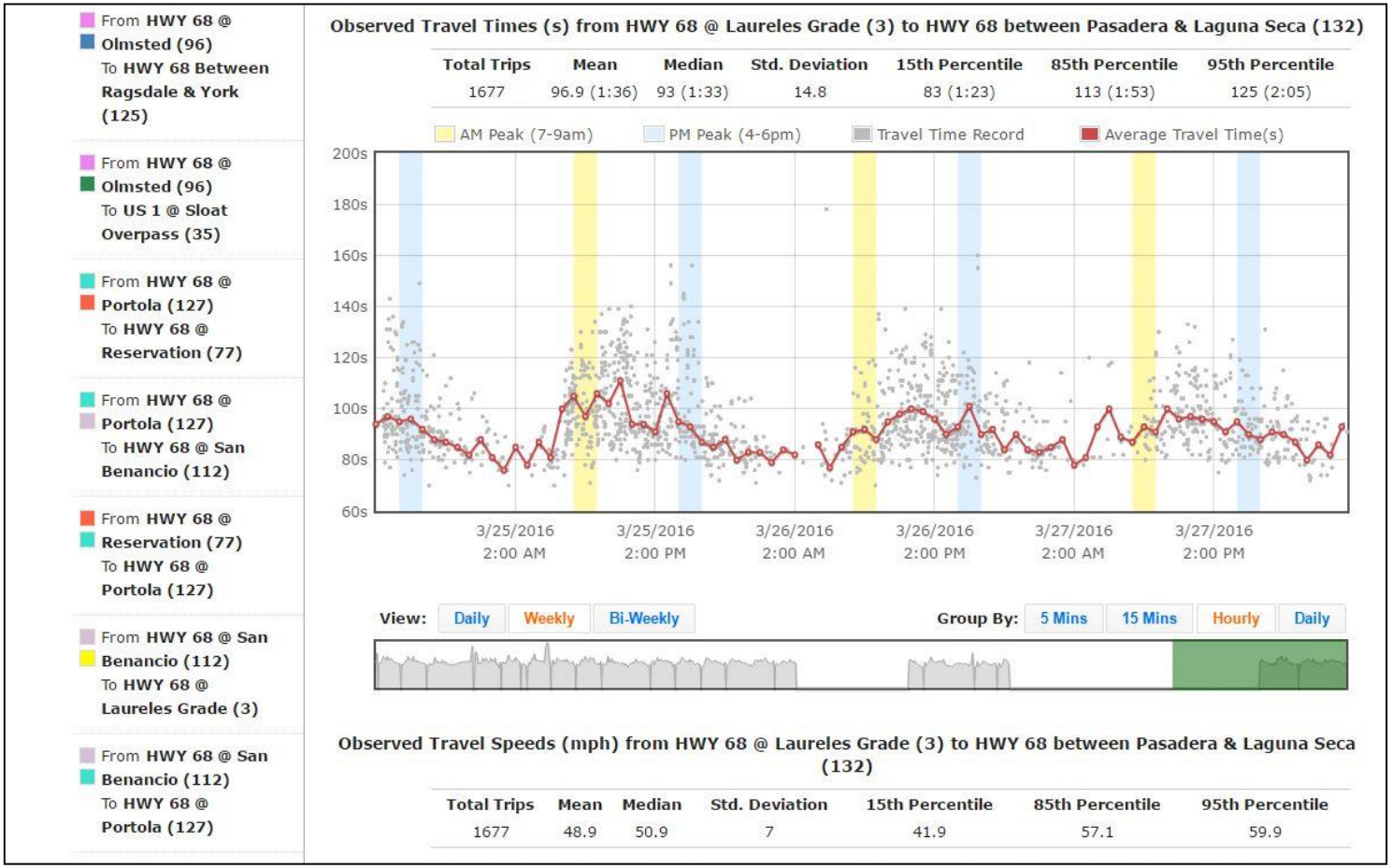
Download CSV

Status	Location	Last Checkin	Total Devices (Last 7 days)	Weekly Trend (Last 7 days)
	Blanco @ S Davis (130)	4/22/2016 11:53 PM	9,536	
	HWY 68 @ Laureles Grade (3)	4/22/2016 11:53 PM	11,326	
	HWY 68 @ Olmsted (96)	4/22/2016 11:59 PM	8,159	
	HWY 68 @ Portola (127)	4/17/2016 3:50 AM	7,650	
	HWY 68 @ Reservation (77)	4/22/2016 11:50 PM	10,067	
	HWY 68 @ San Benancio (112)	4/22/2016 11:56 PM	9,766	

Source: AMBAG

BlueMAC device data (2 of 2)

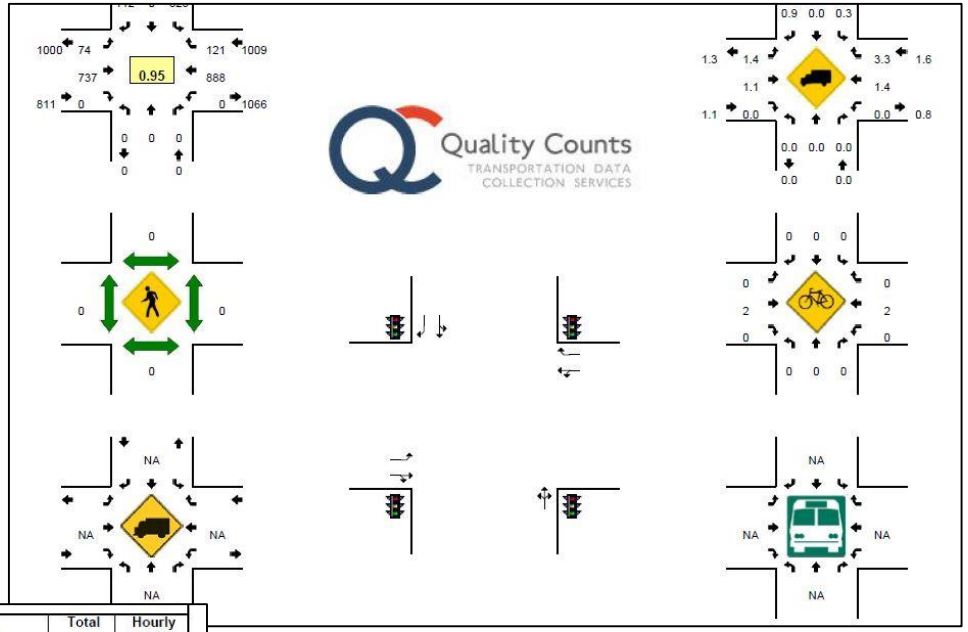
- **Provides average travel times:** by 5min/15min/Hourly/Daily on a specific route between two installed detectors with link information



Source: AMBAG

Turning Movement data

- Data selected on
  - Feb 23~24, 2016
  - 4:00~6:00 PM



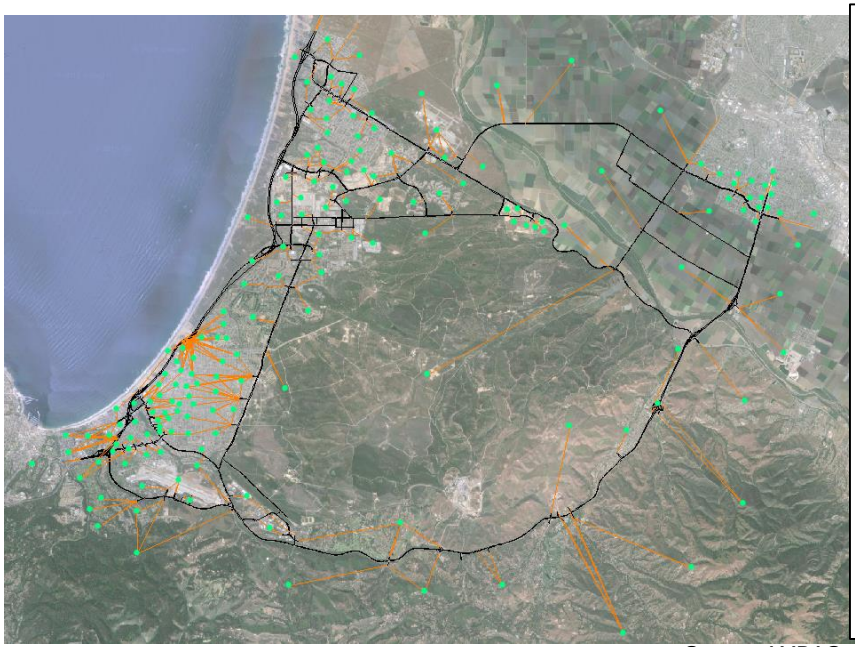
Source: AMBAG

5-Min Count Period Beginning At	York Rd (Northbound)				York Rd (Southbound)				SR 68 (Eastbound)				SR 68 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	25	0	13	0	7	69	0	0	0	53	14	0	181	
4:05 PM	0	0	0	0	22	0	8	0	7	80	0	0	0	69	7	0	193	
4:10 PM	0	0	0	0	40	0	9	0	3	83	0	0	0	68	4	0	207	
4:15 PM	0	0	0	0	31	0	11	0	10	60	0	0	0	48	7	0	167	
4:20 PM	0	0	0	0	22	0	8	0	3	65	0	0	0	72	4	0	174	
4:25 PM	0	0	0	0	14	0	4	0	8	42	0	0	0	75	9	0	152	
4:30 PM	0	0	0	0	19	0	4	0	6	50	0	0	0	74	16	0	169	
4:35 PM	0	0	0	0	35	0	6	0	8	55	0	0	0	66	12	0	182	
4:40 PM	0	0	0	0	24	0	7	0	5	62	0	0	0	78	12	0	188	
4:45 PM	0	0	0	0	31	0	5	0	5	64	0	0	0	65	9	0	179	
4:50 PM	0	0	0	0	22	0	15	0	13	73	0	0	0	70	10	0	203	
4:55 PM	0	0	0	0	26	0	11	0	7	66	0	0	0	86	16	0	212	2207
5:00 PM	0	0	0	0	35	0	10	0	7	70	0	0	0	57	3	0	182	2208
5:05 PM	0	0	0	0	36	0	12	0	5	61	0	0	0	75	5	0	194	2209
5:10 PM	0	0	0	0	22	0	15	0	6	61	0	0	0	77	10	0	191	2193
5:15 PM	0	0	0	0	27	0	12	0	5	59	0	0	0	73	11	0	187	2213
5:20 PM	0	0	0	0	35	0	10	0	3	61	0	0	0	81	8	0	198	2237
5:25 PM	0	0	0	0	17	0	5	0	4	55	0	0	0	86	9	0	176	2261
5:30 PM	0	0	0	0	18	0	10	0	2	71	0	0	0	59	6	0	166	2258
5:35 PM	0	0	0	0	16	0	11	0	4	76	0	0	0	69	7	0	183	2259
5:40 PM	0	0	0	0	17	0	5	0	3	43	0	0	0	77	5	0	150	2221
5:45 PM	0	0	0	0	13	0	5	0	3	63	0	0	0	73	5	0	162	2204
5:50 PM	0	0	0	0	10	0	2	0	5	67	0	0	0	70	6	0	160	2161
5:55 PM	0	0	0	0	14	0	8	0	4	45	0	0	0	42	5	0	118	2067
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	0	0	0	332	0	144	0	108	836	0	0	0	852	116	0	2388	

Source: AMBAG

Additional Turning Movement & Signal Schedules

- 17 additional intersections for signal time/turning movements
- Data is provided by
  - Caltrans
  - 3 Local Municipalities



Source: AMBAG

California Department of Transportation, Caltrans — 2070 Controller Timing Chart — TSCP: 2.20

Location: Mon-68-PM 17.18 EB Ramps@River Rd
System: 68-River/Resrv
Master At: EB ramps
District: 5
I/C:
Designed By: KJV
Installed By:
Service Info:

Timing Change: | Date Start: 4/17/2015 | Date End: | Designed: | Installed:

PHASE		FLASH
	1)	[ ]
P	2) SB from Reservation	[ ]
H	3)	[ ]
A	4)	[ ]
S	5) SB LT to EB on ramp	[ ]
E	6) NB River Rd	[ ]
	7)	[ ]
	8) EB off ramp	[ ]
O	A)	[ ]
V	B)	[ ]
E	C)	[ ]
R	D)	[ ]
L		

Intersection Layout

INTERSECTION: Gen JM & San Pablo

Row	Column Numbers → / Plan Name →	Plan 1	2	3	4	5	6	7	8	9	Row
0	Cycle Length	100	100	100	100	100	100	100	100	100	0
1	Phase 1 - ForceOff	55	60	60	63	60	61	65	65	65	1
2	Phase 2 - ForceOff	0	0	0	0	0	0	0	0	0	2
3	Phase 3 - ForceOff	20	15	20	25	20	25	25	25	25	3
4	Phase 4 - ForceOff	40	40	40	40	40	40	40	40	40	4
5	Phase 5 - ForceOff	55	60	60	61	60	63	65	65	65	5
6	Phase 6 - ForceOff	0	0	0	0	0	0	0	0	0	6
7	Phase 7 - ForceOff	20	15	20	25	20	25	25	25	25	7
8	Phase 8 - ForceOff	40	40	40	40	40	40	40	40	40	8
9	Ring Offset	0	0	0	0	0	0	0	0	0	9
A	Offset 1	0	0	0	0	0	0	0	0	0	A
B	Offset 2	0	0	0	0	0	0	0	0	0	B
C	Offset 3	0	0	0	0	0	0	0	0	0	C
D	Permissive	12	12	12	12	12	12	12	12	0	D
E	Hold Release	255	255	255	255	255	255	255	255	0	E
F	Zone Offset	0	0	0	0	0	0	0	0	0	F

Coordination <C Page>

Row	Column Numbers →	E	F
0	Exclusive Phases		RR Overlap A - Phases
1	RR-1 Clear Phases		RR Overlap B - Phases
2	RR-2 Clear Phases		RR Overlap C - Phases
3	RR-2 Limited Service		RR Overlap D - Phases
4	Prot / Perm Phases		Ped 2P
5	Overlap A - Green Omit		Ped 6P: 6
6	Overlap B - Green Omit		Ped 4P
7	Overlap C - Green Omit		Ped 8P: 8
8	Overlap D - Green Omit		Yellow Flash Phases
9	Overlap Yellow Flash		Overlap A - Phases
A	EV-A Phases		Overlap B - Phases
B	EV-B Phases		Overlap C - Phases
C	EV-C Phases		

Extra 1 Flags
1 = TBC Type 1
2 = NEMA Ext. Coord
3 = Auto Daylight Sevings
4 = EV Advance
5 =
6 = Special Event
7 = Pretimed Operation
8 = Split Ring Operation

Assign 5 Outputs
1 = Right Turn Overlap
2 = TOD Outputs
3 = EV Beacon - Steady

Force-Off Adjust: 0
Coord Force-Off Adjust for Ped Service <C+D+F>
Transition Type: 0
TBC Transition <C+D+D>
Transition Type
0 = Shortway
Non-zero = Lengthen

IC Select Flags
1 =
2 = Modem
3 = 7-Wire Slave

Source: AMBAG

Source: AMBAG

For More Information:

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Caliper Corporation
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Smarter Work Zones

Project Coordination Using WISE: TN Pilot Project

Brad Freeze, P.E. — Tennessee DOT

Sabya Mishra, Ph.D., P.E. — University of Memphis

Overview

- Motivation
- Goals and Tasks
- Rationale
- Pilot Project Experience
- Challenges and Limitations
- Initial Recommendations

Motivation to WISE (1 of 2)

- Significant projects which are anticipated to cause sustained work zone impacts
- Currently revising the TDOT Work Zone Safety Mobility Manual and reformatting the Transportation Management Plan Process (TMPs)
- Optimal multiple project coordination helps to reduce work zone related crashes
- Obtain three pillars of benefit
  - Social
  - Economic
  - Environmental

Source: TDOT

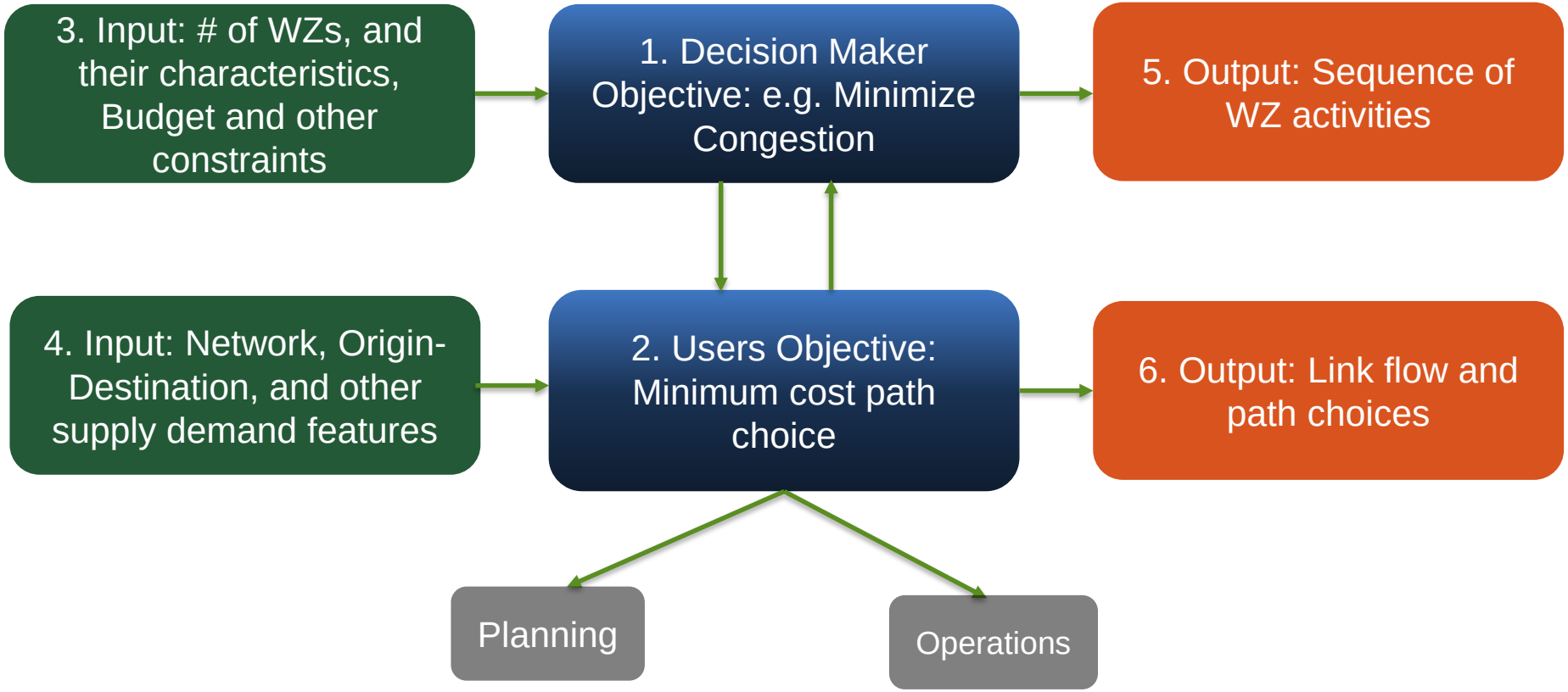
Motivation to WISE (2 of 2)

- Need in Tennessee for coordinating work zone (WZ) projects
  - Type: construction, maintenance, utility, etc.
  - Pass through state
- TDOT selected EDC-3 Smarter Work Zones as an initiative to help stimulate and support the improvement of work zone planning.
- TDOT has an existing lane closure decision support system software that is underutilized and is in need of revitalization.
- In TN
  - Approximately 500 WZ/year on interstates/state routes
  - Highest type of WZ are construction.

Goals and Tasks

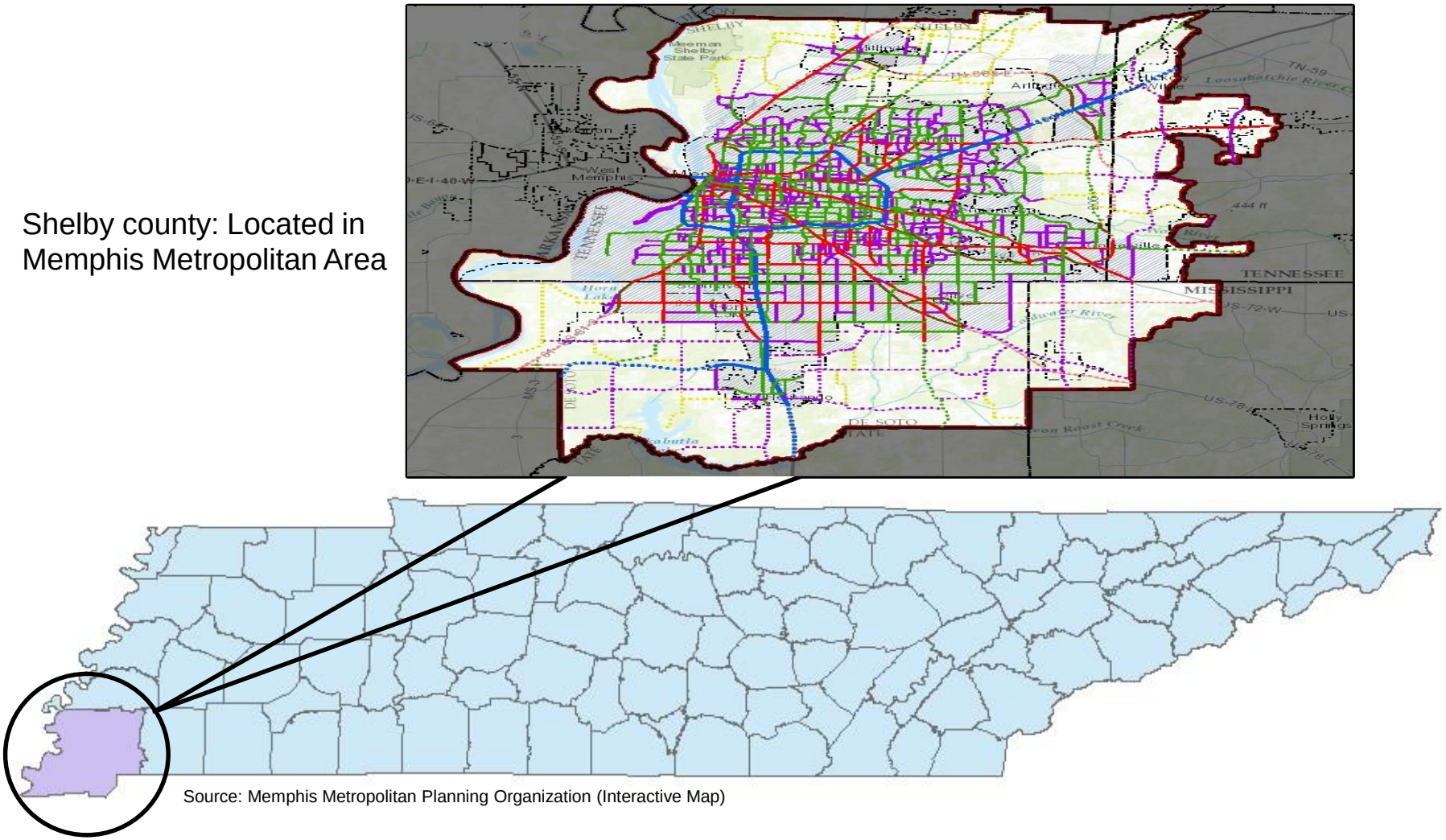
- Goals of the pilot project
  - Assessment of WISE to identify limitations
  - Recommendations to improve WISE
- Tasks of pilot project include
  - Collect network and WZ data,
  - Build
    - Planning and operational strategies for WZ sequencing
  - Model calibration and validation
  - Use WISE to optimize sequence of WZ projects

Rationale Work Zone Sequencing



Pilot Project – Shelby County, Memphis, Tennessee

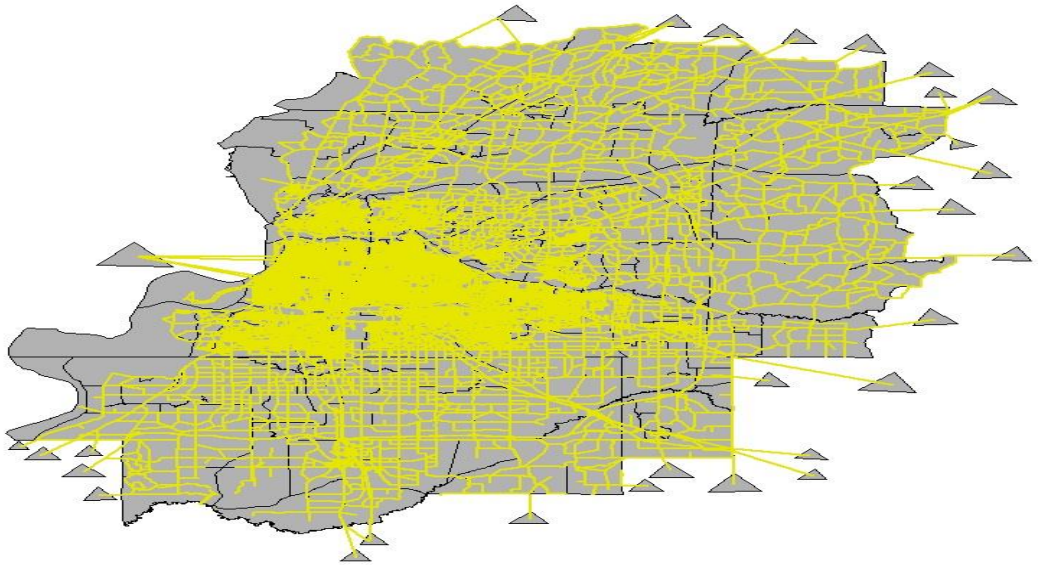
Shelby county: Located in Memphis Metropolitan Area

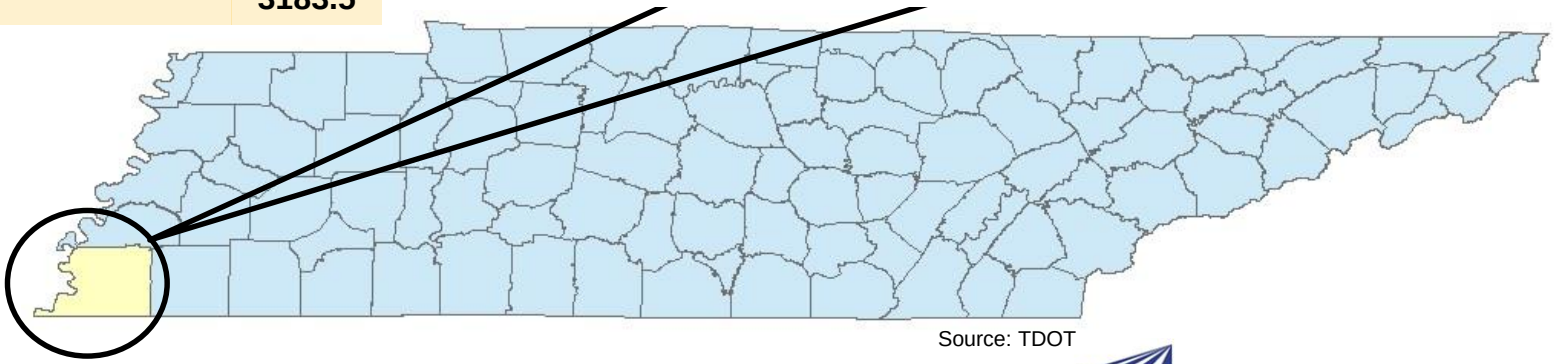


Source: Memphis Metropolitan Planning Organization (Interactive Map)

Pilot Project Network Overview

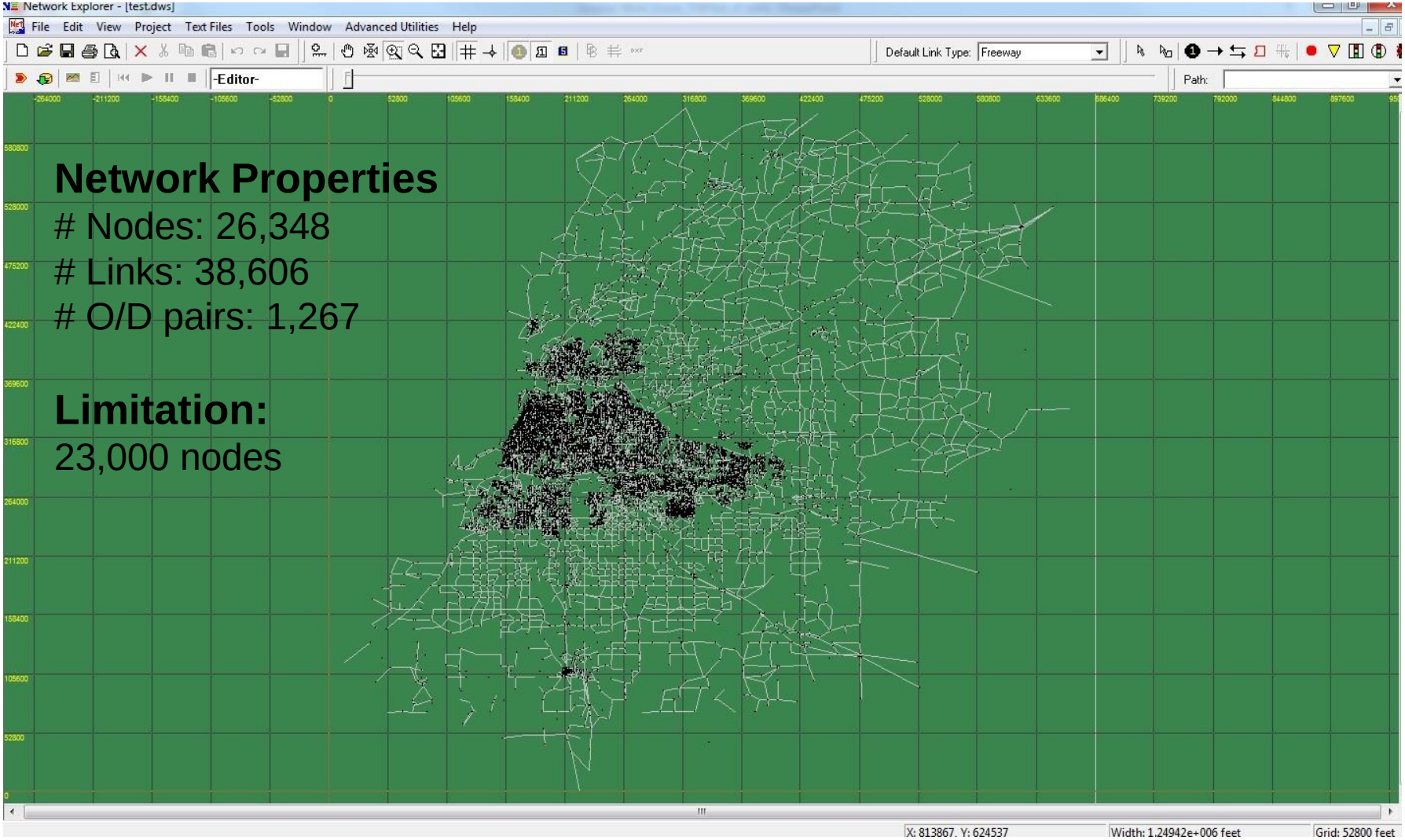
Total Length of Roadway Segments (miles)	
Rural Interstates	**2.1**
Urban Interstates	**60.3**
Rural Principle Arterials	**28.6**
Urban Principle Arterials	**232.7**
Urban Freeways/Expressways	**35.5**
Rural Minor Arterials	**13.6**
Urban Minor Arterials	**513.2**
Rural Major collectors	**7.7**
Urban Collectors	**383.3**
Rural Minor Collector	**81.7**
Local Roads	**3183.5**





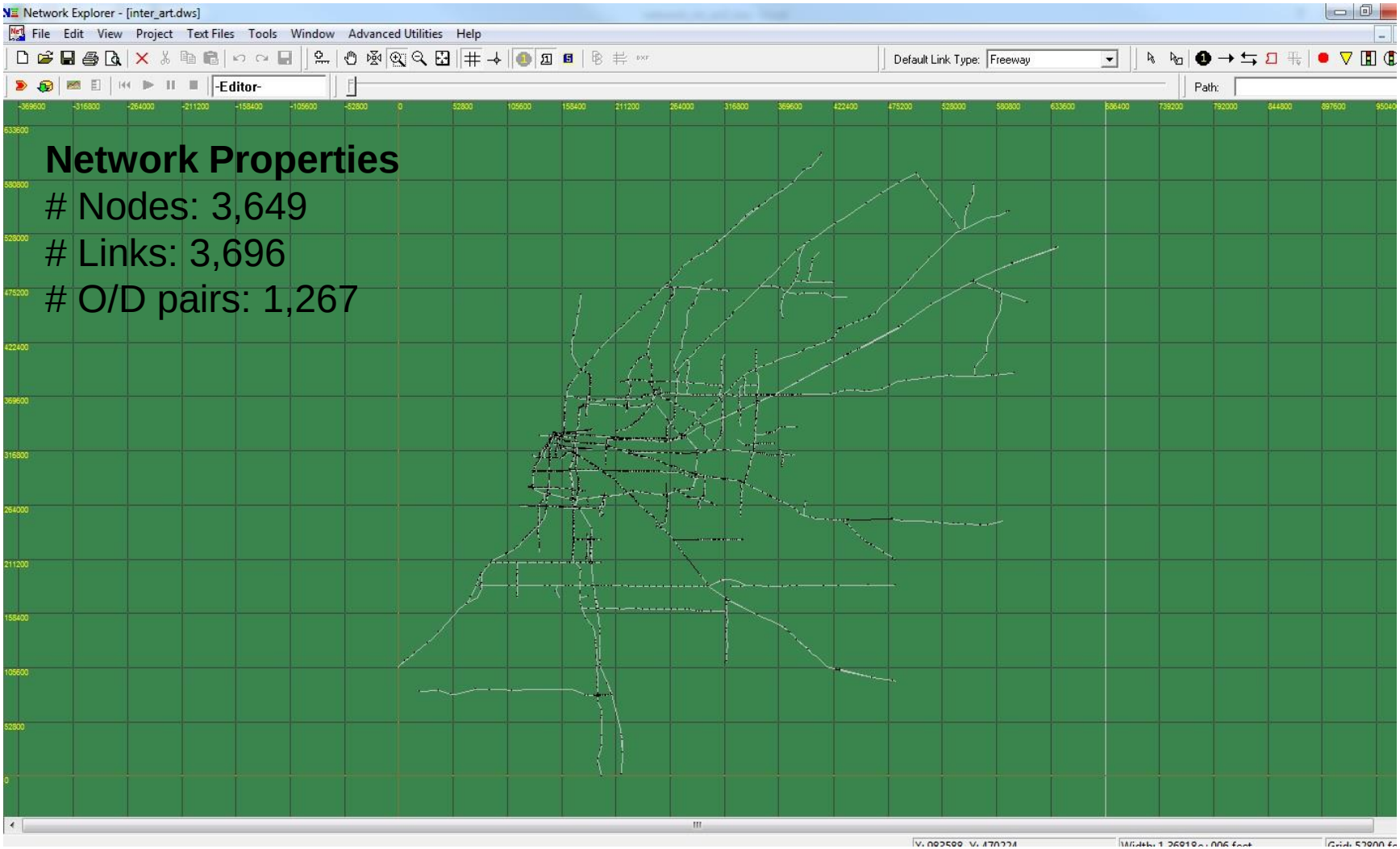
Source: TDOT

NeXTA – Study Area Network



Source: TDOT

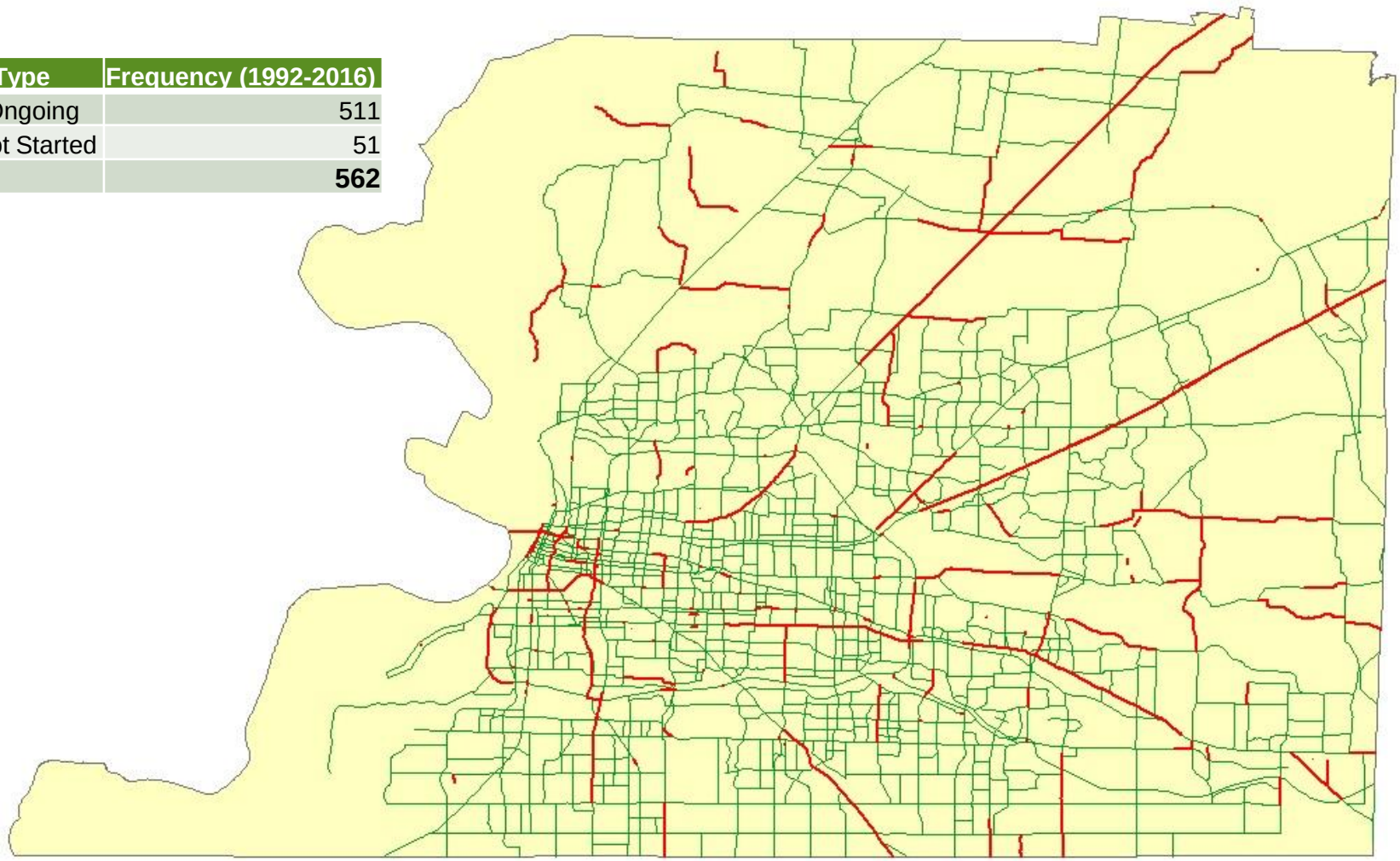
NeXTA – Simplified Study Area Network



Source: TDOT

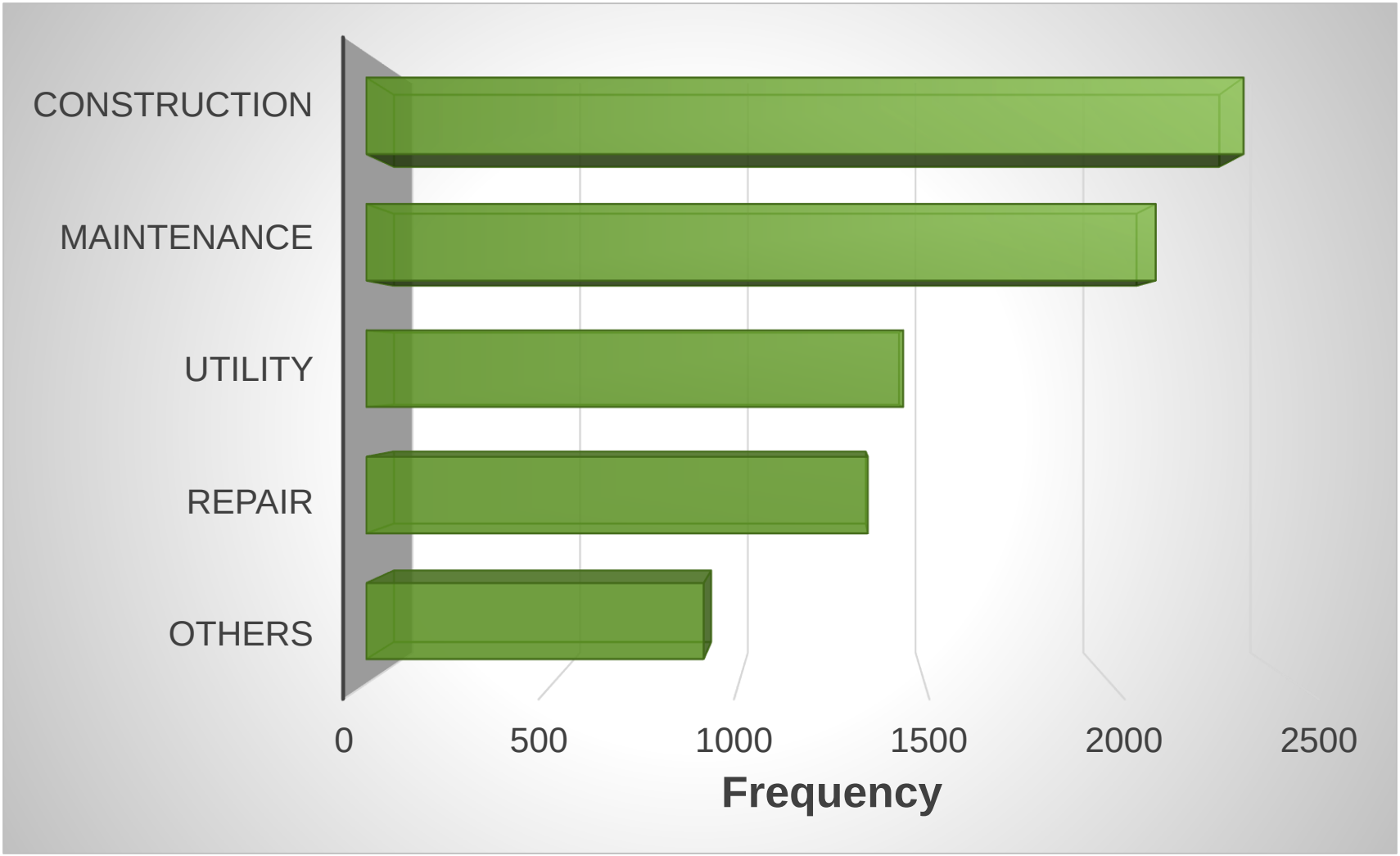
Pilot Project Work Zones

Work Zone Type	Frequency (1992-2016)
Completed/Ongoing	511
Proposed/Not Started	51
Total	**562**



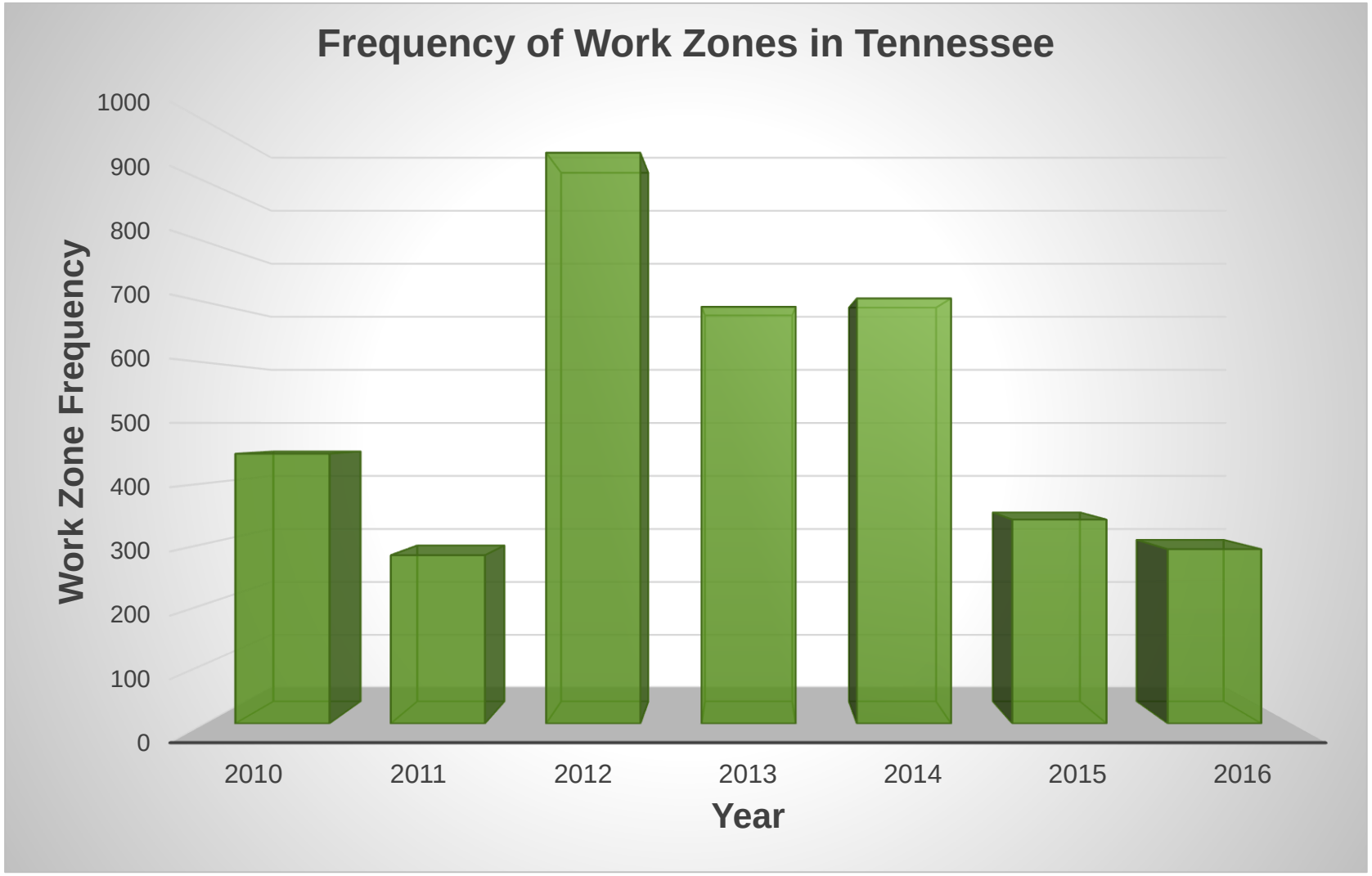
Source: TDOT

Pilot Project Work Zone Characteristics (1 of 2)



Source: TDOT

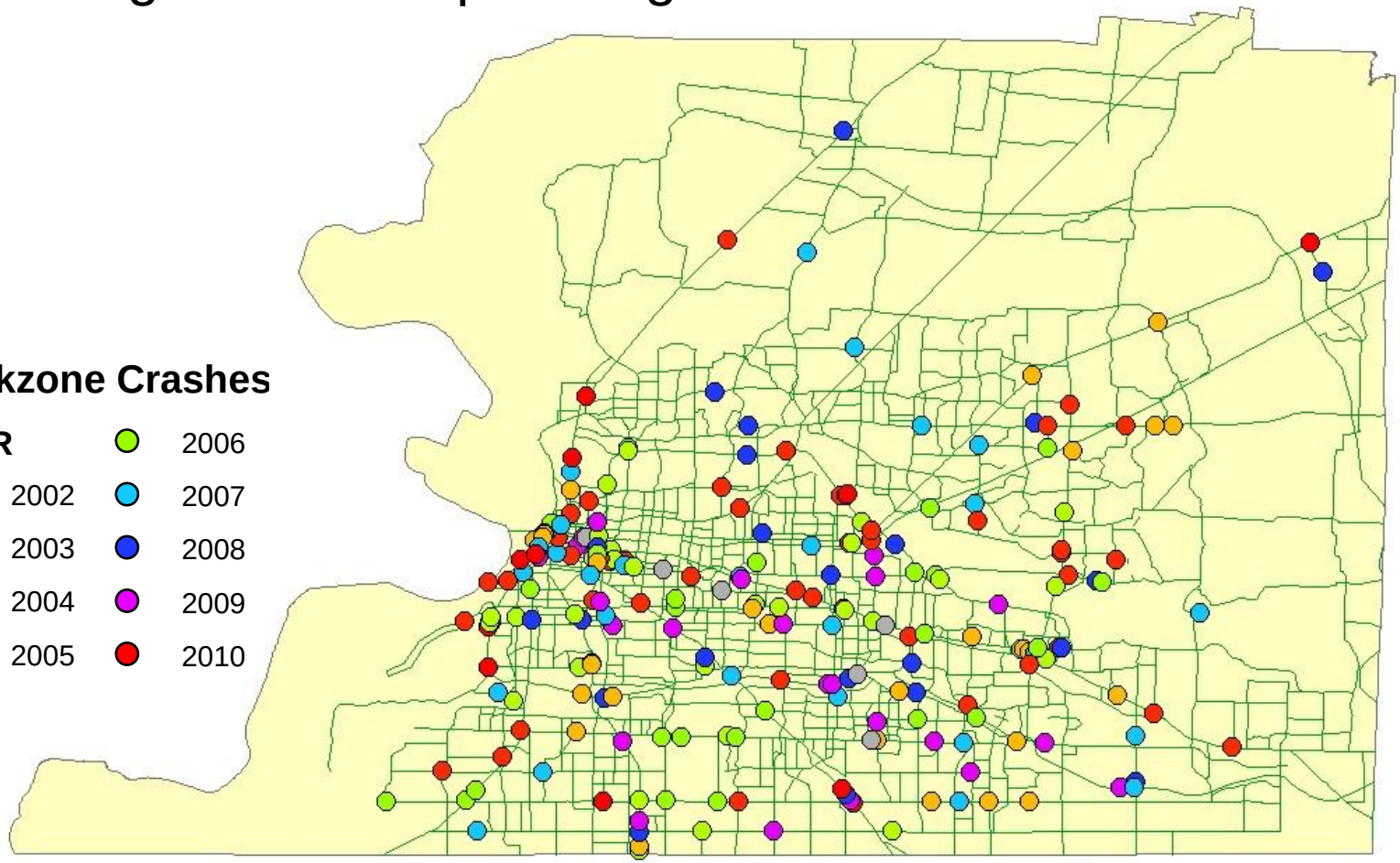
Pilot Project Work Zone Characteristics (2 of 2)



Source: TDOT

Work Zone Crashes

- Anticipated decrease in WZs because of informed rerouting and better planning



Source: TDOT

Challenges and Limitations

- Data Preparation
  - Identify work zones to be analyzed
    - State, MPO, and City (all have different databases!)
  - Sub-area selection if the network is bigger
- WISE uses DynusT for DTA
  - Provide flexibility to include other software
- Significant effort needed mesoscopic model calibration
- Detail construction cost components not defined as input in WISE
  - Labor, materials, tools, schedule conflict, and other components

Initial Recommendations

- Enhance GUI
  - (*for wider use make it practitioner friendly*)
- Data input/output
  - (*provide example data structure*)
- Analyze larger number of WZ projects
  - (*test other sequencing algorithms*)
- Capacity to analyze larger network
  - (*for planning enhance traffic assignment algorithm*)
- Support other DTA platforms
  - (*direct WISE to other DTA platforms*)

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Smarter Work Zones

FHWA Resources

SWZ Interactive Toolkit Available!

https://www.workzonesafety.org/SWZ/

Source: FHWA

Other Resources – Project Coordination

FHWA	• FHWA Work Zone Management Program – Project Coordination http://www.ops.fhwa.dot.gov/wz/construction/crp/index.htm • FHWA Work Zone Management Program – Peer-to-Peer Program http://www.ops.fhwa.dot.gov/wz/p2p/index.htm
TRB SHRP2	• WISE Software User's Guide http://onlinepubs.trb.org/onlinepubs/shrp2/SHRP2_S2-R11-RW-2.pdf
NCHRP	• NCHRP Synthesis 413: Techniques for Effective Highway Construction Projects in Congested Urban Areas http://www.trb.org/main/blurbs/164886.aspx
Others	• Highway Construction Coordination to Minimize Traffic Impacts http://planning.transportation.org/Documents/8-36/NCHRP8-36(56)FinalReport.pdf
WSDOT Example Documents	• Data Sharing Agreement between Washington State DOT and Seattle DOT https://www.workzonesafety.org/files/documents/SWZ/WSDOT-SDOT_data_sharing_agreement.pdf • Washington State DOT Memorandum of Understanding – Construction Traffic Coordination and Mitigation https://www.workzonesafety.org/files/documents/SWZ/MOU_10-25-09.pdf

Thanks for joining us!

- **Questions or Comments?**

Smarter Work Zones

- Jawad Paracha (FHWA Operations, WZ Management Team) jawad.paracha@dot.gov
- Visit The National Work Zone Safety Information Clearinghouse website for more information https://www.workzonesafety.org/swz

SHRP 2/WISE Software

- Tracy Scriba (FHWA SHRP Reliability Program Coordinator & R11 Product Lead) tracy.scriba@dot.gov
- Visit the TRB SHRP2 R11 website for more information http://www.trb.org/Main/Blurbs/168143.aspx