

# Arizona DOT Transportation Systems Management and Operations (TSM&O)

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# ADOT Baseline Condition - Pre TSM&O

Many functions existed but not unified

- Traffic Operations Center was combined with ITS Project Management (under Operations)
- Traffic Safety and Records was combined with Traffic Engineering Design (under Development)
- Regional Traffic Engineers/Traffic Maintenance were under separate District Engineers (under Maintenance)
- Statewide Traffic Maintenance (Signing, Striping, Signal coordination) were supervised by Design Section (under Development)



# ADOT TSM&O Progress

## Division created with existing groups

- TSM&O functions brought into single leadership

## Strategic Plan nearing completion

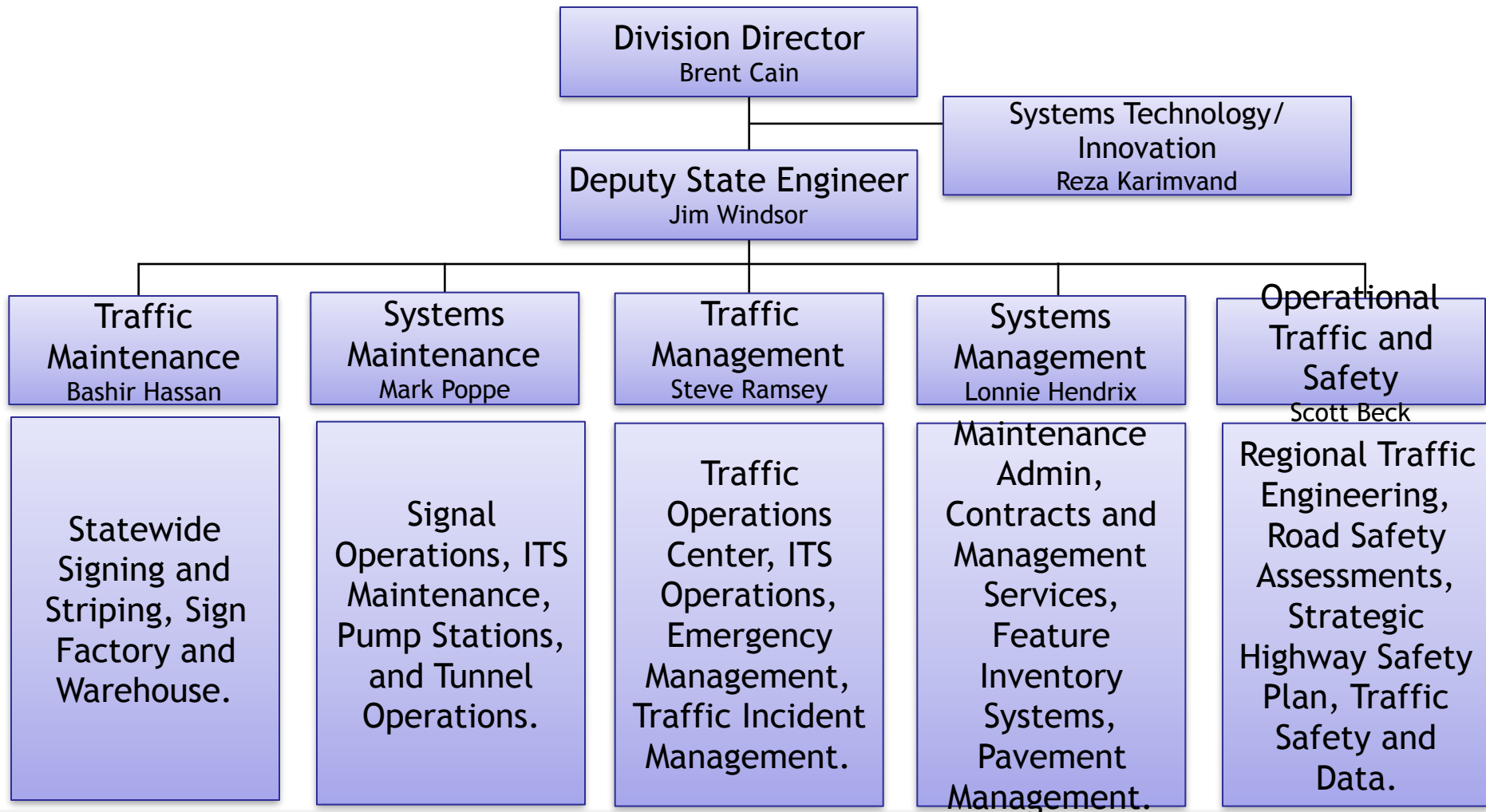
- Consultant hired to bring national best practices
- Identify short-term to long-term initiatives/goals



# TSM&O staffing structure

- Currently evaluating additional efficiency gains across the different groups within TSM&O
- “Deep Dive” process identifying overlaps and waste

# TSM&O Division Organization



# Systems Technology/Innovation

## ➤ Evolutionary/Rapid Technologies

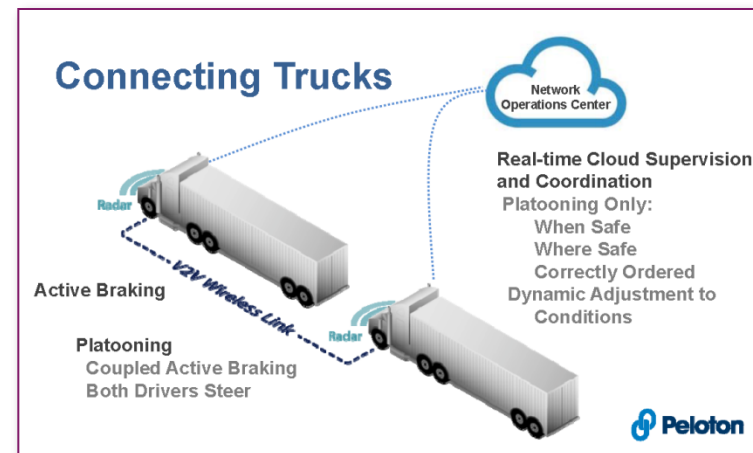
- Connected & Automated Vehicles
- DSRC Communication
- SPaT Challenge

## ➤ Freight

- I-10 Corridor Coalition
- Smart Truck Parking

## ➤ Project Development

- Current Project Support
- Innovation Deployment



# Traffic Maintenance

## ➤ Statewide Signing

- Refine/create asset management system
- Prioritize sign maintenance

## ➤ Statewide Striping

- Develop system LOS measurement
- Balance in-house vs contractor need through “Deep Dive”



# Systems Maintenance

- Traffic Signal Operations
  - Traffic Signal, Ramp Meter, CCTV, and DMS Maintenance
  - Update Traffic Signal Infrastructure in order to deploy ICM Timing Plans
- Phoenix Lighting, Pumps, Tunnels
  - P3 contracts for privatizing
  - Conversion to LED





# Traffic Management

- Traffic Operations Center (TOC)
  - DPS Co-location
  - Improve remote access to field equipment (signals, cameras, ramp meters)
  - Integrated Corridor Management (ICM)
  - Measure uptime for devices
- Traffic Signal Communication
  - Network signals in rural corridors
  - Update timing coordination plans statewide





# Traffic Management

- Traffic Incident Management
  - Train the trainers
  - Quick clearance policy
  - Alt Route/ICM
- Emergency Management
  - COOP/COG
  - SEOC/DEMA/Web-EOC
  - Fire, flood, special events
- Road Weather Management
  - ASU Meteorologist in TOC
  - Winter-storm management



# Systems Management

- Pavement Preservation
  - Statewide procurement - data
- Statewide Permitting (Over-size Loads)
  - Reduce timeframe for over-dimensional freight permitting
- Feature Inventory System
  - Improve asset management tool



# Operational Traffic and Safety

- Speed Limits
  - Variable speed limit (weather)
  - Safety Corridors (enforcement)
- Work Zone Safety
  - Deploy zipper merge
  - Identify Smart WZ technology
- Crash Records
  - Improve electronic submittals
  - Statewide query tool
- SHSP and HSIP Programming
  - Focus on MAP-21 target and re-distribute



# TSM&O Strategic Plan

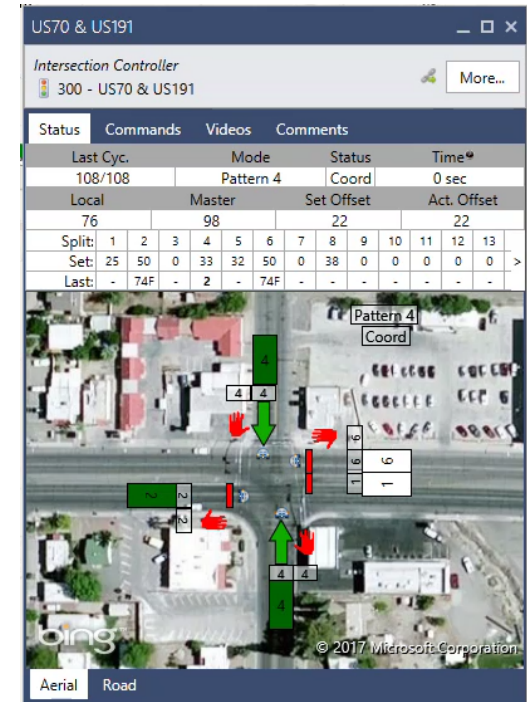
	<b>Immediate Recommendations</b> <b>&lt; 2 YEARS</b>	<b>Near-Term Recommendations</b> <b>2-4 YEARS</b>	<b>Long-Term Recommendations</b> <b>4+ YEARS</b>
<b>TRAFFIC INCIDENT MANAGEMENT</b>	<ul style="list-style-type: none"> <li>Develop a provision to require contractors to take TIM training</li> <li>Formalize ADOT's Quick Clearance policy and roles</li> <li>Create joint ADOT/DPS TIM policies and reporting</li> <li>Develop TIM resources (including website training program)</li> <li>Expand ALERT/FSP to other areas</li> </ul>	<ul style="list-style-type: none"> <li>Establish a Statewide TIM Coordinator</li> <li>Update and automate the Statewide Alternate Routing Plan</li> <li>Expand "Move Over"/"Move Minor Crash" signage and education programs</li> </ul>	<ul style="list-style-type: none"> <li>Develop Regional TIM Coalitions</li> </ul>
<b>FIELD MAINTENANCE</b>	<ul style="list-style-type: none"> <li>Evaluate staff compensation</li> <li>Formalize a career path with promotional opportunities</li> <li>Create training matrix for cross training</li> <li>Develop response-time thresholds for maintenance calls</li> <li>Evaluate P3 opportunities for TSM&amp;O maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Refine/create TSM&amp;O asset management process (FIS)</li> <li>Develop a formalized statewide maintenance training program</li> </ul>	<ul style="list-style-type: none"> <li>Develop a computer-based program to support asset management</li> <li>Evaluate and updating training program</li> </ul>
<b>SAFETY</b>	<ul style="list-style-type: none"> <li>Establish a formal Safety Corridor Program</li> <li>Re-evaluate HSIP programming</li> <li>Finalize Safety Analyst/HSM technology</li> <li>Implement SHSP</li> <li>Refine crash form/electronic form submittal</li> </ul>	<ul style="list-style-type: none"> <li>Update SHSP Plan</li> <li>Implement enhanced GIS/web-based crash reporting and analysis</li> <li>Make safety data available to users</li> <li>Analyze routes with high crash rates and identify low-cost countermeasures</li> </ul>	<ul style="list-style-type: none"> <li>Update SHSP Plan</li> </ul>
<b>PROJECT PROGRAMMING, DEVELOPMENT, AND IMPLEMENTATION</b>	<ul style="list-style-type: none"> <li>Identify and evaluate current and future TSM&amp;O funding sources</li> <li>Develop a 5-year Business Plan to identify TSM&amp;O priority projects</li> <li>Refine TSM&amp;O criteria for ADOT programming process</li> <li>Establish regular meetings with MPD for project programming and implementation</li> <li>Update the PA process to include TSM&amp;O</li> <li>Establish funding ranges for TSM&amp;O improvements</li> </ul>	<ul style="list-style-type: none"> <li>Create a process for performance-based prioritization of TSM&amp;O projects</li> <li>Establish a TSM&amp;O Project Development Engineer position</li> </ul>	<ul style="list-style-type: none"> <li>Update 5-year TSM&amp;O Business Plan</li> </ul>
<b>NEXT GENERATION TECHNOLOGY</b>	<ul style="list-style-type: none"> <li>Develop a Data Assessment to define TSM&amp;O data needs and sources</li> <li>Develop CV/AV strategy</li> <li>Develop a 3-year Technology Plan in coordination with ITG</li> <li>Expand communications links to field devices</li> </ul>	<ul style="list-style-type: none"> <li>Develop a Data Management Strategy with ITG</li> <li>Establish a TSM&amp;O Policy/Research Coordinator position</li> <li>Update Technology Plan &amp; Statewide ITS Architecture</li> <li>Formalize ITG technical staff roles</li> </ul>	<ul style="list-style-type: none"> <li>Update 3-year Technology Plan</li> </ul>
<b>PERFORMANCE MEASURES</b>	<ul style="list-style-type: none"> <li>Finalize TSM&amp;O Performance Measures</li> <li>Develop a Reporting Strategy for internal and external annual reporting</li> <li>Formalize MAP-21 reporting requirements for safety and mobility, align TSM&amp;O Performance Measures to AMS</li> </ul>	<ul style="list-style-type: none"> <li>Distribute a State of the System Report for TSM&amp;O</li> </ul>	<ul style="list-style-type: none"> <li>Conduct a 5-year evaluation of TSM&amp;O Performance at ADOT</li> </ul>
<b>OUTREACH</b>	<ul style="list-style-type: none"> <li>Partner with ADOT Communications to support media coverage and public outreach for TSM&amp;O</li> <li>Establish regular meetings with Regional MPOs</li> <li>Develop a TSM&amp;O inreach strategy to promote TSM&amp;O program internally</li> <li>Create a scheduled program to have TSM&amp;O leadership meet at each ADOT District twice per year</li> </ul>	<ul style="list-style-type: none"> <li>Leverage the Policy Coordinator position to support public outreach</li> </ul>	
<b>PARTNERSHIP WITH UNIVERSITIES</b>	<ul style="list-style-type: none"> <li>Develop an annual TSM&amp;O internship program with statewide universities</li> <li>Update TSM&amp;O Research program through the ADOT Research Center</li> </ul>	<ul style="list-style-type: none"> <li>Formalize partnerships with universities to create projects to support data management and performance measurement</li> </ul>	

➔ Recommendations that build off one another as part of a larger recommendation



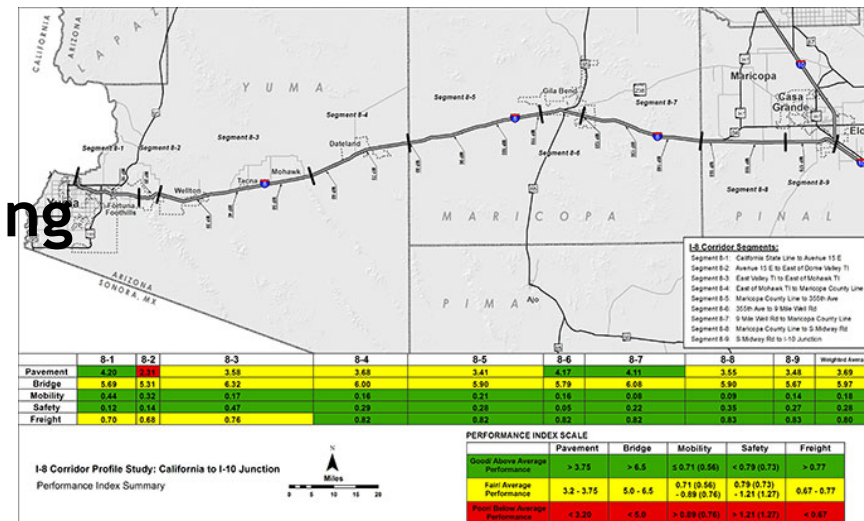
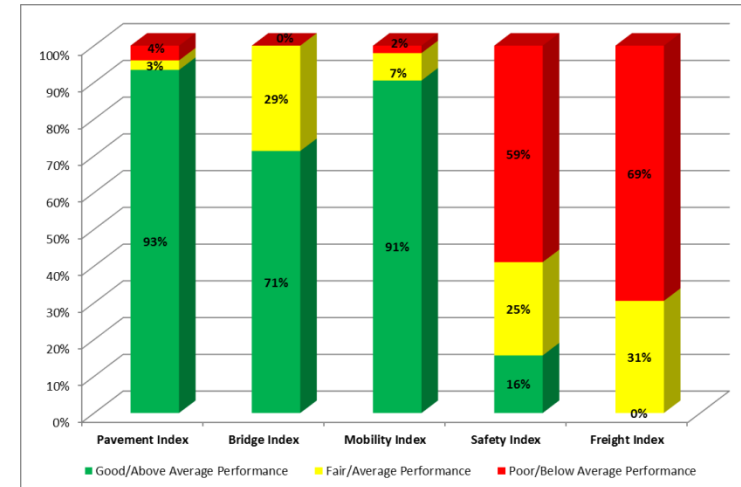
# Project Programming, Development and Implementation

- Identify current and future funding sources
- Develop a 5-year TSM&O Business Plan and identify priority projects
- Work with other Divisions to refine TSM&O criteria for ADOT programming
- Establish regular meetings with MPOs
- Development Engineer to support TSM&O's programming needs



# Performance Measures

- Finalize recommended and required TSM&O performance measures
- TSM&O performance reporting program
  - Frequency of reporting
  - Format of reporting
  - Responsibility for reporting
  - Alignment with P2P



# Research Partnering and Career Development

- Partnership with Universities
  - Create research projects through ADOT Research
  - Identify data management and performance measure opportunities
  - Utilize internships to promote TSM&O careers



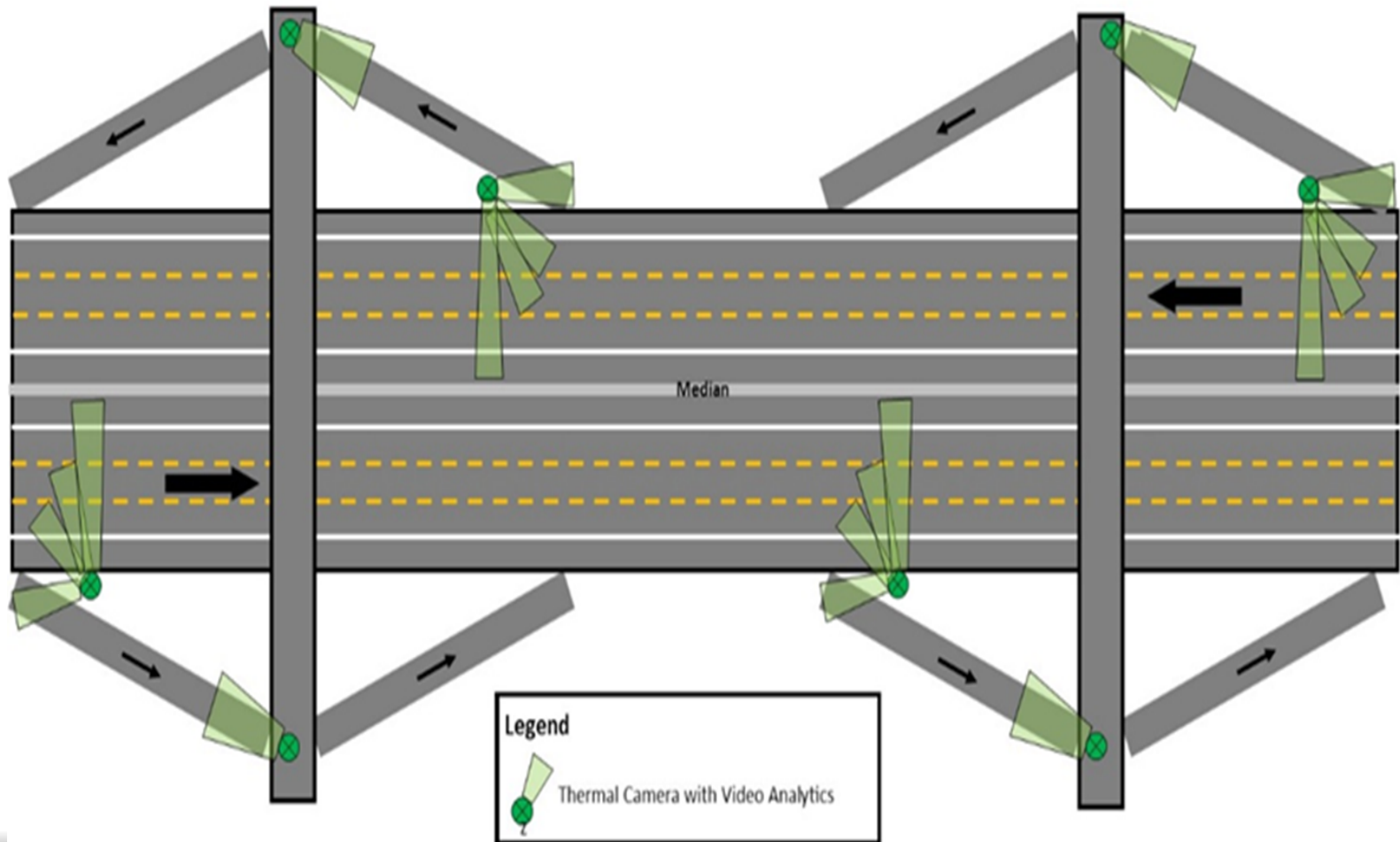


# WWD Pilot Deployment

- **Detection** of a WWD on or entering the freeway
- **Notification** - ADOT TOC - DPS OPCOMM
- **Track** - Automatically position and activate CCTV cameras
- **Warning** - activate DMS WWD messaging

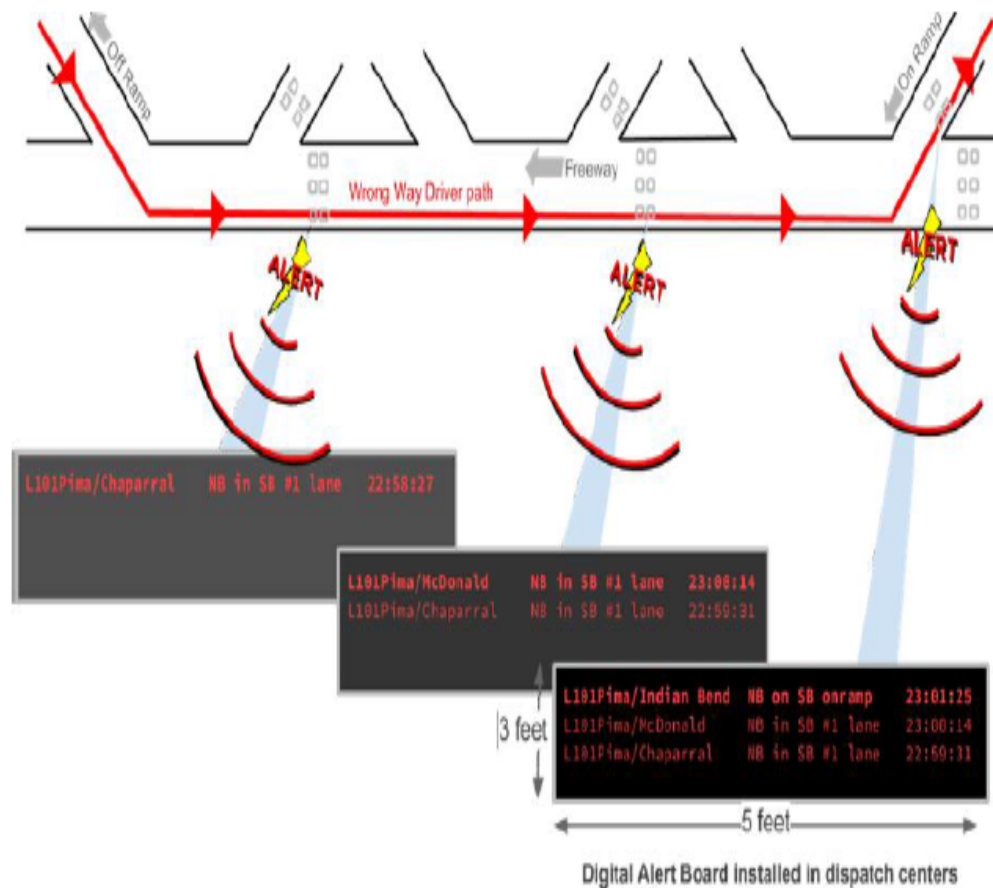


# Detection Element



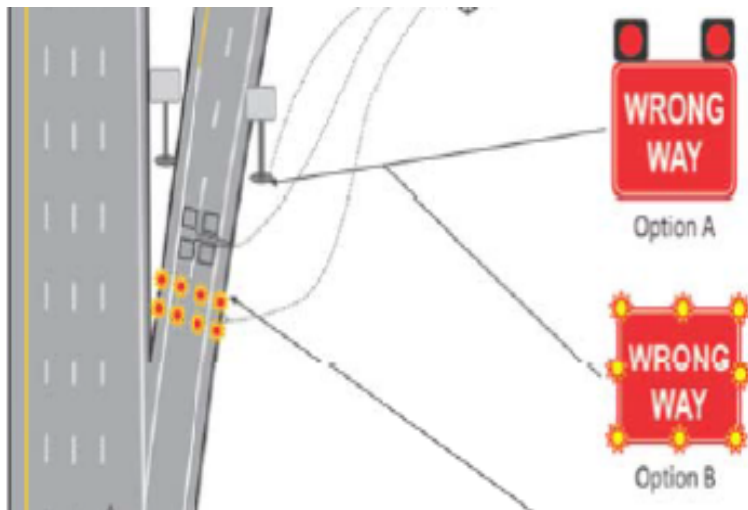
# Notification and Track Elements

- Digital alert board (TOC and DPS OPCOMM)
- Desktop alert notification
- Email notification
- CCTV Cameras Pre-position



# Warning Element

- Warning to the errant driver (ability to self-correct)
- Dynamic Message signs automatically activated

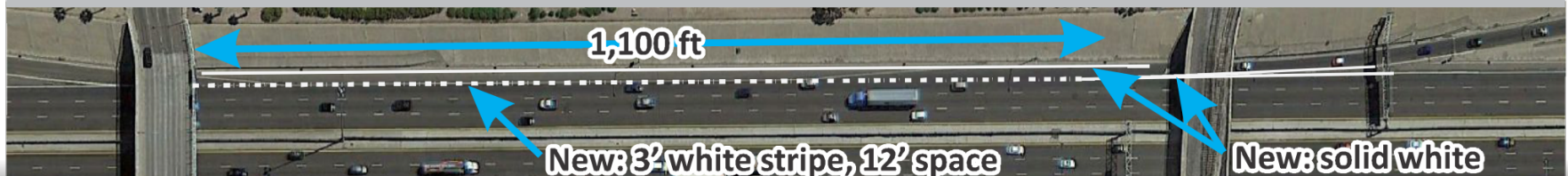


# Freeway Bottleneck Mitigation

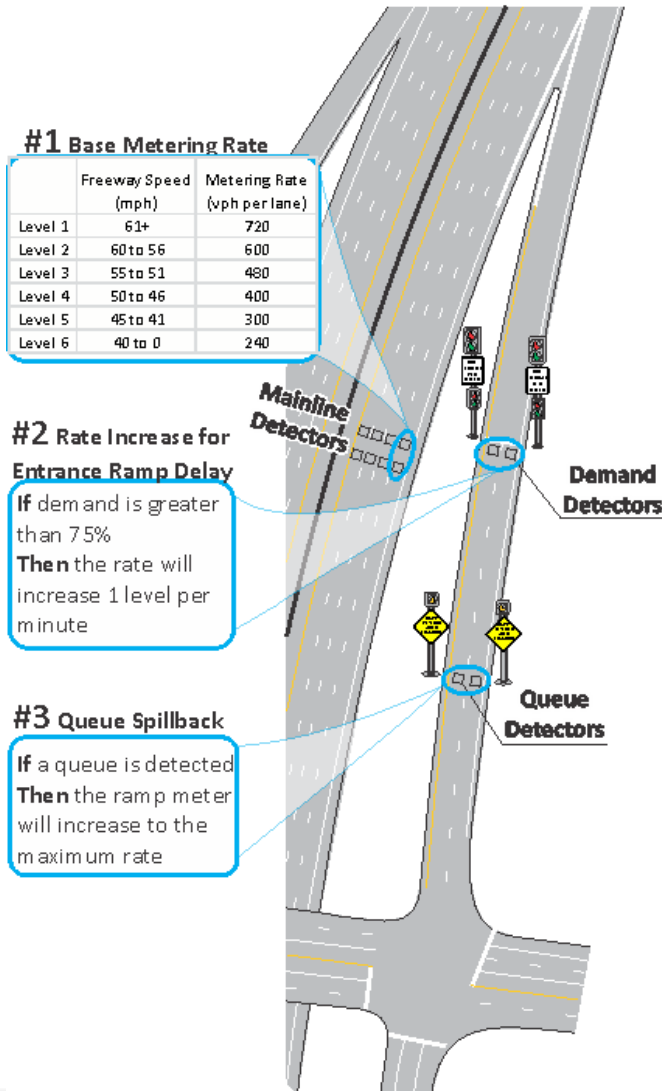
- ▶ **Step #1: Identify freeway bottlenecks**
  - A Lane drop, merge point, or geometry that is overcapacity
- ▶ **Step #2: Develop plans**
  - Most mitigation plans developed by ADOT Engineers
- ▶ **Step #3: Implement low-cost, quick improvements**
  - Striping changes for smooth, efficient merging
  - Minor roadway widening
  - More aggressive ramp metering to manage demand
  - Signal retiming where exit ramp queues to freeway
  - Digital lane control signing to accommodate shifting AM versus PM demand
  - Most improvements completed by ADOT forces

## Example Bottleneck Mitigation

New Striping Creates: 11-foot Auxiliary Lane, 2-foot Shoulder (Narrow)



# Next Generation Ramp Metering



## ► Current Ramp Metering

- Releases vehicles at maximum rate (about 720 vph per lane)
- Affect on freeway congestion is likely minimal

## ► Next Generation Ramp Metering

- Implementation starting this month
- More intelligent by automatically reducing the metering release rate, balancing 3 factors - see graphic
- Goal is to keep the freeway below capacity and above 50 mph
- Achieving this goal will not be possible at locations that are significantly overcapacity
- Improved freeway speed is expected at ALL locations

# SR 51 **SB** from SR 101L to SR 202L

## ► Corridor Adaptive Ramp Metering

**Upstream & downstream ramp meters work together:** At locations where ramp meter queues become excessive, the metering rate will be sped up while another ramp meter with less queue will be slowed down

**Proactively fight congestion:** Individual ramp meters can “see” traffic detectors miles downstream and meter as needed to keep the corridor below capacity

**Cost-effective:** Less than \$100k for hardware, software, consultant, and ADOT staff time. New plug-and-play processor chip and software in existing controllers, and new central control software by Intelight.

**Algorithm:** Custom algorithm developed for SR 51 using the built-in capabilities of Intelight system.

**Benefits:** “Before” and “after” delay will be evaluated. Safety, fuel use, air quality impacts will be evaluated in the future.



# Communication Efforts Supporting Operations/TSM&O

- ▶ PIOs in Traffic Operations Center, 20/7/365
- ▶ Active engagement on social media platforms
- ▶ Collaboration with statewide law enforcement
- ▶ Management of public-facing elements of 511 system
- ▶ PIOs in TIM training
- ▶ Communications project manager focused on safety and operations/TSM&O
- ▶ Coordination with media, in and out of TOC
- ▶ Applying the 'human touch' to communicating info

# Questions?

