DEPARTMENT OF TRANSPORTATION
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September 2, 2011

Bimla Rhinehart
Executive Director
California Transportation Commission
1120 N Street
Room 221 (MS-52)
Sacramento, CA 95814

Dear Ms. Rhinehart:

The California Department of Transportation (Department) supports the Bay Area Infrastructure Financing Authority's (BAIFA) application to the California Transportation Commission (CTC) for the Bay Area Express Lanes Public Partnership Application For High Occupancy Toll Lanes. BAIFA is a joint exercise of powers agency formed by the Metropolitan Transportation Commission (MTC) and the Bay Area Toll Authority seeking authority as a regional transportation agency, by the consent of MTC, to develop and implement a high occupancy toll facility.

The application was developed by the MTC in cooperation with the Department for BAIFA to request the determination of eligibility, pursuant to the Section 149 of the Streets and Highway Code, for an Express Lanes Facility. The proposed Express Lanes Facility would consist of about 265 directional miles of express lanes, including 149 miles of existing HOV lanes to be converted to express lanes, and 116 miles of new express lanes. The Express Lanes Facility is comprised of five freeway routes: I-80 in Alameda, Contra Costa and Solano Counties, I-680 in Contra Costa and Solano Counties, I-880 in Alameda County, SR-84 in Alameda County and SR-92 in Alameda County. The proposal also includes a 19.9 directional mile gap on I-880 for which tolling is not anticipated in the near future. Operational strategies will be employed to enhance mobility on this segment instead. The Express Lanes Facility, when combined with other corridors that already have statutory authority for express lanes, would constitute an Express Lane "Network".

The primary goal of the proposed Express Lanes Facility is to help optimize the freeway system management and traffic operations by making use of the available unused capacity in the HOV lanes. Additionally, the Express Lanes Facility would aid in expediting completion of the region's entire HOV lane network, encompassing other currently authorized corridors in the region, to alleviate congestion for all freeway users.

Caltrans District 4 has approved a Project Study Report (PSR) for a "backbone" set of freeway corridors for which express lanes were considered. The Express Lanes Facility submitted in this application is a subset of the "backbone" network. The PSR is programmatic and precedes development of individual project initiation documents and the Project Approval and Environmental Document phase for individual corridors of the proposed network.

In parallel with development of the programmatic PSR, the Department completed a qualitative assessment of the traffic operational benefits of the proposed "backbone" network, including the Express Lane Facility. As you will notice in the attached, the Department has determined that:

- In spite of their effectiveness in providing significant travel time savings, portions of the existing 420 miles of HOV lanes in the San Francisco Bay Area are not being fully utilized. Additionally, the 800 mile HOV network historically envisioned for the Bay Area includes 113 miles of programmed and 267 miles of unfunded HOV lanes which will remain discontinuous due to right-of-way and funding challenges, and thus, not optimized to allow the lanes to reach their full capacity.

- Some existing HOV lanes are near capacity. Once these lanes reach their capacity, their effectiveness in terms of providing travel time savings to users will diminish. In order to ensure continued travel time saving for transit users and carpoolers, either additional capacity, if deemed feasible, will need to be added or the vehicle occupancy requirement will need to be increased. It is expected that a change in the minimum carpool eligibility requirements would result in increased traffic volumes in the adjacent general purpose lanes and would accompany additional congestion, at least initially while the intended increase in usage of transit and ridesharing take effect. Tolling and Express lane operations can help reduce this impact by allowing solo drivers access to the carpool lane, not only reducing demand and congestion in the adjacent lanes but also helping attain optimum efficiency and full capacity of the system. Such changes are expected to be applied incrementally over time and on a corridor by corridor basis upon detailed analyses of needs, and as needed to maintain the integrity of carpool operations starting from 2020.

- The proposed Express Lanes Facility operations will serve as a complementary and an effective tool for real-time multimodal system management operations, adding benefits due to connectivity afforded by extending and closing existing gaps in the HOV network as well as increased efficiency due to full utilization of the unused capacity in the HOV lanes. Given the qualitative assessment and the programmatic approach, the exact benefits cannot be quantified at this time; however, the resultant mobility benefits are expected to be significant.

- The proposed Express Lanes Facility will be consistent with the established standards, requirements, and limitations that apply to those facilities in Sections 149, 149.1, 149.3, 149.4, 149.5, 149.6 and 149.7 of the Streets and Highways Code. The network will be integrated with and complement the previously authorized Express Lanes in Alameda and Santa Clara Counties, on Interstates 580 and 680, U.S. 101, and State Routes 237 and 85.

- Full effectiveness of the proposed Express Lanes Facility will be realized via inclusion of certain design considerations and operational criteria. These include careful selection of access, operational hours, carpool eligibility, dynamic pricing, and network consistency, in addition to uniform tolling and customer service, integration with toll collection and metering operations at Bay Area toll bridges and re-investment of revenues. It is expected that these criteria will be met through appropriate cooperative agreements and memoranda of understanding among appropriate stakeholders, including the Department, MTC, the California Highway Patrol, and other stakeholders.

In closing, the proposed Bay Area Express Lanes Facility is consistent with State Highway System requirements and with the established standards, requirements, and limitations that apply to those facilities in Sections 149, 149.1, 149.3, 149.4, 149.5, 149.6, and 149.7 of the Streets and Highways Code. It is also consistent with the Department's Traffic Operations Program goals, including preserving safety, enhancing mobility, real-time multimodal transportation system management, and providing choice and control for travelers. In addition, the Express lanes network also allows the Department to engage in innovative solutions, potentially involving public-private sector partnerships, in addressing transportation needs and challenges.

Sincerely,

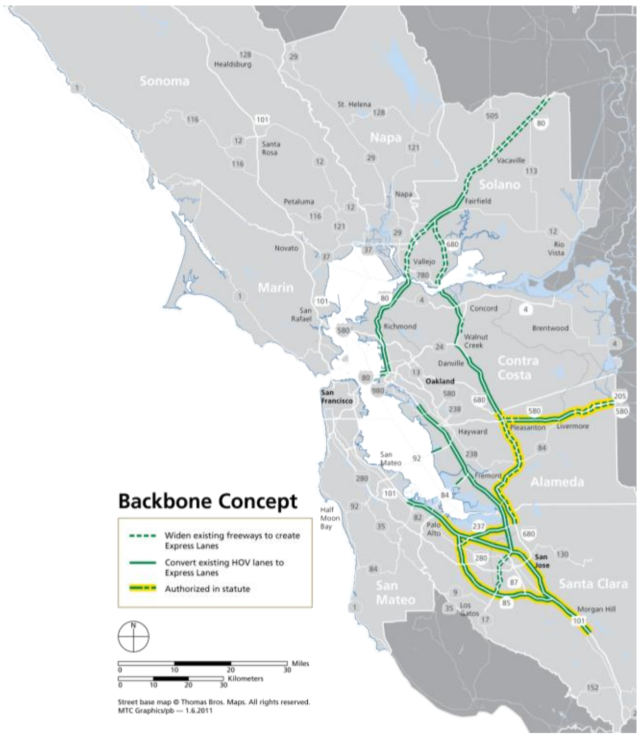
BIJAN SARTIPI
District Director

Attachment: Traffic Operational Assessment, San Francisco Bay Area Express Lanes Network dated August 31, 2011

Cc: Steve Heminger – Executive Director, MTC

Traffic Operational Assessment

SAN FRANCISCO BAY AREA
BACKBONE EXPRESS LANES NETWORK



August 31, 2011

California Department of Transportation
District 4 – Office of Highway Operations

SAN FRANCISCO BAY AREA
BACKBONE EXPRESS LANES NETWORK

I . INTRODUCTION

This evaluation focuses on the potential traffic operational benefits, i.e., congestion reduction and mobility to convert existing and programmed High Occupancy Vehicle (HOV) lanes in the San Francisco Bay Area to a backbone (High Occupancy Toll or) Express Lanes Network. The need for this evaluation has arisen as part of a current proposal by the Metropolitan Transportation Commission (MTC) and the Bay Area Infrastructure Financing Authority is to get authorization for conversion of HOV to Express lanes on five below corridors hereinafter referred to as the "Facility":

- Interstate 80 in Alameda, Contra Costa, and Solano Counties
- Interstate 680 in Contra Costa and Solano Counties
- Interstate 880 in Alameda County
- SR 84 in Alameda County
- SR 92 in Alameda County

A programmatic Project Study Report for the backbone Network that includes this Facility has been completed by the MTC and approved by Caltrans. Future implementation of all individual elements of the Express Lane Network will be subject to detailed analyses and approval on appropriate corridor level bases, assuring further safety and operational evaluations before actual implementation. Also, while mindful of other influencing factors, such as market and consumer acceptance, pricing, or revenue generation, this evaluation purposely does not intend to assess the financial feasibility of the Express Lanes.

II. BACKGROUND

Existing HOV Lanes Network:

The San Francisco Bay Area has a population of over seven million people and consists of nine counties: San Francisco, San Mateo, Santa Clara, Alameda, Contra Costa, Marin, Napa, Sonoma, and Solano. The region's highway network has consistently been ranked as one of the most congested in the nation, and peak period congestion is expected to grow in the future. An extensive network of HOV lanes is currently in place to reduce solo commuting by encouraging ridesharing and transit use.

Currently, there are about 420 lane-miles of HOV lanes in the San Francisco Bay Area. The first HOV lanes in the Bay Area were constructed in 1970's. However, the major expansion of the system started in early 1980's when Santa Clara County residents approved a tax measure to build HOV lanes on all major freeways in the South Bay.

Since then, HOV lanes in the other counties of the Bay Area have been constructed in accordance with the HOV Lane Master Plan that envisions an 800 lane-miles network in the Bay Area.

HOV lanes in the Bay Area have design and operational characteristics that differ from HOV facilities in Southern California. HOV lanes in this region are operated contiguous with general purpose lanes and have continuous unlimited access into and out of the lane, with no buffer (neither physical nor striped) separating them from the adjacent lanes. The lane restrictions are in effect only during weekday commute periods (e.g. 5-9 a.m. and 3-7 p.m.). During off-peak periods and on weekends, the lanes are open to all traffic. Because HOV lanes in this region have historically been operated in this manner, these factors will be considered in the operational and design approach to a Bay Area Express Lane network.

Bay Area HOV lanes continue to be well-utilized and offer time savings. The average peak hour speed in the HOV lane is about 61 mph, compared to average speed of general purpose lanes of about 43 mph. The effective capacity of the HOV lane is about 1650 - 1700 vehicles per hour (vph). According to the HOV lane report for calendar year 2009 (http://www.dot.ca.gov/dist4/highwayops/docs/hov_report_2009.pdf), the majority of the HOV lanes in the Bay Area have surplus unused capacity, even during the highest hour of the commute. Because HOV usage is less in the shoulder hours of the peak period, more unused capacity is available at hours immediately preceding or succeeding the peak.

In spite of their effectiveness in providing significant travel time savings, on average, the existing HOV lanes are not being fully utilized in capacity, and the network remains discontinuous due to right-of-way and funding challenges.

Proposed Backbone Express Lanes Network:

Prior legislation allows implementation of Express lanes in four corridors in the Bay Area, consisting of two in Alameda County (Interstates 580 and 680) and two in Santa Clara County (State Route 85/ U.S. 101 and State Route 237). HOV lanes are already in operation in those corridors except for northbound I-680. An Express lane has been in operation on southbound I-680 from Route 237 to Route 84 in Alameda and Santa Clara Counties since September 2010.

The proposed backbone Express Lanes Network would consist of about 533 miles of Express lanes, including 345 miles of existing and under development HOV lanes to be converted to Express lanes, and 188 miles of new Express lanes. The primary goal of the proposed network is to help optimize the freeway system management and traffic operations. By making use of the available unused capacity in the HOV lanes, and expediting completion of the entire network, congestion for all freeway users could be reduced.

Tolls will vary dynamically based on traffic volumes and congestion in the Express lane and in the adjacent general purpose lanes. Higher tolls will be assessed during peak commute hours when available unused capacity is limited and will be lowered at other times. Peak spreading can be achieved by encouraging modal and temporal shifts to other hours of the peak, further reducing the magnitude of congestion.

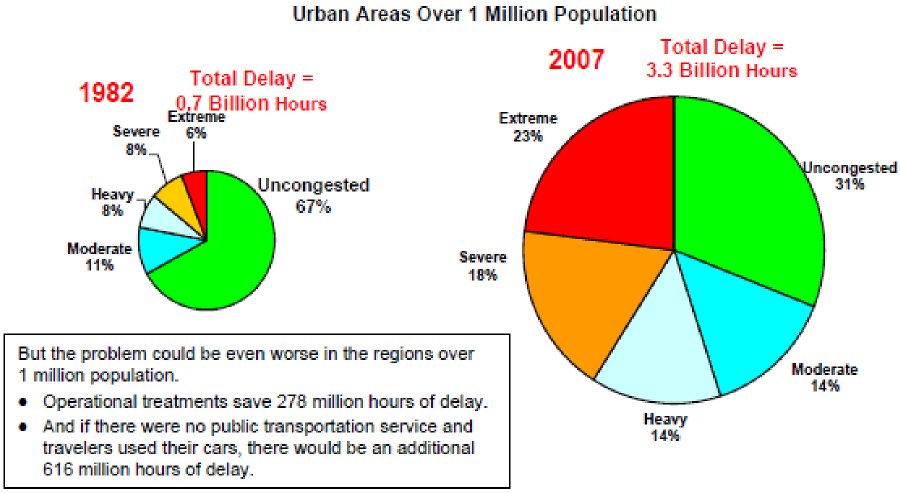
Revenue generated by these lanes can help close the HOV gaps and increase corridors reliability for HOV lanes and help reduce congestion overall. Express lanes and toll lanes have been in operation in the southern California but the only Express lane currently operating in the Bay Area is a 14-miles segment of southbound I-680 between Route 84 in Alameda County to Route 237 in the Santa Clara County. The benefit provided by this Express lane is currently being evaluated as there has not been enough time to allow for the respective traffic operational patterns to stabilize.

Allowing toll paying solo-drivers in the HOV lanes, when there is available unused capacity, facilitates optimization of the freeway system; thus, reducing congestion in mixed flow lanes. Carpoolers and transit will continue to enjoy travel time savings (and potentially cost savings over solo drivers). The proposed network will be dynamically priced to ensure continued optimum travel time savings for the ridesharing and transit in the lane converted from HOV to Express. Collected revenues will be applied towards operating and maintaining the system as well as the completion of the network which in turn will further promote ridesharing and transit through yet more travels time savings and reliability.

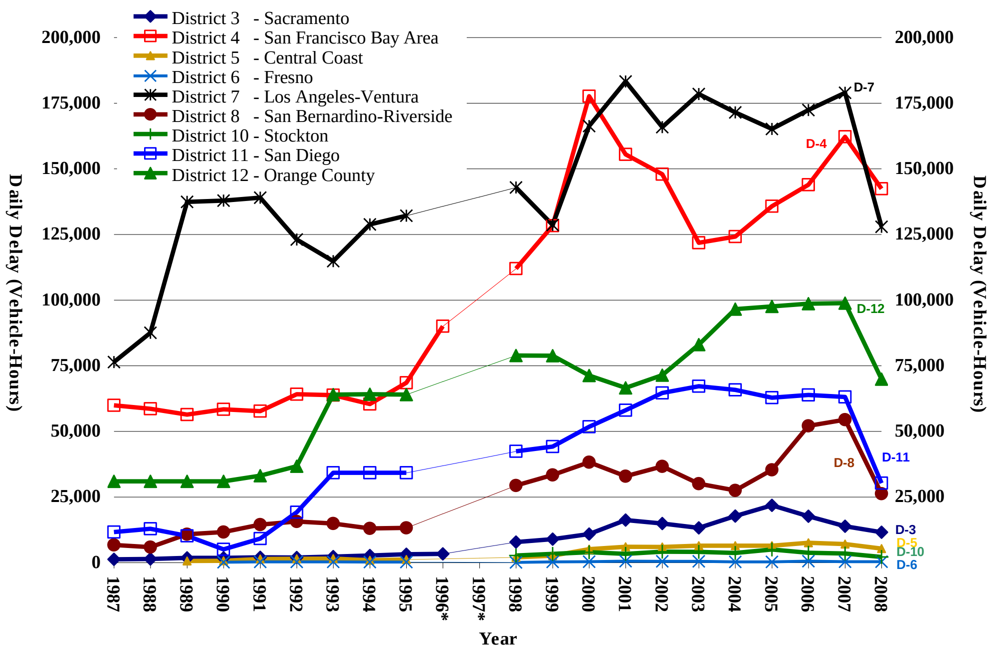
U.S. & California Congestion Trends:

According to the 2009 Urban Mobility Report (UMR) by Texas Transportation Institute, nationwide congestion of the metropolitan area has grown significantly from 1982 with 0.7 billion hours of delay to 3.3 billion hours of delay in 2007.

SAN FRANCISCO BAY AREA
BACKBONE EXPRESS LANES NETWORK

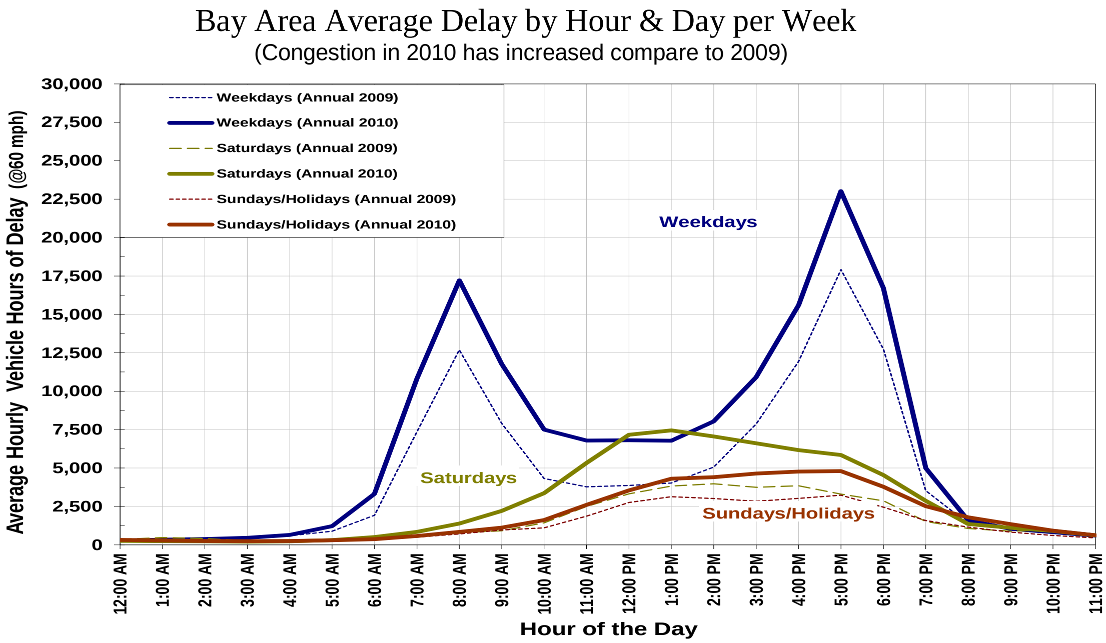


Consistent with national trends, congestion has been on the increase from 1987 to 2007 in California and the Bay Area. In 2008 and 2009 the Bay Area and statewide congestion dropped slightly due to reduction in employment rate and the general slowing of economy.



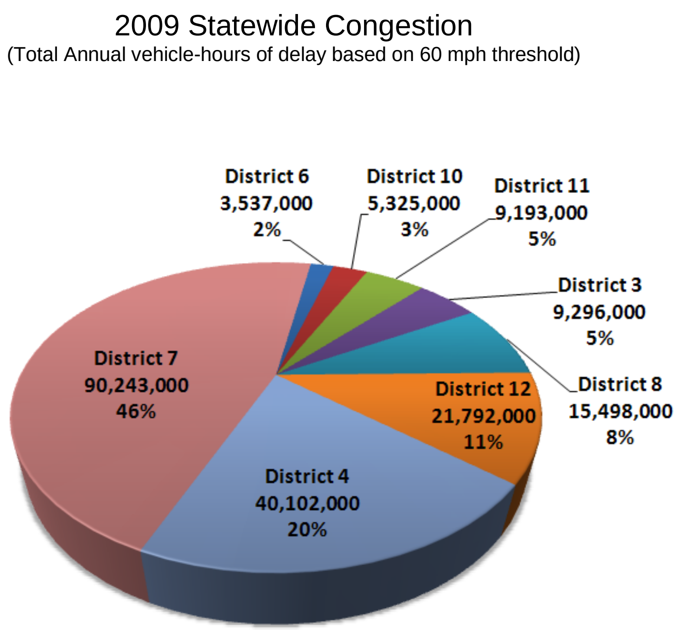
A preliminary comparison of data recently obtained from the California Performance Measurement System (PeMS) revealed that the slight reduction in congestion seen in 2008 and in 2009 has since reversed with increasing daily congestion recorded in 2010.

SAN FRANCISCO BAY AREA BACKBONE EXPRESS LANES NETWORK



Congestion in the San Francisco Bay Area:

In 2009, the Bay Area commuters experienced an annual congestion of about four million hours of delay. As depicted below, based on data collected via PeMS, this, on average, is about 20% of the total statewide congestion on California freeways and highways.



The Bay Area annual congestion data for each county and the top 20 most congested locations are shown below. The Alameda County retained the number one congestion ranking followed by Santa Clara, Contra Costa, San Francisco, San Mateo, Solano, Sonoma, Marin, and Napa Counties. At the same time the Vehicle Miles Traveled (VMT) is also increased from 2009 to 2010, an indication of higher transportation demand.

Bay Area Congestion by County

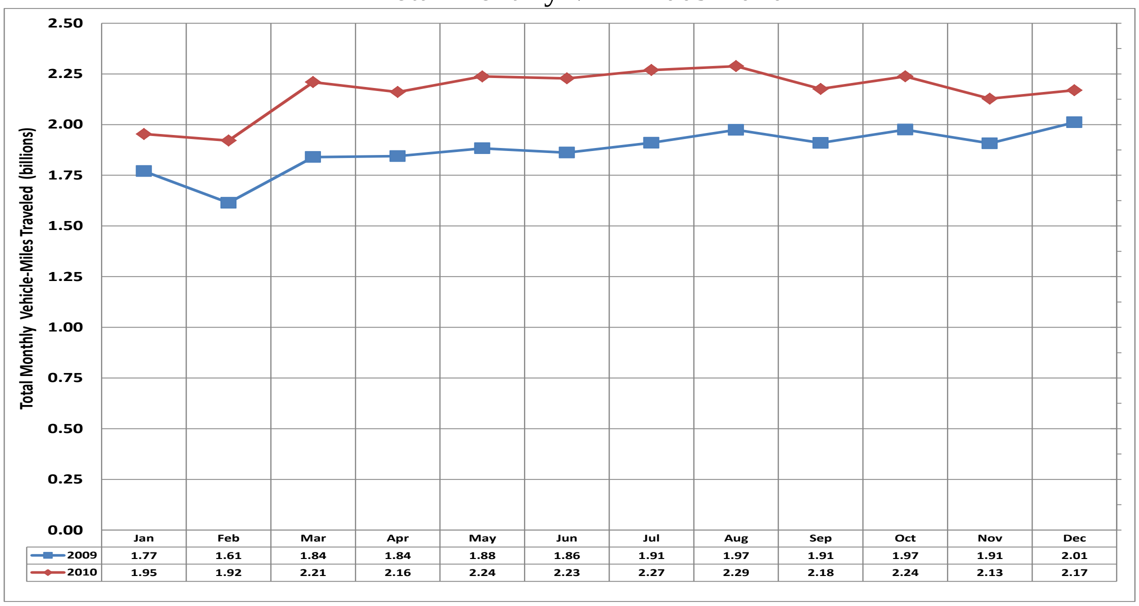
DISTRICT 4 ANNUAL VEHICLE HOURS OF DELAY BY COUNTY

County	2009 AVHD (35 mph)	Percent of District Total (35 mph)	2009 AVHD (60 mph)	Percent of District Total (60 mph)
Alameda	5,550,000	32.8	13,230,000	33.0
Contra Costa	2,257,000	13.3	5,284,000	13.2
Marin	440,000	2.6	1,239,000	3.1
Napa	2,000	0.0	33,000	0.1
San Francisco	2,139,000	12.6	4,509,000	11.2
San Mateo	1,851,000	10.9	3,745,000	9.3
Santa Clara	3,180,000	18.8	7,966,000	19.9
Solano	1,100,000	6.5	2,736,000	6.8
Sonoma	393,000	2.3	1,360,000	3.4
Total	16,911,000*	100.0	40,102,000	100.0

* The County figures for AVHD at 35 mph do not sum exactly to the Total because of rounding to the nearest thousand.

SAN FRANCISCO BAY AREA BACKBONE EXPRESS LANES NETWORK

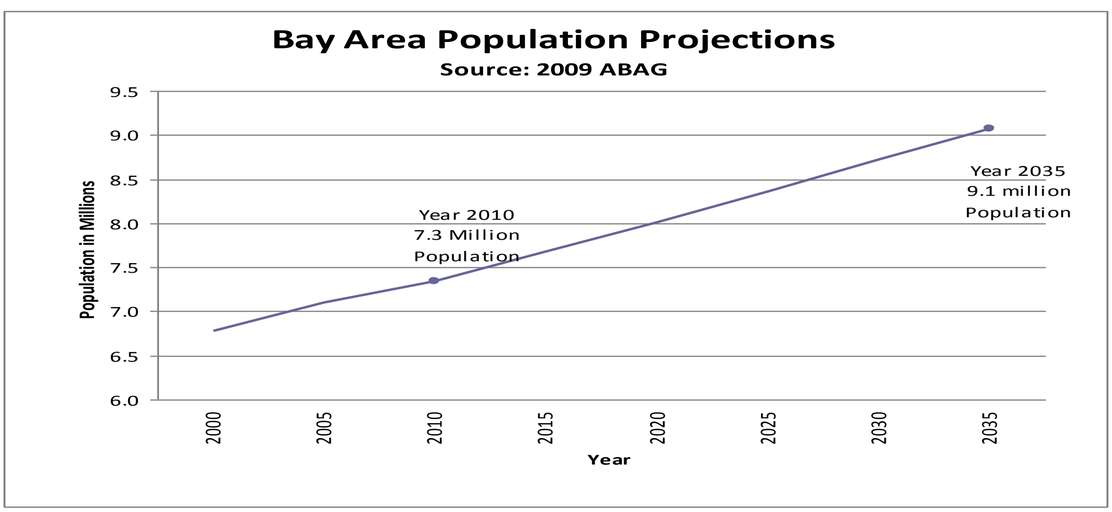
Total Monthly VMT 2009-2010



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	1.77	1.61	1.84	1.84	1.88	1.86	1.91	1.97	1.91	1.97	1.91	2.01
2010	1.95	1.92	2.21	2.16	2.24	2.23	2.27	2.29	2.18	2.24	2.13	2.17

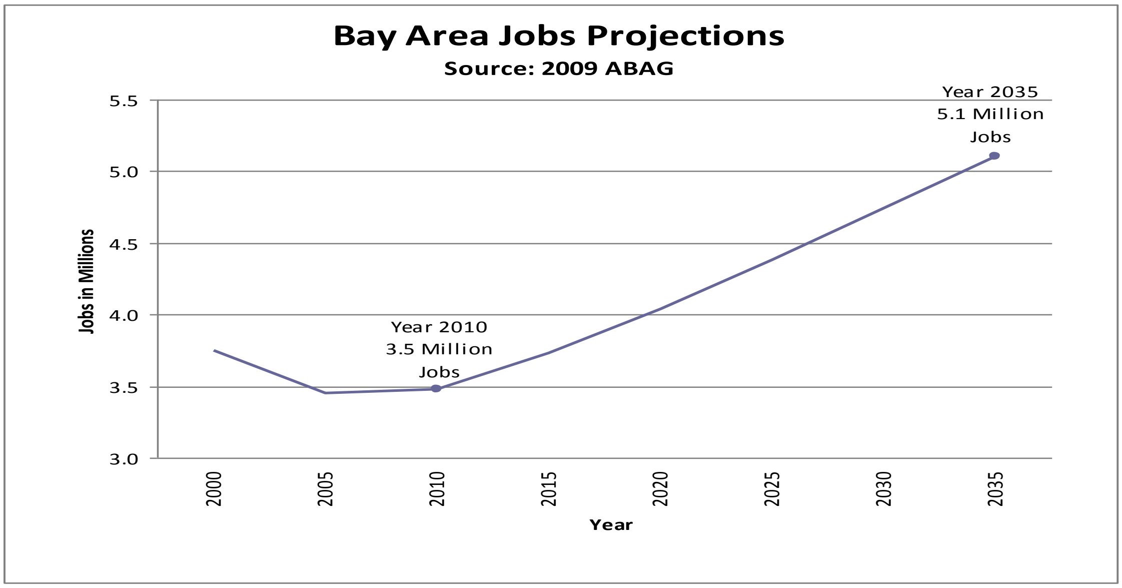
Future Population Growth:

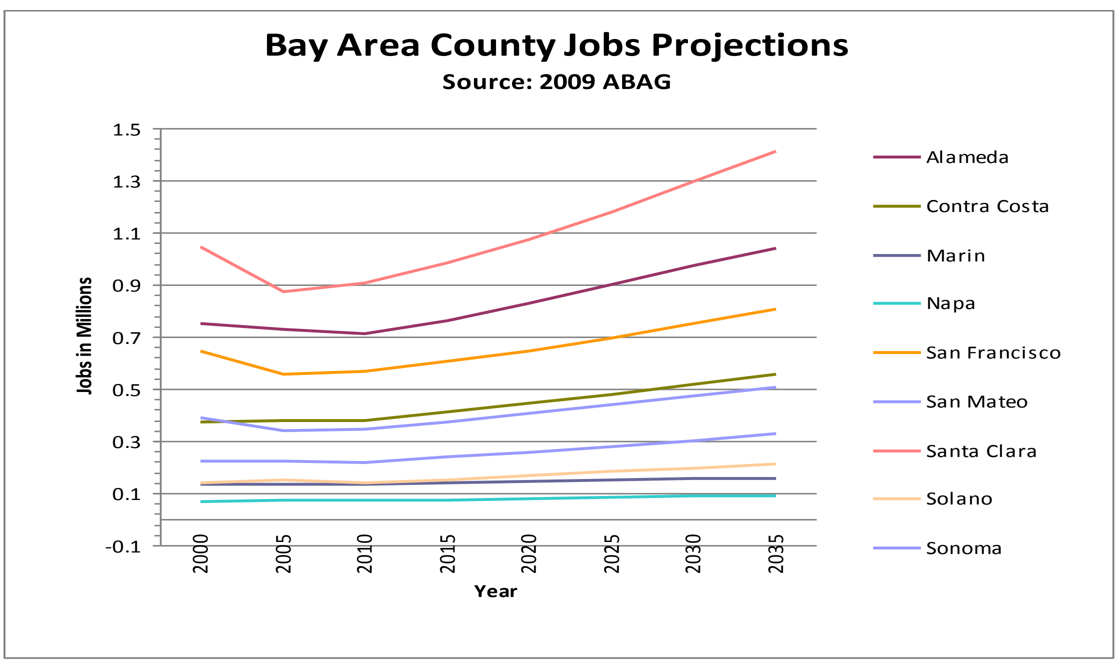
The population of California is expected to increase in the next 20 years. Based on Reason Foundation report in "Building Road to Reduce Congestion in America's Cities", California is expected to add another 10 million people by 2030. According to 2009 ABAG projection the Bay Area population will pass 9 million in the years 2035, an increase of 25% from about 7.3 million people in 2010.



Future Jobs Growth:

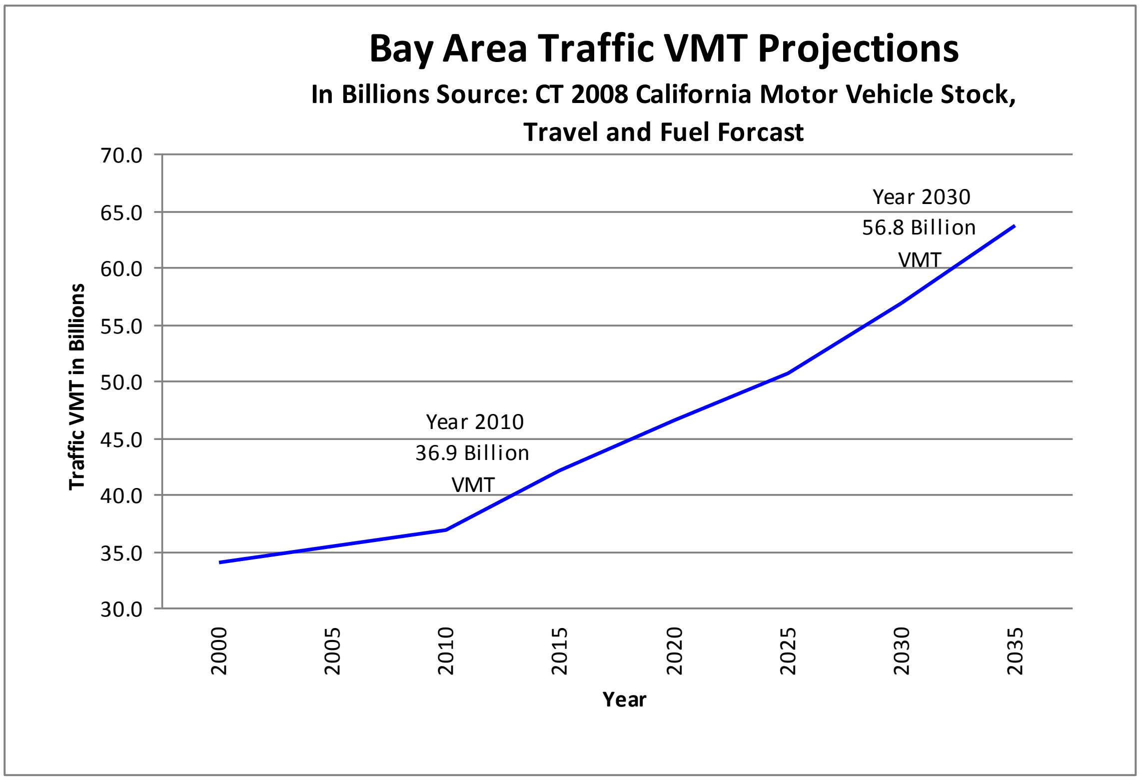
According to ABAG, about 3.5 million jobs were available in 2009 and that is expected to increase to 5.1 million jobs by 2035, an increase of 46%. Most of the job growth is expected to occur in the metropolitan area and while the growth rate is less than what was expected during the height of the Bay Area economy, it is still expected to increase in the future years. Below are job projections for each individual county and combined for all nine Bay Area counties.





Future VMT Increase:

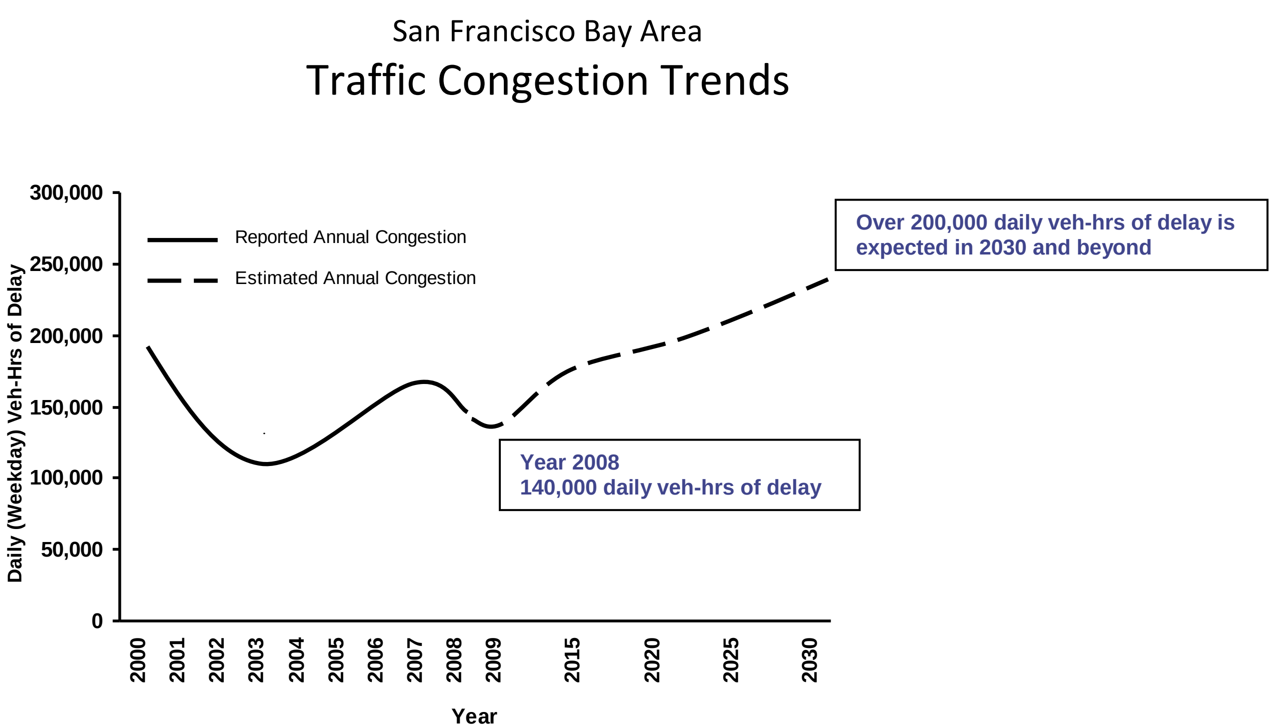
The 2008 California Motor Vehicle Stock, Travel & Fuel Forecast (http://www.dot.ca.gov/hq/tsip/smb/mvstaff.html) reported by Caltrans Division of Transportation System Information, has indicated that the Bay Area VMT will continue to increase by 54% from 2010 to 2030, and to 73% by 2035.



Future Traffic Congestion:

A more in-depth project level analysis for congestion for future years based on hourly traffic volumes for mainline corridors and for all ramps using Micro-Simulation models and more precise geometric plan will be completed as part of the individual project approval process. Study in that magnitude for all corridors in the backbone network will require significant amount of time and resources that cannot be completed at this time. However we can say for certain that as population, VMT, and jobs continuous to grow future congestion level will increase as well. According to Reason Foundation report in "Building Road to Reduce Congestion in America's Cities" currently San Francisco-Oakland Bay Area has the nation's third worst traffic congestion and it will experience even more severe congestion in the future. According to that report San Francisco-Oakland currently has a Travel Time Index (TTI) of 1.54. This means that driving times during peak traffic hours are 54 percent longer than during off-peak times. In 2030, the travel time index is expected to be 1.86 meaning drivers will experience travel delays far worse than even present-day Los Angeles (1.75).

Using the available congestion data recorded from PeMS and other data, it is estimated that the current Bay Area congestion will increase by a minimum of about 50% in the next 20 to 25 years.



As seen by the above information, summarizing the existing and future congestion trends, population and employment growth, leading to increased vehicle miles of travel, there is a compelling case for ensuring full optimization of the transportation system. The proposed backbone Express Network can undoubtedly be expected to fulfill a proportionate role in enhancing the efficiency and full utilization of the capacity on the Bay Area freeway system.

III. TRAFFIC OPERATIONS EFFECTS OF EXPRESS LANES

Several approaches can be employed to better manage the existing transportation system to its optimum potential. Maximizing capacity, increasing person throughput, reducing traffic demand, or shifting demand to less congested periods are options to better manage our existing transportation system. Many of these strategies are included in the various Bay Area Corridor System Management Plans (CSMPs) and are being pursued in cooperation with MTC, through the Freeway Performance Initiative. The Express Lanes Network operations serve as a complementary and an effective tool for real-time multimodal system management operations, adding additional capacity, connectivity, travel time, reliability, transit, and system performance benefits. Of these, the added capacity afforded through full utilization of the unused available capacity in the HOV network and the enhance connectivity via extending and closing existing gaps in the HOV network are expected to have the most prominent effects.

1. Connectivity Benefits:

Continuity and connectivity to and from major employment centers are essential in the effectiveness of HOV lanes in encouraging ridesharing and transit as well as delivery of meaningful travel time savings. Unless gaps are closed and logical extensions are made in the HOV lane network, certain available capacity in the HOV lanes will remain unused, and full system efficiency will not be achieved. The time savings and trip reliability benefits provided by closing specific gaps in the HOV lane network can vary from location to location. A recently completed HOV gap closure on US-101 in Marin County provides an example of the level of congestion relief that can be accomplished:

Southbound, morning commute:

- *Maximum delay in general purpose lanes reduced by 72% from 29 to 8 minutes*
- *Maximum delay in HOV lane reduced by 77% from 22 to 5 minutes*
- *Congestion period reduced by 56% from 4.5 to 2 hours.*

Northbound, afternoon commute:

- *Maximum delay in general purpose lanes reduced by 50% from 12 to 6 minutes*
- *Maximum delay in HOV lanes reduced by 73% from 5.5 to 1.5 minutes*
- *Congested period reduced by 38% from 4 to 2.5 hours.*

With many gaps still in the HOV lane network, transit and HOV lane users will not fully experience reliable trips free of congestion in many freeway segments. Unfortunately, right-of-way challenges and the associated high costs preclude closing of the existing gaps in the HOV lanes network at this time and instead operational strategies will be implemented to enhance the mobility on these segments. Such gaps, for example, include a 19.9-miles segment on both directions of I-880, between the I-80/580/880 distribution structure and Hegenberger Road, in Alameda County.

Notwithstanding, as currently perceived, the proposed Express lanes network would promote connectivity by including new facilities, HOV lane extensions and gap closures on the Bay Area HOV Lane network. New and extensions projects included in the network are:

a) Eastbound and westbound I-80 between Airbase Parkway and I-505 in Solano County

b) Northbound I-680 between SR-237 and SR-84 in Alameda and Santa Clara Counties

c) Northbound I-680 between North Main Street and SR-242 in Contra Costa County

d) Westbound I-580 between San Ramon Valley Road/Foothill Boulevard and Greenville Road

e) Eastbound and westbound I-580 between Greenville Road and the San Joaquin County line in Alameda County

f) Northbound I-880 between Lewelling Boulevard and Hegenberger Road in Alameda County

g) Southbound I-880 between Hegenberger Road and Marina Boulevard in Alameda County

The network would also include system expansion to close the gap in the current HOV lane. These gap closure projects include:

a) Eastbound and westbound I-80 between Red Top Road and the Carquinez Bridge in Solano County

b) Northbound and Southbound I-680 between the Benicia-Martinez Bridge and I-80, including direct connectors between I-80 and I-680 in Solano County

c) I-680 between North Main Street and Livorna Road in Contra Costa County

d) I-680 between Alcosta Boulevard and SR-84, including direct connectors between I-580 and I-680 in Alameda County

The anticipated gap closures and the system extensions that promote connectivity within and to/from the Bay Area are expected to have significant operational benefits in travel delays for carpools and transit, as well as an overall reduction in duration of the congestion.

2. Capacity Benefits:

Utilization of the unused available capacity in the HOV lanes helps optimize the freeway network's overall capacity. With careful conversion of the HOV lanes to Express lanes, when there is available capacity, vehicle-throughput can be increased and mainline congestion can be reduced for all users. The conversion will provide choice for solo vehicles to access the Express lanes. The reduction in the mainline congestion will vary based upon the available capacity in the peak hour and other hours of the peak periods.

Constructing additional Express lanes particularly on corridors with high traffic demand will increase capacity and person throughput but it cannot be implemented on many corridors due to environmental and right-of-way constraints as well as prohibitive capital costs. Encouraging modal and temporal shifts to other hours of the peak period when capacity is available can increase the overall person throughput with careful pricing.

In order to help quantify the potential benefits of the proposed Express Lanes Network, available capacity in each of the proposed corridors was evaluated based on the respective current minimum HOV occupancy requirement, existing traffic volumes and future traffic projections. A preliminary evaluation was made for all Bay Area corridors using existing data from Caltrans HOV lane monitoring report and future peak hour HOV forecast provided by the Metropolitan Transportation Commission (Attachment 2) and approved by Caltrans. Please note that HOV forecast is based on current occupancy requirement. The tables, on the pages following, summarize the estimated increase in total capacity (or throughput) during peak hour for current and future years. As seen by the tables, with the current occupancy requirements remaining unchanged, there are certain corridors where there would be no expected available unused capacity. However, some corridors will have available (unused) capacity that may be utilized for tolling in the interest of system optimization, particularly during the near-term. For the longer term, additional available unused capacity may be available in some corridors such as Santa Clara Route 85 or on Interstate 580 in Alameda County, where adding a second Express lane is possible.

While the expected capacity enhancements vary widely from corridor to corridor, the overall benefit of the conversion from HOV to Express Lanes operation is considered significant.

Estimated Increase in Total Capacity
For
Routes Requesting Express Lane Authority (peak hour)

County/Dir/Rte/Peak	One Express Lane			Two Express Lanes	
	2010	2020	2035	2020	2035
ALA/CC EB I-80 (AM peak), 3+	18%	18%	18%	N/A	N/A
ALA/CC EB I-80 (PM peak), 3+	4%	4%	3%	N/A	N/A
ALA/CC WB I-80 (AM Peak), 3+	0%	0%	0%	N/A	N/A
ALA/CC WB I-80 (PM Peak), 3+	14%	11%	10%	N/A	N/A
SOL EB I-80 (AM Peak), *2+	16%	16%	15%	N/A	N/A
SOL EB I-80 (PM Peak), *2+	11%	9%	6%	N/A	N/A
SOL WB I-80 (AM Peak), *2+	14%	6%	5%	N/A	N/A
SOL WB I-80 (PM Peak), *2+	15%	9%	8%	N/A	N/A
ALA/SCL SB I-880 (AM Peak), 2+	0%	0%	^0%	N/A	N/A
ALA/SCL SB I-880 (PM Peak), 2+	8%	7%	5%	N/A	N/A
ALA/SCL NB I-880 (AM Peak), 2+	3%	3%	^0%	N/A	N/A
ALA/SCL NB I-880 (PM Peak), 2+	3%	3%	^0%	N/A	N/A
CC/SOL NB I-680 (AM Peak), 2+	10%	5%	^0%	N/A	N/A
CC/SOL NB I-680 (PM Peak), 2+	7%	3%	3%	N/A	N/A
CC/SOL SB I-680 (AM Peak), 2+	2%	0%	^0%	N/A	N/A
CC/SOL SB I-680 (PM Peak), 2+	15%	3%	^0%	N/A	N/A

Notes

Reflects current HOV occupancy requirement, unless otherwise noted.

^ Improved mobility can be expected with a 3+ occupancy requirement for 3 hours each during the a.m./p.m. peaks and careful pricing to attract adequate solo users. Minimum occupancy requirement can revert back to 2+ at all other times.

- 2+ occupancy requirement in Solano County must be increased to 3+ to match the occupancy in Contra Costa and Alameda Counties prior to the completion of the last HOV lane segments of this corridor to provide a seamless connected HOV lane.

Estimated Increase in Total Capacity
For
Routes with Existing Express Lane Legislative Authority (peak hour)

County/Dir/Rte/Peak	One Express Lane			Two Express Lanes	
	2010	2020	2035	2020	2035
ALA NB I-680 (AM Peak), 2+	N/A	8%	2%	N/A	N/A
ALA NB I-680 (PM Peak), 2+	N/A	7%	^0%	N/A	N/A
ALA SB I-680 (AM Peak), 2+	EL	EL	EL	N/A	N/A
ALA SB I-680 (PM Peak), 2+	EL	EL	EL	N/A	N/A
ALA EB I-580 (AM Peak), 2+	18%	18%	11%	38%	31%
ALA EB I-580 (PM Peak), 2+	10%	∞10%	0%	∞30%	∞20%
ALA WB I-580 (AM Peak), 2+	N/A	∞10%	0%	∞30%	∞20%
ALA WB I-580 (PM Peak), 2+	N/A	18%	6%	38%	26%
SCL/SM NB US 101 (AM Peak), 2+	0%	0%	0%	25%	20%
SCL/SM NB US 101 (PM Peak), 2+	13%	10%	7%	37%	33%
SCL/SM SB US 101 (AM Peak), 2+	10%	7%	2%	33%	28%
SCL/SM SB US 101 (PM Peak), 2+	0%	0%	0%	22%	18%
SCL NB SR 85 (AM Peak), 2+	0%	0%	0%	40%	38%
SCL NB SR 85 (PM Peak), 2+	33%	33%	25%	73%	65%
SCL SB SR 85 (AM Peak), 2+	35%	33%	33%	73%	73%
SCL SB SR 85 (PM Peak), 2+	0%	0%	0%	35%	33%

Notes

Reflects current HOV occupancy requirement, unless otherwise noted.

∞ Available capacity will be less, if higher forecast HOV volumes by Alameda County (2006) are used.

^ Improved mobility can be expected with a 3+ occupancy requirement for 3 hours each during the a.m./.m. peaks and careful pricing to attract adequate solo users. Minimum occupancy requirement can revert back to 2+ at all other times.

* 2+ occupancy requirement in Solano County must be increased to 3+ to match the occupancy in Contra Costa and Alameda Counties prior to the completion of the last HOV lane segments of this corridor to provide a seamless connected HOV lane.

A discussion of the expected capacity enhancement afforded by the proposed conversion of HOV to Express Lanes for each corridor is provided below:

INTERSTATE 80, from the Bay Bridge Toll Plaza in Alameda County to the Solano/Yolo County Line.

Alameda and Contra Costa Counties: The current HOV lane minimum occupancy requirement in both directions is 3+, hours of operations are: 5 – 10 a.m., 3 – 7 p.m., Monday through Friday.

- Eastbound: The peak direction of travel for eastbound direction occurs in the evening hours. Current peak hour usage in the HOV lane is just above 1300 vehicles per hour (vph). Because of physical constraints at the San Francisco Oakland Bay Bridge (SFOBB) and the distribution structure at I-80/I-580/I-880 interchange, future HOV volumes are not expected to increase significantly from current levels. Therefore some capacity will be available for express vehicles during the peak commute hours. With a conversion to an Express lane, existing mainline capacity can be increased by approximately 4% and future capacity in 2020 by approximately 4% and in 2035 by 3%. Minor improvement in congestion for general purpose lanes without degradation of HOV lane in the peak hour can be expected with conversion to an Express lane. In the shoulder of the peak additional capacity in the HOV lane is available although no major time savings is expected. An increase of capacity of about 8% in the shoulder of the peak can also be expected based on existing HOV lane volumes. Additional weekend capacity is also available however careful pricing will be needed to make sure adequate number of vehicles utilizing the Express lane to prevent creating congestion due to loss of unrestricted capacity.

  The eastbound morning peak will have capacity available but no congestion is expected to occur as this is/will be the off-peak direction, therefore no significant time saving from recurrent congestion will be realized. The conversion to Express lane will increase the capacity by 18%. With Express lane, the travel time savings for the off-peak hours and weekend from non-recurrent congestion due to incidents can be significant.

- Westbound: The westbound peak commute direction on I-80 is in the morning. Due to high time saving benefits experienced by HOV users, the current HOV lane in the peak hour is at capacity and some slow down and congestion in the HOV lane occurs daily. As a result, there is no capacity available for a conversion to an Express lane in the westbound morning peak hours within this segment of the corridor. In addition, with 3+ occupancy currently required in the HOV lane it would be impractical and unlikely that an increase in occupancy to 4+ would occur any time soon to provide additional capacity for an Express lane.

The HOV lane usage in the westbound evening peak is about 500 vph and is expected to increase to 800 vph in 2035. Capacity will be available for an Express lane conversion which could improve congestion in the general purpose lanes that currently exist between University Avenue and the I-580/I-880 junction. With conversion to an Express lane the existing capacity can be increased by approximately 14% and the available capacity in 2020 by approximately 11% and by 10% in 2035.

Solano County: The current HOV lane minimum occupancy requirement in both directions is 2+, hours of operations are: 5 – 10 a.m., 3 – 7 p.m., Monday through Friday.

- Eastbound: It is expected that capacity for I-80 corridor will also be available for Solano County as well. Unlike Alameda and Contra Costa Counties where the peak hour HOV lanes are either at or near capacity, the Solano County HOV lane has available capacity. Currently some evening congestion occurs on eastbound I-80 at around I-680 interchange. No degradation of HOV lane is expected as the current HOV lane usage is about 700 vph in the evening peak and that volumes are expected to grow to about 1100 vph in 2035. With a conversion to an Express lane the existing capacity can be increased by approximately 11% and available capacity in 2020 by approximately 9% and capacity increase in 2035 by 6%. In the shoulder of the peak and on weekends additional capacity in the HOV lane is also available although no major time savings is expected during typical traffic condition. During major incidents time savings can be noticeable and with proper pricing usage of the lane can be increased with conversion to an Express lane.

  The eastbound morning peak will have capacity available but no recurrent congestion is expected to occur as this is and will be the off-peak direction and therefore no significant time saving will be realized. Conversion to Express lane will increase the morning peak capacity by 15% to 16%. With Express lane the travel time savings for the off-peak hours and weekend from non-recurrent congestion due to incidents can be significant.

- Westbound: The westbound peak commute direction is in the morning and the current HOV usage is about 500 vph. The peak hour HOV usage by 2035 is expected to double the current volumes. There is existing congestion near I-780, which Express lane users can bypass. With a conversion to an Express lane existing capacity can be increased by approximately 14% and available capacity in 2020 by approximately 6% and capacity increase in 2035 by 5%.

  The westbound evening peak will have capacity available but no recurrent congestion is expected to occur as this is and will be the off-peak direction and therefore no significant time saving will be realized. The conversion to Express lane will increase the existing capacity by 15% and future capacity from 8% to 9%.

The minimum occupancy requirement of 2+ in Solano County would have to be increased to 3+ to match the occupancy rate in Contra Costa and Alameda Counties prior to the completion of the last HOV lane segments of this corridor that will provide a seamless connected HOV lane. Additional capacity in the Express lane in the Solano County will be available with conversion to 3+ and with careful pricing the utilization of Express lane can be increased to prevent unnecessary slow down in the general purpose lanes.

INTERSTATE 880, from Route 85 in Santa Clara County to Hegenberger Road in Alameda County. This is the main corridor for trucks to access port of Oakland and truck percentage in this corridor is from 9% to 11% of total traffic.

Alameda and Santa Clara Counties: The current HOV lane minimum occupancy requirement in both directions is 2+, hours of operations are: 5 – 9 a.m., 3 – 7 p.m. Monday through Friday.

- Southbound: There is no defined peak direction in this corridor. Current HOV lane usage in the morning peak is about 1300 vph south of Hesperian and is expected to increase to about 1500 vph by 2035 in the morning peak hour. Congestion in the morning peak hour occurs between SR 238 and SR 92 for approximately 3 hours in the general purpose lanes. Theoretically the HOV lane has some available capacity in the current year but the lane slows down near SR 92 and therefore is most likely near capacity already. Because of that the conversion to Express lane would provide a minimal improvement to the future congestion in the general purpose lanes on southbound I-880 approaching SR 92 interchange. It is expected however that some capacity would still be available to improve trip reliability at other portions of this corridor.

  The existing HOV usage in the evening peak hour is slightly less than the peak hour usage in the morning. Currently, about 1100 vph utilized HOV lane in the peak hour. Congestion occurs between SR 238 and Industrial Boulevard in the general purpose lanes on a daily basis. HOV usage is expected to increase to about 1300 vph by 2035 near Whipple Road and near Coleman Avenue therefore there is available capacity in the HOV lane in the evening peak hour. With a conversion of HOV lane to an Express lane, existing general purpose lanes capacity can be increased by approximately 8%, by about 7% in 2020 and by about 5% in 2035.

- Northbound: Current HOV lane usage is about 1400 vph north of Whipple Road and is expected to increase to about 1600 vph by 2035 in the morning peak hour. Existing congestion occurs between Whipple Road to SR 92 for about 2 hours on a daily basis in the general purpose lanes. There is a small amount of capacity available in the HOV lane and with a conversion to an Express lane existing and 2020 capacity can be increased by approximately 3%. However, by 2035 there would be no capacity available in the HOV lane.

  Current HOV lane usage is about 1400 vph north of Whipple Road and is expected to increase to about 1600 vph by 2035 in the evening peak hour. Existing congestion occurs between Decoto Road to SR 92 for about 3 hours, also between SR 262 Mission and Automall Parkway for about 1 hour. There is a small amount of capacity available in the HOV lane and with a conversion to an EL existing capacity can be increased by approximately 3% and by about 3% in 2020. However, by 2035 there would be no capacity available in the HOV lane.

  With EL the travel time savings for the off-peak hours and weekend from non-recurrent congestion due to incidents can be significant.

<u>INTERSTATE 680</u>, from the Alameda/Contra Costa County Line to I-80 in Solano County.

Contra Costa and Solano Counties - the current HOV lane minimum occupancy requirement is 2+, hours of operation 5 – 9 a.m., 3 – 7 p.m., Monday through Friday on mainline, and 3+ during 5 – 10 a.m. and 3 – 7 p.m., Monday through Friday, at the Benicia/Martinez Bridge toll plaza.

- Northbound: The northbound peak in the morning hours occurs between Alcosta Boulevard and Livorna Road with an HOV lane usage of about 1000 vph. The HOV lane usage is expected to increase to 1700 vph by 2035. In the interim years there would be available capacity for a conversion to an Express lane. With a conversion to an Express lane the current capacity can be increased by approximately 10% and by about 5% in 2020. This will relieve some congestion in the general purpose lanes until the HOV lane usage reaches capacity prior to 2035.

  In the evening, the highest HOV usage will be between State Route 242 and Marina Vista interchange at about 1200 vph. The HOV lane usage is expected to increase to 1400 vph by 2035. There would be available capacity for a conversion to an EL that would also provide congestion improvement in the general purpose lanes. With a conversion to an Express lane existing capacity can be increased by approximately 7% and future capacity by approximately 3% in 2020 and also in 2035.

- Southbound: In morning, the southbound peak direction of travel in this corridor is between the Marina Vista and North Main Street with an HOV lane usage of about 1400 vph. The HOV lane usage is expected to reach its capacity with projected volumes of about 1800 vph by 2035 or sooner. There is a small amount of capacity available in the HOV lane initially and with a conversion to an Express lane existing capacity can be increased by approximately 2%. However, by 2020 there would be no capacity available in the HOV lane.

  In the evening the HOV lane usage is about 700 vph, between Livorna Road and Alcosta Boulevard. The future HOV lane usage is expected to increase to 1700 vph by 2035. There is available capacity currently in the HOV lane and with a conversion to an Express lane existing capacity can be increased by approximately 15% and by 3% in 2020. However, by 2035 there would be no capacity available in the HOV lane.

Alameda County - The current HOV lane minimum occupancy requirement is 2+, and the hours of operation is 5 – 9 a.m., 3 – 7 p.m., Monday through Friday.

- Northbound: Currently significant delays occur in the evening peak as demand traffic exceeds the available capacity. There is no existing HOV lane in the northbound direction however the addition of HOV lane is expected to improve congestion from the day of opening. The usage of HOV lane during the evening peak period is expected to be similar to the morning peak in the southbound direction (600-800 vph) initially but that will increase to about 1200 vph in 2020 and about 1600 vph in 2035. In 2020, there would be about 7% available capacity in the HOV lane for an Express lane conversion. However, by 2035 there will be no available capacity.

  The northbound morning peak will have capacity available but no recurrent congestion is expected to occur as this is and will be the off-peak direction and therefore no significant time saving will be realized. The conversion to Express lane however will increase the capacity by 8% in 2020 and by 2% in 2035.

- Southbound: There is an EL from Route 84 in Alameda County to SR 237 in Santa Clara County in operation. The current usage of the Express lane is about 1100 vph in the morning peak with about one half HOV's and the other half solo vehicles. Travel times savings varies from day to day but on an average the Express lane provides about 3 minutes of time savings daily. The section north of

Route 84 is congested so an addition of Express lane in that area can add to the travel time savings for Express lane users.

There is no recurrent congestion in the evening peak hours in the southbound direction in Alameda County as that is the off peak direction. No recurrent congestion occurs on weekend.

INTERSTATE 580 corridor from I-680 to I-205 in Alameda County, a distance of 21 miles. This corridor is currently authorized for Express Lane operations. Main commute route between the affordable residential communities in San Joaquin Valley and employment centers at tri valley and Silicon Valley. The only HOV lane on this corridor is currently in eastbound direction with minimum occupancy requirement of 2+; hours of operation are 5 – 9 a.m., 3 – 7 p.m., Monday through Friday.

- Eastbound**:** In evening, the eastbound direction is the peak direction with an HOV lane usage of about 800 vph. The opening of HOV lanes completed recently has significantly reduced the recurrent congestion in the peak commute hours. Congestion however is expected to increase in the future. The HOV lane is expected to increase to about 1700 vph in 2035. There is available capacity for an EL conversion in the interim which would improve congestion in the GP lanes prior to 2035. With a conversion to an Express lane existing capacity can be increased by approximately 10% and capacity in 2020 by 10%. However, by 2035 there would be no capacity available in the HOV lane. A study by the Alameda County Transportation Commission in 2006 concluded that the capacity of the single HOV lane will be reached prior to 2020 and as a result a second HOV lane between Tassajara Road and Vasco Road is being designed to be constructed in time for conversion to Express lane. With the added second Express lane the available capacity will be increased by about 20%.

  There is no recurrent congestion in the morning peak hours and the current HOV usage is about 200 vph. The utilization of HOV’s in expected to remain at 200 vph and to increase to about 700 vph by 2035. The increase in capacity by conversion to Express lane will be 18%, 18% in 2020, and 11% in 2035.

- Westbound**:** In the morning, the peak commute direction is in the westbound direction as San Joaquin residents headed to employment centers in the east and south bay that results in significant daily congestion. Currently there is no HOV lane in the westbound direction, however there is a planned HOV lane with an expected HOV lane usage of 800 vph in 2020 and 1800 vph in 2035. There is available capacity for an Express lane conversion in the interim, about 10% in 2020, which would improve the overall congestion prior to 2035 but similar to the eastbound direction the single lane capacity can be reached by 2020. With the added second Express lane the capacity will be increased by about 20%.

There is no recurrent congestion in the evening hours except at the approach to the I-680 interchange. The HOV usage in 2020 is expected to be at about 200 vph and in 2035 at about 1100 vph and the increase in capacity will be 18% in 2020 and 6% in 2035.

US-101 corridor from Cochrane Road in Santa Clara County to Whipple Avenue in San Mateo County a distance of nearly 42 miles in each direction. The Santa Clara County portion of this corridor is currently authorized for Express lane operations and a new legislation extended authorization into San Mateo County. Authorization also exists for the segment between Cochrane Road and the San Benito County Line.

Santa Clara and San Mateo County: The minimum occupancy requirement for HOV lane is 2+ and the mainline hours of operations are 5 - 9 a.m., 3 - 7 p.m., –Monday through Friday.

- Northbound**:** The peak direction of travel is in the morning peak and the HOV lane is currently at capacity with about 1600 vph around downtown San Jose. Congestion in the HOV lane occurs at around Mckee Road and between North First Street and Trimble Road. Traffic demand for HOV lane is expected to increase to about 2000 vph in 2035. Because of high demand for the HOV lane already, for a conversion to an EL an additional lane would need to be constructed to provide a two lane EL facility with the needed capacity. With a two lane Express lane, the mainline capacity will be increased by 27% immediately, by 25% in 2020 and by 20% in 2035.

  In the evening, the northbound HOV lane usage is about 800 vph north of SR 85 interchange in Mountain View. The HOV lane usage is expected to increase to about 1200 vph in 2035. There is currently capacity available in the HOV lane. With an Express lane conversion existing capacity can be increased by about 13% and available capacity in 2020 by approximately 10% and by approximately 7% in 2035. However, about 37% more capacity will be added in 2020 when the second Express lane is provided and 33% in 2035.

- Southbound**:** In the evening, the southbound direction is the peak commute direction. Similar to the northbound direction, the southbound HOV lane is currently at capacity with about 1650 vph in the evening peak with HOV congestion approaching the downtown area. Daily congestion and slow-downs in the general purpose lanes occur between Lawrence Expressway and Tully Road. Before conversion to an Express lane, an additional lane would need to be constructed to provide the needed capacity with a two lane Express lane facility. The expected HOV demand by 2035 is forecast to be at about 2100 vph. With the second Express lane, the overall capacity of the corridor is expected to increase by about 22% in 2020 and 18% in 2035.

In the morning, the southbound HOV lane usage is currently at about 1000 vph. This usage is expected to increase to about 1500 vph in 2035. There is currently capacity available in the HOV lane. With an Express lane conversion existing capacity can be increased by about 10% and available capacity in 2020 by 7% and by approximately 2% in 2035. However, in 2020 about 33% and in 2035 about 28% more capacity will be added when the second Express lane is provided.

State Route 85 corridor in Santa Clara County from southern US-101 interchange in south San Jose to northern US-101 interchange in Mountain View a distance of about 24 miles. This corridor currently has legislative authorization for Express lane operations. HOV lane minimum occupancy requirement, 2+, hours of operations 5 - 9 a.m., 3 - 7 p.m., –Monday through Friday on mainline.

- Northbound**:** In the morning, the northbound direction is the peak direction. The HOV lane is currently at capacity and mainline congestion between Santa Teresa Boulevard and Saratoga Avenue. The volumes in the HOV lanes are recorded to be at about 1200 vph but because of some slow down in the lane from SR 87 to north of Winchester Boulevard demand traffic are higher than what is recorded. The HOV lane usage is expected to increase by about 100 vph in 2035. To alleviate the current and future slow-downs in the HOV lanes an additional lane between Route 87 and I-280 where HOV demand is high will increase the available capacity by about 40% in 2020 and by 38% in 2035, when it is converted to Express lane.

  The evening peak will have capacity available but no recurrent congestion is expected to occur as this is/will be the off-peak direction and therefore no significant time saving will be realized except during incidents. The conversion to Express lane will increase the capacity by 33% and 25%. The capacity will increase significantly with the second Express lane.

- Southbound**:** The peak commute direction occurs in the evening hours with about 1200 vph HOV lane usage. Similar to the northbound direction, the HOV lane slows down between I-280 and Camden Avenue, which indicates that demand traffic is higher than the volumes recorded. As such capacity is not available. The HOV lane usage is expected to increase by an additional 300 vph in 2035. For a conversion to an Express lane an additional lane would need to be constructed between I-280 and Route 87 to provide a two lane Express lane facility. That will increase the current available capacity by about 35% in 2020 and 33% in 2035.

The morning peak will have capacity available but no recurrent congestion is expected to occur as this is/will be the off-peak direction and therefore no significant time saving will be realized except during incidents. The current capacity with the conversion to Express lane will be about 35%, 33% in future years and significantly higher with the second Express lane.

Estimated traffic conditions with 3+ minimum occupancy requirement:

Table below summarizes the expected added freeway capacity with conversion to three-or-more persons per vehicle in 2020, based on 3+ forecast data, for corridors currently operating with 2+ minimum carpool occupancy requirement (see attachment 3).

Estimated Increase in Total Capacity For Routes Requesting Express Lane Authority with 3+ occupancy requirement (peak hour)

County/Dir/Rte/Peak	One Express Lane		
	2010	2020	2035
ALA/CC EB I-80 (AM peak), 3+	-	No Change	No Change
ALA/CC EB I-80 (PM peak), 3+	-	No Change	No Change
ALA/CC WB I-80 (AM Peak), 3+	-	No Change	No Change
ALA/CC WB I-80 (PM Peak), 3+	-	No Change	No Change
SOL EB I-80 (AM Peak), 3+	-	NR	NR
SOL EB I-80 (PM Peak), 3+	-	NR	NR
SOL WB I-80 (AM Peak), 3+	-	NR	NR
SOL WB I-80 (PM Peak), 3+	-	NR	NR
ALA SB I-880 (AM Peak), 3+	-	2-3%	1-5%
ALA SB I-880 (PM Peak), 3+	-	1-2%	2-3%
ALA NB I-880 (AM Peak), 3+	-	2-3%	1-3%
ALA NB I-880 (PM Peak), 3+	-	2-7%	2-5%
CC ** NB I-680 (AM Peak), 3+	-	3-6%	1-5%
CC ** NB I-680 (PM Peak), 3+	-	2-8%	3-7%
CC ** SB I-680 (AM Peak), 3+	-	2-6%	3-6%
CC ** SB I-680 (PM Peak), 3+	-	3-8%	2-8%
SOL** NB I-680 (AM Peak), 3+	-	NR	NR
SOL** NB I-680 (PM Peak), 3+	-	NR	NR
SOL** SB I-680 (AM Peak), 3+	-	NR	NR
SOL** SB I-680 (PM Peak), 3+	-	NR	NR

Notes

NR: Not recommended until all HOV/EL gaps in the entire corridor are completed and connected to CC portion, or unless future traffic volumes for HOV/EL will be higher than is forecasted.

** The estimated capacity increase shown are for segments of I-680 in CC County south of the SR 24 interchange. A 3+ conversion north of SR 24 interchange in Contra Costa County and in the entire Solano County on either direction and in both future years is not recommended unless all gaps in the HOV/EL are completed, or unless future traffic forecast for HOV/EL will actually be higher than what is forecasted today.

SAN FRANCISCO BAY AREA BACKBONE EXPRESS LANES NETWORK

This evaluation is for all three corridors that are in the authorization request:

I-80 in Solano County: An increase in the minimum occupancy requirement to 3+ in the year 2020 is not expected to attract many users in the HOV/Express Lanes in Solano County and as a result it will increase traffic volumes in the general purpose lanes. However the added traffic volumes are not expected to cause congestion in the general purpose lanes but a 3+ requirement will cause HOV/Express lanes to be underutilized with low volumes, which can generate negative public reaction. As such increasing the occupancy requirement to 3+ in Solano County segment could be delayed until the last segment of gap closure project is completed, unless future traffic volumes for HOV/Express Lanes will actually be higher than is forecasted. Operating with the same occupancy requirement in the corridor without any gaps will ensure the continuity in the HOV/EL throughout this corridor.

I-680 in Alameda & Contra Costa Counties: An increase in the minimum occupancy requirement for I-680 HOV/EL to 3+ is expected to improve mobility for the segments south of the SR 24 interchange in both directions by the year 2020. But conversion to 3+ for segments north of SR 24 interchange could be delayed and evaluated later for years beyond 2020, unless future traffic volumes for HOV/EL will actually be higher than is forecasted. Conversion to 3+ for the segment north of the SR 24 interchange in 2020 in both directions will increase traffic volumes in the general purpose lanes however that is not expected to cause congestion in the GP lanes.

There is a gap closure project currently in preliminary evaluation phase for the southbound direction to connect the HOV lane north of the SR 24 interchange to the south of the interchange. If that project is completed by the year 2020 then the increase in minimum occupancy requirement to 3+ in the southbound direction will need to be implemented to avoid motorists' confusion. There is no cost effective project currently planned in the northbound direction of I-680 to connect the HOV lanes from south of the SR 24 interchange to the north of the interchange.

I-680 in Solano County: An increase in minimum occupancy requirement to 3+ for segments in Solano County is not expected to attract enough users to the HOV/EL. That would increase traffic volumes in the GP lanes however it is not expected to cause congestion on either direction. Beside the operational need, consistency in the minimum occupancy requirement on I-80 and I-680 in Solano County may be considered as one possible factor prior to change in the occupancy requirement.

I-880 in Alameda County: Increasing the minimum occupancy requirement to 3+ for this corridor in the Alameda County is expected to improve mobility in both directions.

SR 84 in Alameda County: Current peak hour usage of HOV lane is about 1,200 vph. It is expected that in the near future the capacity of the 2+ HOV lane will be reached. Increase in minimum occupancy requirement to 3+ will ensure time saving benefit for carpool and transit users is maintained. Conversion to Express Lane will therefore be necessary to alleviate the impact of additional traffic demand in the general purpose lanes by allowing access to the carpool lane by non-carpool lanes for fee. Prior to increasing the minimum occupancy requirement, the current legislation (AB 2132 enacted on January 1992) that mandated a two-or-more occupancy requirement must be amended.

SR 92 in Alameda County: Current peak hour usage of HOV lane is about 1,100 vph. It is expected that in the near future the capacity of the 2+ HOV lane will be reached. Increase in minimum occupancy requirement to 3+ will ensure time saving benefit for carpool and transit users is maintained. Conversion to Express Lane will therefore be necessary to alleviate the impact of additional traffic demand in the general purpose lanes by allowing access to the carpool lane by non-carpool lanes for fee. Prior to increasing the minimum occupancy requirement, the current legislation (AB 2132 enacted on January 1992) that mandated a two-or-more occupancy requirement must be amended.

IV. Considerations & Criteria for Operational Effectiveness:

In order to gain the operational benefits of the available capacity in the Bay Area HOV lanes through a conversion to tolling, certain considerations and criteria are required as follows:

- With careful conversion of HOV lanes to Express lanes, network capacity and vehicle throughput can be increased and mainline congestion can be reduced for all users. The amount of congestion reduction will depend on the surplus HOV lane capacity in the peak hour and other hours of the peak periods.

- Even on corridors where HOV lanes operate at or near capacity during the peak hour, surplus capacity is available during the shoulder hours of the peak commute periods for use by tolled vehicles.

- All pertaining Statutes of California Streets and Highway Code section 149, which mandate appropriate traffic flow guidelines for the purpose of ensuring optimal use of the Express lanes by high-occupancy vehicles without adversely affecting other traffic on the state highway system, will be met.

- Priority for buses and carpools must be maintained. Current statutes require the HOV and Express lanes to operate at LOS C/D or better with operating speeds of 45 MPH or more. Tolls will be set dynamically based on traffic volumes and traffic conditions in both the Express lane and adjacent general purpose lanes. If the mandated level of service cannot be maintained consistently during certain periods, then the lane would be operated only as an HOV lane at those times. Thus, the proposed Express lanes must be operated such that capacity is never exceeded and operating speeds remain at or above 45 miles per hour to maintain time savings benefits.

- Maximizing use of the Express lane will require that access to the lane have as few restrictions as possible. The recently developed Caltrans Managed Lane Guidelines will be used to ensure that the most appropriate access design will be implemented.

- The access configuration for express lanes will need to be designed carefully to avoid operational impacts. The limited access configuration on the existing express lane on southbound Ala-680 has resulted in a reduction in the number of HOVs using the lane. District 4 is currently evaluating the possibility of implementing Express lanes with no access control on other corridors. The recently published Caltrans' Traffic Operation Program Policy Directive requires detailed analysis of all managed lanes in accordance with Streets and Highway Code section 149, which call for competent engineering estimates to be made on the effects of a managed lanes on safety, congestion, and highway capacity prior to constructing such lanes. Analysis will be done for 20 years after implementation to ensure future safety and mobility of freeways is preserved. See Attachment 1.

  It is intended that during the project level analyses for any future Express lanes, specific access configuration(s) will be analyzed in detail to ensure all concerns and impacts are addressed.

- Some HOV lane facilities have already reached capacity in parts of some corridors. If capacity in the peak hour throughout the corridor is not available, due to significant ridesharing, and widening is not feasible, consideration may be given to raising the minimum HOV occupancy requirement either during the entire peak period or the peak hour, subject to analyses of impacts in the general purpose lanes, and upon significant stakeholder and public outreach.

  Raising the minimum HOV occupancy is expected to associate significant public resistance and may increase congestion. Increasing the minimum HOV occupancy requirement from 2+ to 3+ passengers per vehicle can ensure time savings incentive for transit and qualified HOV lane users. However, absent increased transit use and formation of 3+ carpools, moving the existing (made ineligible) 2+ occupancy vehicles into the general purpose lanes can result in increased congestion. If not mitigated, the added congestion will negatively impact mobility and will most likely result in public dissatisfaction. The negative result will be particularly apparent in those corridors where with 2+ occupancy carpool eligibility, congestion in the HOV lanes is not significant in magnitude; occurs only for a short period; and/or occurs only at few isolated spots within a long corridor.

Accordingly, to ensure public acceptance and to avoid increased congestion, any increase in the minimum occupancy requirement for an existing HOV facility, when warranted by analyses and convincing data, would have to start with a short period of time during the hours that HOV lane is congested, and must then revert back to the lower occupancy requirement when congestion in the HOV/Express lane is not present. The hours that the change in occupancy requirement is necessary must be well publicized in advance and supported by clear signing (e.g. changeable message signs along the corridor). Prior to that change, a detail analysis and evaluation using up to date traffic volumes would have to be completed to make sure impacts to the general purpose lanes are minimized. Prior to any change, all stakeholders, including the California Highway Patrol will be consulted, and the motoring public will be notified and full aware.

Additionally, to ensure optimum operations and to avoid motorists' confusion, careful consideration must be given towards consistency and continuity of the carpool occupancy requirements and operations along the network and within long transportation corridors. Changes in carpool occupancy requirement within a corridor may only be introduced at locations where the change is readily apparent to motorists through an accompanying gap in the HOV/Express lane.

- Interstate 80 HOV lane in Alameda County is already operating at capacity during the morning commute. As a result, operating this segment of the I-80 corridor as an Express lane during the period of greatest congestion will be challenging. Raising the HOV eligibility requirement from 3+ to 4+ would free up capacity to operate as an express lane, but is not practical. A 4+ minimum HOV occupancy has not been attempted anywhere in the state or in the nation. Adding new lanes in this corridor is not feasible as there is no available right-of-way for widening. This HOV lane does, however, have surplus capacity available in the shoulder hours of the peak periods. There is also CMIA-funded project that will add ITS elements in the corridor to improve safety and the associate operational improvements. These elements will provide the infrastructure needed to enable a more flexible mode of operation of an Express lane that may be needed in this corridor. However if the express lane continues to operate at capacity in the peak commute hours even with higher tolls then the lane would be operated only as an HOV lane at those times.

- If a significant portion of an HOV/Express lane nears or reaches capacity, in order to alleviate congestion in the Express lane and/or to avert increased congestion in the general purpose lanes, additional lanes will be considered where feasible, other alternatives may be considered:

  a) Full-time conversion: This will reduce confusion and will help for a better trip planning, but it could add to congestion particularly at shoulder hours of the peak and in the off-peak hours. The congestion may be alleviated with pricing to entice an appropriate number of vehicles into the Express lane; thus, reducing congestion in the general purpose lanes. It should be noted that an increase in minimum HOV occupancy requirement subsequent to opening has not been tried in this region, and would be challenging politically as such an action will be considered a "take away" by motorists.
  b) Part-time conversion: A higher HOV definition could be employed only during the height of the peak when additional capacity is needed, and revert back to the lower occupancy requirement at all other times. This approach could cause motorist confusion, without sufficient advance notice to motorists, but may be more politically acceptable as drivers in northern California are already accustomed to part time HOV operation.
  c) Graduated tolling scheme: This will include cost savings for carpools such as free passage for 3+ carpools and/or 50% discount for 2+ carpools.

  These alternatives will likely impose other requirements for carpoolers such as carrying transponders in their vehicles or advance registration that need to be evaluated before implementation, as needed, consistent with applicable or enabling legislation.

- Hours of operation for Express lanes must be carefully analyzed and selected to avoid creating unnecessary congestion or a poor public perception. In San Francisco Bay Area, where carpool lanes are operated part-time only, 24/7 operations help clearly distinguish the Express lanes from HOV lanes. However, tolling during the off-peak periods can be viewed as a takeaway and excessive by the motoring public, or potentially leading to an unused lane (or capacity) during certain periods. Therefore, Express lane hours of operation must be selected upon a careful evaluation while keeping in mind congestion periods, carpool/transit and solo volume patterns, potential impacts on general purpose lanes, and consistency within the corridor.

- While certain operational or characteristic variations within individual corridors are expected, certain aspects of the San Francisco Bay Area Express Network must remain uniform and consistent throughout the transportation system, including the seven state operated toll bridges and the Golden Gate Bridge, particularly as viewed by motorists. These include a uniform tolling system including the existing FasTrak® transponders used at toll bridges and a common customer service center.

- Express lane tolling operations will also need to be integrated with tolling and/or metering operations at the Bay Area toll bridges so that carpoolers and toll-paying solo users pay their applicable bridge tolls along with the respective and dynamically priced Express lane toll. Special care must be exercised to ensure that the dynamic pricing is set such that downstream capacity on the toll bridges' mainline sections is not exceeded by solo drivers from the Express lane.

- A change in the minimum carpool occupancy requirement from 2+ to 3+ is only considered as an strategy to enhance transit operations and to provide an incentives for ridesharing. Accordingly, such a change would be deferred to only when justified by congestion in the carpool lanes and only if adding an additional carpool (or Express) is determined infeasible. A change in the minimum occupancy could also entail a respective change in carpool operational hours, including weekends, and may include staggered eligibility (2+ or 3+) depending on time of day during the day. It is expected that a change in the minimum carpool eligibility requirements would result in increased traffic volumes in the adjacent general purpose lanes and would accompany additional congestion, at least initially while the intended increase in usage of transit and ridesharing take effect. As an augmenting strategy, tolling and Express lane operations can help reduce this impact by allowing solo drivers access to the carpool lane, not only reducing demand and congestion in the adjacent lanes but also helping attain optimum efficiency and full capacity of the system.

  Such changes are expected to be applied incrementally over time and on a corridor by corridor basis upon detailed analyses of needs, and as needed to maintain the integrity of carpool operations. More specifically and by way of an example, a change to 3+ carpool occupancy within the proposed Express Lane Network and years 2020/2035 planning scenarios, is expected to increase capacity on Interstate 880 in Alameda County and the portion of Interstate 680 in Contra Costa County south of the State Route 24. Conversely, the portion of Interstate 680 in Contra Costa County north of the State Route 24 and in Solano County, a 3+ occupancy requirement is not expected to attract enough carpool and/or Express Lane users to increase the freeway capacity (although at the same time also not expected to cause congestion in the general purpose lanes). Similarly, the Express Lane on Interstate 80 in Solano County will be underutilized with 3+ minimum occupancy requirement but that also is not expected to cause congestion in the general purpose lanes. As such, conversion to 3+ carpool occupancy for segments of Interstates 80 and 680 in Solano County, and the portion of Interstate 680 north of State Route 24 in the Contra Costa County, can be delayed to completion of the existing gaps in carpool lanes within those corridors.

V. CONCLUSION

With the criteria stated above and with careful evaluation and detail analyses at project level for each corridor, the implementation of an Express Lane Network is expected to be beneficial in reducing overall congestion on the Bay Area freeways and in improving trip reliability.

With an appropriate marketing and revenue generation scheme, Express lanes would provide an opportunity for additional funding for reinvestments within each corridor and the region to expand and complete the HOV network, improve transit facilities and services, or other congestion-reducing roadway improvements decades sooner than would be possible by using the traditional state and federal funding sources.

Overall, the proposed Express Lane Network is consistent with the Caltrans' Traffic Operations Program's goals, including preserving safety, enhancing mobility, real-time multimodal transportation system management, and providing choice and control for travelers. In addition, the Express lane network also allows Caltrans to engage in innovative solutions, potentially involving public-private sector partnerships, in addressing transportation challenges.

Attachment 1

Traffic Operations
Policy Directive
No. 11-02

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

TRAFFIC OPERATIONS POLICY DIRECTIVE

TR-0011 (REV 08/2009)

ROBERT COPP, DIVISION CHIEF (Signature)	NUMBER 11-02	PAGE 1 OF 12
SUBJECT: Updated Managed Lane Design	DATE ISSUED 3/23/2011	EFFECTIVE DATE 4/7/2011

DISTRIBUTION

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- ☒ Headquarters Division Chiefs for:

  Design, Project Management, Planning

DOES THIS DIRECTIVE AFFECT OR SUPERSEDE ANOTHER DOCUMENT? ☒YES ☐NO	IF YES, DESCRIBE High Occupancy Vehicle Guidelines for Planning, Design, and Operations
WILL THIS DIRECTIVE BE INCORPORATED IN THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (CA MUTCD) ☒YES ☐NO	IF YES, DESCRIBE Chapters on preferential lane signing and pavement markings to be included in the next edition of the CA MUTCD

DIRECTIVE

In California, managed lanes include high occupancy vehicle (HOV) lanes, high occupancy/toll (HOT) lanes, and express toll lanes. The latter two are referred to generally as "Express Lanes".

The California Department of Transportation (Department) "2003 High Occupancy Vehicle Guidelines for Planning, Design, and Operations" (HOV Guidelines) and the content of this Policy Directive (Directive) shall be applied during the planning and development of freeway managed lane projects, including conversions of existing managed lanes to incorporate tolling or utilize continuous access. It shall be considered during the planning and development of all other freeway improvement projects (e.g. pavement rehabilitation projects) and during the course of traffic investigations that are addressing operational and safety performance deficiencies.

For ongoing projects, changes to the project design pursuant to this Directive shall be determined by the project manager and project engineer in consultation with the Headquarters' Traffic Operations Liaison (Traffic Liaison) and the district HOV program coordinator. The decision to implement the requirements of this directive will be based on the potential benefits and impacts to the project scope, cost and schedule. **The consultation and recommendations shall be documented in the form of a memorandum for the project files with the signature of the Traffic Liaison indicating concurrence.**

Retrofitting of existing facilities will not be required unless physical conditions for that facility change, such as a change in access type or an HOV-Express Lane conversion.

The technical content of this Directive represents best engineering practices and requirements that will be incorporated into the next edition of the HOV Guidelines. This Directive also incorporates material from the most recent (2009) edition of the federal Manual on Uniform Traffic Control Devices (federal MUTCD). This material will be incorporated into the next edition of the CA MUTCD.

The following principles are expected to guide decision-making on the development and/or operations of managed lanes:

- Employ a systems management approach; managed lane strategies can affect the performance of the entire freeway system. The focus should not just be on the operation of the managed lane and its mobility benefits.
- Balance system performance and overarching goals, including safety, mobility, delivery, stewardship, and customer service when selecting and analyzing project alternatives and key features.
- Consider increasing occupancy requirements if HOV lanes are experiencing severe congestion.
- Consider planning for two managed lanes in each direction of travel if analysis determines it to be practical and beneficial.
- Consider implementing congestion pricing to utilize the full capacity of under-utilized HOV lanes if analysis determines it to be practical and beneficial.
- Ensure uniformity and consistency in the appearance of facilities within a region as much as possible; unique conditions and situations may require unconventional treatment(s).
- Ensure enforcement considerations are taken into account. Consult the California Highway Patrol (CHP) during project development.
- Consult with the Traffic Liaison to ensure that emerging best practices and recent "lessons learned" from collision analysis and research are fully considered and implemented.

MANAGED LANES ACCESS

Managed lanes in California utilize either:

- Limited-access designs (via physical barriers or barrier striping within a buffer space) which may include intermediate access openings.
- Continuous-access designs (contiguous/non-separated).

<u>When planning managed lanes, consideration should be given to both access types.</u> The choice of access type is based on a general evaluation of the performance and management benefits for the entire freeway as well as the capital costs of building and operating the facility. See Attachment 2 for a summary of design, cost and performance considerations for the two types of access designs. Various research and engineering studies on managed lane facilities have found that the highway features that can have the greatest affect on performance, including safety and throughput, are:

- The frequency, location, type and design of intermediate access openings on limited-access facilities.
- Shoulder widths.
- Traffic control and safety devices that provide positive guidance (usually related to access points and driver decision-making, such as overhead signing, striping, and lighting).

For additional information and reference material, see the Background section of this Directive and Attachment 1.

Managed lanes may also utilize drop ramps to and from local streets and direct connectors to and from managed lanes on other freeways. These provide system connectivity with the least potential for adverse performance impacts by allowing traffic to directly exit or enter the managed lanes without weaving across adjacent general-purpose lanes. <u>Drop ramps and direct connectors should be considered where substantial congestion in the general-purpose lanes exists or is expected and there is a significant local demand for access to or from the managed lanes</u>. Refer to Sections 3.7 and 3.8 of the HOV Guidelines for more information.

MANAGED LANES ENGINEERING STUDY REQUIREMENTS

Section 149 of the Streets and Highways Code requires that competent engineering estimates be made of the effects of a managed lane on safety, congestion, and highway capacity prior to constructing such lanes. **A traffic study shall be performed for all managed lane projects. This study shall be composed of an operational analysis and a safety analysis.** This traffic study replaces the "HOV Report" located in Appendix B of the HOV Guidelines. The objective of the study is to determine if, and to what extent, the design of the managed lane will meet the performance thresholds and guidance provided in this Directive, as well as any other thresholds the district or project sponsor may establish. **For new projects, the traffic study shall be conducted as early as reasonable during project development.** Ideally the study is conducted during development of the project initiation document (PID) to confidently establish an accurate cost, scope and schedule for the project. Alternatively, a more general assessment or technical evaluation may be adequate during the PID phase in order to:

- Identify potential performance problems for further study.

- Identify the scope of (and resources need for) a formal traffic study to be performed at the start of the Project Approval and Environmental Document phase.

The following information and assumptions shall be identified and utilized as part of the traffic study:
- **Design year peak-hour volumes for the managed lane(s), general-purpose lanes, and adjacent general-purpose ramps. The design year shall be 20 years from the date when the project is scheduled to be completed and opened to traffic as per Highway Design Manual (HDM) Index 103.2.**
- **The design year peak-hour volume of vehicles expected to use access locations.**
- **The types of vehicles expected to use the freeway facility (e.g., transit or trucks).**
- **Geometric constraints on the managed lanes and general purpose lanes, including known and expected bottlenecks and associated queues.**

The operational analysis is to be performed using a methodology that is acceptable to the district and the project sponsor. **The operational analysis shall:**
- **Evaluate the characteristics of the entire freeway facility, including both the managed lane(s) and the adjacent general purpose lanes.**
- **Include a merge/diverge analysis of any drop ramps or direct connectors that may be utilized on the managed lane.**
- **Evaluate the operational impacts of intermediate access openings on a limited-access facility.** Section 4.3 of the HOV Guidelines states that the operation of weaving sections at access openings needs to be considered. See the section on limited-access managed lanes design and performance considerations for more details.

The traffic safety analysis shall be performed by or approved by the district traffic safety office. This analysis will focus on the safety impact of the proposed improvements on operating conditions and collision potential by utilizing traffic and collision data and analytical tools and processes. This is especially important when the project proposes a change in the type of access. This safety analysis is independent of the broader safety review process that is required per HDM Index 110.8.

GENERAL MANAGED LANE DESIGN AND PERFORMANCE REQUIREMENTS

Geometric design of managed lane projects, including lane and shoulder widths, shall conform to the HDM. Deviations from the requirements of the HDM shall be evaluated and approved on a case-by-case basis in the manner prescribed in HDM Index 82.2. Section 3.10 of the HOV Guidelines provides a priority listing for reductions in cross-sectional elements for various managed lane geometric configurations. **This priority listing shall be utilized in the development of managed lane projects where reductions to cross-sectional elements are deemed necessary.**

State law mandates that HOT lanes operate at a Level of Service (LOS) of "C" or better (LOS "D" may be used if the Department and the operator agree). In addition, federal law mandates that HOT lanes and HOV lanes that are used by non-carpool decaled clean-air vehicles operate at a minimum speed of 45 miles per hour during the peak hour no less than 90 percent of the time over a 180-day period. **These performance thresholds shall be taken into consideration when designing a managed lane project.**

LIMITED ACCESS MANAGED LANES DESIGN AND PERFORMANCE REQUIREMENTS

Limited access operation can be implemented with the use of physical barriers or "barrier" striping to separate the managed lane from the adjacent general purpose lanes. A buffer space is typically provided to accommodate barrier striping and other traffic control devices or features (e.g. reflective markers or channelizing devices). The recommended buffer width is 4 ft (ft). However, this width may be reduced as outlined in the priority listing in Section 3.10 of the HOV Guidelines.

Limited access may be used for Express Lanes in order to designate access/tolling points and minimize toll evasions.

Access to and from a limited-access managed lane is primarily provided through at-grade access openings. At-grade access openings also referred to as at-grade ingress and egress, allow vehicles to move into the managed lane from the adjacent general-purpose lanes and vice versa. The different types of at-grade access openings (see Attachment 3) include:
- "Weave Zone": Combined ingress and egress created by short breaks in the barrier striping at carefully selected locations.
- "Weave Lane": Combined ingress and egress, which is facilitated by a weave or speed, change lane. The inclusion of a weave lane minimizes the potential for unstable flow or turbulence along the "crown" weave due to the speed differential between the managed lane and mixed flow lanes.
- "Merge Lane": Separated ingress and egress utilizing dedicated merge lanes. This design separates operational maneuvers and provides drivers with a better opportunity to adjust their speed to match that of the traffic stream into which they are merging. This further reduces the potential for unstable flow.

Any one or all three of these types of at-grade access openings may be adequate for a given location. The type of access opening used in a corridor should be consistent to better satisfy driver expectations. Site-specific operating conditions may warrant the use of a different type. Variations will typically require mitigation in the form of additional signing, enhanced pavement markings, lighting, and/or other traffic control, management, or safety systems.

Existing interchange spacing is the primary consideration for determining the location of access openings. An equally important consideration is the existing and expected location of mainline operational bottlenecks and geometric constraints that produce recurrent congestion and queuing along the general purpose lanes. Access openings should be located and designed such that they will perform at Level of Service (LOS) "C" or "D", as per HDM Index 504.7. They should not produce adverse impacts to managed lane and general purpose lane performance, nor should they be placed where recurrent general purpose lane congestion is expected. This avoids the potential for undesirable conditions that result in operational and safety deficiencies. If the mainline queuing at a proposed access location is limited to a small portion of the overall peak period, then a "weave lane" or "merge lane" configuration might need to be evaluated and provided if it will eliminate or minimize adverse impacts.

Access openings should have a minimum length of 2000 feet (ft). A minimum of 800 ft per lane change should be provided between the opening and the nearest freeway entrance or exit ramp. These lengths should also be utilized at the beginning and ending of managed lanes. These changes supersede the measurements shown in Figure 4.2 of the HOV Guidelines. A figure showing the new measurements for access openings is provided in Attachment 3.

The type and location of proposed access openings shall be determined by the operational analysis. It is expected that an iterative process would be used. For example, an access opening using the simplest design and minimum lengths might be evaluated first. If the analysis supports this concept, then no further analysis of that location is necessary. Otherwise, the process would continue until an appropriate concept is identified, or all concepts are exhausted. The iterative process may require consideration of the following modifications or features (not necessarily in this order):

- Increased weaving lengths.
- Alternative types of access.
- A second managed lane in the vicinity of the opening.
- Relocation of the access opening.
- The addition of auxiliary lanes connecting ramps on the general purpose lanes.
- The use of drop or direct connector ramps.

Proposed access openings that are estimated to operate below the performance thresholds or use less than the minimum lengths or spacing shall be subject to the review and written concurrence of the Traffic Liaison. Approval will be considered when the need for the opening is justified by traffic data and the safety analysis and if traffic impact mitigation is incorporated. Approval may also require specific system monitoring to identify and correct potential performance deficiencies.

Lighting shall be provided for each access opening to facilitate decision making and lane changing maneuvers during hours of darkness. Deviations from this requirement shall be approved by the Traffic Liaison. Lighting will alert drivers that they are approaching left side weaving sections where lane changing and turbulence may be concentrated. Lighting should also be considered for freeway segments located between an access opening and a freeway-to-freeway interchange when the access serves that interchange. This is due to the higher weaving volumes and higher number of lane changes expected in these areas. Contact the district Electrical Design office for information on lighting requirements and assistance in the location and design of all lighting systems.

CONTINUOUS-ACCESS MANAGED LANES DESIGN AND PERFORMANCE REQUIREMENTS

Continuous-access managed lane facilities are designed to allow vehicles to enter or leave at any point. No specific ingress/egress locations are designated. Instead, vehicles move into and out of the managed lane at any point in the same way, they would change lanes in the general-purpose lanes.

Traditionally, continuous-access facilities have only been employed in areas with shorter durations of directional congestion during peak commute traffic periods. However, continuous-access operation may be utilized whether the managed lane operates full-time or part-time. Detail M-2 in the HOV Guidelines shows an option for full-time continuous-access managed lanes.

A limited-access facility may be converted to a continuous-access facility if the conversion is funded by the project sponsor requesting the change. **A traffic study, as described in this directive, shall be required for any conversion project.**

If a new or conversion project is on a route where Express Lanes are planned within the next five years, and there is an intent to operate the Express Lane with continuous access, joint consultation shall be conducted between the project

sponsor, the Department and the CHP to identify strategies in limiting violations. Final recommendations from each entity shall be documented in the project file. Frequent toll readers, visible manual enforcement, and other innovative strategies are expected to be considered.

MANAGED LANES STRIPING AND PAVEMENT MARKINGS REQUIREMENTS

When physical barriers are used to limit access, the facility shall be striped in accordance with Section 3B.23 of the CA MUTCD.

When barrier striping is used to limit access, the facility shall be striped in accordance with the requirements of Chapter 5 of the HOV Guidelines. Paint, rather than thermoplastic, should be used. The 2009 edition of the federal MUTCD requires the use of parallel wide solid white stripes on limited access managed lanes to prohibit and restrict lane changing. The Department is in the process of adopting this standard, pending an amendment to the California Vehicle Code. Using paint for the barrier striping will allow for easier conversion to the federal standard once it is adopted.

Continuous-access facilities shall be striped in accordance with the requirements of Section 3B.23 of the CA MUTCD. The 2009 edition of the federal MUTCD provides several different options for continuous access striping. The Department is performing engineering studies that will lead toward the selection and adoption of one of these options.

The diamond symbol pavement marking shall only be used on HOV lanes. An "HOV LANE" pavement marking shall be used on HOV lanes; the "CAR POOL LANE" pavement marking shall not be utilized. For other types of managed lanes, the appropriate pavement marking, such as "BUSES ONLY", "FASTRAK ONLY" (when all users must have an electronic toll collection transponder) or "FASTRAK OR HOV ONLY" (when only vehicles not meeting the occupancy requirement must have a transponder), shall be used. Markings should be placed along the managed lane as shown in Chapter 5 of the HOV Guidelines.

Deviations from these requirements shall require the concurrence of the Traffic Liaison. The Traffic Liaison should be consulted prior to finalizing striping plans for a managed lane in order to receive the latest guidance and direction.

MANAGED LANE SIGNING REQUIREMENTS

Overhead advance guide signs shall be provided at least 0.5 mile prior to the beginning of limited-access HOV facilities. Overhead guide signs shall be provided at the beginning of and at subsequent at-grade access openings to limited-access HOV facilities. These signs shall conform to the E8-3 and E8-2 signs shown in Figures 2G-5 and 2G-6 of the 2009 edition of the federal MUTCD. An overhead advanced guide sign may also be used in advance of at-grade access openings. **The R87-1(CA) overhead sign shall be placed at the beginning of the buffer or barrier separation.** These requirements amend the figures shown in Details M-1 and M-4 of the HOV Guidelines. The additional guide signs and the adjustment of the regulatory signs are expected to help facilitate driver decision making by more clearly identifying access openings, especially for drivers who are eligible to use the HOV lane and have just entered the freeway.

The R86(CA), R86-2(CA) or R86-3(CA) and R93-2(CA) signs shall be repeated as a package at half-mile intervals along the length of a facility and shall be placed just downstream of where drop ramps or direct connectors merge into the facility. This requirement amends the figures shown in Details M-1 through M-4 of the HOV Guidelines.

Signing for managed lanes that utilize pricing (Express Lanes) should comply with Sections 2G.16 through 2G.18 of the 2009 edition of the federal MUTCD until the adoption of the next edition of the CA MUTCD.

Deviations from these requirements shall require the concurrence of the Traffic Liaison. The Traffic Liaison should be consulted prior to finalizing signing plans for any managed lane in order to receive the latest guidance and direction.

MANAGED LANE ENFORCEMENT REQUIREMENTS

Enforcement strategies and features shall be considered during the planning, design, and operational phases of all managed lane projects. Enforcement of managed lanes is important to maintain flow, safety, and system management capabilities. Violators could impact flow rates and impact the ability of the operating agency to manage accordingly. With any access type, enforcement requires some investment and strategy for zones, systems, and personnel. Due to the personnel cost and traffic impacts of comprehensive manual enforcement, automated enforcement technology may be used once it is demonstrated to have an acceptable degree of accuracy. Until then, occupancy verification requires manual observation, which can be complex given tinted windows and obscured viewing into vehicles.

Section 6.4 of the HOV Guidelines provides guidance for enforcement area configurations utilizing the median shoulder. **Median shoulder enforcement areas shall only be used when the managed lanes are separated from the general purpose lanes by a physical barrier (such as vertical pylons or a concrete wall).** CHP policy only allows enforcement stops in the median shoulder under these conditions.

Observation areas should be used on the median shoulders of facilities that do not utilize physical separation. They may be used on facilities that utilize physical separation. **The provisions in Section 6.4 of the HOV Guidelines related to the placement of median shoulder enforcement areas shall be applicable to observation areas.** Observation areas should be placed downstream of intermediate access points on limited-access facilities and downstream of drop ramps and direct connectors. The recommended dimensions for an observation area are a width of 14 ft and a length of 100 ft, preceded by a 15:1 taper and followed by a 50:1 taper.

Enforcement plans for Express Lane operations shall be developed jointly between the CHP, the Department, and the project sponsor.

DELEGATION

No new delegations of authority are created under this policy.

BACKGROUND

Managed lanes are lanes that are proactively managed in response to changing conditions and are increasingly used nationwide to deal with the increasing congestion and limited resources. The term "managed lanes" may refer to:

- HOV lanes: Buses, vans, and cars with more than one person use these lanes.
- Express Lanes: Managed lanes that utilize congestion pricing:
  - HOT lanes: An HOV lane that allows vehicles with lower occupancy to have access to the lane by paying a toll. The lanes are kept free-flowing by dynamic and congestion-based tolling, a strategy supported by the Department and the Federal Highway Administration. Tolls may change based on real-time conditions (dynamic) or according to a schedule (static).
  - Express toll lanes: Facilities in which all users are required to pay a toll, although HOVs may be offered a discount. They also utilize electronic tolling and congestion pricing. The 91 Express Toll Lanes are the only such facility in California.

Strategic goals of managed lane projects are:

- Decrease congestion duration and reduce congested locations.
- Increase person-throughput on a corridor by increasing vehicle occupancy, whether through carpooling, vanpooling or transit.
- Decrease per-person air quality impacts.
- Increase congestion avoidance choices for the public.
- Increase predictability of travel by reducing variations in delay.
- For Express Lanes, generate revenue for corridor transportation improvements that include transit and closing gaps in the managed lane network.

The type of managed lane facility utilized will be generally based on regional needs, physical and geographic setting, and unique fiscal circumstances. Due to tolling authority laws in California, Express Lanes are typically initiated by, and jointly operated with, regional transportation agencies. This relationship requires policies and standards that can be applied consistently statewide yet be flexible enough for local needs.

The Division of Traffic Operations is participating in a statewide effort to enhance California's network of managed lanes through improved performance management, partnerships, and design/operation strategies. Regional Transportation Plans contain Express Lanes as congestion management and greenhouse-gas reduction strategies. Regional partners are developing managed lanes projects for imminent use in the San Francisco Bay, Inland Empire and Los Angeles areas. The updated guidance is expected to:

- Improve the performance of managed lanes in a cost effective manner.
- Ensure a system management approach that will include all lanes.

- Mitigate the driver performance impacts resulting from the increased complexity of freeways with managed lanes.
- Provide flexibility for regional decisions.
- Provide needed compliance with federal standards.
- Provide consistent methodology statewide.

While many sections of the HOV Guidelines remain valid, some additions and revisions are needed to communicate updated knowledge and policy to internal and external partners. This Directive addresses only the most-urgently needed guidance updates. Further updates and broader topics will be updated during 2011 and 2012. This effort has been supported by the findings and recommendations of a parallel initiative (Strategic Highway Safety Program Challenge Area 5) which is focused on the impacts of our evolving and increasingly complex metropolitan freeway infrastructure and operating conditions on driver performance and safety outcomes. See Attachment 1 for a summary of this background knowledge.

This Directive is a result of the following developments.

- Increasing congestion has led to a need to coordinate strategies, use all available freeway capacity and resources, and maximize performance of corridors.
- Research and corridor specific engineering studies concerned with performance deficiencies have expanded our understanding of the design, operational and safety features that affect managed lane and freeway system performance.
- Safety research has produced findings that supersede previously established knowledge and practices regarding managed lanes. See Attachment 1 for a summary of findings and recommendations from the 2009 report, "A Comparative Safety Study of Limited versus Continuous-Access High Occupancy Vehicle (HOV) Facilities", and the research team's collaboration with the Department's traffic safety engineering practitioners and specialists.
- Lessons have been learned from managed lane access conversion projects in southern California.
- The Department has committed to updating technical guidance and increasing statewide consistency and flexibility in managed lane operations.
- The 2009 edition of the federal MUTCD contains new managed lane signing and striping policies. There is a more stringent requirement for California to be in substantial conformance with those policies.
- There is intensifying interest in implementing Express Lanes immediately in many urban areas of the state.
- Express Lanes are relatively new to the nation and California's project development process, and as such little policy guidance exists.
- Lessons have been learned from implementation of Express Lanes in other states in the last three years.

DEFINITIONS

When used in this Traffic Operations Policy Directive, the text shall be defined as follows:

1) **Standard:** A statement of required, mandatory or specifically prohibited practice. All standards text appears in **bold** type. The verb **shall** is typically used. Standards are sometimes modified by Options.

2) <u>Guidance</u>: A statement of recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate. All Guidance statements text appears in <u>underline</u> type. The verb "should" is typically used. Guidance statements are sometime modified by Options.

3) Option: A statement of practice that is a permissive condition and carries no requirement or recommendation. Options may contain allowable modifications to a **Standard** or <u>Guidance</u>. All Option statements text appears in normal type. The verb "may" is typically used.

4) Support: An informational statement that does not convey any degree of mandate, recommendation, authorization, prohibition, or enforceable condition. Support statements text appears in normal type. The verbs "shall", "should", and "may" are not used in Support statements.

ATTACHMENTS

Summary of Background Knowledge

Updating perspective on the performance of freeways with continuous-access HOV lane operation

In 2009, a University of California at Berkeley / Partners for Advanced Transit and Highways research team completed a comprehensive study of California freeways with HOV lanes. The research team compared collision data analyses for large samples of freeway facilities with continuous-access and limited-access HOV lanes. Contrary to the technical opinions presented in the current HOV Guidelines, the research team found that HOV facilities with limited access operation offer no safety advantages over those with continuous-access operation. A higher percentage of collisions were concentrated on the sample set of limited-access HOV lanes, which also had higher collision rates compared to the sample set of continuous-access HOV facilities.

The research team and the Department's traffic safety practitioners then identified the various design, operational, and safety features that affect the performance of freeways with limited access operation. The most prominent of these features include: access configurations, weaving sections (i.e. the type and length as determined by the location, spacing, and design of access openings), lighting, shoulder width, overhead signing, and pavement delineation.

Similar studies by the Texas Transportation Institute support these findings. The Department adopted a policy in 2008 that allows for the conversion of limited-access facilities to continuous access and continues to support continuous access as a HOV lane design that provides safety and throughput performance in a more cost-effective manner.

Updating design criteria for the length and location of access openings for limited-access HOV facilities

During the last several years of evaluating safety and mobility performance issues associated with HOV lane access points, substantial changes to access opening location, spacing and geometry have become clearly necessary. Bottlenecks and collision concentrations stem from the complex weaving action of vehicles at these access points, and across all freeway lanes between freeway entrances/exits and the HOV lane access points. As volumes increase, the impact of this weaving activity on freeway and driver performance becomes more intense, and eventually requires remediation through infrastructure adjustments and enhancements:

- General collision studies in California support increasing the weaving length at and between access openings beyond the current practices found in the HOV Guidelines.
- Nationally recognized research findings and products recommend longer openings and longer distances for the weaving along and between successive access openings. Prior and current national practice allows for a 1000-foot minimum access opening, and (two-sided) weaving lengths that are based on providing 500-800 ft per lane change.
- Based on the above research findings, and years of experience managing location-specific operational and safety problems, the Department's freeway operations and traffic safety engineering practitioners recommend the following changes to our standard practices:
    - increase the minimum access opening length from 1300 ft to 2000 ft, and
    - increase the "per-lane change" distance from 650 ft to 800 ft in order to avoid pushing drivers to make consecutive lane change maneuvers across the entire freeway
- Enhancements will include the expanded use of lighting, pavement delineation, and overhead signing (see next section).

While the updated criteria are substantiated, flexibility is needed when applying the criteria at the project level. The aforementioned engineering practitioners should use analytical tools, consult with the Department technical reviewers and specialists, and then exercise engineering judgment to determine the site-specific best fit. This will often be an iterative process.

<u>Updating signing and lighting of limited-access designs</u>

Express Lane signing is new to the industry, was just added to the 2009 edition of the federal MUTCD and in May 2010 was accepted by the California Traffic Control Devices Committee for addition to the next (2011) edition of the CA MUTCD. In addition, the Department's freeway safety team (comprised of district and headquarters traffic safety staff and the Traffic Liaisons) recommended the use of lighting along all limited-access openings. This was based on research and the collision studies performed in support of the Strategic Highway Safety Program Challenge Area 5 Action Plan. Speeds, weaving volumes and density are high and headlight glare prevail especially during the critical periods just prior to the morning peak period, and just beyond the evening peak period. Overhead lighting will mitigate the impact of adverse infrastructure and operating conditions (headlight glare, narrow shoulders, and speed differential) on HOV and Express Lane drivers attempting to execute the complex weaving maneuvers required.

A selection of references:

1. A Comparative Safety Study of Limited Versus Continuous Access High Occupancy Vehicle (HOV) Facilities, University of California at Berkeley UCB-ITS-PRR-2009-22, 2009
2. Assessment and Validations of Managed Lanes Weaving and Access Guidelines, University of Texas at Arlington, 2010, http://www.uta.edu/ce/faculty/williams/report0-5578-1.pdf
3. Managed Lane Ramp and Roadway Design Issues, Texas Transportation Institute, 2003, http://tti.tamu.edu/documents/4160-10.pdf
4. Managed Lanes - Traffic Modeling, Texas Transportation Institute, 2002, http://tti.tamu.edu/documents/4160-4.pdf

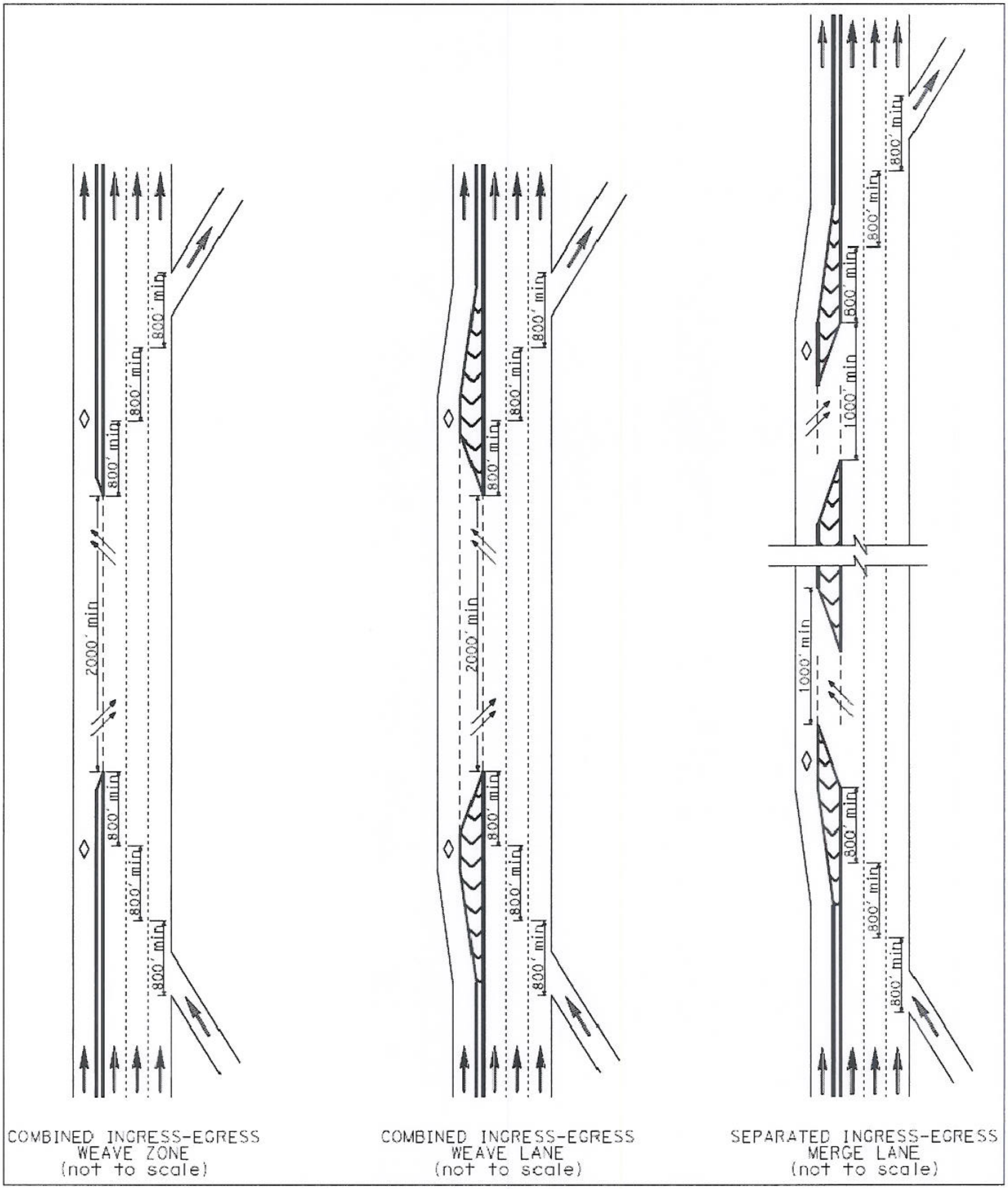
Summary of Design, Cost and Performance Considerations for Continuous and Limited-Access* Facilities

Research and engineering studies show no significant generalized differences in safety and throughput performance between limited and continuous access. The design decision will more appropriately be based on the site-specific types and patterns of traffic and the ability to manage this traffic using the access most appropriate and cost-effective for the corridor.

Criterion	Limited-Access	Continuous-Access
Cost	• Detailed operational analysis and an iterative design process is needed for best placement of access points • May require more roadway width to accommodate the buffer and access openings • Additional pavement markings and overhead signing are required • Investment in monitoring and adjustment of "hot spots" near access points may be needed	• Lower cost for design, analysis, construction, operation, and maintenance • Require less engineering resources to make adjustments
Mobility, Safety and Performance	• Access points can become initial source of unstable flow and queuing in the managed lane, which can trigger the onset of congestion among all lanes • Left-side access openings intensify weaving in the form of concentrated flows and consecutive lane changing across all freeway lanes which may present difficulties for all drivers during periods of congestion. • Drivers are unable to access the managed lane when the need is greatest; this could induce violation of the barrier striping, which may be unexpected by drivers in the managed lane • Can be used to restrict lane changing where demand has produced or may produce a performance deficiency • Accommodates longer-distance trips by discouraging short-term use of lane • Smooth flow, higher speeds can result from limited merging • Greater separation to accommodate lane closure activities in the lane or adjacent lanes • Access to some general purpose ramps is not as convenient	• Users must focus on potential for vehicles to enter or exit the managed lane at any point; this may reduce speeds • Allows last-minute lane changing to reach freeway exit ramps • No concentrated weaving; lane changing occurs along entire corridor when gaps appear • Users can readily access all general purpose ramps • Less complex decision-making by drivers • Easily utilized during off-peak (for part-time facilities) • Less separation to accommodate lane closures • Drivers will not worry about violating barrier striping when managed lane is closed for construction, maintenance, or incidents
Enforcement	• Potentially lower toll evasion and occupancy violation • Ease of enforcement • Express Lane toll collection is simplified due to need for fewer readers	• Greater investment in enforcement activity, systems, and zones to produce the lower violation rates expected with limited-access designs • Potentially higher toll evasion and occupancy violation • Increased cost for Express Lane toll collection due to need for additional readers

*This summary document does not apply to limited-access designs in which managed lane access is provided only via direct ramps to a local or other state highway or freeway

Access Types with Minimum Recommended Opening Lengths and Weaving Distances



Attachment 2

Draft Traffic Forecasting Methodology

Technical Memorandum

Bay Area Express Lanes Network
Draft Traffic and Revenue Forecasting Methodology

303 Second St., Suite 700N
San Francisco, CA 94107
Phone: 415-243-4600

February 18, 2011

In preparation for their 2011 application to the California Transportation Commission (CTC) seeking authorization to develop and operate a regional express lanes network, MTC seeks to update the planning-level traffic and revenue forecasts for the proposed network. This technical memorandum outlines the methodology to be used for this analysis. A separate memorandum outlined the related methodology of traffic analysis to support the development of a programmatic Project Study Report (PSR) for the Express Lanes Network.

Existing Conditions Analysis

The existing conditions analysis for traffic forecasting builds upon the existing conditions data assembled for the PSR. For that effort, PeMS volume and speed data have been extracted from Tuesdays through Thursdays in September 2010, excluding the week of Labor Day. The traffic data collected include the directional 24-hour volumes, as well as AM and PM peak hour volumes and speeds. Peak hour HOV volume data from the most recent annual HOV report, the 2009 Bay Area HOV Lanes, was summarized throughout the Express Lanes Network.

Complementary to those data, a year 2010 travel model run was completed using the MTC activity-based model (Travel Model One). The land use inputs were based on the estimate from the Association of Bay Area Governments' (ABAG's) draft Projections 2011 forecasts. The highway networks were updated from the 2005 validation year networks by adding HOV projects that opened during that five-year period, as identified by the annual HOV reports, as well as any other freeway projects that opened during that timeframe.

Upon completion of the model run, the results in each of the Express Lanes corridors were tabulated and compared to the observed counts. The tabulation included daily, AM peak hour, and PM peak hour traffic volumes by vehicle class (drive-alone, shared ride 2, shared ride 3+, light truck, heavy truck).

At each traffic count location, a count ratio was calculated as the count divided by the modeled volume. Separate count ratios were calculated for the daily versus peak hour volumes, and for the peak hour HOV traffic. The count ratios were interpolated such that they could be applied to locations between traffic count anchor points, and the raw model volumes were scaled by the count ratio to produce and adjusted model result. This adjusted model result compensates for differences between the model result and the observed value.

The data are summarized by segment, corresponding to the segments that will be used for the revenue forecasts. Those segment definitions will be reviewed both for their correspondence to the project implementation and phasing, as well as their ability to provide a reasonable snapshot of the traffic on the system as a whole.

Baseline HOV Forecasts

The MTC activity-based model (Travel Model One) was applied to generate network-wide 2035 forecasts. The forecasts evaluated as part of the PSR will be consistent with the forecasts prepared for and incorporated into the financial analysis of the Express Lanes Network.

The future year 2035 model networks incorporate all projects currently in the adopted Regional Transportation Plan (RTP). The RTP transit networks are the “T-2035” transit networks, reflecting an approximate 22% growth in transit seat miles from 2005 to 2035. The RTP highway network includes an approximate 5% growth in highway lane miles from the year 2005, including the “Backbone” Express Lanes Network. Key regional projects that have been incorporated into the year 2035 network include:

- Backbone Express Lanes Network;
- Doyle Drive reconstruction;
- Operational improvements through the Freeway Performance Initiative;
- BART extension from Fremont to San Jose;
- SMART commuter rail in Marin and Sonoma Counties;
- Caltrain electrification and extension to the Transbay Terminal;
- Expanded ferry service around the region;
- Enhanced service along the Amtrak Capitol Corridor;
- The E-BART extension to eastern Contra Costa County; and
- Improvements to local and express bus services, including Bus Rapid transit in the Grand-MacArth Corridor, Van Ness Avenue and the Alum Rock Corridor.

The travel model runs use the ABAG “Draft Projections 2011” as inputs. The projections data include forecasts of households, population and employment by industry in each traffic analysis zone. They serve as the core driver of activity locations (trip ends) predicted by the model.

This initial set of forecasts treats all express lanes in the Backbone network as HOV lanes consistent with the existing occupancy requirements. The raw model volumes are tabulated by time-of-day and vehicle class in the same format as was done for the base year analysis. The raw model volumes are then scaled using the count ratios derived from the 2010 base year analysis. Applying this same adjustment to the future year volumes ensures that the results are more consistent with the count data, assuming that the differences between the modeled and observed data are consistent over time.

A 2020 intermediate year forecast is also conducted. The purpose of this intermediate year forecast is to support the tolling analysis. Specifically, by allowing revenues to be estimated for two points in time, growth rates can be calculated and applied to the annual revenue stream. Therefore, the 2020 forecast includes the full Backbone network. This assumption is necessary in order to interpolate the annual revenue streams. The 2020 forecasts follow the same reporting and adjusting scheme as 2035.

Identification of Corridors Experiencing Degradation

Based on a combined assessment of the existing conditions and the baseline forecasts, PB will summarize the information demonstrating which HOV facilities are currently experiencing, or will experience level-of-service degradation under HOV 2+ operating restrictions. In consultation with MTC and the project team, the corridors that warrant either a conversion to HOV 3+ or an expansion to two express lanes will be identified, and the justification for those conversions will be documented.

Forecasts for Alternative Scenarios

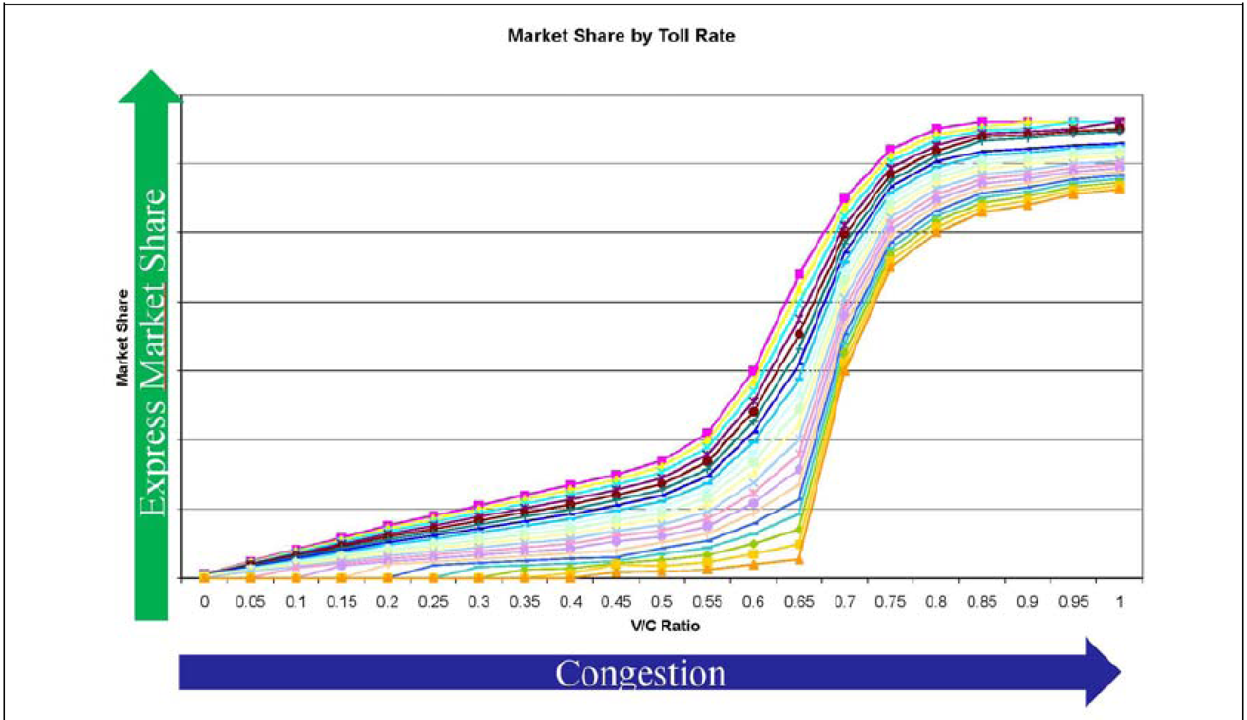
Following the identification of those corridors that warrant either a conversion to HOV 3+ or an expansion to two express lanes, two additional model runs will be completed. In the first additional run, the appropriate corridors will be set to HOV 3+. In the second additional run, the appropriate corridors will be expanded to two express lanes. These runs will be completed both for 2020 and 2035. They will be scaled and summarized as above.

Revenue Forecasts

The travel model runs described above will be used to forecast the total volume in general purpose lanes and in HOV lanes, segmented by vehicle class (drive-alone, shared ride 2, shared ride 3+, light truck, heavy truck). Given those volumes, a supplementary tolling model will be applied. The tolling model will predict the number of vehicles that would pay for entry into the express lanes, as well as the optimal toll level. In this way, vehicles will be shifted from the general purpose lanes to the express lanes, but the total volume in the corridor will remain the same as predicted by the travel model.

For the revenue forecasts, the Express Lane network is divided into tolling segments. Each segment will be analyzed for its potential traffic and revenue. Segments will be chosen to ensure similar traffic patterns exist along a segment. A preliminary review of the proposed network found a potential of 30-35 tolling segments. Each tolling segment will be analyzed directionally, meaning two models exist for each tolling segment. Lane configurations for each segment will be identified and input into the market share spreadsheet model. If the number of lanes on a particular segment varies, the minimum number of lanes will be chosen to ensure congestion is not underrepresented in the model.

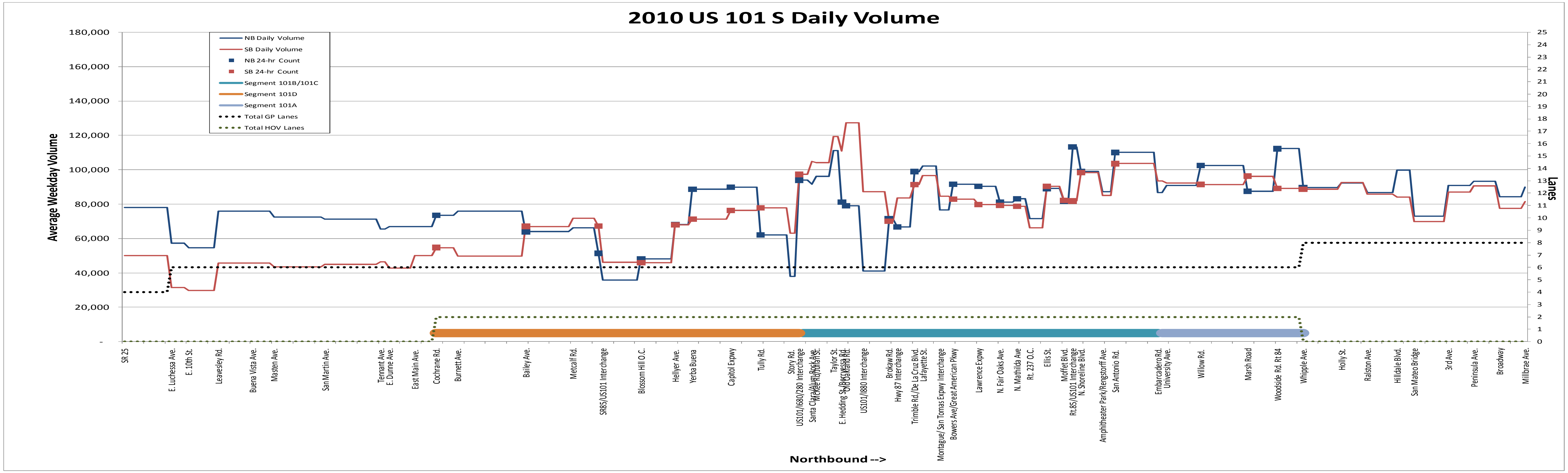
The tolling analysis will use a market share model, developed primarily from data collected on SR 91 in Southern California. The market share curves predict the toll market share (percentage of total corridor traffic using the express lanes) as a function of the congestion level and the price. Example of the market share curves is shown below.

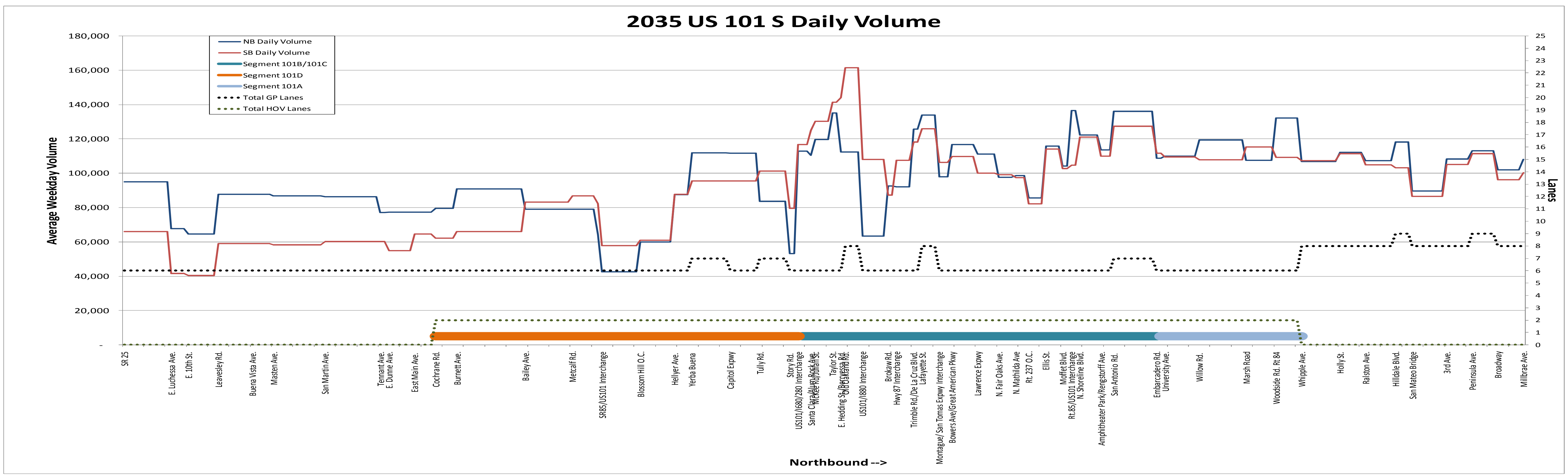


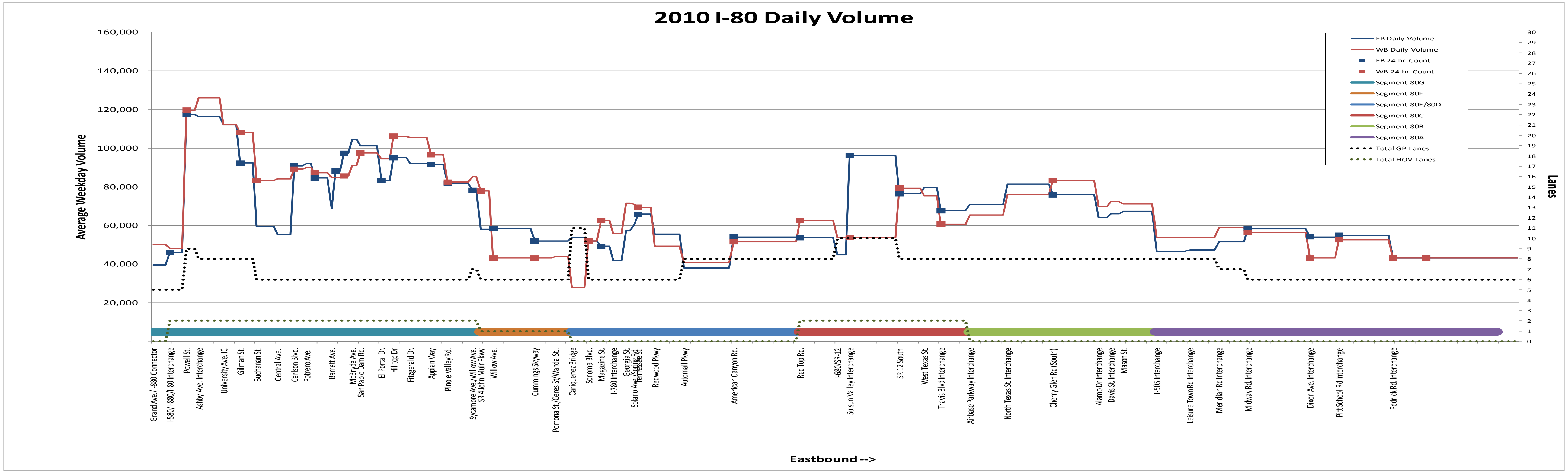
As part of this analysis, the toll rates will be set to achieve maximum throughput (as opposed to maximum revenue). The analysis will be done hour-by-hour, considering the traffic count profile found in the PeMS data. Using information from counts and from experience with other projects, annualization factors will be developed to convert the average weekday revenue into an annual revenue stream.

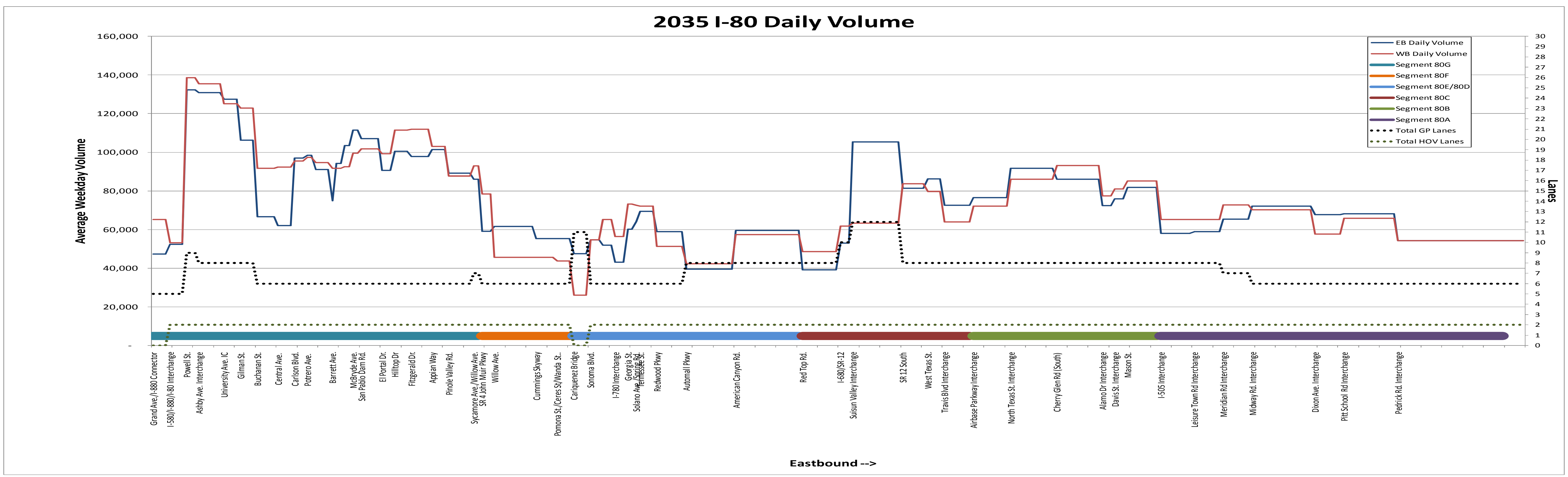
The full set of tolling segments will be analyzed for 2035. A limited set (5-10) will be analyzed for 2020 to determine approximate growth rates. Those growth rates will be applied to determine an annual revenue stream for each year.

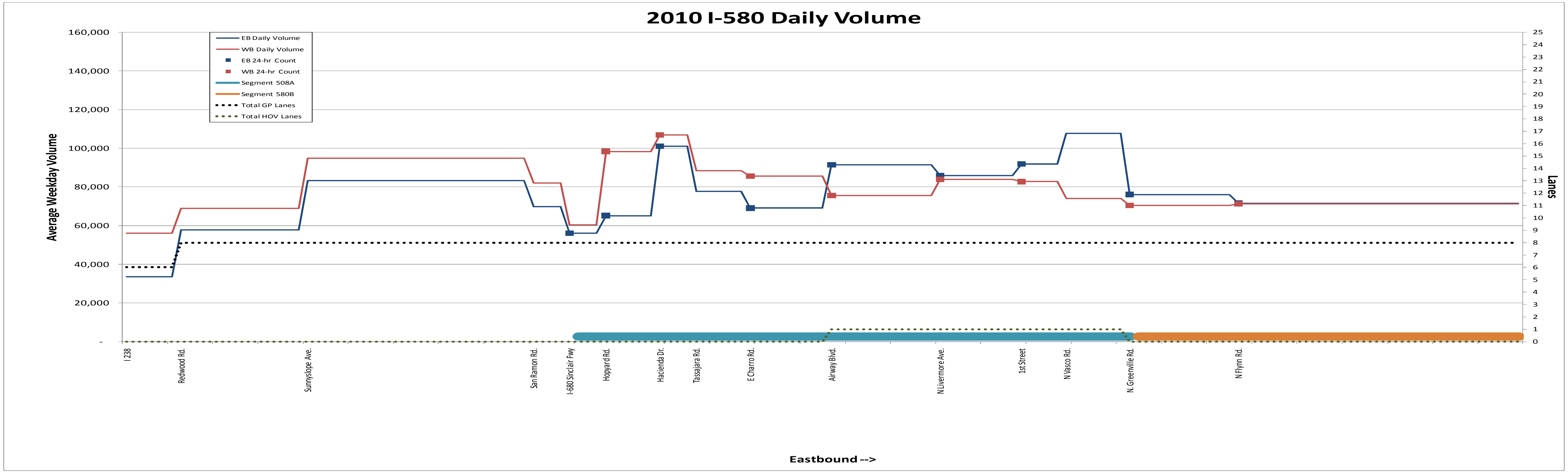
The tolling will be analyzed for up to two alternatives in each segment. For those corridors where the HOV lanes do not fill at HOV 2+, the analysis will compare a HOV 2+ free use to a HOV 3+ free use. For those corridors where the HOV lanes do fill at HOV 2+, the analysis will compare HOV 3+ free use to a dual-lane HOV 2+ free use configuration. The latter comparison is only relevant for those corridors where it is deemed feasible to construct a dual-express lane configuration.

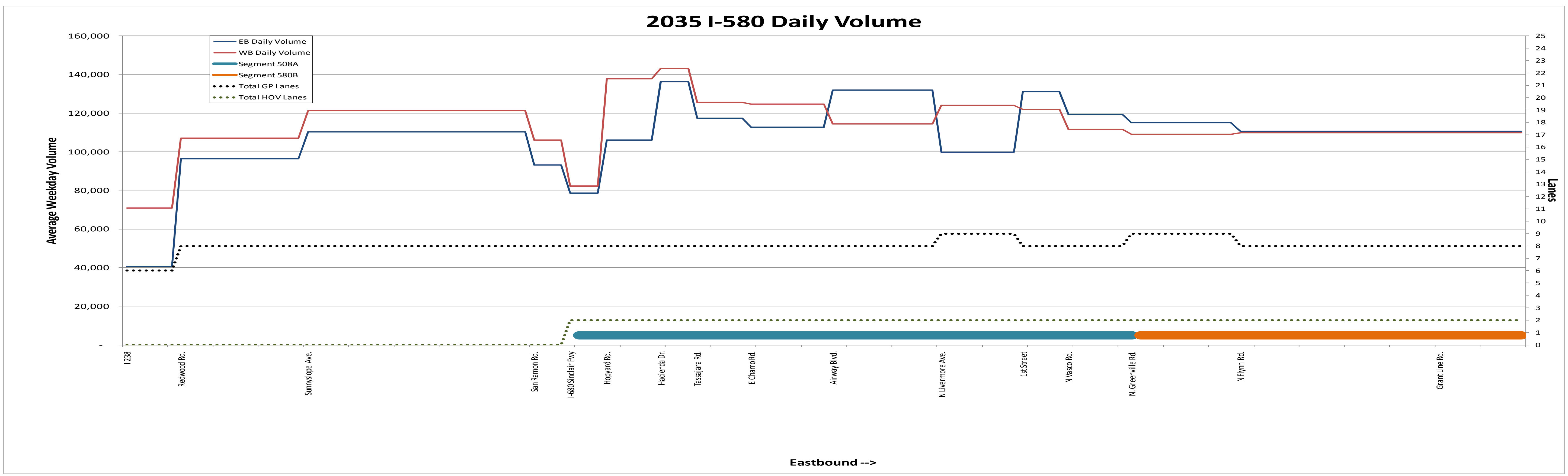

2010 US 101 S Daily Volume
NB Daily Volume
SB Daily Volume
NB 24-hr Count
SB 24-hr Count
Segment 101B/101C
Segment 101D
Segment 101A
Total GP Lanes
Total HOV Lanes
Average Weekday Volume
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
Lanes
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
SR 25
E. Luchessa Ave.
E. 10th St.
Leavesley Rd.
Buena Vista Ave.
Masten Ave.
San Martin Ave.
Tennant Ave.
E. Dunne Ave.
East Main Ave.
Cochrane Rd.
Burnett Ave.
Bailey Ave.
Metcalf Rd.
SR85/US101 Interchange
Blossom Hill O.C.
Hellyer Ave.
Yerba Buena
Capitol Expwy
Tully Rd.
Story Rd.
US101/I680/280 Interchange
Santa Clara/Alum Rock Ave.
McKee Rd/Julian St.
Taylor St.
E. Hedding St./Berryessa Rd.
Old Oakland Rd.
US101/I880 Interchange
Brokaw Rd.
Hwy 87 Interchange
Trimble Rd./De La Cruz Blvd.
Lafayette St.
Montague/ San Tomas Expwy Interchange
Bowers Ave/Great American Pkwy
Lawrence Expwy
N. Fair Oaks Ave.
N. Mathilda Ave
Rt. 237 O.C.
Ellis St.
Moffet Blvd.
Rt.85/US101 Interchange
N. Shoreline Blvd.
Amphitheater Park/Rengstorff Ave.
San Antonio Rd.
Embarcadero Rd.
University Ave.
Willow Rd.
Marsh Road
Woodside Rd. Rt 84
Whipple Ave.
Holly St.
Ralston Ave.
Hilldale Blvd.
San Mateo Bridge
3rd Ave.
Peninsula Ave.
Broadway
Millbrae Ave.
Northbound -->

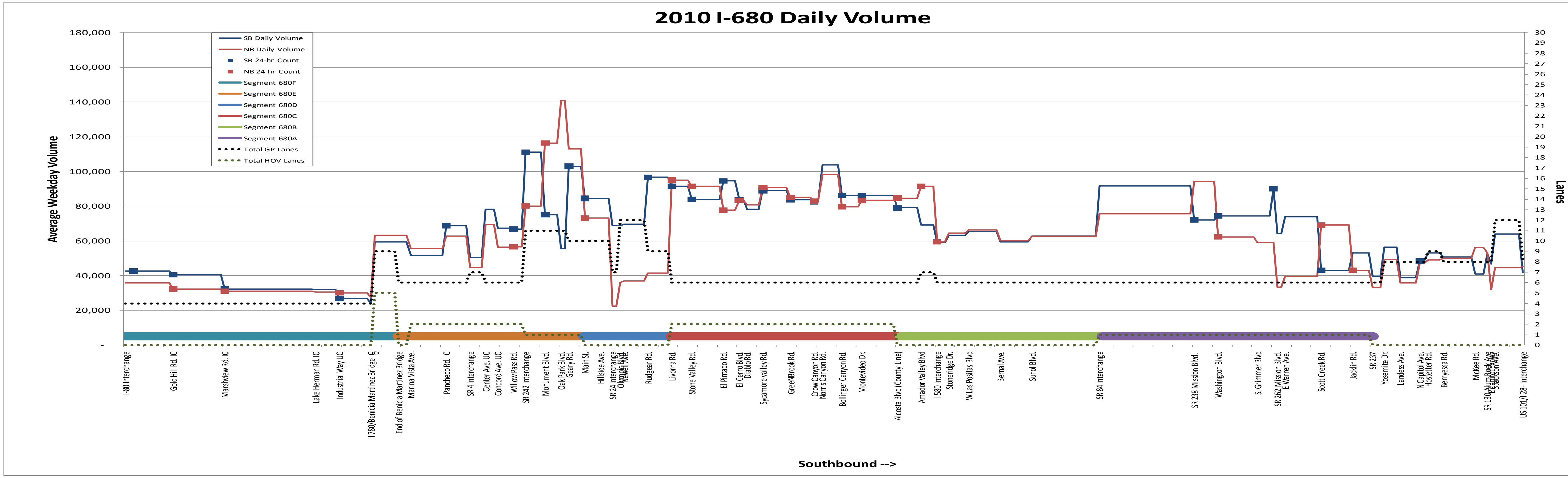

2035 US 101 S Daily Volume
NB Daily Volume
SB Daily Volume
Segment 101B/101C
Segment 101D
Segment 101A
Total GP Lanes
Total HOV Lanes
Average Weekday Volume
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
Lanes
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
SR 25
E. Luchessa Ave.
E. 10th St.
Leavesley Rd.
Buena Vista Ave.
Masten Ave.
San Martin Ave.
Tennant Ave.
E. Dunne Ave.
East Main Ave.
Cochrane Rd.
Burnett Ave.
Bailey Ave.
Metcalf Rd.
SR85/US101 Interchange
Blossom Hill O.C.
Hellyer Ave.
Yerba Buena
Capitol Expwy
Tully Rd.
Story Rd.
US101/I680/280 Interchange
Santa Clara/Alum Rock Ave.
McKee Rd/Julian St.
Taylor St.
E. Hedding St./Berryessa Rd.
Old Oakland Rd.
US101/I880 Interchange
Brokaw Rd.
Hwy 87 Interchange
Trimble Rd./De La Cruz Blvd.
Lafayette St.
Montague/ San Tomas Expwy Interchange
Bowers Ave/Great American Pkwy
Lawrence Expwy
N. Fair Oaks Ave.
N. Mathilda Ave
Rt. 237 O.C.
Ellis St.
Moffet Blvd.
Rt.85/US101 Interchange
N. Shoreline Blvd.
Amphitheater Park/Rengstorff Ave.
San Antonio Rd.
Embarcadero Rd.
University Ave.
Willow Rd.
Marsh Road
Woodside Rd. Rt 84
Whipple Ave.
Holly St.
Ralston Ave.
Hilldale Blvd.
San Mateo Bridge
3rd Ave.
Peninsula Ave.
Broadway
Millbrae Ave.
Northbound -->

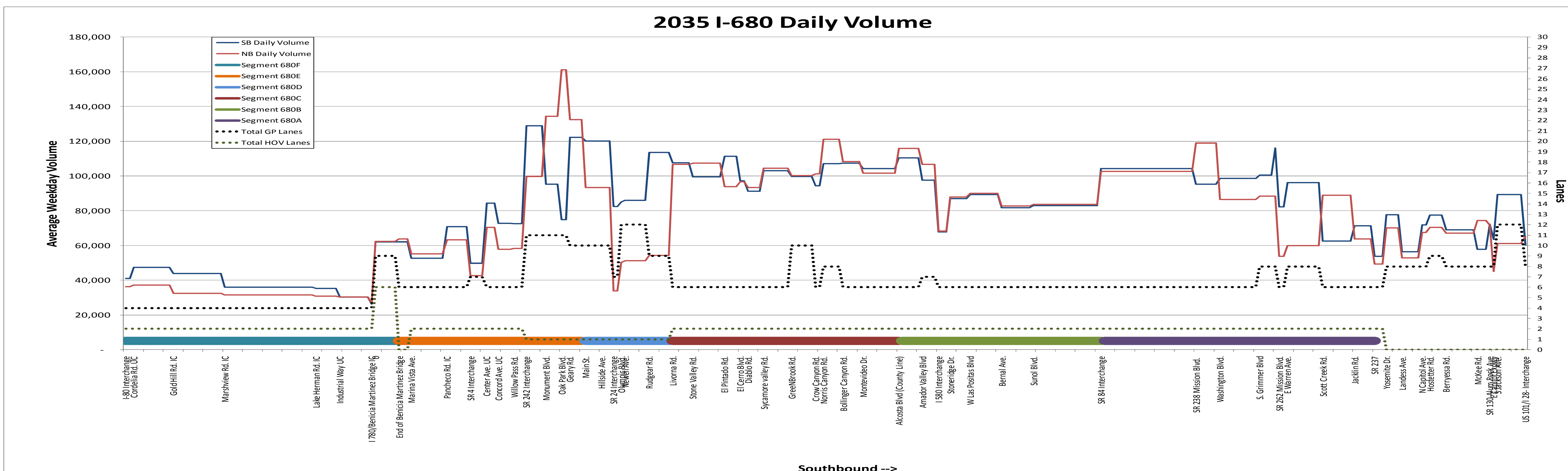

2010 I-80 Daily Volume
Average Weekday Volume
Lanes
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
EB Daily Volume
WB Daily Volume
EB 24-hr Count
WB 24-hr Count
Segment 80G
Segment 80F
Segment 80E/80D
Segment 80C
Segment 80B
Segment 80A
Total GP Lanes
Total HOV Lanes
Grand Ave./I-880 Connector
I-580/I-80 Interchange
Powell St.
Ashby Ave. Interchange
University Ave. IC
Gilman St.
Buchanan St.
Central Ave.
Carlson Blvd.
Potrero Ave.
Barrett Ave.
McBryde Ave.
San Pablo Dam Rd.
El Portal Dr.
Hilltop Dr
Fitzgerald Dr.
Appian Way
Pinole Valley Rd.
Sycamore Ave./Willow Ave.
SR 4 John Muir Pkwy
Willow Ave.
Cummings Skyway
Pomona St./Ceres St/Wanda St.
Carquinez Bridge
Sonoma Blvd.
Magazine St.
I-780 Interchange
Redwood Pkwy
American Canyon Rd.
Red Top Rd.
I-680/SR-12
Suisun Valley Interchange
SR 12 South
West Texas St.
Travis Blvd Interchange
Airbase Parkway Interchange
North Texas St. Interchange
Cherry Glen Rd (South)
Alamo Dr Interchange
Davis St. Interchange
Mason St.
I-505 Interchange
Leisure Town Rd Interchange
Meridian Rd Interchange
Midway Rd. Interchange
Dixon Ave. Interchange
Pitt School Rd Interchange
Pedrick Rd. Interchange
Eastbound -->

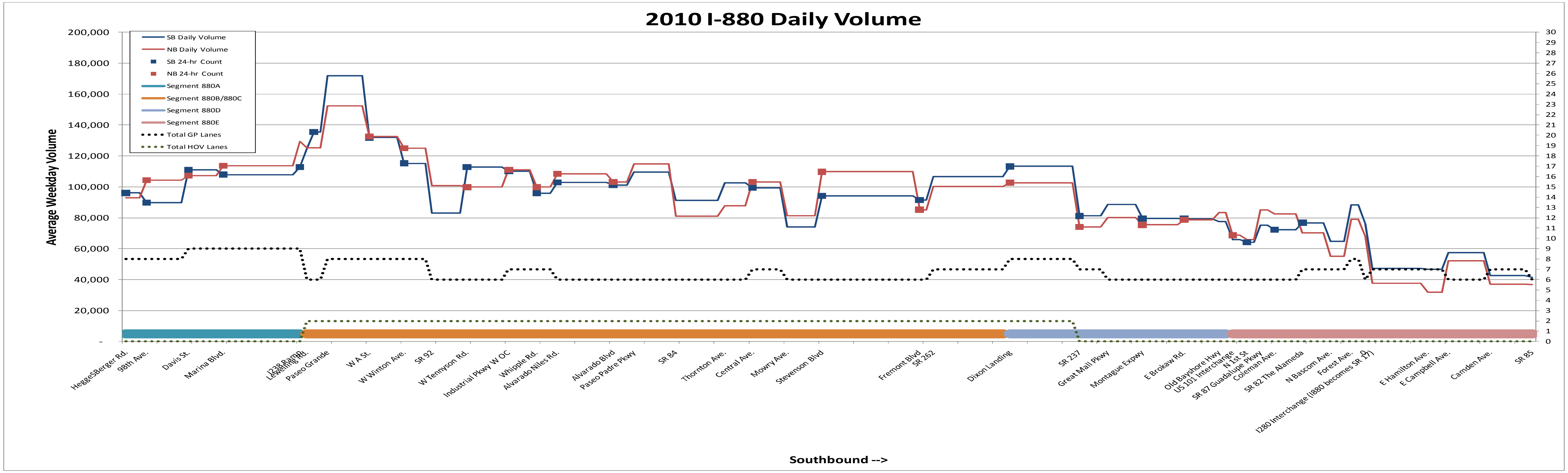

2035 I-80 Daily Volume
Average Weekday Volume
Lanes
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
EB Daily Volume
WB Daily Volume
Segment 80G
Segment 80F
Segment 80E/80D
Segment 80C
Segment 80B
Segment 80A
Total GP Lanes
Total HOV Lanes
Grand Ave./I-880 Connector
I-580/I-80 Interchange
Powell St.
Ashby Ave. Interchange
University Ave. IC
Gilman St.
Buchanan St.
Central Ave.
Carlson Blvd.
Potrero Ave.
Barrett Ave.
McBryde Ave.
San Pablo Dam Rd.
El Portal Dr.
Hilltop Dr
Fitzgerald Dr.
Appian Way
Pinole Valley Rd.
Sycamore Ave./Willow Ave.
SR 4 John Muir Pkwy
Willow Ave.
Cummings Skyway
Pomona St./Ceres St/Wanda St.
Carquinez Bridge
Sonoma Blvd.
I-780 Interchange
Redwood Pkwy
American Canyon Rd.
Red Top Rd.
I-680/SR-12
Suisun Valley Interchange
SR 12 South
West Texas St.
Travis Blvd Interchange
Airbase Parkway Interchange
North Texas St. Interchange
Cherry Glen Rd (South)
Alamo Dr Interchange
Davis St. Interchange
Mason St.
I-505 Interchange
Leisure Town Rd Interchange
Meridian Rd Interchange
Midway Rd. Interchange
Dixon Ave. Interchange
Pitt School Rd Interchange
Pedrick Rd. Interchange
Eastbound -->


2010 I-580 Daily Volume
EB Daily Volume
WB Daily Volume
EB 24-hr Count
WB 24-hr Count
Segment 508A
Segment 580B
Total GP Lanes
Total HOV Lanes
Average Weekday Volume
Lanes
I 238
Redwood Rd.
Sunnyslope Ave.
San Ramon Rd.
I-680 Sinclair Fwy
Hopyard Rd.
Hacienda Dr.
Tassajara Rd.
E Charro Rd.
Airway Blvd.
N Livermore Ave.
1st Street
N Vasco Rd.
N. Greenville Rd.
N Flynn Rd.
Eastbound -->

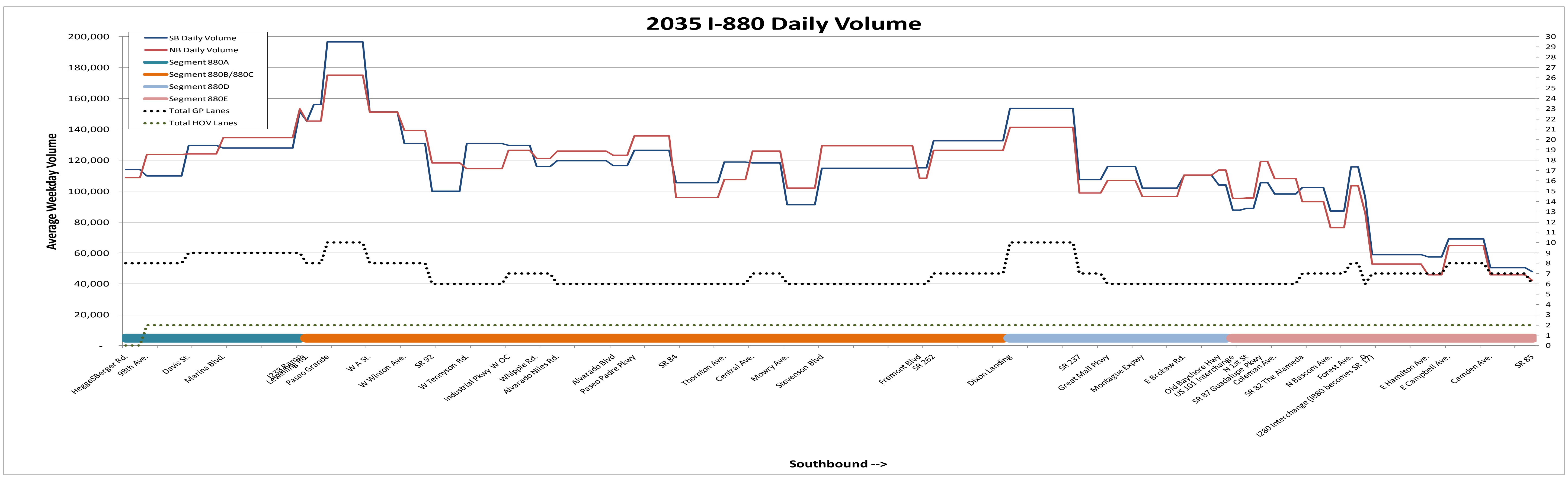

2035 I-580 Daily Volume
EB Daily Volume
WB Daily Volume
Segment 508A
Segment 580B
Total GP Lanes
Total HOV Lanes
Average Weekday Volume
Lanes
I 238
Redwood Rd.
Sunnyslope Ave.
San Ramon Rd.
I-680 Sinclair Fwy
Hopyard Rd.
Hacienda Dr.
Tassajara Rd.
E Charro Rd.
Airway Blvd.
N Livermore Ave.
1st Street
N Vasco Rd.
N. Greenville Rd.
N Flynn Rd.
Grant Line Rd.
Eastbound -->


2010 I-680 Daily Volume
Average Weekday Volume
Lanes
Southbound -->
SB Daily Volume
NB Daily Volume
SB 24-hr Count
NB 24-hr Count
Segment 680F
Segment 680E
Segment 680D
Segment 680C
Segment 680B
Segment 680A
Total GP Lanes
Total HOV Lanes
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
I-80 Interchange
Gold Hill Rd. IC
Marshview Rd. IC
Lake Herman Rd. IC
Industrial Way UC
I 780/Benicia Martinez Bridge
End of Benicia Martinez Bridge
Marina Vista Ave.
Pancheco Rd. IC
SR 4 Interchange
Center Ave. UC
Concord Ave. UC
Willow Pass Rd.
SR 242 Interchange
Monument Blvd.
Oak Park Blvd.
Geary Rd.
Main St.
Hillside Ave.
SR 24 Interchange
Rudgear Rd.
Livorna Rd.
Stone Valley Rd.
El Pintado Rd.
El Cerro Blvd.
Diablo Rd.
Sycamore valley Rd.
GreeNBrook Rd.
Crow Canyon Rd.
Norris Canyon Rd.
Bollinger Canyon Rd.
Montevideo Dr.
Alcosta Blvd (County Line)
Amador Valley Blvd
I 580 Interchange
Stoneridge Dr.
W Las Positas Blvd
Bernal Ave.
Sunol Blvd.
SR 84 Interchange
SR 238 Mission Blvd.
Washington Blvd.
S. Grimmer Blvd
SR 262 Mission Blvd.
E Warren Ave.
Scott Creek Rd.
Jacklin Rd.
SR 237
Yosemite Dr.
Landess Ave.
N Capitol Ave.
Hostetter Rd.
Berryessa Rd.
McKee Rd.
SR 130
US 101/ 28- Interchange

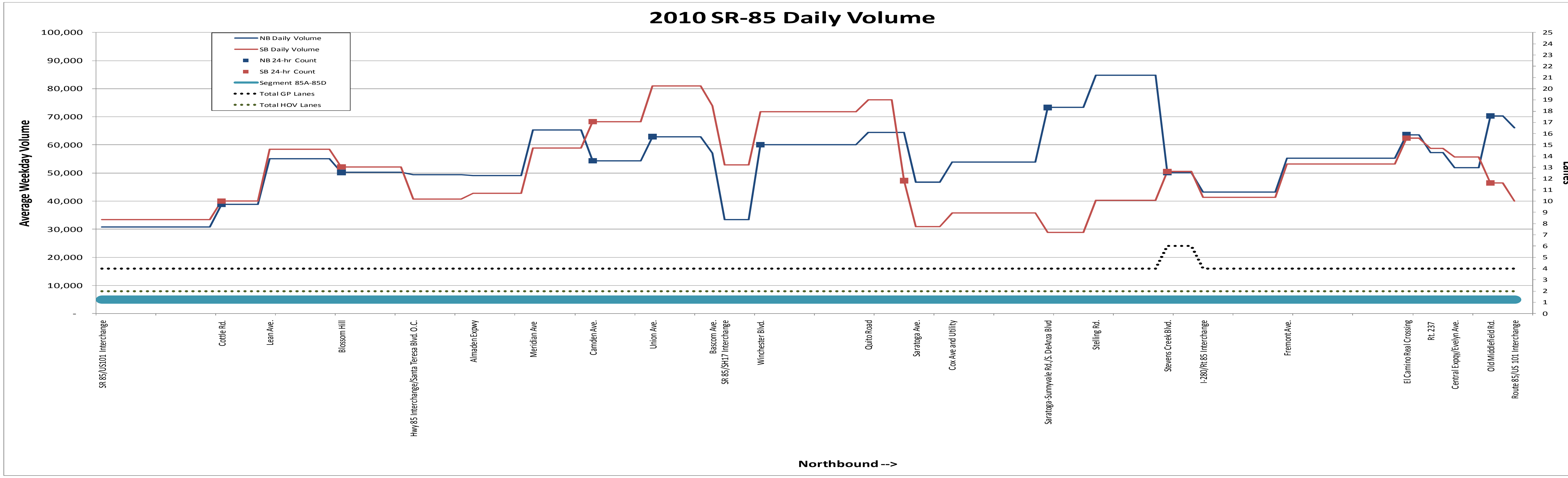

2035 I-680 Daily Volume
Average Weekday Volume
Lanes
Southbound -->
SB Daily Volume
NB Daily Volume
Segment 680F
Segment 680E
Segment 680D
Segment 680C
Segment 680B
Segment 680A
Total GP Lanes
Total HOV Lanes
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
I-80 Interchange
Cordelia Rd. UC
Gold Hill Rd. IC
Marshview Rd. IC
Lake Herman Rd. IC
Industrial Way UC
I 780/Benicia Martinez Bridge
End of Benicia Martinez Bridge
Marina Vista Ave.
Pancheco Rd. IC
SR 4 Interchange
Center Ave. UC
Concord Ave. UC
Willow Pass Rd.
SR 242 Interchange
Monument Blvd.
Oak Park Blvd.
Geary Rd.
Main St.
Hillside Ave.
SR 24 Interchange
Rudgear Rd.
Livorna Rd.
Stone Valley Rd.
El Pintado Rd.
El Cerro Blvd.
Diablo Rd.
Sycamore valley Rd.
GreeNBrook Rd.
Crow Canyon Rd.
Norris Canyon Rd.
Bollinger Canyon Rd.
Montevideo Dr.
Alcosta Blvd (County Line)
Amador Valley Blvd
I 580 Interchange
Stoneridge Dr.
W Las Positas Blvd
Bernal Ave.
Sunol Blvd.
SR 84 Interchange
SR 238 Mission Blvd.
Washington Blvd.
S. Grimmer Blvd
SR 262 Mission Blvd.
E Warren Ave.
Scott Creek Rd.
Jacklin Rd.
SR 237
Yosemite Dr.
Landess Ave.
N Capitol Ave.
Hostetter Rd.
Berryessa Rd.
McKee Rd.
SR 130
US 101/ 28- Interchange

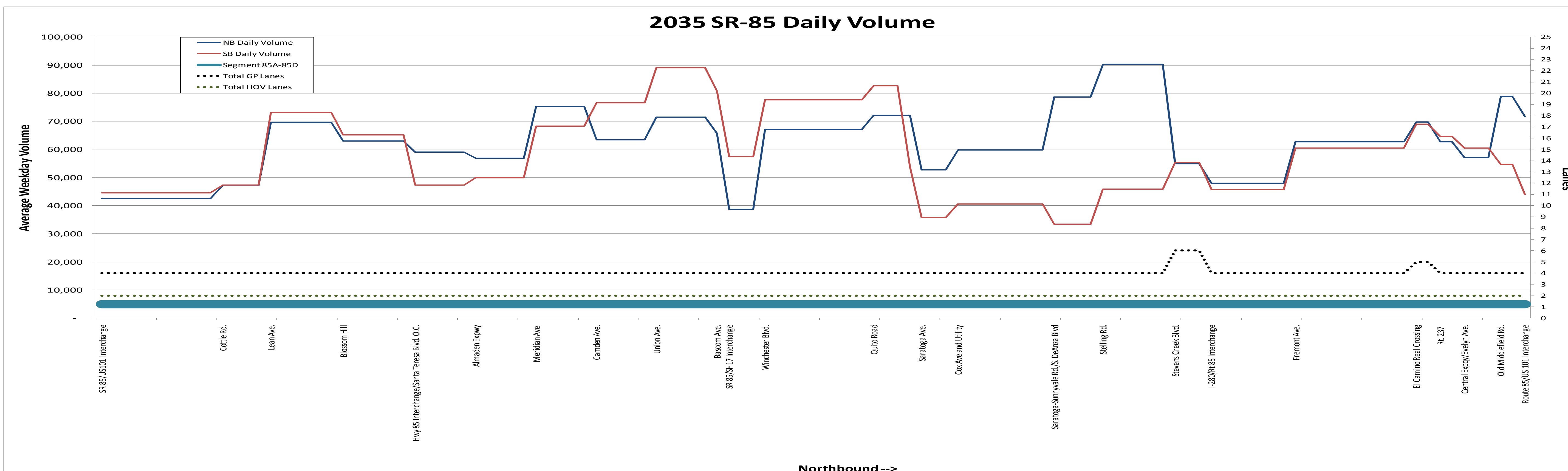


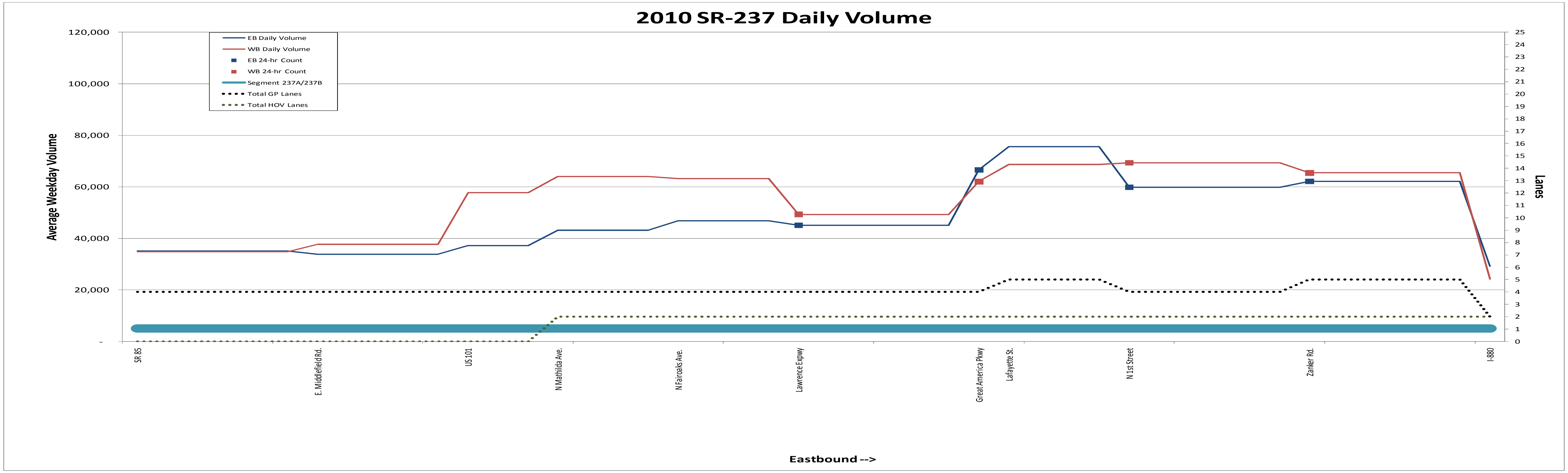
2010 I-880 Daily Volume
SB Daily Volume
NB Daily Volume
SB 24-hr Count
NB 24-hr Count
Segment 880A
Segment 880B/880C
Segment 880D
Segment 880E
Total GP Lanes
Total HOV Lanes
Average Weekday Volume
Southbound -->

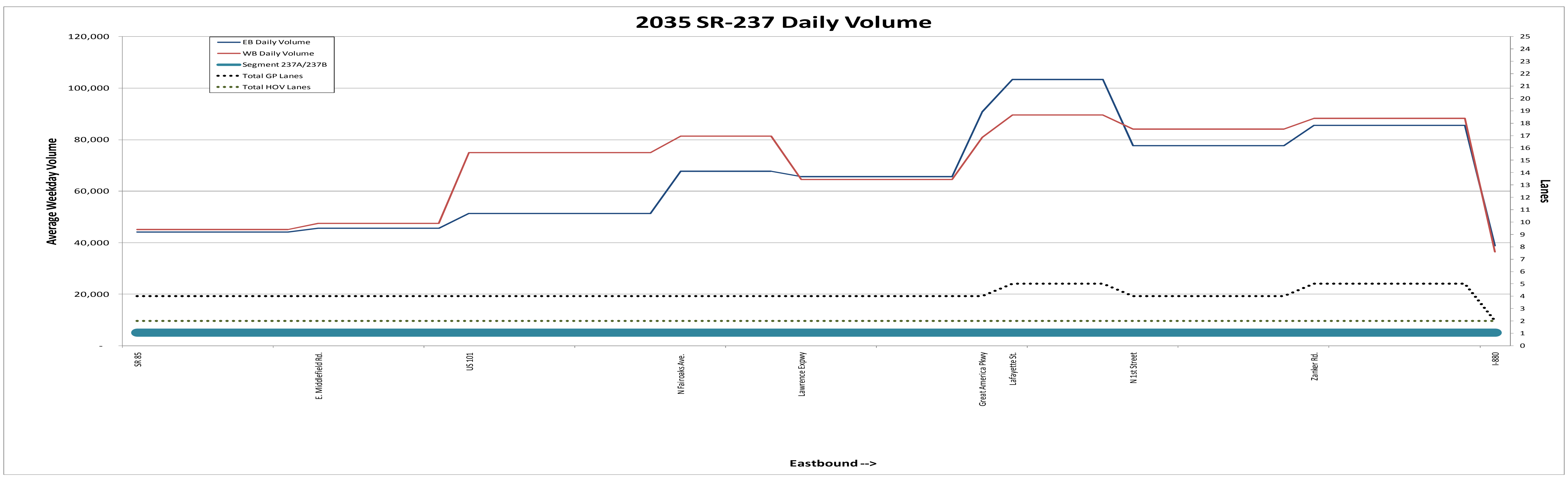


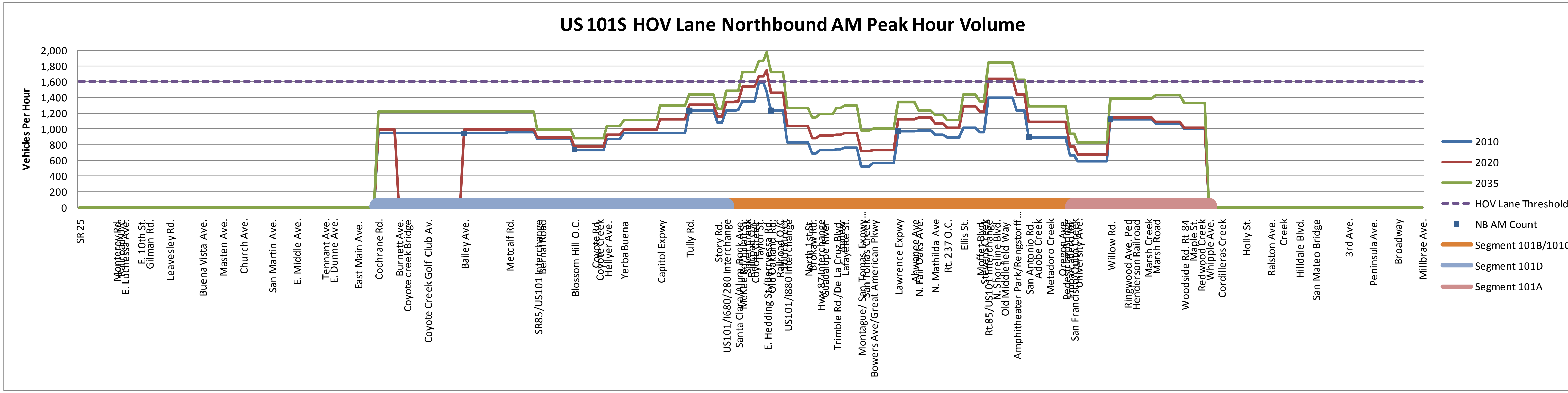
2035 I-880 Daily Volume
SB Daily Volume
NB Daily Volume
Segment 880A
Segment 880B/880C
Segment 880D
Segment 880E
Total GP Lanes
Total HOV Lanes
Average Weekday Volume
Southbound -->

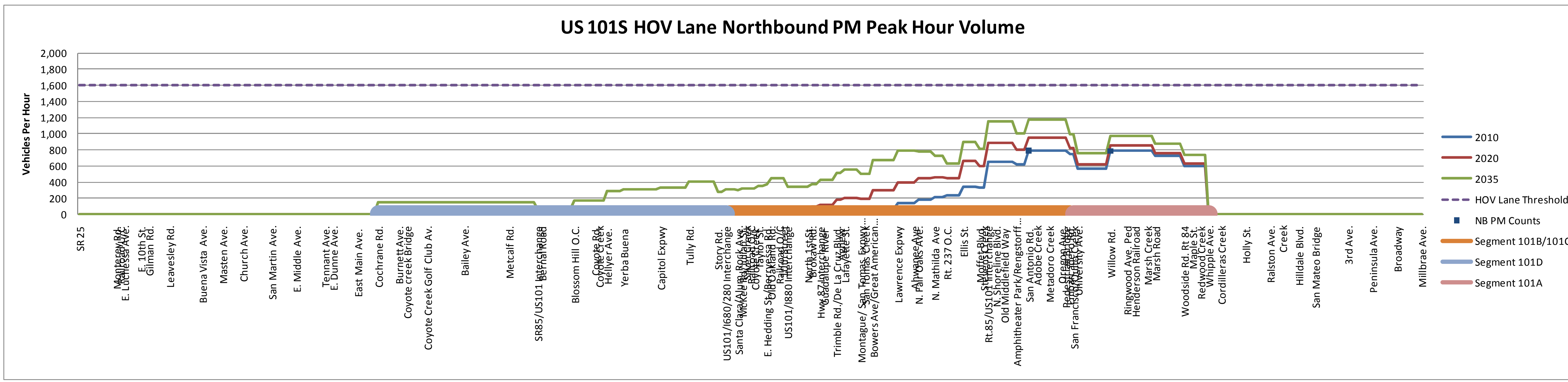

2010 SR-85 Daily Volume
NB Daily Volume
SB Daily Volume
NB 24-hr Count
SB 24-hr Count
Segment 85A-85D
Total GP Lanes
Total HOV Lanes
Average Weekday Volume
Lanes
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
-
SR 85/US101 Interchange
Cottle Rd.
Lean Ave.
Blossom Hill
Hwy 85 Interchange/Santa Teresa Blvd. O.C.
Almaden Expwy
Meridian Ave
Camden Ave.
Union Ave.
Bascom Ave.
SR 85/SH17 Interchange
Winchester Blvd.
Quito Road
Saratoga Ave.
Cox Ave and Utility
Saratoga-Sunnyvale Rd./S. DeAnza Blvd
Stelling Rd.
Stevens Creek Blvd.
I-280/Rt 85 Interchange
Fremont Ave.
El Camino Real Crossing
Rt. 237
Central Expwy/Evelyn Ave.
Old Middlefield Rd.
Route 85/US 101 Interchange
Northbound -->


2035 SR-85 Daily Volume
NB Daily Volume
SB Daily Volume
Segment 85A-85D
Total GP Lanes
Total HOV Lanes
Average Weekday Volume
Lanes
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
-
SR 85/US101 Interchange
Cottle Rd.
Lean Ave.
Blossom Hill
Hwy 85 Interchange/Santa Teresa Blvd. O.C.
Almaden Expwy
Meridian Ave
Camden Ave.
Union Ave.
Bascom Ave.
SR 85/SH17 Interchange
Winchester Blvd.
Quito Road
Saratoga Ave.
Cox Ave and Utility
Saratoga-Sunnyvale Rd./S. DeAnza Blvd
Stelling Rd.
Stevens Creek Blvd.
I-280/Rt 85 Interchange
Fremont Ave.
El Camino Real Crossing
Rt. 237
Central Expwy/Evelyn Ave.
Old Middlefield Rd.
Route 85/US 101 Interchange
Northbound -->

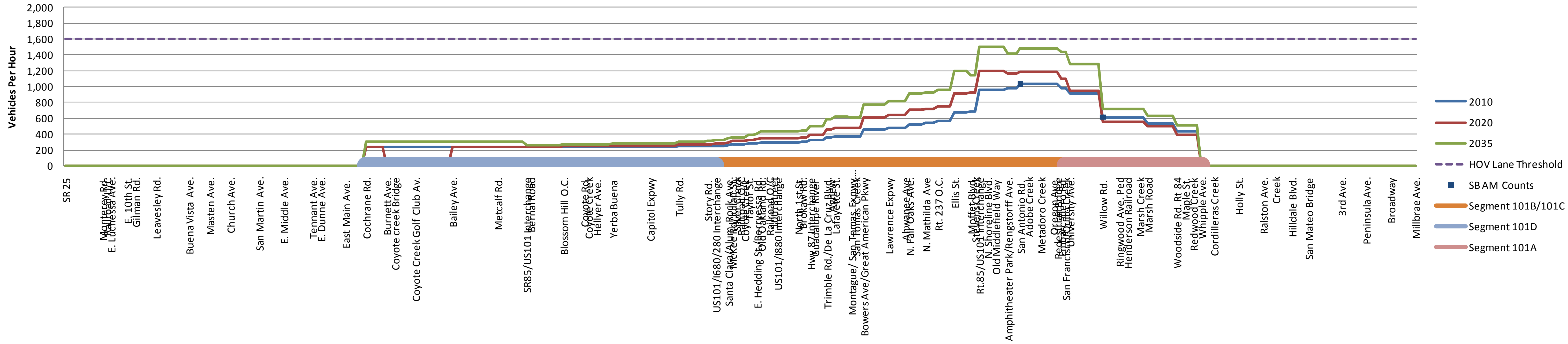

2010 SR-237 Daily Volume
EB Daily Volume
WB Daily Volume
EB 24-hr Count
WB 24-hr Count
Segment 237A/237B
Total GP Lanes
Total HOV Lanes
Average Weekday Volume
Lanes
SR 85
E. Middlefield Rd.
US 101
N Mathilda Ave.
N Fairoaks Ave.
Lawrence Expwy
Great America Pkwy
Lafayette St.
N 1st Street
Zanker Rd.
I-880
Eastbound -->


2035 SR-237 Daily Volume
EB Daily Volume
WB Daily Volume
Segment 237A/237B
Total GP Lanes
Total HOV Lanes
Average Weekday Volume
Lanes
SR 85
E. Middlefield Rd.
US 101
N Fairoaks Ave.
Lawrence Expwy
Great America Pkwy
Lafayette St.
N 1st Street
Zanker Rd.
I-880
Eastbound -->

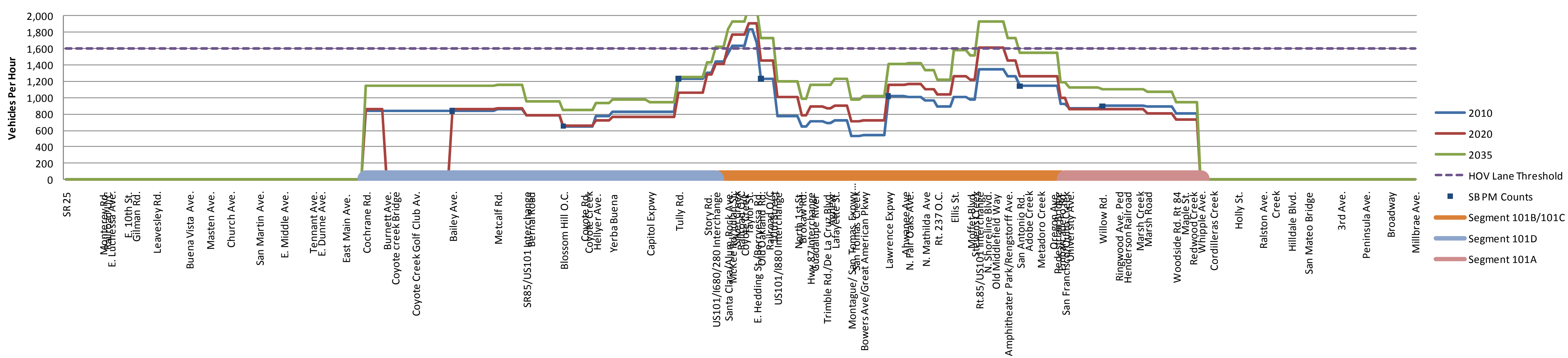

US 101S HOV Lane Northbound AM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2010
2020
2035
HOV Lane Threshold
NB AM Count
Segment 101B/101C
Segment 101D
Segment 101A

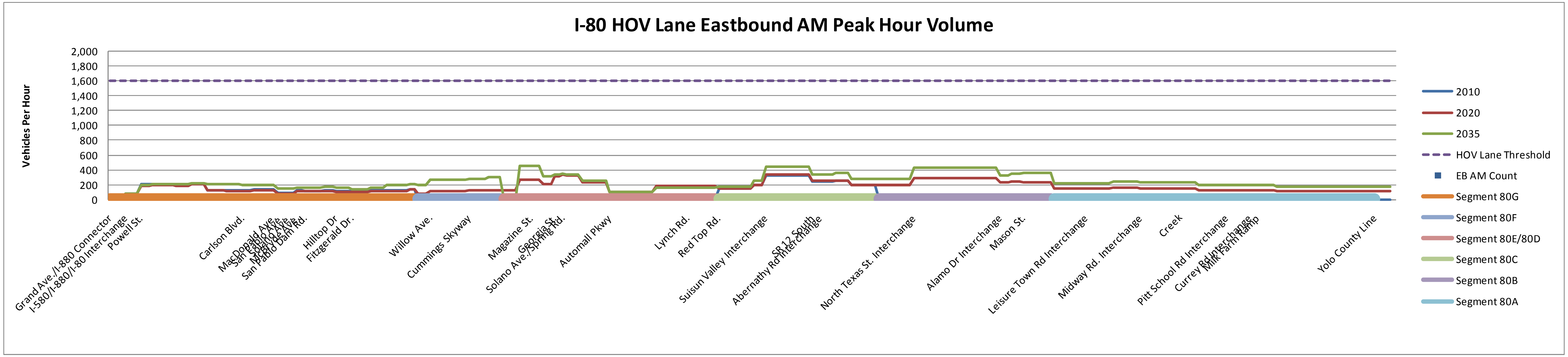

US 101S HOV Lane Northbound PM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2010
2020
2035
HOV Lane Threshold
NB PM Counts
Segment 101B/101C
Segment 101D
Segment 101A

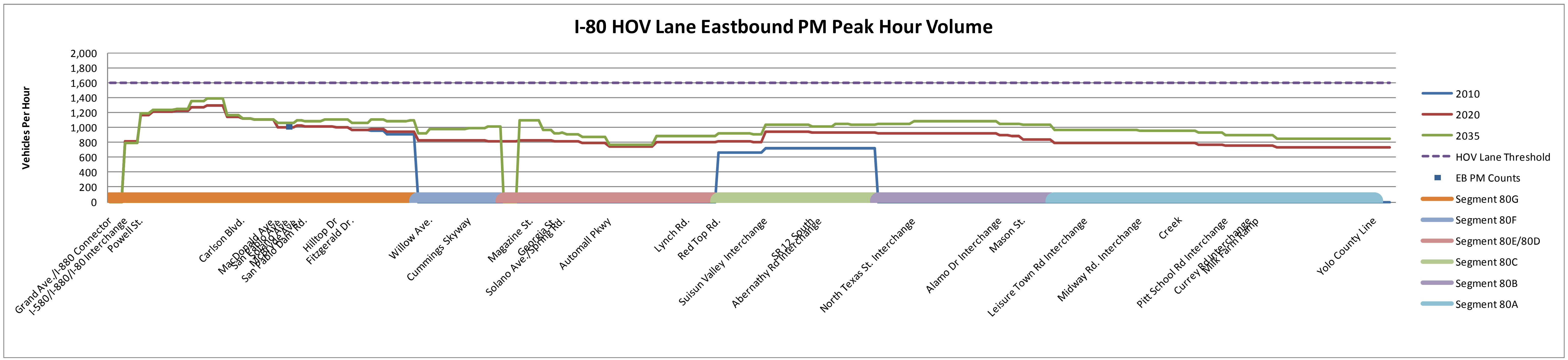
US 101S HOV Lane Soutbound AM Peak Hour Volume

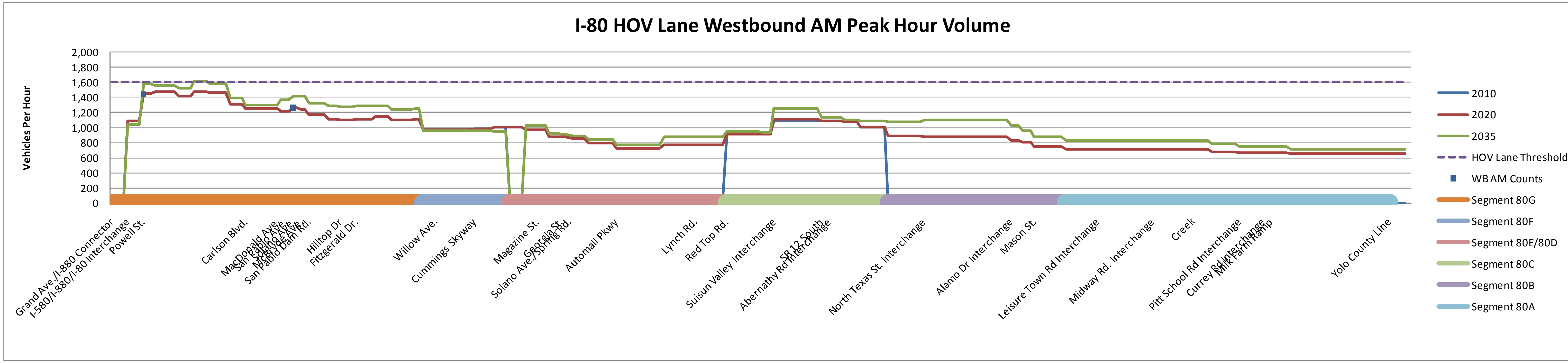


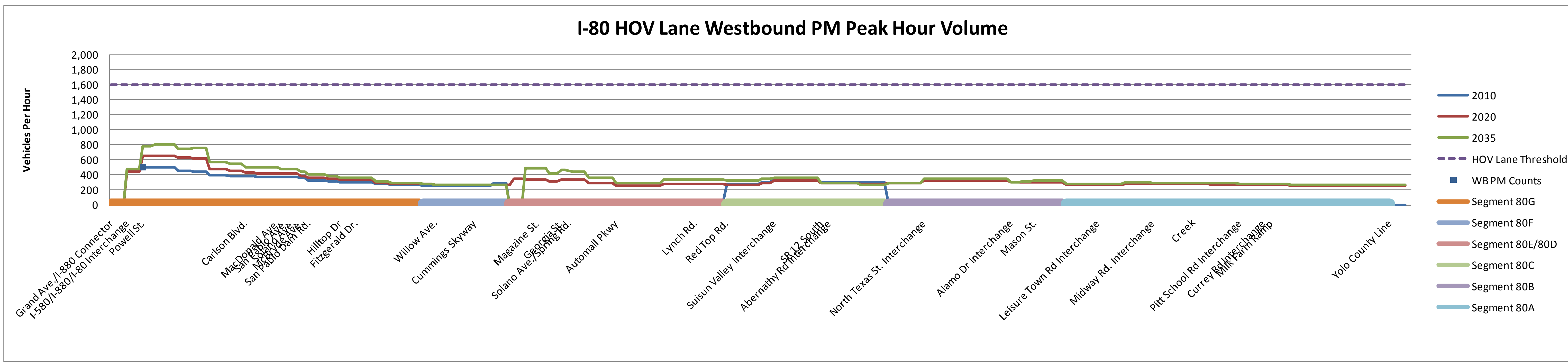
US 101S HOV Lane Southbound PM Peak Hour Volume

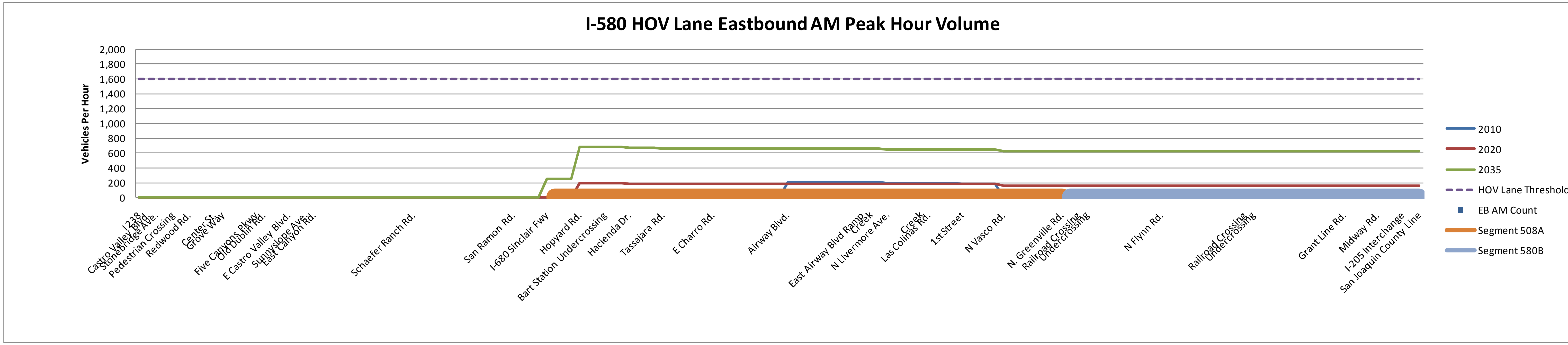


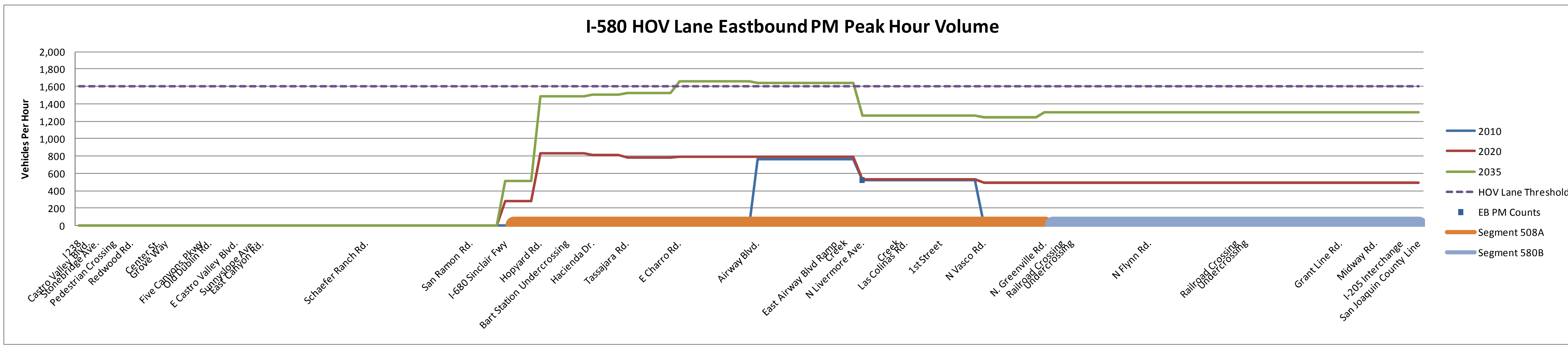

I-80 HOV Lane Eastbound AM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Grand Ave./I-880 Connector
I-580/I-880/I-80 Interchange
Powell St.
Carlson Blvd.
MacDonald Ave.
Willow Ave.
Cummings Skyway
Magazine St.
Automall Pkwy
Lynch Rd.
Red Top Rd.
Suisun Valley Interchange
Abernathy Rd Interchange
North Texas St. Interchange
Alamo Dr Interchange
Mason St.
Leisure Town Rd Interchange
Midway Rd. Interchange
Creek
Pitt School Rd Interchange
Milk Farm Ramp
Yolo County Line
2010
2020
2035
HOV Lane Threshold
EB AM Count
Segment 80G
Segment 80F
Segment 80E/80D
Segment 80C
Segment 80B
Segment 80A

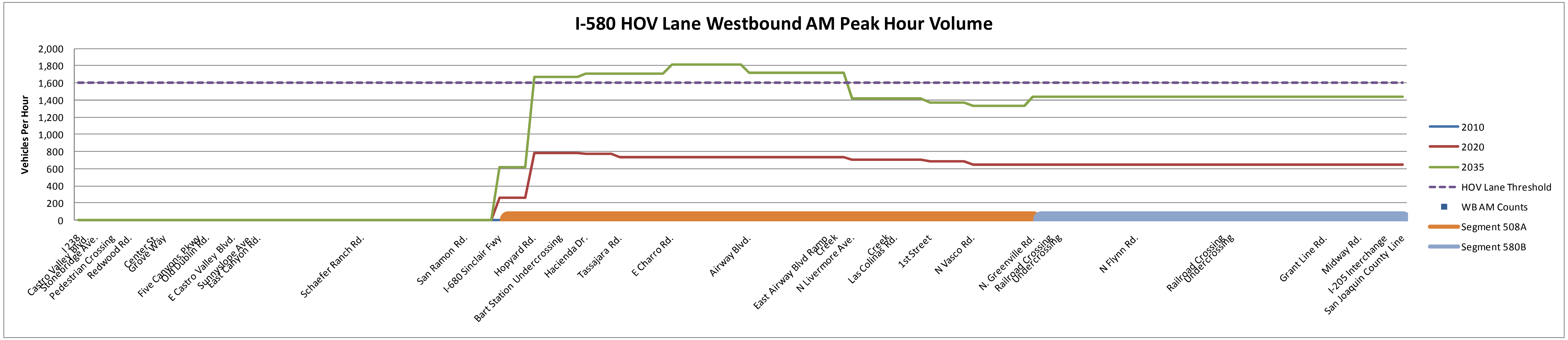

I-80 HOV Lane Eastbound PM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Grand Ave./I-880 Connector
I-580/I-880/I-80 Interchange
Powell St.
Carlson Blvd.
MacDonald Ave.
Willow Ave.
Cummings Skyway
Magazine St.
Automall Pkwy
Lynch Rd.
Red Top Rd.
Suisun Valley Interchange
Abernathy Rd Interchange
North Texas St. Interchange
Alamo Dr Interchange
Mason St.
Leisure Town Rd Interchange
Midway Rd. Interchange
Creek
Pitt School Rd Interchange
Milk Farm Ramp
Yolo County Line
2010
2020
2035
HOV Lane Threshold
EB PM Counts
Segment 80G
Segment 80F
Segment 80E/80D
Segment 80C
Segment 80B
Segment 80A

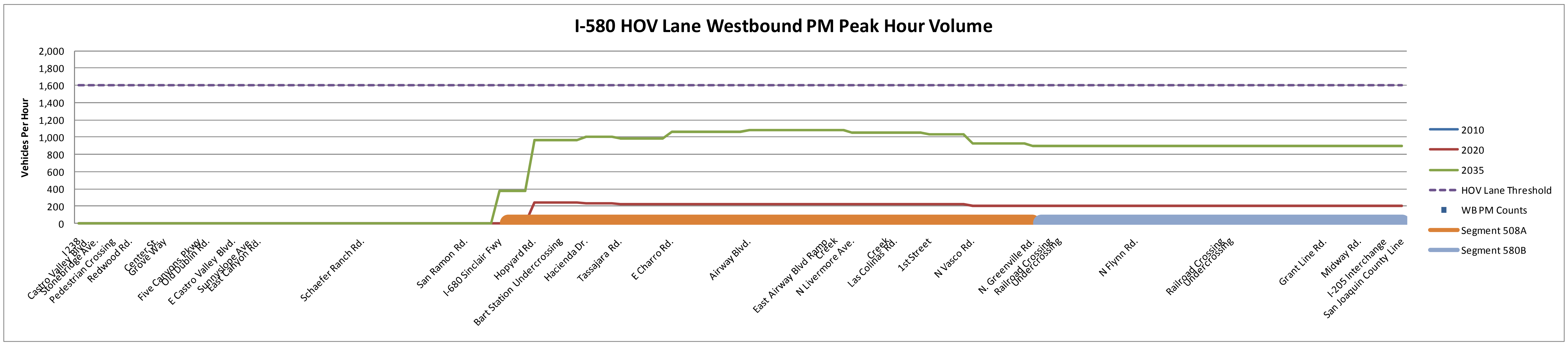

I-80 HOV Lane Westbound AM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Grand Ave./I-880 Connector
I-580/I-880/I-80 Interchange
Powell St.
Carlson Blvd.
MacDonald Ave.
San Pablo Dam Rd.
Hilltop Dr
Fitzgerald Dr.
Willow Ave.
Cummings Skyway
Magazine St.
Georgia St.
Solano Ave./Spring Rd.
Automall Pkwy
Lynch Rd.
Red Top Rd.
Suisun Valley Interchange
SR 12 South
Abernathy Rd Interchange
North Texas St. Interchange
Alamo Dr Interchange
Mason St.
Leisure Town Rd Interchange
Midway Rd. Interchange
Creek
Pitt School Rd Interchange
Currey Rd Interchange
Milk Farm Ramp
Yolo County Line
2010
2020
2035
HOV Lane Threshold
WB AM Counts
Segment 80G
Segment 80F
Segment 80E/80D
Segment 80C
Segment 80B
Segment 80A

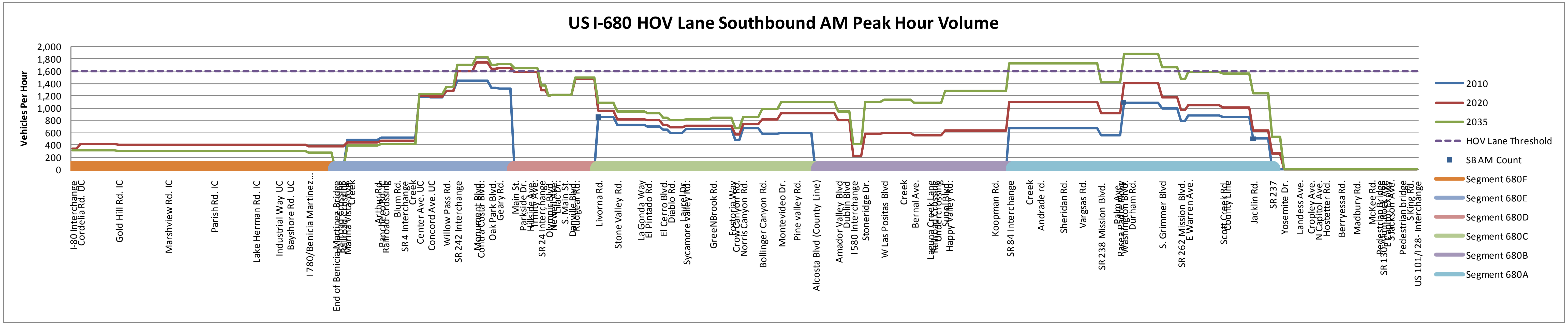

I-80 HOV Lane Westbound PM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Grand Ave./I-880 Connector
I-580/I-880/I-80 Interchange
Powell St.
Carlson Blvd.
MacDonald Ave.
San Pablo Dam Rd.
Hilltop Dr
Fitzgerald Dr.
Willow Ave.
Cummings Skyway
Magazine St.
Georgia St.
Solano Ave./Spring Rd.
Automall Pkwy
Lynch Rd.
Red Top Rd.
Suisun Valley Interchange
SR 12 South
Abernathy Rd Interchange
North Texas St. Interchange
Alamo Dr Interchange
Mason St.
Leisure Town Rd Interchange
Midway Rd. Interchange
Creek
Pitt School Rd Interchange
Currey Rd Interchange
Milk Farm Ramp
Yolo County Line
2010
2020
2035
HOV Lane Threshold
WB PM Counts
Segment 80G
Segment 80F
Segment 80E/80D
Segment 80C
Segment 80B
Segment 80A

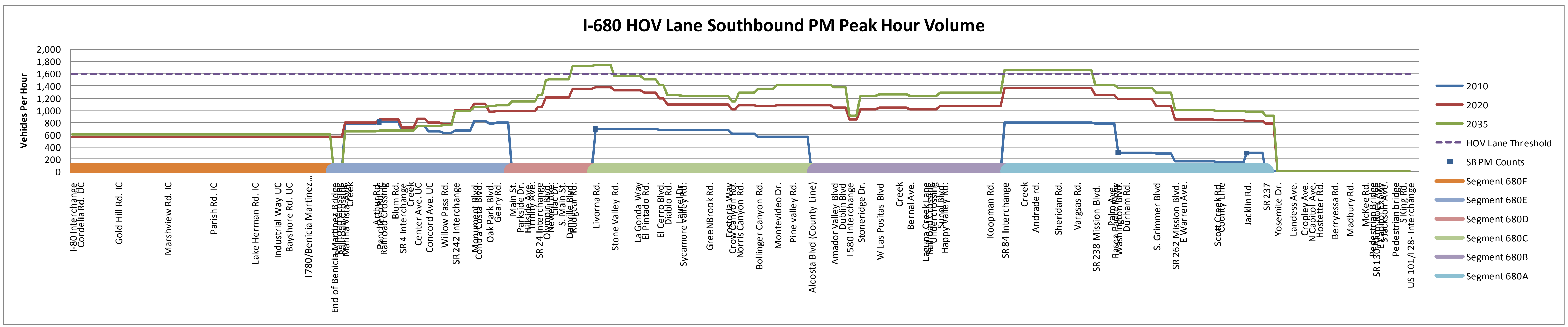

I-580 HOV Lane Eastbound AM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
I238
Castro Valley Blvd.
Stonebridge Ave.
Pedestrian Crossing
Redwood Rd.
Center St.
Grove Way
Five Canyons Pkwy
Old Dublin Rd.
E Castro Valley Blvd.
Sunnyslope Ave.
East Canyon Rd.
Schaefer Ranch Rd.
San Ramon Rd.
I-680 Sinclair Fwy
Hopyard Rd.
Bart Station Undercrossing
Hacienda Dr.
Tassajara Rd.
E Charro Rd.
Airway Blvd.
East Airway Blvd Ramp
Creek
N Livermore Ave.
Creek
Las Colinas Rd.
1st Street
N Vasco Rd.
N. Greenville Rd.
Railroad Crossing
Undercrossing
N Flynn Rd.
Railroad Crossing
Undercrossing
Grant Line Rd.
Midway Rd.
I-205 Interchange
San Joaquin County Line
2010
2020
2035
HOV Lane Threshold
EB AM Count
Segment 508A
Segment 580B

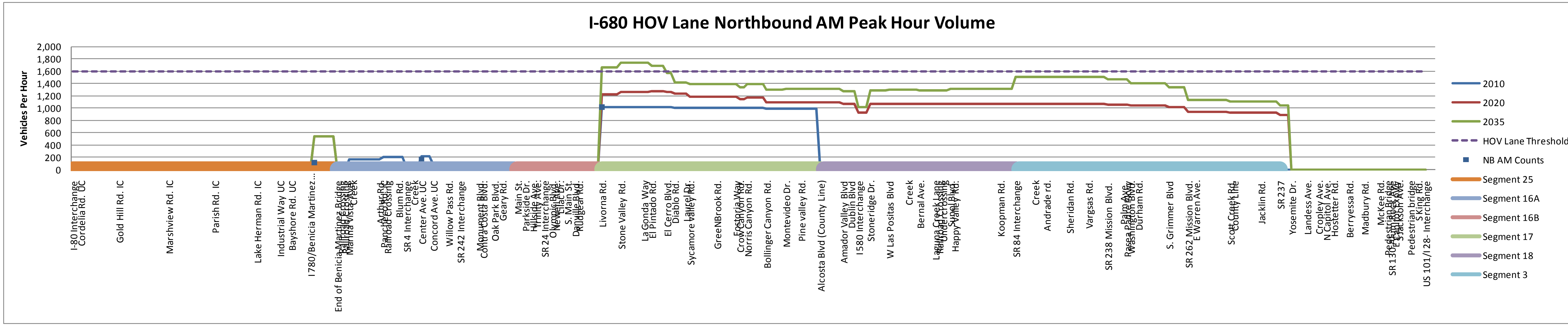

I-580 HOV Lane Eastbound PM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
I238
Castro Valley Blvd.
Stonebridge Ave.
Pedestrian Crossing
Redwood Rd.
Center St.
Grove Way
Five Canyons Pkwy
Old Dublin Rd.
E Castro Valley Blvd.
Sunnyslope Ave.
East Canyon Rd.
Schaefer Ranch Rd.
San Ramon Rd.
I-680 Sinclair Fwy
Hopyard Rd.
Bart Station Undercrossing
Hacienda Dr.
Tassajara Rd.
E Charro Rd.
Airway Blvd.
East Airway Blvd Ramp
Creek
N Livermore Ave.
Creek
Las Colinas Rd.
1st Street
N Vasco Rd.
N. Greenville Rd.
Railroad Crossing
Undercrossing
N Flynn Rd.
Railroad Crossing
Undercrossing
Grant Line Rd.
Midway Rd.
I-205 Interchange
San Joaquin County Line
2010
2020
2035
HOV Lane Threshold
EB PM Counts
Segment 508A
Segment 580B

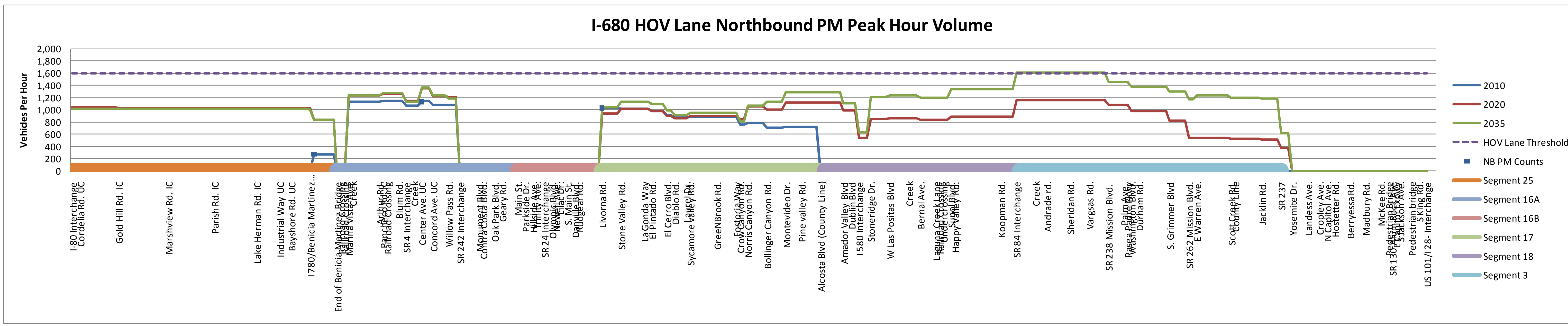

I-580 HOV Lane Westbound AM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2010
2020
2035
HOV Lane Threshold
WB AM Counts
Segment 508A
Segment 580B
I 238
Castro Valley Blvd.
Stonebridge Ave.
Pedestrian Crossing
Redwood Rd.
Center St.
Grove Way
Five Canyons Pkwy.
Old Dublin Rd.
E Castro Valley Blvd.
Sunnyslope Ave.
East Canyon Rd.
Schaefer Ranch Rd.
San Ramon Rd.
I-680 Sinclair Fwy
Hopyard Rd.
Bart Station Undercrossing
Hacienda Dr.
Tassajara Rd.
E Charro Rd.
Airway Blvd.
East Airway Blvd Ramp
Creek
N Livermore Ave.
Creek
Las Colinas Rd.
1st Street
N Vasco Rd.
N. Greenville Rd.
Railroad Crossing
Undercrossing
N Flynn Rd.
Railroad Crossing
Undercrossing
Grant Line Rd.
Midway Rd.
I-205 Interchange
San Joaquin County Line

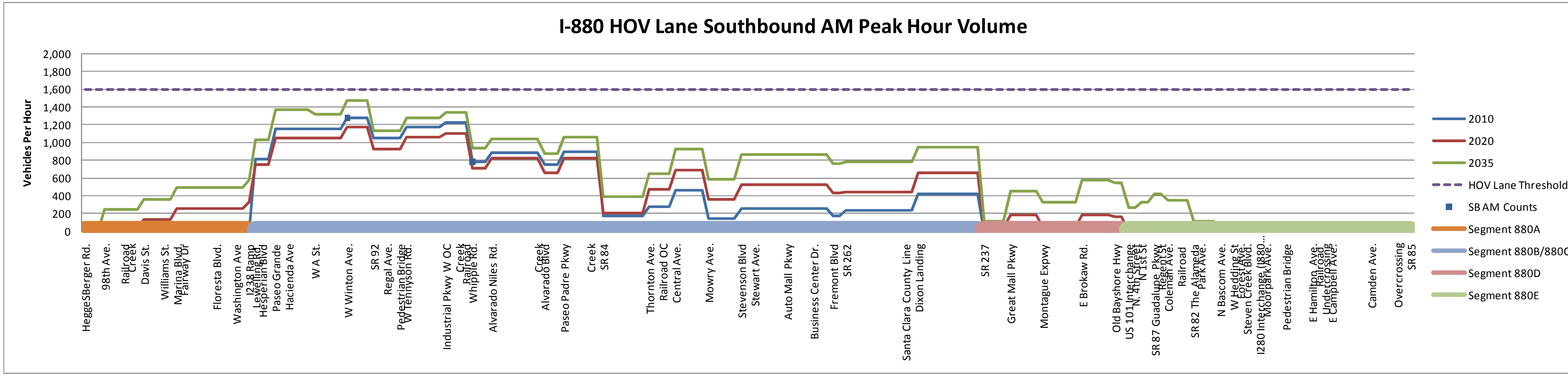

I-580 HOV Lane Westbound PM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2010
2020
2035
HOV Lane Threshold
WB PM Counts
Segment 508A
Segment 580B
I 238
Castro Valley Blvd.
Stonebridge Ave.
Pedestrian Crossing
Redwood Rd.
Center St.
Grove Way
Five Canyons Pkwy.
Old Dublin Rd.
E Castro Valley Blvd.
Sunnyslope Ave.
East Canyon Rd.
Schaefer Ranch Rd.
San Ramon Rd.
I-680 Sinclair Fwy
Hopyard Rd.
Bart Station Undercrossing
Hacienda Dr.
Tassajara Rd.
E Charro Rd.
Airway Blvd.
East Airway Blvd Ramp
Creek
N Livermore Ave.
Creek
Las Colinas Rd.
1st Street
N Vasco Rd.
N. Greenville Rd.
Railroad Crossing
Undercrossing
N Flynn Rd.
Railroad Crossing
Undercrossing
Grant Line Rd.
Midway Rd.
I-205 Interchange
San Joaquin County Line

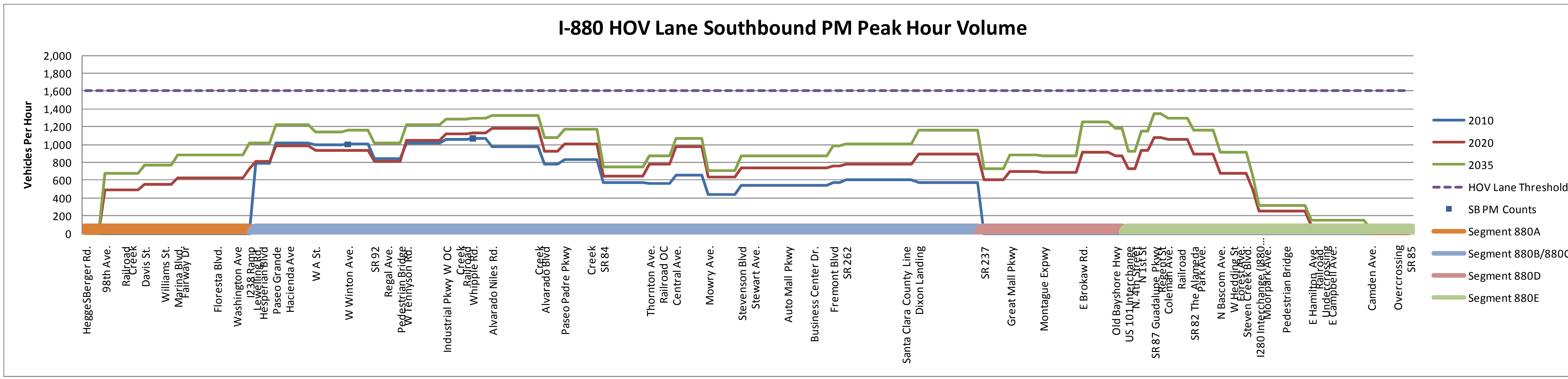

US I-680 HOV Lane Southbound AM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
I-80 Interchange
Cordelia Rd. UC
Gold Hill Rd. IC
Marshview Rd. IC
Parish Rd. IC
Lake Herman Rd. IC
Industrial Way UC
Bayshore Rd. UC
I780/Benicia Martinez...
End of Benicia Martinez Bridge
Blum Rd.
SR 4 Interchange
Center Ave. UC
Concord Ave. UC
Willow Pass Rd.
SR 242 Interchange
Oak Park Blvd.
Geary Rd.
Main St.
Parkside Dr.
SR 24 Interchange
S. Main St.
Livorna Rd.
Stone Valley Rd.
La Gonda Way
El Pintado Rd.
El Cerro Blvd.
Diablo Rd.
Sycamore Valley Rd.
GreeNBrook Rd.
Norris Canyon Rd.
Bollinger Canyon Rd.
Montevideo Dr.
Pine valley Rd.
Alcosta Blvd (County Line)
Amador Valley Blvd
Dublin Blvd
I580 Interchange
Stoneridge Dr.
W Las Positas Blvd
Creek
Bernal Ave.
Koopman Rd.
SR 84 Interchange
Creek
Andrade rd.
Sheridan Rd.
Vargsas Rd.
SR 238 Mission Blvd.
Durham Rd.
S. Grimmer Blvd
SR 262 Mission Blvd.
E Warren Ave.
Jacklin Rd.
SR 237
Yosemite Dr.
Landess Ave.
Cropley Ave.
N Capitol Ave.
Hostetter Rd.
Berryessa Rd.
Madbury Rd.
McKee Rd.
Pedestrian bridge
S King Rd.
US 101/I28- Interchange
2010
2020
2035
HOV Lane Threshold
SB AM Count
Segment 680F
Segment 680E
Segment 680D
Segment 680C
Segment 680B
Segment 680A

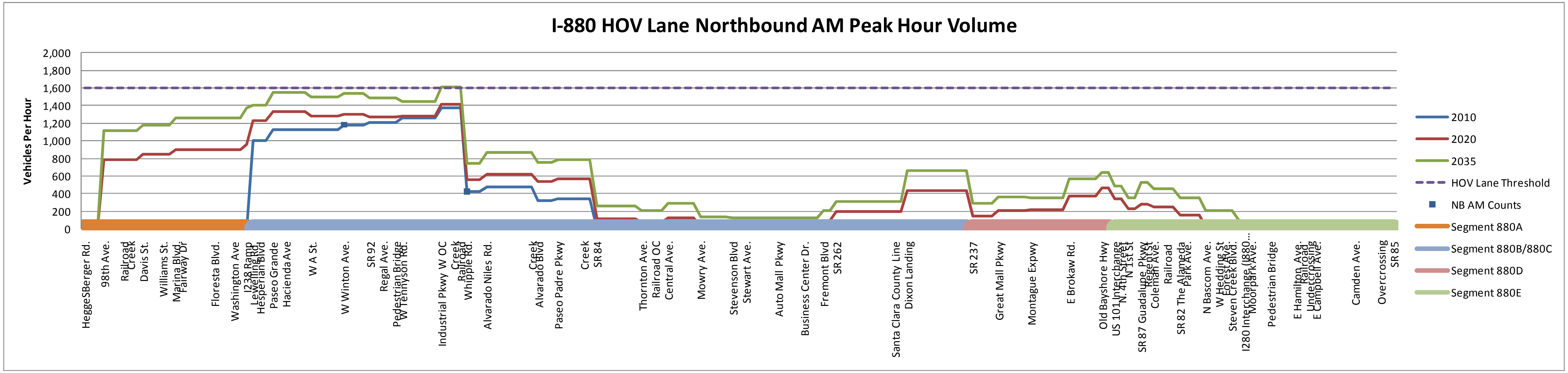

I-680 HOV Lane Southbound PM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
I-80 Interchange
Cordelia Rd. UC
Gold Hill Rd. IC
Marshview Rd. IC
Parish Rd. IC
Lake Herman Rd. IC
Industrial Way UC
Bayshore Rd. UC
I780/Benicia Martinez...
End of Benicia Martinez Bridge
Blum Rd.
SR 4 Interchange
Center Ave. UC
Concord Ave. UC
Willow Pass Rd.
SR 242 Interchange
Oak Park Blvd.
Geary Rd.
Main St.
Parkside Dr.
SR 24 Interchange
S. Main St.
Livorna Rd.
Stone Valley Rd.
La Gonda Way
El Pintado Rd.
El Cerro Blvd.
Diablo Rd.
Sycamore Valley Rd.
GreeNBrook Rd.
Norris Canyon Rd.
Bollinger Canyon Rd.
Montevideo Dr.
Pine valley Rd.
Alcosta Blvd (County Line)
Amador Valley Blvd
Dublin Blvd
I580 Interchange
Stoneridge Dr.
W Las Positas Blvd
Creek
Bernal Ave.
Koopman Rd.
SR 84 Interchange
Creek
Andrade rd.
Sheridan Rd.
Vargsas Rd.
SR 238 Mission Blvd.
Durham Rd.
S. Grimmer Blvd
SR 262 Mission Blvd.
E Warren Ave.
Jacklin Rd.
SR 237
Yosemite Dr.
Landess Ave.
Cropley Ave.
N Capitol Ave.
Hostetter Rd.
Berryessa Rd.
Madbury Rd.
McKee Rd.
Pedestrian bridge
S King Rd.
US 101/I28- Interchange
2010
2020
2035
HOV Lane Threshold
SB PM Counts
Segment 680F
Segment 680E
Segment 680D
Segment 680C
Segment 680B
Segment 680A

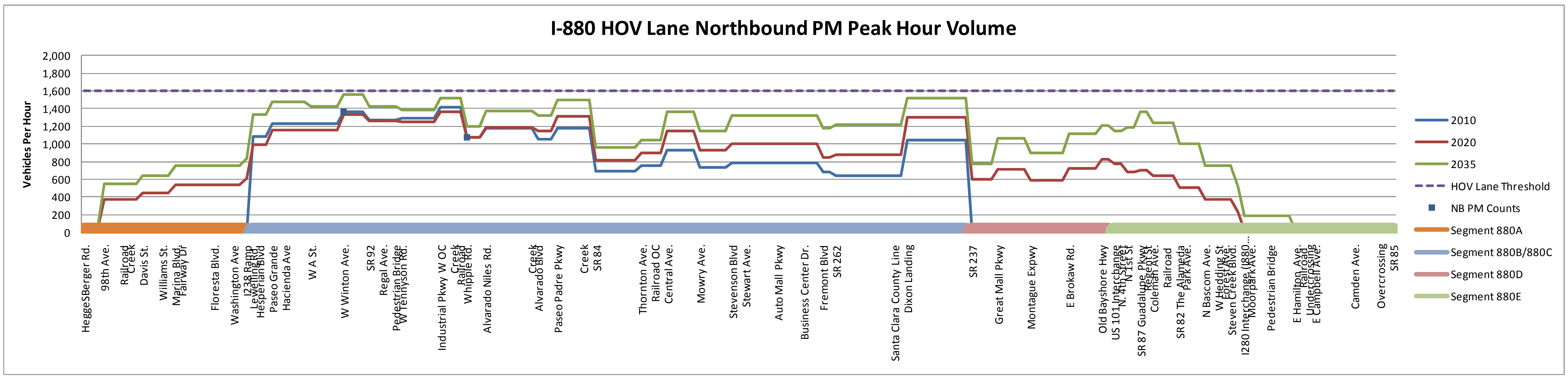

I-680 HOV Lane Northbound AM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
I-80 Interchange
Cordelia Rd. UC
Gold Hill Rd. IC
Marshview Rd. IC
Parish Rd. IC
Lake Herman Rd. IC
Industrial Way UC
Bayshore Rd. UC
I780/Benicia Martinez...
Blum Rd.
SR 4 Interchange
Center Ave. UC
Concord Ave. UC
Willow Pass Rd.
SR 242 Interchange
Oak Park Blvd.
Geary Rd.
Main St.
Livorna Rd.
Stone Valley Rd.
La Gonda Way
El Pintado Rd.
El Cerro Blvd.
Diablo Rd.
GreeNBrook Rd.
Norris Canyon Rd.
Bollinger Canyon Rd.
Montevideo Dr.
Pine valley Rd.
Alcosta Blvd (County Line)
Amador Valley Blvd
Dublin Blvd
I580 Interchange
Stoneridge Dr.
W Las Positas Blvd
Creek
Bernal Ave.
Koopman Rd.
SR 84 Interchange
Andrade rd.
Sheridan Rd.
Vargsas Rd.
SR 238 Mission Blvd.
Durham Rd.
S. Grimmer Blvd
SR 262 Mission Blvd.
E Warren Ave.
Jacklin Rd.
SR 237
Yosemite Dr.
Landess Ave.
Cropley Ave.
N Capitol Ave.
Hostetter Rd.
Berryessa Rd.
Madbury Rd.
McKee Rd.
Pedestrian bridge
S King Rd.
US 101/I28- Interchange
2010
2020
2035
HOV Lane Threshold
NB AM Counts
Segment 25
Segment 16A
Segment 16B
Segment 17
Segment 18
Segment 3

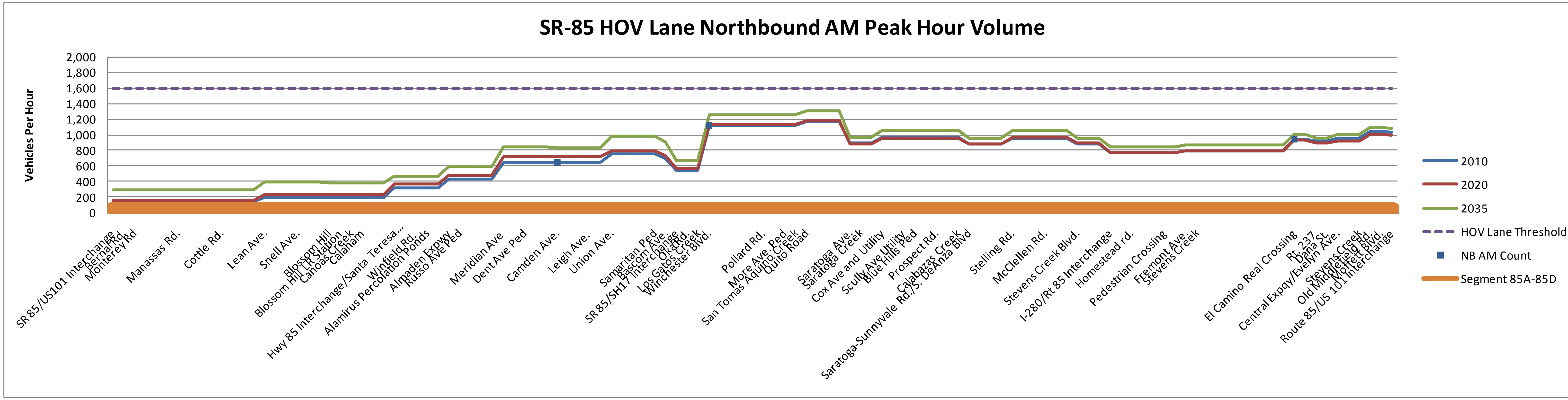

I-680 HOV Lane Northbound PM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
I-80 Interchange
Cordelia Rd. UC
Gold Hill Rd. IC
Marshview Rd. IC
Parish Rd. IC
Lake Herman Rd. IC
Industrial Way UC
Bayshore Rd. UC
I780/Benicia Martinez...
Blum Rd.
SR 4 Interchange
Center Ave. UC
Concord Ave. UC
Willow Pass Rd.
SR 242 Interchange
Oak Park Blvd.
Geary Rd.
Main St.
Livorna Rd.
Stone Valley Rd.
La Gonda Way
El Pintado Rd.
El Cerro Blvd.
Diablo Rd.
GreeNBrook Rd.
Norris Canyon Rd.
Bollinger Canyon Rd.
Montevideo Dr.
Pine valley Rd.
Alcosta Blvd (County Line)
Amador Valley Blvd
Dublin Blvd
I580 Interchange
Stoneridge Dr.
W Las Positas Blvd
Creek
Bernal Ave.
Koopman Rd.
SR 84 Interchange
Andrade rd.
Sheridan Rd.
Vargsas Rd.
SR 238 Mission Blvd.
Durham Rd.
S. Grimmer Blvd
SR 262 Mission Blvd.
E Warren Ave.
Jacklin Rd.
SR 237
Yosemite Dr.
Landess Ave.
Cropley Ave.
N Capitol Ave.
Hostetter Rd.
Berryessa Rd.
Madbury Rd.
McKee Rd.
Pedestrian bridge
S King Rd.
US 101/I28- Interchange
2010
2020
2035
HOV Lane Threshold
NB PM Counts
Segment 25
Segment 16A
Segment 16B
Segment 17
Segment 18
Segment 3

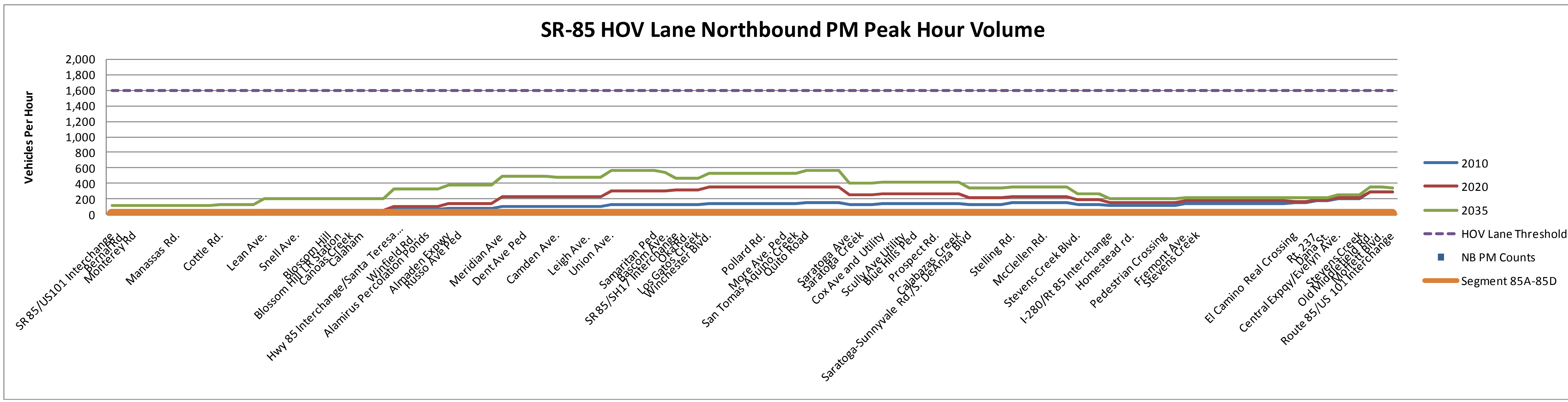

I-880 HOV Lane Southbound AM Peak Hour Volume
Vehicles Per Hour
2010
2020
2035
HOV Lane Threshold
SB AM Counts
Segment 880A
Segment 880B/880C
Segment 880D
Segment 880E


I-880 HOV Lane Southbound PM Peak Hour Volume
Vehicles Per Hour
2010
2020
2035
HOV Lane Threshold
SB PM Counts
Segment 880A
Segment 880B/880C
Segment 880D
Segment 880E

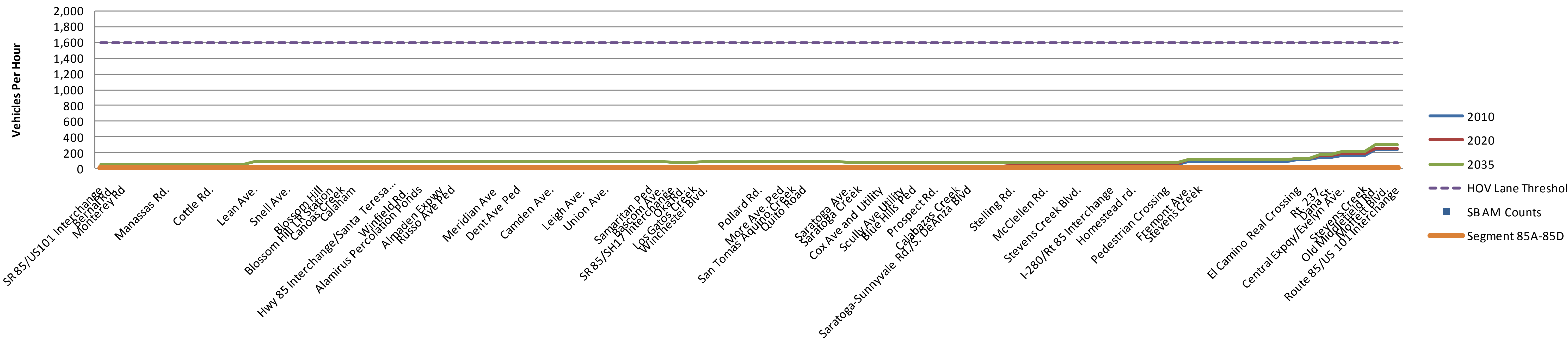

I-880 HOV Lane Northbound AM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
HeggeSBerger Rd.
98th Ave.
Railroad
Creek
Davis St.
Williams St.
Marina Blvd.
Fairway Dr
Floresta Blvd.
Washington Ave
I238 Ramp
Lewelling Blvd
Hesperian Blvd
Paseo Grande
Hacienda Ave
W A St.
W Winton Ave.
SR 92
Regal Ave.
Pedestrian Bridge
W Tennyson Rd.
Industrial Pkwy W OC
Creek
Railroad
Whipple Rd.
Alvarado Niles Rd.
Creek
Alvarado Blvd
Paseo Padre Pkwy
Creek
SR 84
Thornton Ave.
Railroad OC
Central Ave.
Mowry Ave.
Stevenson Blvd
Stewart Ave.
Auto Mall Pkwy
Business Center Dr.
Fremont Blvd
SR 262
Santa Clara County Line
Dixon Landing
SR 237
Great Mall Pkwy
Montague Expwy
E Brokaw Rd.
Old Bayshore Hwy
US 101 Interchange
N. 4th Street
N 1st St
SR 87 Guadalupe Pkwy
Regent St
Coleman Ave.
Railroad
SR 82 The Alameda
Park Ave.
N Bascom Ave.
W Hedding St
Forest Ave.
Steven Creek Blvd.
I280 Interchange (I880...
Moorpark Ave.
Pedestrian Bridge
E Hamilton Ave.
Railroad
Undercrossing
E Campbell Ave.
Camden Ave.
Overcrossing
SR 85
2010
2020
2035
HOV Lane Threshold
NB AM Counts
Segment 880A
Segment 880B/880C
Segment 880D
Segment 880E


I-880 HOV Lane Northbound PM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
HeggeSBerger Rd.
98th Ave.
Railroad
Creek
Davis St.
Williams St.
Marina Blvd.
Fairway Dr
Floresta Blvd.
Washington Ave
I238 Ramp
Lewelling Blvd
Hesperian Blvd
Paseo Grande
Hacienda Ave
W A St.
W Winton Ave.
SR 92
Regal Ave.
Pedestrian Bridge
W Tennyson Rd.
Industrial Pkwy W OC
Creek
Railroad
Whipple Rd.
Alvarado Niles Rd.
Creek
Alvarado Blvd
Paseo Padre Pkwy
Creek
SR 84
Thornton Ave.
Railroad OC
Central Ave.
Mowry Ave.
Stevenson Blvd
Stewart Ave.
Auto Mall Pkwy
Business Center Dr.
Fremont Blvd
SR 262
Santa Clara County Line
Dixon Landing
SR 237
Great Mall Pkwy
Montague Expwy
E Brokaw Rd.
Old Bayshore Hwy
US 101 Interchange
N. 4th Street
N 1st St
SR 87 Guadalupe Pkwy
Regent St
Coleman Ave.
Railroad
SR 82 The Alameda
Park Ave.
N Bascom Ave.
W Hedding St
Forest Ave.
Steven Creek Blvd.
I280 Interchange (I880...
Moorpark Ave.
Pedestrian Bridge
E Hamilton Ave.
Railroad
Undercrossing
E Campbell Ave.
Camden Ave.
Overcrossing
SR 85
2010
2020
2035
HOV Lane Threshold
NB PM Counts
Segment 880A
Segment 880B/880C
Segment 880D
Segment 880E

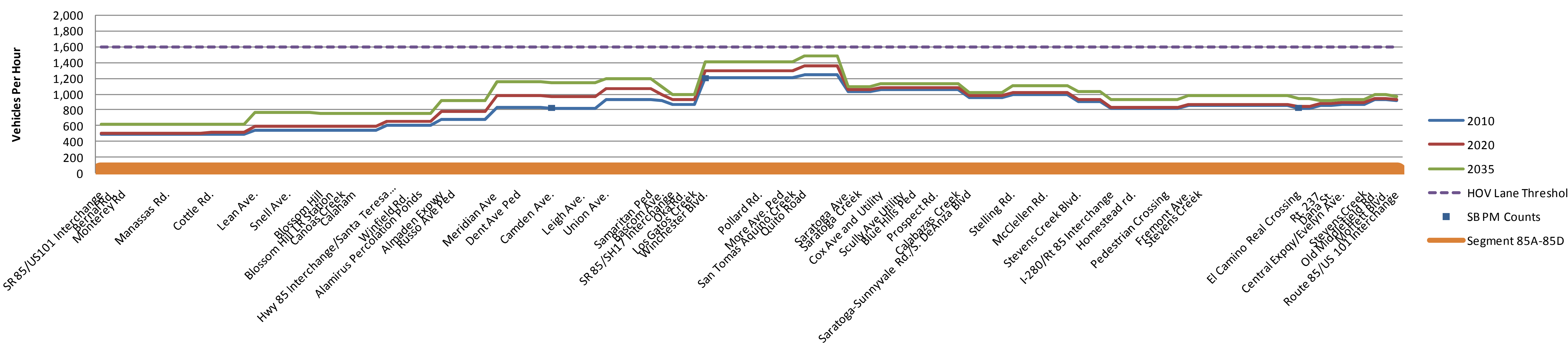

SR-85 HOV Lane Northbound AM Peak Hour Volume
Vehicles Per Hour
2010
2020
2035
HOV Lane Threshold
NB AM Count
Segment 85A-85D

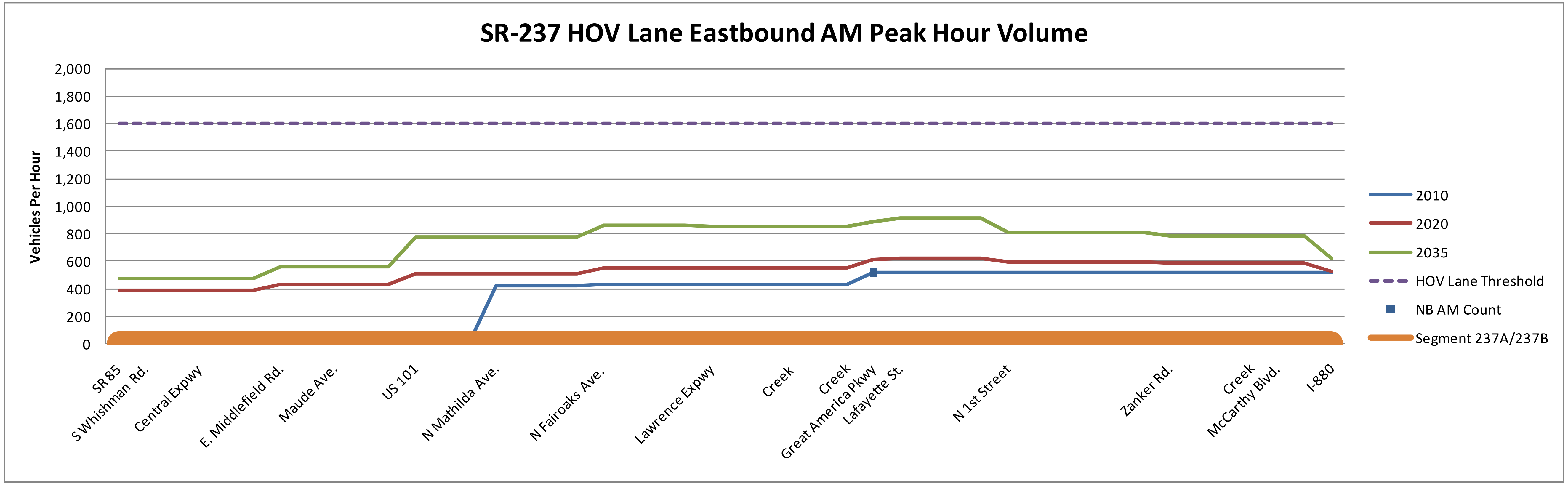

SR-85 HOV Lane Northbound PM Peak Hour Volume
Vehicles Per Hour
2010
2020
2035
HOV Lane Threshold
NB PM Counts
Segment 85A-85D

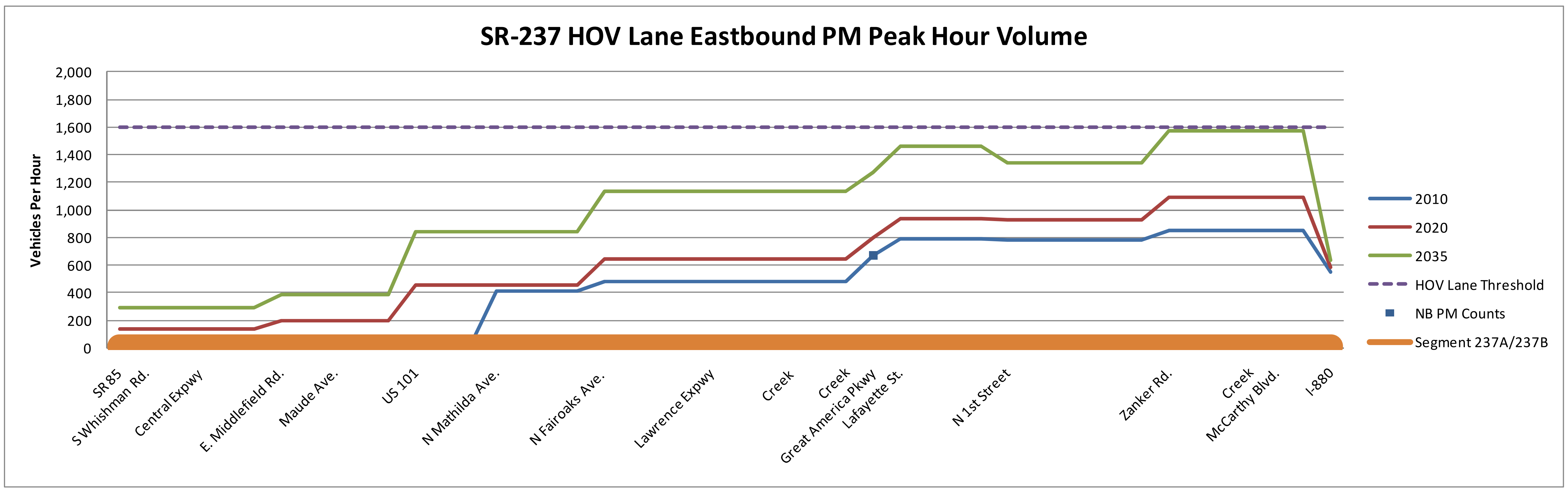
SR-85 HOV Lane Southbound AM Peak Hour Volume

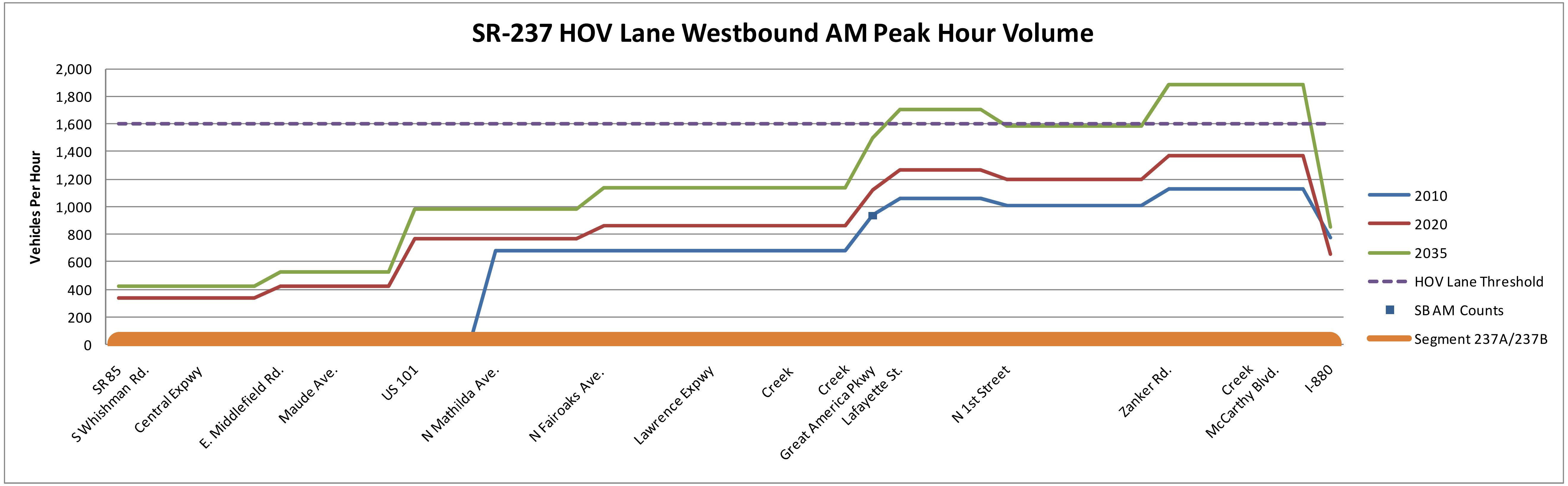


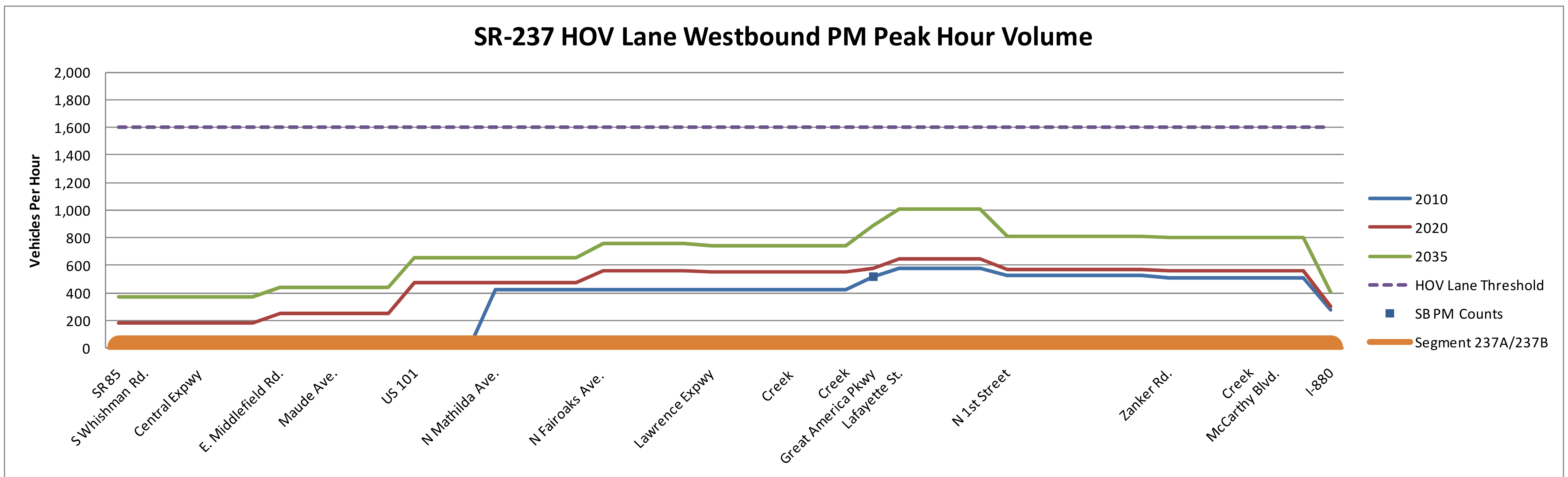
SR-85 HOV Lane Southbound PM Peak Hour Volume




SR-237 HOV Lane Eastbound AM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
SR 85
S Whishman Rd.
Central Expwy
E. Middlefield Rd.
Maude Ave.
US 101
N Mathilda Ave.
N Fairoaks Ave.
Lawrence Expwy
Creek
Creek
Great America Pkwy
Lafayette St.
N 1st Street
Zanker Rd.
Creek
McCarthy Blvd.
I-880
2010
2020
2035
HOV Lane Threshold
NB AM Count
Segment 237A/237B


SR-237 HOV Lane Eastbound PM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
SR 85
S Whishman Rd.
Central Expwy
E. Middlefield Rd.
Maude Ave.
US 101
N Mathilda Ave.
N Fairoaks Ave.
Lawrence Expwy
Creek
Creek
Great America Pkwy
Lafayette St.
N 1st Street
Zanker Rd.
Creek
McCarthy Blvd.
I-880
2010
2020
2035
HOV Lane Threshold
NB PM Counts
Segment 237A/237B


SR-237 HOV Lane Westbound AM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
SR 85
S Whishman Rd.
Central Expwy
E. Middlefield Rd.
Maude Ave.
US 101
N Mathilda Ave.
N Fairoaks Ave.
Lawrence Expwy
Creek
Creek
Great America Pkwy
Lafayette St.
N 1st Street
Zanker Rd.
Creek
McCarthy Blvd.
I-880
2010
2020
2035
HOV Lane Threshold
SB AM Counts
Segment 237A/237B


SR-237 HOV Lane Westbound PM Peak Hour Volume
Vehicles Per Hour
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
SR 85
S Whishman Rd.
Central Expwy
E. Middlefield Rd.
Maude Ave.
US 101
N Mathilda Ave.
N Fairoaks Ave.
Lawrence Expwy
Creek
Creek
Great America Pkwy
Lafayette St.
N 1st Street
Zanker Rd.
Creek
McCarthy Blvd.
I-880
2010
2020
2035
HOV Lane Threshold
SB PM Counts
Segment 237A/237B

Attachment 3

Estimated Traffic Impacts of HOV3+ Occupancy Requirement

Year 2020 HOV3+ model

AM Peak Hour

Freeway	Dir.	Segment	No-Build Condition	No Build: HOV Lane Volume	No Build: GP Lane Volume	No Build: Total Segment Volume	HOT 3+ Operations: HOV Volume	HOT 3+ Operations: Paying Volume	HOT 3+ Operations: Total Express Lane Volume	HOT 3+ Operations: GP Lane Volume	HOT 3+ Operations: Total Segment Volume	Difference vs. No-Build: HOV Volume	Difference vs. No-Build: Paying Volume	Difference vs. No-Build: Total Express Lane Volume	Difference vs. No-Build: GP Lane Volume	Difference vs. No-Build: Total Segment Volume
I-80	WB	I-780 to SR-37	No express lane		4,127	4,127	159	115	274	3,853	4,127	159	115	274	-274	0
		SR-37 to I-680	No express lane		3,397	3,397	91	69	160	3,237	3,397	91	69	160	-160	0
		I-680 to SR-12 South	HOV 2+	609	6,478	7,087	153	289	442	6,645	7,087	-456	289	-167	167	0
		SR-12 South to Airbase Pky	HOV 2+	514	5,059	5,573	116	75	191	5,382	5,573	-398	75	-323	323	0
		Airbase Pky to I-505	No express lane		5,965	5,965	85	126	211	5,754	5,965	85	126	211	-211	0
		I-505 to SR-113	No express lane		3,539	3,539	33	88	121	3,418	3,539	33	88	121	-121	0
	EB	SR-4 to I-780	No express lane		3,378	3,378	87	81	168	3,210	3,378	87	81	168	-168	0
		I-780 to SR-37	No express lane		2,850	2,850	80	57	137	2,713	2,850	80	57	137	-137	0
		SR-37 to I-680	No express lane		2,541	2,541	39	37	76	2,465	2,541	39	37	76	-76	0
		I-680 to SR-12 South	HOV 2+	324	4,593	4,917	81	99	180	4,737	4,917	-243	99	-144	144	0
		SR-12 South to Airbase Pky	HOV 2+	242	3,658	3,900	54	44	98	3,802	3,900	-188	44	-144	144	0
		Airbase Pky to I-505	No express lane		4,040	4,040	59	56	115	3,925	4,040	59	56	115	-115	0
		I-505 to SR-113	No express lane		3,243	3,243	24	77	101	3,142	3,243	24	77	101	-101	0
I-680	NB	SR-84 to I-580	No express lane		4,815	4,815	229	241	470	4,345	4,815	229	241	470	-470	0
		I-580 to Crow Canyon Rd	HOV 2+	1,121	6,454	7,575	296	1,182	1,478	6,097	7,575	-825	1,182	357	-357	0
		Crow Canyon Rd to SR-24	HOV 2+	901	4,784	5,685	233	478	711	4,974	5,685	-668	478	-190	190	0
		SR-24 to SR-242 (Gap in NB)	No express lane		6,309	6,309	-	0	0	6,309	6,309	0	0	0	0	0
		SR-242 to SR-4	HOV 2+	98	3,531	3,629	27	105	132	3,497	3,629	-71	105	34	-34	0
		SR-4 to I-780	HOV 2+	152	3,117	3,269	61	87	148	3,121	3,269	-90	87	-3	3	0
		I-780 to I-80	No express lane		1,917	1,917	26	50	76	1,841	1,917	26	50	76	-76	0
	SB	SR-84 to I-580	No express lane		5,092	5,092	154	304	458	4,634	5,092	154	304	458	-458	0
		I-580 to Crow Canyon Rd	HOV 2+	879	6,271	7,150	220	1,024	1,244	5,906	7,150	-659	1,024	365	-365	0
		Crow Canyon Rd to SR-24	HOV 2+	976	5,677	6,653	251	861	1,112	5,541	6,653	-725	861	136	-136	0
		SR-24 to SR-242	No express lane		7,425	7,425	385	98	483	6,942	7,425	385	98	483	-483	0
		SR-242 to SR-4	HOV 2+	1,101	4,338	5,439	248	415	663	4,776	5,439	-853	415	-438	438	0
		SR-4 to I-780	HOV 2+	419	3,914	4,333	90	167	257	4,076	4,333	-328	167	-161	161	0
		I-780 to I-80	No express lane		3,876	3,876	84	399	483	3,393	3,876	84	399	483	-483	0
I-880	NB	Hegenberger Rd to I-238	HOV 2+	868	7,342	8,210	185	610	795	7,415	8,210	-683	610	-73	73	0
		I-238-238 to SR-92	HOV 2+	1,297	7,028	8,325	296	801	1,097	7,228	8,325	-1,001	801	-200	200	0
		SR-92 to SR-84	HOV 2+	910	5,755	6,665	215	877	1,092	5,573	6,665	-696	877	181	-181	0
		SR-84 to Mission Blvd	HOV 2+	74	5,519	5,593	17	497	514	5,079	5,593	-56	497	441	-441	0
		Mission Blvd to SR-237	HOV 2+	332	6,063	6,395	81	268	349	6,046	6,395	-250	268	18	-18	0
	SB	Hegenberger Rd to I-238	HOV 2+	171	6,182	6,353	42	252	294	6,059	6,353	-129	252	123	-123	0
		I-238-238 to SR-92	HOV 2+	1,083	7,688	8,771	254	922	1,176	7,595	8,771	-829	922	93	-93	0
		SR-92 to SR-84	HOV 2+	979	5,461	6,440	238	796	1,034	5,406	6,440	-742	796	54	-54	0
		SR-84 to Mission Blvd	HOV 2+	470	6,435	6,905	109	880	989	5,916	6,905	-361	880	519	-519	0
		Mission Blvd to SR-237	HOV 2+	569	8,755	9,324	130	1,470	1,600	7,724	9,324	-439	1,470	1,031	-1,031	0

PM Peak Hour

Freeway	Dir.	Segment	No-Build Condition	No Build: HOV Lane Volume	No Build: GP Lane Volume	No Build: Total Segment Volume	HOT 3+ Operations: HOV Volume	HOT 3+ Operations: Paying Volume	HOT 3+ Operations: Total Express Lane Volume	HOT 3+ Operations: GP Lane Volume	HOT 3+ Operations: Total Segment Volume	Difference vs. No-Build: HOV Volume	Difference vs. No-Build: Paying Volume	Difference vs. No-Build: Total Express Lane Volume	Difference vs. No-Build: GP Lane Volume	Difference vs. No-Build: Total Segment Volume
I-80	WB	I-780 to SR-37	No express lane		2,965	2,965	92	56	148	2,817	2,965	92	56	148	-148	0
		SR-37 to I-680	No express lane		2,867	2,867	72	50	122	2,745	2,867	72	50	122	-122	0
		I-680 to SR-12 South	HOV 2+	327	5,456	5,783	47	151	198	5,585	5,783	-280	151	-129	129	0
		SR-12 South to Airbase Pky	HOV 2+	294	3,801	4,095	46	37	83	4,012	4,095	-248	37	-211	211	0
		Airbase Pky to I-505	No express lane		5,154	5,154	35	75	110	5,044	5,154	35	75	110	-110	0
		I-505 to SR-113	No express lane		3,739	3,739	38	93	131	3,608	3,739	38	93	131	-131	0
	EB	SR-4 to I-780	No express lane		4,113	4,113	535	124	659	3,454	4,113	535	124	659	-659	0
		I-780 to SR-37	No express lane		4,100	4,100	236	121	357	3,743	4,100	236	121	357	-357	0
		SR-37 to I-680	No express lane		3,698	3,698	157	82	239	3,459	3,698	157	82	239	-239	0
		I-680 to SR-12 South	HOV 2+	699	6,783	7,482	169	417	586	6,896	7,482	-531	417	-114	114	0
		SR-12 South to Airbase Pky	HOV 2+	733	5,421	6,154	157	123	280	5,874	6,154	-576	123	-453	453	0
		Airbase Pky to I-505	No express lane		6,934	6,934	141	291	432	6,502	6,934	141	291	432	-432	0
		I-505 to SR-113	No express lane		4,025	4,025	87	121	208	3,817	4,025	87	121	208	-208	0
I-680	NB	SR-84 to I-580	No express lane		6,122	6,122	187	591	778	5,344	6,122	187	591	778	-778	0
		I-580 to Crow Canyon Rd	HOV 2+	1,080	6,881	7,961	271	1,289	1,560	6,401	7,961	-810	1,289	479	-479	0
		Crow Canyon Rd to SR-24	HOV 2+	689	5,268	5,957	178	622	800	5,157	5,957	-512	622	110	-110	0
		SR-24 to SR-242 (Gap in NB)	No express lane		8,279	8,279	-	0	0	8,279	8,279	0	0	0	0	0
		SR-242 to SR-4	HOV 2+	1,307	3,302	4,609	355	201	556	4,053	4,609	-952	201	-751	751	0
		SR-4 to I-780	HOV 2+	924	3,728	4,652	301	199	500	4,152	4,652	-622	199	-423	423	0
		I-780 to I-80	No express lane		2,895	2,895	84	136	220	2,675	2,895	84	136	220	-220	0
	SB	SR-84 to I-580	No express lane		5,207	5,207	143	311	454	4,753	5,207	143	311	454	-454	0
		I-580 to Crow Canyon Rd	HOV 2+	764	6,599	7,363	195	1,055	1,250	6,113	7,363	-569	1,055	486	-486	0
		Crow Canyon Rd to SR-24	HOV 2+	848	5,664	6,512	223	801	1,024	5,488	6,512	-625	801	176	-176	0
		SR-24 to SR-242	No express lane		6,558	6,558	134	74	208	6,350	6,558	134	74	208	-208	0
		SR-242 to SR-4	HOV 2+	300	4,457	4,757	78	227	305	4,452	4,757	-223	227	4	-4	0
		SR-4 to I-780	HOV 2+	309	3,655	3,964	86	134	220	3,744	3,964	-223	134	-89	89	0
		I-780 to I-80	No express lane		2,418	2,418	84	104	188	2,230	2,418	84	104	188	-188	0
I-880	NB	Hegenberger Rd to I-238	HOV 2+	497	6,935	7,432	141	490	631	6,801	7,432	-356	490	134	-134	0
		I-238-238 to SR-92	HOV 2+	1,202	8,102	9,304	318	1,046	1,364	7,940	9,304	-884	1,046	162	-162	0
		SR-92 to SR-84	HOV 2+	1,252	6,025	7,277	324	1,041	1,365	5,912	7,277	-928	1,041	113	-113	0
		SR-84 to Mission Blvd	HOV 2+	970	6,909	7,879	230	1,251	1,481	6,398	7,879	-740	1,251	511	-511	0
		Mission Blvd to SR-237	HOV 2+	1,111	7,307	8,418	252	739	991	7,427	8,418	-858	739	-119	119	0
	SB	Hegenberger Rd to I-238	HOV 2+	646	6,903	7,549	147	460	607	6,942	7,549	-499	460	-39	39	0
		I-238-238 to SR-92	HOV 2+	988	8,212	9,200	229	967	1,196	8,004	9,200	-759	967	208	-208	0
		SR-92 to SR-84	HOV 2+	1,051	5,685	6,736	262	876	1,138	5,598	6,736	-790	876	86	-86	0
		SR-84 to Mission Blvd	HOV 2+	752	5,053	5,805	192	627	819	4,986	5,805	-559	627	68	-68	0
		Mission Blvd to SR-237	HOV 2+	856	7,041	7,897	210	1,285	1,495	6,402	7,897	-646	1,285	639	-639	0

Year 2035 HOV3+ Model

				AM Peak Hour													PM Peak Hour												
				No Build			HOT 3+ Operations					Difference vs. No-Build					No Build			HOT 3+ Operations					Difference vs. No-Build				
			No-Build Condition	HOV Lane Volume	GP Lane Volume	Total Segment Volume	HOV Volume	Paying Volume	Total Express Lane Volume	GP Lane Volume	Total Segment Volume	HOV Volume	Paying Volume	Total Express Lane Volume	GP Lane Volume	Total Segment Volume	HOV Lane Volume	GP Lane Volume	Total Segment Volume	HOV Volume	Paying Volume	Total Express Lane Volume	GP Lane Volume	Total Segment Volume	HOV Volume	Paying Volume	Total Express Lane Volume	GP Lane Volume	Total Segment Volume
I-80	WB	I-780 to SR-37	No express lane		4,142	4,142	174	116	290	3,852	4,142	174	116	290	-290	0		2,976	2,976	66	57	123	2,853	2,976	66	57	123	-123	0
		SR-37 to I-680	No express lane		3,508	3,508	106	80	186	3,322	3,508	106	80	186	-186	0		2,961	2,961	47	54	101	2,860	2,961	47	54	101	-101	0
		I-680 to SR-12 South	HOV 2+	624	6,710	7,334	171	381	552	6,782	7,334	-454	381	-73	73	0	358	5,627	5,985	42	140	182	5,803	5,985	-317	140	-177	177	0
		SR-12 South to Airbase Pky	HOV 2+	544	5,029	5,573	126	75	201	5,372	5,573	-418	75	-343	343	0	281	3,814	4,095	57	37	94	4,001	4,095	-225	37	-188	188	0
		Airbase Pky to I-505	No express lane		6,218	6,218	98	115	213	6,005	6,218	98	115	213	-213	0		5,372	5,372	41	90	131	5,241	5,372	41	90	131	-131	0
		I-505 to SR-113	No express lane		3,891	3,891	37	121	158	3,733	3,891	37	121	158	-158	0		4,111	4,111	48	128	176	3,935	4,111	48	128	176	-176	0
	EB	SR-4 to I-780	No express lane		3,344	3,344	212	80	292	3,052	3,344	212	80	292	-292	0		4,071	4,071	677	123	800	3,271	4,071	677	123	800	-800	0
		I-780 to SR-37	No express lane		2,850	2,850	106	57	163	2,687	2,850	106	57	163	-163	0		4,100	4,100	345	121	466	3,634	4,100	345	121	466	-466	0
		SR-37 to I-680	No express lane		2,567	2,567	39	38	77	2,490	2,567	39	38	77	-77	0		3,737	3,737	193	84	277	3,460	3,737	193	84	277	-277	0
		I-680 to SR-12 South	HOV 2+	410	4,678	5,088	147	106	253	4,835	5,088	-263	106	-157	157	0	702	7,041	7,743	191	447	638	7,105	7,743	-511	447	-64	64	0
		SR-12 South to Airbase Pky	HOV 2+	316	3,609	3,925	109	43	152	3,773	3,925	-207	43	-164	164	0	721	5,473	6,194	162	111	273	5,921	6,194	-559	111	-448	448	0
		Airbase Pky to I-505	No express lane		4,182	4,182	131	59	190	3,992	4,182	131	59	190	-190	0		7,176	7,176	147	294	441	6,735	7,176	147	294	441	-441	0
		I-505 to SR-113	No express lane		3,542	3,542	59	95	154	3,388	3,542	59	95	154	-154	0		4,397	4,397	99	157	256	4,141	4,397	99	157	256	-256	0

				No Build			HOT 3+ Operations					Difference vs. No-Build					No Build			HOT 3+ Operations					Difference vs. No-Build				
			No-Build Condition	HOV Lane Volume	GP Lane Volume	Total Segment Volume	HOV Volume	Paying Volume	Total Express Lane Volume	GP Lane Volume	Total Segment Volume	HOV Volume	Paying Volume	Total Express Lane Volume	GP Lane Volume	Total Segment Volume	HOV Lane Volume	GP Lane Volume	Total Segment Volume	HOV Volume	Paying Volume	Total Express Lane Volume	GP Lane Volume	Total Segment Volume	HOV Volume	Paying Volume	Total Express Lane Volume	GP Lane Volume	Total Segment Volume
I-680	NB	SR-84 to I-580	No express lane		5,461	5,461	251	470	721	4,740	5,461	251	470	721	-721	0		6,943	6,943	226	875	1,101	5,842	6,943	226	875	1,101	-1,101	0
		I-580 to Crow Canyon Rd	HOV 2+	1,317	6,692	8,009	311	1,289	1,600	6,409	8,009	-1,006	1,289	283	-283	0	1,170	7,247	8,417	282	1,318	1,600	6,817	8,417	-888	1,318	430	-430	0
		Crow Canyon Rd to SR-24	HOV 2+	1,094	4,963	6,057	260	627	887	5,170	6,057	-834	627	-207	207	0	720	5,627	6,347	170	762	932	5,415	6,347	-550	762	212	-212	0
		SR-24 to SR-242 (Gap in NB)	No express lane		6,904	6,904	-	0	0	6,904	6,904	0	0	0	0	0		9,060	9,060	-	0	0	9,060	9,060	0	0	0	0	0
		SR-242 to SR-4	HOV 2+	129	3,506	3,635	38	106	144	3,491	3,635	-91	106	15	-15	0	1,385	3,232	4,617	348	202	550	4,067	4,617	-1,036	202	-834	834	0
		SR-4 to I-780	HOV 2+	174	3,163	3,337	70	91	161	3,176	3,337	-104	91	-13	13	0	969	3,779	4,748	306	207	513	4,235	4,748	-663	207	-456	456	0
		I-780 to I-80	No express lane		1,854	1,854	34	48	82	1,772	1,854	34	48	82	-82	0		2,800	2,800	84	119	203	2,597	2,800	84	119	203	-203	0
	SB	SR-84 to I-580	No express lane		5,706	5,706	228	471	699	5,007	5,706	228	471	699	-699	0		5,834	5,834	157	599	756	5,078	5,834	157	599	756	-756	0
		I-580 to Crow Canyon Rd	HOV 2+	1,012	6,556	7,568	230	1,169	1,399	6,169	7,568	-781	1,169	388	-388	0	946	6,847	7,793	238	1,205	1,443	6,350	7,793	-708	1,205	497	-497	0
		Crow Canyon Rd to SR-24	HOV 2+	1,098	5,917	7,015	259	999	1,258	5,757	7,015	-839	999	160	-160	0	1,045	5,822	6,867	268	899	1,167	5,700	6,867	-778	899	121	-121	0
		SR-24 to SR-242	No express lane		7,981	7,981	385	145	530	7,451	7,981	385	145	530	-530	0		7,049	7,049	162	107	269	6,780	7,049	162	107	269	-269	0
		SR-242 to SR-4	HOV 2+	1,107	4,406	5,513	248	421	669	4,844	5,513	-859	421	-438	438	0	339	4,483	4,822	92	230	322	4,500	4,822	-247	230	-17	17	0
		SR-4 to I-780	HOV 2+	419	4,027	4,446	90	173	263	4,183	4,446	-328	173	-155	155	0	417	3,651	4,068	121	139	260	3,808	4,068	-296	139	-157	157	0
		I-780 to I-80	No express lane		3,778	3,778	84	388	472	3,306	3,778	84	388	472	-472	0		2,356	2,356	84	102	186	2,170	2,356	84	102	186	-186	0

				No Build			HOT 3+ Operations					Difference vs. No-Build					No Build			HOT 3+ Operations					Difference vs. No-Build				
			No-Build Condition	HOV Lane Volume	GP Lane Volume	Total Segment Volume	HOV Volume	Paying Volume	Total Express Lane Volume	GP Lane Volume	Total Segment Volume	HOV Volume	Paying Volume	Total Express Lane Volume	GP Lane Volume	Total Segment Volume	HOV Lane Volume	GP Lane Volume	Total Segment Volume	HOV Volume	Paying Volume	Total Express Lane Volume	GP Lane Volume	Total Segment Volume	HOV Volume	Paying Volume	Total Express Lane Volume	GP Lane Volume	Total Segment Volume
I-880	NB	Hegenberger Rd to I-238	HOV 2+	1,204	7,550	8,754	272	875	1,147	7,607	8,754	-932	875	-57	57	0	670	7,255	7,925	177	618	795	7,130	7,925	-493	618	125	-125	0
		I-238-238 to SR-92	HOV 2+	1,501	7,478	8,979	344	959	1,303	7,676	8,979	-1,157	959	-198	198	0	1,425	8,610	10,035	367	1,209	1,576	8,459	10,035	-1,058	1,209	151	-151	0
		SR-92 to SR-84	HOV 2+	1,105	6,132	7,237	252	1,053	1,305	5,932	7,237	-853	1,053	200	-200	0	1,402	6,499	7,901	348	1,252	1,600	6,301	7,901	-1,054	1,252	198	-198	0
		SR-84 to Mission Blvd	HOV 2+	188	5,885	6,073	44	657	701	5,372	6,073	-144	657	513	-513	0	1,198	7,357	8,555	269	1,331	1,600	6,955	8,555	-928	1,331	402	-402	0
		Mission Blvd to SR-237	HOV 2+	478	6,703	7,181	109	410	519	6,662	7,181	-370	410	40	-40	0	1,362	8,091	9,453	290	1,015	1,305	8,148	9,453	-1,072	1,015	-57	57	0
	SB	Hegenberger Rd to I-238	HOV 2+	395	6,461	6,856	86	381	467	6,389	6,856	-309	381	72	-72	0	799	7,348	8,147	174	609	783	7,364	8,147	-625	609	-16	16	0
		I-238-238 to SR-92	HOV 2+	1,282	8,048	9,330	288	1,075	1,363	7,967	9,330	-993	1,075	82	-82	0	1,144	8,642	9,786	265	1,182	1,447	8,339	9,786	-879	1,182	303	-303	0
		SR-92 to SR-84	HOV 2+	1,109	5,839	6,948	257	918	1,175	5,773	6,948	-851	918	67	-67	0	1,209	6,058	7,267	286	1,043	1,329	5,938	7,267	-923	1,043	120	-120	0
		SR-84 to Mission Blvd	HOV 2+	715	6,846	7,561	152	1,147	1,299	6,262	7,561	-563	1,147	584	-584	0	855	5,501	6,356	207	791	998	5,358	6,356	-649	791	142	-142	0
		Mission Blvd to SR-237	HOV 2+	859	9,588	10,447	175	1,425	1,600	8,847	10,447	-684	1,425	741	-741	0	1,079	7,769	8,848	251	1,349	1,600	7,248	8,848	-829	1,349	521	-521	0