I-80 Integrated Corridor Mobility (ICM) Project

Corridor System Management Plan (CSMP)

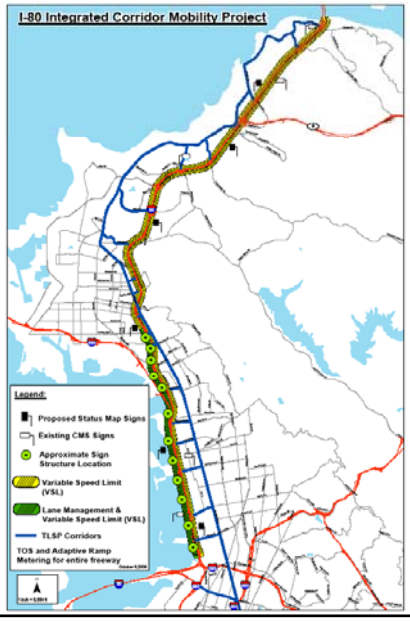
WCCTAC TAC Presentation
June 10, 2010

DRAFT

I-80 Corridor CSMP

- Study Corridor
- Existing Conditions
- Near-Term Conditions and Improvement Strategies
- Intermediate Term Improvements
- Long-Term Conditions and Improvement Strategies
- Summary/Key Findings

Study Corridor



Existing Conditions

Highway Travel Characteristics

- 117,000 to 288,000 vehicle per day; 1.8% to 5.4% are trucks
- Morning peak is westbound and evening peak is eastbound
- HOV 3+ vehicles represent 20% of auto trips the AM, and 15% in the PM
- Accident rate in Berkeley/Emeryville segment is almost double the statewide average

Transit Service

- Transit split: 10 % to 20 % (2006 American Community Survey).
- Average weekday ridership of 9 BART stations is 54,000 (within study corridor).
- Average weekday bus ridership: AC Transit 25,000 and WestCAT 4000 (within study corridor).

Existing AM Bottleneck Locations

Eastbound AM:

- Gilman Street/WB I-580

Westbound AM:

-Pinole Valley Road/Appian Way

-San Pablo Dam Road

-I-580/Gilman Street

-Powell Street/Diverge

-Bay Bridge Toll Plaza

Existing PM Bottleneck Locations

Eastbound PM:

-Gilman Street/I-580

-Carlson Boulevard

-San Pablo Avenue

-Pinole Valley Road/SR 4

Westbound PM:

-I-80/I-580/I-880 Diverge

-Bay Bridge Toll Plaza

Near-Term (2015)
Baseline Conditions

- Freeway demand increases 16%
- Transit Ridership increases by 12%
- Corridor VMT increases by approximately 12% while the VHT increases by approximately 20%
- Freeway vehicle hours of delay projected to increase by 50% in the AM, and 100% in the PM
- Existing bottlenecks will be still present but with longer queues and longer time to clear the queues

Near-Term (2015)
Congestion Mitigation Strategies

- I-80 Eastbound HOV Lane Extension – SR 4 to Carquinez Bridge
- I-80 ICM Project:
  - Freeway Management – adaptive ramp metering, variable advisory speed signs, lane use signs.
  - Arterial Management - coordinated traffic signal systems, TMC for local jurisdictions.
  - Transit Management - ramp meter HOV preferential lanes, TSP, transit traveler information at BART stations
  - Traveler Information – 511 enhancement, CMS, HAR
  - Traffic Surveillance and Monitoring - CCTV cameras, vehicle detection system
  - Incident Management-Vehicle detection, incident response plan
  - Commercial Vehicle Operations – Future preferential treatment of CVO, value pricing

Near-Term (2015)
Congestion Mitigation Strategies

Under recurring conditions:

- AM peak period: Ramp Metering reduces WB I-80 delay by 23% and network delay by 9%
- PM peak period: Ramp Metering reduces WB I-80 delay by 20%, EB I80 delay by 3% and network delay by 5%

Under non-recurring conditions:

- Depending on incident, RM+VASS+Lane Management may reduce freeway delay by 15% & network delay by 5%

Near-Term (2015) - Recurring Conditions Average Benefits (Annual)

Average Delay Savings (Vehicle Hours)	3200 (1)
Average Vehicle Occupancy Rate	1.5 (2)
Average Value of Travel Time/Person	$11.30/hr (3)
Number of Peak Period Days/Year	220
Expected Savings – Annual Delay Reduction	$11,932,800
Total Annual Savings (AM & PM)	

1 –Network Delay Savings - 2015 AM & PM Conditions versus 2015 No Build
2 –Source – 2007 Caltrans HOV Lane Report
3 - Source – California Life-Cycle Benefit/Cost Analysis Model (weighted Avg .– Auto +Truck)

Near-Term (2015) - Recurring Condition Return on Investment Analysis Ramp Metering and TOS

	Estimated Cost	Total Savings	Return on Investment
Annual	$30.0 M	$11.9 M	2.5 Years

Notes:

1 Assuming declining benefits from 100% to 50% during 20-year life cycle

Near-Term (2015) - Non-Recurring Conditions Incidents Summary Findings

- Employing Ramp Metering + VASS + Lane Management together provides significant delay reduction in an incidents located between University & Ashby (8:02 to 8:42 , Lanes 4&5 closed scenario)
  - WB I-80 delay for the entire corridor is reduced by 12%
  - WB I-80 delay from Central to 580/880/ Split is reduced by 19%
  - Flow past incident location (University & Ashby) increases by 5%

Low-end Benefits (Lowest scenario)
2015 AM WB I-80, Non-Recurring Conditions

Average Delay Savings/day (Vehicle Hours)	240 (1)
Average Vehicle Occupancy Rate	1.5 (2)
Average Value of Travel Time/Person	$11.30/hr (3)
Number of Peak Period Incident Days/Year (AM&PM)	200
Expected Savings – Delay Reduction	$814,000
Expected Savings – Accident Costs (4)	$5,700,000
Total Annual Savings	$6,514,000

Notes:

1 – Delay reduction (5 %) for the lowest incident scenario versus 2015 No Build. For WB I-80 only.

2 – Source – 2007 Caltrans HOV Lane Report

3 – Source – California Life-Cycle Benefit/Cost Analysis Model (weighted Avg .– Auto +Truck)

4 – Source – California Life-Cycle Benefit/Cost Analysis and Model Results, assuming 10% reduction in secondary accidents.

Return on Investment, Non-Recurring Conditions
Full Incident Analysis, ATM Elements on I-80

Delay Reduction WB80(4 hr) Scenarios	Secondary Accidents Reduction Scenarios	Estimated Cost	Incident Delay Savings	Accident Reduction Savings	Total Cost Savings	Return on Investment
0%	3%	$10.75 M	0.00	$1.7 M	$1.7 M	6.3
5%	3%	$10.75 M	0.82	$1.7 M	$2.52 M	4.3
0%	10%	$10.75 M	$0.00 M	$5.7 M	$5.7 M	1.9
5%	10%	$10.75 M	$0.82 M	$5.7 M	$6.52 M	1.6
17%	10%	$10.75 M	$2.98 M	$5.7 M	$8.68 M	1.2

Traffic Light Synchronization Project (TLSP)

Expected Benefits of TLSP

- Safety Improvements benefits;
- Signal Coordination Improvement benefits;
- Transit Improvements benefits or expected mode shifts;
- Incident Management benefits or expected reduction in secondary incidents and reduction in incident clearance times;
- Parking Management Strategy benefits or expected mode shifts with availability of on-route parking choices; and
- Traveler Information benefits or expected mode shifts as a result of real-time information dissemination to the public.

Notes:
1 Benefits documented in the TLSP Application

Traffic Light Synchronization Program (TLSP) Return on Investment

	Estimated Cost	Total Savings [1]	Return on Investment
Annual	$25.4 M	$7.74 M	3.28 Years

Notes:

1 Only delay reduction savings included. Other saving include transit mode shift, incident management and parking management (totaling $25.4 M) not included

Intermediate-Term (2025) Congestion Mitigation Strategies

- Freeway and Arterial Geometric Improvements
  - Ramp modifications
    - ✓ Powell – WB on & EB off
    - ✓ Buchanan – WB on
    - ✓ San Pablo/Roosevelt – EB on
    - ✓ SR 4 – WB on, WB I-80 to EB SR 4
  - Interchange modifications
    - ✓ Gilman
    - ✓ Central
    - ✓ McBryde
    - ✓ San Pablo Dam
    - ✓ El Portal Drive

Intermediate-Term (2025)
Congestion Mitigation Strategies

- Freeway and Arterial Geometric Improvements (con't)
  - Auxiliary lanes
    - ✓ WB San Pablo Dam Road to San Pablo Avenue
    - ✓ EB Ashby to University
    - ✓ EB Pinole Valley to SR 4
  - Mainline
    - ✓ Re-stripe WB to 580/880 connector to 4 lanes
    - ✓ Drop WB HOV lane sooner

Intermediate-Term (2025)
Congestion Mitigation Strategies

- System Management Improvements
  - Freeway-to-freeway connector metering
  - Extend lane management capabilities
  - Signalize ramp intersections (i.e. Carlson)
  - Extend SMART Corridor
  - Corridor-wide signal coordination
  - Allow shoulder use during incidents
- Transit Improvements/Enhancements
  - Enhance express bus and rail services
  - Additional station parking capacity
  - New Park-and-Ride lots

Long-Term (2035)
Baseline Conditions

- Freeway demand increases by approximately 70%
- Transit Ridership increases by 64%
- Corridor VMT increases by approximately 35% while VHT increases by over 90%
- I-80 corridor is expected to operate under extreme congested conditions - more severe congestion associated with existing bottlenecks, new bottlenecks also emerge

Long-Term (2035)
Congestion Mitigation Strategies

- Potential for roadway expansion is constrained physically and institutionally
- Limited support for roadway widening due to:
  - High costs
  - Significant environmental impacts
  - Potential for increased capacity drawing more vehicles into the corridor
- Need to focus on strategies that:
  - Maximize the efficiency of the existing roadway system
  - Encourage use of other modes
  - Reduce the occurrence and impact of incidents
  - Reduce or manage peak period vehicle travel demand

Long-Term (2035)
Congestion Mitigation Strategies

- System Management Improvements
  - Full ATM implementation
  - Allow shoulder use during incidents
- Transit Improvements/Enhancements
  - Extend BART
  - New ferry service
  - Enhance express bus and Capitol Corridor rail services
  - Additional station parking capacity
  - New Park-and-Ride lots

Long-Term (2035)
Congestion Mitigation Strategies

- Demand Management
  - Continue transit commute benefits promotion, flex work, carpool,
  - TOD around transit centers
  - promote urban infill development
- Goods Movement Policies
  - Construct satellite freight consolidation facility
  - Peak period restrictions

Long-Term (2035)
Congestion Mitigation Strategies

- Freeway and Arterial Geometric Improvements
  - Ramp modifications
    - ✓ Construct HOV preferential lanes
  - Interchange modifications
    - ✓ Central
    - ✓ McBryde
    - ✓ San Pablo Dam
    - ✓ El Portal Drive
  - Auxiliary lanes
    - ✓ WB Carlson to Potrero
    - ✓ EB El Portal to San Pablo Dam
    - ✓ EB Hilltop to Richmond Parkway
  - Mainline
    - ✓ Convert HOV lanes to Express lanes

Implementation Plan

	Near Term	Intermediate Term	Long Term
Time frame	0 to 10 years	10 to 20 years	20 to 30 years
Type of projects	Secured funding, obtained environmental clearance, design stage, do not require significant physical work or funding	Have support but no funding, on-going environmental clearance or design, do not require significant physical work or funding	Significant physical work and funding, consensus building, institutional issues
Proposed projects	I-80 ICM Project, adopt land use strategies, express buses for the I-80 corridor, initiate ferry service	Minor to moderate geometric improvements, improved connectors between roadways, signalization of interchange intersections, increase in public transit service	Major public transportation expansion, additional roadway capacity, revised goods movement strategies, large-scale ITS improvements

EB I-580 Connector Metering Scenario

EB I-580 Connector Metering
Scenario Definition

- Modeled 2015 AM WB I-80, Peak Period
- Metered all Westbound “Local” On-Ramps plus Eastbound I-580 Connector
- Assumed Metering Layout for Eastbound I-580 Connector based on Preliminary Design:
  - 2 General-Purpose (GP) Lanes plus 1 HOV Preferential Lane

EB I-580 Connector Metering Scenario

Westbound Performance
I-80 2015 AM, Peak Period

- **Hours of Delay**

	Base	"Local" ARM	"I-580" RM
Carq Br to SR 4	50	40 (-8%)	30 (-42%)
SR 4 to Central	1600	1400 (-13%)	1260 (-21%)
Central to 580/880 Split	2470	1720 (-30%)	500 (-80%)
Total	4110	3160 (-23%)	1790 (-56%)

EB I-580 Connector Metering
Summary Findings

- Metering of I-580 connector will:
  - Provide significant benefits to Westbound I-80 through Berkeley/Emeryville Area; Notably in the segment from Central to the I-80/I-580/I-880 Split (-80%)
  - Shift Delay from I-80 WB to I-580 EB which will provide significant reduction in Vehicle Hours of Delay on I-80 Westbound: (-56%) compared to No Build
  - Reduce Metering Load at Local On-Ramps on I-80
  - Help traffic entering from I-580 EB into I-80 WB

EB I-580 Connector Metering

Summary Findings

However, with Assumed design:

- Eastbound I-580 demand (up to 3100 vph) will greatly exceeds Meter Capacity (approx 2100 vph)
- Significant Queuing and Delay is projected for Eastbound I-580

Estimated Queue Length

	Base	"Local" RM	"I-580" RM
Estimated Maximum Queue Length	2.5 miles	1 mile	> 5 miles*

* Queue continuing to grow at end of analysis period

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Ramp Metering

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I-80 Most Congested Highway in the San Francisco Bay Area

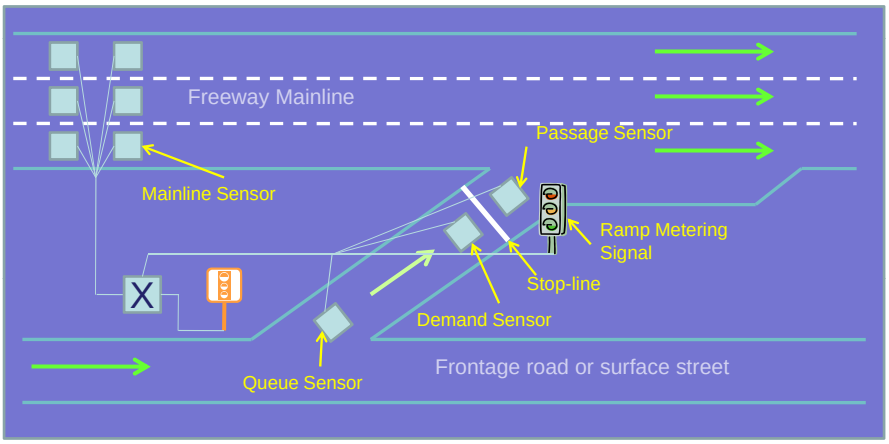
HIGHWAY

ARTERIAL

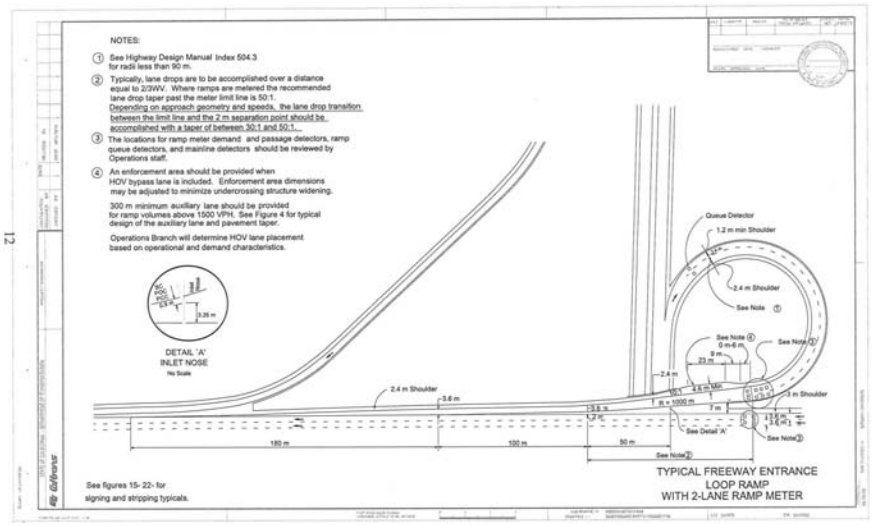
I-80 Ramp Metering

- Goals of Ramp Metering
  - Balance arterial and freeway traffic flow
  - Minimize merging impacts
  - Reduce number of collisions
  - Increase travel speed

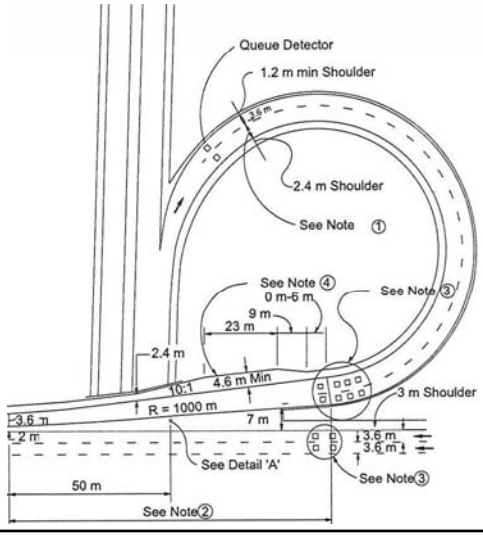
Ramp Metering



Caltrans Ramp Meter Design Guidelines



Caltrans Ramp Meter Design Guidelines



Typical vs. Adaptive Ramp Metering

- Typical
  - Advanced Queue Detector
  - Based on Measured Freeway and Ramp Demand
  - Rate is Fine-Tuned as needed
  - "Max Rate" addresses ramp queue
- Adaptive
  - Advanced Queue Detector + additional mainline detection
  - Based on Real-Time Freeway and Ramp Demand
  - Rate changes as freeway demand changes based on algorithm
  - "Max Rate" addresses ramp queue

Adaptive Ramp Metering

What will be done

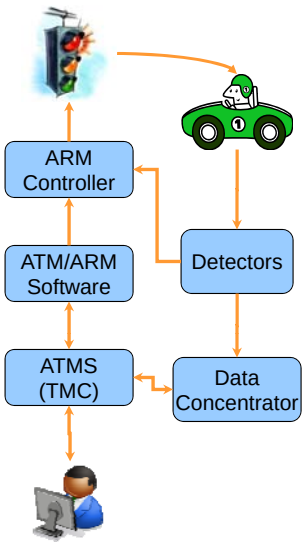
- Allocate in a balance way the total traffic flow entering the freeway

How

- Fixed Time Ramp Meters
- Local Traffic Responsive Ramp Metering
- System-Wide Traffic Responsive Ramp Metering

Why

- Create a balanced traffic flow on the freeway



I-80 Software ARM Evaluation Criteria

- Corridor-wide capabilities
- Solid deployment track record
- Minimal impact on existing ramp metering
- Infrastructure

Algorithms Being Considered

- Fuzzy Logic (Deployed by WSDOT in Seattle area)
- Stratified Zone (Deployed by MNDOT in Twin Cities area)
- HERO (Deployed in Europe and Australia)

Near-Term (2015)
Congestion Mitigation Strategies

Under recurring conditions:

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Under non-recurring conditions:

Depending on incident, RM+VASS+Lane Management may reduce freeway delay by 15% & network delay by 5%

Ramp Meter Configuration (EB)

Location	Peak Demand	Configuration	Limit Line Placement
EASTBOUND			
Powell St.	982	2	Use Proposed Loops
Ashby Ave./Potter St.	899	2	Use Proposed Loops
University Ave.	982	2	Use Existing Loops
Gilman St.	887	2	Use Existing Loops
Buchanan St.	377	1	Use Existing Loops
Central Ave.	639	2	Use Existing Loops
Carlson Blvd.	774	2	Use Existing Loops
Cutting Blvd. (loop ramp)	801	1	Use Proposed Loops
Cutting Blvd.	1003	2	Use Existing Loops
San Pablo Ave.	1370	2	Use Existing Loops
San Pablo Dam Rd.	910	1	Use Existing Loops
El Portal Dr.	863	2	Use Existing Loops
Eastbound Hilltop Dr. (loop ramp)	470	1	Use Existing Loops
Westbound Hilltop Dr.	224	1+1	Use Existing Loops
Eastbound Fitzgerald/ Richmond Pkwy. (loop ramp)	1445	2	Use Existing Loops
Westbound Fitzgerald/Richmond Parkway	236	1	Use Existing Loops
Southbound Appian Way (loop ramp)	355	1	Use Existing Loops
Northbound Appian Way	609	2	Use Existing Loops
Pinole Valley Rd.	453	1	Use Existing Loops
John Muir Pkwy. (SR-4)	392		Part of different Caltrans Project
Willow Ave.	238		Part of different Caltrans Project
Cummings Skyway	654		Part of different Caltrans Project

Ramp Meter Configuration (WB)

Location	Peak Demand	Configuration	Limit Line Placement
WESTBOUND			
San Pablo Ave. / Pomona St.	289	1	Use Existing Loops
Cummings Skyway	23	1	Use Existing Loops
Willow Avenue	776		Part of different Caltrans Project
John Muir Parkway (SR-4)	2350	2+1	Still researching limit line placement with respect to bridge
Pinole Valley Rd.	1198	2	Use Proposed Loops
Appian Way	1229	2	Use Existing Loops
Fitzgerald Dr./Richmond Parkway	757	1	Use Existing Loops if single lane; use proposed loops if 2 lane
Westbound Hilltop Dr. (loop ramp)	770	1	Use Existing Loops
Hilltop Dr.	309	1+1	Use Existing Loops
El Portal Dr.	1006	2	Use Existing Loops
San Pablo Dam Rd.	1156	2	Use Existing Loops
Solano Ave.	790	1	Use Existing Loops
Barrett Ave.	794	2	Use Existing Loops
Potrero Ave.	659	2	Use Proposed Loops
Carlson Blvd.	418	2	Use Existing Loops
Central Ave.	608	1	Use Existing Loops
Buchanan St.	1143	1+1	Use Existing Loops
Gilman St.	738	1+1	Use Existing Loops
University Ave. (loop)	777	1+1	Use Proposed Loops
Ashby Ave. & Frontage Rd.	1178	2+1	Use Proposed Loops
Powell St./Frontage Rd.	1655	2	Use Proposed Loops
Powell St.	466	1	Use Proposed Loops