Caltrans

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STATE ROUTE 51
PRELIMINARY INVESTIGATION

Approvals:

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INTRODUCTION

The State Route (SR) 51 Preliminary Investigation (PI) is one of a series of studies being conducted by Caltrans District 3, in coordination and consultation with major stakeholder partners, to determine the feasibility and prioritization of improvements to the State Highway System within a segment of the larger corridor defined within the 2009 *Interstate 80 and Capital City Freeway Corridor System Management Plan* (I-80/SR 51 CSMP), as shown in Figure 1. The PI is the first stage of the project initiation document process, which is the linkage between planning and project development. The PI provides critical initial project scoping and assurances regarding project feasibility and selection, and significantly improves and streamlines the development of the subsequent Project Initiation Document (PID), thereby focusing resources on achieving the most mobility benefits for the least amount of cost.

The SR 51 PI addresses the need for operational and capacity improvements for the entire segment of SR 51 in the City of Sacramento. Candidate improvement projects include Transportation Operation System (TOS) elements, High Occupancy Vehicle (HOV, Bus/Carpool) lanes, and auxiliary/transition lanes.

PRELIMINARY INVESTIGATION NEED AND PURPOSE

There is a need to address the traffic conditions on SR 51 which is currently operating beyond capacity, and congestion and delay will be exacerbated by proposed local land use development in the vicinity and by population growth. Planned development, particularly at Cal Expo, will increase traffic which will degrade travel times, average speed, and other traffic performance measures. The *2009 Mobility Performance Report* (*MPR*) identified SR 51 as having five of District 3's top 10 bottlenecks.

The purpose of the SR 51 PI is to create a planning approach that focuses on gaining early consensus regarding needed improvements, determine feasibility, and prioritize projects to reduce congestion and improve traffic operations. This will allow for a coordinated approach to programming (funding) the capital investments to achieve an efficient transportation system based on the most effective improvements. Early and consistent collaboration with local partners and stakeholders is needed to gain a consensus on a funding and programming approach to implement needed improvements within SR 51 to ensure the timely implementation of improvements for continued efficient operation of the highway.

CORRIDOR BACKGROUND

As shown in Figure 2, SR 51 is located in the City of Sacramento and is officially signed as part of Business Loop 80 and named the Capital City Freeway. SR 51 is a route of vital importance to regional and interregional travel and goods movement. It provides a vital link for downtown Sacramento, Cal Expo, and Arden Mall, and it connects two major highways, US Highway 50 (US 50) and Interstate 80 (I-80). It is a heavily traveled facility and experiences significant congestion during peak periods. As growth continues, local land use development will put additional pressure on SR 51.

The 8.9-mile urban arterial freeway runs southwest to northeast and begins at the junction of US 50 and SR 99 as an elevated 6-lane freeway with one Bus/Carpool lane and auxiliary lane in each direction. Between Exposition Boulevard (Bl.) and SR 160, the facility is five lanes until SR 160 when SR 51 becomes an 8-lane facility and then narrows to and remains a 6-lane freeway from SR 160 to its eastern junction with I-80. Bus/Carpool lanes exist between SR 99 and J Street (St.), and auxiliary lanes run in the north and southbound directions between SR 99 and J St. as well as between the Arden Way and Marconi Avenue (Av.) interchanges. The lane configuration diagram is shown in Figure 3.

Figure 1: Interstate 80/Capital City Freeway Corridor System Management Plan Network

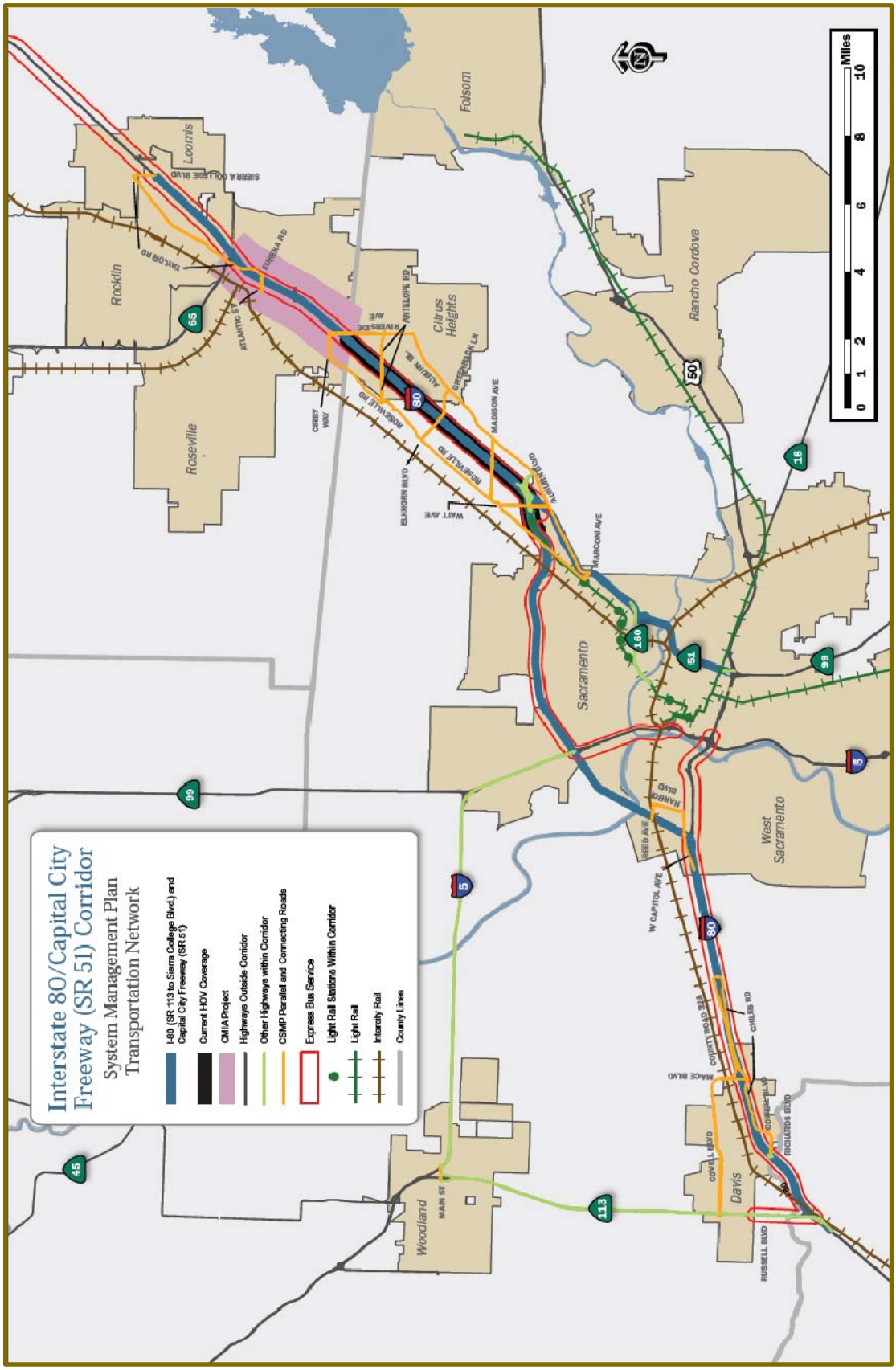


Figure 2: SR 51 PI Project Area

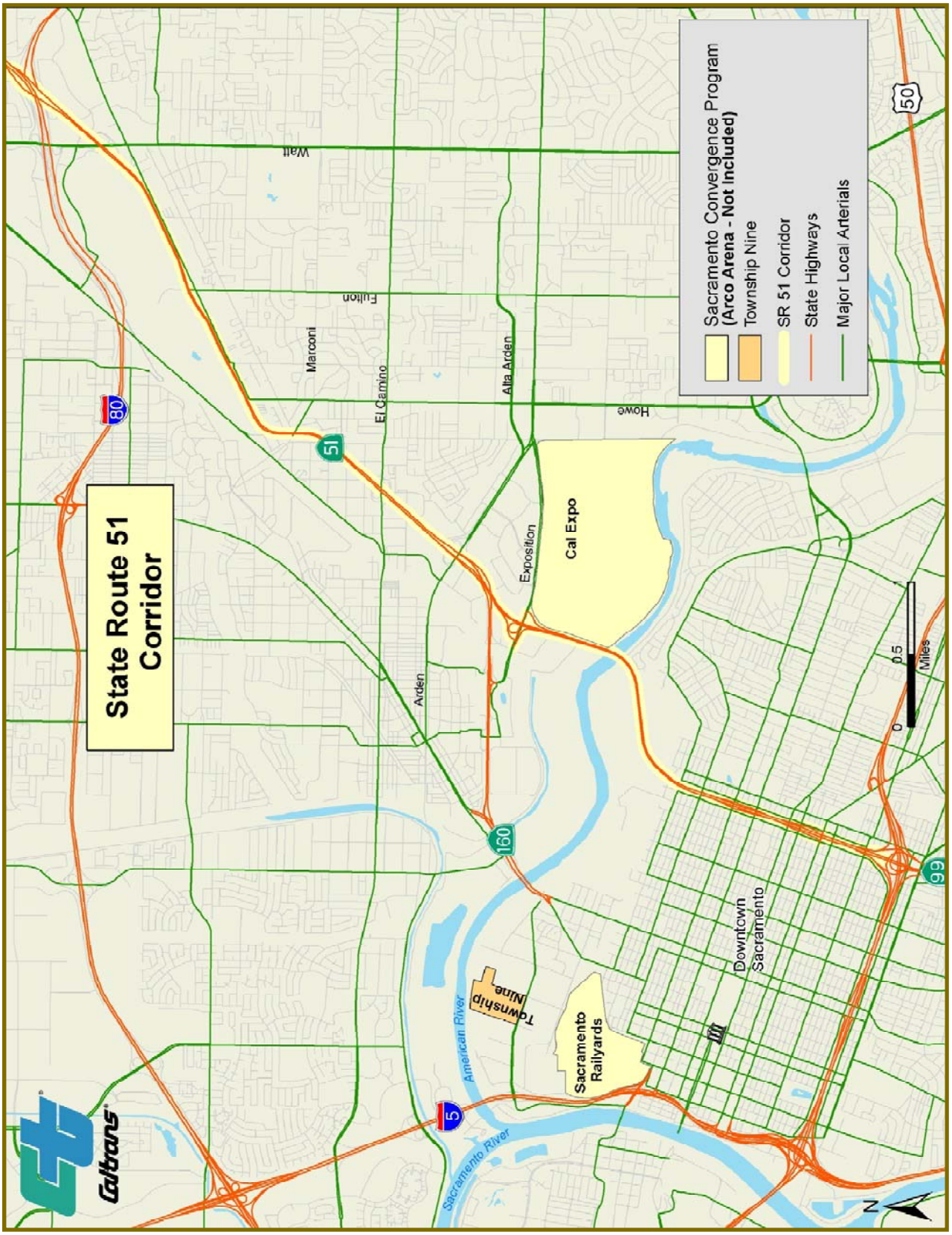
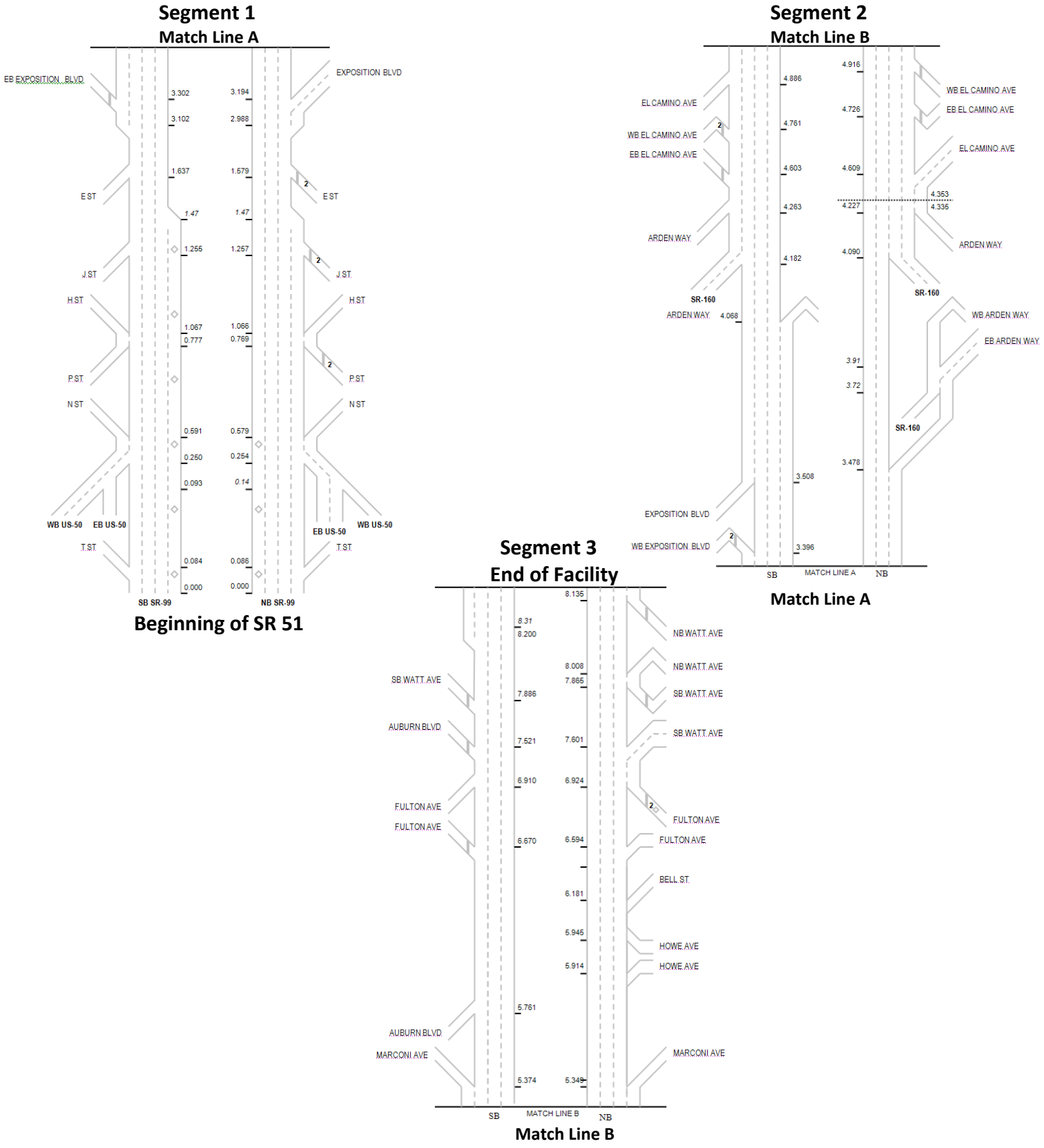


Figure 3: SR 51 Lane Configuration Diagram



EXISTING AND FUTURE CONDITIONS

EXISTING CONDTIONS

The PI used existing data supplied in the 2009 *I-80/SR 51 Corridor System Management Plan*, the 2011 *I-80/SR 51 State of the Corridor Report*, and the 2012 *SR 51 Preliminary Investigation Modeling Report*. It should be noted that some of the existing facility performance data is several years old. However, the current economic recession has resulted in stagnant growth and traffic volumes have remained relatively flat. Therefore, the performance data is still valid. These Plans and Reports show that SR 51 is currently operating with low free flow speeds, stop-and-go traffic, bottlenecks, and significant vehicle hours of delay. There were approximately 855,000 annual vehicle hours of delay in 2009 for both directions on the corridor. The cost of these vehicle hours of delay are calculated by factoring lost time, fuel consumed, and wear and tear on the vehicle. Vehicle hour of delay cost equals $17.35 based on the vehicle mix of trucks and cars, the price of fuel, value of time and wages, and vehicle repairs. In sum, annual vehicle hours of delay on SR 51 cost $14.8 million in 2009, as shown in Table 1.

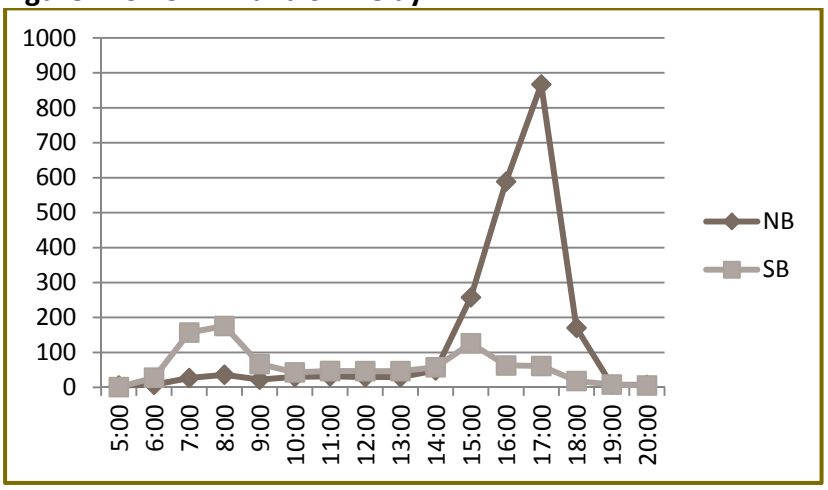
Table 1: Existing Facility Conditions

Segment	Post Miles	Location Description	Existing LOS	Existing Facility	Total Annual Vehicle Hours of Delay (60 mph) SR 51 NB, 2009	Total Annual Vehicle Hours of Delay (60 mph) SR 51 SB, 2009	Cost of Delay per Hour	Total Annual Cost of Delay, NB and SB, 2009
1	0.0/4.4	US 50/SR 99/ SR 51 IC to Arden Way	F	6F + 2 HOV to N St + 2 Aux to J St., 6F to Arden Way	437,000	171,000	$17.35	$10,548,800
2	4.4/8.9	Arden Way to I-80	F	6F + 2 Aux to Marconi Av., 6F to I-80	150,000	97,000	$17.35	$4,285,450

The more recent *MPR* identified an increase in annual vehicle hours of delay for both directions in 2011 to approximately 959,693. This equates to an even greater annual cost of $16.7 million.

Southbound (SB) daily delay increases steadily throughout the week with the lowest delays occurring on Monday and the highest delays on Fridays. Northbound (NB) daily delay remains fairly constant throughout the week. The NB direction of SR 51 experiences minor delay in the morning peak period and major delay in the afternoon, peaking between 3:15 and 6:15 p.m. As shown on Figure 4, the SB direction experiences peaking between 6:00 and 9:00 A.M. and 3:00 and 6:00 P.M..

Figure 4: SR 51 NB and SB Delay



Vehicle Hours of Delay under 65 MPH by Time of Day, April 1-14, 2008

BOTTLENECK ANALYSIS

The *2000 Highway Capacity Manual* defines a bottleneck as "a road element on which demand exceeds capacity." Bottleneck locations and causality were identified for SR 51 as part of the development of the *I-80/SR 51 CSMP*. Bottleneck locations identified in the CSMP were determined using a combination of Caltrans Performance Measurement System (PeMS) data, the Highway Congestion Monitoring Program (HICOMP) report, probe vehicle tachometer ("tach") runs, and field observations. Causalities for these major bottlenecks range from high traffic demand (congestion), heavy weaving/merging areas, or physical constraints such as lane drops, incomplete Bus/Carpool lane network, and incomplete Auxiliary/Transition Lane network. Minor or hidden bottlenecks are less pronounced but may result in a major bottleneck if another major bottleneck is removed or not activated. These minor bottlenecks include the termination of auxiliary lanes. The report compared the tach run data, field observations, and the number of days a particular bottleneck occurs to determine the severity of the bottlenecks. Table 2 shows a summary of the SR 51 bottlenecks.

Table 2: SR 51 Bottlenecks

Location	Post Miles	PeMS Speed Contours		Caltrans Probe Vehicle Runs		Cause
		AM	PM	AM	PM	
Northbound						
E St.	2	Minor	Major		Major	The upstream lane drop combined with the increase in traffic from E St and the short merge at the E St. on-ramp.
Exposition Bl.	2.5	Minor	Minor		Minor	Exiting vehicles at Exposition Bl., as well as the lane drop at the Arden off-ramp.
El Camino Av.	4.5	Minor	Major			The increase in traffic demand from El Camino Av. causes the bottleneck at El Camino Av.. Also, the lane drop and horizontal curve at the Marconi Bridge cause a reduction in capacity, resulting in a bottleneck and a queue that extends back to El Camino, and sometimes to the SR 51/SR 160 merge point.
Marconi Av.	5.5	Minor	Minor			The termination of the auxiliary lane at Marconi Av. and a horizontal curve on SR 51 just past the Marconi Av. interchange.
Watt Av.	8				Major	Vehicles exiting and entering at Watt Ave create a merging and weaving
Southbound						
Watt Av.	7	Major		Major		The increase in traffic entering from Watt Ave and is perpetuated by the upstream lane drop and heavy volumes from I-80.
El Camino Av.	4.5	Major		Major		Weaving vehicles headed to Arden or SR 160, along with vehicles entering from El Camino and the lane drop at SR 160.
Exposition Bl.	3		Major		Major	The increase in traffic entering from Exposition Bl., the heavy volume exiting at Exposition, heavy demand from Arden, and the downstream lane drop.
E St.	2	Minor			Minor	The narrowing of the freeway right-of-way as it crosses under the railway and service bridges while rounding a corner.

The more recent *2011 MPR* and 2012 PeMs data identified an additional SB AM bottleneck at Auburn Bl. (PM 7.6), NB and SB PM bottlenecks between E St. and the American River Bridge, and NB and SB PM bottlenecks by T St. (PM 0.1).

FUTURE CONDITIONS

Overall traffic has increased and will continue to increase due to development within the corridor. Table 3 depicts the current and forecasted data for the facility as identified in the *I-80/SR 51 CSMP*. Traffic volumes are forecasted to increase 40 percent (%) in the twenty years from 2007 to 2027 for both the peak hour traffic and the average annual daily traffic. While the actual volume increases between 2007 and 2027 will likely be smaller due to the downturn of the economy, there will still be significant increased demand. Along with this, the volume over capacity (V/C) ratio will significantly increase from 1.02 to 1.29 on Segment 1 and from 1.08 to 1.54 on Segment 2. With such large increases, it is imperative to provide improvements that will ensure the continued functionality and operating efficiency of SR 51.

Table 3: Current and Future Travel Conditions

County	Location	Current Traffic Data—2007					Future Traffic Data — 2027[4]			
		% of Trucks	Peak Directional Split[1]	Peak Hour Traffic	Average Annual Daily Traffic[2]	Volume over Capacity[3]	Peak Hour Traffic (Build)	Average Annual Daily Traffic (Build)[2]	Volume over Capacity (No-Build)[3]	Volume over Capacity (Build)[3]
SAC	Segment 1: US 50/SR 99 to Arden Way/SR 51/ 160 IC	4%	59%	13,000	166,000	1.02	18,200	232,400	1.29	1.29
	Segment 2: Arden Way/ SR 51/ 160 IC to I 80	4%	59%	11,800	151,000	1.08	16,520	211,400	1.54	1.54

[1] Peak Directional Split: The percentage of total traffic in the heaviest traveled direction during the peak hour.
[2] Average Annual Daily Traffic (AADT): The average number of vehicles per day in both directions.
[3] Volume over Capacity (V/C): The volume of traffic compared to the capacity of the roadway.
[4] Data derived from *SACMET Travel Demand* modal

PROJECT IMPROVEMENTS AND PRIORITIZATION PROCESS

A prioritized list of candidate improvement projects was developed based on the following process:

A SR 51 PI Project Development Team (PDT) composed of representatives from Caltrans' Planning, Right-of-Way, Environmental, and Traffic Operations, as well as the City of Sacramento, Sacramento Regional Transit District (SacRT), and the Sacramento Area Council of Governments (SACOG) participated in a series of meetings where they identified the scope, desired outcomes, resource needs, and a candidate list of improvements to SR 51. The improvements included traffic operations system (TOS) elements, auxiliary/transition lanes, Bus/Carpool lanes, and widening of structures, and are depicted in Figure 5.

Once the candidate improvement projects were identified, they were analyzed to identify their incremental contribution toward corridor mobility and prioritized based on the results of the individual and aggregated analyses. Transportation modeling applications, including micro simulation analysis, were used to quantify the benefits and determine the prioritization of the auxiliary/transition lanes and Bus/Carpool lane projects. Ramp metering and Intelligent Transportation System projects were not included in the micro simulation analysis, but are the highest priority based on their relatively low cost and high benefits.

The micro simulation modeling determined the traffic impacts and measures of effectiveness of specific/packaged projects on the SR 51 mainline and interchanges. The modeling incorporated PeMS count data, manual counts, origin/destination data, and projected growth from the SACMET travel demand model.

The modeling was conducted in two separate studies. The first focused on alternatives associated with adding a transition lane in the NB direction from E St. to the American River (Am. River) Bridge. The second examined the benefits of adding auxiliary/transition lanes compared to adding Bus/Carpool lanes on all of SR 51. The E St. NB transition lane project was separated from the second modeling study because it involved the possible closure of the E St. on-ramp and, therefore, would require unique considerations.

The final list of prioritized projects is indicated in Table 4.

Figure 5: SR 51 PI Improvement Projects

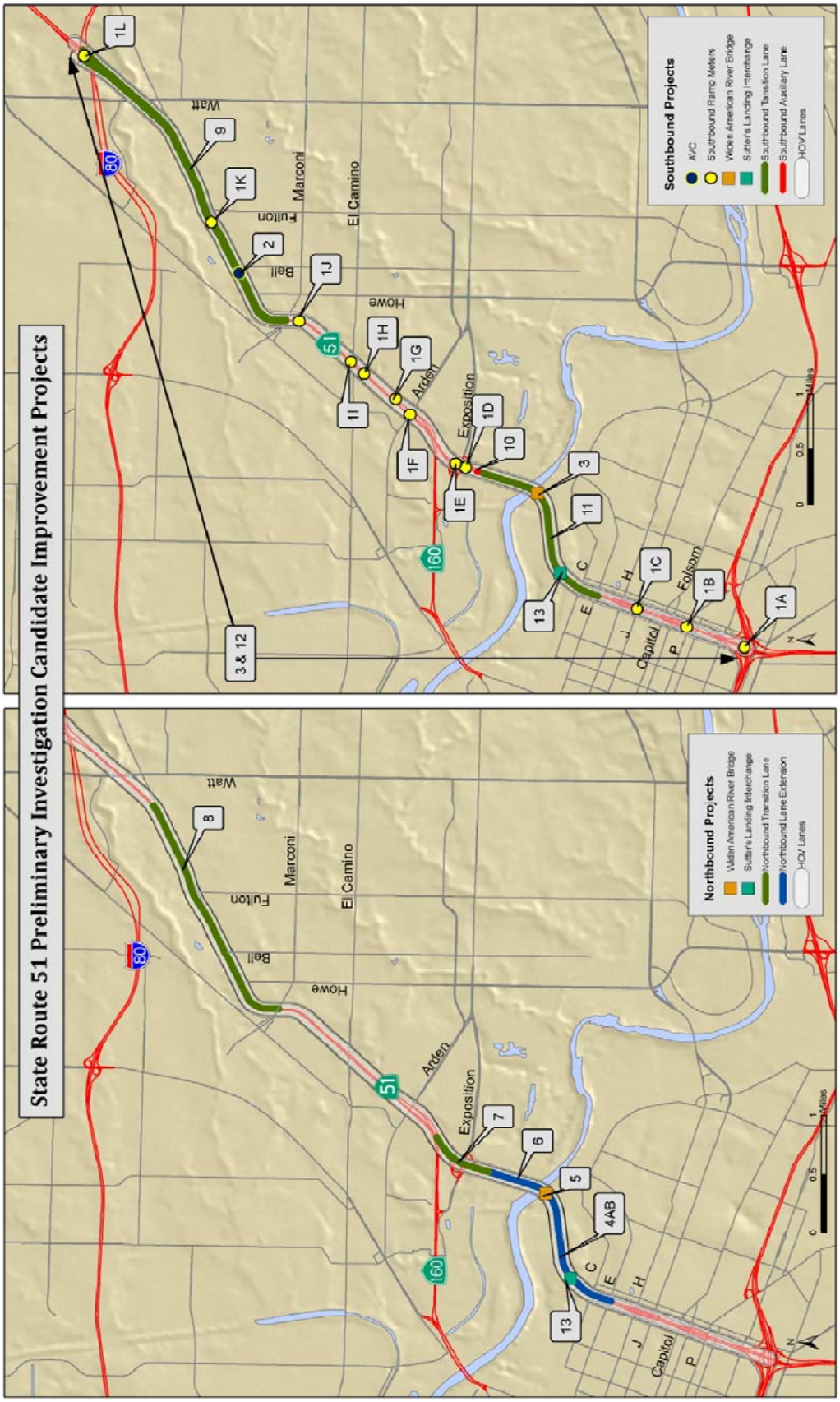


Table 4: SR 51 PI Prioritized Projects

Project #		Post Mile	Location	Description	Cost Estimates ($1,000)①					
					Road	Structures	# Parcels Impacted	ROW	Subtotal (capital costs)	TOTAL (with support)
Ramp Metering Projects②										
1	**A**	0.1	T St.	Add Ramp Meter, southbound (SB)					$500	**$660**
	B	0.6	N St.	Add Ramp Meter, SB					$500	**$660**
	C	1.1	H St.	Add Ramp Meter, SB					$500	**$660**
	D	3.3	Exposition Bl.	Add Ramp Meter, northbound (NB)					$500	**$660**
	E	3.4	Exposition Bl.	Add Ramp Meter, SB					$500	**$660**
	F	4.1	Arden Way	Add Ramp Meter, SB					$500	**$660**
	G	4.2	Arden Way	Add Ramp Meter, NB					$500	**$660**
	H	4.6	El Camino Av.	Add Ramp Meter, NB					$500	**$660**
	I	4.8	El Camino Av.	Add Ramp Meter, SB					$500	**$660**
	J	5.4	Marconi Av.	Add Ramp Meter, SB					$500	**$660**
	K	6.7	Fulton Av.	Add Ramp Meter, SB					$500	**$660**
	L	8.6	SR 244	Add Ramp Meter, SB					$500	**$660**
Intelligent Transportation System (ITS) Projects										
2		6.22	Bell St.	Convert Traffic Monitoring Station to Automatic Vehicle Counter for improved vehicle classification data set.	$60	0	0	0	$60	**$79**
3		0.0/8.8	US 50 to I-80	Install fiber-optic communication lines along corridor to connect all ITS elements, and improve communication and reliability. Also, add Blue Tooth reader for improved travel time measurement.	$880	0	0	0	$880	**$1,300**
E Street Transition Lane Project										
4A		1.4/2.6	E St to the Am. River Bridge	Add NB Transition Lane. This Project alternative assumes that the E St. On-Ramp will remain open. Additional Structural and ROW costs will become necessary to lengthen B St. and Elvas St. underpasses, and A St. overcrossing (OC).	$3,780	$8,600	11 to 20	$35,000 +/- $15,000	$47,380	**$62,500**
4B		1.4/2.6	E St to the Am. River Bridge	Add NB Transition Lane. This Project alternative assumes design exceptions for reduced lane width in certain locations and that the E St. NB On-Ramp will close. No additional Structural and ROW costs will become necessary.	$2,940	$0	$0	$0	$2,940	**$3,900**
American River Bridge Project③										
5		2.6	Am. River Bridge	Widen from 3- to 5-lanes in each direction for phased inclusion of Transition and Bus/Carpool lanes.	$2,700	$91,300	1 to 10	$3,000 +/- $2,000	$97,000	**$128,000**
Transition and Auxiliary Lane Projects④										
6		2.6/3.1	Am. River Bridge to Exposition Bl.	Add NB Transition lane.	$2,700	$0	1 to 10	$3,000 +/- $2,000	$5,700	**$7,500**
7		3.1/3.7	NB Exposition Bl. to SR 160	Add NB Transition lane. Widen NB SR 160 SEP to 4-lanes	$3,000	$31,500	0	$25 +/- $25	$34,525	**$45,600**
8		5.5/7.6	Marconi Av. to Watt Av.	Add NB Transition lane. Lengthen Marconi, Fulton & Watt Avs. OC. Reconstruct Howe & Bell Avs. Ramps. Lengthen SB on-ramp from Auburn/Watt Av. ramp flyover ramp. Widen Arcade Creek Bridge to 4-lanes each direction.	$19,500	$21,200	1 to 10	$3,000 +/- $2,000	$43,700	**$57,700**
9		5.5/8.7	Watt Av. to Marconi Av.	Add SB Transition lane. Lengthen Marconi, Fulton & Watt Avs. OC. Lengthen SB on-ramp from Auburn/Watt Av. ramp flyover ramp.	$17,500	$0	1 to 10	$3,000 +/- $2,000	$20,500	**$27,000**
10		3.0/3.2	Exposition Bl.	Add Auxiliary lane SB between ramps. Modify EB Exposition Bl. loop on-ramp.	$9,000	$0	0	$500 +/- $500	$9,500	**$12,500**
11		1.4/3.1	Exposition Bl. to E St.	Add SB Transition lane. Lengthen B St. underpass. Lengthen A St. OC. Extend Bus/Carpool lane. This Project Alternative assumes completion of Project 2B. Structures work not required if Project 2A completed.	$5,200	$8,600	11 to 20	$50,000	$63,800	**$84,200**
Bus/Carpool Lane Projects⑤										
12		0.0/8.2	US 50 to I-80	Add Bus/Carpool lanes	$150,100	$76,500	100 +	$50,000+	$276,600	**$365,100**
Other Projects										
13		1.8	Sutter's Landing IC & Parkway	Construct a full interchange and 4-lane parkway from SR 160 to SR 51 (City of Sacramento Project)	$100,000	TBD	21 to 50	$35,000 +/- $15,000	$135,000	**$178,200**

① Cost Estimates include roadways, structures, right of way (ROW), and support costs (32%). Roadway costs include retaining and sound walls, and ramps. Structures costs include over and under crossings, separations, connections, bridges, and demolitions. For the Bus/Carpool Lane Project, ROW acquisition costs and the number of parcels impacted are based on ROW needs of 300 feet from the centerline to the north and south (600 total), and include commercial, residential, railroad, State, and other public lands. Actual costs and number of impacted parcels should be substantially less. ROW costs do not include utility conflicts and/or relocation costs, if any, but do include environmental permits and mitigation. For all projects, the average ROW cost from the cost range was used to determine the total cost. All costs are planning-level rough estimates and have been rounded. Actual costs may vary. More precise cost estimates will be determined at the projects' PID and PA&ED phases.

② A Project Initiation Document (PSR/PDS) is currently being prepared for Ramp Meters at Various Locations (EA 03-0F350) and include Projects 1A, 1B, 1C, and 1G. Ramp metering cost estimates do not include any potential structure and roadway costs.

③ It is assumed that the bridge structure will only be widened once to accommodate the ultimate 4-lane addition (2-Auxiliary/Transition and 2-Bus/Carpool) with standard shoulders. Roadway costs are for Transition lanes only. Additional roadway costs will be required for Bus/Carpool lane additions.

④ Structure work required for Projects 7 and 10 have been combined into Project 7, and Structure work required for Projects 8 and 9 have also been combined into Project 8 as it is assumed that overcrossings, separations, and demolitions cannot be completed for just the NB or SB direction only. The apparent high ROW costs for Project 11 are due to the need to reconstruct two railroad grades (geometry, ballast, track, signal equipment, and flagging around $8.6 million) and landfill acquisition.

⑤ Bus/Carpool lanes will be constructed in phases. Structure costs assume completion of Project 5 (Am. River bridge). Roadway costs include $16.2 million for retaining/sound walls. This cost can be reduced if coordinated with the retaining/sound walls required in the transition/auxiliary lane Projects 8, 9, and 10.

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E STREET TRANSITION LANE MODELING

The purpose of modeling the E St. to Am. River Bridge transition lane as an individual project was to evaluate and compare the two alternatives for the project: adding the transition lane and closing the E St. on-ramp or adding the transition lane with the on-ramp open. The modeled scenarios were as follows:

- 2020 Future Base (No Build)
- 2020 Future Base + Transition lane with E St. on-ramp open
- 2020 Future Base + Transition lane with E St. on-ramp closed

The study area for this analysis was NB SR 51 from the P St. on-ramp to the end of the proposed transition lane, the beginning of the Am. River Bridge, a distance of 1.8 miles. The Study area also included the P St., J St., and E St. on-ramps. The PM peak period (3:00 P.M. – 7:00 P.M.) was chosen as the analysis time period because the PM has much higher congestion in the study area than the AM peak period.

The models were developed using Paramics micro simulation software and produced several measures of effectiveness, including traffic volumes, average speeds, travel times, and delays. Figure 6 compares the total vehicle hours of delay (all vehicles) per day for each scenario. Figure 7 compares the vehicles hours of delay for each scenario based on facility type.

Figure 6: PM Total Delay Comparison

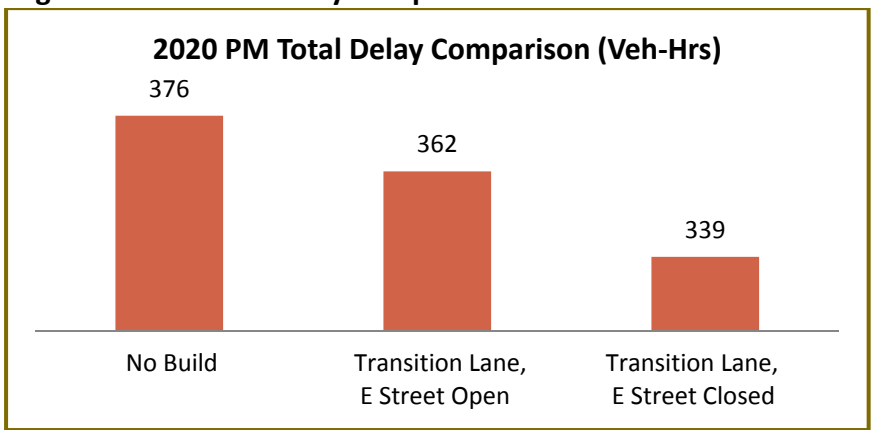
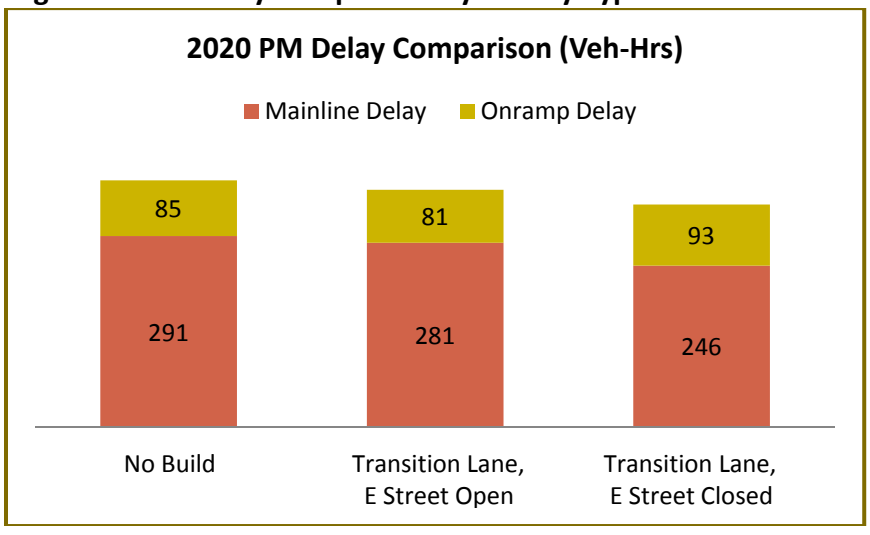


Figure 7: PM Delay Comparison by Facility Type

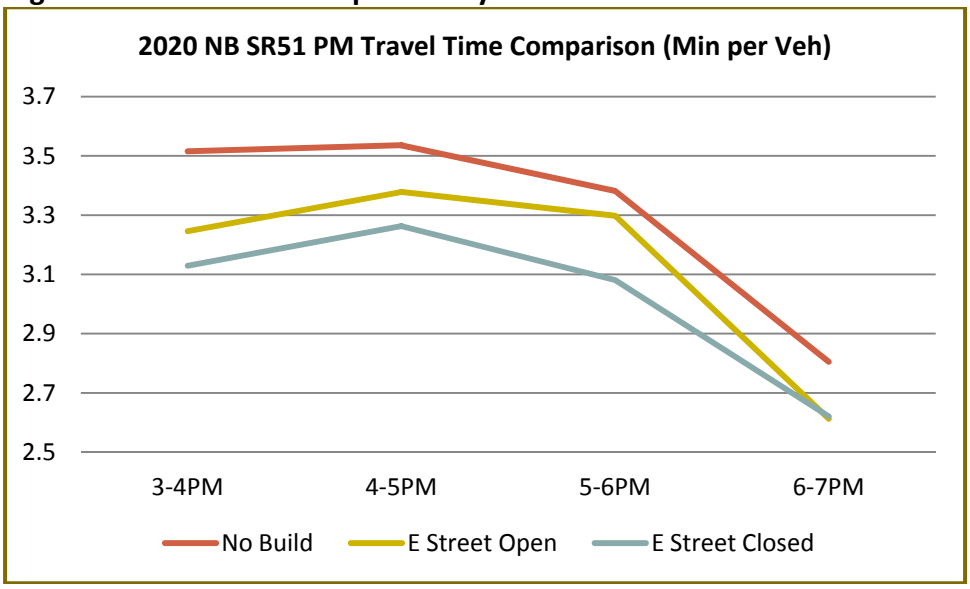


The addition of the transition lane reduced overall mainline delay for both scenarios. In comparison to the "No Build" scenario, the transition lane with the E St. on-ramp open reduced overall vehicle hours of delay by 4 percent (%). The transition lane eliminated the bottleneck upstream of the E St. on-ramp, which is caused by a lane drop from 4 to 3 lanes and merging from the J St. on-ramp. The project does create a new bottleneck at the Am. River Bridge where the transition lane ends, but the new bottleneck is not as intense as the existing bottleneck.

The transition lane with the E St. on-ramp closed reduces overall vehicle hours of delay by 10%. This scenario eliminates the same bottleneck as the E St. on-ramp open scenario plus removes the congestion caused by the merging from the E St. on-ramp. Vehicles flow with no congestion due to weaving or merging until the end of the transition lane. This scenario also creates a new bottleneck at the Am. River Bridge that is not as intense as the existing lane drop bottleneck. As expected, the elimination of the E St. onramp does increase the delay on the J St. on-ramp slightly; however because freeway access is reduced, the mainline delay reduction is more substantial than with E St. on-ramp open. Our initial modeling also indicates we would be able to meter traffic onto the freeway at a rate which prevents any queuing to the local street system and still maintain substantive mainline freeway benefits which exceed those with the E St. off-ramp remaining open.

Figure 8 compares the PM peak period travel times for all three alternatives on NB SR 51. The transition lane with the E Street on ramp closed decreases the travel time per vehicle more than the other two scenarios especially during the 5:00 P.M. – 6:00 P.M. peak hour. The peak hour travel time reduced by 3% with E St. open, which is less than the 9% reduction with E St. closed. Adding the transition lane and closing E St. provides more congestion relief and costs much less than leaving E St. open.

Figure 8: Travel Time Comparison by Scenario



BUS/CARPOOL LANE-TRANSITION LANE COMPARISON MODELING

This modeling study focused on the SR 51 corridor as a whole and the cumulative traffic impacts of the proposed projects. The *I-80/SR 51 CSMP* micro simulation models included base year, future year, and project specific future year scenarios and modeled the entire SR 51 corridor as well as its connections to I-80, SR 99, and US 50. The CSMP modeling effort had two additional future scenarios available for the I-80/SR 51 corridor, which were used to derive the performance measures in this report. Table 5 shows the proposed projects that were modeled.

Table 5: Projects Modeled

Project #	Post Miles	Location	Project Description
4A	1.4/2.6	E St. to the American River Bridge	Add NB Transition Lane with E Street on-ramp open.
4B	1.4/2.6	E St. to the American River Bridge	Add NB Transition Lane with E Street on-ramp closed.
5	2.6	American River Bridge	Widen to 4-lanes in each direction
6	2.6/3.1	American River Bridge to Exposition Bl.	Add NB transition lane.
7	3.1/3.7	NB Exposition Bl. to SR 160	Add NB transition lane and widen NB SR 160 SEP to 4-lanes.
8	5.5/7.6	Marconi Av. to Watt Av.	Add NB transition lane. Lengthen Marconi, Fulton & Watt Avs. OC. Reconstruct Howe & Bell Avs. Ramps. Lengthen SB on-ramp from Auburn Bl./Watt Av. ramp flyover ramp. Widen Arcade Creek Bridge to 4-lanes each direction
9	5.5/8.7	Watt Av. to Marconi Av.	Add SB transition lane. Lengthen Marconi, Fulton & Watt Avs. OC. Lengthen SB on-ramp from Auburn Bl./Watt Av. ramp flyover ramp
10	3.0/3.2	Exposition Bl.	Add auxiliary (aux) lane SB between ramps. Modify EB Exposition Bl. loop on-ramp.
11	1.4/3.1	Exposition Bl. to E St.	Add SB transition lane and lengthen B St underpass. Lengthen A St. overcrossing. Extend Bus/Carpool lane.
12	0.0/8.9	US 50 to I 80	Add Bus/Carpool lanes.

The study combined the proposed projects into the scenarios described below because only two future scenarios were available:

- 2020 Future Base plus key CSMP projects (No Build)
- 2020 No Build plus projects 4-11 (All Aux/Transition lanes)
- 2020 No Build plus project 12 (Bus/Carpool Lane)

The study area for this analysis was the entire SR 51 corridor (NB and SB) as well as all of the on and off ramps. The AM and PM peak period (6:00 – 10:00 A.M. and 3:00 – 7:00 P.M.) were used as the analysis time period. The models were developed using Paramics micro simulation software and produced several measures of effectiveness, including traffic volumes, average speeds, travel times, and delays. Figures 9 through 12 compare the mainline vehicle hours of delay for all three modeled alternatives for each peak period. On- and off-ramp delay stayed consistent for all three scenarios.

Figure 9: 2020 AM Delay - NB/SB

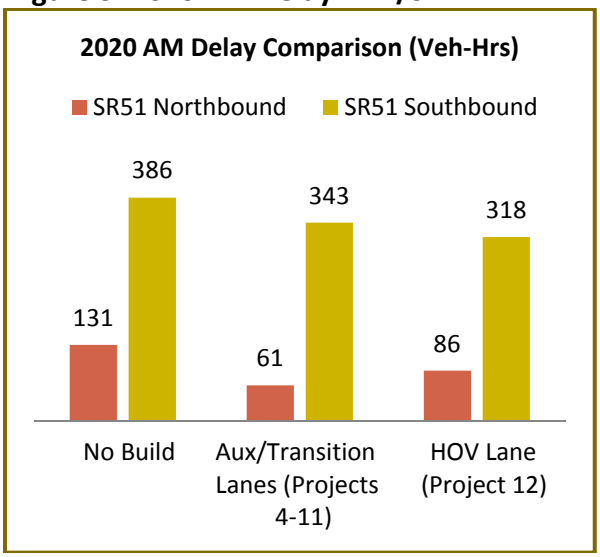


Figure 10: 2020 AM Delay - Combined

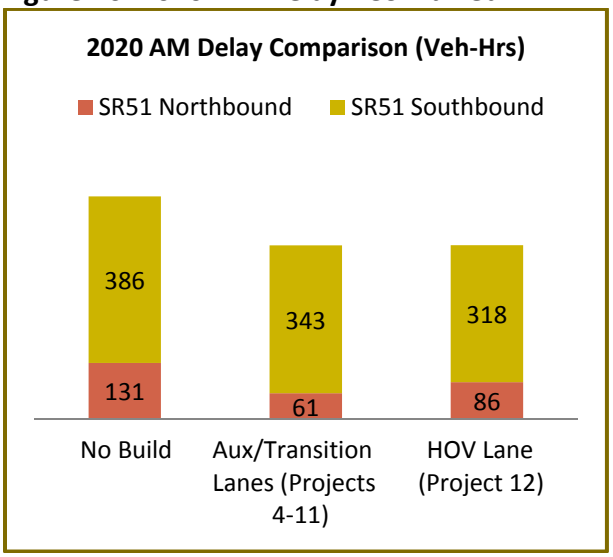


Figure 11: 2020 PM Delay – NB/SB

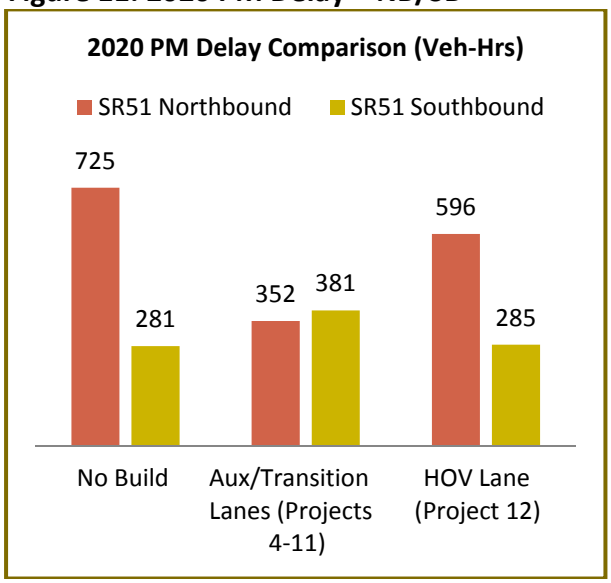
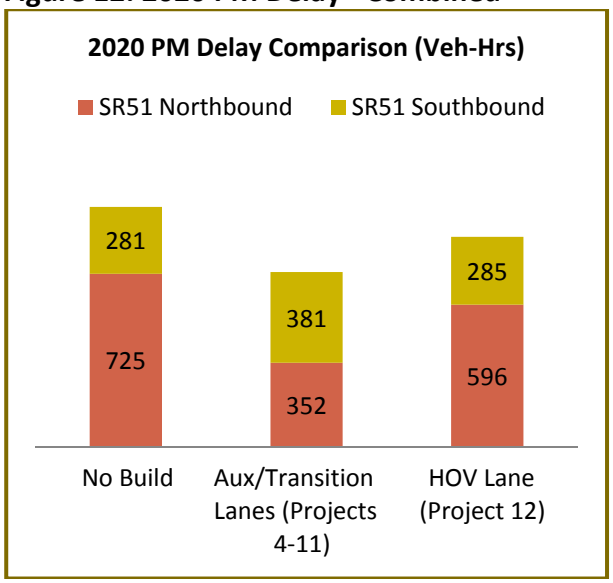


Figure 12: 2020 PM Delay - Combined



Overall delay was reduced significantly in most scenarios. For example, the NB PM delay reduced by 52% with the Aux/Transition lanes alternative and 18% with the Bus/Carpool lane alternative. SR 51 NB AM also saw major delay savings of 54% and 34% with the Aux/Transition lanes and Bus/Carpool lane alternative.

Delay in the SB AM on SR 51 decreased by 11% with the Aux/Transition lanes and 18% with the Bus/Carpool lane added to the network. Unexpectedly, the PM delay in the SB direction increased by 36% with the Aux/Transition

lanes alternative and 2% with the Bus/Carpool lane alternative. The increase in delay for SB SR 51 was due to additional congestion caused by weaving and merging between Marconi Av. and SR 160. Even though there was no specific mainline improvement, vehicles in the model approached this section from an additional lane and changed the lane distribution of vehicles. This created additional lane changes and weaving through the section. In addition to this preliminary analysis, further analysis is needed to determine the causality of the congestion and identify any potential improvements that would alleviate the potential congestion on this section of SR 51.

During the PM Peak Period, overall delay for both directions was reduced by 27% Aux/Transition lanes alternative and 12% in the Bus/Carpool lane alternative. During the AM Peak Period, overall delay for both directions was reduced by 22% in both alternatives. Figures 13 and 14 compare the PM travel times for all three alternatives on NB and SB SR 51.

Figure 13: 2020 Northbound PM Travel Time Comparison

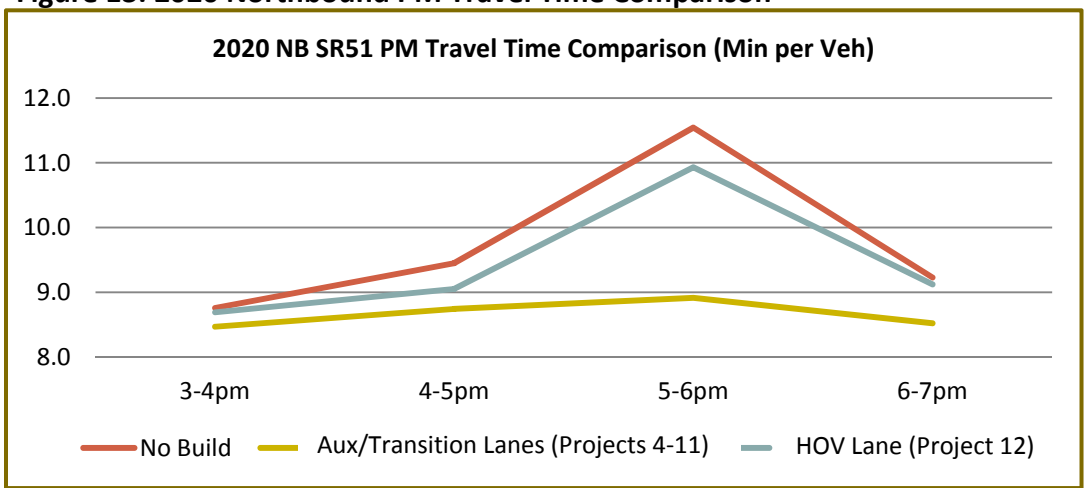
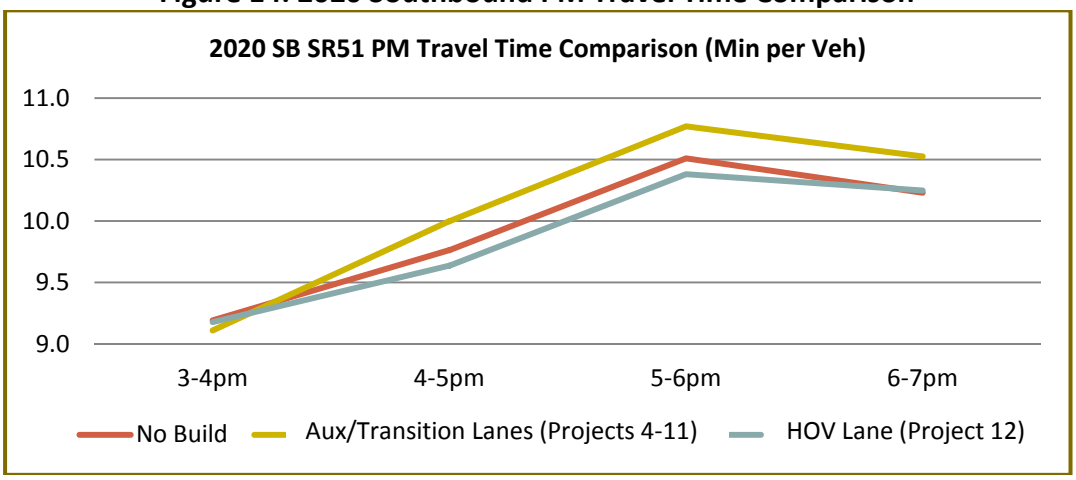


Figure 14: 2020 Southbound PM Travel Time Comparison



The NB PM peak hour travel time improved by 23% with the Aux/Transition lanes alternative and over 5% with the Bus/Carpool lane alternative. Because of the additional weaving and merging, the SB travel times increased by 2.5% with the Aux/Transition lanes alternative and decreased by 1% with the Bus/Carpool lane alternative. The AM scenarios saw travel time improvements in both SB and NB directions.

Both the Aux/Transition Lanes and Bus/Carpool Lane project scenarios provide significant congestion relief. However, since the Aux/transition lane alternatives are substantially lower in cost, they are prioritized higher than the Bus/Carpool lanes. Combining both the Aux/Transition lanes and the Bus/Carpool lanes offer significant cost-efficiencies, though, because widening the American River Bridge is assumed to only occur with the Aux/Transition Lanes and Bus/Carpool Lane combined project scenario.

CORRIDOR CHALLENGES

Improvements to SR 51 face a number of significant challenges associated with its constrained location and high traffic volumes. The lack of multiple American River crossings in the Sacramento urban core and limited parallel roadway capacity contribute toward high travel demand on SR 51. SR 51, along with I-5, SR 160, Jibboom St., J St., Watt Av., and Howe Av., is one of only a few vehicle crossings of the American River in the City of Sacramento. In addition, because the corridor passes through downtown Sacramento, there are several challenges to implement improvements, such as land use, financial, limited right-of-way (ROW), environmental and geometric constraints, and high construction costs.

LAND USE

There are several challenges along this corridor that stem from land use and environmental issues. In terms of land use, SR 51 traverses the eastern boundary of downtown Sacramento with its high and medium density residential, commercial, and industrial uses. There are also large trip generators along the corridor, namely retail shopping in Arden, the State Fair site at Cal Expo, and more commercial, retail, and housing to its connection with I-80, which provides interstate travel opportunities. Land use adjacent to SR 51 is built out with the exception of the State-owned Cal Expo property and 48 acres of property located near Sutter's Landing Park on the southeast side of SR 51. Numerous development proposals for this Sutter's Landing property have been submitted to the City of Sacramento over the years ranging from a 397 dwelling units project to a mixed-use project with 1.0 million square feet (sq. ft.) of office space, over 400,000 sq. ft. of retail/restaurant space, a 350 room hotel, and 900 dwelling units. The most current proposal includes solar panels to be constructed on the site. Several proposals have been made for the Cal Expo property, such as an arena for the local professional basketball team. Such a large trip generator would pose several challenges for the corridor. Any large proposal would create another large trip generator.

FINANCIAL AND ROW

It is anticipated that several funding sources will be needed to support the needed improvements to SR51, including Congestion Mitigation and Air Quality Improvement (CMAQ), Regional Surface Transportation Program (RSTP), developer fees, and other local and regional transportation dollars. Funding these projects will most likely require phasing or incremental improvements to the facility due to funding limitations.

In part, these financial constraints stem from the ROW challenges on the corridor. The facility is surrounded almost in its entirety by developed private lands with high land values. The high land costs and potential disruption in those communities would pose several challenges to any facility expansion project.

A creative solution to the financial and ROW problems for one of the key projects has already been proposed. This is the proposed E St. on-ramp closure. At this location, there is not sufficient ROW for an auxiliary/transition lane, and purchasing new ROW would be prohibitively expensive. Further, widening would require the expansion and reconstruction of the A St., B St., and Elvas St. crossing, which would be very costly. Instead, this PI has analyzed

the closure of the E St. on-ramp. The ROW from the acceleration lane would be used for the auxiliary/transition lane. It would not require the reconstruction of the crossings, thus saving significant funds. This, however, would require design exceptions for 11 foot wide lanes under the structures. Also, this would impact two SacRT bus routes that use this on-ramp. This closure would require SacRT to re-route busses to the J St. on-ramp. Caltrans will continue to explore this option with the City of Sacramento and SacRT.

NEXT STEPS

The projects identified in the SR 51 PI will take many years to implement and will require several different funding sources to bring to fruition. Caltrans will continue to work with its local and regional partners to plan, program, and construct individual projects and segments as upcoming transportation funding opportunities become available.

In addition, Caltrans will continue to remain engaged with the City of Sacramento as developments are proposed which may impact SR 51. This will allow Caltrans, the City, and the applicant developer to review, analyze, and coordinate the mitigation of direct and cumulative significant impacts to SR51 relating to the specific land use proposal and, as appropriate and indicated by an objective nexus study, provide for developer contributions for the needed improvements to SR 51. It is hoped that this PI can be used to streamline that process.

Prior to programming and constructing the proposed improvement projects, a Project Initiation Document (PID) must be prepared for each project or group of projects to identify the purpose and need, scope, cost, and schedule. As an initial step, Caltrans will begin to include the highest priority projects into the Three-Year PID Work Plan. This allows resources to be allocated for PID development and to compete for funding. Projects identified in this SR 51 PI that are included in the Fiscal Year 2012/13 Non SHOPP Three-Year PID Work Program include many of the Ramp Metering Projects (Project 1), the E St. to the Am. River Bridge NB Transition Lane Project (Project 4A/4B), the Am. River Bridge Widening Project (Projects 5), the Am. River Bridge to Exposition Bl. NB Transition Lane Project (Project 6), the Exposition Bl. to SR 160 NB Transition Lane and widening the NB SR 160 Separator Project (Project 7), and the Marconi Av. to Watt Av. NB Transition Lane Project (Project 8). Caltrans will add the remaining SR 51 projects in future PID Work Programs. The planned completion dates of the aforementioned PIDs range from June 30, 2013 to June 30, 2016, though contingent on available PID resources.

It is likely that Caltrans will propose funding for the first phase project development (Project Approval and Environmental Document – "PAED") for the northbound extension of the transition lane from E Street to the American River Bridge through the next SACOG programming cycle in 2013. During this process, a substantive public and stakeholder outreach dialogue would occur regarding the project and, specifically, the alternative which includes closing the E St. on-ramp. Also, more detailed micro simulation modeling would be performed to assess the impacts to the J St. interchange and the surrounding local street network. Consideration should also be given to an innovative project funding strategy which would allow for the programming of full project funding during the upcoming SACOG programming cycle to ensure the timely completion of final project design and construction immediately following the PAED phase based on the selected alternative.