

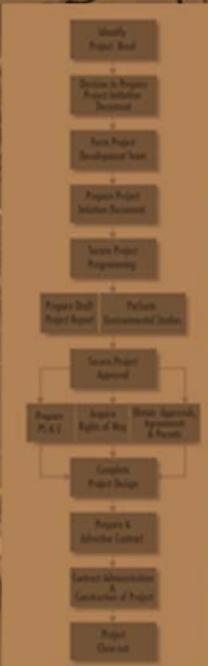
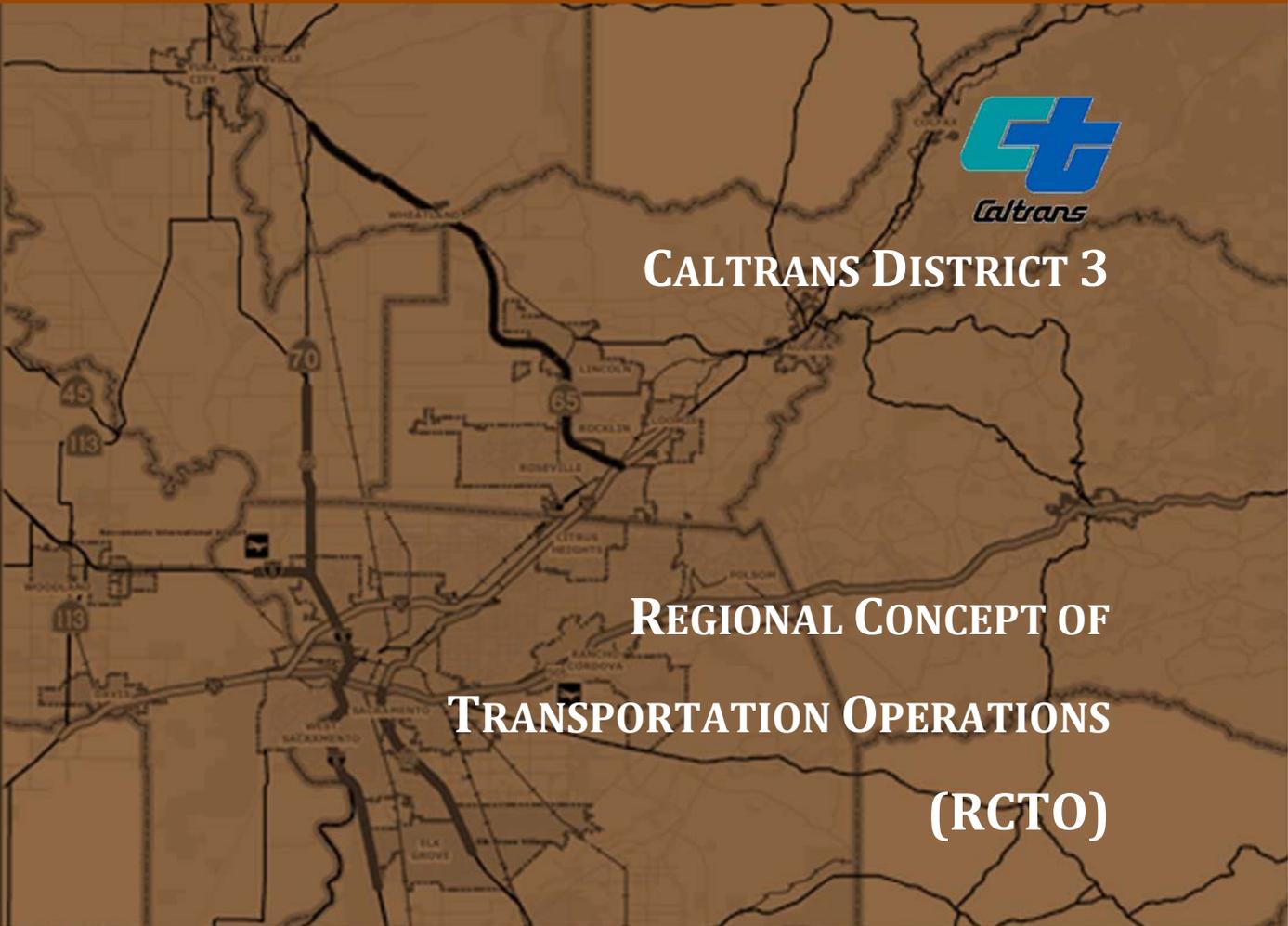


CALTRANS DISTRICT 3

REGIONAL CONCEPT OF TRANSPORTATION OPERATIONS (RCTO)

Corridors

- I-5/SR 99
- US 50
- SR 51
- SR 65
- I-80



May 2016

CALTRANS DISTRICT 3

REGIONAL CONCEPT OF

TRANSPORTATION OPERATIONS

System Metrics Group, Inc.

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What is RCTO?

FHWA (The Blueprint for Action):

"A common thread among (the) partnerships and others like them is the agreed objectives and the strategies for achieving them, including institutional relationships and performance expectations.

This thread is the concept for how (agencies) want to improve regional transportation system performance by working together. RCTO formalizes this thread by providing a framework that guides collaborative efforts to improve system performance through management and operations strategies."

The **Caltrans District 3 Regional Concept of Transportation Operations (RCTO)** is a strategic plan to assist in planning and implementing Transportation System Management and Operations (TSM&O) in a collaborative and sustained manner. The **purpose** of the RCTO is to improve regional transportation system performance through management and operations strategies and by providing a framework for collaboration and partnership with stakeholders. It is intended for Caltrans staff to use this RCTO as a reference guide in planning for future system management and operations. The RCTO is organized by freeway corridor with strategic initiatives formulated by functional areas.

The emphasis of the RCTO is in the collaborative planning effort to achieve common objectives. Successfully managing and operating the regional transportation system, including state highways, requires deliberate, sustained collaboration among operators, planners, external partners, and other stakeholders, more so now than ever before. Shared and realistic objectives guide this effort, to agree on the best course(s) of actions to follow. This collaboration prevents unnecessary duplication, limited or slowed progress, inconsistent traveler information, and underutilized or incompatible technologies.

RCTO Initiatives Include Six Functional Areas

Transportation System Management

1. Freeway Management

- Ramp metering
- HOV/managed lanes
- Integrated Corridor Management

2. Highway Arterial Management

- Traffic signal system

Incident Management

3. Incident and Event Management

- Freeway/highway incidents
- Planned/unplanned events

Traveler Information

4. Traveler Information Systems

- Pre-trip information
- Enroute information

5. Freeway and Highway

Infrastructure Improvements

- Auxiliary lanes, passing lanes, truck climbing lanes, turnouts
- Ramp improvements
- Interchange modifications
- Intersection improvements

Multimodal Transportation

6. Multimodal System Improvements

- Active Transportation
- Park and ride lots
- Parking management system
- Complete streets system
- Freight management
- Multimodal connections

Operational Improvements

Caltrans District 3 RCTO Corridors

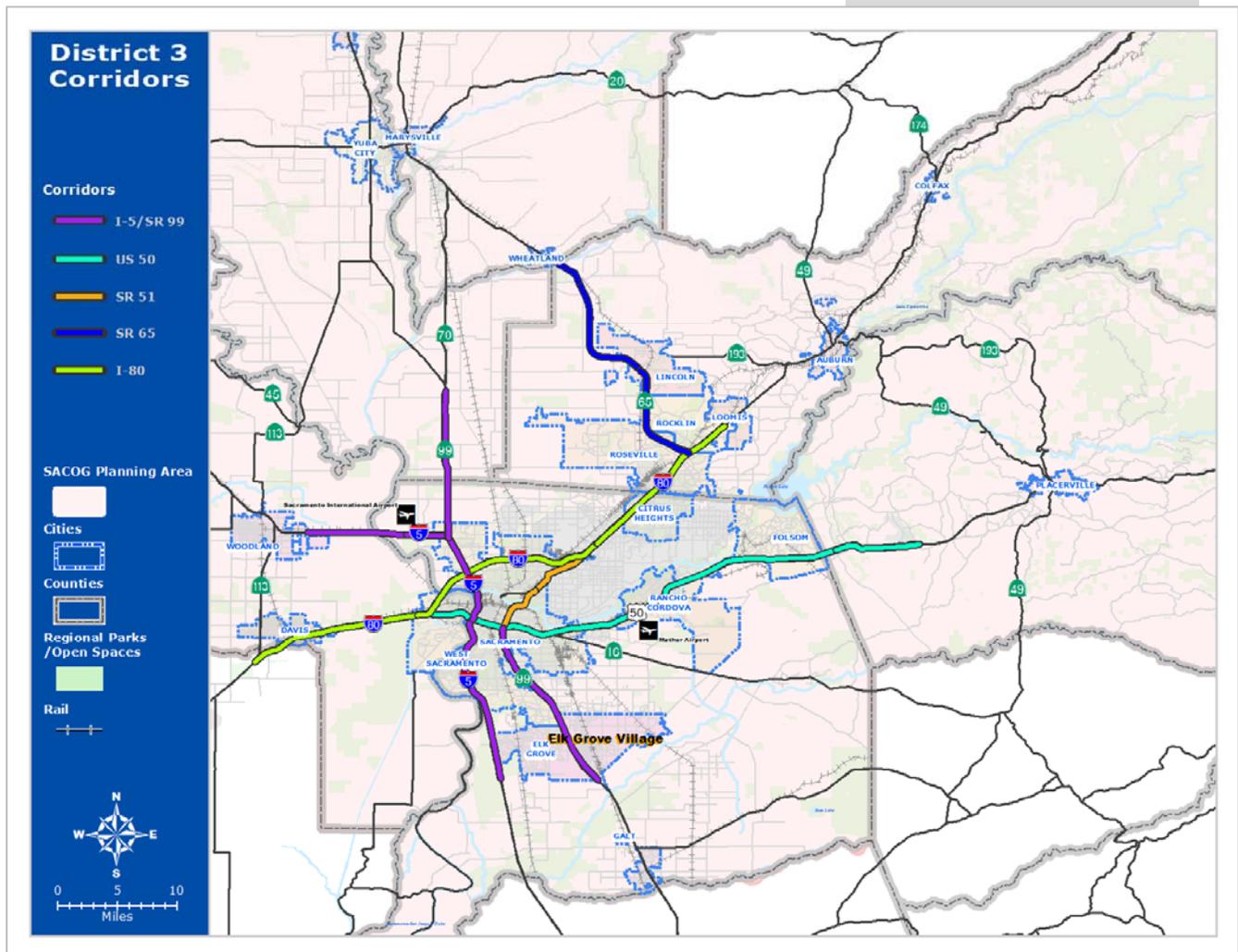
The Caltrans District 3 RCTO is organized to be specific to each of the selected Corridor System Management Plan (CSMP) corridors in the District to address existing and future Freeway and Highway System Management, Incident and Event Management, Traveler Information, Operational Improvements, and Multimodal System Improvements. These corridors represent the initial focus of this RCTO on urban areas. Additional corridors may be added in the future editions of the District 3 RCTO.

For each RCTO corridor, strategic initiatives were formulated in collaboration with corridor partner agencies and other stakeholders by the six functional areas for the short-term, medium-term, and long-term.

The RCTO corridors include:

- US 50 in Yolo, Sacramento, and El Dorado County
- I-80 in Yolo, Sacramento, and Placer County
- I-5/SR 99 in Yolo, Sacramento, and Sutter County
- SR 51 in Sacramento County
- SR 65 in Placer County

District 3 RCTO Corridors



Partners and Stakeholders

Caltrans District 3 RCTO corridors partner agencies include, but not limited to:

- *El Dorado CTC*
- *Placer County TPA*
- *Sacramento Area COG*
- *El Dorado County*
- *Placer County*
- *Sacramento County*
- *Yolo County*
- *City of Citrus Heights*
- *City of Davis*
- *City of Elk Grove*
- *City of Folsom*
- *City of Lincoln*
- *Town of Loomis*
- *City of Rancho Cordova*
- *City of Rocklin*
- *City of Roseville*
- *City of Sacramento*
- *City of West Sacramento*
- *City of Woodland*

One or more stakeholder workshops were conducted for each RCTO corridor in late 2014 and early 2015 with corridor jurisdictional agencies and other stakeholders as part of the collaboration effort. Corridor system management and operational strategies were discussed to determine collective mutual interest and common objectives. When asked what they would like from Caltrans operations practices and planning for future operations, various RCTO corridors partner agency and stakeholder staff responded with seven common themes. These include:

- ❖ Corridor operations and management should be improved
- ❖ Data and information should be shared and applied to system management adjustments
- ❖ Caltrans should be more transparent in ITS/Operations planning, decision-making, and system management
- ❖ Caltrans should involve the partner agencies more in ITS/Operations planning and system management
- ❖ Partner agencies should also improve and change in ITS/Operations planning and system management
- ❖ Systems integration is a good idea and should be explored for future implementation
- ❖ Most local agencies do not have enough staff or financial resources for ITS/Operations planning and/or active system management and should be taken into consideration in future system management and operations

The RCTO corridors partner agencies and stakeholders agreed that the regional concept of transportation operations must progress from the current independent operations to coordinated, and eventually to fully integrated operations. It is understood that the integration would involve the development of a common system that includes the Caltrans and local jurisdictions traffic management systems operations, consistent with and using the Statewide and Sacramento Regional Intelligent Transportation System (ITS) Architecture as the guiding framework. In part, the Sacramento Transportation Area Network (STARNET) is an information exchange network and operations coordination framework for integration and data exchange.

Mutually Desired Progression of System Management and Operations





Caltrans District 3 Planning for Operations

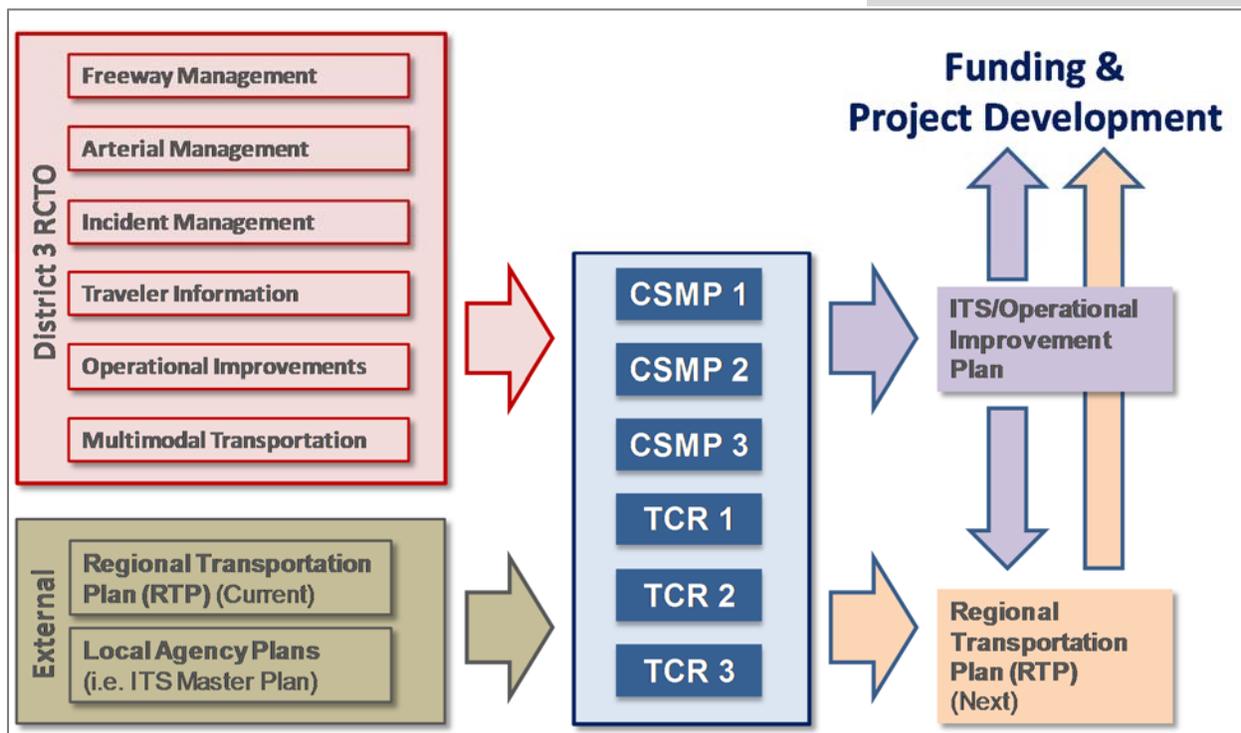
The planning for future operations process is evolving. Caltrans District 3 has established an initial planning for operations process as depicted in the diagram below.

The process utilizes the RCTO as guidance to help the Caltrans Divisions of Planning and Operations and its partners to collaboratively identify projects to be incorporated into the District’s Corridor System Management Plan (CSMP) and Transportation Concept Report (TCR) processes to be analyzed and evaluated in achieving corridor objectives, as well as Caltrans and Regional strategic goals and objectives. Once the projects and other actions are valued, they can then be included into the updates of the ITS/Ops Plan for prioritization for potential programming, working with partner agencies, and potentially for their inclusion into the Regional Transportation Plan (RTP).

Caltrans Director Malcolm Dougherty (Moving Toward Transportation System Management and Operations - TSM&O, June 24, 2015):

“Our TSM&O Vision, the transformation from separated to integrated, historical to real-time, reactive to predictive and closer coordination between planning, operations and maintenance, sets the stage for our new Mission: to provide a safe, sustainable, integrated and efficient transportation system to enhance California’s economy and livability.”

Caltrans District 3 Planning for Operations Process





RCTO Development Process

Caltrans SMP (2015-2020):

"We recognize the vital need for collaboration and partnership with all our stakeholders to provide Californians with a world-class transportation system.

The goal for Caltrans is to be a high-performance, efficient, transparent, accountable, and modern organization – meeting transportation challenges by improving communication, building stronger partnerships, and fostering a culture of performance and innovation.

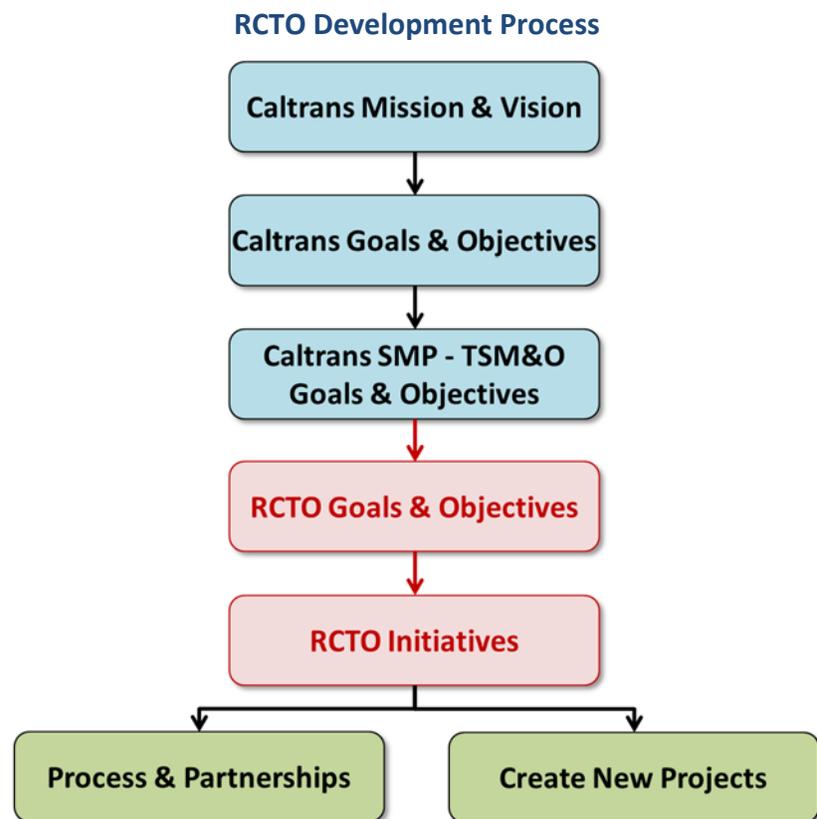
The purpose of the Strategic Management Plan is to be a roadmap of Caltrans' role, expectations, and operations as we meet the challenges of modernizing Caltrans into a world-class Department of Transportation. The tools we will use to implement this Plan are performance management, transparency, accountability, sustainability, and innovation."

Caltrans Director Malcolm Dougherty (Moving Toward TSM&O, June 24, 2015):

"Caltrans will play a strong role as champions of TSM&O in California and nationally, creating an environment for effective, cross-functional coordination and well-maintained infrastructure with improved system performance that others can follow."

Caltrans has developed a **Strategic Management Plan (SMP)** with goals, objectives, and performance measures. The SMP was developed to achieve the Caltrans mission, vision, and goals. Caltrans District 3 RCTO is intended to support many of the SMP identified goals, objectives, and performance targets. Goals and objectives applicable to the TSM&O are taken from the Caltrans SMP to develop RCTO goals and objectives.

The RCTO is intended to guide District staff to create management strategies, formulate projects in relation to State and Regional strategic performance measures, and work together to program and implement the projects through the corridor planning process. The intent is to support desired future operations that can produce the expected outcomes, meeting the Caltrans and Regional goals and objectives. To achieve the RCTO goals and objectives, the strategic initiatives were developed for each RCTO corridor by each TMS business functions. The flow chart below illustrates the RCTO development.





RCTO Goals, Objectives, and Performance Targets

Caltrans’ renewed focus is placed on safety, sustainability, integration, and efficiency. In support of this mission, the Caltrans District 3 RCTO initiatives are the strategies in the pursuit of achieving and realizing the performance targets of the Caltrans goals and objectives. Each corridor is strategized to produce the most efficient and effective performance and effectiveness. The RCTO goals, objectives, and performance targets, consistent with the Caltrans SMP, are summarized in the table below. The RCTO objectives and performance targets are specific to District 3 only (and not statewide as in the SMP).

District 3 RCTO Goals, Objectives, and Performance Targets

District 3 RCTO Goals & Objectives	District 3 Performance Targets
Goal 1 (Caltrans SMP Goal #1) - Safety and Health	
1 Reduce user fatalities and injuries	<ul style="list-style-type: none"> Result in 0.5 or less fatalities per 100 million VMT on SHS every year 10% reduction in number of fatalities in calendar year in each mode type
Goal 2 (Caltrans SMP Goal #2) - Stewardship and Efficiency	
1 Effectively manage transportation assets with asset management plan (fix-it-first)	<ul style="list-style-type: none"> By 2020, maintain 90% or better ITS elements health
Goal 3 (Caltrans SMP Goal #3) - Sustainability, Livability, and Economy	
1 Provide mobility choice, increase accessibility to all transportation modes and create transportation corridors	<ul style="list-style-type: none"> By 2020, increase non-auto modes (triple bicycles, double pedestrians, and double transit ridership)
2 Support statewide reduction of GHG emissions	<ul style="list-style-type: none"> By 2020, 15% reduction of GHG (from 2010 levels) By 2020, 20% increase incorporating green infrastructure into projects
Goal 4 (Caltrans SMP Goal #4) - System Performance	
1 Improve travel time reliability for all modes	<ul style="list-style-type: none"> By 2020, improve buffer time index reliability ranking by one level or 15%
2 Reduce peak period travel times and delays for all modes	<ul style="list-style-type: none"> By 2020, reduce to 8% rate of growth in daily vehicle hours delay (DVHD) under 35 mph on urban SHS
3 Improve integration and operations	<ul style="list-style-type: none"> By 2020, provide real-time multimodal system information to public of integrated corridors
4 Increase number of Complete Streets features on SHS	<ul style="list-style-type: none"> By 2020, increase annual number of Complete Streets features by 5%
5 Develop integrated corridor management (ICM) strategies	<ul style="list-style-type: none"> By 2020, complete one ICM implementation plan in District 3 By 2025, implement one ICM corridor in District 3, reduce to 6% rate of DVHD growth on corridor
Goal 5 (Caltrans Goal #5) - Organizational Excellence	
1 Improve internal and external communication to demonstrate professionalism and service levels to the public and stakeholders	<ul style="list-style-type: none"> By 2020, increase approval rating by stakeholders by at least 5% annually
2 Improve collaborative partnerships	<ul style="list-style-type: none"> By 2020, have at least 75% approval rating by collaborative partners

Development of RCTO Initiatives

FHWA (The Blueprint for Action):

"The starting point for an RCTO is an identified regional need, goal, or widely acknowledged regional operations concern. The motivation captures why the partners have decided to undertake this common effort, why their action is needed, and why the focus of the RCTO is important to the region that they collectively serve.

Frequently the motivation provides the linkage between regional plans and day-to-day management and operation of the transportation system and serves as the primary catalyst for collaboration. It grounds the effort in the public's interest as embodied in regional plans and agency responsibilities and priorities."

In achieving the RCTO goals, objectives, and performance targets, there needs to be a progression or migration from the existing practices to corridor management and performance monitoring to advanced system management and collaborative practice with partner agencies to eventually integrated multimodal operation, as shown in the illustration below.

RCTO Strategic Progression of Future Operations



The RCTO initiatives are the strategic pathways to realizing this systematically. The development of the RCTO initiatives involves incorporating several key concept strategies. These concept strategies allow for the evolution of the systems and operations of corridor agencies, from the existing independent operations to fully-integrated multimodal operations. The concept strategies include:

- Implement corridor management and operations
- Maximize the effective capacity of the transportation corridor
- Implement advanced system management capabilities
- Share data and information among corridor partners
- Make performance-based decision-making for outcomes
- Apply benefit-cost driven decision-making for cost effectiveness
- Update operational practices using collaborative approach
- Implement multimodal system integration
- Improve staff expertise and performance with training
- Foster stronger partnerships to pool resources and effort



RCTO Initiatives Approach

The RCTO initiatives are a cohesive design of actions, encompassing the concept strategies described above, purposely intended to achieve the operations objectives. These initiatives should be updated periodically to stay current and relevant. The RCTO initiatives were developed based on the results of the series of discussion workshops with the Caltrans Transportation Planning and Traffic Operations staff and with partner agencies and stakeholders conducted in late 2014 and early 2015. Consensus was reached in the desire for improved corridor performance outcomes in the short, medium, and long range, and in the collaborative corridor management approach. The boxes below summarize the overall approach to the initiatives.

RCTO Initiatives Approach

Short Range (2016 to 2020)

- Implement performance measures and monitoring
- Implement central control management and operations
- Implement real-time data/information exchange and apply to decision-making
- Develop various feasibility and implementation plans
- Implement easy installations and simple facilities construction
- Develop charter(s), agreement(s), and/or MOU(s) as needed

Medium Range (2020 to 2025)

- Implement advanced system management and operations
- Implement multimodal elements and applications
- Begin integration and collaborative operations
- Implement more complex facilities construction

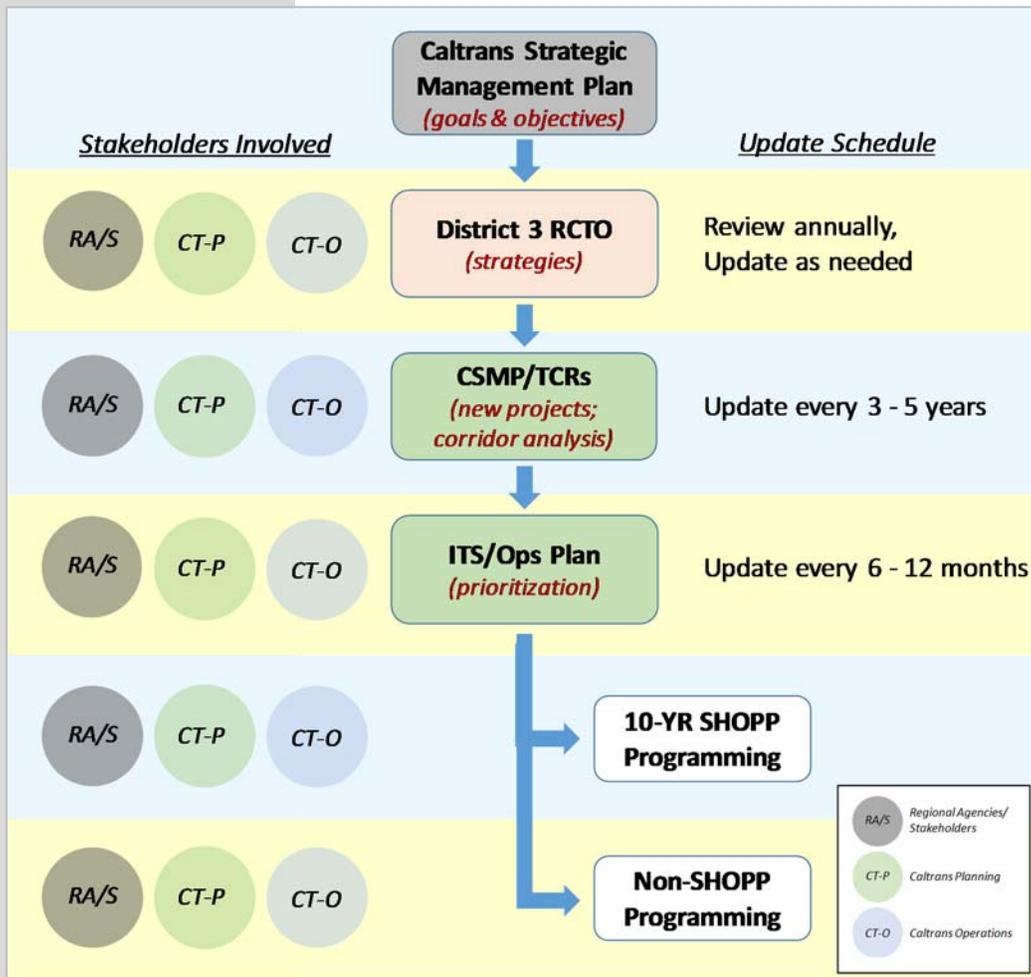
Long Range (2025 to 2035)

- Implement advanced, multimodal, and/or integration system
- Implement facilities construction that requires longer lead times
- Integrate other technology applications

Applying RCTO Initiatives

Applying the RCTO initiatives into producing real projects that can ultimately yield the desired performance outcomes requires taking action. This action involves several key subsequent steps outside of the RCTO as outlined in the diagram below. The RCTO provides the strategies needed to guide future system developments and operational practices.

Caltrans District 3 Planning for Operations Process Steps



In the CSMP and TCR development for each corridor, corridor analysis is conducted and new projects are formulated and analyzed, including benefit/cost analysis. New projects that are carried forward then gets incorporated into the ITS/Ops database.

As part of the ITS/Ops Plan updates, projects are reprioritized applying appropriate prioritization methods.



Caltrans District 3 RCTO Initiatives



Freeway Management

Ramp Metering

CALTRANS POLICIES

(Caltrans Deputy Directive 35-R1: Ramp Metering, Director's Policy-08: Freeway System Management)

(Caltrans Director's Policy 26: Intelligent Transportation System)

“Caltrans is committed to using ramp metering as an effective traffic management strategy to maintain an efficient freeway system and protect the investment made in constructing freeways to keeping them operating at or near capacity flow rates.”

“Caltrans implements advanced technologies and new processes that combine information, electronic and communications technologies with management strategies to enhance the Intelligent Transportation Systems (ITS), Transportation Management System (TMS), and ramp metering system to produce a coordinated and integrated traffic management system.”

The RCTO ramp metering initiatives table below illustrates the District’s ramp metering deployment and advancement short, medium, and long range strategies for freeway management on the six major urban corridors. Each initiative is described in the subsequent pages, detailing the elements.

RCTO Initiatives for Freeway Management (Ramp Metering) by Corridor

RAMP METERING	US 50	I-80	I-5/SR 99	SR 51	SR 65
Establish corridor RM performance monitoring	●	●	●	●	●
Implement corridor-wide RM	●	●	●	●	●
Prepare for future Advanced RM (Coordinated RMS)	●	●	●	●	●
Develop new RMS projects by corridor-wide by county	●	●	●	●	●
Implement Connector Metering	●	●	●	●	●
I-5/I-80		●			
US-50/SR-99, US-50/I-5	●		●		
I-80/SR-65, I-80/SR-244		●			●
SR-51/SR-244				●	
Implement Advanced RM (Coordinated RMS)	●	●	●	●	●
Prepare for future ICM (Integrated RMS)	●	●	●	●	●
Implement ICM (Integrated RMS)	●	●	●	●	●
Integrate other technology applications into RMS	●	●	●	●	●

● Short Range (2015-2020)

● Medium Range (2020-2025)

● Long Range (2025-2035)

Freeway Management

Ramp Metering

Short Range (2016-2020) Target Initiatives

- **Establish corridor ramp metering performance monitoring**
 - Measure and analyze corridor hourly and daily vehicle hours of delay (VHD), hourly travel times, average speeds, bottleneck locations (and duration and queue lengths), hourly flows downstream of bottleneck, travel time reliability by county, and collisions, pertaining to ramp metering performance
 - Analyze goals' performance targets attainment
- **Implement Corridor-wide Ramp Metering**
 - Complete installation of ramp metering locations per Caltrans Ramp Metering Development Plan
 - Implement and complete HOV bypass metering
 - Implement queue control (install queue detectors)
 - Implement and complete CCTV coverage (at selected key locations)
 - Implement central control operations
- **Prepare for future Advanced Ramp Metering**
 - Investigate and select preferred Advanced RMS algorithm
 - Identify method of data/information sharing in real-time with partner agencies (both directions)
 - Identify the system hardware needs
 - Develop implementation plan
 - Develop operations and maintenance plan
- **Develop new projects corridor-wide by county**
 - Develop projects by functional objective (e.g. corridor-wide ramp metering, advanced ramp metering) by county
 - Conduct benefit/cost analysis for each project
 - Incorporate into the ITS/Ops Plan

Studies have shown that corridor-wide advanced ramp metering systems (such as the coordinated bottleneck algorithm) can increase mainline traffic flows by over 60%, reduce travel times by over 45%, and reduce collisions by nearly 40%, while maintaining less than 3 minutes delay at the ramps. (Source: R. Bertini, 2006)

Freeway Management

Ramp Metering

Medium Range (2020-2025) Target Initiatives

- **Implement Connector Metering**
 - Analyze potential freeway to freeway connector metering, and if feasible, develop implementation plan
- **Implement Advanced Ramp Metering**
 - Evaluate for and implement adaptive ramp metering operations with selected algorithm
 - Implement data/information sharing in real-time with partner agencies and incorporate into ramp metering decision-making
 - Provide real-time ramp wait times into traveler information to allow for ramp choice selection
- **Prepare for Integrated Corridor Management (ICM)**
 - Evaluate and implement integration of ramp metering with ramp signal at select locations
 - Evaluate for potential ICM deployment, and prepare ICM implementation plan

Studies have shown that ICM deployment (e.g., analysis of the I-15 ICM) can result in 246,000 annual person-hours travel time savings, over 10% improvement in travel time reliability, over 300,000 gallons of fuel saved annually, and over 3,000 tons of emissions saved annually, yielding a benefit to cost ratio of 10 to 1. (Source: V. Alexiadis, 2011)

Long Range (2025-2035) Target Initiatives

- **Implement Integrated Corridor Management (ICM)**
 - Incorporate the advanced RMS into the ICM deployment
 - Expand the corridor (length) ICM as needed
 - Evaluate for and implement RMS-specific traveler information
 - Conduct before/after evaluation of the RMS performance in the ICM operations
- **Integrate other technology applications into RMS**
 - Evaluate for potential implementation of other technology integration such as connected vehicles (CV) information system



Freeway Management

Ramp Metering

Roles & Responsibilities

Caltrans Partner Agencies Staff

- Metropolitan Planning Organization (MPO)
- Regional Transportation Planning Agency (RTPA)
- County, City, Community
- Other
- ❖ *Provide collaborative review and input to strategies, system development, and new projects*

- ❖ **Caltrans Traffic Operations Ramp Metering Engineer(s)**
 - Take lead in developing advanced RMS operations
 - Take lead in developing new projects
 - Take lead in conducting technical evaluations and performance monitoring
 - Collaborate with Planning and partner agencies
- ❖ **Caltrans Traffic Operations Electrical (ITS) Support Engineer(s)**
 - Provide hardware/software technical support and solutions to RM Engineer(s) in developing new RMS operations program and new projects
 - Maintain asset database and assist with ensuring proper maintenance of the RMS
- ❖ **Caltrans Planning Corridor Manager**
 - Take lead in coordinating with Traffic Operations staff and to formulate new projects
 - Coordinate with other Planning supervisors to collaborate with external partners and stakeholders in formulating new projects
 - Take lead in incorporating new projects into the CSMP and ITS/Ops Plan
 - Take lead in planning process of the new projects
- ❖ **Caltrans Planning System Planning Supervisor**
 - Take lead in developing the CSMP and work with Planning Corridor Manager to incorporate the new projects into corridor analysis
- ❖ **Caltrans Planning Regional Planning Supervisors**
 - Work with local partners to incorporate projects into Regional Transportation Plans (RTPs)
- ❖ **Caltrans Traffic Operations and Planning - other staff**
 - Provide input to Ramp Metering Engineer(s) and/or Planning Corridor Manager on corridor operations and any stakeholder interaction regarding ramp metering operations
- ❖ **Caltrans Traffic Operations and Planning Senior Managers**
 - Provide RCTO initiatives guidance to staff
 - Provide training for staff to support RCTO practice



Freeway Management

HOV/Managed Lanes

“A managed lane is an exclusive- or preferential-use lane that is managed proactively in response to changing conditions in order to achieve improved efficiency and performance. Managed lanes use operational strategies such as access control, vehicle eligibility, and tolling, or a combination thereof. Strategies may be adjusted to meet required performance standards or to address other managed lane or freeway performance issues.”

The HOV/Managed Lanes initiatives table below illustrates the District’s short, medium, and long range strategies for freeway management on the six major urban corridors. Each initiative is described in the subsequent pages, detailing the elements.

CALTRANS POLICIES

(Caltrans Deputy Directive 43-R1: High Occupancy Vehicle Systems)

Other Statutes and Policies:

(CTC, Resolution G-87-8)

(CVC 21655.5 & 21655.6)

(Federal Highway Act, Title 23, Ch 1)

(FHWA, California Division Office, Procedure Memorandum D 6103)

(Public Resources Code - Chapter 5.8, Section 25485)

(S&HC - Section 149 and 149.7)

(STA Act - Section 167)

RCTO Initiatives for Freeway Management (HOV/Managed Lanes) by Corridor

HOVL/Managed Lanes	US 50	I-80	I-5/SR 99	SR 51	SR 65
Establish corridor HOVL performance monitoring	●	●	●	●	●
Evaluate for corridor HOVL expansion	●	●	●	●	●
Planned expansions	●	●	●	●	●
Conceptual expansions	●	●	●	●	●
Implement Corridor-wide HOVL Management	●	●	●	●	●
Develop new projects by county	●	●	●	●	●
Prepare for future ICM for integrated management	●	●	●	●	●
Evaluate for HOT Managed Lanes feasibility	●	●	●	●	●
US-50, SR-99, SR-51	●		●	●	
I-80, I-5, SR-65		●	●		●
Implement ICM (Integrated HOVL access/utilization)	●	●	●	●	●
Implement HOT Managed Lanes, if feasible	●	●	●	●	●
Integrate other technology applications into HOVL	●	●	●	●	●

● Short Range (2015-2020)

● Medium Range (2020-2025)

● Long Range (2025-2035)



Freeway Management

HOV/Managed Lanes

Short Range (2016-2020) Target Initiatives

- **Establish corridor HOV Lane performance monitoring**
 - Measure and analyze corridor hourly and daily vehicle hours of delay (VHD), hourly travel times, average speeds, bottleneck locations (and duration and queue lengths), hourly flows downstream of bottleneck, travel time reliability by county, violation rates, average occupancy, and collisions pertaining to HOV/Managed Lanes performance
 - Analyze goals' performance targets attainment
- **Evaluate for corridor HOV Lane expansion**
 - Develop District Managed Lanes System Plan
 - Planned expansions and conceptual expansions
 - HOV direct connectors and drop ramps
 - Feasibility studies and preliminary investigations
- **Implement Corridor-wide HOV Lane Management**
 - Identify deficiency locations, and develop plan to address them
 - Evaluate violations and work with partner agencies to reduce violations
 - Work with partner agencies on operational parameters (occupancy requirements, hours, etc.)
 - Install Closed-Circuit Television Cameras (CCTV) at select key locations for monitoring and Changeable Message Signs (CMS) for HOV management and traveler information
 - Identify potential locations for multimodal hubs to implement direct access HOV drop ramps
 - Develop operations and maintenance plan
- **Develop new projects by county**
 - Conduct benefit/cost analysis for each project
 - Incorporate into the ITS/Ops Plan

References:

- *Caltrans District 3 Sacramento Region Bus/Carpool Lane Network Vision*
- *Caltrans High-Occupancy Vehicle Guidelines for Planning, Design, and Operations, August 2003*
- *AASHTO's Guide for HOV Facilities, June 2003*
- *Texas Transportation Institute NCHRP Report 414: HOV Systems Manual*

Studies have shown that HOV lanes carry over 2,500 persons per hour during peak hours, substantially more than congested mixed-flow lane, induce people to carpool, provides a modal choice for travelers, and produce less pollutant emissions per lane than mixed-flow lanes, resulting in less emissions per the same amount of people carried. (Source: CE-CERT, UC Riverside, 2005; LA Metro, 2002)



Freeway Management

HOV/Managed Lanes

Medium Range (2020-2025) Target Initiatives

- **Prepare for future Integrated Corridor Management (ICM) for integrated system and management**
 - Evaluate for and implement lane management strategies (e.g., use HOV Lanes for SOVs during incidents)
 - Evaluate for direct transit access ramps into HOV Lanes and transit stops along HOV Lanes
- **Evaluate for HOT Lanes feasibility**
 - Evaluate for HOT Lanes
 - If feasible, prepare HOT Lanes implementation plan

Long Range (2025-2035) Target Initiatives

- **Implement Integrated Corridor Management (ICM)**
 - Incorporate HOV Lanes operations into ICM deployment
 - Conduct before/after evaluation of HOV Lane performance in the ICM operations
- ❖ **Implement HOT Lanes, if feasible**
 - Implement HOT Lanes, if feasible, as according to the implementation plan
- ❖ **Integrate other technology applications into HOVL management**
 - Evaluate for potential implementation of other technology integration such as connected vehicles (CV) information system

Studies have shown that ICM deployment (e.g., analysis of the I-15 ICM where use of the Managed Lanes are integrated) can result in 246,000 annual person-hours travel time savings, over 10% improvement in travel time reliability, over 300,000 gallons of fuel saved annually, and over 3,000 tons of emissions saved annually, yielding a benefit to cost ratio of 10 to 1. (Source: V. Alexiadis, 2011)



Freeway Management

HOV/Managed Lanes

Roles & Responsibilities

- ❖ **Caltrans Traffic Operations HOV/Managed Lanes Engineer(s)**
 - Take lead in developing advanced HOV/Managed Lanes operations and management program
 - Take lead in identifying new projects and strategies
 - Take lead in conducting technical evaluations and performance monitoring
 - Collaborate with Planning and partner agencies
- ❖ **Caltrans Traffic Operations Electrical (ITS) Support Engineer(s)**
 - Provide technical support and solutions to HOV/Managed Lanes Engineer(s)
- ❖ **Caltrans Planning Corridor Manager**
 - Take lead in coordinating with Traffic Operations staff and to formulate new projects
 - Coordinate with other Planning supervisors to collaborate with external partners and stakeholders in formulating new projects
 - Take lead in incorporating new projects into the CSMP and ITS/Ops Plan
 - Take lead in planning process of the new projects
- ❖ **Caltrans Planning System Planning Supervisor**
 - Take lead in developing the CSMP and work with Planning Corridor Manager to incorporate the new projects into corridor analysis
- ❖ **Caltrans Planning Regional Planning Supervisors**
 - Work with local partners to incorporate projects into Regional Transportation Plans (RTPs)
- ❖ **Caltrans Traffic Operations and Planning - other staff**
 - Provide input to HOV/Managed Lanes Engineer(s) and/or Planning Corridor Manager on corridor operations and any stakeholder interaction regarding HOV/Managed Lanes operations
- ❖ **Caltrans Traffic Operations and Planning Managers**
 - Provide RCTO initiatives guidance to staff
 - Provide training for staff to support RCTO practice

Caltrans Partner Agencies Staff

- California Highway Patrol (CHP)
- Metropolitan Planning Organization (MPO)
- Regional Transportation Planning Agency (RTPA)
- County, City, Community
- Other

- ❖ *Provide collaborative review and input to strategies, system development, and new projects*



Arterial Management

References:

- *Caltrans Letter of Adoption for the 2014 California Manual on Uniform Traffic Control Devices, MUTCD, November 7, 2014*
- *Traffic Operations Policy Directive 13-02: Intersection Control Evaluation (ICE), August 23, 2013*

The RCTO highway arterials management initiatives table below illustrates the District’s short, medium, and long range strategies for arterial management along the six major urban freeway corridors. For each freeway corridor, the arterial management system includes the freeway ramps and associated or connecting highways. Each initiative is described in the subsequent pages, detailing the elements. For all corridors, the TOPD 13-02 should be taken into consideration.

As according to the TOPD 13-02: “Engineer must evaluate impacts to all intersection traffic. In order to identify the most effective and comprehensive access alternatives, the engineer must consider various strategies, treatments, configurations and countermeasures. The fundamental objective is to balance the needs of all modes and users with system performance goals and the highway facility context.”

“The directive shall be applied to access-related investment proposals initiated after the effective date, unless the sponsor of an ongoing project elects to apply some or all of the updated evaluation process to their projects.”

RCTO Initiatives for Highway Arterial Management by Corridor

Highway Arterials & Traffic Signals	US 50	I-80	I-5/SR 99	SR 51	SR 65
Freeway corridor ramps	☑	☑	☑	☑	☑
Highway arterial corridors and traffic signals	☑		☑	☑	☑
SR-16	☑				
SR-160			☑	☑	
SR-65					☑
Establish corridor performance monitoring	●	●	●	●	●
Implement Corridor-wide Arterial Management	●	●	●	●	●
Prepare for future Advanced Arterial Management	●	●	●	●	●
Develop new projects corridor-wide by county	●	●	●	●	●
Implement Advanced Arterial Management	●	●	●	●	●
Prepare for future ICM	●	●	●	●	●
Implement ICM	●	●	●	●	●
Integrate other technology applications into AMS	●	●	●	●	●

● Short Range (2015-2020)

● Medium Range (2020-2025)

● Long Range (2025-2035)

Arterial Management

Short Range (2016-2020) Target Initiatives

- **Establish corridor performance monitoring – Freeway corridor ramps and Highway corridors**
 - Analyze and monitor ramp intersections and arterial highway performance
 - Measure highway corridor hourly and daily vehicle hours of delay (VHD), hourly travel times, average speeds, hourly flows, travel time reliability, collisions, and intersection level of service (LOS)
 - Analyze goals' performance targets attainment
- **Implement Corridor-wide Arterial Management (must collaborate with local partner agencies) – Freeway corridor ramps and Highway corridors**
 - Identify poorly operating intersections and evaluate technology solutions and alternative treatments, strategies, and configurations, consistent with the TOPD 13-02
 - Implement central control operations
 - Implement and complete CCTV coverage at select locations for visual verification of conditions and effect of operational changes
 - Implement CMS at select locations for routing and guidance (e.g. near transit hubs for active mode travel time information)
 - Synchronize arterial signals along select corridor segments to optimize flow
- **Prepare for future Advanced Arterial Management**
 - Evaluate requirements for advanced signal system such as adaptive signal operations
 - Identify method of data/information sharing in real-time with partner agencies including signal operations, arterial performance measures, and video surveillance
 - Identify the system hardware needs
 - Develop implementation plan
 - Develop operations and maintenance plan

Studies have shown that corridor-wide advanced signal system with signal coordination can reduce delays by 14% to 44% and travel times by 8% to 41%. (Source: IDAS Database)

Studies have shown that corridor-wide adaptive signal system can reduce delay over the coordinated signal system by 34% to 76%, reduce travel times by 15% to 55%, stops by 30% to 95%, collisions by 17% to 30%, and fuel and emissions by 20% to 30%. (Source: E. Basic, 2002; R. Chandra, 2012)

Arterial Management

- **Develop new projects corridor-wide by county**
 - Develop projects by functional objective (e.g. corridor-wide arterial management, advanced arterial management) by county
 - Conduct benefit/cost analysis for each project
 - Incorporate into the ITS/Ops Plan

Medium Range (2020-2025) Target Initiatives

- **Implement Advanced Arterial Management**
 - Implement adaptive arterial signal operations with selected traffic control software (TCS)
 - Implement data/information sharing in real-time with partner agencies and incorporate arterial operations decision-making
 - Provide real-time traveler information to allow for modal choice or route selection
- **Prepare for future Integrated Corridor Management (ICM)**
 - Evaluate for and implement integration of ramp signals with ramp metering at select locations
 - Evaluate for potential ICM deployment, and prepare ICM implementation plan

Studies have shown that ICM deployment with arterial signal integration can result in 246,000 annual person-hours travel time savings, over 10% improvement in travel time reliability, over 300,000 gallons of fuel saved annually, and over 3,000 tons of emissions saved annually, (Source: V. Alexiadis, 2011)

Long Range (2025-2035) Target Initiatives

- **Implement Integrated Corridor Management (ICM)**
 - Incorporate the advanced Arterial Management System (AMS) into the ICM deployment
 - Conduct before/after evaluation of the AMS performance in the ICM operations
- **Integrate other technology applications into Arterial Management System**
 - Evaluate for potential implementation of other technology integration such as connected vehicles (CV) information system



Arterial Management

Roles & Responsibilities

Caltrans Partner Agencies Staff

- Metropolitan Planning Organization (MPO)
- Regional Transportation Planning Agency (RTPA)
- County, City, Community
- Other
- ❖ *Provide collaborative review and input to strategies, system development, and new projects*

- ❖ **Caltrans Highway Operations and Traffic Signal Engineer(s)**
 - Take lead in developing advanced AMS and traffic signal operations program
 - Take lead in developing new projects
 - Take lead in conducting technical evaluations and performance monitoring
 - Collaborate with Planning and partner agencies
- ❖ **Caltrans Traffic Operations Electrical (ITS) Support Engineer(s)**
 - Provide hardware/software technical support and solutions to Highway Operations and Traffic Signal Engineer(s) in developing new projects
 - Maintain asset database and assist with ensuring proper maintenance of the AMS
- ❖ **Caltrans Planning Corridor Manager**
 - Take lead in coordinating with Traffic Operations staff and to formulate new projects
 - Coordinate with other Planning supervisors to collaborate with external partners and stakeholders in formulating new projects
 - Take lead in incorporating new projects into the CSMP and ITS/Ops Plan
 - Take lead in planning process of the new projects
- ❖ **Caltrans Planning System Planning Supervisor**
 - Take lead in developing the CSMP and work with Planning Corridor Manager to incorporate the new projects
- ❖ **Caltrans Planning Regional Planning Supervisors**
 - Work with local partners to incorporate projects into Regional Transportation Plans (RTPs)
- ❖ **Caltrans Traffic Operations and Planning - other staff**
 - Provide input to Highway Operations and Traffic Signal Engineer(s) and/or Planning Corridor Manager on corridor operations and any stakeholder interaction regarding signal operations
- ❖ **Caltrans Traffic Operations and Planning Senior Managers**
 - Provide RCTO initiatives guidance to staff
 - Provide training for staff to support RCTO practice



Incident Management

Incident & Event Management

“Roles & Responsibilities:

Caltrans is responsible for the Transportation Management Centers (TMCs), District Maintenance forces Traffic Management Teams (TMTs), and partner with CHP for Freeway Service Patrol (FSP).

Typical responsibilities include (*non-Maintenance*):

- (1) Monitor traffic operations (TMC).
- (2) Perform incident detection and verification (TMC, FSP, TMT).
- (3) Protect incident scene (TMT).
- (5) Clear minor incidents (FSP).
- (6) Implement traffic control strategies and provides supporting resources (TMT).
- (7) Disseminate traveler information (TMC/TMT).
- (10) Develop alternate routes (TMC, TMT).
- (13) Support unified command as necessary (TMT).”

“The combination of TMC strategies increase safety and reduces incidents, delay, environmental degradation, and cost to tax payers.

- Expedites the removal of major incidents to prevent secondary incidents and reduce delay.
- Expedites the removal of any minor vehicular problems on the highway.
- Provides weather warning systems in vital areas.
- Controls traffic demand on the system.
- Informs the public of transportation information.

Each Urban TMC maintains a real-time system performance database and employs data archiving procedures for planning and analysis. Responsibilities within their area include, to:

- Aggressively manage recurrent and non-recurrent congestion.
- Coordinate maintenance and construction real-time traffic management activities including lane closures.
- Coordinate special event activities.

CALTRANS POLICIES

(Traffic Incident Management Guidelines, 2014)

(Caltrans – TMC Master Plan, 1997)



Incident Management

Incident & Event Management

- Coordinate with Caltrans Headquarters Maintenance to update CHIN.
- Coordinate with local agencies.
- Pursue and maintain multimodal partnerships.
- Coordinate new technology projects.
- Provide a traffic media focal point.
- Coordinate the CHP and Caltrans communications center activities including dispatching.

Regional TMCs responsibilities are inclusive of Urban TMC responsibilities, and also include, to:

- Assist 24-hour transportation management in the region.
- Coordinate all new deployment of technology projects that cross district/division boundaries.
- Coordinate and manage regional traveler information.”

The RCTO Incident and Event Management initiatives table below illustrates the District’s short, medium, and long range strategies for freeway and highway incident and event management on the six major urban corridors. Each initiative is described in the subsequent pages, detailing the elements.

RCTO Initiatives for Incident and Event Management by Corridor

Incident and Event Management	US 50	I-80	I-5/SR 99	SR 51	SR 65
Improve proactive IM practices	●	●	●	●	●
Establish corridor IM performance	●	●	●	●	●
Implement Corridor-wide IM	●	●	●	●	●
Develop new projects by function by county	●	●	●	●	●
Develop emergency preparedness plan	●	●	●	●	●
Enhance surveillance and security measures	●	●	●	●	●
Prepare for future ICM	●	●	●	●	●
Implement ICM	●	●	●	●	●
Integrate other technology applications into IM	●	●	●	●	●

● Short Range (2015-2020)

● Medium Range (2020-2025)

● Long Range (2025-2035)



Incident Management

Incident & Event Management

Short Range (2016-2020) Target Initiatives

- **Improve proactive incident & event management (IM) practices**
 - Help manage enroute traffic during incidents
 - Develop and document response plans to various incident scenarios working with local partner agencies (using ramp metering, ramp signal operations, FSP, and traveler information)
 - Develop real-time active traffic modeling capabilities to predict response options
 - Identify necessary TOS needs and applications to support enroute traffic monitoring and management (e.g. trail blazer signs, etc.)
 - Support Caltrans Traffic Incident Management (TIM) program and provide for staff training
- **Establish corridor IM performance monitoring**
 - Measure and report detection-verification-response-clearance times, incident/event based non-recurrent congestion, economic cost of incidents, and secondary collisions
 - Analyze incident diversions to local arterials
 - Conduct before/after evaluations
 - Analyze goals' performance targets attainment
- **Implement Corridor-wide IM**
 - Identify deficiency locations of incident response options (e.g., available alternate routes, poor access to alternate routes, etc.) and address them
 - Work with partner agencies on the response plan development and identifying improvement needs
 - Work with partner agencies to develop enhanced regional traveler information
 - Work with Planning and partner agencies to identify multimodal access alternatives along the corridor as part of the response plan options
 - Develop real-time data and information sharing with partner agencies (response actions, video, etc.)
- **Develop new projects by function by county**
 - Conduct benefit/cost analysis for each project
 - Incorporate into the ITS/Ops Plan

Studies have shown that corridor-wide advanced incident management programs can reduce queues by 50%, clearance times by 11% to 36%, travel times by up to 25%, reduce collisions by up to 50%, reduce delays by 10% to 45%, and increase traffic throughput by 8% to 22%. (Source: RITA, 2011; Cisco Systems, 2003)



Incident Management

Incident & Event Management

- **Develop emergency preparedness plan**
 - Freeway closure plans
 - Disaster planning (e.g., flooding, severe fog, etc.)
 - Downtown Sacramento/Sacramento International Airport emergency access via I-80 corridor
- **Enhance surveillance and security measures**
 - Develop visual coverage of key ramps and freeway infrastructure (e.g., interchanges, bridge over Sacramento River, etc.)

Medium Range (2020-2025) Target Initiatives

Prepare for future Integrated Corridor Management (ICM)

- Develop concepts for multimodal incident response strategies for various scenarios using ICM
- Develop concepts for event management and lane closure management strategies using ICM
- Identify traveler information needs for ICM incident management
- Investigate new technology applications for enhanced incident management
- Develop ICM implementation plan

Long Range (2025-2035) Target Initiatives

- **Implement Integrated Corridor Management (ICM)**
 - Implement multimodal incident response plans into ICM deployment
 - Implement advanced ICM specific traveler information
 - Conduct before/after evaluation of ICM incident management performance
- **Integrate other technology applications into incident management**
 - Evaluate for potential implementation of other technology integration such as connected vehicles (CV) information system

Studies have shown that ICM deployment with advanced incident management can result in 246,000 annual person-hours travel time savings, over 10% improvement in travel time reliability, and over 300,000 gallons of fuel and over 3,000 tons of emissions saved annually. (Source: V. Alexiadis, 2011)



Incident Management

Incident & Event Management

Roles & Responsibilities

- ❖ **Caltrans TMC Supervisor and IM Engineer(s)/Operator(s)**
 - Take lead in developing advanced incident management response strategies
 - Take lead in conducting technical evaluations and performance monitoring
 - Collaborate with Planning and partner agencies
- ❖ **Caltrans Traffic Operations Electrical (ITS) Support Supervisor and Engineer(s)**
 - Provide ITS technical support and solutions to TMC Supervisor and IM Engineer(s)/Operator(s) in developing new projects
 - Take lead in developing new projects
- ❖ **Caltrans Planning Corridor Manager**
 - Take lead in coordinating with Traffic Operations staff and to formulate new projects
 - Coordinate with other Planning supervisors to collaborate with external partners and stakeholders in formulating new projects
 - Take lead in incorporating new projects into the CSMP and ITS/Ops Plan
 - Take lead in planning process of the new projects
- ❖ **Caltrans Planning System Planning Supervisor**
 - Take lead in developing the CSMP and work with Planning Corridor Manager to incorporate the new projects into corridor analysis
- ❖ **Caltrans Planning Regional Planning Supervisors**
 - Work with local partners to incorporate projects into Regional Transportation Plans (RTPs)
- ❖ **Caltrans Traffic Operations and Planning - other staff**
 - Provide input to TMC Supervisor and IM Engineer(s)/Operator(s) and/or Planning Corridor Manager on corridor operations and any stakeholder interaction regarding incident and event management operations
- ❖ **Caltrans Operations and Planning Manager**
 - Provide RCTO initiatives guidance to staff
 - Provide training for staff to support RCTO practice

Caltrans Partner Agencies Staff

- California Highway Patrol (CHP)
- Metropolitan Planning Organization (MPO)
- Regional Transportation Planning Agency (RTPA)
- County, City, Community
- Other
- ❖ *Provide collaborative review and input to strategies, system development, and new projects*



Traveler Information

CALTRANS POLICIES

(Caltrans Deputy Directive-78: Travel Information, Caltrans Director's Policy-06: Caltrans Partnerships, Director's Policy-08: Freeway System Management)

(Caltrans Traffic Operations Policy Directive 06-02: Distributing Traveler Information to Commercial/Media Information Service Providers)

“Caltrans maximizes the widespread distribution of its travel information to improve mobility across California. Informed travelers making wise transportation choices are essential for reaching the Department’s strategic goal for safety, reliability, flexibility, productivity and performance.

Caltrans provides its travel information directly to travelers through commercial/media information service providers and through public/private partnerships. Partnerships are encouraged to improve the efficiency and effectiveness of travel information collection and distribution.”

“ISPs (Information Service Providers) may request travel information through the local Deputy District Directors for Operations, the Headquarters Travel Information manager, or via the Department’s ‘Travel Information Commercial (Wholesale) Web Portal’ (CWWP) located at www.dot.ca.gov/cwwp. Upon receiving a request, the manager receiving the request shall assist the requestor with obtaining the requested travel information.”

The RCTO Traveler Information initiatives table below illustrates the District’s short and medium range strategies for freeway and highway traveler information on the six major urban corridors. As traveler information is heavily technology dependent that is evolving frequently, long range initiatives are not described. Each initiative is described in the subsequent pages, detailing the elements.

RCTO Initiatives for Traveler Information by Corridor

Traveler Information	US 50	I-80	I-5/SR 99	SR 51	SR 65
Provide improved access to data	●	●	●	●	●
Develop and implement multi-modal trip-planning	●	●	●	●	●
Enhance en-route traveler information system	●	●	●	●	●
Prepare for and implement ICM traveler information	●	●	●	●	●
Develop new projects corridor-wide by county	●	●	●	●	●

● Short Range (2015-2020)

● Medium Range (2020-2025)

● Long Range (2025-2035)

Traveler Information

Short Range (2016-2020) Target Initiatives

- **Provide improved access to detection data by partner agencies and value added resellers/information service providers**
 - Collaborate with partner agencies to integrate data (e.g., regional 511 system)
 - Identify new opportunities for sharing real-time and historical data (e.g., mobile device access, third party providers)
- **Work with partner agencies to develop and implement multi-modal trip-planning capabilities**
 - Collaborate with partner agencies in integrating freeway and highway traffic data with rail and transit data
 - Collaborate with partner agencies to identify the appropriate data and performance measures for traveler information
 - Collaborate with partner agencies to increase geographic and modal coverage of data collection
 - Collaborate with partner agencies to provide enhanced roadway weather conditions information integrated for improved access
- **Work with partner agencies to enhance enroute traveler information system**
 - Identify opportunities to combine/supplement roadway CMS's with other traveler information sources (e.g., 511, HAR)
 - Collaborate with partner agencies to market traveler information sources
- **Prepare for and implement Integrated Corridor Management (ICM) with Traveler Information**
 - Collaborate with partner agencies to develop ICM specific traveler information
- **Develop new projects corridor-wide by county**
 - Develop specific project by direction by county
 - Conduct benefit/cost analysis for each project
 - Incorporate into the ITS/Ops Plan

Studies have shown that enhanced traveler information system results in benefit to cost ratio of 16:1 to 25:1 and modal shift from car to transit of up to 4%, nearly 8% when travel time savings were greater than 20 minutes. Studies have also shown that motorists who select better routes can reduce their carbon footprint by 20% during their daily commutes. Studies have also shown that customer satisfaction with regional 511 deployment range from 68% to 92%. (Source: RITA, 2011)



Traveler Information

Roles & Responsibilities

Caltrans Partner Agencies Staff

- Metropolitan Planning Organization (MPO)
- Regional Transportation Planning Agency (RTPA)
- County, City, Community
- Other

- ❖ *Provide collaborative review and input to strategies, system development, and new projects*

- ❖ **Caltrans Freeway and Highway Traffic Operations Engineer(s)**
 - Take lead in identifying potential enhancements to traveler information and developing new projects
 - Collaborate with Planning and partner agencies to develop projects and identify potential funding

- ❖ **Caltrans Traffic Operations Electrical (ITS) Support Engineer(s)**
 - Provide technical support and solutions to Operations Engineer(s) in developing new technology applications to improvements
 - Maintain asset database and assist with ensuring proper maintenance of the system

- ❖ **Caltrans Planning Corridor Manager**
 - Take lead in coordinating with Traffic Operations staff and to formulate new projects
 - Coordinate with other Planning supervisors to collaborate with external partners and stakeholders in formulating new projects
 - Take lead in incorporating new projects into the CSMP and ITS/Ops Plan
 - Take lead in planning process of the new projects into corridor analysis

- ❖ **Caltrans Planning System Planning Supervisor**
 - Take lead in developing the CSMP and work with Planning Corridor Manager to incorporate the new projects into corridor analysis

- ❖ **Caltrans Planning Regional Planning Supervisors**
 - Work with local partners to incorporate projects into Regional Transportation Plans (RTPs)

- ❖ **Caltrans Traffic Operations and Planning - other staff**
 - Provide input to Operations Engineer(s) and/or Planning Corridor Manager on corridor operations and any stakeholder interaction regarding operations

- ❖ **Caltrans Traffic Operations and Planning Senior Managers**
 - Provide RCTO initiatives guidance to staff
 - Provide training for staff to support RCTO practice



Operational Improvements

Caltrans Director’s Policy (DP-08-R1) on Transportation System Management and Operations provides direction and guidance on operational improvements.

The RCTO Operational (Infrastructure) Improvements initiatives table below illustrates the District’s short range strategies for freeway and highway infrastructure operational improvements on the six major urban corridors. No medium or long range initiatives were identified as the initiatives are focused on the identification and evaluation of improvements (for all short, medium, and long range implementation schedules). These initiatives can be repeated at the medium and long term time periods. Each initiative is described in the subsequent pages, detailing the elements.

For any intersection improvement, the TOPD 13-02 should be taken into consideration. As according to the TOPD 13-02: “Engineer must evaluate impacts to all intersection traffic. In order to identify the most effective and comprehensive access alternatives, the engineer must consider various strategies, treatments, configurations and countermeasures. The fundamental objective is to balance the needs of all modes and users with system performance goals and the highway facility context.” “The directive shall be applied to access-related investment proposals initiated after the effective date, unless the sponsor of an ongoing project elects to apply some or all of the updated evaluation process to their projects.”

CALTRANS POLICIES

(Caltrans Director’s Policy DP-08-R1, Transportation System Management and Operations, Draft)

Reference:

Traffic Operations Policy Directive 13-02: Intersection Control Evaluation (ICE), August 23, 2013

RCTO Initiatives for Operational Improvements by Corridor

Operational (Infrastructure) Improvements	US 50	I-80	I-5/SR 99	SR 51	SR 65
Establish corridor performance monitoring	●	●	●	●	●
Maximize corridor effective capacity	●	●	●	●	●
Identify bottlenecks and deficiencies					
Identify solutions for improvements					
Evaluate innovative solutions					
Identify corridor safety improvements					
Identify demand management improvements					
Develop new projects by county by time frame	●	●	●	●	●

● Short Range (2015-2020)

● Medium Range (2020-2025)

● Long Range (2025-2035)

Operational Improvements

Short Range (2016-2020) Target Initiatives

- **Establish corridor operations performance monitoring**
 - Measure and report corridor hourly and daily vehicle hours of delay (VHD), hourly travel times, average speeds, bottleneck locations (duration and queue lengths), hourly flows downstream of bottleneck, travel time reliability, and collisions
 - Analyze goals' performance targets attainment
- **Maximize corridor effective capacity**
 - Identify bottlenecks and poorly operating segments and identify solutions for improvements. Examples include:
 - Acceleration/deceleration lanes
 - Auxiliary lanes
 - Dynamic lane assignment
 - Grade reduction
 - Interchange modifications
 - Part-time shoulder use
 - Passing lanes/truck climbing lanes
 - Ramp modifications (and braided ramps)
 - Reversible lanes
 - Shoulder widening
 - Sight distance improvements
 - Speed harmonization
 - Evaluate intersection and interchange alternatives and control methods, (e.g., diverging diamond interchanges, single point interchanges, roundabouts) consistent with the TOPD 13-02 (ICE).
 - Identify corridor safety improvements
 - Identify demand management improvements to reduce demand
 - Park and ride lots, transit hubs
 - Trip reduction improvements
 - Multimodal strategies (active modes)
- **Develop new projects corridor-wide by county by time frame (short, medium, long range implementation)**
 - Develop specific project by direction by county
 - Conduct benefit/cost analysis for each project
 - Incorporate into the ITS/Ops Plan

Studies have shown that freeway auxiliary lanes can reduce delay by as much as 87,000 vehicle hours, resulting in a benefit to cost ratio of 8 to 1 (Source: MnDOT, 2007), and improve speeds by 55% to over 190% and significantly reducing collisions (Source: TxDOT, 2001).



Operational Improvements

Roles & Responsibilities

- ❖ **Caltrans Freeway and Highway Traffic Operations Engineer(s)**
 - Take lead in conducting technical evaluations and performance monitoring
 - Take lead in identifying potential solutions and developing new projects
 - Collaborate with Planning and partner agencies to develop projects and identify potential funding
- ❖ **Caltrans Traffic Operations Electrical (ITS) Support Engineer(s)**
 - Provide technical support and solutions to Operations Engineer(s) in developing new technology applications to improvements
 - Maintain asset database and assist with ensuring proper maintenance of the system
- ❖ **Caltrans Planning Corridor Manager**
 - Take lead in coordinating with Traffic Operations staff and to formulate new projects
 - Coordinate with other Planning supervisors to collaborate with external partners and stakeholders in formulating new projects
 - Take lead in incorporating new projects into the CSMP and ITS/Ops Plan
 - Take lead in planning process of the new projects into corridor analysis
- ❖ **Caltrans Planning System Planning Supervisor**
 - Take lead in developing the CSMP and work with Planning Corridor Manager to incorporate the new projects into corridor analysis
- ❖ **Caltrans Planning Regional Planning Supervisors**
 - Work with local partners to incorporate projects into Regional Transportation Plans (RTPs)
- ❖ **Caltrans Traffic Operations and Planning - other staff**
 - Provide input to Operations Engineer(s) and/or Planning Corridor Manager on corridor operations and any stakeholder interaction regarding operations
- ❖ **Caltrans Traffic Operations and Planning Senior Managers**
 - Provide RCTO initiatives guidance to staff
 - Provide training for staff to support RCTO practice

Caltrans Partner Agencies Staff

- Metropolitan Planning Organization (MPO)
- Regional Transportation Planning Agency (RTPA)
- County, City, Community
- Other
- ❖ *Provide collaborative review and input to strategies, system development, and new projects*



Multimodal Transportation

Multimodal System Improvements

CALTRANS POLICIES

(Caltrans Deputy Directive-64-R2: Complete Streets – Integrating the Transportation System)

(Caltrans Director's Policy-05: Multimodal Alternatives Analysis)

“Caltrans develops integrated multimodal projects in balance with community goals, plans, and values.” “Bicycles, pedestrian, and transit travel is facilitated by creating “complete streets” beginning early in the system planning and continuing through project delivery and maintenance and operations. Developing a network of ‘complete streets’ requires collaboration among all Department functional units and stakeholders to establish effective partnership”

“Caltrans promotes long-range transportation plans, corridor studies and project studies based on early and objective multimodal alternatives analysis.” “The intent of this Policy is improved mobility options for the people of California; a new strengthened or expanded relationship with the Department’s partners; and early resolution of issues leading to mutually acceptable solutions and a subsequent reduction in project delay and uncertainties.”

The RCTO Multimodal System Improvements initiatives table below illustrates the District’s short, medium, and long range strategies along the six major urban freeway corridors. Each initiative is described in the subsequent pages. Multimodal improvements relating to park and ride lots, transit, goods movement, and bicycle and pedestrian access at freeway ramp intersections, interchange cross streets, over and under crossings, and to transit stations should be considered.

RCTO Initiatives for Multimodal System Improvements by Corridor

Multimodal Transportation	US 50	I-80	I-5/SR 99	SR 51	SR 65
Establish corridor performance monitoring	●	●	●	●	●
Develop Complete Streets Plans	●	●	●	●	●
Maximize corridor effective capacity	●	●	●	●	●
Develop new projects by county	●	●	●	●	●
Prepare for future ICM	●	●	●	●	●
Implement multimodal improvement projects	●	●	●	●	●
Implement ICM	●	●	●	●	●
Integrate other technology applications	●	●	●	●	●

● Short Range (2015-2020)

● Medium Range (2020-2025)

● Long Range (2025-2035)

Multimodal Transportation

Multimodal System Improvements

Short Range (2016-2020) Target Initiatives

Active modes provide additional mobility choices and increase accessibility to all transportation modes. Every mode shift from vehicle to an active mode will result in reduced greenhouse (GHG) gas emissions.

- **Establish corridor complete streets performance monitoring**
 - Measure and report bicycle and pedestrian flows at various locations throughout the corridor
 - Measure and report transit performance
 - Measure and report park and ride lot utilization
 - Analyze goals' performance targets attainment
 - Evaluate available alternative mode detection systems for potential implementation
- **Develop Multimodal Plans**
 - Update the D3 State Highway Bicycle Facilities Plan
 - Update the D3 Goods Movement Plan as needed
 - Update the D3 Park and Ride Plan as needed
 - Develop a D3 Complete Streets Plan
 - Assist local partners with sustainable community planning grants related to complete streets
 - Incorporate relevant operational impact projects from these multi-modal plans into the ITS/Ops Plan
- **Maximize corridor effective capacity**
 - Identify and evaluate for multimodal hubs
 - Identify and evaluate for real-time multimodal traveler information
 - Identify existing obstacles that discourage active mode use
 - Identify opportunities for park and ride lot and ridesharing program improvements
 - Identify active mode demand management strategies to reduce demand and trips
 - Identify multimodal strategies to increase person-throughput
 - Identify freight/goods movement improvement strategies
 - Identify opportunities for bicycle and pedestrian connectivity improvements with interchange modifications
- **Develop new projects by county**
 - Conduct benefit/cost analysis for each project
 - Incorporate into the ITS/Ops Plan and CSMPs

Multimodal Transportation

Multimodal System Improvements

Medium Range (2020-2025) Target Initiatives

- **Prepare for Integrated Corridor Management (ICM) for integrated system and management**
 - Identify and evaluate for multimodal elements to ICM development
 - Identify and evaluate for ICM-specific real-time multimodal traveler information
- **Implement multimodal improvement projects**
 - Implement multimodal hubs, real-time multimodal traveler information, park and ride, parking management, demand management, and other multimodal improvement projects

Long Range (2025-2035) Target Initiatives

- **Implement Integrated Corridor Management (ICM)**
 - Incorporate multimodal elements into ICM deployment
 - Conduct before/after evaluation of multimodal systems performance in the ICM operations
- **Integrate other technology applications into multimodal system**
 - Evaluate for potential implementation of other technology integration such as connected vehicles (CV) information system



Multimodal Transportation

Multimodal System Improvements

Roles & Responsibilities

Caltrans Partner Agencies Staff

- Metropolitan Planning Organization (MPO)
- Regional Transportation Planning Agency (RTPA)
- County, City, Community
- Other
- ❖ *Provide collaborative review and input to strategies, system development, and new projects*

- ❖ **Caltrans Freeway and Highway Traffic Operations Engineer(s)**
 - Take lead in implementing active modes into operations program
 - Take lead in developing new multimodal improvement projects
 - Take lead in conducting technical evaluations and performance monitoring
 - Collaborate with Planning and partner agencies
- ❖ **Caltrans Traffic Operations Electrical (ITS) Support Engineer(s)**
 - Provide ITS technical support and solutions to Operations Engineer(s) in developing new multimodal improvement projects
- ❖ **Caltrans Planning Corridor Manager**
 - Take lead in coordinating with Traffic Operations staff and to formulate new projects
 - Coordinate with other Planning supervisors to collaborate with external partners and stakeholders in formulating new projects
 - Take lead in incorporating new projects into the CSMP and ITS/Ops Plan
 - Take lead in planning process of the new projects
- ❖ **Caltrans Planning System Planning Supervisor**
 - Take lead in developing the CSMP and work with Planning Corridor Manager to incorporate the new projects
- ❖ **Caltrans Planning Regional Planning Supervisors**
 - Work with local partners to incorporate projects into Regional Transportation Plans (RTPs)
- ❖ **Caltrans Traffic Operations and Planning - other staff**
 - Provide input to Operations Engineer(s) and/or Planning Corridor Manager on corridor operations and any stakeholder interaction regarding active modes
- ❖ **Caltrans Operations and Planning Manager**
 - Provide RCTO initiatives guidance to staff
 - Provide training for staff to support RCTO practice



APPENDIX A

Glossary of Terms

List of Acronyms



GLOSSARY OF TERMS

Active Transportation

Active transportation is a program of effort to encourage increased use of active modes of transportation by increasing the proportion of trips accomplished by biking and walking; increasing safety and mobility for non-motorized users; reducing greenhouse gas (GHG) emissions; enhancing public health; ensuring that disadvantaged communities fully share in the benefits of the program; and providing a broad spectrum of projects to benefit many types of active transportation users.

Adaptive Ramp Metering

Adaptive ramp metering is a ramp metering strategy to dynamically control the rate vehicles entering a freeway facility. It utilizes traffic responsive/actuated or adaptive algorithms (as opposed to pre-timed or fixed time rates) to system-wide conditions to optimize flow along an entire length of the facility, corridor segment, or system-wide.

Advanced Ramp Metering

Advanced ramp metering utilizes advanced metering technologies such as dynamic bottleneck identification, automated incident detection, and integration with adjacent arterial traffic signals operations to adjust ramp meter rates. It utilizes responsive/actuated or adaptive algorithms.

Advanced RMS Algorithms

Advanced RMS algorithms are part of ramp metering system software programming that uses local traffic conditions and system-wide traffic conditions to determine metering rates.

Advanced System Management

Advanced system management is one of the Caltrans District 3 RCTO corridor concept strategies to improve corridor management and performance outcomes. It involves the identification, evaluation, development, and implementation or deployment of advanced applications, tools, practices, innovation, and systems to allow for better management and operations of the corridor transportation system. It requires institutional and the functional opportunities. It requires a desire to progress from the current system management state to a future state with real-time data usage, predictive business processes, dynamic resource assignment, and coordinated or integrated systems and functions.

Benefit-Cost Analysis

Benefit-cost analysis is a technique for evaluating prospective ITS and operational improvement projects by comparing the life-cycle economic benefits against the economic costs. Caltrans has adopted the Caltrans Cal-B/C tool for conducting the benefit-cost analysis. It includes the impacts to greenhouse gas emissions and fuel consumption in the analysis.



Benefit-Cost Driven Decision-Making

Benefit-cost driven decision-making is the decision-making process for ITS and operational improvement projects based on benefit-cost analysis results. It assumes the consideration of cost-effectiveness and air quality as the decision-making criteria.

Caltrans Strategic Management Plan

The Caltrans Strategic Management Plan (SMP) defines Caltrans' role, expectations, and operations for meeting statewide strategic objectives, creating and deepening strategic partnerships, and providing performance measures that monitor success.

Complete Streets

Complete streets are designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists and transit. Refer to Caltrans policy DD-64-R2.

Connector Metering

Connector metering is a ramp metering system for freeway-to-freeway connectors as part of a freeway traffic management strategy. It is intended to lessen the impact of the merging of the connector traffic into the mainline flow.

Coordinated System

A coordinated system is a transportation operations system that is coordinated (or with traffic signals, synchronized) with nearby other traffic control systems. The coordination is to allow for the safe and efficient progressive movement of people and goods for improved performance outcomes

Corridor Management and Operations

Corridor management and operations is one of the Caltrans District 3 RCTO corridor concept strategies to improve corridor management and performance outcomes. It involves progressing the system management and operations by freeway corridor approach, as opposed to the current functional approach. With the corridor approach, system management and freeway operations are conducted with corridor specific intent to produce best possible corridor performance outcomes given the available resources, tools, and techniques. Corridor management and operations should be conducted corridor-wide, initially focused on the urban segments and eventually expanding to the entire corridor facility.

Corridor-wide Arterial Management

Corridor-wide arterial management involves working with local partner agencies to identify deficient intersections and technology solutions for improvements; implementing central operations including upgrading controllers, traffic control software, data collection and archiving and automated performance



measures; implementing CCTV and CMS monitoring and route guidance; and synchronizing arterial signals.

Corridor-wide HOV Lane Management

Corridor-wide HOV Lane management is the management, operations, and maintenance of the corridor HOV lane system to identify deficient locations and develop plans to address them; evaluate violations and operational parameters; install CCTV and CMS at select key locations; and identify potential locations for multimodal hubs to implement direct access, to improve corridor performance outcomes.

Corridor-Wide Ramp Metering

Corridor-wide ramp metering is a system management strategy to optimize the flow and corridor performance through an entire corridor segment. It involves installing ramp metering at all ramps locations within the corridor, considering HOV bypass lanes, queue control, and monitoring. Ideally, it should also be controlled remotely using a central computer system. Advanced or adaptive ramp metering systems are a more advanced application of a corridor-wide metering strategy.

Diverging Diamond interchanges

Also known as a double crossover diamond interchange, the diverging diamond interchange is a type of diamond interchange in which the two directions of traffic on the local street or road cross to the opposite side on both sides of the freeway. It requires traffic on the local street or road to briefly drive on the left side of the road. This configuration reduces turning movement conflicts and allows for safer and more efficient turning movements.

Dynamic Lane Assignment

Dynamically managing the entry of vehicles into merge areas with a series of advisory messages or lane control signs that prepare motorists for an upcoming merge and encouraging or directing a consistent merging behavior

Independent System

An independent system is a transportation management system of one agency not coordinated or integrated with the systems of another agency.

Integrated System

Integrated system is a transportation management system integrated with another by hardware and software, and the management of those systems. An integrated system can enable transportation systems managers, transportation control systems, vehicles, and travelers within a corridor to work together in a highly coordinated and collaborative manner.



Intelligent Transportation System (ITS)

It is the electronics, photonics, communications, or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system (From Section 501 of title 23, United States Code as amended by MAP-21). It includes the application of advanced information and communications technology to be used for transportation system management and operations, and traveler information.

Isolated System

An isolated system is a transportation management system that is localized or isolated, and not coordinated with any other system, either within the agency or across jurisdictions.

Lane Management Strategies

Lane management strategies utilize all the available lanes on the roadway to maximize performance outcomes. It can include managed lanes such as HOV lanes, HOT lanes, express lanes, and dynamic lane assignments. It can also include using the HOV, HOT, or Managed Lanes for other temporary uses such as construction detours, incident management, and event/emergency management. It can also include use of roadway shoulders for temporary or part-time travel lane usage or turnouts.

Managed Lanes

A managed lane is an exclusive- or preferential-use lane that is managed proactively in response to changing conditions in order to achieve improved efficiency and performance. Managed lanes use operational strategies such as access control, vehicle eligibility, and tolling, or a combination thereof. These strategies are determined based on factors such as safety, regional and interregional consistency, impacts on freeway performance, enforcement needs, environmental considerations, and community support. Strategies may be adjusted to meet required performance standards or to address other managed lane or freeway performance issues. For the purposes of this document, a managed lane is defined as one of the following:

- A high-occupancy vehicle (HOV) lane, which is a lane that may be used by vehicles with a minimum number of occupants
- A high-occupancy/toll (HOT) lane, which is an HOV lane that may also be accessed by tolled vehicles that have less than the minimum number of occupants.

Maximize Effective Capacity

Maximizing effective capacity is one of the Caltrans District 3 RCTO corridor concept strategies to improve corridor management and performance outcomes. Effective capacity or maximum capacity at a location under most conditions are reduced due to traffic merging, traffic weaving, roadway curves, reduced lane widths, limited shoulder widths, limited lateral clearances, sight distance obstructions, and other hindrances. Maximizing effective capacity involves getting the most out of the existing infrastructure by



using operational improvements and system management to restore the lost effective capacity to its full potential.

Multimodal System Integration

Multimodal system integration is one of the Caltrans District 3 RCTO corridor concept strategies to improve corridor management and performance outcomes. It involves the concept that the freeway corridor is seen as one multimodal transportation system corridor with freeway, arterials, transit, and complete streets, rather than separate systems. It involves integrating all of the different modes of transportation along the corridor into a cohesive multimodal system management and operations for seamless transitions between modes and facilities. A person's trip could utilize multiple modes on a corridor; for example, a person may drive a vehicle or ride a bicycle to a transit center, takes transit to a destination station, and then walks to the final destination. The multimodal system integration would allow for efficient transitions with easy access, parking, timing, traveler information, safety and security, and convenience.

Operational Improvements

Operational improvements are infrastructure improvements that enable elements of a transportation network to perform more efficiently. Examples include auxiliary lanes, passing lanes, truck climbing lanes, ramp improvements, and intersection modifications, to name a few. Such projects often can increase effective roadway capacity by reducing or eliminating merging or weaving conflicts.

Organizational Excellence

Organizational excellence is a Caltrans Strategic Management Plan (SMP) goal to be a national leader in delivering quality service through excellent employee performance, public communication, and accountability. Strategic objectives are to promote a positive work environment, increase customer satisfaction, improve internal and external communication, and improve partnerships with agencies, industries, municipalities, and tribal governments.

Performance-based Decision-making

Performance-based decision-making is one of the Caltrans District 3 RCTO corridor concept strategies to improve corridor management and performance outcomes. It is the decision-making process for corridor system management based on existing or projected future performance outcomes. It assumes the consideration of maximizing corridor performance as the decision-making criteria for system management and corridor operations.

Performance Monitoring

Performance monitoring involves the analysis, evaluation, and continuous monitoring of freeway, highway, and arterial performance metrics to improve corridor management and performance outcomes. Performance metrics may include delay, travel times, speeds, volume, level of service, travel time



reliability, flows, average occupancy, violation rates, and collisions to name a few. Performance measures can identify deficiencies, improve business practices, make adjustments to system management parameters, prioritize improvement projects, and/or identify future operational needs.

Performance Outcomes

Performance outcomes are the end result of system management and corridor operations. Whether nothing is done or something is done, the corridor will have end result performance measures will identify outcomes.

Performance Targets

Performance targets are set by Caltrans (SMP goal teams) to measure and monitor progress. They are aggressive, yet attainable, targets. As it pertains to Caltrans District 3 RCTO, the performance targets are specifically set to monitor progress of achieving the identified RCTO objectives associated with the specific goals.

Reversible Lane Operations

Reversible lane operations designate movement for traffic in one direction during part of the day and in the opposition direction during another part of the day. It is intended to increase capacity (supply) of the facility in the peak direction to improve traffic flow using devices and signs that notify drivers which lanes are open or closed to driving or turning. Reversible lane operations typically require dedicated operations and maintenance program to support it.

Roundabouts

A roundabout is a circular intersection or junction in which traffic flows almost continuously in one direction around a central island.

Queue Control

Queue control is a ramp queue management measure used to prevent queues from spilling onto the adjacent local street. It typically requires a vehicle detection device at the base of the ramp and a software algorithm either in the controller or in the central control system.

Safety and Health

Safety and health is a Caltrans Strategic Management Plan goal to provide a safe transportation system for workers and users and promote health through active transportation and reduced pollution in communities.



Shared Data (Data Exchange) and Information

Sharing data (data exchange) and information is one of the Caltrans District 3 RCTO ten key corridor concept strategies to improve corridor management and performance outcomes. It involves developing mechanisms, tools, and institutional avenues to allow for traffic and transportation data and information exchange with partner agencies, stakeholders, and potentially third-party traveler information providers. It requires a gradual progression in the data exchange from “as needed” to real-time. It also requires protocols and procedures in place to analyze the data/information and make appropriate system management decisions.

Single Point Interchanges

A single point interchange is a type of diamond interchange that can efficiently move large volumes of traffic through limited amounts of space. A single point urban interchange has the advantage of allowing opposing left turns to proceed simultaneously by compressing the two intersections of a diamond into one single intersection over or under the free-flowing road. The term "single point" refers to the fact that through traffic on the arterial street, and the traffic turning left onto or off the interchange, can be controlled by a single traffic signal.

Speed Harmonization

Speed harmonization is a practice of using an expert system to monitor data coming from field-deployed sensors on a roadway and automatically adjusting speed limits when congestion thresholds are exceeded and congestion and queue formation are impending. Sign gantries that span the facility are often employed to provide speed limits and additional information, depending on roadway conditions.

Staff Performance

Staff performance is one of the Caltrans District 3 RCTO corridor concept strategies to improve corridor management and performance outcomes. It involves improving Caltrans Planning and Operations staff knowledge and skill to manage the transportation systems and improve operations, through brainstorming and discussion workshops, partnership meetings with stakeholders, exposure to new information and educational materials, and training. It requires management’s commitment to providing staff the learning opportunities and staff’s commitment to continuous self-improvements.

Stewardship and Efficiency

Stewardship and efficiency is a Caltrans Strategic Management Plan (SMP) goal to responsibly manage California’s transportation-related assets. Its strategic objectives include to manage transportation assets by implementing an asset management plan, embracing a fix-it-first philosophy, and to efficiently deliver projects and services on time and on budget.



Strategic Objective

Strategic objectives define how a vision is put into practice. These objectives are to guide activities in each program and division to accomplish agreed upon goals.

Sustainability, Livability, and Economy

Sustainability, livability, and economy are part of Caltrans Strategic Management Plan (SMP) goal to make long-lasting, smart mobility decisions that improve the environment, support a vibrant economy, and build communities, not sprawl.

System Performance

System performance is a Caltrans Strategic Management Plan (SMP) goal to utilize leadership, collaboration, and strategic partnerships to develop an integrated transportation system that provides reliable and accessible mobility for travelers. Strategic objectives are to improve travel time reliability, reduce peak period travel times and delay, and improve operation of the transportation system.

Traffic Control

Traffic control is the management of freeway system and highway arterial facilities and devices including ramp metering, HOV/Managed Lanes, integrated corridors, and arterial systems. Operational objectives of traffic control systems include making the best use of existing roadway and freeway network capacity and reducing trip times.

Traveler Information

An information system that provides travelers with information that will facilitate their decisions concerning route choice, departure time, trip delay or elimination, and mode of transportation.

Update Operational Practices

Updating operational practices is one of the Caltrans District 3 RCTO corridor concept strategies to improve corridor management and performance outcomes, collaborating with Caltrans partners. It involves revisiting and evaluating existing business and system management practices and protocols to update and refine them for improvements. It involves maximizing the efficiencies and effectiveness of the system management activities. It requires identified initiatives that support the organizational vision and mission. It requires a dedication and commitment from management and staff to improve its system management and operations.



List of Acronyms:

CSMP	Corridor System Management Plan
CCTV	Close Circuit Television Camera
CHP	California Highway Patrol
CMS	Changeable Message Sign
CV	Connected Vehicles
FHWA	Federal Highway Administration
FSP	Freeway Service Patrol
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
ICM	Integrated Corridor Management
MUTCD	Manual of Uniform Traffic Control Devices
RCTO	Regional Concept of Transportation Operations
RMS	Ramp Metering System
RTP	Regional Transportation Plan
SHRP-2	Second Strategic Highway Research Program
SMP	Strategic Management Plan
SOV	Single Occupancy Vehicle
TCR	Transportation Concept Report
TCS	Traffic Control Software
TIM	Traffic Incident Management
TMS	Transportation Management System
TMT	Traffic Management Team
TOS	Traffic Operations System
TSM&O	Transportation System Management and Operations
VHD	Vehicle Hours of Delay



APPENDIX B

RCTO Initiatives Goals and Objectives



RCTO Initiatives Goals and Objectives

As described on page 6, the Caltrans District 3 RCTO goals, objectives, and performance targets, consistent with the Caltrans Strategic Management Plan, are summarized in the table below. The initiatives are the strategies in the pursuit of achieving and realizing the performance targets. As presented in the preceding pages, various studies have shown that significant performance outcome benefits can be achieved, in reaching these performance targets, with the RCTO initiatives.

It is in the development of corridor studies, such as CSMPs, that projects are identified and proposed based on the RCTO initiatives, analyzed, and expected benefits estimated. The list of proposed projects are then prioritized in the update of the ITS/Ops Inventory for programming and funding. Each corridor should be optimized for the most efficient and effective performance.

District 3 RCTO Goals & Objectives	District 3 Performance Targets
Goal 1 (Caltrans SMP Goal #1) - Safety and Health	
1 Reduce user fatalities and injuries	<ul style="list-style-type: none"> Result in 0.5 or less fatalities per 100 million VMT on SHS every year 10% reduction in number of fatalities in calendar year in each mode type
Goal 2 (Caltrans SMP Goal #2) - Stewardship and Efficiency	
1 Effectively manage transportation assets with asset management plan (fix-it-first)	<ul style="list-style-type: none"> By 2020, maintain 90% or better ITS elements health
Goal 3 (Caltrans SMP Goal #3) - Sustainability, Livability, and Economy	
1 Provide mobility choice, increase accessibility to all transportation modes and create transportation corridors	<ul style="list-style-type: none"> By 2020, increase non-auto modes (triple bicycles, double pedestrians, and double transit ridership)
2 Support statewide reduction of GHG emissions	<ul style="list-style-type: none"> By 2020, 15% reduction of GHG (from 2010 levels) By 2020, 20% increase incorporating green infrastructure into projects
Goal 4 (Caltrans SMP Goal #4) - System Performance	
1 Improve travel time reliability for all modes	<ul style="list-style-type: none"> By 2020, improve buffer time index reliability ranking by one level or 15%
2 Reduce peak period travel times and delays for all modes	<ul style="list-style-type: none"> By 2020, reduce to 8% rate of growth in daily vehicle hours delay (DVHD) under 35 mph on urban SHS
3 Improve integration and operations	<ul style="list-style-type: none"> By 2020, provide real-time multimodal system information to public of integrated corridors
4 Increase number of Complete Streets features on SHS	<ul style="list-style-type: none"> By 2020, increase annual number of Complete Streets features by 5%
5 Develop integrated corridor management (ICM) strategies	<ul style="list-style-type: none"> By 2020, complete one ICM implementation plan in District 3 By 2025, implement one ICM corridor in District 3, reduce to 6% rate of DVHD growth on corridor
Goal 5 (Caltrans Goal #5) - Organizational Excellence	
1 Improve internal and external communication to demonstrate professionalism and service levels to the public and stakeholders	<ul style="list-style-type: none"> By 2020, increase approval rating by stakeholders by at least 5% annually
2 Improve collaborative partnerships	<ul style="list-style-type: none"> By 2020, have at least 75% approval rating by collaborative partners



Freeway Management (Ramp Metering)

For ramp metering initiatives, the primary goals are to improve freeway operations and traffic safety, and reduce emissions, collaborating closely with local partner agencies particularly with systems integration. For normal operations, the desire is to maximize freeway corridor performance, while minimizing impacts to local arterials. This can be achieved by utilizing all of the available capacity of all on-ramps along identified Focus Corridors and controlling the metering release rates for optimal timing corridor-wide. In order to do this effectively, advanced corridor-wide adaptive ramp metering will be needed in the Focus Corridors, ultimately moving towards ICM deployment, integrating the advanced ramp metering with arterial signal management in ICM application. The ICM system is needed to utilize ramp metering more effectively during incidents on the freeway or on the local arterials. Projects are needed to modernize the system and infrastructure for this advanced future application. Projects should be identified and incorporated into the CSMP for analysis. As part of the development, CSMPs should assess and monitor the progress of achieving corridor-specific performance targets agreed upon by corridor stakeholders.

Freeway Management (HOV/Managed Lanes)

For HOV/managed lanes initiatives, the primary goals are also to improve freeway operations and traffic safety, and reduce emissions, collaborating closely with partner agencies particularly with ICM deployment. For normal operations, the desire is to maximize freeway corridor performance, as well as providing advantageous modal choice options to carpool or transit. It is both a demand management as well as operations strategy. The current District 3 HOV/Managed Lanes system is in basic form without integration of technology application or advanced features like direct access ramps or freeway to freeway direct connectors. For future, the system needs to migrate and transition into a more advanced application and operations. In addition to the system network expansion, consideration should be given for ITS application (like lane management, electronic travel time signs, etc.), direct access ramps, and direct connectors, ultimately moving towards ICM deployment. Projects are needed to modernize the system and infrastructure for advanced future application, which should be identified and incorporated into the CSMP for analysis. As part of the development, CSMPs should assess and monitor the progress of achieving corridor-specific performance targets agreed upon by corridor stakeholders.

Arterial Management (Traffic Signal Systems)

For traffic signal systems initiatives, the primary goals are to improve ramp intersection operations, highway operations, and traffic safety, and reduce emissions, collaborating closely with partner agencies particularly with ICM deployment. For normal operations, the desire is to maximize freeway corridor ramp intersection performance and highway arterial performance. This can be achieved with central control and advanced adaptive signal control operations, ultimately moving towards ICM deployment, integrating the advanced Caltrans signal operations with local arterial signal management in ICM application. The ICM system is needed to utilize signal operations more effectively during incidents on the freeway or on the local arterials to move traffic expeditiously around incidents and minimize delays and collisions. Projects are needed to modernize the system and infrastructure for this advanced future application. Projects should be identified and incorporated into the CSMP for analysis. As part of the development, the CSMPs should assess and monitor the progress of achieving corridor-specific performance targets agreed upon by corridor stakeholders.



Incident and Event Management

For incident and event management initiatives, the primary goals are to improve incident management operations to reduce non-recurrent congestion and emissions, and to improve traffic safety. The incident management program needs to take advantage of the recent technology advancements and utilize all of the technology applications along a well-equipped corridor, ultimately moving towards ICM deployment. To achieve this requires improving on proactive practices by developing detailed response plans, and collaborating with local and regional partner agencies. Projects should be identified and incorporated into the CSMP for analysis. As part of the development, the CSMPs should assess and monitor the progress of achieving corridor-specific performance targets agreed upon by corridor stakeholders.

Traveler Information

For traveler information initiatives, the primary goals are to improve traffic safety for all modes, improve mobility and access, reduce emissions, and increase use of active modes by way of traveler information to the public for pre-trip planning and enroute traffic. One desire is to improve on the quality of detection data collection and sharing of the data with partner agencies and information service providers. Another is to improve on the regional traveler information program in collaboration with partner agencies. Another is to provide ICM corridor specific traveler information both for pre-trip planning and enroute traffic management. Projects should be identified and incorporated into the CSMP for analysis. As part of the development, the CSMPs should assess and monitor the progress of achieving corridor-specific performance targets agreed upon by corridor stakeholders.

Operational (Infrastructure) Improvements and Multimodal Transportation

For operational improvements and multimodal transportation initiatives, the primary goals are to improve traffic safety for all modes, improve mobility and access, reduce emissions, and increase use of active modes. The operational improvements to the infrastructure can include a variety of measures such as acceleration/deceleration lanes, auxiliary lanes, interchange modifications, etc., that can achieve much of the performance targets. Improvements should also include measures to encourage greater use of active modes and multimodal hubs for mode transitions. Future trips can include combination of different modes instead of the single occupant vehicle mode, commonly used today. Some of the new infrastructure improvements can be incorporated into an ICM system, with multimodal integration. Projects should be identified and incorporated into the CSMP for analysis. As part of the development, the CSMPs should assess and monitor the progress of achieving corridor-specific performance targets agreed upon by corridor stakeholders. Any features that involve active transportation and multimodal elements should involve partner agencies for collaboration.



APPENDIX C

List of References



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