

Caltrans District 4

Division of Operations Presentation at
Planning Academy

10/16/2012

DISTRICT 4

CALTRANS...



We're here *to get you there.*



Presentation Outline

- ◆ Bay Area Congestion
- ◆ Multimodal Corridor Management
 - Operations and System Planning
 - Operational Strategies
- ◆ Ongoing Bay Area TOS/ITS
 - Freeway Performance Initiative TOS/ITS
 - Integrated Corridor Management and SMART Corridor Projects



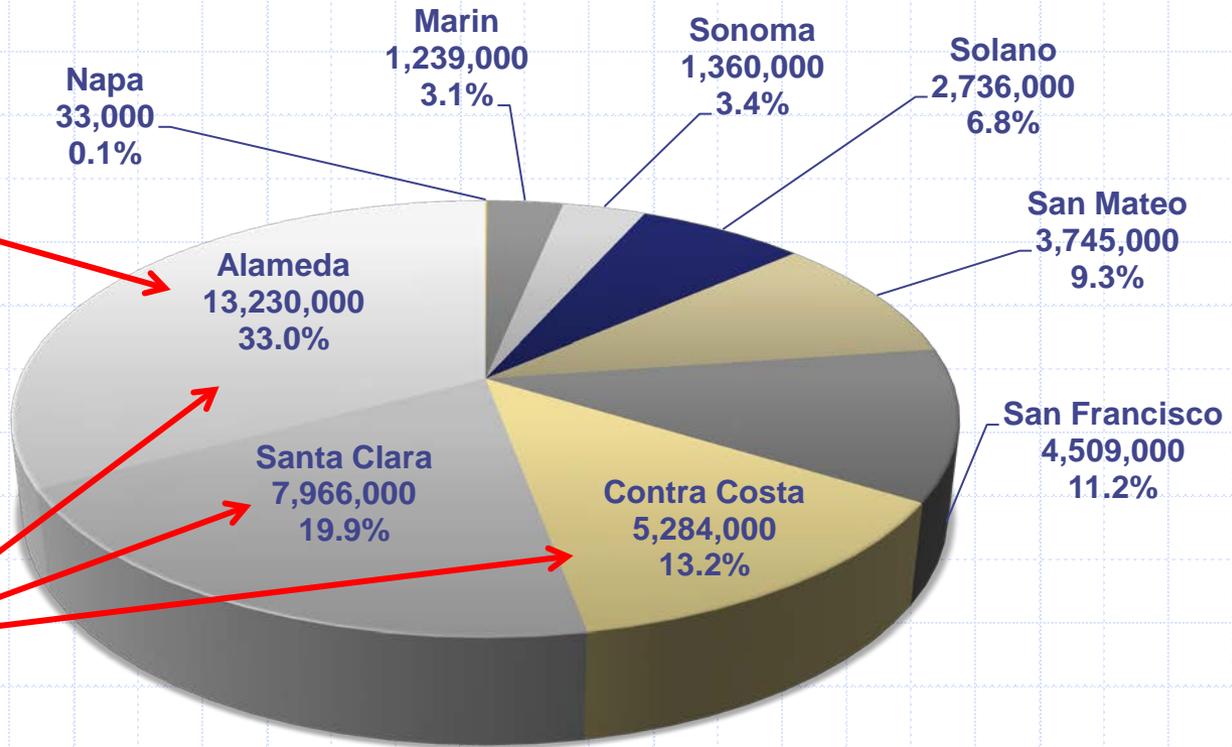
San Francisco Bay Area Total Annual Delay by County (2009)

(Total vehicle-hours of delay per year based on 60 mph threshold)

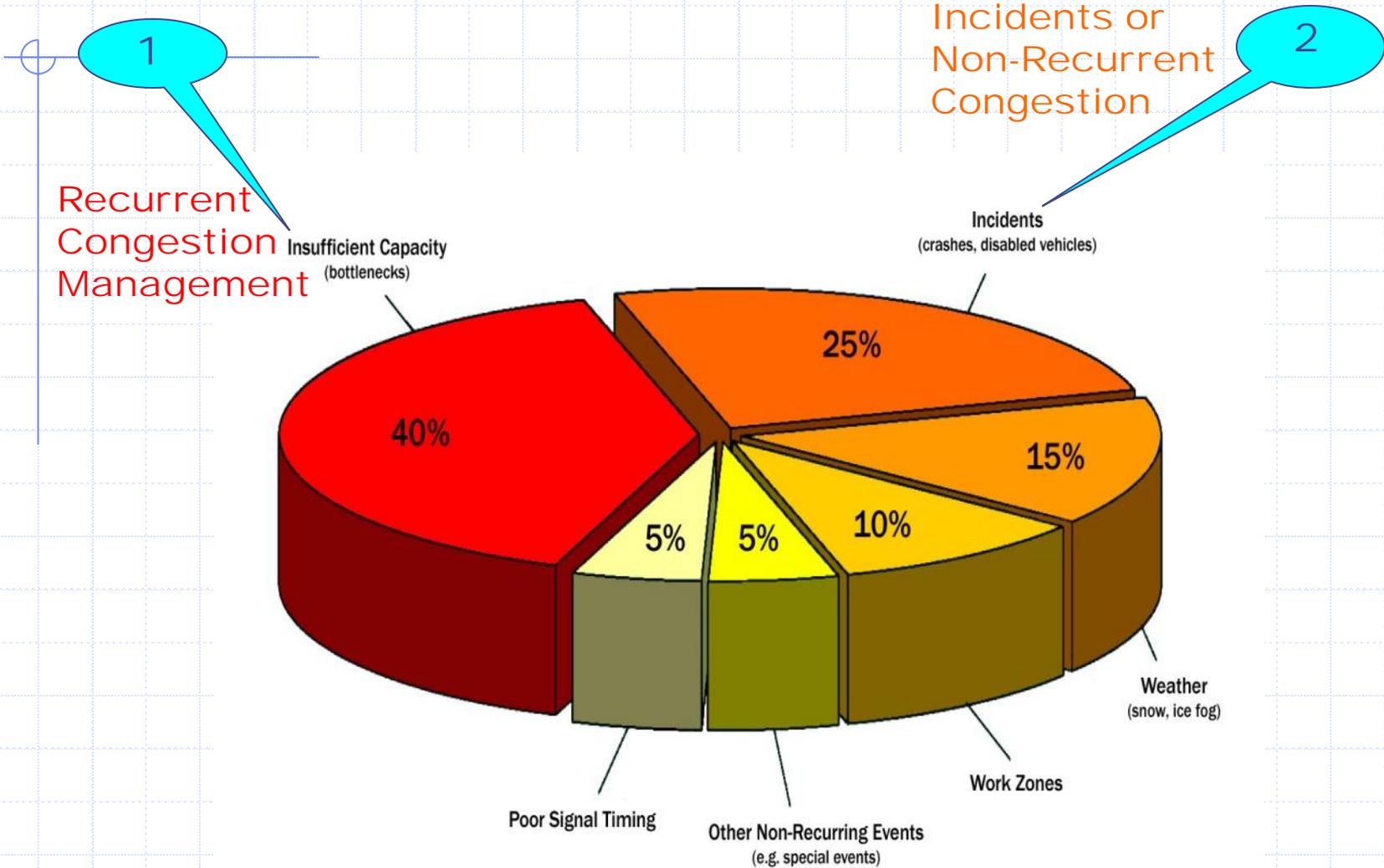
Bay Area Total Annual Congestion Delay 40,102,000 vehicle-hrs

**Most Congested
County**

**Three Counties
account for two thirds
of Bay Area
Congestion**



Causes of Congestion



Source: Federal Highway Administration, 2003

Multimodal Corridor Management



Mobility Update

San Francisco Bay Area

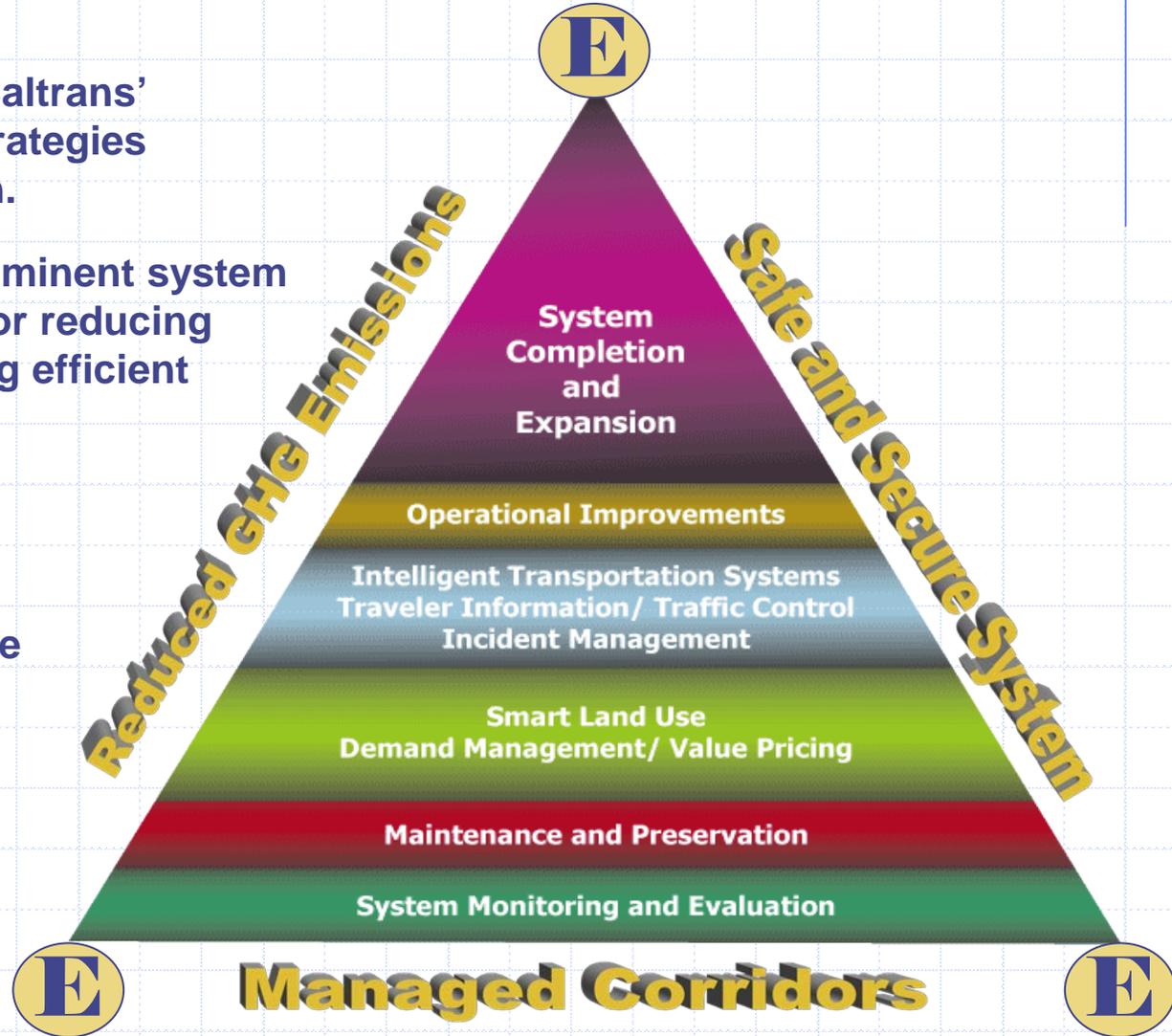
- ◆ **Multimodal Corridor Management**
 - **Operations and System Planning**
 - ◆ System Management Plans (RCR, CSMP, CP)
 - ◆ Performance Measures
 - ◆ Bottlenecks
 - ◆ Mitigation Strategies
 - **Operational Strategies**
 - ◆ Express Lanes Network
 - ◆ Ramp Meters
 - ◆ TOS/ITS

Operations and System Planning

Mobility Pyramid

Multimodal Corridor Management

- This pyramid outlines Caltrans' system management strategies for reducing congestion.
- ITS deployment is a prominent system management strategy for reducing congestion and enabling efficient system monitoring and evaluation.
- Together, these strategies facilitate development of effective Corridor System Management Plans.
- We have developed specific CSMPs for 10 of our most congested corridors.





System Management Plans: How did they evolve?

Through a growing recognition of how Planning and Operations functions complement each other

What Planners Are Good At – Long-Term Vision (seeing the forest)

What Operations Engineers Are Good At – Short-Term Strategies (seeing the trees)

- Route Concept Report (RCR)
- Transportation Corridor Concept Reports (TCCR)
- Corridor Plan (CP)
- Corridor System Management Plan (CSMP)



System Management Plans (4-Panel TCCR)

TCCR CORRIDOR #11B:
MTC 2001 RTP Corridor Name:

INTERSTATE 880 / STATE ROUTE 17 (Alameda I-80 to Santa Cruz SR-1 - ALAMEDA COUNTY PORTION)
Eastshore South / Fremont Southbay / Silicon Valley

PRELIMINARY DRAFT 5/25/02

DISTRICT 4
Transportation Planning/Traffic Operations

Existing Conditions (2000)



Location (Post Mile)
Segment
Existing Lanes (2000)
Vehicle Hours Delay (AM/PM) *

Location (Post Mile) Segment	Existing Lanes (2000)	Vehicle Hours Delay (AM/PM) *
ALA I-80	5F (1H)	34.37
s/o 80W / 80E split	6F	34.1
s/o I-880-I-880 IC	8F (M30)	31.68
s/o Marina Blvd.	8F (1H) (M5)	22.84
s/o Hesperian Blvd.	10F (2H) (M4)	19.96
n/o SR-92-I-880 IC	8F (2H) (M10)	16.99
n/o Alvarado-Niles	8F (2H) (M6)	13.1
n/o SR-84-I-880 IC	8F (2H) (M23)	10.5
ALA/SC/Co. Line	6F (M5)	0.0 (10.5)
n/o Montague Expt.		0.75

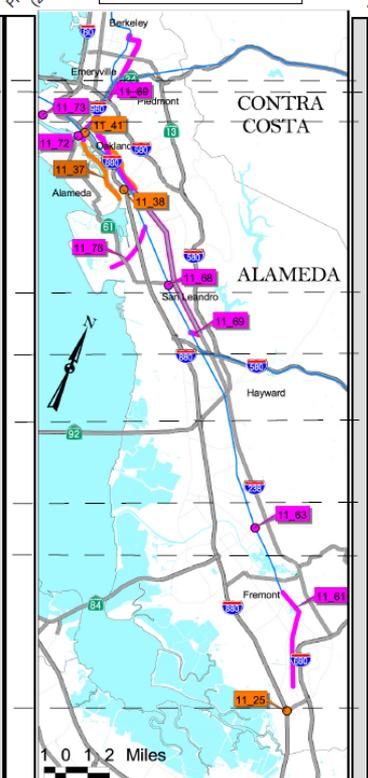
Programmed Projects (Committed Funding)



Major Programmed Projects (Committed Funding) ☐
Map Number/Source Document Code/Project Name

- 11_23 / E: I-880-I-880 cross connector (study only)
- 11_24 / A: Reconstruct I-880/SR262 interchange and widen I-880 from SR-262 (Mission Blvd.) to the Santa Clara County line from 8 to 10 lanes (8 mixed-flow and 2 HOV lanes)
- 11_29 / A: I-880/SR-92 IC Improvements + Aux Lanes Tennyson to Winton
- 11_34 / C: Washington Ave. IC Improvements
- 11_39 / C: SB Aux Lane - Embarcadero to Oak Street
- 11_62 / E: Regional Express Bus Program: I-880/Fremont BART Station to Silicon Valley
- 11_66 / E: Regional Express Bus Program: I-880/Hayward BART Station to Silicon Valley
- 11_71 / E: Capitol Corridor intercity rail service (9 round trips daily between Oakland and Sacramento, and 7 round trips daily between San Jose and Oakland)
- 11_75 / E: Port of Oakland Joint Intermodal Terminal.
- 11_77 / E: Fruitvale BART Station transit village

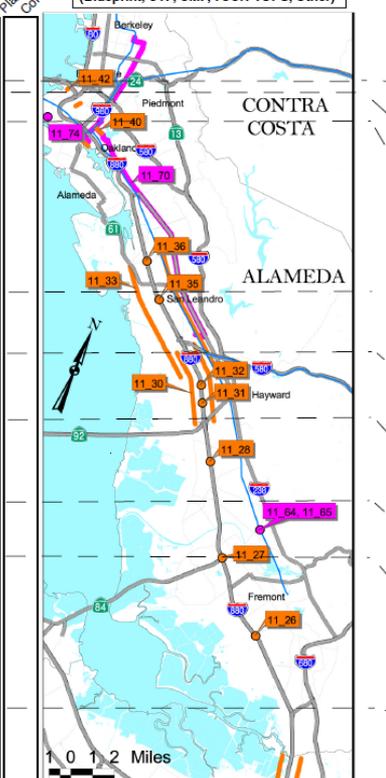
Planned Projects (RTP Track 1, Unprogrammed)



Major Planned Projects (RTP Track 1) ☐☐
Map Number/Source Document Code/Project Name

- 11_25 / E: Widen and reconstruct Route 262/Warren Avenue/I-880 IC and east Warren Avenue/UPRR grade separation.
- 11_37 / A: I-880/Broadway-Jackson interchange improvements (Phase 1) + Aux Lanes to High Street
- 11_38 / E: 42nd Avenue/High Street access improvements to I-880 in Oakland, includes widening and realignment of local streets, connector roads, and ramps near interchange
- 11_41 / E: Route 200 to I-880 connection improvements between Alameda and Oakland.
- 11_61 / E: BART extension to Warm Springs
- 11_63 / E: Union City Intermodal Station access improvements (Phase 1); includes extending 11th Street and constructing a grade parking and pedestrian grade separation.
- 11_68 / E: San Leandro BART Station transit village (Phase 1); includes parking structure, kiss-and-ride and bus improvements.
- 11_69 / E: Rapid Bus Transit (RBT) at Oakland/Berkeley/San Leandro Corridor (Stage 1)
- 11_72 / E: Capitol Corridor mitigation for track work at Jack London Square
- 11_73 / E: Joint Intermodal Terminal - Port of Oakland access improvements (Phase 1)
- 11_76 / E: BART-Oakland International Airport Connector

Major Planned, Highway Concept Projects (Blueprint, CTP, CMP, TCCR-TOPS, Other)



Major Planned, Concept Projects (Blueprint/CTP/CMP/TCCR-TOPS/Other) ☐☐☐
Map Number/Source Document Code/Project Name

- 11_26 / F: Conist bus slip-ramp at Stevenson IC
- 11_27 / I: Build new Park & Ride Lot at Decoto Rd
- 11_28 / E: I-880 Industrial Parkway interchange northbound offramp (design phase only)
- 11_30 / G: Widen I-880 from I-288 to SR-92
- 11_31 / E: I-880/Winton interchange improvements
- 11_32 / E: A Street/I-880 interchange improvements
- 11_33 / F: Extend HOV lanes from Hacienda to 98th Ave
- 11_35 / E: Marina Boulevard/I-880 ramp improvements (Stages 1 & 2)
- 11_36 / E: ITS deployment along 98th Avenue from I-880 to Oakland International Airport
- 11_40 / E: I-880/Broadway-Jackson interchange improvements (Phase 2)
- 11_42 / I: Provide HOV access from Maritime on-ramp to Bay Bridge toll plaza
- 11_43 / E: I-880 Operational improvements (not shown on map)
- 11_49 / C10: Corridor-wide TMS/ITS elements (not shown on map)
- 11_53 / C10: Corridor-wide TMS/ITS elements NB/SB (not shown on map)
- 11_54 / C10: Corridor-wide fiber elements (not shown on map)
- 11_64 / E: Union City Intermodal (Phase 2); includes 19 bus bay transit center and kiss-and-ride area.
- 11_65 / E: Union City Intermodal (Phase 3): BART parking structure to support transit village
- 11_70 / E: Oakland/Berkeley/San Leandro AC Transit Corridor enhancement (Stage 2, BRT)
- 11_74 / E: Joint Intermodal Terminal (JIT)-Port of Oakland access improvements (Phase 2)

Highway Operational Concept Configuration (2025) ☐☐☐
% ADT Growth Forecast (2010-2020) **
Segment

Highway Operational Concept Configuration (2025) ☐☐☐	% ADT Growth Forecast (2010-2020) **	Segment
5F (1H) (M2)	R	20%
7F (1H) (M4)	Q	20%
8-10F (2H) (M30)	P	20%
9F (2H) (M5)	O	20%
12F (4H) (M4)	N	20%
9F (2H) (M10)	M	20%
8F (2H) (M8)	L	30%
8F (2H) (M23)	K	30%
8F (2H) (M8)	J	30%

Sources of Operating Condition Information:
Caltrans Highway Congestion Report (1996)
MTC BANGAST 2000. ADT Growth % is 2000 to 2020.

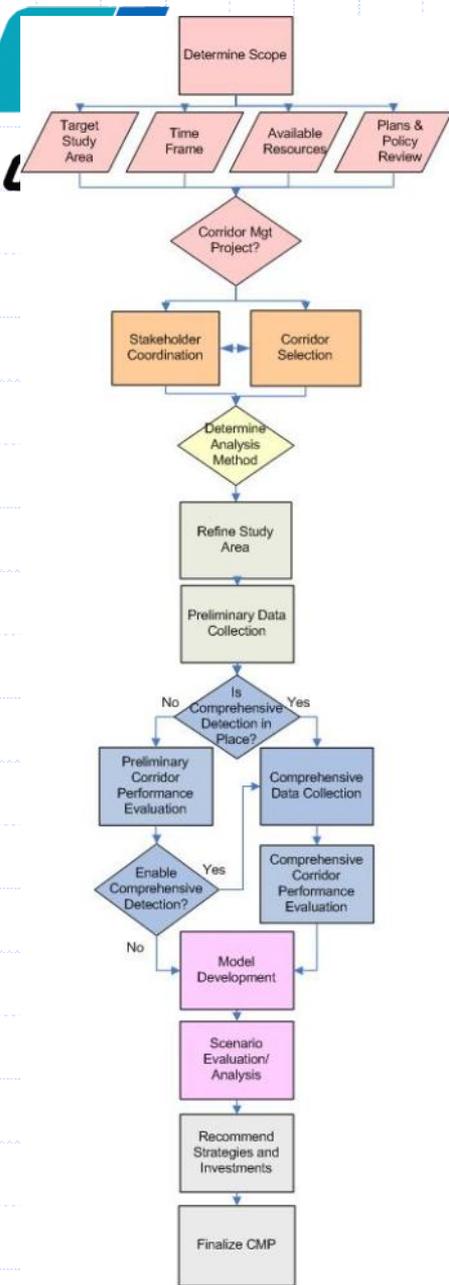
Sources of Plans and Program Document Information:
2000 STIP, SHOPP, 2001 TIP, MTC RTP (2001) Committed
MTC RTP (2001) Track 1 (unprogrammed)
MTC Blueprint (2000), RTP (1998) Track 2, County CMPs, MIS, Traffic Operational Strategies (TOPS)

MAP LEGEND
U.S. Highway Interstate Highway
California State Highway

Project Code Legend
Proj. # / A: Project Description Example: 5-2 / A: San Pablo IC
5-2: Project Number
A: Source Document Code (highest planning document; see legend, right)

Lane Classification
F: Freeway
E: Expressway
C: Conventional
H: High Occupancy
R: HOV - Reversible
TCL: Truck Climbing Lane
M# # of Metering Locations

Source Document Code
A: TIP F: 2000 Blueprint
B: STIP G: County CTP/CMP
C: SHOPP I: TCCR-TOPS
C10: 10-yr SHOPP Plan
D: Local J: Construction
E: 2001 RTP K: Permits
T: TORP



System Management Plans: CSMP and CP

A Corridor System Management Plan responds to the following questions:

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

Objective:

Performance based decision making.



System Management Plans (CSMP and CP): Milestones and Document Outline

Document Outline

- 1. Study Overview and Planning Context**
 - **planning and system management objectives**
- 2. Stakeholder Participation**
 - **committee structure, nature of stakeholder involvement**
- 3. Corridor Description**
 - **freeways, major arterials, transit, intermodal facilities, land use, major generators and attractors, environmental issues**
- 4. Current Performance**
 - **data needs, multimodal performance assessment**
- 5. Expected Future Performance**
 - **operational analysis, alternative improvement scenarios**
- 6. Recommended Improvements**
 - **recommend strategies, project prioritization and phasing**



System Management Plans (CSMP and CP): Performance Measures and Data Sources

Data Sources:

- ⑩ Detection data using PeMS
- ⑩ Annual HICOMP report
- ⑩ Probe vehicle data
- ⑩ Previous studies conducted by Caltrans or its stakeholders
- ⑩ Transportation Corridor Concept Reports (TCCRs)
- ⑩ Project Study Reports (PSRs)
- ⑩ Pavement condition data

Key Performance Measures:

- ◆ Mobility – Delay, Travel Time
- ◆ Reliability – Variation of travel time (PeMS)
- ◆ Safety – Accidents, accident rates
- ◆ Productivity – Lost lane miles (PeMS)
- ◆ Preservation – number and locations of distressed lane miles

Bottlenecks

◆ Bottleneck Definition - Demand exceeds Capacity

- Demand is hourly rate (vph) at which persons or vehicles want to use a section of highway
- Capacity is maximum hourly rate (vph) at which persons or vehicles can reasonably be expected to pass a point or section of highway under *prevailing roadway & traffic conditions*

◆ Typical Bottleneck Locations

- Recurrent
 - ◆ Downstream of an on-ramp
 - ◆ Downstream of a lane drop
 - ◆ Horizontal Curves
 - ◆ Uphill grades
- Non-Recurrent
 - ◆ Construction/maintenance work zone
 - ◆ Stalled vehicle
 - ◆ Accident

Mitigation Strategies

Table 2. Mapping Bottleneck Problems to Mitigation Measures

Bottleneck Types	Mitigation Measures									
	Right Shoulder Conversion	Left Shoulder Conversion	Lane Width Reduction	Auxillary Lanes	Collector-Distributor Road	Re-Stripping to Add More Narrow Lanes All Purpose Lane (Concurrent or Reversible)	HOV Lanes (Concurrent or Reversible)	Ramp Metering	Temporary Ramp Closures	Traveler Information
Heavy On-Ramp Demand										
Weaving Sections										
Lane Drops										
Tunnels and Bridges										
Horizontal and Vertical Curves										
Narrow Lanes and Lateral Obstruction										
Inadequate Accelerated and/or Decelerated Lanes										

= good solution
 = may be helpful
 = not applicable

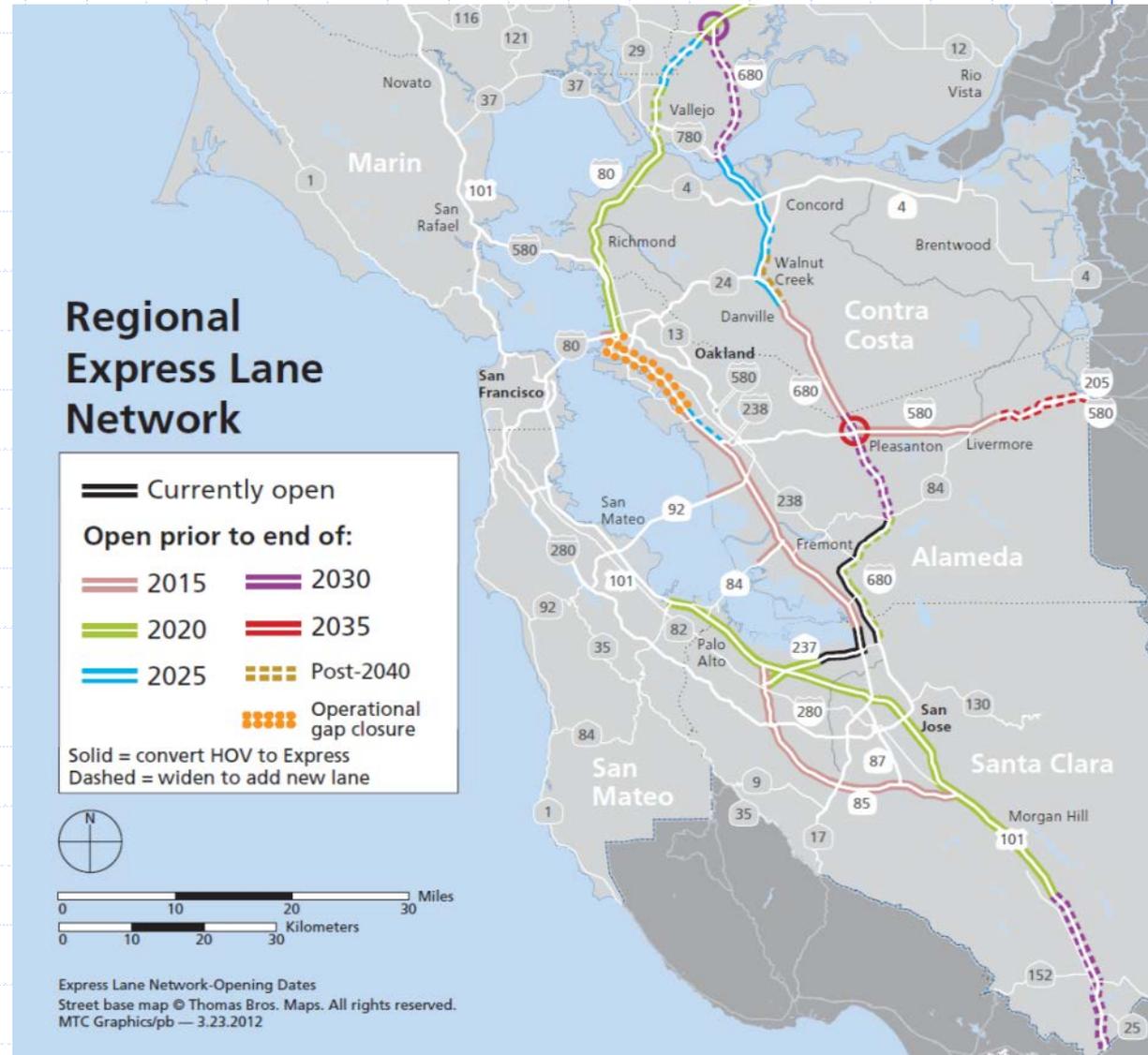
Operational Strategies

Bay Area Express Lanes Network

Bay Area Regional Express Lane Network

Benefits:

- Making HOV lanes more efficient
- Continue to provide free access to transit and carpool vehicles
- Increase time-savings for carpools & transit by closing gaps in the network sooner
- Express Lane provides a reliable congestion free option for drivers
- In mixed flow lanes, increase throughput, enhance speed, reduce delays & associated greenhouse gas effects



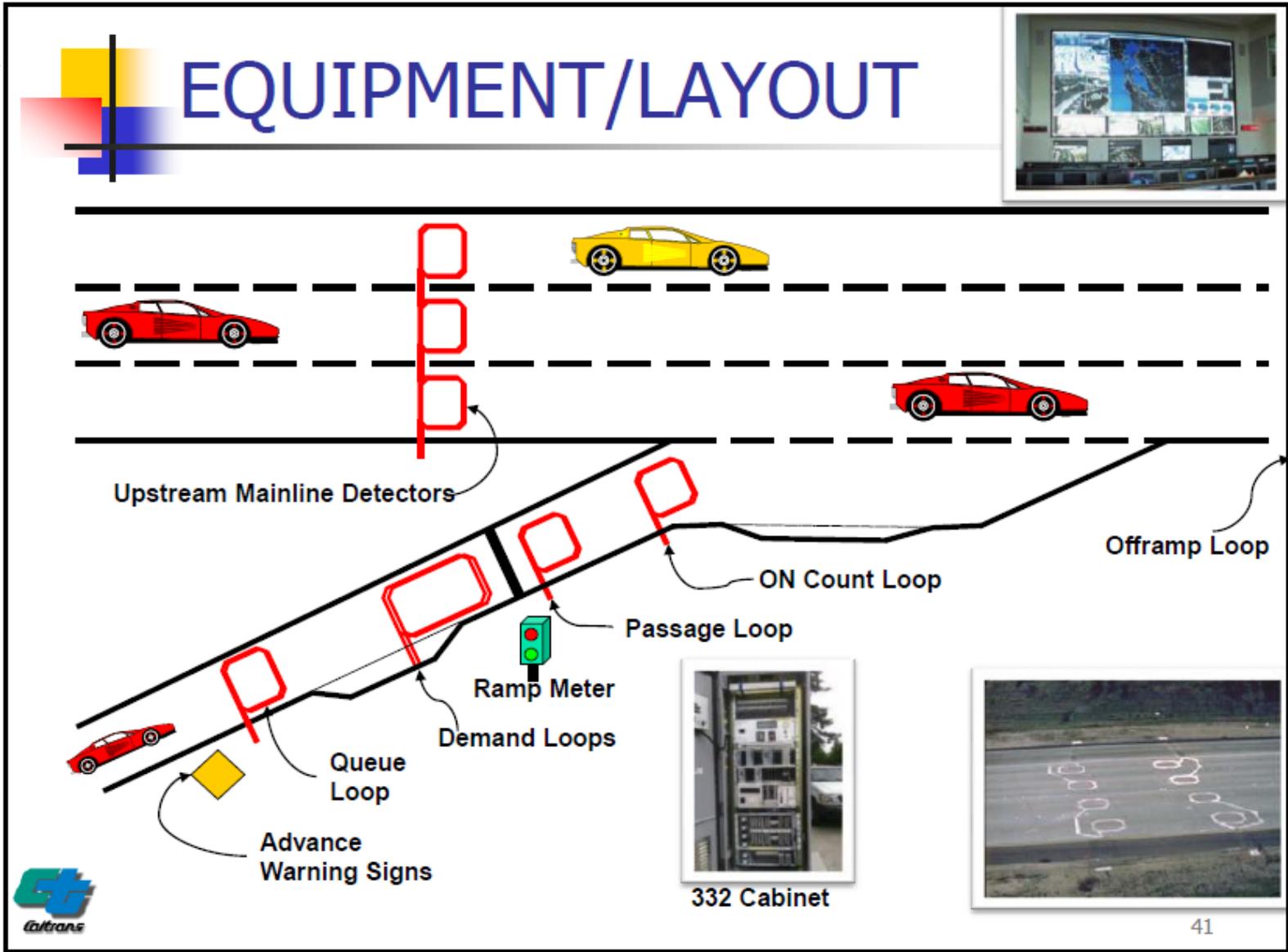
Ramp Meters

Ramp Meters

- ◆ **Policies/Manuals/Plans**
 - **DD-35-R1**
 - **Ramp Meter Development Plan**
 - **Ramp Meter Design Manual**

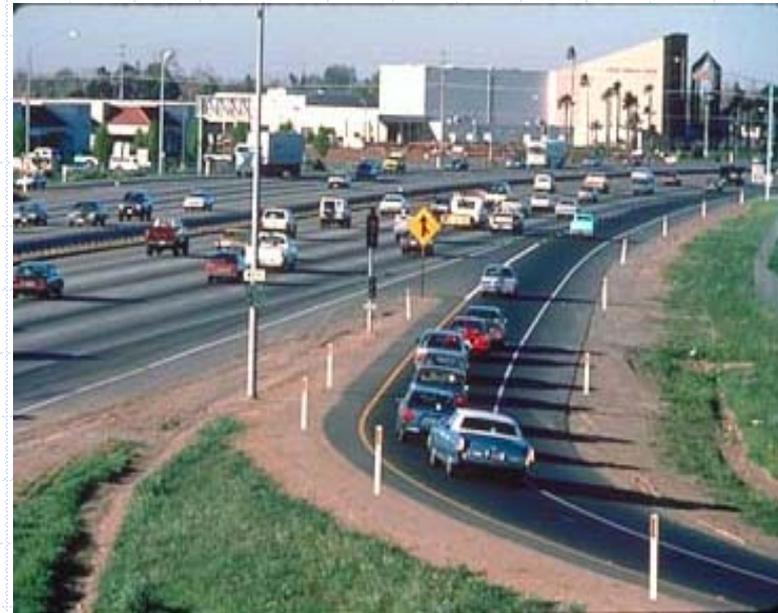
- ◆ **Types of Ramp Meter Operation**
 - **Fixed Rate**
 - **Local Mainline Responsive**
 - **Corridor**

Ramp Meter Layout



RAMP METERING BENEFITS

1. Reduce Congestion: Breaks up platoons



- ◆ Meters work like dams
- ◆ Meters prevent flooding of the downstream bottlenecks by 'managing' the upstream flow

RAMP METERING BENEFITS

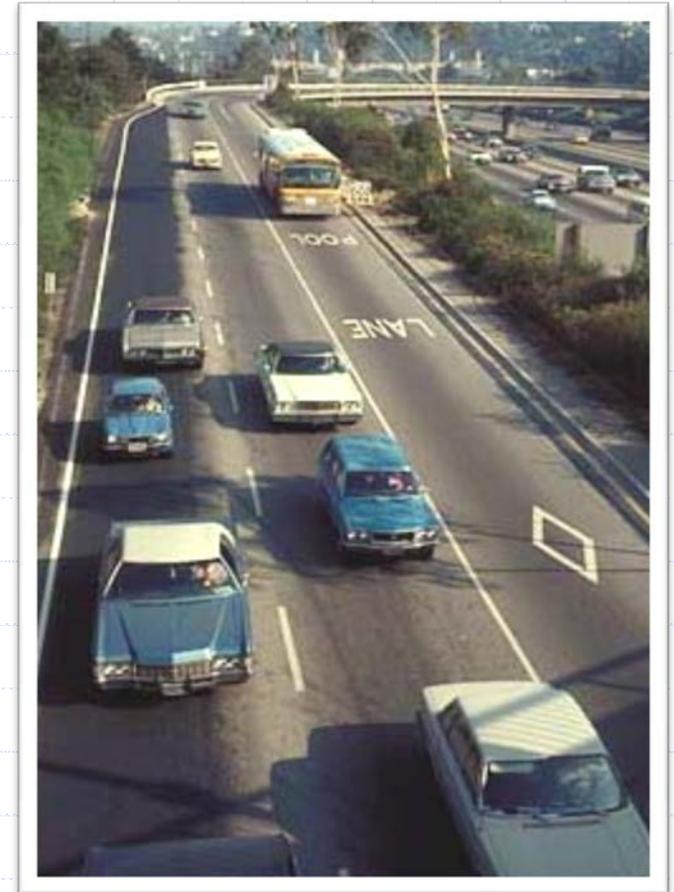
2. Utilize Capacity of Corridor

- ◆ Route
 - Different ramp
 - Frontage road
 - Surface street
- ◆ Time
 - Earlier
 - Later
 - Not at all



RAMP METERING BENEFITS

3. Encourage Modal Shift





Ramp Meter Deployments in Bay Area

Effects of Ramp Metering Deployments Since 2007

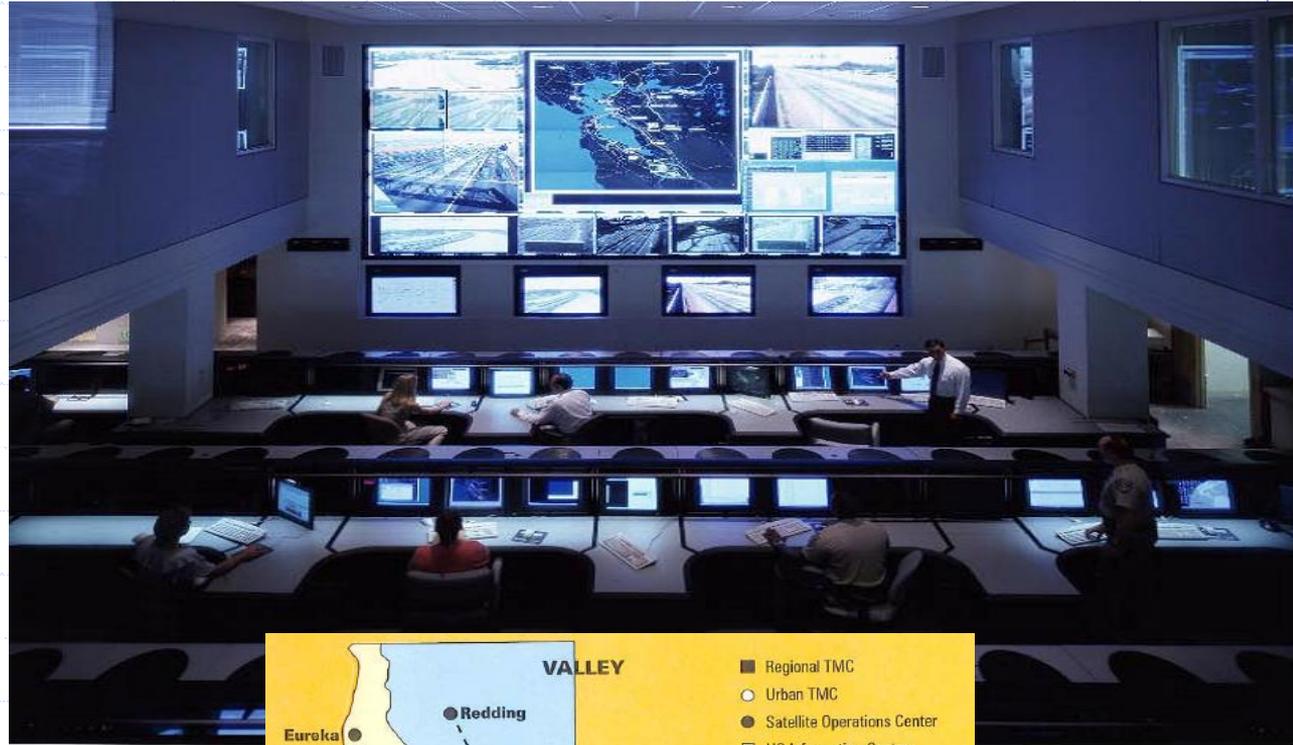
		Maximum Travel Time Reduction	Peak Period Duration Reduction	% Delay Reduction
SM-101	SB; Hillsdale to University	-19 min.	-1 hr	57%
ALA-580	EB; Foothill to Greenville	-11 min.	-2 hr	33%
SM-280	NB; Sneath to Serramonte	-3 min.	-1 hr	28%
SCL-85	SB; Almaden to Cottle	-4 min.	-1 hr	52%
SCL-87	NB; Rte 85 to Skyport	-4 min.	-2 hr	30%
SCL-87	SB; Charcot to Santa Teresa	-9 min.	-1 hr	41%
ALA-580	WB; I-205 to Foothill	-7 min.	-1hr	24%
SCL-101	SB; Embarcadero to De La Cruz	-1 min.	N/A	5%
SCL-880	SB; SR 237 to Stevens Creek	-11 min.	-1 hr	38%

Bay Area Traffic Operations & Intelligent Transportation Systems



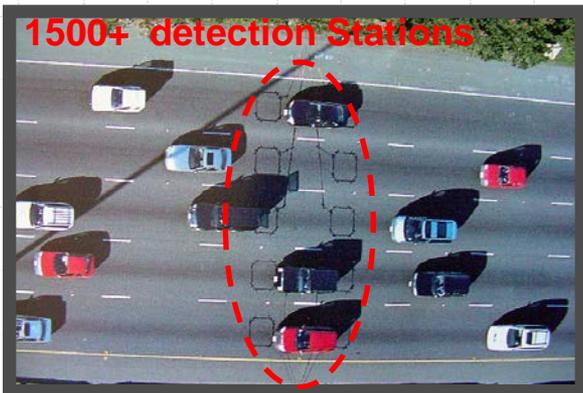
Transportation Management Center (TMC)

- Built in 1996 and operational 24/7
- Jointly staffed by Caltrans, CHP and MTC/511
- Aggressively monitors and rapidly deploys available traffic management and motorist information services.
- Enhances communication among stakeholders.
- Minimizes traffic congestion due to incidents, planned highway work, and major special events.





Intelligent Transportation Systems (ITS) for Improved Mobility





Bay Area 511 Real Time Trip Data

- Traffic Conditions on Phone, Web & Mobile
- Driving Times™ on Phone & Web
- Driving Times on Caltrans' District 4 CMS
- Multi-modal Trip Planning
- 511.org and m.511.org



The screenshot shows the 511.org website for the SF Bay Area. At the top, there are navigation links for 511.ORG, TRANSIT, TRAFFIC, RIDESHARE, and BICYCLING. Below this is a navigation bar with links for Home, Get Around, Go Green, Call 511, About 511, and Mobile & Apps. A 'Breaking News' section highlights an accident on Northbound Hwy. 1. The main content area is divided into several sections: 'Public Transit Trip Planner' with input fields for start/end locations, time, and preferences; 'Current Traffic Conditions' with a map showing congestion levels; 'Real-Time Transit Departures' with dropdown menus for agency, route, direction, and stop; and 'Regional Transportation Tweets' featuring recent tweets from PresidioParkway, SpareTheAir, and BayAreaClipper. On the right side, there are promotional banners for 'Announcements', '511 Mobile', 'Get Real-Time Info!', 'Get your Clipper card now!', 'FasTrak', and 'Get Driving Times'. A 'Find a Carpool' section is also visible at the bottom right.

Traveler Information

- Travel Time on variable message Signs.
- U.S. 101 Commuter Travel Time Information System





Electronic Toll Collection & SFOBB Time of Day Pricing





Bay Area

T-2035, Freeway Performance Initiative (Infrastructure Investment for TOS/ITS)

- The Bay Area TOS is about 35% to 50% built-out.
- Build-out of the Bay Area TOS requires:

• Capital Cost	\$ 600 M
• Operations & Maintenance	\$ 625 M (at \$25 M per Year)

\$1,125 M

Escalated
to 2035

\$2 Billion

- Current goal is to build-out TOS in the next ten years and include it as one of the top priorities in T-2040.

Notes: 1. Caltrans has identified an additional \$180 M in less critical areas to be considered in next RTP.
2. Excludes support costs.

Ongoing Bay Area TOS/ITS Activities



Freeway Performance Initiative (FPI) TOS/ITS

- Complete the TOS/ITS in Bay Area
 - Traffic Detection
 - Ramp Metering
 - CCTV
 - Changeable Message Signs (CMS)
 - Highway Advisory Radio (HAR)
- \$309.1 million in Projects identified
 - SB SCL 280 - \$3.4 million – completed in 7/2011
 - NB SCL 280 - \$3.1 million - completed in 10/2011
 - SCL85 - \$12.7 million to be awarded by 9/2012
 - SCL 680 - \$22 million to be awarded by 10/2012
 - SCL101 - \$35.5 million to be awarded by 4/2013

I 80 Integrated Corridor Management (ICM)





San Mateo Smart Corridor

In San Mateo County on Route 101, SR 82, and on Local Streets between I-380 and to San Mateo/Santa Clara County line.

- Phase 1 – City of San Mateo (Demo Project)
- Phase 2 – San Bruno to Redwood City
- Phase 3 – Redwood City to Palo Alto

Total Estimated Project Cost is \$34.5 million



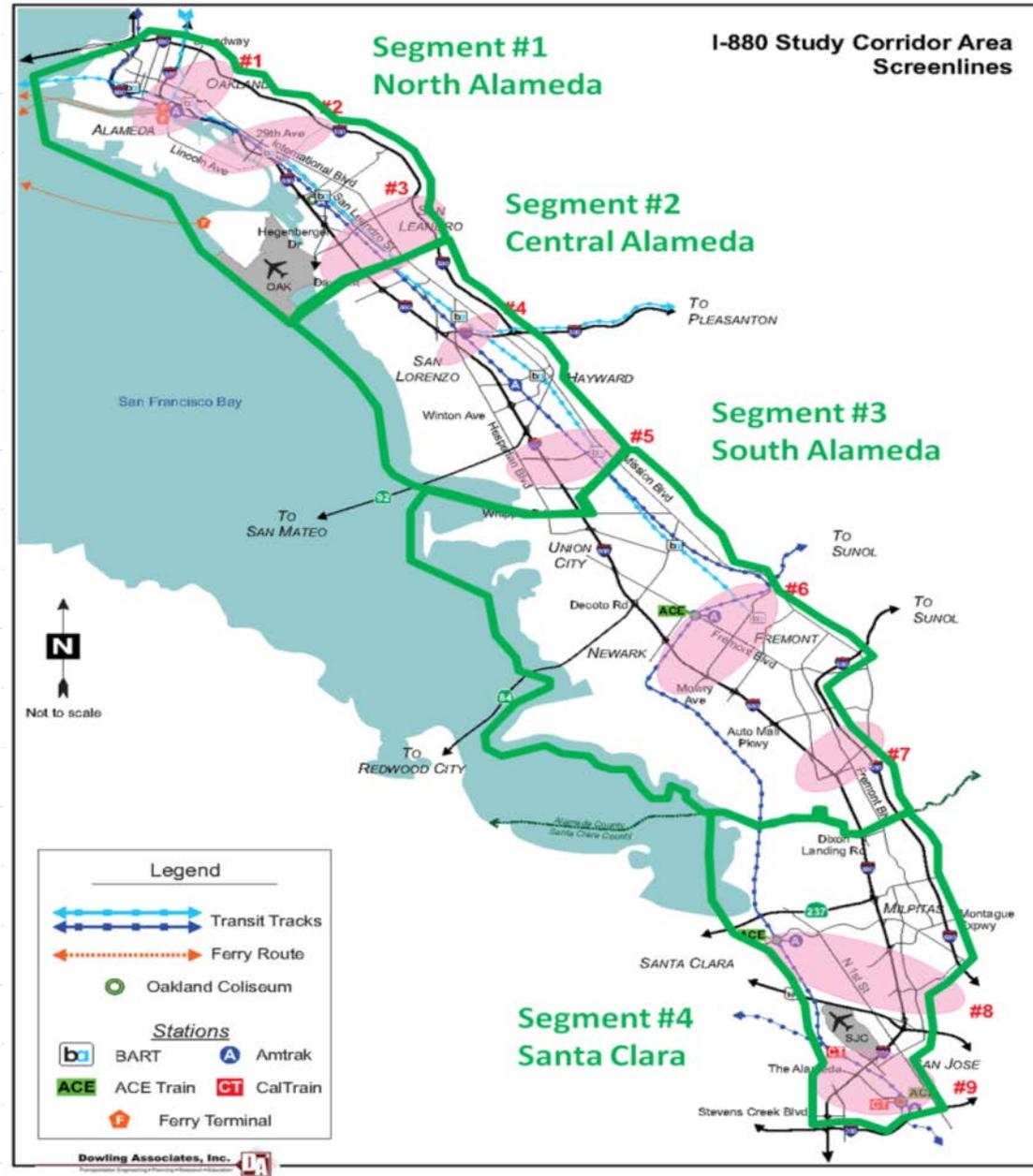


San Mateo Smart Corridor (cont.)

- ◆ Purpose of the project:
 - To provide incident management on local streets due to vehicles naturally self diverting from US-101.
 - To provide capability to manage recurrent traffic on local streets and El Camino Real (SR 82).
 - To provide capability to manage special events.
 - ◆ City of San Mateo Event Center
- ◆ Project Scope:
 - Traffic Operation Systems (TOS) and infrastructure
 - ◆ CCTV and PTZ cameras
 - ◆ signal controllers
 - ◆ vehicle detection devices
 - ◆ static and dynamic trailblazer message signs
 - ◆ fiber optic based communications
 - ◆ System Integration – hardware/software development to be able to optimize signal timing and activate trailblazer signs as conditions dictate
 - ◆ *Traffic Engineering – develop signal timing plans for special events and incidents*

I-880 Integrated Corridor Management (ICM)

- MTC funded \$700K project to develop an implementable plan for deployment of Integrated Corridor Management (ICM) strategies along the I-880 Corridor
- Partners include Caltrans, CMA's, Counties, and Cities
- I-880 ICM Segment #4 in Santa Clara County





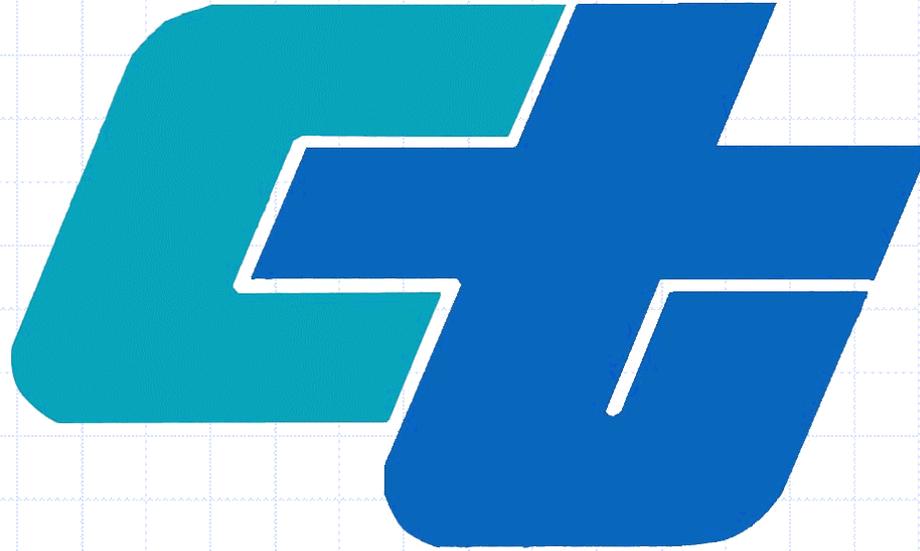
I-880 Integrated Corridor Management (ICM) (cont.)

PURPOSE

Develop an implementable plan to reduce congestion on and adjacent to the I-880 Corridor (from Oakland to San Jose) by developing an integrated transportation network, enhancing safety, efficiency, mobility and transportation choices for all regional travelers under all conditions.

ICM Strategies:

- Traveler Information System Improvements
- Travel Demand Management
- Improved Coordinated Ramp Metering
- Minor Geographic Improvements at Bottlenecks
- Lane Management
- Transit Coordination
- Congestion Pricing
- Goods Movement Strategies
- Integrated Incident Management Program



Caltrans

Questions & Answers