

# Regional Operations Forum Transportation Systems Management & Operations

## TSM&O Caltrans Statewide Perspective

December 15-17, 2015 – East Bay  
California



**Transportation Investments have more impact if built upon this foundation**

### The Promise of TSM&O

“We promise **travelers and shippers** that we will **manage** traffic and incidents as well as provide timely and accurate travel information so that they can make informed decisions to **minimize their unexpected delay and improve the safety** of their travel.”

SHRP2 L17 Technical Report

# Transportation Systems Management & Operations

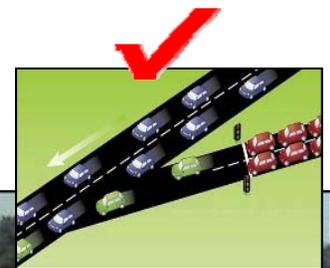
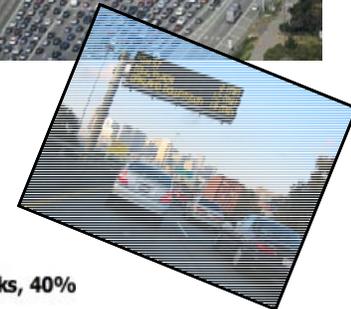
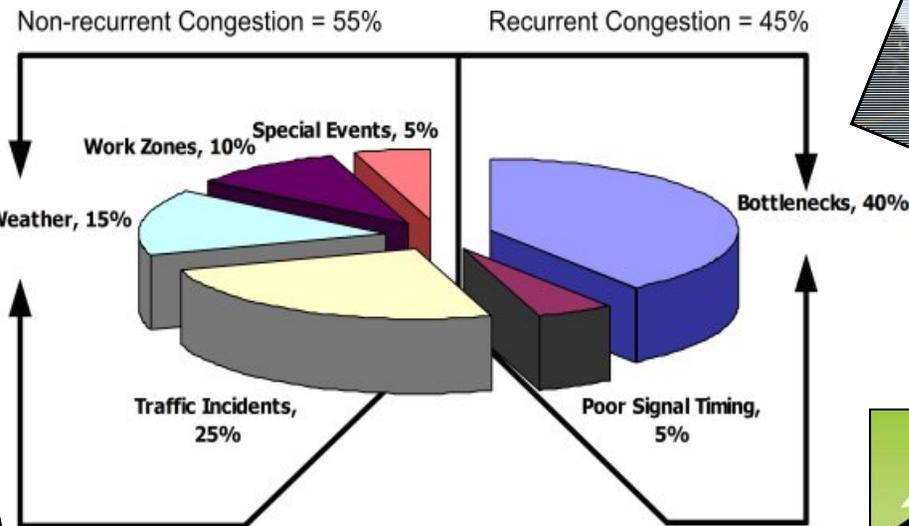
## Traditional Approach to Managing Transportation

- Predict future (long range) traffic volumes
- Fund major capital projects to provide additional capacity

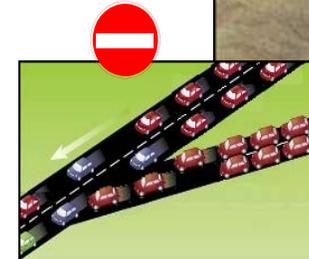
This only addresses 45% of the congestion problem

- Also becoming more and more difficult to provide new capacity

## New Approach to Managing Transportation



Delay



# TSM&O Strategic Growth Plan / CMIA Legacy

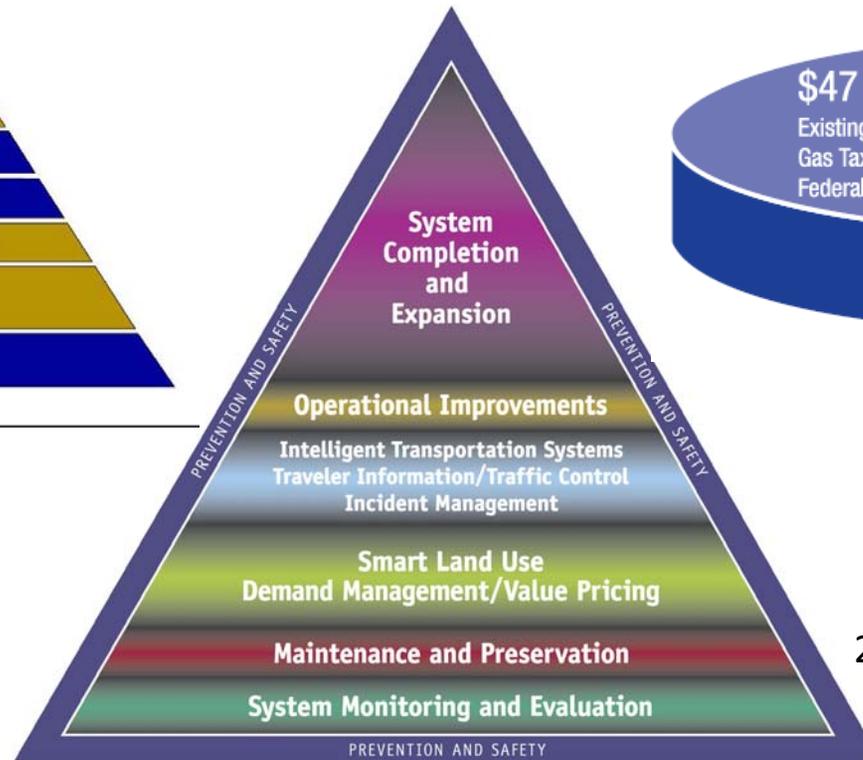
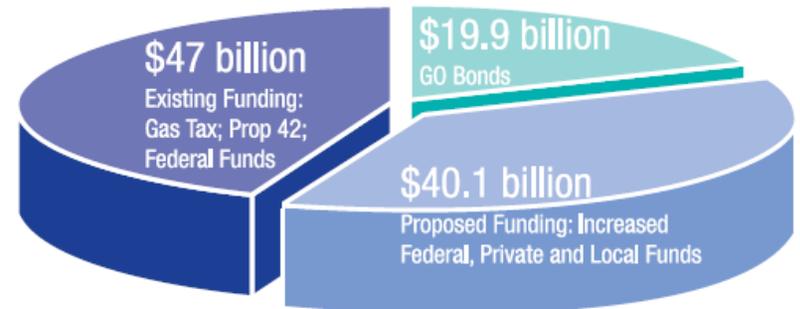
2000



**Governor Arnold Schwarzenegger's Strategic Growth Plan:  
Transportation Investments for Mobility and Quality of Life**

*TMS are the business processes and associated tools, field elements and communication systems that help maximize the productivity of the transportation system.*

2004



2007

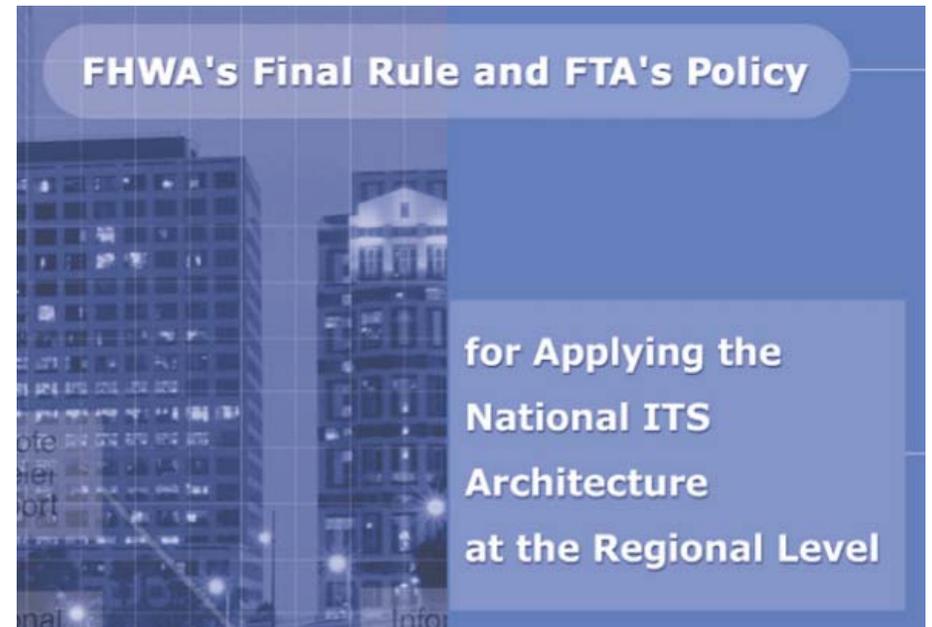
**Transportation Investments have more impact if built upon this foundation**



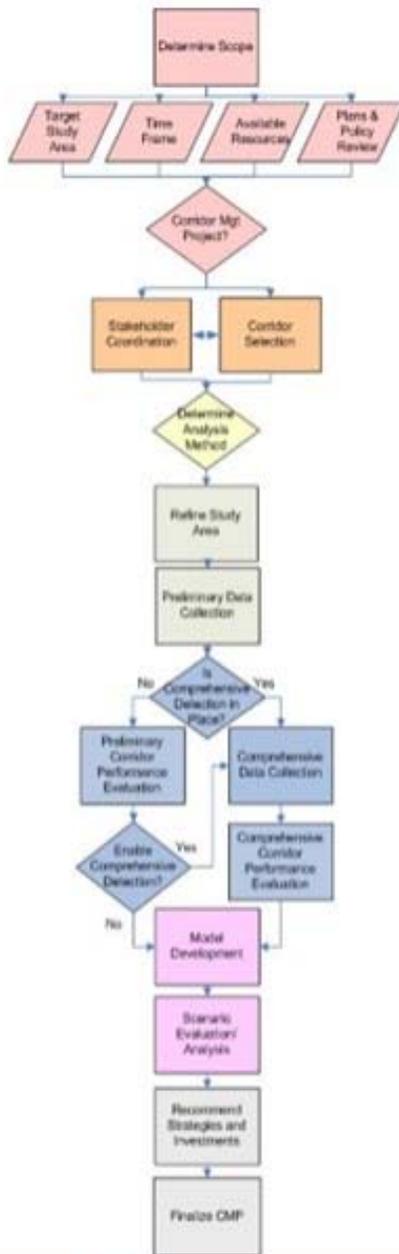
# TSM&O Coordination: ITS Mainstreaming efforts



*ITS Mainstreaming initiatives*  
*ITS Architecture requirement*



# TSM&O and Corridor System Management Planning

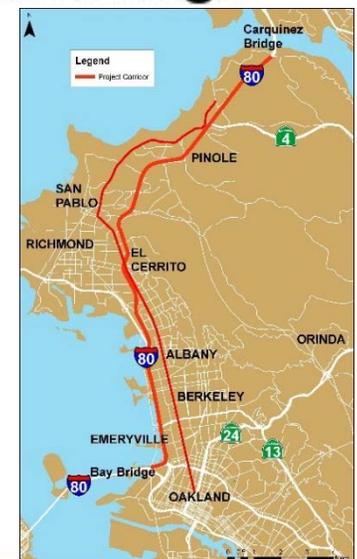


## A Corridor System Management Plan responds to the following questions:

- How is a travel corridor performing?
- Why is it performing that way?
- What system management strategies best address the problems?

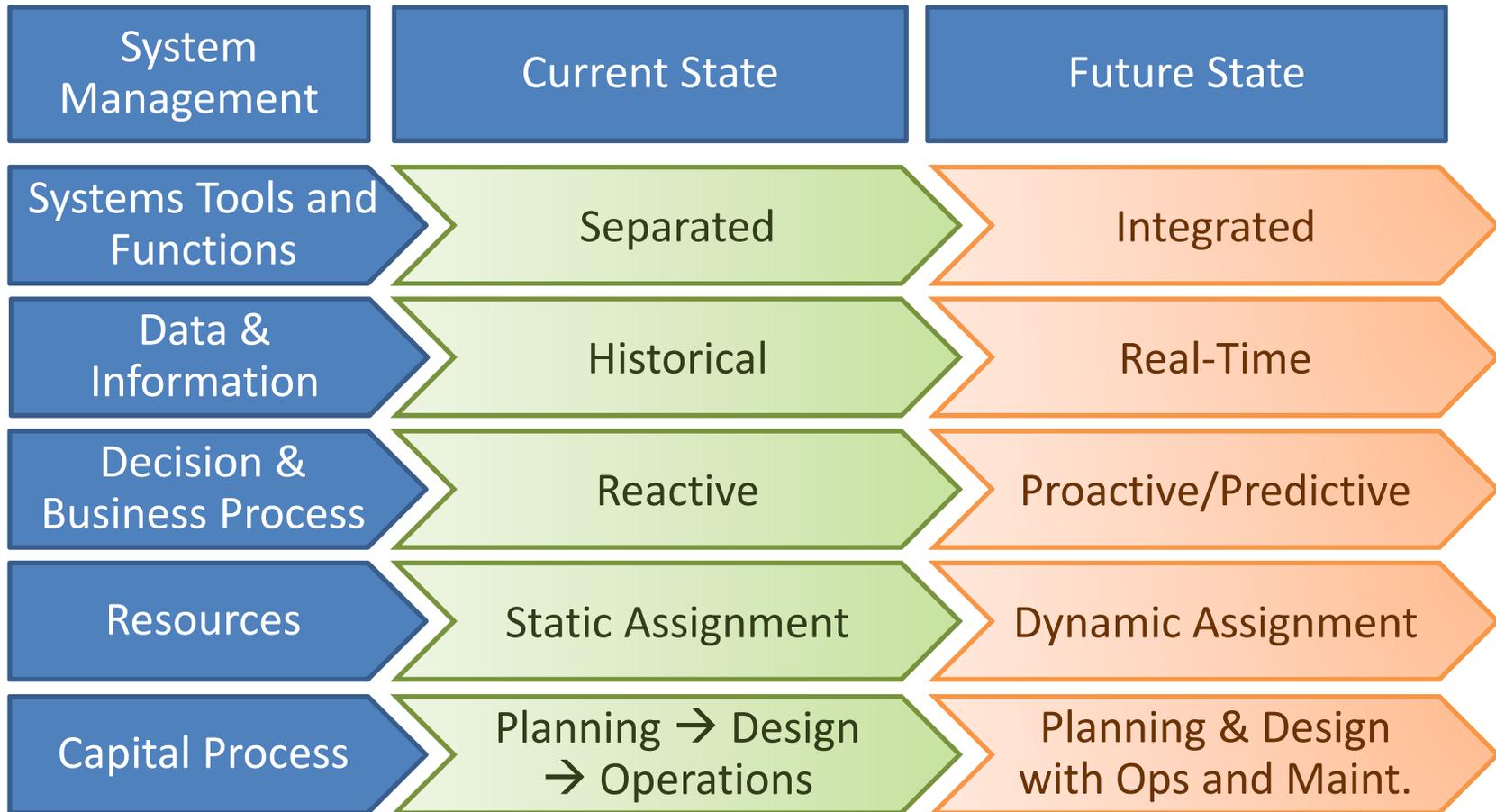
## Objective:

Performance based decision making.



# Transportation Systems Management and Operations

## Current and Future State



# Transportation Systems Management & Operations

## ***TSM&O Goals \****

*System Management Culture / Performance-Based / Well-Maintained /  
Cooperative Management / Consensus on Standards /*

- **Create a system management culture.**
- **Performance-based framework for all TMS work activities and funding prioritization.**
- **Establish a well-maintained and high-performing TMS infrastructure that supports real-time traffic management.**
- **Cooperatively develop and implement real-time (active) traffic management to optimize flow, safety and aid regions and the State to meet greenhouse gas reduction (GHG) targets from transportation.**
- **Renew consensus on and adhere to critical statewide standards.**



*\* From Caltrans 2013 TMS Business Plan*

## Shaping Our Future

- *TSM&O Goals and Policy (TMS Business Plan - 2013)*
- *California Transportation Investment Program Needs – 10 Yr Performance Based*
  - *Making the case for operational investments, link to goals - Fix It First*
- *SHRP2 Implementation - TSM&O Implementation Plan – Regional Ops Forums/CMM Workshop*
- *D3 RCTO / ITS-Operations Plans*

## Caltrans TSM&O Progress

- ***2015-2020 Caltrans Strategic Management Plan – e.g., Stewardship and System Performance Goals***
- ***Draft TSM&O Director’s Policy -08 & Draft ITS DD-70***
- ***25 Top Priority Corridors***
- ***National Engagement***
  - 2012 SHRP2 Capability Maturity Model Self Assessment
  - SHRP 2 Lead Adopter Federal Technical Assistance \$200,000 – Approved Implementation Plan
- ***Integrated Corridor Management - Connected Corridors D-7 Pilot***
- ***Transportation Management System Pilot Corridors Study***
- ***Regional Operations Forums/Capability Maturity Model Self Assessments (Scheduled)***
- ***Caltrans TSM&O Steering Committee***
- ***Planning for Operations Study***

# Transportation Systems Management & Operations Progress

## 2015-2020 Caltrans Strategic Management Plan –

### System Performance Goal

- ❑ Top 25 Corridors (peak travel time delay)
- ❑ ICM Implementation Plans – by 2018, 5 corridors (I-210, **I-80**, SR-57, I-110, SR-91)
- ❑ ICM Implementation – by 2020, 3 corridors (I-210, **I-80**, SR-57)



# TSM&O

## Corridor Performance Measurement

Baseline, quarterly and annual gathering and reporting of data:

### Traffic Operations:

- **Safety** – Number of incidents, major incident clearance time, and prevention of severe secondary collisions
- **Travel Time Reliability/Peak Period Travel Time** – TMS element health\*, peak period and total daily delay under 35 mph\*, corridor travel time reliability\*

### Maintenance:

- **Level of Service – Timeliness of Maintenance Response:**
  - “Preventative Maintenance” checks (K-family electrical performance on time or not)
  - Number of tickets open in TRAC (average, minimum/maximum, days to close)

### Other benefits:

\*Real-time multimodal system information

\*Included in 2015-2020 Caltrans Strategic Management Plan



# Transportation Systems Management & Operations

## TSM&O Cornerstones

- **TSM&O Policy: Draft DP-08 R1**

California Department of Transportation

Serious drought.  
Help save water!

### *Director's Policy*

<i>Number:</i>	DP-08-R1
<i>Effective Date:</i>	TBD by DBFS Administrator
<i>Supersedes:</i>	DP-08 (12/30/1992), DP-26 (08/2006)
<i>Responsible Program:</i>	Traffic Operations

*TITLE* Transportation System Management and Operations

#### *POLICY*

In order to optimize California's transportation system's performance for all system users and modes, the California Department of Transportation (Caltrans) commits to effective Transportation System Management and Operations (TSM&O). TSM&O is the integration of projects, business processes, systems, technology, performance measurement, organization and workforce to actively and efficiently manage California's transportation system. In partnership with others, Caltrans uses TSM&O to preserve system capacity, while improving safety, security, reliability, and sustainability.

#### *INTENDED RESULTS*

The intent of this policy is to promote TSM&O strategies as crucial tools in meeting Caltrans mission to provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability. TSM&O strategies are essential to a performance-based decision making process Caltrans will use to improve the efficient and effective operation of the transportation network. Examples of TSM&O strategies include:

- Ramp metering
- Traffic signal synchronization
- Intelligent Transportation Systems (ITS)
- Real time traveler information
- Incident and special event management
- Managed lanes
- Traffic Management Plans (TMPs)
- Dynamic lane management



# Transportation Systems Management & Operations

## Planning for Operations

### TSM&O Cornerstones

- **Intelligent Transportation Systems: DD-70-R1**

California Department of Transportation

Serious drought.  
Help save water!

### Deputy Directive

Number:	DD-70-R1
Refer to Director's Policy:	DP-08-R1 Transportation System Management
Effective Date:	TBD
Supersedes:	DD-70 Transportation Management Systems (06-05-02)
Responsible Program:	Maintenance & Operations

**TITLE** Intelligent Transportation Systems

### POLICY

The California Department of Transportation (Caltrans) implements Intelligent Transportation Systems (ITS) that support full Transportation System Management (TSM) to improve the safety, reliability, and efficiency of multi-modal transportation throughout the State. Caltrans supports deployments of integrated transportation services that support TSM strategies while making the best use of limited resources, and engaging in long-term planning for technological solutions to transportation problems.

### DEFINITION/BACKGROUND

ITS enables coordinated and integrated service systems to improve the security, performance, and cost-effectiveness of transportation services, vehicles, and infrastructure. This policy promotes an information-based transportation network that enables a performance-based evaluation of the State's transportation network. Caltrans partners with metropolitan planning organizations and regional transportation planning agencies that maintain regional ITS architectures throughout the state. This policy promotes the use of a systems engineering methodology to ensure that Caltrans' systems and projects are developed to meet the needs of the traveling public, state, regional, and local stakeholders.

ITS-Electronics, communications, or information processing used singly or in combination to improve the efficiency and safety of surface transportation systems.

ITS Architecture-A common framework for ITS interoperability comprising logical and physical components to satisfy a defined set of user services.



# Transportation Systems Management & Operations

## TSM&O Cornerstones: **Capability Maturity Model (CMM)**

Excerpt from: AASHTO TSM&O One-Minute Guidance Evaluation

[http://www.aashtotsmoguidance.org/one\\_minute\\_evaluation/](http://www.aashtotsmoguidance.org/one_minute_evaluation/)

Dimension	Level 1	Level 2	Level 3	Level 4
<b>Business Processes</b> <i>(Planning, programming, budgeting, implementation)</i>	Processes related to TSM&O activities ad hoc and un-integrated	Multiyear statewide TSM&O plan and program exists with deficiencies, evaluation, and strategies	Programming, Budgeting, and project development processes for TSM&O standardized and documented	Processes streamlined and subject to continuous improvement
<b>Systems &amp; Technology</b> <i>(Systems engineering, standards and technology interoperability)</i>	Ad hoc approaches outside systematic systems engineering	Systems engineering employed and consistently used for ConOps, architecture and systems development	Systems and technology standardized, documented and trained statewide, and new technology incorporated	Systems and technology routinely upgraded and utilized to improve efficiency performance
<b>Performance Measurement</b> <i>(Measures, data &amp; analytics and utilization)</i>	No regular performance measurement related to TSM&O	TSM&O strategies measurement largely via outputs, with limited after-action analyses	Outcome measures identified and consistently used for TSM&O strategies improvement	Mission-related outputs/ outcomes data routinely utilized for management, reported internally and externally, and archived
<b>Culture</b> <i>(Technical understanding, leadership, outreach, and program authority)</i>	Value of TSM&O not widely understood beyond champions	Agency-wide appreciation of the value and role of TSM&O	TSM&O accepted as a formal core program	Explicit agency commitment to TSM&O as key strategy to achieve full range of mobility, safety and livability/ sustainability objectives
<b>Organization/Workforce</b> <i>(Organizational structure and workforce capability development)</i>	Fragmented roles based on legacy organization and available skills	Relationship among roles and units rationalized and core staff capacities identified	Top level management position and core staff for TSM&O established in central office and districts	Professionalization and certification of operations core capacity positions including performance incentives
<b>Collaboration</b> <i>(Partnerships among levels of government and with public safety agencies and private sector)</i>	Relationships on informal, infrequent and personal basis	Regular collaboration at regional level	Collaborative interagency adjustment of roles/responsibilities by formal interagency agreements	High level of operations coordination institutionalized among key players –public and private

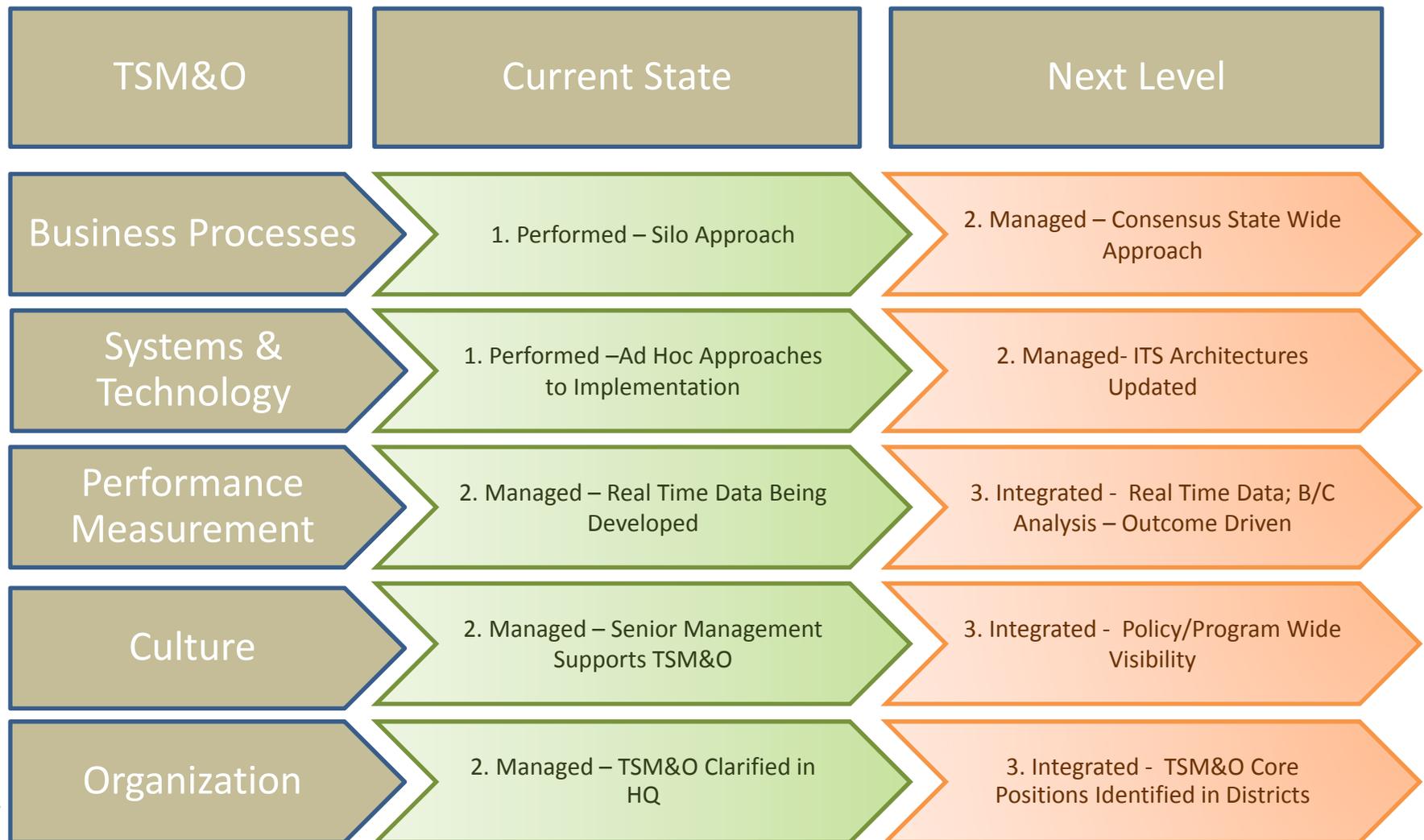
## Capability Maturity Model – Self Assessment A Tool to Assess Progress

**Table 4. Comparison of Region-wide Traffic Management CMF Capability Assessment by 2012 and 2014 Workshop Participants**

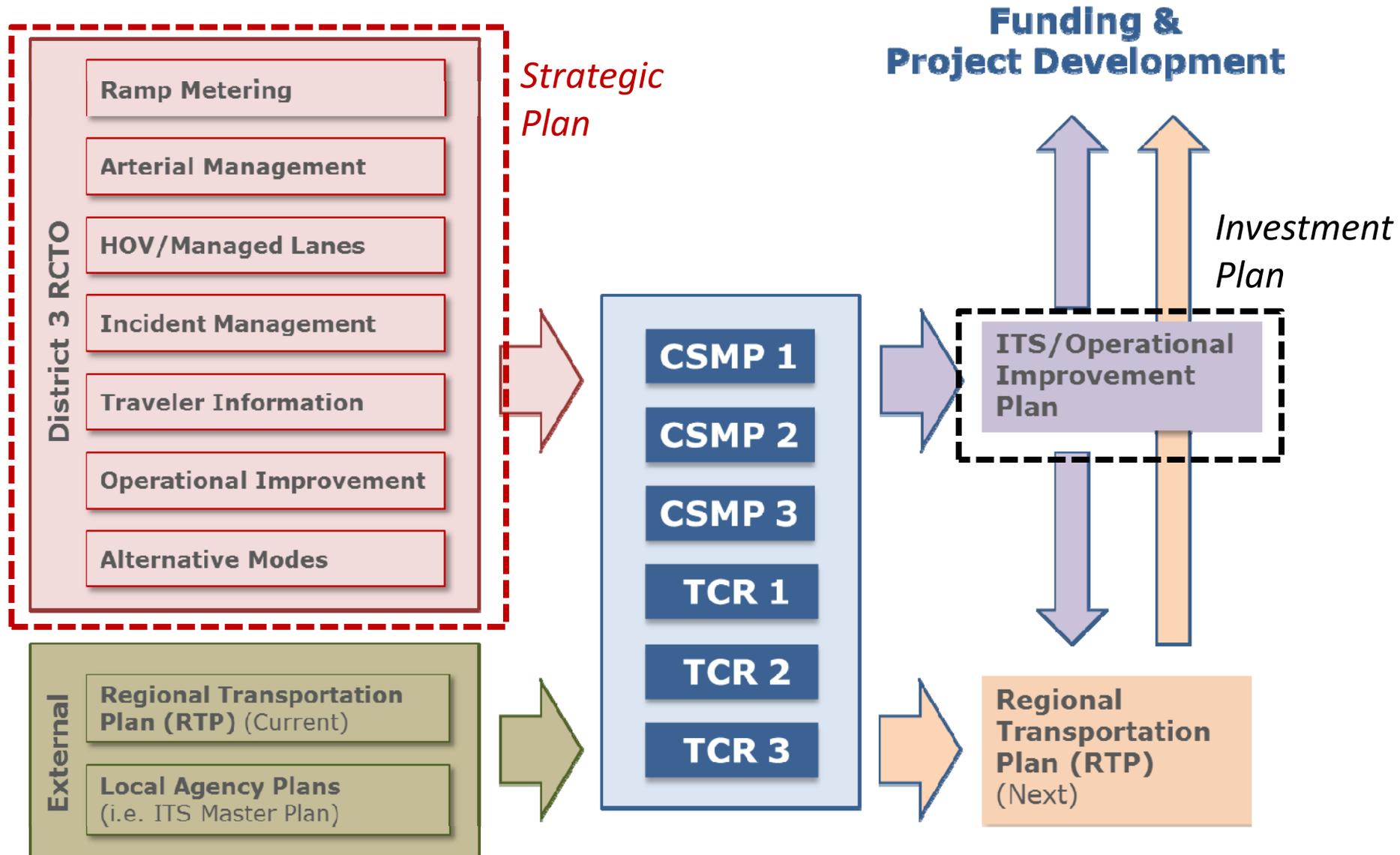
Dimension	2012 LA CMF Workshop Participants				2014 Workshop Participants
	Level 1	Level 2	Level 3	Level 4	
Business Process	1+				2.33
Systems & Technology		2-	3+ (Caltrans/ Safety)		2.17
Performance Management	1				1.67
Culture	1	2 (Caltrans)			2.00
Organization & Workforce		2			2.83
Collaboration	1+ (routine)		3 (emergencies)		2.67

# Transportation Systems Management & Operations Capability Maturity Model – Caltrans Statewide Mgmt

## TSM&O Cornerstones: CA Capability Maturity Model (CMM) Self Assessment -2013                      2015-2017 (?)



## Process for planning for future operations



# Transportation Systems Management & Operations

## Planning for Operations

### ***Achieving TSM&O Goals***

*Partnerships / Data / Training / Communication / Integration*

#### **Institutional Integration**

Coordination to collaboration between various agencies and jurisdictions that transcends institutional boundaries.

#### **Operational Integration**

Multi-agency and cross-network operational strategies to manage the total capacity and demand of the corridor.

#### **Technical Integration**

Sharing and distribution of information, and system operations and control functions to support the immediate analysis and response.

# Transportation System Management & Operations

## Integrated Corridor Management

While the ICM term is well known, various existing management efforts already support the ICM concept, particularly ITS applications. The key to ICM is integrating existing ITS and management efforts with new concepts and relationships to develop a coherent multi-modal, multi-jurisdiction, corridor-wide transportation management system.



## California Connected Corridors Program

A Statewide Program for the most highly congested un-reliable corridors in CA to lead Integrated Corridor Management in partnership with others – can be replicated

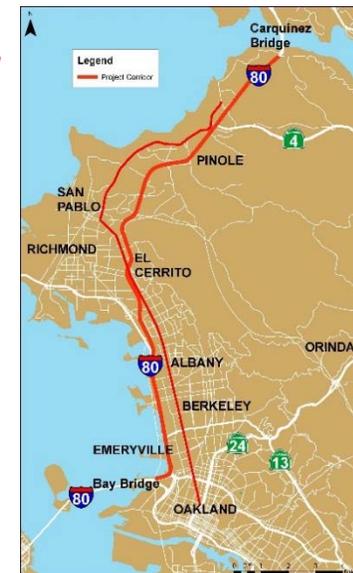
elsewhere

Website: [www.connected-corridors.berkeley.edu](http://www.connected-corridors.berkeley.edu)



## Shaping Our Future

- **CA Connected Corridors Program**
  - *I-210 Pilot Corridor*
  - *Corridor Performance Reports Templates*
  - *Technical Assistance and Training*
  - *District 7 Operations (and Planning) Reorganization*
  - ***Transportation Management System (TMS) Pilot Corridors***
    - *I-80*
    - *I-210/10/605*



# Connected Corridors - Corridor Selection Criteria

## Traffic Operations Selection Criteria:

- High Annual Vehicle Hours Delay (AVHD) under 35 mph (Corridor ranked in Top 50 most congested corridors for AVHD under 35 mph in California)
- High number of incidents and the incident response time
- High level of partnership participation to improve corridor performance
- Degree of parallel arterial and multimodal capacity
- The number of on and off-ramps connected to parallel local arterials
- Greatest opportunity for or includes local arterial detection and signal synchronization
- Extent of existing TMS field elements e.g., detection health in corridor and on-ramps
- Minimal impact by construction/closures

## All Partners:

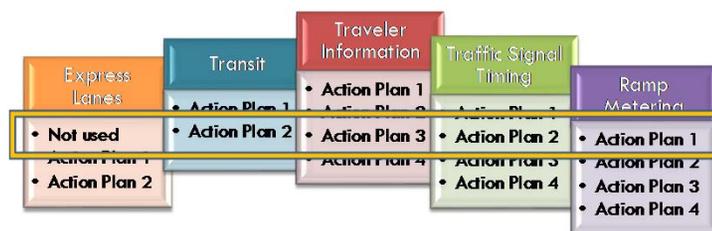
- Enhanced traffic monitoring systems
- Enhanced communication
- Freeway operations
- Arterial operations
- Enhanced traveler information
- Decision support system
- Enhanced data/information sharing



## Local:



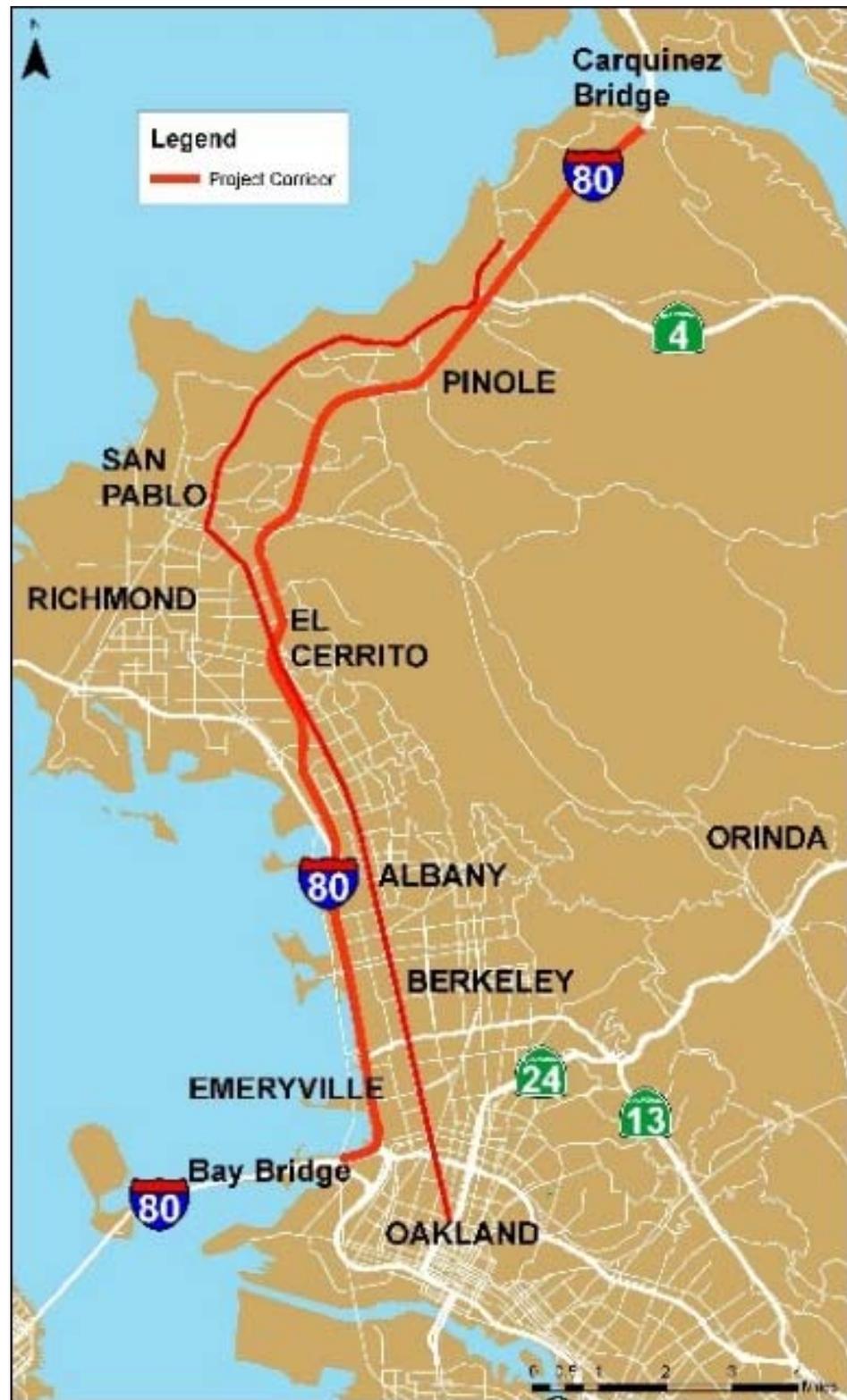
## Prop 1B CMIA/TLSP MTC – Freeway Performance Initiative





RSS for Media (Events, Link Data)	Interactive Voice Response (IVR)
ALERT System	My511 Mobile App
Public Website	Links to Social Medias

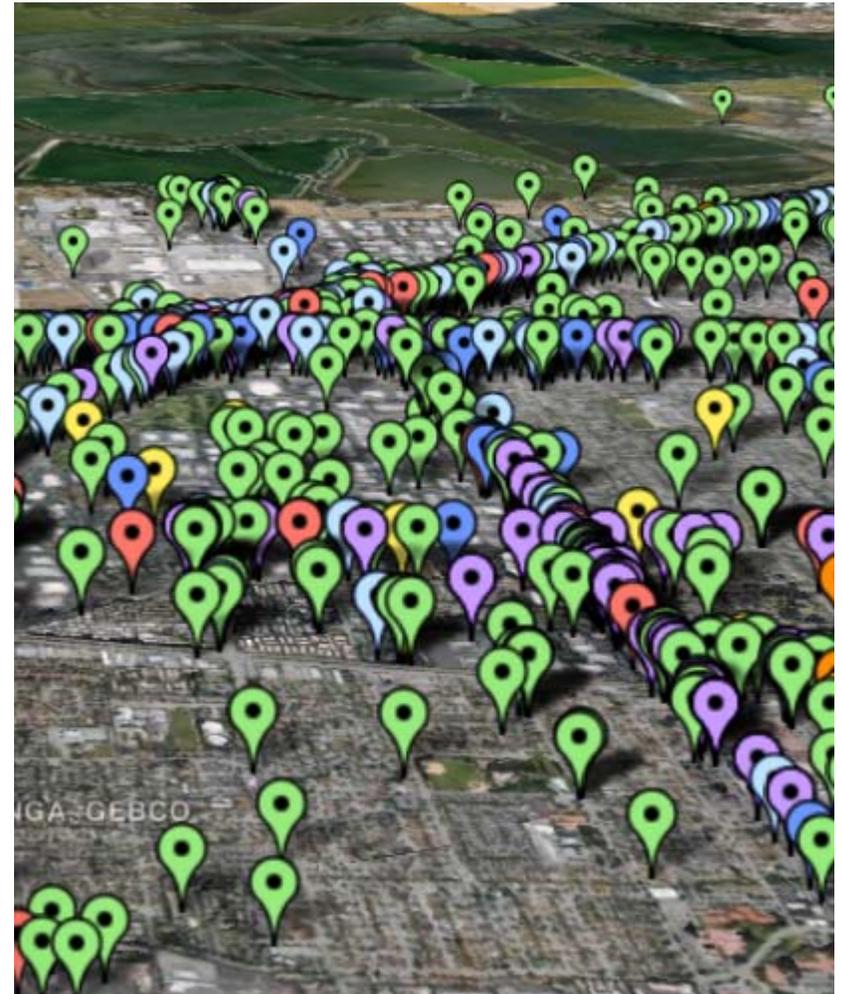
# I-80 Smart Corridor



# Transportation Systems Management & Operations

## CA Connected Corridors Program

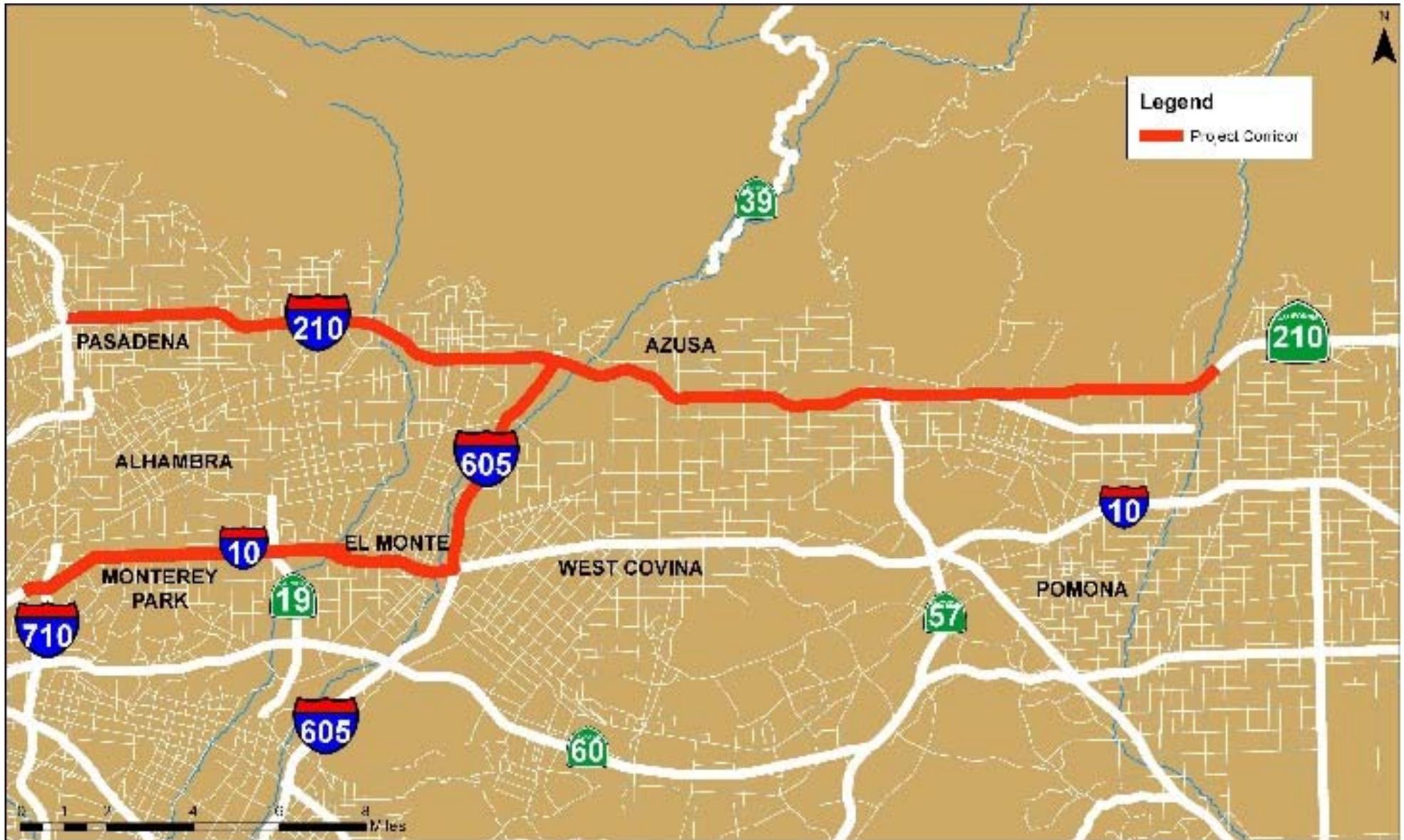
- Enable existing transportation infrastructure and vehicles to work together in a highly coordinated manner
- Deliver improved corridor performance (safety, reliability, mobility)
- Improve accountability
- Evolve Caltrans to real-time operations and management
- Enhance regional , local and private sector partnerships



# Orange County Connected Corridors (ICM) Focus



# I-210 Connected Corridors (ICM) Pilot Corridor and TMS Pilot Corridor

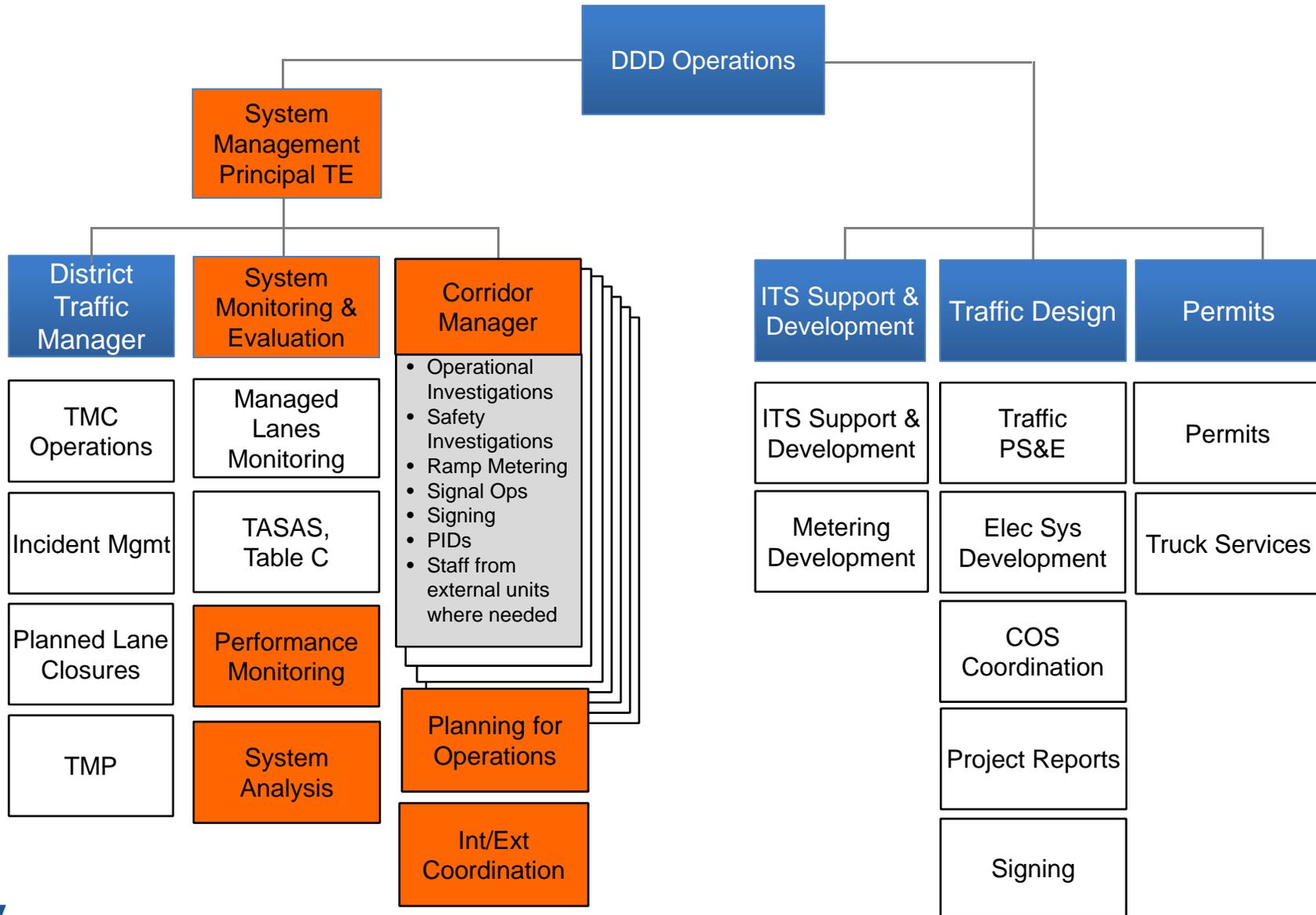


# Transportation System Management & Operations

## Integrated Corridor Management – Connected Corridors I-210 Pilot

- Improvements in travel time reliability and delay
- Reduce incident response times
- Likely reduction in secondary incidents, leading to improvements in safety
- Enhanced coordination between agencies, traffic managers, transit managers, and first responders
- Increased attractiveness of transit services
- Improve traveler experience

# District 7 Operations Reorganization: Long Term



# District 12 Organization/Management Structure

## Existing Org. Chart and Structure for the Division of Operations

Traffic Ops NORTH	Traffic Ops SOUTH	Traffic Studies & Toll Roads	HOV & Managed lanes	Traffic Management	Ramp Metering & ITS System Development	Electrical Systems	TMP, DTM & TMT	Permits	Trucks & SHOPP
Operational Investigations	Operational Investigations	Toll Road Operational Investigations	HOV/HOT Lanes	TMC Operations	Ramp Metering & Development	Signal Operations	TMP	Permits Review	Oversized Truck Services
IGR Reviews	IGR Reviews	Toll Road IGR Reviews	Legal, COS & Capital PS&E Support	District Traffic Mgr	ITS Support & Development	Communications and ITS	DTM	Permits Inspection	SHOPP Management
Signing	Signing	Signing	PIDs	Incident Mgmt	COS & Capital PS&E Support	Network Management	TMT	Special Events	Division resources
PIDs	PIDs	Safety Investigations	HOV Congestion Monitoring	Planned Lane Closures	ATMS	COS & Capital PS&E Support			
Legal, COS & Capital PS&E Support	Legal, COS & Capital PS&E Support	TASAS, Census & Table C	Safety Review Committee chairman	COS Coordination	System Monitoring				
Congestion Monitoring Report	ADA Coordination	PIDs							
		Legal, COS & Capital PS&E Support							

# District 12 Organization/Management Structure

## Proposed Org. Chart and Structure for the Division of Operations

Traffic Ops NORTH WEST	Traffic Ops SOUTH WEST	Traffic Ops SOUTH EAST Studies & Toll Roads	Traffic Ops NORTH EAST	Traffic Management	Ramp Metering & ITS System Development	Electrical & Communication	<del>TMP, DTM &amp; TMT</del>	Permits	Corridor Manager & SHOPP
Operational Investigations	Operational Investigations	Toll Road Operational Investigations	HOV/HOT Lanes	TMC Operations	Ramp Metering & Development	Signal Operations	<del>TMP</del>	Permits Review	TSM Corridor Manager
IGR Reviews	IGR Reviews	Toll Road IGR Reviews	Legal, COS & Capital PS&E Support	District Traffic Mgr	ITS Support & Development	Communications and ITS	<del>DTM</del>	Permits Inspection	SHOPP Management
Signing	Signing	Signing	Signing	Incident Mgmt	COS & Capital PS&E Support	Network Management	<del>TMT</del>	Special Events	Division resources
PIDs	PIDs	PIDs	PIDs	Planned Lane Closures	ATMS	COS & Capital PS&E Support		Oversized Truck Services	
TMP	TMP	TMP	TMP	COS Coordination	System Monitoring	TSM Corridor Network Management			
Legal, COS & Capital PS&E Support	Legal, COS & Capital PS&E Support	TASAS, Census & Table C	HOV Congestion Monitoring	DTM	TSM Corridor Ramp Metering	TSM Corridor Communication			
Congestion Monitoring Report	ADA Coordination	Safety Investigations	Safety Review Committee chairman	TMT	TSM Corridor Central System Application	TSM Corridor Signal Operation			
HOV/HOT Lanes	HOV/HOT Lanes	Legal, COS & Capital PS&E Support							



# Upcoming CA TSM&O Related Efforts

❑ Connected Corridors Charter and Concept of Operations (ICM Examples & Templates)

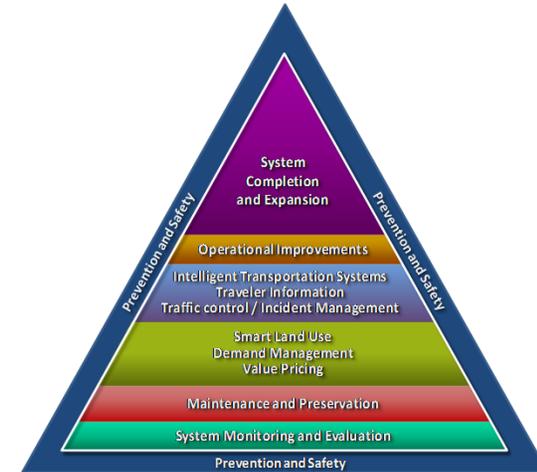
❑ Follow on to Organizing for Corridor Management Study and Implementation –

- ❑ Defining roles, responsibilities and necessary skills (Templates for ICM future)

❑ District 12 (Orange Co.) 1-day Regional ICM Workshop with Partners (April 2015)

❑ FHWA ICM Grant \$200,000 – I-210 Concept of Operations Plan

❑ Transportation Management System (TMS) Pilot Corridors Study



# Upcoming CA TSM&O Related Efforts

## ❑ Tailored Regional Operations Forums/Capability Maturity Model (CMM) Self Assessments

### ❑ New 3 Day Regional Operations Forum (ROF)/ CMM

❑ D-12 Orange County ROF/CMM Date: August 4-6

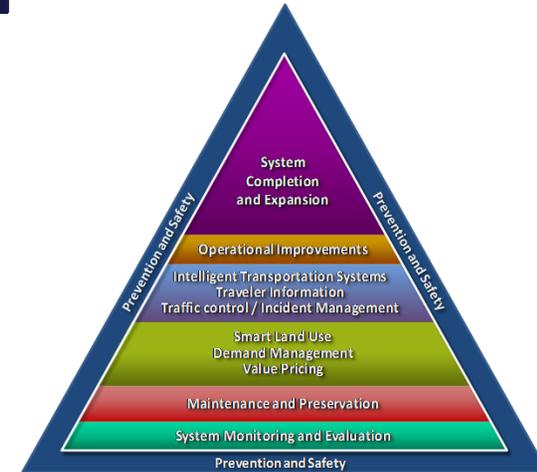
❑ D-4 East Bay Counties- Bay Area ROF/CMM December 14-16, 2015)

❑ Other Regions/districts 3,8,11 in 2016

### ❑ Asset Management

### ❑ Caltrans-sponsored research

### ❑ TOPL operations analysis tool



# Transportation System Management & Operations - California

*Questions...*

