



**Active Traffic
Management in
Michigan**

ITS HEARTLAND ANNUAL MEETING

Erik Minge, PE – April 27, 2022

Project Team



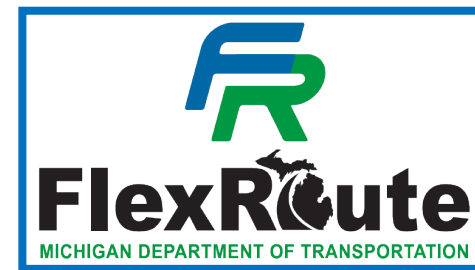
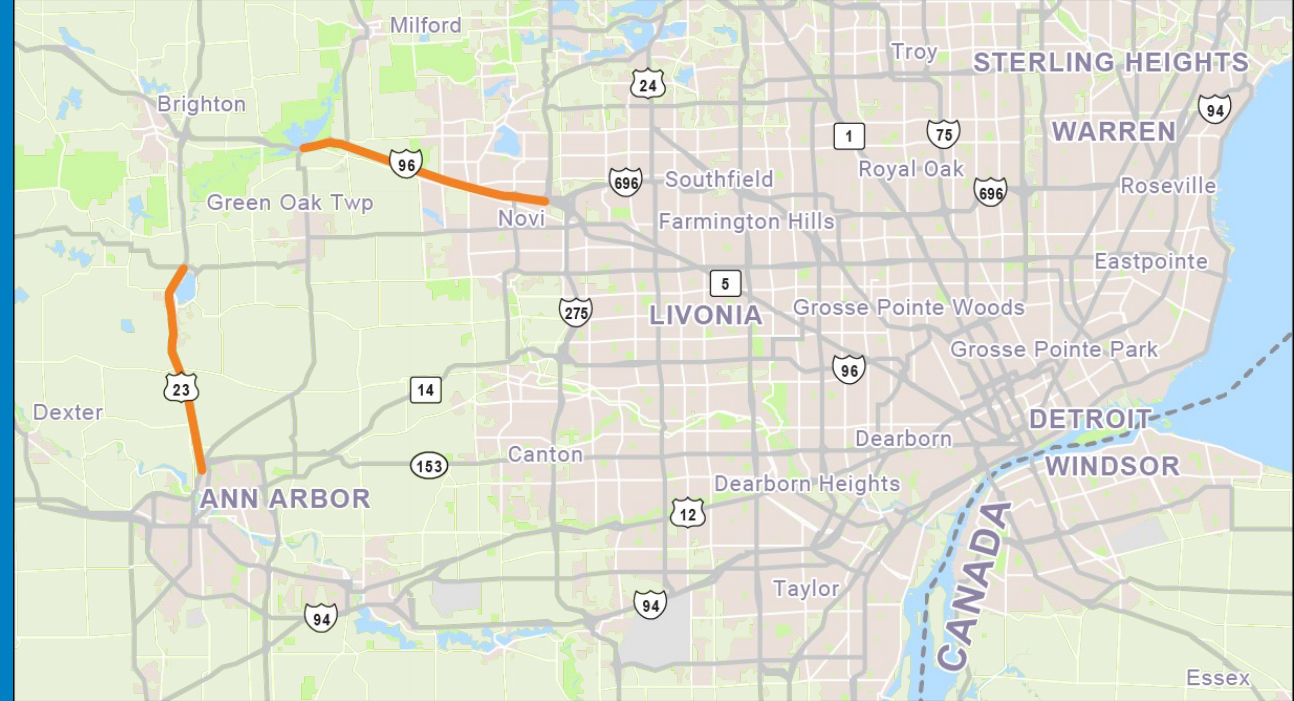
University Region

Metro Region



Presentation Overview

- Michigan's first managed lane, US-23 Flex Route
 - ATM strategies and components
- Next, I-96 Flex Route
 - Similarities & differences
 - New strategy, ramp metering



US-23 Flex Route - Background

- Located north of Ann Arbor, 8.5 miles
- Operational issues
 - Recurring directional peak hour congestion
 - Non-recurring congestion
 - Incidents
- Public outreach began 2013
- System fully operational 2018



Active Traffic Management (ATM) Strategy

- ATM strategies:
 - Dynamic shoulder use
 - Overhead lane control signals
 - Variable speed advisory
 - Small & large DMS
 - Surveillance & detection



US-23 Flex Route Components

- 33 gantries
- 93 land control signs
- 9 small DMS
- 3 large DMS
- 11 microwave vehicle detection
- 21 low-light cameras
- 11 miles of fiber/conduit

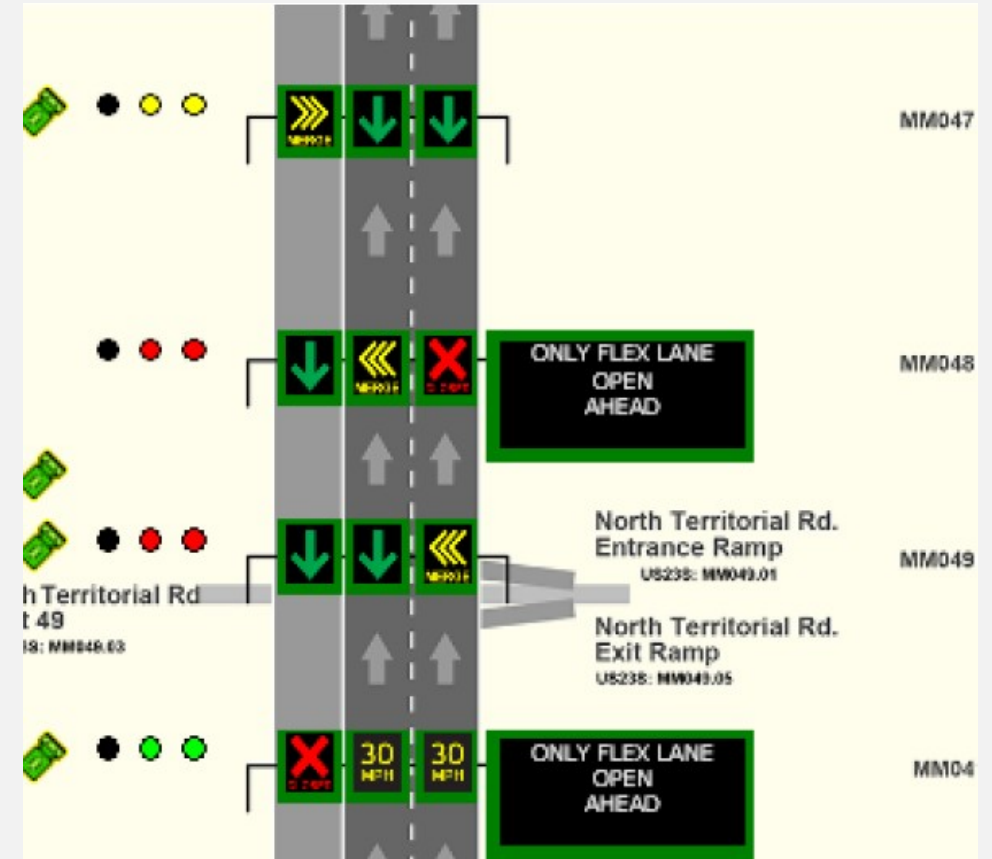


Operation of the Flex Route

- Median shoulder used for directional peaks
 - Southbound from 6:00 to 9:30 AM
 - Northbound from 3:00 to 7:00 PM
- Operator confirms that the shoulder is clear
 - By Freeway Courtesy Patrol
 - By cameras
- Also, system alerts when congestion thresholds are met



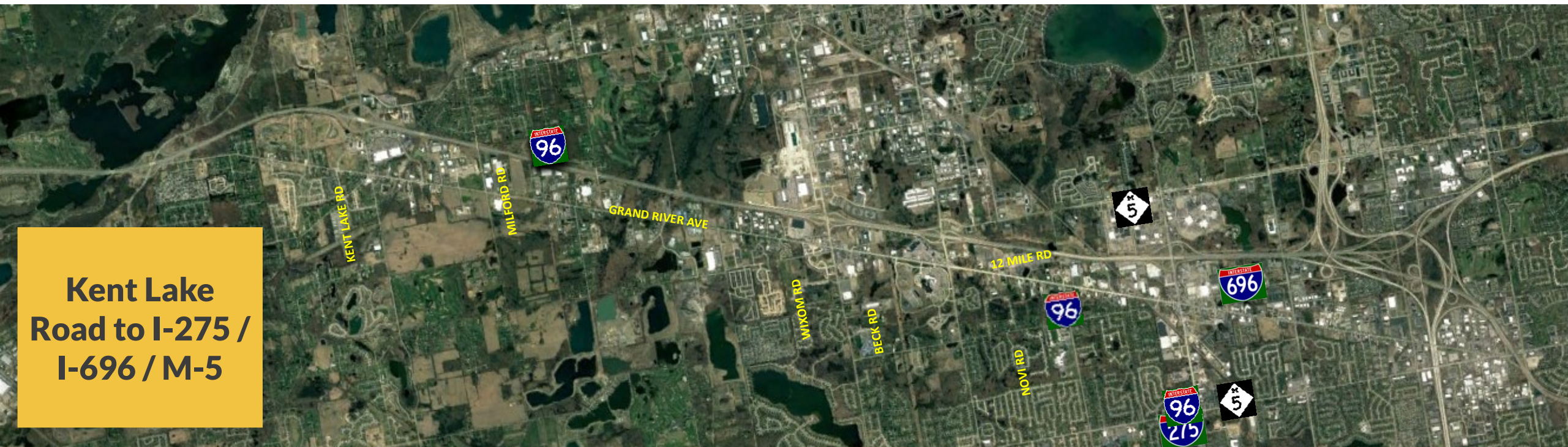
Dynamic Lane Use Example



I-96 Existing Corridor Conditions



- 12-mile segment of Lansing-Detroit corridor
- Recurring directional congestion
- 163,000 vehicles/day
- Frequent incidents
- Inconsistent travel time reliability
- Existing wide median shoulders



**Kent Lake
Road to I-275 /
I-696 / M-5**

Differences between US-23 and I-96 Flex Routes

	US-23	I-96
General Purpose Lanes	2	3
Existing Freeway Lighting	One interchange	Some
Small DMS Placement	Strategically placed*	Every other gantry
Variable Speed Advisory (VSA)**	Automatic when shoulder is open with max speed of 60 mph	Automatic when shoulder is open and speed drops below determined threshold
Ramp Metering	No	Yes

*Lesson learned – every other gantry preferred

** VSA provides a dynamic speed advisory that adjusts based on operating conditions

Managed Lane Solution – Part-Time Shoulder Use



CCTV

Lane Control Signs

Peak Period Median
Shoulder Use

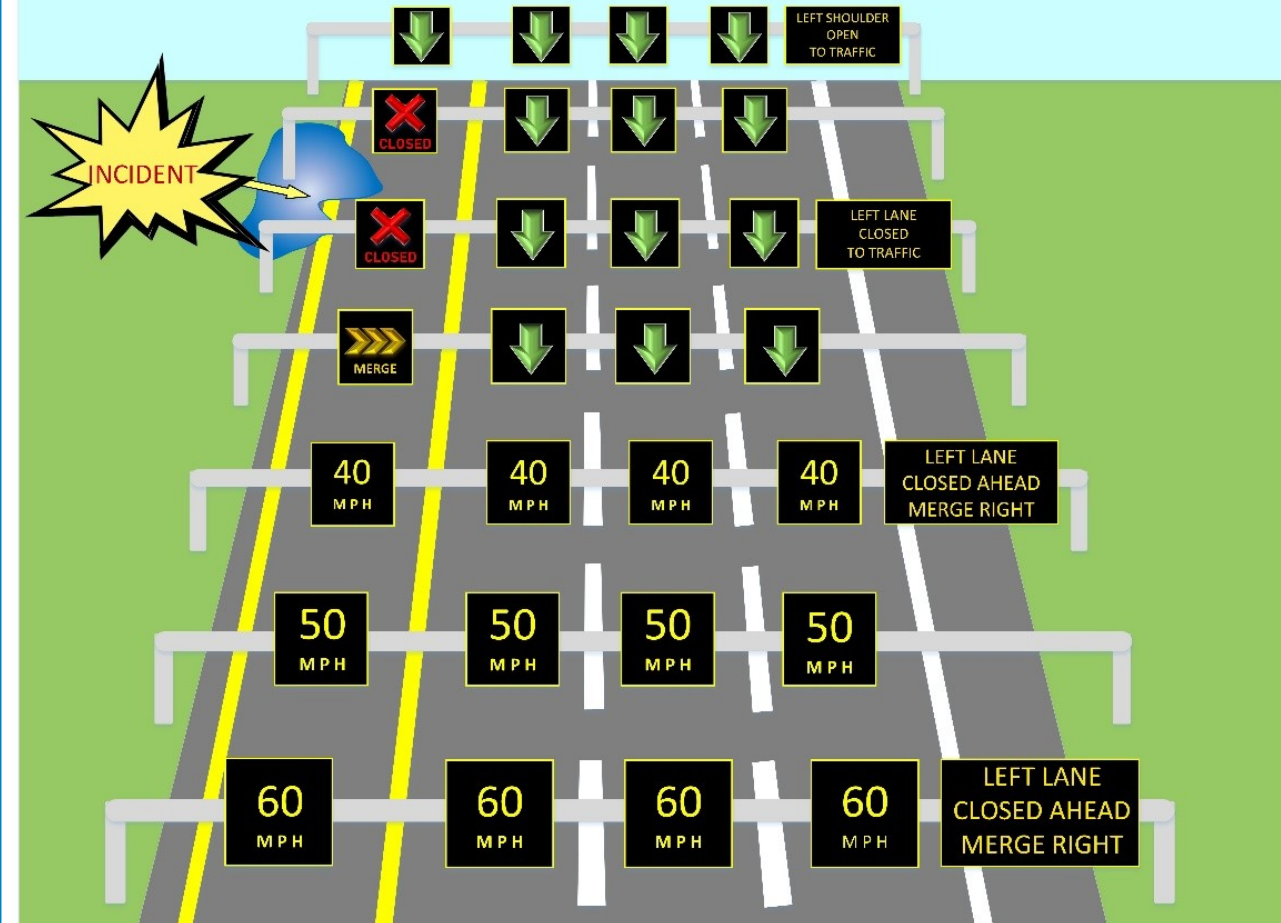
Microwave Detectors

Small DMS

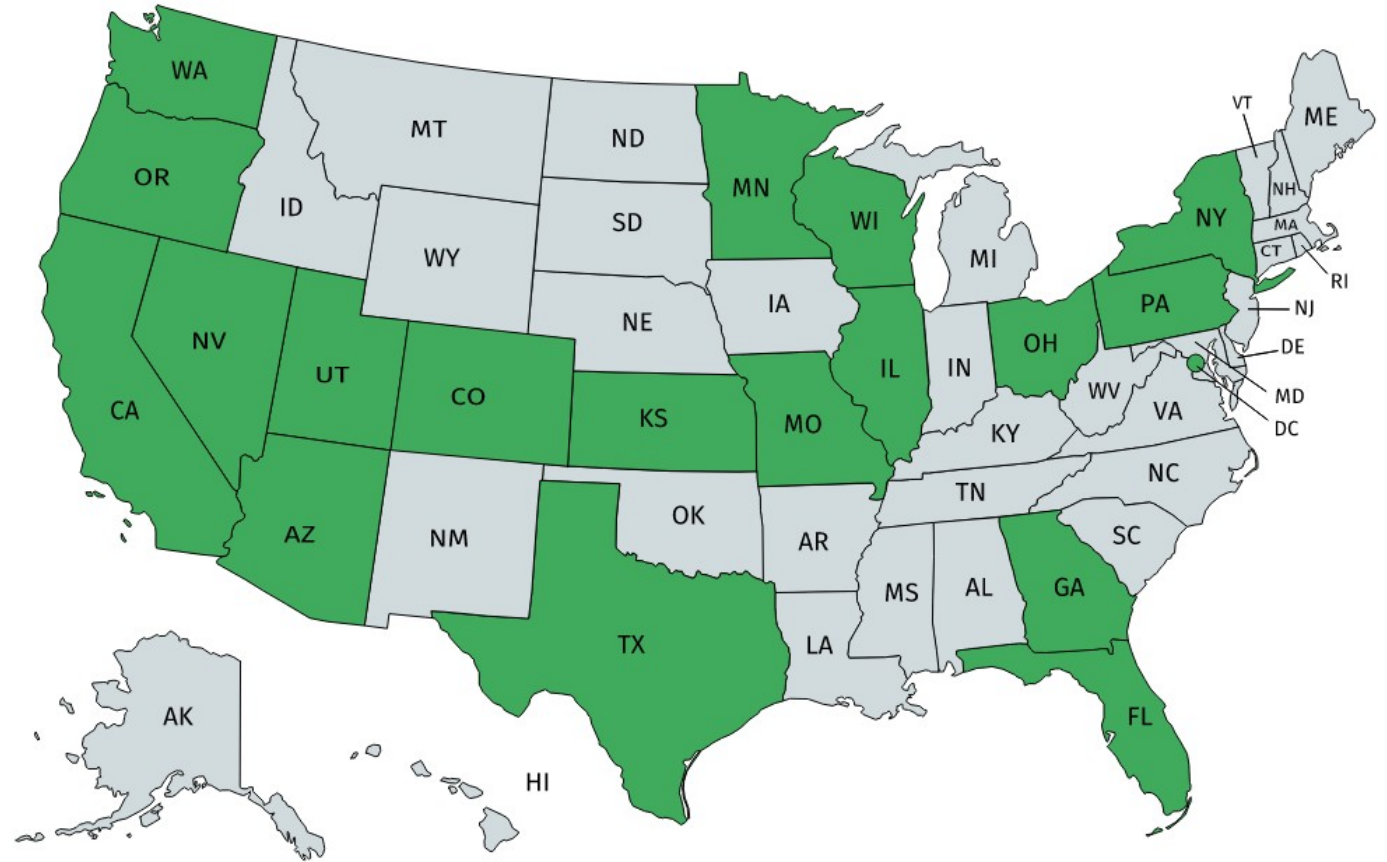
Gantry

I-96 Flex Route – Operational Scenarios

1. Free flow traffic
2. Recurring congestion
3. Incident response
4. Special events
5. Roadway – maintenance activity
6. Winter maintenance operations
7. System offline

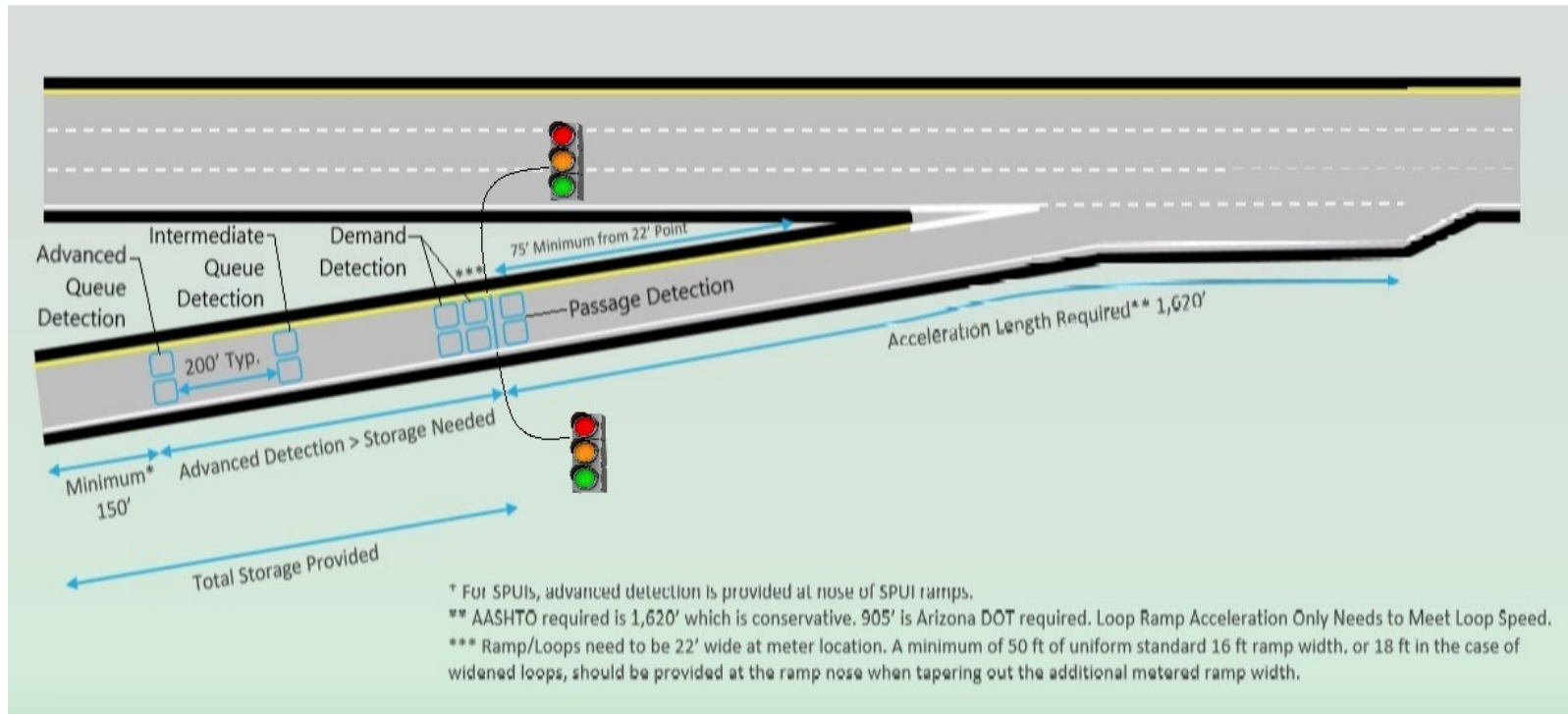


State Using Ramp Metering



Ramp Metering Considerations

- National Survey of Best Practices
- Design Considerations:
 - Ramp geometry – loop vs. diamond
 - Signal heads configuration, signing, detection, enforcement, etc.
- Functional Considerations:
 - Hours of Operation
 - Localized vs. central system
 - Pre-timed vs. adaptive
 - Algorithms



Signal Head Configuration Options



Advance Warning Sign Options



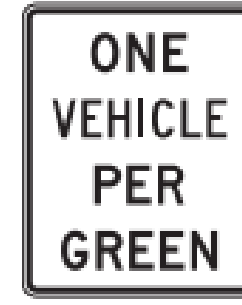
Signing Options



R10-6



R10-6a

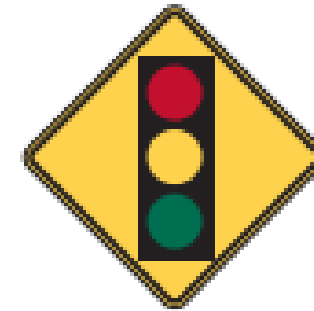


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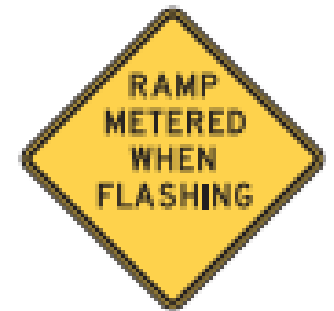


R10-29

Sign Designation	Sign Picture
W88-2 (CA)	
W88-3 (CA)	
W89 (CA)	



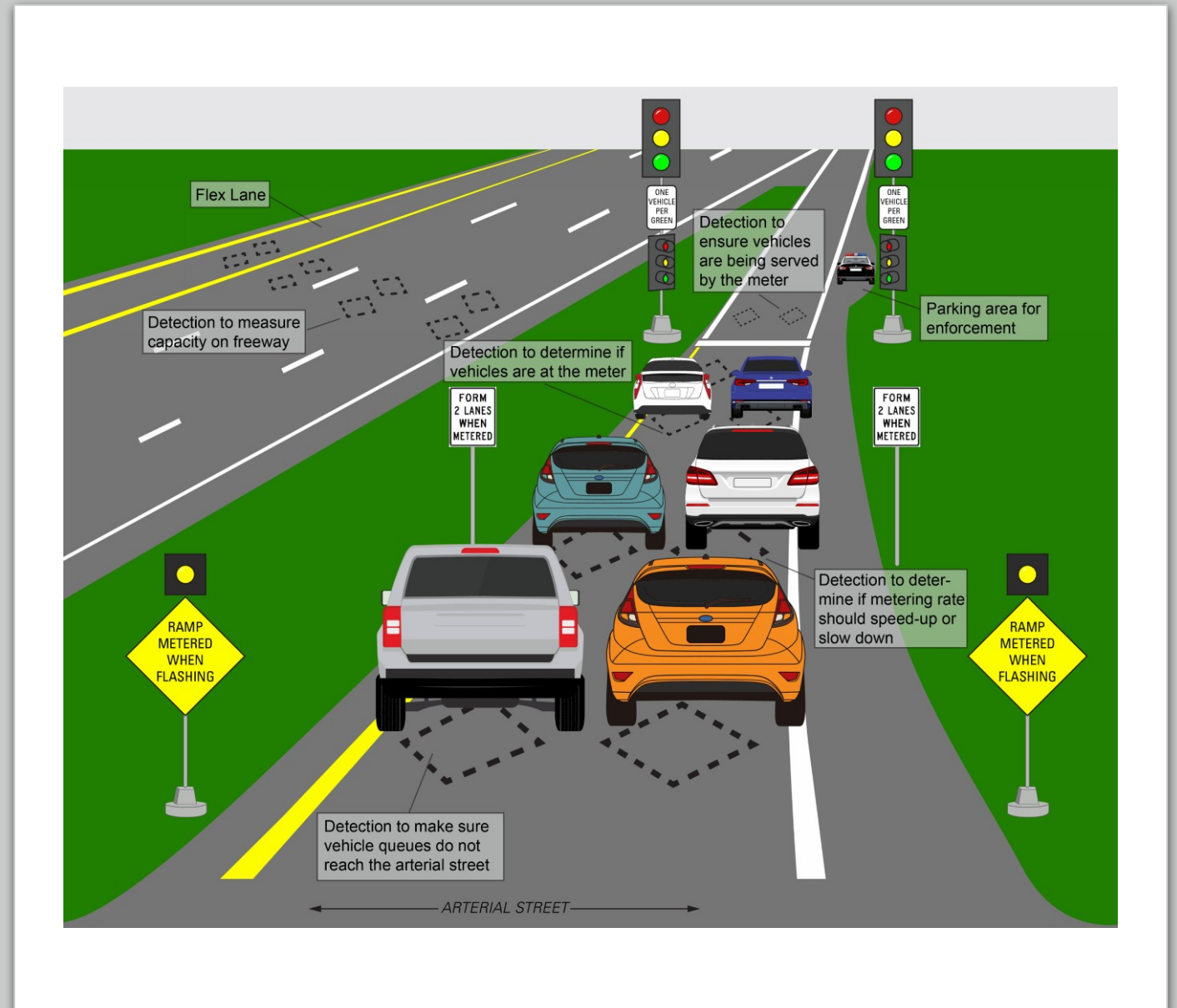
W3-3



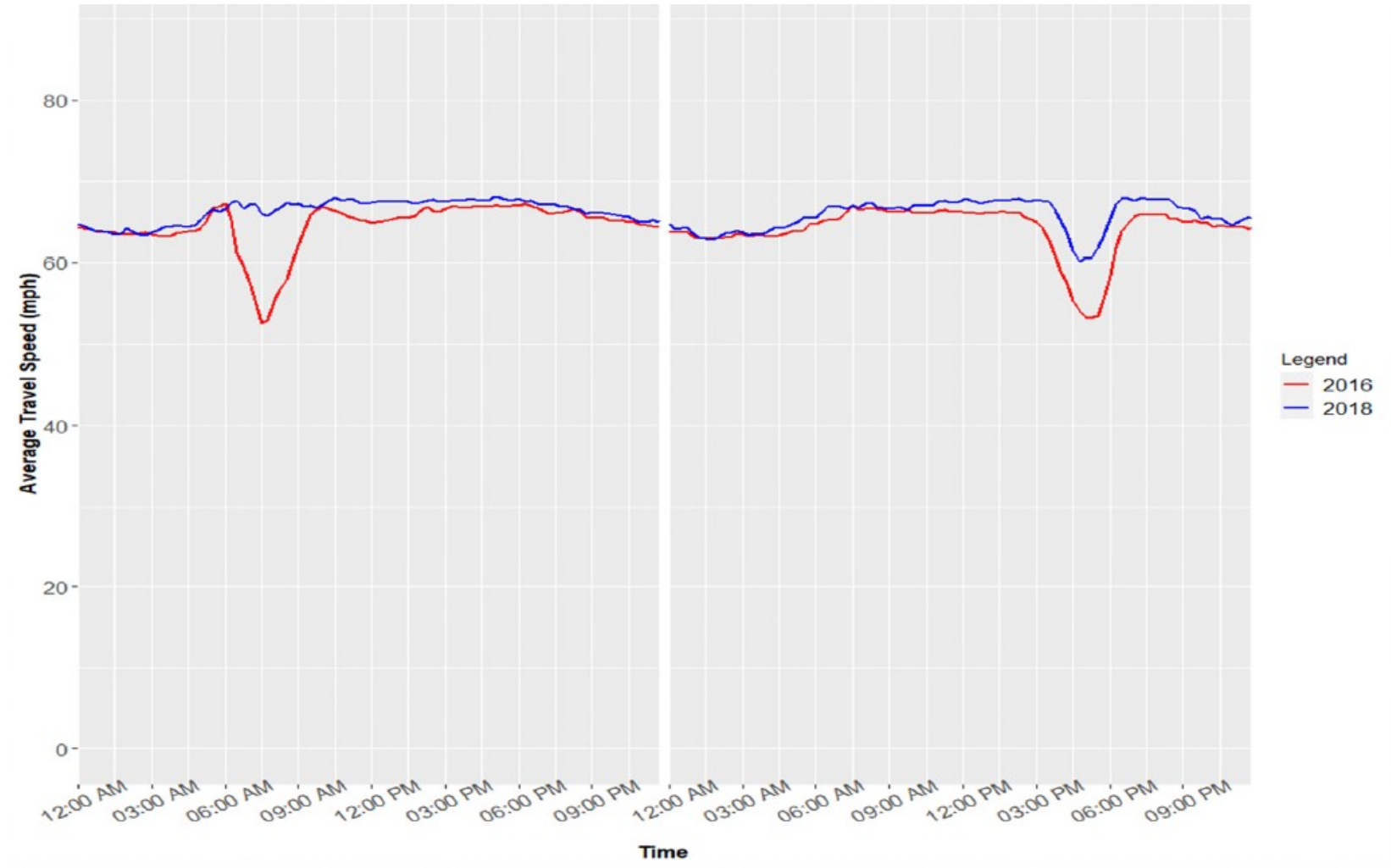
W3-8

Envisioned System

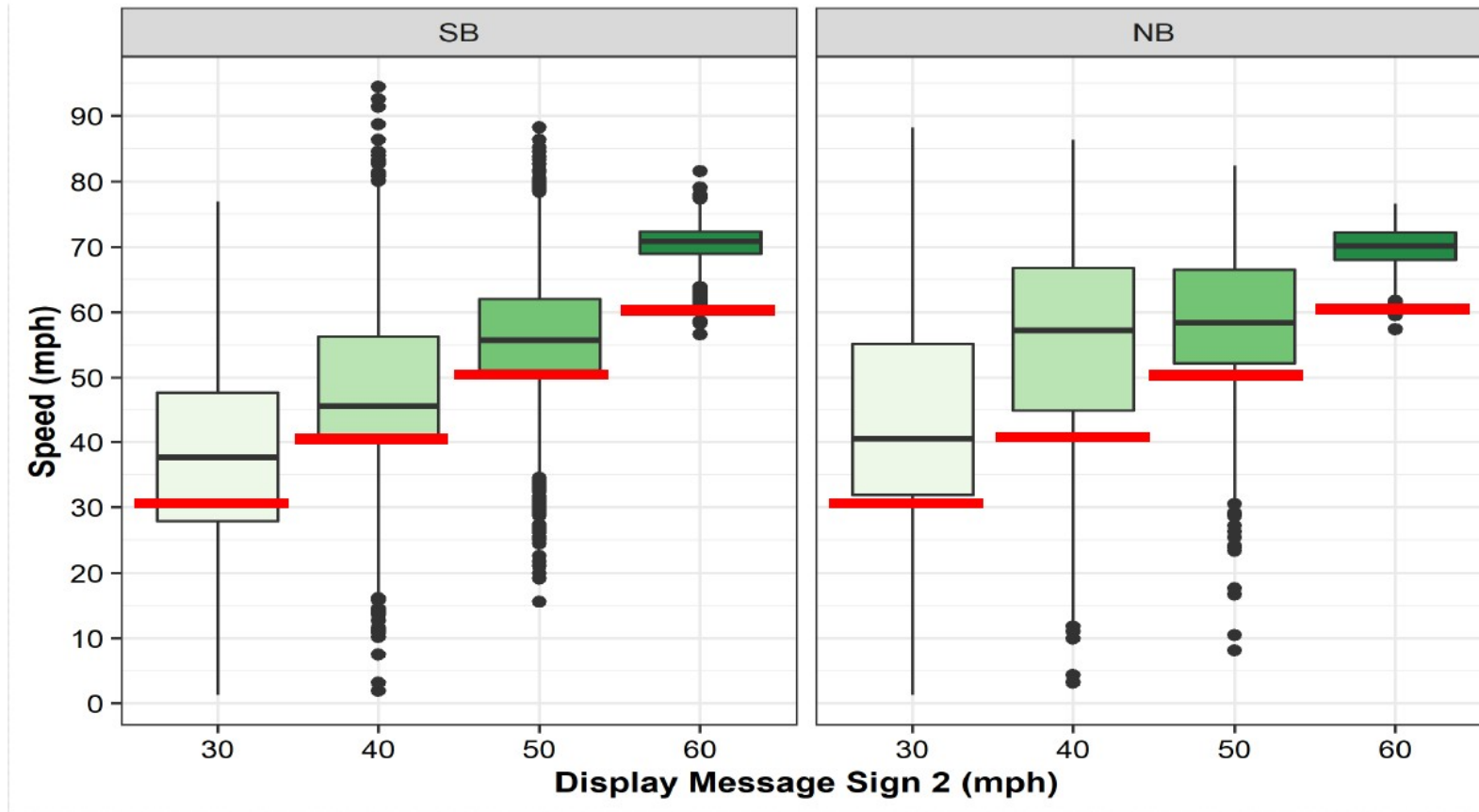
- Advance warning & signing
- Signal head configuration
- Detection
- Enforcement light
- Enforcement parking area
- CAV-ready



Average Travel Speed – Weekdays



Advisory Speed Compliance



ATM Benefits

US-23 Findings

- Overall improvement in speed, crashes, travel time and travel time reliability
- SB US-23 results
 - 50% improvement in TT Reliability
 - 5 min reduction in TT
 - 19 mph increase in speed
 - 3.09 benefit/cost ratio
- NB US-23 results
 - 27% improvement in TT Reliability
 - 1.4 min reduction TT
 - 6 mph increase in speed
 - 3.01 benefit/cost ration

I-96 Expected Benefits (flex lane and ramp metering combined)

1. Improved Safety

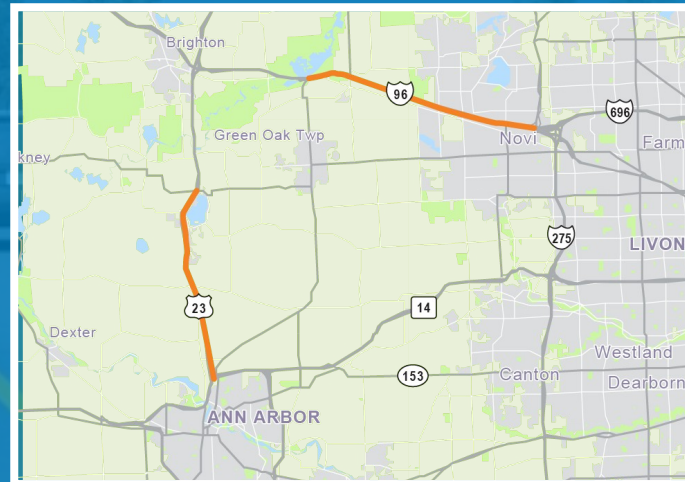
- Reduced rear-end crashes
- Reduced merge crashes

2. Improved Travel Time Reliability

- Improved travel time reliability
 - EB morning – up to 65%
 - WB afternoon – up to 75%
- Reduced peak period duration
 - EB morning – up to 80%
 - WB afternoon – up to 67%

Conclusion

- Flex Route initiatives successful, demonstrated benefits on US-23
- Expansion planning underway for US-23 corridor
- Extensive examination of ramp metering alternatives on I-96





Thank You!
Questions?



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