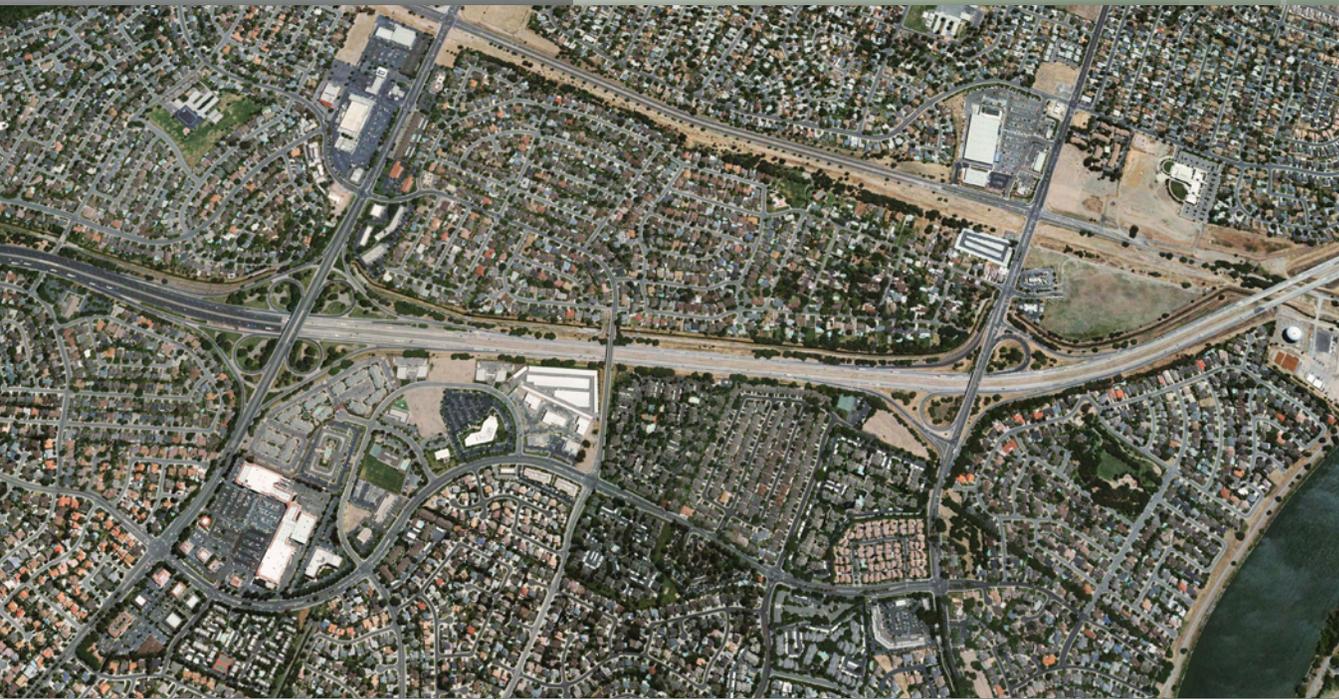




FEHR & PEERS  
TRANSPORTATION CONSULTANTS



## I-5 Bus/Carpool Lanes Traffic Report

Prepared for:



Submitted by:  
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September 30, 2009  
RS06-2352D

# TRAFFIC REPORT

FOR THE INTERSTATE 5 BUS/CARPOOL LANES  
PROJECT REPORT/ENVIRONMENTAL DOCUMENT

Prepared for

California Department of Transportation

Prepared by

Fehr & Peers  
Transportation Consultants

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This report was prepared under my direction and responsible charge. I attest to the technical information contained herein and have judged the qualification of any technical specialists providing engineering data upon which recommendations, conclusions, and decisions are based.

*David Stanek*

9/30/09

David Stanek, P.E.  
Registered Professional Civil Engineer  
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Date



## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>6</b>
Background.....	6
Analysis Results .....	7
Summary .....	9
Additional Considerations.....	9
<b>1. Introduction.....</b>	<b>11</b>
Background.....	11
Purpose and Need.....	13
Outline .....	13
<b>2. Existing Conditions Analysis.....</b>	<b>15</b>
Traffic Operations Model Development.....	15
Traffic Operations Analysis.....	22
Safety.....	26
<b>3. Travel Demand Forecasts.....</b>	<b>28</b>
Project Alternatives.....	28
Base Year Model Development.....	28
Future Year Model Development.....	28
Traffic Forecasts.....	29
<b>4. Project Alternatives.....</b>	<b>48</b>
No Build Alternative .....	48
Mixed Flow Addition Alternative .....	48
Bus/Carpool Addition Alternative.....	51
Bus/Carpool Conversion Alternative.....	51
Other Planned Projects .....	51
<b>5. Construction Year (2013) Conditions Analysis .....</b>	<b>55</b>
Northbound – AM Peak Period.....	55
Southbound – PM Peak Period .....	58
<b>6. Interim Year (2023) Conditions Analysis.....</b>	<b>62</b>
Northbound – AM Peak Period.....	62
Southbound – PM Peak Period .....	65
<b>7. Design Year (2033) Conditions Analysis.....</b>	<b>69</b>
Northbound – AM Peak Period.....	69
Southbound – PM Peak Period .....	72
<b>8. Other Considerations.....</b>	<b>76</b>
Park and Ride.....	76
Traffic Operations System Elements .....	78
Bus/Carpool Lane Safety.....	79
Transit Use .....	80
HOT Lanes .....	81

## APPENDICES

- Appendix A: Detailed Model Results – Existing Conditions
- Appendix B: Detailed Model Results – Construction Year (2013) Conditions
- Appendix C: Detailed Model Results – Interim Year (2023) Conditions
- Appendix D: Detailed Model Results – Design Year (2033) Conditions
- Appendix E: Design Options Analysis

## LIST OF FIGURES

Figure 1 – Study Area .....	12
Figure 2 – Lane Configuration – Existing Conditions.....	16
Figure 3A – Traffic Volumes – Existing Conditions.....	18
Figure 3B – Traffic Volumes – Existing Conditions.....	19
Figure 3C – Traffic Volumes – Existing Conditions .....	20
Figure 4A – Travel Demand Volumes – No Build and Mixed Flow Addition Alternatives 2013 Conditions .....	30
Figure 4B – Travel Demand Volumes – No Build and Mixed Flow Addition Alternatives 2013 Conditions .....	31
Figure 4C – Travel Demand Volumes – No Build and Mixed Flow Addition Alternatives 2013 Conditions .....	32
Figure 4D – Travel Demand Volumes – Bus/Carpool Addition and Conversion Alternatives 2013 Conditions .....	33
Figure 4E – Travel Demand Volumes – Bus/Carpool Addition and Conversion Alternatives 2013 Conditions .....	34
Figure 4F – Travel Demand Volumes – Bus/Carpool Addition and Conversion Alternatives 2013 Conditions .....	35
Figure 5A – Travel Demand Volumes – No Build and Mixed Flow Addition Alternatives 2023 Conditions .....	36
Figure 5B – Travel Demand Volumes – No Build and Mixed Flow Addition Alternatives 2023 Conditions .....	37
Figure 5C – Travel Demand Volumes – No Build and Mixed Flow Addition Alternatives 2023 Conditions .....	38
Figure 5D – Travel Demand Volumes – Bus/Carpool Addition and Conversion Alternatives 2023 Conditions .....	39
Figure 5E – Travel Demand Volumes – Bus/Carpool Addition and Conversion Alternatives 2023 Conditions .....	40
Figure 5F – Travel Demand Volumes – Bus/Carpool Addition and Conversion Alternatives 2023 Conditions .....	41
Figure 6A – Travel Demand Volumes – No Build and Mixed Flow Addition Alternatives 2033 Conditions .....	42
Figure 6B – Travel Demand Volumes – No Build and Mixed Flow Addition Alternatives 2033 Conditions .....	43
Figure 6C – Travel Demand Volumes – No Build and Mixed Flow Addition Alternatives 2033 Conditions .....	44
Figure 6D – Travel Demand Volumes – Bus/Carpool Addition and Conversion Alternatives 2033 Conditions .....	45
Figure 6E – Travel Demand Volumes – Bus/Carpool Addition and Conversion Alternatives 2033 Conditions .....	46

Figure 6F – Travel Demand Volumes – Bus/Carpool Addition and Conversion Alternatives 2033 Conditions .....	47
Figure 7 – No Build Alternative .....	49
Figure 8 – Mixed Flow Addition Alternative.....	50
Figure 9 – Bus/Carpool Addition Alternative .....	52
Figure 10 – Bus/Carpool Conversion Alternative.....	53
Figure 11 – Park and Ride Facilities .....	77
Figure E-1 – Design Options – Northbound Bus/Carpool Lane Start .....	E-2
Figure E-2 – Design Options – Southbound Bus/Carpool Lane End.....	E-3

**LIST OF TABLES**

Table ES1 – Peak-Period Network Summary for 2033 Conditions .....	7
Table ES2 – Highest Peak-Hour Bus/Carpool Lane Volume Served .....	8
Table 1 – Calibration Adjustments .....	21
Table 2 – Validation Adjustments .....	21
Table 3 – Validation Criteria Thresholds Comparison .....	22
Table 4 – Freeway Mainline and Ramp Junction/Weave Section LOS Thresholds .....	23
Table 5 – Northbound Mainline AM Peak-Hour Analysis for Existing Conditions.....	24
Table 6 – Southbound Mainline PM Peak-Hour Analysis for Existing Conditions .....	24
Table 7 – Observed Travel Time and Speed for Existing Conditions .....	25
Table 8 – Peak-Period Network Summary for Existing Conditions.....	26
Table 9 – Accident History .....	26
Table 10 – Accidents by Peak Period and Accident Type .....	27
Table 11 – HOV Percentage by Analysis Year .....	29
Table 12 – Assumed Number of Lanes at Ramp Meters.....	54
Table 13 – 2013 Northbound AM Peak-Hour Travel Time and Speed.....	55
Table 14 – 2013 Northbound AM Peak-Period Network Summary .....	56
Table 15 – 2013 Northbound AM Peak-Hour Volume and Speed.....	57
Table 16 – 2013 Northbound AM Peak-Hour LOS and Density .....	57
Table 17 – 2013 Northbound AM Peak-Hour Bus/Carpool Lane Volume and Speed.....	58
Table 18 – 2013 Southbound PM Peak-Hour Travel Time and Speed .....	59

Table 19 – 2013 Southbound PM Peak-Period Network Summary.....	59
Table 20 – 2013 Southbound PM Peak-Hour Volume and Speed .....	60
Table 21 – 2013 Southbound PM Peak-Hour LOS and Density.....	60
Table 22 – 2013 Southbound PM Peak-Hour Bus/Carpool Lane Volume and Speed .....	61
Table 23 – 2023 Northbound AM Peak-Hour Travel Time and Speed.....	62
Table 24 – 2023 Northbound AM Peak-Period Network Summary .....	63
Table 25 – 2023 Northbound AM Peak-Hour Volume and Speed.....	63
Table 26 – 2023 Northbound AM Peak-Hour LOS and Density .....	64
Table 27 – 2023 Northbound AM Peak-Hour Bus/Carpool Lane Volume and Speed.....	65
Table 28 – 2023 Southbound PM Peak-Hour Travel Time and Speed .....	65
Table 29 – 2023 Southbound PM Peak-Period Network Summary.....	66
Table 30 – 2023 Southbound PM Peak-Hour Volume and Speed .....	67
Table 31 – 2023 Southbound PM Peak-Hour LOS and Density.....	67
Table 32 – 2023 Southbound PM Peak-Hour Bus/Carpool Lane Volume and Speed .....	68
Table 33 – 2023 Northbound AM Peak-Hour Travel Time and Speed.....	69
Table 34 – 2023 Northbound AM Peak-Period Network Summary .....	70
Table 35 – 2023 Northbound AM Peak-Hour Volume and Speed.....	70
Table 36 – 2023 Northbound AM Peak-Hour LOS and Density .....	71
Table 37 – 2023 Northbound AM Peak-Hour Bus/Carpool Lane Volume and Speed.....	72
Table 38 – 2023 Southbound PM Peak-Hour Travel Time and Speed .....	73
Table 39 – 2023 Southbound PM Peak-Period Network Summary.....	73
Table 40 – 2023 Southbound PM Peak-Hour Volume and Speed .....	74
Table 41 – 2023 Southbound PM Peak-Hour LOS and Density.....	74
Table 42 – 2023 Southbound PM Peak-Hour Bus/Carpool Lane Volume and Speed .....	75
Table 43 – Existing Park and Ride Lots.....	76
Table 44 – Traffic Operations System Elements .....	79
Table 45 – Existing Peak Period Bus Volume .....	80
Table E1 – Design Option Northbound AM Peak-Hour Travel Time and Speed.....	E-4
Table E2 – Design Option Northbound AM Peak-Period Network Summary.....	E-4
Table E3 – Design Option Northbound AM Peak-Hour Volume and Speed .....	E-5

Table E4 – Design Option Northbound AM Peak-Hour LOS and Density .....	E-5
Table E5 – Design Option Northbound AM Peak-Hour Bus/Carpool Lane Volume and Speed .....	E-6
Table E6 – Design Option Southbound PM Peak-Hour Travel Time and Speed .....	E-6
Table E7 – Design Option Southbound PM Peak-Period Network Summary .....	E-7
Table E8 – Design Option Southbound PM Peak-Hour Volume and Speed.....	E-7
Table E9 – Design Option Southbound PM Peak-Hour LOS and Density .....	E-8
Table E10 – Design Option Southbound PM Peak-Hour Bus/Carpool Lane Volume and Speed.....	E-8

## EXECUTIVE SUMMARY

### BACKGROUND

This traffic report analyzes alternatives for the Interstate 5 (I-5) Bus/Carpool Lanes project in Sacramento County from 1.1 miles south of Elk Grove Boulevard to the U. S. Highway 50 (US-50) interchange. The proposed project would widen the freeway to provide an additional through lane and construct auxiliary lanes in both directions between Pocket Road and Florin Road. The following alternatives are considered for the proposed project.

- No widening (No Build Alternative)
- Add mixed-flow lanes (Mixed Flow Addition Alternative)
- Add bus/carpool lanes (Bus/Carpool Addition Alternative)
- No widening and converting existing lanes to bus/carpool lanes (Bus/Carpool Conversion Alternative)

This report is being prepared for the Project Report/Environmental Document stage of project development to address traffic operations (capacity and congestion) and safety.

The purpose of the proposed project is to reduce future peak-period traffic congestion. The build project alternatives propose to accomplish this objective through an increase in mixed-flow and/or bus/carpool roadway capacity. As the responsible agency for operating and maintaining I-5, Caltrans can accomplish this through increasing capacity, managing travel demand, or both. Capacity is increased through the addition of new lanes along the corridor. Travel demand is managed using ramp metering and encouraging ridesharing by designating lanes only for buses and carpools (although such lanes are often called high-occupancy vehicle, or HOV, lanes, they are called bus/carpool lanes in this report).

Evaluating peak-period traffic congestion requires the use of a traffic operations model. The VISSIM microsimulation software was used to develop traffic operations models of the northbound direction for the AM peak period and the southbound direction for the PM peak period. Existing conditions models were constructed from geometric data (aerial photographs, field observations, etc.), traffic control data (ramp meter signal timing plans), and traffic flow data (traffic counts of single-occupant vehicles, trucks and HOVs; travel time measurements; field observations; etc.). The existing conditions models were calibrated and validated to observed traffic volumes, travel time, and queues.

Travel demand forecasts were prepared for the project alternatives under construction (2013), interim (2023), and design year (2033) conditions. Traffic forecasts were prepared using the SACMET regional travel demand forecasting model that was validated to existing volumes. SACMET models were developed for the base (2006) and cumulative years (2035). To determine the traffic forecasts for the analysis years of 2013, 2023, and 2033, linear interpolation was used.

The following separate projects are assumed to be constructed under all alternatives during all future years.

- I-5/Cosumnes River Boulevard Interchange – This project would extend Cosumnes River Boulevard from Franklin Boulevard to Freeport Boulevard and construct a partial cloverleaf (Type L-9) interchange at I-5.
- Ramp Meter System – This future project would install ramp meters and associated high-occupancy vehicle (HOV) bypass lanes on selected on-ramps that do not currently have them.

This report analyzes the following project alternatives (see Figures 7, 8, 9, and 10).

- No Build Alternative – The existing freeway lane configuration would be maintained although other separate projects would be constructed.
- Mixed Flow Addition Alternative – Two mixed-flow lanes would be added (one in each direction) from south of Elk Grove Boulevard to US-50 and auxiliary lanes would be constructed between Pocket Road and Florin Road.
- Bus/Carpool Addition Alternative – Two contiguous, peak-period bus/carpool lanes would be added (one in each direction) from south of Elk Grove Boulevard to US-50 and auxiliary lanes would be constructed between Pocket Road and Florin Road.
- Bus/Carpool Conversion Alternative – The existing freeway lane configuration would be maintained but the leftmost lane would be restricted to buses and carpools during peak periods from south of Laguna Boulevard to US-50.

## ANALYSIS RESULTS

Table ES1 compares the network statistics under existing and design year (2033) conditions for each of the project alternatives during the four-hour AM and PM peak periods.

TABLE ES1 – PEAK-PERIOD NETWORK SUMMARY FOR 2033 CONDITIONS					
Direction & Peak Period	Alternative	Vehicles Served	Persons Served <sup>1</sup>	Average Speed (All) <sup>2</sup>	Average Speed (HOV) <sup>2</sup>
Northbound AM Peak	Existing (2005)	49,300	58,900	29.2	28.7
	No Build	60,000	78,700	14.7	18.1
	Mixed Flow Addition	65,100	84,300	18.5	21.7
	Bus/Carpool Addition	64,900	91,300	17.3	23.3
	Bus/Carpool Conversion	41,500	59,800	8.7	11.5
Southbound PM Peak	Existing (2005)	56,000	69,000	38.6	37.9
	No Build	65,000	86,900	23.4	25.9
	Mixed Flow Addition	78,700	99,000	39.0	41.2
	Bus/Carpool Addition	76,000	103,400	32.2	41.1
	Bus/Carpool Conversion	59,200	77,900	22.1	29.6

Notes: 1. Based on traffic counts, HOVs, trucks, and other vehicles are assumed to have vehicle occupancies of 2.35, 1.2, and 1.0 persons per vehicle, respectively.  
2. Speed is reported in miles per hour for all vehicles and for HOVs.

Source: Fehr & Peers, 2009

In the northbound direction, the number of persons served through the corridor may increase as much as 55 percent over existing conditions by 2033. Under 2033 conditions, the lane addition alternatives would serve a higher number of vehicles and persons at a higher average speed when compared to the No Build Alternative. Both the Mixed Flow and Bus/Carpool Addition Alternatives would serve similar numbers of vehicles, but the Bus/Carpool Addition Alternative would serve 7,000 more people. The average speed for all vehicles would be about 1 mph higher for the Mixed Flow Addition Alternative, but the average speed for HOVs would be about 1.5

mph higher for the Bus/Carpool Addition Alternative. The Bus/Carpool Conversion Alternative would move fewer persons at a lower overall average speed than the other alternatives.

Under existing conditions, the main bottleneck in the northbound direction is the off-ramp connector to US-50 although smaller bottlenecks exist at Pocket Road and Laguna Boulevard. Under 2033 conditions, these bottlenecks would remain for the No Build Alternative although the severity of the congestion would increase. The lane addition alternatives would add capacity south of US-50, but the US-50 bottleneck would remain. This bottleneck would make the Bus/Carpool Conversion Alternative less effective at delivering people to downtown than the other alternatives.

The analysis results for the southbound direction show higher volume served and average speed than the northbound direction. Similar to the results for the northbound direction, the lane addition alternatives would serve a higher number of vehicles and persons at a higher average speed when compared to the No Build and Bus/Carpool Conversion Alternatives. The Mixed Flow Addition Alternative would serve more vehicles at a higher overall speed, but the Bus/Carpool Addition Alternative would serve 4,000 more people during the peak period. The average speed for HOVs would be the same under both the Mixed Flow and Bus/Carpool Addition Alternatives due to similar bottleneck locations that would affect all lanes (that is, the bus/carpool lane would operate at capacity).

In the southbound direction, two bottlenecks exist currently – the lane drop north of Sutterville Road and the section between Florin Road and Pocket Road. Under 2033 conditions, these bottlenecks would also exist under the No Build and Bus/Carpool Conversion Alternatives, and queuing from Pocket Road would extend back through the bottleneck at Sutterville Road. For both lane addition alternatives, the lane drop at Pocket Road would become a bottleneck and would cause LOS F conditions to the north. LOS E conditions would also occur between Cosumnes River Boulevard and Laguna Boulevard due to the high off-ramp volume to Laguna Boulevard.

Table ES2 shows the peak HOV lane volume served during the peak hour for the Bus/Carpool Alternatives. The Caltrans guidelines recommend a threshold of 800 vph in the HOV lane during the opening year. For the Bus/Carpool Addition Alternative, the southbound direction would have higher than 800 vph in the construction year (2013) although the northbound volume would be less than the threshold. For the other analysis years, the peak bus/carpool lane volume would be higher than 1,000 vph. The Bus/Carpool Conversion Alternative would have a HOV lane volume in the northbound direction greater than 800 vph in 2013, but the 2033 volume would be less than the Bus/Carpool Addition Alternative due to upstream bottlenecks, which constrain the traffic from entering the lane. In the southbound direction, the HOV lane volume would be less than the Bus/Carpool Addition Alternative due to a bottleneck at the start of the HOV lane which constrains HOV (and non-HOV) volume from entering the project area.

<b>TABLE ES2 – HIGHEST PEAK-HOUR BUS/CARPOOL LANE VOLUME SERVED</b>					
<b>Direction</b>	<b>Peak Period</b>	<b>Alternative</b>	<b>Analysis Year</b>		
			<b>2013</b>	<b>2023</b>	<b>2033</b>
Northbound	AM	Bus/Carpool Addition	725	1,120	1,461
		Bus/Carpool Conversion	944	1,188	1,397
Southbound	PM	Bus/Carpool Addition	977	1,564	1,662
		Bus/Carpool Conversion	746	964	890

Source: Fehr & Peers, 2009

## SUMMARY

The following list summarizes the alternatives analysis under design year (2033) conditions.

- The No Build Alternative would not reduce peak-period congestion since no additional capacity would be provided. Bottlenecks in the study area would create long delays and could result in a number of different responses by future travelers. The delays would be severe enough that some people may decide not to travel while others that choose to travel could divert to other routes, other times of day, and/or other travel modes.
- The Mixed Flow Addition Alternative would serve more vehicles, although fewer persons, compared to the Bus/Carpool Addition Alternative, and the average speed of all vehicles would be higher.
- The Bus/Carpool Addition Alternative would serve more people than the Mixed Flow Addition Alternative. Importantly, this alternative would also provide higher speeds for HOVs than the other alternatives.
- The Bus/Carpool Conversion Alternative would cause a mode shift to carpools or buses. However, this alternative does not reduce peak-period congestion since no additional capacity would be provided and the mode shift to carpools or buses would not offset future vehicle traffic growth. Bottlenecks in the study area would worsen and create long delays resulting in conditions similar to the No Build Alternative.

Under current conditions, the accident rate in the study area is lower than the statewide average for similar facilities. A review of accident rates before and after bus/carpool lanes were constructed on US-50 and I-80 in the Sacramento area showed no significant number of accidents related to the bus/carpool lane, such as rear-end or sideswipe crashes in the left lanes (*Contiguous HOV Lane Safety Review*, Fehr & Peers, 2006). As a result, the alternative with the most congestion would be likely to have the higher accident rates.

## ADDITIONAL CONSIDERATIONS

Although the Mixed Flow and Bus/Carpool Addition Alternatives would provide additional capacity, the following bottlenecks would exist under design-year conditions both within and adjacent to the study area.

- US-50 Interchange – The connector ramps will not provide enough capacity for the forecasted demand volume. Even if the connectors were widened, sufficient capacity would not exist on the US-50 mainline. As a result, bus/carpool lane direct connectors should be considered to allow HOVs a travel time advantage at the interchange.
- Northbound I Street to Richards Boulevard Weaving Section – This weaving section is an existing bottleneck during the PM peak period due to high on-ramp volumes. Under future conditions, this location will also be a bottleneck during the AM peak period. More restrictive ramp metering and upstream signal coordination should be considered to effectively meter traffic in response to available capacity.
- Hood Franklin Road Interchange – The proposed Elk Grove to Rancho Cordova connector roadway will terminate at the I-5/Hood Franklin Road Interchange. Regional traffic plus future development in the City of Elk Grove will result in significant traffic volume growth for the I-5 mainline between Hood Franklin Road and Elk Grove Boulevard. Future improvements to the Hood Franklin Road Interchange should include a lane addition on the I-5 mainline from Hood Franklin Road north to the proposed lane drop located approximately 1.1 miles south of Elk Grove Boulevard.
- Elk Grove Boulevard, Laguna Boulevard, and Cosumnes River Boulevard Interchanges – Given the high demand volumes at the ramps and resulting delays – particularly at Laguna Boulevard, direct bus/carpool median ramps to and from the north could be considered at these locations. The median ramps would

allow HOVs to avoid merging from the bus/carpool lane to the right-side exits, which would reduce delay both to exiting HOVs and mainline through traffic.

- Aggressive Ramp Metering Strategy – As applied in this report, the same metering rate was used at the ramp meter locations for all alternatives. More restrictive metering rates on a system-wide basis would improve freeway throughput by maintaining a higher capacity, reduce recurrent congestion, and provide shorter travel times. The drawback of such a strategy would be higher volumes on the arterial street network and long queues on the freeway on-ramps.

The analysis presented in this report uses 2033 as the design year. Due to programming changes, the design year has been updated to 2036. Due to forecasted population trends, traffic volumes in 2036 are likely to be higher than 2033. However, the conclusions of the traffic study are not likely to be affected by the higher traffic volumes. As noted above, traffic operations under both no build and build conditions will have congested, LOS F conditions during the peak hour, so the higher traffic volumes will result in longer delays but the LOS results would remain the same.

## 1. INTRODUCTION

This traffic report analyzes alternatives for the Interstate 5 (I-5) Bus/Carpool Lanes project in Sacramento County from 1.1 miles south of Elk Grove Boulevard to the U. S. Highway 50 (US-50) interchange. The proposed project would widen the freeway to provide an additional through lane and construct auxiliary lanes in both directions between Pocket Road and Florin Road. The following alternatives are considered for the proposed project.

- No widening (No Build Alternative)
- Add mixed-flow lanes (Mixed Flow Addition Alternative)
- Add bus/carpool lanes (Bus/Carpool Addition Alternative)
- No widening and converting existing lanes to bus/carpool lanes (Bus/Carpool Conversion Alternative)

This report is being prepared for the Project Report/Environmental Document stage of project development to address traffic operations (capacity and congestion) and safety.

### BACKGROUND

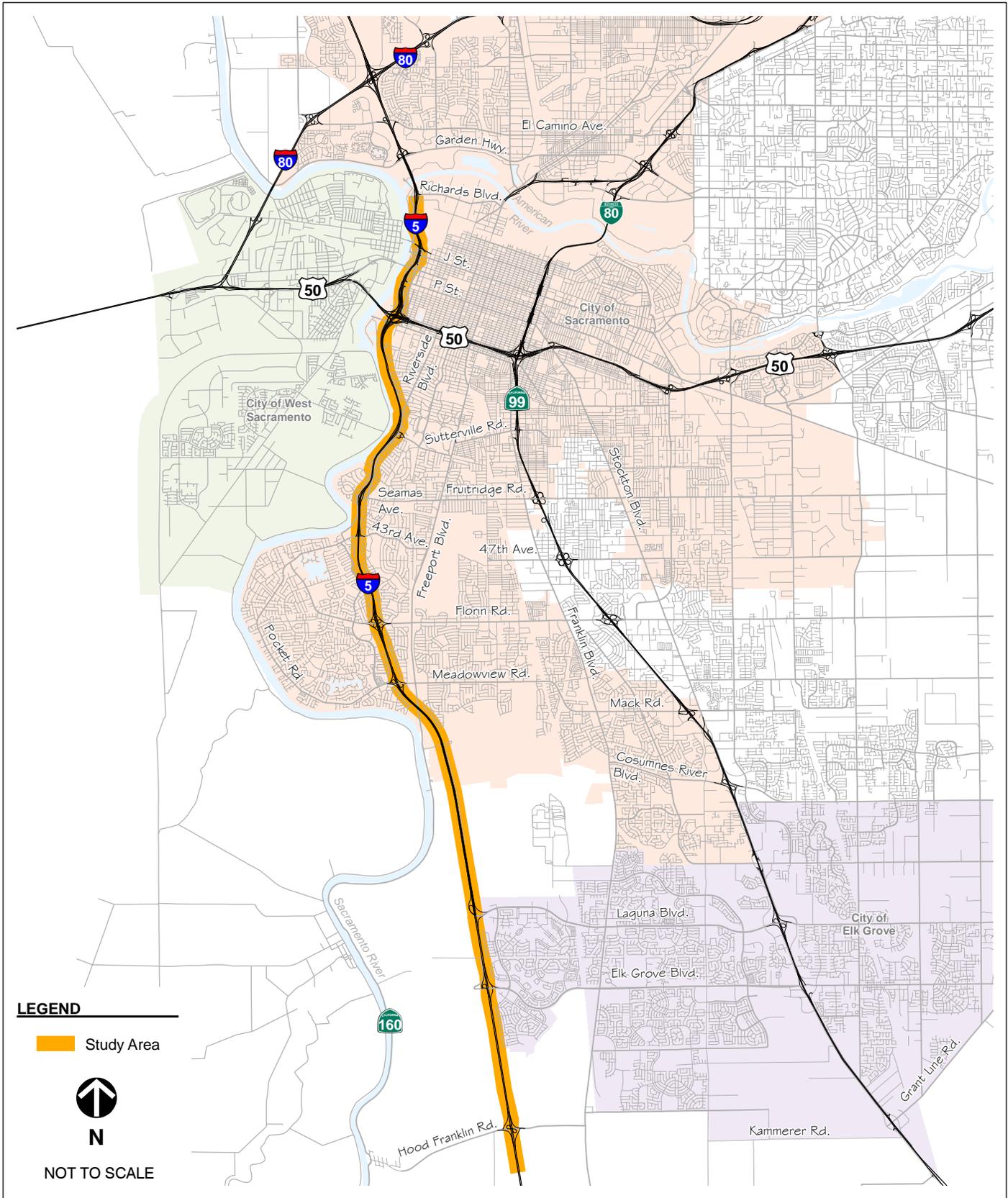
I-5 is a national north-south route that connects California to Oregon to the north and Mexico to the south. As such, this interregional route serves as an important corridor for freight trucks. In the Sacramento area, I-5 is also a vital commuter route for residents traveling into the central business district of the City of Sacramento from south Sacramento and the City of Elk Grove. Other commuters travel into Sacramento from San Joaquin County or out to the San Francisco Bay area via I-205 and I-580.

In the project study area (see Figure 1), I-5 is located within unincorporated Sacramento County, the City of Elk Grove, and the City of Sacramento. The study area runs from Hood Franklin Road in the south to Richards Boulevard in the north. The section from US-50 to Richards Boulevard was added to the study area to account for bottleneck locations in downtown Sacramento. Figure 2 shows the existing lane configurations on I-5 and the 12 interchanges in the study area: Hood Franklin Road, Elk Grove Boulevard, Laguna Boulevard, Pocket Road, Florin Road, 43<sup>rd</sup> Avenue, Seamas Avenue, Sutterville Road, US-50, P/Q Streets, I/J/L Streets, and Richards Boulevard.

The freeway has three grade-separated crossings at former railroad rights-of-way: Freeport Boulevard, Land Park, and R Street. Grade-separated crossings for motor vehicles exist at Stonecrest Avenue, Freeport Boulevard, South Land Park Drive, 56<sup>th</sup> Avenue, Gloria Drive, 35<sup>th</sup> Avenue, Riverside Boulevard, Broadway, O Street, Capitol Mall, and I Street. Pedestrian-only grade-separated crossings exist at Casilada Way and K Street Mall.

The following are proposed projects in or near the study area.

- I-5 “Boat Section” Bus/Carpool Lane – narrowed lane and shoulder widths to provide a continuous bus/carpool lane through downtown Sacramento (in the project initiation phase, so not assumed to be built in this analysis)
- I-5/Cosumnes River Boulevard Interchange – a new partial cloverleaf (Type L-9) interchange to be built about one mile south of the existing Pocket Road interchange (Project Report completed)



## PURPOSE AND NEED

In the study area, traffic congestion (defined as an average speed below 35 miles per hour for more than 15 minutes) occurs in the northbound direction during the AM peak period and in the southbound direction during the PM peak period. During the AM peak period, the congested area extends from south of Elk Grove Boulevard to Sutterville Road and lasts for more than two hours – from 6:15 to 8:30 AM. During the PM peak period, the congested area extends from Garden Highway to Sutterville Road and lasts from 3:45 to 6:15 PM (Fall 2006 HICOMP for Sacramento Metropolitan Area, Caltrans District 3 Office of Freeway Operations – Sacramento, 2007). With a projected regional population increase of 50 percent by 2030, the level of traffic congestion will increase significantly without improvements to corridor capacity.

The purpose of the proposed project is to reduce future peak-period traffic congestion. The build project alternatives propose to accomplish this objective through an increase in mixed-flow and/or bus/carpool roadway capacity. As the responsible agency for operating and maintaining I-5, Caltrans can accomplish this through increasing capacity, managing travel demand, or both. Capacity is increased through the addition of new lanes along the corridor. Travel demand is managed using ramp metering and encouraging ridesharing by designating lanes for bus and carpool use only (although such lanes are often called high-occupancy vehicle, or HOV, lanes, they are called bus/carpool lanes in this report).

In summary, the proposed project has the following objectives.

- Provide congestion relief to improve traffic flow and mobility by carrying more people in fewer vehicles during peak periods
- Promote ride sharing and the use of high occupancy vehicles (HOVs) – that is, carpools, vanpools, express bus services, etc.
- Provide more consistent and predictable travel time for carpools, vanpools, buses, paratransit service, and emergency vehicles during peak periods
- Improve traffic operations and safety
- Use the highway facilities as efficiently as possible
- Help to achieve the goals of the Sacramento Area Council of Governments' Metropolitan Transportation Plan

## OUTLINE

The remainder of this report is divided into the following chapters.

- Chapter 2 – Existing Conditions Analysis
- Chapter 3 – Traffic Demand Forecasts
- Chapter 4 – Project Alternatives
- Chapter 5 – Construction Year (2013) Conditions Analysis
- Chapter 6 – Interim Year (2023) Conditions Analysis
- Chapter 7 – Design Year (2033) Conditions Analysis
- Chapter 8 – Other Considerations

Following this introduction, Chapter 2 describes the analysis of existing conditions. Chapter 3 summarizes the development of the traffic demand forecasts. Chapter 4 describes the project alternatives and the planned projects in the study area. Chapters 5, 6, and 7 present the traffic analysis results of the project alternatives under construction (2013), interim (2023), and design year (2033) conditions, respectively. Chapter 8 discusses other considerations for the proposed project.

## 2. EXISTING CONDITIONS ANALYSIS

This chapter describes the development of the traffic analysis simulation model, the existing traffic operations, and accident data.

### TRAFFIC OPERATIONS MODEL DEVELOPMENT

To analyze freeway traffic operations, a VISSIM traffic simulation model was developed as follows.

1. The model was constructed from roadway network (lane configuration), traffic volume (traffic counts), and traffic control (ramp meters) data.
2. Additional detail was incorporated into the VISSIM network (posted speed limits, grades, etc.) to reflect observed field conditions.
3. Driver behavior parameters were adjusted based on field observations.
4. The distribution of vehicle types was calibrated to local conditions so that the percentage of trucks and high-occupancy vehicles (HOVs) match the traffic counts.

The VISSIM model was validated to existing conditions using the criteria suggested in *Guidelines for Applying Traffic Microsimulation Modeling Software* (California Department of Transportation, 2002) and additional criteria developed by Fehr & Peers. The default VISSIM parameters for geometrics and driver behavior were iteratively adjusted until the model was validated to observed conditions. Since micro-simulation models like VISSIM rely on the random arrival of vehicles, multiple runs are needed to provide a reasonable level of statistical accuracy and validity. Therefore, the results of 10 separate runs (each using a different random seed number) were averaged to determine the final results.

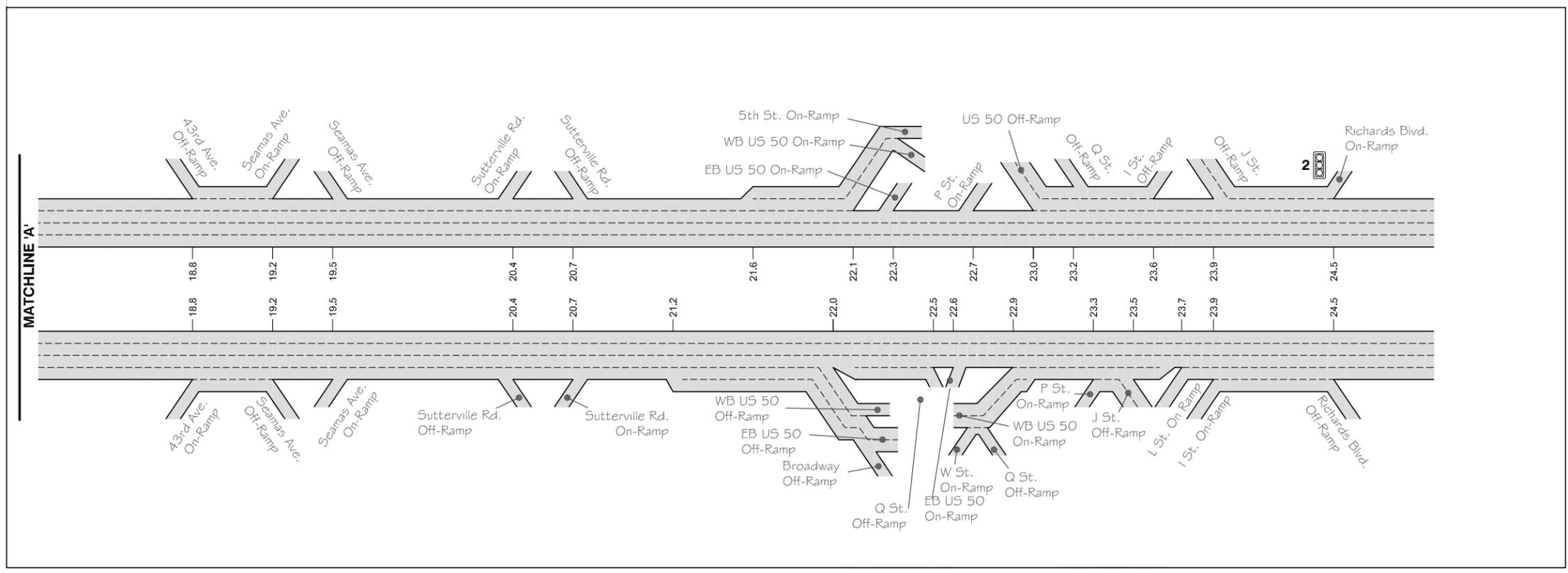
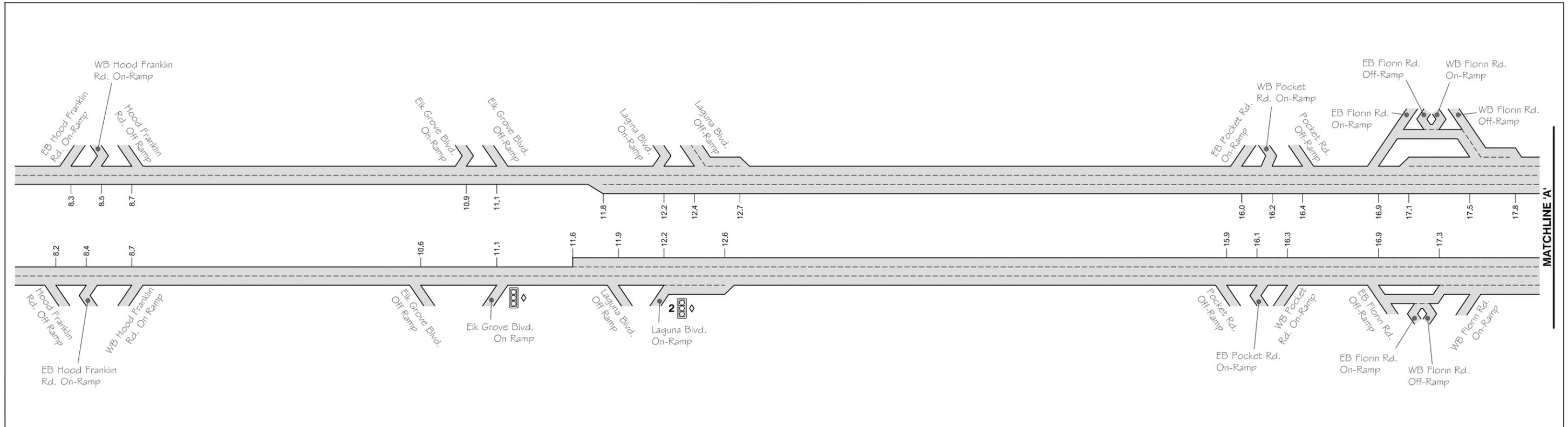
The calibrated and validated model was used to generate performance measures that are consistent with the *Highway Capacity Manual* (HCM) (Transportation Research Board, 2000). Additionally, the percent demand volume served at each study location (ramp junction) was determined. This measure of congestion indicates a bottleneck location when the value is significantly less than 100 percent (that is, not all of the demand volume is served within the allotted time). Finally, average travel times for the corridor were reported.

#### **Operations Model Input Data**

The model setup required the input of geometric, traffic control, and traffic flow data.

Roadway geometric data were gathered using aerial photographs, design plans, and field observations. The lane configurations (shown in Figure 2) that initially were taken from aerial photographs were confirmed or revised based on field observations.

The Caltrans Traffic Operations Sacramento Area office provided timing information for the ramp meters that were operating when the traffic counts were collected (the northbound ramp meters from Pocket Road to I Street were activated after the traffic counts were collected). The posted speed limits for the freeways and ramps were collected during field observations.



- LEGEND**
- Ramp Metered Lanes (One lane unless otherwise noted)
  - 2** Number of Metered Lanes
  - HOV-Only Lane
  - 6.0 Post-mile

NOTE: The figure shows only those ramp meters that were active when the traffic counts were collected during Fall 2006.



Figures 3A, B, and C show the peak-hour and peak-period existing volumes. Caltrans District 3 provided the existing traffic volumes in 15-minute intervals for the four-hour morning and evening peak periods: 6:00 to 10:00 AM and 3:00 to 7:00 PM. The system-wide peak hours are 6:30 to 7:30 AM in the northbound direction and 4:15 to 5:15 PM in the southbound direction.

The traffic counts for the freeway mainline and most on- and off-ramps were collected using both manual and electronic methods mostly during Fall 2006. The traffic counts for the US-50 connectors and the ramps to the north were collected in 2004 and 2005. A growth factor of three percent per year was used to adjust the counts to 2006 conditions. Fehr & Peers estimated an origin-destination matrix using the exiting volume percentages for use in the traffic operations analysis model.

The manual traffic counts also collected truck and HOV volumes at some locations. The corridor truck percentages are relatively high with 20 percent measured for northbound I-5 at Hood Franklin Road during the AM peak period and 14 and 11 percent measured for the US-50 connectors to southbound I-5 during the PM peak period. The percentage of trucks is higher at the south end of the study area compared to the north end due to lower overall traffic volume south of Elk Grove compared to downtown Sacramento. HOV percentages for the US-50 connectors were 16 and 17 percent. For other ramps, the truck and HOV volumes were estimated using typical values of 2 and 17 percent, respectively.

Separate operations models were created for the northbound direction during the AM peak period and the southbound direction during the PM peak period. As directed by Caltrans, this approach provides an analysis of the peak direction for each peak period. Under existing conditions, the northbound direction is also congested during the PM peak period from US-50 to Richards Boulevard, which is outside the limits of the proposed improvements.

### ***Operations Model Calibration***

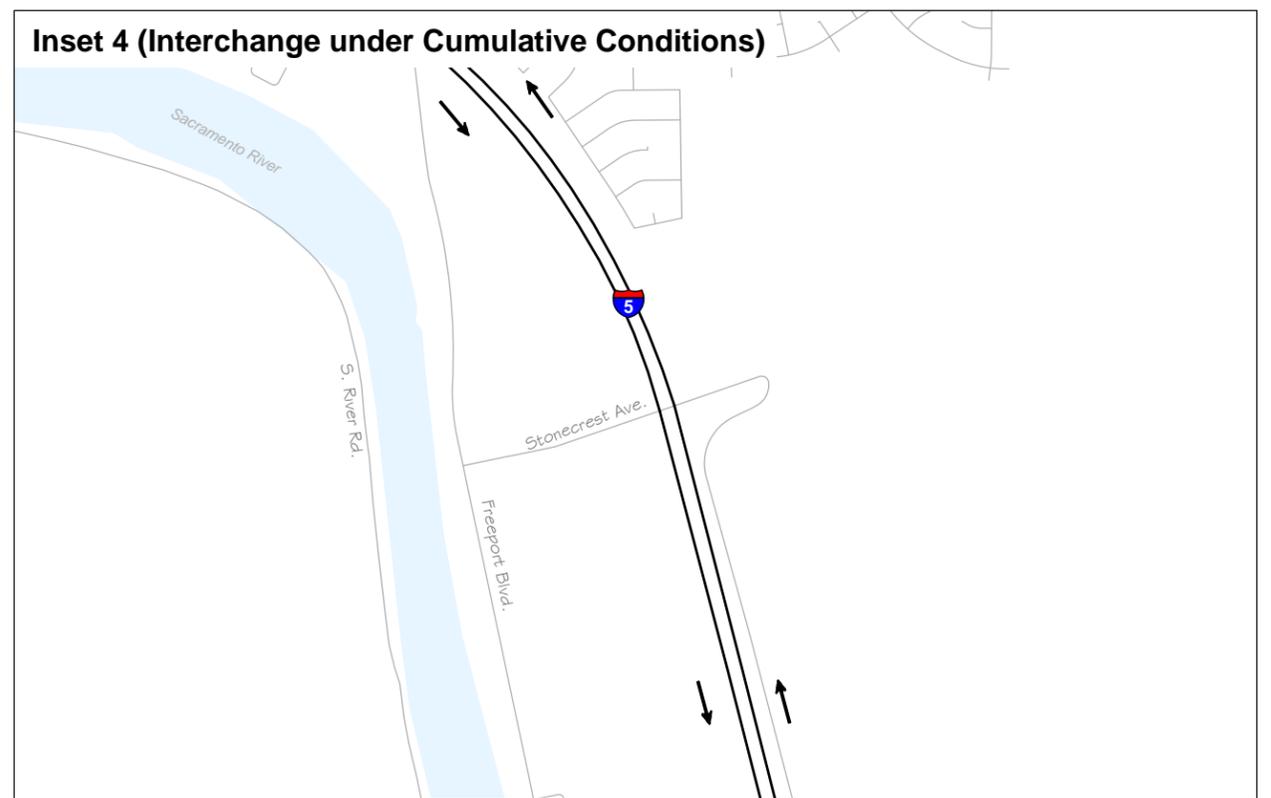
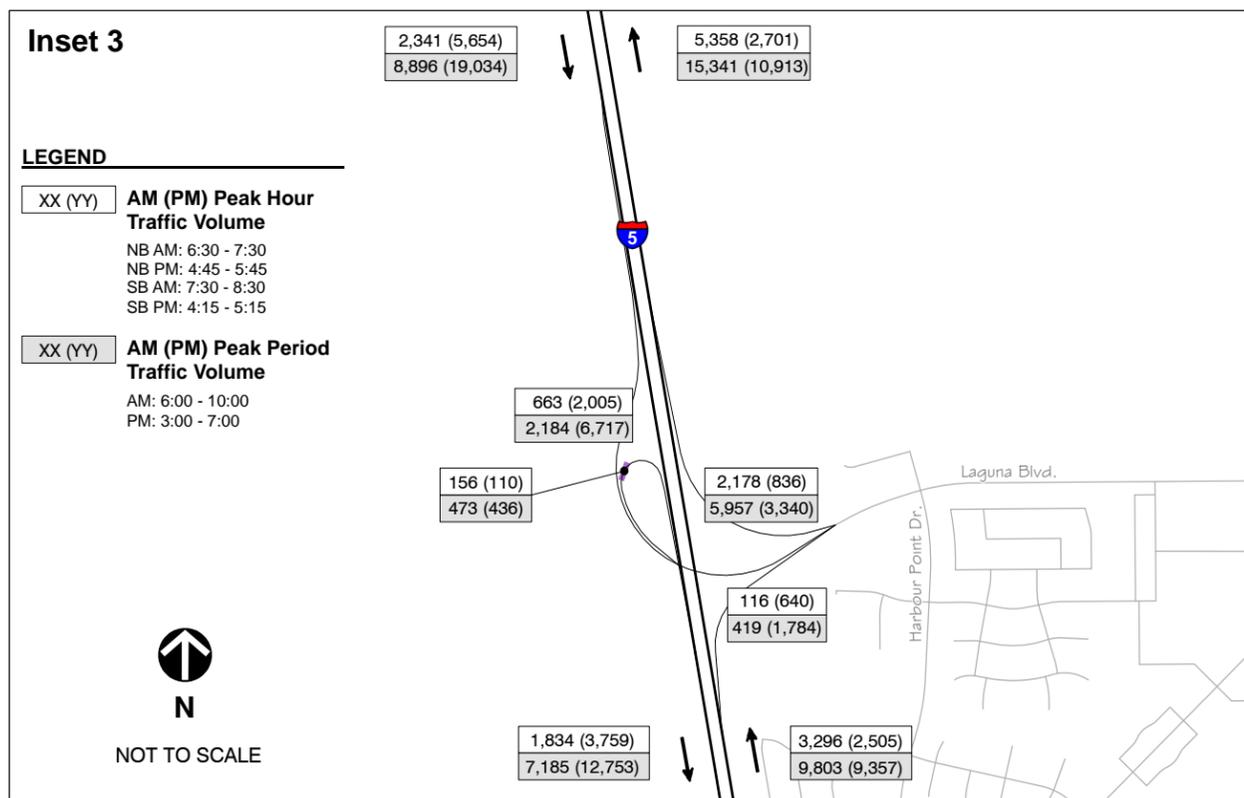
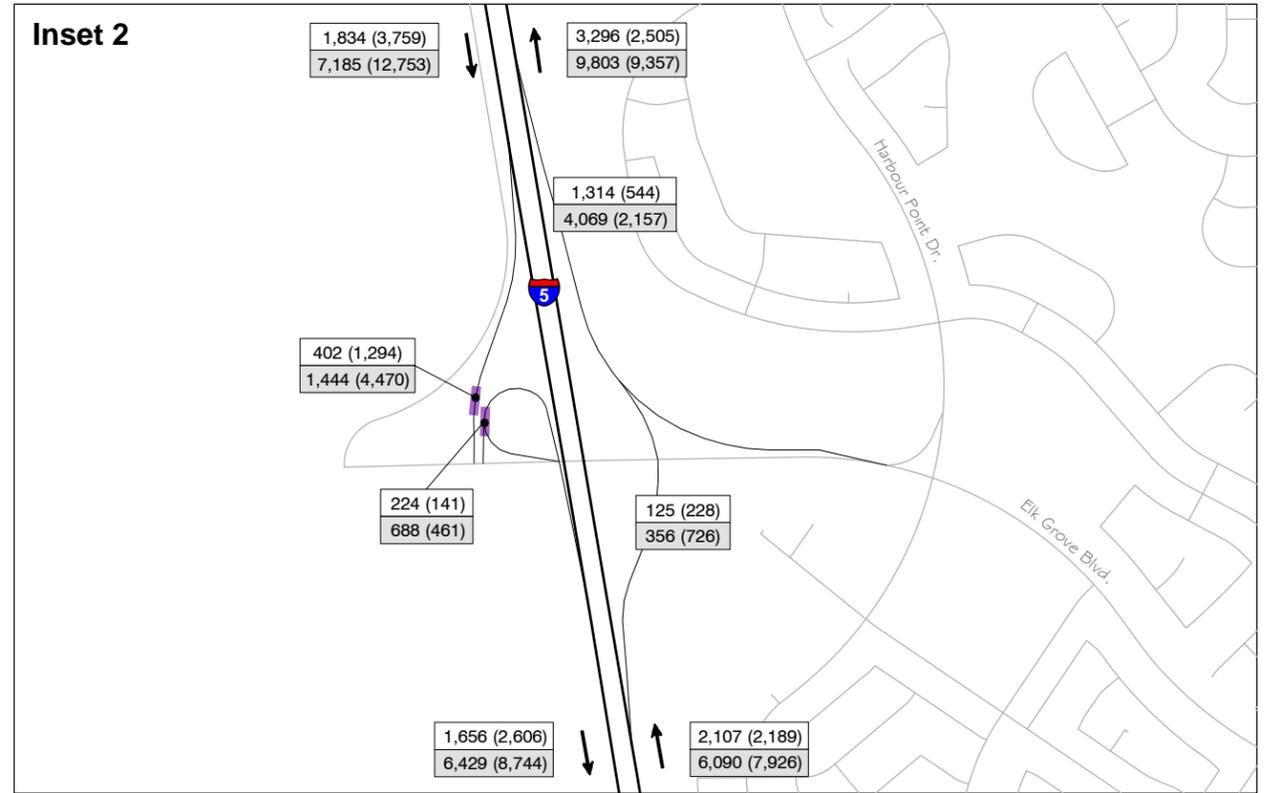
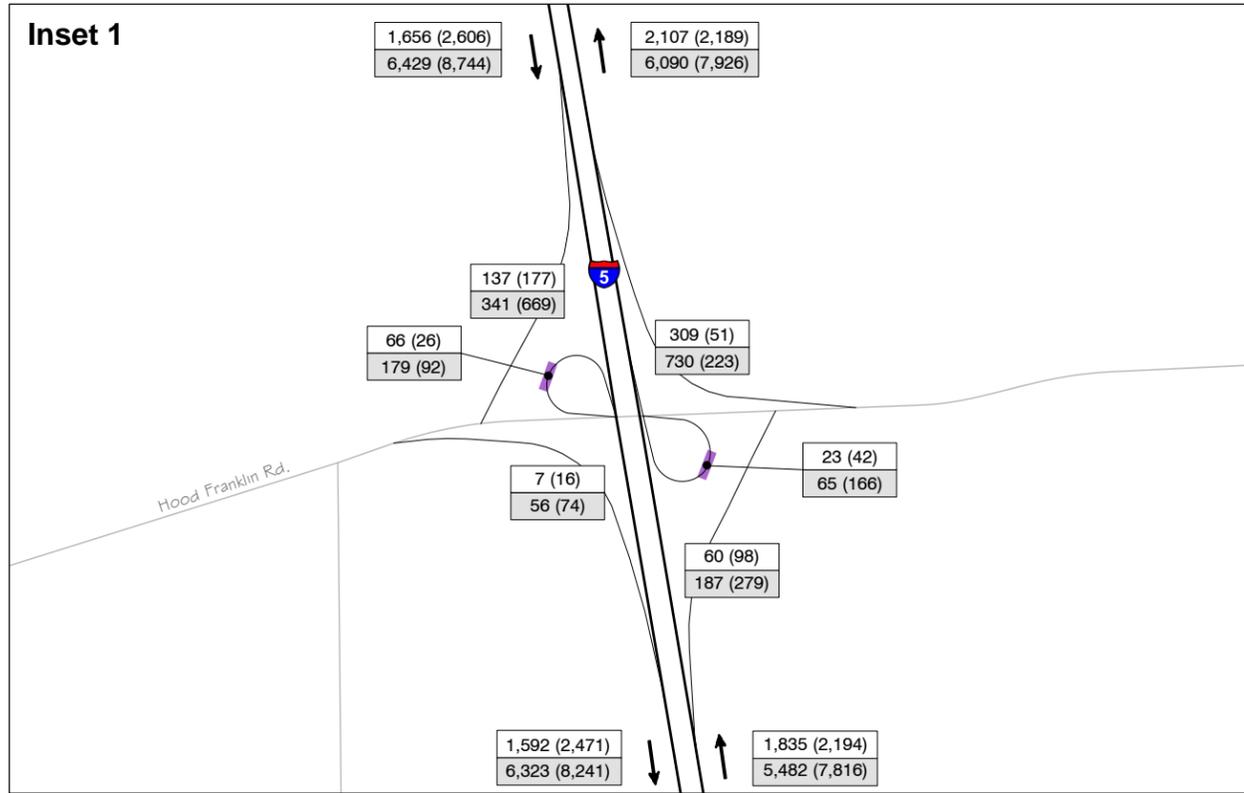
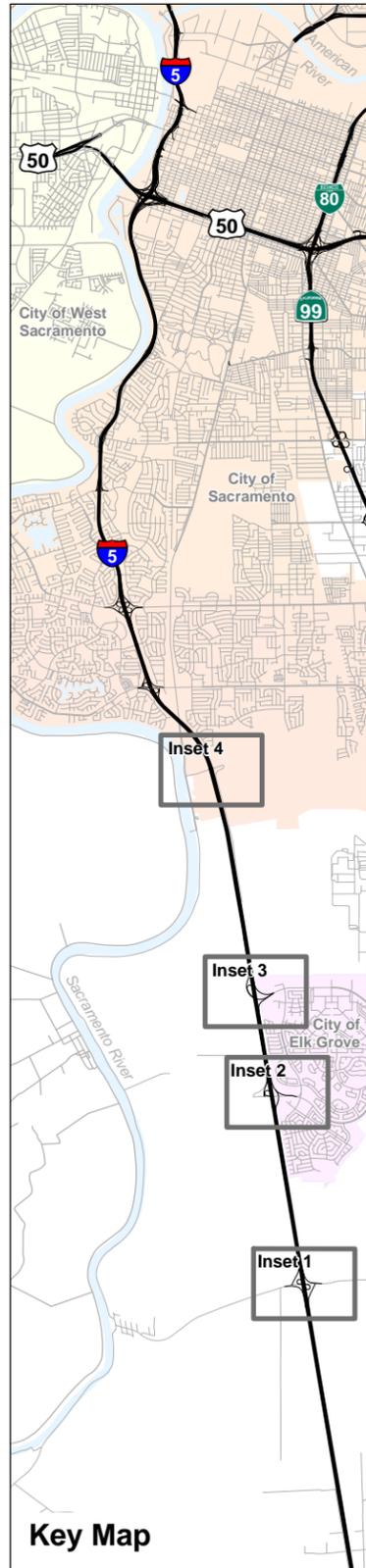
The VISSIM model was calibrated by replacing the default values with the values as shown in Table 1. During the validation step, these values are adjusted further to refine the VISSIM model.

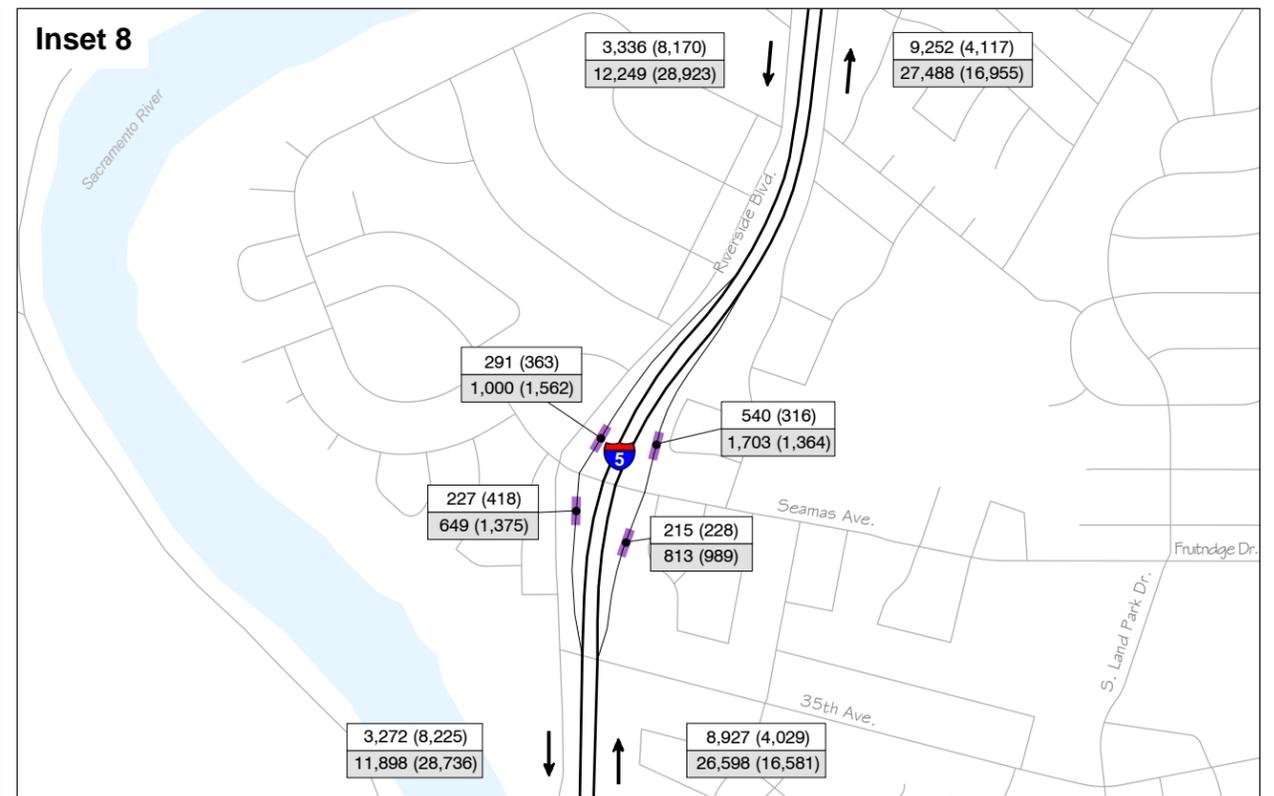
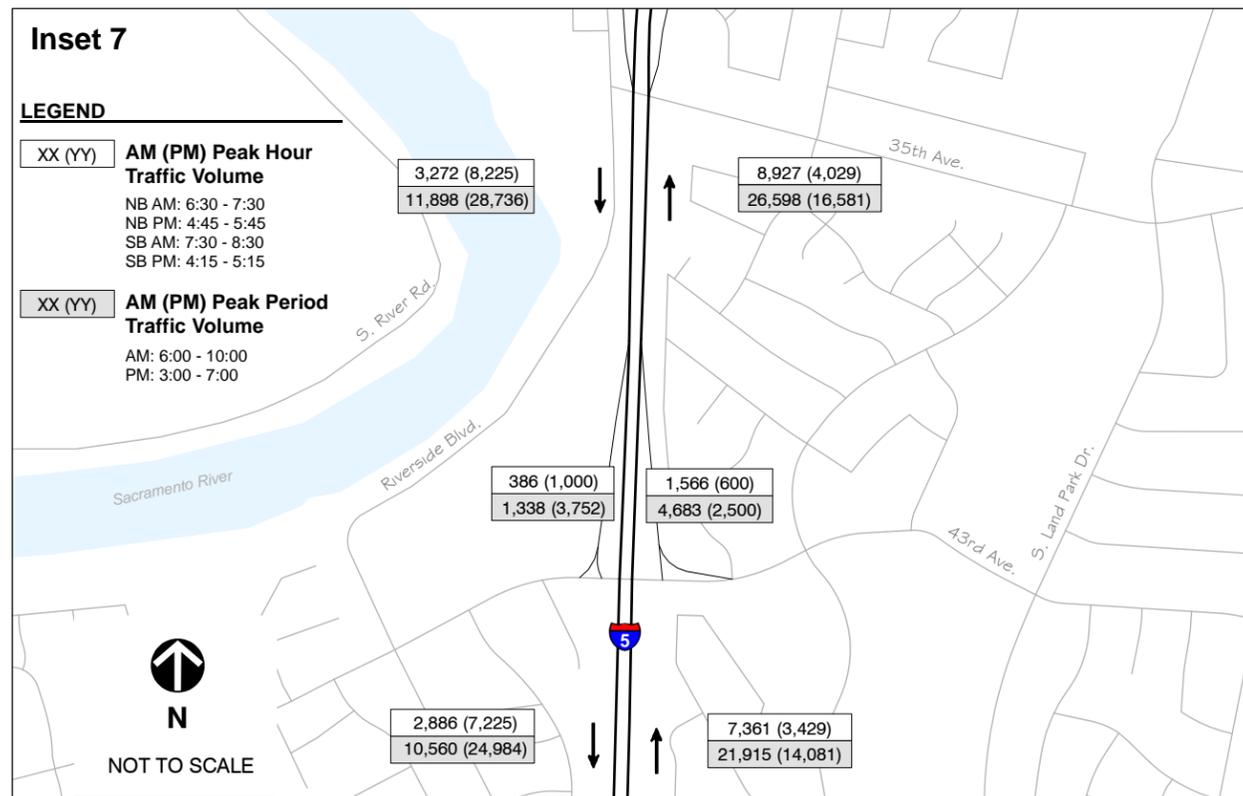
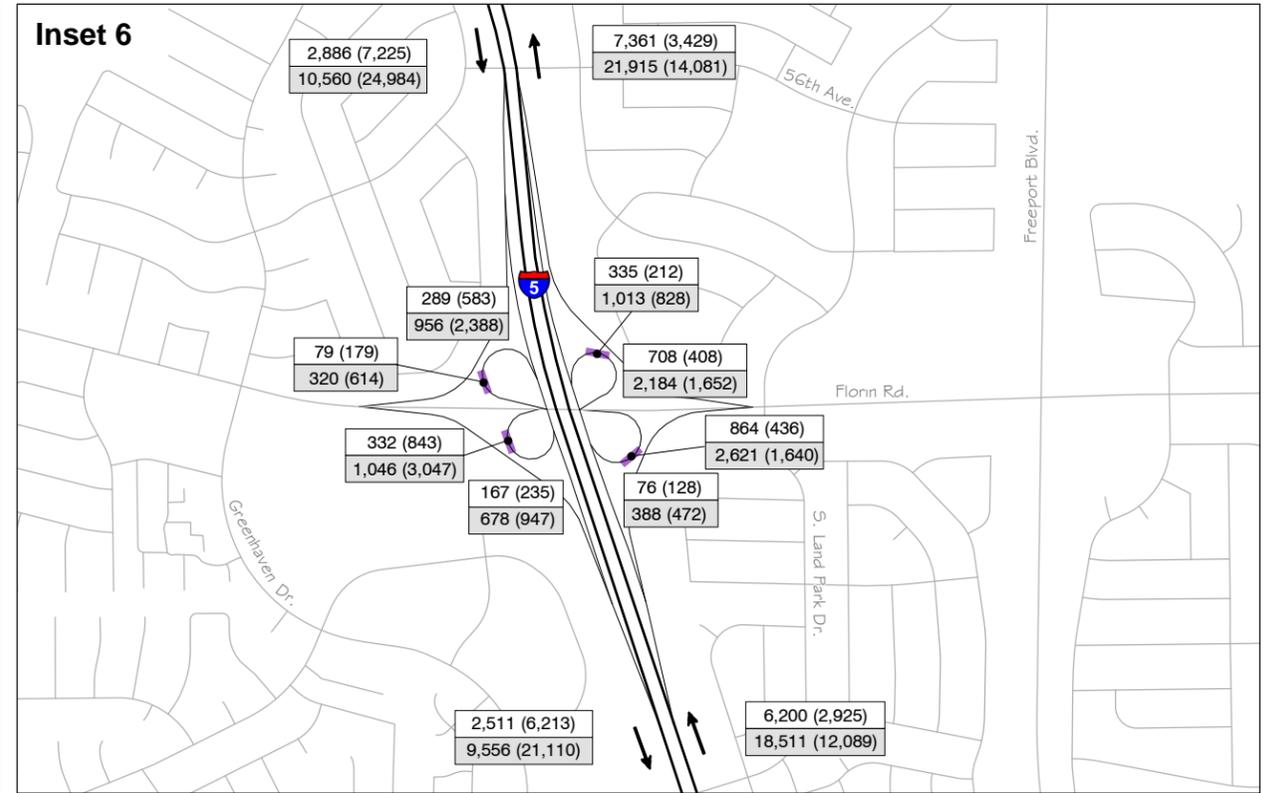
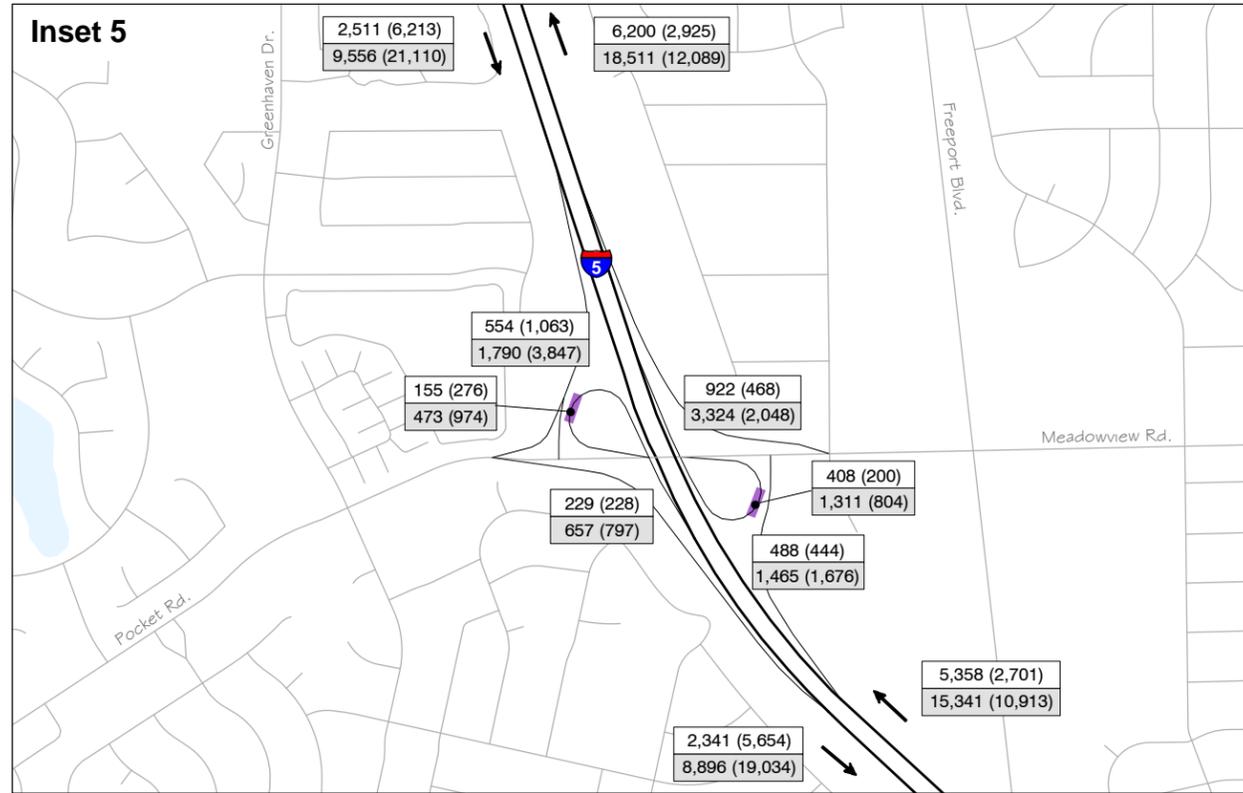
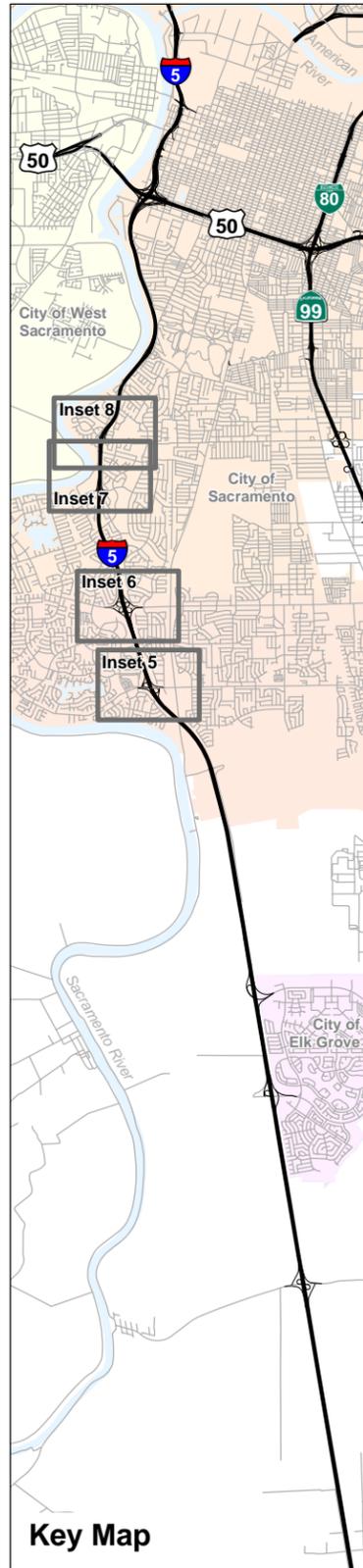
The default VISSIM input parameter values did not represent study-area conditions. The calibrated values in Table 1 represent field observation and Fehr & Peers' experiences with similar projects elsewhere in California (such as the I-80 Across the Top project in Sacramento). For example, the default vehicle composition contains only standard sedans. However, a significant portion of vehicles in the Sacramento area (and most U.S. metropolitan areas) are SUVs and light trucks. As a result, the traffic composition has been revised to reflect this condition.

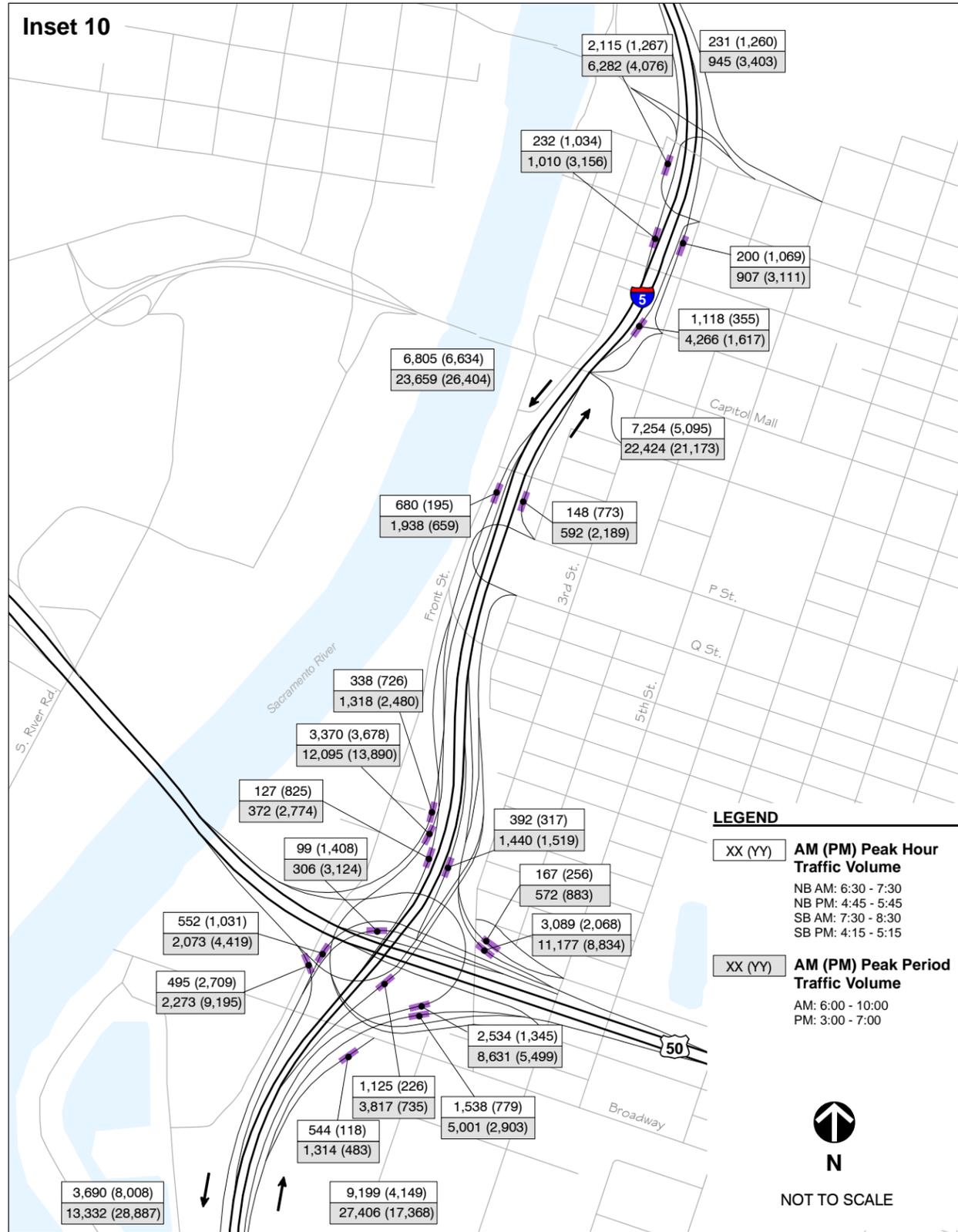
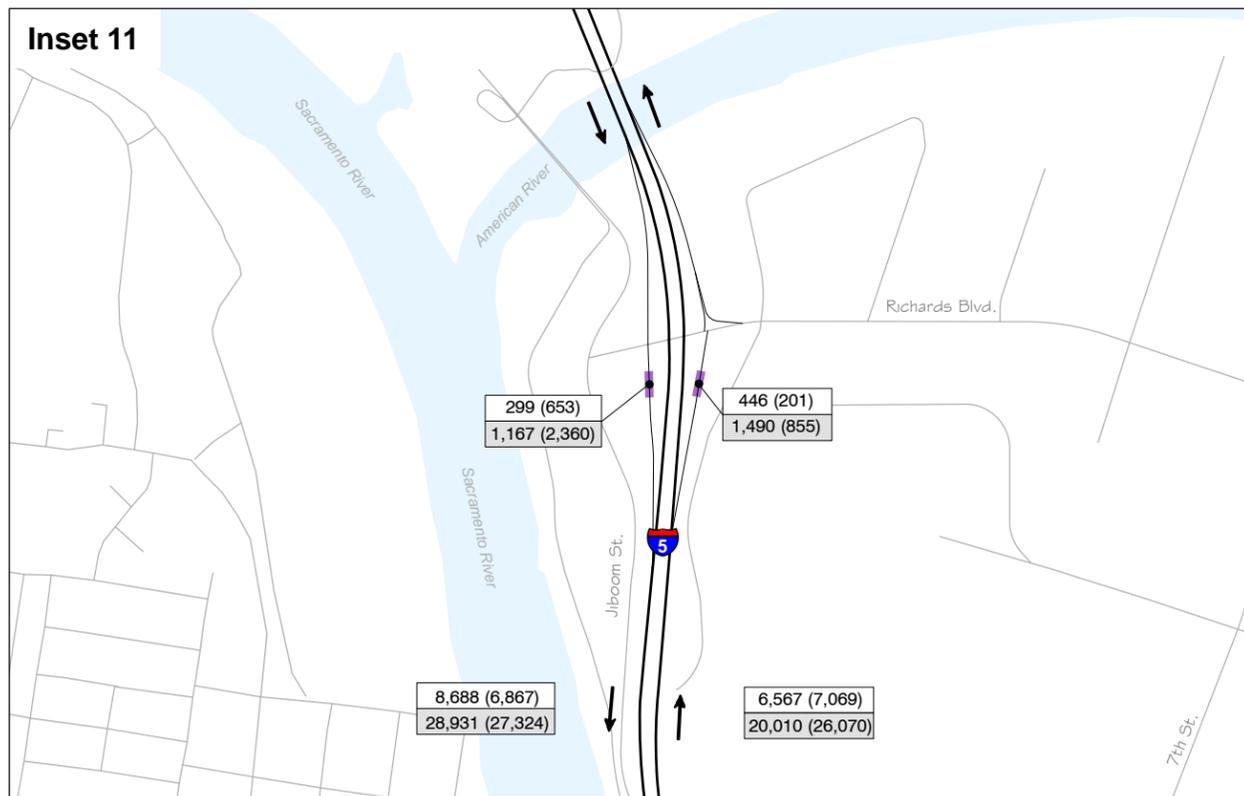
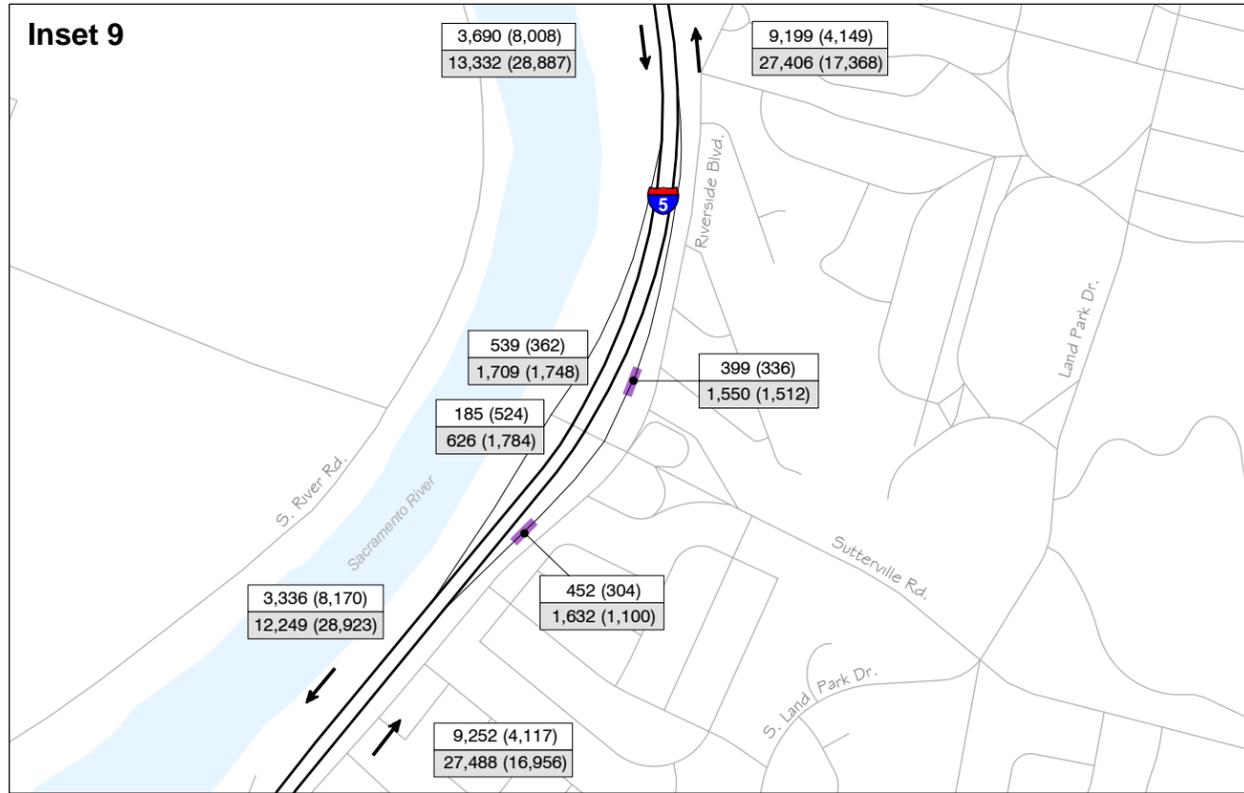
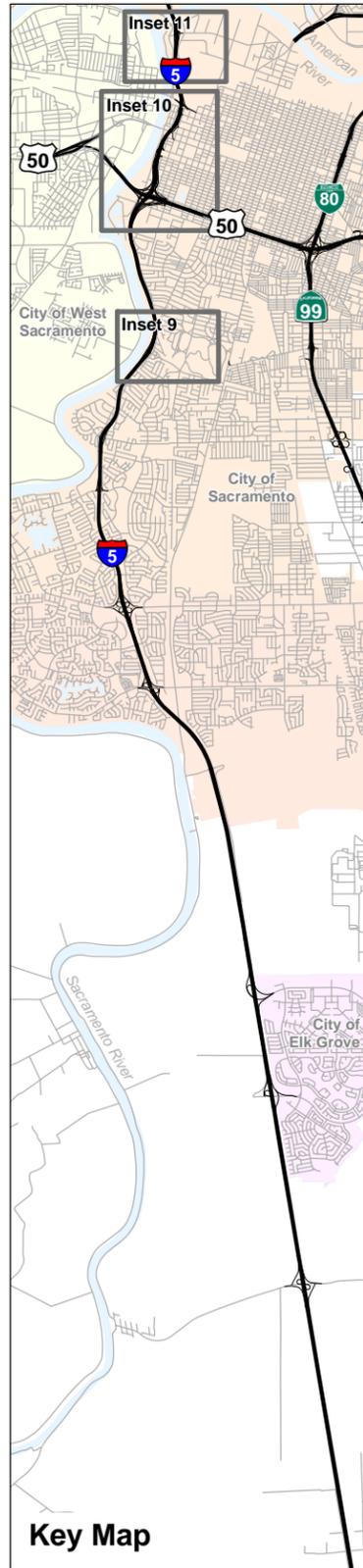
### ***Operations Model Validation***

The parameters affecting capacity were adjusted so that the observed traffic conditions (speed and queuing) were replicated in the VISSIM models. Table 2 lists the adjustments made to the VISSIM model parameters and critical locations as part of the validation process.

For the AM peak period, the average VISSIM headway parameter was increased to reduce freeway capacity so that congestion would occur between Laguna Boulevard and Pocket Road. (VISSIM defines headway as the time between the rear bumper of the leading vehicle and front bumper of the following vehicle, unlike the HCM which uses the front bumper to front bumper time.) The lane change distance for the US-50 off-ramp was increased to model the queuing in the right lanes between Sutterville Road and US-50.







**LEGEND**

XX (YY) **AM (PM) Peak Hour Traffic Volume**  
 NB AM: 6:30 - 7:30  
 NB PM: 4:45 - 5:45  
 SB AM: 7:30 - 8:30  
 SB PM: 4:15 - 5:15

XX (YY) **AM (PM) Peak Period Traffic Volume**  
 AM: 6:00 - 10:00  
 PM: 3:00 - 7:00



NOT TO SCALE

**TABLE 1 – CALIBRATION ADJUSTMENTS**

Category	Parameter	Default Value	Adjusted Value
Vehicle Fleet Composition	Car Percentage for Sedans	98%	48%
	Car Percentage for Sports Cars	2%	15%
	Car Percentage for SUVs/Vans/Pickups	0%	37%
	Truck Percentage for 2-axle trucks	0%	67%
	Truck Percentage for 3+-axle trucks	100%	33%
Lane Changing Behavior	Emergency Stop Distance	16 ft	100 ft
	Anticipatory Lane Change Distance	656 ft	2,000 ft
	Max. Look Ahead Distance	820.2 ft	1,500 ft
	Average Standstill Distance <sup>1</sup>	4.92 / 6.56 ft	6.0 ft
	Safety Distance Reduction Factor	0.6	0.4
	Max. decel. for cooperative braking	-9.84 ft/s <sup>2</sup>	-20 ft/s <sup>2</sup>

Note: 1. The default average standstill distance varies for freeway (4.92 ft) and urban (6.56 ft) driving behavior models.

Source: Fehr & Peers, 2009

**TABLE 2 – VALIDATION ADJUSTMENTS**

Category	Parameter	Default Value	Adjusted Value <sup>2</sup>	
Freeway Mainline Capacity	Average Headway <sup>1</sup>	0.9 sec	AM	1.05, 1.3, 1.5 sec
			PM	1.25 sec
Freeway Lane Change Behavior	Anticipatory Lane Change Distance	2,000 ft	AM	7,500 ft (US-50 off)
			PM	3,000 ft (Q St off), 4,000 ft (US-50 off), 5,000 ft (J St off)
Merge Area Capacity	Additive Part of Safety Distance	2.0	AM	1.0, 1.25
			PM	1.0, 1.5
	Multiplicative Part of Safety Distance	3.0	AM	1.5, 1.75
			PM	1.5, 2.0
Merge Area Lane Change Behavior	Safety Reduction Factor	0.4	0.1	
	Max. Decel. for Cooperative Braking	-20 ft/s <sup>2</sup>	-30 ft/s <sup>2</sup>	

Notes: 1. In VISSIM, the headway is defined as the time between the back bumper of the leading vehicle to the front bumper of the following vehicle.  
2. Multiple values indicate validation adjustments at more than one location.

Source: Fehr & Peers, 2009

For the PM peak period, the average headway for the lane drop south of US-50 was increased to reflect the observed bottleneck. Additionally, the lane change distances for the off-ramps in the downtown were adjusted to more accurately model observed queues and congestion.

Table 3 shows that the existing conditions VISSIM models for the AM and PM peak periods meet the validation criteria thresholds recommended in the FHWA and Caltrans guidelines with one exception.

TABLE 3 – VALIDATION CRITERIA THRESHOLDS COMPARISON							
Criteria	Criteria Threshold	% Met Target	AM Peak Period		PM Peak Period		
			% Met	Pass/Fail	% Met	Pass/Fail	
Link Volumes	< 700 vph	100 vph	> 85%	100%	Pass	100%	Pass
	between 700 & 2,700 vph	15%	> 85%	100%	Pass	100%	Pass
	> 2,700 vph	400 vph	> 85%	100%	Pass	100%	Pass
	GEH Statistic	5	> 85%	97%	Pass	90%	Pass
Sum of Link Volumes	All Links	5%	-	(0%)	Pass	(3%)	Pass
	GEH Statistic	4	-	(0.3)	Pass	(14.3)	<b>Fail</b> <sup>2</sup>
Volume at Interchanges	5%	100%	100%	100%	Pass	100%	Pass
Travel Time	15% <sup>1</sup>	> 85%	100%	100%	Pass	100%	Pass
Travel Speeds	match observations		-	Pass	-	Pass	
Queuing	match observations		-	Pass	-	Pass	
<p>Notes: Bold and underline font indicates that the criteria is not met.</p> <ol style="list-style-type: none"> <li>For travel times, the criterion is to be within 15% or one minute, if higher.</li> <li>For the VISSIM models to meet this criterion according to the sum of all links, the modeled sum would have to be within 0.8% of the counted sum because the sum of all links is a large number, which affects the GEH statistic formula.</li> </ol> <p>Source: Fehr &amp; Peers, 2009</p>							

The GEH statistic for the sum of all link volumes was not met for the PM peak period. The value of 14.3 is higher than the recommended value of 4. Although the PM peak-period model fails one of the validation criteria, the differences between the criteria and the modeled values are relatively small. Also, consistent traffic count data is difficult to collect given the large study area; that is, the counts at different locations are from different dates. Given these considerations, both models are considered to be validated for use in the existing conditions analysis.

## TRAFFIC OPERATIONS ANALYSIS

Existing traffic operations were analyzed using the calibrated and validated VISSIM models for the AM and PM peak periods. The analysis results include a descriptive term known as level of service (LOS). LOS is a measure of traffic operating conditions, which varies from LOS A (the best) to LOS F (the worst). Table 4 describes the LOS thresholds from the HCM for freeway sections.

TABLE 4 – FREEWAY MAINLINE AND RAMP JUNCTION/WEAVE SECTION LOS THRESHOLDS			
Level of Service	Description	Density (vplpm) <sup>1</sup>	
		Mainline (Basic)	Ramp / Weave
A	Free-flow speeds prevail. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream.	≤ 11	≤ 10
B	Free-flow speeds are maintained. The ability to maneuver with the traffic stream is only slightly restricted.	> 11 to 18	> 10 to 20
C	Flow with speeds at or near free-flow speeds. Freedom to maneuver within the traffic stream is noticeably restricted, and lane changes require more care and vigilance on the part of the driver.	> 18 to 26	> 20 to 28
D	Speeds decline slightly with increasing flows. Freedom to maneuver with the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort.	> 26 to 35	> 28 to 35
E	Operation at capacity. There are virtually no usable gaps within the traffic stream, leaving little room to maneuver. Any disruption can be expected to produce a breakdown with queuing.	> 35 to 45	> 35 to 43 <sup>2</sup>
F	Represents a breakdown in flow.	> 45	> 43 <sup>2</sup>

Notes: 1. Density is reported in vehicles per lane per mile. The HCM uses passenger cars per lane per mile to set the LOS thresholds; however, the relatively low percentage of trucks in the study area makes the density as measured in vplpm similar to pcplpm.  
2. The maximum density for ramp junctions under LOS E is not defined in the HCM. The maximum density for weaving sections of 43 vplpm was assumed to apply to ramp junctions.

Source: HCM (Transportation Research Board, 2000)

The peak-hour density calculations provided in this report are consistent with the definitions from the HCM, which defines four freeway section types: merge, diverge, weave, and basic. Merge and diverge sections, which refer to the freeway ramp junctions, are defined as the section of the freeway 1,500 feet downstream of an on-ramp and upstream of an off-ramp, respectively. The density is measured over the two adjacent freeway through lanes plus any auxiliary lanes. A weaving section occurs between a successive on-ramp and off-ramp pair connected by an auxiliary lane where the distance between the ramps is less than 2,500 feet. Basic freeway sections include all other freeway sections that are not included in a merge, diverge, or weaving section. The densities at weaving and basic sections are measured across all mixed-flow freeway lanes (including both through lanes and auxiliary lanes, but excluding bus/carpool lanes). Additionally, the reported peak-hour density is also the density for the peak 15-minute interval since the analysis uses 15-minute interval volumes rather than a peak-hour factor (which would otherwise estimate the peak 15-minute volume from the peak-hour volume).

Tables 5 and 6 show the LOS, density, volume, and speed for the mainline sections under existing conditions (see Appendix A for technical calculations).

**TABLE 5 – NORTHBOUND MAINLINE AM PEAK-HOUR ANALYSIS FOR EXISTING CONDITIONS**

Location	Type	Volume <sup>1</sup>	Speed <sup>1</sup>	LOS/Density <sup>1</sup>
Hood Franklin Rd to Elk Grove Blvd	Basic	1,747	64	B / 18
Elk Grove Blvd to Laguna Blvd	Basic	2,829	55	<b><u>F / 60</u></b>
Laguna Blvd to Pocket Rd	Basic	4,421	<b><u>25</u></b>	<b><u>F / 126</u></b>
Pocket Rd to Florin Rd	Merge <sup>2</sup>	4,940	<b><u>18</u></b>	<b><u>F / 130</u></b>
Florin Rd to 43 <sup>rd</sup> Ave	Basic	5,655	<b><u>21</u></b>	<b><u>F / 110</u></b>
43 <sup>rd</sup> Ave to Seamas Ave	Weave	4,548	<b><u>22</u></b>	<b><u>F / 122</u></b>
Seamas Ave to Sutterville Rd	Basic	7,405	<b><u>33</u></b>	<b><u>F / 85</u></b>
Sutterville Rd to US-50/P St/Q St	Basic	7,455	58	D / 36
US-50/P St/Q St to I/J/L St	Weave	6,301	51	<b><u>F / 46</u></b>
I/J/L St to Richards Blvd	Weave	5,566	60	C / 24

Notes: Bold and underline font indicates speed below 35 mph or LOS F conditions.

1. Volume is reported in vehicles per hour, speed is reported in miles per hour, and density is reported in vehicles per lane per mile.
2. The distance between the Florin Road and Pocket Road ramps is less 3,000 feet, so no basic freeway segment exists. Instead, the worst ramp junction (merge or diverge) LOS is shown.

Source: Fehr & Peers, 2009

**TABLE 6 – SOUTHBOUND MAINLINE PM PEAK-HOUR ANALYSIS FOR EXISTING CONDITIONS**

Location	Type	Volume <sup>1</sup>	Speed <sup>1</sup>	LOS/Density <sup>1</sup>
Richards Blvd to I/J/L St	Weave	6,132	42	<b><u>F / 141</u></b>
I/J/L St to US-50/P St/Q St	Weave	5,634	<b><u>34</u></b>	<b><u>F / 99</u></b>
US-50/P St/Q St to Sutterville Rd	Basic	7,619	37	<b><u>F / 120</u></b>
Sutterville Rd to Seamas Ave	Basic	7,869	64	D / 32
Seamas Ave to 43 <sup>rd</sup> Ave	Weave	7,486	61	D / 31
43 <sup>rd</sup> Ave to Florin Rd	Basic	6,816	62	D / 33
Florin Rd to Pocket Rd	Diverge <sup>3</sup>	5,663	43	<b><u>F / 56</u></b>
Pocket Rd to Laguna Blvd	Basic	5,225	62	D / 29
Laguna Blvd to Elk Grove Blvd	Basic	3,507	53	E / 39
Elk Grove Blvd to Hood Franklin Rd	Basic	2,391	63	C / 21

Notes: Bold and underline font indicates speed below 35 mph or LOS F conditions.

1. Volume is reported in vehicles per hour, speed is reported in miles per hour, and density is reported in vehicles per lane per mile.
2. The distance between the Florin Road and Pocket Road ramps is less 3,000 feet, so no basic freeway segment exists. Instead, the worst ramp junction (merge or diverge) LOS is shown.

Source: Fehr & Peers, 2009

The AM peak period model shows congested LOS F conditions at the Elk Grove Boulevard on-ramp, from Laguna Boulevard to Sutterville Road, and from the US-50 westbound on-ramp to the J Street off-ramp. Bottlenecks exist at the end of the acceleration lane north of Laguna Boulevard, at the US-50 off-ramp, and at the lane drop north of the J Street off-ramp. Additional bottlenecks occur at high-volume on-ramps at Pocket Road, Florin Road, and 43<sup>rd</sup> Street. Shortly after the traffic counts were taken, ramp meters were activated at these on-ramps, which resulted in a significant congestion reduction as measured by a subsequent travel time measurement (tach run).

The PM peak period model has congested conditions from Richards Boulevard to Sutterville Road and from Florin Road to Pocket Road. The bottlenecks in the southbound direction are located at the US-50 off-ramp, at the lane drop north of Sutterville Road, and the Pocket Road off-ramp. Congestion on US-50 and the low-speed connector ramps result in congestion on southbound I-5. The Sutterville Road bottleneck causes queuing on the US-50 connector ramps that extend to the US-50 mainline in both directions. The combination of entering traffic from Florin Road with high off-ramp volume to Pocket Road causes the last bottleneck.

Table 7 presents the observed existing travel time and speed for existing conditions. The travel time and speed for free-flow conditions is compared to the values during the middle two hours of the four-hour peak periods. The average travel speed in the northbound direction during the AM peak period is between 28 and 41 mph. In the southbound direction during the PM peak period, the average speed is similar, between 30 and 41 mph.

<b>TABLE 7 – OBSERVED TRAVEL TIME AND SPEED FOR EXISTING CONDITIONS</b>			
<b>Route</b>	<b>Off-peak</b>	<b>7 to 8 AM / 4 to 5 PM</b>	<b>8 to 9 AM / 5 to 6 PM</b>
Northbound I-5 (AM): Hood Franklin Rd to Richards Blvd	14.8 min (65 mph)	33.9 min (28 mph)	23.5 min (41 mph)
Southbound I-5 (PM): Richards Blvd to Pocket Rd	8.0 min (65 mph)	12.5 min (41 mph)	17.2 min (30 mph)
Source: Fehr & Peers, 2009			

Table 8 shows the network-wide summary statistics for the four-hour peak period. The results reflect the higher observed level of congestion in the northbound direction, which translates to lower average speeds and higher average delays.

<b>TABLE 8 – PEAK-PERIOD NETWORK SUMMARY FOR EXISTING CONDITIONS</b>		
<b>Performance Measure</b>	<b>Northbound (AM)</b>	<b>Southbound (PM)</b>
Number of Vehicles Served	49,300	56,000
Number of Persons Served <sup>1</sup>	60,300	69,000
Travel Distance (vehicle-miles)	303,200	409,400
Travel Time (vehicle-hours)	10,400	10,600
Average Speed – All vehicles (mph)	29.2	38.6
Average Speed – HOVs (mph)	28.7	37.9
Travel Delay <sup>2</sup> (vehicle-hours)	5,300	4,100
Average Delay <sup>2</sup> (seconds per vehicle)	380	260
Notes: 1. Based on traffic counts, HOVs, trucks, and other vehicles are assumed to have vehicle occupancies of 2.35, 1.2, and 1.0 persons per vehicle, respectively.		
2. Delay is measured as the additional travel time when a vehicle travels less than its desired free-flow speed.		
Source: Fehr & Peers, 2009		

## SAFETY

Table 9 summarizes the traffic accident data compiled by Caltrans' Traffic Accident Surveillance and Analysis System (TASAS). The data shown is for the three-year period between July 2003 and June 2006.

<b>TABLE 9 – ACCIDENT HISTORY</b>				
<b>Location</b>	<b>Total Accidents</b>	<b>Total Fatalities</b>	<b>Actual Accident Rate<sup>1</sup></b>	<b>Average Accident Rate<sup>1</sup></b>
Northbound I-5 (PM 8.49 to 22.57) Hood Franklin Rd to US-50	547	5	0.67	0.81
Southbound I-5 (PM 22.57 to 8.49) US-50 to Hood Franklin Rd	422	1	0.52	0.81
Note: 1. The accident rate is accidents per million vehicle-miles.				
Source: Caltrans District 3, 2007				

I-5 within the study area had 969 accidents, six of which were fatality-related accidents. The actual accident rate for the project area (Hood Franklin Road to US-50) was lower than the average accident rate for similar freeway facilities. The fatal accidents did not occur in any one specific section of the freeway but were spread over its entire length.

Table 10 categorizes the accidents within the three-year period according to peak period and accident type. The AM and PM four-hour peak periods (one-third of the day) accounted for majority of the accidents (55 percent). More accidents occurred during the AM peak period than the PM peak period, which is consistent with the higher

level of congestion during the morning peak period. Rear-end collisions, which are associated with congested conditions, were the most frequent type of accident and accounted for 38 percent of all accidents.

**TABLE 10 – ACCIDENTS BY PEAK PERIOD AND ACCIDENT TYPE**

Statistic	Peak Period			Accident Type				Total
	6 to 10 AM	3 to 7 PM	Off-peak	Rear End	Hit Object	Sideswipe	Other <sup>1</sup>	
Northbound	237	86	224	241	156	105	45	547
Southbound	42	170	210	126	144	107	45	422
Total	279	256	434	367	300	212	90	969
Percentage	29%	26%	45%	38%	31%	22%	9%	100%

Note: 1. The "Other" category includes head-on, broadside, overturn, and other accident types.

Source: Caltrans District 3, 2007

Because I-5 is a major interstate truck route, the accident rate according to vehicle type was reviewed. The data revealed that 89 percent of all collisions involved a passenger car. Large trucks and/or tractor trailers were involved in 18 percent of the northbound collisions and 23 percent of the southbound collisions. Since trucks make up 10 to 15 percent of peak period volume, they are involved in a disproportionately high number of accidents.

### 3. TRAVEL DEMAND FORECASTS

Travel demand forecasts for the project alternatives were prepared for construction year (2013), interim year (2023), and design year (2033) conditions. Further details on the forecast development process are provided in the I-5 Bus/Carpool Lanes Travel Demand Forecast Report (Fehr & Peers, September 11, 2009). A summary of the forecast development is provided below.

#### PROJECT ALTERNATIVES

Traffic forecasts were developed for the following project alternatives.

- No Build Alternative – This scenario assumes that no mainline lanes are constructed on I-5. However, the model includes other planned projects in the region, including a new interchange at Cosumnes River Boulevard and a new regional connector road with a terminus at the Hood Franklin Road interchange.
- Mixed Flow Addition Alternative – This scenario assumes that a new mixed flow lane is constructed on I-5 within the project limits. As in the No Build Alternative, this scenario also assumes the other planned projects.
- Bus/Carpool Addition Alternative – This scenario is similar to the Mixed Flow Addition Alternative except that the additional lane would be restricted to high occupancy vehicles (HOVs). As with the other two alternatives, this scenario assumes the other planned projects.
- Bus/Carpool Conversion Alternative – This scenario assumes that no new traffic lanes are constructed on I-5. However, the left lane (Lane 1) of I-5 between Elk Grove Boulevard and US 50 is converted from a mixed flow lane to a bus/carpool-only lane.

#### BASE YEAR MODEL DEVELOPMENT

Regional models are not suited to applications like developing directional freeway corridor or ramp volumes; therefore, a more detailed sub-area model was developed for this project. The development of the I-5 sub-area model began with a detailed review and update of the roadway network and land use files in the base year version of the SACMET regional travel demand forecasting (TDF) model. Model modifications were made to accurately reflect interchange geometries, roadway conditions, and land use totals. The updates were based on a review of aerial photographs, census data, and parcel map information.

Following the creation of the base year I-5 sub-area model, it was tested to ensure that it could replicate existing traffic counts and respond reasonably to changes in the roadway network. As described in the Travel Demand Forecast Report, the base year (2006) model validated against both the static and dynamic tests. Lastly, using the validated base year sub-area model, origin-destination (OD) matrices were extracted (OD matrices are inputs to the freeway operations model). When assigned to the roadway network, the adjusted OD matrices from the sub-area model produced traffic flows that were nearly identical to the traffic counts collected by Caltrans.

#### FUTURE YEAR MODEL DEVELOPMENT

Future year traffic volume forecasts are based on the SACOG land use and roadway network projections for year 2035 conditions. New land use and roadway network projects were incorporated into the updated I-5 sub area model to forecast changes in future travel demands and travel patterns. Year 2035 sub-area models and OD

matrices were created for each of the three project alternatives. Linear interpolation was used to develop traffic forecasts under the construction (2013), interim (2023), and design (2033) years.

## TRAFFIC FORECASTS

By assigning the future year OD matrices described above to the roadway network, daily, AM peak period, and PM peak period traffic forecasts were developed for each of the project alternatives and analysis years.

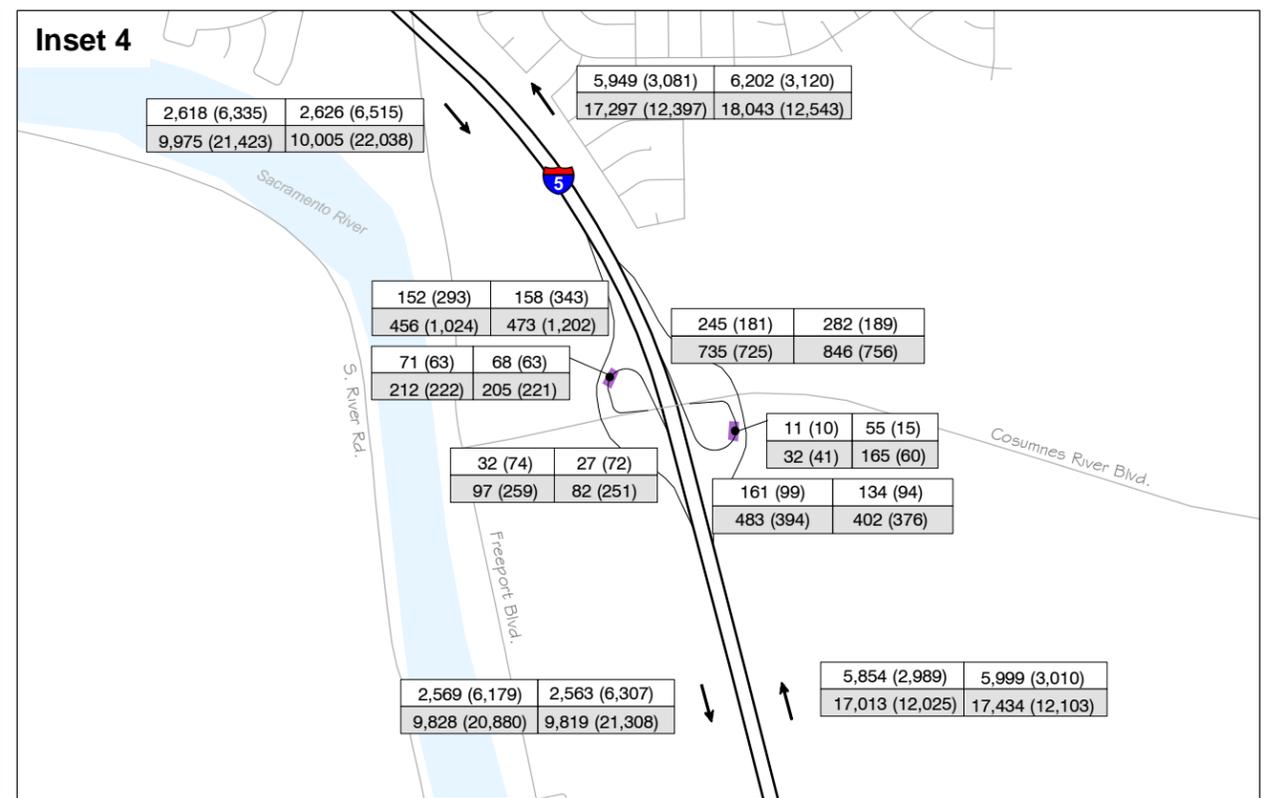
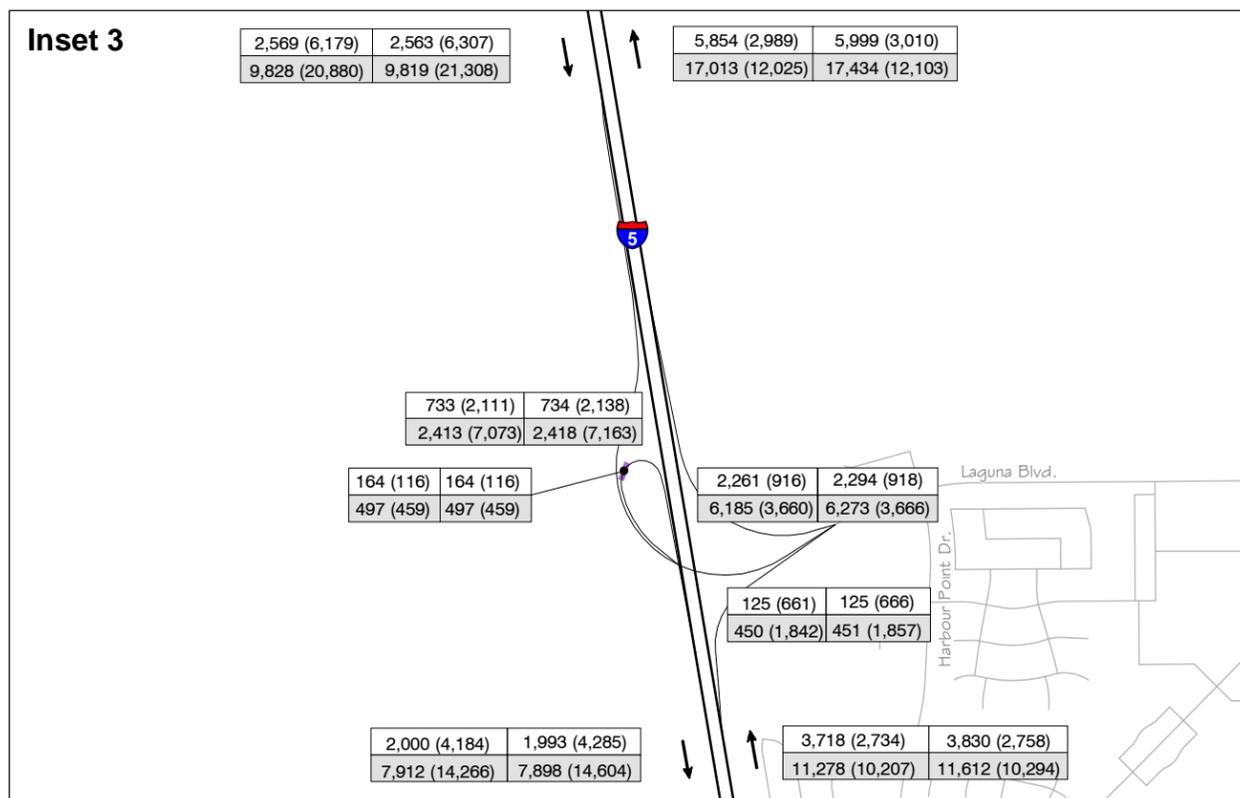
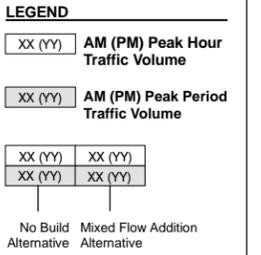
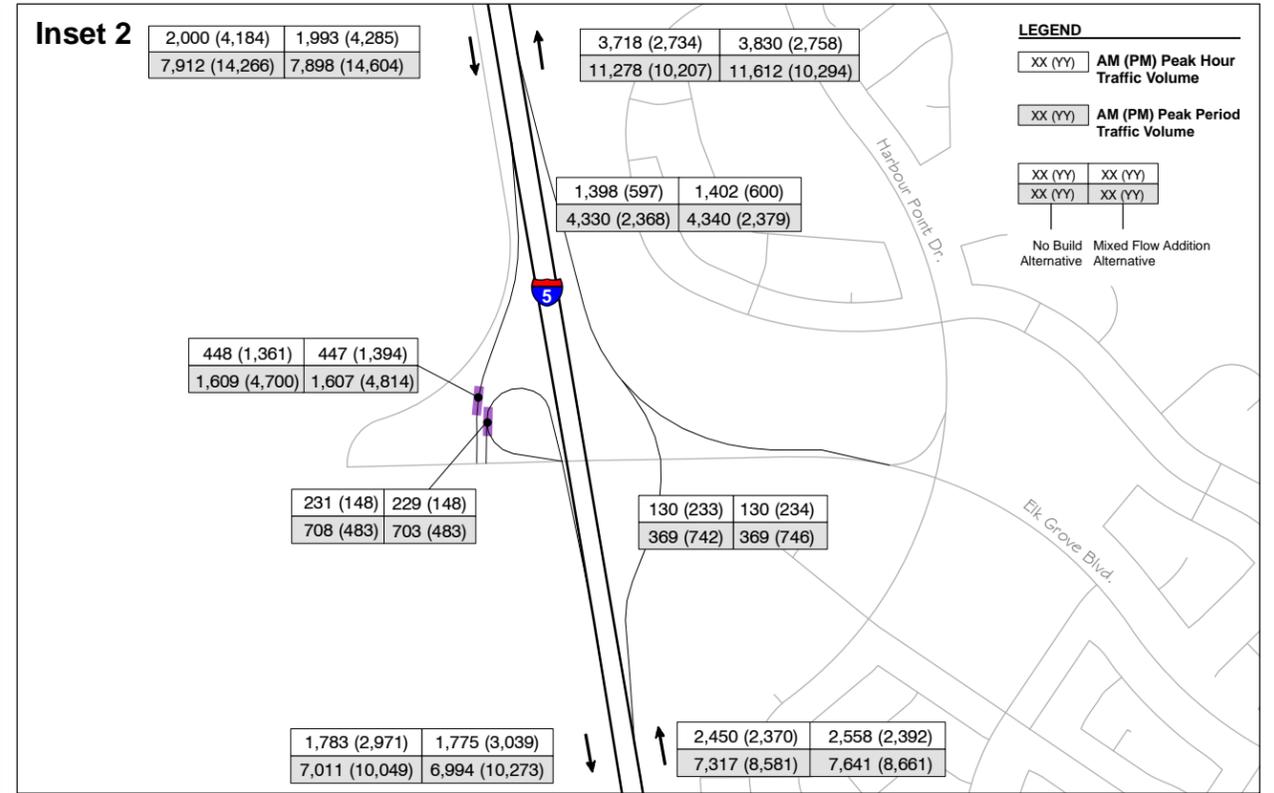
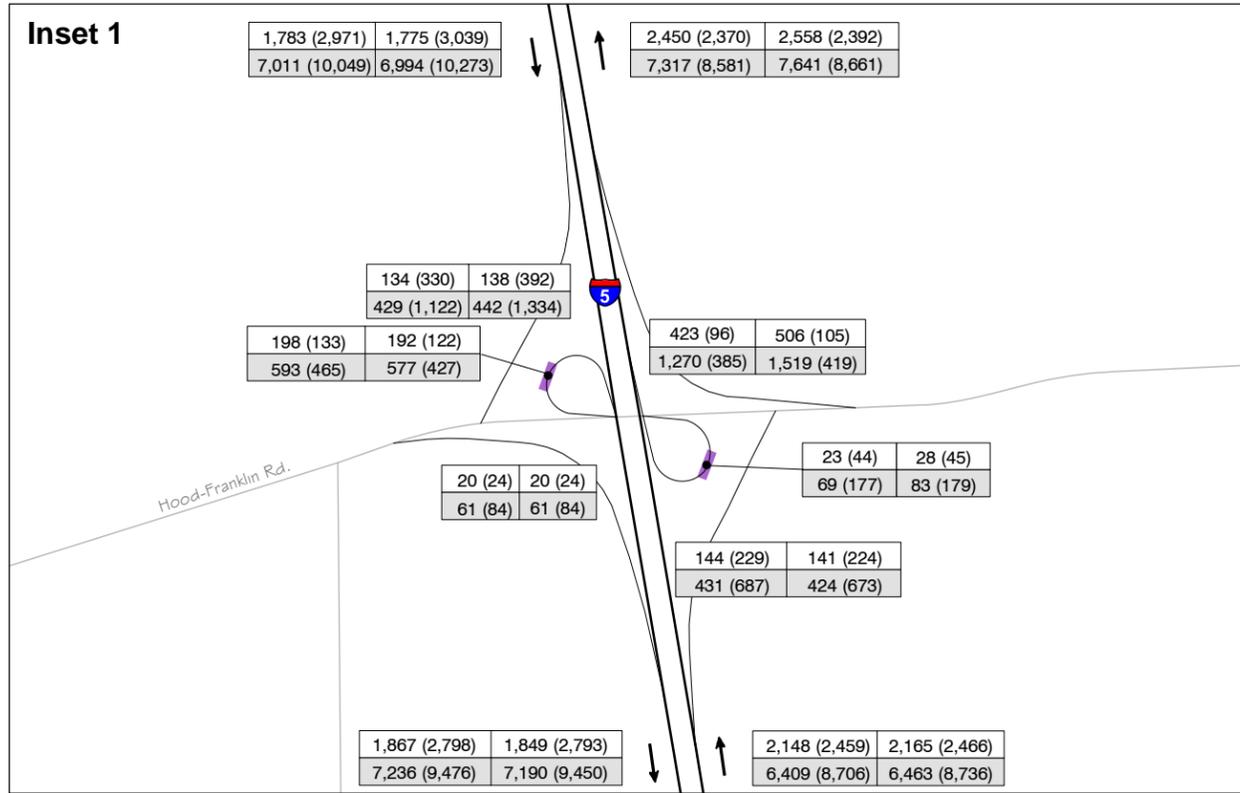
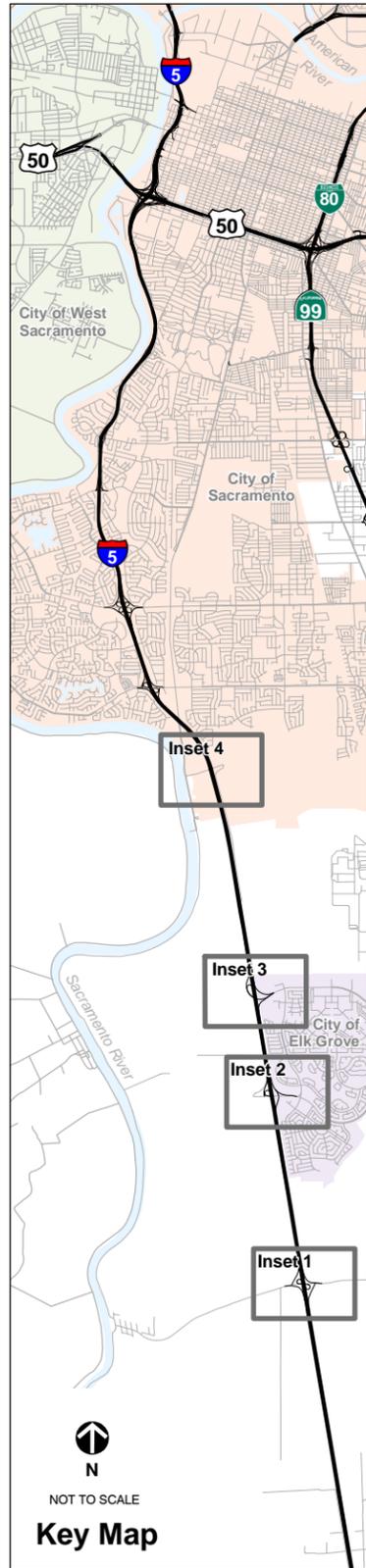
The Travel Demand Forecast Report included a discussion of induced travel. In simple terms, induced travel refers to the travel demand response to a reduction in travel cost (i.e., shorter travel times) associated with capacity changes. For example, travel time savings to a traveler can result in a change of route, change of schedule, consolidation of trips, change in mode of travel, and/or change in final destination. The SACMET model accounts for a portion of induced travel such as changes in route or mode, but it is not sensitive to changes in trip generation or time-of-day travel. While this may result in potential underestimates of future demand for capacity-adding alternatives, the model's use of fixed trip generation rates and peak-period to peak-hour trip factors, which are based on base year conditions, likely offset this condition. Essentially, the model does not account for the potential influence that congestion has on trip generation, and the forecasts of peak-period and peak-hour demand are based on the distribution of peak-period traffic from the base year. Since the roadway system was less congested in the base year than it will be in the future, the use of the fixed percentages holds the demand profile constant when there will likely be less demand on a percentage basis as peak spreading occurs. Also, the SACMET model was run using the same land use forecasts for all project alternatives. As a result, the influence of accessibility on future land use allocations may not be fully considered.

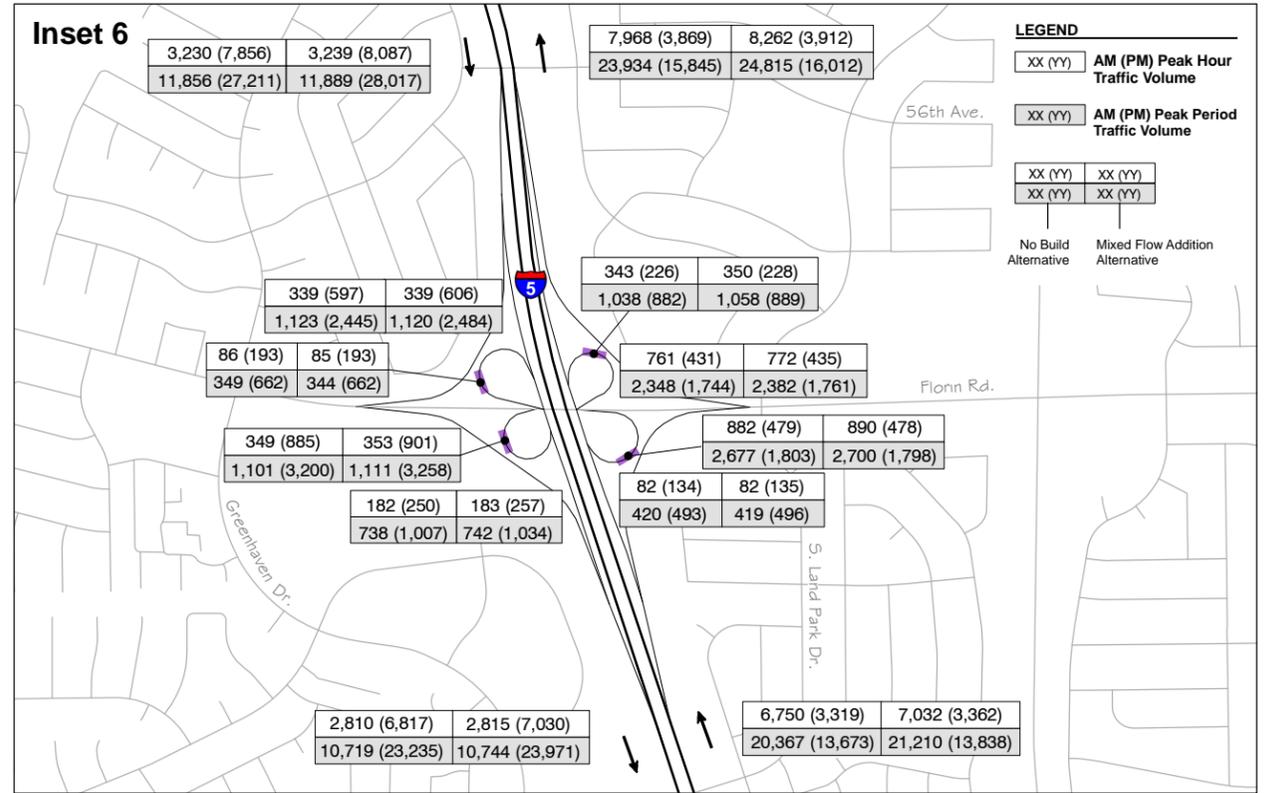
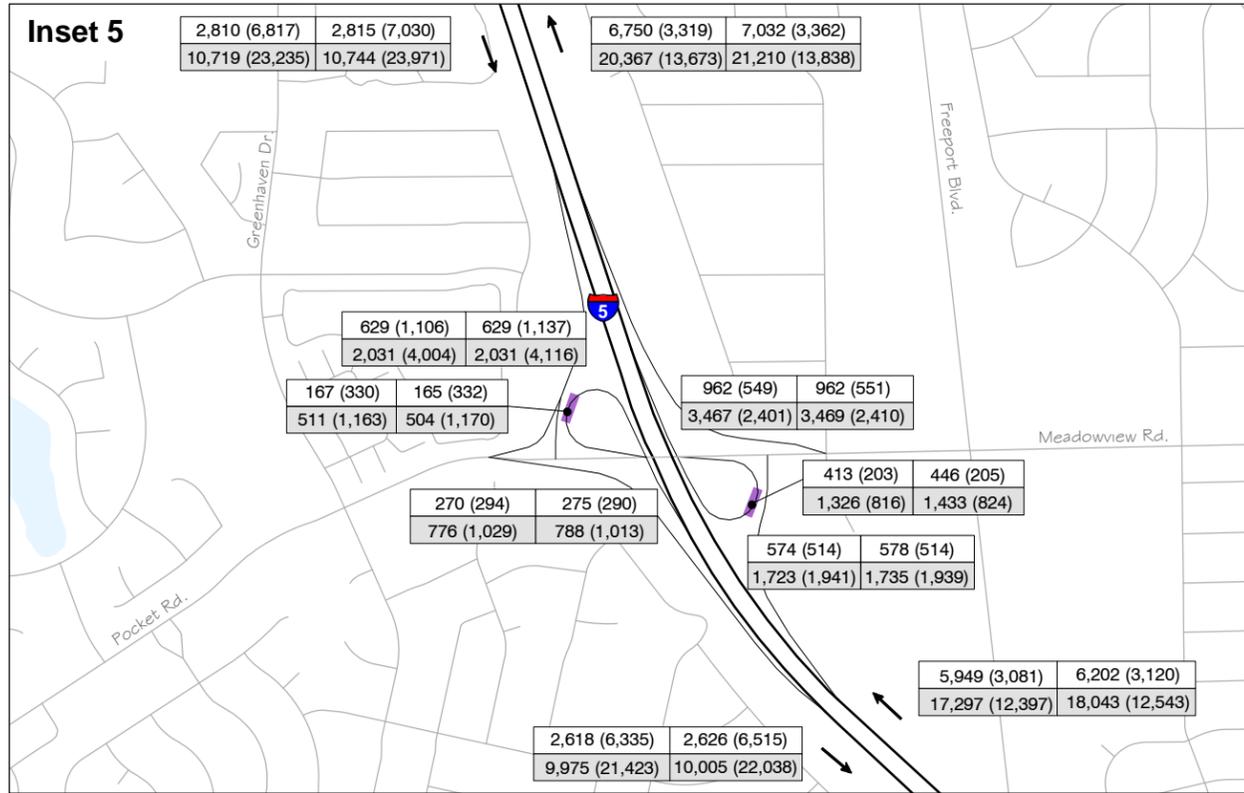
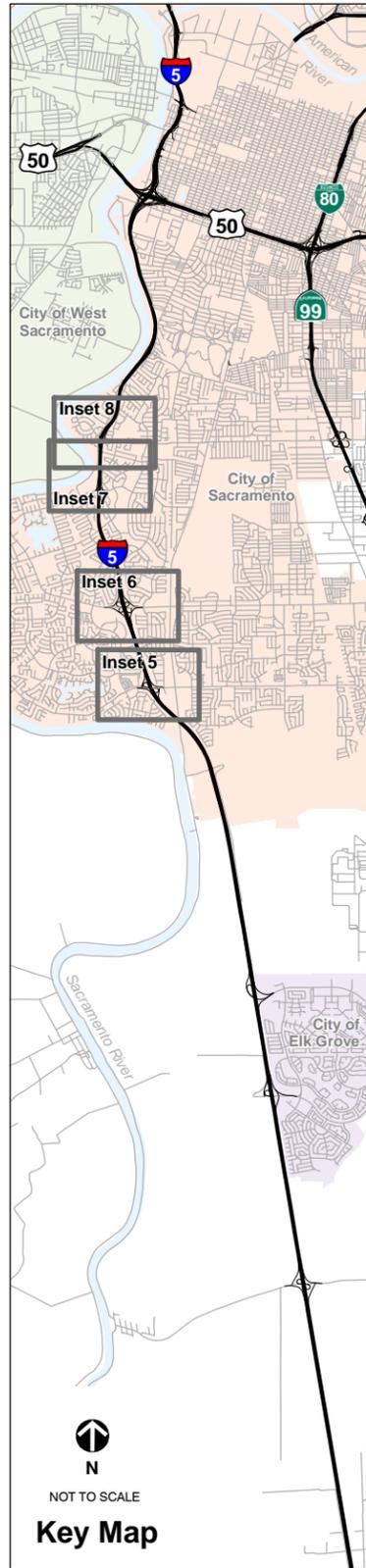
Figures 4A through 6F show the peak-hour and peak-period traffic forecast volumes for the project alternatives under 2013, 2023, and 2033 conditions.

HOV forecasts were also developed for each scenario. The HOV forecasts from the sub-area model were adjusted because the model tends to underestimate the number of HOVs on a facility. The final HOV forecasts were based on historic data provided by Caltrans from other bus/carpool lanes in the Sacramento region. Table 11 lists the HOV percentage at the mainline entry points into the study area. The HOV percentage at on-ramps has similar variation among alternatives. Although HOV percentages are forecasted to increase in the future, the truck percentages were assumed to remain the same as existing for all analysis years.

Peak Period	Alternative	Existing	Forecast		
		2005	2013	2023	2033
AM Peak Period Northbound I-5	No Build	17%	18%	20%	22%
	Mixed Flow Addition		18%	20%	22%
	Bus/Carpool Addition and Bus/Carpool Conversion		20%	25%	30%
PM Peak Period Southbound I-5	No Build	17%	18%	20%	22%
	Mixed Flow		18%	20%	22%
	Bus/Carpool Addition and Bus/Carpool Conversion		20%	25%	30%

Source: Fehr & Peers, 2009





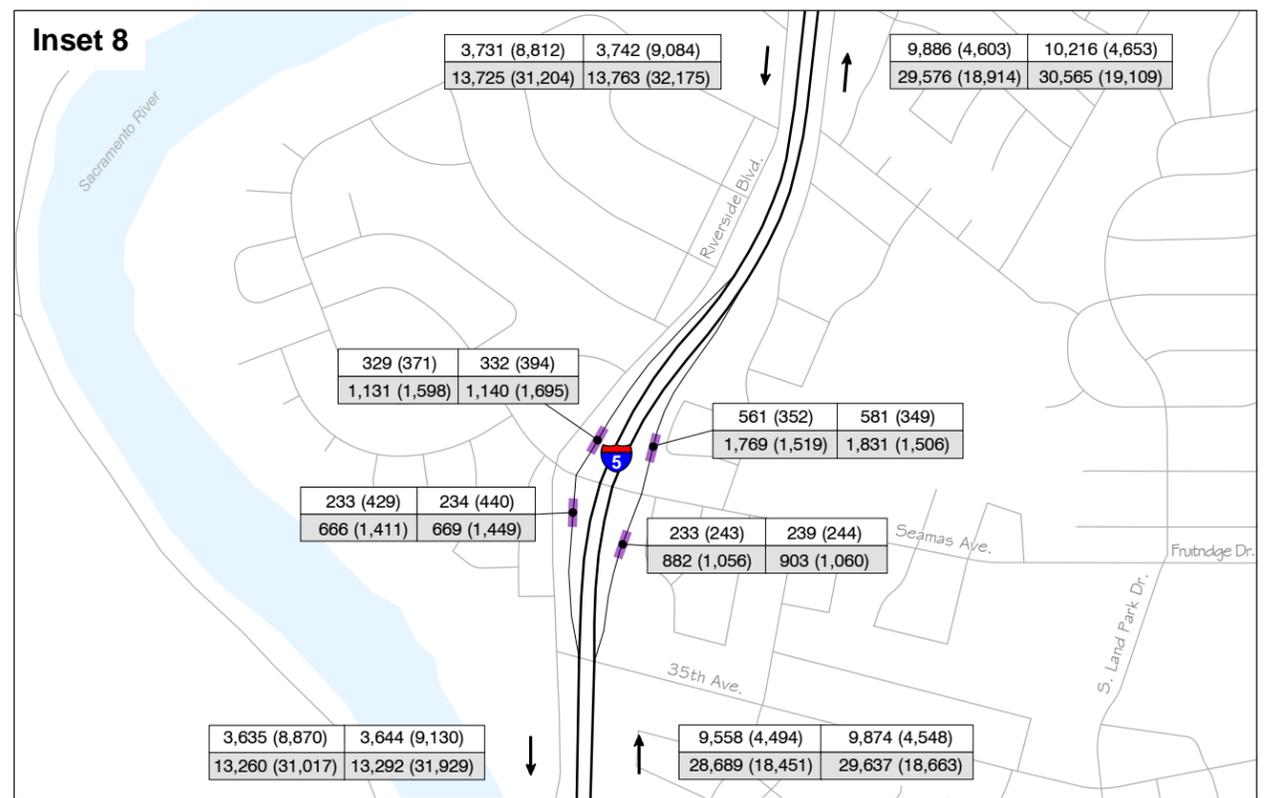
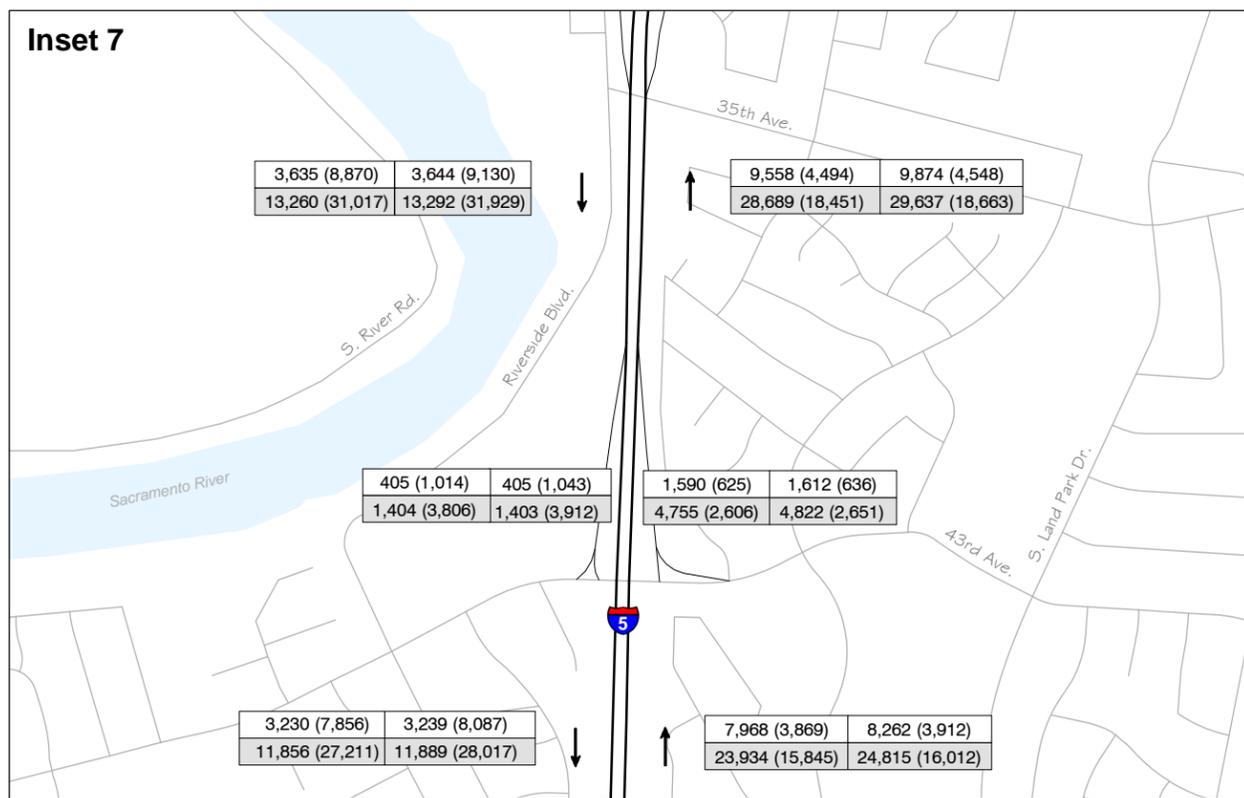
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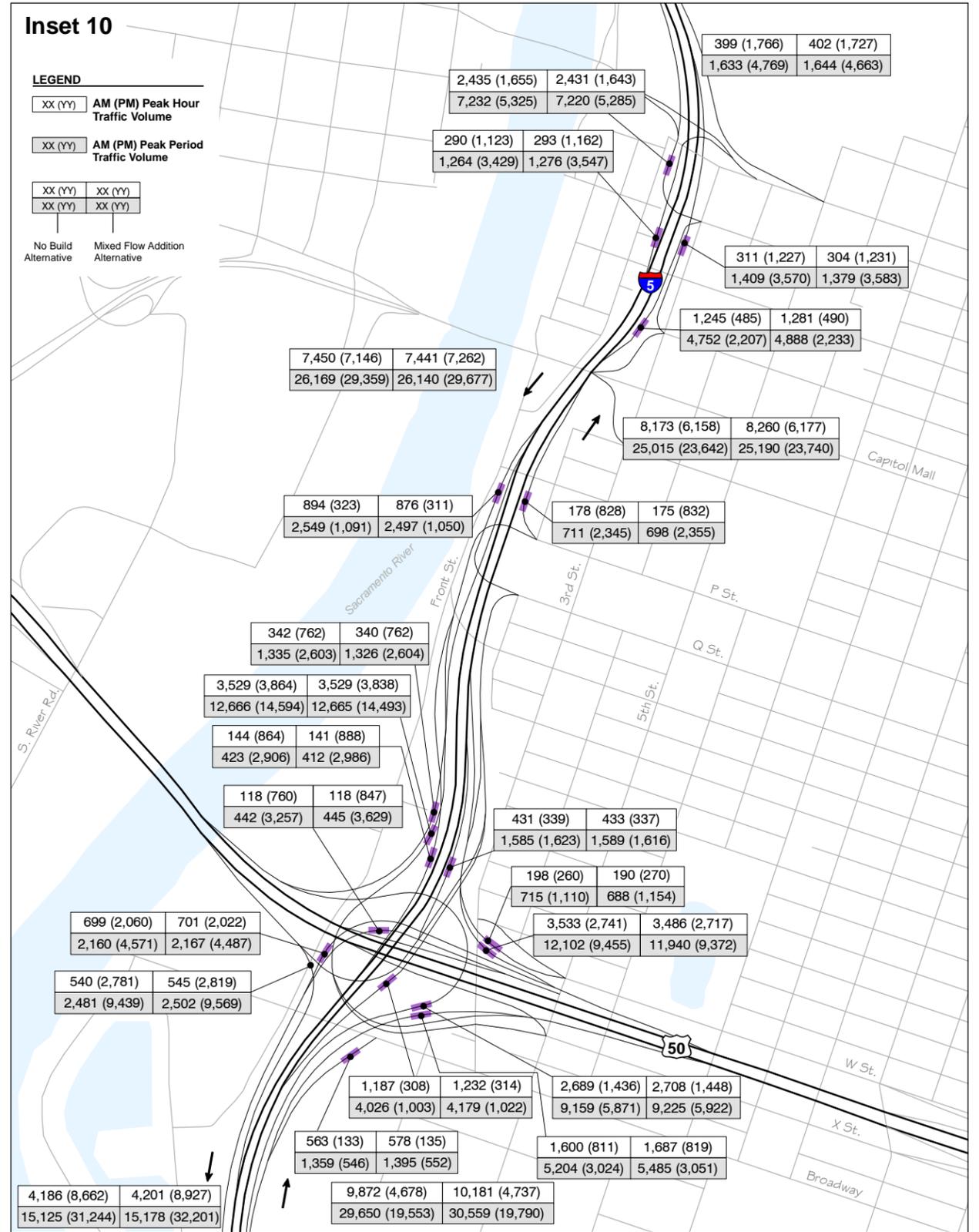
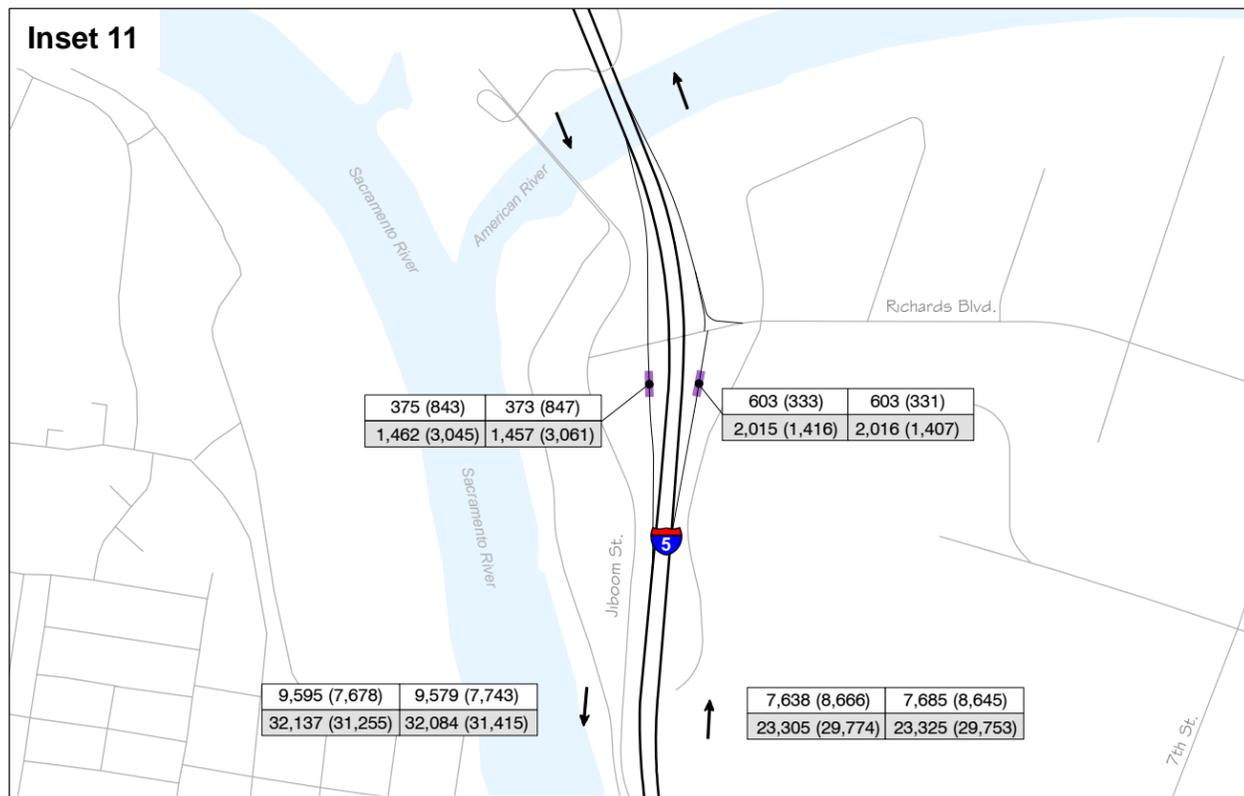
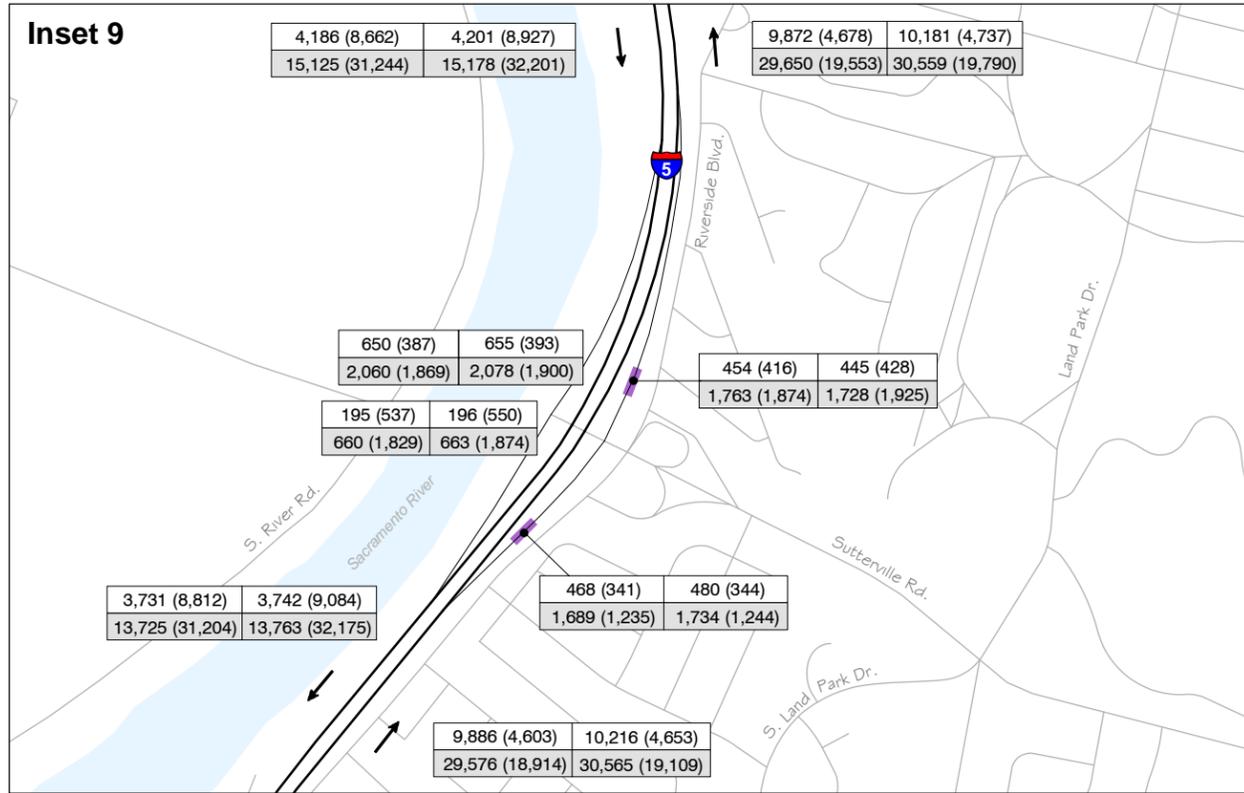
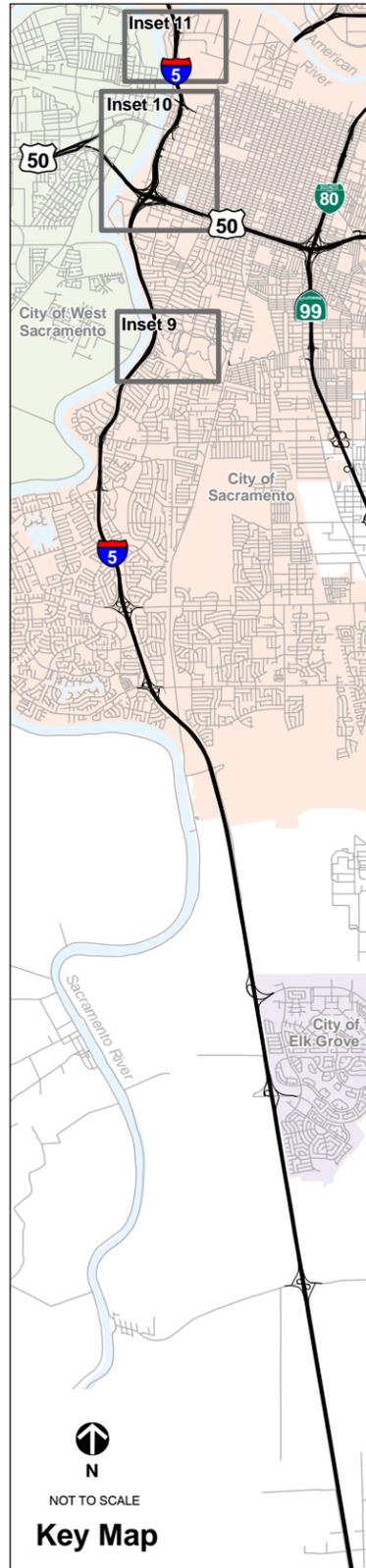
XX (YY) AM (PM) Peak Hour Traffic Volume

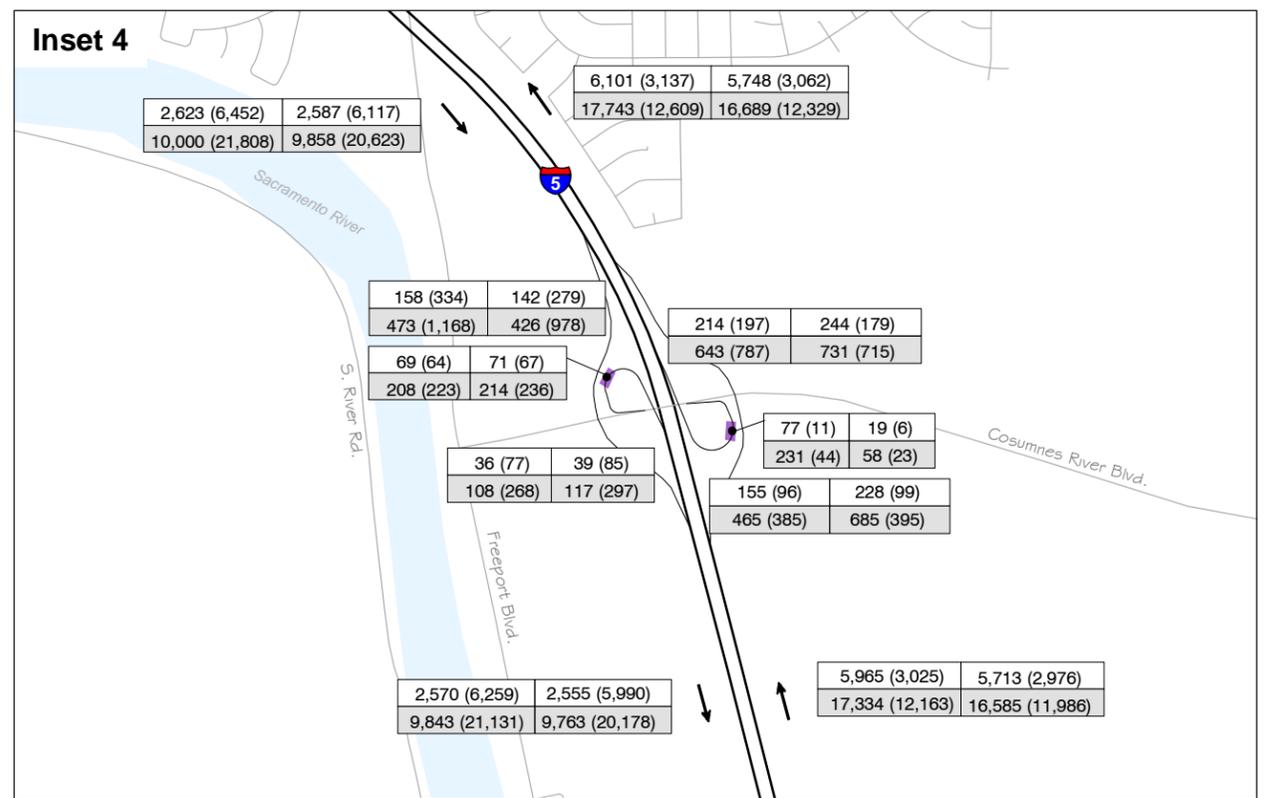
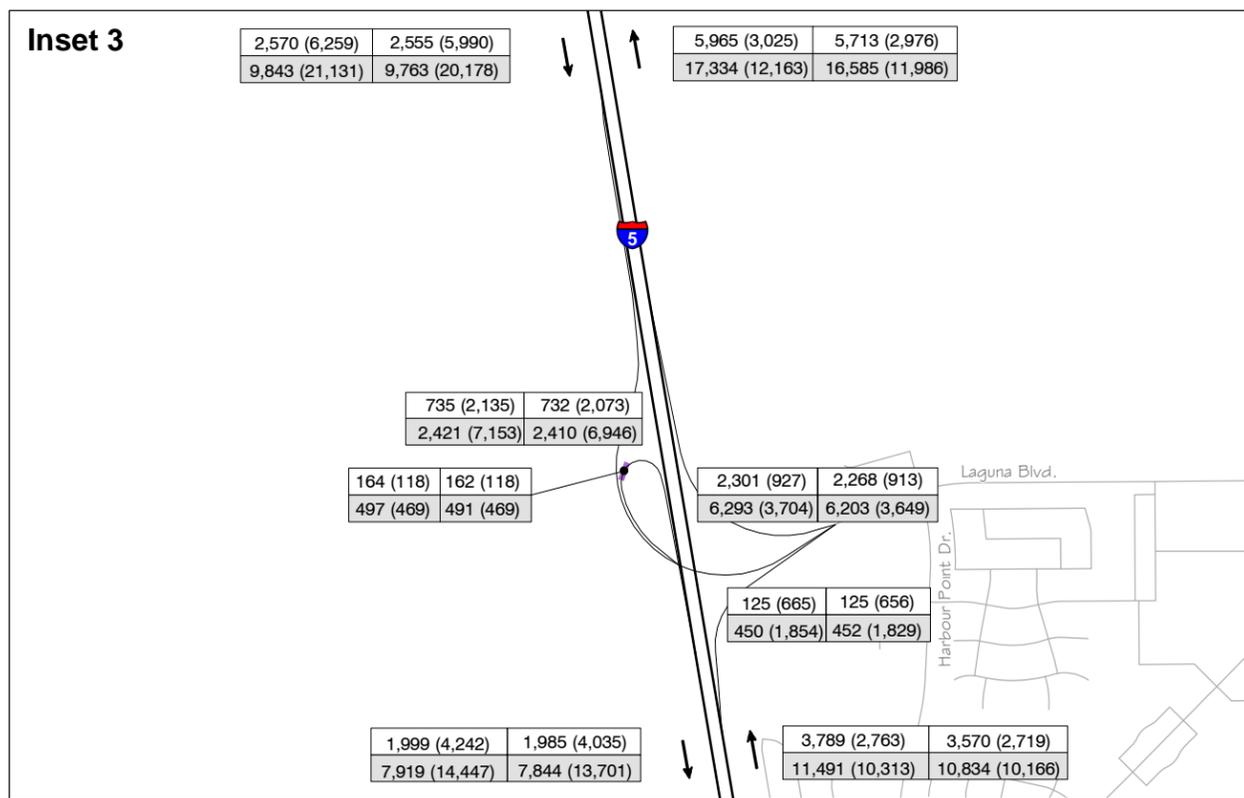
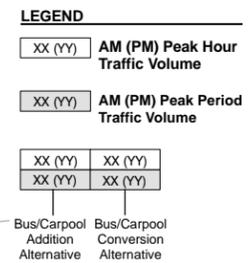
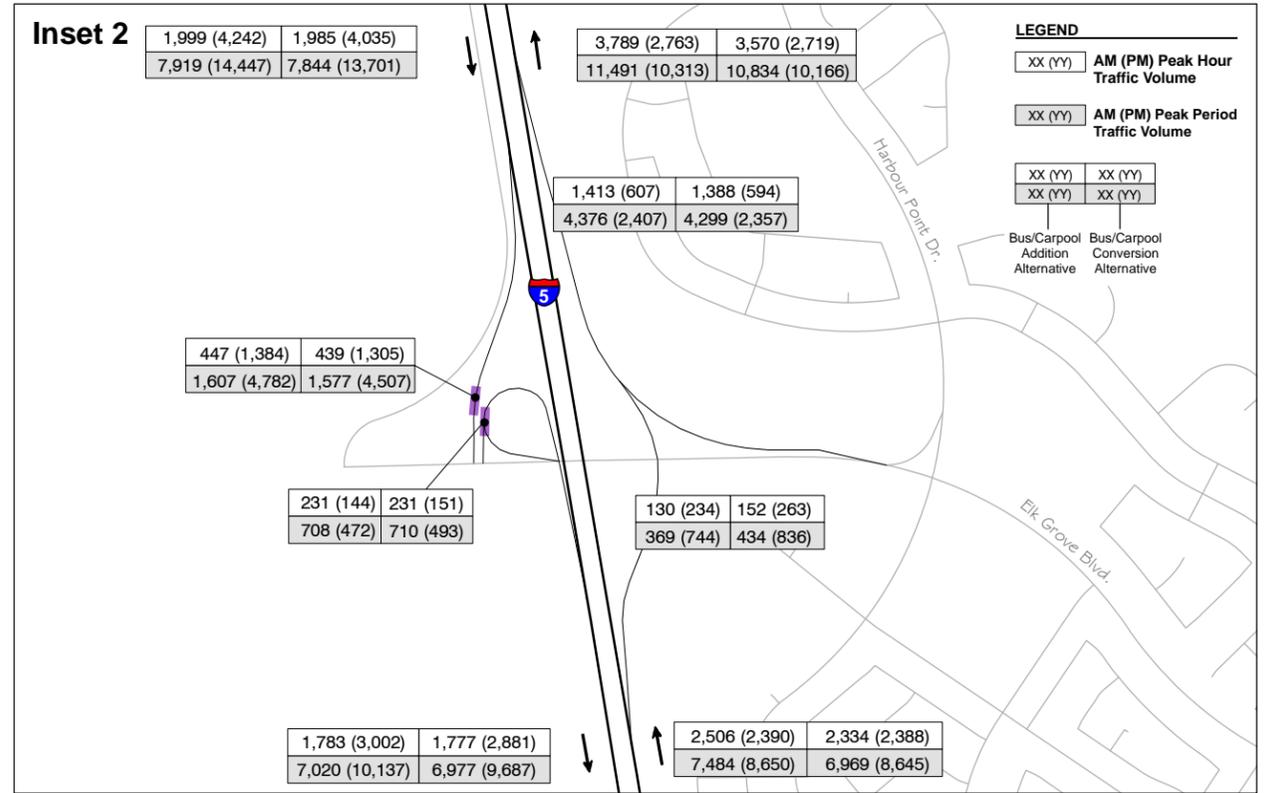
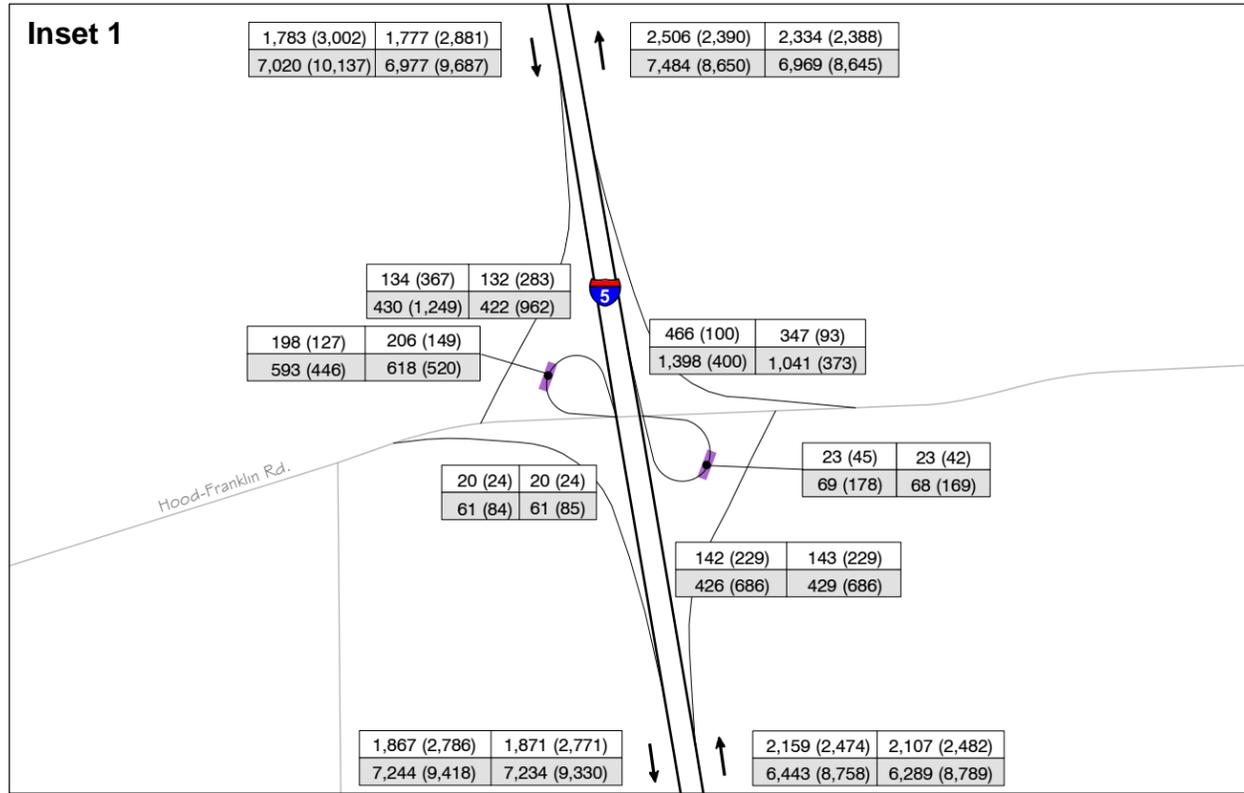
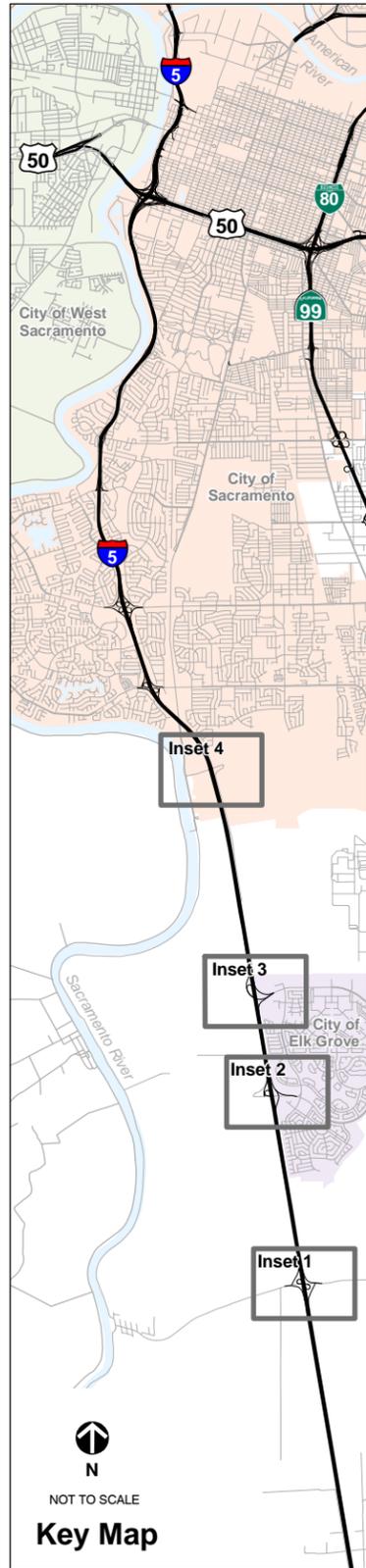
XX (YY) AM (PM) Peak Period Traffic Volume

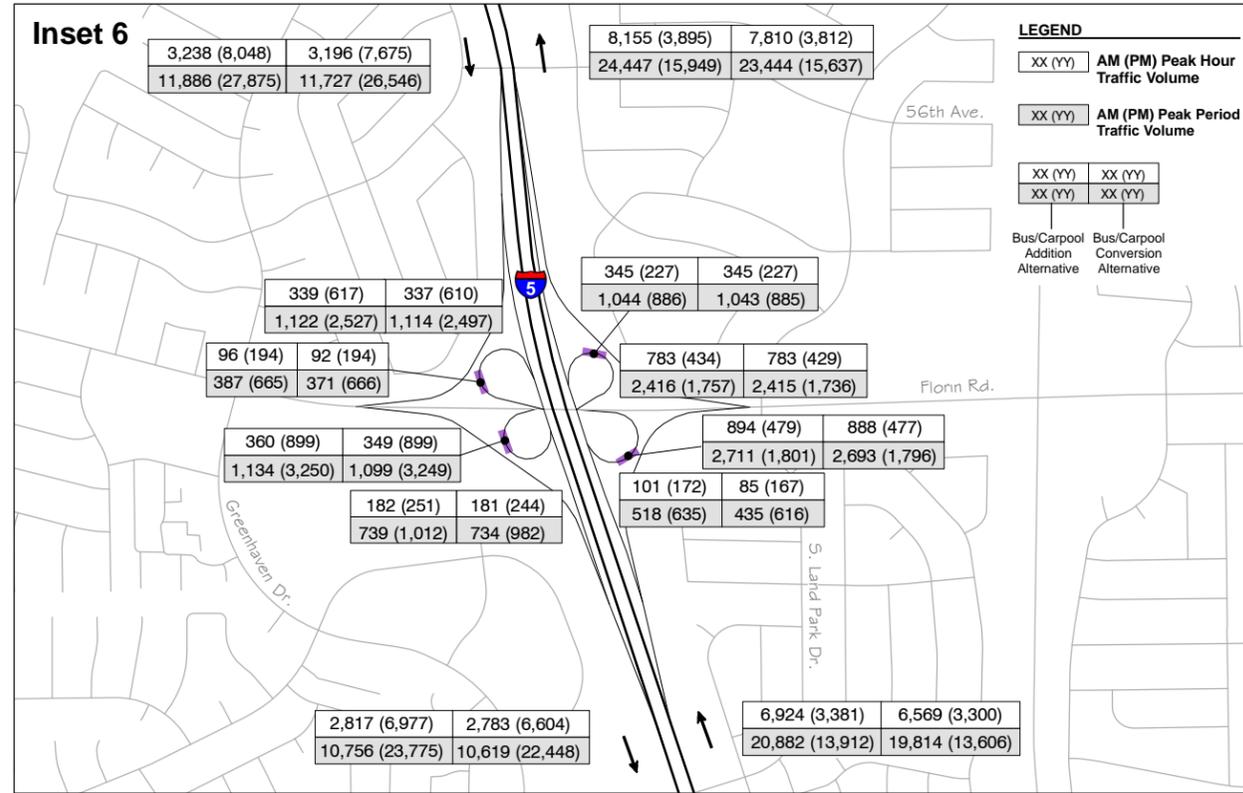
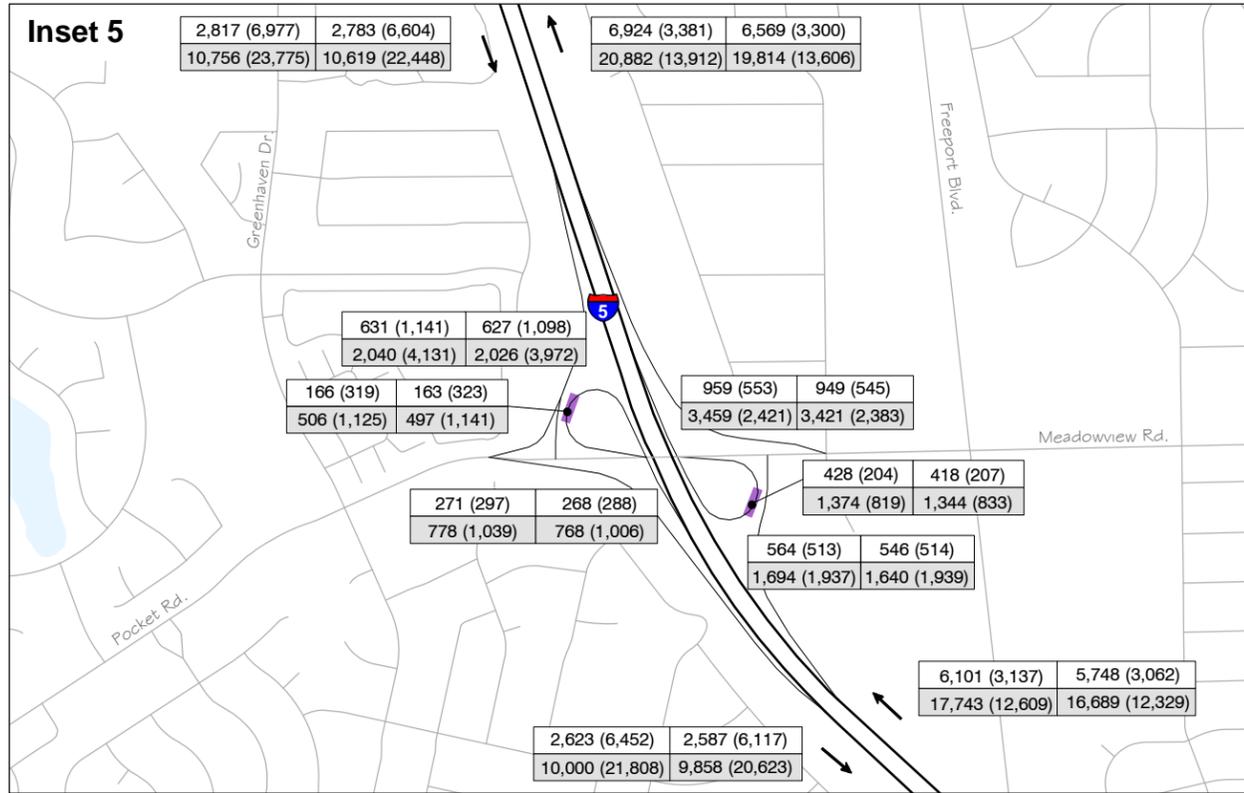
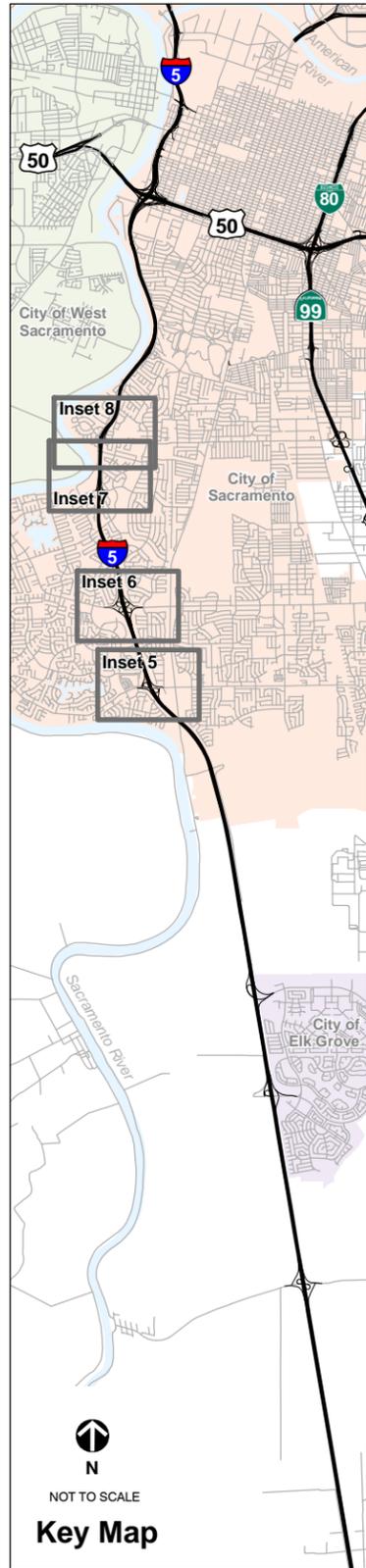
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No Build Alternative      Mixed Flow Addition Alternative









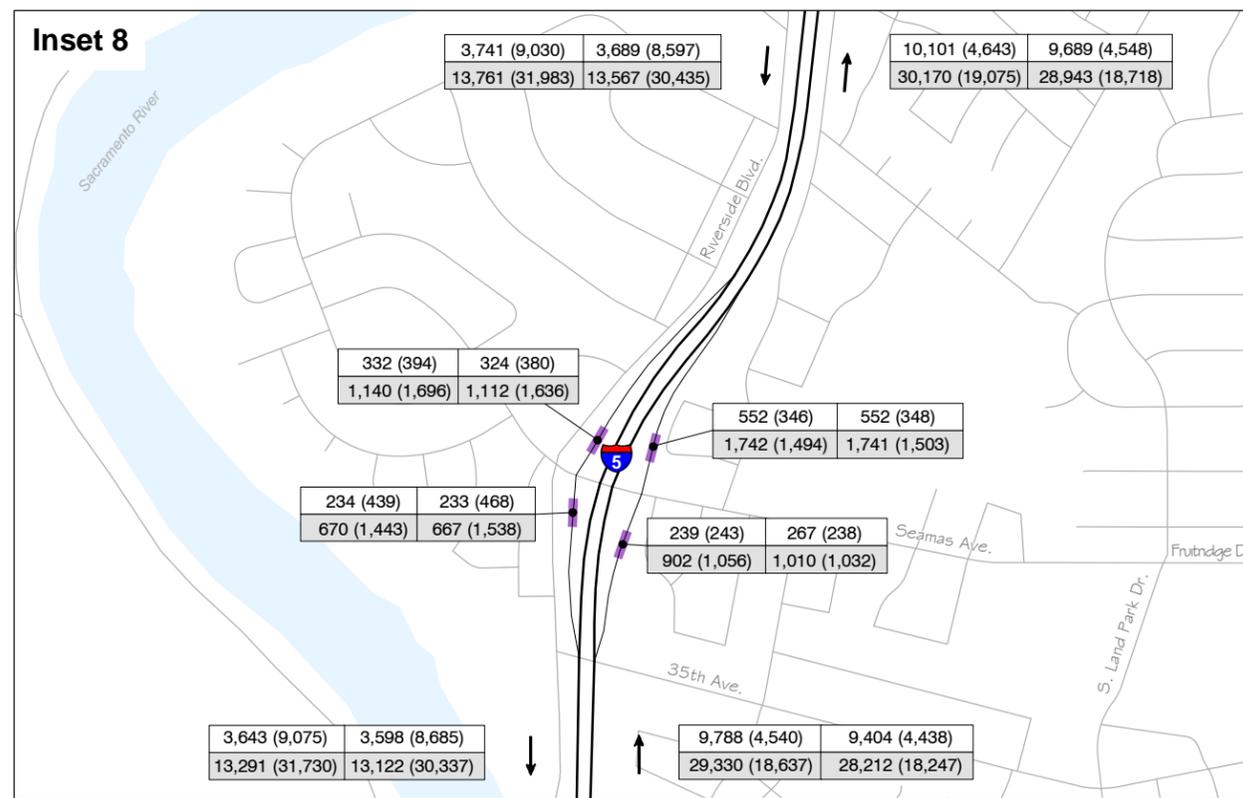
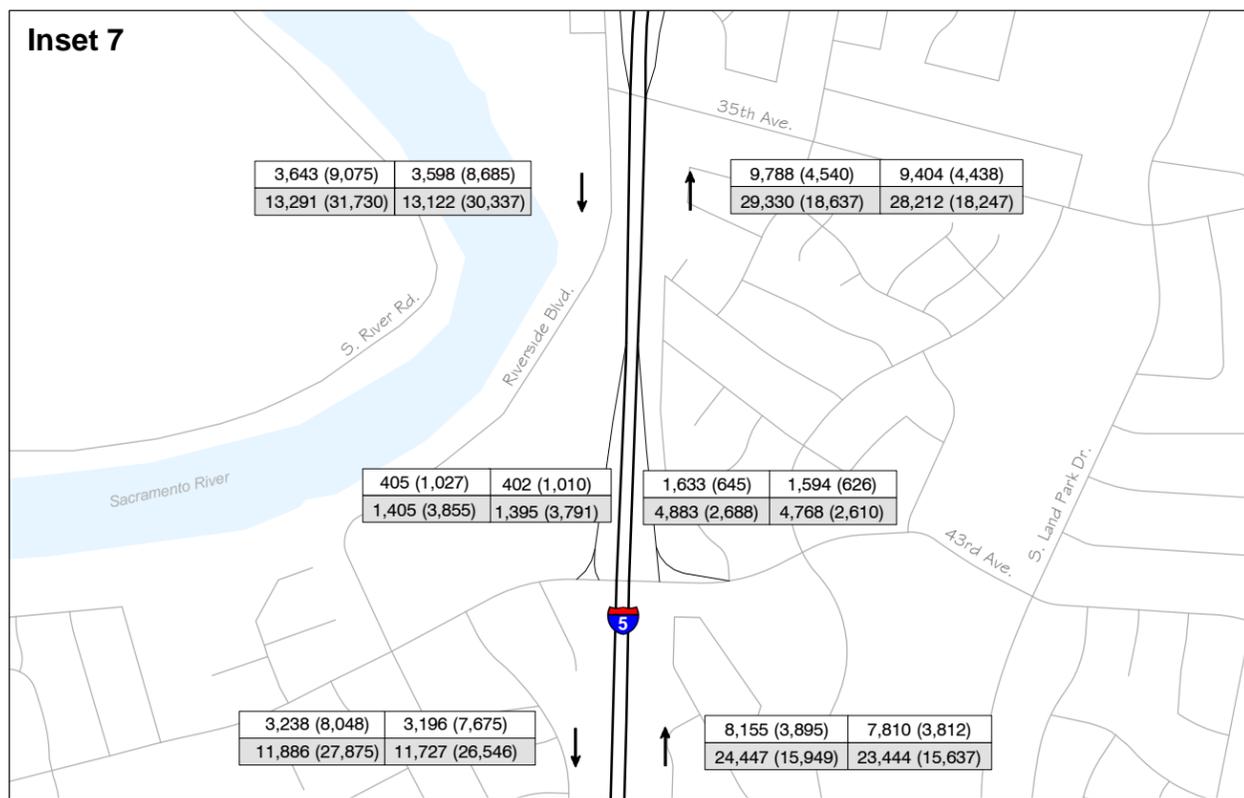
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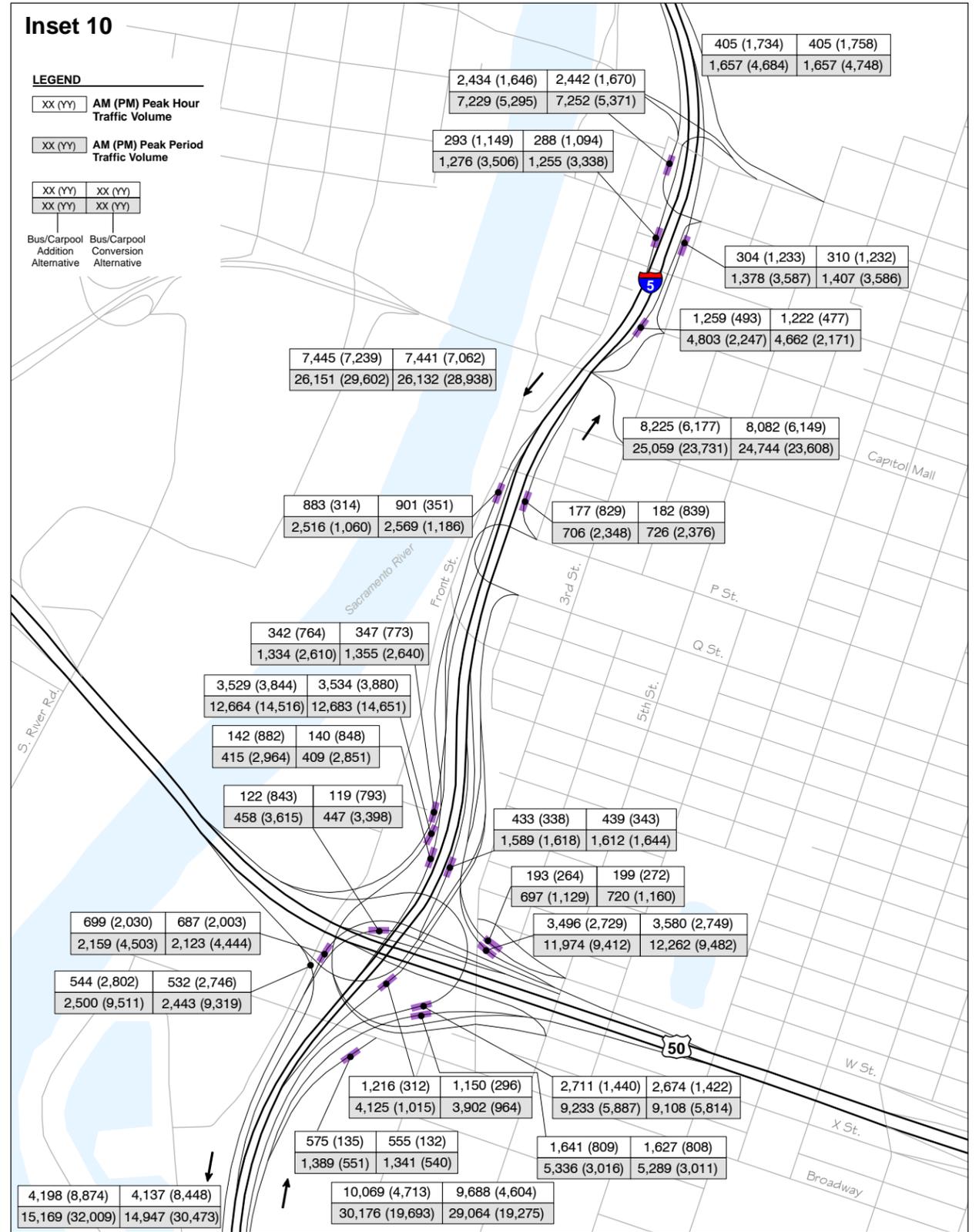
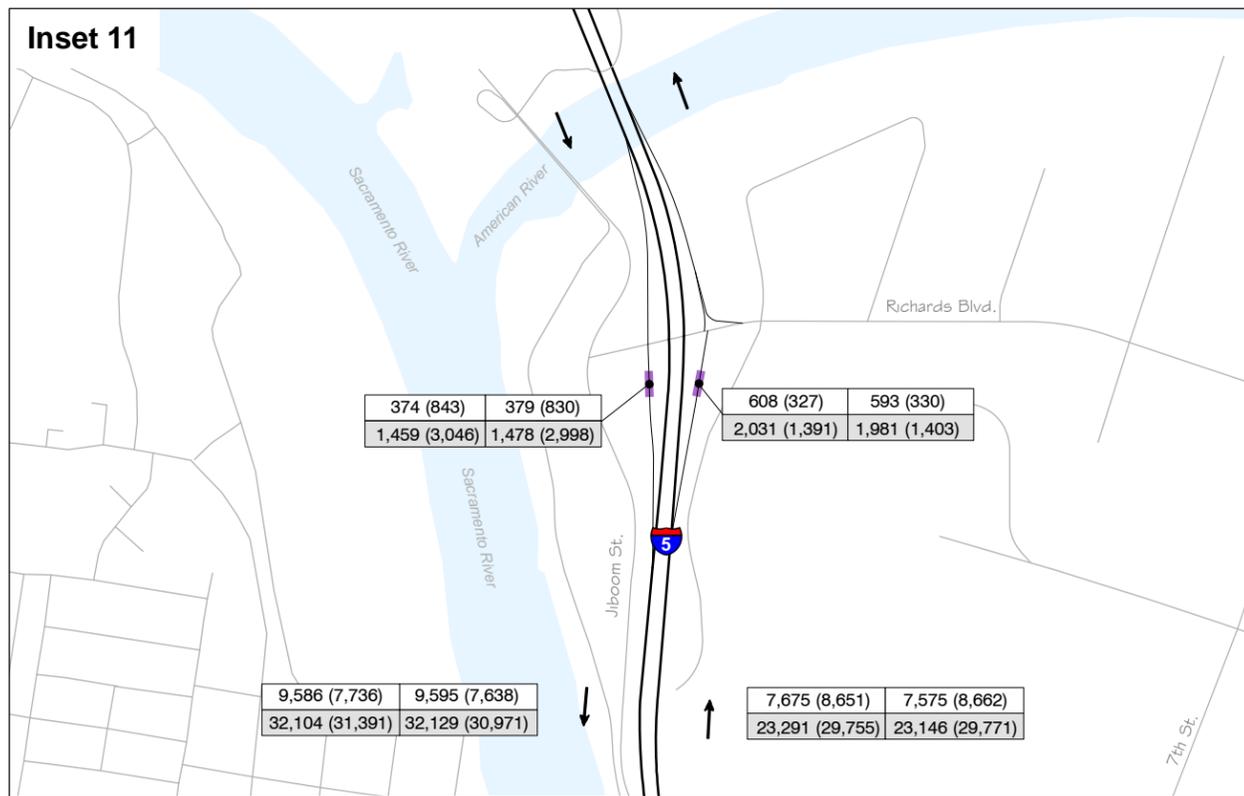
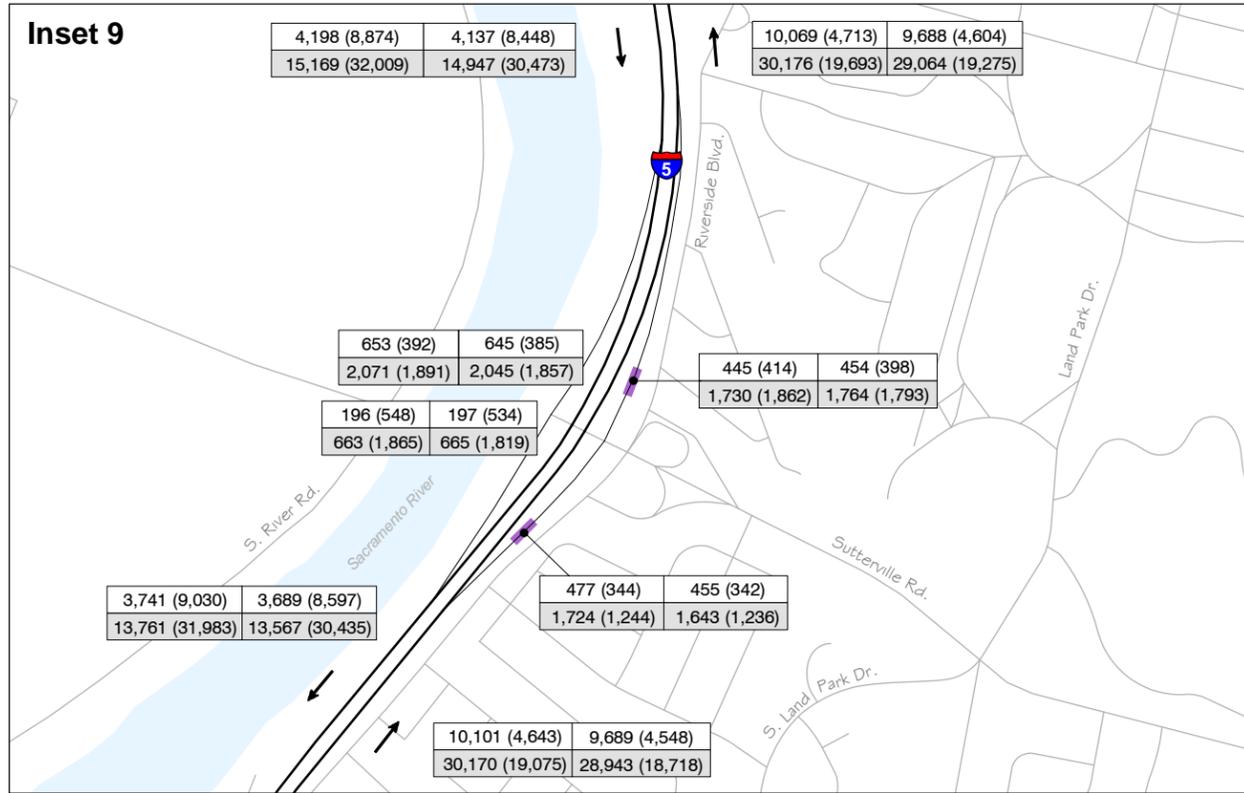
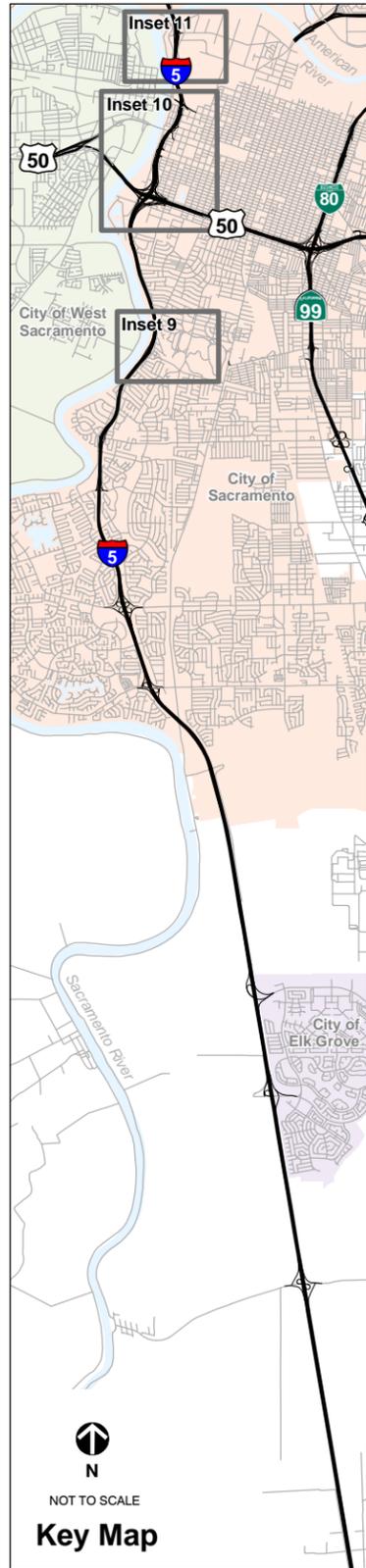
XX (YY) AM (PM) Peak Hour Traffic Volume

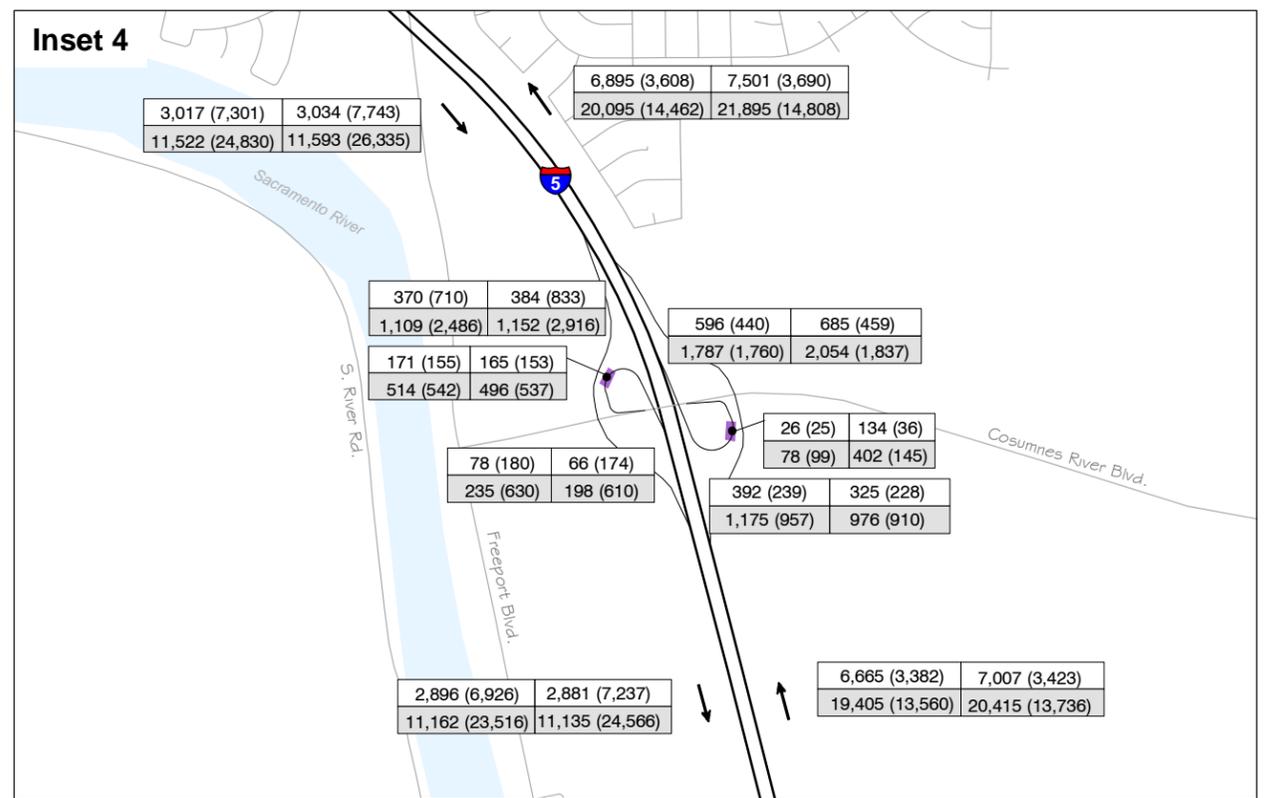
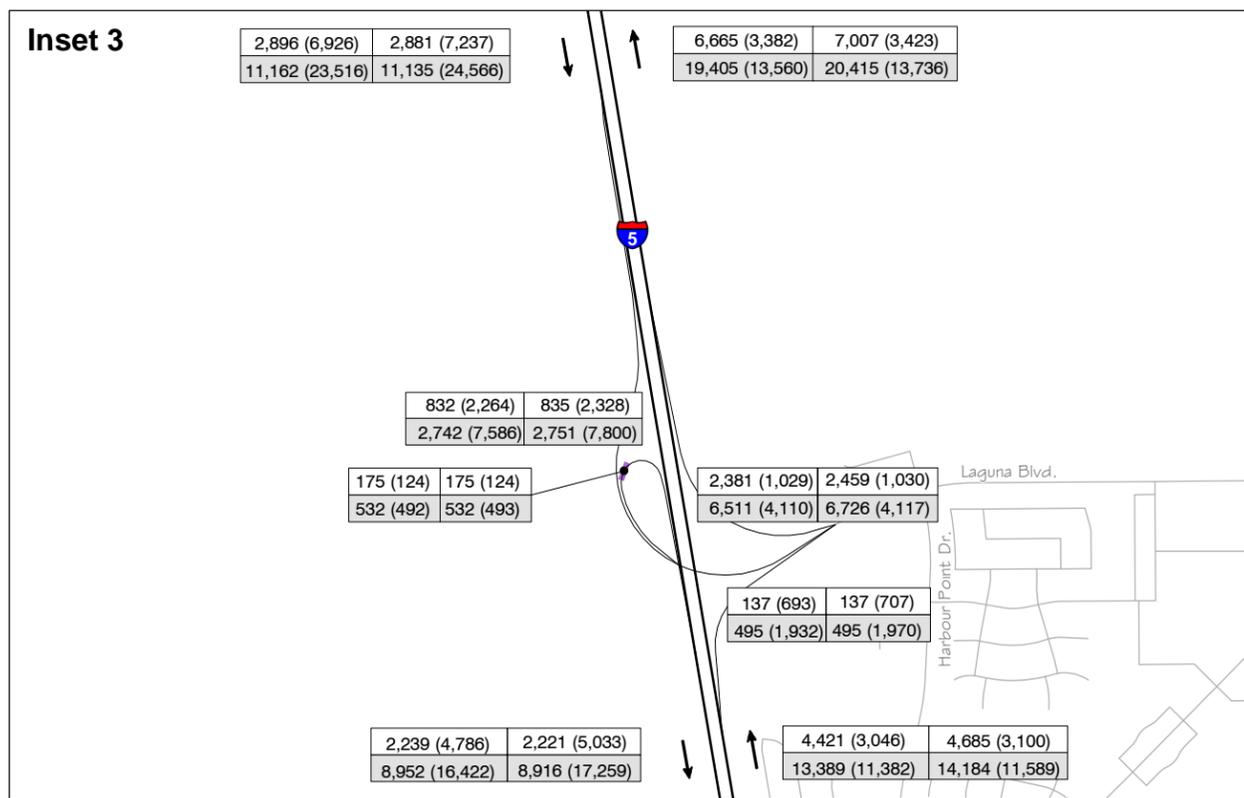
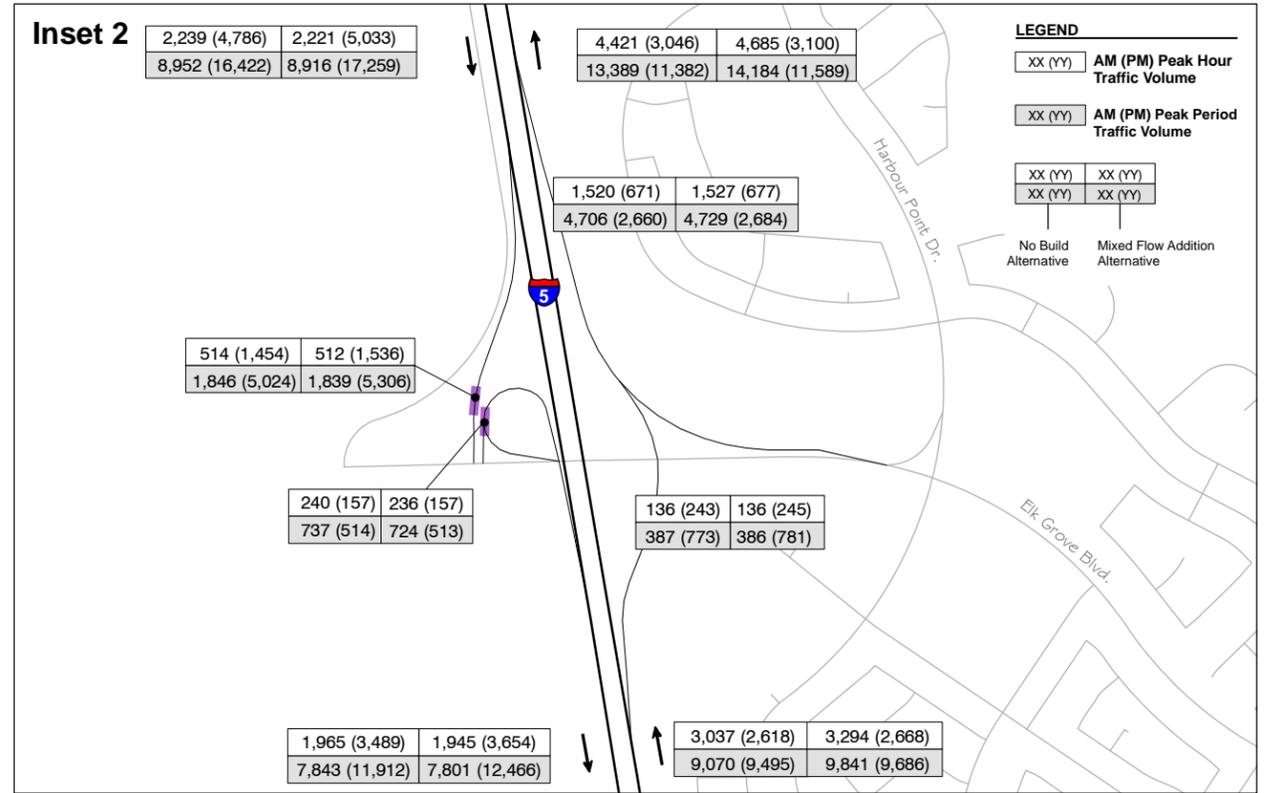
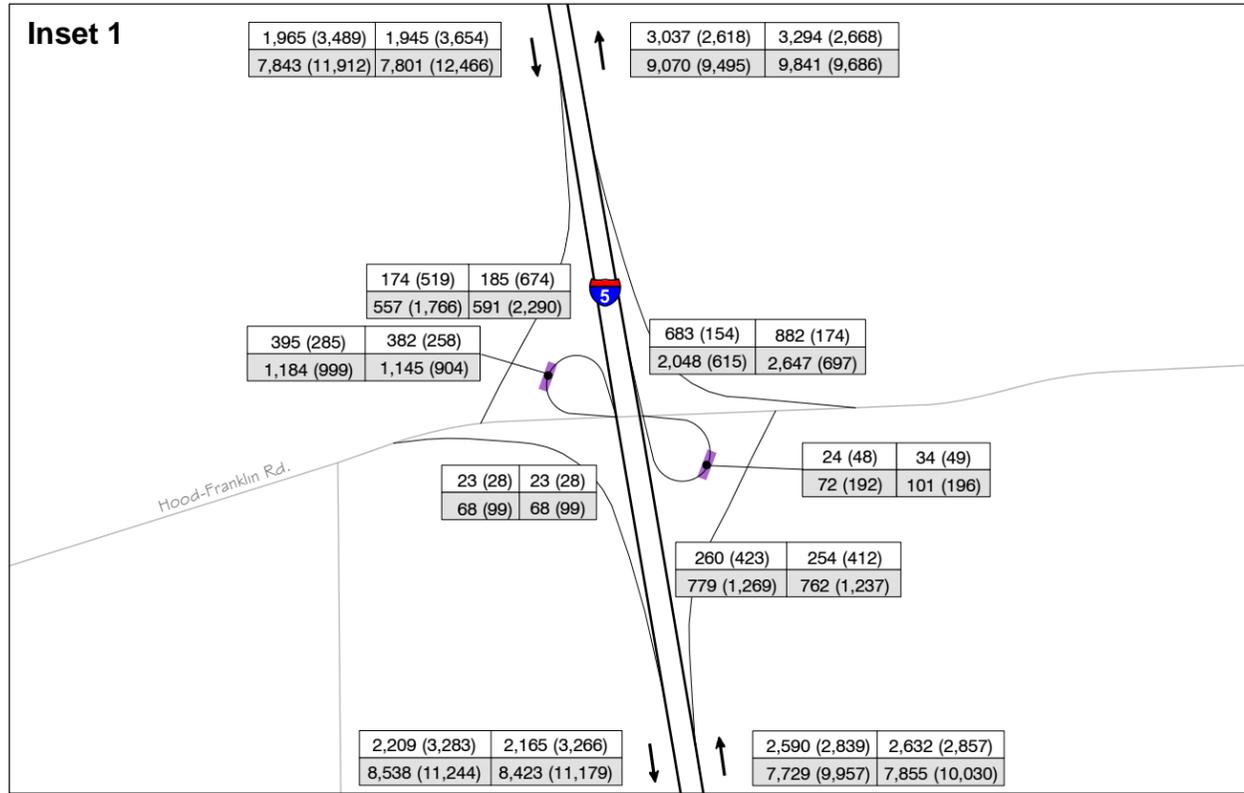
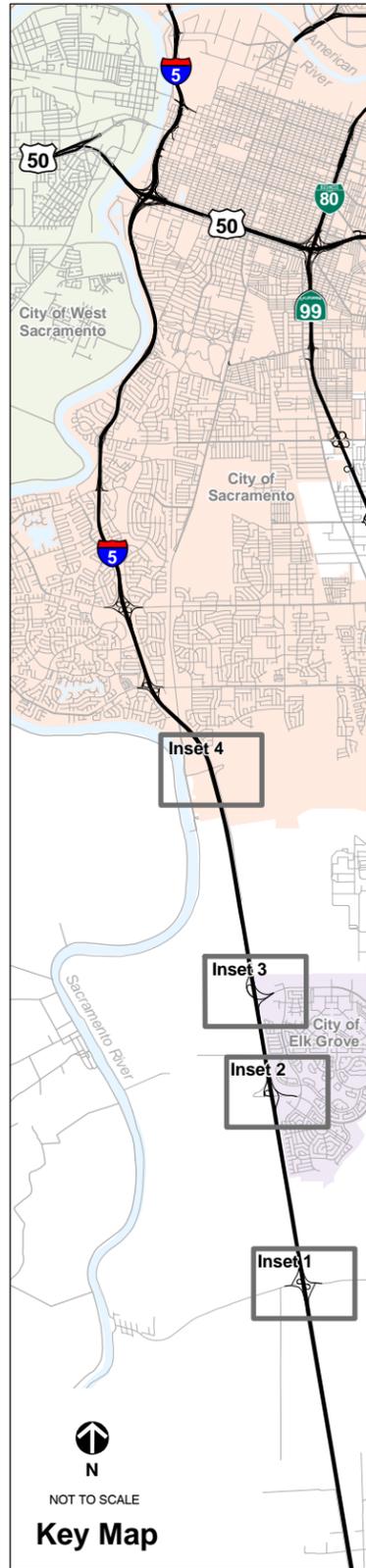
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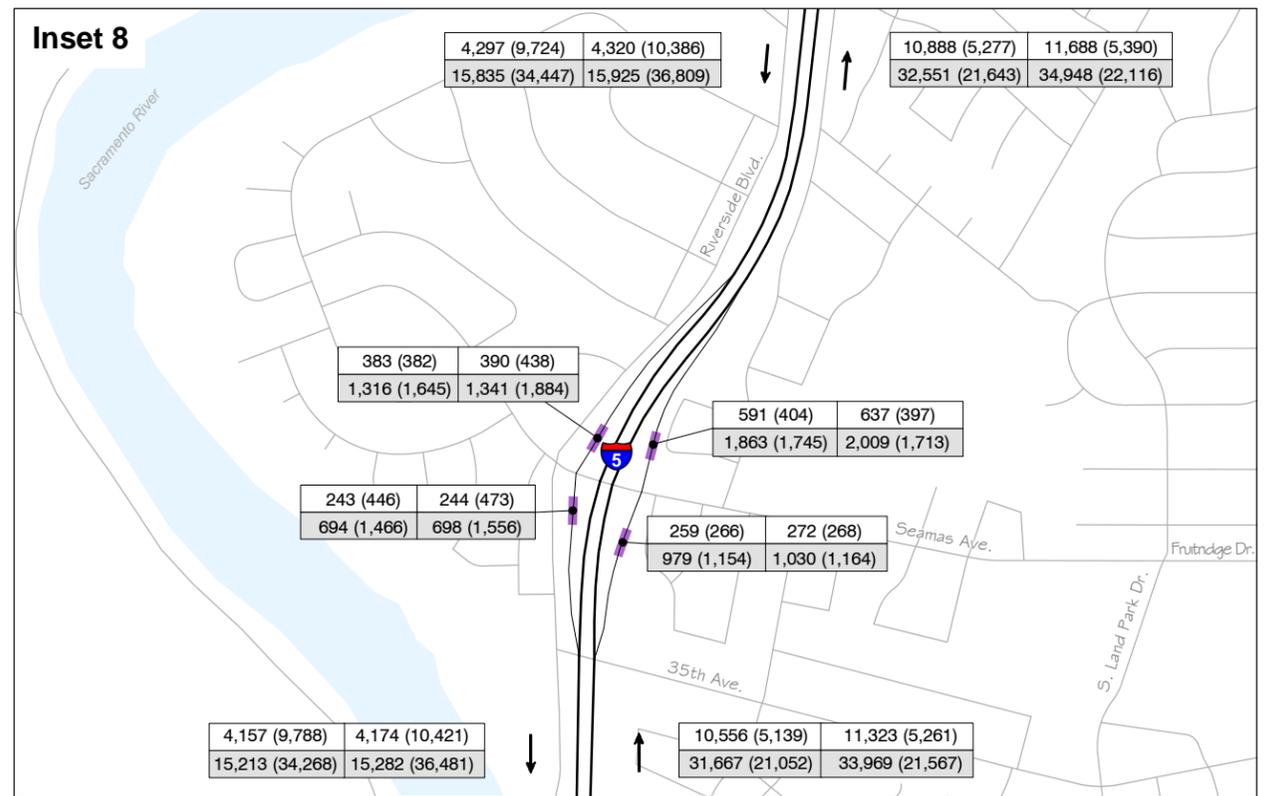
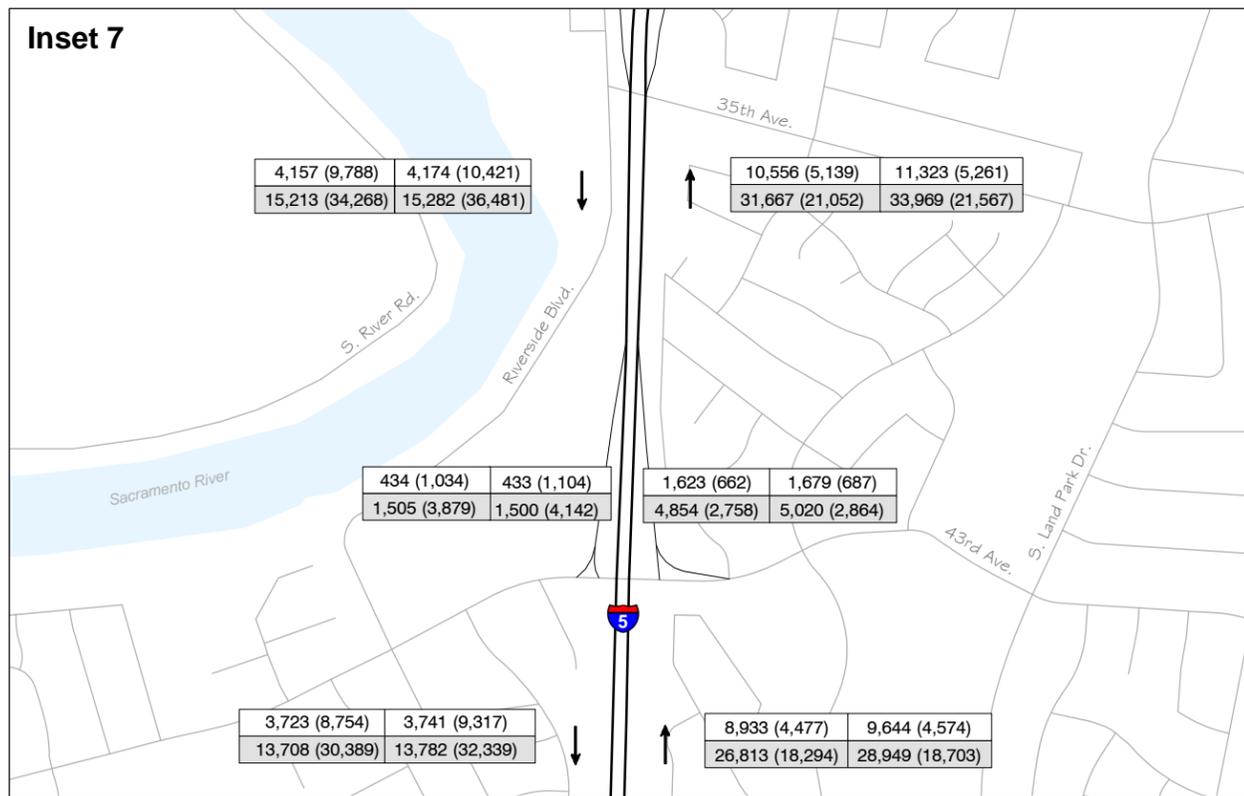
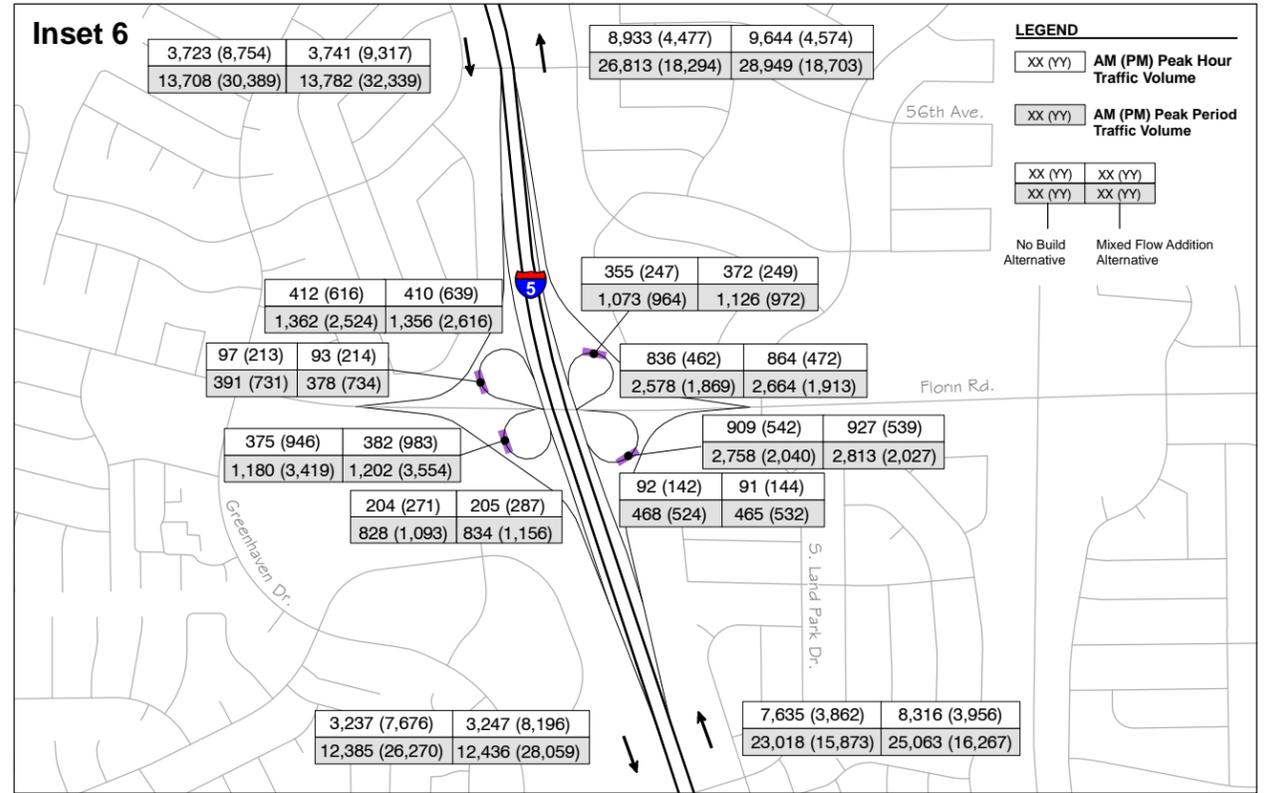
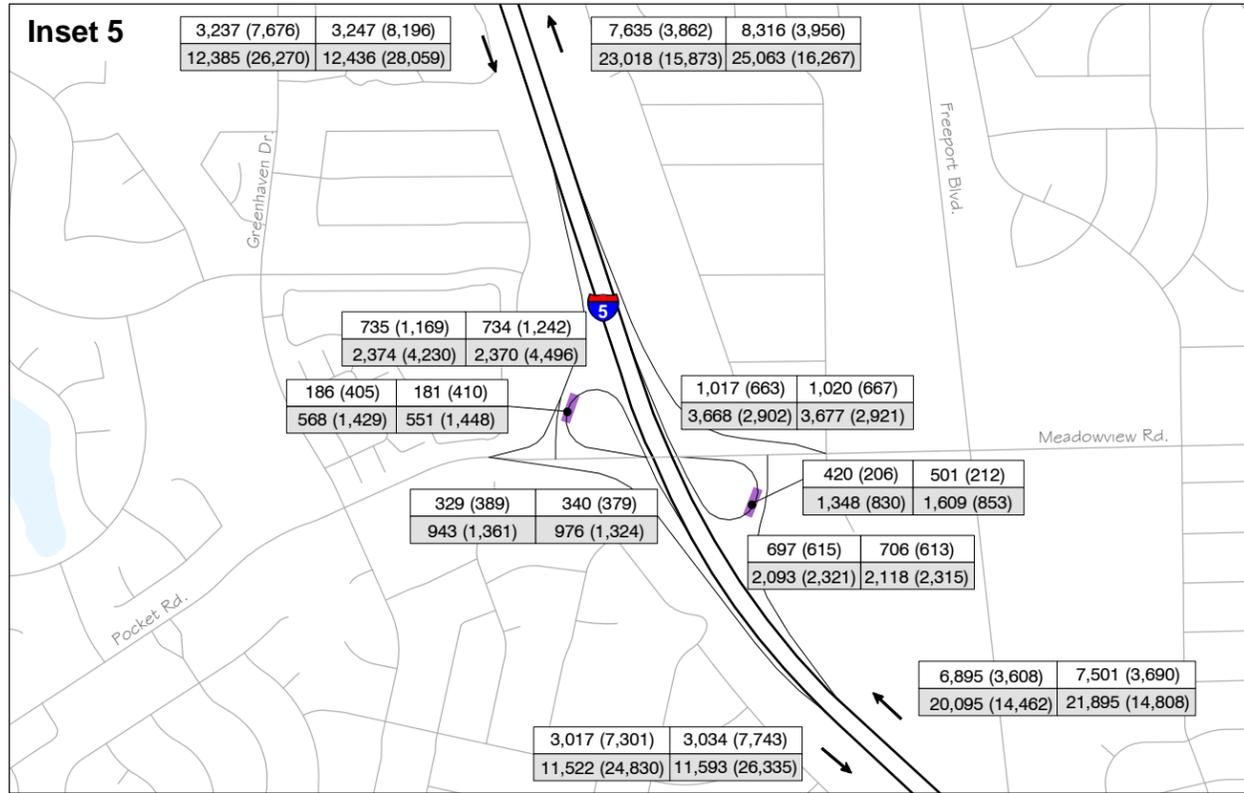
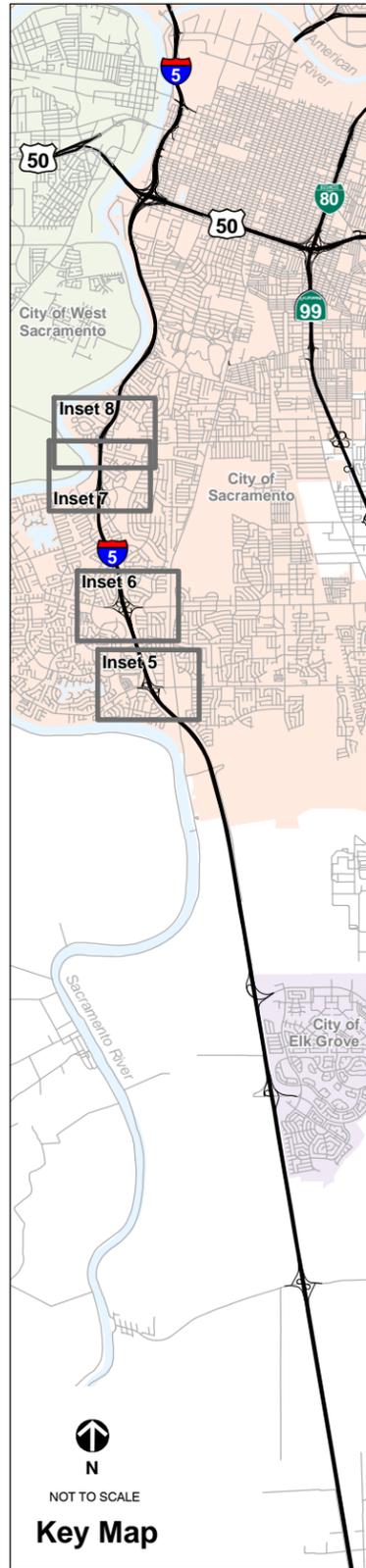
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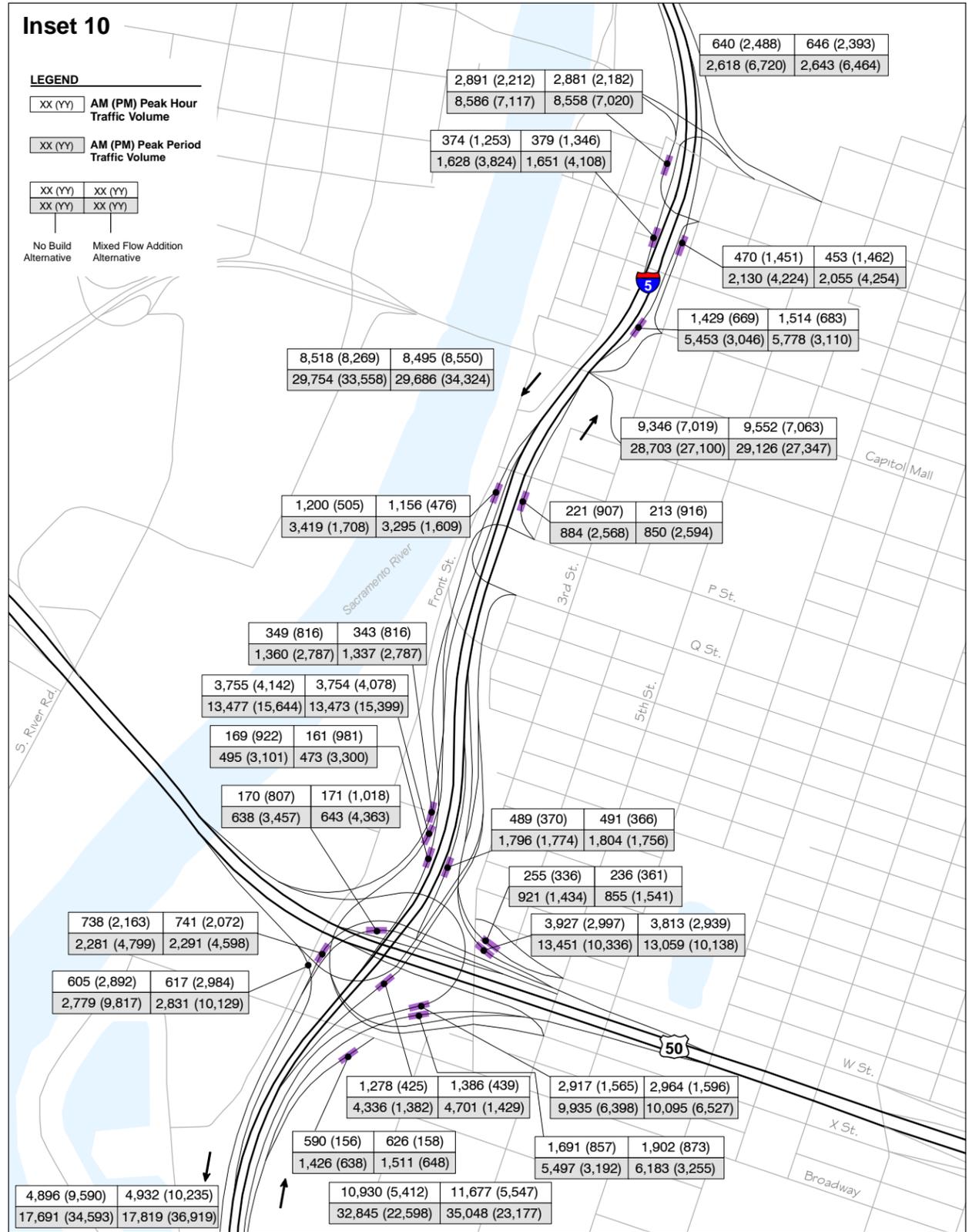
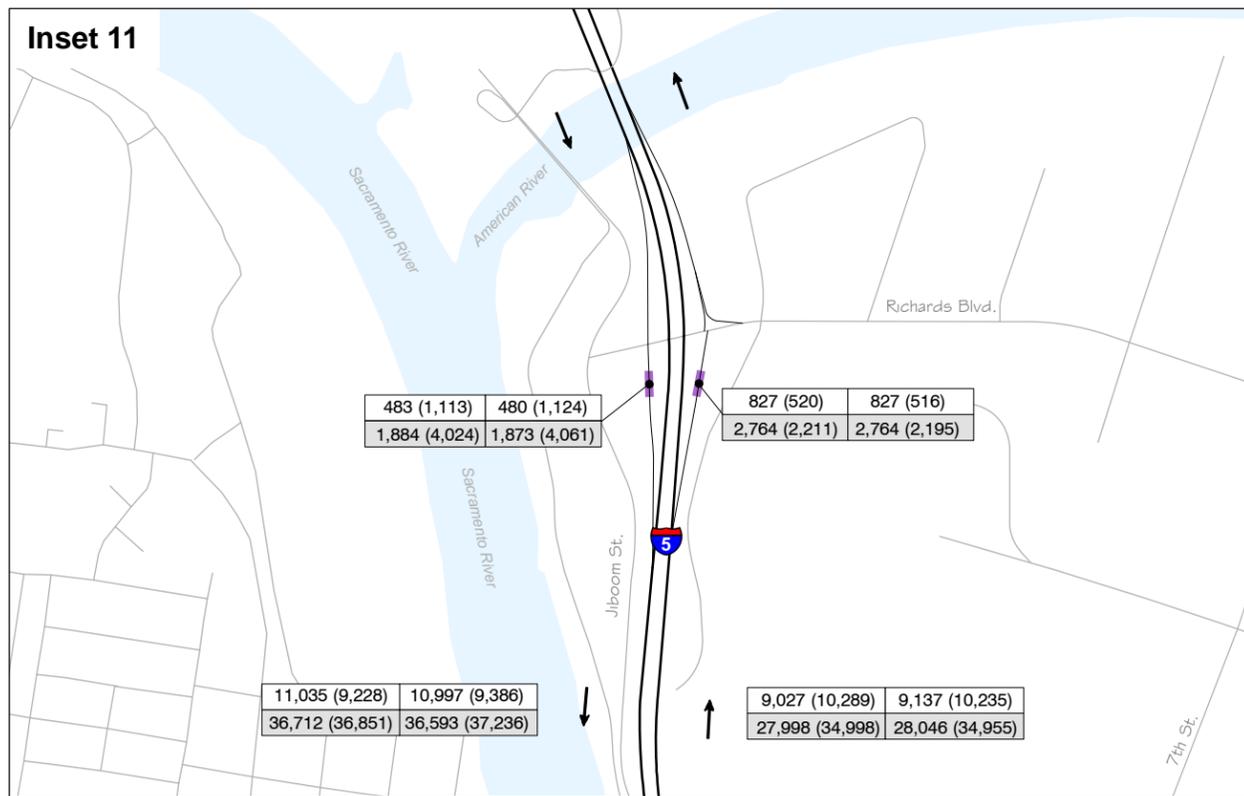
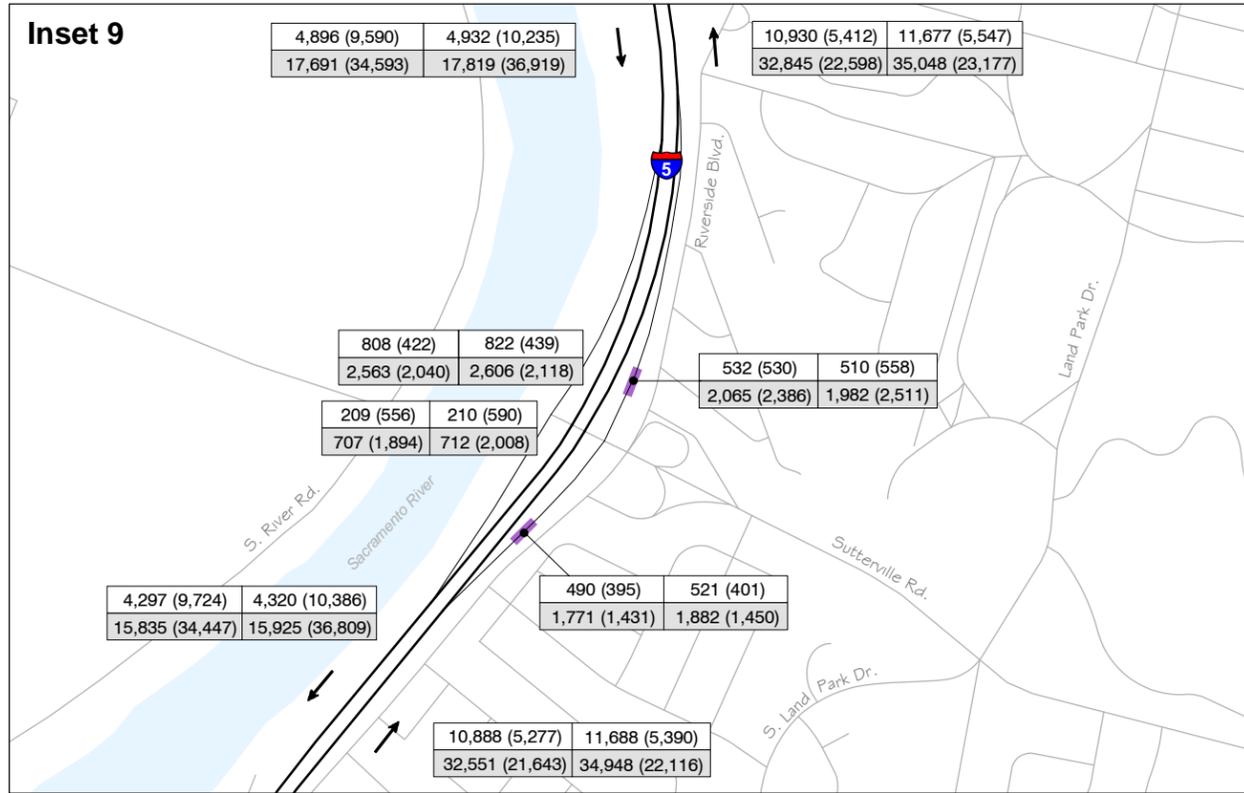
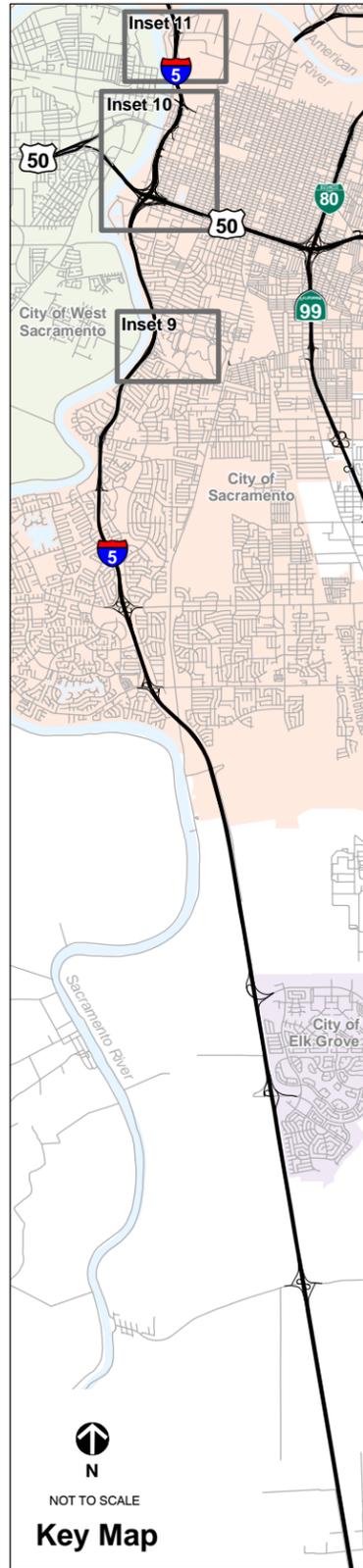
Bus/Carpool Addition Alternative    Bus/Carpool Conversion Alternative

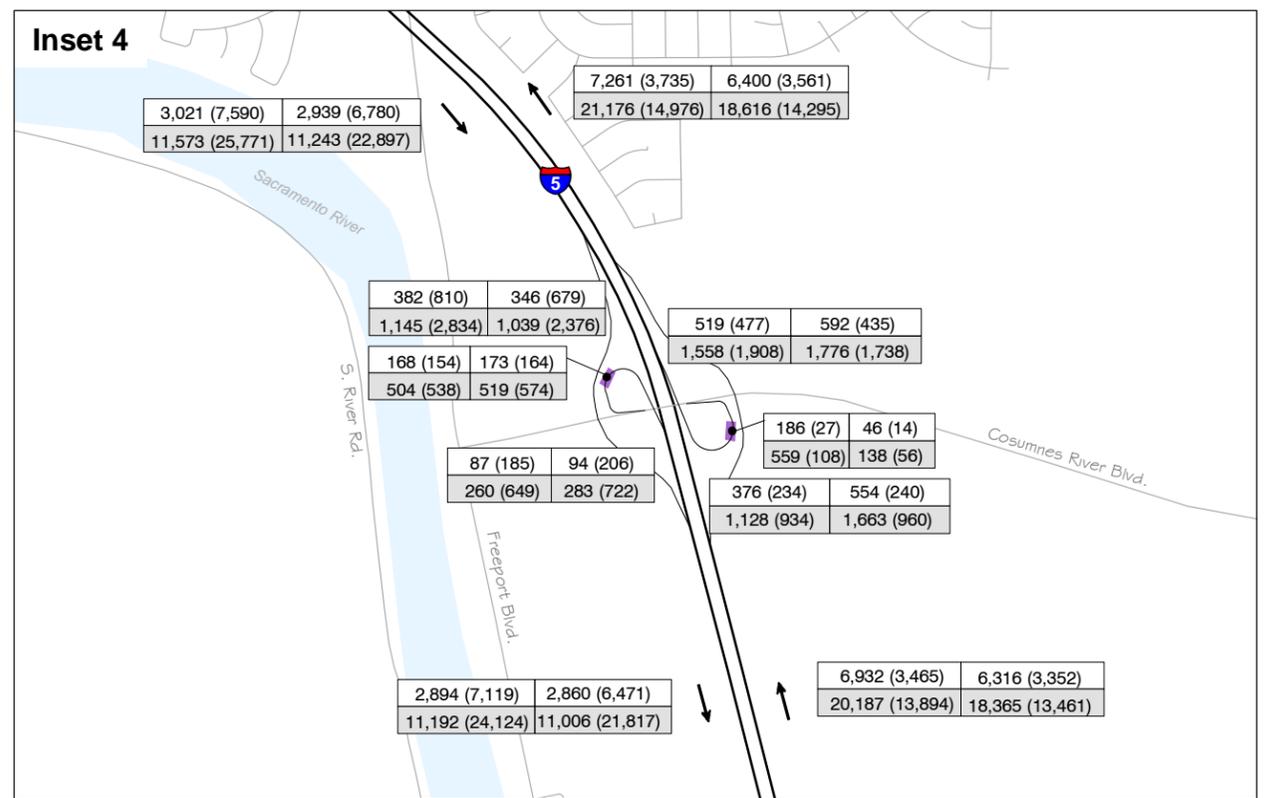
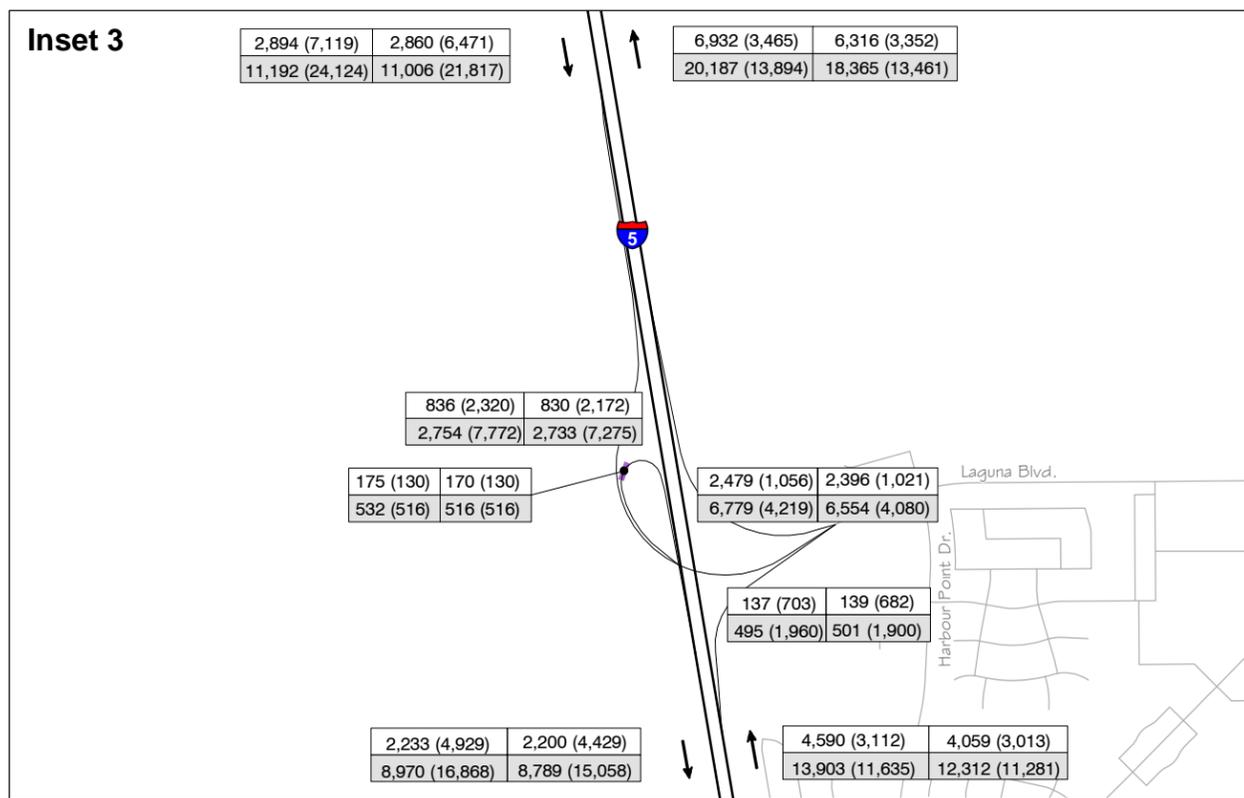
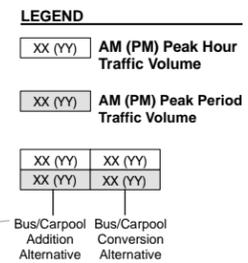
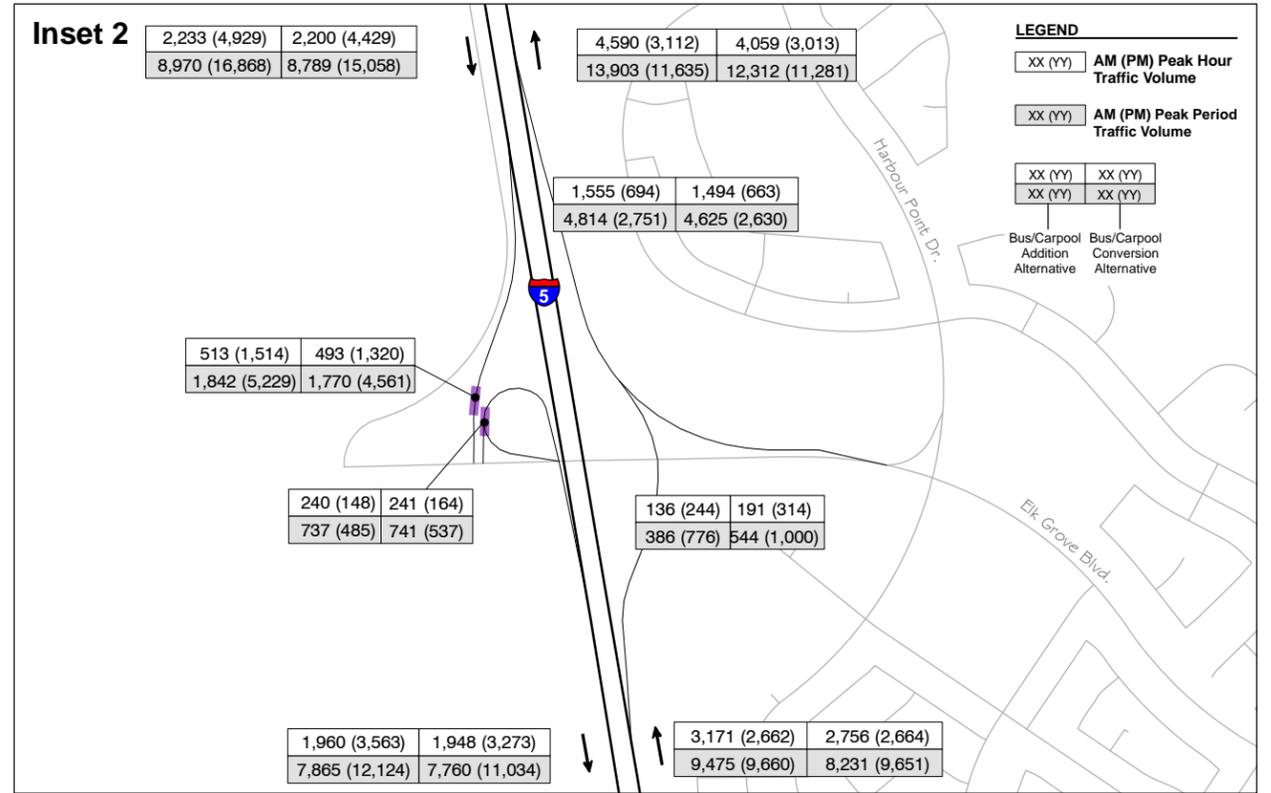
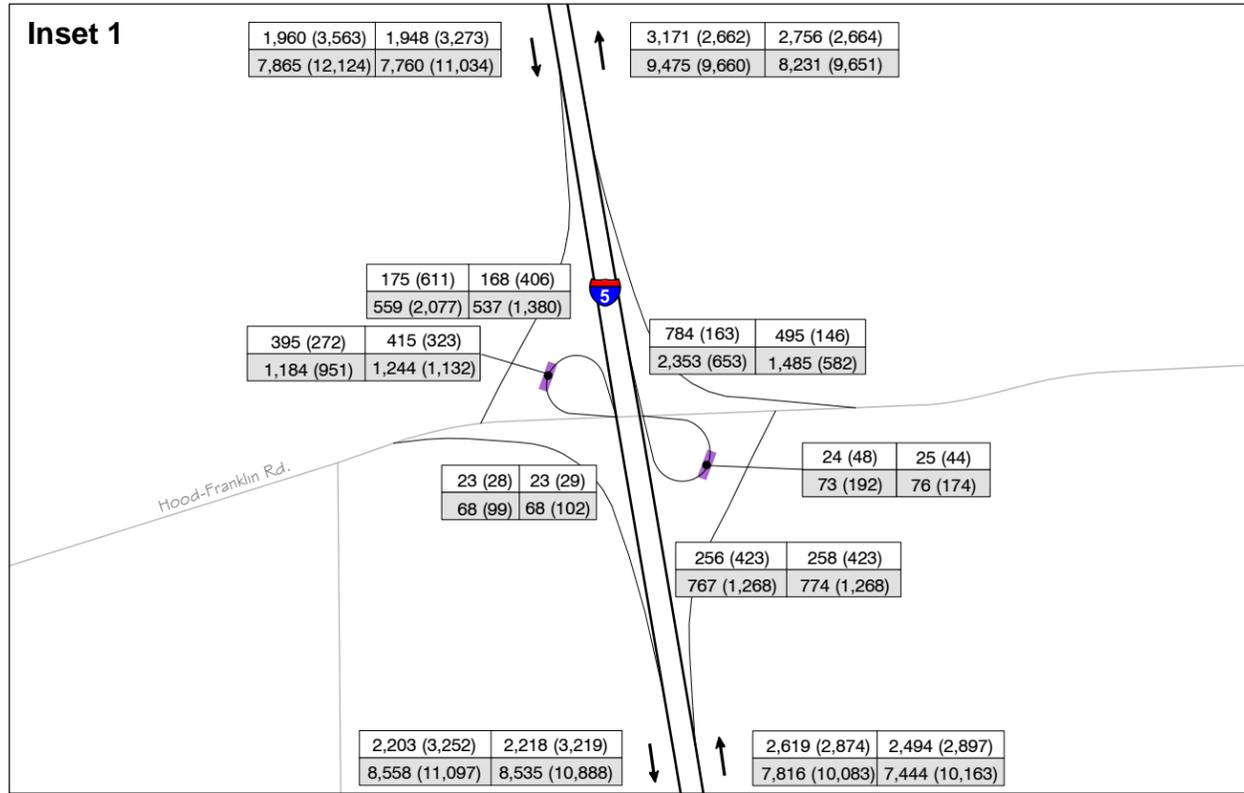
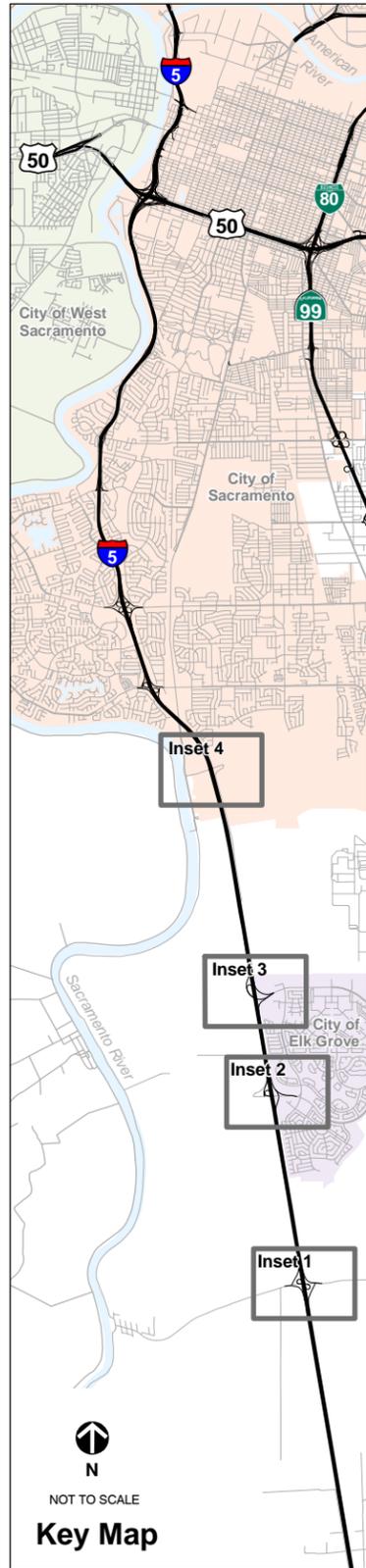


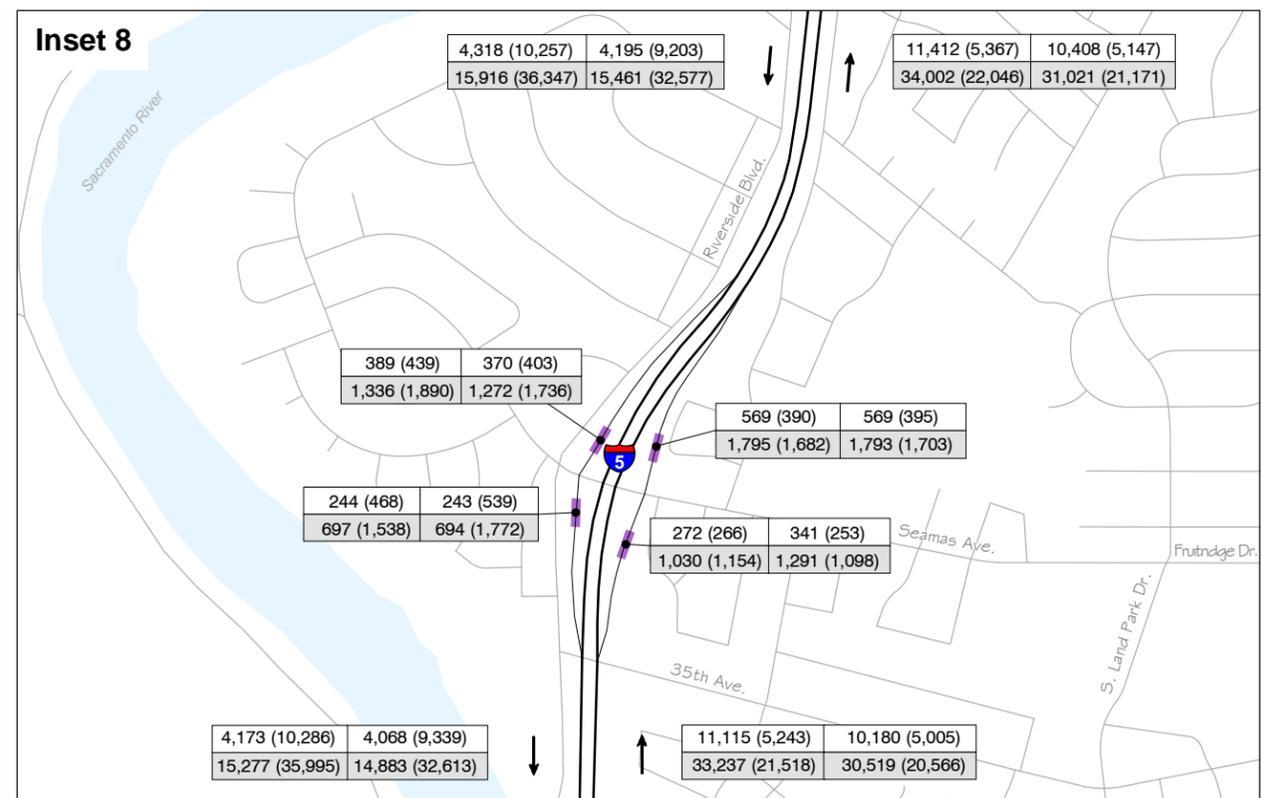
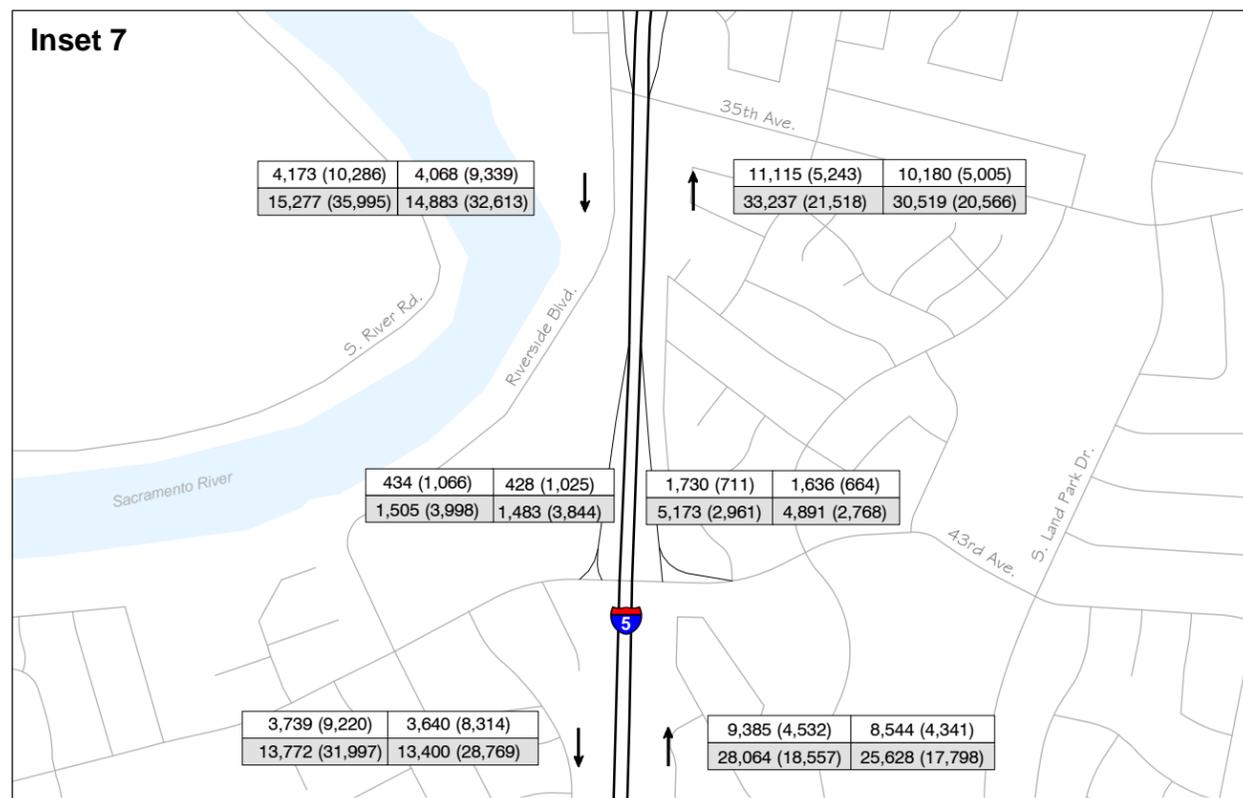
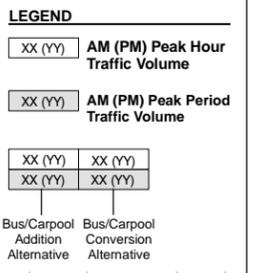
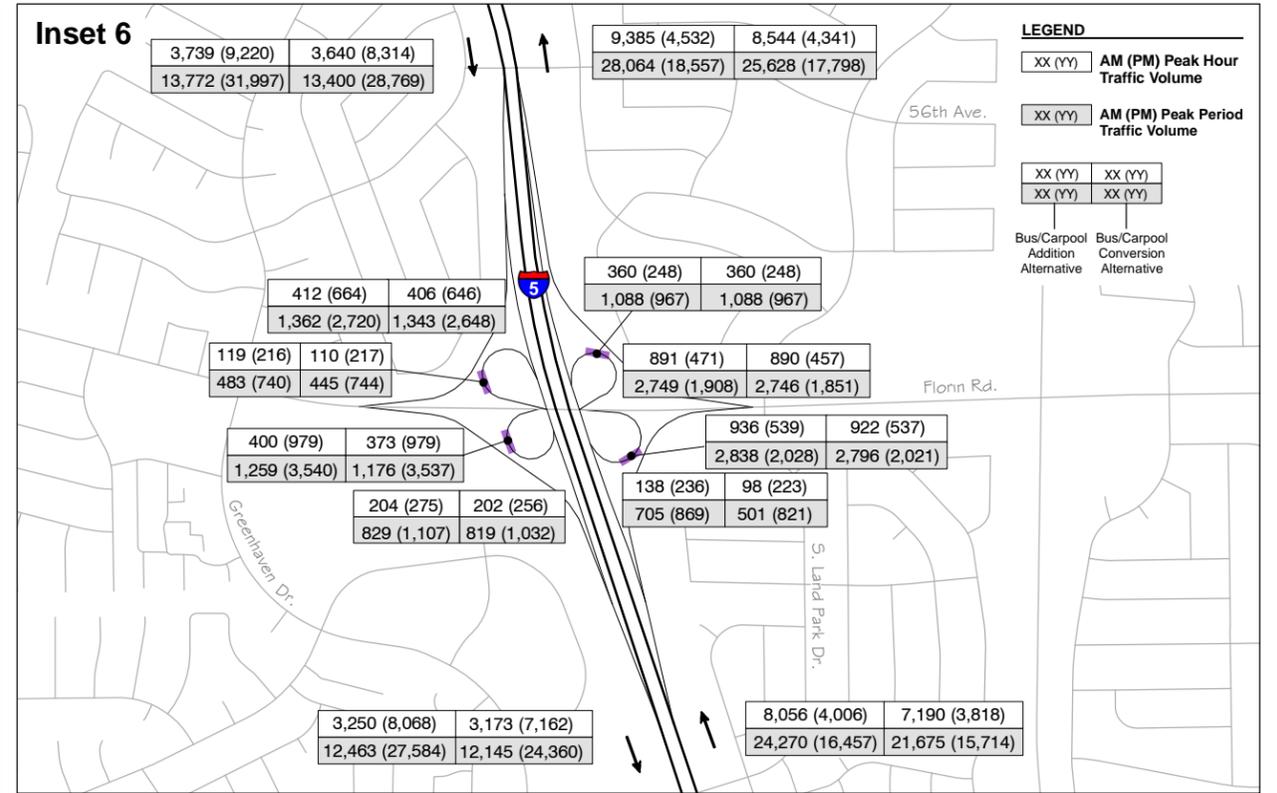
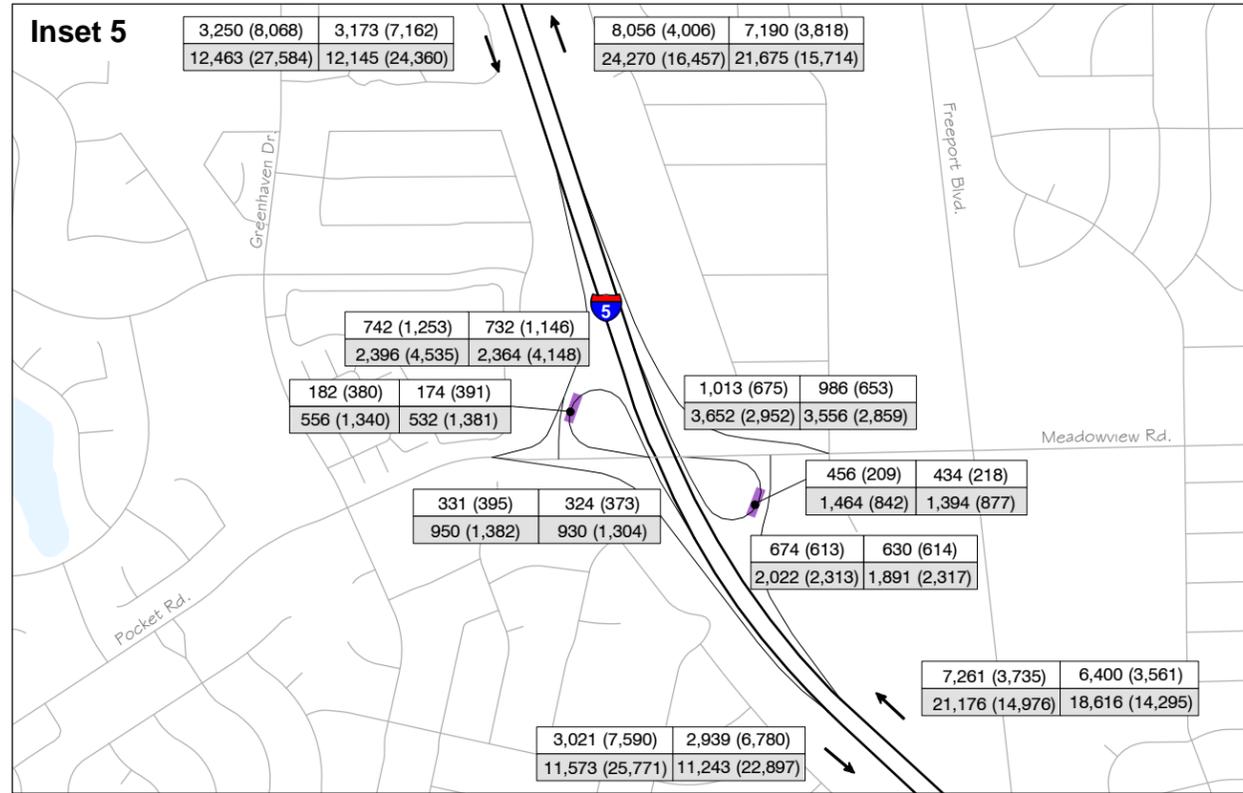
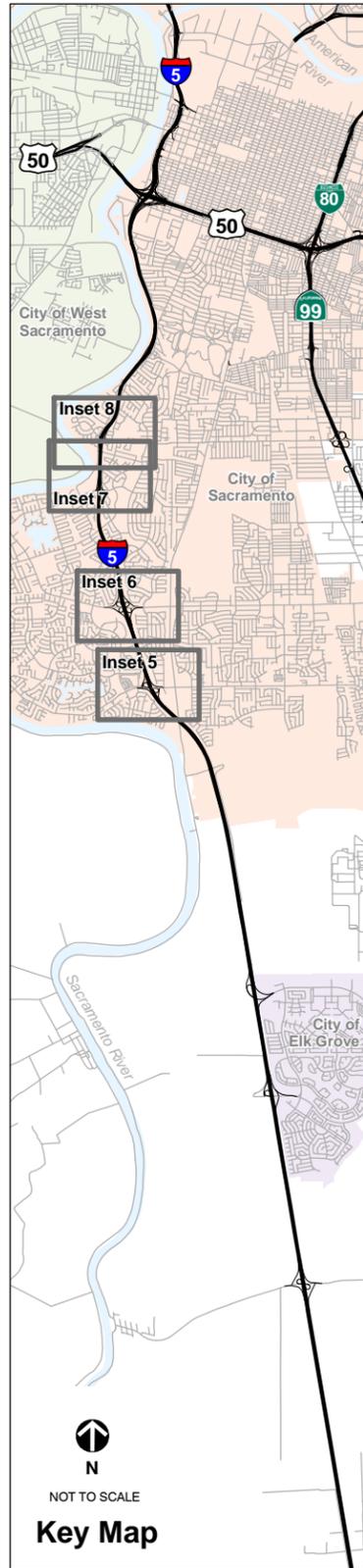


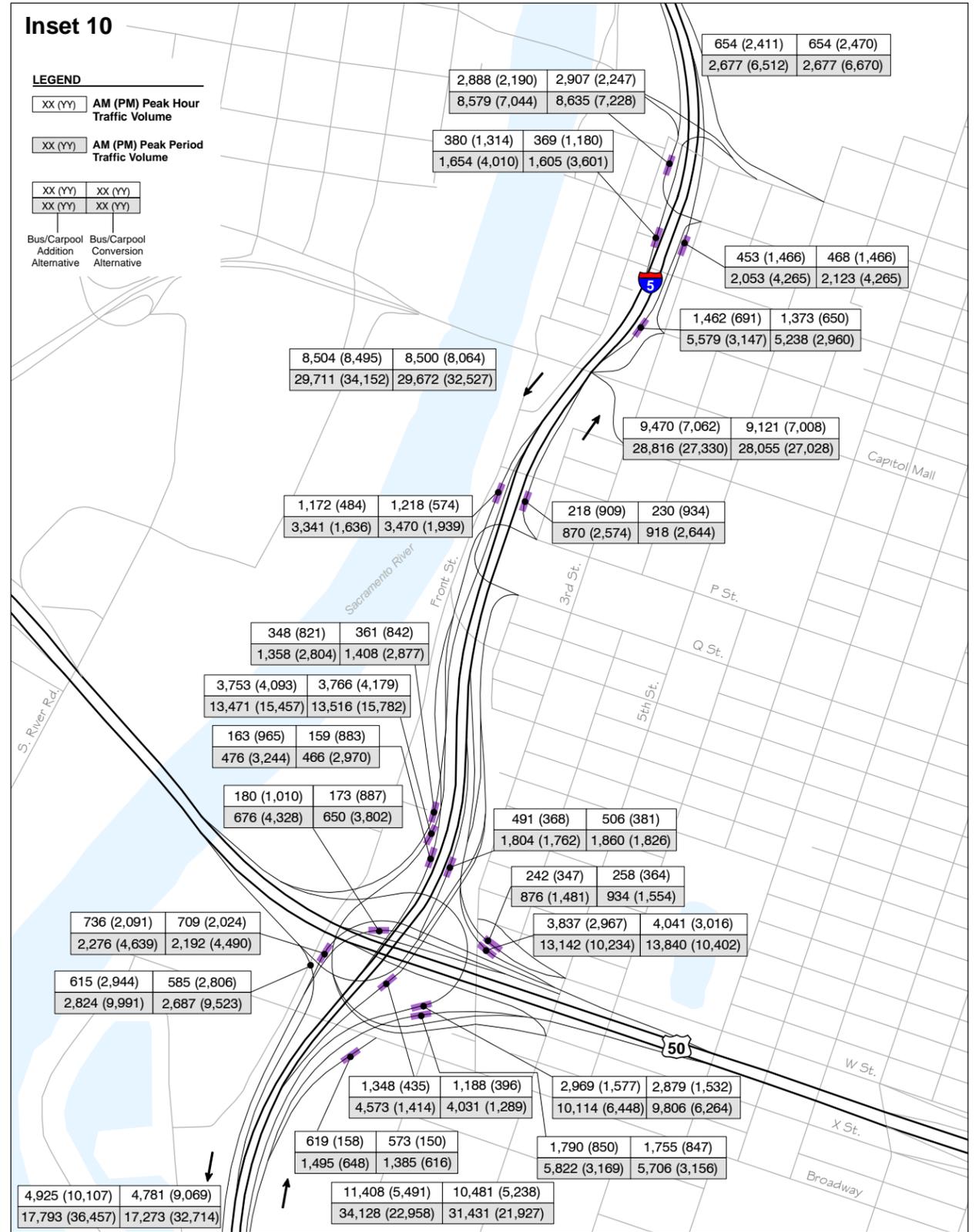
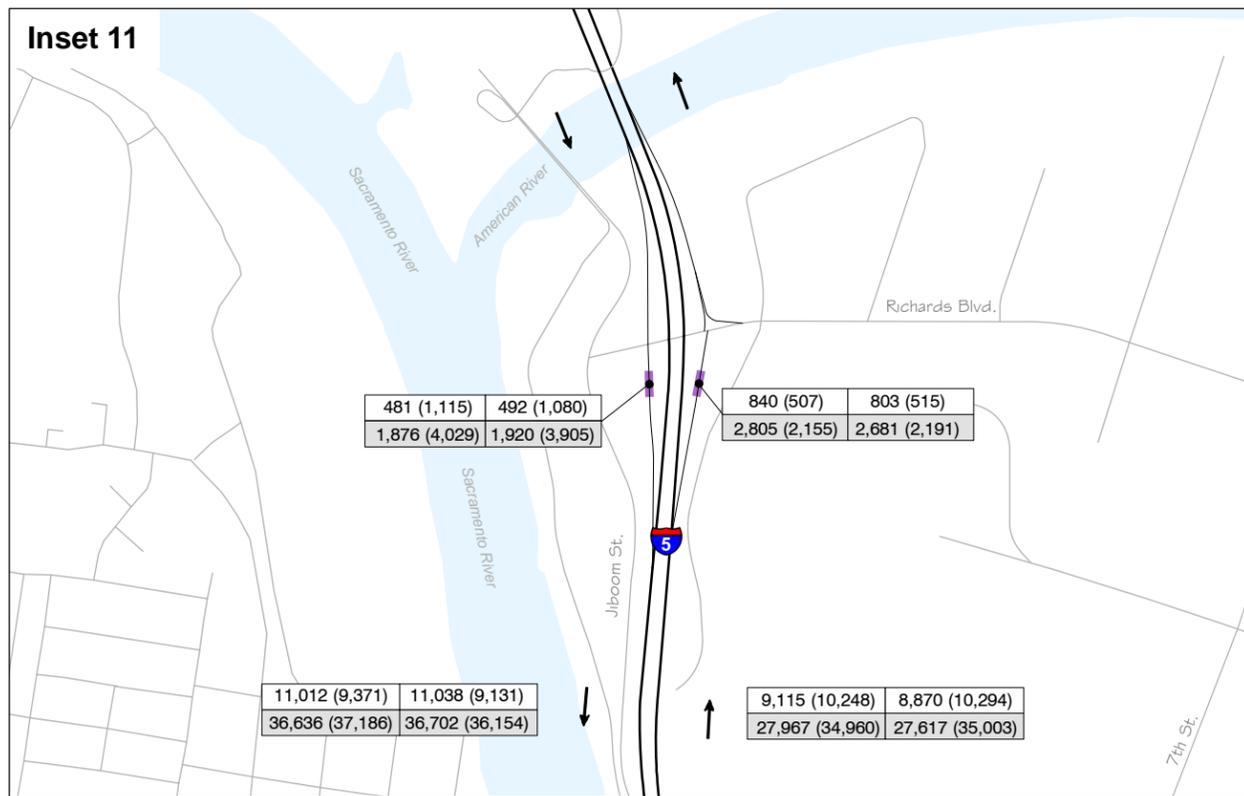
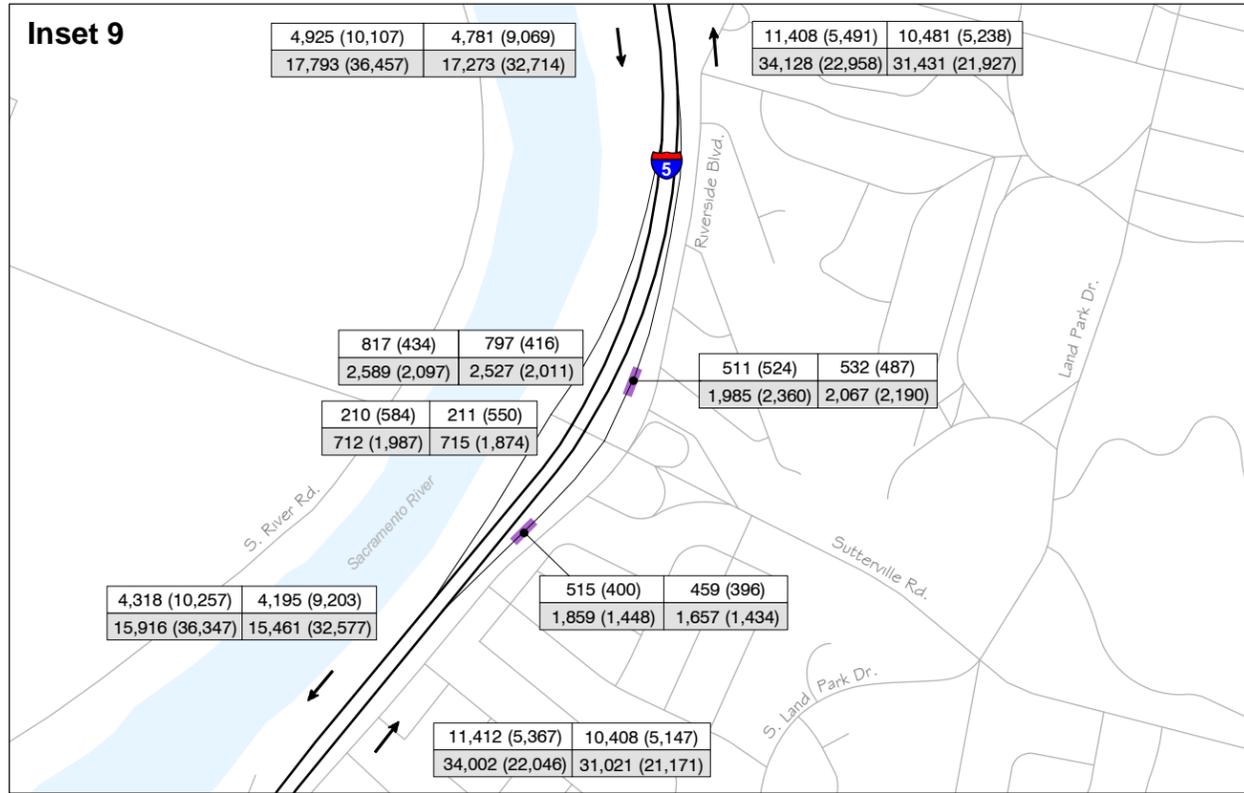
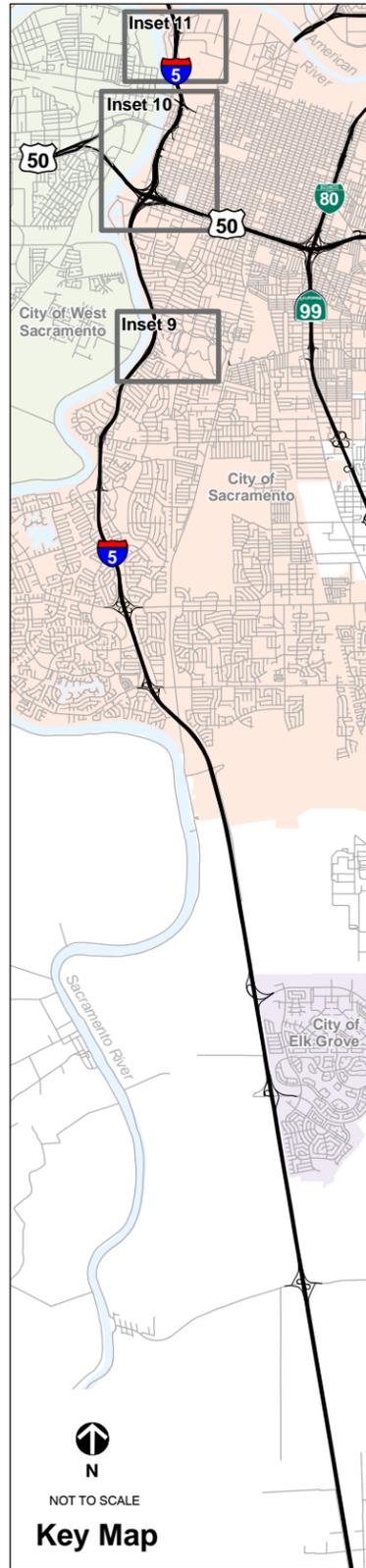


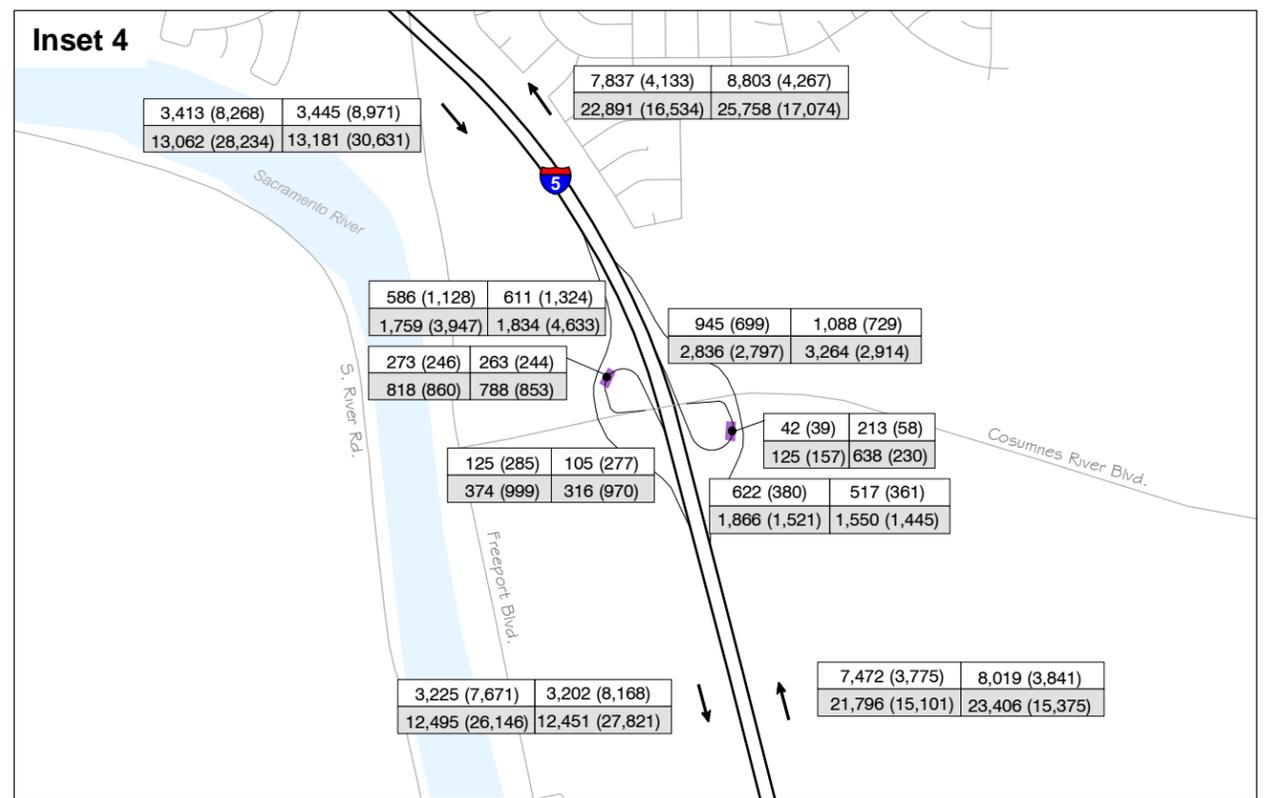
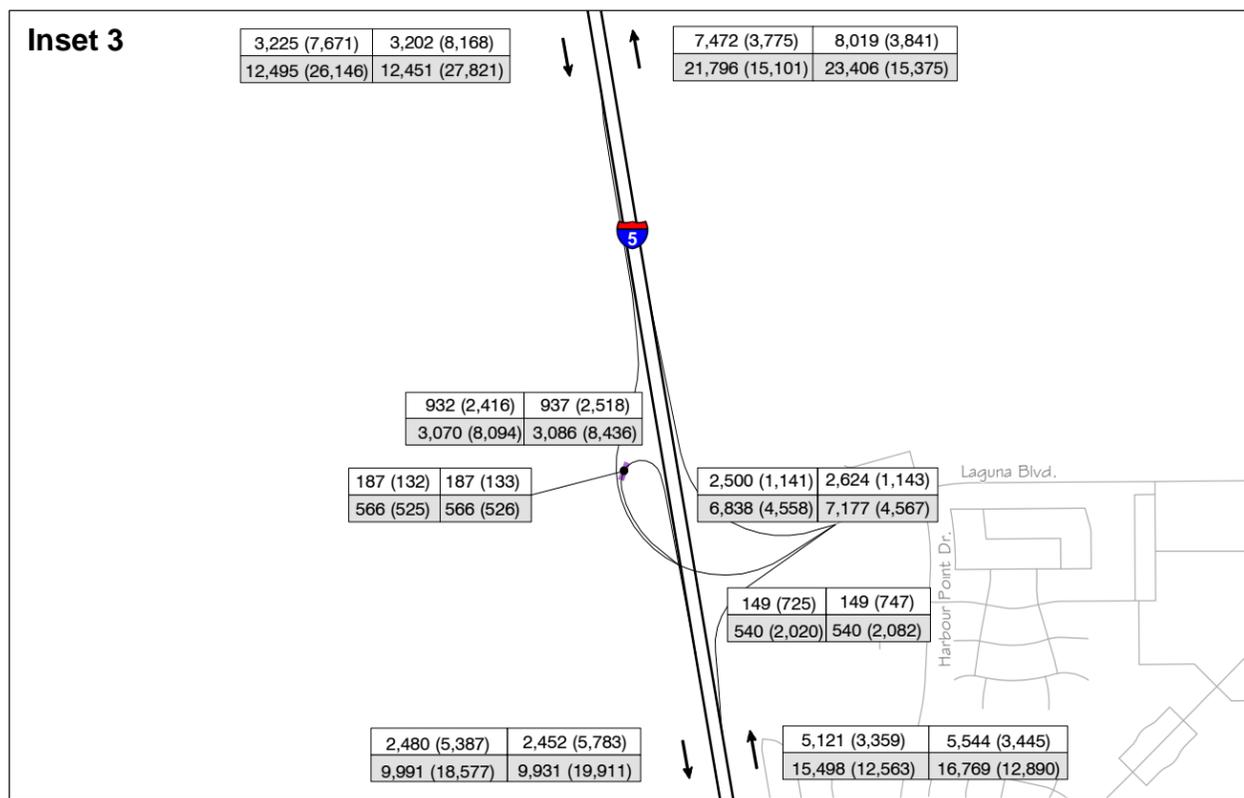
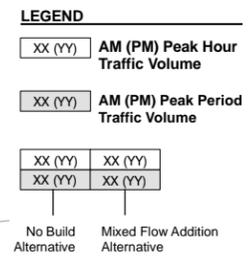
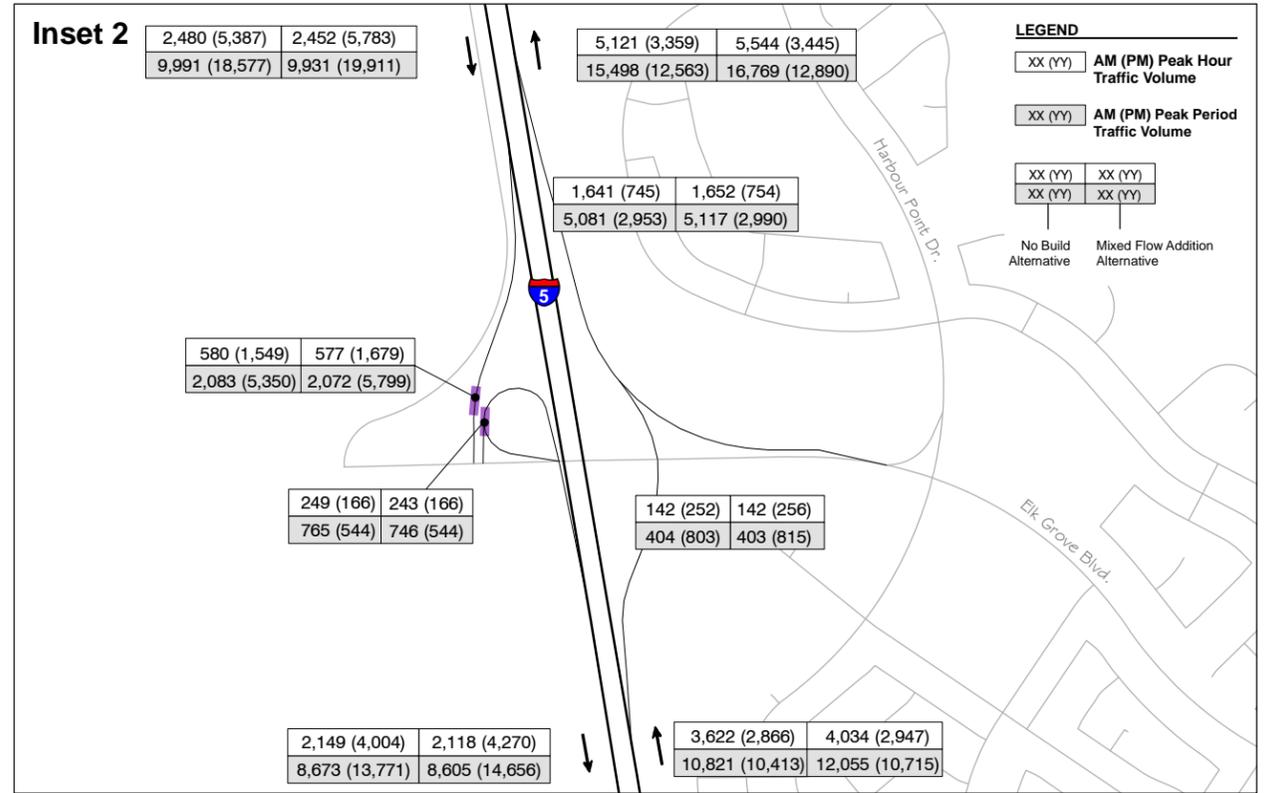
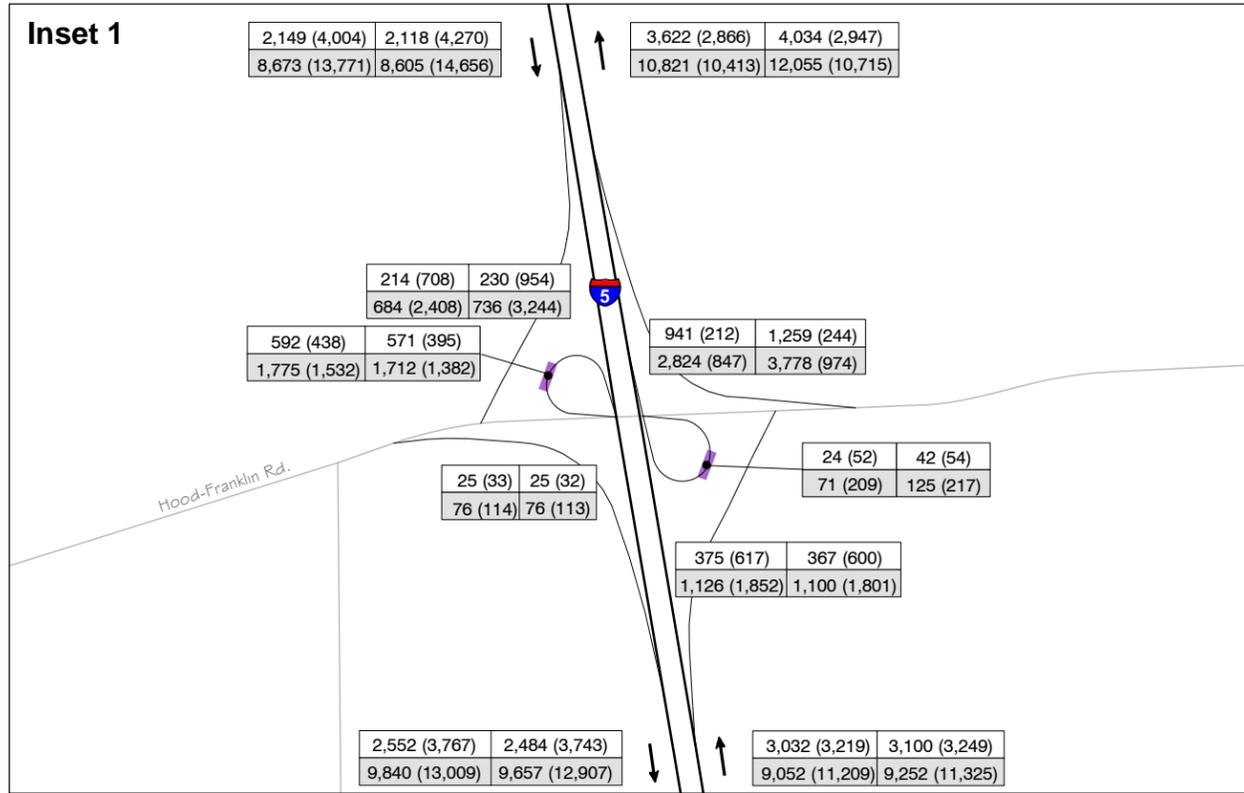
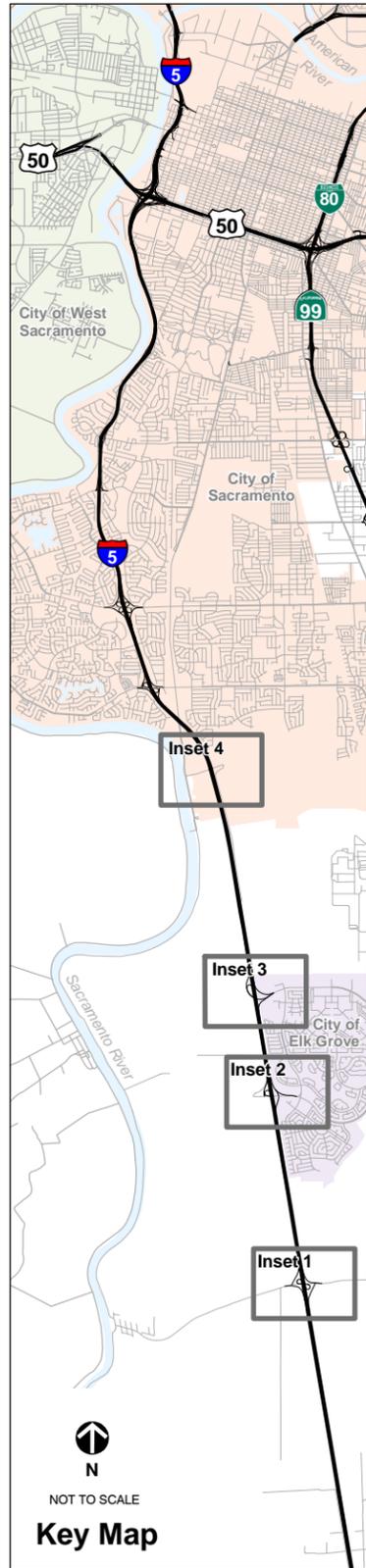


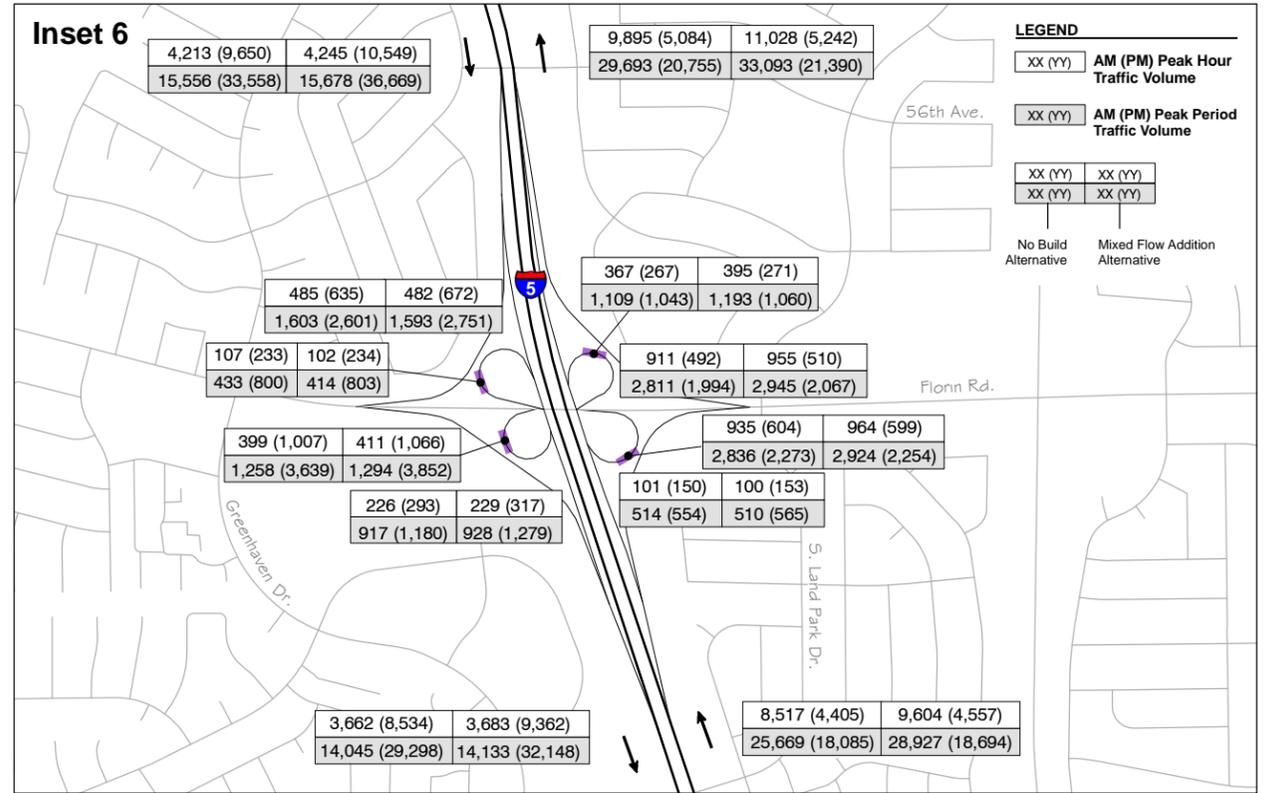
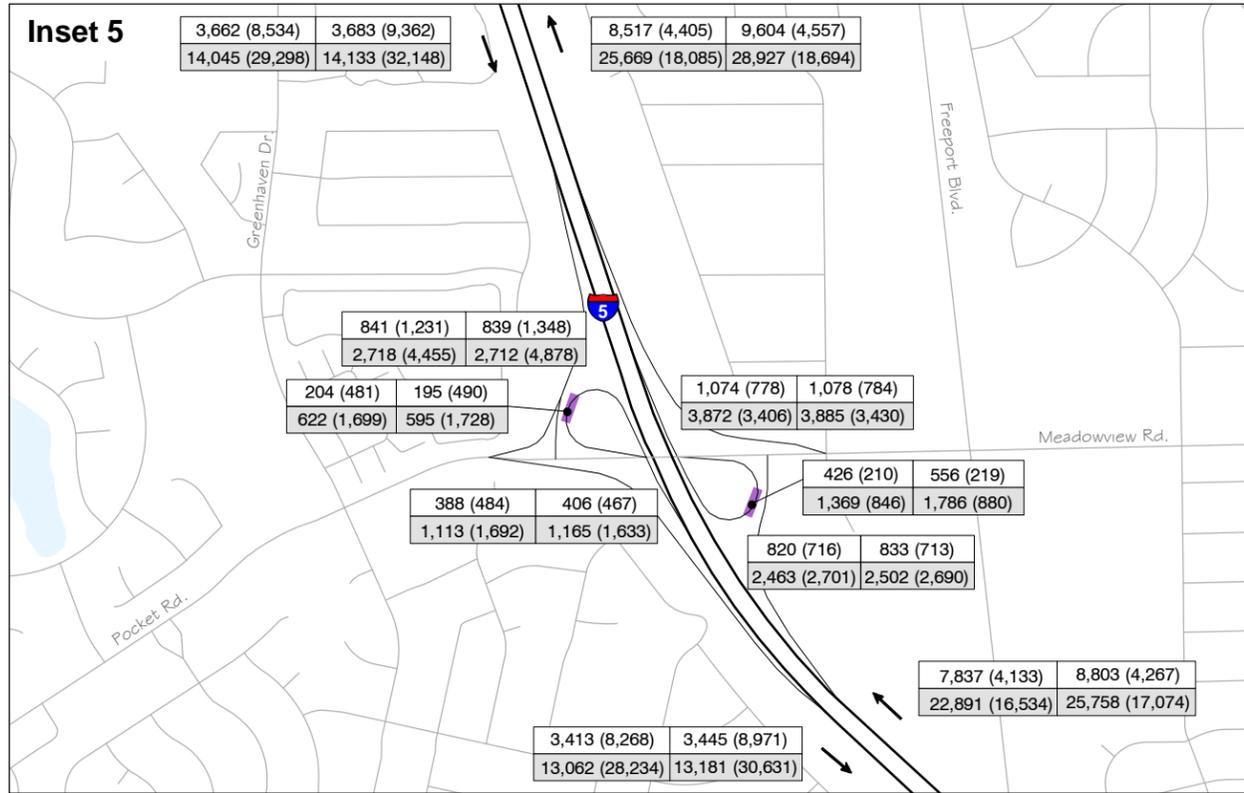
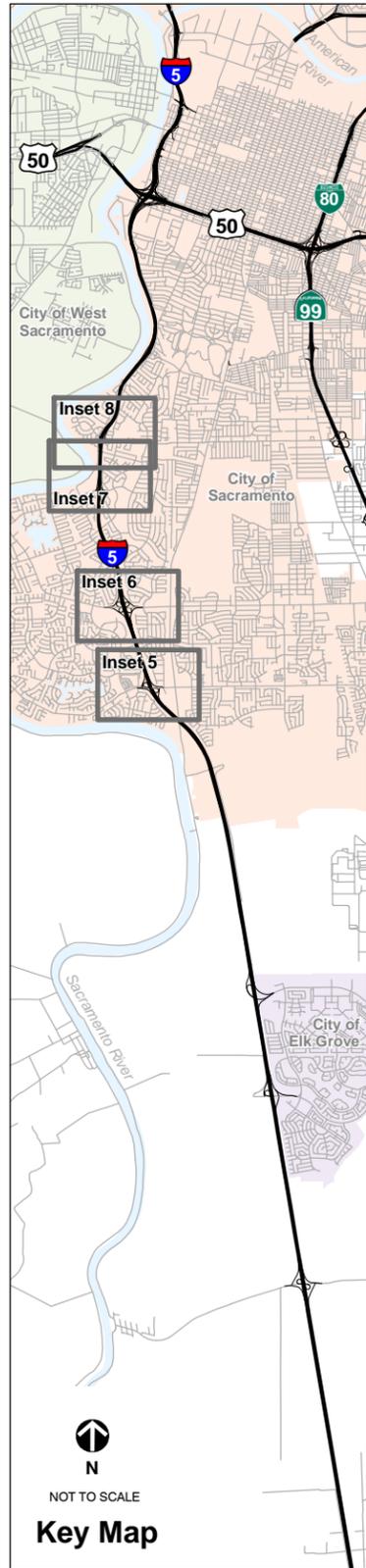








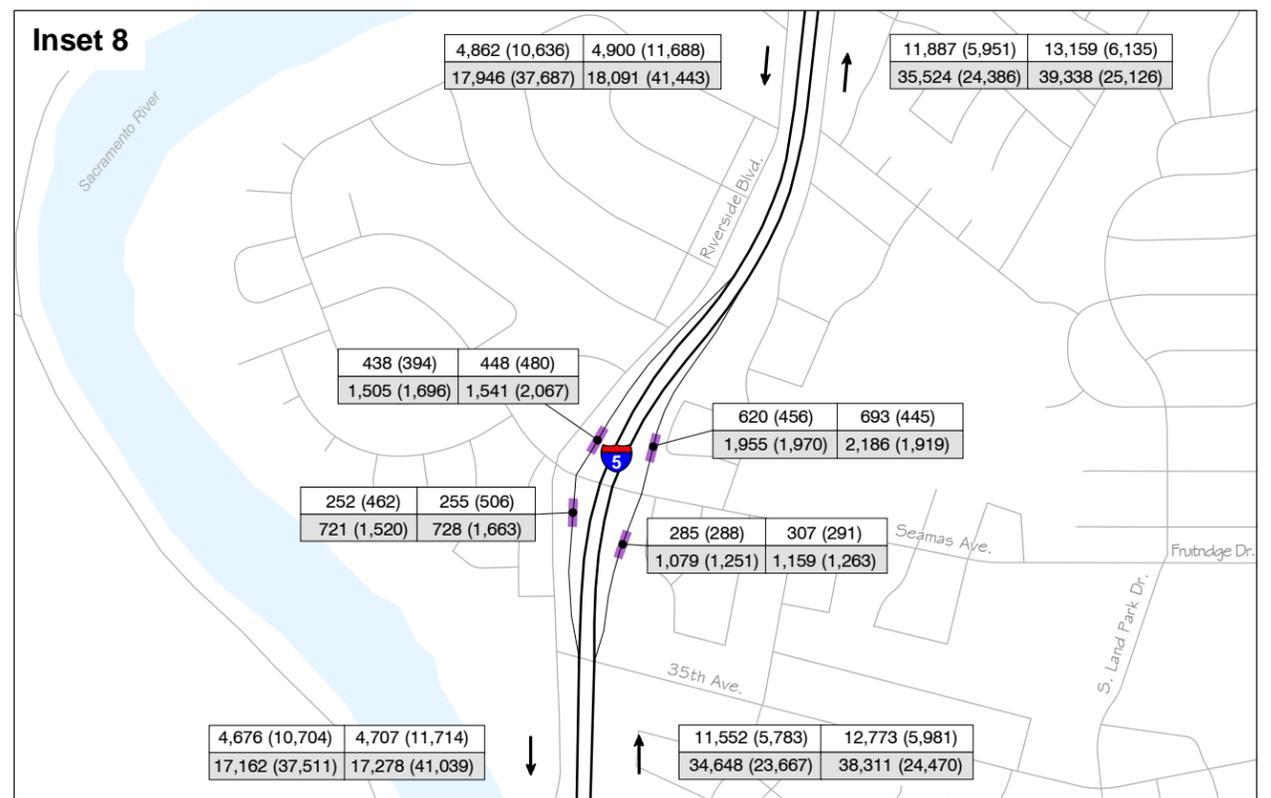
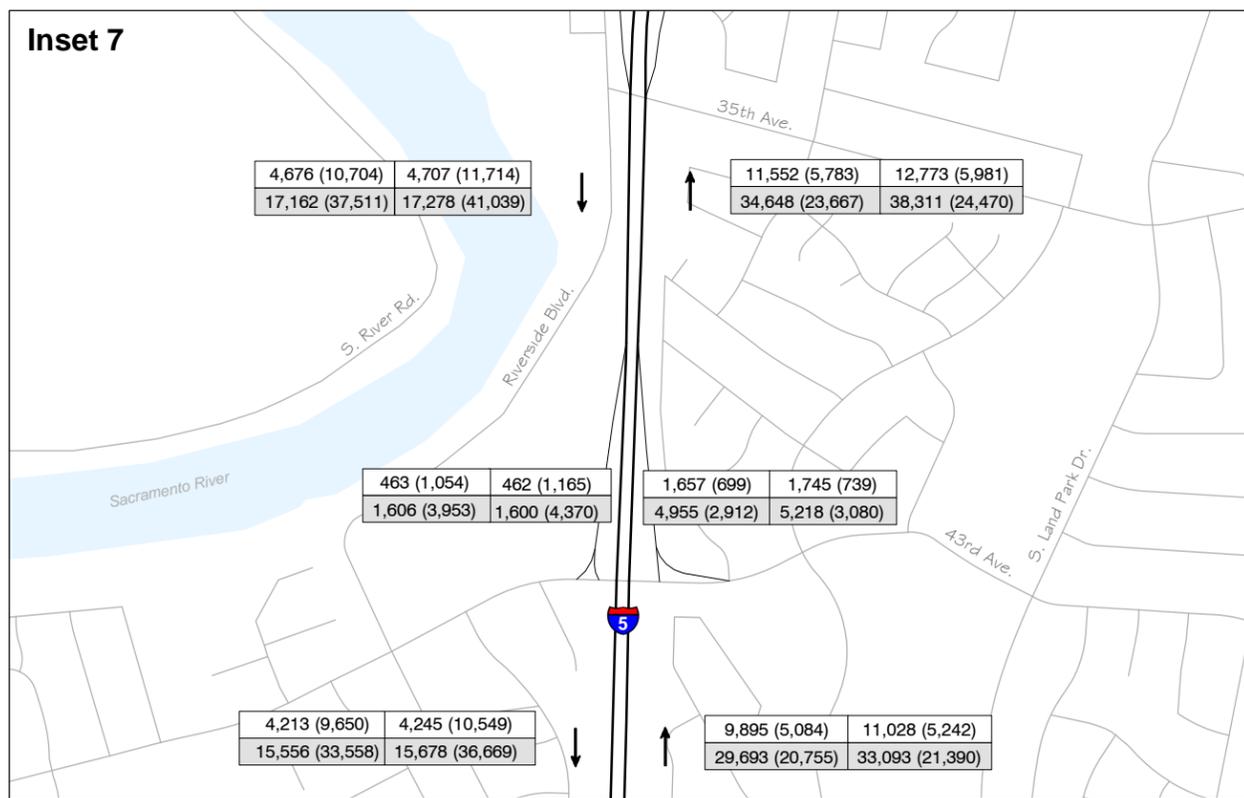


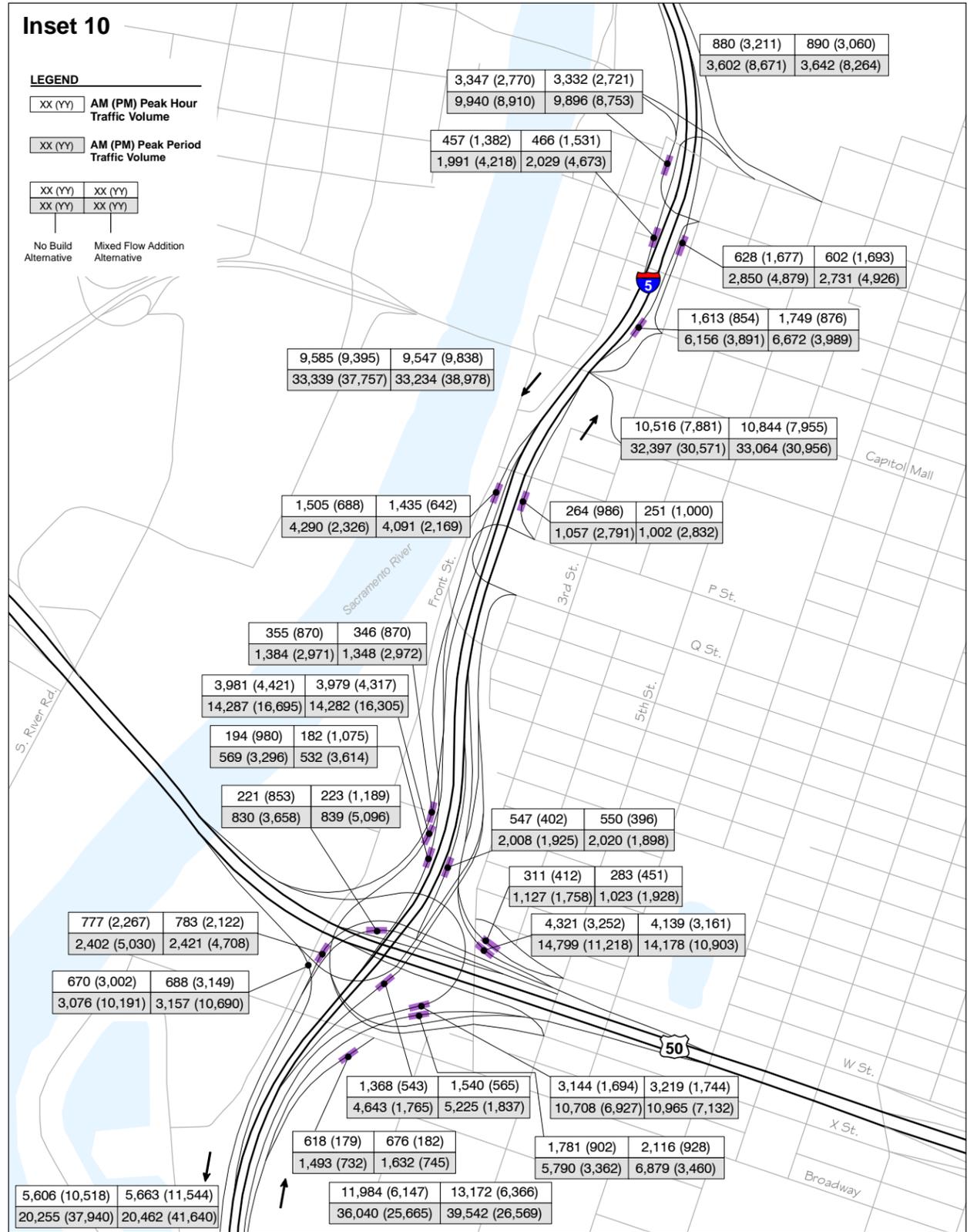
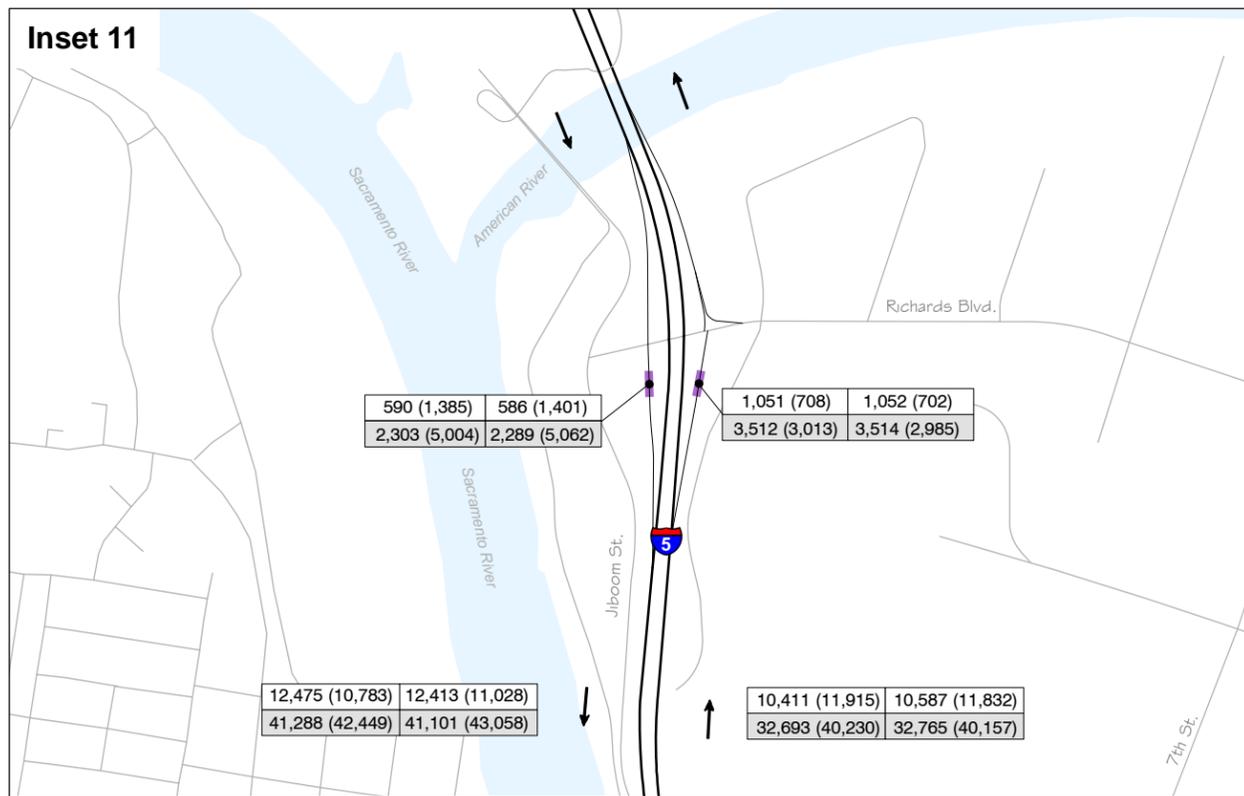
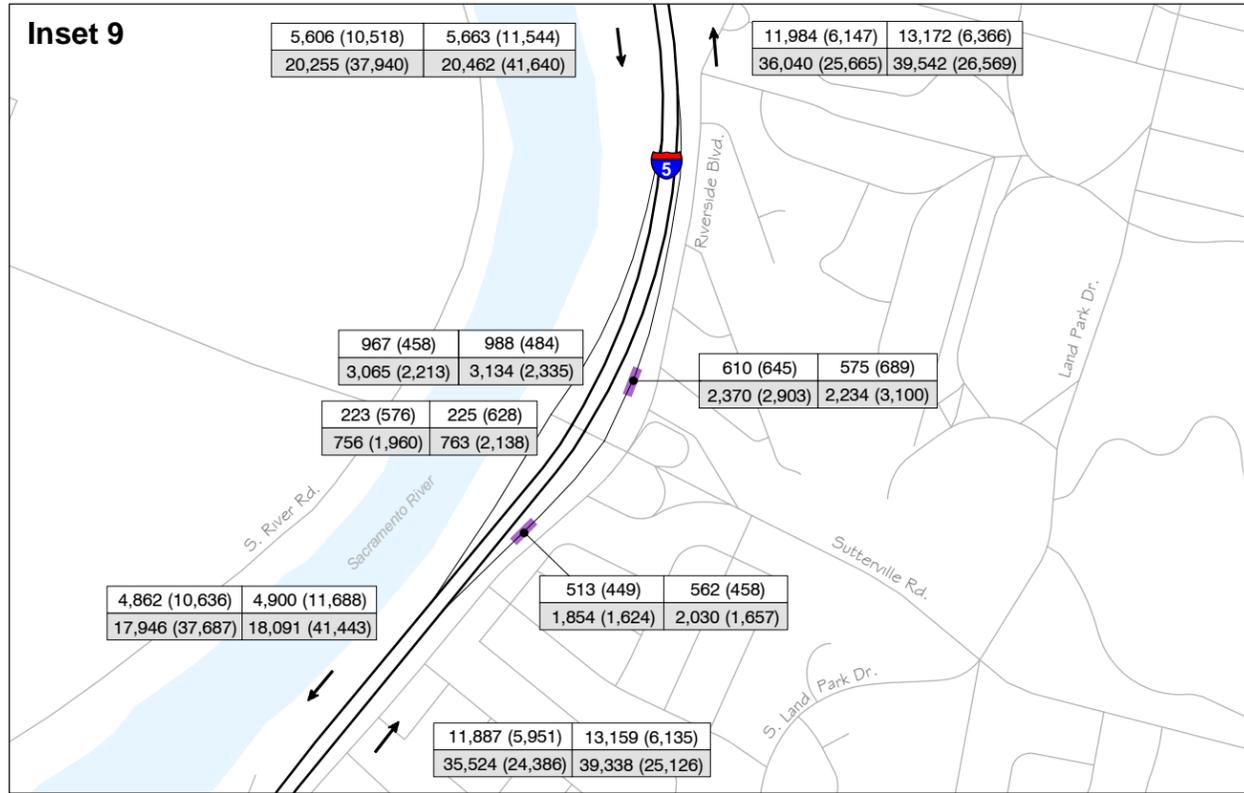
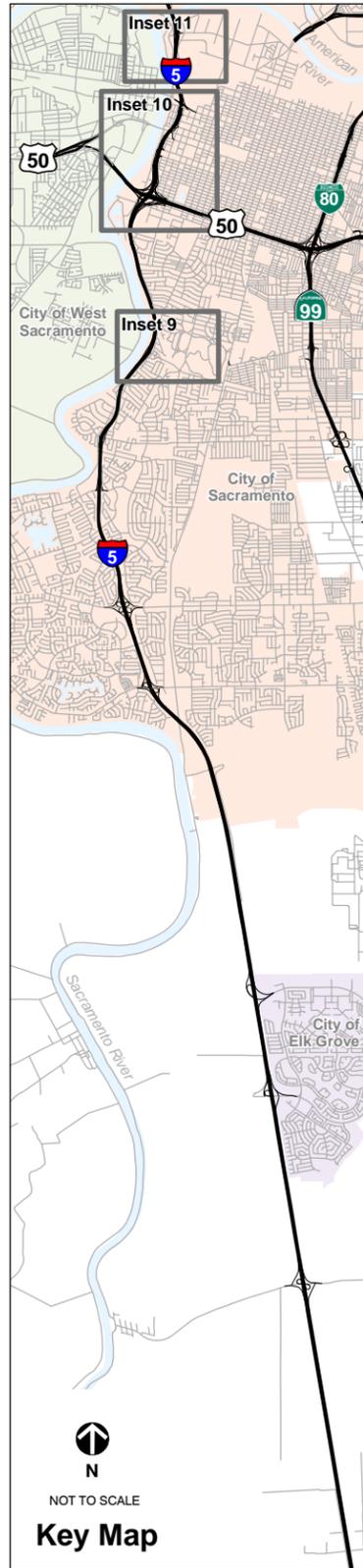


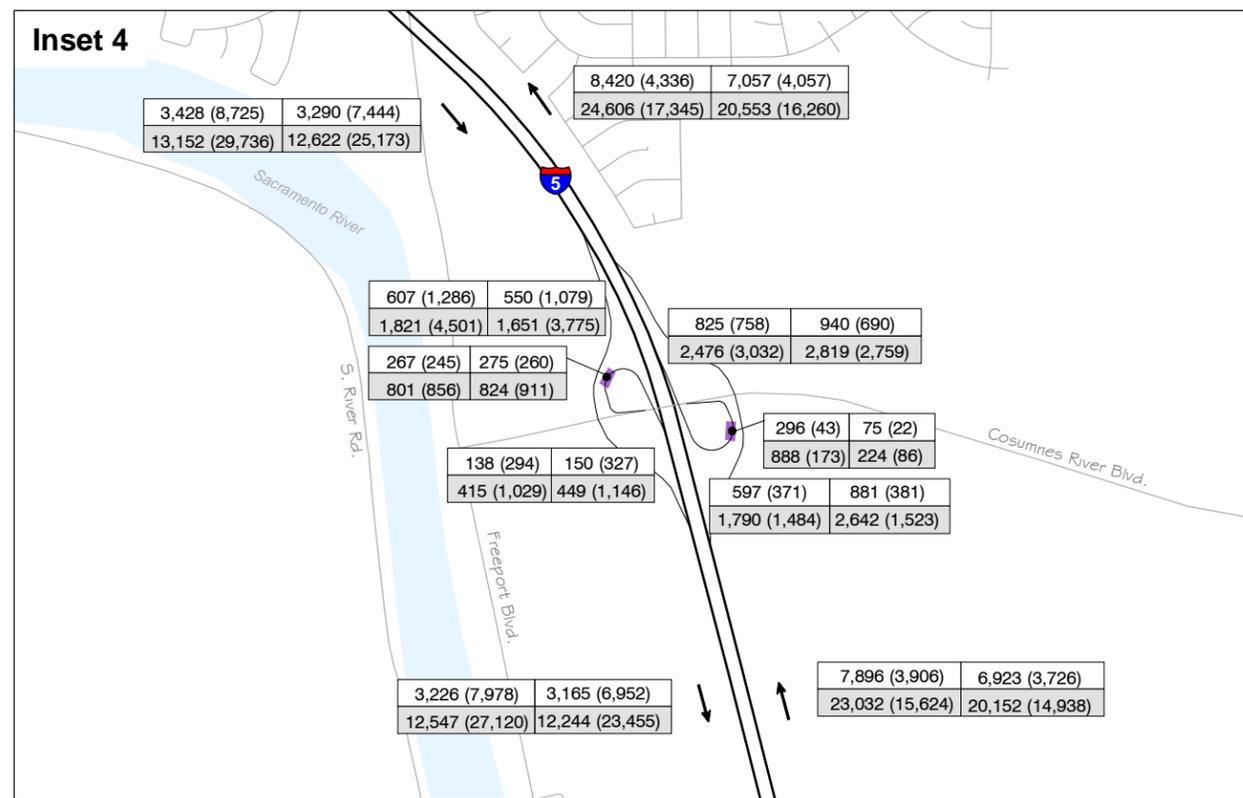
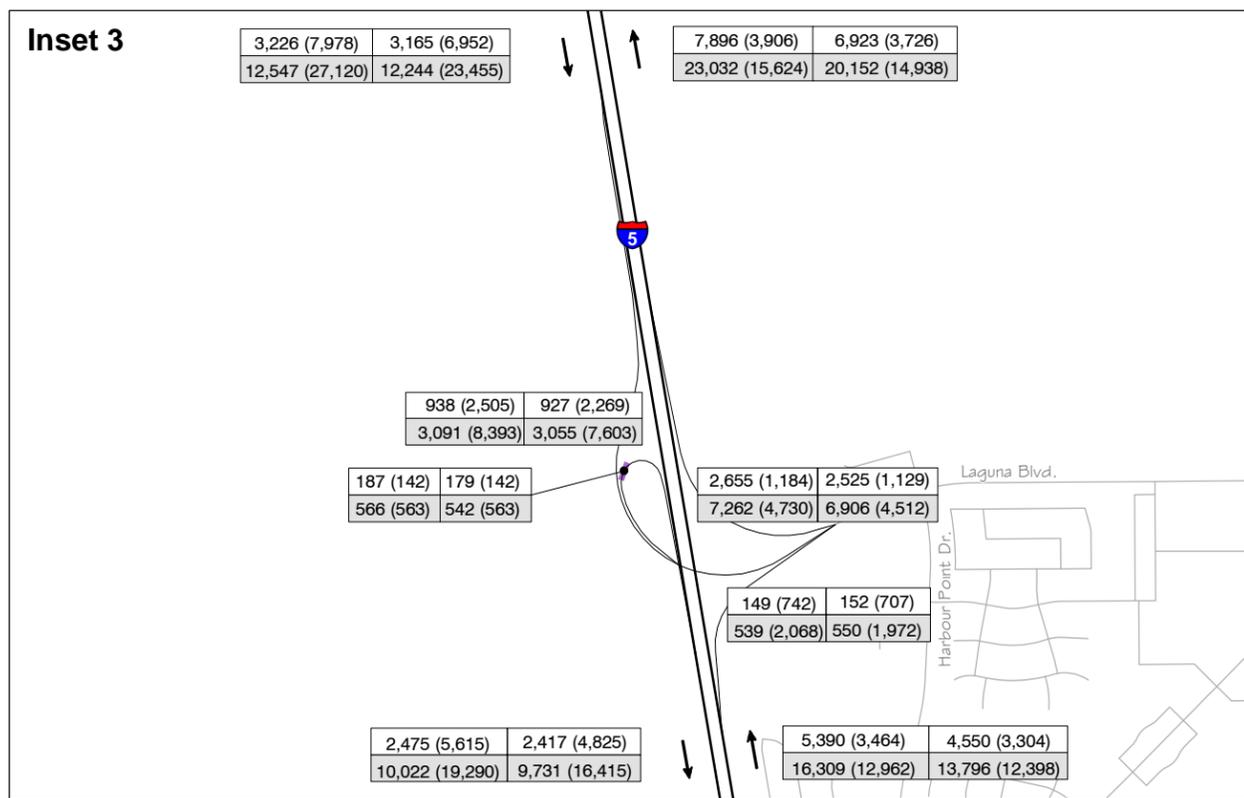
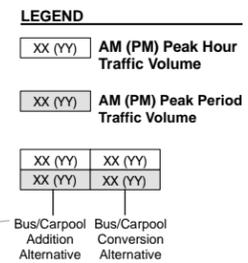
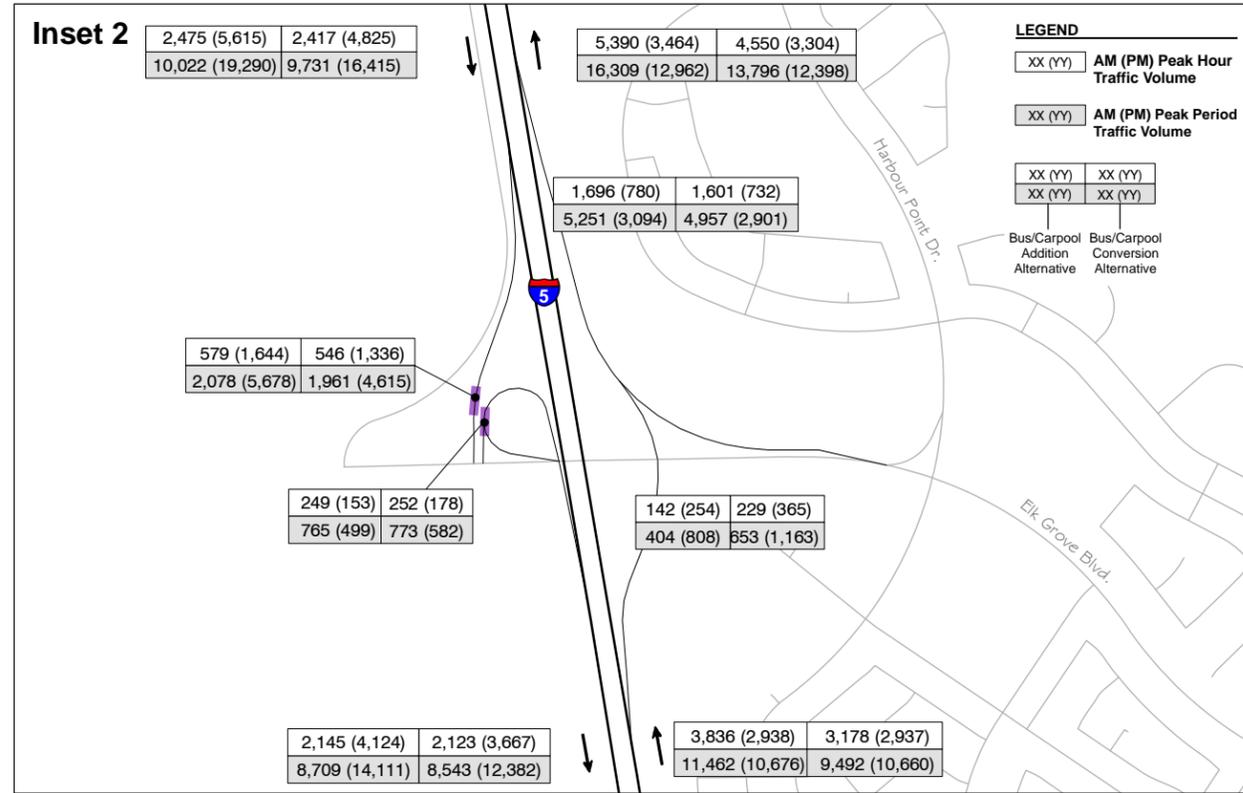
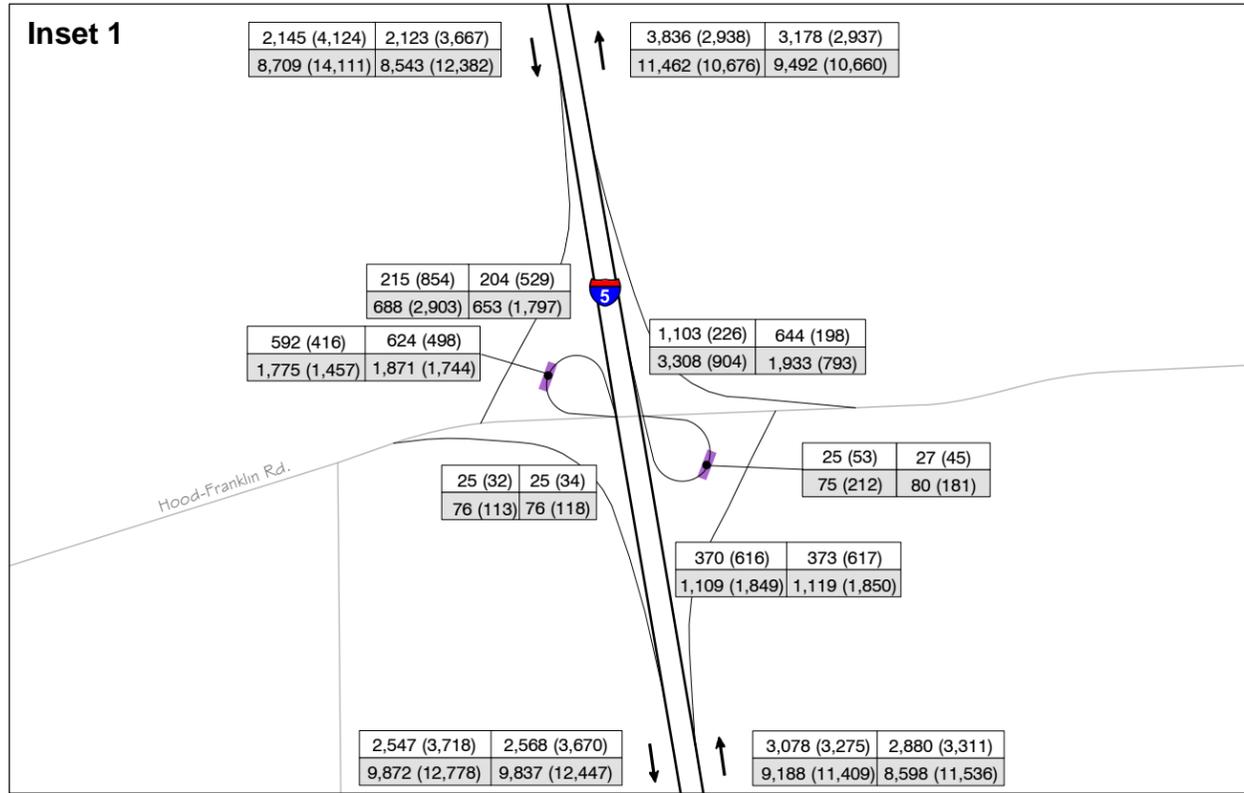
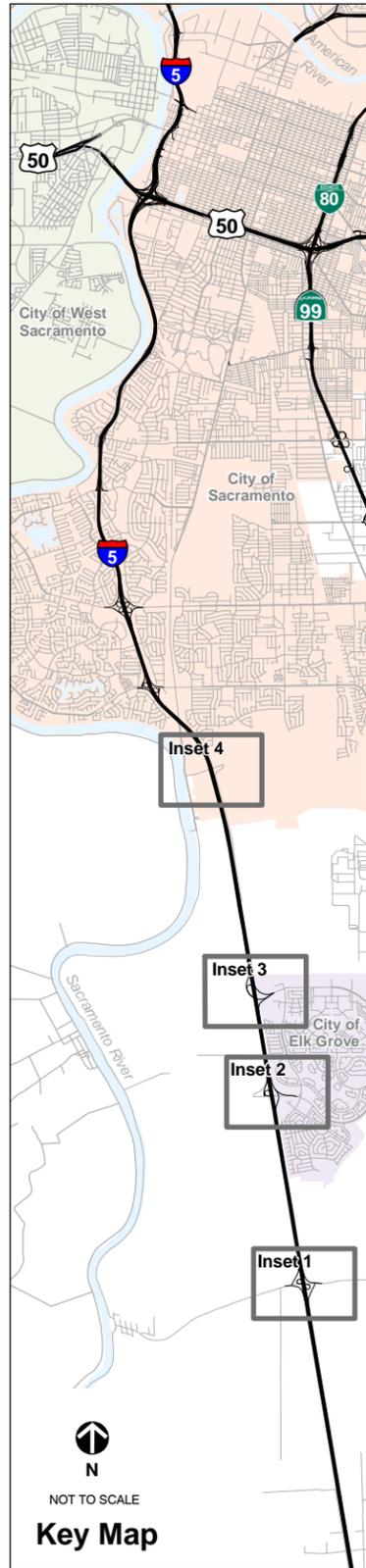
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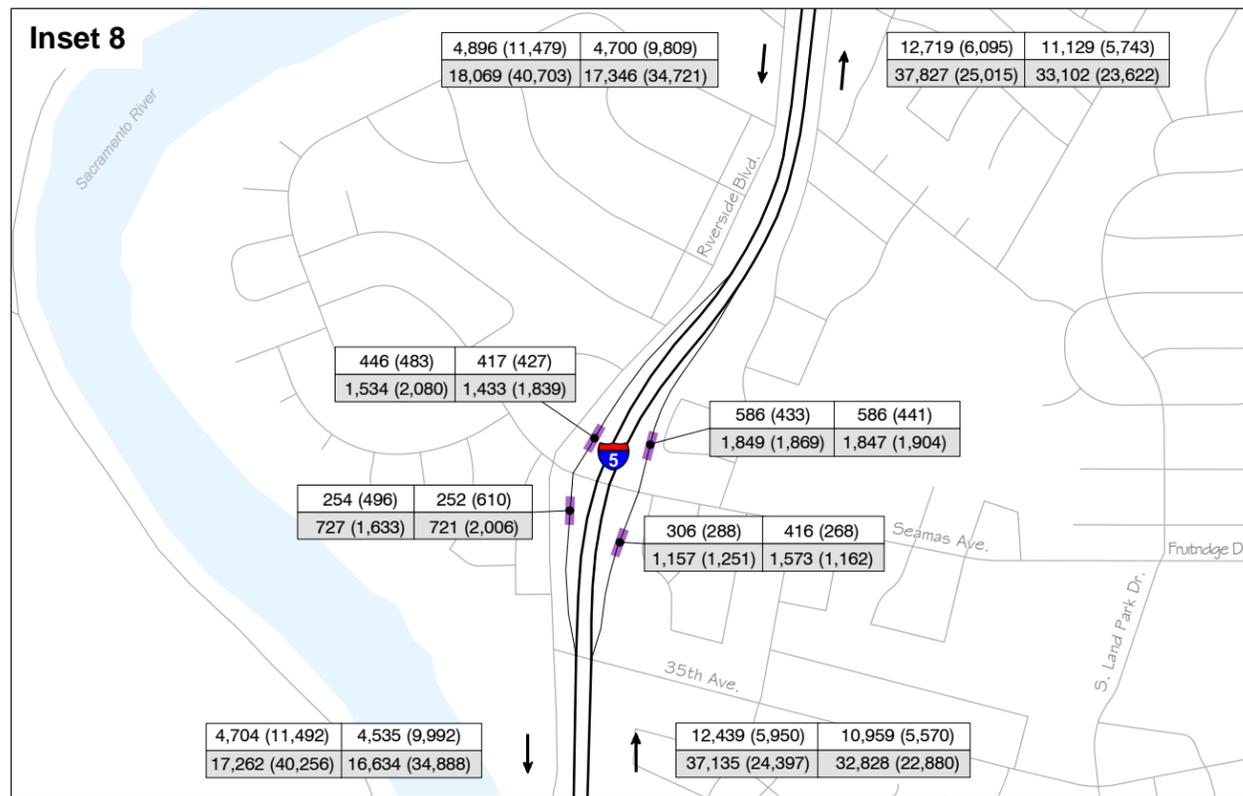
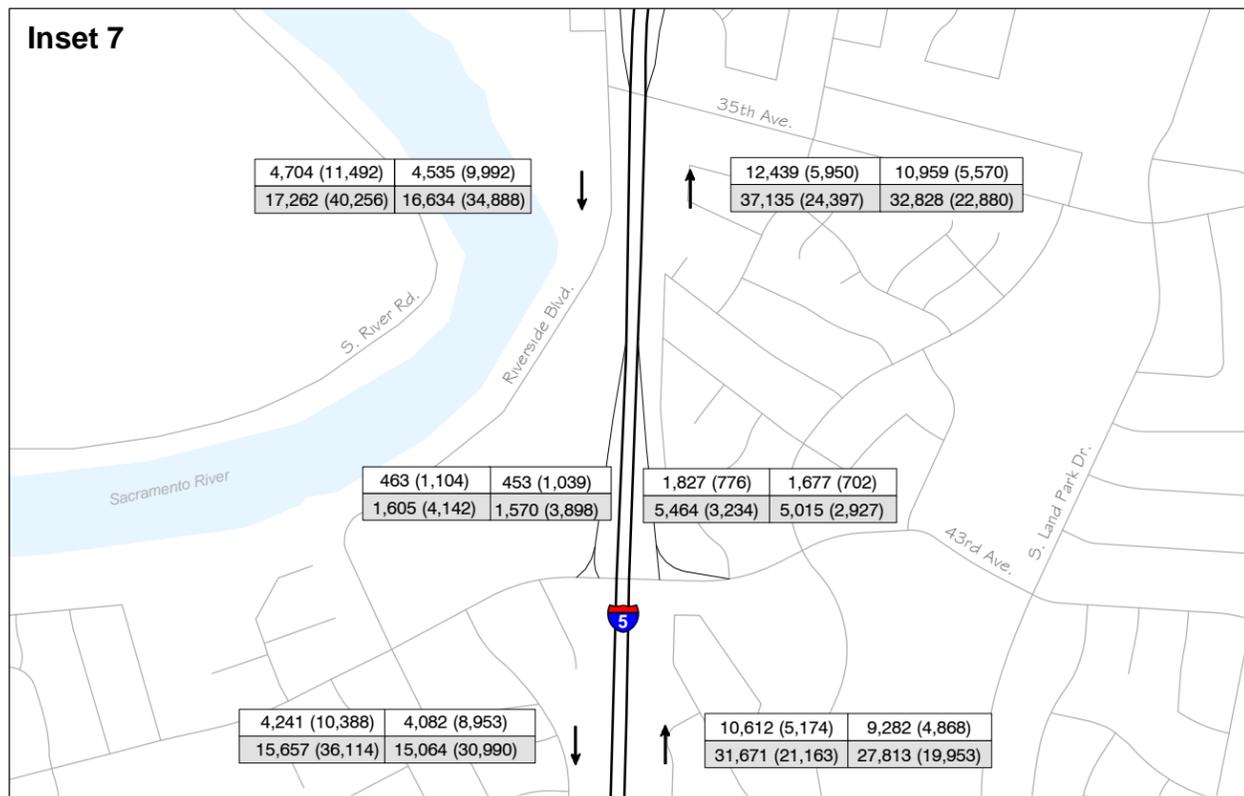
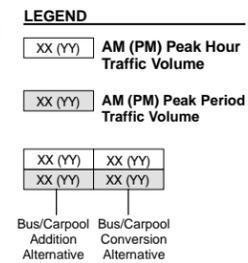
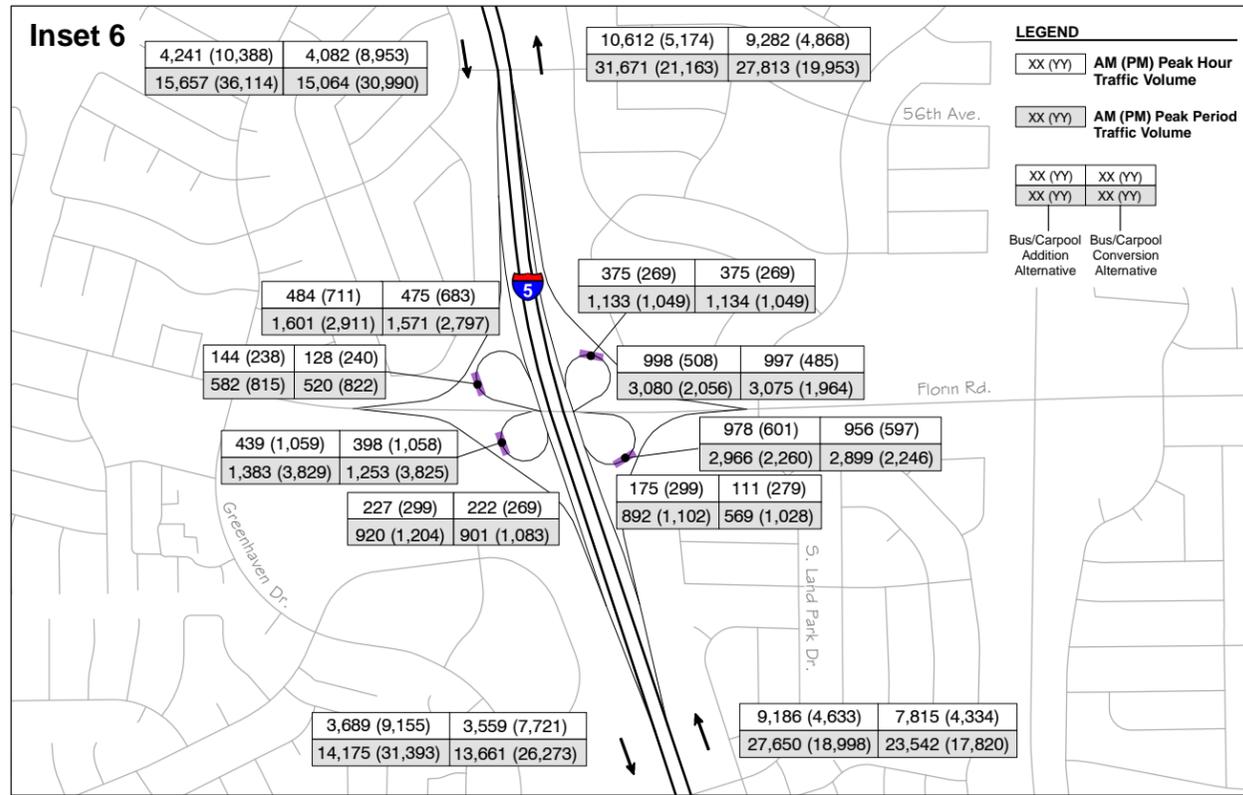
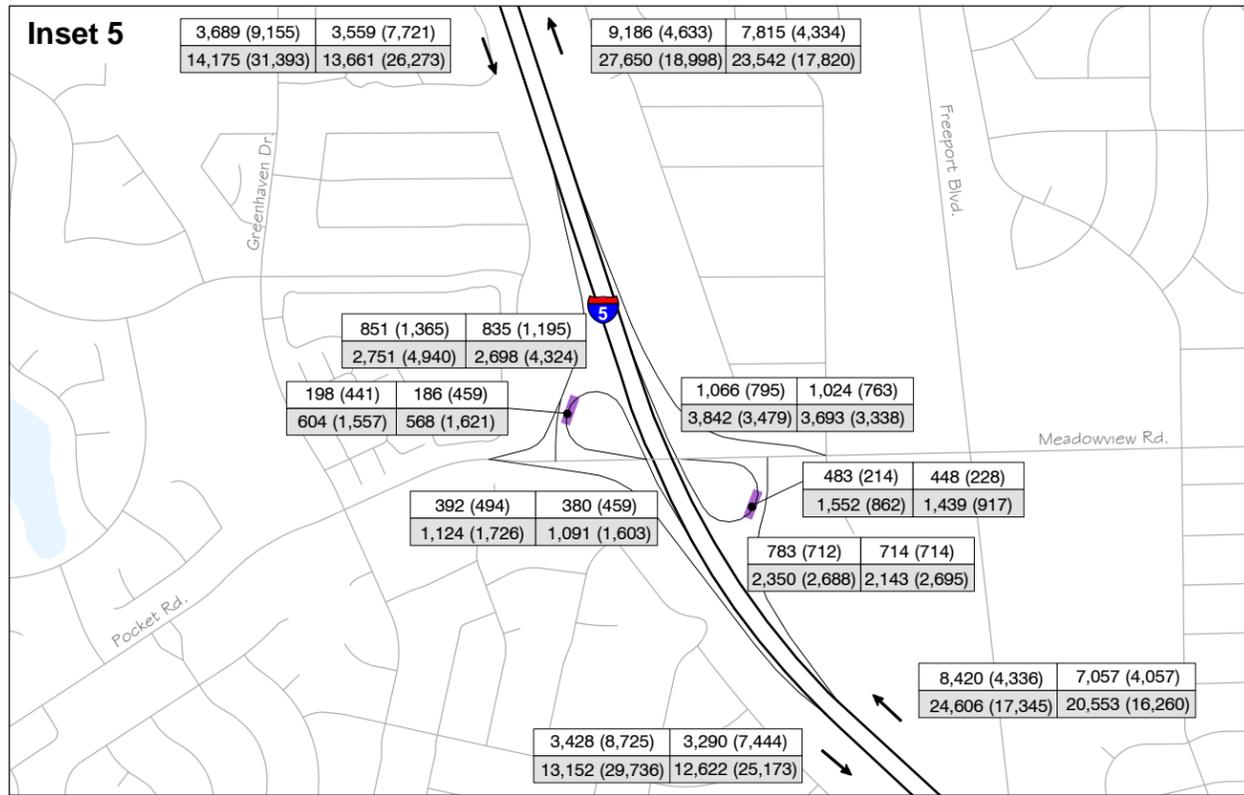
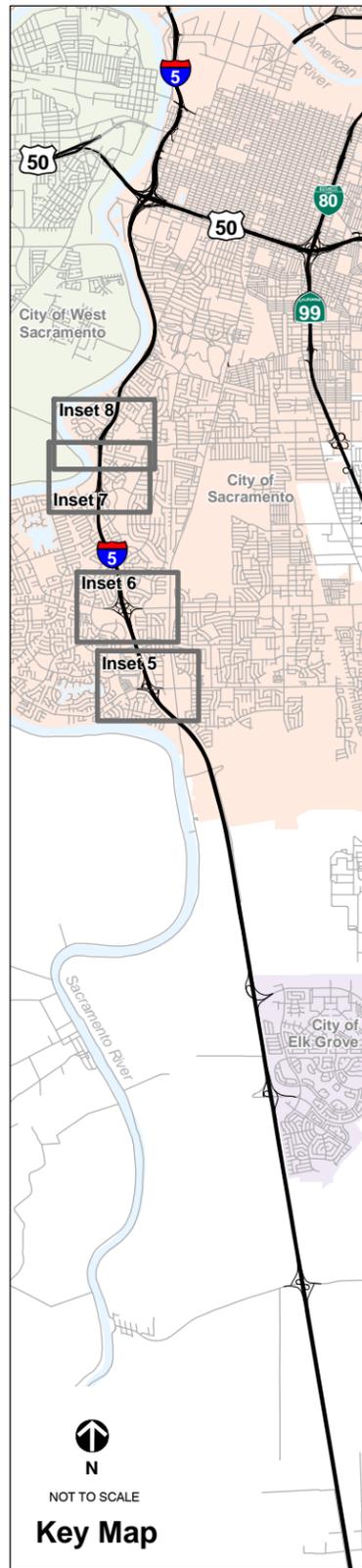
XX (YY)	AM (PM) Peak Hour Traffic Volume
XX (YY)	AM (PM) Peak Period Traffic Volume
XX (YY)	XX (YY)
XX (YY)	XX (YY)

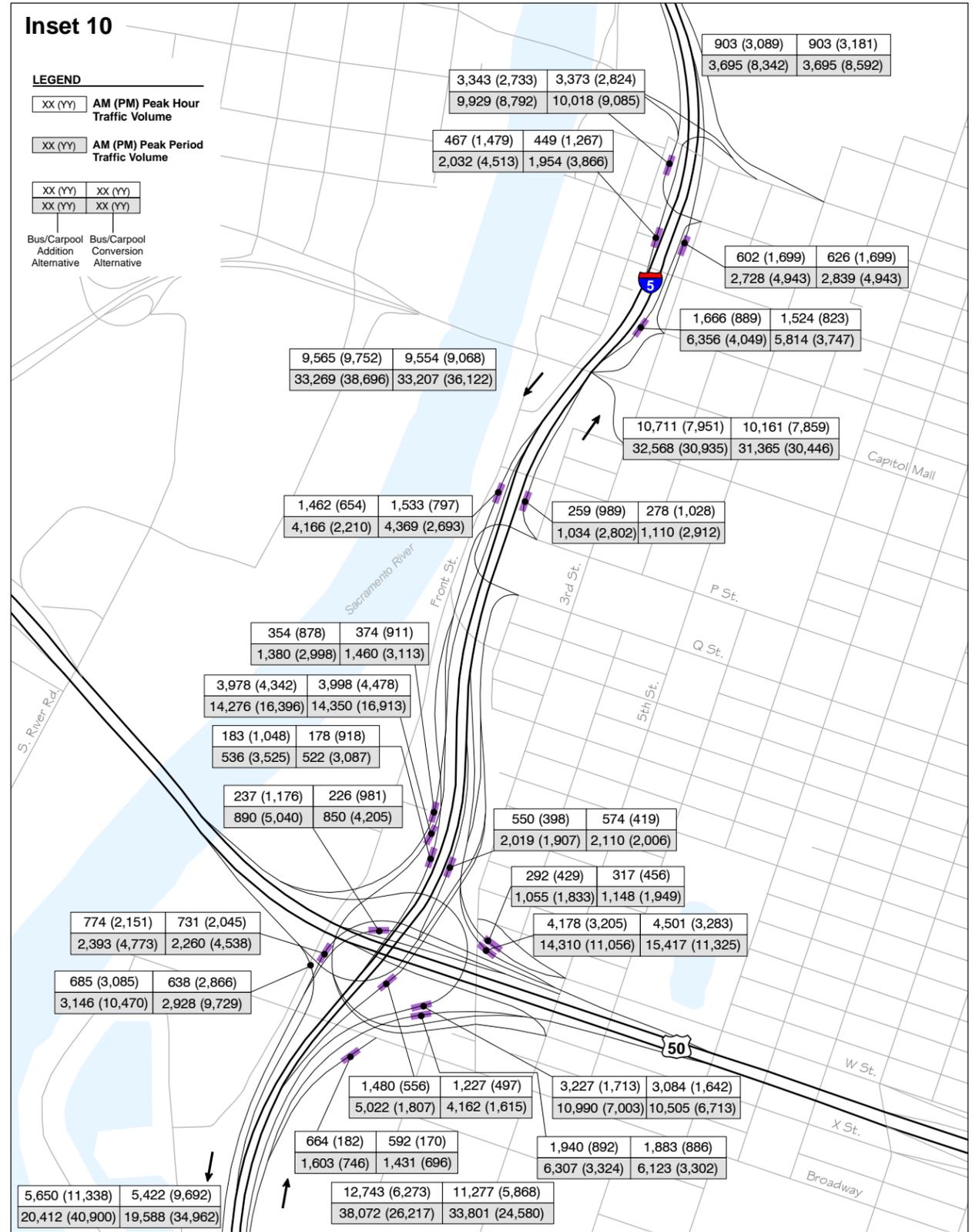
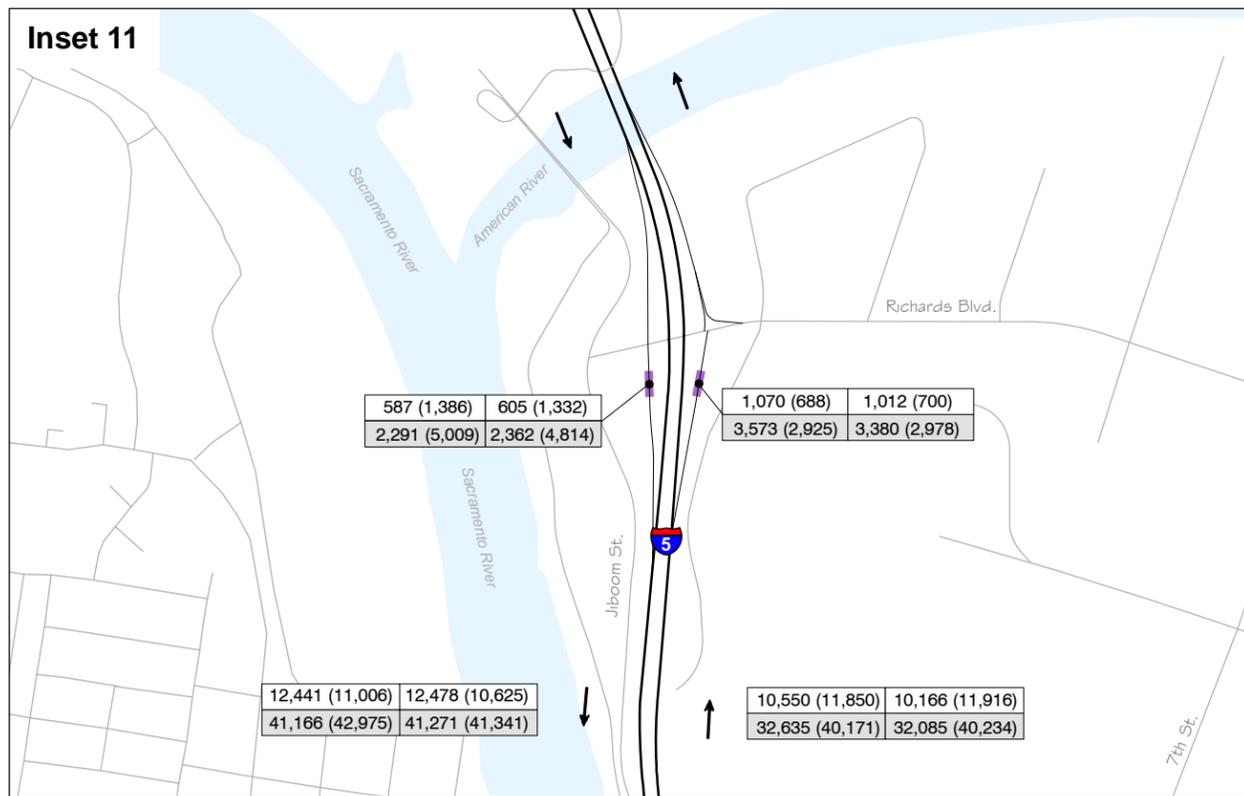
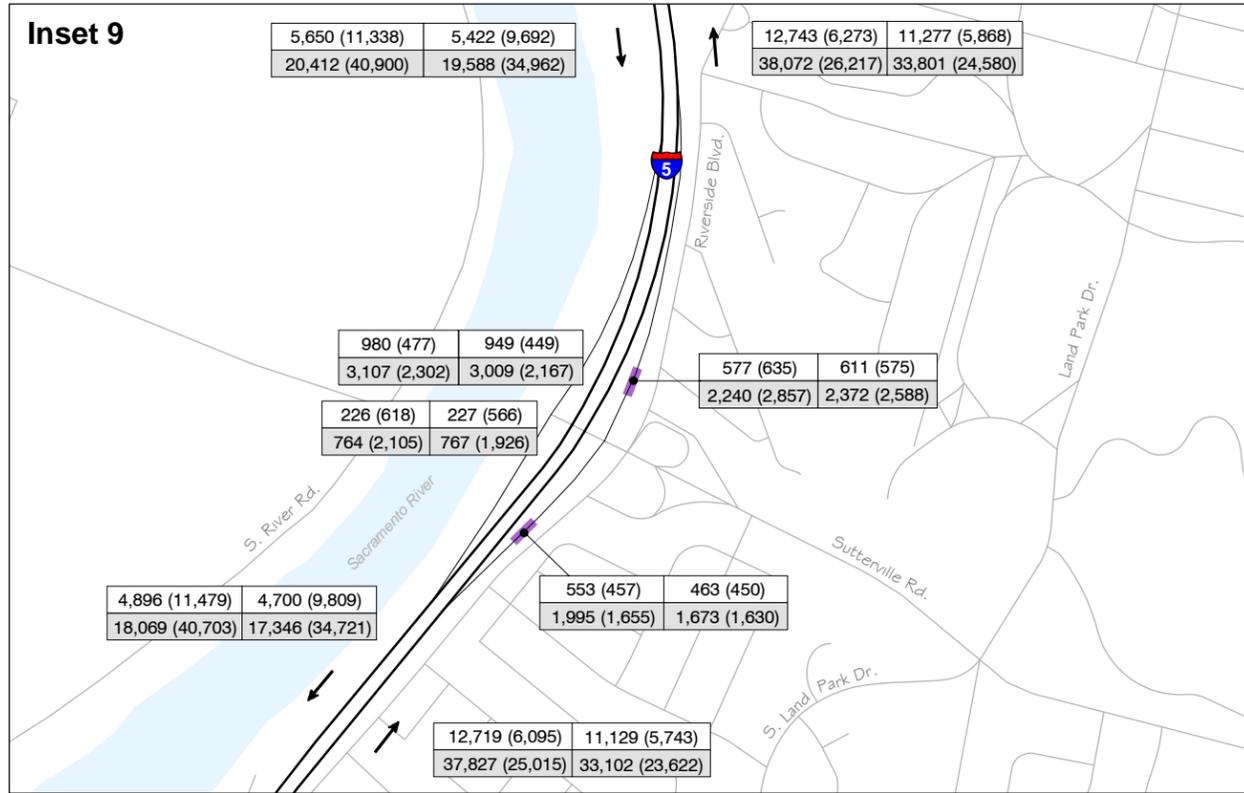
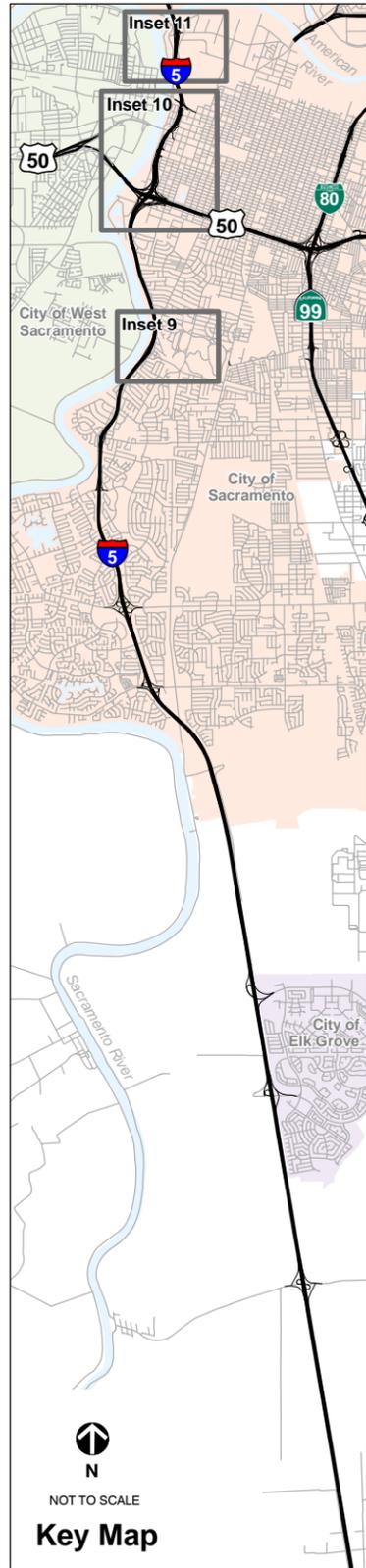
No Build Alternative      Mixed Flow Addition Alternative











## 4. PROJECT ALTERNATIVES

This report analyzes the following project alternatives under all three analysis years.

- No Build Alternative
- Mixed Flow Addition Alternative
- Bus/Carpool Addition Alternative
- Bus/Carpool Conversion Alternative

Each of these alternatives is described further below followed by descriptions of other planned projects in the study area.

### NO BUILD ALTERNATIVE

For the No Build Alternative, the I-5 corridor from Hood Franklin Road to US-50 would maintain the existing cross-section as shown in Figure 7. However, other planned projects are assumed to be built: the I-5/Cosumnes River Boulevard interchange and ramp meters for most on-ramps in the study area (these projects are described in more detail below).

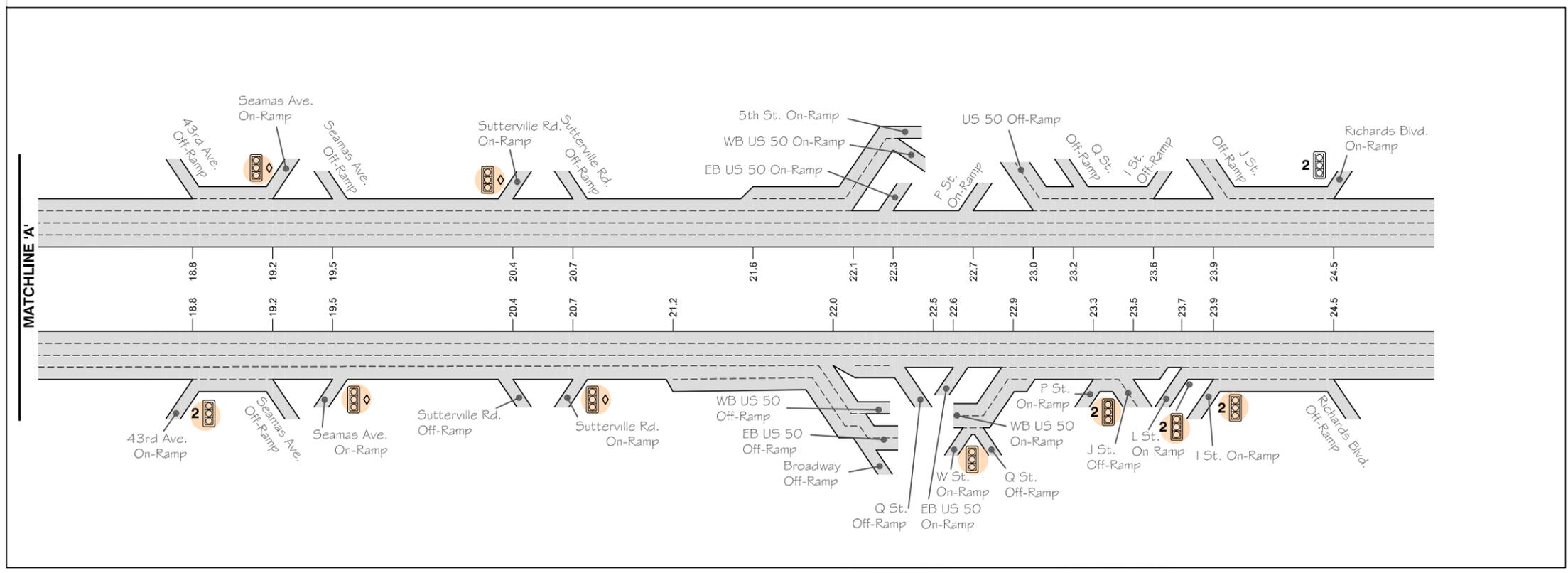
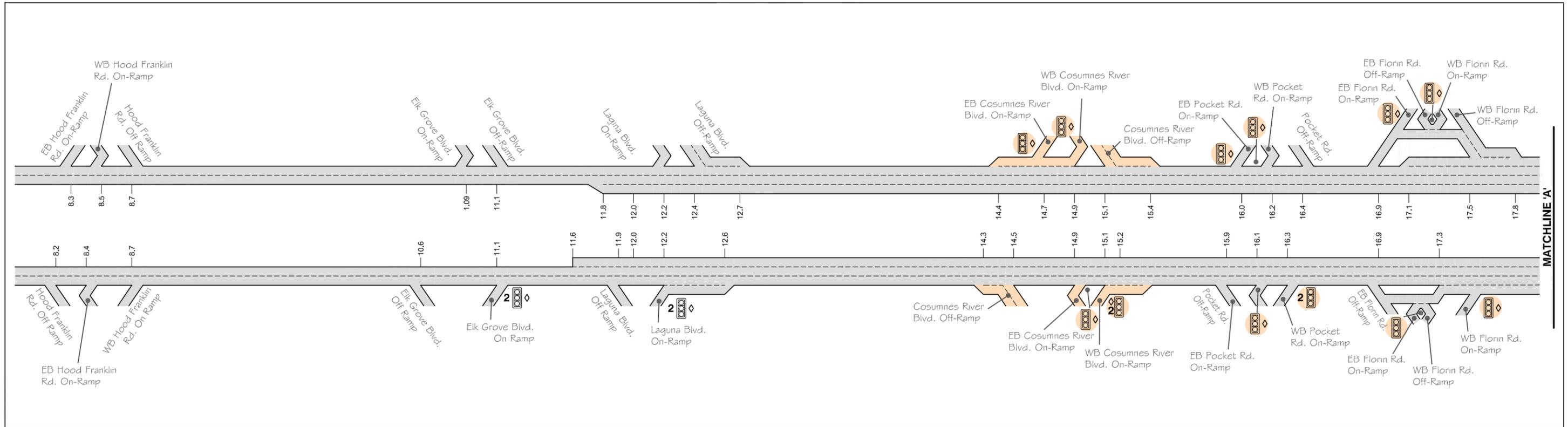
### MIXED FLOW ADDITION ALTERNATIVE

The second alternative has the following roadway improvements, as shown in Figure 8.

- In the northbound direction, extend the existing lane addition between Elk Grove Boulevard and Laguna Boulevard back to the Elk Grove Boulevard on-ramp and add a mixed-flow lane from about one mile south of Elk Grove Boulevard to the Q Street off-ramp.
- In the southbound direction, add a mixed-flow lane from the US-50 eastbound connector on-ramp to about 1 mile south of Elk Grove Boulevard. Provide a partial auxiliary lane from the existing lane drop between Laguna Boulevard and Elk Grove Boulevard to the Elk Grove Boulevard off-ramp, and widen the off-ramp to two lanes.
- Add auxiliary lanes (one in each direction) between Pocket Road and Florin Road, and widen the southbound off-ramp to Pocket Road to two lanes.
- Replace the Casilada Way pedestrian overcrossing to meet ADA requirements.

The additional mixed-flow mainline lane would be constructed by widening into the median south of Pocket Road. North of Pocket Road, widening will occur on both the inside and outside shoulders. North of Florin Road, the bus/carpool lane and one or more of the inside lanes will narrow from 12 to 11 feet wide.

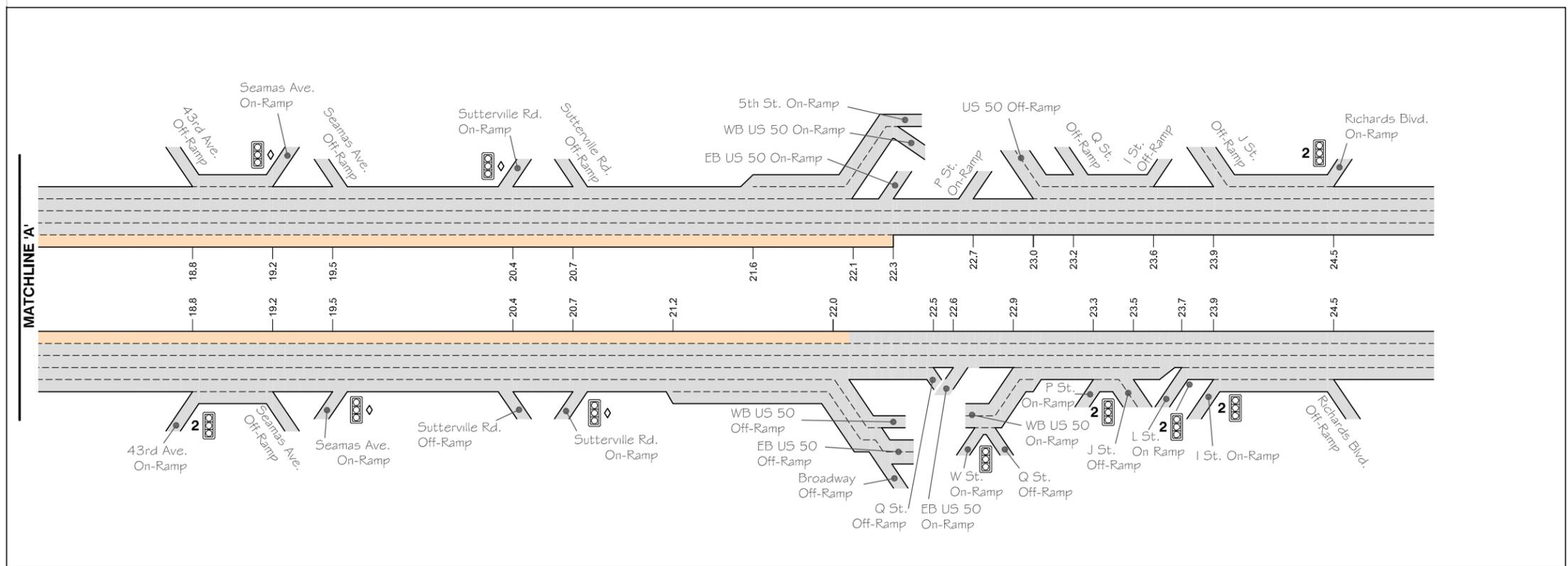
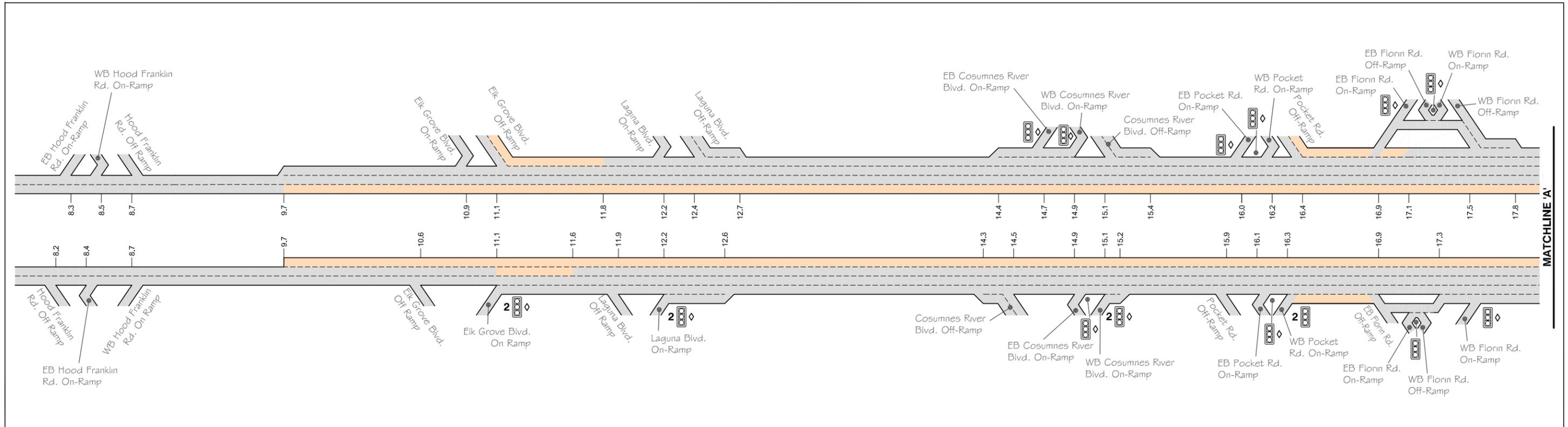
The auxiliary lanes would be constructed by widening to the outside. In the northbound direction, the auxiliary lane would begin at the Pocket Road westbound slip on-ramp and would extend to the Florin Road off-ramp. In the southbound direction, the auxiliary lane would run from the Florin Road on-ramp to the Pocket Road off-ramp.



- LEGEND**
- Ramp Metered Lanes (One lane unless otherwise noted)
  - 2** Number of Metered Lanes
  - HOV-Only Lane
  - 6.0 Post-mile

NOTE: Changes from existing conditions due to other projects are highlighted.





- LEGEND**
- Ramp Metered Lanes (One lane unless otherwise noted)
  - 2** Number of Metered Lanes
  - HOV-Only Lane
  - Proposed Lanes
  - 6.0 Post-mile



## **BUS/CARPOOL ADDITION ALTERNATIVE**

The third alternative has the following roadway improvements, as shown in Figure 9. The improvements are identical to the Mixed Flow Alternative except that the added mainline lane would be restricted to HOVs during the AM and PM peak periods.

The bus/carpool lanes would be contiguous to the mixed-flow lanes: that is, no buffer or barrier would separate the bus/carpool lane from the mixed-flow lanes, and drivers would enter and exit the bus/carpool lane at any point. The bus/carpool lane restriction – two or more occupants per vehicle, motorcycles, or registered “Clean Air Vehicles” – would be in effect for the AM and PM peak periods (weekdays 6:00 to 10:00 AM and 3:00 to 7:00 PM) to conform to bus/carpool lane operation elsewhere in the Sacramento area. During off-peak times, the bus/carpool lane would be available to all vehicles (except commercial trucks, which are restricted to the outside lanes).

Four design options of the Bus/Carpool Alternative were analyzed under 2033 conditions. Two options evaluated alternate configurations for the start of the northbound HOV lane, and two options evaluated alternate configurations for the end of the southbound HOV lane. The lane configurations for the design options are described in Appendix E.

## **BUS/CARPOOL CONVERSION ALTERNATIVE**

The Bus/Carpool Conversion Alternative has the same number of lanes as the No Build Alternative as shown in Figure 10. The difference is that the left lane from south of Laguna Boulevard to US-50 would be restricted to HOVs during the AM and PM peak periods.

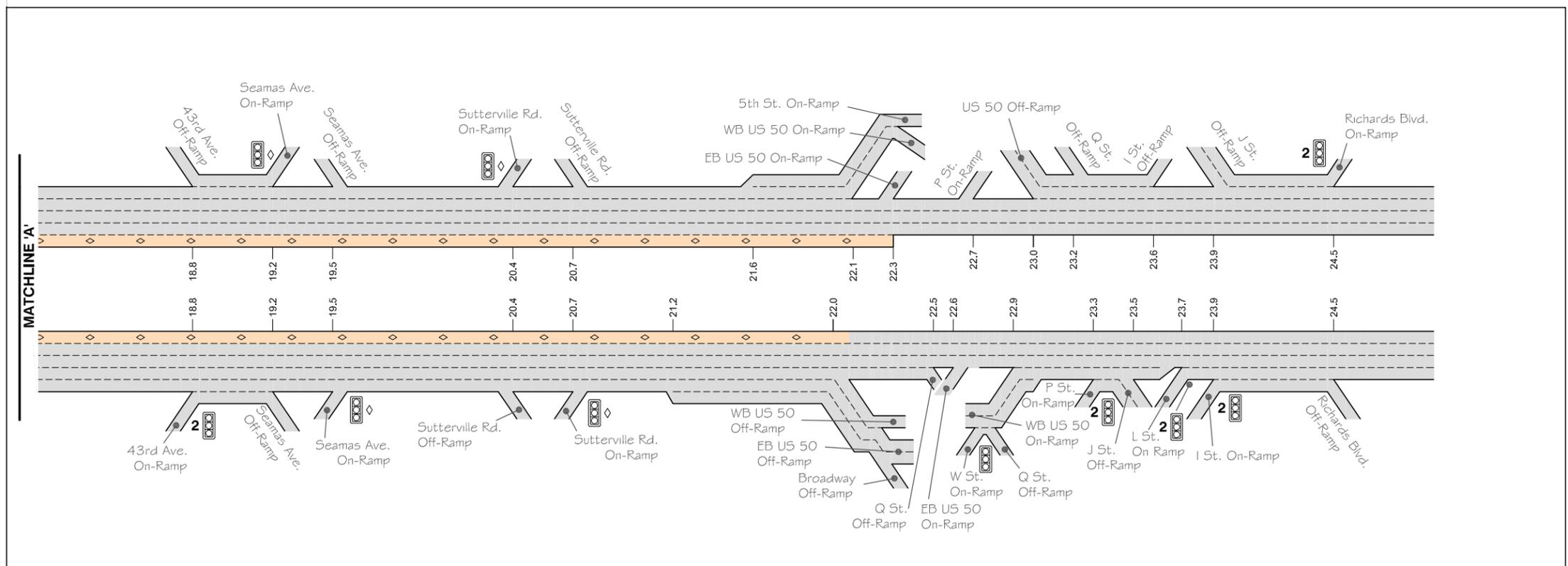
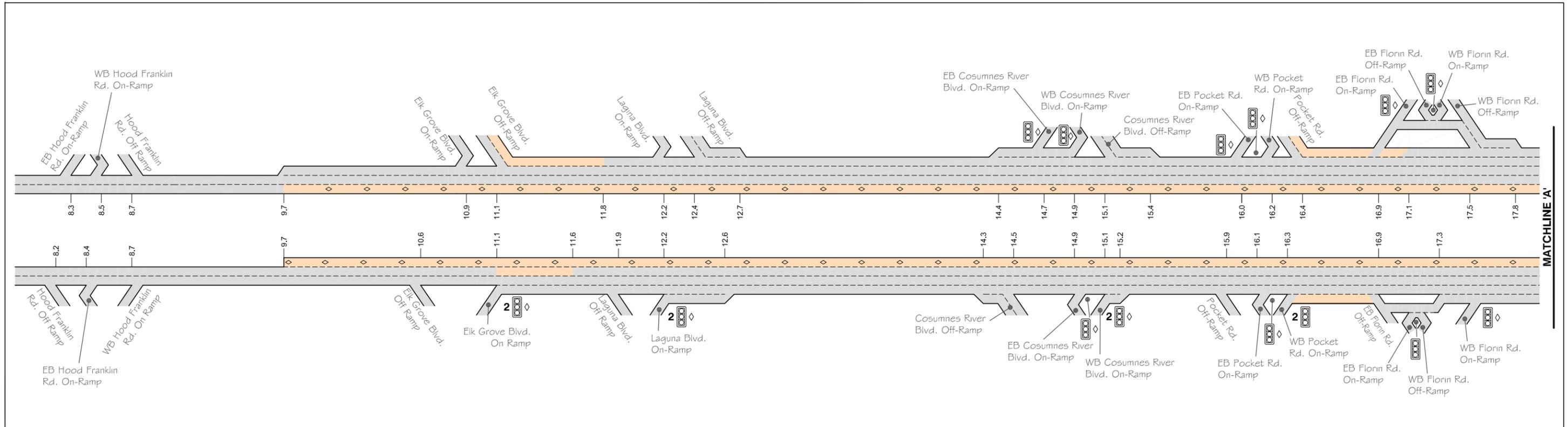
In the northbound direction, the bus/carpool lane would start at the location of the existing lane addition south of Laguna Boulevard. To start the bus/carpool lane addition on the left in the southbound direction would require installing a lane drop on the right after the US-50 off-ramp.

## **OTHER PLANNED PROJECTS**

The following separate projects are planned for the study area. The roadway improvements associated with each of the following projects is assumed to be in place by 2013.

### ***I-5/Cosumnes River Boulevard Interchange***

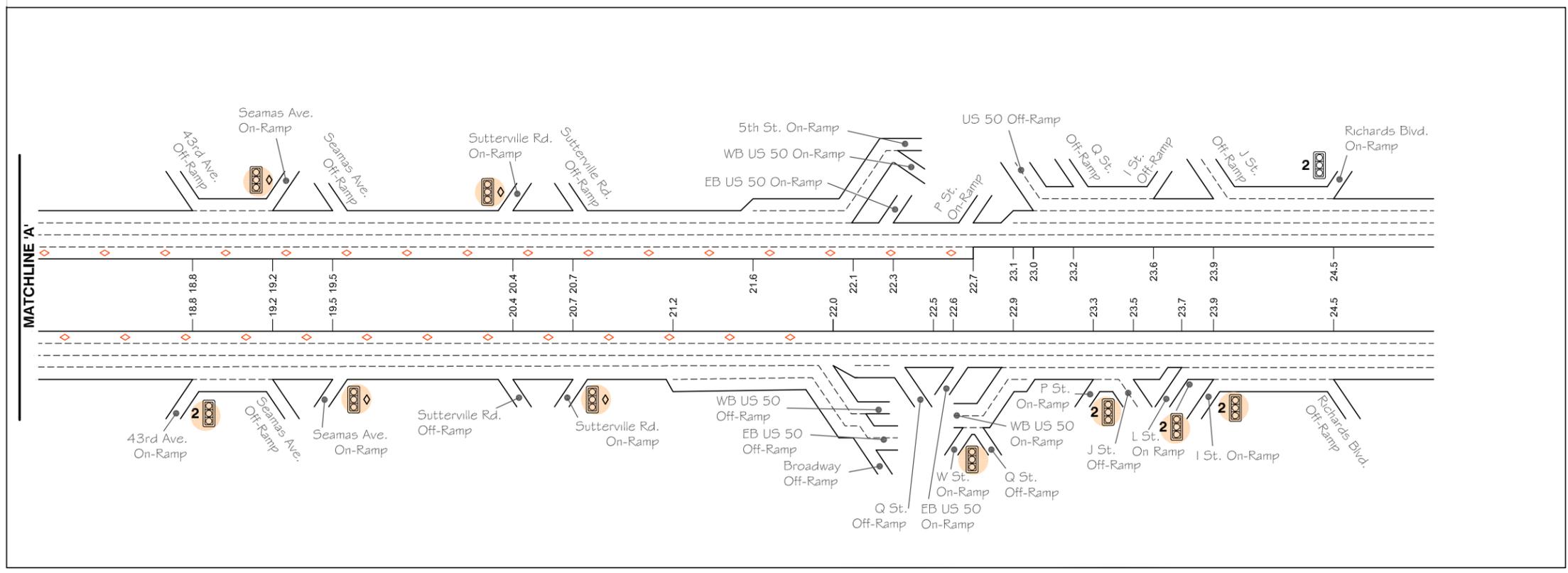
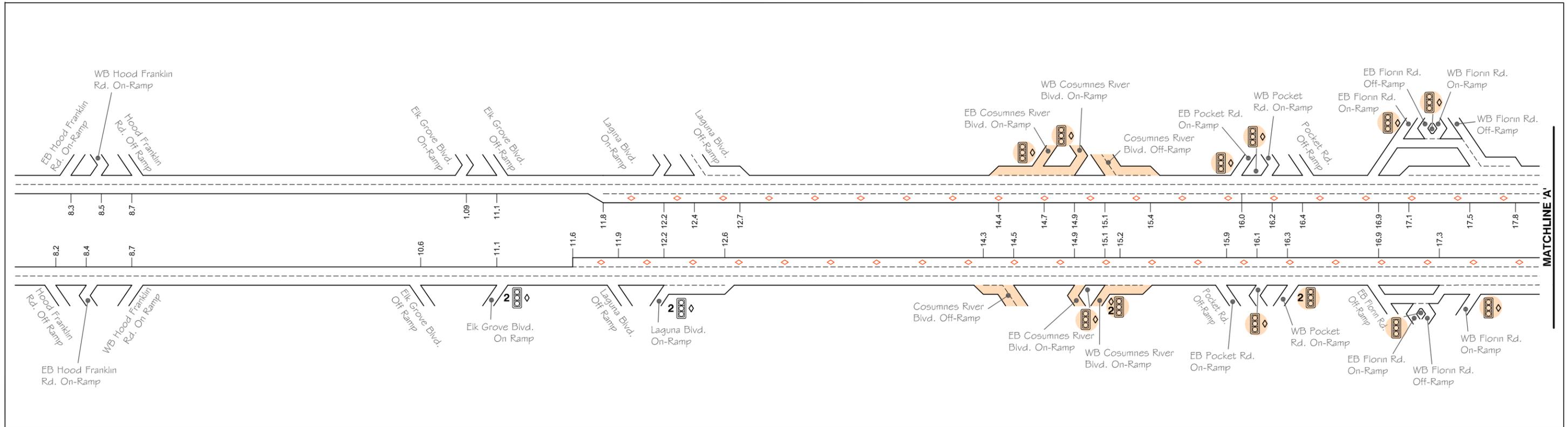
The City of Sacramento is planning to extend Cosumnes River Boulevard from its current terminus at Franklin Boulevard to Freeport Boulevard and construct an interchange at I-5. The proposed interchange would be a partial cloverleaf (Type L-9) with a diagonal off-ramp, a loop on-ramp, and a slip on-ramp in each direction. Partial auxiliary lanes with two-lane exits would be provided at the off-ramps. Partial auxiliary lanes will also be added for the northbound slip on-ramp and southbound loop on-ramp. The interchange improvements on I-5 are shown on Figures 7, 8, 9, and 10.



- LEGEND**
- Ramp Metered Lanes (One lane unless otherwise noted)
  - 2** Number of Metered Lanes
  - HOV-Only Lane
  - Proposed Lanes
  - 6.0 Post-mile



**N**  
NOT TO SCALE



- LEGEND**
- Ramp Metered Lanes (One lane unless otherwise noted)
  - 2** Number of Metered Lanes
  - Proposed HOV-Only Lane
  - 6.0 Post-mile

NOTE: Changes from existing conditions due to other projects are highlighted.



**N**  
NOT TO SCALE

### Ramp Meter System

Ramp meters are assumed to be constructed at many on-ramps in the study area, either as a separate project or as part of the above project. Ramp meters for the US-50 connectors were not assumed since freeway-to-freeway connectors are not metered elsewhere in the Sacramento area. Using the 15-minute forecasts for 2033 conditions described in Chapter 3, the configuration for ramp meters in the study area was determined. Table 12 shows the assumed ramp configurations that were used for the analysis of 2013, 2023, and 2033 conditions. Although traffic demand volumes vary somewhat among the alternatives, the ramp meter rates were held constant for a given analysis year.

TABLE 12 – ASSUMED NUMBER OF LANES AT RAMP METERS				
Location	Northbound		Southbound	
	Mixed Flow	HOV	Mixed Flow	HOV
Hood Franklin Rd EB	1	0	-	-
Hood Franklin Rd WB	<b><u>2</u></b>	<b><u>1</u></b>	-	-
Elk Grove Blvd	<b><u>2</u></b>	1	-	-
Laguna Blvd	2	1	-	-
Cosumnes River Blvd EB	<b><u>1</u></b>	<b><u>1</u></b>	<b><u>1</u></b>	<b><u>1</u></b>
Cosumnes River Blvd WB	<b><u>2</u></b>	<b><u>1</u></b>	<b><u>1</u></b>	<b><u>1</u></b>
Pocket Rd EB	1	1	1	<b><u>1</u></b>
Pocket Rd WB	2	0	1	<b><u>1</u></b>
Florin Rd EB	1	0	1	<b><u>1</u></b>
Florin Rd WB	1	0	1	0
43 <sup>rd</sup> Ave	2	0	n/a	
Seamas Ave	1	1	1	1
Sutterville Rd	1	1	1	1
5 <sup>th</sup> St / W St	1	0	-	-
P St	2	0	-	-
L St	2	0	n/a	
I St	2	0	-	-
Richards Blvd	n/a		2	0

Notes: Shading indicates that a ramp meter exists (either currently operating or recently constructed). Bold and underline font indicates new ramp lanes. "n/a" indicates that the ramp does not exist or is not within the study area.

Source: Fehr & Peers, 2009

## 5. CONSTRUCTION YEAR (2013) CONDITIONS ANALYSIS

This chapter presents the analysis results of the project alternatives under construction year (2013) conditions. For each alternative, traffic operations are evaluated using peak-hour volume, speed, LOS, density, travel time, and network summary statistics. Figures 4A through 4F show the peak-hour demand and served volume and lane configuration under 2013 conditions. Appendix B contains the results summary sheets for the travel time, network statistics, and freeway section analysis.

### NORTHBOUND – AM PEAK PERIOD

Table 13 shows the average peak-hour travel time and speed for the project alternatives. Under the No Build Alternative, the commute time from Hood Franklin Road to US-50 would be almost 45 minutes. For the lane addition alternatives, the travel time would improve to about 20 and 35 minutes for the Mixed Flow and Bus/Carpool Addition Alternatives, respectively. With the reduction in capacity, the Bus/Carpool Conversion travel time for all vehicles would increase by about 40 minutes although HOVs would have a 10 minute reduction in travel time compared to the No Build Alternative. Under the Bus/Carpool Addition Alternative, the average travel time for HOVs would be 19 minutes.

Route	Type	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
		Time	Speed	Time	Speed	Time	Speed	Time	Speed
Hood Franklin Rd EB On-ramp to Pocket Rd Off-ramp	All	24.4	18.8	7.7	59.4	18.9	24.5	53.6	8.6
	HOV	24.5	18.8	7.7	59.7	9.1	50.4	24.4	19.6
Pocket Rd Off ramp to US-50 Off-ramp	All	19.2	18.2	12.6	27.8	16.7	20.9	28.3	12.4
	HOV	19.2	18.2	12.4	28.2	9.8	35.6	9.5	36.7
Hood Franklin Rd EB On-ramp to US-50 Off-ramp	All	43.6	18.5	20.3	45.8	35.6	22.9	81.9	10.2
	HOV	43.7	18.5	20.1	46.1	18.9	44.0	33.9	27.0
Peak Hour		7:15 – 8:15 AM		7:00 – 8:00 AM		7:15 – 8:15 AM		8:00 – 9:00 AM	
Notes: The average travel time and speed for the peak hour are reported as minutes and miles per hour, respectively. The HOV type includes travel by HOVs in any travel lane (mixed-flow or bus/carpool lane).									
Source: Fehr & Peers, 2009									

Table 14 summarizes the network statistics for the AM peak period. The lane addition alternatives would serve more vehicles, have a higher average speed, and have less delay than the No Build Alternative. The Bus/Carpool Addition Alternative would serve more vehicles and more persons. However, average speed would be higher and average delay would be lower for the Mixed Flow Addition Alternative. The Bus/Carpool Conversion Alternative would serve the least number of vehicles with the lowest average speed.

As expected, the average speed for HOVs is higher than all vehicles due to bypass lanes provided at ramp meters. Despite the presence of a bus/carpool lane, the average speed for HOVs would be higher under the Mixed Flow Addition Alternative than the Bus/Carpool Addition Alternative due to lower congestion levels. Additionally, the bus/carpool lane would have low speeds (see Table 17) due to existing vehicles slowing to

merge with congested traffic approaching the US-50 interchange. Similarly, the Bus/Carpool Conversion Alternative would have lower speeds for HOVs due to more congestion and, therefore, fewer gaps for vehicles exiting the HOV lane.

**TABLE 14 – 2013 NORTHBOUND AM PEAK-PERIOD NETWORK SUMMARY**

<b>Performance Measure</b>	<b>No Build</b>	<b>Mixed Flow Addition</b>	<b>Bus/Carpool Addition</b>	<b>Bus/Carpool Conversion</b>
Number of Vehicles Served	54,200	55,400	55,900	37,300
Number of Persons Served <sup>1</sup>	68,200	69,700	70,200	49,300
Travel Distance (vehicle-miles)	433,300	443,500	456,600	350,500
Travel Time (vehicle-hours)	18,900	13,300	15,400	28,300
Average Speed – All vehicles (mph)	22.9	33.3	29.7	12.4
Average Speed – HOVs (mph)	27.0	40.8	38.0	23.2
Travel Delay <sup>2</sup> (vehicle-hours)	12,000	6,200	8,050	22,700
Average Delay <sup>2</sup> (seconds per vehicle)	760	390	510	1,770
Notes:	1. Based on traffic counts, HOVs, trucks, and other vehicles are assumed to have vehicle occupancies of 2.35, 1.2, and 1.0 persons per vehicle, respectively. 2. Delay is measured as the additional travel time when traveling less than the desired free-flow speed.			
Source:	Fehr & Peers, 2009			

Tables 15 and 16 show the average 2013 AM peak-hour volume served, speed, LOS, and density for the mainline sections between interchanges in the northbound direction. Appendix B lists the LOS and density results for the ramp junctions.

The results for all alternatives show a bottleneck at the US-50 off-ramp. The location of congested conditions (speeds less than 35 mph and LOS F) for the No Build Alternative would be similar to existing conditions. For the Mixed Flow Addition Alternative, the additional mixed-flow lane would shorten the congested area to start at Florin Road. However, because more traffic is delivered to downtown in this alternative, LOS F conditions would also occur north of US-50. The Bus/Carpool Addition Alternative would have congested conditions starting at Laguna Boulevard. The extent of congestion under the Bus/Carpool Conversion Alternative would be similar to the No Build Alternative. The later peak hour for this alternative is caused by the reduced capacity, which constrains downstream volumes.

At US-50, the Mixed Flow Addition Alternative would serve a higher volume during the peak hour than the other two alternatives; the Bus/Carpool Addition Alternative would have about 700 fewer vehicles, the No Build Alternative would have about 1,300 fewer vehicles, and the Bus/Carpool Conversion Alternative would have about 3,200 fewer vehicles.

**TABLE 15 – 2013 NORTHBOUND AM PEAK-HOUR VOLUME AND SPEED**

Freeway Segment	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed
Hood Franklin Rd to Elk Grove Blvd	2,170	54	2,505	59	2,316	56	1,436	57
Elk Grove Blvd to Laguna Blvd	3,285	<u>21</u>	3,715	61	3,419	59	1,963	<u>14</u>
Laguna Blvd to Cosumnes River Blvd	3,998	<u>25</u>	5,218	60	4,752	<u>34</u>	2,317	<u>27</u>
Cosumnes River Blvd to Pocket Rd	4,092	<u>22</u>	4,984	59	4,722	<u>25</u>	2,542	<u>21</u>
Pocket Rd to Florin Rd	4,719	<u>17</u>	5,754	61	5,471	<u>19</u>	2,926	<u>21</u>
Florin Rd to 43 <sup>rd</sup> Ave	5,546	<u>22</u>	7,386	<u>29</u>	6,252	<u>24</u>	4,017	<u>24</u>
43 <sup>rd</sup> Ave to Seamas Ave	5,541	<u>18</u>	5,391	<u>19</u>	6,273	<u>23</u>	4,582	<u>21</u>
Seamas Ave to Sutterville Rd	7,385	<u>30</u>	8,868	<u>30</u>	8,122	<u>32</u>	5,202	<u>28</u>
Sutterville Rd to US-50/P St/Q St	7,395	61	8,738	61	8,025	62	5,568	40
US-50/P St/Q St to I/J/L St	6,636	57	6,814	56	6,701	58	6,432	<u>26</u>
I/J/L St to Richards Blvd	5,755	61	5,879	61	5,759	62	6,817	60
Peak Hour	7:15 – 8:15 AM		7:00 – 8:00 AM		7:15 – 8:15 AM		8:00 – 9:00 AM	

Notes: Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively. The bus/carpool lane is included in the calculation of average volume and speed.

Source: Fehr & Peers, 2009

**TABLE 16 – 2013 NORTHBOUND AM PEAK-HOUR LOS AND DENSITY**

Freeway Segment	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
	LOS	Density	LOS	Density	LOS	Density	LOS	Density
Hood Franklin Rd to Elk Grove Blvd	D	27	B	17	C	21	D	33
Elk Grove Blvd to Laguna Blvd	<u>F</u>	<u>99</u>	C	19	C	19	<u>F</u>	<u>146</u>
Laguna Blvd to Cosumnes River Blvd	<u>F</u>	<u>120</u>	C	26	<u>F</u>	<u>93</u>	<u>F</u>	<u>158</u>
Cosumnes River Blvd to Pocket Rd	<u>F</u>	<u>96</u>	D	34	<u>F</u>	<u>86</u>	<u>F</u>	<u>131</u>
Pocket Rd to Florin Rd	<u>F</u>	<u>131</u>	D	31	<u>F</u>	<u>112</u>	<u>F</u>	<u>162</u>
Florin Rd to 43 <sup>rd</sup> Ave	<u>F</u>	<u>108</u>	<u>F</u>	<u>97</u>	<u>F</u>	<u>102</u>	<u>F</u>	<u>126</u>
43 <sup>rd</sup> Ave to Seamas Ave	<u>F</u>	<u>111</u>	<u>F</u>	<u>119</u>	<u>F</u>	<u>118</u>	<u>F</u>	<u>116</u>
Seamas Ave to Sutterville Rd	<u>F</u>	<u>86</u>	<u>F</u>	<u>91</u>	<u>F</u>	<u>84</u>	<u>F</u>	<u>117</u>
Sutterville Rd to US-50/P St/Q St	D	30	D	33	D	32	<u>F</u>	<u>73</u>
US-50/P St/Q St to I/J/L St	C	27	<u>F</u>	<u>47</u>	C	25	<u>F</u>	<u>88</u>
I/J/L St to Richards Blvd	C	23	C	25	C	22	C	26

Notes: Bold and underline font indicate LOS F conditions. The average density is reported in vehicles per lane per mile. The bus/carpool lane is not included in the LOS or density calculation. The peak hour LOS is based on the peak 15 minutes of the peak hour according to the HCM.

Source: Fehr & Peers, 2009

Table 17 shows the volume served and average speed in the bus/carpool lane under alternatives with bus/carpool lanes. For the Bus/Carpool Addition Alternative, the peak volume of 725 vehicles per hour (vph) would occur in the Seamas Avenue to Sutterville Road segment. This volume is less than the suggested 800 vph volume threshold for opening-day conditions in the Caltrans HOV guidelines. The volume drops north of this location due to HOV traffic that is destined for US-50. The average speed in this section, 46 mph, is less than free-flow due to US-50 bound vehicles slowing to merge into the congested mixed-flow lanes.

<b>TABLE 17 – 2013 NORTHBOUND AM PEAK-HOUR BUS/CARPOOL LANE VOLUME AND SPEED</b>				
<b>Freeway Segment</b>	<b>Bus/Carpool Addition</b>		<b>Bus/Carpool Conversion</b>	
	<b>Volume</b>	<b>Speed</b>	<b>Volume</b>	<b>Speed</b>
Hood Franklin Rd to Elk Grove Blvd	169	65	-	-
Elk Grove Blvd to Laguna Blvd	300	64	-	-
Laguna Blvd to Cosumnes River Blvd	522	57	559	57
Cosumnes River Blvd to Pocket Rd	617	42	699	36
Pocket Rd to Florin Rd	605	56	717	44
Florin Rd to 43 <sup>rd</sup> Ave	647	49	781	46
43 <sup>rd</sup> Ave to Seamas Ave	666	58	852	50
Seamas Ave to Sutterville Rd	725	46	879	43
Sutterville Rd to US-50/P St/Q St	455	63	944	55
<b>Peak Hour</b>	<b>7:15 – 8:15 AM</b>		<b>8:00 – 9:00 AM</b>	
Note:	Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively.			
Source:	Fehr & Peers, 2009			

The Bus/Carpool Conversion Alternative would have a peak volume of 944 vph on the Sutterville Road to US-50 segment. The fewer number of lanes in this segment compared to the Bus/Carpool Addition Alternative makes the bus/carpool lane more likely to be used.

### **SOUTHBOUND – PM PEAK PERIOD**

Table 18 shows the average peak-hour travel time and speed for the project alternatives. Under the No Build Alternative, the average travel time from US-50 to Hood Franklin Road would be about 23 minutes. The average travel time for the Mixed Flow and Bus/Carpool Addition Alternatives would be 13 and 14 minutes, respectively. The average travel time for the Bus/Carpool Conversion Alternative would be about three minutes less than the No Build Alternative.

North of Pocket Road, the build alternatives would have lower travel times than the No Build Alternative. South of Pocket Road, travel times would be about seven and a half minutes for the three of the alternatives, but the Bus/Carpool Conversion Alternative travel time would be almost 10 minutes.

**TABLE 18 – 2013 SOUTHBOUND PM PEAK-HOUR TRAVEL TIME AND SPEED**

Route	Type	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
		Time	Speed	Time	Speed	Time	Speed	Time	Speed
US-50 WB On-Ramp to Pocket Rd WB On-Ramp	All	16.0	22.2	5.8	61.6	6.7	53.1	10.7	33.9
	HOV	16.4	22.1	5.8	61.6	6.0	58.8	6.2	57.5
Pocket Rd WB On-Ramp to Hood Franklin Rd WB On-Ramp	All	7.4	47.9	7.1	49.7	7.5	47.1	9.7	36.8
	HOV	7.4	48	7.1	49.8	7.1	49.7	7.1	49.7
US-50 WB On-Ramp to Hood Franklin Rd WB On-Ramp	All	23.4	36.5	12.9	55.0	14.2	49.8	20.3	35.5
	HOV	23.4	36.5	12.9	55.0	13.1	53.7	13.3	53.2
Peak Hour		5:30 – 6:30 PM		4:30 – 5:30 PM		4:45 – 5:45 PM		5:30 – 6:30 PM	

Notes: The average travel time and speed for the peak hour are reported as minutes and miles per hour, respectively. The HOV type includes travel by HOVs in any travel lane (mixed-flow or bus/carpool lane).

Source: Fehr & Peers, 2009

Table 19 summarizes the network statistics for the PM peak period. The No Build Alternative would serve fewer vehicles at a lower average speed than the lane addition alternatives. The Mixed Flow Addition Alternative would serve more vehicles, but fewer persons, than the Bus/Carpool Addition Alternative. The average speed of all traffic would be about 2 mph higher under the Mixed Flow than the Bus/Carpool Addition Alternative although the average speed of HOVs would be about 1 mph lower under the latter alternative. The Bus/Carpool Conversion Alternative would serve fewer vehicles due to the lane drop at the start of the bus/carpool lane, which constrains traffic from entering the corridor. Due to the lower entering volume, the average speed would be higher.

**TABLE 19 – 2013 SOUTHBOUND PM PEAK-PERIOD NETWORK SUMMARY**

Performance Measure	No Build	Mixed Flow Addition	Bus/Carpool Addition	Bus/Carpool Conversion
Number of Vehicles Served	60,600	63,400	63,000	56,900
Number of Persons Served <sup>1</sup>	74,600	78,700	79,800	71,900
Travel Distance (vehicle-miles)	441,400	466,600	463,300	395,500
Travel Time (vehicle-hours)	13,300	10,400	10,800	10,400
Average Speed – All vehicles (mph)	33.2	45.1	43.0	38.5
Average Speed – HOVs (mph)	34.6	46.3	45.2	44.8
Travel Delay <sup>2</sup> (vehicle-hours)	6,300	3,000	3,500	4,100
Average Delay <sup>2</sup> (seconds per vehicle)	360	160	190	252

Notes: 1. Based on traffic counts, HOVs, trucks, and other vehicles are assumed to have vehicle occupancies of 2.35, 1.2, and 1.0 persons per vehicle, respectively.  
2. Delay is measured as the additional travel time when traveling less than the desired free-flow speed.

Source: Fehr & Peers, 2009

Tables 20 and 21 show the average 2013 PM peak-hour volume served, speed, LOS, and density for the mainline sections between interchanges in the southbound direction. Appendix B lists the LOS and density results for the ramp junctions.

**TABLE 20 – 2013 SOUTHBOUND PM PEAK-HOUR VOLUME AND SPEED**

Freeway Segment	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed
Richards Blvd to I/J/L St	7,466	<u>21</u>	7,304	50	6,792	<u>33</u>	8,500	<u>36</u>
I/J/L St to US-50/P St/Q St	7,145	<u>20</u>	7,531	<u>25</u>	7,044	<u>17</u>	7,835	<u>34</u>
US-50/P St/Q St to Sutterville Rd	7,422	<u>23</u>	8,912	57	8,717	55	6,208	<u>33</u>
Sutterville Rd to Seamas Ave	7,568	<u>31</u>	9,053	64	8,966	63	6,475	64
Seamas Ave to 43 <sup>rd</sup> Ave	7,625	<u>32</u>	9,060	62	9,018	61	6,660	61
43 <sup>rd</sup> Ave to Florin Rd	6,626	<u>28</u>	8,632	59	7,913	61	5,843	52
Florin Rd to Pocket Rd	5,590	37	6,884	62	6,778	58	4,901	51
Pocket Rd to Cosumnes River Blvd	5,347	62	6,400	63	6,239	62	4,696	52
Cosumnes River Blvd to Laguna Blvd	5,254	62	6,204	63	6,071	61	4,541	49
Laguna Blvd to Elk Grove Blvd	3,507	59	3,329	63	4,111	63	3,091	62
Elk Grove Blvd to Hood Franklin Rd	2,413	63	2,974	64	2,860	62	2,191	63
Peak Hour	5:30 – 6:30 PM		4:30 – 5:30 PM		4:45 – 5:45 PM		5:30 – 6:30 PM	

Notes: Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively. The bus/carpool lane is included in the calculation of average volume and speed.

Source: Fehr & Peers, 2009

**TABLE 21 – 2013 SOUTHBOUND PM PEAK-HOUR LOS AND DENSITY**

Freeway Segment	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
	LOS	Density	LOS	Density	LOS	Density	LOS	Density
Richards Blvd to I/J/L St	<u>F</u>	<u>135</u>	D	33	<u>F</u>	<u>136</u>	<u>F</u>	<u>100</u>
I/J/L St to US-50/P St/Q St	<u>F</u>	<u>84</u>	<u>F</u>	<u>93</u>	<u>F</u>	<u>87</u>	<u>F</u>	<u>64</u>
US-50/P St/Q St to Sutterville Rd	<u>F</u>	<u>122</u>	E	39	<u>F</u>	<u>46</u>	<u>F</u>	<u>116</u>
Sutterville Rd to Seamas Ave	<u>F</u>	<u>113</u>	D	30	D	33	D	32
Seamas Ave to 43 <sup>rd</sup> Ave	<u>F</u>	<u>95</u>	C	26	D	28	D	29
43 <sup>rd</sup> Ave to Florin Rd	<u>F</u>	<u>80</u>	D	27	D	31	<u>F</u>	<u>57</u>
Florin Rd to Pocket Rd	E	37	C	26	<u>F</u>	<u>60</u>	<u>F</u>	<u>81</u>
Pocket Rd to Cosumnes River Blvd	D	30	D	27	D	30	<u>F</u>	<u>55</u>
Cosumnes River Blvd to Laguna Blvd	D	32	D	29	E	37	<u>F</u>	<u>45</u>
Laguna Blvd to Elk Grove Blvd	D	34	C	19	C	29	D	27
Elk Grove Blvd to Hood Franklin Rd	C	20	C	19	C	24	C	18

Notes: Bold and underline font indicate LOS F conditions. The average density is reported in vehicles per lane per mile. The bus/carpool lane is not included in the LOS or density calculation. The peak hour LOS is based on the peak 15 minutes of the peak hour according to the HCM.

Source: Fehr & Peers, 2009

By 2013 under the No Build Alternative, the existing bottleneck between Florin Road and Pocket Road would cause congested conditions to extend upstream to the congested area at the Sutterville Road lane drop bottleneck. As a result, free-flow speeds would exist south of Pocket Road. In contrast, the Mixed Flow and Bus/Carpool Addition Alternatives would have free-flow speeds south of the Sutterville Road lane drop. Although the average hourly speed is higher than 55 mph for the Florin Road to Pocket Road segment under the Bus/Carpool Addition Alternative, the density during the peak 15 minutes results in LOS F conditions. Similar to the No Build Alternative, the Bus/Carpool Conversion Alternative would have a bottleneck between Florin Road and Pocket Road, but the average speeds would be above 50 mph.

At the Sutterville Road bottleneck, the Mixed Flow Addition Alternative would serve a higher volume during the peak hour than the other alternatives; the Bus/Carpool Addition Alternative would have 100 fewer vehicles, the No Build Alternative would have about 1,500 fewer vehicles, and the Bus/Carpool Conversion Alternative would have about 2,600 fewer vehicles. South of Cosumnes River Boulevard, the Mixed Flow Addition Alternative would serve about 100, 950, and 1,700 more vehicles per hour than the Bus/Carpool Addition, No Build, and Bus/Carpool Conversion Alternatives, respectively.

As shown in Table 22, the bus/carpool lane would serve about 975 vehicles per hour between Sutterville Road and Seamas Avenue under the Bus/Carpool Addition Alternative. This volume is higher than the suggested volume threshold of 800 vehicles per hour for opening-day conditions in the Caltrans HOV guidelines. The bus/carpool lane average speed would be higher than 60 mph along the corridor. The peak volume would be lower for the Bus/Carpool Conversion Alternative (746 vph) due to bottlenecks at US-50, which would constrain traffic from entering the bus/carpool lane.

<b>TABLE 22 – 2013 SOUTHBOUND PM PEAK-HOUR BUS/CARPOOL LANE VOLUME AND SPEED</b>				
<b>Freeway Segment</b>	<b>Bus/Carpool Addition</b>		<b>Bus/Carpool Conversion</b>	
	<b>Volume</b>	<b>Speed</b>	<b>Volume</b>	<b>Speed</b>
US-50/P St/Q St to Sutterville Rd	909	62	509	64
Sutterville Rd to Seamas Ave	977	64	746	64
Seamas Ave to 43 <sup>rd</sup> Ave	910	63	728	64
43 <sup>rd</sup> Ave to Florin Rd	760	63	688	61
Florin Rd to Pocket Rd	744	62	700	63
Pocket Rd to Cosumnes River Blvd	871	63	698	62
Cosumnes River Blvd to Laguna Blvd	816	62	720	62
Laguna Blvd to Elk Grove Blvd	372	64	-	-
Elk Grove Blvd to Hood Franklin Rd	397	64	-	-
Peak Hour	4:45 – 5:45 PM		5:30 – 6:30 PM	
Note:	Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively.			
Source:	Fehr & Peers, 2009			

## 6. INTERIM YEAR (2023) CONDITIONS ANALYSIS

This chapter presents the analysis results of the project alternatives under interim year (2023) conditions. For each alternative, traffic operations are evaluated using peak-hour volume, speed, LOS, density, travel time, and network summary statistics. Figures 5A through 5F show the peak-hour demand and served volume and lane configuration under 2023 conditions. Appendix C contains the results summary sheets for the travel time, network statistics, and freeway section analysis.

### NORTHBOUND – AM PEAK PERIOD

Table 23 shows the average peak-hour travel time and speed for the project alternatives. Under the No Build Alternative, the commute time from Hood Franklin Road to US-50 would be about 55 minutes. For the lane addition alternatives, the travel time would improve to about 37 minutes for the Mixed Flow Addition Alternative, but the Bus/Carpool Addition Alternative's travel time would be almost as long as the No Build Alternative's. However, the travel time for HOVs under the Bus/Carpool Addition Alternative would be less than 30 minutes. For the Bus/Carpool Conversion Alternative, both the total and HOV travel time would be worse than the No Build Alternative.

Route	Type	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
		Time	Speed	Time	Speed	Time	Speed	Time	Speed
Hood Franklin Rd EB On-ramp to Pocket Rd Off-ramp	All	34.8	13.2	18.9	24.3	36.3	12.7	74.0	6.3
	HOV	34.8	13.2	18.6	24.7	18.0	26.3	48.7	9.6
Pocket Rd Off ramp to US-50 Off-ramp	All	19.6	17.8	18.0	19.3	16.7	20.9	31.8	11.0
	HOV	19.4	17.9	17.8	19.3	10.8	32.2	17.5	20.3
Hood Franklin Rd EB On-ramp to US-50 Off-ramp	All	54.4	15.2	36.9	22.2	53.0	16.2	105.8	8.3
	HOV	54.2	15.2	36.4	22.5	28.8	28.9	66.2	14.3
Peak Hour		7:00 – 8:00 AM		7:15 – 8:15 AM		7:15 – 8:15 AM		7:45 – 8:45 AM	
Notes: The average travel time and speed for the peak hour are reported as minutes and miles per hour, respectively. The HOV type includes travel by HOVs in any travel lane (mixed-flow or bus/carpool lane).									
Source: Fehr & Peers, 2009									

Table 24 summarizes the network statistics for the AM peak period. The lane addition alternatives would serve more vehicles, have a higher average speed, and have less delay than the No Build Alternative. While the Mixed Flow Addition Alternative would serve more vehicles, the Bus/Carpool Addition Alternative would serve more persons. Average speed for HOVs would be 1 mph higher with the Bus/Carpool Addition Alternative compared to the Mixed Flow Addition Alternative, although the overall average speed would be about 3 mph less. The Bus/Carpool Conversion Alternative would serve the least number of vehicles with the lowest average speed.

**TABLE 24 – 2023 NORTHBOUND AM PEAK-PERIOD NETWORK SUMMARY**

Performance Measure	No Build	Mixed Flow Addition	Bus/Carpool Addition	Bus/Carpool Conversion
Number of Vehicles Served	56,800	62,100	60,600	39,200
Number of Persons Served <sup>1</sup>	73,400	79,400	82,000	55,100
Travel Distance (vehicle-miles)	452,500	510,600	503,900	357,200
Travel Time (vehicle-hours)	26,800	22,200	25,500	35,000
Average Speed – All vehicles (mph)	16.9	23.0	19.8	10.2
Average Speed – HOVs (mph)	20.6	25.3	26.4	14.7
Travel Delay <sup>2</sup> (vehicle-hours)	19,500	14,000	17,400	29,300
Average Delay <sup>2</sup> (seconds per vehicle)	1,140	780	980	2,070

Notes: 1. Based on traffic counts, HOVs, trucks, and other vehicles are assumed to have vehicle occupancies of 2.35, 1.2, and 1.0 persons per vehicle, respectively.  
2. Delay is measured as the additional travel time when traveling less than the desired free-flow speed.

Source: Fehr & Peers, 2009

Tables 25 and 26 show the average 2023 AM peak-hour volume served, speed, LOS, and density for the mainline sections between interchanges in the northbound direction. Appendix C lists the LOS and density results for the ramp junctions.

**TABLE 25 – 2023 NORTHBOUND AM PEAK-HOUR VOLUME AND SPEED**

Freeway Segment	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed
Hood Franklin Rd to Elk Grove Blvd	2,735	<u>25</u>	3,003	57	2,732	35	1,726	<u>18</u>
Elk Grove Blvd to Laguna Blvd	3,108	<u>20</u>	4,220	58	3,732	<u>17</u>	1,983	<u>14</u>
Laguna Blvd to Cosumnes River Blvd	3,648	<u>22</u>	5,801	<u>31</u>	4,368	<u>26</u>	2,453	<u>28</u>
Cosumnes River Blvd to Pocket Rd	3,979	<u>21</u>	5,692	<u>23</u>	4,595	<u>23</u>	2,705	<u>21</u>
Pocket Rd to Florin Rd	4,637	<u>17</u>	6,535	<u>14</u>	5,630	<u>19</u>	3,251	<u>16</u>
Florin Rd to 43 <sup>rd</sup> Ave	5,518	<u>22</u>	7,237	<u>23</u>	6,449	<u>24</u>	4,212	<u>19</u>
43 <sup>rd</sup> Ave to Seamas Ave	5,517	<u>18</u>	7,223	<u>20</u>	6,474	<u>24</u>	4,868	<u>17</u>
Seamas Ave to Sutterville Rd	7,394	<u>30</u>	8,958	<u>29</u>	8,311	<u>32</u>	5,362	<u>28</u>
Sutterville Rd to US-50/P St/Q St	7,517	60	8,917	61	8,409	60	5,702	39
US-50/P St/Q St to I/J/L St	6,914	56	7,138	54	7,083	53	6,478	<u>26</u>
I/J/L St to Richards Blvd	6,110	59	6,230	60	6,275	59	7,023	60
Peak Hour	7:00 – 8:00 AM		7:15 – 8:15 AM		7:15 – 8:15 AM		7:45 – 8:45 AM	

Notes: Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively. The bus/carpool lane is included in the calculation of average volume and speed.

Source: Fehr & Peers, 2009

The results for all alternatives show a bottleneck at the US-50 off-ramp and a minor bottleneck (LOS F conditions for the peak 15 minutes but average speed over the hour of higher than 35 mph) at the J Street off-ramp except for the Bus/Carpool Addition Alternative. Under the No Build and Bus/Carpool Conversion Alternatives, congested speeds would start south of Hood Franklin Road. For the Bus/Carpool Addition Alternative, speeds less than 35 mph would not occur until Elk Grove Boulevard. For the Mixed Flow Addition Alternative, speeds would be above 35 mph until Cosumnes River Boulevard.

At US-50, the Mixed Flow Addition Alternative would serve 500 vehicles more than the Bus/Carpool Addition Alternative, 1,400 vehicles more than the No Build Alternative, and 3,200 more than the Bus/Carpool Conversion Alternative during the peak hour.

**TABLE 26 – 2023 NORTHBOUND AM PEAK-HOUR LOS AND DENSITY**

Freeway Segment	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
	LOS	Density	LOS	Density	LOS	Density	LOS	Density
Hood Franklin Rd to Elk Grove Blvd	<u>F</u>	<u>114</u>	C	22	<u>F</u>	<u>139</u>	<u>F</u>	<u>149</u>
Elk Grove Blvd to Laguna Blvd	<u>F</u>	<u>105</u>	C	23	<u>F</u>	<u>138</u>	<u>F</u>	<u>143</u>
Laguna Blvd to Cosumnes River Blvd	<u>F</u>	<u>127</u>	<u>F</u>	<u>109</u>	<u>F</u>	<u>134</u>	<u>F</u>	<u>161</u>
Cosumnes River Blvd to Pocket Rd	<u>F</u>	<u>100</u>	<u>F</u>	<u>89</u>	<u>F</u>	<u>108</u>	<u>F</u>	<u>139</u>
Pocket Rd to Florin Rd	<u>F</u>	<u>135</u>	<u>F</u>	<u>119</u>	<u>F</u>	<u>128</u>	<u>F</u>	<u>167</u>
Florin Rd to 43 <sup>rd</sup> Ave	<u>F</u>	<u>109</u>	<u>F</u>	<u>103</u>	<u>F</u>	<u>106</u>	<u>F</u>	<u>132</u>
43 <sup>rd</sup> Ave to Seamas Ave	<u>F</u>	<u>114</u>	<u>F</u>	<u>120</u>	<u>F</u>	<u>125</u>	<u>F</u>	<u>121</u>
Seamas Ave to Sutterville Rd	<u>F</u>	<u>87</u>	<u>F</u>	<u>90</u>	<u>F</u>	<u>90</u>	<u>F</u>	<u>123</u>
Sutterville Rd to US-50/P St/Q St	D	31	D	34	E	36	<u>F</u>	<u>79</u>
US-50/P St/Q St to I/J/L St	<u>F</u>	<u>56</u>	<u>F</u>	<u>45</u>	D	30	<u>F</u>	<u>88</u>
I/J/L St to Richards Blvd	C	25	C	25	C	24	C	27

Notes: Bold and underline font indicate LOS F conditions. The average density is reported in vehicles per lane per mile. The bus/carpool lane is not included in the LOS or density calculation. The peak hour LOS is based on the peak 15 minutes of the peak hour according to the HCM.

Source: Fehr & Peers, 2009

Table 27 shows the volume served and average speed in the bus/carpool lane. For the Bus/Carpool Addition Alternative, the peak volume of 1,120 occurs between Seamas Avenue and Sutterville Road. The average speed in the bus/carpool lane drops below 50 mph in some segments due to existing vehicles slowing to merge with congested traffic. The Bus/Carpool Conversion Alternative would have higher volumes for some segments, but average speeds would be lower due to more congestion in the adjacent mixed-flow lanes which affects the ability of vehicles to change lanes out of the lane.

<b>TABLE 27 – 2023 NORTHBOUND AM PEAK-HOUR BUS/CARPOOL LANE VOLUME AND SPEED</b>				
<b>Freeway Segment</b>	<b>Bus/Carpool Addition</b>		<b>Bus/Carpool Conversion</b>	
	<b>Volume</b>	<b>Speed</b>	<b>Volume</b>	<b>Speed</b>
Hood Franklin Rd to Elk Grove Blvd	391	62	-	-
Elk Grove Blvd to Laguna Blvd	608	38	-	-
Laguna Blvd to Cosumnes River Blvd	719	46	691	54
Cosumnes River Blvd to Pocket Rd	884	34	874	32
Pocket Rd to Florin Rd	934	51	1,006	20
Florin Rd to 43 <sup>rd</sup> Ave	1,008	44	996	23
43 <sup>rd</sup> Ave to Seamas Ave	1,045	56	1,081	28
Seamas Ave to Sutterville Rd	1,120	42	1,104	41
Sutterville Rd to US-50/P St/Q St	668	60	1,188	52
Peak Hour	7:15 – 8:15 AM		7:45 – 8:45 AM	
Note: Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively. Source: Fehr & Peers, 2009				

## SOUTHBOUND – PM PEAK PERIOD

Table 28 shows the average peak-hour travel time and speed for the project alternatives.

<b>TABLE 28 – 2023 SOUTHBOUND PM PEAK-HOUR TRAVEL TIME AND SPEED</b>									
<b>Route</b>	<b>Type</b>	<b>No Build</b>		<b>Mixed Flow Addition</b>		<b>Bus/Carpool Addition</b>		<b>Bus/Carpool Conversion</b>	
		<b>Time</b>	<b>Speed</b>	<b>Time</b>	<b>Speed</b>	<b>Time</b>	<b>Speed</b>	<b>Time</b>	<b>Speed</b>
US-50 WB On-Ramp to Pocket Rd WB On-Ramp	All	21.2	16.7	7.7	46.4	15.8	22.6	19.8	18.0
	HOV	21.7	16.3	7.7	46.3	9.2	38.9	8.3	42.7
Pocket Rd WB On-Ramp to Hood Franklin Rd WB On-Ramp	All	8.3	43.2	8.9	39.9	8.5	41.7	8.0	44.3
	HOV	8.3	43.1	8.9	39.8	7.4	48.1	7.1	49.7
US-50 WB On-Ramp to Hood Franklin Rd WB On-Ramp	All	19.5	31.4	16.6	42.8	24.3	33.2	27.8	32.6
	HOV	30.0	31.2	16.6	42.7	16.5	44.0	15.4	46.6
Peak Hour		5:00 – 6:00 PM		5:15 – 6:15 PM		5:30 – 6:30 PM		5:30 – 6:30 PM	
Notes: The average travel time and speed for the peak hour are reported as minutes and miles per hour, respectively. The HOV type includes travel by HOVs in any travel lane (mixed-flow or bus/carpool lane). Source: Fehr & Peers, 2009									

Under the No Build Alternative, the average travel time from US-50 to Hood Franklin Road would be about 30 minutes. The average travel time for the Mixed Flow and Bus/Carpool Addition Alternatives would be 17 and 24

minutes, respectively. The HOV travel time under the Bus/Carpool Addition Alternative would be about 17 minutes, which is the same as the travel time for all vehicles under the Mixed Flow Addition Alternative. Average HOV travel time for the Bus/Carpool Conversion Alternative would be lower than the other alternatives, but the overall average travel time would be higher than the other alternatives.

Table 29 summarizes the network statistics for the PM peak period. The No Build Alternative would serve fewer vehicles, at a lower average speed, and with higher delay than the Mixed Flow Addition Alternative. Although the Mixed Flow Addition Alternative would have a higher average speed and higher vehicles served, the Bus/Carpool Addition Alternative would have a higher persons served, and the average speed for the HOVs would be the same for both alternatives. Compared to the No Build Alternative, the Bus/Carpool Conversion Alternative would have a higher average speed for HOVs but serve less vehicles.

<b>TABLE 29 – 2023 SOUTHBOUND PM PEAK-PERIOD NETWORK SUMMARY</b>				
<b>Performance Measure</b>	<b>No Build</b>	<b>Mixed Flow Addition</b>	<b>Bus/Carpool Addition</b>	<b>Bus/Carpool Conversion</b>
Number of Vehicles Served	66,500	77,900	74,900	59,200
Number of Persons Served <sup>1</sup>	88,400	97,500	100,700	76,600
Travel Distance (vehicle-miles)	468,000	567,000	544,000	401,800
Travel Time (vehicle-hours)	18,500	14,800	16,500	15,500
Average Speed – All vehicles (mph)	25.3	38.2	32.9	26.0
Average Speed – HOVs (mph)	28.4	41.3	41.3	33.3
Travel Delay <sup>2</sup> (vehicle-hours)	11,100	5,800	7,900	9,100
Average Delay <sup>2</sup> (seconds per vehicle)	570	260	370	530
Notes:	1. Based on traffic counts, HOVs, trucks, and other vehicles are assumed to have vehicle occupancies of 2.35, 1.2, and 1.0 persons per vehicle, respectively. 2. Delay is measured as the additional travel time when traveling less than the desired free-flow speed.			
Source:	Fehr & Peers, 2009			

Tables 30 and 31 show the average 2023 PM peak-hour volume served, speed, LOS, and density for the mainline sections between interchanges in the southbound direction. Appendix C lists the LOS and density results for the ramp junctions.

Similar to 2013 conditions, the No Build and Bus/Carpool Conversion Alternatives would be congested from north of US-50 to Pocket Road due to the bottleneck between Florin Road and Pocket Road. In contrast, the Mixed Flow Addition Alternative would have two areas of congestion: north of Sutterville Road and from Cosumnes River Boulevard to Laguna Boulevard. The latter congestion is due to the high volume of traffic exiting at Laguna Boulevard. The Bus/Carpool Addition Alternative would have congestion north of US-50 and from 43<sup>rd</sup> Avenue to Pocket Road. Although this alternative includes an auxiliary lane between Florin Road and Pocket Road, the mixed flow demand volume at the Pocket Road overcrossing exceeds the mixed flow capacity.

At the Sutterville Road bottleneck, the Mixed Flow Addition Alternative would serve about 750, 3,300, and 4,000 vehicles more than the Bus/Carpool Addition, No Build, and Bus/Carpool Conversion Alternatives during the peak hour, respectively. South of Cosumnes River Boulevard, the Mixed Flow Addition Alternative would serve 600 vehicles more than the Bus/Carpool Addition Alternative, 1,400 vehicles more than the No Build Alternative, and 2,500 vehicles more than the Bus/Carpool Conversion Alternative.

**TABLE 30 – 2023 SOUTHBOUND PM PEAK-HOUR VOLUME AND SPEED**

Freeway Segment	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed
Richards Blvd to I/J/L St	7,704	<u>25</u>	10,579	35	9,369	<u>31</u>	9,122	<u>28</u>
I/J/L St to US-50/P St/Q St	8,053	<u>26</u>	9,795	43	8,981	35	8,116	<u>29</u>
US-50/P St/Q St to Sutterville Rd	6,645	<u>19</u>	9,796	53	9,161	51	5,796	<u>26</u>
Sutterville Rd to Seamas Ave	6,588	<u>25</u>	9,888	63	9,135	44	5,795	<u>33</u>
Seamas Ave to 43 <sup>rd</sup> Ave	6,787	<u>24</u>	10,001	62	9,070	39	5,976	<u>31</u>
43 <sup>rd</sup> Ave to Florin Rd	6,025	<u>24</u>	9,520	57	7,987	<u>31</u>	5,267	<u>29</u>
Florin Rd to Pocket Rd	5,423	<u>29</u>	7,557	62	6,880	<u>28</u>	4,563	<u>40</u>
Pocket Rd to Cosumnes River Blvd	5,648	62	7,331	62	6,728	60	4,633	61
Cosumnes River Blvd to Laguna Blvd	5,667	58	7,061	<u>31</u>	6,449	45	4,540	54
Laguna Blvd to Elk Grove Blvd	3,898	53	3,740	64	4,382	63	3,104	62
Elk Grove Blvd to Hood Franklin Rd	2,824	63	3,379	63	3,103	61	2,263	63
Peak Hour	5:00 – 6:00 PM		5:15 – 6:15 PM		5:30 – 6:30 PM		5:30 – 6:30 PM	

Notes: Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively. The bus/carpool lane is included in the calculation of average volume and speed.

Source: Fehr & Peers, 2009

**TABLE 31 – 2023 SOUTHBOUND PM PEAK-HOUR LOS AND DENSITY**

Freeway Segment	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
	LOS	Density	LOS	Density	LOS	Density	LOS	Density
Richards Blvd to I/J/L St	<u>F</u>	<u>129</u>	<u>F</u>	<u>113</u>	<u>F</u>	<u>120</u>	<u>F</u>	<u>128</u>
I/J/L St to US-50/P St/Q St	<u>F</u>	<u>71</u>	<u>F</u>	<u>49</u>	<u>F</u>	<u>65</u>	<u>F</u>	<u>75</u>
US-50/P St/Q St to Sutterville Rd	<u>F</u>	<u>139</u>	<u>F</u>	<u>114</u>	<u>F</u>	<u>113</u>	<u>F</u>	<u>131</u>
Sutterville Rd to Seamas Ave	<u>F</u>	<u>132</u>	D	33	<u>F</u>	<u>112</u>	<u>F</u>	<u>133</u>
Seamas Ave to 43 <sup>rd</sup> Ave	<u>F</u>	<u>110</u>	D	28	<u>F</u>	<u>98</u>	<u>F</u>	<u>113</u>
43 <sup>rd</sup> Ave to Florin Rd	<u>F</u>	<u>94</u>	D	30	<u>F</u>	<u>84</u>	<u>F</u>	<u>98</u>
Florin Rd to Pocket Rd	<u>F</u>	<u>78</u>	D	30	<u>F</u>	<u>103</u>	<u>F</u>	<u>98</u>
Pocket Rd to Cosumnes River Blvd	D	32	D	32	D	33	D	34
Cosumnes River Blvd to Laguna Blvd	E	38	<u>F</u>	<u>56</u>	<u>F</u>	<u>54</u>	E	42
Laguna Blvd to Elk Grove Blvd	<u>F</u>	<u>60</u>	C	21	C	22	D	27
Elk Grove Blvd to Hood Franklin Rd	C	24	C	22	D	27	C	19

Notes: Bold and underline font indicate LOS F conditions. The average density is reported in vehicles per lane per mile. The bus/carpool lane is not included in the LOS or density calculation. The peak hour LOS is based on the peak 15 minutes of the peak hour according to the HCM.

Source: Fehr & Peers, 2009

Table 32 shows the volume served in the bus/carpool lane under the bus/carpool alternatives. For the lane addition alternative, the peak volume of 1,564 would occur between 43<sup>rd</sup> Avenue and Florin Road. The bus/carpool lane speed would be less than 60 mph from Seamas Avenue to Pocket Road due to exiting vehicles that are slowing to merge into the congested mixed-flow lanes. The peak volume for the lane conversion alternative would be lower at 964 vph, but the average speed would be similar to the lane addition alternative.

<b>TABLE 32 – 2023 SOUTHBOUND PM PEAK-HOUR BUS/CARPOOL LANE VOLUME AND SPEED</b>				
<b>Freeway Segment</b>	<b>Bus/Carpool Addition</b>		<b>Bus/Carpool Conversion</b>	
	<b>Volume</b>	<b>Speed</b>	<b>Volume</b>	<b>Speed</b>
US-50/P St/Q St to Sutterville Rd	1,500	59	606	63
Sutterville Rd to Seamas Ave	1,516	62	951	63
Seamas Ave to 43 <sup>rd</sup> Ave	1,530	58	964	57
43 <sup>rd</sup> Ave to Florin Rd	1,564	49	948	50
Florin Rd to Pocket Rd	1,362	57	784	59
Pocket Rd to Cosumnes River Blvd	1,115	63	728	63
Cosumnes River Blvd to Laguna Blvd	1,237	61	747	53
Laguna Blvd to Elk Grove Blvd	534	64	-	-
Elk Grove Blvd to Hood Franklin Rd	531	63	-	-
Peak Hour	5:30 – 6:30 PM		5:30 – 6:30 PM	
Note:	Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively.			
Source:	Fehr & Peers, 2009			

## 7. DESIGN YEAR (2033) CONDITIONS ANALYSIS

This chapter presents the analysis results of the project alternatives under design year (2033) conditions. For each alternative, traffic operations are evaluated using peak-hour volume, speed, LOS, density, travel time, and network summary statistics. Figures 6A through 6F show the peak-hour demand and served volume and lane configuration under 2033 conditions. Appendix D contains the results summary sheets for the travel time, network statistics, and freeway section analysis.

Four design options for the Bus/Carpool Addition Alternative were analyzed under 2033 conditions. The results of the design options analysis and a comparison with the Bus/Carpool Addition Alternative results are provided in Appendix E. The design options either had marginal operational differences or significantly worse performance.

### NORTHBOUND – AM PEAK PERIOD

Table 33 shows the average peak-hour travel time and speed for the project alternatives. Under the No Build Alternative, the commute time from Hood Franklin Road to US-50 would be similar to 2023 conditions – about 55 minutes. Travel times would improve to about 41 and 49 minutes for the Mixed Flow and Bus/Carpool Addition Alternatives, respectively. Under the Bus/Carpool Addition Alternative, the average travel time for HOVs would be 28 minutes. Total travel time under the Bus/Carpool Conversion Alternative would be higher than the other alternatives.

Route	Type	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
		Time	Speed	Time	Speed	Time	Speed	Time	Speed
Hood Franklin Rd EB On-ramp to Pocket Rd Off-ramp	All	34.1	13.5	23.1	19.9	32.4	14.2	78.1	6.0
	HOV	34.2	13.5	22.8	20.2	17.3	26.8	45.2	10.4
Pocket Rd Off ramp to US-50 Off-ramp	All	19.2	18.2	18.3	19.0	16.4	21.2	27.2	13.1
	HOV	19.0	18.4	18.4	19.0	10.9	32.0	11.4	30.9
Hood Franklin Rd EB On-ramp to US-50 Off-ramp	All	53.3	15.5	41.5	19.5	48.8	17.2	105.3	9.1
	HOV	53.2	15.6	41.2	19.7	28.2	29.0	56.5	19.2
Peak Hour		7:15 – 8:15 AM		7:15 – 8:15 AM		7:00 – 8:00 AM		7:30 – 8:30 AM	
Notes: The average travel time and speed for the peak hour are reported as minutes and miles per hour, respectively. The HOV type includes travel by HOVs in any travel lane (mixed-flow or bus/carpool lane).									
Source: Fehr & Peers, 2009									

Table 34 summarizes the network statistics for the AM peak period. The lane addition alternatives would serve more vehicles, have a higher average speed, and have less delay than the No Build Alternative. While both lane addition alternatives would serve about the same number of vehicles, the Bus/Carpool Addition Alternative would serve more persons. Average speed for HOVs would be 1.6 mph higher with the Bus/Carpool Addition Alternative although the overall average speed would be 1.2 mph less than the Mixed Flow Addition Alternative. The Bus/Carpool Conversion Alternative would have worse network performance than the other alternatives.

Tables 35 and 36 show the average 2033 AM peak-hour volume served, speed, LOS, and density for the mainline sections between interchanges in the northbound direction. Appendix D lists the LOS and density results for the ramp junctions.

**TABLE 34 – 2033 NORTHBOUND AM PEAK-PERIOD NETWORK SUMMARY**

Performance Measure	No Build	Mixed Flow Addition	Bus/Carpool Addition	Bus/Carpool Conversion
Number of Vehicles Served	60,000	65,100	64,900	41,500
Number of Persons Served <sup>1</sup>	78,700	84,300	91,300	59,800
Travel Distance (vehicle-miles)	470,000	540,300	537,900	361,100
Travel Time (vehicle-hours)	31,900	29,200	31,100	41,400
Average Speed – All vehicles (mph)	14.7	18.5	17.3	8.7
Average Speed – HOVs (mph)	18.1	21.7	23.3	11.5
Travel Delay <sup>2</sup> (vehicle-hours)	24,300	20,500	22,500	35,700
Average Delay <sup>2</sup> (seconds per vehicle)	1,320	1,050	1,150	2,330

Notes: 1. Based on traffic counts, HOVs, trucks, and other vehicles are assumed to have vehicle occupancies of 2.35, 1.2, and 1.0 persons per vehicle, respectively.  
2. Delay is measured as the additional travel time when traveling less than the desired free-flow speed.

Source: Fehr & Peers, 2009

**TABLE 35 – 2033 NORTHBOUND AM PEAK-HOUR VOLUME AND SPEED**

Freeway Segment	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed
Hood Franklin Rd to Elk Grove Blvd	2,871	<u>27</u>	3,607	56	2,756	<u>27</u>	1,697	<u>18</u>
Elk Grove Blvd to Laguna Blvd	3,278	<u>21</u>	4,779	<u>17</u>	3,992	<u>17</u>	2,018	<u>15</u>
Laguna Blvd to Cosumnes River Blvd	3,932	<u>24</u>	5,757	<u>26</u>	4,853	<u>29</u>	2,413	<u>28</u>
Cosumnes River Blvd to Pocket Rd	4,034	<u>22</u>	5,837	<u>24</u>	5,172	<u>25</u>	2,557	<u>20</u>
Pocket Rd to Florin Rd	4,838	<u>18</u>	6,671	<u>15</u>	6,202	<u>21</u>	3,423	<u>22</u>
Florin Rd to 43 <sup>rd</sup> Ave	5,459	<u>22</u>	7,139	<u>22</u>	6,717	<u>25</u>	4,488	<u>25</u>
43 <sup>rd</sup> Ave to Seamas Ave	5,457	<u>17</u>	7,144	<u>19</u>	6,733	<u>26</u>	5,366	<u>24</u>
Seamas Ave to Sutterville Rd	7,379	<u>30</u>	8,956	<u>29</u>	8,576	<u>32</u>	5,812	<u>29</u>
Sutterville Rd to US-50/P St/Q St	7,686	61	9,105	61	8,822	61	6,226	43
US-50/P St/Q St to I/J/L St	7,186	54	7,201	48	7,259	50	6,536	<u>26</u>
I/J/L St to Richards Blvd	6,638	59	6,598	59	6,665	58	7,318	60
Peak Hour	7:15 – 8:15 AM		7:15 – 8:15 AM		7:00 – 8:00 AM		7:30 – 8:30 AM	

Notes: Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively. The bus/carpool lane is included in the calculation of average volume and speed.

Source: Fehr & Peers, 2009

TABLE 36 – 2033 NORTHBOUND AM PEAK-HOUR LOS AND DENSITY

Freeway Segment	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
	LOS	Density	LOS	Density	LOS	Density	LOS	Density
Hood Franklin Rd to Elk Grove Blvd	<u>F</u>	<u>103</u>	C	24	<u>F</u>	<u>129</u>	<u>F</u>	<u>153</u>
Elk Grove Blvd to Laguna Blvd	<u>F</u>	<u>96</u>	<u>F</u>	<u>118</u>	<u>F</u>	<u>129</u>	<u>F</u>	<u>138</u>
Laguna Blvd to Cosumnes River Blvd	<u>F</u>	<u>116</u>	<u>F</u>	<u>108</u>	<u>F</u>	<u>127</u>	<u>F</u>	<u>154</u>
Cosumnes River Blvd to Pocket Rd	<u>F</u>	<u>95</u>	<u>F</u>	<u>88</u>	<u>F</u>	<u>103</u>	<u>F</u>	<u>138</u>
Pocket Rd to Florin Rd	<u>F</u>	<u>129</u>	<u>F</u>	<u>119</u>	<u>F</u>	<u>125</u>	<u>F</u>	<u>162</u>
Florin Rd to 43 <sup>rd</sup> Ave	<u>F</u>	<u>109</u>	<u>F</u>	<u>103</u>	<u>F</u>	<u>108</u>	<u>F</u>	<u>134</u>
43 <sup>rd</sup> Ave to Seamas Ave	<u>F</u>	<u>113</u>	<u>F</u>	<u>117</u>	<u>F</u>	<u>126</u>	<u>F</u>	<u>123</u>
Seamas Ave to Sutterville Rd	<u>F</u>	<u>87</u>	<u>F</u>	<u>89</u>	<u>F</u>	<u>90</u>	<u>F</u>	<u>121</u>
Sutterville Rd to US-50/P St/Q St	D	31	D	33	E	36	<u>F</u>	<u>80</u>
US-50/P St/Q St to I/J/L St	<u>F</u>	<u>68</u>	<u>F</u>	<u>67</u>	<u>F</u>	<u>59</u>	<u>F</u>	<u>90</u>
I/J/L St to Richards Blvd	C	27	C	27	C	27	C	27

Notes: Bold and underline font indicate LOS F conditions. The average density is reported in vehicles per lane per mile. The bus/carpool lane is not included in the LOS or density calculation. The peak hour LOS is based on the peak 15 minutes of the peak hour according to the HCM.

Source: Fehr & Peers, 2009

The location of congested conditions (speeds less than 35 mph) would be similar for the No Build and lane addition alternatives. All alternatives show a bottleneck at the US-50 off-ramp. Because drivers are changing lanes before the US-50 exit, the model also shows a bottleneck at the Sutterville Road interchange. The Laguna Boulevard and Cosumnes River Boulevard on-ramps are additional bottleneck locations due to the high volume of entering traffic.

As expected, the average speeds would be lower and the densities would be higher for the No Build Alternative compared to the lane addition alternatives. Under the lane addition alternatives, the congested area would be shorter. The segment between Hood Franklin Road and Elk Grove Boulevard would operate at LOS C or D compared to LOS F under the No Build Alternative. Average speeds would be higher under the Bus/Carpool Addition Alternative in the congested area, which would reflect the higher, uncongested travel speed of the bus/carpool lane. Unlike the earlier analysis years, the minor bottleneck at the J Street off-ramp would occur for all alternatives. Although the No Build Alternative would have a lower percentage of HOVs, the roadway capacity would be lower under the Bus/Carpool Conversion Alternative, so the density would be higher and the average speed lower.

At US-50, the Mixed Flow Addition Alternative would serve 1,400 vehicles more than the No Build Alternative, 300 vehicles more than the Bus/Carpool Addition Alternative, and 2,900 vehicles more than the Bus/Carpool Conversion Alternative during the peak hour.

As shown in Table 37, the bus/carpool lane would have a peak volume of 1,461 vehicles per hour between Seamas Avenue and Sutterville Road under the Bus/Carpool Addition Alternative. In general, the Bus/Carpool

Conversion Alternative would have lower HOV lane volumes, but the peak-hour volume would be higher on the segment between Sutterville Road and US-50. This segment is less congested in the lane addition alternative, so fewer HOVs are using in the leftmost lane.

<b>TABLE 37 – 2033 NORTHBOUND AM PEAK-HOUR BUS/CARPOOL LANE VOLUME AND SPEED</b>				
<b>Freeway Segment</b>	<b>Bus/Carpool Addition</b>		<b>Bus/Carpool Conversion</b>	
	<b>Volume</b>	<b>Speed</b>	<b>Volume</b>	<b>Speed</b>
Hood Franklin Rd to Elk Grove Blvd	503	60	-	-
Elk Grove Blvd to Laguna Blvd	737	36	-	-
Laguna Blvd to Cosumnes River Blvd	883	47	776	52
Cosumnes River Blvd to Pocket Rd	1,123	34	875	31
Pocket Rd to Florin Rd	1,220	49	919	39
Florin Rd to 43 <sup>rd</sup> Ave	1,320	43	1,070	43
43 <sup>rd</sup> Ave to Seamas Ave	1,360	57	1,263	49
Seamas Ave to Sutterville Rd	1,461	44	1,364	44
Sutterville Rd to US-50/P St/Q St	900	60	1,397	53
Peak Hour	7:00 – 8:00 AM		7:30 – 8:30 AM	
Note:	Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively.			
Source:	Fehr & Peers, 2009			

### **SOUTHBOUND – PM PEAK PERIOD**

Table 38 shows the average peak-hour travel time and speed for the project alternatives. Under the No Build Alternative, the average travel time from US-50 to Hood Franklin Road would be 31 minutes. The average travel time for the Mixed Flow and Bus/Carpool Addition Alternatives would be 17 and 27 minutes, respectively. Both the No Build and Bus/Carpool Addition Alternatives would have a bottleneck at Pocket Road, but the Mixed Flow Addition Alternative would not. South of Pocket Road, travel times are similar under all three alternatives. Under the Bus/Carpool Addition Alternative, HOVs would have a shorter travel time, 15 minutes, than under the other alternatives. The Bus/Carpool Conversion Alternative would have an overall travel time similar to the No Build Alternative with a HOV travel time similar to the Bus/Carpool Addition Alternative.

Table 39 summarizes the network statistics for the PM peak period. The No Build Alternative would serve fewer vehicles than the lane addition alternatives. The Mixed Flow Addition Alternative would serve the most vehicles at the highest speed, but the Bus/Carpool Addition Alternative would serve the most persons. The average speed for HOVs would be about the same under both lane addition alternatives. Similar to 2023 conditions, the Bus/Carpool Conversion Alternative would serve the fewest vehicles and persons although the average HOV speed would be higher than the No Build Alternative.

**TABLE 38 – 2033 SOUTHBOUND PM PEAK-HOUR TRAVEL TIME AND SPEED**

Route	Type	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
		Time	Speed	Time	Speed	Time	Speed	Time	Speed
US-50 WB On-Ramp to Pocket Rd WB On-Ramp	All	23.3	15.2	9.6	37.0	19.2	18.5	21.9	16.4
	HOV	23.8	14.9	9.6	37.1	7.7	46.3	8.7	41.0
Pocket Rd WB On-Ramp to Hood Franklin Rd WB On-Ramp	All	7.8	45.7	7.6	46.5	7.6	46.3	7.9	45.5
	HOV	7.8	45.7	7.6	46.5	7.2	49.4	7.1	49.6
US-50 WB On-Ramp to Hood Franklin Rd WB On-Ramp	All	31.0	32.2	17.2	42.3	26.9	33.9	29.7	32.5
	HOV	31.5	32.0	17.2	42.3	14.9	48.0	15.9	45.8
Peak Hour		5:00 – 6:00 PM		5:15 – 6:15 PM		5:15 – 6:15 PM		5:15 – 6:15 PM	

Notes: The average travel time and speed for the peak hour are reported as minutes and miles per hour, respectively. The HOV type includes travel by HOVs in any travel lane (mixed-flow or bus/carpool lane).

Source: Fehr & Peers, 2009

**TABLE 39 – 2033 SOUTHBOUND PM PEAK-PERIOD NETWORK SUMMARY**

Performance Measure	No Build	Mixed Flow Addition	Bus/Carpool Addition	Bus/Carpool Conversion
Number of Vehicles Served	65,000	78,700	76,000	59,200
Number of Persons Served <sup>1</sup>	86,900	99,000	103,400	77,900
Travel Distance (vehicle-miles)	457,200	576,300	551,300	393,100
Travel Time (vehicle-hours)	19,500	14,800	17,100	17,800
Average Speed – All vehicles (mph)	23.4	39.0	32.2	22.1
Average Speed – HOVs (mph)	25.9	41.2	41.1	29.6
Travel Delay <sup>2</sup> (vehicle-hours)	12,300	5,700	8,400	11,600
Average Delay <sup>2</sup> (seconds per vehicle)	640	250	380	660

Notes: 1. Based on traffic counts, HOVs, trucks, and other vehicles are assumed to have vehicle occupancies of 2.35, 1.2, and 1.0 persons per vehicle, respectively.

2. Delay is measured as the additional travel time when traveling less than the desired free-flow speed.

Source: Fehr & Peers, 2009

Tables 40 and 41 show the average 2033 PM peak-hour volume served, speed, LOS, and density for the mainline sections between interchanges in the southbound direction. Appendix D lists the LOS and density results for the ramp junctions.

**TABLE 40 – 2033 SOUTHBOUND PM PEAK-HOUR VOLUME AND SPEED**

Freeway Segment	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed
Richards Blvd to I/J/L St	7,734	<u>27</u>	10,313	<u>35</u>	10,300	36	8,159	<u>26</u>
I/J/L St to US-50/P St/Q St	7,965	<u>29</u>	9,698	39	9,630	38	7,667	<u>25</u>
US-50/P St/Q St to Sutterville Rd	6,193	<u>18</u>	9,873	53	8,613	43	5,347	<u>24</u>
Sutterville Rd to Seamas Ave	6,140	<u>22</u>	10,045	63	8,499	<u>35</u>	5,270	<u>34</u>
Seamas Ave to 43 <sup>rd</sup> Ave	6,412	<u>22</u>	10,188	62	8,519	<u>33</u>	5,512	<u>29</u>
43 <sup>rd</sup> Ave to Florin Rd	5,784	<u>23</u>	9,666	57	7,658	<u>29</u>	4,908	<u>29</u>
Florin Rd to Pocket Rd	5,272	<u>26</u>	7,843	42	6,741	<u>27</u>	4,383	42
Pocket Rd to Cosumnes River Blvd	5,583	62	7,704	61	6,788	61	4,576	61
Cosumnes River Blvd to Laguna Blvd	5,409	62	7,069	60	6,333	61	4,480	61
Laguna Blvd to Elk Grove Blvd	3,786	56	3,844	64	4,458	63	3,106	62
Elk Grove Blvd to Hood Franklin Rd	2,802	63	3,633	63	3,270	63	2,348	63
Peak Hour	5:00 – 6:00 PM		5:15 – 6:15 PM		5:15 – 6:15 PM		5:15 – 6:15 PM	

Notes: Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively. The bus/carpool lane is included in the calculation of average volume and speed.

Source: Fehr & Peers, 2009

**TABLE 41 – 2033 SOUTHBOUND PM PEAK-HOUR LOS AND DENSITY**

Freeway Segment	No Build		Mixed Flow Addition		Bus/Carpool Addition		Bus/Carpool Conversion	
	LOS	Density	LOS	Density	LOS	Density	LOS	Density
Richards Blvd to I/J/L St	<u>F</u>	<u>130</u>	<u>F</u>	<u>109</u>	<u>F</u>	<u>111</u>	<u>F</u>	<u>129</u>
I/J/L St to US-50/P St/Q St	<u>F</u>	<u>74</u>	<u>F</u>	<u>50</u>	<u>F</u>	<u>50</u>	<u>F</u>	<u>72</u>
US-50/P St/Q St to Sutterville Rd	<u>F</u>	<u>141</u>	<u>F</u>	<u>113</u>	<u>F</u>	<u>130</u>	<u>F</u>	<u>147</u>
Sutterville Rd to Seamas Ave	<u>F</u>	<u>135</u>	D	34	<u>F</u>	<u>129</u>	<u>F</u>	<u>145</u>
Seamas Ave to 43 <sup>rd</sup> Ave	<u>F</u>	<u>114</u>	D	29	<u>F</u>	<u>109</u>	<u>F</u>	<u>129</u>
43 <sup>rd</sup> Ave to Florin Rd	<u>F</u>	<u>97</u>	D	31	<u>F</u>	<u>91</u>	<u>F</u>	<u>110</u>
Florin Rd to Pocket Rd	<u>F</u>	<u>83</u>	<u>F</u>	<u>88</u>	<u>F</u>	<u>106</u>	<u>F</u>	<u>106</u>
Pocket Rd to Cosumnes River Blvd	D	31	D	33	D	32	D	33
Cosumnes River Blvd to Laguna Blvd	D	32	E	38	E	36	E	35
Laguna Blvd to Elk Grove Blvd	<u>F</u>	<u>48</u>	C	22	C	22	D	27
Elk Grove Blvd to Hood Franklin Rd	C	23	C	23	D	28	C	19

Notes: Bold and underline font indicate LOS F conditions. The average density is reported in vehicles per lane per mile. The bus/carpool lane is not included in the LOS or density calculation. The peak hour LOS is based on the peak 15 minutes of the peak hour according to the HCM.

Source: Fehr & Peers, 2009

The location of congested conditions (speeds less than 35 mph) differs across alternatives. For the No Build and Alternative, congestion extends from north of US-50 to Pocket Road. For the Mixed Flow Addition Alternative, average speeds would be less than 40 mph north of US-50 and less than 50 mph between Florin Road and Pocket Road. The Bus/Carpool Addition Alternative would have similar average speeds north of US-50, but average speeds would be less than 35 mph from Sutterville Road to Pocket Road. For the Bus/Carpool Conversion Alternative, the bottleneck would be the Florin Road off-ramp as reflected in the higher speeds south of this location. This differs from the Bus/Carpool Addition Alternative which has an auxiliary lane between Florin Road and Pocket Road, so its bottleneck would be further south at Pocket Road.

At Sutterville Road, the Mixed Flow Addition Alternative would serve 3,900 vehicles more than the No Build Alternative, 1,500 vehicles more than the Bus/Carpool Addition Alternative, and 4,800 vehicles more than the Bus/Carpool Conversions Alternative during the peak hour. At Cosumnes River Boulevard, the Mixed Flow Addition Alternative would serve 1,700, 700, and 2,600 vehicles more than the No Build, Bus/Carpool Addition, and Bus/Carpool Conversion Alternatives, respectively.

Table 42 shows, for the Bus/Carpool Addition Alternative, the peak bus/carpool lane volume of 1,662 vph would occur between 43<sup>rd</sup> Avenue and Florin Road. The average speed in the bus/carpool lane would be 45 mph in this segment, but the remaining segments would have average speeds of 55 mph or higher. Under the Bus/Carpool Conversion Alternative, the bottleneck at the start of the bus/carpool lane and other bottlenecks in the network would constrain the volume of traffic in the bus/carpool to have about half the volume under the Bus/Carpool Addition Alternative.

<b>TABLE 42 – 2033 SOUTHBOUND PM PEAK-HOUR BUS/CARPOOL LANE VOLUME AND SPEED</b>				
<b>Freeway Segment</b>	<b>Bus/Carpool Addition</b>		<b>Bus/Carpool Conversion</b>	
	<b>Volume</b>	<b>Speed</b>	<b>Volume</b>	<b>Speed</b>
US-50/P St/Q St to Sutterville Rd	1,637	55	479	63
Sutterville Rd to Seamas Ave	1,651	62	833	63
Seamas Ave to 43 <sup>rd</sup> Ave	1,649	55	890	54
43 <sup>rd</sup> Ave to Florin Rd	1,662	45	881	50
Florin Rd to Pocket Rd	1,457	56	743	60
Pocket Rd to Cosumnes River Blvd	1,152	63	747	63
Cosumnes River Blvd to Laguna Blvd	1,102	62	777	63
Laguna Blvd to Elk Grove Blvd	544	63	-	-
Elk Grove Blvd to Hood Franklin Rd	578	63	-	-
<b>Peak Hour</b>	<b>5:15 – 6:15 PM</b>		<b>5:15 – 6:15 PM</b>	
Note:	Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively.			
Source:	Fehr & Peers, 2009			

## 8. OTHER CONSIDERATIONS

The following chapter covers other considerations regarding traffic operations and the proposed widening of I-5 from 1.1 miles south of Elk Grove Boulevard to US-50.

### PARK AND RIDE

Commuters who want to avoid traffic congestion and save on commuting costs can leave their cars in park and ride facilities, join car or vanpools or ride buses, and utilize a bus/carpool lane for their trip to work. Current carpools and transit users utilize the few existing park and ride facilities along the I-5 corridor. In general, the commute destination is downtown Sacramento from the residential areas in Elk Grove and south Sacramento. Transit stops enhance park and ride lot use, and locating these lots along or near both the freeway and the intersecting transit route will reduce auto trips. Proximity to bicycle and pedestrian facilities with safe sidewalks and bike lockers are also essential for a successful park and ride lot.

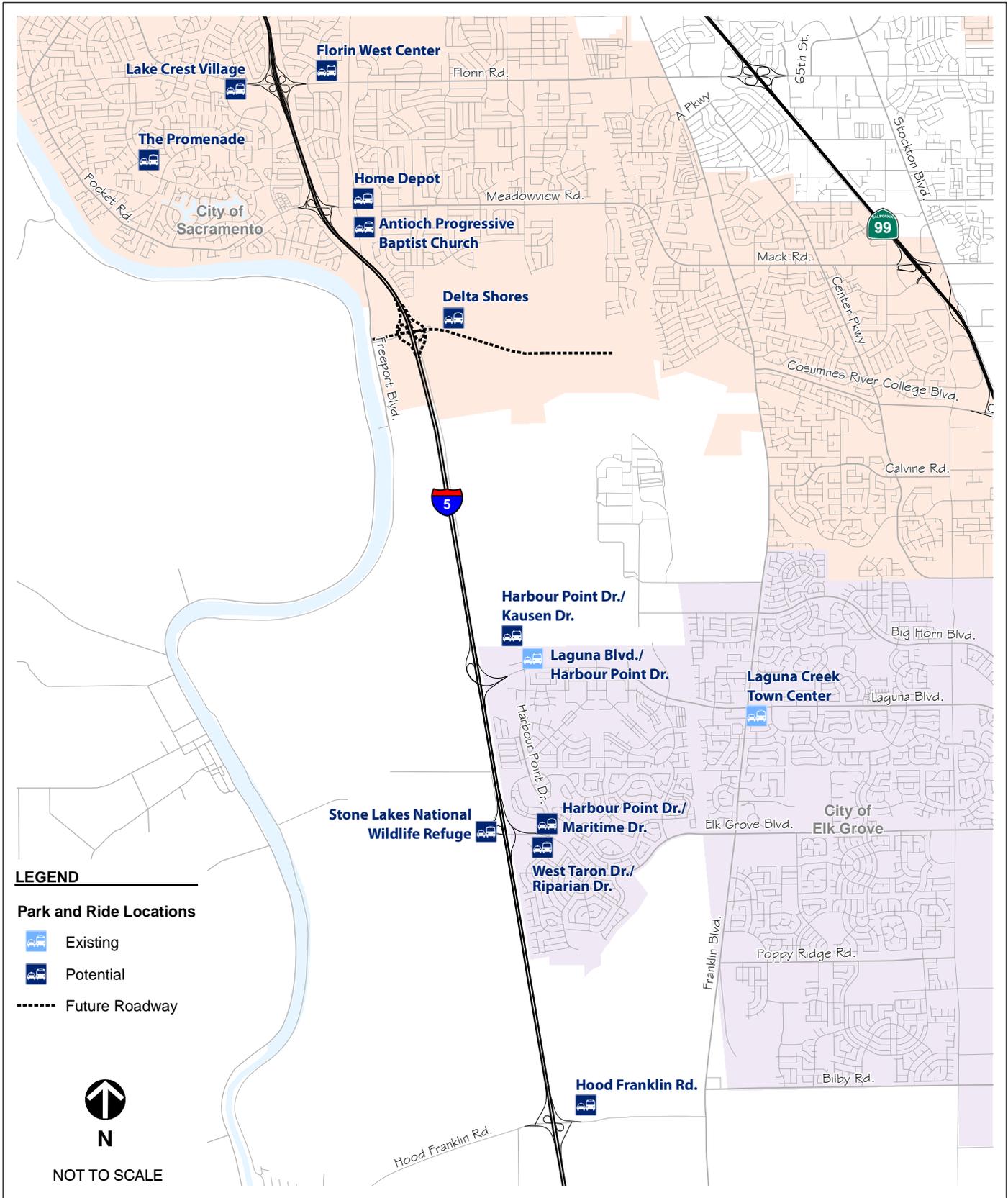
Table 43 and Figure 11 show the park and ride lots nearest the study area.

TABLE 43 – EXISTING PARK AND RIDE LOTS			
Location	City	Parking Spaces	Average Usage
Laguna Blvd / Harbour Point Dr	Elk Grove	73	Full
Laguna Creek Town Center	Elk Grove	65	Full
Source: eTran, 2007			

The two park and ride lots in the City of Elk Grove that are close to I-5 are intended for bus riders. The City of Elk Grove and eTran, Elk Grove's transit agency, maintain the lots.

Caltrans does not own or maintain any park and ride lots along the I-5 corridor within the study area. Informal park and ride arrangements may be occurring at large parking areas adjacent to I-5 and along city streets. Potential locations for future park and ride lots are described below.

- Hood Franklin Road – As development occurs in this area, a new park and ride lot should be considered near the I-5 interchange. The lot could be a condition of approval for a development project, or it could be built in conjunction with roadway widening or signal installation projects.
- Elk Grove Boulevard – Vacant properties exist near Maritime Drive / Harbour Point Drive and near West Taron Drive / Riparian Drive east of the freeway. The entrance to the Stone Lakes National Wild Life Refuge is on the west side of the freeway. A parking lot could be shared between visitors to the refuge and commuters.
- Laguna Boulevard – Vacant land exists north of the existing eTran park and ride lot at Harbour Point Drive / Kausen Drive. Since the lot is typically full, additional parking spaces would be beneficial.



- Cosumnes River Boulevard – As development occurs in this area, a new park and ride lot should be considered near the proposed I-5 interchange. The lot could be a condition of approval for a development project. The commercial sites proposed just east of the interchange may provide a shared parking opportunity.
- Pocket Road – Vacant properties exist east of the interchange. A church on Freeport Boulevard and a large shopping center at Meadowview Road / Freeport Boulevard may have space available for a park and ride lot.
- Promenade Shopping Center – Regional Transit, the Sacramento area transit agency, operates a transit center at this shopping center located at Rush River Drive / Windbridge Drive. A park and ride lot could be developed similar to the one in the City of Elk Grove at the Laguna Creek Town Center.
- Franklin Boulevard Station (future) – Sacramento Regional Transit's South Line Light Rail extension Phase 2 proposes a 700-space Park and Ride lots at the Franklin Boulevard Station. This location is the closest to I-5 (via the future Cosumnes River Boulevard extension and interchange) and may accommodate some bus/carpool lane users.

Caltrans should continue to utilize public/private partnerships to develop additional park and ride lots since they are valuable to the users of the bus/carpool lanes and contribute to the success of bus/carpool lanes in general.

## TRAFFIC OPERATIONS SYSTEM ELEMENTS

Caltrans planning documents (Ramp Meter Development Report, etc.) call for the installation of traffic operations system (TOS) elements along I-5 in the study area. These elements, which provide control and monitoring of traffic conditions, include the following.

- Ramp meters
- Traffic monitoring stations (TMS)
- Closed-circuit television cameras (CCTV)
- Changeable message signs (CMS)
- Highway advisory radio (HAR)
- Real-time weather information system (RWIS)

Table 44 lists the proposed TOS elements to be constructed as part of the proposed project and a separate project that will construct TOS elements throughout the Sacramento region. If a build alternative is selected, the project should include the remaining TOS elements along the corridor so that the freeway can be operated and managed effectively.

TABLE 44 – TRAFFIC OPERATIONS SYSTEM ELEMENTS			
Element	Project	Location	Post Mile
CCTV	I-5 Bus/Carpool Lanes (EA 3C9000)	Elk Grove Boulevard	10.8
		Laguna Boulevard	12.2
TMS	Sacramento TOS Elements (EA 4C0301)	South of Elk Grove Boulevard	10.0
		South of Laguna Boulevard	11.7
		Beach Lake Bridge	12.7
		North of Beach Lake Bridge	13.2
		South of River Bend Overcrossing	14.5
		Route 160 Overhead	15.5

Source: I-5 Bus/Carpool Lanes Project Study Report, Caltrans District 3, 2007 and Caltrans District 3, 2008

## BUS/CARPOOL LANE SAFETY

Recent research studies in other states have reported higher accident rates associated with bus/carpool lanes on freeways. The studies have focused on buffer or barrier-separated facilities, which have accident concentrations at ingress/egress locations. For contiguous bus/carpool lanes, such as the ones in Caltrans District 3, safety concerns exist due to the speed difference between the freely flowing bus/carpool lane and the adjacent congested mixed-flow lanes. As a result, a review of accident data for bus/carpool lanes in the Sacramento area was conducted.

In Caltrans District 3, contiguous bus/carpool lanes exist along the SR-51/SR-99 corridor from Elk Grove to Sacramento, along US-50 from Rancho Cordova to El Dorado Hills, and along I-80 from Sacramento to Roseville. The SR-51/SR-99 bus/carpool lanes have sections with reduced lane and shoulder width, which will be similar to the proposed bus/carpool lanes on I-5 north of Florin Road.

Accident data from the US-50 and I-80 bus/carpool lanes were assessed. Caltrans District 3 provided TASAS accident data of at least one year before and after the construction of the HOV Lanes. The accident data was reviewed according to the following categories.

- Type of collision – rear-end, sideswipe, hit object, etc.
- Movement preceding collision – changing lanes, proceeding straight, stopped, etc.
- Time of day – peak period (during bus/carpool lane restriction) versus off-peak period
- Location of collision – bus/carpool lane, inside lanes, right lanes, shoulder

The principal conclusion was that accident rates are sensitive to traffic congestion whether or not a freeway has bus/carpool lanes. Furthermore, no clear differences were found in collision type, movement preceding collision, or other factors, which would support the hypothesis that contiguous bus/carpool lanes affect freeway safety. For further details, please see the separate technical report, *Contiguous HOV Lane Safety Review* (Fehr & Peers, 2006).

Due to right of way constraints, the build alternatives propose 11-foot lanes and reduced shoulder widths in some segments of the project. Design exceptions for these standards have been approved for roadway operations and safety. Although segments with reduced lane and median widths may have increased accident rates compared to segments with standard lane and shoulder widths, the congestion reduction associated with the lane addition under the proposed project would provide a reduced accident rate that would counteract this increase. In particular, congestion reduction is associated with fewer rear-end crashes, which is the most frequent type of crash in the study area.

## TRANSIT USE

The proposed bus/carpool lanes would benefit transit routes that would use I-5 in the study area. Bus/carpool lanes would provide reduced travel time and improved travel time reliability since the bus/carpool lanes would have less congestion than the adjacent mixed-flow lanes. The following transit agencies have routes that use I-5 in the study area.

- eTran – The City of Elk Grove’s transit agency has four routes that make a total of 32 trips per day during the morning and afternoon peak periods from Laguna Boulevard to downtown Sacramento. Average daily ridership for these routes is 750 passengers.
- Regional Transit – The Sacramento area transit agency operates two routes that make a total of 14 trips per day during the morning and afternoon peak periods from 43<sup>rd</sup> Avenue to downtown Sacramento. Average daily ridership on these routes is 330 to 380 passengers.
- San Joaquin Regional Transit District – San Joaquin RTD provides one route that makes a total of two trips per day (one northbound in the morning and one southbound in the afternoon) from Stockton to downtown Sacramento. Average daily ridership is 130 passengers (that is, the 65-passenger bus is full).

Bus/carpool lanes along I-5 would provide a travel time advantage during peak periods. Other bus services that could take advantage of the bus/carpool lanes include school buses and recreational tours, such as those that travel to and from the Reno/Lake Tahoe area.

Table 45 shows the number of buses counted during the AM and PM peak periods in September 2006. The traffic counts show a larger number of buses than can be accounted for by the scheduled transit routes listed above. Intercity buses (for example, Amtrak and Greyhound Lines), school buses, and charter/tour buses are likely included in these counts.

Location	Peak Period	Direction	Occupancy				Total
			Full	50% Full	25% Full	Empty	
Seamas Ave	AM	Northbound	18	10	10	5	43
	PM	Southbound	12	13	13	17	55
Hood Franklin Rd	AM	Northbound	4	2	0	0	6
	PM	Southbound	5	1	0	1	7

Source: Caltrans District 3, 2006

## HOT LANES

High-occupancy toll (HOT) lanes allow single-occupant vehicles to use the bus/carpool lane for a fee that is based on the value of travel time savings and on the amount of congestion in the mixed-flow lanes. Previously, an analysis of the proposed US-50 bus/carpool lanes in Sacramento concluded that HOT lanes would be infeasible (*US-50 High Occupancy Toll (HOT) Lane Strategy Evaluation*, Dowling Associates, 2005). As conceived in that study, the HOT lane would be a barrier or buffer-separated facility with limited access points so that toll collection and enforcement could be performed. The limited access points would prevent HOVs from using the lane as easily as compared to a contiguous bus/carpool lane. The barrier-separated design may have right-of-way impacts, would have higher construction costs, and may have higher accident rates.

Other states have recently started HOT lane facilities that do not have barrier separation. In Utah, stickers have been sold to single-occupant drivers to allow access to the I-15 HOV lane. In Washington State, the State Route 167 HOT lane uses electronic tolling for a painted buffer-separated facility, where the width of the buffer is effectively zero feet. Advances in electronic tolling technology may allow HOT lanes to operate on contiguous lane facilities in the future. The Sacramento Council of Governments and the Placer County Transportation Planning Agency are co-sponsoring a feasibility of HOT lane on I-80 that is on-going. Conclusions regarding HOT lane feasibility for I-80 may be applicable for the I-5 study corridor.

**APPENDIX A**  
**DETAILED MODEL RESULTS**  
**EXISTING CONDITIONS**

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**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5**  
**EX AM NB**  
**6 to 10 AM - Northbound**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	49,312	70
Number of Persons Served	All Vehicles	60,316	85
Travel Distance [mi]	All Vehicles	303,177	692
Travel Time [h]	All Vehicles	10,380	141
Average Speed [mph]	All Vehicles	29.2	0.4
Total Delay [h]	All Vehicles	5,320	137
Average Delay per Vehicle [s]	All Vehicles	382	10
VHD/VMT (min/mile)	All Vehicles	1.05	0.03
Number of Vehicles Served	HOVs	7,634	42
Number of Persons Served	HOVs	17,940	98
Travel Distance [mi]	HOVs	42,897	215
Travel Time [h]	HOVs	1,496	28
Average Speed [mph]	HOVs	28.7	0.4
Total Delay [h]	HOVs	813	26
Average Delay per Vehicle [s]	HOVs	379	12
VHD/VMT (min/mile)	HOVs	1.14	0.03
Number of Vehicles Served	Trucks	3,488	38
Number of Persons Served	Trucks	4,185	45
Travel Distance [mi]	Trucks	24,182	165
Travel Time [h]	Trucks	758	11
Average Speed [mph]	Trucks	31.9	0.5
Total Delay [h]	Trucks	370	11
Average Delay per Vehicle [s]	Trucks	375	12
VHD/VMT (min/mile)	Trucks	0.92	0.03

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

## *Level Of Service by Location Report*

<i>Project Name</i>	I-5	<i>Peak Hour</i>	AM Peak
<i>Alternative</i>	Existing-NB	<i>Num of Runs</i>	10

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<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	15.6	0.1	F
NB: H-F Off	Diverge	15.7	0.3	F
NB: H-F EB On	Merge	15.2	0.4	F
NB: H-F WB On	Merge	16.9	0.4	F
NB: H-F to Elk Grove	Basic	18.0	0.5	F
NB: Elk Grove Off	Diverge	18.0	0.6	F
NB: Elk Grove Off to On	Basic	27.4	16.6	F
NB: Elk Grove On	Merge	40.8	9.7	F
NB: Elk Grove to Laguna	Basic	59.5	18.6	F
NB: Laguna Off	Diverge	38.8	4.2	F
NB: Laguna Off to On	Basic	32.8	14.8	F
NB: Laguna On	Merge	103.1	14.2	F
NB: Laguna to Pocket	Basic	126.3	4.9	F
NB: Pocket Off	Diverge	86.8	3.6	F
NB: Pocket Off to On	Basic	97.2	3.2	F
NB: Pocket EB On	Merge	99.7	3.6	F
NB: Pocket WB On	Merge	140.7	2.8	F
NB: Florin Off	Diverge	101.7	4.2	F
NB: Florin Off to On	Basic	105.1	2.8	F
NB: Florin EB On	Merge	96.2	4.7	F
NB: Florin WB On	Merge	123.7	2.3	F
NB: Florin to 43rd	Basic	110.0	1.3	F
NB: 43rd On to Semas Off	Weave	121.9	1.4	F
NB: Semas Off to On	Basic	96.0	1.9	F
NB: Semas On	Merge	122.5	3.5	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Seamas to Sutterville	Basic	85.4	0.9	F
NB: Sutterville Off	Diverge	83.7	1.2	F
NB: Sutteville Off to On	Basic	85.6	1.2	F
NB: Sutterville On	Merge	57.5	1.3	F
NB: Sutterville to US-50	Basic	36.2	1.2	F
NB: US-50 Off	Basic	26.6	0.3	F
NB: US-50 Off to Q St Off	Basic	23.0	3.1	F
NB: Q St Off	Diverge	27.5	16.8	F
NB: Q St Off to US-50 EB On	Basic	16.0	0.3	F
NB: US-50 EB On	Merge	18.4	0.6	F
NB: US-50 WB On	Merge	54.7	3.2	F
NB: P St On to J St Off	Weave	45.6	11.5	F
NB: J St Off to Lane Drop	Basic	57.5	8.9	F
NB: Lane Drop to L St On	Basic	39.5	0.6	F
NB: L St On	Merge	25.1	0.4	F
NB: I St On to Richards Off	Weave	24.4	1.9	F
NB: Richards Off to On	Basic	24.1	0.5	F
Pocket to Florin	Basic	129.6	3.2	F



**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**Existing Conditions - Southbound**  
**PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	56,017	85
Number of Persons Served	All Vehicles	68,957	104
Travel Distance [mi]	All Vehicles	409,430	1,041
Travel Time [h]	All Vehicles	10,620	237
Average Speed [mph]	All Vehicles	38.6	0.8
Total Delay [h]	All Vehicles	4,145	233
Average Delay per Vehicle [s]	All Vehicles	255	14
VHD/VMT (min/mile)	All Vehicles	0.61	0.03
Number of Vehicles Served	HOVs	9,090	66
Number of Persons Served	HOVs	21,361	156
Travel Distance [mi]	HOVs	61,243	690
Travel Time [h]	HOVs	1,615	46
Average Speed [mph]	HOVs	37.9	0.9
Total Delay [h]	HOVs	645	40
Average Delay per Vehicle [s]	HOVs	244	14
VHD/VMT (min/mile)	HOVs	0.63	0.04
Number of Vehicles Served	Trucks	3,344	54
Number of Persons Served	Trucks	4,013	65
Travel Distance [mi]	Trucks	26,466	317
Travel Time [h]	Trucks	764	20
Average Speed [mph]	Trucks	34.7	0.8
Total Delay [h]	Trucks	346	18
Average Delay per Vehicle [s]	Trucks	351	19
VHD/VMT (min/mile)	Trucks	0.78	0.04

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

## *Level Of Service by Location Report*

*Project Name* I-5 Bus/Carpool Lanes *Peak Hour* PM  
*Alternative* Existing Conditions - Southbound *Num of Runs* 10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	112.9	46.0	F
SB: Richards to J St	Weave	141.0	2.5	F
SB: J St Off to I St On	Basic	140.0	4.2	F
SB: I St On to US-50 Off	Weave	99.4	3.2	F
SB: US-50 Off to P St On	Basic	16.6	0.5	B
SB: P St On	Merge	30.6	2.2	D
SB: P St On to US-50 EB On	Basic	52.4	18.8	F
SB: US-50 EB On	Merge	97.8	19.9	F
SB: US-50 WB On	Merge	121.2	6.8	F
SB: US-50 to Lane Drop	Basic	120.4	3.8	F
SB: Lane Drop to Sutterville	Basic	62.8	5.3	F
SB: Sutterville Off	Diverge	63.5	5.7	F
SB: Sutterville Off to On	Basic	31.5	0.2	D
SB: Sutterville On	Merge	31.9	1.0	D
SB: Sutterville to Seamas	Basic	32.3	0.4	D
SB: Seamas Off	Diverge	36.5	1.4	E
SB: Seamas Off to On	Basic	36.0	2.3	E
SB: Seamas On to 43rd Off	Weave	30.8	1.8	D
SB: 43rd to Florin	Basic	33.3	4.3	D
SB: Florin Off	Diverge	50.6	11.6	F
SB: Florin Off to Lane Drop	Basic	42.5	15.8	E
SB: Lane Drop to Florin On	Basic	63.7	14.0	F
SB: Florin On	Merge	91.3	11.4	F
SB: Pocket Off	Diverge	55.6	1.9	F
SB: Pocket Off to On	Basic	26.7	0.3	D

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket WB On	Merge	27.1	0.7	C
SB: Pocket EB On	Merge	28.6	0.7	D
SB: Pocket to Laguna	Basic	28.8	0.4	D
SB: Laguna Off	Diverge	29.2	2.3	D
SB: Laguna Off to On	Basic	19.5	0.2	C
SB: Laguna On	Merge	29.5	4.3	D
SB: Laguna On to Lane Drop	Basic	38.5	7.6	E
SB: Lane Drop to Elk Grove	Basic	33.3	4.6	D
SB: Elk Grove Off	Diverge	35.6	2.7	E
SB: Elk Grove Off to On	Basic	20.3	0.3	C
SB: Elk Grove On	Merge	20.4	0.4	C
SB: Elk Grove to H-F	Basic	21.0	0.3	C
SB: H-F Off	Diverge	21.2	0.5	C
SB: H-F Off to On	Basic	19.8	0.5	C
SB: H-F WB On	Merge	19.9	0.5	B
SB: H-F EB On	Merge	20.3	0.5	C

**APPENDIX B**  
**DETAILED MODEL RESULTS**  
**CONSTRUCTION YEAR (2013) CONDITIONS**

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**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5**  
**NP AM NB 2013**  
**6 to 10 AM - Northbound**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	54,244	79
Number of Persons Served	All Vehicles	68,231	99
Travel Distance [mi]	All Vehicles	433,327	824
Travel Time [h]	All Vehicles	18,921	141
Average Speed [mph]	All Vehicles	22.9	0.2
Total Delay [h]	All Vehicles	11,987	146
Average Delay per Vehicle [s]	All Vehicles	762	9
VHD/VMT (min/mile)	All Vehicles	1.34	0.69
Number of Vehicles Served	HOVs	9,781	42
Number of Persons Served	HOVs	22,984	99
Travel Distance [mi]	HOVs	77,877	365
Travel Time [h]	HOVs	2,887	23
Average Speed [mph]	HOVs	27.0	0.2
Total Delay [h]	HOVs	1,644	22
Average Delay per Vehicle [s]	HOVs	585	8
VHD/VMT (min/mile)	HOVs	107.64	224.51
Number of Vehicles Served	Trucks	3,915	13
Number of Persons Served	Trucks	4,698	16
Travel Distance [mi]	Trucks	34,231	96
Travel Time [h]	Trucks	1,186	11
Average Speed [mph]	Trucks	29	0
Total Delay [h]	Trucks	646	11
Average Delay per Vehicle [s]	Trucks	573	10
VHD/VMT (min/mile)	Trucks	99.54	207.92

Note: Vehicle occupancy assumed to be 1.0 for non-HOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5**  
**MF AM NB 2013**  
**6 to 10 AM - Northbound**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	55,418	82
Number of Persons Served	All Vehicles	69,735	103
Travel Distance [mi]	All Vehicles	443,498	1,201
Travel Time [h]	All Vehicles	13,304	115
Average Speed [mph]	All Vehicles	33.3	0.3
Total Delay [h]	All Vehicles	6,202	106
Average Delay per Vehicle [s]	All Vehicles	388	7
VHD/VMT (min/mile)	All Vehicles	0.68	0.34
Number of Vehicles Served	HOVs	10,017	39
Number of Persons Served	HOVs	23,541	91
Travel Distance [mi]	HOVs	80,094	254
Travel Time [h]	HOVs	1,964	26
Average Speed [mph]	HOVs	40.8	0.6
Total Delay [h]	HOVs	684	26
Average Delay per Vehicle [s]	HOVs	239	9
VHD/VMT (min/mile)	HOVs	86.31	180.89
Number of Vehicles Served	Trucks	3,967	13
Number of Persons Served	Trucks	4,761	16
Travel Distance [mi]	Trucks	34,682	190
Travel Time [h]	Trucks	872	14
Average Speed [mph]	Trucks	40	1
Total Delay [h]	Trucks	324	12
Average Delay per Vehicle [s]	Trucks	286	11
VHD/VMT (min/mile)	Trucks	88.89	186.29

Note: Vehicle occupancy assumed to be 1.0 for non-HOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5**  
**HOV AM NB 2013**  
**6 to 10 AM - Northbound**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	55,867	30
Number of Persons Served	All Vehicles	70,161	38
Travel Distance [mi]	All Vehicles	456,589	847
Travel Time [h]	All Vehicles	15,351	139
Average Speed [mph]	All Vehicles	29.7	0.3
Total Delay [h]	All Vehicles	8,052	136
Average Delay per Vehicle [s]	All Vehicles	505	8
VHD/VMT (min/mile)	All Vehicles	0.75	0.50
Number of Vehicles Served	HOVs	9,998	35
Number of Persons Served	HOVs	23,496	82
Travel Distance [mi]	HOVs	80,827	257
Travel Time [h]	HOVs	2,126	26
Average Speed [mph]	HOVs	38.0	0.4
Total Delay [h]	HOVs	836	23
Average Delay per Vehicle [s]	HOVs	294	7
VHD/VMT (min/mile)	HOVs	154.62	247.97
Number of Vehicles Served	Trucks	3,980	12
Number of Persons Served	Trucks	4,776	14
Travel Distance [mi]	Trucks	34,880	166
Travel Time [h]	Trucks	1,033	13
Average Speed [mph]	Trucks	34	0
Total Delay [h]	Trucks	483	11
Average Delay per Vehicle [s]	Trucks	426	9
VHD/VMT (min/mile)	Trucks	187.17	300.11

Note: Vehicle occupancy assumed to be 1.0 for non-HOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2013 Lane Conversion - Northbound**  
**AM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	37,257	62
Number of Persons Served	All Vehicles	49,306	81
Travel Distance [mi]	All Vehicles	349,481	765
Travel Time [h]	All Vehicles	28,262	66
Average Speed [mph]	All Vehicles	12.4	0.0
Total Delay [h]	All Vehicles	22,698	71
Average Delay per Vehicle [s]	All Vehicles	1,772	4
VHD/VMT (min/mile)	All Vehicles	3.90	0.02
Number of Vehicles Served	HOVs	8,564	64
Number of Persons Served	HOVs	20,124	151
Travel Distance [mi]	HOVs	83,477	530
Travel Time [h]	HOVs	3,599	78
Average Speed [mph]	HOVs	23.2	0.5
Total Delay [h]	HOVs	2,277	76
Average Delay per Vehicle [s]	HOVs	869	25
VHD/VMT (min/mile)	HOVs	1.64	0.05
Number of Vehicles Served	Trucks	2,443	21
Number of Persons Served	Trucks	2,932	25
Travel Distance [mi]	Trucks	28,169	219
Travel Time [h]	Trucks	2,086	21
Average Speed [mph]	Trucks	13.5	0.1
Total Delay [h]	Trucks	1,645	20
Average Delay per Vehicle [s]	Trucks	1,959	18
VHD/VMT (min/mile)	Trucks	3.50	0.05

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

## *Level Of Service by Location Report*

<i>Project Name</i> <u>I-5</u>	<i>Peak Hour</i> <u>AM Peak</u>
<i>Alternative</i> <u>NP-Alt-2013 - NB</u>	<i>Num of Runs</i> <u>10</u>

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	18.6	0.4	F
NB: H-F Off	Diverge	18.7	0.5	F
NB: H-F EB On	Merge	17.1	0.6	F
NB: H-F WB On	Merge	22.6	0.6	F
NB: H-F to Elk Grove -1	Basic	27.4	0.9	F
NB: Elk Grove Off	Diverge	27.9	0.9	F
NB: Elk Grove Off to On	Basic	28.0	3.1	F
NB: Elk Grove On	Merge	108.8	3.8	F
NB: Elk Grove to Laguna	Basic	98.5	3.7	F
NB: Laguna Off	Diverge	73.3	6.5	F
NB: Laguna Off to On	Basic	81.2	3.6	F
NB: Laguna On	Merge	141.4	5.2	F
NB: Laguna to Cosumnes	Basic	119.9	2.5	F
NB: Pocket Off	Diverge	95.6	4.4	F
NB: Pocket Off to On	Basic	94.8	3.0	F
NB: Pocket EB On	Merge	99.9	2.7	F
NB: Pocket WB On	Merge	128.4	2.3	F
NB: Florin Off	Diverge	105.2	2.0	F
NB: Florin Off to On	Basic	101.3	1.1	F
NB: Florin EB On	Merge	100.4	2.4	F
NB: Florin WB On	Merge	139.6	2.4	F
NB: Florin to 43rd	Basic	107.8	0.8	F
NB: 43rd On to SeAmas Off	Weave	111.0	1.0	F
NB: Seamas Off to On	Basic	93.2	0.5	F
NB: Seamas On	Merge	121.1	3.5	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Seamas to Sutterville	Basic	86.2	0.6	F
NB: Sutterville Off	Diverge	84.6	1.6	F
NB: Sutterville Off to On	Basic	74.0	0.9	F
NB: Sutterville On	Merge	46.2	2.6	F
NB: Sutterville to US-50	Basic	30.2	0.7	F
NB: US-50 Off	Diverge	25.7	0.6	F
NB: US-50 Off to Q St Off	Basic	22.3	0.6	F
NB: Q St Off	Diverge	20.5	0.5	F
NB: Q St Off to US-50 EB On	Basic	16.5	0.4	F
NB: US-50 EB On	Merge	19.7	0.5	F
NB: US-50 WB On	Merge	61.8	1.1	F
NB: P St On to J St Off	Weave	27.1	0.9	F
NB: J St Off to Lane Drop	Basic	29.3	0.7	F
NB: Lane Drop to L St On	Basic	35.3	2.3	F
NB: L St On	Merge	25.8	0.8	F
NB: I St On to Richards Off	Weave	22.7	0.3	F
NB: Richards Off to On	Basic	24.1	0.4	F
NB: H-F to Elk Grove -2	Basic	27.4	0.9	F
Cosumnes Off	Diverge	123.7	3.0	F
Cosumnes EB Loop On-Ramp	Merge	111.5	4.4	F
Cosumnes WB Slip On-Ramp	Merge	126.1	2.4	F
Cosumnes to Pocket	Basic	96.0	3.3	F
Pocket to Florin	Basic	130.8	1.5	F

## *Level Of Service by Location Report*

<i>Project Name</i> <u>I-5</u>	<i>Peak Hour</i> <u>AM Peak</u>
<i>Alternative</i> <u>MF-Alt-2013 - NB</u>	<i>Num of Runs</i> <u>10</u>

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	18.9	0.4	F
NB: H-F Off	Diverge	19.0	0.5	F
NB: H-F EB On	Merge	17.3	0.5	F
NB: H-F WB On	Merge	22.6	0.6	F
NB: Elk Grove Off	Diverge	15.7	0.4	F
NB: Elk Grove Off to On	Basic	18.2	0.5	F
NB: Elk Grove On	Merge	17.8	0.7	F
NB: Elk Grove to Laguna	Basic	18.6	0.3	F
NB: Laguna Off	Diverge	18.2	0.5	F
NB: Laguna Off to On	Basic	20.0	0.6	F
NB: Laguna On	Merge	25.5	1.1	F
NB: Laguna to Cosumnes	Basic	25.5	1.0	F
NB: Pocket Off	Diverge	35.1	3.1	F
NB: Pocket Off to On	Basic	33.0	1.4	F
NB: Pocket EB On	Merge	29.8	1.2	F
NB: Florin Off to On	Basic	49.0	7.2	F
NB: Florin EB On	Merge	29.5	0.8	F
NB: Florin WB On	Merge	50.5	27.8	F
NB: Florin to 43rd	Basic	97.4	5.8	F
NB: 43rd On to Seamas Off	Weave	118.7	3.3	F
NB: Seamas Off to On	Basic	95.7	1.3	F
NB: Seamas On	Merge	131.5	1.5	F
NB: Seamas to Sutterville	Basic	90.9	1.3	F
NB: Sutterville Off	Diverge	91.2	1.5	F
NB: Sutterville Off to On	Basic	79.2	1.3	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Sutterville On	Merge	85.0	3.1	F
NB: Sutterville to US-50	Basic	33.1	0.2	F
NB: US-50 Off	Diverge	29.9	2.1	F
NB: US-50 Off to Q St Off	Basic	20.7	0.8	F
NB: Q St Off	Diverge	22.1	1.0	F
NB: Q St Off to US-50 EB On	Basic	22.0	0.6	F
NB: US-50 EB On	Merge	27.2	2.3	F
NB: US-50 WB On	Merge	72.3	4.9	F
NB: P St On to J St Off	Weave	46.8	10.7	F
NB: J St Off to Lane Drop	Basic	80.7	16.6	F
NB: Lane Drop to L St On	Basic	57.8	0.8	F
NB: L St On	Merge	28.0	0.3	F
NB: I St On to Richards Off	Weave	24.6	1.2	F
NB: Richards Off to On	Basic	25.7	0.7	F
NB: H-F to Elk Grove -2	Basic	17.0	0.2	F
Cosumnes Off	Diverge	26.8	1.3	F
Cosumnes EB Loop On-Ramp	Merge	28.2	1.6	F
Cosumnes WB Slip On-Ramp	Merge	26.8	1.3	F
Cosumnes to Pocket	Basic	34.0	3.6	F
Pocket to Florin	Weave	31.2	1.7	F

## *Level Of Service by Location Report*

*Project Name* I-5 *Peak Hour* AM Peak  
*Alternative* HOV Alt-2013 - NB *Num of Runs* 1

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	15.5		F
NB: H-F Off	Diverge	15.6		F
NB: H-F EB On	Merge	14.3		F
NB: H-F WB On	Merge	18.5		F
NB: H-F to Elk Grove -1	Basic	21.3		F
NB: Elk Grove Off	Diverge	19.4		F
NB: Elk Grove Off to On	Basic	16.0		F
NB: Elk Grove On	Merge	19.5		F
NB: Elk Grove to Laguna	Basic	18.8		F
NB: Laguna Off	Diverge	21.0		F
NB: Laguna Off to On	Basic	25.3		F
NB: Laguna On	Merge	63.5		F
NB: Laguna to Cosumnes	Basic	92.7		F
NB: Pocket Off	Diverge	77.8		F
NB: Pocket Off to On	Basic	78.9		F
NB: Pocket EB On	Merge	61.8		F
NB: Florin Off to On	Basic	97.9		F
NB: Florin EB On	Merge	96.8		F
NB: Florin WB On	Merge	137.4		F
NB: Florin to 43rd	Basic	102.3		F
NB: 43rd On to Seamas Off	Weave	117.7		F
NB: Seamas Off to On	Basic	91.7		F
NB: Seamas On	Merge	112.1		F
NB: Seamas to Sutterville	Basic	83.7		F
NB: Sutterville Off	Diverge	72.2		F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Sutterville Off to On	Basic	70.9		F
NB: Sutterville On	Merge	53.8		F
NB: Sutterville to US-50	Basic	31.5		F
NB: US-50 Off	Diverge	24.4		F
NB: US-50 Off to Q St Off	Basic	16.8		F
NB: Q St Off	Diverge	17.7		F
NB: Q St Off to US-50 EB On	Basic	14.3		F
NB: US-50 EB On	Merge	17.3		F
NB: US-50 WB On	Merge	55.0		F
NB: P St On to J St Off	Weave	25.4		F
NB: J St Off to Lane Drop	Basic	27.3		F
NB: Lane Drop to L St On	Basic	31.1		F
NB: L St On	Merge	24.0		F
NB: I St On to Richards Off	Weave	21.7		F
NB: Richards Off to On	Basic	22.9		F
NB: H-F to Elk Grove -2	Basic	20.0		F
Cosumnes Off	Diverge	107.1		F
Cosumnes EB Loop On-Ramp	Merge	93.8		F
Cosumnes WB Slip On-Ramp	Merge	120.9		F
Cosumnes to Pocket	Basic	86.1		F
Pocket to Florin	Weave	112.2		F

## *Level Of Service by Location Report*

<i>Project Name</i>	I-5 Bus / Carpool	<i>Peak Hour</i>	AM
<i>Alternative</i>	2013 Lane Conversion	<i>Num of Runs</i>	10

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<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	11.5	0.3	B
NB: H-F Off	Diverge	11.5	0.4	B
NB: H-F EB On	Merge	11.2	0.3	B
NB: H-F WB On	Merge	13.1	0.3	B
NB: H-F to Elk Grove -1	Basic	33.4	34.9	D
NB: Elk Grove Off	Diverge	73.0	38.0	F
NB: Elk Grove Off to On	Basic	116.7	28.8	F
NB: Elk Grove On	Merge	164.6	5.5	F
NB: Elk Grove to Laguna	Basic	145.7	6.4	F
NB: Laguna Off	Diverge	127.8	9.6	F
NB: Laguna Off to On	Basic	125.4	11.2	F
NB: Laguna On	Merge	167.8	7.6	F
NB: Laguna to Cosumnes	Basic	158.0	4.9	F
NB: Pocket Off	Diverge	123.5	5.9	F
NB: Pocket Off to On	Basic	125.7	8.8	F
NB: Pocket EB On	Merge	136.9	8.8	F
NB: Pocket WB On	Merge	142.2	7.0	F
NB: Florin Off	Diverge	138.9	4.4	F
NB: Florin Off to On	Basic	132.0	4.3	F
NB: Florin EB On	Merge	127.6	3.8	F
NB: Florin WB On	Merge	152.1	2.3	F
NB: Florin to 43rd	Basic	126.0	1.7	F
NB: 43rd On to SeAmas Off	Weave	116.4	1.2	F
NB: Seamas Off to On	Basic	96.7	3.9	F
NB: Seamas On	Merge	134.9	5.4	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Seamas to Sutterville	Basic	116.9	2.4	F
NB: Sutterville Off	Diverge	114.2	2.5	F
NB: Sutterville Off to On	Basic	102.6	2.1	F
NB: Sutterville On	Merge	97.4	2.5	F
NB: Sutterville to US-50	Basic	72.9	1.8	F
NB: US-50 Off	Diverge	77.8	2.6	F
NB: US-50 Off to Q St Off	Basic	106.5	1.9	F
NB: Q St Off	Diverge	99.3	1.4	F
NB: Q St Off to US-50 EB On	Basic	112.5	3.8	F
NB: US-50 EB On	Merge	106.7	2.3	F
NB: US-50 WB On	Merge	122.9	0.8	F
NB: P St On to J St Off	Weave	88.4	1.4	F
NB: J St Off to Lane Drop	Basic	100.1	2.5	F
NB: Lane Drop to L St On	Basic	57.9	0.5	F
NB: L St On	Merge	28.4	0.3	D
NB: I St On to Richards Off	Weave	26.4	0.2	C
NB: Richards Off to On	Basic	29.2	0.3	D
NB: H-F to Elk Grove -2	Basic	33.4	34.9	D
Cosumnes Off	Diverge	154.5	4.4	F
Cosumnes EB Loop On-Ramp	Merge	144.2	7.8	F
Cosumnes WB Slip On-Ramp	Merge	119.7	9.8	F
Cosumnes to Pocket	Basic	130.5	5.4	F
Pocket to Florin	Basic	161.6	3.7	F









**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2013 No Project**  
**PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	60,577	225
Number of Persons Served	All Vehicles	74,545	277
Travel Distance [mi]	All Vehicles	441,429	966
Travel Time [h]	All Vehicles	13,308	236
Average Speed [mph]	All Vehicles	33.2	0.6
Total Delay [h]	All Vehicles	6,329	236
Average Delay per Vehicle [s]	All Vehicles	361	13
VHD/VMT (min/mile)	All Vehicles	0.86	0.03
Number of Vehicles Served	HOVs	10,129	124
Number of Persons Served	HOVs	23,803	291
Travel Distance [mi]	HOVs	73,525	884
Travel Time [h]	HOVs	2,127	39
Average Speed [mph]	HOVs	34.6	0.6
Total Delay [h]	HOVs	964	36
Average Delay per Vehicle [s]	HOVs	328	11
VHD/VMT (min/mile)	HOVs	0.79	0.03
Number of Vehicles Served	Trucks	1,470	36
Number of Persons Served	Trucks	1,764	44
Travel Distance [mi]	Trucks	10,102	197
Travel Time [h]	Trucks	343	10
Average Speed [mph]	Trucks	29.5	0.8
Total Delay [h]	Trucks	183	9
Average Delay per Vehicle [s]	Trucks	429	19
VHD/VMT (min/mile)	Trucks	1.09	0.05

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor  
Average Values from 10 Runs  
Network Statistics**

**I-5 Bus/Carpool Lanes  
2013 Mixed Flow  
PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	63,416	463
Number of Persons Served	All Vehicles	78,667	574
Travel Distance [mi]	All Vehicles	466,570	2,386
Travel Time [h]	All Vehicles	10,356	160
Average Speed [mph]	All Vehicles	45.1	0.8
Total Delay [h]	All Vehicles	2,975	178
Average Delay per Vehicle [s]	All Vehicles	164	11
VHD/VMT (min/mile)	All Vehicles	0.38	0.02
Number of Vehicles Served	HOVs	11,064	209
Number of Persons Served	HOVs	26,001	490
Travel Distance [mi]	HOVs	81,615	1,578
Travel Time [h]	HOVs	1,765	42
Average Speed [mph]	HOVs	46.3	0.6
Total Delay [h]	HOVs	474	25
Average Delay per Vehicle [s]	HOVs	150	8
VHD/VMT (min/mile)	HOVs	0.35	0.02
Number of Vehicles Served	Trucks	1,570	25
Number of Persons Served	Trucks	1,884	31
Travel Distance [mi]	Trucks	10,985	167
Travel Time [h]	Trucks	281	5
Average Speed [mph]	Trucks	39.0	1.0
Total Delay [h]	Trucks	107	6
Average Delay per Vehicle [s]	Trucks	239	14
VHD/VMT (min/mile)	Trucks	0.59	0.04

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2013 HOV**  
**PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	63,074	375
Number of Persons Served	All Vehicles	79,828	474
Travel Distance [mi]	All Vehicles	463,261	2,428
Travel Time [h]	All Vehicles	10,788	192
Average Speed [mph]	All Vehicles	43.0	0.8
Total Delay [h]	All Vehicles	3,459	201
Average Delay per Vehicle [s]	All Vehicles	191	11
VHD/VMT (min/mile)	All Vehicles	0.45	0.03
Number of Vehicles Served	HOVs	12,179	170
Number of Persons Served	HOVs	28,620	400
Travel Distance [mi]	HOVs	89,495	1,251
Travel Time [h]	HOVs	1,980	35
Average Speed [mph]	HOVs	45.2	0.7
Total Delay [h]	HOVs	564	31
Average Delay per Vehicle [s]	HOVs	162	9
VHD/VMT (min/mile)	HOVs	0.38	0.02
Number of Vehicles Served	Trucks	1,563	33
Number of Persons Served	Trucks	1,876	40
Travel Distance [mi]	Trucks	10,940	251
Travel Time [h]	Trucks	296	10
Average Speed [mph]	Trucks	37.0	0.8
Total Delay [h]	Trucks	122	8
Average Delay per Vehicle [s]	Trucks	272	14
VHD/VMT (min/mile)	Trucks	0.67	0.04

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor  
Average Values from 10 Runs  
Network Statistics**

**I-5 Bus/Carpool Lanes  
2013 Lane Conversion - Southbound  
PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	56,867	375
Number of Persons Served	All Vehicles	71,911	474
Travel Distance [mi]	All Vehicles	395,502	2,304
Travel Time [h]	All Vehicles	10,373	969
Average Speed [mph]	All Vehicles	38.5	3.9
Total Delay [h]	All Vehicles	4,115	998
Average Delay per Vehicle [s]	All Vehicles	252	62
VHD/VMT (min/mile)	All Vehicles	0.62	0.15
Number of Vehicles Served	HOVs	10,942	173
Number of Persons Served	HOVs	25,714	408
Travel Distance [mi]	HOVs	75,315	1,352
Travel Time [h]	HOVs	1,704	187
Average Speed [mph]	HOVs	44.8	5.6
Total Delay [h]	HOVs	513	196
Average Delay per Vehicle [s]	HOVs	165	64
VHD/VMT (min/mile)	HOVs	0.41	0.16
Number of Vehicles Served	Trucks	1,364	33
Number of Persons Served	Trucks	1,637	40
Travel Distance [mi]	Trucks	8,938	151
Travel Time [h]	Trucks	269	28
Average Speed [mph]	Trucks	33.5	3.8
Total Delay [h]	Trucks	127	28
Average Delay per Vehicle [s]	Trucks	327	77
VHD/VMT (min/mile)	Trucks	0.85	0.19

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

## *Level Of Service by Location Report*

<i>Project Name</i>	I-5 HOV	<i>Peak Hour</i>	PM
<i>Alternative</i>	2013 No Project	<i>Num of Runs</i>	10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	135.8	5.5	F
SB: Richards to J St	Weave	134.6	2.2	F
SB: J St Off to I St On	Basic	124.0	6.9	F
SB: I St On to US-50 Off	Weave	84.0	3.5	F
SB: US-50 Off to P St On	Basic	17.8	1.2	B
SB: P St On	Merge	16.5	0.9	B
SB: P St On to US-50 EB On	Basic	27.1	4.9	D
SB: US-50 EB On	Merge	94.2	11.4	F
SB: US-50 WB On	Merge	124.8	4.9	F
SB: US-50 to Lane Drop	Basic	121.8	4.9	F
SB: Lane Drop to Sutterville	Basic	70.5	5.6	F
SB: Sutterville Off	Diverge	73.2	7.5	F
SB: Sutterville Off to On	Basic	59.3	17.5	F
SB: Sutterville On	Merge	98.9	26.0	F
SB: Sutterville to Seamas	Basic	113.3	7.9	F
SB: Seamas Off	Diverge	121.8	3.4	F
SB: Seamas Off to On	Basic	77.7	3.2	F
SB: Seamas On to 43rd Off	Weave	95.4	2.9	F
SB: 43rd to Florin	Basic	80.6	1.9	F
SB: Florin Off	Diverge	74.1	1.1	F
SB: Florin Off to Lane Drop	Basic	122.8	1.4	F
SB: Lane Drop to Florin On	Basic	75.5	2.2	F
SB: Florin On	Merge	37.4	5.9	E
SB: Pocket Off to On	Basic	66.9	20.9	F
SB: Pocket WB On	Merge	69.4	9.6	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket EB On	Merge	33.1	0.7	D
SB: Pocket to Cosumnes	Basic	29.6	0.3	D
SB: Laguna Off	Diverge	26.0	0.5	C
SB: Laguna Off to On	Basic	20.3	0.3	C
SB: Laguna On	Merge	28.1	0.7	D
SB: Laguna to Lane Drop	Basic	34.1	2.6	D
SB: Elk Grove Off	Diverge	29.1	0.5	D
SB: Elk Grove Off to On	Basic	19.4	0.4	C
SB: Elk Grove On	Merge	19.5	0.3	B
SB: Elk Grove to End of HOV	Basic	20.1	0.3	C
SB: H-F Off	Diverge	20.2	0.4	C
SB: H-F Off to On	Basic	17.5	0.4	B
SB: H-F WB On	Merge	18.4	0.5	B
SB: H-F EB On	Merge	18.6	0.5	B
SB: Cosumnes Off	Diverge	25.2	0.2	C
SB: Cosumnes Off to On	Basic	28.6	0.4	D
SB: Cosumnes WB On	Merge	25.5	0.5	C
SB: Cosumnes EB On	Merge	28.1	0.6	D
SB: Cosumnes to Laguna	Basic	31.9	0.7	D
SB: End of HOV to Lane Drop	Basic	20.2	0.3	C
SB: Lane Drop to H-F Off	Basic	20.2	0.4	C
SB: Pocket Off	Diverge	50.8	26.8	F

## *Level Of Service by Location Report*

*Project Name* I-5 Bus/Carpool Lanes *Peak Hour* PM  
*Alternative* 2013 Mixed Flow *Num of Runs* 10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	32.7	10.2	D
SB: Richards to J St	Weave	127.8	18.1	F
SB: J St Off to I St On	Basic	136.4	7.3	F
SB: I St On to US-50 Off	Weave	93.0	4.2	F
SB: US-50 Off to P St On	Basic	19.7	1.3	C
SB: P St On	Merge	19.7	1.0	B
SB: P St On to US-50 EB On	Basic	24.5	1.1	C
SB: US-50 EB On	Merge	36.5	1.4	E
SB: US-50 WB On	Merge	37.8	0.6	E
SB: US-50 to Lane Drop	Basic	36.8	3.1	E
SB: Lane Drop to Sutterville	Basic	38.8	5.5	E
SB: Sutterville Off	Diverge	44.2	5.7	F
SB: Sutterville Off to On	Basic	29.0	0.6	D
SB: Sutterville On	Merge	30.6	0.7	D
SB: Sutterville to Seamas	Basic	30.0	0.4	D
SB: Seamas Off	Diverge	36.3	0.5	E
SB: Seamas Off to On	Basic	31.0	0.6	D
SB: Seamas On to 43rd Off	Weave	25.7	0.4	C
SB: 43rd to Florin	Basic	27.0	0.4	D
SB: Florin Off	Diverge	25.7	0.8	C
SB: Florin Off to On	Basic	23.8	0.6	C
SB: Florin to Pocket Weave	Weave	25.7	0.7	C
SB: Pocket Off to On	Basic	25.6	1.8	C
SB: Pocket WB On	Merge	34.2	3.9	D
SB: Pocket EB On	Merge	26.9	1.3	C

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket to Cosumnes	Basic	26.8	0.8	D
SB: Laguna Off	Diverge	28.7	1.1	D
SB: Laguna Off to On	Basic	18.0	0.6	C
SB: Laguna On	Merge	17.1	0.5	B
SB: Laguna to Elk Grove	Basic	19.3	0.4	C
SB: Elk Grove Off	Diverge	20.0	0.5	C
SB: Elk Grove Off to On	Basic	16.1	0.6	B
SB: Elk Grove On	Merge	16.1	0.6	B
SB: Elk Grove to End of HOV	Basic	19.2	0.6	C
SB: H-F Off	Diverge	25.4	0.9	C
SB: H-F Off to On	Basic	22.0	0.9	C
SB: H-F WB On	Merge	23.3	1.2	C
SB: H-F EB On	Merge	23.1	1.0	C
SB: Cosumnes Off	Diverge	22.8	0.5	C
SB: Cosumnes Off to On	Basic	25.9	0.9	C
SB: Cosumnes WB On	Merge	22.3	0.4	C
SB: Cosumnes EB On	Merge	24.3	0.5	C
SB: Cosumnes to Laguna	Basic	29.3	1.4	D
SB: End of HOV to Lane Drop	Basic	25.4	1.0	C
SB: Lane Drop to H-F Off	Basic	25.3	0.8	C

## *Level Of Service by Location Report*

<i>Project Name</i>	I-5 HOV	<i>Peak Hour</i>	PM
<i>Alternative</i>	2013 HOV (S2)	<i>Num of Runs</i>	10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	56.1	35.7	F
SB: Richards to J St	Weave	135.7	2.3	F
SB: J St Off to I St On	Basic	130.2	5.8	F
SB: I St On to US-50 Off	Weave	87.0	5.5	F
SB: US-50 Off to P St On	Basic	17.1	1.6	B
SB: P St On	Merge	16.0	0.8	B
SB: P St On to US-50 EB On	Basic	21.2	1.0	C
SB: US-50 EB On	Merge	32.2	1.2	D
SB: US-50 WB On	Merge	36.0	0.3	E
SB: US-50 to Lane Drop	Basic	47.6	11.8	F
SB: Lane Drop to Sutterville	Basic	46.1	4.4	F
SB: Sutterville Off	Diverge	43.0	4.6	E
SB: Sutterville Off to On	Basic	30.9	0.3	D
SB: Sutterville On	Merge	34.4	3.2	D
SB: Sutterville to Seamas	Basic	32.8	0.3	D
SB: Seamas Off	Diverge	39.1	3.4	E
SB: Seamas Off to On	Basic	36.0	1.7	E
SB: Seamas On to 43rd Off	Weave	28.2	0.4	D
SB: 43rd to Florin	Basic	30.8	0.9	D
SB: Florin Off	Diverge	27.7	1.0	C
SB: Florin Off to On	Basic	30.0	9.0	D
SB: Florin to Pocket Weave	Weave	60.3	26.0	F
SB: Pocket Off to On	Basic	80.7	17.5	F
SB: Pocket WB On	Merge	73.0	8.4	F
SB: Pocket EB On	Merge	32.8	0.6	D

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket to Cosumnes	Basic	29.7	0.5	D
SB: Laguna Off	Diverge	27.9	1.3	C
SB: Laguna Off to On	Basic	20.7	0.4	C
SB: Laguna On	Merge	19.6	0.5	B
SB: Laguna to Elk Grove	Basic	20.8	0.4	C
SB: Elk Grove Off	Diverge	22.1	0.5	C
SB: Elk Grove Off to On	Basic	19.8	0.5	C
SB: Elk Grove On	Merge	19.7	0.5	B
SB: Elk Grove to End of HOV	Basic	26.8	1.2	D
SB: H-F Off	Diverge	23.8	0.8	C
SB: H-F Off to On	Basic	20.7	0.6	C
SB: H-F WB On	Merge	21.8	1.0	C
SB: H-F EB On	Merge	21.9	0.7	C
SB: Cosumnes Off	Diverge	25.2	0.6	C
SB: Cosumnes Off to On	Basic	28.4	0.5	D
SB: Cosumnes WB On	Merge	25.0	0.5	C
SB: Cosumnes EB On	Merge	27.7	1.1	C
SB: Cosumnes to Laguna	Basic	36.6	3.9	E
SB: End of HOV to Lane Drop	Basic	23.9	0.8	C
SB: Lane Drop to H-F Off	Basic	23.6	0.7	C

## *Level Of Service by Location Report*

*Project Name* I-5 Bus / Carpool *Peak Hour* PM  
*Alternative* 2013 Lane Conversion *Num of Runs* 10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	64.4	42.7	F
SB: Richards to J St	Weave	99.7	49.2	F
SB: J St Off to I St On	Basic	93.1	37.9	F
SB: I St On to US-50 Off	Weave	63.8	23.2	F
SB: US-50 Off to P St On	Basic	24.6	2.8	C
SB: P St On	Merge	67.9	30.9	F
SB: P St On to US-50 EB On	Basic	108.8	26.7	F
SB: US-50 EB On	Merge	128.8	7.3	F
SB: US-50 WB On	Merge	118.5	3.9	F
SB: US-50 to Lane Drop	Basic	116.1	1.7	F
SB: Lane Drop to Sutterville	Basic	46.2	2.1	F
SB: Sutterville Off	Diverge	41.7	4.7	E
SB: Sutterville Off to On	Basic	29.4	0.5	D
SB: Sutterville On	Merge	30.9	0.5	D
SB: Sutterville to Seamas	Basic	31.6	0.3	D
SB: Seamas Off	Diverge	36.8	3.1	E
SB: Seamas Off to On	Basic	35.1	2.3	E
SB: Seamas On to 43rd Off	Weave	29.1	5.4	D
SB: 43rd to Florin	Basic	56.5	22.2	F
SB: Florin Off	Diverge	65.5	18.0	F
SB: Florin Off to Lane Drop	Basic	119.9	5.0	F
SB: Lane Drop to Florin On	Basic	71.3	3.1	F
SB: Florin On	Merge	62.8	6.4	F
SB: Pocket Off to On	Basic	82.1	3.6	F
SB: Pocket WB On	Merge	69.1	3.3	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket EB On	Merge	58.8	3.9	F
SB: Pocket to Cosumnes	Basic	55.0	10.6	F
SB: Laguna Off	Diverge	28.4	0.5	D
SB: Laguna Off to On	Basic	21.5	0.4	C
SB: Laguna On	Merge	24.6	0.6	C
SB: Laguna to Lane Drop	Basic	26.8	0.7	D
SB: Elk Grove Off	Diverge	25.4	0.4	C
SB: Elk Grove Off to On	Basic	17.3	0.4	B
SB: Elk Grove On	Merge	17.5	0.5	B
SB: H-F Off	Diverge	18.1	0.5	B
SB: H-F Off to On	Basic	16.2	0.2	B
SB: H-F WB On	Merge	17.1	0.4	B
SB: H-F EB On	Merge	17.4	0.4	B
SB: Cosumnes Off	Diverge	80.6	11.5	F
SB: Cosumnes Off to On	Basic	55.4	8.8	F
SB: Cosumnes WB On	Merge	85.8	21.6	F
SB: Cosumnes EB On	Merge	76.3	15.1	F
SB: Cosumnes to Laguna	Basic	45.4	4.7	F
SB: Elk Grove to Lane Drop	Basic	18.1	0.4	C
SB: Lane Drop to H-F Off	Basic	18.0	0.4	C
SB: Pocket Off	Diverge	81.0	5.2	F

**APPENDIX C**  
**DETAILED MODEL RESULTS**  
**INTERIM YEAR (2023) CONDITIONS**

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**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5**  
**NP AM NB 2023**  
**6 to 10 AM - Northbound**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	56,760	132
Number of Persons Served	All Vehicles	73,366	170
Travel Distance [mi]	All Vehicles	452,472	982
Travel Time [h]	All Vehicles	26,759	105
Average Speed [mph]	All Vehicles	16.9	0.1
Total Delay [h]	All Vehicles	19,470	103
Average Delay per Vehicle [s]	All Vehicles	1,143	6
VHD/VMT (min/mile)	All Vehicles	2.58	0.01
Number of Vehicles Served	HOVs	11,703	80
Number of Persons Served	HOVs	27,503	187
Travel Distance [mi]	HOVs	95,078	421
Travel Time [h]	HOVs	4,606	52
Average Speed [mph]	HOVs	20.6	0.2
Total Delay [h]	HOVs	3,080	52
Average Delay per Vehicle [s]	HOVs	898	15
VHD/VMT (min/mile)	HOVs	1.94	0.03
Number of Vehicles Served	Trucks	4,032	50
Number of Persons Served	Trucks	4,838	60
Travel Distance [mi]	Trucks	36,369	309
Travel Time [h]	Trucks	1,705	17
Average Speed [mph]	Trucks	21.3	0.2
Total Delay [h]	Trucks	1,130	16
Average Delay per Vehicle [s]	Trucks	950	14
VHD/VMT (min/mile)	Trucks	1.86	0.03

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5**  
**MF AM NB 2023**  
**6 to 10 AM - Northbound**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	62,146	88
Number of Persons Served	All Vehicles	79,389	113
Travel Distance [mi]	All Vehicles	510,605	745
Travel Time [h]	All Vehicles	22,232	102
Average Speed [mph]	All Vehicles	23.0	0.1
Total Delay [h]	All Vehicles	14,012	92
Average Delay per Vehicle [s]	All Vehicles	781	5
VHD/VMT (min/mile)	All Vehicles	1.65	0.01
Number of Vehicles Served	HOVs	12,164	56
Number of Persons Served	HOVs	28,584	131
Travel Distance [mi]	HOVs	100,423	294
Travel Time [h]	HOVs	3,973	33
Average Speed [mph]	HOVs	25.3	0.2
Total Delay [h]	HOVs	2,358	30
Average Delay per Vehicle [s]	HOVs	673	7
VHD/VMT (min/mile)	HOVs	1.41	0.01
Number of Vehicles Served	Trucks	4,112	42
Number of Persons Served	Trucks	4,934	50
Travel Distance [mi]	Trucks	37,795	176
Travel Time [h]	Trucks	1,465	17
Average Speed [mph]	Trucks	25.8	0.3
Total Delay [h]	Trucks	868	16
Average Delay per Vehicle [s]	Trucks	731	11
VHD/VMT (min/mile)	Trucks	1.38	0.02

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5**  
**HOV AM NB 2023**  
**6 to 10 AM - Northbound**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	60,619	140
Number of Persons Served	All Vehicles	81,999	190
Travel Distance [mi]	All Vehicles	503,902	1,267
Travel Time [h]	All Vehicles	25,486	190
Average Speed [mph]	All Vehicles	19.8	0.2
Total Delay [h]	All Vehicles	17,392	211
Average Delay per Vehicle [s]	All Vehicles	975	13
VHD/VMT (min/mile)	All Vehicles	2.07	0.03
Number of Vehicles Served	HOVs	15,226	78
Number of Persons Served	HOVs	35,781	184
Travel Distance [mi]	HOVs	126,229	497
Travel Time [h]	HOVs	4,779	53
Average Speed [mph]	HOVs	26.4	0.3
Total Delay [h]	HOVs	2,755	53
Average Delay per Vehicle [s]	HOVs	628	11
VHD/VMT (min/mile)	HOVs	1.31	0.03
Number of Vehicles Served	Trucks	4,127	40
Number of Persons Served	Trucks	4,952	48
Travel Distance [mi]	Trucks	37,650	205
Travel Time [h]	Trucks	1,703	25
Average Speed [mph]	Trucks	22.1	0.3
Total Delay [h]	Trucks	1,109	24
Average Delay per Vehicle [s]	Trucks	924	17
VHD/VMT (min/mile)	Trucks	1.77	0.04

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2023 Lane Conversion - Northbound**  
**AM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	39,203	202
Number of Persons Served	All Vehicles	55,059	283
Travel Distance [mi]	All Vehicles	357,201	1,278
Travel Time [h]	All Vehicles	35,037	263
Average Speed [mph]	All Vehicles	10.2	0.1
Total Delay [h]	All Vehicles	29,330	253
Average Delay per Vehicle [s]	All Vehicles	2,074	5
VHD/VMT (min/mile)	All Vehicles	4.93	0.04
Number of Vehicles Served	HOVs	11,356	530
Number of Persons Served	HOVs	26,687	1,245
Travel Distance [mi]	HOVs	106,397	3,938
Travel Time [h]	HOVs	7,275	638
Average Speed [mph]	HOVs	14.7	0.8
Total Delay [h]	HOVs	5,583	578
Average Delay per Vehicle [s]	HOVs	1,454	63
VHD/VMT (min/mile)	HOVs	3.14	0.21
Number of Vehicles Served	Trucks	2,624	218
Number of Persons Served	Trucks	3,149	261
Travel Distance [mi]	Trucks	29,248	1,937
Travel Time [h]	Trucks	3,102	598
Average Speed [mph]	Trucks	9.6	1.2
Total Delay [h]	Trucks	2,643	567
Average Delay per Vehicle [s]	Trucks	2,504	170
VHD/VMT (min/mile)	Trucks	5.38	0.79

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

## *Level Of Service by Location Report*

<i>Project Name</i>	I-5	<i>Peak Hour</i>	AM Peak
<i>Alternative</i>	NP-Alt-2023 - NB	<i>Num of Runs</i>	10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	22.6	0.5	F
NB: H-F Off	Diverge	22.9	0.8	F
NB: H-F EB On	Merge	36.2	15.2	F
NB: H-F WB On	Merge	96.0	29.7	F
NB: H-F to Elk Grove -1	Basic	114.3	2.7	F
NB: Elk Grove Off	Diverge	113.9	3.0	F
NB: Elk Grove Off to On	Basic	117.8	2.9	F
NB: Elk Grove On	Merge	128.2	3.2	F
NB: Elk Grove to Laguna	Basic	104.6	2.9	F
NB: Laguna Off	Diverge	83.4	5.8	F
NB: Laguna Off to On	Basic	89.2	3.4	F
NB: Laguna On	Merge	150.3	2.6	F
NB: Laguna to Cosumnes	Basic	127.0	3.0	F
NB: Pocket Off	Diverge	102.8	2.5	F
NB: Pocket Off to On	Basic	100.4	1.1	F
NB: Pocket EB On	Merge	107.8	3.5	F
NB: Pocket WB On	Merge	131.9	2.3	F
NB: Florin Off	Diverge	108.0	1.9	F
NB: Florin Off to On	Basic	102.0	1.6	F
NB: Florin EB On	Merge	102.4	3.3	F
NB: Florin WB On	Merge	139.6	1.6	F
NB: Florin to 43rd	Basic	108.7	0.7	F
NB: 43rd On to SeAmas Off	Weave	114.0	1.6	F
NB: Seamas Off to On	Basic	93.6	0.7	F
NB: Seamas On	Merge	120.3	4.4	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Seamas to Sutterville	Basic	86.6	0.8	F
NB: Sutterville Off	Diverge	85.3	1.2	F
NB: Sutterville Off to On	Basic	72.8	0.7	F
NB: Sutterville On	Merge	45.2	0.9	F
NB: Sutterville to US-50	Basic	30.9	0.6	F
NB: US-50 Off	Diverge	26.6	0.4	F
NB: US-50 Off to Q St Off	Basic	24.9	0.8	F
NB: Q St Off	Diverge	23.2	0.8	F
NB: Q St Off to US-50 EB On	Basic	19.4	0.7	F
NB: US-50 EB On	Merge	24.8	0.8	F
NB: US-50 WB On	Merge	73.1	2.8	F
NB: P St On to J St Off	Weave	56.2	14.6	F
NB: J St Off to Lane Drop	Basic	81.5	16.9	F
NB: Lane Drop to L St On	Basic	57.9	1.9	F
NB: L St On	Merge	28.7	0.4	F
NB: I St On to Richards Off	Weave	24.7	0.2	F
NB: Richards Off to On	Basic	25.9	0.4	F
NB: H-F to Elk Grove -2	Basic	114.3	2.7	F
Cosumnes Off	Diverge	124.9	3.3	F
Cosumnes EB Loop On-Ramp	Merge	119.0	3.2	F
Cosumnes WB Slip On-Ramp	Merge	179.9	3.3	F
Cosumnes to Pocket	Basic	100.4	2.5	F
Pocket to Florin	Basic	134.9	1.2	F

## *Level Of Service by Location Report*

<i>Project Name</i>	I-5	<i>Peak Hour</i>	AM Peak
<i>Alternative</i>	MF-Alt-2023 - NB	<i>Num of Runs</i>	10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	23.1	0.5	F
NB: H-F Off	Diverge	23.6	0.9	F
NB: H-F EB On	Merge	20.9	0.8	F
NB: H-F WB On	Merge	39.6	6.1	F
NB: H-F to Elk Grove -1	Basic	22.2	0.5	F
NB: Elk Grove Off	Diverge	20.3	0.4	F
NB: Elk Grove Off to On	Basic	24.7	1.0	F
NB: Elk Grove On	Merge	24.0	0.8	F
NB: Elk Grove to Laguna	Basic	22.5	0.3	F
NB: Laguna Off	Diverge	26.3	1.6	F
NB: Laguna Off to On	Basic	27.3	1.3	F
NB: Laguna On	Merge	84.1	21.1	F
NB: Laguna to Cosumnes	Basic	108.7	1.2	F
NB: Pocket Off	Diverge	95.0	4.9	F
NB: Pocket Off to On	Basic	92.2	2.0	F
NB: Pocket EB On	Merge	98.8	2.5	F
NB: Florin Off to On	Basic	96.1	1.0	F
NB: Florin EB On	Merge	106.6	2.5	F
NB: Florin WB On	Merge	144.6	1.7	F
NB: Florin to 43rd	Basic	102.7	0.9	F
NB: 43rd On to Seamas Off	Weave	119.7	2.1	F
NB: Seamas Off to On	Basic	93.8	1.1	F
NB: Seamas On	Merge	131.5	1.6	F
NB: Seamas to Sutterville	Basic	89.8	0.6	F
NB: Sutterville Off	Diverge	89.4	0.9	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Sutterville Off to On	Basic	78.1	1.0	F
NB: Sutterville On	Merge	80.4	4.0	F
NB: Sutterville to US-50	Basic	33.4	0.4	F
NB: US-50 Off	Diverge	29.5	1.3	F
NB: US-50 Off to Q St Off	Basic	21.4	0.6	F
NB: Q St Off	Diverge	23.6	0.7	F
NB: Q St Off to US-50 EB On	Basic	22.8	0.8	F
NB: US-50 EB On	Merge	28.9	2.8	F
NB: US-50 WB On	Merge	72.0	5.1	F
NB: P St On to J St Off	Weave	45.4	8.3	F
NB: J St Off to Lane Drop	Basic	76.5	15.2	F
NB: Lane Drop to L St On	Basic	57.6	2.8	F
NB: L St On	Merge	28.5	0.4	F
NB: I St On to Richards Off	Weave	24.8	0.5	F
NB: Richards Off to On	Basic	26.1	0.4	F
NB: H-F to Elk Grove -2	Basic	22.2	0.5	F
Cosumnes Off	Diverge	114.9	3.0	F
Cosumnes EB Loop On-Ramp	Merge	110.1	2.3	F
Cosumnes WB Slip On-Ramp	Merge	181.1	4.3	F
Cosumnes to Pocket	Basic	88.8	1.9	F
Pocket to Florin	Weave	119.0	1.6	F

## *Level Of Service by Location Report*

<i>Project Name</i>	I-5	<i>Peak Hour</i>	AM Peak
<i>Alternative</i>	HOV-N2-Alt-2023 - NB	<i>Num of Runs</i>	10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	22.6	0.7	F
NB: H-F Off	Diverge	23.2	1.8	F
NB: H-F EB On	Merge	115.1	34.1	F
NB: H-F WB On	Merge	148.8	7.4	F
NB: H-F to Elk Grove -1	Basic	138.6	5.8	F
NB: Elk Grove Off	Diverge	143.5	4.1	F
NB: Elk Grove Off to On	Basic	147.3	3.5	F
NB: Elk Grove On	Merge	159.5	3.8	F
NB: Elk Grove to Laguna	Basic	137.8	3.7	F
NB: Laguna Off	Diverge	113.6	4.0	F
NB: Laguna Off to On	Basic	94.4	5.2	F
NB: Laguna On	Merge	147.7	5.3	F
NB: Laguna to Cosumnes	Basic	133.5	3.4	F
NB: Pocket Off	Diverge	99.0	4.1	F
NB: Pocket Off to On	Basic	104.1	5.6	F
NB: Pocket EB On	Merge	105.2	7.1	F
NB: Florin Off to On	Basic	103.8	2.2	F
NB: Florin EB On	Merge	108.4	3.9	F
NB: Florin WB On	Merge	144.8	2.5	F
NB: Florin to 43rd	Basic	106.1	1.7	F
NB: 43rd On to Seamas Off	Weave	125.4	3.3	F
NB: Seamas Off to On	Basic	96.0	1.7	F
NB: Seamas On	Merge	124.8	2.0	F
NB: Seamas to Sutterville	Basic	89.9	2.3	F
NB: Sutterville Off	Diverge	76.3	1.9	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Sutterville Off to On	Basic	76.3	0.9	F
NB: Sutterville On	Merge	68.9	6.1	F
NB: Sutterville to US-50	Basic	35.5	0.7	F
NB: US-50 Off	Diverge	27.0	0.6	F
NB: US-50 Off to Q St Off	Basic	19.3	0.4	F
NB: Q St Off	Diverge	22.0	0.6	F
NB: Q St Off to US-50 EB On	Basic	19.5	0.6	F
NB: US-50 EB On	Merge	23.0	0.9	F
NB: US-50 WB On	Merge	65.1	1.1	F
NB: P St On to J St Off	Weave	30.1	1.6	F
NB: J St Off to Lane Drop	Basic	42.1	10.2	F
NB: Lane Drop to L St On	Basic	47.9	6.5	F
NB: L St On	Merge	29.8	0.7	F
NB: I St On to Richards Off	Weave	24.0	0.3	F
NB: Richards Off to On	Basic	25.2	0.4	F
Cosumnes Off	Diverge	124.9	3.2	F
Cosumnes EB Loop On-Ramp	Merge	118.2	3.7	F
Cosumnes WB Slip On-Ramp	Merge	180.4	4.8	F
Cosumnes to Pocket	Basic	108.3	4.4	F
Pocket to Florin	Weave	127.9	3.8	F

## *Level Of Service by Location Report*

<i>Project Name</i>	I-5 Bus / Carpool	<i>Peak Hour</i>	AM
<i>Alternative</i>	2023 Lane Conversion	<i>Num of Runs</i>	10

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<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	139.7	18.0	F
NB: H-F Off	Diverge	153.4	3.6	F
NB: H-F EB On	Merge	151.4	3.9	F
NB: H-F WB On	Merge	161.4	5.1	F
NB: H-F to Elk Grove -1	Basic	149.0	6.2	F
NB: Elk Grove Off	Diverge	148.8	4.6	F
NB: Elk Grove Off to On	Basic	150.7	3.6	F
NB: Elk Grove On	Merge	163.5	3.6	F
NB: Elk Grove to Laguna	Basic	143.2	4.2	F
NB: Laguna Off	Diverge	122.2	6.9	F
NB: Laguna Off to On	Basic	121.5	11.7	F
NB: Laguna On	Merge	166.7	10.6	F
NB: Laguna to Cosumnes	Basic	160.7	6.3	F
NB: Pocket Off	Diverge	131.9	5.0	F
NB: Pocket Off to On	Basic	142.8	6.6	F
NB: Pocket EB On	Merge	148.1	3.9	F
NB: Pocket WB On	Merge	162.3	7.4	F
NB: Florin Off	Diverge	144.9	4.3	F
NB: Florin Off to On	Basic	138.5	4.9	F
NB: Florin EB On	Merge	133.6	6.1	F
NB: Florin WB On	Merge	157.1	4.4	F
NB: Florin to 43rd	Basic	132.2	2.4	F
NB: 43rd On to SeAmas Off	Weave	120.8	2.8	F
NB: Seamas Off to On	Basic	113.7	4.1	F
NB: Seamas On	Merge	150.0	3.2	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Seamas to Sutterville	Basic	123.1	2.6	F
NB: Sutterville Off	Diverge	120.0	2.8	F
NB: Sutterville Off to On	Basic	108.2	3.4	F
NB: Sutterville On	Merge	103.6	2.5	F
NB: Sutterville to US-50	Basic	79.0	2.8	F
NB: US-50 Off	Diverge	75.4	2.4	F
NB: US-50 Off to Q St Off	Basic	90.1	3.0	F
NB: Q St Off	Diverge	78.8	3.6	F
NB: Q St Off to US-50 EB On	Basic	91.0	5.8	F
NB: US-50 EB On	Merge	106.2	1.2	F
NB: US-50 WB On	Merge	122.9	0.9	F
NB: P St On to J St Off	Weave	88.0	1.1	F
NB: J St Off to Lane Drop	Basic	100.6	1.6	F
NB: Lane Drop to L St On	Basic	58.1	0.7	F
NB: L St On	Merge	28.7	0.3	D
NB: I St On to Richards Off	Weave	26.8	0.3	C
NB: Richards Off to On	Basic	29.8	0.4	D
NB: H-F to Elk Grove -2	Basic	149.0	6.2	F
Cosumnes Off	Diverge	154.0	5.0	F
Cosumnes EB Loop On-Ramp	Merge	144.1	6.4	F
Cosumnes WB Slip On-Ramp	Merge	188.8	3.2	F
Cosumnes to Pocket	Basic	138.6	5.3	F
Pocket to Florin	Basic	167.0	3.7	F









**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2023 No Project**  
**PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	66,517	237
Number of Persons Served	All Vehicles	88,417	315
Travel Distance [mi]	All Vehicles	467,950	1,448
Travel Time [h]	All Vehicles	18,504	230
Average Speed [mph]	All Vehicles	25.3	0.4
Total Delay [h]	All Vehicles	11,111	240
Average Delay per Vehicle [s]	All Vehicles	568	14
VHD/VMT (min/mile)	All Vehicles	1.42	0.03
Number of Vehicles Served	HOVs	15,975	402
Number of Persons Served	HOVs	37,541	944
Travel Distance [mi]	HOVs	111,593	2,549
Travel Time [h]	HOVs	3,930	104
Average Speed [mph]	HOVs	28.4	0.4
Total Delay [h]	HOVs	2,164	72
Average Delay per Vehicle [s]	HOVs	458	12
VHD/VMT (min/mile)	HOVs	1.16	0.03
Number of Vehicles Served	Trucks	1,667	72
Number of Persons Served	Trucks	2,000	86
Travel Distance [mi]	Trucks	11,621	399
Travel Time [h]	Trucks	535	24
Average Speed [mph]	Trucks	21.7	0.5
Total Delay [h]	Trucks	350	19
Average Delay per Vehicle [s]	Trucks	716	23
VHD/VMT (min/mile)	Trucks	1.81	0.06

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2023 Mixed Flow**  
**PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	77,854	449
Number of Persons Served	All Vehicles	97,531	562
Travel Distance [mi]	All Vehicles	567,302	2,836
Travel Time [h]	All Vehicles	14,792	108
Average Speed [mph]	All Vehicles	38.4	0.3
Total Delay [h]	All Vehicles	5,824	96
Average Delay per Vehicle [s]	All Vehicles	261	4
VHD/VMT (min/mile)	All Vehicles	0.62	0.01
Number of Vehicles Served	HOVs	14,325	316
Number of Persons Served	HOVs	33,663	742
Travel Distance [mi]	HOVs	104,480	2,177
Travel Time [h]	HOVs	2,531	78
Average Speed [mph]	HOVs	41.3	0.6
Total Delay [h]	HOVs	877	49
Average Delay per Vehicle [s]	HOVs	212	8
VHD/VMT (min/mile)	HOVs	0.50	0.02
Number of Vehicles Served	Trucks	1,692	87
Number of Persons Served	Trucks	2,031	104
Travel Distance [mi]	Trucks	11,769	603
Travel Time [h]	Trucks	327	20
Average Speed [mph]	Trucks	36.0	0.7
Total Delay [h]	Trucks	140	12
Average Delay per Vehicle [s]	Trucks	287	11
VHD/VMT (min/mile)	Trucks	0.71	0.03

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2023 Bus/Carpool**  
**PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	74,865	601
Number of Persons Served	All Vehicles	100,689	809
Travel Distance [mi]	All Vehicles	544,246	3,407
Travel Time [h]	All Vehicles	16,546	115
Average Speed [mph]	All Vehicles	32.9	0.2
Total Delay [h]	All Vehicles	7,943	102
Average Delay per Vehicle [s]	All Vehicles	367	5
VHD/VMT (min/mile)	All Vehicles	0.88	0.01
Number of Vehicles Served	HOVs	18,852	573
Number of Persons Served	HOVs	44,303	1,347
Travel Distance [mi]	HOVs	137,417	3,653
Travel Time [h]	HOVs	3,333	143
Average Speed [mph]	HOVs	41.3	0.9
Total Delay [h]	HOVs	1,158	92
Average Delay per Vehicle [s]	HOVs	212	12
VHD/VMT (min/mile)	HOVs	0.51	0.03
Number of Vehicles Served	Trucks	1,867	52
Number of Persons Served	Trucks	2,240	62
Travel Distance [mi]	Trucks	13,363	440
Travel Time [h]	Trucks	476	22
Average Speed [mph]	Trucks	28.1	0.7
Total Delay [h]	Trucks	264	17
Average Delay per Vehicle [s]	Trucks	486	20
VHD/VMT (min/mile)	Trucks	1.19	0.06

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2023 Lane Conversion - Southbound**  
**PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	59,213	493
Number of Persons Served	All Vehicles	76,645	638
Travel Distance [mi]	All Vehicles	401,754	2,745
Travel Time [h]	All Vehicles	15,468	213
Average Speed [mph]	All Vehicles	26.0	0.3
Total Delay [h]	All Vehicles	9,114	197
Average Delay per Vehicle [s]	All Vehicles	525	11
VHD/VMT (min/mile)	All Vehicles	1.36	0.03
Number of Vehicles Served	HOVs	12,676	205
Number of Persons Served	HOVs	29,789	482
Travel Distance [mi]	HOVs	85,348	1,399
Travel Time [h]	HOVs	2,561	76
Average Speed [mph]	HOVs	33.3	0.8
Total Delay [h]	HOVs	1,209	66
Average Delay per Vehicle [s]	HOVs	328	15
VHD/VMT (min/mile)	HOVs	0.85	0.04
Number of Vehicles Served	Trucks	1,593	36
Number of Persons Served	Trucks	1,912	43
Travel Distance [mi]	Trucks	10,527	253
Travel Time [h]	Trucks	500	20
Average Speed [mph]	Trucks	21.1	0.7
Total Delay [h]	Trucks	333	18
Average Delay per Vehicle [s]	Trucks	713	29
VHD/VMT (min/mile)	Trucks	1.90	0.09

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

## *Level Of Service by Location Report*

<i>Project Name</i>	I-5 HOV	<i>Peak Hour</i>	PM
<i>Alternative</i>	2023 No Project	<i>Num of Runs</i>	10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	145.4	2.8	F
SB: Richards to J St	Weave	128.5	4.9	F
SB: J St Off to I St On	Basic	115.8	7.8	F
SB: I St On to US-50 Off	Weave	70.9	5.6	F
SB: US-50 Off to P St On	Basic	28.5	16.2	D
SB: P St On	Merge	81.3	43.0	F
SB: P St On to US-50 EB On	Basic	107.2	25.5	F
SB: US-50 EB On	Merge	137.1	5.5	F
SB: US-50 WB On	Merge	147.9	4.4	F
SB: US-50 to Lane Drop	Basic	138.9	4.3	F
SB: Lane Drop to Sutterville	Basic	92.6	4.7	F
SB: Sutterville Off	Diverge	101.7	6.8	F
SB: Sutterville Off to On	Basic	87.8	4.2	F
SB: Sutterville On	Merge	136.6	5.3	F
SB: Sutterville to Seamas	Basic	131.5	4.4	F
SB: Seamas Off	Diverge	142.6	7.2	F
SB: Seamas Off to On	Basic	95.7	5.2	F
SB: Seamas On to 43rd Off	Weave	110.1	5.1	F
SB: 43rd to Florin	Basic	94.4	3.6	F
SB: Florin Off	Diverge	78.6	2.2	F
SB: Florin Off to Lane Drop	Basic	127.7	2.4	F
SB: Lane Drop to Florin On	Basic	84.6	3.7	F
SB: Florin On	Merge	78.3	7.5	F
SB: Pocket Off to On	Basic	89.7	2.7	F
SB: Pocket WB On	Merge	75.9	4.1	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket EB On	Merge	41.1	1.2	E
SB: Pocket to Cosumnes	Basic	31.6	0.4	D
SB: Laguna Off	Diverge	28.0	2.3	C
SB: Laguna Off to On	Basic	39.9	27.4	E
SB: Laguna On	Merge	63.9	34.7	F
SB: Laguna to Lane Drop	Basic	60.3	19.8	F
SB: Elk Grove Off	Diverge	32.3	0.6	D
SB: Elk Grove Off to On	Basic	22.3	0.3	C
SB: Elk Grove On	Merge	23.3	0.6	C
SB: Elk Grove to End of HOV	Basic	23.7	0.5	C
SB: H-F Off	Diverge	24.1	0.5	C
SB: H-F Off to On	Basic	20.1	0.6	C
SB: H-F WB On	Merge	25.9	1.2	C
SB: H-F EB On	Merge	24.4	0.7	C
SB: Cosumnes Off	Diverge	26.0	0.6	C
SB: Cosumnes Off to On	Basic	28.7	0.5	D
SB: Cosumnes WB On	Merge	26.7	3.8	C
SB: Cosumnes EB On	Merge	34.0	8.9	D
SB: Cosumnes to Laguna	Basic	37.6	3.3	E
SB: End of HOV to Lane Drop	Basic	23.7	0.6	C
SB: Lane Drop to H-F Off	Basic	23.9	0.6	C
SB: Pocket Off	Diverge	103.7	4.6	F

## *Level Of Service by Location Report*

*Project Name* I-5 Bus/Carpool Lanes *Peak Hour* PM  
*Alternative* 2023 Mixed Flow - Southbound *Num of Runs* 10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	122.1	10.9	F
SB: Richards to J St	Weave	112.6	7.3	F
SB: J St Off to I St On	Basic	90.6	9.4	F
SB: I St On to US-50 Off	Weave	49.2	7.7	F
SB: US-50 Off to P St On	Basic	23.8	0.9	C
SB: P St On	Merge	23.0	0.8	C
SB: P St On to US-50 EB On	Basic	30.2	1.8	D
SB: US-50 EB On	Merge	74.2	10.9	F
SB: US-50 WB On	Merge	116.0	6.3	F
SB: US-50 to Lane Drop	Basic	114.0	1.9	F
SB: Lane Drop to Sutterville	Basic	49.1	2.8	F
SB: Sutterville Off	Diverge	42.6	4.7	E
SB: Sutterville Off to On	Basic	31.5	0.3	D
SB: Sutterville On	Merge	36.7	3.8	E
SB: Sutterville to Seamas	Basic	33.3	0.6	D
SB: Seamas Off	Diverge	70.6	19.1	F
SB: Seamas Off to On	Basic	42.2	2.7	E
SB: Seamas On to 43rd Off	Weave	28.4	0.2	D
SB: 43rd to Florin	Basic	30.3	0.4	D
SB: Florin Off	Diverge	28.2	0.7	D
SB: Florin Off to On	Basic	26.7	0.7	D
SB: Florin to Pocket Weave	Weave	29.6	3.4	D
SB: Pocket Off to On	Basic	47.8	19.9	F
SB: Pocket WB On	Merge	56.5	10.9	F
SB: Pocket EB On	Merge	38.7	2.2	E

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket to Cosumnes	Basic	32.0	0.4	D
SB: Laguna Off	Diverge	34.8	1.2	D
SB: Laguna Off to On	Basic	20.3	0.3	C
SB: Laguna On	Merge	18.7	0.4	B
SB: Laguna to Elk Grove	Basic	21.3	0.4	C
SB: Elk Grove Off	Diverge	22.4	0.6	C
SB: Elk Grove Off to On	Basic	18.9	0.5	C
SB: Elk Grove On	Merge	18.6	0.5	B
SB: Elk Grove to End of HOV	Basic	22.3	0.6	C
SB: H-F Off	Diverge	29.9	1.0	D
SB: H-F Off to On	Basic	23.7	0.9	C
SB: H-F WB On	Merge	30.2	2.5	D
SB: H-F EB On	Merge	27.0	1.0	C
SB: Cosumnes Off	Diverge	26.4	2.2	C
SB: Cosumnes Off to On	Basic	34.0	10.2	D
SB: Cosumnes WB On	Merge	50.6	34.1	F
SB: Cosumnes EB On	Merge	61.7	24.9	F
SB: Cosumnes to Laguna	Basic	56.2	1.7	F
SB: End of HOV to Lane Drop	Basic	31.3	2.2	D
SB: Lane Drop to H-F Off	Basic	29.8	1.0	D

## *Level Of Service by Location Report*

*Project Name* I-5 Bus/Carpool Lanes *Peak Hour* PM  
*Alternative* 2023 Bus/Carpool - Southbound *Num of Runs* 10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	135.9	9.4	F
SB: Richards to J St	Weave	120.1	8.0	F
SB: J St Off to I St On	Basic	105.8	10.7	F
SB: I St On to US-50 Off	Weave	64.5	9.9	F
SB: US-50 Off to P St On	Basic	25.2	0.7	C
SB: P St On	Merge	20.8	0.5	C
SB: P St On to US-50 EB On	Basic	30.3	3.3	D
SB: US-50 EB On	Merge	88.4	15.1	F
SB: US-50 WB On	Merge	92.3	5.6	F
SB: US-50 to Lane Drop	Basic	112.6	4.6	F
SB: Lane Drop to Sutterville	Basic	55.6	11.4	F
SB: Sutterville Off	Diverge	51.6	17.1	F
SB: Sutterville Off to On	Basic	51.2	16.4	F
SB: Sutterville On	Merge	92.8	26.0	F
SB: Sutterville to Seamas	Basic	112.0	8.9	F
SB: Seamas Off	Diverge	120.8	5.6	F
SB: Seamas Off to On	Basic	79.9	6.6	F
SB: Seamas On to 43rd Off	Weave	98.4	5.6	F
SB: 43rd to Florin	Basic	83.8	4.4	F
SB: Florin Off	Diverge	78.4	3.1	F
SB: Florin Off to On	Basic	125.3	2.0	F
SB: Florin to Pocket Weave	Weave	102.8	2.3	F
SB: Pocket Off to On	Basic	91.7	1.5	F
SB: Pocket WB On	Merge	79.9	2.2	F
SB: Pocket EB On	Merge	42.9	1.8	E

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket to Cosumnes	Basic	32.5	1.1	D
SB: Laguna Off	Diverge	30.8	1.0	D
SB: Laguna Off to On	Basic	21.1	0.6	C
SB: Laguna On	Merge	19.8	0.7	B
SB: Laguna to Elk Grove	Basic	21.8	0.6	C
SB: Elk Grove Off	Diverge	23.4	1.7	C
SB: Elk Grove Off to On	Basic	21.6	0.9	C
SB: Elk Grove On	Merge	21.2	0.8	C
SB: Elk Grove to End of HOV	Basic	29.5	1.7	D
SB: H-F Off	Diverge	26.5	0.9	C
SB: H-F Off to On	Basic	21.6	0.6	C
SB: H-F WB On	Merge	26.4	1.8	C
SB: H-F EB On	Merge	25.0	0.7	C
SB: Cosumnes Off	Diverge	25.0	0.6	C
SB: Cosumnes Off to On	Basic	27.5	0.4	D
SB: Cosumnes WB On	Merge	25.4	1.9	C
SB: Cosumnes EB On	Merge	37.4	12.1	E
SB: Cosumnes to Laguna	Basic	54.1	6.9	F
SB: End of HOV to Lane Drop	Basic	27.0	1.3	D
SB: Lane Drop to H-F Off	Basic	26.3	0.6	D

## *Level Of Service by Location Report*

*Project Name* I-5 Bus / Carpool *Peak Hour* PM  
*Alternative* 2023 Lane Conversion *Num of Runs* 10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	138.6	9.0	F
SB: Richards to J St	Weave	128.1	6.6	F
SB: J St Off to I St On	Basic	113.1	9.4	F
SB: I St On to US-50 Off	Weave	74.5	17.5	F
SB: US-50 Off to P St On	Basic	42.6	40.6	E
SB: P St On	Merge	116.8	12.1	F
SB: P St On to US-50 EB On	Basic	133.7	9.2	F
SB: US-50 EB On	Merge	141.7	8.7	F
SB: US-50 WB On	Merge	130.2	5.7	F
SB: US-50 to Lane Drop	Basic	130.9	3.8	F
SB: Lane Drop to Sutterville	Basic	89.5	4.8	F
SB: Sutterville Off	Diverge	93.6	6.3	F
SB: Sutterville Off to On	Basic	91.5	2.4	F
SB: Sutterville On	Merge	130.9	6.7	F
SB: Sutterville to Seamas	Basic	133.2	5.6	F
SB: Seamas Off	Diverge	139.2	6.6	F
SB: Seamas Off to On	Basic	100.0	6.5	F
SB: Seamas On to 43rd Off	Weave	113.1	5.7	F
SB: 43rd to Florin	Basic	97.9	3.1	F
SB: Florin Off	Diverge	85.6	2.7	F
SB: Florin Off to Lane Drop	Basic	147.7	2.6	F
SB: Lane Drop to Florin On	Basic	85.7	2.7	F
SB: Florin On	Merge	82.2	1.9	F
SB: Pocket Off to On	Basic	92.5	1.7	F
SB: Pocket WB On	Merge	76.2	2.3	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket EB On	Merge	56.0	1.9	F
SB: Pocket to Cosumnes	Basic	33.5	0.3	D
SB: Laguna Off	Diverge	28.6	1.0	D
SB: Laguna Off to On	Basic	21.0	0.6	C
SB: Laguna On	Merge	24.8	0.8	C
SB: Laguna to Lane Drop	Basic	27.2	1.0	D
SB: Elk Grove Off	Diverge	25.6	0.6	C
SB: Elk Grove Off to On	Basic	18.2	0.4	C
SB: Elk Grove On	Merge	18.4	0.5	B
SB: Elk Grove to H-F	Basic	19.0	0.6	C
SB: H-F Off	Diverge	19.1	0.6	B
SB: H-F Off to On	Basic	16.5	0.5	B
SB: H-F WB On	Merge	18.8	0.5	B
SB: H-F EB On	Merge	19.2	0.4	B
SB: Cosumnes Off	Diverge	27.4	1.4	C
SB: Cosumnes Off to On	Basic	32.9	9.3	D
SB: Cosumnes WB On	Merge	31.0	23.0	D
SB: Cosumnes EB On	Merge	36.7	16.0	E
SB: Cosumnes to Laguna	Basic	42.4	4.9	E
SB: Pocket Off	Diverge	98.0	2.4	F

**APPENDIX D**  
**DETAILED MODEL RESULTS**  
**DESIGN YEAR (2033) CONDITIONS**

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**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5**  
**NP AM NB 2033**  
**6 to 10 AM - Northbound**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	59,956	107
Number of Persons Served	All Vehicles	78,711	140
Travel Distance [mi]	All Vehicles	469,922	886
Travel Time [h]	All Vehicles	31,883	113
Average Speed [mph]	All Vehicles	14.7	0.1
Total Delay [h]	All Vehicles	24,340	113
Average Delay per Vehicle [s]	All Vehicles	1,322	5
VHD/VMT (min/mile)	All Vehicles	3.11	0.02
Number of Vehicles Served	HOVs	13,290	112
Number of Persons Served	HOVs	31,232	264
Travel Distance [mi]	HOVs	108,534	711
Travel Time [h]	HOVs	5,996	84
Average Speed [mph]	HOVs	18.1	0.2
Total Delay [h]	HOVs	4,260	73
Average Delay per Vehicle [s]	HOVs	1,076	12
VHD/VMT (min/mile)	HOVs	2.35	0.03
Number of Vehicles Served	Trucks	4,066	24
Number of Persons Served	Trucks	4,879	29
Travel Distance [mi]	Trucks	37,925	144
Travel Time [h]	Trucks	2,034	28
Average Speed [mph]	Trucks	18.6	0.2
Total Delay [h]	Trucks	1,438	27
Average Delay per Vehicle [s]	Trucks	1,173	19
VHD/VMT (min/mile)	Trucks	2.27	0.04

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5**  
**MF AM NB 2033**  
**6 to 10 AM - Northbound**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	65,147	131
Number of Persons Served	All Vehicles	84,269	169
Travel Distance [mi]	All Vehicles	540,258	1,209
Travel Time [h]	All Vehicles	29,210	45
Average Speed [mph]	All Vehicles	18.5	0.0
Total Delay [h]	All Vehicles	20,498	35
Average Delay per Vehicle [s]	All Vehicles	1,054	2
VHD/VMT (min/mile)	All Vehicles	2.28	0.01
Number of Vehicles Served	HOVs	13,550	88
Number of Persons Served	HOVs	31,843	207
Travel Distance [mi]	HOVs	114,590	609
Travel Time [h]	HOVs	5,270	56
Average Speed [mph]	HOVs	21.7	0.2
Total Delay [h]	HOVs	3,426	51
Average Delay per Vehicle [s]	HOVs	855	11
VHD/VMT (min/mile)	HOVs	1.79	0.02
Number of Vehicles Served	Trucks	4,144	53
Number of Persons Served	Trucks	4,973	63
Travel Distance [mi]	Trucks	39,968	323
Travel Time [h]	Trucks	1,822	24
Average Speed [mph]	Trucks	21.9	0.2
Total Delay [h]	Trucks	1,193	21
Average Delay per Vehicle [s]	Trucks	965	14
VHD/VMT (min/mile)	Trucks	1.79	0.03

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5**  
**HOV N2 AM NB 2033**  
**6 to 10 AM - Northbound**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	64,873	117
Number of Persons Served	All Vehicles	91,328	165
Travel Distance [mi]	All Vehicles	537,889	1,309
Travel Time [h]	All Vehicles	31,091	275
Average Speed [mph]	All Vehicles	17.3	0.2
Total Delay [h]	All Vehicles	22,456	287
Average Delay per Vehicle [s]	All Vehicles	1,148	14
VHD/VMT (min/mile)	All Vehicles	2.50	0.04
Number of Vehicles Served	HOVs	18,982	107
Number of Persons Served	HOVs	44,607	252
Travel Distance [mi]	HOVs	159,291	582
Travel Time [h]	HOVs	6,852	142
Average Speed [mph]	HOVs	23.3	0.4
Total Delay [h]	HOVs	4,300	137
Average Delay per Vehicle [s]	HOVs	773	23
VHD/VMT (min/mile)	HOVs	1.62	0.05
Number of Vehicles Served	Trucks	4,145	38
Number of Persons Served	Trucks	4,974	46
Travel Distance [mi]	Trucks	39,412	286
Travel Time [h]	Trucks	2,015	35
Average Speed [mph]	Trucks	19.6	0.4
Total Delay [h]	Trucks	1,395	35
Average Delay per Vehicle [s]	Trucks	1,123	29
VHD/VMT (min/mile)	Trucks	2.12	0.06

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor  
Average Values from 10 Runs  
Network Statistics**

**I-5 Bus/Carpool Lanes  
2033 Lane Conversion - Northbound  
AM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	41,523	83
Number of Persons Served	All Vehicles	59,829	120
Travel Distance [mi]	All Vehicles	361,084	1,530
Travel Time [h]	All Vehicles	41,424	103
Average Speed [mph]	All Vehicles	8.7	0.0
Total Delay [h]	All Vehicles	35,663	113
Average Delay per Vehicle [s]	All Vehicles	2,331	9
VHD/VMT (min/mile)	All Vehicles	5.93	0.04
Number of Vehicles Served	HOVs	13,191	65
Number of Persons Served	HOVs	30,999	152
Travel Distance [mi]	HOVs	119,247	934
Travel Time [h]	HOVs	10,362	88
Average Speed [mph]	HOVs	11.5	0.1
Total Delay [h]	HOVs	8,463	90
Average Delay per Vehicle [s]	HOVs	1,836	22
VHD/VMT (min/mile)	HOVs	4.26	0.06
Number of Vehicles Served	Trucks	2,494	34
Number of Persons Served	Trucks	2,993	41
Travel Distance [mi]	Trucks	26,928	409
Travel Time [h]	Trucks	2,943	77
Average Speed [mph]	Trucks	9.2	0.2
Total Delay [h]	Trucks	2,521	75
Average Delay per Vehicle [s]	Trucks	2,701	53
VHD/VMT (min/mile)	Trucks	5.62	0.16

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

## *Level Of Service by Location Report*

<i>Project Name</i> <u>I-5</u>	<i>Peak Hour</i> <u>AM Peak</u>
<i>Alternative</i> <u>NP-Alt-2033 - NB</u>	<i>Num of Runs</i> <u>10</u>

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	104.1	4.0	F
NB: H-F Off	Diverge	104.1	3.8	F
NB: H-F EB On	Merge	113.8	2.0	F
NB: H-F WB On	Merge	124.0	1.7	F
NB: H-F to Elk Grove -1	Basic	103.0	3.9	F
NB: Elk Grove Off	Diverge	104.1	3.7	F
NB: Elk Grove Off to On	Basic	107.6	4.1	F
NB: Elk Grove On	Merge	118.4	5.1	F
NB: Elk Grove to Laguna	Basic	95.7	4.8	F
NB: Laguna Off	Diverge	69.3	8.6	F
NB: Laguna Off to On	Basic	79.3	7.8	F
NB: Laguna On	Merge	143.4	4.7	F
NB: Laguna to Cosumnes	Basic	116.3	3.2	F
NB: Pocket Off	Diverge	94.4	2.9	F
NB: Pocket Off to On	Basic	94.0	3.0	F
NB: Pocket EB On	Merge	98.7	3.3	F
NB: Pocket WB On	Merge	125.3	2.0	F
NB: Florin Off	Diverge	101.5	1.8	F
NB: Florin Off to On	Basic	95.8	1.1	F
NB: Florin EB On	Merge	88.4	1.9	F
NB: Florin WB On	Merge	132.0	6.2	F
NB: Florin to 43rd	Basic	109.3	1.0	F
NB: 43rd On to SeAmas Off	Weave	113.1	1.5	F
NB: Seamas Off to On	Basic	94.2	1.1	F
NB: Seamas On	Merge	122.9	1.2	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Seamas to Sutterville	Basic	86.7	0.6	F
NB: Sutterville Off	Diverge	86.1	0.9	F
NB: Sutterville Off to On	Basic	72.8	0.7	F
NB: Sutterville On	Merge	43.1	0.6	F
NB: Sutterville to US-50	Basic	30.5	0.5	F
NB: US-50 Off	Diverge	26.8	0.3	F
NB: US-50 Off to Q St Off	Basic	26.4	0.6	F
NB: Q St Off	Diverge	24.5	0.6	F
NB: Q St Off to US-50 EB On	Basic	21.0	0.4	F
NB: US-50 EB On	Merge	29.2	2.6	F
NB: US-50 WB On	Merge	81.2	4.2	F
NB: P St On to J St Off	Weave	68.0	7.2	F
NB: J St Off to Lane Drop	Basic	94.4	6.1	F
NB: Lane Drop to L St On	Basic	60.1	0.9	F
NB: L St On	Merge	29.9	0.3	F
NB: I St On to Richards Off	Weave	27.3	0.6	F
NB: Richards Off to On	Basic	28.5	0.3	F
NB: H-F to Elk Grove -2	Basic	103.0	3.9	F
Cosumnes Off	Diverge	112.9	3.1	F
Cosumnes EB Loop On-Ramp	Merge	110.0	3.8	F
Cosumnes WB Slip On-Ramp	Merge	177.3	3.3	F
Cosumnes to Pocket	Basic	94.9	2.9	F
Pocket to Florin	Basic	129.4	1.8	F

## *Level Of Service by Location Report*

<i>Project Name</i>	I-5	<i>Peak Hour</i>	AM Peak
<i>Alternative</i>	MF-Alt-2033 - NB	<i>Num of Runs</i>	10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	27.3	0.7	F
NB: H-F Off	Diverge	30.5	4.6	F
NB: H-F EB On	Merge	31.1	4.8	F
NB: H-F WB On	Merge	72.9	7.9	F
NB: H-F to Elk Grove -1	Basic	23.8	0.5	F
NB: Elk Grove Off	Diverge	68.6	41.4	F
NB: Elk Grove Off to On	Basic	98.3	21.3	F
NB: Elk Grove On	Merge	53.8	5.4	F
NB: Elk Grove to Laguna	Basic	118.1	1.9	F
NB: Laguna Off	Diverge	94.0	2.7	F
NB: Laguna Off to On	Basic	68.2	4.3	F
NB: Laguna On	Merge	138.9	4.3	F
NB: Laguna to Cosumnes	Basic	108.3	1.7	F
NB: Pocket Off	Diverge	94.9	2.5	F
NB: Pocket Off to On	Basic	92.9	1.3	F
NB: Pocket EB On	Merge	98.1	1.9	F
NB: Florin Off to On	Basic	93.2	0.6	F
NB: Florin EB On	Merge	94.9	3.2	F
NB: Florin WB On	Merge	139.4	5.6	F
NB: Florin to 43rd	Basic	103.0	0.9	F
NB: 43rd On to Seamas Off	Weave	116.6	2.6	F
NB: Seamas Off to On	Basic	93.5	0.7	F
NB: Seamas On	Merge	129.9	1.4	F
NB: Seamas to Sutterville	Basic	89.3	0.8	F
NB: Sutterville Off	Diverge	90.0	1.2	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Sutterville Off to On	Basic	77.1	0.8	F
NB: Sutterville On	Merge	76.0	3.4	F
NB: Sutterville to US-50	Basic	33.4	0.2	F
NB: US-50 Off	Diverge	27.4	0.7	F
NB: US-50 Off to Q St Off	Basic	22.2	0.3	F
NB: Q St Off	Diverge	24.9	1.3	F
NB: Q St Off to US-50 EB On	Basic	24.4	1.8	F
NB: US-50 EB On	Merge	35.4	6.3	F
NB: US-50 WB On	Merge	87.1	8.2	F
NB: P St On to J St Off	Weave	67.1	7.3	F
NB: J St Off to Lane Drop	Basic	90.5	10.2	F
NB: Lane Drop to L St On	Basic	59.2	0.8	F
NB: L St On	Merge	29.8	0.3	F
NB: I St On to Richards Off	Weave	27.3	0.6	F
NB: Richards Off to On	Basic	28.8	0.6	F
NB: H-F to Elk Grove -2	Basic	23.8	0.5	F
Cosumnes Off	Diverge	108.8	3.2	F
Cosumnes EB Loop On-Ramp	Merge	107.1	3.0	F
Cosumnes WB Slip On-Ramp	Merge	181.1	3.0	F
Cosumnes to Pocket	Basic	88.0	1.4	F
Pocket to Florin	Weave	118.5	1.5	F

## *Level Of Service by Location Report*

<i>Project Name</i> <u>I-5</u>	<i>Peak Hour</i> <u>AM Peak</u>
<i>Alternative</i> <u>HOV-N2-Alt-2033 - NB</u>	<i>Num of Runs</i> <u>10</u>

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<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	74.5	38.1	F
NB: H-F Off	Diverge	110.0	30.2	F
NB: H-F EB On	Merge	126.3	4.4	F
NB: H-F WB On	Merge	139.9	5.0	F
NB: H-F to Elk Grove -1	Basic	129.3	5.2	F
NB: Elk Grove Off	Diverge	135.7	4.9	F
NB: Elk Grove Off to On	Basic	138.9	4.8	F
NB: Elk Grove On	Merge	150.3	4.5	F
NB: Elk Grove to Laguna	Basic	129.0	3.4	F
NB: Laguna Off	Diverge	102.9	6.3	F
NB: Laguna Off to On	Basic	85.0	7.0	F
NB: Laguna On	Merge	141.2	6.9	F
NB: Laguna to Cosumnes	Basic	126.9	4.8	F
NB: Pocket Off	Diverge	93.9	5.4	F
NB: Pocket Off to On	Basic	96.8	8.6	F
NB: Pocket EB On	Merge	95.8	6.7	F
NB: Florin Off to On	Basic	98.4	2.7	F
NB: Florin EB On	Merge	96.9	5.0	F
NB: Florin WB On	Merge	140.9	8.6	F
NB: Florin to 43rd	Basic	108.1	2.0	F
NB: 43rd On to Seamas Off	Weave	125.5	2.4	F
NB: Seamas Off to On	Basic	97.4	1.8	F
NB: Seamas On	Merge	127.4	1.4	F
NB: Seamas to Sutterville	Basic	90.2	1.6	F
NB: Sutterville Off	Diverge	78.2	1.8	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Sutterville Off to On	Basic	77.6	1.6	F
NB: Sutterville On	Merge	66.0	6.0	F
NB: Sutterville to US-50	Basic	36.3	0.4	F
NB: US-50 Off	Diverge	27.0	0.4	F
NB: US-50 Off to Q St Off	Basic	22.4	0.9	F
NB: Q St Off	Diverge	25.8	1.8	F
NB: Q St Off to US-50 EB On	Basic	25.0	0.7	F
NB: US-50 EB On	Merge	36.5	6.9	F
NB: US-50 WB On	Merge	82.6	5.4	F
NB: P St On to J St Off	Weave	58.6	7.3	F
NB: J St Off to Lane Drop	Basic	84.8	15.0	F
NB: Lane Drop to L St On	Basic	58.3	3.0	F
NB: L St On	Merge	32.1	0.5	F
NB: I St On to Richards Off	Weave	27.3	0.6	F
NB: Richards Off to On	Basic	28.3	0.5	F
Cosumnes Off	Diverge	113.4	3.4	F
Cosumnes EB Loop On-Ramp	Merge	111.1	4.9	F
Cosumnes WB Slip On-Ramp	Merge	179.0	2.2	F
Cosumnes to Pocket	Basic	103.0	5.5	F
Pocket to Florin	Weave	124.7	4.2	F

## *Level Of Service by Location Report*

<i>Project Name</i> <u>I-5 Bus / Carpool</u>	<i>Peak Hour</i> <u>AM</u>
<i>Alternative</i> <u>2033 Lane Conversion</u>	<i>Num of Runs</i> <u>10</u>

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<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	155.3	4.7	F
NB: H-F Off	Diverge	154.2	4.2	F
NB: H-F EB On	Merge	151.0	4.1	F
NB: H-F WB On	Merge	165.1	4.1	F
NB: H-F to Elk Grove -1	Basic	152.7	5.4	F
NB: Elk Grove Off	Diverge	152.9	6.2	F
NB: Elk Grove Off to On	Basic	152.2	5.5	F
NB: Elk Grove On	Merge	160.6	5.1	F
NB: Elk Grove to Laguna	Basic	138.3	5.7	F
NB: Laguna Off	Diverge	121.1	5.4	F
NB: Laguna Off to On	Basic	80.2	2.4	F
NB: Laguna On	Merge	167.6	3.1	F
NB: Laguna to Cosumnes	Basic	154.2	4.2	F
NB: Pocket Off	Diverge	135.8	7.9	F
NB: Pocket Off to On	Basic	147.5	7.6	F
NB: Pocket EB On	Merge	158.2	7.8	F
NB: Pocket WB On	Merge	149.6	9.2	F
NB: Florin Off	Diverge	140.8	6.5	F
NB: Florin Off to On	Basic	134.2	8.2	F
NB: Florin EB On	Merge	132.3	8.9	F
NB: Florin WB On	Merge	158.4	6.4	F
NB: Florin to 43rd	Basic	134.3	5.1	F
NB: 43rd On to SeAmas Off	Weave	122.9	4.1	F
NB: Seamas Off to On	Basic	121.2	6.2	F
NB: Seamas On	Merge	154.1	4.3	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Seamas to Sutterville	Basic	121.4	4.2	F
NB: Sutterville Off	Diverge	120.2	4.2	F
NB: Sutterville Off to On	Basic	107.5	4.7	F
NB: Sutterville On	Merge	105.7	4.1	F
NB: Sutterville to US-50	Basic	79.9	2.9	F
NB: US-50 Off	Diverge	81.5	2.9	F
NB: US-50 Off to Q St Off	Basic	104.7	2.7	F
NB: Q St Off	Diverge	98.1	1.5	F
NB: Q St Off to US-50 EB On	Basic	110.3	2.8	F
NB: US-50 EB On	Merge	106.4	2.1	F
NB: US-50 WB On	Merge	123.6	0.8	F
NB: P St On to J St Off	Weave	89.8	1.6	F
NB: J St Off to Lane Drop	Basic	100.6	2.1	F
NB: Lane Drop to L St On	Basic	58.0	0.3	F
NB: L St On	Merge	28.9	0.4	D
NB: I St On to Richards Off	Weave	27.4	0.7	C
NB: Richards Off to On	Basic	30.9	0.4	D
NB: H-F to Elk Grove -2	Basic	152.7	5.4	F
Cosumnes Off	Diverge	146.1	5.1	F
Cosumnes EB Loop On-Ramp	Merge	138.8	6.8	F
Cosumnes WB Slip On-Ramp	Merge	186.5	3.1	F
Cosumnes to Pocket	Basic	138.2	5.3	F
Pocket to Florin	Basic	161.7	4.8	F









**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2033 No Project - Southbound**  
**PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	64,953	399
Number of Persons Served	All Vehicles	86,857	534
Travel Distance [mi]	All Vehicles	457,183	2,311
Travel Time [h]	All Vehicles	19,526	178
Average Speed [mph]	All Vehicles	23.4	0.2
Total Delay [h]	All Vehicles	12,305	173
Average Delay per Vehicle [s]	All Vehicles	638	7
VHD/VMT (min/mile)	All Vehicles	1.61	0.02
Number of Vehicles Served	HOVs	15,971	467
Number of Persons Served	HOVs	37,531	1,098
Travel Distance [mi]	HOVs	110,900	3,619
Travel Time [h]	HOVs	4,288	195
Average Speed [mph]	HOVs	25.9	0.4
Total Delay [h]	HOVs	2,534	139
Average Delay per Vehicle [s]	HOVs	533	15
VHD/VMT (min/mile)	HOVs	1.37	0.03
Number of Vehicles Served	Trucks	1,723	55
Number of Persons Served	Trucks	2,067	66
Travel Distance [mi]	Trucks	11,946	264
Travel Time [h]	Trucks	606	20
Average Speed [mph]	Trucks	19.7	0.4
Total Delay [h]	Trucks	417	17
Average Delay per Vehicle [s]	Trucks	813	28
VHD/VMT (min/mile)	Trucks	2.09	0.06

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2033 Mixed Flow**  
**PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	78,705	324
Number of Persons Served	All Vehicles	98,984	408
Travel Distance [mi]	All Vehicles	576,256	2,086
Travel Time [h]	All Vehicles	14,765	77
Average Speed [mph]	All Vehicles	39.0	0.2
Total Delay [h]	All Vehicles	5,660	80
Average Delay per Vehicle [s]	All Vehicles	252	4
VHD/VMT (min/mile)	All Vehicles	0.59	0.01
Number of Vehicles Served	HOVs	14,751	327
Number of Persons Served	HOVs	34,664	768
Travel Distance [mi]	HOVs	107,189	2,227
Travel Time [h]	HOVs	2,604	83
Average Speed [mph]	HOVs	41.2	0.6
Total Delay [h]	HOVs	909	52
Average Delay per Vehicle [s]	HOVs	215	8
VHD/VMT (min/mile)	HOVs	0.51	0.02
Number of Vehicles Served	Trucks	1,829	42
Number of Persons Served	Trucks	2,195	51
Travel Distance [mi]	Trucks	12,660	405
Travel Time [h]	Trucks	350	16
Average Speed [mph]	Trucks	36.2	0.7
Total Delay [h]	Trucks	149	10
Average Delay per Vehicle [s]	Trucks	284	16
VHD/VMT (min/mile)	Trucks	0.71	0.03

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2033 Bus/Carpool**  
**PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	75,978	371
Number of Persons Served	All Vehicles	103,403	505
Travel Distance [mi]	All Vehicles	551,317	2,472
Travel Time [h]	All Vehicles	17,120	151
Average Speed [mph]	All Vehicles	32.2	0.3
Total Delay [h]	All Vehicles	8,412	143
Average Delay per Vehicle [s]	All Vehicles	382	6
VHD/VMT (min/mile)	All Vehicles	0.92	0.02
Number of Vehicles Served	HOVs	20,019	414
Number of Persons Served	HOVs	47,045	973
Travel Distance [mi]	HOVs	143,961	2,820
Travel Time [h]	HOVs	3,508	100
Average Speed [mph]	HOVs	41.1	0.6
Total Delay [h]	HOVs	1,232	65
Average Delay per Vehicle [s]	HOVs	213	9
VHD/VMT (min/mile)	HOVs	0.51	0.02
Number of Vehicles Served	Trucks	1,997	63
Number of Persons Served	Trucks	2,396	75
Travel Distance [mi]	Trucks	14,209	335
Travel Time [h]	Trucks	552	13
Average Speed [mph]	Trucks	25.8	0.6
Total Delay [h]	Trucks	326	11
Average Delay per Vehicle [s]	Trucks	561	22
VHD/VMT (min/mile)	Trucks	1.38	0.05

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2033 Lane Conversion - Southbound**  
**PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	59,233	580
Number of Persons Served	All Vehicles	77,903	763
Travel Distance [mi]	All Vehicles	393,089	4,464
Travel Time [h]	All Vehicles	17,774	179
Average Speed [mph]	All Vehicles	22.1	0.5
Total Delay [h]	All Vehicles	11,552	239
Average Delay per Vehicle [s]	All Vehicles	655	14
VHD/VMT (min/mile)	All Vehicles	1.76	0.06
Number of Vehicles Served	HOVs	13,606	463
Number of Persons Served	HOVs	31,975	1,088
Travel Distance [mi]	HOVs	90,492	2,951
Travel Time [h]	HOVs	3,063	188
Average Speed [mph]	HOVs	29.6	1.0
Total Delay [h]	HOVs	1,627	145
Average Delay per Vehicle [s]	HOVs	406	25
VHD/VMT (min/mile)	HOVs	1.08	0.07
Number of Vehicles Served	Trucks	1,511	69
Number of Persons Served	Trucks	1,814	83
Travel Distance [mi]	Trucks	9,896	369
Travel Time [h]	Trucks	569	45
Average Speed [mph]	Trucks	17.5	0.9
Total Delay [h]	Trucks	411	40
Average Delay per Vehicle [s]	Trucks	905	46
VHD/VMT (min/mile)	Trucks	2.49	0.17

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

## *Level Of Service by Location Report*

<i>Project Name</i>	I-5 HOV	<i>Peak Hour</i>	PM
<i>Alternative</i>	2033 No Project	<i>Num of Runs</i>	10

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<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	146.9	2.8	F
SB: Richards to J St	Weave	130.3	4.3	F
SB: J St Off to I St On	Basic	113.6	6.1	F
SB: I St On to US-50 Off	Weave	74.1	14.5	F
SB: US-50 Off to P St On	Basic	75.9	28.9	F
SB: P St On	Merge	140.4	5.5	F
SB: P St On to US-50 EB On	Basic	133.7	4.0	F
SB: US-50 EB On	Merge	140.6	2.1	F
SB: US-50 WB On	Merge	151.2	1.7	F
SB: US-50 to Lane Drop	Basic	140.7	2.6	F
SB: Lane Drop to Sutterville	Basic	97.1	3.8	F
SB: Sutterville Off	Diverge	107.8	3.8	F
SB: Sutterville Off to On	Basic	92.2	1.8	F
SB: Sutterville On	Merge	142.8	3.2	F
SB: Sutterville to Seamas	Basic	134.8	2.2	F
SB: Seamas Off	Diverge	147.2	2.7	F
SB: Seamas Off to On	Basic	99.4	2.7	F
SB: Seamas On to 43rd Off	Weave	113.6	2.7	F
SB: 43rd to Florin	Basic	97.3	1.9	F
SB: Florin Off	Diverge	79.8	1.1	F
SB: Florin Off to Lane Drop	Basic	129.2	0.9	F
SB: Lane Drop to Florin On	Basic	87.7	2.1	F
SB: Florin On	Merge	83.0	3.9	F
SB: Pocket Off to On	Basic	91.7	1.9	F
SB: Pocket WB On	Merge	78.6	2.1	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket EB On	Merge	44.5	2.3	F
SB: Pocket to Cosumnes	Basic	31.1	0.5	D
SB: Laguna Off	Diverge	26.2	0.3	C
SB: Laguna Off to On	Basic	22.2	2.6	C
SB: Laguna On	Merge	40.1	23.0	E
SB: Laguna to Lane Drop	Basic	47.7	17.2	F
SB: Elk Grove Off	Diverge	31.3	0.4	D
SB: Elk Grove Off to On	Basic	22.2	0.4	C
SB: Elk Grove On	Merge	23.0	0.4	C
SB: Elk Grove to End of HOV	Basic	23.4	0.3	C
SB: H-F Off	Diverge	23.4	0.5	C
SB: H-F Off to On	Basic	19.2	0.5	C
SB: H-F WB On	Merge	24.0	1.1	C
SB: H-F EB On	Merge	23.1	0.7	C
SB: Cosumnes Off	Diverge	25.2	0.3	C
SB: Cosumnes Off to On	Basic	27.0	0.3	D
SB: Cosumnes WB On	Merge	24.2	0.4	C
SB: Cosumnes EB On	Merge	28.6	0.6	D
SB: Cosumnes to Laguna	Basic	32.1	0.9	D
SB: End of HOV to Lane Drop	Basic	23.4	0.3	C
SB: Lane Drop to H-F Off	Basic	23.3	0.4	C
SB: Pocket Off	Diverge	108.0	2.4	F

## *Level Of Service by Location Report*

*Project Name* I-5 Bus/Carpool Lanes *Peak Hour* PM  
*Alternative* 2033 Mixed Flow - Southbound *Num of Runs* 10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	119.7	8.8	F
SB: Richards to J St	Weave	109.0	6.6	F
SB: J St Off to I St On	Basic	91.0	8.1	F
SB: I St On to US-50 Off	Weave	49.5	9.8	F
SB: US-50 Off to P St On	Basic	25.6	1.2	C
SB: P St On	Merge	24.2	0.8	C
SB: P St On to US-50 EB On	Basic	31.9	1.5	D
SB: US-50 EB On	Merge	82.2	9.2	F
SB: US-50 WB On	Merge	116.3	0.8	F
SB: US-50 to Lane Drop	Basic	113.3	0.6	F
SB: Lane Drop to Sutterville	Basic	47.8	2.2	F
SB: Sutterville Off	Diverge	40.7	7.2	E
SB: Sutterville Off to On	Basic	31.5	0.1	D
SB: Sutterville On	Merge	36.7	4.3	E
SB: Sutterville to Seamas	Basic	34.1	2.8	D
SB: Seamas Off	Diverge	78.6	24.7	F
SB: Seamas Off to On	Basic	42.3	2.8	E
SB: Seamas On to 43rd Off	Weave	28.6	0.3	D
SB: 43rd to Florin	Basic	30.6	0.5	D
SB: Florin Off	Diverge	28.1	0.5	D
SB: Florin Off to On	Basic	60.1	22.8	F
SB: Florin to Pocket Weave	Weave	88.0	15.6	F
SB: Pocket Off to On	Basic	81.7	0.7	F
SB: Pocket WB On	Merge	74.3	2.5	F
SB: Pocket EB On	Merge	45.3	1.9	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket to Cosumnes	Basic	32.7	0.6	D
SB: Laguna Off	Diverge	32.4	0.8	D
SB: Laguna Off to On	Basic	20.5	0.2	C
SB: Laguna On	Merge	18.9	0.4	B
SB: Laguna to Elk Grove	Basic	21.5	0.3	C
SB: Elk Grove Off	Diverge	22.3	0.3	C
SB: Elk Grove Off to On	Basic	19.6	0.6	C
SB: Elk Grove On	Merge	19.3	0.3	B
SB: Elk Grove to End of HOV	Basic	23.0	0.6	C
SB: H-F Off	Diverge	31.8	2.8	D
SB: H-F Off to On	Basic	23.9	1.2	C
SB: H-F WB On	Merge	31.0	3.5	D
SB: H-F EB On	Merge	27.1	0.7	C
SB: Cosumnes Off	Diverge	25.2	0.6	C
SB: Cosumnes Off to On	Basic	27.6	0.4	D
SB: Cosumnes WB On	Merge	23.2	0.5	C
SB: Cosumnes EB On	Merge	26.9	0.7	C
SB: Cosumnes to Laguna	Basic	38.2	3.9	E
SB: End of HOV to Lane Drop	Basic	33.3	3.1	D
SB: Lane Drop to H-F Off	Basic	30.9	0.9	D

## *Level Of Service by Location Report*

*Project Name* I-5 Bus/Carpool Lanes *Peak Hour* PM  
*Alternative* 2033 Bus/Carpool - Southbound *Num of Runs* 10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	125.7	10.5	F
SB: Richards to J St	Weave	110.8	10.2	F
SB: J St Off to I St On	Basic	93.4	10.2	F
SB: I St On to US-50 Off	Weave	50.2	8.8	F
SB: US-50 Off to P St On	Basic	30.9	15.4	D
SB: P St On	Merge	45.5	25.8	F
SB: P St On to US-50 EB On	Basic	76.6	19.5	F
SB: US-50 EB On	Merge	129.5	3.9	F
SB: US-50 WB On	Merge	119.5	7.6	F
SB: US-50 to Lane Drop	Basic	129.8	2.6	F
SB: Lane Drop to Sutterville	Basic	81.2	2.4	F
SB: Sutterville Off	Diverge	92.5	4.8	F
SB: Sutterville Off to On	Basic	84.2	3.7	F
SB: Sutterville On	Merge	129.7	5.3	F
SB: Sutterville to Seamas	Basic	128.8	3.0	F
SB: Seamas Off	Diverge	134.7	3.4	F
SB: Seamas Off to On	Basic	92.9	2.5	F
SB: Seamas On to 43rd Off	Weave	108.5	3.0	F
SB: 43rd to Florin	Basic	90.9	2.3	F
SB: Florin Off	Diverge	81.8	1.1	F
SB: Florin Off to On	Basic	128.2	1.2	F
SB: Florin to Pocket Weave	Weave	105.8	1.8	F
SB: Pocket Off to On	Basic	93.2	1.6	F
SB: Pocket WB On	Merge	81.9	2.7	F
SB: Pocket EB On	Merge	41.6	2.1	E

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket to Cosumnes	Basic	32.3	0.5	D
SB: Laguna Off	Diverge	27.6	1.0	C
SB: Laguna Off to On	Basic	21.3	0.2	C
SB: Laguna On	Merge	20.3	0.3	C
SB: Laguna to Elk Grove	Basic	21.9	0.4	C
SB: Elk Grove Off	Diverge	23.4	0.6	C
SB: Elk Grove Off to On	Basic	22.2	0.5	C
SB: Elk Grove On	Merge	21.9	0.4	C
SB: Elk Grove to End of HOV	Basic	30.4	1.5	D
SB: H-F Off	Diverge	27.8	0.8	C
SB: H-F Off to On	Basic	21.9	0.8	C
SB: H-F WB On	Merge	26.8	1.7	C
SB: H-F EB On	Merge	25.5	0.6	C
SB: Cosumnes Off	Diverge	25.6	2.3	C
SB: Cosumnes Off to On	Basic	26.3	0.4	D
SB: Cosumnes WB On	Merge	23.2	0.5	C
SB: Cosumnes EB On	Merge	27.1	0.8	C
SB: Cosumnes to Laguna	Basic	36.1	4.3	E
SB: End of HOV to Lane Drop	Basic	28.6	1.1	D
SB: Lane Drop to H-F Off	Basic	27.5	0.8	D

## *Level Of Service by Location Report*

*Project Name* I-5 Bus / Carpool *Peak Hour* PM  
*Alternative* 2033 Lane Conversion *Num of Runs* 10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	146.6	3.5	F
SB: Richards to J St	Weave	129.3	4.1	F
SB: J St Off to I St On	Basic	117.0	6.3	F
SB: I St On to US-50 Off	Weave	71.6	7.1	F
SB: US-50 Off to P St On	Basic	58.0	25.3	F
SB: P St On	Merge	136.9	5.8	F
SB: P St On to US-50 EB On	Basic	146.2	5.9	F
SB: US-50 EB On	Merge	152.6	5.1	F
SB: US-50 WB On	Merge	149.8	5.1	F
SB: US-50 to Lane Drop	Basic	146.7	4.2	F
SB: Lane Drop to Sutterville	Basic	102.7	6.6	F
SB: Sutterville Off	Diverge	113.3	7.5	F
SB: Sutterville Off to On	Basic	104.1	5.8	F
SB: Sutterville On	Merge	147.1	9.2	F
SB: Sutterville to Seamas	Basic	145.2	4.5	F
SB: Seamas Off	Diverge	154.0	6.6	F
SB: Seamas Off to On	Basic	114.7	5.4	F
SB: Seamas On to 43rd Off	Weave	129.0	6.2	F
SB: 43rd to Florin	Basic	110.1	3.0	F
SB: Florin Off	Diverge	92.5	4.5	F
SB: Florin Off to Lane Drop	Basic	145.6	4.5	F
SB: Lane Drop to Florin On	Basic	95.6	4.8	F
SB: Florin On	Merge	97.4	9.6	F
SB: Pocket Off to On	Basic	96.4	6.3	F
SB: Pocket WB On	Merge	86.1	10.9	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket EB On	Merge	59.5	4.6	F
SB: Pocket to Cosumnes	Basic	33.0	1.3	D
SB: Laguna Off	Diverge	27.6	0.6	C
SB: Laguna Off to On	Basic	20.7	0.6	C
SB: Laguna On	Merge	24.6	0.7	C
SB: Laguna to Lane Drop	Basic	27.1	1.1	D
SB: Elk Grove Off	Diverge	25.7	0.9	C
SB: Elk Grove Off to On	Basic	18.5	0.6	C
SB: Elk Grove On	Merge	18.7	0.6	B
SB: Elk Grove to H-F	Basic	19.4	0.5	C
SB: H-F Off	Diverge	19.7	0.4	B
SB: H-F Off to On	Basic	16.7	0.4	B
SB: H-F WB On	Merge	21.0	1.1	C
SB: H-F EB On	Merge	21.0	0.7	C
SB: Cosumnes Off	Diverge	26.1	1.1	C
SB: Cosumnes Off to On	Basic	29.3	6.6	D
SB: Cosumnes WB On	Merge	34.2	25.7	D
SB: Cosumnes EB On	Merge	43.7	21.6	F
SB: Cosumnes to Laguna	Basic	35.4	3.1	E
SB: Pocket Off	Diverge	105.6	9.4	F

**APPENDIX E**  
**DESIGN OPTIONS ANALYSIS**

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## DESIGN OPTIONS ANALYSIS

This chapter presents the analysis results of the Bus/Carpool Addition Alternative design options under design year (2033) conditions. Two design options were analyzed for the northbound and southbound directions. For each design option, traffic operations are evaluated using peak-hour volume, speed, LOS, density, and travel time, and network summary statistics. Figures 6D through 6F show the peak-hour demand and served volume and lane configuration under 2033 conditions. The results summary sheets for the travel time, network statistics, and freeway section analysis are provided at the end of this appendix.

### LANE CONFIGURATIONS

The design options focused on the start of the bus/carpool lane in the northbound direction and the end of the bus/carpool lane in the southbound direction. The design options are described below and shown in Figures E-1 and E-2.

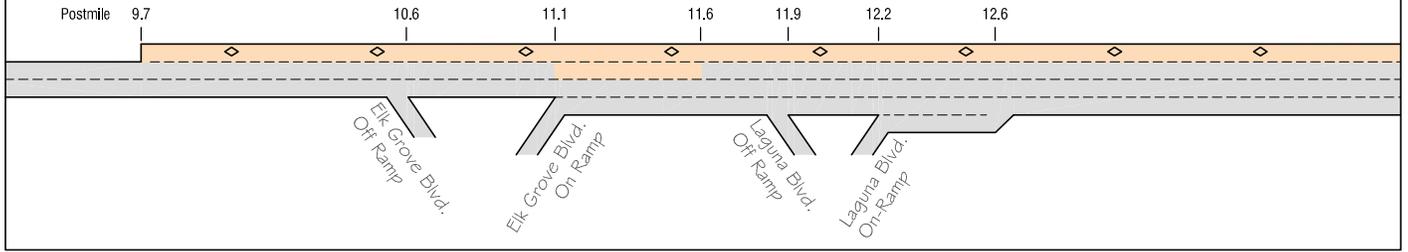
- Option N1 – The mixed-flow lane would be extended south from the existing lane addition between Elk Grove Boulevard and Laguna Boulevard to about one mile south of Elk Grove Boulevard. The bus/carpool lane would begin at about a half mile south of Elk Grove Boulevard.
- Option N3 – The bus/carpool lane would begin one quarter mile north of the existing lane addition between Elk Grove Boulevard and Laguna Boulevard.
- Option S1 – The mixed-flow lane would be extended south from the existing lane drop between Elk Grove Boulevard and Laguna Boulevard to about one half mile south of Elk Grove Boulevard. A partial auxiliary lane and second exit lane would be added to the Elk Grove Boulevard off-ramp.
- Option S3 – The existing mixed-flow lane would be converted to a bus/carpool lane from the beginning of the deceleration lane to the Laguna Boulevard off-ramp to the existing lane drop south of Laguna Boulevard. The mixed-flow lanes would transition to the right north of Laguna Boulevard so that a lane would be dropped at the Laguna Boulevard off-ramp.

The two northbound design options (N1 and N3) would maintain a left-side mixed-flow lane addition before the bus/carpool lane addition to minimize driver confusion. In the northbound direction, the Bus/Carpool Addition Alternative would add the mixed-flow lane on the right side at the Elk Grove Boulevard on-ramp. The two southbound design options (S1 and S3) would provide a bus/carpool lane south of Elk Grove Boulevard as in the Bus/Carpool Addition Alternative, but the first option would provide an additional mixed-flow lane through the Laguna Boulevard and Elk Grove Boulevard interchanges and widen the Elk Grove Boulevard off-ramp. In the southbound direction, the Bus/Carpool Addition Alternative would extend an auxiliary lane to the Elk Grove Boulevard off-ramp and widen the same off-ramp. Options N2 and S2 were incorporated into the Bus/Carpool Addition Alternative

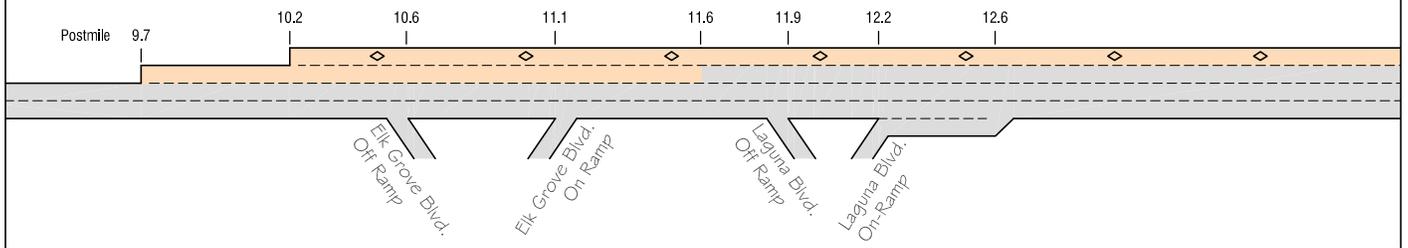
### NORTHBOUND – AM PEAK PERIOD

For the design options in the northbound direction, the lane configuration differences all occur south of Laguna Boulevard. As a result, Table E1 shows the travel time only for the segment between Hood Franklin Road and Pocket Road since the travel time north of Pocket Road is the same. Option N1 would have a shorter travel time than the Bus/Carpool Addition Alternative since another mainline lane is provided through the Elk Grove Boulevard interchange. Option N3 would also have a shorter travel time for mainline traffic because less traffic would be able to enter from the Elk Grove Boulevard on-ramp since fewer lanes would be provided. However, the travel time for HOVs would be higher than the Bus/Carpool Addition Alternative because the bus/carpool lane would be shorter.

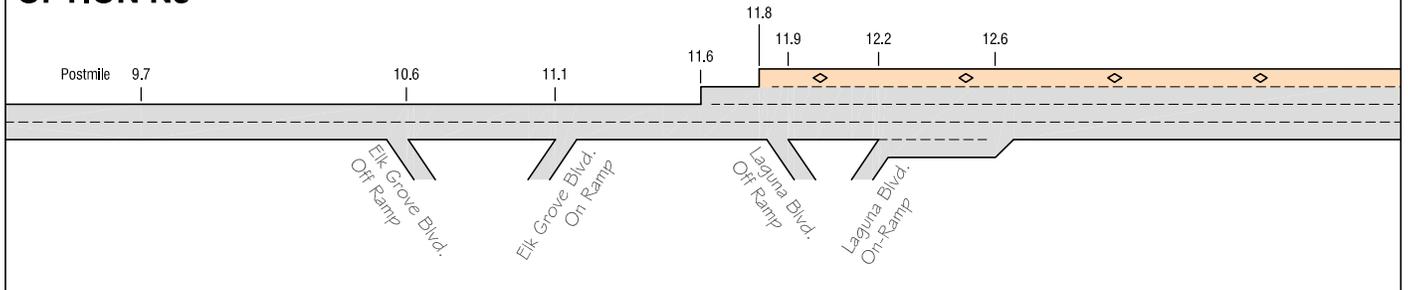
### BUS/CARPOOL ALTERNATIVE



### OPTION N1



### OPTION N3



#### LEGEND

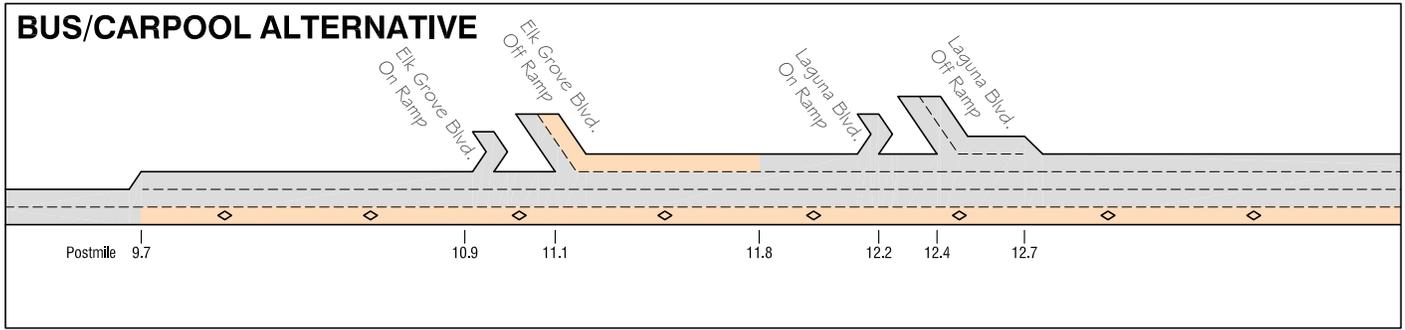
- ◇ HOV Lane
- Proposed Lanes



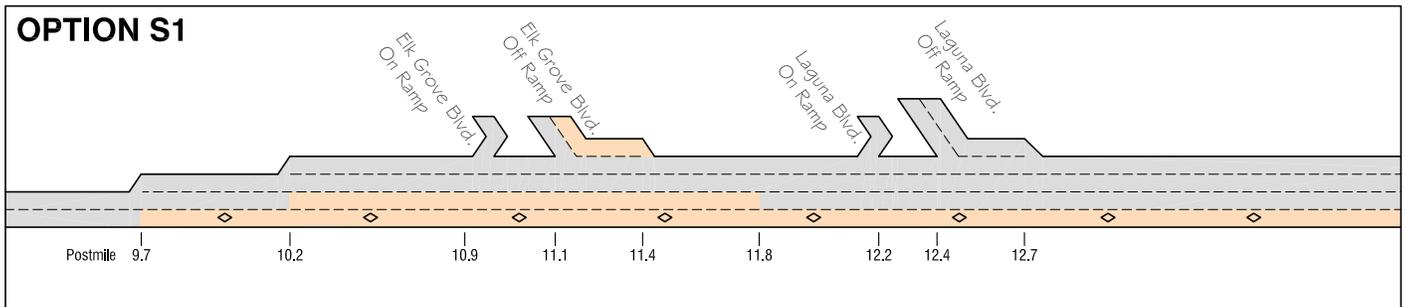
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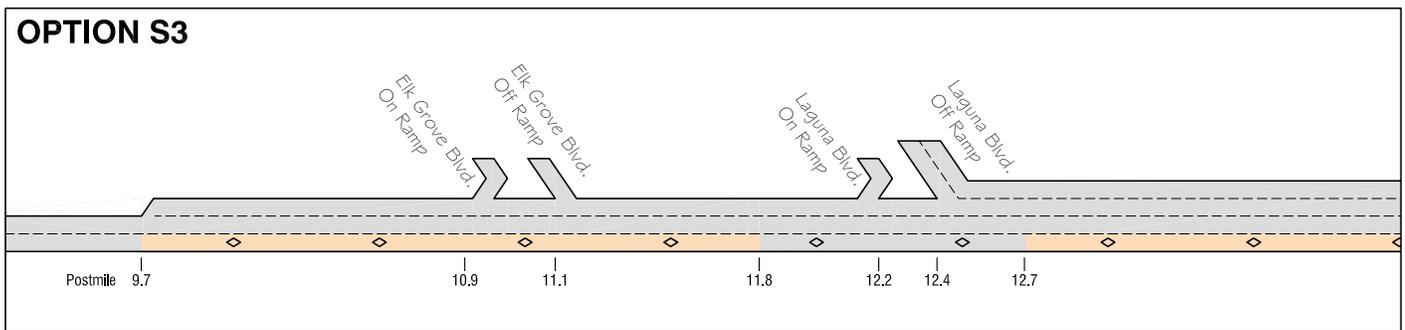
**BUS/CARPOOL ALTERNATIVE**



**OPTION S1**



**OPTION S3**



**LEGEND**

- ◇ HOV Lane
- Proposed Lanes



**N**

NOT TO SCALE



**FEHR & PEERS**  
TRANSPORTATION CONSULTANTS

Mar 25, 2008 sjr  
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**DESIGN OPTIONS - SOUTHBOUND  
BUS/CARPOOL LANE END**

**FIGURE E-2**

TABLE E1 – DESIGN OPTION NORTHBOUND AM PEAK-HOUR TRAVEL TIME AND SPEED							
Route	Type	Bus/Carpool Addition		Option N1		Option N3	
		Time	Speed	Time	Speed	Time	Speed
Hood Franklin Rd EB On-ramp to Pocket Rd Off-ramp	All	32.4	14.2	25.7	18.0	24.3	18.9
	HOV	17.3	26.8	14.8	31.4	19.5	23.6
Peak Hour		7:00 – 8:00 AM		7:00 – 8:00 AM		7:15 – 8:15 AM	
Notes: The average travel time and speed for the peak hour are reported as minutes and miles per hour, respectively. The HOV type includes travel by HOVs in any travel lane (mixed-flow or bus/carpool lane).							
Source: Fehr & Peers, 2009							

Table E2 shows that the three design options would perform similarly although Option N1 would have higher average speeds and lower delays. The higher capacity under Option N1 would allow easier access to the bus/carpool lane, which would result in a higher average speed for HOVs. Option N3 would constrain the network south of Laguna Boulevard such that fewer vehicles would be served, but the metering effect would result in a higher average speed for all vehicles (but not for HOVs).

Tables E3 and E4 show the average 2033 AM peak-hour volume served, speed, LOS, and density for the mainline sections between interchanges in the northbound direction. The LOS and density results for the ramp junctions are provided at the end of this appendix.

The location of congested conditions is similar for the Bus/Carpool Addition Alternative and Option N1 although density would be lower for Option N1 south of Elk Grove Boulevard. Similar to the Bus/Carpool Addition Alternative, Option N3 (which has fewer lanes) would have LOS F conditions south of Elk Grove Boulevard. However, Option N3 would not have LOS F conditions north of US-50 due to the capacity constraint south of Laguna Boulevard.

Table E5 compares the volume served and average speed in the bus/carpool lane across the design options. The volume would be higher under Options N1 and N3, but the difference would be less than 120 vph in most cases. The average speed would be similar for all alternatives.

TABLE E2 – DESIGN OPTION NORTHBOUND AM PEAK-PERIOD NETWORK SUMMARY			
Performance Measure	Bus/Carpool Addition	Option N1	Option N3
Number of Vehicles Served	64,900	64,800	64,600
Number of Persons Served <sup>1</sup>	91,300	91,200	91,100
Travel Distance (vehicle-miles)	537,900	538,900	529,900
Travel Time (vehicle-hours)	31,100	31,210	29,200
Average Speed – All vehicles (mph)	17.3	17.3	18.1
Average Speed – HOVs (mph)	23.3	23.7	22.9
Travel Delay <sup>2</sup> (vehicle-hours)	22,500	22,500	20,700
Average Delay <sup>2</sup> (seconds per vehicle)	1,150	1,150	1,080
Notes: 1. Based on traffic counts, HOVs, trucks, and other vehicles are assumed to have vehicle occupancies of 2.35, 1.2, and 1.0 persons per vehicle, respectively.			
2. Delay is measured as the additional travel time when traveling less than the desired free-flow speed.			
Source: Fehr & Peers, 2009			

**TABLE E3 – DESIGN OPTION NORTHBOUND AM PEAK-HOUR VOLUME AND SPEED**

Freeway Segment	Bus/Carpool Addition		Option N1		Option N3	
	Volume	Speed	Volume	Speed	Volume	Speed
Hood Franklin Rd to Elk Grove Blvd	2,756	<u>27</u>	3,700	55	3,084	<u>28</u>
Elk Grove Blvd to Laguna Blvd	3,992	<u>17</u>	4,013	<u>18</u>	3,554	<u>24</u>
Laguna Blvd to Cosumnes River Blvd	4,853	<u>29</u>	4,835	<u>29</u>	5,333	<u>41</u>
Cosumnes River Blvd to Pocket Rd	5,172	<u>25</u>	5,158	<u>25</u>	5,316	<u>26</u>
Pocket Rd to Florin Rd	6,202	<u>21</u>	6,172	<u>21</u>	6,189	<u>23</u>
Florin Rd to 43 <sup>rd</sup> Ave	6,717	<u>25</u>	6,704	<u>24</u>	6,625	<u>25</u>
43 <sup>rd</sup> Ave to Seamas Ave	6,733	<u>26</u>	6,710	<u>26</u>	6,615	<u>26</u>
Seamas Ave to Sutterville Rd	8,576	<u>32</u>	8,541	<u>31</u>	8,441	<u>32</u>
Sutterville Rd to US-50/P St/Q St	8,822	61	8,790	60	8,621	61
US-50/P St/Q St to I/J/L St	7,259	50	7,240	49	7,155	55
I/J/L St to Richards Blvd	6,665	58	6,645	58	6,464	60
Peak Hour	7:00 – 8:00 AM		7:00 – 8:00 AM		7:15 – 8:15 AM	

Notes: Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively. The bus/carpool lane is included in the calculation of average volume and speed.

Source: Fehr & Peers, 2009

**TABLE E4 – DESIGN OPTION NORTHBOUND AM PEAK-HOUR LOS AND DENSITY**

Freeway Segment	Bus/Carpool Addition		Option N1		Option N3	
	LOS	Density	LOS	Density	LOS	Density
Hood Franklin Rd to Elk Grove Blvd	<u>F</u>	<u>129</u>	D	33	<u>F</u>	<u>97</u>
Elk Grove Blvd to Laguna Blvd	<u>F</u>	<u>129</u>	<u>F</u>	<u>128</u>	<u>F</u>	<u>86</u>
Laguna Blvd to Cosumnes River Blvd	<u>F</u>	<u>127</u>	<u>F</u>	<u>125</u>	<u>F</u>	<u>109</u>
Cosumnes River Blvd to Pocket Rd	<u>F</u>	<u>103</u>	<u>F</u>	<u>103</u>	<u>F</u>	<u>101</u>
Pocket Rd to Florin Rd	<u>F</u>	<u>125</u>	<u>F</u>	<u>125</u>	<u>F</u>	<u>125</u>
Florin Rd to 43 <sup>rd</sup> Ave	<u>F</u>	<u>108</u>	<u>F</u>	<u>109</u>	<u>F</u>	<u>108</u>
43 <sup>rd</sup> Ave to Seamas Ave	<u>F</u>	<u>126</u>	<u>F</u>	<u>126</u>	<u>F</u>	<u>126</u>
Seamas Ave to Sutterville Rd	<u>F</u>	<u>90</u>	<u>F</u>	<u>91</u>	<u>F</u>	<u>91</u>
Sutterville Rd to US-50/P St/Q St	E	36	E	36	E	36
US-50/P St/Q St to I/J/L St	<u>F</u>	<u>59</u>	<u>F</u>	<u>62</u>	E	41
I/J/L St to Richards Blvd	C	27	C	28	C	27

Notes: Bold and underline font indicate LOS F conditions. The average density is reported in vehicles per lane per mile. The bus/carpool lane is not included in the LOS or density calculation. The peak hour LOS is based on the peak 15 minutes of the peak hour according to the HCM.

Source: Fehr & Peers, 2009

<b>TABLE E5 – DESIGN OPTION NORTHBOUND AM PEAK-HOUR BUS/CARPOOL LANE VOLUME AND SPEED</b>						
<b>Freeway Segment</b>	<b>Bus/Carpool Addition</b>		<b>Option N1</b>		<b>Option N3</b>	
	<b>Volume</b>	<b>Speed</b>	<b>Volume</b>	<b>Speed</b>	<b>Volume</b>	<b>Speed</b>
Hood Franklin Rd to Elk Grove Blvd	503	60	-	-	-	-
Elk Grove Blvd to Laguna Blvd	737	36	753	42	-	-
Laguna Blvd to Cosumnes River Blvd	883	47	938	48	871	58
Cosumnes River Blvd to Pocket Rd	1,123	34	1,167	34	1,166	36
Pocket Rd to Florin Rd	1,220	49	1,259	47	1,224	54
Florin Rd to 43 <sup>rd</sup> Ave	1,320	43	1,361	42	1,290	45
43 <sup>rd</sup> Ave to Seamas Ave	1,360	57	1,396	56	1,313	59
Seamas Ave to Sutterville Rd	1,461	44	1,485	43	1,397	45
Sutterville Rd to US-50/P St/Q St	900	60	884	59	847	62
Peak Hour	7:00 – 8:00 AM		7:00 – 8:00 AM		7:15 – 8:15 AM	
Note: Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively. Source: Fehr & Peers, 2009						

## **SOUTHBOUND – PM PEAK PERIOD**

Table E6 shows the average peak-hour travel time and speed for the design options. The Bus/Carpool Addition Alternative and Option S1 would have similar travel times, about 27 minutes. The travel time for Option S3 would be almost twice as long, 50 minutes. Even the travel time for HOVs would be longer under Option S3 than the other two design options.

<b>TABLE E6 – DESIGN OPTION SOUTHBOUND PM PEAK-HOUR TRAVEL TIME AND SPEED</b>							
<b>Route</b>	<b>Type</b>	<b>Bus/Carpool Addition</b>		<b>Option S1</b>		<b>Option S3</b>	
		<b>Time</b>	<b>Speed</b>	<b>Time</b>	<b>Speed</b>	<b>Time</b>	<b>Speed</b>
US-50 WB On-Ramp to Pocket Rd WB On-Ramp	All	19.2	18.5	19.6	18.1	28.5	12.4
	HOV	7.7	46.3	8.1	44.2	9.2	39.7
Pocket Rd WB On-Ramp to Hood Franklin Rd WB On-Ramp	All	7.6	46.3	7.6	46.4	21.7	16.3
	HOV	7.2	49.4	7.2	49.5	16.5	21.5
US-50 WB On-Ramp to Hood Franklin Rd WB On-Ramp	All	26.9	33.9	27.2	33.8	50.2	14.6
	HOV	14.9	48.0	15.3	47.1	25.7	29.6
Peak Hour		5:15 – 6:15 PM		5:15 – 6:15 PM		5:00 – 6:00 PM	
Notes: The average travel time and speed for the peak hour are reported as minutes and miles per hour, respectively. The HOV type includes travel by HOVs in any travel lane (mixed-flow or bus/carpool lane). Source: Fehr & Peers, 2009							

As shown in Table E7, the network statistics for the Bus/Carpool Addition Alternative and Option S1 would be similar, but Option S3 would be significant worse. Option S3 would serve fewer vehicles and people, have a lower average speed, and have higher delay than the Bus/Carpool Addition Alternative and Option S1. Compared to the

Bus/Carpool Addition Alternative and Option S1, Option S3 would have an average speed that would be 12 mph lower.

<b>TABLE E7 – DESIGN OPTION SOUTHBOUND PM PEAK-PERIOD NETWORK SUMMARY</b>			
<b>Performance Measure</b>	<b>Bus/Carpool Addition</b>	<b>Option S1</b>	<b>Option S3</b>
Number of Vehicles Served	76,000	75,300	69,000
Number of Persons Served <sup>1</sup>	103,400	102,100	93,600
Travel Distance (vehicle-miles)	551,300	547,100	500,900
Travel Time (vehicle-hours)	17,100	17,300	24,400
Average Speed – All vehicles (mph)	32.2	31.6	20.6
Average Speed – HOVs (mph)	41.1	40.8	28.1
Travel Delay <sup>2</sup> (vehicle-hours)	8,400	8,700	16,200
Average Delay <sup>2</sup> (seconds per vehicle)	380	400	780
Notes: 1. Based on traffic counts, HOVs, trucks, and other vehicles are assumed to have vehicle occupancies of 2.35, 1.2, and 1.0 persons per vehicle, respectively.			
2. Delay is measured as the additional travel time when traveling less than the desired free-flow speed.			
Source: Fehr & Peers, 2009			

Tables E8 and E9 show the average 2033 PM peak-hour volume served, speed, LOS, and density for the mainline sections between interchanges in the southbound direction.

<b>TABLE E8 – DESIGN OPTION SOUTHBOUND PM PEAK-HOUR VOLUME AND SPEED</b>						
<b>Freeway Segment</b>	<b>Bus/Carpool Addition</b>		<b>Option S1</b>		<b>Option S3</b>	
	<b>Volume</b>	<b>Speed</b>	<b>Volume</b>	<b>Speed</b>	<b>Volume</b>	<b>Speed</b>
Richards Blvd to I/J/L St	10,300	36	9,543	<u><b>32</b></u>	8,826	<u><b>30</b></u>
I/J/L St to US-50/P St/Q St	9,630	38	9,104	<u><b>33</b></u>	8,998	<u><b>32</b></u>
US-50/P St/Q St to Sutterville Rd	8,613	43	8,478	43	7,059	<u><b>35</b></u>
Sutterville Rd to Seamas Ave	8,499	<u><b>35</b></u>	8,349	<u><b>34</b></u>	6,580	<u><b>29</b></u>
Seamas Ave to 43 <sup>rd</sup> Ave	8,519	<u><b>33</b></u>	8,451	<u><b>32</b></u>	6,799	<u><b>24</b></u>
43 <sup>rd</sup> Ave to Florin Rd	7,658	<u><b>29</b></u>	7,625	<u><b>29</b></u>	6,121	<u><b>24</b></u>
Florin Rd to Pocket Rd	6,741	<u><b>27</b></u>	6,702	<u><b>27</b></u>	5,537	<u><b>22</b></u>
Pocket Rd to Cosumnes River Blvd	6,788	61	6,742	61	5,739	<u><b>25</b></u>
Cosumnes River Blvd to Laguna Blvd	6,333	61	6,301	62	5,506	<u><b>21</b></u>
Laguna Blvd to Elk Grove Blvd	4,458	63	4,454	62	3,916	<u><b>26</b></u>
Elk Grove Blvd to Hood Franklin Rd	3,270	63	3,269	61	2,857	<u><b>30</b></u>
Peak Hour	5:15 – 6:15 PM		5:15 – 6:15 PM		5:00 – 6:00 PM	
Notes: Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively. The bus/carpool lane is included in the calculation of average volume and speed.						
Source: Fehr & Peers, 2009						

The LOS and density results for the ramp junctions are provided at the end of this appendix. Similar to the travel time and network statistics, the Bus/Carpool Addition Alternative and Option S1 have similar results. All freeway segments under Option S3 would have average hourly speeds less than 35 mph and peak hour LOS F

conditions. The Bus/Carpool Addition Alternative and Option S1 would serve 1,800 to 1,900 vph more at Sutterville Road and 800 vph more at Cosumnes River Boulevard compared to Option S3.

TABLE E9 – DESIGN OPTION SOUTHBOUND PM PEAK-HOUR LOS AND DENSITY						
Freeway Segment	Bus/Carpool Addition		Option S1		Option S3	
	LOS	Density	LOS	Density	LOS	Density
Richards Blvd to I/J/L St	<u>F</u>	<u>111</u>	<u>F</u>	<u>116</u>	<u>F</u>	<u>121</u>
I/J/L St to US-50/P St/Q St	<u>F</u>	<u>50</u>	<u>F</u>	<u>56</u>	<u>F</u>	<u>74</u>
US-50/P St/Q St to Sutterville Rd	<u>F</u>	<u>130</u>	<u>F</u>	<u>130</u>	<u>F</u>	<u>152</u>
Sutterville Rd to Seamas Ave	<u>F</u>	<u>129</u>	<u>F</u>	<u>127</u>	<u>F</u>	<u>152</u>
Seamas Ave to 43 <sup>rd</sup> Ave	<u>F</u>	<u>109</u>	<u>F</u>	<u>108</u>	<u>F</u>	<u>134</u>
43 <sup>rd</sup> Ave to Florin Rd	<u>F</u>	<u>91</u>	<u>F</u>	<u>91</u>	<u>F</u>	<u>118</u>
Florin Rd to Pocket Rd	<u>F</u>	<u>106</u>	<u>F</u>	<u>106</u>	<u>F</u>	<u>129</u>
Pocket Rd to Cosumnes River Blvd	D	32	D	32	<u>F</u>	<u>93</u>
Cosumnes River Blvd to Laguna Blvd	E	36	E	37	<u>F</u>	<u>92</u>
Laguna Blvd to Elk Grove Blvd	C	22	C	23	<u>F</u>	<u>79</u>
Elk Grove Blvd to Hood Franklin Rd	D	28	D	28	<u>F</u>	<u>54</u>

Notes: Bold and underline font indicate LOS F conditions. The average density is reported in vehicles per lane per mile. The bus/carpool lane is not included in the LOS or density calculation. The peak hour LOS is based on the peak 15 minutes of the peak hour according to the HCM.

Source: Fehr & Peers, 2009

Table E10 shows the volume and speed in the bus/carpool lane for the design options. The Bus/Carpool Addition Alternative and Option S1 would serve 200 to 250 vph more at Pocket Road compared to Option S3. Additionally, the average speed south of Pocket Road would be higher than 60 mph with the Bus/Carpool Addition Alternative and Option S1 compared to less than 40 mph under Option S3.

TABLE E10 – DESIGN OPTION SOUTHBOUND PM PEAK-HOUR BUS/CARPOOL LANE VOLUME AND SPEED						
Freeway Segment	Bus/Carpool Addition		Option S1		Option S3	
	Volume	Speed	Volume	Speed	Volume	Speed
US-50/P St/Q St to Sutterville Rd	1,637	55	1,536	57	1,294	57
Sutterville Rd to Seamas Ave	1,651	62	1,566	62	1,314	60
Seamas Ave to 43 <sup>rd</sup> Ave	1,649	55	1,590	56	1,350	48
43 <sup>rd</sup> Ave to Florin Rd	1,662	45	1,601	46	1,383	42
Florin Rd to Pocket Rd	1,457	56	1,407	56	1,211	52
Pocket Rd to Cosumnes River Blvd	1,152	63	1,113	63	1,162	37
Cosumnes River Blvd to Laguna Blvd	1,102	62	1,077	62	1,283	23
Laguna Blvd to Elk Grove Blvd	544	63	456	64	662	33
Elk Grove Blvd to Hood Franklin Rd	578	63	502	63	532	44
Peak Hour	5:15 – 6:15 PM		5:15 – 6:15 PM		5:00 – 6:00 PM	

Note: Bold and underline font indicates average speed less than 35 miles per hour. The average volume and speed for the peak hour are reported as vehicles per hour and miles per hour, respectively.

Source: Fehr & Peers, 2009

The Bus/Carpool Addition Alternative and Option S1 would provide three mixed-flow lanes plus the bus/carpool lane between Laguna Boulevard and Elk Grove Boulevard, while Option S3 would provide only two mixed-flow lanes plus the bus/carpool lane. Without the additional mixed-flow lane, a bottleneck occurs at Laguna Boulevard under Option S3 that would cause more congestion. Since the results for the Bus/Carpool Addition Alternative and Option S1 are similar, no operational benefits would exist for extending the fourth mainline lane through the Elk Grove Boulevard interchange as in Option S1. As a result, neither Option S1 nor S3 are recommended.





**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5**  
**HOV N1 AM NB 2033**  
**6 to 10 AM - Northbound**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	64,782	141
Number of Persons Served	All Vehicles	91,191	198
Travel Distance [mi]	All Vehicles	538,856	1,177
Travel Time [h]	All Vehicles	31,210	132
Average Speed [mph]	All Vehicles	17.3	0.1
Total Delay [h]	All Vehicles	22,527	144
Average Delay per Vehicle [s]	All Vehicles	1,152	8
VHD/VMT (min/mile)	All Vehicles	2.51	0.02
Number of Vehicles Served	HOVs	18,947	149
Number of Persons Served	HOVs	44,524	350
Travel Distance [mi]	HOVs	159,825	969
Travel Time [h]	HOVs	6,741	108
Average Speed [mph]	HOVs	23.7	0.3
Total Delay [h]	HOVs	4,170	98
Average Delay per Vehicle [s]	HOVs	749	17
VHD/VMT (min/mile)	HOVs	1.57	0.03
Number of Vehicles Served	Trucks	4,160	35
Number of Persons Served	Trucks	4,992	42
Travel Distance [mi]	Trucks	39,491	224
Travel Time [h]	Trucks	1,870	19
Average Speed [mph]	Trucks	21.1	0.2
Total Delay [h]	Trucks	1,248	18
Average Delay per Vehicle [s]	Trucks	1,002	13
VHD/VMT (min/mile)	Trucks	1.90	0.03

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5**  
**HOV N3 AM NB 2033**  
**6 to 10 AM - Northbound**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	64,641	122
Number of Persons Served	All Vehicles	91,124	172
Travel Distance [mi]	All Vehicles	529,885	509
Travel Time [h]	All Vehicles	29,248	357
Average Speed [mph]	All Vehicles	18.1	0.2
Total Delay [h]	All Vehicles	20,744	357
Average Delay per Vehicle [s]	All Vehicles	1,077	17
VHD/VMT (min/mile)	All Vehicles	2.35	0.04
Number of Vehicles Served	HOVs	18,996	133
Number of Persons Served	HOVs	44,640	313
Travel Distance [mi]	HOVs	159,081	728
Travel Time [h]	HOVs	6,937	111
Average Speed [mph]	HOVs	22.9	0.4
Total Delay [h]	HOVs	4,391	109
Average Delay per Vehicle [s]	HOVs	793	20
VHD/VMT (min/mile)	HOVs	1.66	0.04
Number of Vehicles Served	Trucks	4,194	53
Number of Persons Served	Trucks	5,032	63
Travel Distance [mi]	Trucks	39,676	280
Travel Time [h]	Trucks	1,831	35
Average Speed [mph]	Trucks	21.7	0.5
Total Delay [h]	Trucks	1,207	37
Average Delay per Vehicle [s]	Trucks	972	35
VHD/VMT (min/mile)	Trucks	1.82	0.06

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

## *Level Of Service by Location Report*

<i>Project Name</i>	I-5	<i>Peak Hour</i>	AM Peak
<i>Alternative</i>	HOV-N1-Alt-2033 - NB	<i>Num of Runs</i>	10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	26.4	0.6	F
NB: H-F Off	Diverge	28.0	1.7	F
NB: H-F EB On	Merge	27.6	3.1	F
NB: H-F WB On	Merge	71.3	4.8	F
NB: H-F to Elk Grove -1	Basic	31.7	14.4	F
NB: Elk Grove Off	Diverge	61.3	51.5	F
NB: Elk Grove Off to On	Basic	117.8	20.4	F
NB: Elk Grove On	Merge	143.3	4.1	F
NB: Elk Grove to Laguna	Basic	127.8	5.2	F
NB: Laguna Off	Diverge	102.7	7.0	F
NB: Laguna Off to On	Basic	82.8	11.2	F
NB: Laguna On	Merge	141.3	6.6	F
NB: Laguna to Cosumnes	Basic	124.9	5.9	F
NB: Pocket Off	Diverge	93.6	6.2	F
NB: Pocket Off to On	Basic	96.8	8.4	F
NB: Pocket EB On	Merge	97.3	5.4	F
NB: Florin Off to On	Basic	99.2	2.2	F
NB: Florin EB On	Merge	100.0	4.2	F
NB: Florin WB On	Merge	145.3	7.4	F
NB: Florin to 43rd	Basic	108.8	1.1	F
NB: 43rd On to Seamas Off	Weave	125.9	1.2	F
NB: Seamas Off to On	Basic	99.0	0.9	F
NB: Seamas On	Merge	127.1	2.5	F
NB: Seamas to Sutterville	Basic	90.8	1.2	F
NB: Sutterville Off	Diverge	78.2	1.1	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Sutterville Off to On	Basic	77.8	1.6	F
NB: Sutterville On	Merge	66.8	9.3	F
NB: Sutterville to US-50	Basic	36.2	0.6	F
NB: US-50 Off	Diverge	27.2	0.5	F
NB: US-50 Off to Q St Off	Basic	22.3	0.6	F
NB: Q St Off	Diverge	25.8	1.2	F
NB: Q St Off to US-50 EB On	Basic	24.5	0.9	F
NB: US-50 EB On	Merge	34.4	4.3	F
NB: US-50 WB On	Merge	79.5	4.2	F
NB: P St On to J St Off	Weave	61.8	7.2	F
NB: J St Off to Lane Drop	Basic	90.5	5.9	F
NB: Lane Drop to L St On	Basic	60.0	1.1	F
NB: L St On	Merge	32.2	0.4	F
NB: I St On to Richards Off	Weave	27.9	1.0	F
NB: Richards Off to On	Basic	28.6	0.3	F
Cosumnes Off	Diverge	114.6	3.7	F
Cosumnes EB Loop On-Ramp	Merge	113.9	6.4	F
Cosumnes WB Slip On-Ramp	Merge	179.3	5.0	F
Cosumnes to Pocket	Basic	102.7	4.1	F
Pocket to Florin	Weave	124.6	3.8	F

## *Level Of Service by Location Report*

<i>Project Name</i>	I-5	<i>Peak Hour</i>	AM Peak
<i>Alternative</i>	HOV-N3-Alt-2033 - NB	<i>Num of Runs</i>	10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Twin Cities to H-F	Basic	98.5	9.3	F
NB: H-F Off	Diverge	99.1	3.9	F
NB: H-F EB On	Merge	109.9	2.1	F
NB: H-F WB On	Merge	120.4	3.1	F
NB: H-F to Elk Grove -1	Basic	96.9	2.5	F
NB: Elk Grove Off	Diverge	97.0	2.0	F
NB: Elk Grove Off to On	Basic	100.1	1.8	F
NB: Elk Grove On	Merge	120.7	2.4	F
NB: Elk Grove to Laguna	Basic	85.5	0.7	F
NB: Laguna Off	Diverge	48.5	0.3	F
NB: Laguna Off to On	Basic	21.0	0.4	F
NB: Laguna On	Merge	86.4	29.4	F
NB: Laguna to Cosumnes	Basic	109.2	12.4	F
NB: Pocket Off	Diverge	89.8	4.1	F
NB: Pocket Off to On	Basic	91.3	6.2	F
NB: Pocket EB On	Merge	94.6	5.5	F
NB: Florin Off to On	Basic	100.2	1.7	F
NB: Florin EB On	Merge	99.5	4.1	F
NB: Florin WB On	Merge	145.8	4.3	F
NB: Florin to 43rd	Basic	108.2	1.6	F
NB: 43rd On to Seamas Off	Weave	126.0	1.9	F
NB: Seamas Off to On	Basic	98.1	1.6	F
NB: Seamas On	Merge	128.6	2.3	F
NB: Seamas to Sutterville	Basic	91.0	2.5	F
NB: Sutterville Off	Diverge	78.0	2.0	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
NB: Sutterville Off to On	Basic	78.8	1.3	F
NB: Sutterville On	Merge	76.6	6.8	F
NB: Sutterville to US-50	Basic	35.5	0.6	F
NB: US-50 Off	Diverge	26.8	0.8	F
NB: US-50 Off to Q St Off	Basic	20.1	0.6	F
NB: Q St Off	Diverge	22.9	0.8	F
NB: Q St Off to US-50 EB On	Basic	21.1	1.0	F
NB: US-50 EB On	Merge	26.1	1.3	F
NB: US-50 WB On	Merge	68.5	2.4	F
NB: P St On to J St Off	Weave	41.0	12.6	F
NB: J St Off to Lane Drop	Basic	76.1	21.0	F
NB: Lane Drop to L St On	Basic	57.5	3.8	F
NB: L St On	Merge	31.5	0.5	F
NB: I St On to Richards Off	Weave	26.8	0.6	F
NB: Richards Off to On	Basic	27.7	0.5	F
Cosumnes Off	Diverge	110.1	4.2	F
Cosumnes EB Loop On-Ramp	Merge	109.2	5.7	F
Cosumnes WB Slip On-Ramp	Merge	178.4	3.8	F
Cosumnes to Pocket	Basic	101.2	4.7	F
Pocket to Florin	Weave	124.6	4.9	F





**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2033 HOV S1**  
**PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	75,309	537
Number of Persons Served	All Vehicles	102,127	728
Travel Distance [mi]	All Vehicles	547,075	3,325
Travel Time [h]	All Vehicles	17,321	80
Average Speed [mph]	All Vehicles	31.6	0.2
Total Delay [h]	All Vehicles	8,679	86
Average Delay per Vehicle [s]	All Vehicles	397	5
VHD/VMT (min/mile)	All Vehicles	0.95	0.01
Number of Vehicles Served	HOVs	19,573	514
Number of Persons Served	HOVs	45,996	1,209
Travel Distance [mi]	HOVs	140,999	3,757
Travel Time [h]	HOVs	3,460	112
Average Speed [mph]	HOVs	40.8	0.6
Total Delay [h]	HOVs	1,231	63
Average Delay per Vehicle [s]	HOVs	218	8
VHD/VMT (min/mile)	HOVs	0.52	0.02
Number of Vehicles Served	Trucks	1,971	57
Number of Persons Served	Trucks	2,365	69
Travel Distance [mi]	Trucks	14,024	327
Travel Time [h]	Trucks	553	14
Average Speed [mph]	Trucks	25.4	0.4
Total Delay [h]	Trucks	330	11
Average Delay per Vehicle [s]	Trucks	575	21
VHD/VMT (min/mile)	Trucks	1.41	0.04

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

**VISSIM Post-Processor**  
**Average Values from 10 Runs**  
**Network Statistics**

**I-5 Bus/Carpool Lanes**  
**2033 HOV S3**  
**PM Peak Period**

<b>Network Performance</b>	<b>Vehicle Types</b>	<b>Average</b>	<b>Std. Dev.</b>
Number of Vehicles Served	All Vehicles	68,952	392
Number of Persons Served	All Vehicles	93,594	532
Travel Distance [mi]	All Vehicles	500,904	2,540
Travel Time [h]	All Vehicles	24,355	177
Average Speed [mph]	All Vehicles	20.6	0.2
Total Delay [h]	All Vehicles	16,196	188
Average Delay per Vehicle [s]	All Vehicles	775	10
VHD/VMT (min/mile)	All Vehicles	1.94	0.03
Number of Vehicles Served	HOVs	18,007	249
Number of Persons Served	HOVs	42,316	586
Travel Distance [mi]	HOVs	129,064	2,030
Travel Time [h]	HOVs	4,588	89
Average Speed [mph]	HOVs	28.1	0.4
Total Delay [h]	HOVs	2,461	70
Average Delay per Vehicle [s]	HOVs	466	12
VHD/VMT (min/mile)	HOVs	1.14	0.03
Number of Vehicles Served	Trucks	1,666	74
Number of Persons Served	Trucks	1,999	88
Travel Distance [mi]	Trucks	11,862	621
Travel Time [h]	Trucks	745	50
Average Speed [mph]	Trucks	15.9	0.4
Total Delay [h]	Trucks	552	41
Average Delay per Vehicle [s]	Trucks	1,043	37
VHD/VMT (min/mile)	Trucks	2.79	0.09

Note: Vehicle occupancy assumed to be 1.0 for SOVs, 1.2 for Trucks, and 2.35 for HOVs.

## *Level Of Service by Location Report*

*Project Name* I-5 Bus/Carpool Lanes *Peak Hour* PM  
*Alternative* 2033 HOV S1 *Num of Runs* 10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	132.1	8.7	F
SB: Richards to J St	Weave	116.4	9.5	F
SB: J St Off to I St On	Basic	100.6	10.9	F
SB: I St On to US-50 Off	Weave	55.9	9.7	F
SB: US-50 Off to P St On	Basic	27.6	7.6	D
SB: P St On	Merge	38.0	24.3	E
SB: P St On to US-50 EB On	Basic	77.8	26.0	F
SB: US-50 EB On	Merge	129.7	5.1	F
SB: US-50 WB On	Merge	121.5	10.0	F
SB: US-50 to Lane Drop	Basic	129.5	3.9	F
SB: Lane Drop to Sutterville	Basic	82.2	6.3	F
SB: Sutterville Off	Diverge	93.1	6.4	F
SB: Sutterville Off to On	Basic	83.3	2.8	F
SB: Sutterville On	Merge	128.6	3.2	F
SB: Sutterville to Seamas	Basic	127.1	2.3	F
SB: Seamas Off	Diverge	135.4	3.5	F
SB: Seamas Off to On	Basic	93.3	2.6	F
SB: Seamas On to 43rd Off	Weave	107.5	2.5	F
SB: 43rd to Florin	Basic	91.3	2.8	F
SB: Florin Off	Diverge	82.6	1.2	F
SB: Florin Off to On	Basic	128.2	1.1	F
SB: Florin to Pocket Weave	Weave	106.0	1.5	F
SB: Pocket Off to On	Basic	93.6	1.3	F
SB: Pocket WB On	Merge	82.5	2.6	F
SB: Pocket EB On	Merge	41.3	1.0	E

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket to Cosumnes	Basic	32.4	0.8	D
SB: Laguna Off	Diverge	27.3	1.2	C
SB: Laguna Off to On	Basic	21.4	0.4	C
SB: Laguna On	Merge	20.0	0.4	C
SB: Laguna to Elk Grove	Basic	23.4	0.7	C
SB: Elk Grove Off	Diverge	17.8	0.4	B
SB: Elk Grove Off to On	Basic	15.8	0.2	B
SB: Elk Grove On	Merge	15.9	0.3	B
SB: Elk Grove to Lane Drop	Basic	27.6	0.8	D
SB: H-F Off	Diverge	27.7	0.6	C
SB: H-F Off to On	Basic	22.0	0.6	C
SB: H-F WB On	Merge	26.8	1.3	C
SB: H-F EB On	Merge	25.3	0.9	C
SB: Cosumnes Off	Diverge	25.9	2.3	C
SB: Cosumnes Off to On	Basic	26.6	0.7	D
SB: Cosumnes WB On	Merge	23.5	0.7	C
SB: Cosumnes EB On	Merge	27.7	1.3	C
SB: Cosumnes to Laguna	Basic	36.7	3.3	E
SB: End of HOV to Lane Drop	Basic	28.3	0.9	D
SB: Lane Drop to H-F Off	Basic	27.6	0.6	D
SB: Lane Drop to End of HOV	Basic	45.2	1.6	F

## *Level Of Service by Location Report*

*Project Name* I-5 Bus/Carpool Lanes *Peak Hour* PM  
*Alternative* 2033 HOV S3 *Num of Runs* 10

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Richards Off to On	Basic	132.9	7.8	F
SB: Richards to J St	Weave	120.8	8.0	F
SB: J St Off to I St On	Basic	102.0	10.3	F
SB: I St On to US-50 Off	Weave	74.4	22.5	F
SB: US-50 Off to P St On	Basic	86.0	33.4	F
SB: P St On	Merge	103.3	27.3	F
SB: P St On to US-50 EB On	Basic	124.6	14.5	F
SB: US-50 EB On	Merge	148.5	3.0	F
SB: US-50 WB On	Merge	160.0	2.4	F
SB: US-50 to Lane Drop	Basic	152.0	3.3	F
SB: Lane Drop to Sutterville	Basic	112.4	3.8	F
SB: Sutterville Off	Diverge	134.5	5.4	F
SB: Sutterville Off to On	Basic	111.1	3.7	F
SB: Sutterville On	Merge	162.0	5.3	F
SB: Sutterville to Seamas	Basic	151.9	3.6	F
SB: Seamas Off	Diverge	164.5	5.7	F
SB: Seamas Off to On	Basic	120.6	4.0	F
SB: Seamas On to 43rd Off	Weave	133.8	4.3	F
SB: 43rd to Florin	Basic	117.7	3.2	F
SB: Florin Off	Diverge	94.5	1.7	F
SB: Florin Off to On	Basic	144.1	2.3	F
SB: Florin to Pocket Weave	Weave	129.2	3.0	F
SB: Pocket Off to On	Basic	111.5	4.1	F
SB: Pocket WB On	Merge	109.2	3.7	F
SB: Pocket EB On	Merge	93.5	6.8	F

<i>Location Description</i>	<i>Segment Type</i>	<i>Average Density</i>	<i>Std Dev Density</i>	<i>LOS</i>
SB: Pocket to Cosumnes	Basic	93.1	3.1	F
SB: Laguna Off	Diverge	84.6	3.2	F
SB: Laguna Off to On	Basic	91.0	3.4	F
SB: Laguna On	Merge	86.4	1.3	F
SB: Laguna to Elk Grove	Basic	79.3	2.2	F
SB: Elk Grove Off	Diverge	65.4	2.2	F
SB: Elk Grove Off to On	Basic	31.1	1.5	D
SB: Elk Grove On	Merge	35.0	2.5	E
SB: Elk Grove to End of HOV	Basic	49.1	3.7	F
SB: H-F Off	Diverge	51.3	3.5	F
SB: H-F Off to On	Basic	39.4	4.6	E
SB: H-F WB On	Merge	50.5	4.2	F
SB: H-F EB On	Merge	52.4	3.3	F
SB: Cosumnes Off	Diverge	112.1	3.4	F
SB: Cosumnes Off to On	Basic	108.3	1.6	F
SB: Cosumnes WB On	Merge	125.7	2.9	F
SB: Cosumnes EB On	Merge	114.2	4.8	F
SB: Cosumnes to Laguna	Basic	91.9	2.3	F
SB: End of HOV to Lane Drop	Basic	54.1	4.5	F
SB: Lane Drop to H-F Off	Basic	58.5	3.7	F