2016 Level of Service Monitoring Report

ALAMEDA
County Transportation Commission

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prepared by **Iteris**

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2016
LEVEL OF SERVICE MONITORING

ON THE CONGESTION MANAGEMENT PROGRAM ROADWAY NETWORK

ALAMEDA COUNTY TRANSPORTATION COMMISSION

NOVEMBER 2016

Prepared by Iteris, Inc.

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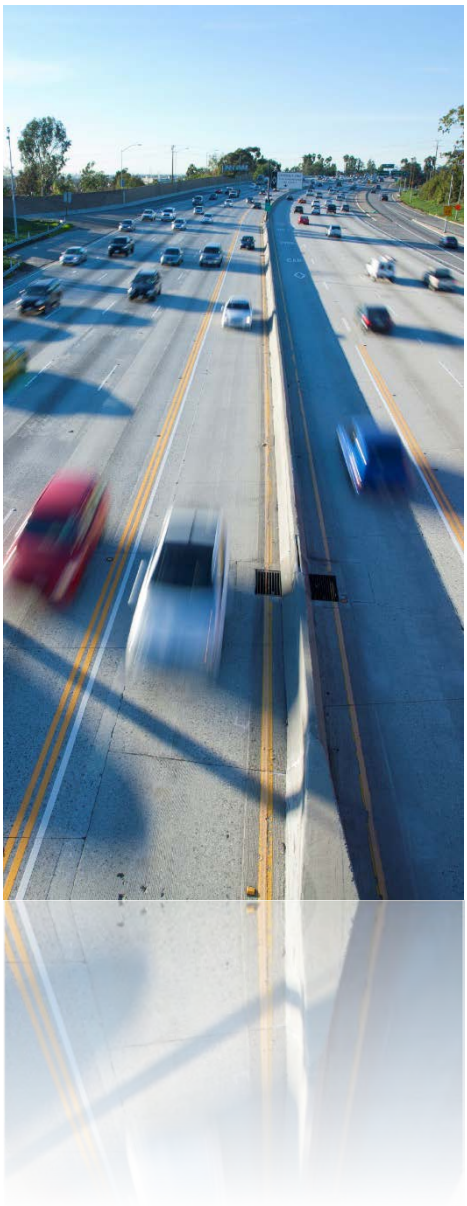
ES | Executive Summary

Traffic congestion is common on roadways in major metropolitan areas. Congestion can be seen as a situation in which at a certain time, on a certain roadway, the demand exceeds the capacity. Roadway capacity can be improved through operational improvements such as signal timing or increased by adding lanes; while population, land use and economic changes such as employment or commercial activity can influence the demand on the transportation network. Carpooling, bicycling, and using public transit can further reduce demand and allow satisfactory operation without adding road capacity. Even with reduction in transportation demand, it may still exceed the supply, resulting in traffic congestion.



California law mandates that urban areas develop a Congestion Management Program (CMP) that describes the strategies to assess, monitor, and improve the performance of each county's multimodal transportation system, and strengthen the integration of transportation and land use. The Alameda County Transportation Commission (Alameda CTC) has been designated as the Congestion Management Agency (CMA) for Alameda County and is responsible for managing and updating the CMP. As part of the CMP which has been in place since 1991, Alameda CTC has been monitoring traffic congestion every two years on the county's designated CMP roadways.

The LOS monitoring's focus is to measure average travel speeds on the county roadways, identify congested segments, and assess long term congestion trends on the CMP network. The Highway Capacity Manual (HCM) is used to describe the level of service (LOS) at which each roadway segment operates, based on travel speeds measured during the LOS monitoring effort. As required by state law, if a CMP segment is found to operate at LOS F conditions during any LOS monitoring cycle, after applicable exemptions, a deficiency plan is required to be prepared to improve the performance of that CMP segment. The LOS monitoring results provide a better understanding of the performance of Alameda County's roadways, but also informs the agency's other planning processes.

Alameda County CMP Network and Other Monitoring Elements

The CMP legislation requires that Alameda CTC designates a CMP roadway network for performance monitoring. Alameda County's CMP network consists of approximately 328 miles of roadways and is divided into two tiers (see Figure ES-1). The CMP network's Tier 1 roadways were initially adopted in 1991 and updated in 1992, and included all freeways, state highways, selected principal arterials and freeway ramp connectors. The Tier 2 roadways were added to the CMP network in 2011 and

included principal and major arterials. Monitoring of Tier 1 roadways in the afternoon peak period (4:00 to 6:00 p.m.) is subject to CMP conformity. Monitoring of Tier 1 roadways in the morning peak period (7:00 to 9:00 a.m.) and Tier 2 roadways for both peak periods are for information purposes only.

In addition to monitoring the Tier 1 and Tier 2 roadways, the LOS Monitoring Report also includes other monitoring elements for informational purpose only, including monitoring the three bridges connecting Alameda County to San Francisco and San Mateo counties. The LOS Monitoring Report also conducts travel time surveys between 10 origin and destination (OD) pairs using multiple transportation modes. Starting in the 2014 LOS monitoring cycle, Alameda CTC also began monitoring mainline freeway HOV and express lanes.

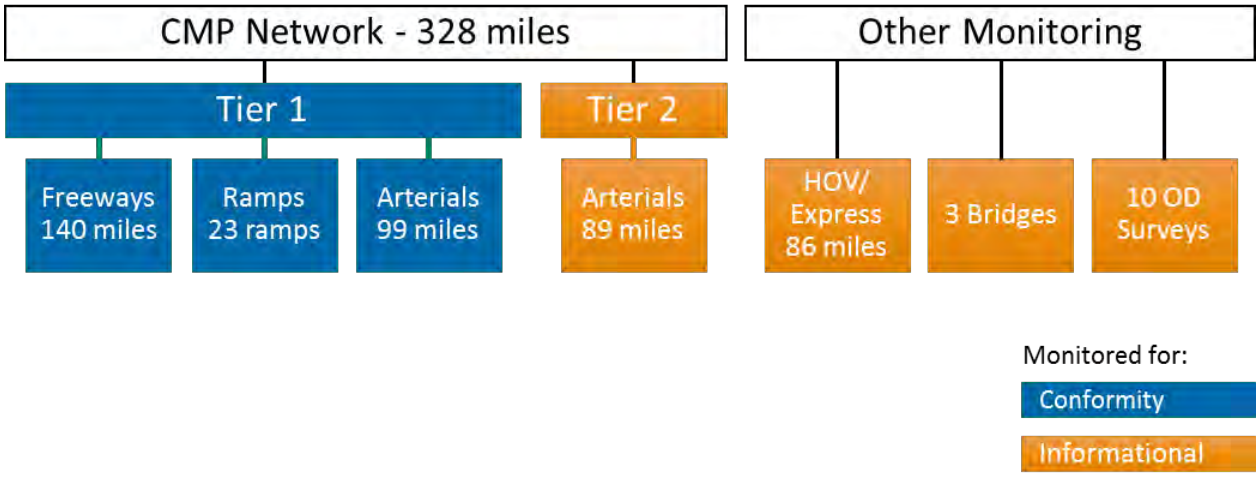


Figure ES-1: Alameda County CMP Network Details and Other Monitoring Elements

Measuring Congestion Levels: LOS Standards

Roadway segments are monitored by measuring the average traffic speed over a specific length of roadway. Prior to 2014, speeds were calculated from travel time data that is typically obtained from floating car surveys. However, starting in the 2014 monitoring cycle, the study has also used commercially available speed information for monitoring a large portion of the CMP network. This commercial speed data is obtained through a third-party data collection vendor, INRIX, for the 2016 monitoring cycle.

Based on the average speed, an LOS grade is assigned to each roadway segment using adopted standards based on the HCM. The LOS category gives information about the quality of service to drivers, and ranges from LOS A (best) to LOS F (worst). LOS A represents the best travel conditions

from the driver's perspective where roadways operate at free flow speeds and LOS F represents congested or stop-and-go conditions.

CMP Conformity

Alameda CTC evaluates Tier 1 roadway segments in the afternoon peak period for CMP performance conformity. A Tier 1 roadway segment that performs at LOS F in the afternoon peak may trigger CMP conformance requirements, where the respective local jurisdiction would be required to prepare a deficiency plan to improve segment performance. The deficiency plan will typically include details on the cause of the deficiency, measures to improve the roadway performance, and a funding plan for the proposed improvements. There are statutory exemptions that would exempt some of the congested roadways from deficiency planning, including if the roadway segment was already deficient or "grandfathered" in the base monitoring year (when the CMP network was formed in 1991 or 1992), or construction work was active during the monitoring period.

Data Collection Technology: Commercial Speed Data and Floating Car Surveys

Starting in the 2014 monitoring cycle, Alameda CTC began using commercial speed data in addition to the traditional floating car surveys for LOS monitoring purposes. Use of commercial speed data was approved by the Commission in 2013 based on a validation exercise carried out by Alameda CTC. The validation exercise determined that commercial speed data could be used for all freeways (Tier 1), most ramps (Tier 1), and a portion of the Tier 2 arterials with available commercial speed data. These segments make up two-thirds of the CMP network, and were monitored using commercial speed data in 2014 and 2016. The remaining one-third of CMP roadway segments, including all Tier 1 arterials and a portion of Tier 2 arterials were monitored using floating car surveys in 2014 and 2016. Further, HOV lanes, where commercial speed data is not reported on these lanes separately from general purpose lanes, three ramps (Tier 1), and 18 miles of arterials (Tier 2) that had inadequate coverage of commercial speed data were also monitored using floating car surveys.

Countywide Results

The 2016 monitoring results indicate that average speeds on the CMP network declined from 2014 as shown in Figure ES-2, continuing the trend observed since 2010 as in the previous 2012 and 2014 monitoring cycles. Overall, the results show that:

- **Freeways**: The average speed change on freeways (Tier 1) declined during all periods in 2016 compared to 2014. The decline ranged from a moderate decrease (-1.1 mph) during the morning peak to a sharper decrease (-3.3 mph) during the afternoon peak;
- **Tier 1 Arterials:** The average speed change on Tier 1 arterials were modest in 2016 compared to 2014. Tier 1 Arterials experienced a slight decrease (- 0.5 mph) during the morning peak and a marginal improvement (+ 0.1 mph) during the afternoon peak; and
- **Tier 2 Arterials**: The average speed change on Tier 2 arterials declined during all periods in 2016 compared to 2014 with moderate declines during the morning (- 1.3 mph) and afternoon (- 2.2 mph) peaks.

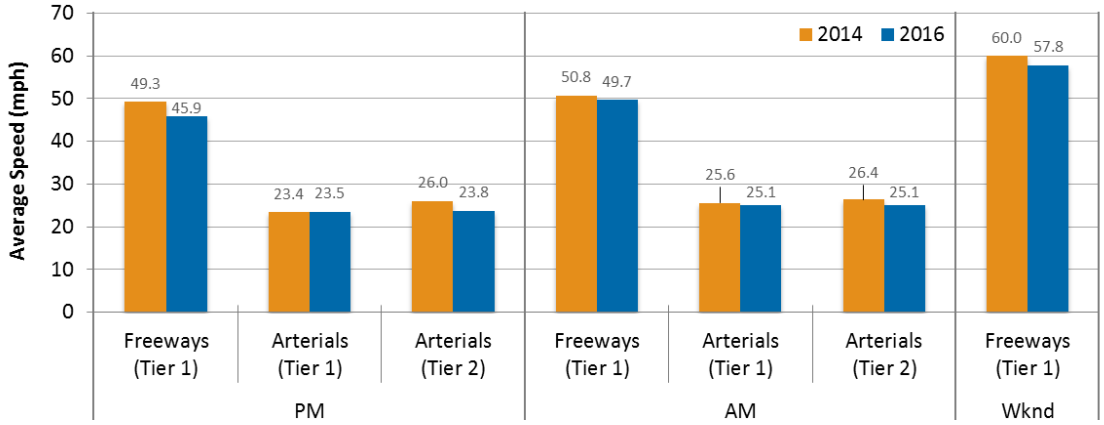


Figure ES-2: Average Speeds on CMP Network – 2014 vs 2016

2016 monitoring generally reported increased congestion on the CMP network from the 2014 monitoring cycle, with declined network average speeds and increased number of congested segments.

The general trend of decreasing roadway speeds is likely due to the improving economy combined with other trends such as gas price reduction which bring more traffic onto the roads. There was also a notable location showing increasing speed due to completion of an improvement project, namely SR-92 approaching I-880, where ramp meters were activated between the 2014 and 2016 monitoring cycles.

In 2016, the number of congested segments operating at LOS F increased from 45 to 64 in the afternoon peak. Similar trends were noticed in the morning peak, where the LOS F segments increased from 32 to 37. Figure ES-3 shows the locations of the LOS F segments in the afternoon and morning peak periods, and active construction during the 2016 LOS monitoring period.

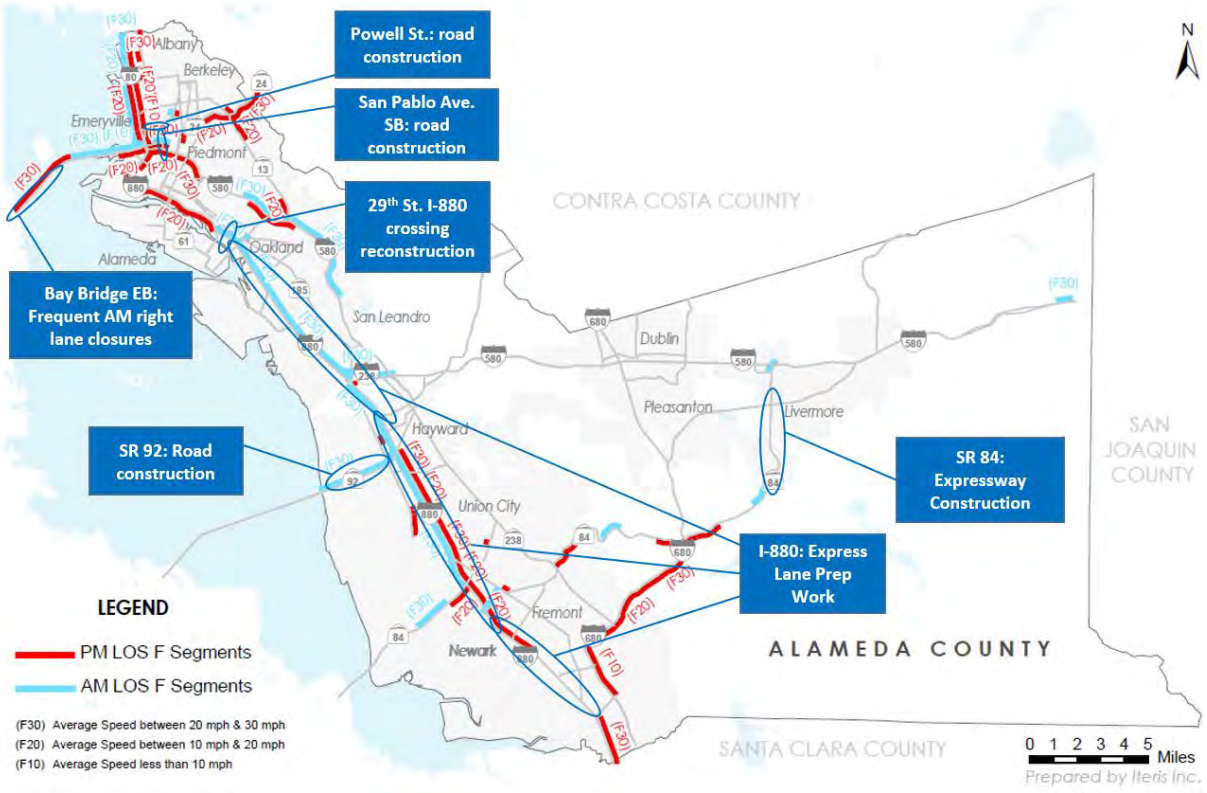


Figure ES-3: 2016 LOS Monitoring: Congested Segments in the Morning and Afternoon Peak Periods and Active Construction

After applying applicable statutory exemptions (including interregional trips on the segments that performed at LOS F during the 2016 LOS monitoring in the afternoon peak period), no new deficient segments were identified.

Two performance metrics developed from big data were computed for the first time in this monitoring cycle. The first new metric was reliability, which measures the variation in travel time from day to day. The results showed that travel in the morning peak period was typically more reliable than the afternoon peak period. Further, while the congested segments generally exhibited less reliability, an interesting finding was that some freeway segments, such as State Route 92 in the eastbound direction in the afternoon peak, had heavy congestion, but reliably long travel times. The second new metric examined was the duration of congestion. This metric measured the period of time across the day that the segment was considered to be congested. It is a measure of how much the congestion spreads beyond the typical commute peak periods. Many of the segments with the longest durations of congestion were on the I-80 or I-580 segments connecting to the Bay Bridge. The results from this new analysis can be used as a baseline in future monitoring studies.

Trends

Alameda CTC has been monitoring the CMP road network's performance since 1991. In recent years, there has been a noticeable increase in network congestion influenced by the regional and national economic conditions. Figure ES-4a shows the average CMP network speeds on freeways and arterials between 2006 and 2016. Overall, average speeds on the CMP network almost returned to pre-recession speeds in 2014, after peaking in 2010 during the economic recession. Average freeways and arterials speeds show a close correlation to unemployment rates (see Figures ES-4a and ES-4b, Source: BLS[1]). Unemployment increased around 2010 and therefore fewer workers commuted during the peak periods, resulting in improved speeds across the roadway network. As unemployment decreased after 2012, CMP roadway speeds declined. Since 2014, the arterial speeds have leveled off, and the freeway speeds have continued to decline, with the most pronounced decline in the afternoon peak.

Employment and population have continued to track upwards. By 2014, unemployment in Alameda County reached pre-recession levels and since then has continued to decrease (see Figure ES-4b). Employment and population estimates from 2015 to 2016 in Alameda and surrounding counties show robust, albeit uneven growth (see Figure ES-5). Alameda County, being in the geographic center of the region, has many regional commute corridors connecting to the adjacent counties. These corridors have generally experienced more increased traffic than the roads serving internal trips within Alameda County.

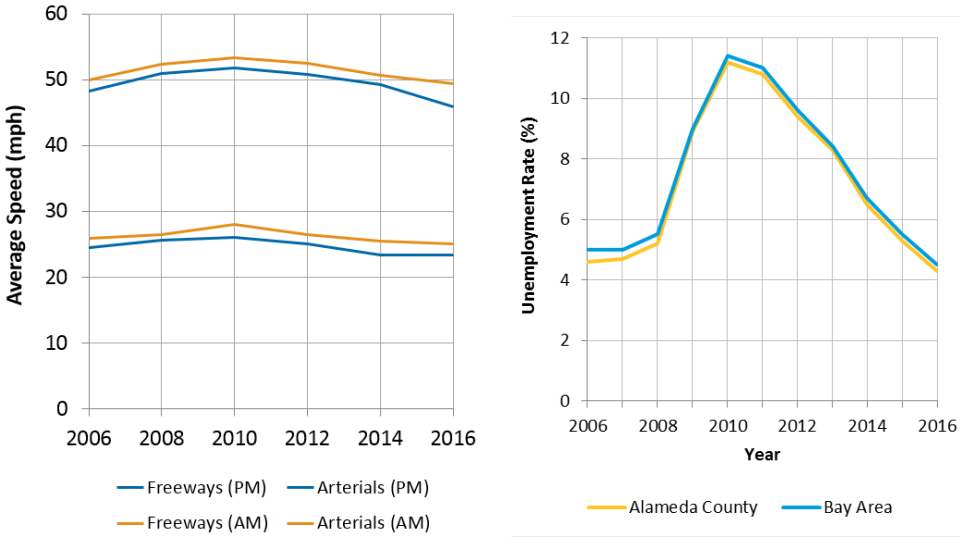


Figure ES-4: a) CMP Network Speeds (mph) and b) Unemployment Rates

[1] Local Area Unemployment Statistics. January, Not Seasonally Adjusted. Bureau of Labor Statistics. http://data.bls.gov/cgi-bin/dsrv?la

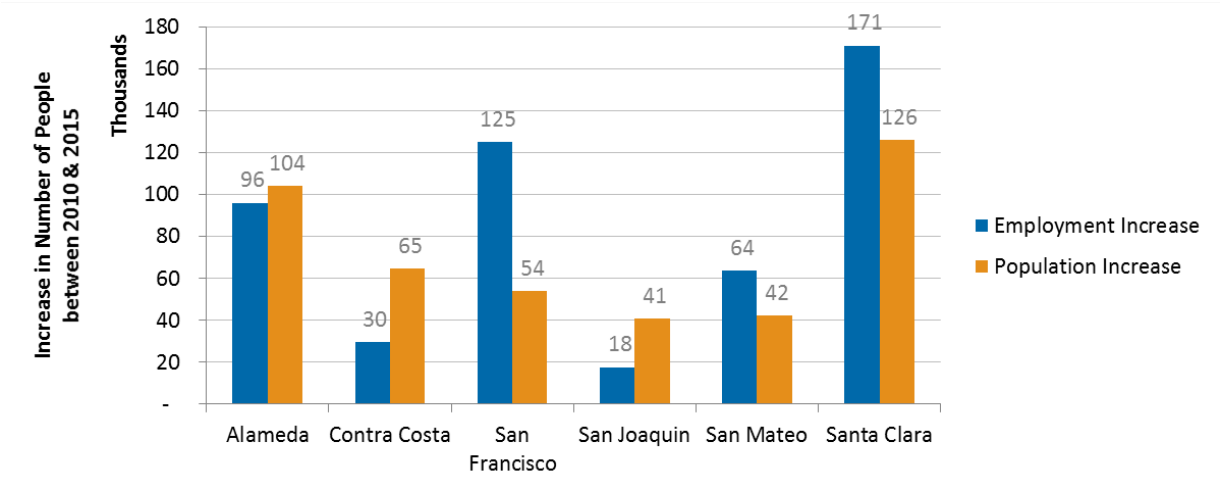


Figure ES-5: Population and Employment Growth in Alameda and Surrounding Counties (Source: DOF E-5 Report 2015-16 estimate)

Similar trends have been observed in ridership on the major regional transit system. As shown in Figure ES-6, in 2010 at the peak of unemployment, BART ridership was low and the reduced demand on freeways resulted in increased average speeds. Through the economic recovery since 2012, transit and freeway travel demand has increased again, resulting in increased ridership on BART and decline in average speeds on the CMP network.

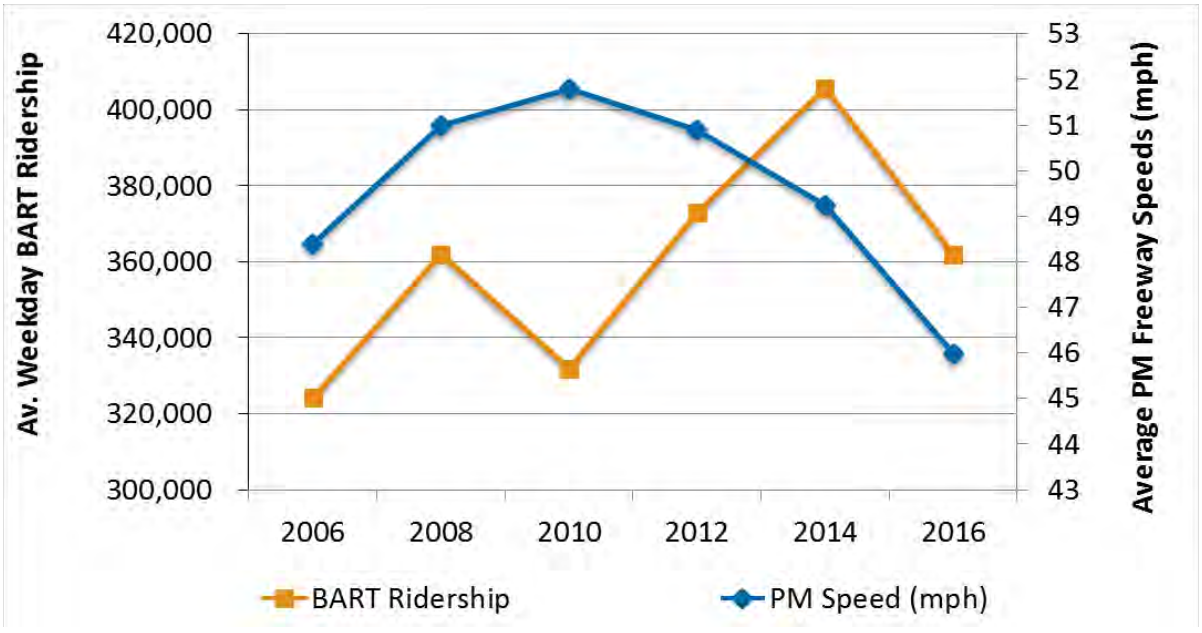


Figure ES-6: PM Peak Period Average Freeway Speed & BART Ridership (Source: BART)

The lower gas price has been cited in a nationwide study as a factor in increased automobile miles driven.[3]

As a further factor for consideration, between 2014 and 2016, the retail price of gasoline for Alameda County motorists dropped precipitously and has since fluctuated. At the start of 2014, the price of gas in California was around $4 per gallon, but by the end of the year the price had dropped into the $2-$3 range.[2] In early 2015, the price returned to the $3-$4 range, but dropped again towards the end of the year. By 2016, it has been slightly rising, but stayed within the $2-$3 range during the monitoring period. The lower gas price has been cited in a nationwide study as a factor in increased automobile miles driven and a study of fuel consumption in California found that gasoline consumption has risen since 2014. [3] [4] The miles traveled on the Alameda County freeway network has risen 12.5% between the 2014 and 2016 monitoring cycles which further confirms this observation. [5]

Planned and Potential Transportation Improvements

In 2016, one of the impacts on road network performance were construction and maintenance activities, particularly on major corridors. However, it is noted that construction impacts were less in 2016 than 2014. This further highlights the increasing demand on the CMP network, since the network average speeds in 2016 were lower than 2014; despite the fact that 2014 had more construction.

Major construction work was present on State Route 84 in east county, and I-880 interchanges and median work in north and Central County. On the arterial network, Tassajara Road in East County and Alvarado Boulevard in South County had sections which were under repair with long term road closures. Figure ES-3 highlights the location of active construction work in 2016 that occurred in the vicinity of any CMP segments. The next LOS monitoring effort in 2018 will likely show improved performance resulting from these completed upgrades.

Beyond the above projects currently under construction, potential improvements identified to be in various stages of plan/project development were grouped as follows:

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[2] California All Grades All Formulations Retail Prices. U.S. Energy Information Administration.
https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epm0_pte_sca_dpg&f=m
Cushing, OK WTI Spot Price FOB.
https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RWTC&f=M

[3] U.S. Driving Tops 3.1 Trillion Miles in 2015, New Federal Data Show. Federal Highway Administration. News Release Feb 22, 2016.
http://www.fhwa.dot.gov/pressroom/fhwa1607.cfm

[4] Net Taxable Gasoline Gallons. California State Board of Equalization.
http://www.boe.ca.gov/sptaxprog/spftrpts.htm

[5] Alameda County Vehicle Miles Travelled Report. Caltrans Performance Measurement System (PeMS).
http://pems.dot.ca.gov/

1. Projects with approval that have already been **programmed** for construction. For example, the I-880 North Safety & Operational Improvements at 23rd Avenue starting in 2017;
2. Projects in the **development or planning** phases. For example, the express lane project on I-680 northbound that is currently in the Environmental Phase; and
3. Countywide **planning study** efforts. For example, Alameda CTC's recently completed Goods Movements Plan, Transit Plan and Multimodal Arterial Plan assessed the county's multimodal needs and identified potential improvements.

Additionally, the 2014 Transportation Expenditure Plan, which is an $8 billion, 30 year plan was passed by voters as Measure BB during the November 2014 ballot and is expected to improve the countywide transportation system in all aspects. One component of the sales tax measure is investments in technology and innovation. Many current and upcoming technology trends offer potential strategies to address congestion on Alameda County's roadways. The aim of this Technology, Innovation and Development Program is to support next generation development and application of technologies that enhance the performance of a multimodal transportation system. Specifically, the program supports new and innovative approaches that improve the efficiency and safety of the movement of people and goods on all modes.

In recent years, the private sector has also applied technologies that impact transportation in Alameda County. Transportation network companies such as Uber and Lyft offer affordable first and last mile connections to a fixed route transit service (i.e. BART) that would otherwise have been a door-to-door or door-to-transit automobile trip. Delivery services such as Amazon and Instacart may eliminate the need for some shopping trips altogether, but also add more delivery vehicles to the traffic stream. Navigation driving mobile applications such as Waze have allowed drivers to make better pre-trip and en-route choices of route and departure time using historic and real time traffic information, and provide alternate route guidance around congestion and incidents. Other mobile applications have made it easier to use public transit with routing and scheduling suggestions including real time arrival information.

Moving forward, Alameda CTC will monitor these and future technology trends, when developing measures to improve the transportation system in Alameda County.

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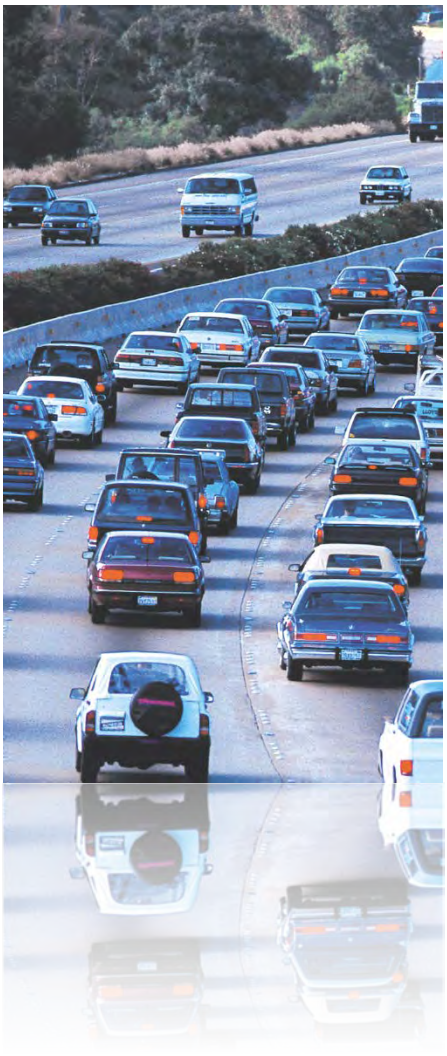
1 | Introduction



Every two years, the Alameda County Transportation Commission (Alameda CTC) performs level of service (LOS) monitoring on its Congestion Management Program (CMP) designated roadway network as required by state law. This monitoring gives Alameda CTC a better understanding of how the county's key roadways perform and informs transportation decisions for future improvements.

The objectives of this monitoring effort are to:

- Determine the average travel speeds and LOS on Alameda County's CMP network;
- Identify the congested segments (i.e. those operating at LOS F); and
- Identify the long-term traffic congestion trends across the CMP network.

This report is organized into nine sections and includes a number of appendices with supportive information. The first section, Introduction, provides a context for undertaking this LOS Monitoring Report. Section 2 summarizes the methodology used to collect travel time data and the days of collection. Sections 3, 4, 5 and 6 present the LOS monitoring results for the Tier 1/Tier 2 network, HOV/express lanes, bridges and OD surveys, respectively. Section 7 introduces new Big Data performance metrics such as reliability and congestion duration, and Section 8 presents a comparison of the results and additional insight on economic, technology, and transportation trends that affect CMP network performance. Lastly, Section 9 provides conclusions, future improvements and recommendations for next steps. The Appendices contain maps and tables of the LOS monitoring results, and additional details on the data collection methodology.

1.1 | The CMP Network

The Alameda County CMP network is divided into two tiers. Tier 1 roadways are part of the CMP network initially adopted in 1991 and updated in 1992. As part of the LOS monitoring program, Tier 1 roadways are monitored for CMP conformity during the afternoon peak period and for information only during the morning peak period. Tier 2 roadways were added during an update to the CMP network in 2011. Tier 2 roadways are monitored for informational purposes only.

The entire CMP network consists of approximately 328 miles of roadways. Of this, Tier 1 roadways comprise approximately 239 miles and include all freeways, all state highways, principal and major arterials, as well as 23 ramp connections. Tier 2 roadways make up the remaining 89 miles of the network and include other major arterials and rural roadways. Table 1-1 summarizes the distances monitored for each roadway type during the

2016 CMP LOS monitoring. Tables 1-2 and 1-3 provide a full list of routes for Tier 1 and Tier 2 summarized by jurisdiction. Figure 1-1 shows a map of the CMP Network.

Table 1-1: Alameda CTC CMP Network

CMP Network Category	Distance Monitored
Freeways (Tier 1)	140 miles[4]
Ramps & Special Segments (Tier 1)	23 connections
Arterials (Tier 1)[1]	99 miles[4]
Arterials (Tier 2)	89 miles[4]
HOV/Express Lanes	86 miles[4] (each direction included separately)
Bridges[2]	10 miles
OD surveys[3]	10 routes

1. Includes 70 miles of conventional state highways.
2. A section of bridges outside Alameda County are grouped under this category. The freeways category (Tier 1) contains Alameda County portions.
3. Includes nine auto, nine transit, one high occupancy vehicle (HOV), and one bike survey.
4. As measured in 2016 based on actual changes to the network observed in the field and the updated GIS shape file for the CMP network.

Alameda CTC also separately evaluates traffic levels on ten high occupancy vehicle (HOV)/express lane routes covering 86 miles of freeway and compares their performance to the freeway performance as a whole (as shown in Figure 1-2). For this comparison, each direction of the HOV/express route is considered separately as the end points are often different.

Further, Alameda CTC also monitors congestion levels on three bridges connecting Alameda County to San Francisco and San Mateo counties. These bridges are monitored for informational purposes to understand travel from and through Alameda County to the Peninsula and San Francisco.

Lastly, Alameda CTC conducts travel time surveys between selected origin and destination (OD) pairs for auto, transit, HOV, and bicycle trips. The purpose of the OD surveys is to evaluate the comparative performance of various transportation modes between major employment centers and residential areas across the county. These surveys provide insight into the journey-to-work travel times.

Table 1-2: Tier 1 – Alameda County CMP Designated Roadway Network Routes by Jurisdiction

Jurisdiction	Freeway	Miles	Other State Highways	Miles	Other Arterials	Miles
Albany	I-80	1.11	State Route (SR) 123 (San Pablo Ave.)	1.2	None	-
	I-580	0.8				
Berkeley	I-80	2.4	SR 123 (San Pablo Ave.)	2.3	University Ave.	2.1
			SR 13 (Ashby/Tunnel Rd.)	3.5	Shattuck Ave., Adeline	1.8
Emeryville	I-80	1.2	SR 123 (San Pablo Ave.)	0.5	None	-
Oakland	I-80	3.3	SR 123 (San Pablo Ave.)	1.3	MLK Jr. Blvd.	1.4
	I-880	11.3	SR 13 (Tunnel Rd.)	0.4	Hegenberger Rd.	2.5
	I-980	2.5	SR 61/260 (Tubes)	0.6	29th Ave./23rd Ave.	0.5
	I-580	11.7	SR 61 (Doolittle Dr.)	2.3	See Park St.-Alameda	
	SR 24	4.6	SR 77 (42nd Ave.)	0.4		
	SR 13	5.9	SR 185 (E 14th St.)	4.0		
Piedmont	None	-	None	-	None	-
Alameda	None	-	SR 61 (Doolittle Dr., Otis, Broadway, Central, Encinal Ave.)	3.9	Webster St. Atlantic Ave.	0.6 0.8
			SR 260 (Tubes)	0.8	Park St.	1.0
San Leandro	I-880	3.9	SR 61 (Doolittle Dr.)	0.9	150th Ave.	0.5
	I-580	1.6	SR 61/112 (Davis St.)	1.8	Hesperian Blvd.	1.0
	I-238	0.5	SR 185 (E 14th St.)	3.2		
Hayward	I-880	4.5	SR 185 (Mission Blvd.)	0.6	A St.	1.5
	SR 92	6.7	SR 238 (Mission Blvd.)	4.8	Hesperian Blvd.	2.7
			SR 238 (Foothill Blvd.)	1.2	Tennyson Rd.	2.4
			SR 92 (Jackson St.)	1.7		
Union City	I-880	1.9	SR 238 (Mission Blvd.)	3.1	Decoto Rd.	1.8
Fremont	I-680	7.5	SR 238 (Mission Blvd.)	4.8	Decoto Rd.	1.2
	I-880	11.7	SR 262 (Mission Blvd.)	1.6	Mowry Ave.	2.8
	SR 84	3.8	SR 84 (Thornton, Fremont, Peralta, Mowry Ave.)	10.7		
Newark	SR 84	2.4	None	-	None	-
Pleasanton	I-580	7.6	None	-	None	-
	I-680	3.6				
Livermore	I-580	5.6	SR 84	5.1	1st St.	1.7
					Airway Blvd. (old SR 84)	1.1
Dublin	I-680	1.9	None	-	None	-
Unincorporated Areas	I-680	8.4	SR 84 (Vallecitos Rd.)	6.1	Hesperian Blvd.	2.0
	I-580	19.4	SR 185 (Mission Blvd. & E 14th St.)	2.4		
	I-238	2.1	SR 238 (Foothill Blvd.)	0.8		
	I-880	2.0				
Totals	**139.7 mi**			**69.7 mi**		**29.0 mi**

Table 1-3: Tier 2 – Alameda County CMP Designated Network Routes by Jurisdiction

Jurisdiction	Arterials	Miles	Arterials	Miles
Alameda County	A St.*	0.6	Grove Way	0.9
	Crow Canyon Rd.	7.1	Tassajara Rd.	0.5
	Sunol Blvd.-1st St.-Stanley Blvd.*	2.8		
Alameda	High St.	1.1	Telegraph Ave.*	1.1
Berkeley	Bancroft/Durant Ave.	0.7	Powell St.–Stanford Ave.	0.1
	College Ave.*	1.2	Shattuck Ave.*	0.7
Dublin	Dougherty Rd.	1.9	San Ramon Rd.	1.6
	Dublin Blvd.	3.6	Tassajara Rd.	2.2
Emeryville	40th St.-Shellmound Ave.	1.4	Powell St.–Stanford Ave.	0.6
Fremont	Automall Pkwy.	1.6	Alvarado Blvd.	1.2
	Fremont Blvd.	8.6		
Hayward	A St.*	0.6	Winston Ave.-D St.	2.2
	Hesperian Blvd.-Union City Blvd.*	1.6		
Livermore	E. Stanley Blvd.-Railroad Ave.-1st St.	2.4	Vasco Rd.	6.5
Oakland	12th St.-Lakeshore Ave.	2.4	International Blvd.	2.9
	51st St.	0.8	Powell St.-Stanford Ave.	0.8
	Broadway	3.7	Shattuck Ave.*	0.8
	College Ave.*	1.0	Telegraph Ave.*	1.1
	E. 15th St.	1.0	W. Grand Ave. to Grand Ave.	3.1
	Foothill Blvd.	5.4	73rd Ave.	1.1
	High St.	2.4		
Pleasanton	Santa Rita Rd.	1.2	Sunol Blvd.-1st St.-Stanley Blvd.*	2.9
	Stoneridge Dr.	2.5		
Union City	Alvarado Blvd.	1.0	Hesperian Blvd.-Union City Blvd.*	1.3
Total	**88.2 miles**			

* Denotes that roadway traverses more than one jurisdiction.

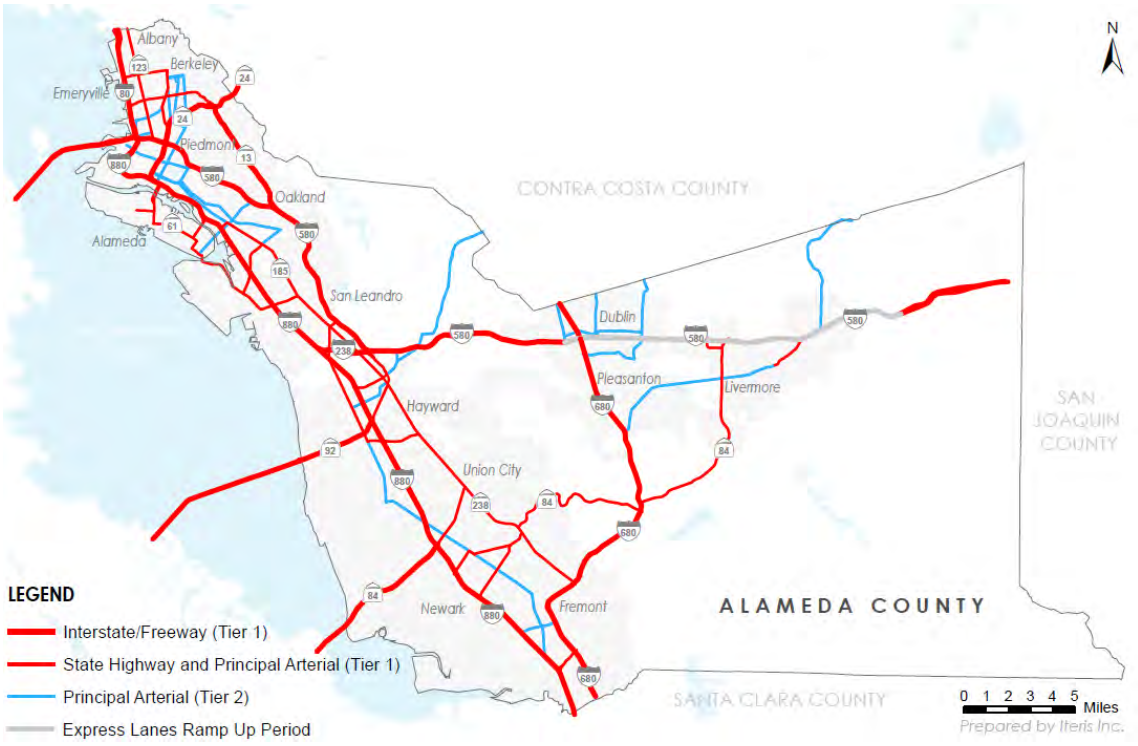


Figure 1-1: Alameda County CMP Network

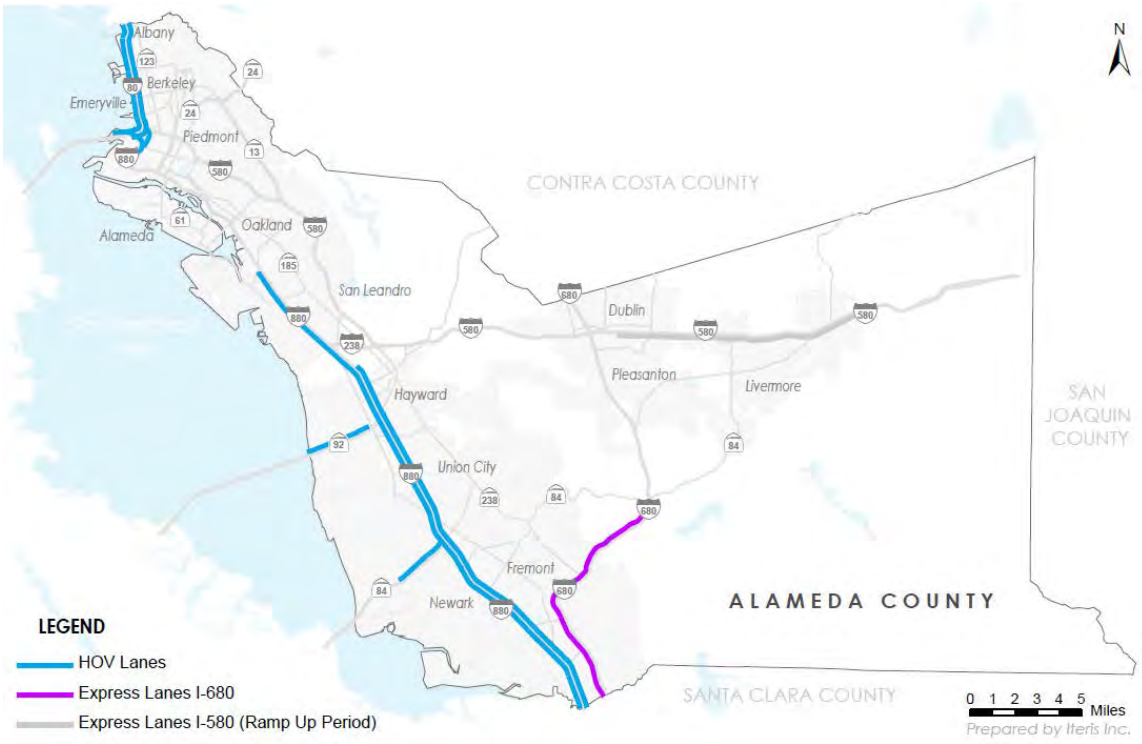


Figure 1-2: Monitoring of HOV/Express Lanes and Bridges

1.1.1 | CMP Network Update

During each CMP update, the CMP network is reviewed for any potential update including expansion of the network or changes due to construction. These changes are incorporated into the CMP network and in the subsequent updates. For example, in 2016 new HOV segments were added along I-880 in the southbound direction. Appendix C details all such road network changes.

One other significant change to the network occurred along I-580 in the east county. Existing HOV lanes in the eastbound direction were converted into express lanes and an additional lane was added as an express lane in the westbound direction. This new facility opened to traffic in February 2016. Separate performance monitoring will be conducted by Alameda CTC after the initial ramp up period has passed. For this reason, the I-580 express lanes were not monitored in this study.

1.1.2 | Division of CMP Network

For LOS monitoring purposes, the entire CMP network is divided into shorter lengths of roads called CMP segments. The limits for the **freeway** segments are typically at major interchanges. Where traffic volumes entering and exiting the freeway were minor, the length between three or more sections were combined into longer segments. However, where land use changes over the years impact the traffic pattern significantly, Alameda CTC reviews the segment limits and, if needed, develops appropriate shorter segments. For example, the I-580 corridor in the east county was segmented in 2007 to develop short segments using this approach.

For **arterials**, break points between segments generally occur at:

- Jurisdiction boundaries;
- Points where the number of travel lanes change;
- Major arterial street crossings; and
- Points where land use, speed limit, or channelization schemes change significantly.

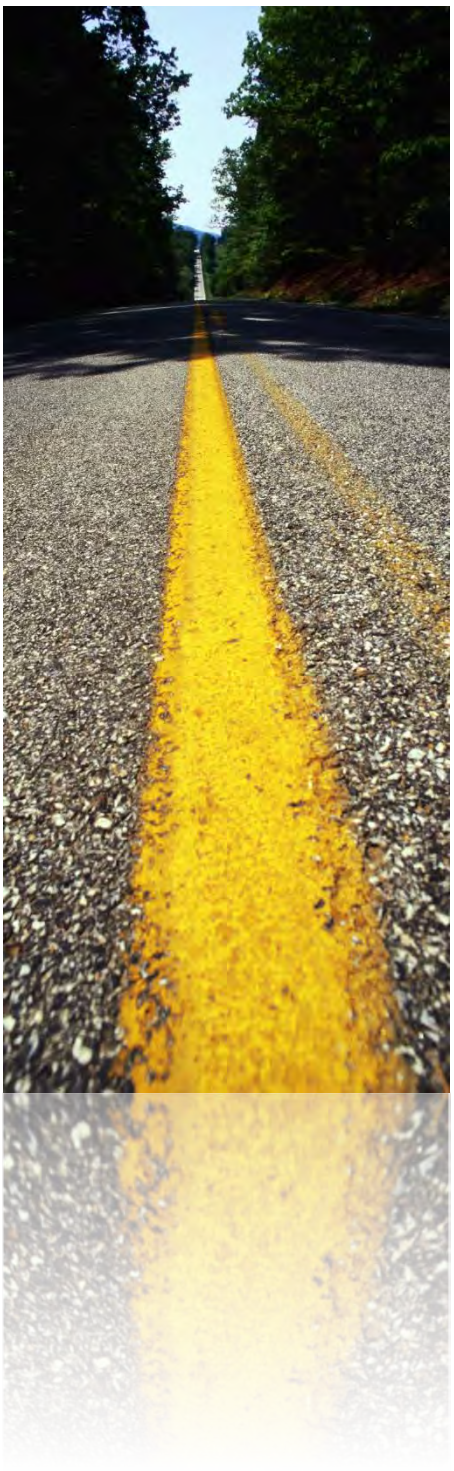
Segment boundaries for arterial roadways are identical for both directions and the distances are generally the same or sufficiently similar so as to be considered equal. However, the distances for each direction of the same segment may differ slightly in cases of very wide intersections or when the street crossings are staggered.

Additionally, Alameda CTC classified the arterials in order to determine the LOS. Arterial class is based on access control, land use intensity, free flow speed and other factors as defined in the 1985 Highway Capacity Manual (HCM). For this purpose, each section between two adjacent signals was first reviewed to determine its arterial class as Class I, II, or III.

1.2 | LOS Standards and CMP Conformity

Alameda CTC performs LOS monitoring by measuring the average speed of traffic as vehicles travel a length of roadway on the CMP network. The average speed is then classified from LOS A (best) to LOS F (worst). LOS A represents the best travel conditions from the driver's perspective where roadways are uncongested, and LOS F represents congested conditions or deteriorated traffic flows. These standards are based on the HCM. Tier 1 roadways that report LOS F conditions representing deteriorated traffic flows in the afternoon peak are further analyzed under special requirements (CMP conformity). Based on the CMP conformity analysis, if the roadway is identified to be deficient, the respective local jurisdiction will be required to prepare a deficiency plan that details the cause of the deficiency, identify measures to improve the performance of the roadway, and a funding plan for the proposed improvements. A roadway may be exempt from being identified as deficient for the following reasons:

- It operated at LOS F in the base monitoring years (1991 and 1992 when the CMP network was formed) and is therefore "grandfathered" in at LOS F;
- It is located within an Infill Opportunity Zone (IOZ);
- It is under construction;
- It carries a certain volume of interregional trips (analysis performed using the Alameda Countywide Travel Demand Model);
- It is impacted due to freeway ramp metering or recent traffic signal coordination;
- It operated at LOS F due to traffic generated by developments such as low-income housing, a high-density development, or a mixed-use development subject to certain criteria.



As shown in Table 1-4, only the Tier 1 CMP network in the afternoon peak periods is subject to LOS conformance and associated deficiency planning (where applicable). Additional data monitored or collected is used for information purposes only.

Table 1-4: CMP Network Monitoring Periods and Purpose of Monitoring

Tier	Time Period	CMP Category	Purpose
Tier 1	PM	Freeways	Conformity
		Arterials	
		Ramps & Special Segments	
	AM	Freeways	Informational
		Arterials	
		Ramps & Special Segments	
	Weekends	Freeways	
Tier 2	All	Arterials	
Other	All	HOV & Express Lanes	
		Bridges	
		OD Surveys	

1.3 | What's New in this Monitoring Cycle?

Again for 2016, as in 2014, commercial speed data was used where available to analyze the performance of Tier 1 Freeways, Tier 1 Ramps and Tier 2 Arterials. Because the quality and penetration of commercial speed data is evolving from year to year, Alameda CTC re-examined the 2014 results of the commercial speed data in comparison to floating car data for the same CMP segments. The project team found significant differences in arterial speeds between these two sources. Based on the outcome of this 2016 Validation Report and considering the significance that these results bear on CMP conformity and associated deficiency plans, it was recommended that floating car surveys be continued on Tier 1 Arterials for 2016.[6] Further, it is recommended that, prior to conducting the 2018 CMP monitoring, another validation of the commercial speed data on Tier 1 Arterials be conducted. By that time the accuracy of commercial speed data may have improved. If it is found to be valid, Alameda CTC may be able to realize the potential cost savings from this methodology, when conducting the 2018 Monitoring Report.

For the first time in an Alameda CTC LOS Monitoring Report, the commercial speed data was used to analyze the reliability in travel times along freeway segments and the duration of time in which congestion is experienced on each segment. This analysis leverages the large sample size of commercial speed data to compute these insightful measures of congestion. The reliability measure quantifies the degree to which travel times vary from day to day. It is perceived by some that a ***consistently*** congested road is more appealing than an ***inconsistently*** congested road since drivers can better plan their trip to account for congestion. The duration of congestion measure is extremely relevant for congested corridors since it measures the length of time in which a corridor is considered congested throughout the day. For example, two corridors may be considered congested, and LOS F may be reported in the LOS monitoring Report. However, the first corridor is congested for four hours in the morning peak and the other is congested for two hours. Rightly so, a motorist would perceive the first roadway to be more congested since it is most difficult to delay their trip to avoid congestion.

In prior monitoring cycles, the transit OD surveys were conducted using in-field data collection only. For the 2016 monitoring year only, a pilot study was also conducted using an online transit survey method. At the same time as the in-field transit survey took place, staff at a desktop computer collected similar data using transit information from online sources. Alameda CTC will explore full countywide multimodal monitoring in future monitoring cycles. The following two paragraphs review legislation, which

[6] Validating the use of Commercial Speed Data for Alameda CTC Level of Service Monitoring. Alameda CTC. 2016.

may not impact the current Alameda CTC LOS Monitoring Report, however should be reviewed for potential implications to future studies.

Senate Bill 743 was approved by Governor Jerry Brown on September 27, 2013. It contains guidelines that will change the way transportation projects are assessed under the California Environmental Quality Act (CEQA). It removes certain CMP LOS standards around CMP-designated Infill Opportunity Zones (IOZ), and replaces them with vehicle miles of travel (VMT) in these IOZ zones. The Office of Planning and Research (OPR) issued new guidelines affecting how transportation impacts are assessed under CEQA. The final guidelines are still under discussion.[7] Alameda CTC will continue to monitor the status of the guidelines development and assess its implication for LOS monitoring.

Assembly Bill 1098 was introduced on February 27, 2015, and amended on March 26, 2015. It calls for major revisions of the CMP legislation, in particular, the removal of LOS as an element of the CMP. It would also delete related requirements, including the requirement that a city or county prepare a deficiency plan when the highway or roadway LOS standards are not maintained. The bill would revise and recast the requirements for other elements of a CMP by, among other things, requiring performance measures to include VMT, air emissions, and bicycle, transit, and pedestrian mode share. The designated agency would be required to include in the 7-year capital improvement program an analysis of the potential for induced vehicle travel due to roadway capacity expansion projects. The bill, if approved would require the regional agency to evaluate how the CMP contributes to achieving a specified greenhouse gas reduction target for the region established by the State Air Resources Board.[8]

Alameda CTC is proactively working with other Congestion Management Agencies (CMAs) in the region and MTC to follow, inform, and incorporate recommendations related to the above legislation in a meaningful way. Because of the major legislative changes underway, the 2015 Alameda County CMP report was drafted as a "focused, basic update only to incorporate the implementation results for various CMP elements that occurred since the adoption of the last CMP in October 2013."[9] [10]

Refer to Section 9.4 | for recommendations on potential improvements in the future monitoring cycles.

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[7] Updating the Analysis of Transportation Impacts Under CEQA. California Governor's Office of Planning & Research (OPR). https://www.opr.ca.gov/s_sb743.php

[8] AB-1098 Transportation: congestion management. California Legislative Information. (2015-2016) http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB1098

[9] Congestion Management Program. Alameda CTC. http://www.alamedactc.org/app_pages/view/5224

[10] Memorandum: Draft 2015 Congestion Management Program. Alameda CTC. October 15, 2015. http://www.alamedactc.org/files/managed/Document/17295/6.6_Combo.pdf

2 | Methodology

This section discusses the three-step methodology for measuring LOS during the current monitoring cycle. In the first step, Alameda CTC screened days within the monitoring period to ensure that only days that were expected to result in typical commuter traffic conditions were retained. Days that may have produced lighter than usual traffic conditions such as public holidays or heavier than usual conditions such as special events were identified for later removal.

The second step consisted of the actual data collection using either commercial speed data or floating car surveys. Data was collected for the Tier 1/Tier 2 CMP network, HOV/express lanes, bridges, and OD surveys. In the final step, data was analyzed separately for commercial speed data and floating car surveys to obtain the average speed and converted to LOS using HCM methodologies.

2.1 | Screening for Data Collection Periods

As a preliminary step in the analysis, it was necessary to identify all the days and time periods during which the CMP network could be monitored. Since travel time data for 2016 was collected using a combination of commercial speed data and in-field floating car surveys, monitoring days for both data sources were reviewed and identified separately.

As a part of the preliminary analysis, all potential factors that may affect the monitoring effort were carefully examined. This included identifying school holidays across the county and any events that occurred during the monitoring period. Analyzing these additional factors was necessary to identify good quality data for the current monitoring. This in turn ensured that the LOS results are representative of typical traffic conditions experienced by a daily commuter.

2.1.1 | Base Monitoring Times

Data for the LOS monitoring is typically collected in spring when the schools are in session. For the 2016 monitoring cycle, commercial speed data collection and floating car surveys were conducted in the last week of February, and the months of March, April and May. The project team collected weekday data on Tuesdays, Wednesdays and Thursdays for the morning (7:00 a.m. to 9:00 a.m.) and afternoon (4:00 p.m. to 6:00 p.m.) peak periods. This resulted in a total of 43 monitoring days from which additional days were excluded for public holidays and school spring break. Freeways (Tier 1) were also monitored separately on weekends between 1:00 p.m. to 3:00 p.m.

2.1.2 | Public Holidays and Spring Breaks

Weeks containing public holidays and school spring break periods were expected to produce non-representative traffic patterns. The associated data were therefore removed from the commercial speed datasets. Figure 2-1 shows public holidays and spring break periods during the 2016 data collection period.

The spring break periods of Alameda County schools varied by the school district and occurred as early as March 25 and ended as late as April 15.[11] For spring break periods, data was not collected on the arterial network within the school district boundaries during their designated spring break. However, travel time data collection on the freeway and ramp networks continued during spring break periods as these facilities were expected to serve more inter-county and interregional traffic.

2.1.3 | Special Events

Special events in Alameda County were reviewed to see if they occurred during or near the specified weekday monitoring times. Traffic data associated with such events was removed from monitoring due to expected irregularities.

While there were some significant regional events, the majority of the events did not occur within the monitoring period. Events in Oracle Arena, such as Warrior basketball games and Oakland A's baseball games, or concert performances were the notable exceptions (see Figure 2-1). Games were played on a number of Tuesdays, Wednesdays, and Thursdays starting at 12:35 p.m., 7:05 p.m., or 7:30 p.m. These games could have had an impact on the afternoon peak period and therefore data for all the relevant CMP segments near or approaching Oracle Arena were excluded in the afternoon peak on these event days.

2.1.4 | Weather Events

Weather events were also considered as a part of the analysis, however, no events were observed to impact traffic conditions, although some floating car surveys were rescheduled as a precaution.

2.1.5 | Construction and Maintenance

The project team reviewed various information sources to identify significant construction impacts during the monitoring period. These included the following (see Figure 2-2):

- Alameda CTC projects page;
- Other government websites (including Caltrans District 4);
- Specific construction project websites;

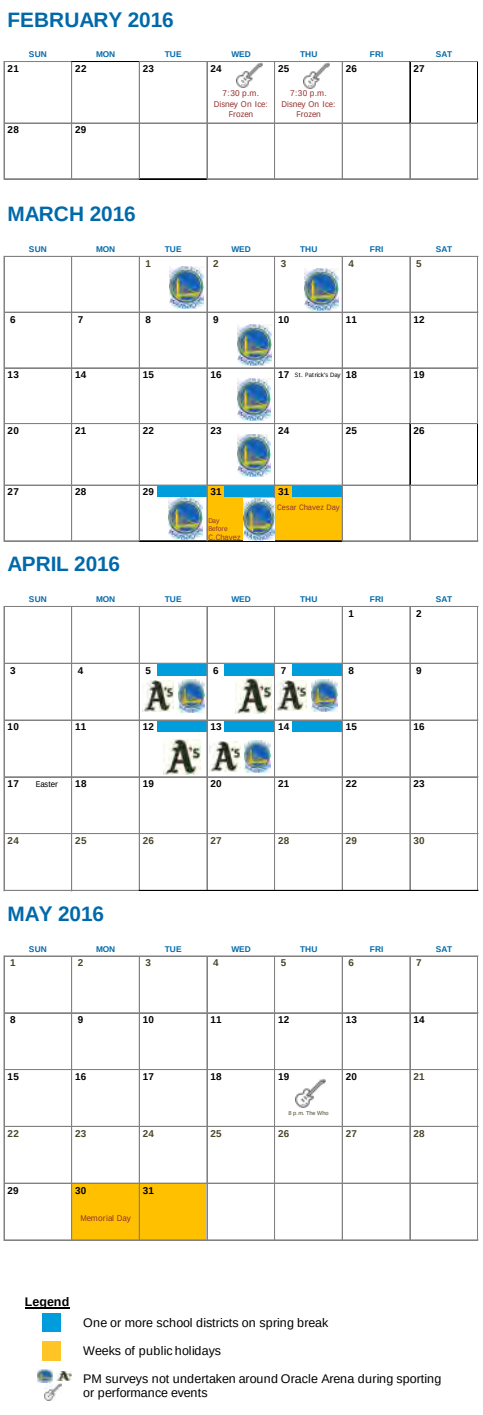


Figure 2-1: Public Holidays, Spring Break Periods, and Events in Alameda County: Spring 2016

[11] Composite Calendar for the 2015-2016 School Year. Alameda County Office of Education. http://www.acoe.org/acoe/files/Home/CompositeCalendar2015-16.pdf

Facebook news feeds from cities, major projects

Twitter news feeds from cities, major projects

Caltrans lane closure database

PeMS lane closure database & incident feeds

Figure 2-2: Sources of Information about Construction Activities and Lane Closures

- Facebook and Twitter feeds (such as the 511 SF Bay Twitter Feed[12]); and
- Caltrans Performance Measurement System (PeMS) lane closure database.

Further, cities and the county were requested to share their construction and maintenance schedules. Both long and short term construction activities were identified. As an example of a long term construction activity, I-80 eastbound along the San Francisco-Oakland Bay Bridge experienced ongoing construction for the majority of the monitoring period in the morning peak, including a regular closure of one travel lane. In this instance, there would not be adequate alternative days to gather a suitable sample size if all the days impacted by construction were removed. Therefore, data collection days were not restricted based on such long term construction. Table 2-1 lists segments impacted by ongoing long term construction.

Short term construction activities were reviewed and evaluated separately. For example, one lane on State Route 24 (eastbound) was closed from Tuesday March 22nd at 9 p.m. to Wednesday March 23rd at 10 a.m. between the Martin Luther King Jr. Boulevard off-ramp and the Broadway on-ramp. Data collected from the days and particular CMP segments impacted by construction were removed from the monitoring data set to eliminate the potential construction impact on the traffic flows. Given the short duration of the construction activities compared to the total monitoring period, the remaining data provided an adequate sample size for monitoring.

[12] Twitter Feed for 511 SF Bay twitter.com/511SFBay

Table 2-1: Long-term Construction Projects active during Spring 2016 LOS Monitoring

Tier	Impacted Roads	Extents	Description of Work
Freeway (Tier 1)	I-80 EB Bay Bridge	Bryan St. On-ramp to SF-Alameda County Line	Road Construction
Freeway (Tier 1)	I-880	Between SR 262 (Mission Blvd.) and 42nd Ave.	Median Barrier Construction
Freeway (Tier 1)	SR 92	Between the toll plaza and I-880	Road Construction
Arterial (Tier 1)	SR 238	Between I-580 Off-ramp to 680 On-ramp	Delineation
Arterial (Tier 1)	SR 123 (San Pablo Ave.)	Between 35th St. and 53rd St.	Road Construction
Arterial (Tier 1)	SR 84	Between culvert located 1.63 miles south of Kalthoff Common, to Stanley Blvd.	Expressway Construction
Arterial (Tier 2)	Alvarado Ave WB	Fair Ranch Rd. to Fredi St.	Road Construction. Complete Road Closure.
Arterial (Tier 2)	Sunol Blvd. NB	I-680 Off-ramp to Bernal Ave.	PG&D Gas Transmission Line Upgrade
Arterial (Tier 2)	Fremont Blvd. NB	Paseo Padre Pkwy. to NB I-880 Off-ramp	Condominium project
Arterial (Tier 2)	Fremont Blvd. SB	Paseo Padre Pkwy. to Decoto Rd.	Condominium project
Arterial (Tier 2)	Fremont Blvd. NB	Paseo Padre Pkwy. to Decoto Rd.	Church improvement
Arterial (Tier 2)	Fremont Blvd. NB	Thornton Ave. to Decoto Rd.	School site construction
Arterial (Tier 2)	Fremont Blvd. NB	Adams Ave. to Stevenson Rd.	Condominium project
Arterial (Tier 2)	Fremont Blvd. NB	Blacow Rd. to Adams Ave.	Condominium project
Arterial (Tier 2)	Tassajara Rd. NB & SB	Between Gleason Dr. and Fallon Rd.	Culvert Replacement. Complete Road Closure.
Arterial (Tier 2)	Broadway in Oakland	Between Grand Ave. and 14th St.	Streetscape Improvements
Arterial (Tier 2)	Powell St. in Emeryville	Between San Pablo Ave. and I-80	Road Construction

2.1.6 | Incidents

Incidents are generally expected to impact traffic conditions, and therefore data associated with incidents has been excluded. For floating car surveys, where the driver observed an incident, the floating car survey run was repeated. For commercial speed data, freeway incident data sets from the Performance Monitoring System (PeMS) were reviewed and the speed data records for the time period corresponding to an incident were removed across all the relevant CMP segments. Figure 2-3 shows a heat map of freeway incidents using data from PeMS and qualitatively indicates incident hot spots. Locations with higher densities of incidents are shown in red.

Notable incident hotspots observed were on freeways connecting to the Bay Bridge and San Mateo Bridge.

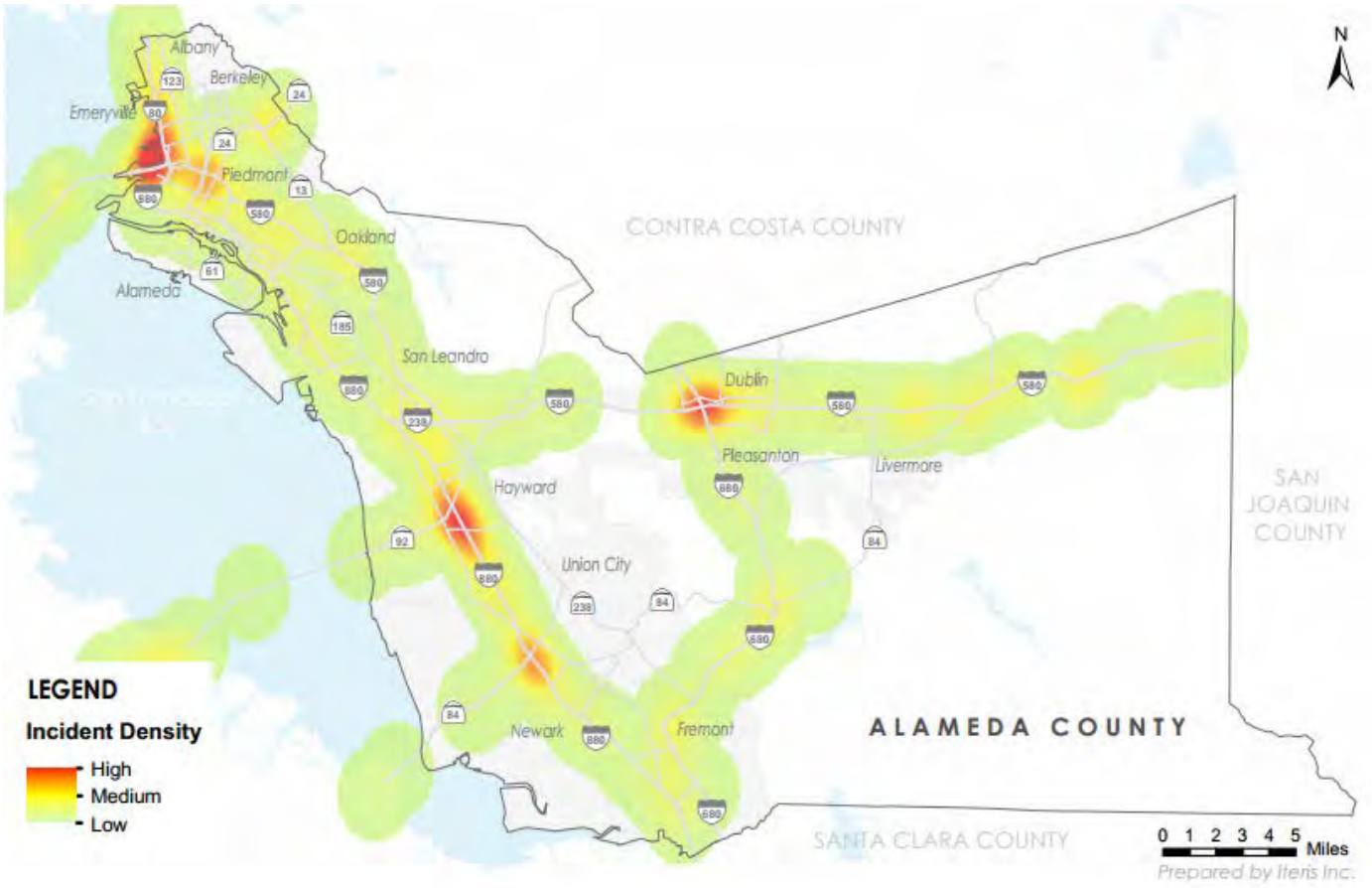


Figure 2-3: Incident Density Heat Map (Source: Freeway PeMS Incident Data, 2016)

These locations with high incident density reported around 80 to 100 incidents in the vicinity during the monitoring period. Locations with medium incident density, such as around the interchange area of I-580/ State Route 24 in Oakland, and the interchange area of State Route 84/I-880, reported around 30 to 40 incidents each during the monitoring period. Other locations with low incident densities, including I-680 along the Sunol Grade and along I-580 in East County between Livermore and the Altamont Pass, reported less than 15 incidents during the monitoring period.

2.2 | Data Collection

As in the 2014 LOS Monitoring Report, Alameda CTC used both commercial speed data and floating car surveys to measure average speed to determine the LOS. Table 2-2 and Figure 2-4 summarizes the source of travel time data for each category of CMP segment.

Table 2-2: Summary of Data Collection Methods

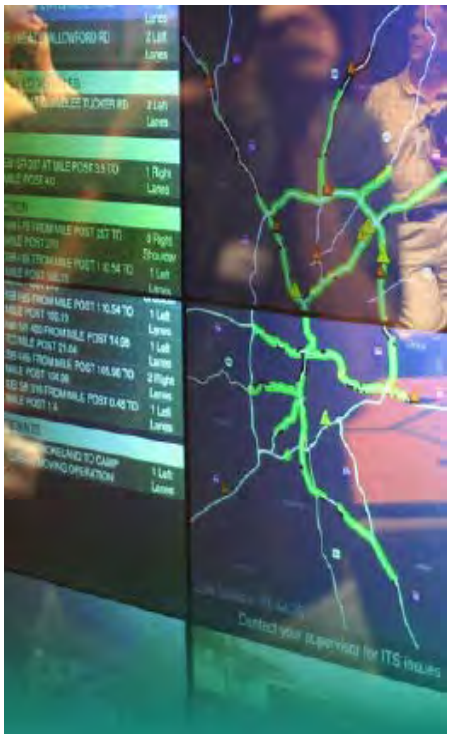
CMP Network Category	Miles	2014 Data Collection	2016 Data Collection
Freeways (Tier 1)	140 miles	Commercial data[1]	Commercial data
Ramp and Special Segments (Tier 1)	23 connections	Commercial data[1]	Commercial data[2]
Arterials (Tier 1)	99 miles	Floating car surveys	Floating car surveys
Arterials (Tier 2)	89 miles	65 miles Commercial data 25 miles Floating car surveys	71 miles Commercial data 18 miles Floating car surveys
HOV/Express Lanes	86 miles	Floating car surveys	Floating car surveys
Bridges	10 miles	Commercial data	Commercial data
OD surveys	10 routes	Floating car, transit and bike surveys	Floating car, transit and bike surveys. Desktop study conducted for two routes.

1. Data for two segments collected using floating car surveys.
2. Data for three segments collected using floating car surveys.

Figure 2-4: Data Collection Methodology (2016)

2.2.1 | Commercial Speed Data

In 2013, MTC contracted with a third-party commercial data vendor, INRIX, to obtain region-wide commercial speed data, and has made the data available free of charge to CMAs and other local governments for planning and monitoring purposes. This LOS Monitoring Report used the commercial speed data from INRIX through MTC's contract.



INRIX "aggregates traffic data from GPS-enabled vehicles and mobile devices, traditional road sensors and hundreds of other sources."[13] Traffic data is reported by INRIX using discrete roadway links defined as Traffic Message Channels (TMCs). Each TMC link is associated with a unique ID represented by a nine-digit code, where each individual number in the TMC code describes a portion of the geography including country, direction of travel, and roadway segment. INRIX data contains speeds aggregated at one-minute level for each TMC code in the network. For the current monitoring period, data at one minute intervals was accessed for the selected monitoring times across all the identified TMCs in Alameda County. This resulted in a sample size of approximately 3,500 data points for the majority of CMP segments. Appendix F provides technical details about this data collection.

2.2.2 | Floating Car Survey Data

Where the coverage of commercial speed data was not adequate or results were not expected to be reliable, floating car surveys were used. The floating car surveys were completed using GPS technology to determine the travel time between the start and end of each CMP segment. For each of these CMP segments on the arterials (Tier 1/Tier 2) and HOV/express lanes, the study completed six floating car surveys. Several freeway ramps, which were not covered by commercial data, were also measured using floating car survey. If a CMP segment that used floating car surveys experienced congestion (LOS F) in the afternoon peak and the segment was subject to CMP conformity, then two additional runs were generally completed. Appendix G provides additional technical details on the floating car data collection effort.

2.2.3 | OD Surveys

Travel time on ten origin-destination pairs that reflect typical Alameda County commute trips (between major residential areas and employment centers) were monitored for comparability of travel by auto and alternative modes (See Appendix E). OD surveys were completed using:

- Floating car surveys for the auto and HOV component (4 runs);
- Transit passenger travel surveys for the transit component (2 runs);
- Online transit travel surveys for the transit component (2 runs) were completed for two OD routes; and
- A bike rider for the bicycle component (2 runs).

The OD routes were monitored either in the morning or afternoon peak depending on the peak direction of the route. Consistent with the general LOS monitoring procedure, Alameda CTC conducted surveys on

[13] INRIX. http://inrix.com

Tuesdays, Wednesday and Thursdays during the route's monitoring period on two different days.

A number of surveyors traversed between the designated OD points, documenting their travel times. Transit trips were taken either on buses (AC Transit, Union City Transit, VTA, or Wheels), rail (BART or ACE), or a combination of these modes. The bicycle trip was taken on local streets in Emeryville and Berkeley. Whenever necessary, the auto and transit trip started on the same day at the same time. These survey times included walking, waiting, parking and traveling times, as applicable.

As a pilot study for the 2016 analysis cycle, the study conducted online transit surveys concurrently with some in-field transit surveys. In this method, staff at a desktop computer observed and logged the real-time departure and arrival times of transit vehicles online. This pilot tested the possibility to expand the use of Big Data to monitor transit travel countywide.

As a pilot study for the 2016 analysis cycle, the study conducted online transit surveys concurrently with some in-field transit surveys.

2.3 | Data Analysis

The methodology for deriving the LOS from raw commercial speed and floating car survey data includes two key steps. The first step consists of converting the raw speed data into average peak period speeds on every CMP segment. In the second step, average speeds are converted to estimate LOS using a specific method depending on the type of roadway.

2.3.1 | Calculate Average Peak Period Speed

The steps for converting raw speed data to average peak period speeds vary based on the data source.

- **Commercial Speed Data:** Once collected from the INRIX database, the commercial speed data points were associated to the appropriate CMP segment through a spatial mapping process. Next, data outside the monitoring period and data with poor data quality were removed. To calculate the average speed for all the data points, the data was averaged on each CMP segment for each time period. See additional technical details in Appendix F.
- **Floating Car Survey Data:** Once the floating car survey data was collected using GPS units, it was processed to extract the average speed and travel time on sub segments of each CMP segment. Alameda CTC then input sub segment average speeds and travel times into a spreadsheet that calculated aggregated average speed for each CMP segment using the segment's travel time and length. Appendix G provides additional technical details.

2.3.2 | LOS Estimation

The next step in the analysis process was to assign LOS based on the average speeds calculated on each CMP segment. As adopted in the 2013 CMP, LOS is estimated for the entire CMP network based on HCM

1985 with the exception that Tier 2 arterial segments will also be reported using HCM 2000 for comparison purposes. This study uses the LOS speed standards as shown in Tables 2-3, 2-4 and 2-5.

Table 2-3: Freeway LOS (Source: HCM 1985)

Level of Service	Speed (mph)	Density (pc/mi/ln[1])	V/C Ratio	Maximum Service Flow (pcphpl[2])
A	≥ 60	≤ 12	0.35	700
B	≥ 55	≤ 20	0.58	1,000
C	≥ 49	≤ 30	0.75	1,500
D	≥ 41	≤ 42	0.90	1,800
E	≥ 30	≤ 67	1.00	2,000
F	< 30	> 67	- [3]	-

Range for LOS F for Freeway Sections[4]
F30—Average Travel Speed < 30
F20—Average Travel Speed < 20
F10—Average Travel Speed < 10

Source: Adapted from Table 4-1, Special Report 209, HCM 1985

1. Density measured in passenger cars per mile per lane
2. Maximum service flow under ideal conditions, expressed as passenger cars per hour per lane
3. Highly variable, unstable flow; V/C Ratio is not applicable
4. Approved by Alameda CTC in June 2004 to show degrees of LOS F on congested roadways.

Table 2-4: Arterial LOS (Source: HCM 1985)

Arterial Class	I	II	III
Range of Free Flow Speed (mph)	45 to 35	35 to 30	35 to 25
Typical Free Flow Speed (mph)	40	33	27
Level of Service	**Average Travel Speed (mph)**		
A	≥ 35	≥ 30	≥ 25
B	≥ 28	≥ 24	≥ 19
C	≥ 22	≥ 18	≥ 13
D	≥ 17	≥ 14	≥ 9
E	≥ 13	≥ 10	≥ 7
F	< 13	< 10	< 7

Source: Table 12-1, Special Report 209, HCM 1985

Table 2-5: Arterial LOS (Source: HCM 2000)

Urban Street Class	I	II	III	IV
Range of Free Flow Speed (mph)	55 to 45	45 to 35	35 to 30	35 to 25
Typical Free Flow Speed (mph)	50	40	35	30
Level of Service	**Average Travel Speed (mph)**			
A	> 42	> 35	> 30	> 25
B	> 34-42	> 28-35	> 24-30	> 19-25
C	> 27-34	> 22-28	> 18-24	> 13-19
D	> 21-27	> 17-22	> 14-18	> 9-13
E	> 16-21	> 13-17	> 10-14	> 7-9
F	≤ 16	≤ 13	≤ 10	≤ 7

Source: Exhibit 15-2, HCM 2000 (U.S. Customary Units)

2.3.2.1 Freeways

Based on the average speed of the freeway in the morning and afternoon peaks and using the HCM standards as shown in Table 2-3, LOS was estimated for each CMP segment in each time period. For example, the I-80 eastbound segment between Ashby Avenue and University Avenue had an average speed of 62.9 mph during the morning peak period, which is LOS A based on the adopted standards.

2.3.2.2 Ramps and Special Segments

Based on the suggested guidelines from the HCM:

- LOS A is deemed to occur when vehicles are traveling at a free-flow speed for the given roadway conditions.
- LOS F is estimated to occur when speeds have dropped below 50 percent of the free flow speeds.
- Levels of Service B to E are calculated at even intervals between free flow speeds and LOS F speeds.

To determine LOS for these ramps, the free flow speed was obtained from special studies conducted in 1992, during off-peak low-volume conditions. There is one ramp segment that is classified as a weaving segment and is therefore not assigned a LOS consistent with previous monitoring cycles. The performance of this segment can be judged on its average speed.

2.3.2.3 Arterials

Both HCM 1985 and 2000 methods first require classification of the arterial according to its free flow speed and other road characteristics. The road classification based on HCM 1985 could be Class I, II or III and based on HCM 2000 it could be Class I, II, III or IV. The classifications for both tiers were previously determined and were obtained from previous LOS monitoring reports.

Using the classification of the street and the average travel speed, and based on relevant HCM standards as shown in Tables 2-4 and 2-5, LOS for the arterial segment is determined for both HCM methodologies. For example, Broadway southbound (between Grand Avenue and 14th Street) had an average speed of 14.5 mph during the morning peak. It was classified as HCM 1985 Class III (based on the segment's free flow speed and other road characteristics) and therefore assigned a LOS C. Using HCM 2000, it was classified as Class IV and assigned a LOS C again. In later sections where the number of LOS F segments are tallied and compared to previous years, LOS F segments were identified using the HCM 2000 methodology for Tier 2 Arterials.

2.3.2.4 Rural Roadways

A few of the Tier 1 and Tier 2 CMP routes (mostly located in the east county) are rural roadways and require a special analysis procedure. Traffic and speed characteristics are fairly uniform on these roadways.

Variations in speed are a function of roadway curvature and the presence of slower trucks in the traffic stream. One such Tier 1 roadway is State Route 84 between the southern city limit of Livermore and Mission Boulevard in Fremont. Rural roadways identified in the Tier 2 network include a portion of Vasco Road in Livermore and a part of Crow Canyon Road, both connecting to the county line.

To be consistent with the methodology used in the prior monitoring cycle, based on guidelines from HCM 1985, LOS A is deemed to occur when vehicles are traveling near the free-flow speed for the given roadway conditions. LOS F is estimated to occur when speeds have dropped below 50 percent of the free flow speeds. Levels of Service B to E are calculated at even intervals between free flow speeds and LOS F speeds. This is adapted from Table 8-1, HCM 1985. Based on this methodology, LOS is calculated for rural roadways (both Tier 1 and Tier 2) for the current monitoring cycle.

The 2014 LOS Monitoring Report indicated that the HCM 2000 methodology was not appropriate for rural roads since it used speed thresholds only for evaluating the LOS. The HCM 2000 did not recognize that rural roads take many forms with different speed limits, functions and geometric constraints. When these speed thresholds were applied to the 2014 arterial (Tier 2) data, it was apparent that the HCM 2000 methodology was not appropriate for lower speed rural roadways. For this reason, the HCM 2000 LOS is not reported in this study as well. Later versions of the HCM have been modified to accommodate the shortcomings and may be considered in future monitoring cycles[14].

[14] Highway Capacity Manual (HCM). Transportation Research Board of the National Academies, Washington D.C. 2010

3 | Level of Service Results: Freeways and Arterials

This section presents a summary of LOS results for the freeways, ramps and arterials (Tier 1 and Tier 2 CMP network). In general, the number of congested segments across the CMP network increased from 2014 to 2016. Additionally, the majority of major corridors showed a slight decline in speed in 2016. This is likely caused by the improving economy combined with impact due to construction activities occurring across the county. The 2016 results demonstrate a continuation in the speed decline trend observed during the 2012 and 2014 monitoring periods. Appendices A and B provide detailed segment results.

3.1 | Average Speeds

Figure 3-1 compares the countywide average of the freeway and arterial speeds by peak period between 2014 and 2016. For Tier 1 Freeways, there was a moderate decline (- 1.1 mph) in the morning peak period, and sharp reductions in speeds in the afternoon (- 3.4 mph) and weekend (- 2.2 mph) peaks. Note that the 2016 average speeds do not include I-580 data in East County (between San Ramon Road/Foothill Road and North Flynn Road) as the segment is in an express lane ramp up period, whereas the 2014 average speeds includes that segment. The Tier 1 Arterials saw a moderate drop (- 0.5 mph) in the morning peak, and held nearly steady in the afternoon peak with a slight increase (+ 0.1 mph). For Tier 2 Arterials, there were stronger speed decreases in the morning (-1.3 mph) and afternoon (-2.2 mph) peaks.

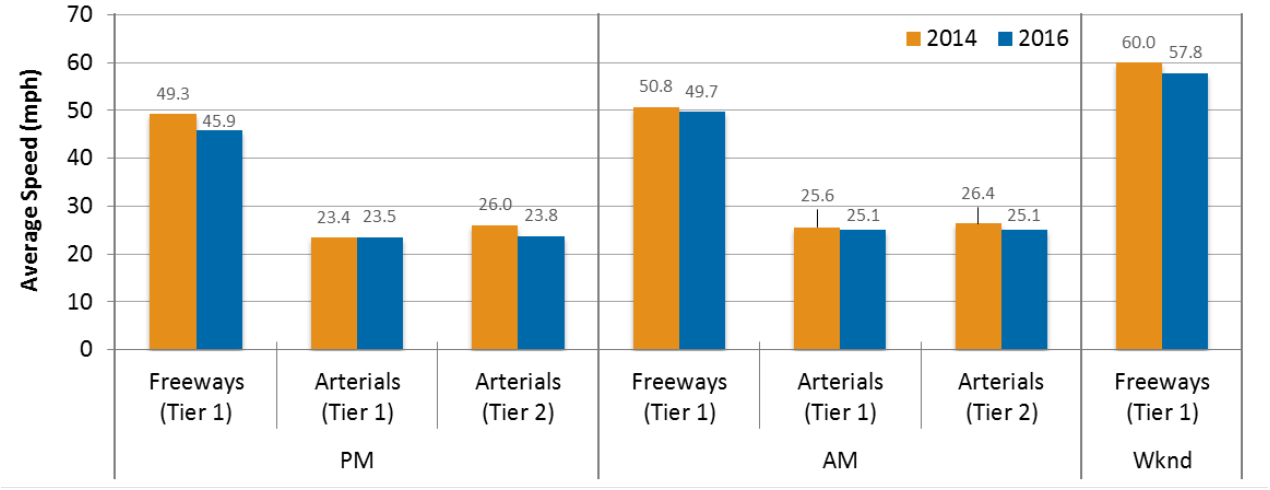


Figure 3-1: Average Speeds (mph) on CMP Network – 2014 vs 2016

In 2016, a larger reduction in speed was observed on the Tier 2 Arterial network, particularly in the afternoon peak period. Traffic congestion and slowing of traffic speeds generally can be seen as an indicator of increased traffic demand, driven by economic activity of a healthy regional economy. These trends and other possible reasons for this speed reduction are discussed in Section 8 |.

3.2 | Overview of Congested (LOS F) Segments

Under the CMP legislation, any CMP segment performing at LOS F during the monitoring is potentially subject to CMP conformity requirements. Alameda CTC monitors only Tier 1 CMP network performance in the afternoon peak for CMP conformity, or potential development of a deficiency plan.

Alameda CTC considers segments performing at LOS F as congested. In 2016, the number of congested segments increased from 42 to 61 in the afternoon peak period for Tier 1 segments. Freeway and Tier 1 Arterial segments saw the greatest increase in number of congested segments. Similarly in the morning peak period, the number of congested segments increased from 32 to 37 (see Figure 3-2), with the increase consisting almost entirely of freeway segments. When compared to the afternoon peak, the morning peak had fewer congested segments in 2014 and 2016.

Since the CMP segment lengths vary significantly, to better understand the extent of the network experiencing congestion, congested segments were also analyzed using their lengths. Of the total CMP network length, 11.1% was congested in the afternoon peak and 7.4% was congested in the morning peak. Weekend congestion is also rising with two additional congested freeway segments from 2014 to 2016, bringing the 2016 total to ten congested segments. The length of the freeway network that is congested on weekends has also risen from 2.9% in 2014 to 3.5% in 2016.

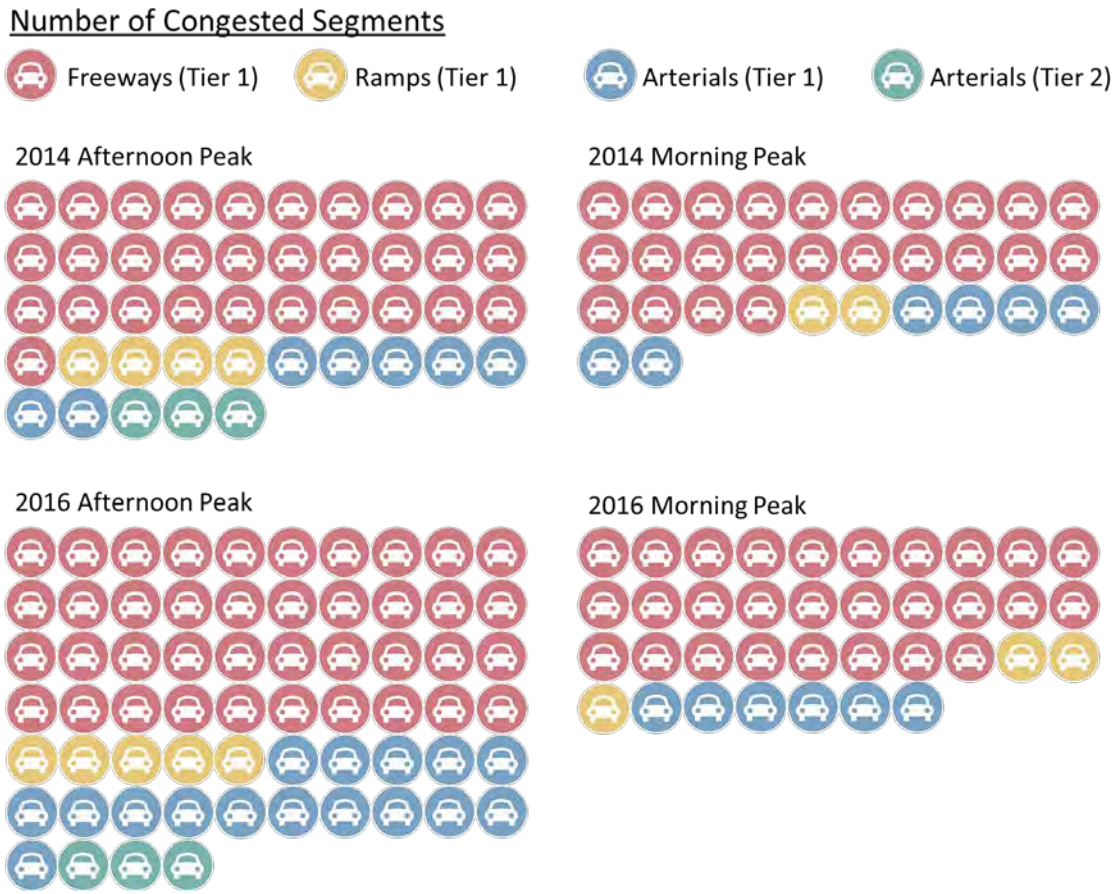


Figure 3-2: Number of Congested Segments in 2014 and 2016

3.3 | Countywide Network Performance

Figures 3-3 and 3-4 compare the location of congested segments between 2014 and 2016 on the Tier 1 and Tier 2 networks. They highlight the congested segments (LOS F) in:

- Both monitoring cycles;
- 2014 only, but performance improved in 2016; and
- 2016 only, indicating performance declined in 2016.

In the afternoon peak, new congested segments were observed on I-880 (northbound) which is one of the key intraregional commute corridors connecting with employment centers in Santa Clara County. Largely, these new congested segments appeared adjacent to existing congested segments indicating that the length of queuing is increasing. New congested segments for 2016 were also found on the Tier 1 Arterial network especially on several eastbound segments of State Route 84 in Niles Canyon and approaching Pigeon Pass. These segments have experienced performance drop between 2014 and 2016, possibly due to increased demand as they serve as an alternative route to the already-congested eastbound I-680.

In the morning peak, there were notable improvements from 2014 congested conditions on I-880 southbound in Newark and on westbound State Route 262 (Mission Boulevard). New congested segments emerged on I-80 (westbound) in Berkeley, on I-580 (westbound) between Foothill Boulevard/MacArthur Boulevard and the split to State Route 13 (northbound), and on I-880 (northbound) between Marina Boulevard and Hegenberger Road. Similarly, the new congested segments were generally adjacent to existing congested conditions.

The following sub-sections discuss the 2016 observations for each category of the CMP network. Each sub-section includes a table containing details of the congested segments. The tables also note the CMP segments impacted by construction and those that were congested (LOS F) in the 1991 or 1992 base monitoring years (i.e. grandfathered). The subsections also provide details on network improvements completed between 2014 and 2016 that could potentially explain changes in segment performance.

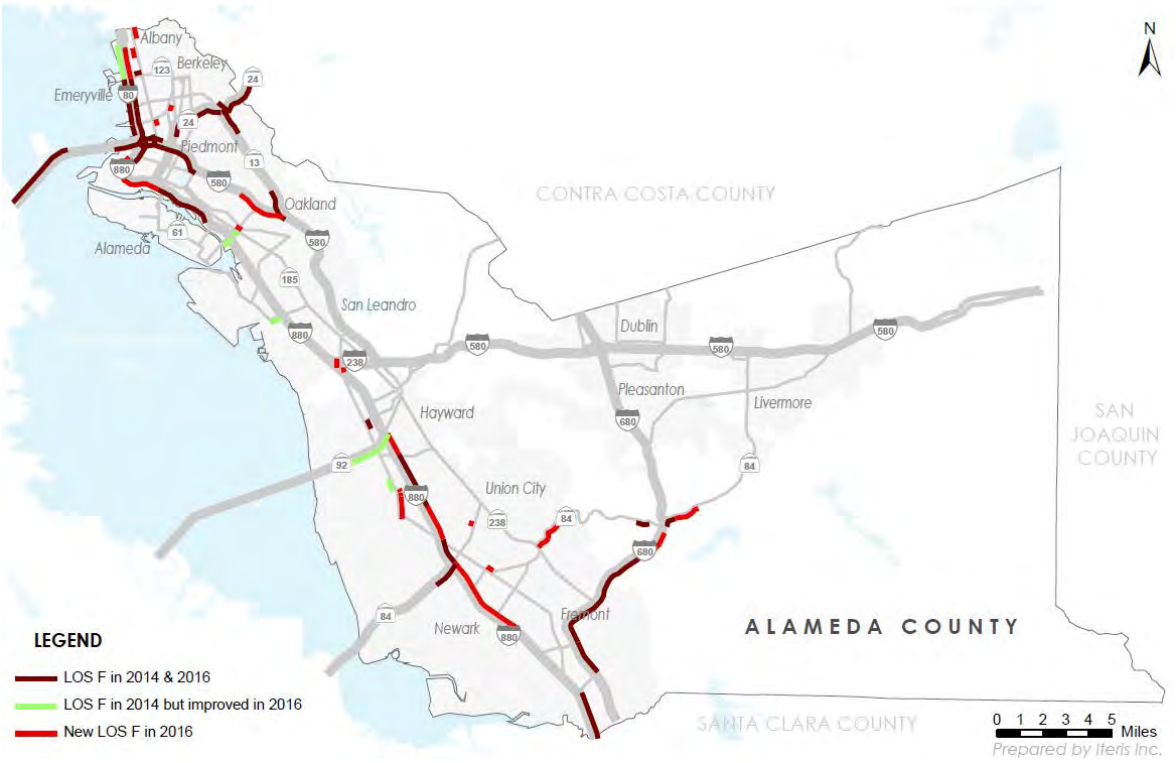


Figure 3-3: Change in Congested Segments (LOS F) from 2014 to 2016 – PM Peak Period

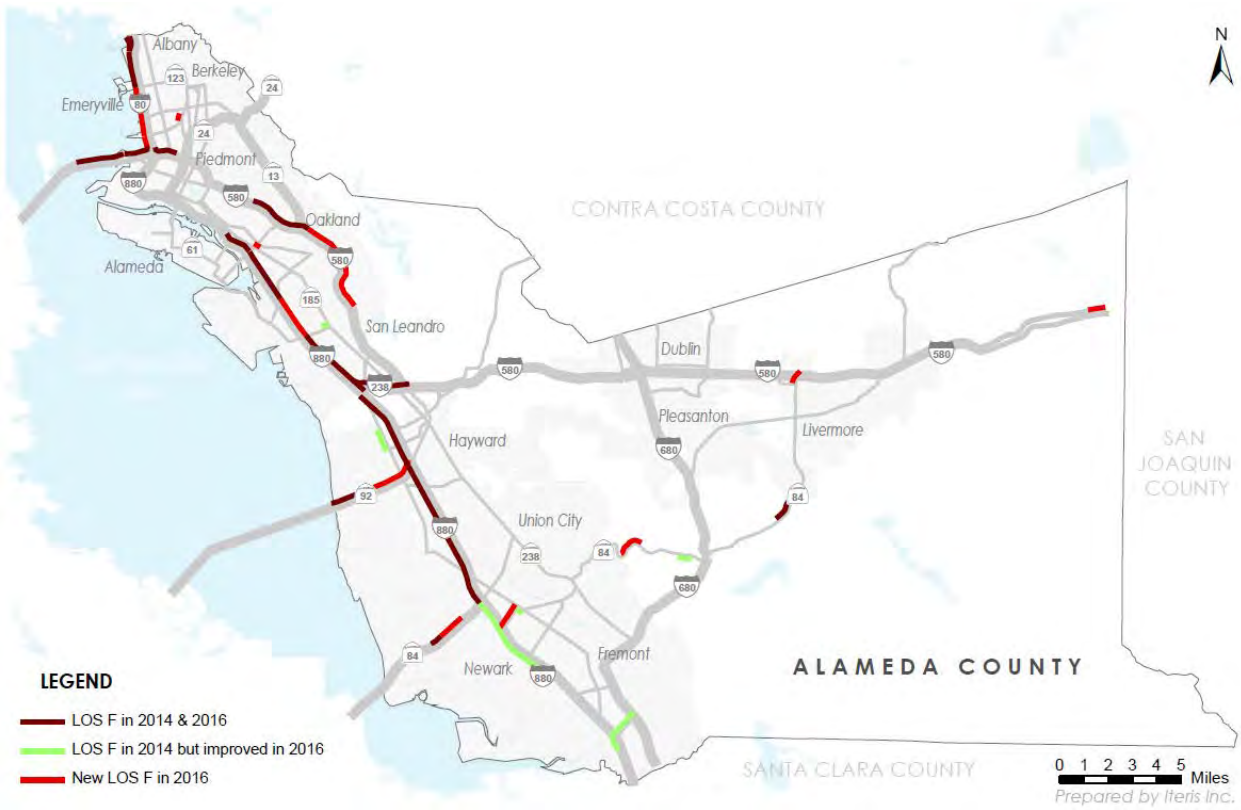


Figure 3-4: Change in Congested Segments (LOS F) from 2014 to 2016 – AM Peak Period

3.3.1 | Freeways (Tier 1)

As shown in Figure 3-3 and Figure 3-4, the majority of congested (LOS F) segments were located on the freeway network. There were 40 congested segments in the afternoon and 28 in the morning peak periods (See Tables 3-1 and 3-2). Out of the 40 afternoon congested segments, 15 were grandfathered and five segments were impacted by construction.

In the afternoon peak, the majority of these congested segments were located in the north county leading to or from the Bay Bridge. Many of the remaining congested segments were on corridors carrying traffic from San Mateo and Santa Clara counties; this is likely to be traffic returning from job centers on the Peninsula and in Silicon Valley.

In the morning peak, many of the congested segments were located on I-880 and on other corridors/bridges connecting to San Francisco, San Mateo and Santa Clara counties. It is noted that north county had fewer congested segments in the morning peak compared to the afternoon peak.

Table 3-1: Congested Segments on Freeways (Tier 1) – PM

CMP Route	Segment Limits	Jurisdiction
I-80 – EB**	Toll Plaza to I-580 SB Merge	Oakland
I-80 – EB**	I-80/I-580 (Merge) to Powell St.	Emeryville
I-80 – EB**	Powell St. to Ashby Ave.	Emeryville – Berkeley
I-80 – EB**	Ashby Ave. to University Ave.	Berkeley
I-80 – EB**	University Ave. to Jct. I-580 (off)	Berkeley – Albany
I-80 – WB**	University Ave. to Ashby Ave.	Berkeley
I-80 – WB**	Ashby Ave. to Powell St.	Emeryville
I-80 – WB**	Powell St. to I-80/I-580 (Split)	Emeryville
I-580 – EB	San Ramon Rd./ Foothill Rd. to I-680	Pleasanton
I-580 – EB	I-680 to Hopyard Rd.	Pleasanton
I-580 – EB	Hopyard Rd. to Santa Rita Rd.	Pleasanton
I-580 – EB	1st St. to Greenville Rd.	Livermore
I-580 – EB	Greenville Rd. to N.Flynn Rd.	Unincorporated
I-580 – EB**	I-80 to I-980	Oakland
I-580 – EB	I-980 to Harrison St.	Oakland
I-580 – EB	Harrison St. to Lakeshore Ave.	Oakland
I-580 – EB	Coolidge Ave. to SR 13 Off	Oakland
I-580 – WB **	SR 24 On-ramp to I-80/580 Split	Oakland
I-680 – NB	Rt. 262/Mission Blvd. to Durham Rd.	Fremont
I-680 – NB	Durham Rd. to Washington Blvd.	Fremont
I-680 – NB	Washington Blvd. to Rt. 238/Mission Blvd.	Fremont
I-680 – NB	SR 238/Mission Blvd. to Vargas Rd.	Fremont
I-680 –NB	Vargas Rd. to Andrade Rd.	Unincorporated
I-680 – NB	Andrade Rd. to Calaveras Rd.	Unincorporated
I-880 – NB **	Dixon Landing Rd. to SR 262/Mission Blvd.	Fremont
I-880 – NB*	Stevenson Blvd. to Decoto Rd.	Fremont
I-880 – NB*	Decoto Rd. to Alvarado Blvd.	Fremont
I-880 – NB*	Alvarado Blvd. to Alvarado-Niles Blvd.	Fremont - Union City
I-880 – NB*	Alv-Niles Blvd. to Tennyson Rd.	Union City – Hayward
I-880 – NB*, **	Tennyson Rd. to SR 92	Hayward
I-880 – NB	I-880/I-80 (split) to I-880/I-80 (merge)	Oakland
I-880 – SB	I-880/I-80 merge to Jct. 980	Oakland
I-880 – SB	I-980 to 23rd	Oakland
SR 13 – NB	Moraga Ave. to Hiller Dr. (Sig)	Oakland
SR 13 – SB	Redwood Rd. to Jct. I-580 (EB Merge)	Oakland
SR 24 – EB **	Jct. I-580 (on) to Broadway/SR 13	Oakland
SR 24 – EB **	Broadway/SR 13 to Caldecott Tun. (enter)	Oakland
SR 24 – EB **	Caldecott Tun. (enter) to Fish Ranch Rd.	Oakland
SR 84 – EB	Newark Blvd./ Ardenwood Blvd. to I-880 NB (off)	Newark
I-80 – WB ***	SF County Line to Fremont St. off-ramp	SF

* Construction

** Grandfathered

*** This segment is outside of Alameda County and reported for informational purposes

Table 3-2: Congested Segments on Freeways (Tier 1) – AM

CMP Route	Segment Limits	Jurisdiction
I-80 – WB	Central (County Line) to Jct. I-580	Albany
I-80 – WB	Jct. I-580 to University Ave.	Berkeley – Albany
I-80 – WB	University Ave. to Ashby Ave.	Berkeley
I-80 – WB	Ashby Ave. to Powell St.	Emeryville
I-80 – WB	Powell St. to I-80/I-580 (Split)	Emeryville
I-80 – WB	I-580 Split to Toll Plaza	Oakland
I-80 – WB	Toll Plaza to SF County	Oakland
I-238 – WB	I-580 to I-880	Unincorporated -San Leandro
I-580 – WB	I-205 (SJ Co) to Grant Line Rd.	Unincorporated
I-580 – WB	Foothill Blvd. /MacArthur Blvd. to SR 13 Off	Oakland
I-580 – WB	SR 13 Off to Fruitvale Ave.	Oakland
I-580 – WB	SR 24 On-ramp to I-80/580 Split	Oakland
I-580 – EB	Central Ave. (County Line) to I-80 Jct.	Albany
I-880 – NB*	I-880/I238 (split) to Marina Blvd.	San Leandro
I-80 – WB	Central (County Line) to Jct. I-580	Albany
I-880 – NB*	Marina Blvd. to SR 112/Davis	San Leandro
I-880 – NB*	SR 112/Davis to Hegenberger Rd.	Oakland – San Leandro
I-880 – NB*	Hegenberger Rd. to High St./42nd Ave.	Oakland
I-880 – NB	High/42nd Ave. to 23rd Ave (first on)	Oakland
I-880 – SB*	I-238 (Marina Blvd. before 06) to A St.	Unincorporated
I-880 – SB*	A St. to SR 92	Hayward
I-880 – SB*	SR 92 to Tennyson Rd.	Hayward
I-880 – SB*	Tennyson Rd. to Alv-Niles Blvd.	Hayward - Union City
I-880 – SB*	Alvarado-Niles to Alvarado Blvd.	Union City – Fremont
I-880 – SB*	Alvarado Rd. to Decoto Rd.	Fremont
SR 84 – WB	Ardenwood Blvd. /Newark Blvd. to Paseo Padre Pkwy.	Newark
SR 84 – WB	Paseo Padre Pkwy. to Toll Gate	Fremont
SR 92 – WB*	I-880 to Clawiter Rd.	Hayward
SR 92 – WB*	Clawiter Rd. to Toll Plaza	Hayward

* Construction

The I-80 Integrated Corridor Management (ICM) Project in Alameda and Contra Costa Counties, implements dynamic signing and adaptive ramp meter control and is expected to begin operation by September 2016. This is expected to result in operational improvements on I-80 that will be captured in the next monitoring cycle. CMP segments that were congested (LOS F) in 2014 afternoon peak, but have improved in 2016 are:

- I-80 - Westbound: Junction with I-580 to University (Berkeley – Albany) (LOS F to E)
- State Rte 92 – Eastbound: Clawiter Rd to I-880 (Hayward) (LOS F to E)

CMP segments that were congested (LOS F) in the 2014 morning peak, but have improved in 2016 are:

- I-880 - Southbound: Decoto Road to Stevenson Boulevard (Fremont) (LOS F to E)

The afternoon peak performance improvement on the SR 92 segment mentioned may have attributed to ramp metering implementation on interchanges in that segment. Table 3-3 shows other freeway improvements completed between 2014 and 2016 and their corresponding influence on the performance of the impacted CMP network segments.

The I-80 Integrated Corridor Management (ICM) Project in Alameda and Contra Costa Counties, implements dynamic signing and adaptive ramp meter control and is expected to begin operation by September 2016. This is expected to result in operational improvements on I-80 that will be captured in the next monitoring cycle.

CMP segments that were congested (LOS F) in 2014 afternoon peak, but have improved in 2016 are:

- I-80 - Westbound: Junction with I-580 to University (Berkeley – Albany) (LOS F to E)
- State Route 92 – Eastbound: Clawiter Road to I-880 (Hayward) (LOS F to E)

CMP segments that were congested (LOS F) in the 2014 morning peak, but have improved in 2016 are:

- I-880 - Southbound: Decoto Road to Stevenson Boulevard (Fremont) (LOS F to E)

The afternoon peak performance improvement on the SR 92 segment mentioned may have attributed to ramp metering implementation on interchanges in that segment. Table 3-3 shows other freeway improvements completed between 2014 and 2016 and their corresponding influence on the performance of the impacted CMP network segments.

Table 3-3: Freeway improvements completed between 2014 and 2016

Project	CMP Segments impacted	Changes
I-880 / 5th Avenue Seismic Retrofit in Oakland	I-880 between 23rd St. and I-980	Northbound • AM – remained at LOS D • PM – remained at LOS B Southbound • AM – remained at LOS B • PM – improved from F30 to F20
I-880 SB HOV Lanes from Hegenberger Rd. to Marina Blvd.	I-880 SB from Hegenberger Rd. to SR 112 (Davis St.) and from SR 112 (Davis St.) to Marina Blvd.	Hegenberger Rd. to Davis St.: • AM – remained at LOS A • PM – LOS D to C Davis St. to Marina Blvd.: • AM – LOS C to A • PM – LOS D to C
I-80 ICM Project: Implementation of adaptive ramp meter control and dynamic signing. It is expected to be operating by September of 2016.	Between the Contra Costa County Line and the Bay Bridge Toll Plaza	The changes due to this construction improvement will be analyzed in the next monitoring cycle.
I-580 HOV/Express Lanes: Major construction were completed along both directions of I-580 in the Tri Valley area. This added express lanes in both east and westbound directions to improve person throughput and performance of the corridor in general. The express lanes opened to traffic in February 2016, just prior to the 2016 CMP monitoring period.	I-580 EB from Hacienda Dr. to Greenville Rd. I-580 WB from Greenville Rd. to I-680	Performance is not considered in this CMP study because the facility recently opened and is still in the express lanes ramp up period.
SR 92 Ramp Metering. Implementation of ramp metering on the interchanges between the Toll Plaza and I-880.	SR 92 between the Toll Plaza and Clawiter Rd. SR 92 between Clawiter Rd. and I-880	Eastbound: Toll Plaza to Clawiter Rd. • AM – LOS A to A • PM – remained at LOS E Clawiter Rd. to I-880 • AM – LOS B to B • PM – LOS F30 to E Westbound: I-880 to Clawiter Rd. • AM – LOS E to F30 • PM – remained at LOS A Clawiter Rd. to Toll Plaza • AM – remained at LOS F30 • PM – remained at LOS B

3.3.2 | Ramps and Special Segments (Tier 1)

Five ramp segments were congested in 2016 in the afternoon peak period and three in the morning peak period (See Tables 3-4 and 3-5). Two of them were grandfathered in their base monitoring year, and the ramp connector between State Routes 13/24 was also congested (LOS F) in 2014. The connectors from I-880 to the Webster/Posey Tubes in the afternoon were observed to be congested again in 2016, as they were in 2014. In the morning peak period, Posey Tube (northbound) connector to I-880 was congested in both 2014 and 2016.

Table 3-4: Congested Segments on Ramps & Special Segments (Tier 1) – PM

CMP Route	Segment Limits	Jurisdiction
I-80/I-580 Interchange**	I-580 WB to I-80 NB	Oakland
I-580/SR 24 Interchange	I-580 WB to SR 24 EB	Oakland
I-580/SR 24 Interchange	SR 24 WB to I-580 EB	Oakland
SR13/SR 24 Interchange**	SR 13 NB to SR 24 EB	Oakland
I-880/SR 260 Connection	SR 260 EB to I-880 NB	Oakland

** Grandfathered

Table 3-5: Congested Segments on Ramps & Special Segments (Tier 1) - AM

CMP Route	Segment Limits	Jurisdiction
I-880/I-238 Interchange	I-238 WB to I-880 NB	San Leandro
I-580/I-680 Interchange	I-580 WB to I-680 SB	Pleasanton
I-880/SR 260 Connection	SR 260 EB to I-880 NB	Oakland

In the afternoon peak, one ramp CMP segment was at LOS F in 2014 and improved in 2016, as follows:

- I-880/State Route 260 Connection from I-880 (southbound) to State Route 260 (westbound) (LOS F to E)

In the morning, there has been no improvement to congested segments on Ramps and Special Segments for 2016.

3.3.3 | Arterials (Tier 1)

In this monitoring cycle, the overall number of congested segments increased on the Tier 1 arterial network from 2014. In the afternoon, there were 16 congested segments, of which one experienced construction as well as being grandfathered, and four more segments which were grandfathered. In the morning there were six congested segments, of which one experienced construction. In terms of geographical location within the county, the maps in Appendix A show that there is no strong clustering of congested segments on arterials (Tier 1) in either the morning or afternoon peaks. However, many congested segments appear on the same roads in the morning and afternoon peak periods indicating likely presence of consistent bottlenecks.

Table 3-6: Congested Segments on Arterials (Tier 1) – PM

CMP Route	Segment Limits	Jurisdiction
Hesperian Blvd. – NB **	La Playa to W.Winton Ave.	Hayward
Hesperian Blvd. – NB	Grant to Llewelling	Unincorporated
Hesperian Blvd. – SB **	Springlake to Llewelling	Unincorporated
Adeline St. – NB	MLK Jr - South to MLK Jr - North	Berkeley
University Ave. – WB	San Pablo Ave. to 6th	Berkeley
Decoto Rd. – WB **	Union Square to Alv-Niles Rd.	Union City
SR 84/Fremont Blvd. (Fre) – WB **	Peralta Blvd. to Thornton Ave.	Fremont
SR 84 – EB	SR 238/Mission Blvd. to Union City Limit	Fremont
SR 84 - EB	Sunol Rd. to Plea-Sunol Rd.	Fremont
SR 84 - EB	SR 84 (Off)/I-680 to Vallecitos Ln.	Unincorporated
SR 84 - EB	Vallecitos Ln. to Vallecitos Nuclear Center	Unincorporated
SR 123 San Pablo Ave. - SB	Marin Ave. to Gilman Ave.	Albany – Berkeley
SR 123 San Pablo Ave. – SB * **	Park Ave. to 35th St.	Emeryville - Oakland
SR 123 San Pablo Ave. – NB	53nd Ave. to Stanford Ave.	Oakland
SR 123 San Pablo Ave. – NB	Washington Ave. to Carlson Blvd.	Albany
SR 185 (International Blvd.) – NB	46th Ave. to 42nd Ave.	Oakland

Table 3-7: Congested Segments on Arterials (Tier 1) - AM

CMP Route	Segment Limits	Jurisdiction
Adeline St. – SB	MLK Jr - North to MLK Jr - South	Berkeley
SR 84/Thornton Ave. (Fre)-WB	Fremont to I-880 SB	Fremont
SR 84 - WB *	Ruby Hill /Kaithoff to Culvert (Lat/Long: 37.613854,-121.817224)	Unincorporated
SR 84 - WB	Niles Canyon Quarry to Eastern Fremont City Limit	Fremont
SR 185 (International Blvd.) – NB	46th St. to 42nd	Oakland
SR 84 (Liv) - SB – realign	I-580 WB (off) to Airway)	Livermore

These are the major observations from Tables 3-6 (afternoon) and 3-7 (morning):

- Following the trend identified in the 2014 report, additional segments on State Route 84 in Niles Canyon and around the Pigeon Pass area received LOS F in 2016. This performance trend follows a speed decrease trend observed over past CMP analysis cycles.
- State Route 84 in Fremont also received some new LOS F segments in 2016 in the morning, continuing a speed decrease trend over past analysis cycles.
- State Route 123 (San Pablo Avenue) in North County received three new LOS segments in the afternoon peak, again continuing the downward speed trend. One of the segments, southbound from Park Avenue to 35th Street was under construction.

- Hesperian Boulevard added 3 new Tier 1 Arterial LOS F segments for 2016 in the evening. This roadway is parallel to I-880 and is likely serving some of the regional commuter traffic.

CMP segments that were congested (LOS F) in the 2014 afternoon peak, but have improved in 2016 are:

- State Route 112 (Davis Street) – eastbound from Doolittle Drive to I-880 (San Leandro) (LOS F to E)
- State Route 185 (International Boulevard) – southbound from 42nd Avenue to 46th Avenue (Oakland) (LOS F to C)

For the morning peak, the following CMP segments have improved since 2014:

- Hesperian Boulevard – southbound from A Street to W. Winton Avenue (Hayward) (LOS F to D)
- State Route 84/Fremont Boulevard – eastbound from Thornton Avenue to Peralta Boulevard (Fremont) (LOS F to D)
- State Route 84 – eastbound from Sunol Road to Pleasanton-Sunol Road (Fremont) (LOS F to C)
- State Route 112 (Davis Street) – westbound from East 14th to San Leandro Boulevard (San Leandro) (LOS F to D)
- State Route 262 (Mission Boulevard) – westbound from I-680 to I-880 (Fremont) (LOS F to C)

Table 3-8 shows construction completed on Tier 1 Arterials between the 2014 and 2016 monitoring periods, and their corresponding influence on the performance of the CMP network.

Table 3-8: Tier 1 Arterial Improvements completed between 2014 and 2016

Project	CMP Segments impacted	Changes
SR 112 Davis St. I-880 overcrossing replacement.	SR 112 (Davis St.) between Doolittle Dr. and I-880 SR 112 (Davis St.) between I-880 and San Leandro Blvd.	Eastbound: Doolittle Dr. to I-880 • AM – LOS D to E • PM – LOS F to E I-880 to San Leandro Blvd. • AM – LOS D to C • PM – LOS D to E Westbound: San Leandro Blvd. to I-880 • AM – remained at LOS C • PM – LOS B to C I-880 to Doolittle Dr. • AM - LOS D to C • PM – LOS D to C
SR 84 Expressway North Segment (north of Concannon Boulevard to Jack London Boulevard) widened from 4 to 6 lanes and enhanced bike and pedestrian safety and access. Completed and opened to traffic in June 2014.	SR 84 between Concannon Blvd. and Stanley Blvd. SR 84 between Stanley Blvd. and W. Jack London Blvd.	Northbound: Concannon Blvd. to Stanley Blvd. • AM – LOS B to A • PM – LOS B to A Stanley Blvd. to W. Jack London Blvd. • AM – remained at LOS A • PM – remained at LOS A Southbound: W. Jack London Blvd. to Stanley Blvd. • AM – LOS B to A • PM – LOS C to A Stanley Blvd. to Concannon Blvd. • AM – LOS A to B • PM – LOS A to B

3.3.4 | Arterials (Tier 2)

There were only three congested segments reported on the arterial (Tier 2) network in the afternoon (See Table 3-9) peak period and none in the morning peak period. This is expected, as by their very definition, these arterials are second tier arterials and do not typically carry high traffic volumes. Listed below are two observations:

- The segment on Broadway is categorized as LOS F under the HCM 2000, while HCM 1985 categorized the segment as LOS E. This difference can arise on higher speed arterials as HCM 2000 has an additional class of arterials which recognizes free flow speeds between 45-55 mph. Under this HCM 2000 class, average speed

conditions are assigned to LOS categories differently to the equivalent in HCM 1985. Refer to Tables 2-4 and 2-5.

- The other two congested segments are on Hesperian Boulevard and have experienced declining speeds in recent years.

Table 3-9: Congested Segments on Arterials (Tier 2) – PM

CMP Route	Segment Limits	Jurisdiction
Broadway (Connection to I-880)-NB	I-880 off-ramp to 5th St./Broadway	Oakland
Hesperian Blvd.-Union City Blvd.-NB	Union City/Alvarado Blvd to Whipple Rd.	Union City
Hesperian Blvd.-Union City Blvd.-NB	Whipple Rd. to Hesperian Blvd./Union City Blvd./overcrossing	Union City

All of the congested segments in 2014 during the afternoon peak period have improved in 2016. These are listed below:

- Broadway (Connection to I-880)-southbound from 5th Street/Broadway to the I-880 on-ramp (Oakland) (LOS F to E)
- High Street-eastbound from Fernside Boulevard to northbound I-880 off-ramp (Alameda, Oakland) (LOS F to E)
- Hesperian Boulevard-Union City Boulevard – southbound from Industrial Boulevard to Hesperian/Union City Boulevard/overcrossing (Hayward) (LOS F to D)

3.3.5 | Weekend Monitoring on Freeways (Tier 1)

Congested segments on weekends were primarily concentrated in the north county similar to the weekday results (See Table 3-10); this concentration is similar to 2014 monitoring results. No segments which were LOS F in 2014 improved in 2016. One segment was at LOS F for the first time in 2016: I-80 – westbound from the Toll Plaza to the SF County Line. All LOS F segments are connections to the Bay Bridge. Appendix B provides detailed weekend results.

Table 3-10: Congested Segments on Tier 1 Freeways - Weekend

CMP Route	Segment Limits	Jurisdiction
I-80 - EB	I-80/I-580 (Merge) to Powell St.	Emeryville
I-80 - EB	Powell St. to Ashby Ave.	Emeryville – Berkeley
I-80 - WB	Central (County Line) to Jct. I-580	Albany
I-80 - WB	Jct. I-580 to University Ave.	Berkeley – Albany
I-80 - WB	University Ave. to Ashby Ave.	Berkeley
I-80 - WB	Ashby Ave. to Powell St.	Emeryville
I-80 - WB	Powell St. to I-80/I-580 (Split)	Emeryville
I-80 - WB	I-580 Split to Toll Plaza	Oakland
I-80 - WB	Toll Plaza to SF County	Oakland
I-580 - WB	SR 24 On-ramp to I-80/580 Split	Oakland

3.4 | Corridor Performance Analysis

Considering that Alameda County is located at the geographic center of the region, and the employment centers are located considerably apart, either within the county or the region, trips made by drivers on the CMP network often cover several CMP segments. So, it is useful to aggregate the results for the entire corridor to understand the overall change in corridor performance. This analysis has been undertaken since 1991 for analyzing the performance in the afternoon peak period. Appendix D provides the full results for each corridor.

The majority of the Alameda County CMP corridors showed continued decreases in average speed in 2016.

3.4.1 | Freeways

Out of the 14 freeway corridors reviewed in the afternoon peak (each direction considered separately), speeds stayed relatively stable over the long term. Exceptions to this include I-680 northbound, State Route 24 eastbound and State Route 13 both directions where declining speeds were observed over the years. The lowest speed was experienced on State Route 24 in the eastbound direction, which reduced further (- 1.8 mph) in 2016. Large reductions in speed from 2014 to 2016 were observed on the I-880 in the northbound direction (- 10.5 mph) and State Route 13 in the southbound direction (- 10.0 mph). Note that the I-580 Corridor in the Tri Valley area was not included in the corridor analysis for the 2016 monitoring because it is still in the express lane ramp up period.

When comparing the 2016 results to 2014, half of the corridors had average speeds within ± 5 mph of the 2014 results. Most of these showed moderate decreases in speeds. Of the remaining corridors with larger changes in speed, with the exception of State Route 24 (westbound, in north county) (+5.1 mph), all of these corridors had reductions in speed. Speed decreases of at least - 5 mph resulted on the following directional freeways (See Figure 3-5):

- I-580 eastbound in North and Central County (-5.7 mph);
- I-680 northbound in South and central County (-6.5 mph);
- I-880 northbound in South, Central and North County (-10.5 mph);
- I-880 southbound in South, Central and North County (-5.5 mph); and
- State Route 13 southbound in north county (- 10.0 mph).

As mentioned, State Route 24 in the westbound direction increased in speed by +5.1 mph in 2016. It is thought that the performance improved due to the interaction of increasing congestion levels upstream on the I-680 in the northbound direction, which has the effect of constraining flows on State Route 24 (westbound).

Figure 3-5: Change in Freeway Corridor Average Afternoon Speed from 1991 to 2016 (mph)

Three of the corridors which underwent changes of at least five miles per hour between 2014 and 2016 are examined in detail below.

There was a significant increase in speed on State Route 24 (westbound) from Fish Ranch Road to I-580 between 2014 and 2016. At the time of monitoring in 2014, the Caldecott Tunnel 4th bore was already opened (since November 2013), allowing a capacity increase from two to four lanes in the off-peak (westbound) direction. Because this capacity increase was already in effect during 2014 monitoring, it is not the direct cause of the improved performance between 2014 and 2016 (LOS D to B).

There was a significant decrease in speed on I-680 (northbound) from Scott Creek Road to Alcosta Boulevard. While the northern portion of this route continues to operate at LOS A, the average speed on the southern section between has degraded. This continues the trend for this corridor which was already underway from 2012 to 2014. Overall, from 2014 to 2016 the corridor has experienced an average decline in speed of - 6.5 mph resulting in an additional travel time of approximately 12 minutes. The resulting LOS remained at LOS F as it had been in 2012 and 2014. One additional congested segment was also identified in 2016, bringing the count up to three congested segments on I-680 (northbound) in this corridor.

As mentioned above, there was also a significant decrease in speed on I-880 (northbound) from Dixon Landing to I-980. The average speed on the entire corridor has degraded, with three additional congested CMP segments on the southern half of the corridor in 2016. This trend was already underway from 2012 to 2014, but has become even more pronounced and could be attributed to the corridor being on the homebound commute from Santa Clara County employment centers and significant increase in regional employment in this analysis cycle, as discussed in Chapter 8.

3.4.2 | Arterials

Historic corridor monitoring has been conducted on 26 arterial corridors (each direction considered separately) as shown in Figure 3-6. This figure below includes a new graph that compares the old and new alignments of State Route 84 in Livermore in 2016, and the freeway and arterial components for the Decoto Road/Dumbarton Bridge corridor.

Of these 26 corridors, 20 had average speeds within ± 2.5 mph of 2014 results; with the majority showing slight decreases in speed. Of the remaining six corridors, one showed a significant increase and five showed a significant decreases. Changes in average LOS were not reviewed as the arterial class of the segments varied along the arterial corridors.

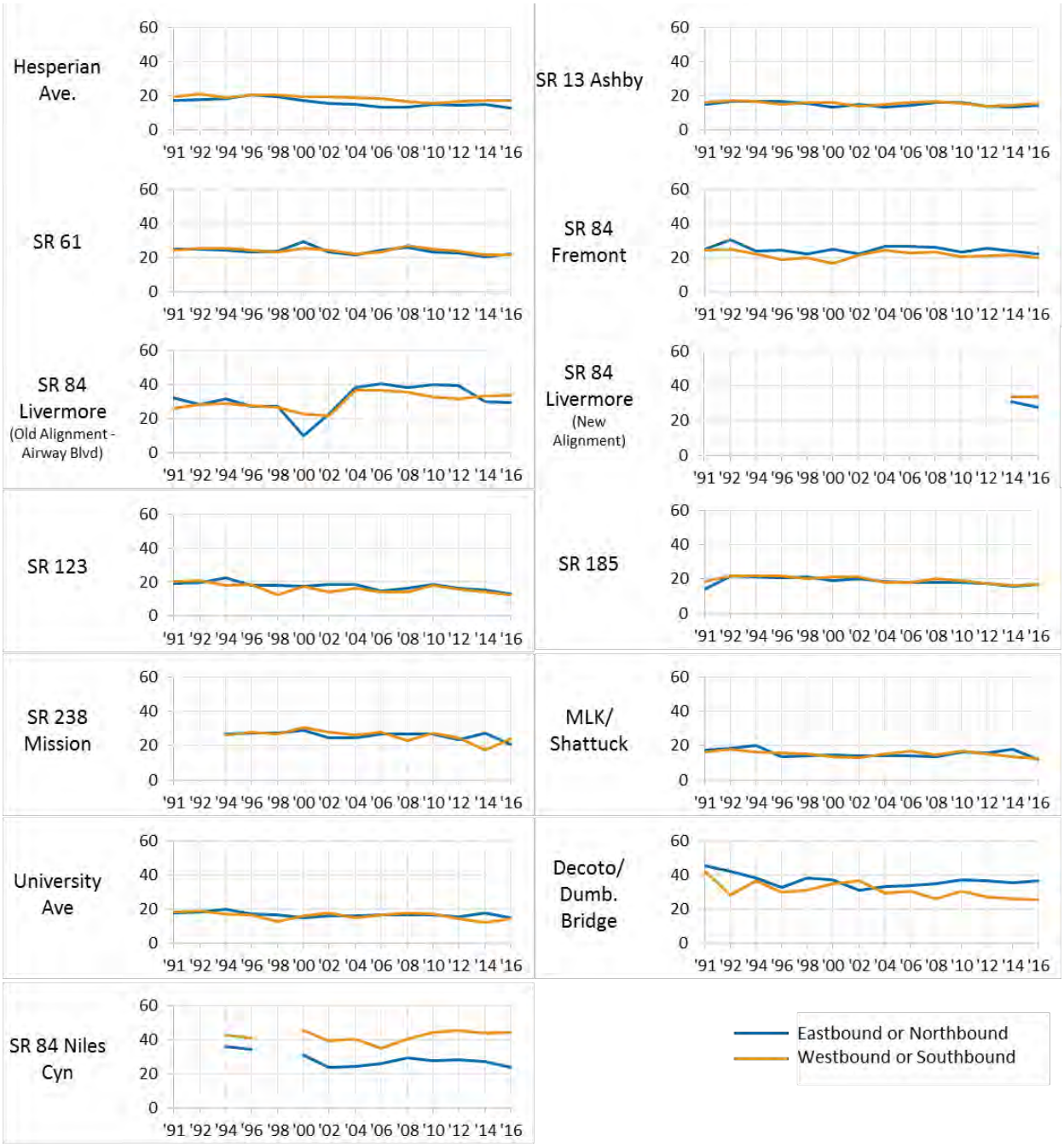


Figure 3-6: Change in Arterial Corridor Average Afternoon Speed from 1991 to 2016 (mph)

Review of long term trends on these arterial (Tier 1) corridors show that speeds stayed relatively stable in the afternoon peak with the exception of Decoto Road/Dumbarton Bridge and State Route 84 in Livermore. State Route 84 (Livermore) showed a significant drop in speeds during 2000, the dot com boom period, and then a steady increase thereafter. Speed on Decoto Road/Dumbarton Bridge has been declining gradually over the years, reflecting the regional nature of traffic this road carries.

For the comparison between 2014 and 2016 performance, there was a significant speed increase on State Route 238 Mission Boulevard (southbound) from Jackson Street in Hayward to I-680. The average speed increased by + 6.6 mph.

There was a significant decrease in the same corridor in the northbound direction, reversing the trend from 2012 to 2014. The average speed decreased by - 6.8 mph. Another significant decrease in average speed (- 6.2 mph) from 2014 to 2016 was seen on northbound Martin Luther King Jr. Way /Shattuck Avenue in North Oakland and Berkeley. The segment of Martin Luther King Jr. Way northbound from State Route 24 to Adeline Street changed from LOS C in 2014 to LOS E in 2016. The segment of Adeline Street which shares roadway with Martin Luther King Jr. Way became a congested segment for the first time in 2016, down from LOS E in 2014. The segment of Shattuck Avenue northbound from Adeline Street to Dwight Way changed from LOS D to LOS E.

Review of long term trends on these arterial (Tier 1) corridors show that speeds stayed relatively stable in the afternoon peak with one exception.

4 | Level of Service Results: HOV and Express Lanes

Considering the importance of managed lanes (such as HOV and express lanes) in improving the overall performance of a corridor, Alameda CTC started monitoring these facilities in 2014. Results are presented in Appendix B, Tables B-10 and B-11. The new I-580 Express Lanes in East County opened in February 2016, but were not included in the 2016 monitoring because they were still in the express lane ramp up period. In 2018, it is recommended that the eastbound managed lanes be considered as express lanes and the corresponding updates to the CMP network be performed. New segment definitions for the westbound express lanes will be required as well.

Since the last monitoring cycle, a new section of HOV facility opened on I-880 (southbound) from south of Hegenberger Road to Marina Boulevard, where it joins the existing I-880 (southbound) HOV facility. Two new CMP segments have been introduced to represent this new HOV section:

- I-880 (southbound) HOV from the HOV facility start south of Hegenberger Road to State Route 112 (Davis Street); and
- I-880 (southbound) HOV from State Route 112 (Davis Street) to Marina Boulevard.

4.1 | Congested Segments

Travel time data for HOV and express lanes from 2016 revealed that 11 segments were congested in the afternoon peak (See Table 4-1) and none in the morning peak. These occurred mostly on the major regional and interregional corridors I-80 and I-880. For the identified congested HOV segments, all the corresponding general purpose lanes were also congested (LOS F), with the exception of I-80 (westbound) from the Toll Plaza to the End of HOV which was slightly better at LOS E.

Table 4-1: Congested Segments on HOV Lanes - PM

CMP Route	Segment Limits	Jurisdiction
I-80 – EB	Begin of HOV to I-80 HOV/GP Gore	Oakland
I-80 – EB	I-80 HOV/GP Gore to Powell St.	Emeryville – Berkeley
I-80 – EB	Powell to Ashby Ave.	Emeryville – Berkeley
I-80 – EB	Ashby Ave. to University Ave.	Emeryville – Berkeley
I-80 – WB	Toll Plaza to End of HOV	Oakland
I-880 – NB	SCL County Line to SR 262/Mission Blvd. (450 ft s/o Warren Ave. Overhead Bridge)	Fremont
I-880 – NB *	Stevenson Blvd. to Decoto Rd.	Fremont
I-880 – NB *	Decoto Rd. to Alvarado Blvd.	Fremont
I-880 – NB *	Alvarado Blvd. to Alvarado-Niles Rd.	Fremont – Union City
I-880 – NB *	Alvarado-Niles Rd. to Tennyson Rd.	Union City – Hayward
I-880 – NB *	Tennyson Rd. to SR 92	Hayward

* Construction

Congested segments are assigned differently on express lanes than HOV lanes. Alameda CTC determined that express lanes are considered congested if they are assigned LOS D, E, or F which is equivalent to speeds less than 49 mph. Review of the 2016 results for express lanes (other than I-580 which was not analyzed due to express lane ramp up period) revealed no congested segments in either peak period.

4.2 | Average Speeds

Appendix A contains the maps showing the HOV and express lanes' performance. Managed lane overall system average speeds for 2016 are presented in Table 4-2 and Figure 4-1, along with a comparison to results from the previous monitoring cycle. Compared to 2014, the morning peak speed slightly increased and the afternoon peak speed decreased for the HOV lanes, and the morning peak speed slightly increased and the afternoon peak speed increased for the express lanes. All changes were less than two miles per hour.

Table 4-2: 2014 - 2016 Average Speed of Managed Lanes (mph)

Monitoring Year	Period	HOV	Express Lane
2014	PM	49.3	67.4
	AM	56.3	64.9
2016	PM	48.3	68.4
	AM	58.1	65.2
Change 2014 – 2016	PM	-1.0	+1.0
	AM	+1.8	+0.3

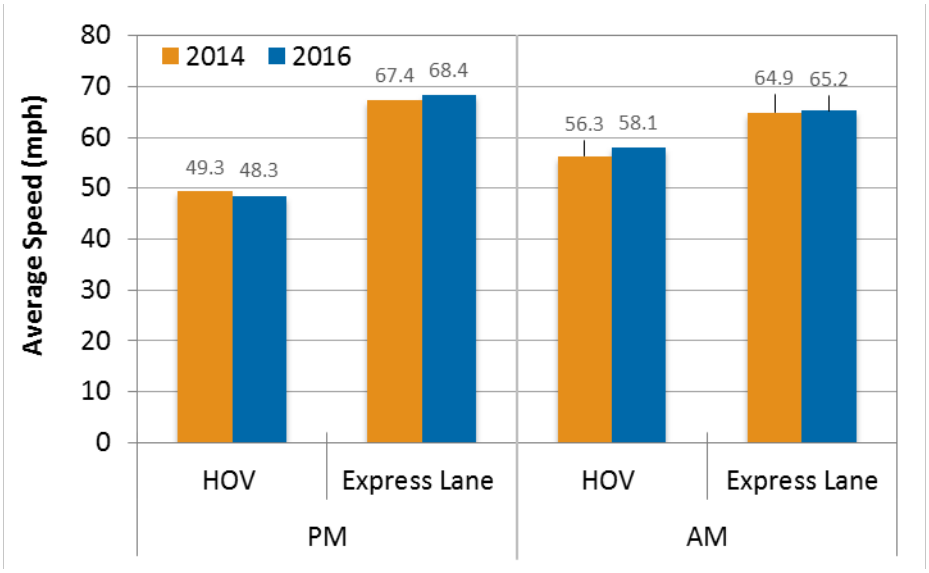


Figure 4-1: Average Speeds on the Managed Lane Network (2014 to 2016)

4.3 | Comparison to Freeway Performance across All Lanes

Through the implementation of managed lanes, Alameda CTC and associated agencies are not only encouraging commuters to carpool (HOV lanes), but are also maximizing efficiency by enabling single occupancy vehicles to access managed lanes by paying a toll (express lanes). By meeting these occupancy or payment requirements, HOV/express lane users gain access to managed lanes that are unavailable to general purpose lane users. This section reviews the effect of these managed lanes by comparing freeway general purpose lane performance to managed lane performance. Appendix B presents detailed data of managed lane performance.

The plots shown in Figure 4-2 provide a comparison of the speed along the freeway (all lanes) and managed lanes for the afternoon and morning peak periods. Each graph contains a diagonal line which represents parity between the average speeds along freeways and HOV/express lanes. Data points above the line indicate that average speeds on the managed lanes were faster than the freeway speeds. This was the case with the majority of the data points during both the peak periods, indicating that managed lanes were less congested than overall freeway lanes, as expected. However, a minority of data points are below the diagonal line, indicating exceptions, likely due to different sampling rates.

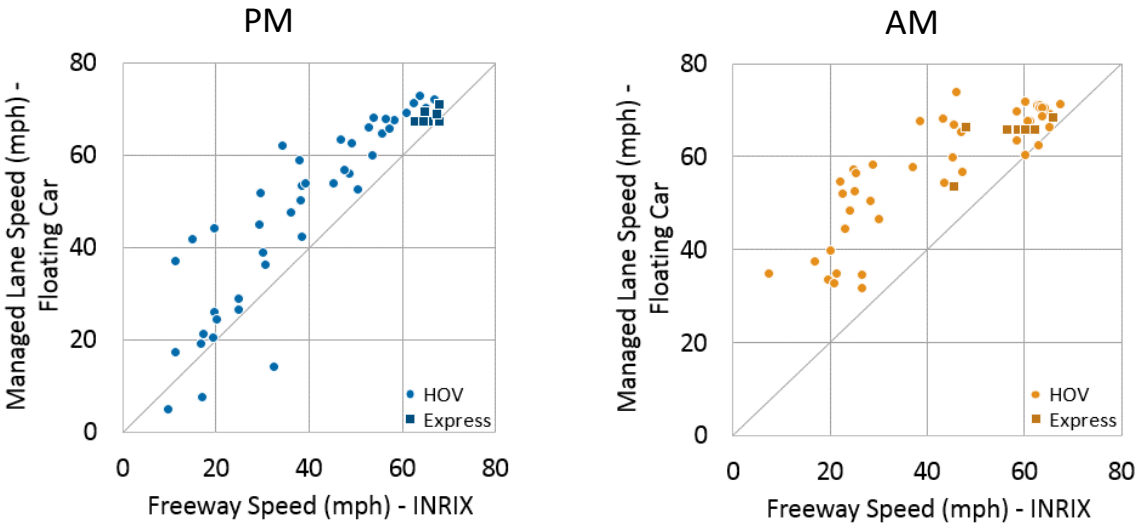
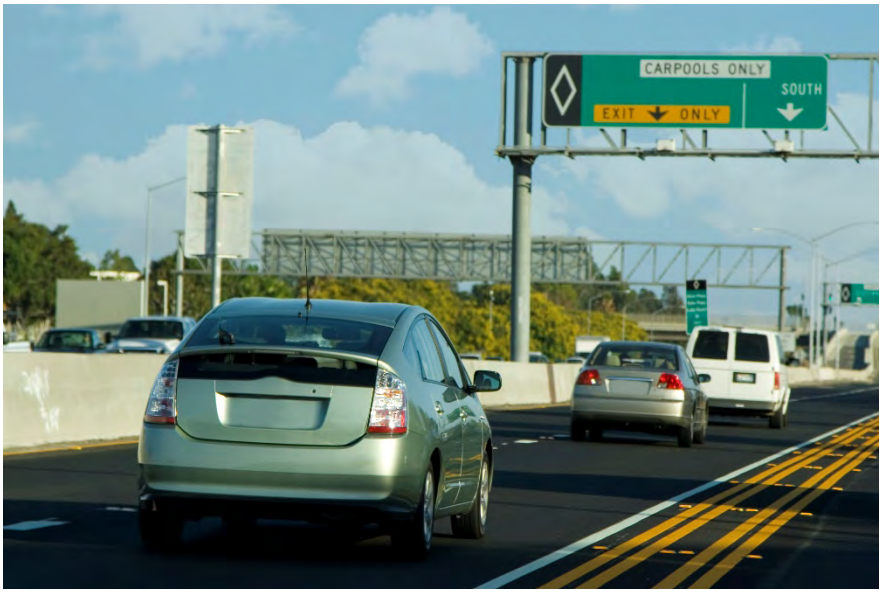


Figure 4-2: Freeway (Tier 1) to HOV Speed Comparison (2016)

While these graphs are useful to compare the performance across different types of freeway lanes, it is important to understand the two limitations of performing the comparison using the current data collection technologies and methodologies (i.e. floating car surveys for managed lanes and commercial speed data for all freeway lanes).

First, the floating car surveys have a limited sample size (six) compared to the commercial data (in thousands). By using an increased sample size, the data obtained is more representative of the average conditions throughout the entire monitoring period and is less prone to influence from individual events.

Second, the commercial data includes data for both general purpose and managed lanes due to the current inability of commercial speed data to report on speeds lane by lane. However, freeway speeds captured by commercial data will be more representative of general purpose lanes as there are more of these lanes than managed lanes. Hence, it is reasonable to expect that the speed along the general purpose lanes is slightly slower than reported under the freeway category and that the benefit of using managed lanes is higher than reported.



Even though freeways and HOV/express lanes were monitored using different data collection methodologies, the comparison is still possible, and generally showed the anticipated difference in performance. Continued undertaking of this effort provides Alameda CTC with a quantitative comparison of the performance of managed lanes within congested freeway corridors. For the next cycle, Alameda CTC may consider using lane-by-lane commercial speed data that has been made available recently.

In the 2016 monitoring cycle, the results indicate that speeds along HOV lanes were generally faster than the freeway performance across all lanes by an average of 8.6 mph in the afternoon peak period and 15.1 mph in the morning peak period. These values were weighted by distance consistent with methods used in freeway monitoring from previous cycles. While HOV performance was generally faster, these managed lanes still experienced congestion at similar locations and time periods as their corresponding general purpose lanes. For example, it was not common to observe free flowing HOV lanes when the performance of the freeway as a whole was notably slower.

The express lane monitoring in 2016 included a single express lane on the I-680 in the southbound direction. It offered travel speeds averaging 2 mph and a maximum of 5 mph faster compared to the overall freeway during the afternoon peak period. In the morning peak period, the express lane offered a larger improvement averaging 7 mph and a maximum of 18 mph faster on one segment (I-680 southbound from the Washington

Boulevard Entry Point to the Auto Mall Parkway Exit Point). There is a larger difference in speed between the lanes in the morning peak period since this is the peak direction towards Santa Clara County and as expected, the express lane provides its greatest benefit during this time. Since I-680 southbound travels largely at free flow speeds in the afternoon peak period, the speeds across all lanes are more similar. As more express lanes are opened in Alameda County in future years, the express lane monitoring will broaden from a single road to a network and therefore, network trends will be more observable instead of the patterns of a single express lane.

5 | Travel Time Results for Bay Crossing Bridges

Alameda County is the geographic center of the region. It borders the San Francisco Bay on the western side and the three bay crossing bridges (Bay Bridge, San Mateo Bridge, and Dumbarton Bridge) provide critical transportation conduits to major employment centers in San Francisco, the Peninsula and Silicon Valley. Currently, the Bay Bridge toll is priced at $6 in the weekday commute periods (between 5:00 a.m. and 10:00 a.m., and between 3:00 p.m. and 7:00 p.m.), $4 for other weekday time periods, and $5 on weekends. The San Mateo and Dumbarton Bridges tolls are $5 all day and every day of the week. Also, the posted speed limit is lower on the Bay Bridge (50 mph) compared to 65 mph on the other two bridges.

Alameda CTC has been monitoring the performance of these three bridges using travel time data since 2002. This was accomplished by using data collected by Caltrans or MTC or from Toll Tag information. The methodology and end points used to monitor the bridges have varied in the previous monitoring cycles depending on the data source.

Starting in 2014, commercial speed data was used for the bridges similar to freeway segments. The 2014 and 2016 data are presented in Appendix B, Tables B-12 through B-14. These tables include the performance of only the bridge CMP segments which are outside of Alameda County. The in-county bridge CMP segments are included in the Freeways (Tier 1) segments listing in Section 3.3.1 | and in Appendix B.1.

Comparing the 2016 performance of the bridges to 2014, a slight decline in speed is generally observed on all three bridges in the morning, afternoon and weekend peak periods (including county and non-county portions of the bridges). A larger average speed reduction was observed in the morning peak period in the westbound directions for the Bay Bridge (- 7.9 mph) and the Dumbarton Bridge (- 10.6 mph). For the Dumbarton Bridge, the afternoon peak in the eastbound direction also had a larger reduction in average speed (- 9.1 mph). Figure 5-1 depicts the performance of the bridges.

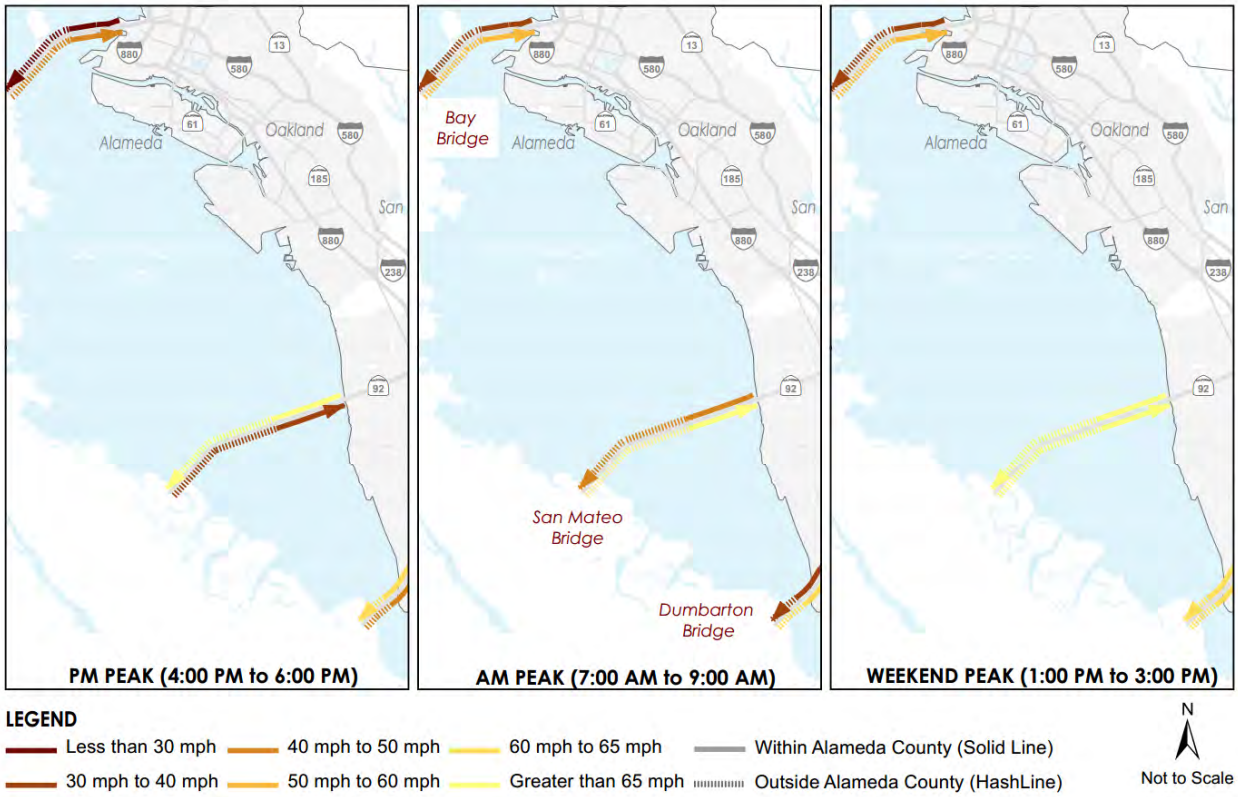


Figure 5-1: Average Speed (mph) across Bay Crossing Bridges (2016)

Based on this data, it is possible to compare the performance of the bridges to each other. It is recognized that some commuters may have the choice of using two bridges for their daily work commute or for weekend travel. The likely choices for drivers may be between the Bay Bridge and San Mateo Bridge, or between San Mateo Bridge and Dumbarton Bridge. Using Figure 5-1 it is also possible to compare the performance of each bridge in either direction between the east and west landings.

A typical Alameda County resident accessing San Francisco or the Peninsula for work, would travel westbound in the morning and eastbound towards Alameda County in the afternoon. For such residents choosing between the Bay Bridge and San Mateo Bridge in the morning, the westbound San Mateo Bridge has a 12 mph faster average speed (43 mph) compared to the westbound Bay Bridge (31 mph). In the evening, the eastbound Bay Bridge has a 5 mph faster average speed (41 mph) compared to the eastbound San Mateo Bridge (36 mph). For residents choosing between the San Mateo and Dumbarton Bridges, a similar speed difference is encountered. In the morning, the westbound San Mateo Bridge has an 11 mph faster average speed (43 mph) compared to the westbound Dumbarton Bridge (32 mph). In the evening, the

eastbound Dumbarton Bridge has an 11 mph faster average speed (47 mph) compared to the eastbound San Mateo Bridge (36 mph). Interestingly, in the commute directions and times (westbound in the morning, eastbound in the evening), the San Mateo Bridge shows faster speeds than the other two bridges in the morning, and slower in the evening. On the weekend, the San Mateo Bridge has the fastest speeds reported in both directions of the three bridges.

6 | Travel Time Results for Origin – Destination Pairs

The purpose of the OD travel time surveys is to compare the performance of various transportation modes between major employment centers and residential areas in Alameda County. These surveys help understand the journey-to-work travel times in the county. Surveys for some of these ten routes began as early as 1996. Section 2.2.3 | provides details of the survey methodology; as described, OD travel times were gathered with a limited number of surveys (two to four surveyed runs per mode per OD pair). In the OD travel time results of this monitoring year and past years, which have occurrences of high year-on-year variability, the reader should keep in mind the small sample size of this study.

New for the 2016 Monitoring Report, online transit surveys were also conducted. Simultaneously with the in-field transit travel survey, staff at a desktop computer observed the real-time departure and arrival times of transit vehicles using real time transit information through the 511 Bay Area website (511.org), and estimated walking times using Google Maps. Using this method, it was possible to compute the door-to-door travel time by transit. This method was introduced as a pilot study for demonstration purposes for this cycle. Full countywide multimodal monitoring using Big Data will be explored in future cycles.

In 2016, all the OD routes were reviewed and updated as reported in Appendix C. All transit schedules were reviewed in order to obtain the quickest travel time between the specified origin-destinations, using the 511 Bay Area website. As a result, new transit options were chosen for the following pairs:

- Between Emeryville and Berkeley (OD 2),
- Between Hayward and Livermore (OD 3) an express bus 12X was used instead of 12, and
- The transit route between Fremont and San Jose (OD 6), the VTA 330 bus stop location was updated to reflect changes in the bus line since 2014.

On average, travel times on transit routes were approximately twice as long as auto routes between the same origin-destinations. In 2016, transit travel times have increased from the previous monitoring cycle on seven of the nine routes; this trend differs from the 2014 monitoring cycle where largely decreases from the previous monitoring cycle were observed. Two of the nine routes: Hayward-Livermore (OD 3) and Alameda-Oakland (OD 10) show improved transit travel times from 2014 to 2016. The auto travel times generally increased compared to previous monitoring cycles, while the HOV travel time between Fremont and San Jose (OD 7) slightly decreased (-2 minutes). Overall, this indicates that transit performance may be getting worse on selected routes at the same time as the road network is becoming more congested, although, as mentioned above, a

greater sample size would be needed to confirm this finding. Figure 6-1 shows a graph of the OD results for 2014 and 2016. Appendix E presents detailed results for all years.

The routes from Hayward to Newark (OD 1), Oakland to San Leandro (OD 4), Fremont to San Jose (OD 6&7), Oakland to Pleasanton (OD 8), Fremont to Alameda (OD 9), and Alameda to Oakland (OD 10) showed similar travel times to previous monitoring efforts, across all modes, with a general trend of increased travel times.

The route from Emeryville to Berkeley (OD 2) showed a good performance by auto, but very poor performance by transit and bicycle. The transit route, despite having the best scheduled travel time of all possible transit routes, took an average of 102 minutes. The field surveyor experienced long waits for the H bus to arrive. This bus route is a Transbay commuter line and has a scheduled service interval of approximately every 20 minutes during the afternoon peak period. It may have been delayed in traffic on the Bay Bridge or on eastbound I-80, where the route passes through three congested segments on both the HOV and general purpose lanes in the afternoon peak period.

Also for the same O-D pair, Emeryville to Berkeley (OD 2), the bicycle times were longer, averaging at over 57 minutes, nearly double the Google Maps suggested bicycle travel time of 33 minutes. Earlier survey years from 1998 to 2008 show bike travel times around 30-35 minutes, but recent travel times are longer, with 47 minutes in 2010, and 48 minutes in 2014. The data collection field staff mentioned that the final portion of the bicycle route required climbing a difficult hill, with a vertical rise of over 250 feet. The change in travel time performance compared to past years may reflect variation in cyclist ability. In future study years, increasing the sample size (and using multiple cyclists) would improve the estimate.

The route from Hayward to Livermore (OD 3) showed an increase in auto travel times reflective of the greater afternoon peak period congestion found in this study. The transit travel time decreased compared to 2014, likely because of improved connections. In the 2014survey, the transit travel time was influenced by a missed bus connection caused by a slightly late running BART segment, resulting in a long wait for the Wheels route 12 bus which operated once every 30 minutes. In the 2016 transit survey, Wheels route 12 was supplemented by Wheels route 12x route which provided greater service frequency. Consequently, the connection and overall travel time decreased from 2014 to 2016.

The route from Fremont to Pleasanton (OD 5), which required numerous transfers (walk, bus to BART, BART to BART, BART to bus, and walk), performed especially poorly in 2016, with long waits on many of the transfers, despite this route having the best scheduled travel time. On the first run, the bus at the start of the route was a few minutes early and

the transit survey staff missed the bus, and had to wait one hour until the next bus.

OD pairs 6 and 7 survey travel time from Fremont to San Jose and are the only pairs that survey travel to an employment center outside of Alameda County. 2016 results for these two OD pairs showed increases in auto and transit travel times compared to 2014, and a slight improvement in HOV travel time. As in 2014, the HOV travel time was significantly less than the single-occupant auto travel time. The transit route, which uses the ACE train and VTA bus, is able to bypass the freeway congestion on southbound I-880, and achieve a travel time that is only slightly (20%) longer than the single-occupant auto travel time.

For the two routes with transit travel time based on the online desktop survey (Hayward to Newark OD 1 and Oakland to San Leandro OD 4), a total of four desktop runs were collected and generally they showed good alignment to field survey travel time. One of the four online desktop surveys experienced a travel time different more than a few minutes compared to field survey travel time, due to a disappearing bus on the real- time position online display map. For that run, the in-field transit surveyor reported a long wait for the bus. AC Transit is planning a major bus positioning and dispatching system upgrade in the next few years, so the quality of the real time bus position and arrival information is expected to improve in upcoming monitoring cycles.

For a better comparison of auto and transit modal performance, a large-scale, automated transit monitoring study will be a valuable input. By increasing the robustness of transit monitoring in line with that of Alameda CTC's robust roadway monitoring, the comparison between auto and transit modal performance will be more effective. More discussion on this is included in Chapter 9.

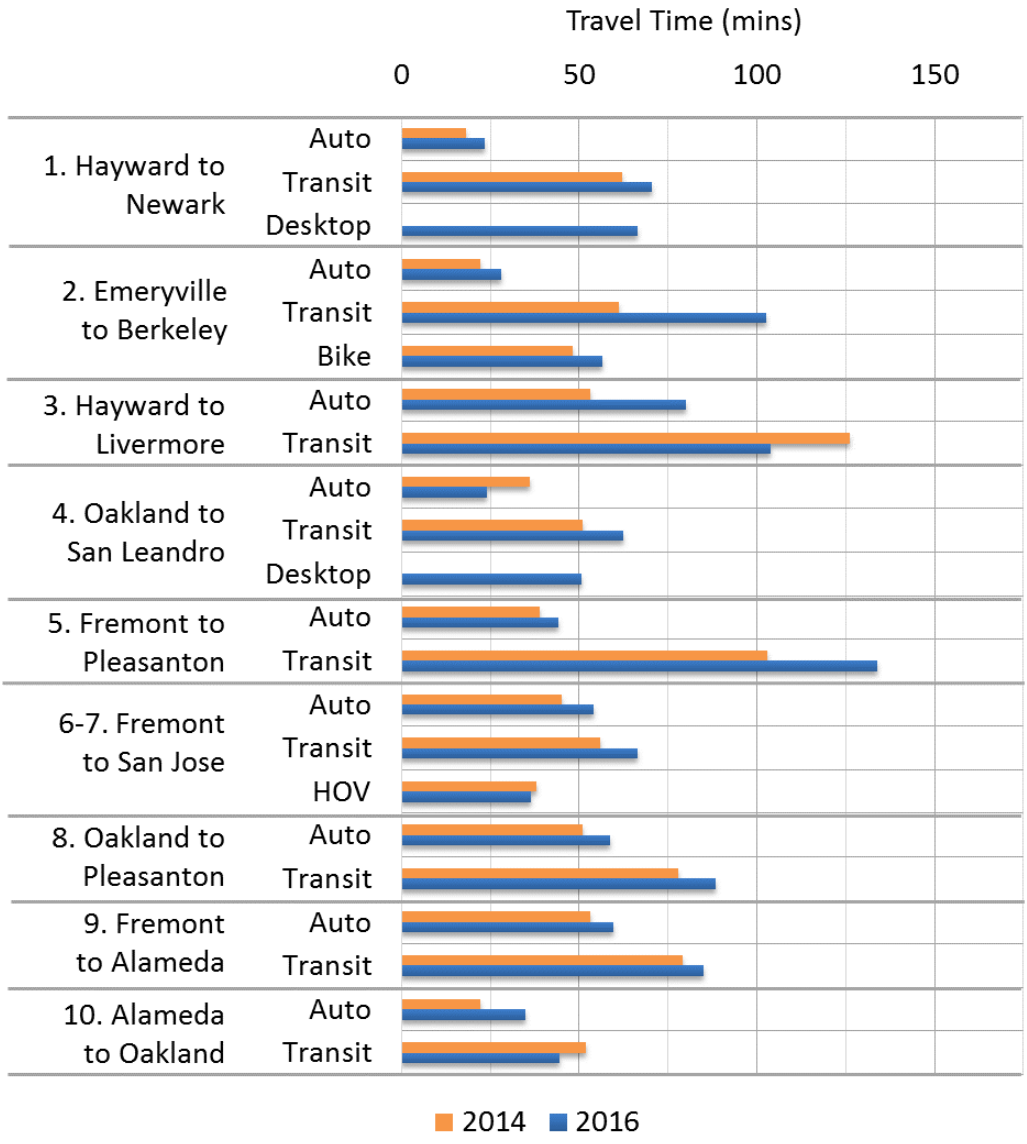


Figure 6-1: OD Survey Results

7 | Big Data Performance Metrics

Reliability and Duration of Congestion metrics are measured for the first time in 2016 further utilizing the benefits of commercial speed data

Recently, new data technologies and performance measurement approaches have been radically transforming congestion monitoring practices nationwide. These technologies and approaches revolve around the emerging fields of Big Data and Analytics. These analytical techniques improve the monitoring program by providing more data for a lower cost and widening the scope of congestion analysis.

Using the commercial speed data from INRIX, big data performance metrics of reliability and duration of congestion are computed (for informational purposes) for the first time in the 2016 LOS Monitoring Report. Data for these additional performance metrics was used from all Tuesdays, Wednesdays and Thursdays in the defined monitoring period. In this report, the reliability and duration of congestion performance measures are analyzed for the Alameda County freeway network.

7.1 | Reliability

The reliability metric considers the travel time variability. For a user, this is important to determine how much time to allow for a trip to arrive on time with a degree of certainty. Unreliable travel times can be caused by normal fluctuations in demand, inclement weather, incidents, work zones and special events.[15] These influencing factors can cause significance variation in the travel times.

The calculation of reliability for the current project includes the following assumptions:

- The monitoring periods for this reliability analysis were 7:00 a.m. to 9:00 a.m. for the morning peak period and 4:00 p.m. to 6:00 p.m. for the afternoon peak period.
- Reliability metrics were calculated based on INRIX measurements of average speed of all vehicles from each minute within the monitoring period. This differs from a traditional reliability calculation which is calculated for each individual vehicle.

7.1.1 | The Reliability Concept

A reliability analysis is typically depicted using a probability distribution function. For example, if a driver takes the same trip for 34 days, the graphic shows the travel time results for each of those 34 surveys (see Figure 7-1). Insights may be obtained by reviewing the:

- High point on the graph which aligns with the most commonly experienced travel times;

[15] SHRP2 LO8: Proposed Chapters for Incorporating Travel Time Reliability into the Highway Capacity Manual. Transportation Research Board of the National Academies, Washington D.C. 2013.

- Leftmost and rightmost parts of the distribution which align with the minimum and maximum experienced travel times; and
- The range of travel times or the difference between the maximum and minimum occurring travel times.

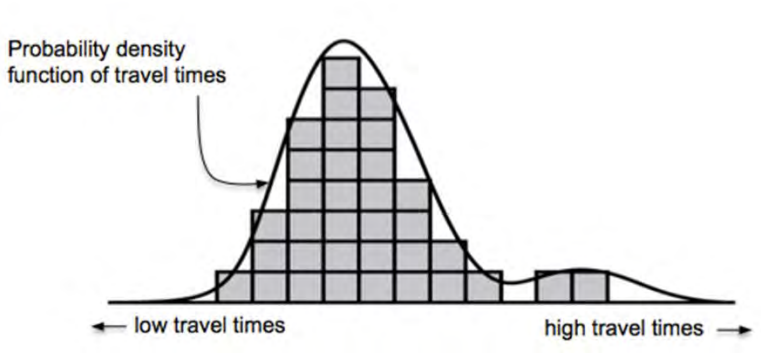


Figure 7-1: Example Probability Distribution Function

In order to compare the reliability across various travel time distributions, the following performance measures are defined.[16]

Planning Time: In planning a trip, how much time should one allow for a trip to ensure 95% on-time arrival. It is equivalent to the 95th percentile of travel times experienced (i.e. if the same trip was taken 100 times, the 95th percentile would be equal to the travel time of the 95th longest trip).

$$Planning\ Time = 95th\ Percentile\ Travel\ Time$$

Planning Time Index (PTI): To allow for comparison across different routes and different trip lengths, the planning time index is a ratio of the 95th percentile travel time to the free flow travel time. If a trip takes 20 minutes in light conditions (i.e. free flow) and a planning time of 30 minutes will ensure 95% on-time arrival, then the planning time index is 1.5. A free flow of 65 mph was assumed as is common practice in reliability analysis. [17]

$$Planning\ Time\ Index = \frac{95th\ Percentile\ Travel\ Time}{Free\ Flow\ Travel\ Time}$$

Buffer Time/Index: The buffer index (BTI) represents the extra buffer or cushion that one allows in addition to the average travel time to account for any delay. For example, if a trip in the morning peak normally takes 25 minutes (i.e. mean travel time), and 30 minutes will ensure a 95% chance

[16] Travel Time Reliability: Making it there on time, All the time. Federal Highway Administration. 2005. http://ops.fhwa.dot.gov/publications/tt_reliability/TTR_Report.htm
[17] Technical Memorandum: Analysis Procedures and Mobility Performance Measures – 100 Most Congested Texas Road Sections. Texas A&M Transportation Institute. 2014.

of on-time arrival, then the buffer time is 5 minutes and the buffer index is 0.2. A larger buffer index indicates a wider range of travel times and represents less reliable travel.

$$Buffer\ Time = 95th\ Percentile\ Travel\ Time - Mean\ Travel\ Time$$

$$Buffer\ Index = \frac{95th\ Percentile\ Travel\ Time - Mean\ Travel\ Time}{Mean\ Travel\ Time}$$

Figure 7-2 shows an example probability distribution and labels the reliability metrics.

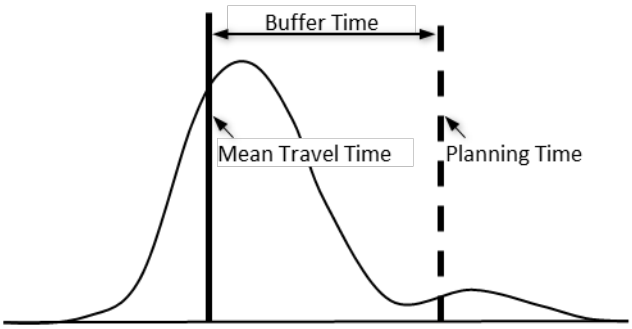


Figure 7-2: Example Probability Distribution Function with Reliability Metrics

7.1.2 | Reliability Case Study for I-880 Corridor

Since reliability is calculated for the first time in this monitoring cycle, the reliability concept is expanded in a case study on the I-880. This section reviews the probability distribution functions on the I-880, then shows the reliability metrics for this road and finally provides discussion about the reliability in the northbound and southbound directions in both the morning and afternoon peak periods.

The probability distribution function on the full length of I-880 in Alameda County is presented in Figure 7-3. It shows the distribution of morning and afternoon peak period travel times for the northbound and southbound directions separately. Note that the graphs in this chapter and the Appendix show two colored distributions, pink and green, for the morning and afternoon peak periods, respectively, while the darker shades of both colors represent regions occupied by both peak period distributions.

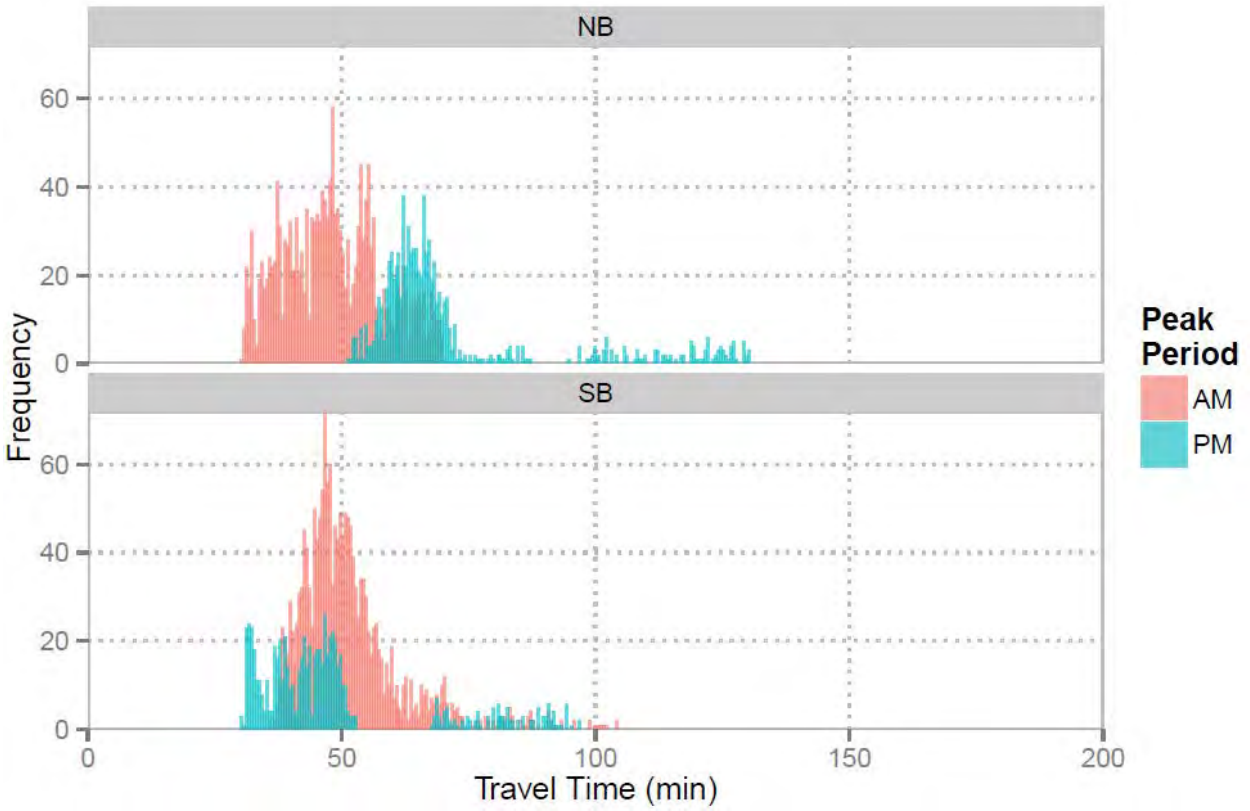


Figure 7-3: Distribution of Travel Times along I-880 in Alameda County (2016)

In the northbound direction, which has a total length of 35.4 miles, the lower limits for travel time for the morning and afternoon periods were approximately 30 minutes (71 mph) and 51 minutes (42 mph) respectively. The morning travel time distribution had a median of 48 minutes (44 mph) and a maximum of 70 minutes (30 mph). The afternoon travel time distribution had a median of 65 minutes (33 mph) and a maximum of 130 minutes (16 mph). Overall, in the morning, the northbound direction experiences moderate congestion with a small amount of free flow traffic. The afternoon period has heavier congestion with a wider range of travel times.

In the southbound direction, which has a total length of 35.2 miles, the lower limits for travel time for the morning and afternoon periods were approximately 36 minutes (59 mph) and 30 minutes (70 mph) respectively. The morning peak travel time distribution has a median of 49 minutes (43 mph) and a maximum of 104 minutes (20 mph). The afternoon travel time distribution has a median of 44 minutes (48 mph) and a maximum of 94 minutes (23 mph). Overall, the southbound direction experiences heavier congestion in the morning period and a mixture of moderate congestion and free flow in the afternoon period. Both directions have a wide range

of travel times. The higher frequency of longer travel time for southbound morning trips and northbound afternoon trips correspond to the commuter traffic flows to and from the employment centers in the South Bay and southern Peninsula which are reached by I-880.

Figure 7-4 then adds the reliability measures to previous figure. For the northbound direction, the morning peak period has a lower mean travel time and shorter buffer time (meaning better travel time reliability), compared to the afternoon peak. For the southbound direction, the mean morning and afternoon peak mean travel times are similar, but the afternoon has a much longer buffer time (meaning poorer travel time reliability).

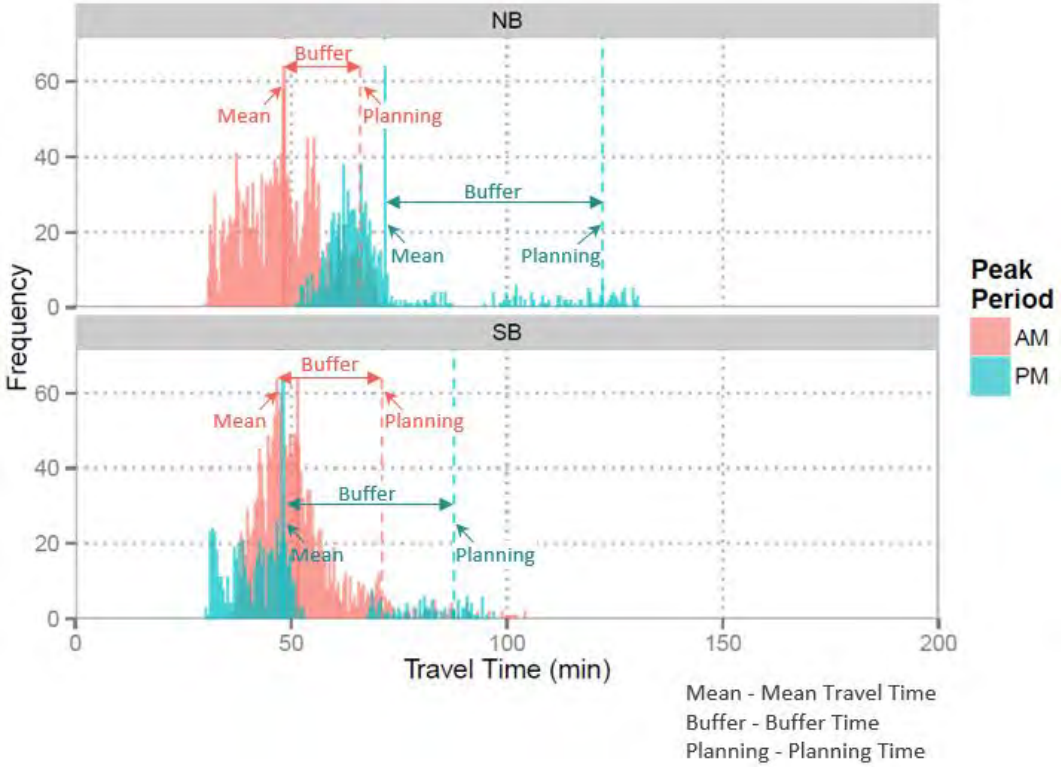


Figure 7-4: Travel Time Distributions on I-880 with Reliability Measures (2016)

A summary of all these values is presented in Table 7-1. The table shows that southbound I-880 in the afternoon peak period is the least reliable (BTI = 0.8). A value of 0.8 indicates that drivers would need to allow nearly the same amount of travel time beyond the mean travel time to ensure 95% on-time arrival. It also shows that morning peak period travel, in both directions, is generally more reliable with the lowest BTI value of 0.4.

Table 7-1: Summary Reliability Statistics for I-880 (2016)

Dir	Length (mi)	Peak	Free Flow Travel Time (mins)	Mean Travel Time (mins)	95th Percentile / Planning Time (mins)	Buffer Time (mins)	PTI	BTI
NB	35.4	AM	32.7	48.3	65.9	17.5	2.0	0.4
		PM	32.7	71.8	122.1	50.3	3.7	0.7
SB	35.2	AM	32.5	51.5	71.0	19.4	2.2	0.4
		PM	32.5	48.1	87.7	39.6	2.7	0.8

7.1.3 | Results

The results for the reliability measures were computed individually for smaller freeway segments across the entire CMP freeway network. The study team determined the limits of these smaller freeway segments by combining one or more CMP segments between major freeway system interchanges or county borders. Considering the I-880 case study further to illustrate this concept, there were three Reliability Segments: between I-80 and State Route 92, between State Route 92 and State Route 84 / Decoto Road, and between State Route 84 / Decoto Road and the Santa Clara County Line. The reason for using these longer segments to analyze reliability is to provide more useful results to freeway managers and agencies, by better reflecting the typical traveler experience of the combined effects of the smaller segments on the travel corridor. If CMP segments were used, then the analysis would be focused toward the location of individual bottlenecks, rather than travel on a length of corridor. The commercial speed data was aggregated for both peak periods during the monitoring period to compute travel time distributions on these individual Reliability Segments.

The segments and their reliability results for the complete CMP freeway network are presented in Appendix H, along with tables, graphs and maps for the following:

- Travel time and reliability for each individual Reliability Segment.
- Travel time distributions for each Reliability Segment.
- Morning and afternoon period maps showing the reliability for each Reliability Segment

Additional findings can also be seen on the reliability distributions. Continuing the case study on I-880, the southern segment of I-880 (between the Santa Clara County Line and State Route 84 / Decoto Road, Reliability Segments N23 and N28) exhibits poor reliability and longer travel times to and away from the South Bay employment centers during the commute direction peak period. The middle segment (between State Route 84 / Decoto Road and State Route 92, Reliability Segments N24 and N27) shows similar but relatively less pronounced

commuter peaking. The northern segment (between State Route 92 and I-80, Reliability Segments N25 and N26) has no peaking, with poor reliability and long travel times in both directions in both the morning and afternoon peak periods. It is likely that the northern section is serving a combination of commute trips to and from San Francisco, Peninsula, as well as South Bay employment centers.

Now reviewing other parts of the freeway network, the reliability results can be compared to the LOS monitoring results to yield interesting observations. In general, the reliability is worse on segments that also experience a lot of congestion. For example, one of least reliable segments is on the I-80 westbound between the Contra Costa County Line and the Bay Bridge Toll Plaza in the afternoon peak period. Much of this segment is LOS F at this time. However, this relationship is not universal. For example, in the afternoon peak period, State Route 24 showed LOS F in the eastbound direction and LOS A in the westbound direction. However, the reliability in both directions was approximately equal. For the eastbound direction, there is poor reliability that results from the presence of congestion. However, the westbound could possibly warrant more investigation to determine the source of the poor reliability. They may include occasional queuing back from the MacArthur Maze which is already known to have heavier congestion. Alternatively, it could be caused by regular incidents either on this segment or around the MacArthur Maze, or a greater variation by the day of week.

There are also examples of roadways that experience congestion, yet are more reliable. Consider State Route 92 in the afternoon peak period. The westbound direction experiences LOS E conditions, quite reliably. One can travel at the free flow speed in just over 10 minutes; however on average during the peak it takes approximately 19.5 minutes. The 95th percentile travel time is nearly 24 minutes. So despite the longer travel time on average in the peak (i.e. nearly double the free flow travel time), the buffer time is just over four minutes. In other words, the variation between the average and 95th percentile travel times is smaller and therefore, this road can be viewed as *reliably slower*. This may be perceived by drivers as more desirably than unreliably slower, since they can more accurately predict their travel time.

Since this analysis was conducted for the first time in 2016, these results can be used as a baseline in future monitoring studies. In 2018, comparisons of reliability between cycles will be possible.

7.1.4 | Most/Least Reliable Segments

This section highlights the most reliable and least reliable freeway segments in Alameda County using the Buffer Index (BTI) as the primary metric (See Table 7-2 and Table 7-3). The most reliable segments tend to be those which are less congested, but as discussed in the previous

section, this is not always true as a severely congested segment may also be reliable if it is consistently congested. Reliability can be improved through improvements other than reducing traffic demand, such as:

- Operational improvements: adaptive ramp metering, dynamic pricing, adjustments to freeway service patrols, variable speed limits and lane control systems; and
- Geometric improvements: Accessible shoulders, emergency crossovers, improvements to detour routes, and vehicle turnouts.

Table 7-2: Most Reliable Freeway Segments (2016)

Reliability Segment ID	Peak Period	Description	Length (mi)	PTI	BTI
N20	PM	I-680 - SB from Contra Costa County Line to I-580	1.9	1.0	0.1
N16	AM	I-580 - WB from I-80 to Contra Costa County Line	0.9	1.1	0.1
N12	AM	I-580 - EB from SR 13 to I-238	7.9	1.0	0.1
N23	AM	I-880 - NB from Santa Clara County Line to SR 84 / Decoto Rd.	10.1	1.1	0.1
N17	AM	I-680 - NB from Santa Clara County Line to SR 238 (Mission Blvd.)	6.3	1.1	0.1
N21	PM	I-680 - SB from I-580 to SR 238 (Mission Blvd.)	13.1	1.1	0.1
N19	PM	I-680 - NB from I-580 to Contra Costa County Line	1.9	1.1	0.1
N11	AM	I-580 - EB from I-80 to SR 13	7.5	1.1	0.1
N30	AM	I-980 - EB from I-880 to I-580	2.4	1.1	0.1
N12	PM	I-580 - EB from SR 13 to I-238	7.9	1.2	0.1

Table 7-3: Least Reliable Freeway Segments (2016)

Reliability Segment ID	Peak Period	Description	Length (mi)	PTI	BTI
N15	PM	I-580 - EB from Contra Costa County Line to I-80	0.7	3.0	1.2
N3	PM	I-80 - WB from Contra Costa County Line to Toll Plaza	6.0	4.6	1.1
N19	AM	I-680 - NB from I-580 to Contra Costa County Line	1.9	3.2	0.9
N4	PM	I-80 - WB from Toll Plaza to SF County Line	5.3	4.3	0.8
N6	AM	I-238 - WB from I-580 to I-880	2.5	5.5	0.8
N5	AM	I-238 - EB from I-880 to I-580	2.6	2.5	0.8
N31	AM	SR 13 - NB from I-580 to SR 24	5.8	3.3	0.8
N30	PM	I-980 - EB from I-880 to I-580	2.4	2.7	0.8
N7	PM	I-580 - EB from I-238 to I-680	10.4	2.9	0.7
N13	AM	I-580 - WB from I-238 to SR 13	7.9	3.3	0.7

7.2 | Duration of Congestion

The duration of congestion commonly increases when roadways become more congested resulting in peak spreading and nullifying the old concept of the "rush hour." There is an upper limit to capacity of a roadway and as the demand increases beyond this, the peak period must extend in duration in order to serve the demand.

The duration of congestion is a performance measure that adds another dimension to assessing congestion levels. For example, two separate freeways could experience similar magnitudes of congestion during the peak period, however, one of the freeways could be congested for four hours and the other for just one hour. So while the LOS could be similar at the peak, travelers can more easily shift their commute time to avoid congestion on the second freeway. In such cases, the second freeway may be perceived as overall less congested during a specific time period.

The duration of congestion was calculated as the average length of time per day in which speeds fell below 30 mph between the hours of 4 a.m. and 10 p.m. For example, if the speed falls below 30 mph for 60 minutes on Day 1 and 50 minutes on Day 2, then the average duration of congestion is 55 minutes. The 30 mph threshold for this analysis is equivalent to the threshold for LOS F conditions on freeways based on the 1985 HCM shown in Table 2-3. This analysis is conducted for each freeway CMP segment. The benefits of this analysis are as follows:

- While a traditional LOS analysis would have just shown LOS F, this analysis differentiates this segment from others at LOS F by showing how long it is congested. Thus it is conceivable to conclude that a segment that experiences LOS F for one hour is better than another segment that experiences LOS F for four hours.
- The time value is also tangible and understandable to constituents and the public, whereas total vehicle-hours of delay (i.e. values in the thousands) is often difficult to perceive.

Table 7-4 shows the Top 10 longest congested CMP segments and their corresponding LOS in both the morning and afternoon peak periods (from Chapter 3 |). Many of these segments were on I-80 westbound in Emeryville and Berkeley, with one having congestion lasting 442 minutes

(i.e. over 7 hours per day). Four of these segments experienced significant congestion (i.e. LOS F) across both peak periods. A further four segments experienced LOS F in one peak period and then LOS D or E conditions in the other peak. Two of the Top 10 segments experienced LOS F in one peak period and then uncongested conditions in the other peak period indicating that there is a long period of congestion in the afternoon peak. One such segment was on the I-680 northbound from Vargas Road to Andrade Road with 270 minutes (i.e. 4.5 hours) of congestion daily most likely attributed to commuters returning from Silicon Valley. This is an example of the congestion spreading beyond the two hour peak period window allocated for monitoring the LOS in Chapter 3 |, and where the duration of congestion performance measure can more completely describe the roadway performance experienced by commuters. A complete listing of the duration of congestion for all freeway segments is provided in Appendix H.

Table 7-4: Top 10 Segments Impacted by Congestion for the Longest Duration per Day (2016)

Rank	CMP	Description	Length (mi)	Duration of Congestion (Avg. mins per day) [1]	LOS AM / LOS PM
1	F11	I-80 - WB from Ashby Ave. to Powell St.	0.7	442	(F30) / (F20)
2	F10	I-80 - WB from University Ave. to Ashby Ave.	1.3	394	(F30) / (F20)
3	F9	I-80 - WB from Jct I-580 to University Ave.	1.5	310	(F20) / E
4	F14	I-80 - WB from Toll Plaza to SF County	2.0	291	(F30) / E
5	F56	I-580 - WB from SR 24 On-ramp to I-80/580 Split	1.2	289	(F30) / (F30)
6	F13	I-80 - WB from I-580 Split to Toll Plaza	1.3	286	(F10) / E
7	F12	I-80 - WB from Powell to I-80/I-580 (Split)	0.5	276	(F30) / (F30)
8	F64	I-680 - NB from Vargas Rd. to Andrade Rd.	2.2	270	A / (F20)
9	F61	I-680 - NB from Durham Rd. to Washington Blvd.	1.3	262	A / (F10)
10	F91	I-880 - NB from Alvarado-Niles to Tennyson Rd.	2.6	253	D / (F20)

[1]. Includes times between 4:00 a.m. and 10 p.m. covering both the morning and afternoon peak periods.

8 | Trend Analysis

Alameda CTC has been monitoring the performance of the CMP road network since 1991. In recent times, there has been a noticeable change in congestion on the network and overall performance influenced by the economic conditions in the Bay Area and the nation. This section analyzes the long term trends from 2000, the height of the dot-com boom, until today, and relates the performance of the transportation network to external factors that likely influence the traffic volume on the network such as the economy, levels of employment, demographics and transit ridership.

Overall, average speeds on the CMP network almost returned to pre-recession speeds in 2014, after peaking in 2010 during the economic recession. Figure 8-1 shows the average CMP network speeds on freeways and arterials between 2000 and 2016. Considering the large extent of the CMP network being monitored, the increase in average afternoon peak network speed, peaking in 2010 from 2006 by 0.8 mph to 51.8 mph on freeways and 0.4 mph to 26.1 mph on arterials, represents a significant improvement in network performance for both freeways and arterials. From 2010 to 2016, the speeds have been steadily declining. Freeway speeds in 2016 are now the lowest in the last 15 years, lower even than in the dot-com era.

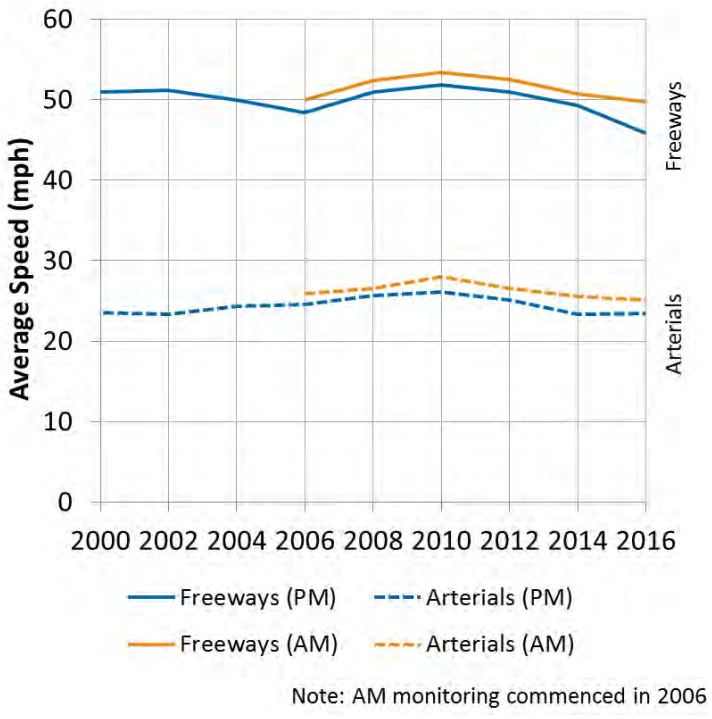


Figure 8-1: Average Speed on CMP network (mph)

8.1 | Economic and Demographic Trends

Figure 8-2 compares the economic activity and residential population in Alameda County to the traffic conditions experienced on the CMP network. While the number of residents in Alameda County continued to increase since 2006, employment has seen its ups and downs due to the recession. In 2009, employment in the county dropped significantly and was at its lowest level of the past decade in 2010. By 2011, it began to recover with more significant improvements which continues to the current year, exceeding the number of people employed in 2000, at the height of the dot-com boom (refer to Figures 8-2 and 8-3). By 2014, employment had reached and exceeded the levels of pre-recession years. The rising employment continues to add traffic to the CMP network and has resulted in the decreasing speeds and increasing number of congested (LOS F) CMP segments in the 2016 monitoring cycle.

As previously mentioned, average freeways and arterials speeds show a close correlation to employment. With the decreased employment around 2010, there were fewer workers commuting during the peak periods, resulting in improved speeds across the roadway network. As employment recovered after 2012, CMP roadway speeds declined, demonstrating that the roadway performance was more closely correlated to employment levels than the residential population.

In 2016, the Bay Area is in another economic boom on par with the dot-com era. The regional growth in jobs and population continues to add traffic to the CMP network, and residents are experiencing unprecedented lower speeds and more congestion.

Figure 8-2: Alameda County Population and Employment (Source: 2000 - 2004 Annual NAICS Employment Data: US Census; 2000 - 2004 Intercensal Population Data: US Census; 2005 - 2009 Population and Employment Data: 2010 US Census; 2010 - 2015 Population Data: DOF E-2 Report, July 1 Estimate; 2010 - 2015 Employment Data: Quarterly Census of Employment and Wages, June Estimate)

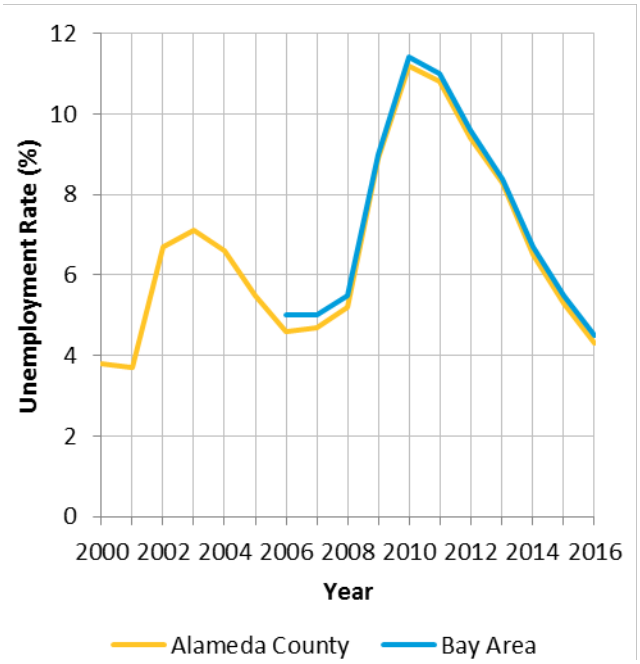


Figure 8-3: Unemployment Rate 2006-2016 (January, not seasonally adjusted) (Source: BLS / Federal Reserve)[18] [19]

Since Alameda County is the geographic center of the Bay Area, regional and inter-regional commutes impact many of the regional connectors; particularly I-80, I-880, and the three bridge crossings connecting Alameda County with the regional employment centers of Silicon Valley (Santa Clara County), San Francisco and the Peninsula (San Mateo County).

Employment data shows that Alameda and the surrounding counties all experienced increases in population and employment between 2010 and 2015 (see Figure 8-4). In half of the counties, the employment growth exceeded population growth; this disparity was particularly pronounced for San Francisco and Santa Clara Counties. The increased population in Alameda County and the suburban and exurban counties of San Joaquin and Contra Costa has resulted in a further burden on the county's transportation network from workers commuting to the employment centers. This is further evident when reviewing the vehicle volumes across the bridges and regional gateways. While stable in prior years, since 2012 there has been an increase in volumes at these points (see Figure 8-5).

[18] Local Area Unemployment Statistics. Bureau of Labor Statistics. http://data.bls.gov/cgi-bin/dsrv?la

[19] Unemployment Rate in Alameda County, CA, Percent, Monthly, Not Seasonally Adjusted. Federal Reserve Bank of St Louis. https://fred.stlouisfed.org/series/CAALAM1URN. Data prior to 2006 was not available.

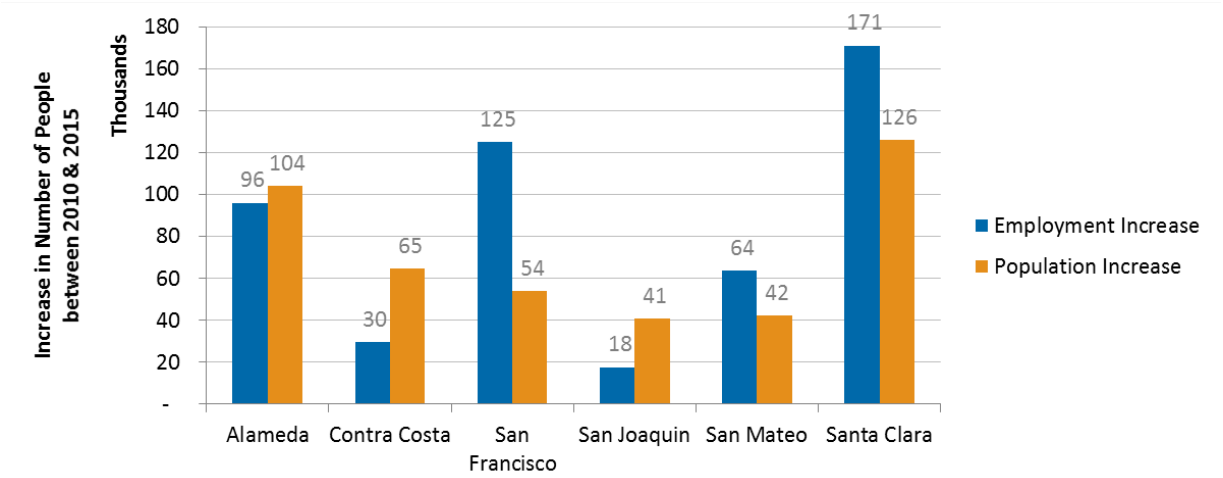


Figure 8-4: Population and Employment Growth in Alameda and Surrounding Counties (Source: DOF E-5 Report 2015-16 estimate)

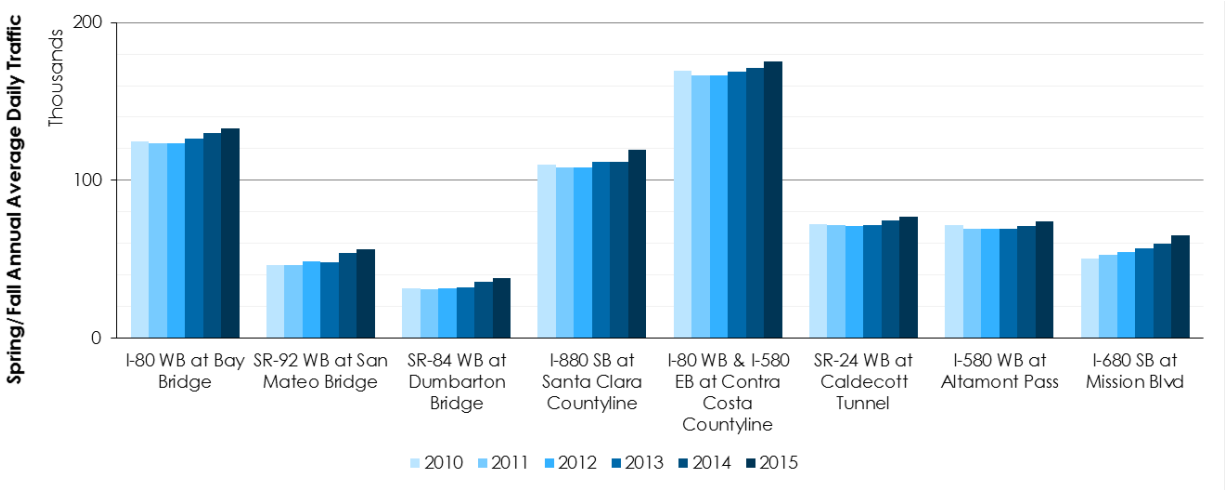


Figure 8-5: Alameda County Gateway Annual Average Daily Traffic (Source: MTC, PeMS) [20]

As a further factor for consideration, between 2014 and 2016, the retail price of gasoline for Alameda County motorists dropped precipitously and has since fluctuated. At the start of 2014, the price of gas in California was around $4 per gallon, but by the end of the year the price had dropped into the $2-$3 range.[21] In 2016, it has been slightly rising, tracking the global oil price as seen in Figure 8-6. The lower gas price has been cited in a

[20] Volumes are Tuesday-Thursday AADT from March-May and September-October. PeMS volumes extracted from MTC processing of raw PeMS Data.
[21] California All Grades All Formulations Retail Prices. U.S. Energy Information Administration. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epm0_pte_sca_dpg&f=m
Cushing, OK WTI Spot Price FOB.
https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RWTC&f=M

nationwide study as a factor in increased automobile miles driven.[22] A study of fuel consumption in California also found that gasoline consumption was rising again since 2014 (see Figure 8-6). [23] The miles traveled on the Alameda County freeway network has risen 12.5% between the 2014 and 2016 monitoring cycles which further confirms this observation. [24]

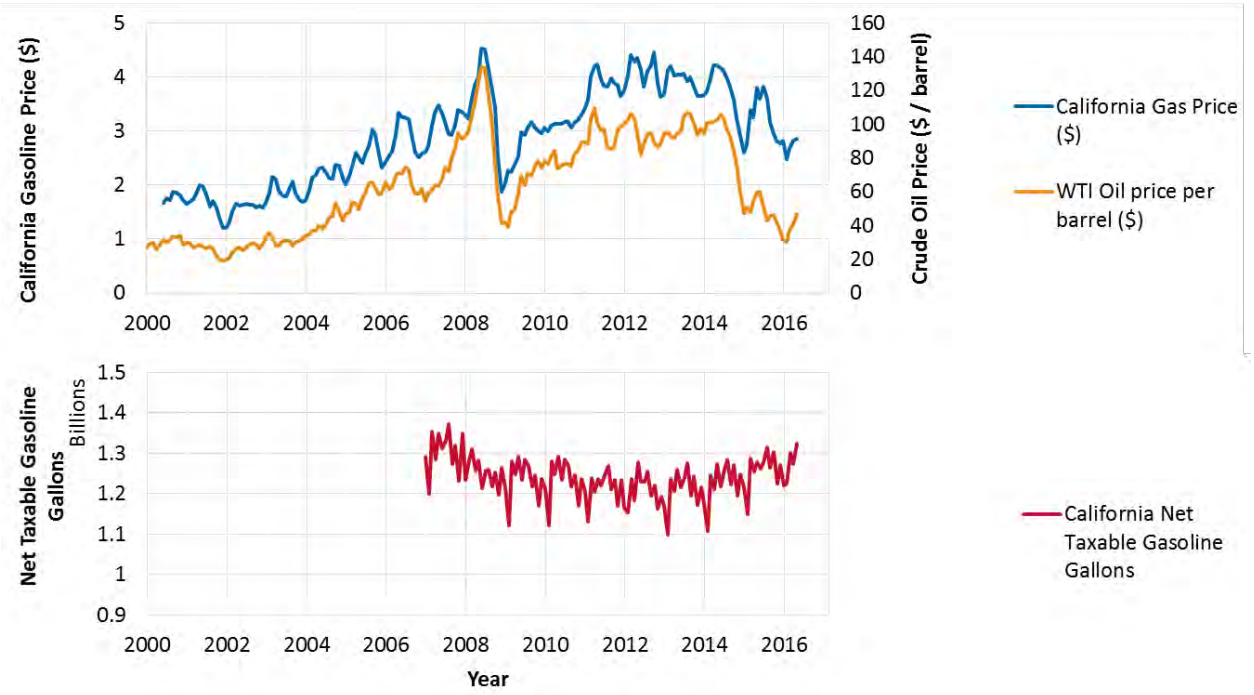


Figure 8-6: Gasoline/Crude Oil Prices (Source: EIA) and Gasoline Consumption [25] (Source: California State Board of Equalization)

In 2016, a larger reduction in speed was observed on the Tier 2 Arterial network, particularly in the afternoon peak period. This reduction may be caused by motorists that are less inclined to use freeways and major arterials that are already close to capacity, and utilizing spare capacity on the Tier 2 Arterial network.

8.2 | Transit Trends

The CMP network roadway speeds were also compared to public transit ridership, specifically on BART, a major regional transit system. Figure 8-7

[22] U.S. Driving Tops 3.1 Trillion Miles in 2015, New Federal Data Show. Federal Highway Administration. News Release Feb 22, 2016.
http://www.fhwa.dot.gov/pressroom/fhwa1607.cfm
[23] Net Taxable Gasoline Gallons. California State Board of Equalization.
http://www.boe.ca.gov/sptaxprog/spftrpts.htm
[24] Alameda County Vehicle Miles Travelled Report. Caltrans Performance Measurement System (PeMS).
http://pems.dot.ca.gov/
[25] Data not available prior to 2007

shows the relationship between average afternoon peak freeway speeds and BART ridership. In 2010, at the peak of recent recession, BART ridership was low and the demand on freeways had lessened as evident from higher afternoon peak freeway speeds. During the economic recovery in 2012 through 2016, the demand on these two transportation services has increased, showing increasing BART ridership and declining average afternoon peak freeway speeds.

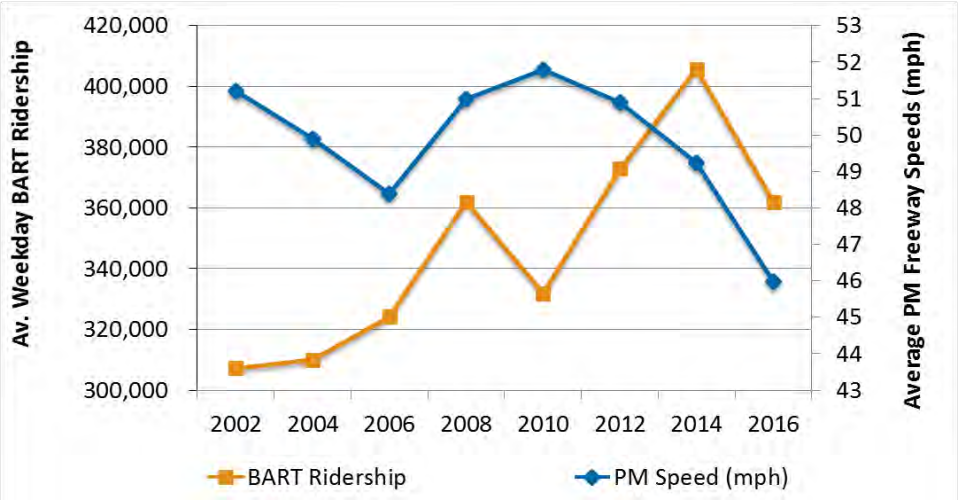


Figure 8-7: PM Peak Average Freeway Speed and BART Ridership (Source: BART)

In addition to economic growth, other recent policy changes and trends may have influenced the greater usage of BART. Since October 2013, BART has allowed passengers to bring their bikes on non-crowded cars except for the lead car.[26] This can make BART trips more attractive to users who would otherwise drive, by providing convenient first and last mile connections at the BART trip ends.

[26] BART Board votes to permanently lift bike ban. BART Website. http://www.bart.gov/news/articles/2013/news20131024

8.3 | Technology Trends

Mobile technology advances are also leading to changes in how people get around. In 2015, 64% of Americans were found to own a smartphone, up from 58% in early 2014.[27] Smartphone applications make it easier to drive and use public transit with routing and scheduling suggestions including real time arrival information. Driving navigation applications such as Waze have allowed drivers to make better pre-trip and en-route choices of route and departure time using historic and real time traffic information, and provide alternate route guidance around congestion and incidents.

Bike sharing could also potentially change travel behaviors in Alameda County. Bay Area Bike Share was introduced in some San Francisco neighborhoods in 2013, and a wider rollout of 7,000 bicycles is planned for San Francisco, Oakland and Berkeley in 2017.[28] This expansion into Alameda County offers residents another transportation option in getting to and from various activities and transit services, and have the potential to significantly change transportation patterns.[29]

There continues to be new technologies and services emerging for ridesharing. Lyft, in partnership with MTC, launched Scoop, a carpool option in its ride-hailing application in spring of 2016. It allows commuters to arrange carpools on Bay Area commuter routes. Passengers will pay $4 to $10 per ride, of which the driver will receive a portion to offset his/her travel costs.[30] Google began a pilot program in May that enables several thousand workers at specific South Bay firms to use the Waze app to connect with fellow commuters. This service, like Scoop, charges riders a per-mile rate, which is directed to the driver to offset his/her costs. The service may be considered for expansion to the general public.[31]

Figure 8-8. Bay Area Bike Share

...to name a few

Overall, traveler behavior as a whole may be changing. These ride sharing services may help to provide the first and last mile connections to a fixed route transit service (i.e. BART) that would otherwise have been a door-to-door or door-to-transit automobile trip. Delivery services such as Amazon and instacart may eliminate the need for some shopping trips altogether, but also add more delivery vehicles to the traffic stream. If these services begin to use automated driving, the reduced cost may make them even more appealing and widespread, although it could result in increased traffic.

[27] US Smartphone Use in 2015. By Aaron Smith. Chapter 1: A Portrait of Smartphone Ownership. Pew Research Center. 2015. http://www.pewinternet.org/2015/04/01/chapter-one-a-portrait-of-smartphone-ownership/

[28] Bike-share system expanding in Bay Area, starting in SF. SFGATE. March 23, 2016. http://www.sfgate.com/bayarea/article/Bike-share-system-expanding-in-Bay-Area-starting-6974166.php

[29] Special Report 319: Between Public and Private Mobility. Examining the rise of technology-enabled transportation services. Transportation Research Board. 2016. http://onlinepubs.trb.org/onlinepubs/sr/sr319.pdf

[30] Lyft adding S.F. to South Bay carpooling service to app. SFGATE. March 30, 2016. http://www.sfgate.com/business/article/Lyft-to-leverage-app-for-commute-carpools-7215297.php

[31] Google Takes on Uber With New Ride-Share Service. Alphabet's carpooling program in San Francisco offers rides at cheaper rates. Wall Street Journal. August 31, 2016. http://www.wsj.com/articles/google-takes-on-uber-with-new-ride-share-service-1472584235

9 | Monitoring Program Results and Next Steps

The improving economy, greater levels of employment and lower gas prices observed in 2016 have generally resulted in higher travel demands on the transportation network. This is apparent through declining speeds on the CMP network and increased ridership on BART; continuing the trends observed since 2010. The change in average speeds on freeways and arterials ranged from a - 3.3 mph speed decrease on freeways in the afternoon peak period, to a + 0.1 mph increase on Tier 1 Arterials in the afternoon peak period.

This section highlights the 2016 monitoring results in terms of conformity and summarizes upcoming improvements to the road network that may be encountered in the next monitoring cycle or beyond. Finally, innovative ideas that could further improve the effectiveness of monitoring studies have been identified for potential consideration. These include expanding the use of Big Data for transportation planning, ITS and connected vehicle implementations, and inclusion of countywide monitoring of alternative modes.

9.1 | 2016 CMP Conformity

CMP conformity is evaluated for the Tier 1 network in the afternoon peak period on segments that fail to meet the LOS E threshold and operate at LOS F. There were 61 segments operating at LOS F in 2016 in the afternoon peak period. Of these 61 segments, 26 were exempt from deficiency planning requirements because they were either grandfathered in the 1991-1992 LOS surveys or impacted by construction. The Alameda CTC model was utilized to conduct estimate LOS on the remaining 35 segments if trips originating from outside Alameda County were removed. Based on this analysis, no new deficient segments were identified.

9.2 | Construction during the 2016 Monitoring Cycle

In 2016, construction and maintenance activities have had an impact on road network performance, particularly on major corridors, although possibly not to the same extent as in 2014. Although it is not typical for construction to close lanes during peak hours, they often still unavoidably impact traffic flows either through the traffic friction caused by narrower lanes, presence of concrete barriers at close proximity, or rubbernecking by roadway users.

In Alameda County, major construction was present on State Route 84 in East County, I-880 in north, central and South County, and State Route 92 in Central County. The I-580 freeway in East County had operational changes with the new express lanes opening to traffic in February 2016, just before the start of the 2016 monitoring period; therefore, I-580

segments were not monitored as a part of the 2016 LOS Monitoring Report since the express lanes were in the ramp up period. Figure 9-1 maps the location of the morning and afternoon congested segments, and associated major construction.

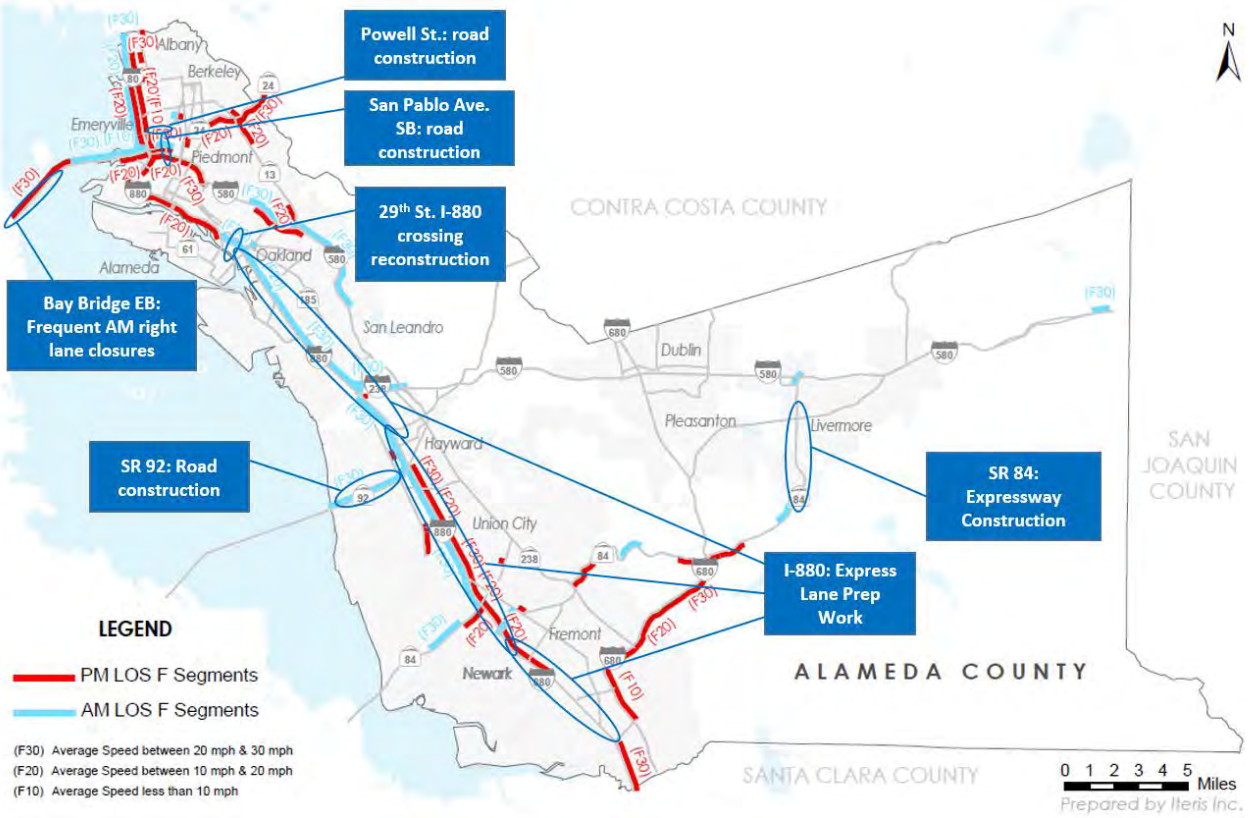


Figure 9-1: 2016 Congested Segments and Construction Activities on the CMP Network

Major construction during the 2016 monitoring period includes:

- **I-880 Improvements:** The 29th Avenue crossings in Oakland is being replaced as an operational and safety improvement. Work will begin on the 23rd Avenue crossing in 2017.
- **I-880 Express Lanes:** Early work on the I-880 express lanes consists of median barrier work in both directions between State Route 262 Mission Boulevard and 42nd Avenue.
- **I-580 Freeway Improvement:** I-580 Altamont Pass Eastbound Truck Climbing Lanes.
- **State Route 84 Expressway (South Segment):** Adding lanes and upgrading the roadway to a multi-lane expressway from Ruby Hills Drive north to South of Stanley Boulevard.
- **State Route 92:** State Route 92/ Clawiter-Whitesell Interchange and Reliever Route project.
- **International Boulevard BRT in Oakland:** A Bus Rapid Transit (BRT) system with station redesign is underway between San Leandro BART

and Downtown Oakland along International Boulevard. Service is planned to begin in November 2017.

- **Drainage Repair:** Tassajara Road in East County and Alvarado Boulevard in Fremont had sections closed for drainage repair.

9.3 | Future Planned Network Improvements

To realize future performance improvement, Alameda CTC has recently completed three plans that studied the county's multimodal transportation issues comprehensively:

1. **Goods Movement Plan** – Development of a long-range strategy for how to move goods efficiently, reliably, and sustainably within, to, from, and through Alameda County by roads, rail, air and water.
2. **Transit Plan** – Identification of near and long-term transit capital and operating priorities in the county to reduce travel times, and improve access and connectivity. The draft Countywide Transit Plan was approved by Alameda CTC in May 2016, and the final Countywide Transit Plan is scheduled for adoption in June 2016.[32]
3. **Multimodal Arterial Plan** - This plan studied the county's major arterials to identify strategies and solutions for improving multimodal connectivity, access, and mobility. The final report was approved by the Alameda CTC in June 2016.[33]

In March 2016, Alameda CTC approved the Measure BB Capital Project Delivery Plan (CPDP), which included 20 specific projects for delivery by Alameda CTC in the role of project manager.[34] This Plan is based on the 2014 Transportation Expenditure Plan (TEP), which was passed by voters for a potential funding of $8 billion.

There are also many other improvement projects in various project development, programming, or planning stages as shown in Table 9-1.

[32] Countywide Transit Plan. Alameda CTC. 2016.
http://www.alamedactc.org/app_pages/view/13345
[33] Countywide Multimodal Arterial Plan. Alameda CTC. 2016.
http://www.alamedactc.org/app_pages/view/13346
[34] Capital Project Delivery Plan. Alameda CTC. 2016.
http://www.alamedactc.org/files/managed/Document/18558/CPDP_FINAL_20160328.pdf

Table 9-1: Future Improvements

Project	Scope	Current Performance
I-80 Integrated Corridor Management (ICM) Project	Install adaptive ramp meter control and dynamic signing between the Contra Costa County Line and the Bay Bridge Toll Plaza. The system is anticipated to begin in summer 2016. Operational performance will be assessed in the next CMP analysis cycle.	Congested segments present within the I-80 project boundaries between the Contra Costa County Line and the Bay Bridge Toll Plaza.
I-80 Gilman Interchange Reconstruction	The proposed project will reconfigure the I-80 / Gilman St. Interchange, located in northwest Berkeley. The project will improve traffic on the local street and frontage roads, and improve bicycle and pedestrian regional connectivity by completing a missing segment of the Bay Trail.	Congested segments present on I-80 around the Gilman Street Interchange.
I-880 North Safety & Operational Improvements at 23rd Ave.	This project proposes to construct operational and safety improvements on I-880 at the existing overcrossing of 23rd Avenue in the City of Oakland. Construction begins in early 2017.	Congested segments present on I-880 around the 23rd Ave. Interchange
I-880 Express Lanes	HOV to express lane conversion between Hegenberger Rd. / I-238 and the Santa Clara County Line.	Congested segments present on I-880 between Hegenberger Rd. and the Santa Clara County line.
I-680 NB Express Lanes	HOV/express lane implementation from SR 237 to north of SR 84 including additional auxiliary lanes and allowances for tolling infrastructure. This project is currently in the Environmental Phase.	PM Peak hour congested segments on I-680 NB between SR 238 and SR 84.
International Blvd. BRT	AC Transit's BRT will operate between downtown Oakland and San Leandro – primarily utilizing historic International Boulevard and East 14th Street. Construction of the 150 block transit service (that spans 9.5 miles) is slated to begin in May 2016 with service expected to begin in November 2017.	Congested segments present on International Blvd NB between 46th and 42nd in both peak periods.
I-880 to Mission Blvd. East-West Connector	This project will construct an improved east-west connection between I-880 and Route 238 (Mission Boulevard) and is a combination of new roadways, improvements to existing roadways and improvements to intersections along Decoto Road, Fremont Boulevard, Paseo Padre Parkway, Alvarado-Niles Road and Route 238 (Mission Boulevard). PSE completion is expected in 2017.	Congested segments present on Decoto Road (WB in PM), nearby Fremont Boulevard (WB between Peralta Blvd. and Thornton Ave.) and Thornton Ave.
I-580 Altamont Pass Eastbound Truck Climbing Lanes	Along with I-580 repaving, this project will add a truck climbing lane in the Eastbound direction on Altamont Pass.	Congested segments present on I-580 EB in the afternoon from Greenville Rd. to N. Flynn Rd.

9.4 | Recommendations for Future Monitoring Studies

The significant improvements which were made to the LOS monitoring methodology in the 2014 monitoring cycle such as the use of commercial data, inclusion of HOV/express lanes and bridges for monitoring, and developing arterial classification for Tier 2 network, were followed in the 2016 cycle. To continue further improvement and to expand the scope of the LOS monitoring for larger level applications, Alameda CTC could consider the following recommended enhancements.

9.4.1 | Expanding the Use of Big Data for CMP Monitoring

For the 2018 monitoring cycle, Alameda CTC may consider expanding the use of commercial speed data to survey all arterials and HOV/express lanes as well, if such suitable data becomes available.

Arterials (Tier 1): In 2014 and 2016, arterials (Tier 1) were monitored using floating car surveys as the 2013 and 2016 Validation Studies could not adequately validate the commercial speed data on arterials. [35] The 2016 Validation Study recommended that the use of commercial speed data on principal arterials with low signal density (i.e. less than or equal to 1 signal per mile).

However, in recent years, commercial speed data providers, including INRIX, have continued improving their algorithms and coverage on arterials. Given the significance that these results bear on the conformity of the CMP and associated deficiency plans, the application of commercial speed data for monitoring the Tier 1 arterials is worth further exploring with another validation study prior to the next monitoring cycle. More prevalent use of commercial speed data across the arterial network would represent a significant savings and redirect resources towards a more comprehensive focus on multimodal monitoring.

HOV and express lanes: These managed lanes were also monitored using a floating car methodology as exclusive managed lanes data was not available. These floating car surveys are more resource intensive than conventional floating car surveys due to the multiple passenger occupancy requirements.

Commercial speed data providers have continued to make progress in developing a data product which provides lane-based speeds. First generation products have been recently made available for purchase and these may be considered for next cycle. Alternatively, Alameda CTC can use the speed data collected from the express lanes operations itself, for further cost savings and data consistency.

Monitoring Alternative Modes: Monitoring of alternative modes has been undertaken since 1996 through ten OD surveys. The objective is to compare the time taken to travel between major employment centers and residential areas by various modes - auto, transit, bike and HOV. While these surveys provide a useful insight to understand the competiveness of different modes, results from only ten survey routes limit the capability to facilitate countywide improvement.

Alternatively, multimodal big datasets may be obtained for countywide monitoring. For transit, Automated Passenger Counter (APC) or Automatic

[35] Validating the use of Commercial Speed Data for Alameda CTC Level of Service Monitoring. Alameda CTC. 2016. Also completed in 2013. http://www.alamedactc.org/app_pages/view/8091

Vehicle Location (AVL) data may be processed to understand the speed of transit vehicles along the CMP network and their competitiveness with the auto mode. The processing task involves cleaning the data to remove faulty and outlier data samples, filtering to weekday peak periods only (as applicable), mapping onto the CMP segments and aggregating the records for both the morning and afternoon peak periods. This direct comparison of speeds for the entire CMP network would provide actionable information for agencies within Alameda County to help prioritize transit improvement projects such as BRT systems, dedicated bus lanes, transit signal priority or queue jump facilities. The analysis could also yield performance information along major transit lines, in off-peak periods or between specific ODs.

For bicycle and pedestrian data, Alameda CTC may explore newer data sources from providers such as Strava Metro that aggregate crowd sourced bicycle and pedestrian activity into commercial data products. The data can be filtered by commute or recreational purposes, and can be used to perform monitoring such as bicycle travel times and route choice, and to evaluate the success of new multimodal infrastructure. In both datasets, the sample size would significantly exceed that of the existing monitoring efforts for transit and bicycle.

Big Data Performance Metrics: In 2016, Alameda CTC expanded their monitoring to include calculation of reliability and the duration of congestion on freeways. In future monitoring cycles once the commercial speed data is adequately validated on arterials, this analysis may be expanded to include the arterial network also.

9.4.2 | Expanding the Visualizations Included in the Monitoring Report

For the 2018 Monitoring Report, Alameda CTC may consider including additional graphics and summary snapshots of the results. By providing visualization, it can better engage and inform the audience of stakeholders, policy makers, and the public, about monitoring traffic congestion. Additionally, these displays can provide added insights across data levels. Two examples are presented below.

Congestion Heat Map: For each roadway segment and for a 5-minute period, this heat map plots the average speed in terms of time (y-axis) and distance (x-axis). Stakeholders can view where and when congested conditions are forming. These contour maps when compared between different years, help to better visualize the patterns or trends in congestion or bottlenecks across each segment.

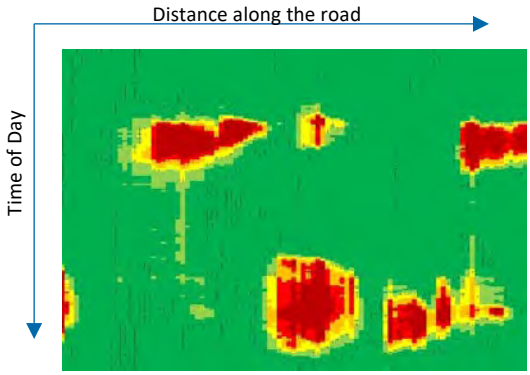


Figure 9-2. Example Congestion Space Time Map

Performance Report Card: In addition to the tabulated LOS results by network category, which are provided in the 2016 Monitoring Report, customized "report cards" for each city or planning area listing their congested (LOS F) segments could be generated by an automated script. An example report card is shown for the 2016 Monitoring Report for the City of Hayward in Figure 9-3. This can help individual cities track performance of their individual roadways and requirements for any applicable conformity studies.

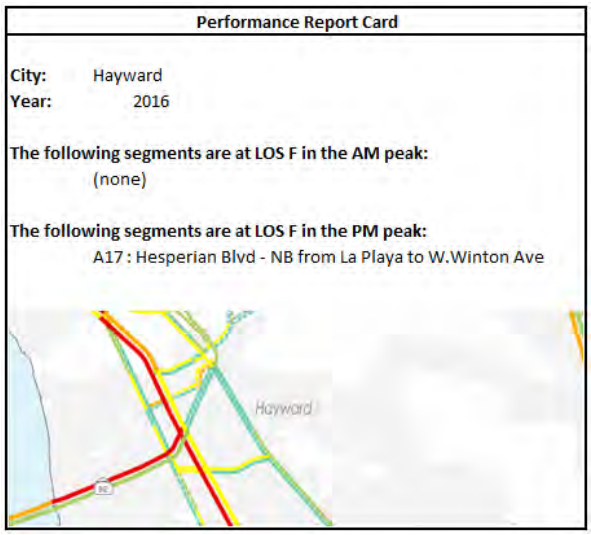


Figure 9-3. Performance Report Card

9.4.3 | Update CMP Database and GIS Segments

There were issues encountered with the existing CMP roadway segments (mostly Tier 1 Arterials) in compiling the 2016 monitoring results, such as the CMP roadway segment limits not matching surrounding land use transition points, or reflecting updates from traffic operational improvements e.g. conversion of a two way street to one-way, etc. It is recommended that a complete countywide inventory of CMP segments be conducted including the following efforts:

- Make corrections on the GIS segment geometries to more precisely match the intersection locations, especially on intersections involving freeway ramps;
- Update the segment descriptions in the GIS database, which are used when conducting field studies, as well as in reports based on the CMP segments analyzed; and
- Where land use changes have impacted traffic patterns significantly in recent years, it is recommended that the CMP segments be split into two or more segments as appropriate. A similar process was undertaken in 2007 on the I-580 in the east county.

Maintenance on the CMP roadway segment data in the GIS system is a task is that is needed periodically to ensure that the CMP segmentation is appropriate for the current CMP network.

9.4.4 | Performance Monitoring Tool

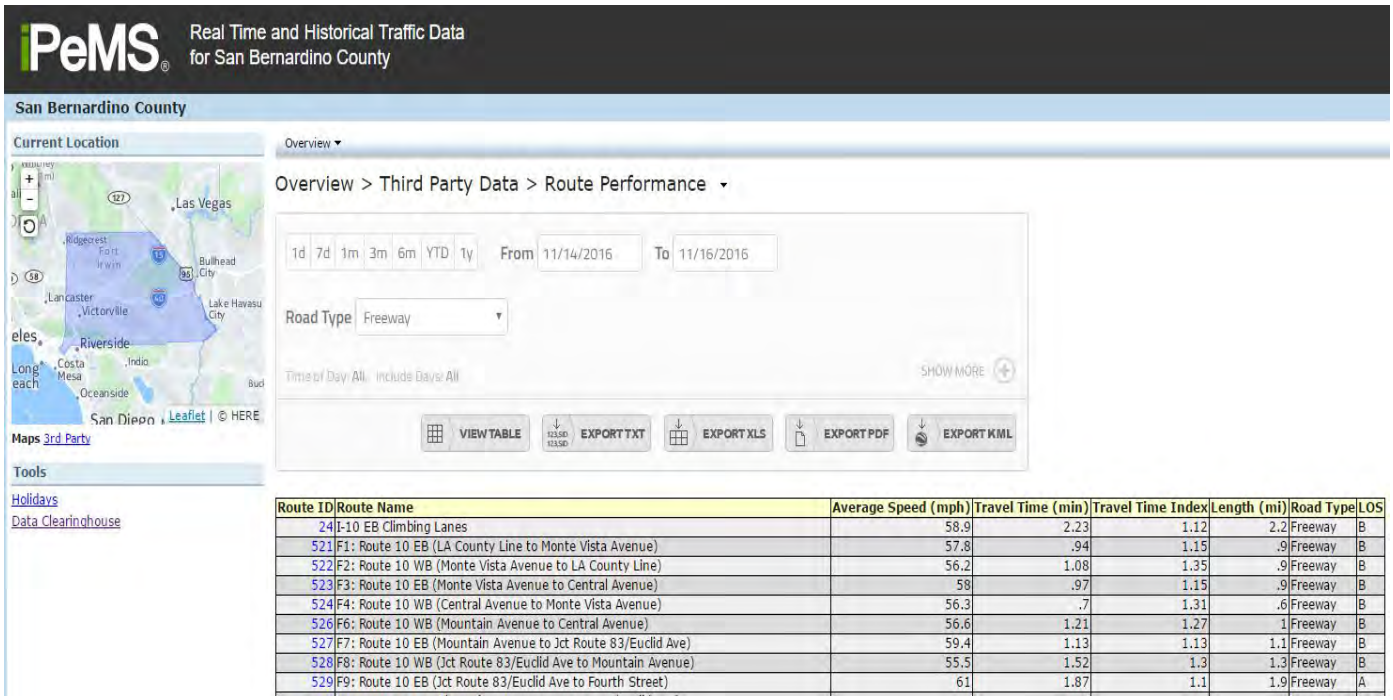
Currently, CMP speed measurements from floating car surveys and commercial speed data are recorded in spreadsheets. The floating car results are stored in separate spreadsheets according to the route and then summarized in higher level spreadsheets by the category of CMP segment (i.e. freeway, ramp, arterial, HOV). The commercial speed data is processed separately and then directly imported into the summary spreadsheets. For the next cycle, Alameda CTC could consider alternatives such as a database or online monitoring tool to process and store both the floating car and commercial speed data. Implementation of online tools would open up opportunities for Alameda CTC's stakeholders and the public to interact directly with the data; thereby increasing engagement with the LOS monitoring process.[36]

Prior to implementation of tools for the floating car survey portion, it is recommended that careful consideration be given to the role of floating car surveys in future monitoring cycles. It is anticipated that as the quality and coverage of commercial speed data improves over time (particularly on arterials) and as new data products such as lane-by-lane data become more readily available, that future LOS monitoring cycles could phase out floating car surveys (or minimize their use significantly).

Regarding other commercial speed data tools, an example is the iPeMS platform, a real-time data monitoring tool, which is being used by San Bernardino Associated Governments (SANBAG) in part to meet state CMP legislative requirements. The tool allows users to define each CMP segment which the tool then aggregates the commercial speed data for a user-defined time and date range. CMP performance reports (see Figure 9-4) can be generated as needed for the selected network category or city / planning area automatically. The performance

[36] Public viewing would be possible where data licensing agreements permit.

measures include average speed, delay, travel time, travel time index, reliability metrics and LOS. Additional features provide users reports on individual CMP segments with detailed reliability metrics or enhanced visualizations such as heat plots (see Figure 9-5). Such tools have uses beyond LOS monitoring studies which can include performance of signal synchronization projects and programs, ramp metering review, and monitoring construction impacts.



Route ID	Route Name	Average Speed (mph)	Travel Time (min)	Travel Time Index	Length (mi)	Road Type	LOS
24	I-10 EB Climbing Lanes	58.9	2.23	1.12	2.2	Freeway	B
521	F1: Route 10 EB (LA County Line to Monte Vista Avenue)	57.8	.94	1.15	.9	Freeway	B
522	F2: Route 10 WB (Monte Vista Avenue to LA County Line)	56.2	1.08	1.35	.9	Freeway	B
523	F3: Route 10 EB (Monte Vista Avenue to Central Avenue)	58	.97	1.15	.9	Freeway	B
524	F4: Route 10 WB (Central Avenue to Monte Vista Avenue)	56.3	.7	1.31	.6	Freeway	B
526	F6: Route 10 WB (Mountain Avenue to Central Avenue)	56.6	1.21	1.27	1	Freeway	B
527	F7: Route 10 EB (Mountain Avenue to Jct Route 83/Euclid Ave)	59.4	1.13	1.13	1.1	Freeway	B
528	F8: Route 10 WB (Jct Route 83/Euclid Ave to Mountain Avenue)	55.5	1.52	1.3	1.3	Freeway	B
529	F9: Route 10 EB (Jct Route 83/Euclid Ave to Fourth Street)	61	1.87	1.1	1.9	Freeway	A

Figure 9-4. Example Web-based CMP Performance Report (Source: SANBAG)

Figure 9-5: iPeMS Performance Report: Time/Space Heat Map (Source: SANBAG)

Additional monitoring tools may be considered for multimodal performance monitoring such as high level countywide monitoring of transit. Some off the shelf tools to monitor transit Big Data exist and can be generally grouped into two categories:

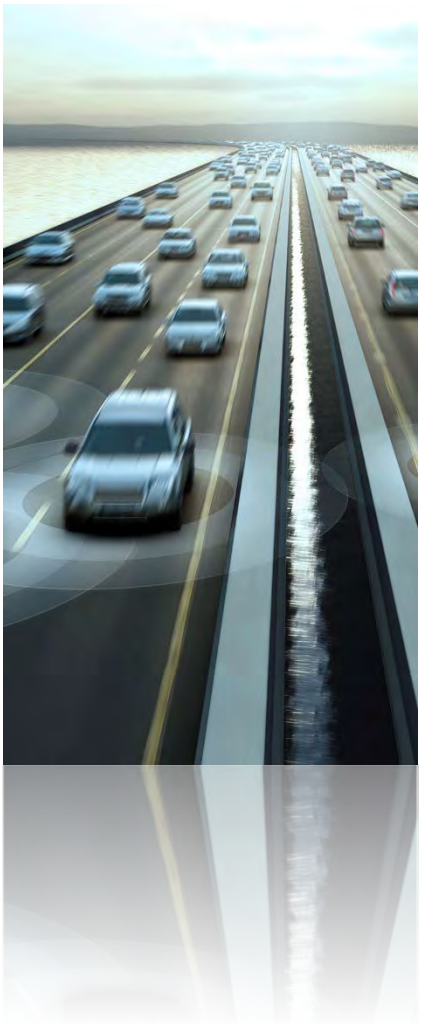
- Tools that review transit performance from an operational perspective, monitor the adherence to the schedule or predict arrival / departure times. While useful to transit agencies, this is likely to be less useful to a CMA like Alameda CTC.
- Tools that review the performance of transit from a planning perspective. These tools would help to monitor how well the transit mode meets the transportation needs of Alameda County residents, and perhaps compares transit travel times to other modes. It may identify locations within Alameda County with regular delays, slow travel speeds or poor reliability to help Alameda CTC and other local agencies plan for and program improvements to the transit system. This type of monitoring would be useful for future LOS Monitoring Reports.

The Caltrans PeMS deployment currently has a transit module which covers data for two specific agencies in San Diego: the Metropolitan Transit System (MTS) and the North County Transit District (NCTD). This was a module developed in 2011 as a prototype for a multimodal study by San Diego Association of Governments (SANDAG), the regional planning agency for San Diego. The module produces real-time and historical performance measures and visualizations using APC and AVL data. Caltrans is currently expanding the module's features and coverage to other transit agencies in California including AC Transit and BART where PeMS is ingesting schedule data in order to provide performance measures such as service frequency, capacity and schedule transit speed.

9.4.5 | Recommendations for Monitoring Connected & Autonomous Vehicle Deployments

Connected vehicles (CV) and autonomous vehicles (AV) are rapidly gaining attention in the transportation industry publicizing benefits in:

- **Safety** – Through the reduction of vehicle crashes and loss of life;
- **Mobility** – Through reduced travel times and more efficient travel on roadways;
- **Environment**: Through reduction of emissions and lower fuel usage; and
- **Economy**: Through more efficient goods movement.



In terms of CV, the associated communication deployments are categorized as vehicle to vehicle (V2V), vehicle to infrastructure (V2I), or the more generic term vehicle to everything (V2X). Public agencies such as Alameda CTC will have future opportunities to support the V2I aspect by installing CV infrastructure or integrating CV features into existing roadside infrastructure. This infrastructure would support applications such as driver advisories, driver warnings, and vehicle and/or infrastructure controls, by capturing real-time data from equipment located on-board vehicles and within the transportation infrastructure. The data is transmitted wirelessly and used by transportation agencies in a wide range of dynamic, multi-modal applications to manage the transportation system for optimal performance. There are close to 100 individual connected vehicle applications being tested or available in the market. For example, Multi-Modal Intelligent Traffic Signal System (MMITS) is a next-generation traffic signal system that seeks to provide a comprehensive traffic information framework to service all modes of transportation that is focused at the arterial roadway level. The MMITS application bundle seeks to improve mobility along signalized corridors using advanced communications and data to facilitate the efficient travel of passenger vehicles, pedestrians, transit, and freight and include applications such as with Intelligent Traffic Signal System (I-SIG), Freight Signal Priority (FSP), Mobile Accessible Pedestrian Signal System (PED-SIG), and Transit Signal Priority (TSP). An example operational environment of MMITSS is shown in Figure 9-6.

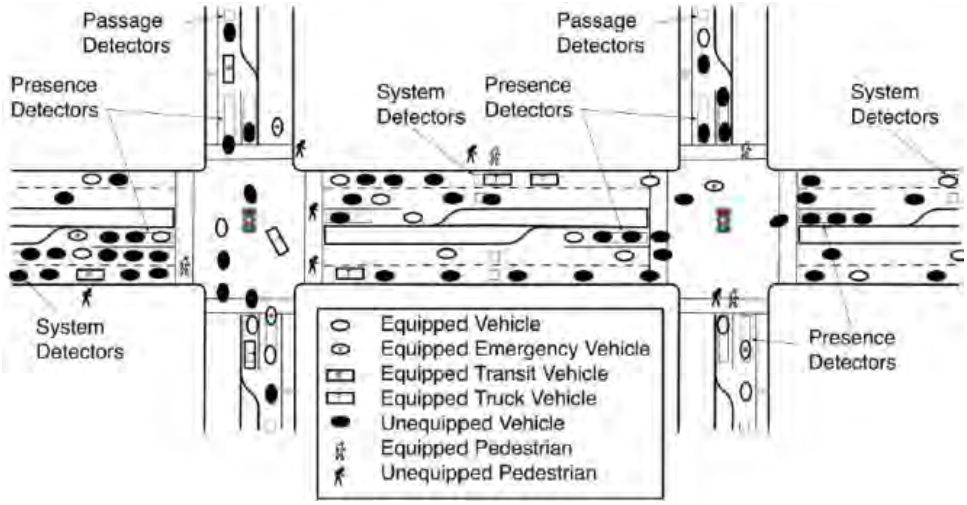


Figure 9-6: Illustration of the MMITSS Concept (Source: University of Arizona[37])

Transportation agencies, along with other public and private sector entities, must prepare for emerging technologies that will fundamentally change mobility. Vitally important for public agencies will be to direct investment in CV deployments towards applications that are expected to benefit their travelers, commuters and the community as a whole. In this respect, Alameda CTC could develop a CV Master Plan that:

- Considers uptake rates of (private) vehicle deployments which are needed in order to communicate with the infrastructure, and therefore the expected best timing for Alameda CTC to invest in CV infrastructure;
- Evaluates how existing Alameda CTC planning efforts can incorporate CV deployments (e.g. the Multimodal Arterial Plan, the Goods Movement Plan and the Countywide Transit Plan);
- Reviews current infrastructure within Alameda County, the needs of the county, and evaluates opportunities for integrating CV features into existing equipment or installing new roadside equipment. The corresponding maintenance approach would also need to be considered; and
- Proposes a monitoring approach that evaluates the performance of CV deployments after installation and the resulting benefit.

The last item is of particular relevance to this LOS monitoring study as periodic monitoring of CV features could be undertaken as a part of this effort.

[37] MMITSS Final ConOps. Chapter 9. University of Arizona. 2012. http://www.cts.virginia.edu/wp-content/uploads/2014/05/Task2.3._CONOPS_6_Final_Revised.pdf

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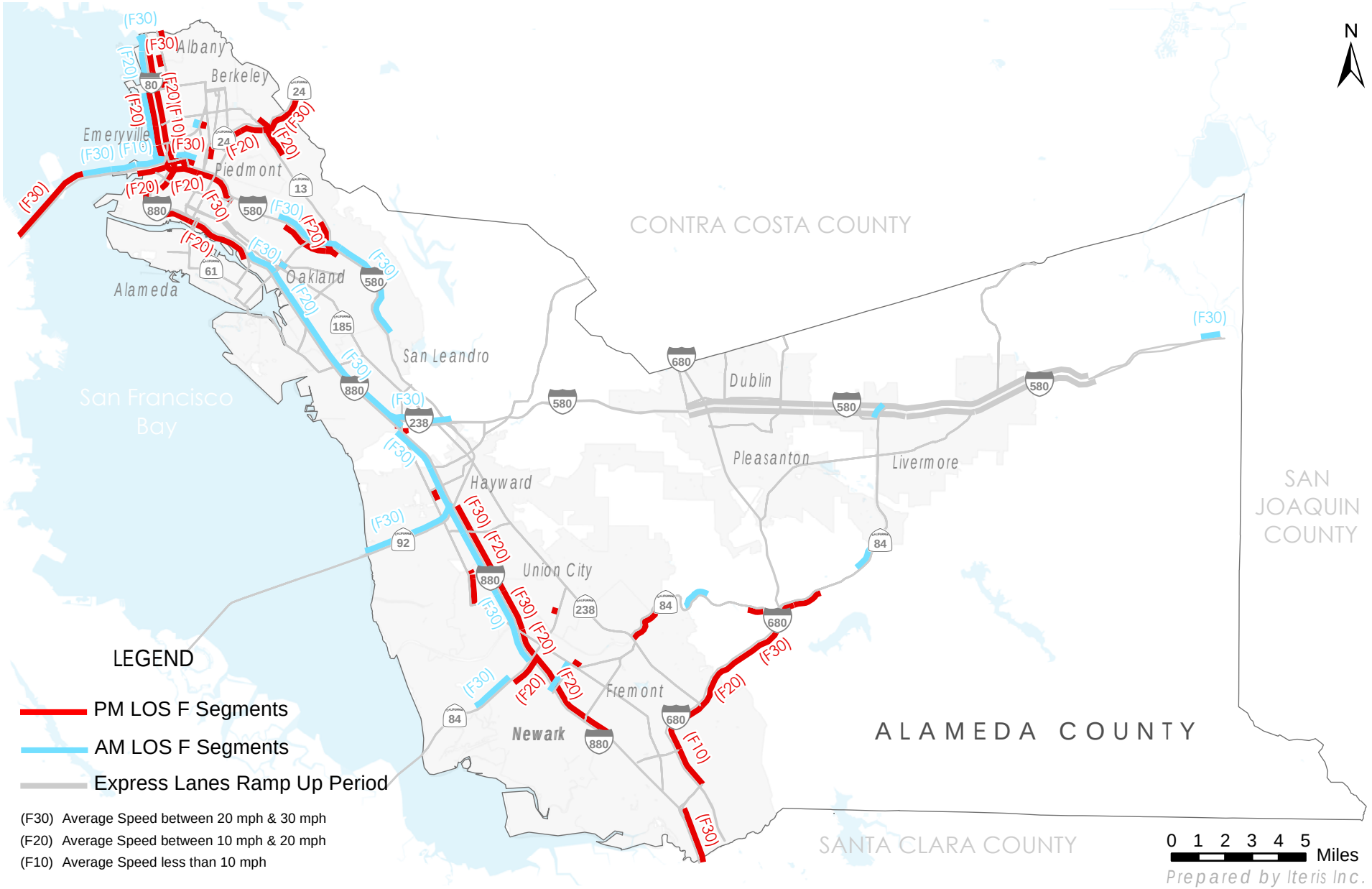
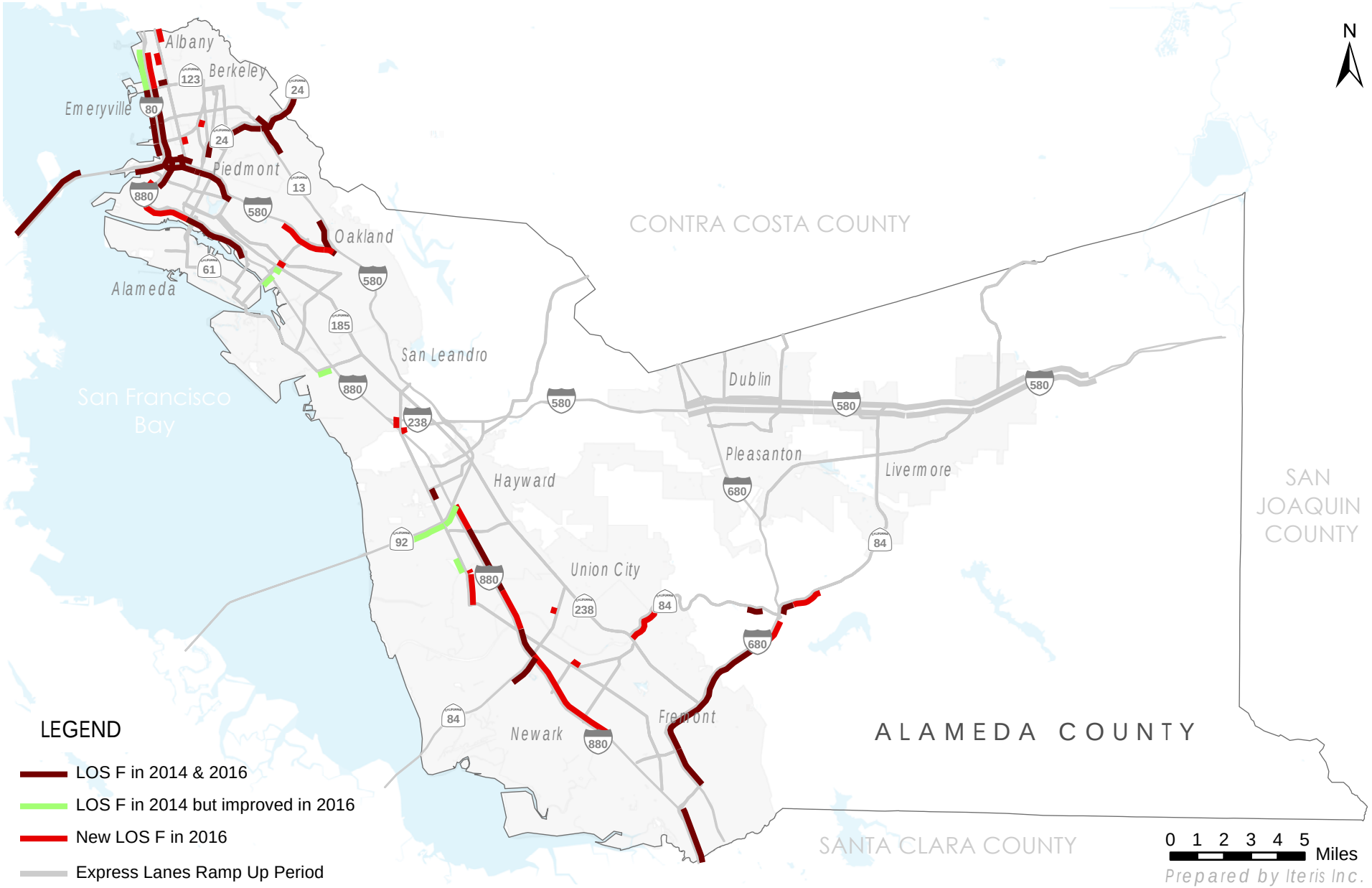
Appendix A | 2016 Level of Service Maps



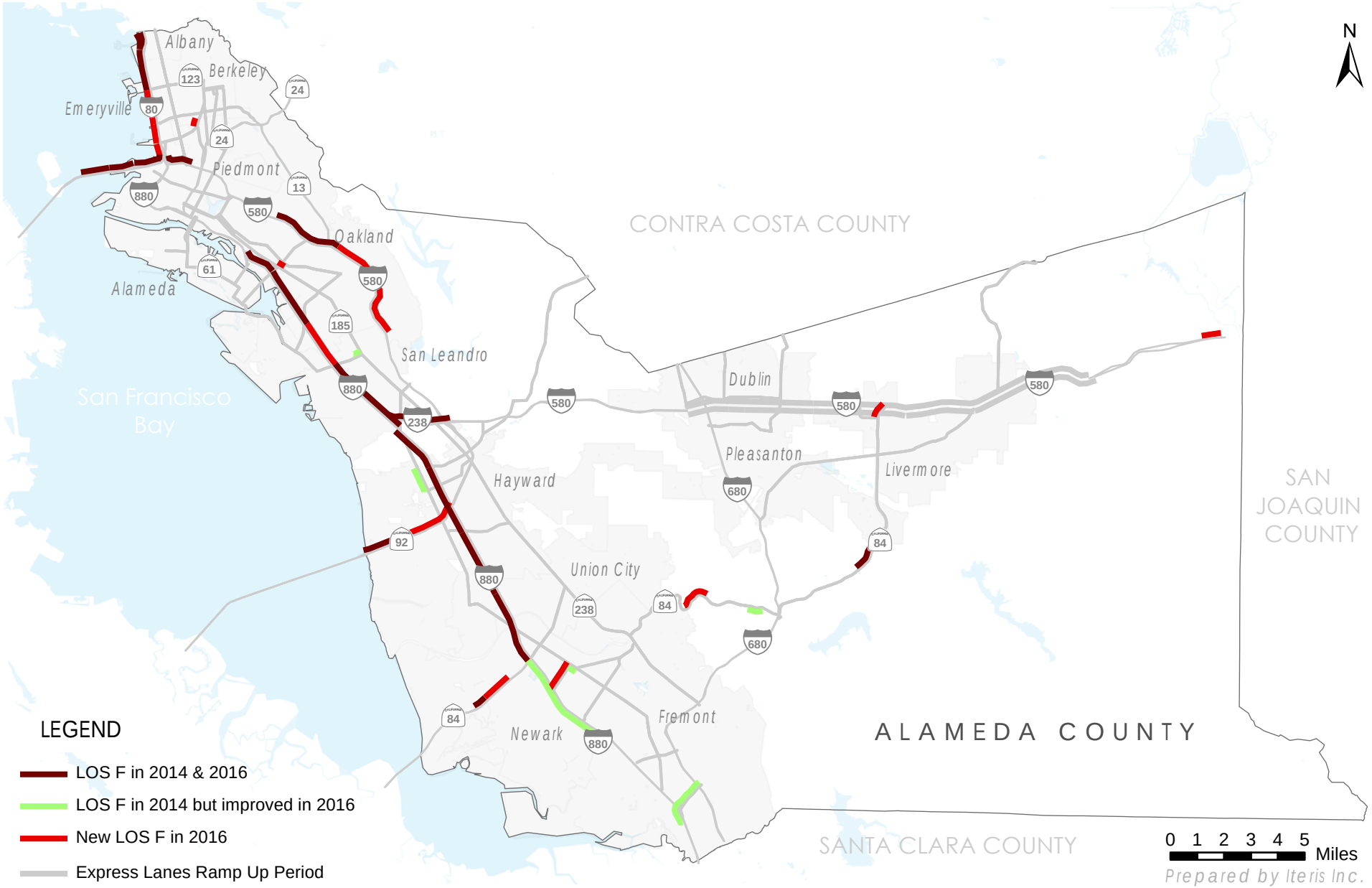
A.1

2016 LEVEL OF SERVICE MONITORING RESULTS: LOS F SEGMENTS - AM & PM PEAK PERIODs



A.2

2016 LEVEL OF SERVICE MONITORING RESULTS: CHANGE IN LOS F FROM 2014 TO 2016 - PM PEAK PERIOD



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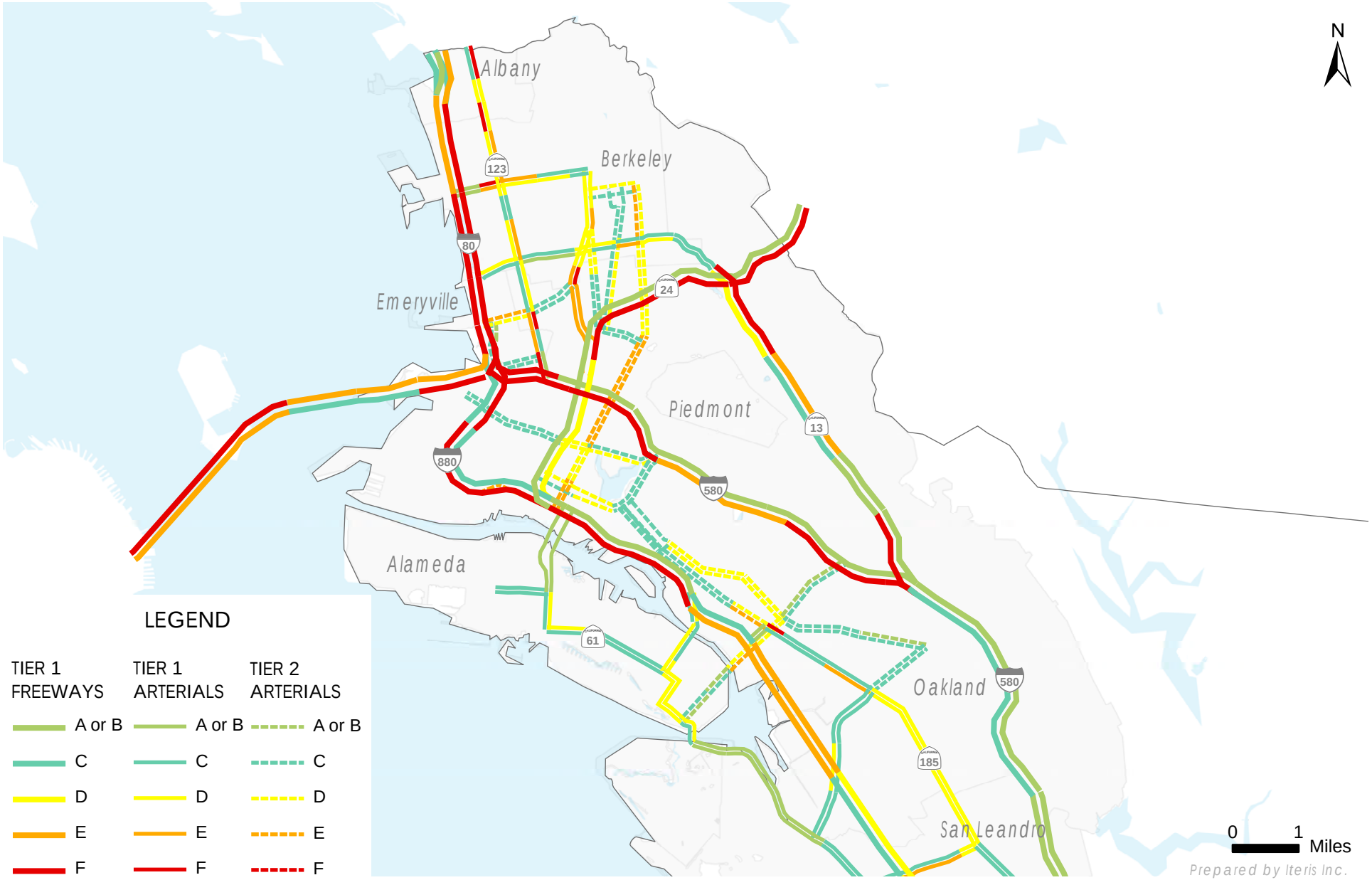
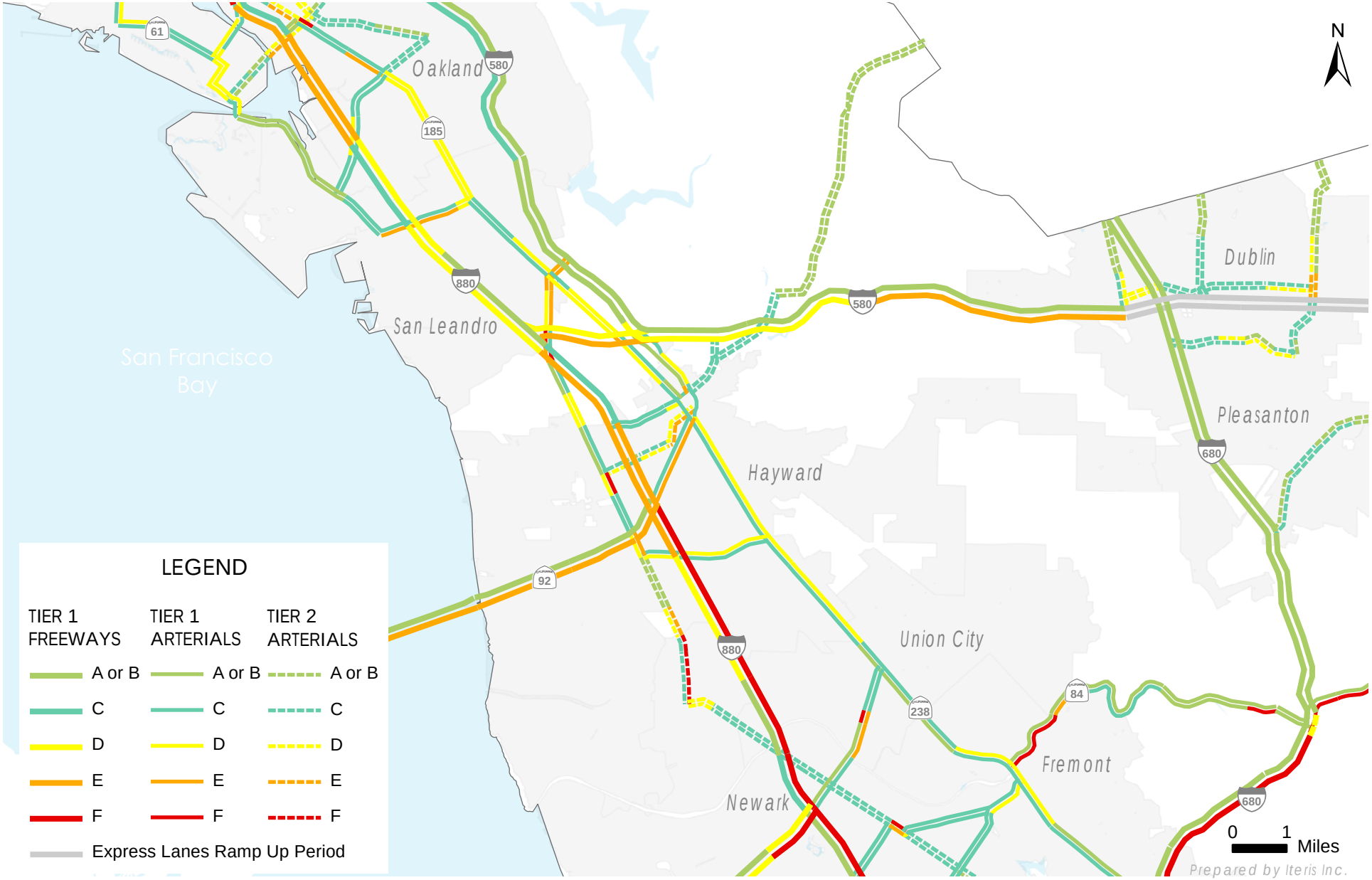


A.4

2016 LEVEL OF SERVICE MONITORING RESULTS: PLANNING AREA (NORTH) - PM PEAK PERIOD (4:00 PM to 6:00 PM)



A.5

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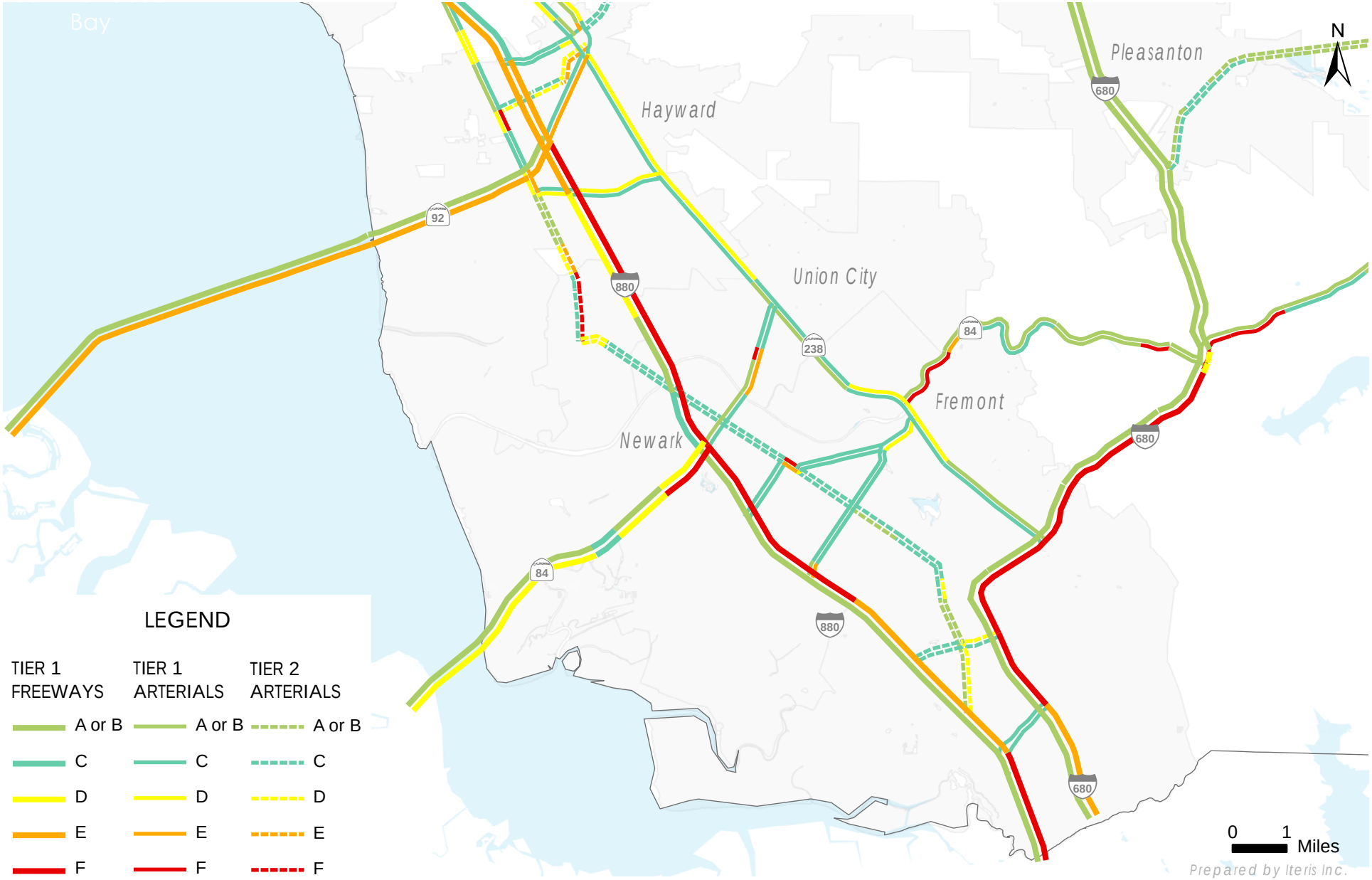
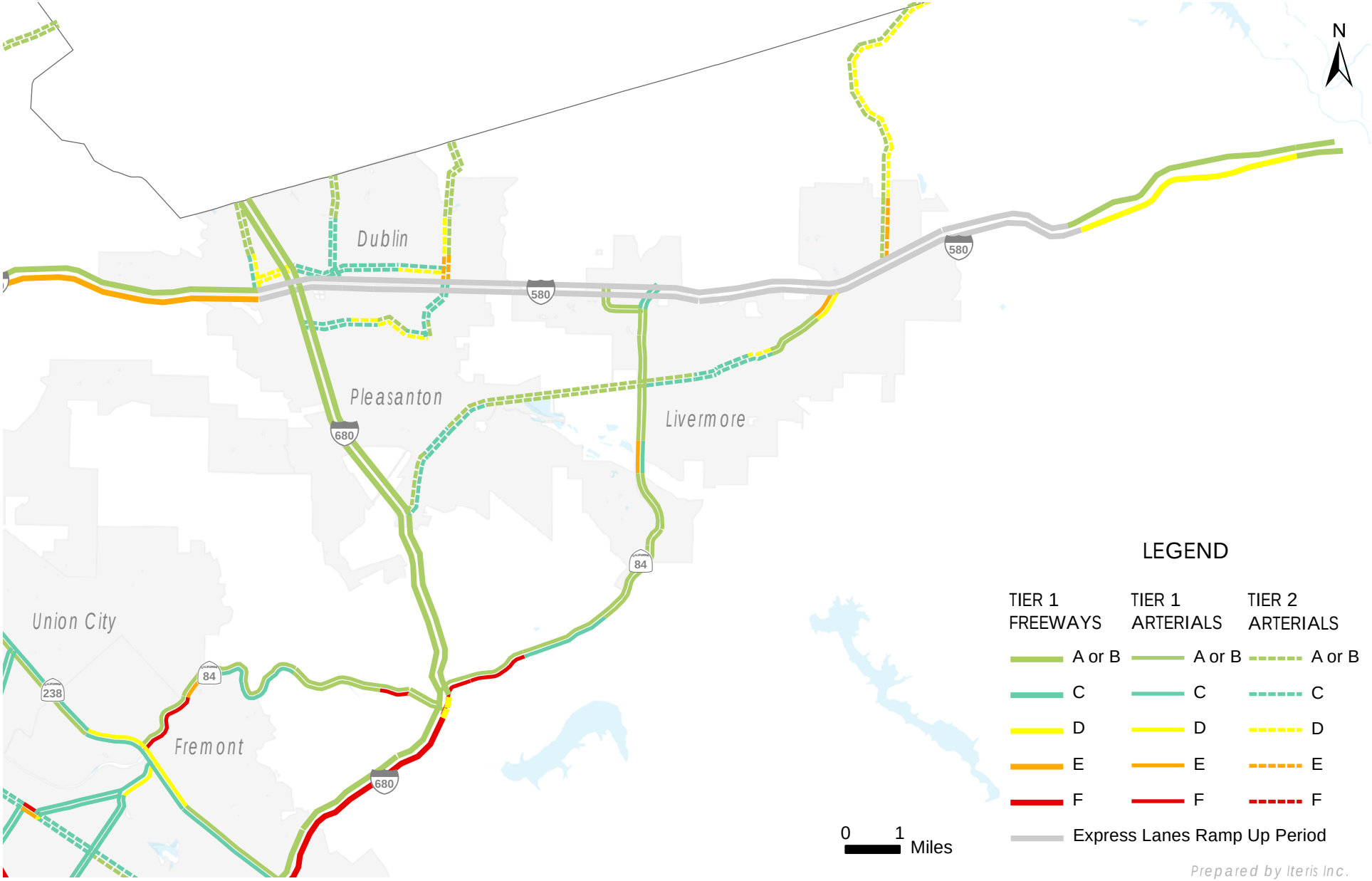


A.6

2016 LEVEL OF SERVICE MONITORING RESULTS: PLANNING AREA (SOUTH) - PM PEAK PERIOD (4:00 PM to 6:00 PM)



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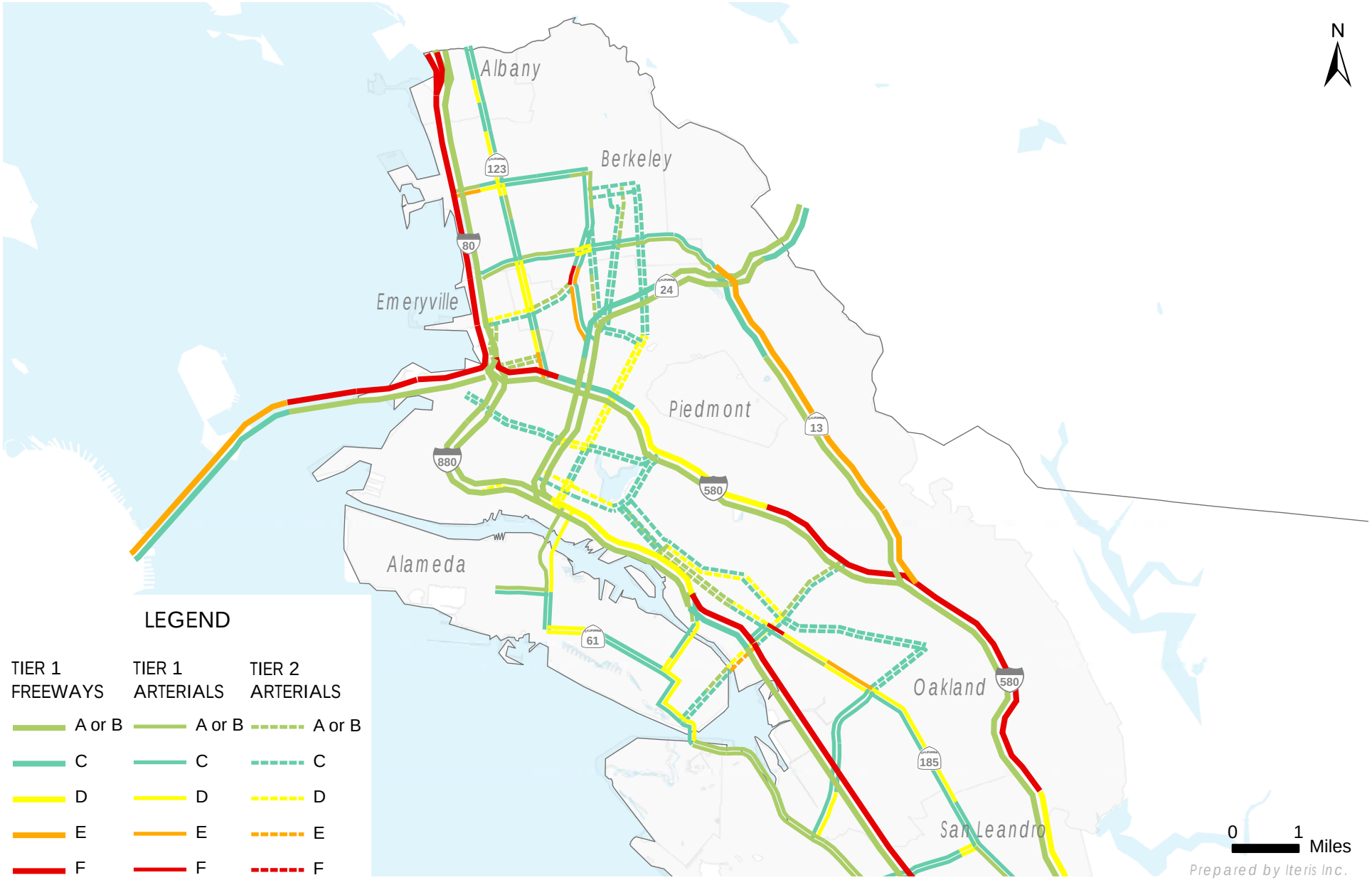

A.8

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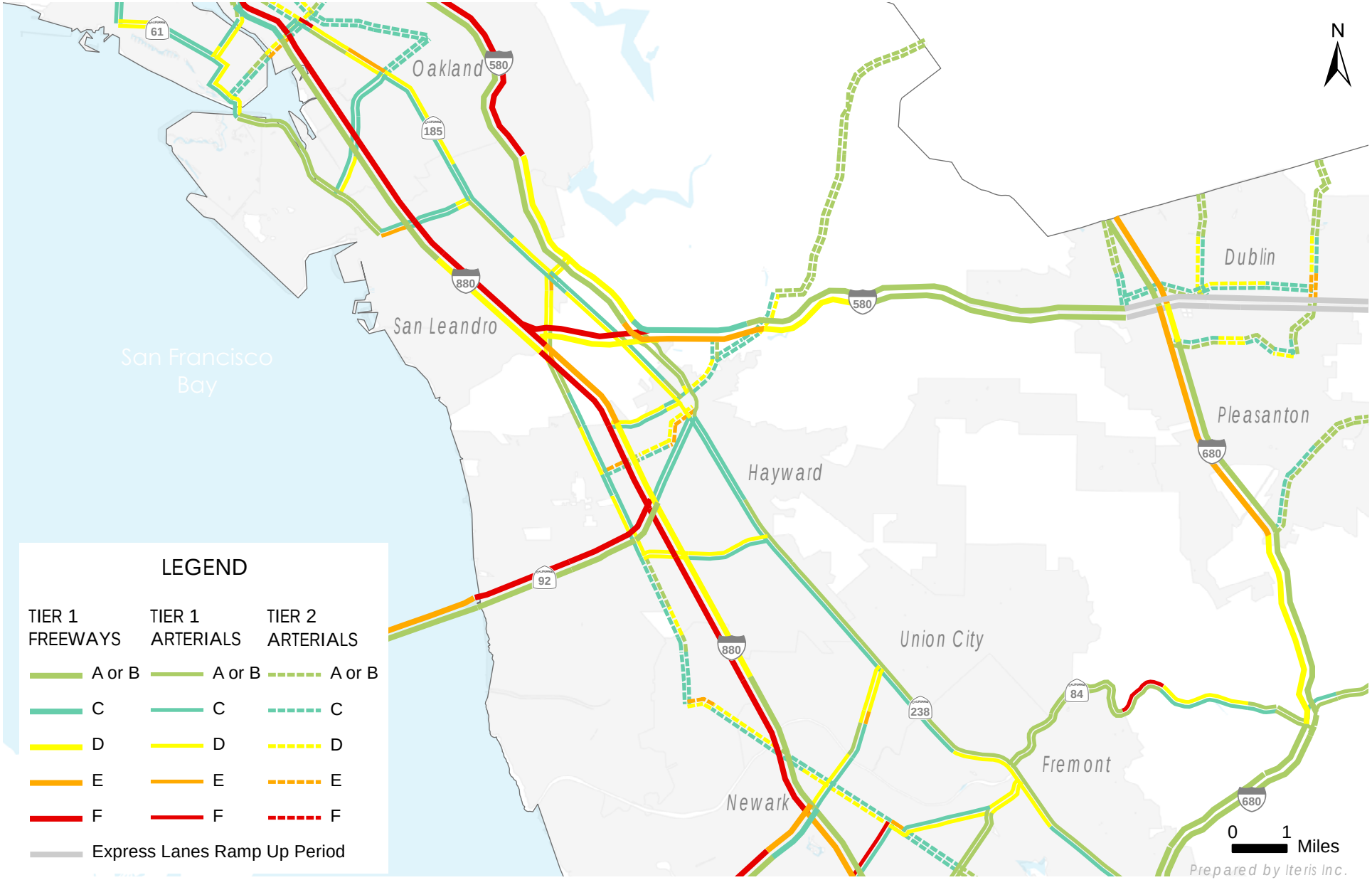

A.9

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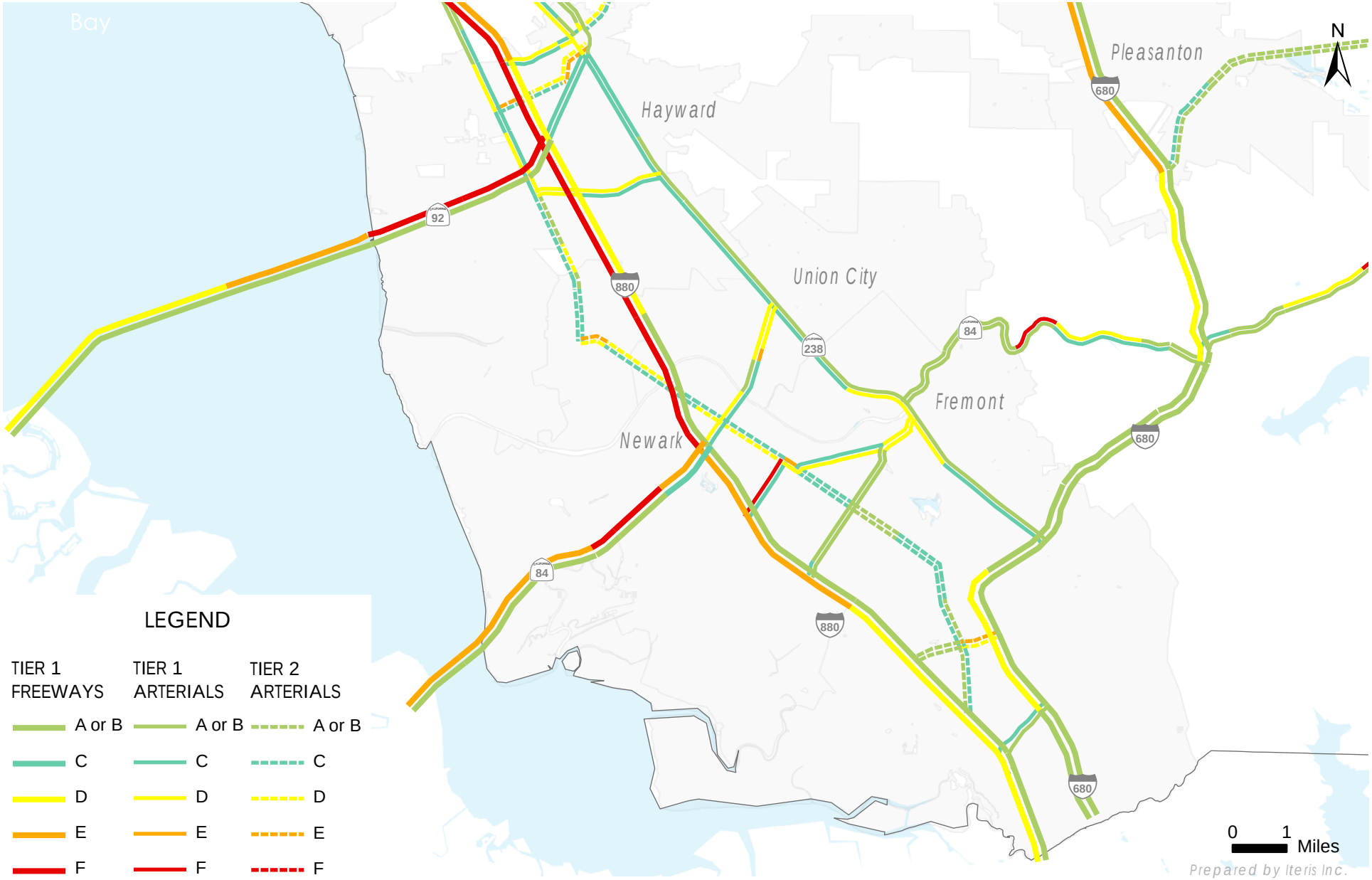

A.10

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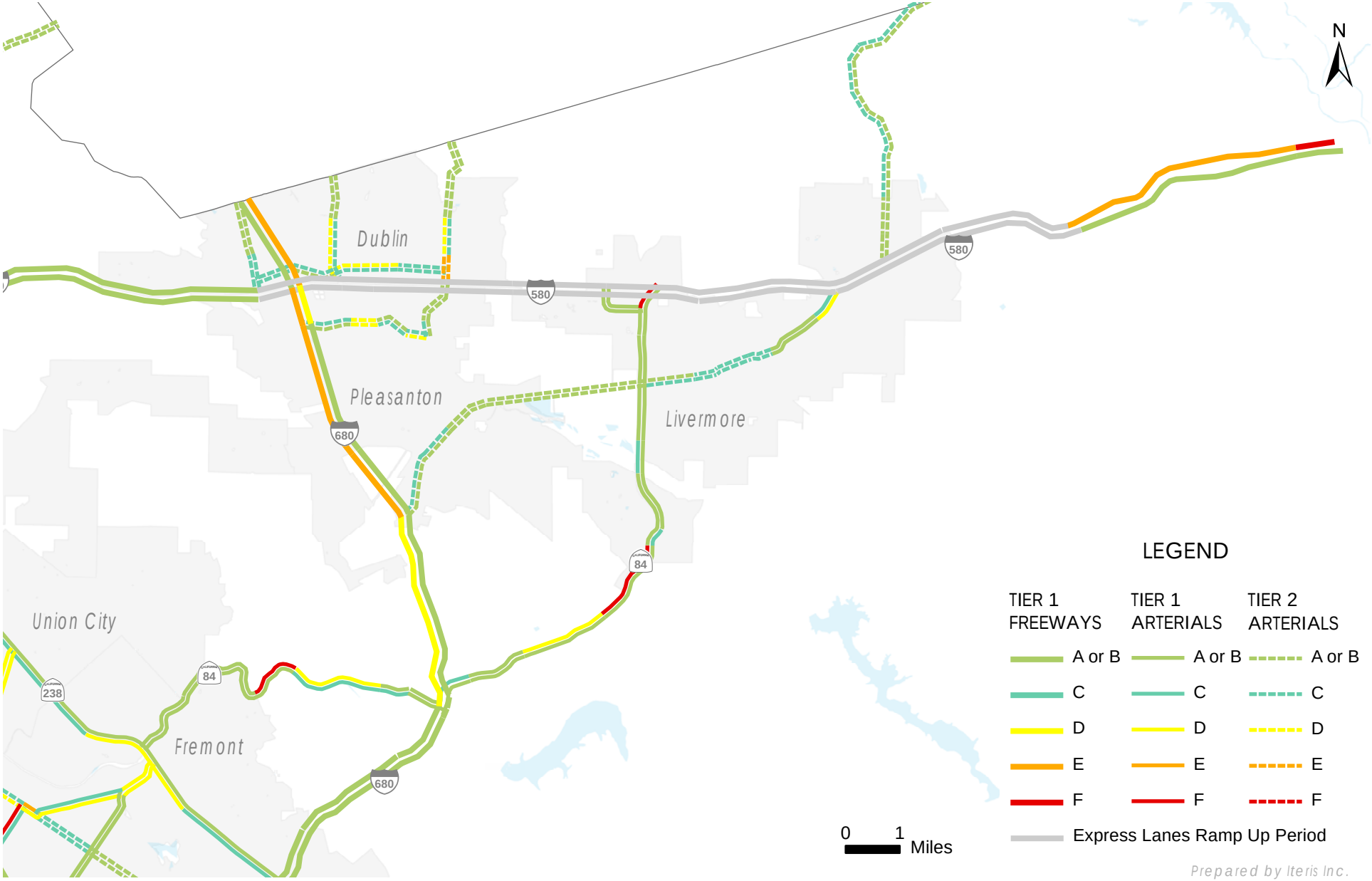
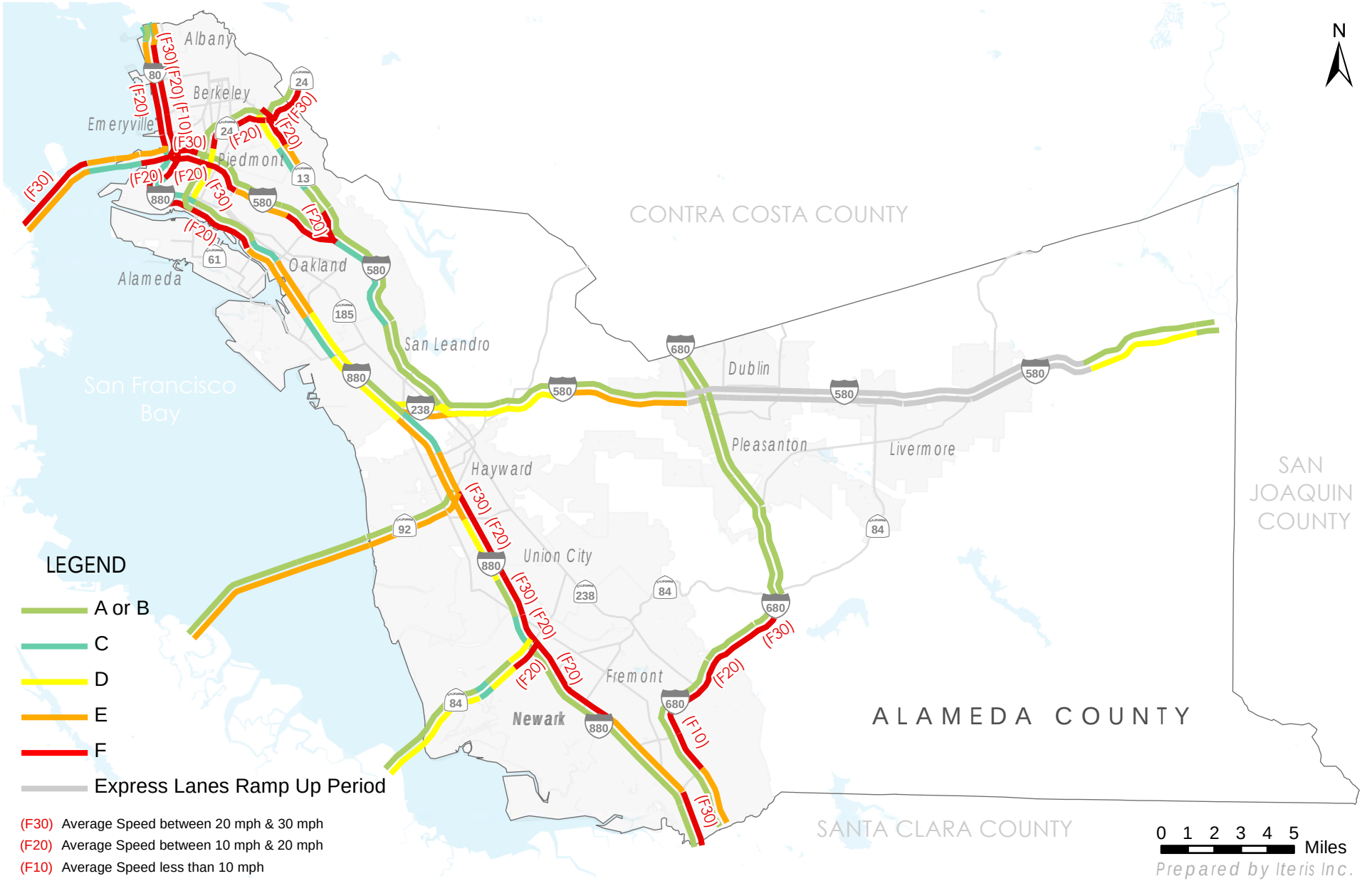


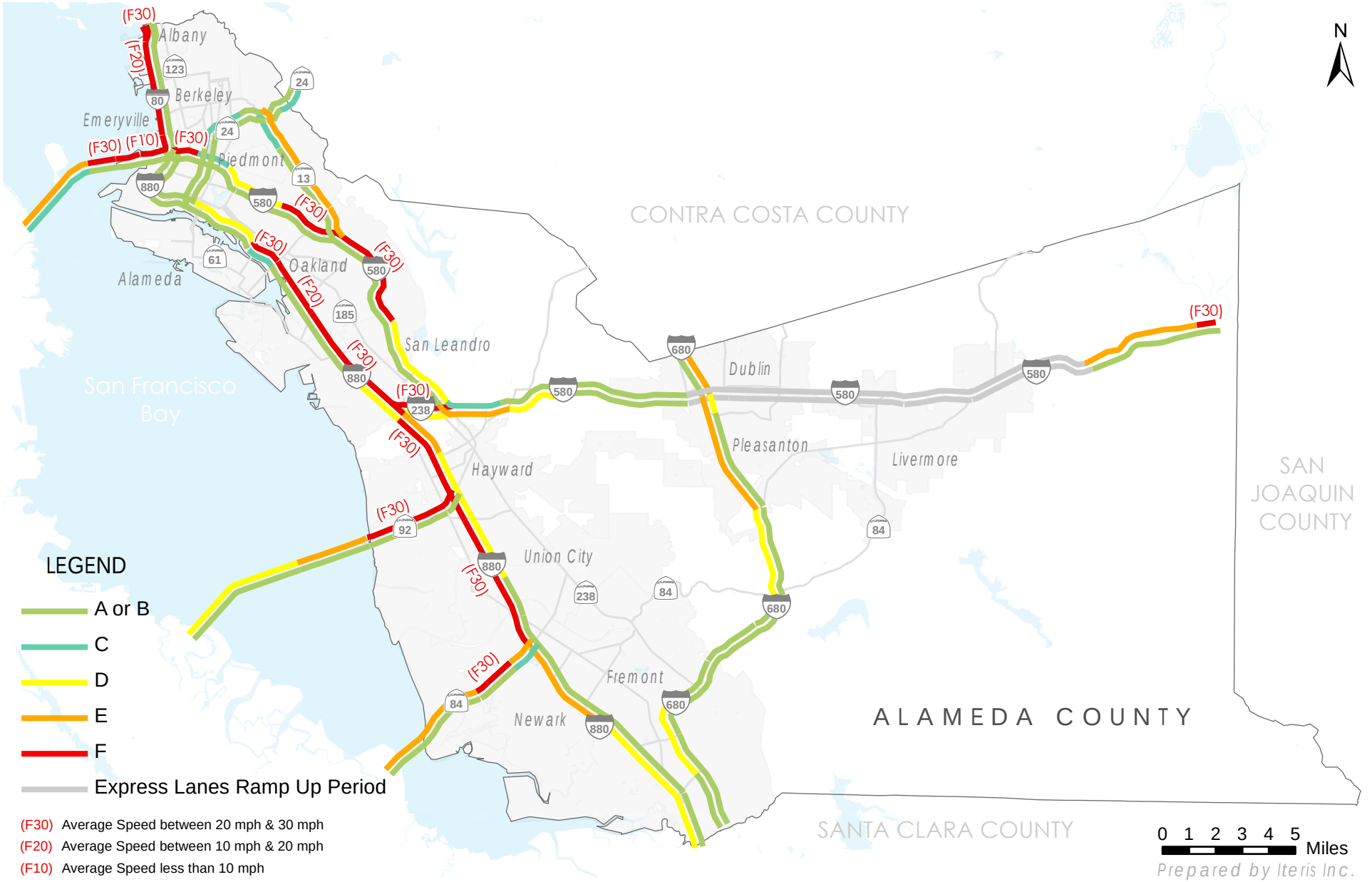
A.11

2016 LEVEL OF SERVICE MONITORING RESULTS: PLANNING AREA (EAST) - AM PEAK PERIOD (7:00 AM to 9:00 AM)



A.12

2016 LEVEL OF SERVICE MONITORING RESULTS: TIER 1 FREEWAYS & BRIDGES - PM PEAK PERIOD (4:00 PM to 6:00 PM)

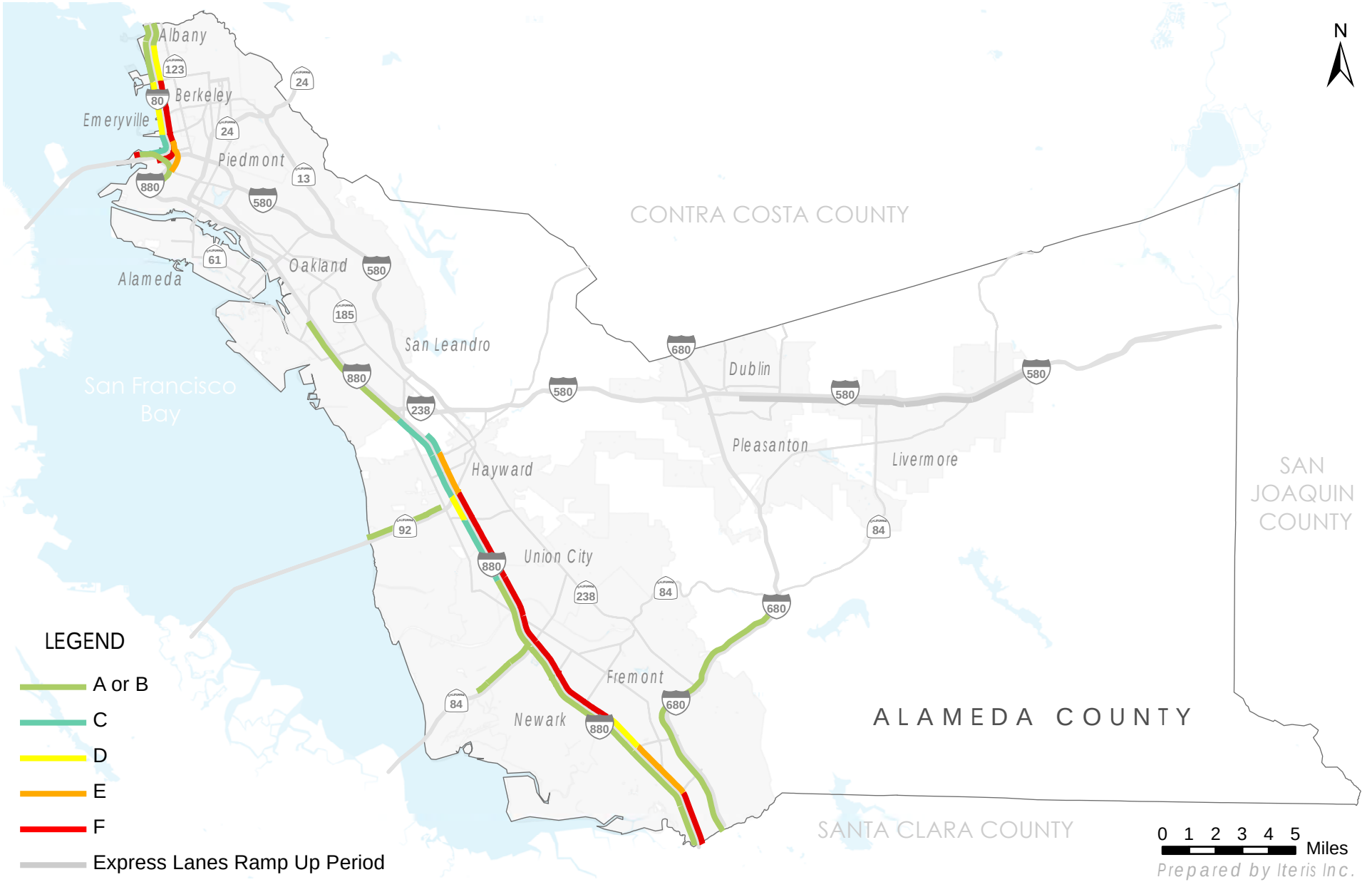


A.13

2016 LEVEL OF SERVICE MONITORING RESULTS: TIER 1 FREEWAYS & BRIDGES - AM PEAK PERIOD (7:00 AM to 9:00 AM)

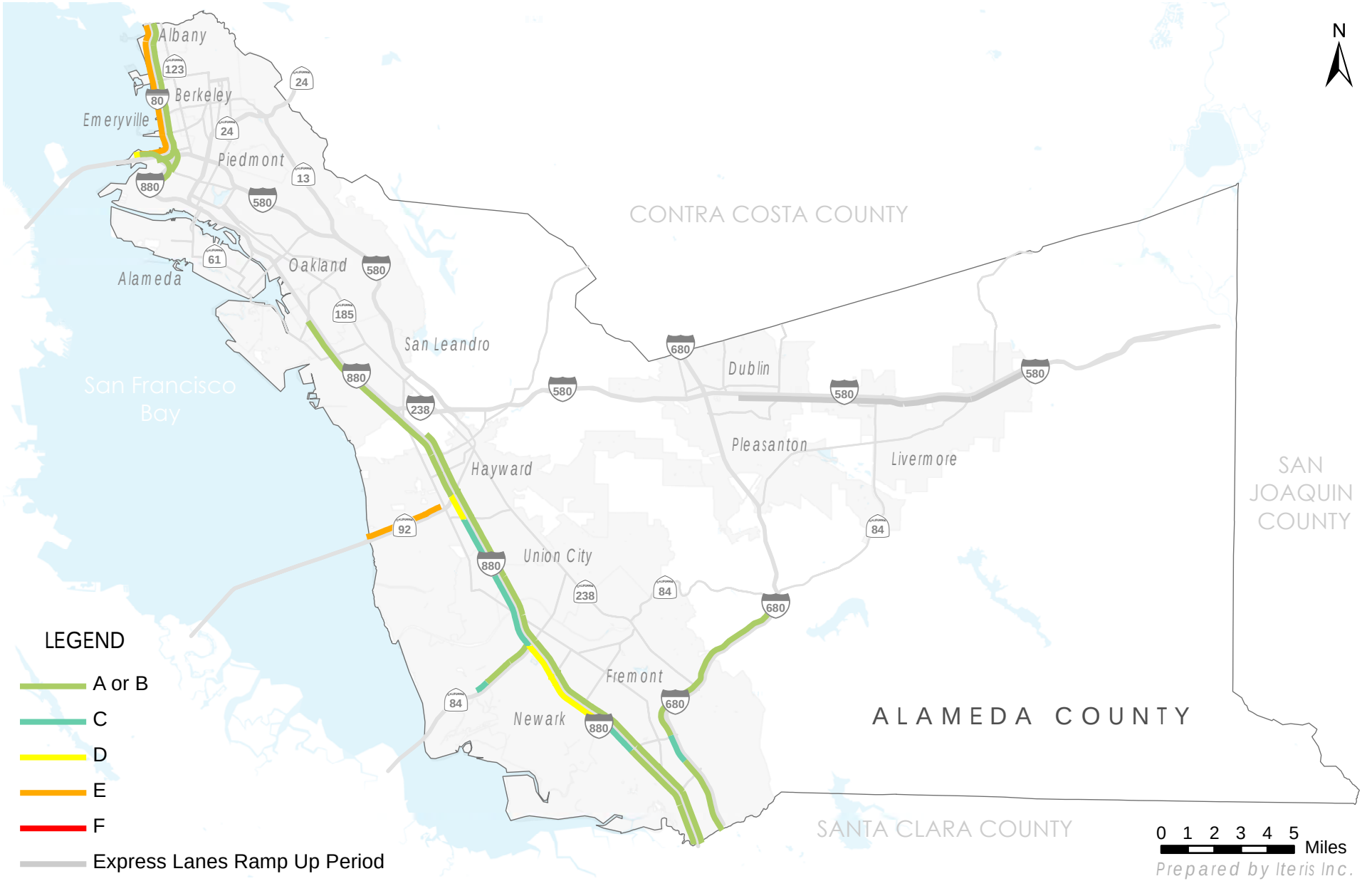
A.14

2016 LEVEL OF SERVICE MONITORING RESULTS: TIER 1 FREEWAYS & BRIDGES - WEEKEND



A.15

2016 LEVEL OF SERVICE MONITORING RESULTS: HOV & EXPRESS LANES - PM PEAK PERIOD



A.16

2016 LEVEL OF SERVICE MONITORING RESULTS: HOV & EXPRESS LANES - AM PEAK PERIOD

Appendix B | 2016 Level of Service Results

This Appendix shows the results for all CMP segments. Tables are included for freeways (Tier 1), ramps (Tier 1), arterials (Tier 1 & 2), HOV/express lanes and bridges for the afternoon, morning and weekend monitoring periods as appropriate. Table notes below each table correspond to numbers in the Notes column and should be looked up as appropriate.

The following abbreviations are used for jurisdictions in Alameda County:

Ala – Alameda
Alb – Albany
Berk – Berkeley
Dub – Dublin
Emery – Emeryville
Fre – Fremont
Hay – Hayward
Liv – Livermore
New – Newark
Oak – Oakland
Plea – Pleasanton
San L – San Leandro
Uni Cty – Union City
Uninc – Unincorporated

The abbreviations for other jurisdictions are:

SM – San Mateo
SF – San Francisco

The abbreviations for Plan Areas are:

N – North
S – South
C – Central
E – East

B.1 | Freeways (Tier 1)

Table B-1: 2016 LOS Monitoring Results for Freeways (Tier 1) - PM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F1	I-80 - EB	SF County Line	Toll Plaza	Oak	2.01	N	5	3779	53.9	C	3319	52.8	C	
F2	I-80 - EB	Toll Plaza	I-580 SB Merge	Oak	1.3	N	6	3779	24.7	(F30)	3199	17.3	(F20)	
F3	I-80 - EB	I-80/I-580 (Merge)	Powell	Emery	0.54	N	6	2833	12.1	(F20)	3559	9.9	(F10)	
F4	I-80 - EB	Powell	Ashby	Emery - Berk	0.72	N	6	2833	13.4	(F20)	2721	11.5	(F20)	
F5	I-80 - EB	Ashby	University	Berk	1.3	N	5	2833	23.5	(F30)	2719	19.9	(F20)	
F6	I-80 - EB	University	Jct I-580 (off)	Berk - Alb	1.37	N	5	2948	34.7	E	2628	29.6	(F30)	
F7	I-80 - EB	Jct I-580 (off)	Central (County Line)	Alb	0.84	N	4	2835	48.1	D	2990	38.2	E	
F8	I-80 - WB	Central (County Line)	Jct I-580	Alb	0.7	N	4	3185	54.7	C	2990	56.0	B	
F9	I-80 - WB	Jct I-580	University	Berk - Alb	1.51	N	6	2948	26.7	(F30)	2628	34.5	E	
F10	I-80 - WB	University	Ashby	Berk	1.31	N	5	2714	18.8	(F20)	2719	19.8	(F20)	
F11	I-80 - WB	Ashby	Powell	Emery	0.71	N	5	2635	15.4	(F20)	2721	15.2	(F20)	

Table B-1: 2016 LOS Monitoring Results for Freeways (Tier 1) - PM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F12	I-80 - WB	Powell	I-80/I-580 (Split)	Emery	0.47	N	6	2377	28.3	(F30)	3559	29.7	(F30)	
F13	I-80 - WB	I-580 Split	Toll Plaza	Oak	1.31	N	8	3208	41.0	D	3076	38.5	E	
F14	I-80 - WB	Toll Plaza	SF County	Oak	2.01	N	4	3777	37.5	E	3319	32.6	E	
F15	I-238 - EB	I-880	I-580	Uninc-San L	2.59	C	3	2477	44.9	D	1910	32.8	E	
F16	I-238 - WB	I-580	I-880	Uninc-San L	2.48	C	3	2454	56.5	B	1910	48.9	D	
F17	I-580 - EB	I-580/I-238 changed fm (I-238/Fthl Off)	Grove	Uninc	2.68	C	5	3182	49.9	C	3320	43.5	D	
F18	I-580 EB	Grove	Eden Canyon	Uninc - Plea	2.19	E	4	3540	49.6	C	3205	41.1	D	
F19	I-580 EB	Eden Canyon	San Ramon/ Foothill	Uninc - Plea	4.82	E	4	3067	50.4	C	2483	34.8	E	
F20	I-580 EB	San Ramon/ Foothill	I-680	Plea	0.71	E	4	3662	35.4	E	-	-	-	[3]
F21	I-580 EB	I-680	Hopyard	Plea	0.87	E	6	3430	30.1	E	-	-	-	[3]
F22	I-580 EB	Hopyard	Santa Rita	Plea	1.9	E	6	3073	31.3	E	-	-	-	[3]
F23	I-580 EB	Santa Rita	El Charro	Uninc-Pleas	1.25	E	6	3900	38.7	E	-	-	-	[3]
F24	I-580 EB	El Charro	SR 84/Airway Blvd.	Uninc	1.72	E	6	3543	45.2	D	-	-	-	[3]
F25	I-580 EB	SR 84/Airway Blvd.	Portola	Liv	1.73	E	5	3900	40.1	E	-	-	-	[3]
F26	I-580 - EB	Portola	1st St	Liv	2.56	E	5	3424	41.4	D	-	-	-	[3]
F27	I-580 - EB	1st St	Greenville	Liv	2.13	E	6	2829	22.2	(F30)	-	-	-	[3]
F28	I-580 - EB	Greenville	N.Flynn	Uninc	2.73	E	4	3779	36.8	E	3200	27.6	(F30)	
F29	I-580 - EB	N.Flynn	Grant Line	Uninc	4.32	E	4	3426	59.0	B	2963	47.1	D	
F30	I-580 - EB	Grant Line	I-205 (SJ Co) Off	Uninc	0.87	E	5	3778	58.3	B	3437	56.4	B	
F31	I-580 - WB	I-205 (SJ Co)	Grant Line	Uninc	0.72	E	5	3259	66.3	A	2756	68.2	A	
F32	I-580 - WB	Grant Line	N Flynn	Uninc	4.59	E	4	3307	65.7	A	2603	65.7	A	
F33	I-580 - WB	N Flynn	Greenville Rd	Liv - Uninc	2.43	E	5	3780	67.5	A	3200	67.3	A	
F34	I-580 - WB	Greenville Rd	1st St	Liv	2.21	E	4	3779	67.2	A	-	-	-	[3]
F35	I-580 - WB	1st St	Portola Ave	Liv	2.56	E	4	3895	66.5	A	-	-	-	[3]
F36	I-580 - WB	Portola	SR 84/Airway Blvd	Liv	1.73	E	4	3779	65.3	A	-	-	-	[3]
F37	I-580 - WB	SR 84/Airway Blvd	Fallon Rd/El Charro	Liv - Uninc	1.73	E	4	3900	64.7	A	-	-	-	[3]
F38	I-580 - WB	Fallon Rd/El Charro	Tassajara	Plea	1.23	E	4	3900	59.4	B	-	-	-	[3]

Table B-1: 2016 LOS Monitoring Results for Freeways (Tier 1) - PM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F39	I-580 - WB	Tassajara Rd	I-680	Plea	2.78	E	4	3305	49.7	C	-	-	-	[3]
F40	I-580 - WB	I-680	San Ramon Rd	Plea	0.71	E	4	3543	58.9	B	-	-	-	[3]
F41	I-580 - WB	San Ramon Rd	Eden Caynon	Plea - Uninc	4.82	E	4	3305	62.8	A	2483	58.3	B	
F42	I-580 - WB	Eden Canyon	Center St	Uninc	2.5	E	4	3541	66.0	A	3203	64.8	A	
F43	I-580 - WB	Center	I-580/238	Uninc	2.26	C	5	3660	64.9	A	3320	63.5	A	
F44	I-580 - EB	I-80	I-980	Oak	1.27	N	5	3658	24.4	(F30)	3197	19.2	(F20)	
F45	I-580 - EB	I-980	Harrison	Oak	1.02	N	5	3545	24.2	(F30)	2962	16.0	(F20)	
F46	I-580 - EB	Harrison	Lakeshore	Oak	0.84	N	4	3664	25.7	(F30)	3322	21.5	(F30)	
F47	I-580 - EB	Lakeshore	Coolidge	Oak	2.21	N	5	3541	33.0	E	2846	31.9	E	
F48	I-580 - EB	Coolidge	SH 13 Off	Oak	2.2	N	4	3414	36.1	E	3228	29.7	(F30)	
F49	I-580 - EB	SH 13 Off	MacArthur	Oak	4.08	N	4	3654	54.8	C	3432	51.3	C	
F50	I-580 - EB	MacArthur	I-580/238	San L - Uninc	3.78	C	4	3538	67.0	A	3101	65.3	A	
F51	I-580 - WB	I-238	Foothill/MacArthur	Uninc	3.86	C	4	3729	68.4	A	3112	65.3	A	
F52	I-580 - WB	Foothill/MacArthur	SH 13 Off	Oak	4.04	N	4	3644	65.8	A	3433	62.4	A	
F53	I-580 - WB	SH 13 Off	Fruitvale	Oak	2.63	N	4	3619	67.5	A	3228	66.4	A	
F54	I-580 - WB	Fruitvale	Harrison	Oak	2.68	N	4	3515	64.6	A	2609	63.4	A	
F55	I-580 - WB	Harrison	SH 24 On-ramp	Oak	1.24	N	5	3541	59.2	B	2962	58.8	B	
F56	I-580 - WB	SH-24 On-ramp	I-80/580 Split	Oak	1.17	N	5	3777	29.3	(F30)	3197	23.8	(F30)	
F57	I-580 - EB	Central (County Line)	I-80 Jct	Alb	0.7	N	2	8	53.5	C	3314	48.3	C	[2]
F58	I-580 - WB	I-80 Jct	Central (County Line)	Alb	0.86	N	3	8	52.5	C	3345	56.0	C	[2]
F59	I-680 - NB	Scott Creek Rd	Rt 262/Mission	Fre	2.26	S	3	3664	36.6	E	3410	35.3	E	
F60	I-680 - NB	Rt 262/Mission	Durham Rd	Fre	1.62	S	3	3308	12.9	(F20)	3197	8.4	(F10)	
F61	I-680 - NB	Durham Rd	Washington Blvd	Fre	1.3	S	3	3437	11.9	(F20)	2992	8.7	(F10)	
F62	I-680 - NB	Washington Blvd	Rt 238/Mission	Fre	1.14	S	3	3437	19.2	(F20)	3208	13.8	(F20)	
F63	I-680 NB	SR 238/Mission	Vargas Rd	Fre	1.1	S	4	3781	24.0	(F30)	3559	16.7	(F20)	
F64	I-680 NB	Vargas Rd	Andrade Rd	Uninc	2.21	S	4	3545	19.8	(F20)	3197	15.1	(F20)	
F65	I-680 NB	Andrade Rd	Calaveras	Uninc	1.15	S	3	3664	30.5	E	3077	25.2	(F30)	
F66	I-680 NB	Calaveras	Rt.84/Vallecitos	Uninc	0.39	S	3	3783	51.9	C	3200	43.1	D	
F67	I-680 NB	SR 84	Sunol Blvd	Plea - Uninc	3.52	E	3	3895	66.6	A	3200	66.9	A	
F68	I-680 NB	Sunol Blvd.	Bernal Ave	Plea - Uninc	1.49	E	3	3898	65.0	A	3320	65.1	A	

Table B-1: 2016 LOS Monitoring Results for Freeways (Tier 1) - PM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F69	I-680 NB	Bernal Ave	Stoneridge Dr	Plea	2.53	E	3	3898	63.1	A	3320	60.1	A	
F70	I-680 NB	Stoneridge Dr	I-580	Plea	0.74	E	4	3900	61.9	A	3200	60.6	A	
F71	I-680 - NB	I-580	Alcosta	Dub	1.85	E	4	3900	64.7	A	2960	65.3	A	
F72	I-680 - SB	Alcosta	I-580	Dub	1.85	E	5	3787	67.5	A	2960	66.8	A	
F73	I-680 SB	I-580	Stoneridge Dr	Plea	0.73	E	4	3781	59.4	B	3200	64.7	A	
F74	I-680 SB	Stoneridge Dr	Bernal	Plea	2.54	E	3	3774	65.9	A	3320	65.3	A	
F75	I-680 SB	Bernal Ave.	Sunol Blvd	Uninc	1.49	E	3	3767	66.9	A	3318	65.9	A	
F76	I-680 SB	Sunol Blvd.	SR 84	Uninc	3.71	E	3	3769	67.4	A	3074	66.8	A	
F77	I-680 SB	SR 84 (Niles Canyon)	Andrade Rd	Uninc	1.33	S	4	3779	67.3	A	3074	66.5	A	
F78	I-680 SB	Andrade Rd	Sheridon Rd	Uninc	1.4	S	5	3895	62.2	A	3200	63.0	A	
F79	I-680 SB	Sheridon Rd	Vargas Rd	Uninc	0.81	S	4	3895	65.7	A	3318	64.8	A	
F80	I-680 SB	Vargas Rd	SR 238/Mission	Fre	1.11	S	4	3778	69.9	A	3557	67.8	A	
F81	I-680 - SB	Rt 238/Mission	Washington Blvd	Fre	1.14	S	4	3783	69.3	A	3197	68.1	A	
F82	I-680 - SB	Washington Blvd	Durham Rd	Fre	1.35	S	4	3783	68.7	A	2983	67.6	A	
F83	I-680 - SB	Durham Rd	Rt 262/Mission	Fre	1.63	S	4	3664	67.0	A	3228	65.1	A	
F84	I-680 - SB	Rt 262/Mission	Scott Creek Rd	Fre	2.25	S	4	3545	68.3	A	3439	68.2	A	
F85	I-880 - NB	Dix Landing	SR 262/Mission	Fre	2.09	S	6	3307	25.8	(F30)	3199	25.0	(F30)	
F86	I-880 - NB	SR 262/Mission	AutoMall Pkwy	Fre	2.43	S	4	3307	36.1	E	3079	30.4	E	[1]
F87	I-880 - NB	AutoMall Pkwy	Stevenson	Fre	1.53	S	4	3545	44.8	D	3559	38.7	E	[1]
F88	I-880 - NB	Stevenson	Decoto	Fre	4.06	S	4	3307	35.9	E	2120	19.7	(F20)	[1]
F89	I-880 - NB	Decoto	Alvarado Blvd	Fre	1.17	S	4	3309	28.8	(F30)	3199	17.0	(F20)	[1]
F90	I-880 - NB	Alvarado Blvd	Alvarado-Niles Blvd	Fre- Uni Cty	1.57	S	4	3428	31.6	E	2846	20.5	(F30)	[1]
F91	I-880 - NB	Alv-Niles	Tennyson	Uni Cty - Hay	2.6	S	4	2714	24.8	(F30)	2480	17.5	(F20)	[1]
F92	I-880 - NB	Tennyson	SR 92	Hay	1.02	C	5	3421	34.7	E	2720	25.1	(F30)	[1]
F93	I-880 - NB	SR 92	A St	Hay	1.68	C	5	3660	35.9	E	3077	30.9	E	[1]
F94	I-880 - NB	A St	I-238 (Marina before 06)	Uninc	1.95	C	5	3779	52.2	C	3439	50.6	C	[1]
F95	I-880 - NB	I-880/I238 (split)	Marina Blvd	San L	2.54	C	5	2250	62.6	A	1796	57.2	B	[1]
F96	I-880 - NB	Marina Blvd	SR 112/Davis	San L	0.82	C	4	2250	59.0	B	2150	41.3	D	[1]
F97	I-880 - NB	SR 112/Davis	Hegenberger	Oak - San L	1.83	C	4	2369	59.2	B	1670	48.2	D	[1]
F98	I-880 - NB	Hegenberger	High/42nd	Oak	2.34	N	4	2369	58.7	B	1913	32.8	E	[1]

Table B-1: 2016 LOS Monitoring Results for Freeways (Tier 1) - PM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F99	I-880 - NB	High/42nd	23rd (1st on)	Oak	1.25	N	4	2256	59.6	B	1916	49.9	C	
F100	I-880 - NB	23RD (1ST on)	Jct 980 (off)	Oak	2.63	N	4	2486	59.1	B	1909	59.4	B	
F101	I-880 - NB	Jct 980 (off)	I-880/I-80 split	Oak	2.43	N	4	3766	55.0	C	3558	54.1	C	
F102	I-880 - NB	I-880/I-80 (split)	I-880/I-80 (merge)	Oak	1.44	N	4	3765	14.3	(F20)	3433	11.4	(F20)	
F103	I-880 - SB	I-880/I-80 split	I-880/I-80 merge	Oak	1.28	N	4	3779	53.3	C	3439	50.2	C	
F104	I-880 - SB	I-880/I-80 merge	Jct 980	Oak	2.51	N	4	3779	32.6	E	3199	21.1	(F30)	
F105	I-880 - SB	I-980	23rd	Oak	2.74	N	5	2250	26.5	(F30)	1796	15.3	(F20)	
F106	I-880 - SB	23rd St	High/42nd	Oak	1.1	N	5	2488	33.7	E	1916	30.2	E	
F107	I-880 - SB	High/42nd	Hegenberger	Oak	2.36	N	4	2250	34.7	E	1913	37.1	E	[1]
F108	I-880 - SB	Hegenberger	SR 112/Davis	Oak - San L	1.82	N	4	2488	43.3	D	1670	49.5	C	[1]
F109	I-880 - SB	SR 112/Davis	Marina Blvd	San L	0.82	N	4	2369	54.6	C	2150	47.8	D	[1]
F110	I-880 - SB	Marina Blvd	SR 238 WB (merge)	Oak - San L	2.55	N	4	2369	56.7	B	1796	48.9	D	[1]
F111	I-880 - SB	I-238 (Marina before 06)	A St	Uninc	1.91	C	5	3660	47.1	D	3439	38.6	E	[1]
F112	I-880 - SB	A St	Rt 92	Hay	1.7	C	5	3660	45.7	D	3199	39.4	E	[1]
F113	I-880 - SB	Rt 92	Tennyson	Hay	1.01	C	5	3422	42.1	D	2720	36.4	E	[1]
F114	I-880 - SB	Tennyson	Alv-Niles	Hay - Uni Cty	2.6	C	4	3305	45.2	D	2480	45.4	D	[1]
F115	I-880 - SB	Alvarado-Niles	Alvarado	Uni Cty - Fre	1.56	S	4	3547	52.8	C	2846	57.4	B	[1]
F116	I-880 - SB	Alvarado	Decoto	Fre	1.19	S	4	3309	47.8	D	3079	53.7	C	[1]
F117	I-880 - SB	Decoto	Stevenson	Fre	4.06	S	4	3426	55.9	B	2000	56.6	B	[1]
F118	I-880 - SB	Stevenson	AutoMall Pkwy	Fre	1.52	C	4	3783	65.3	A	3559	62.6	A	[1]
F119	I-880 - SB	AutoMall Pkwy	Rt 262/Mission	Fre	2.83	C	4	3783	66.7	A	3079	65.3	A	[1]
F120	I-880 - SB	SR 262/Mission	Dix Landing(off)	Fre	1.69	S	4	3783	66.2	A	3199	67.1	A	
F121	I-980 - WB	SR 24 @ 580	I-880	Oak	2.49	N	4	2349	57.2	B	1791	61.2	A	
F122	I-980 - EB	I-880	SR 24 @ 580	Oak	2.44	N	4	2486	38.6	E	1911	43.3	D	
F123	SR 13 - NB	Mountain On	Carson/Redwood (1) (off)	Oak	1.27	N	2	3397	63.0	A	3337	60.9	A	
F124	SR 13 - NB	Carson/Redwood (1) (off)	Joaquin Miller	Oak	1.08	N	2	3505	59.2	B	3365	62.4	A	
F125	SR 13 - NB	Joa Miller/Linc	Moraga Ave	Oak	1.83	N	2	3498	31.7	E	3402	35.0	E	
F126	SR 13 - NB	Moraga Ave	Hiller (Sig)	Oak	1.63	N	2	1899	17.2	(F20)	1983	17.5	(F20)	
F127	SR 13 - SB	Hiller Sig	Moraga Ave	Oak	1.6	N	2	1390	52.9	C	2222	41.5	D	
F128	SR 13 - SB	Moraga Ave	Joa Miller/Linc	Oak	1.85	N	2	2824	60.6	A	3328	53.7	C	

Table B-1: 2016 LOS Monitoring Results for Freeways (Tier 1) - PM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F129	SR 13 - SB	Joaq Miller/Lincoln	Redwood	Oak	1.07	N	2	3334	62.9	A	3427	58.9	B	
F130	SR 13 - SB	Redwood	Jct I-580 (EB Merge)	Oak	1.4	N	2	3148	22.1	(F30)	3330	14.8	(F20)	
F131	SR 24 - EB	Jct I-580 (on)	Broadway/SR 13	Oak	1.84	N	4	3779	14.1	(F20)	3439	13.0	(F20)	
F132	SR 24 - EB	Broadway/SR 13	Caldecott (enter)	Oak	1.65	N	4	3660	12.9	(F20)	3325	11.1	(F20)	
F133	SR 24 - EB	Caldecott (enter)	Fish Ranch Road	Oak	1.04	N	4	3657	30.0	(F30)	2770	25.1	(F30)	
F134	SR 24 - WB	Fish Ranch Road (CC)	Caldecott (exit)	Oak	0.99	N	4	1397	47.1	D	2209	57.9	B	
F135	SR 24 - WB	Caldecott (exit)	Broadway	Oak	1.73	N	4	3318	58.2	B	2483	61.5	A	
F136	SR 24 - WB	Broadway	Jct I-580 (on)	Oak	1.86	N	4	3741	61.0	A	3439	63.5	A	
F137	SR 84 - EB	San M CL	Toll Plaza	Fre	3.29	S	3	3783	58.1	B	3559	48.2	D	
F138	SR 84 - EB	Toll Plaza	Thornton	Fre	0.54	S	3	3664	55.5	B	3559	53.5	C	
F139	SR 84 - EB	Thornton Ave/Pascon Padre	Newark Blvd/Ardenwood Blvd	New	1.16	S	3	3544	40.7	E	3559	46.9	D	
F140	SR 84 - EB	Newark Blvd/Ardenwood Blvd	I-880 NB (off)	New	1.2	S	2	3660	16.1	(F20)	3557	16.5	(F20)	
F141	SR 84 - WB	I-880 NB (off)	Ardenwood/Newark	New	1.21	S	3	3364	43.6	D	3413	47.1	D	
F142	SR 84 - WB	Ardenwood/Newark	Paseo Padre Pkwy	New	1.15	S	3	2818	62.7	A	3079	64.1	A	
F143	SR 84 - WB	Paseo Padre Pkwy	Toll Gate	Fre	0.54	S	3	3696	46.6	D	3377	53.0	C	
F144	SR 84 - WB	Toll Plaza	San M CL	Fre	3.29	C	3	2745	61.4	A	3559	61.9	A	
F145	SR 92 - EB	San M CL	Toll Plaza	Hay	2.78	C	3	3543	41.5	D	3438	39.2	E	
F146	SR 92 - EB	Toll Plaza	Clawiter	Hay	1.87	C	3	3539	39.0	E	3437	38.6	E	[1]
F147	SR 92 - EB	Clawiter	I-880	Hay	2.07	C	4	3050	20.5	(F30)	3064	30.7	E	[1]
F148	SR 92 - WB	I-880	Clawiter	Hay	2.05	C	4	3512	62.0	A	2776	61.0	A	[1]
F149	SR 92 - WB	Clawiter	Toll Plaza	Hay	1.88	C	4	3753	57.6	B	3439	58.6	B	[1]
F150	SR 92 - WB	Toll Plaza	San M CL	Hay	2.79	C	3	3746	65.8	A	3439	65.5	A	

Notes
[1] Data impacted by long term construction and recurrent lane closures
[2] Monitored in 2014 with floating car surveys
[3] Express Lane Ramp Up Period

Table B-2: 2016 LOS Monitoring Results for Freeways (Tier 1) - AM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F1	I-80 - EB	SF County Line	Toll Plaza	Oak	2.01	N	5	3302	58.6	B	2795	62.2	A	
F2	I-80 - EB	Toll Plaza	I-580 SB Merge	Oak	1.3	N	6	3728	60.6	A	1889	63.2	A	
F3	I-80 - EB	I-80/I-580 (Merge)	Powell	Emery	0.54	N	6	3191	53.3	C	3070	58.7	B	
F4	I-80 - EB	Powell	Ashby	Emery - Berk	0.72	N	6	3074	60.7	A	3386	61.4	A	
F5	I-80 - EB	Ashby	University	Berk	1.3	N	5	3072	61.5	A	3504	62.9	A	
F6	I-80 - EB	University	Jct I-580 (off)	Berk - Alb	1.37	N	5	3194	62.6	A	2962	63.5	A	
F7	I-80 - EB	Jct I-580 (off)	Central (County Line)	Alb	0.84	N	4	3194	64.3	A	3305	65.3	A	
F8	I-80 - WB	Central (County Line)	Jct I-580	Alb	0.7	N	4	3075	16.3	(F20)	3305	17.1	(F20)	
F9	I-80 - WB	Jct I-580	University	Berk - Alb	1.51	N	6	2841	19.5	(F20)	2962	19.7	(F20)	
F10	I-80 - WB	University	Ashby	Berk	1.31	N	5	2957	32.6	E	3504	26.7	(F30)	
F11	I-80 - WB	Ashby	Powell	Emery	0.71	N	5	2698	32.2	E	3386	26.9	(F30)	
F12	I-80 - WB	Powell	I-80/I-580 (Split)	Emery	0.47	N	6	2688	33.1	E	3270	21.0	(F30)	
F13	I-80 - WB	I-580 Split	Toll Plaza	Oak	1.31	N	8	3279	7.7	(F10)	2088	7.6	(F10)	
F14	I-80 - WB	Toll Plaza	SF County	Oak	2.01	N	4	3421	27.0	(F30)	2677	24.2	(F30)	
F15	I-238 - EB	I-880	I-580	Uninc-San L	2.59	C	3	3766	55.2	B	3040	47.4	D	
F16	I-238 - WB	I-580	I-880	Uninc-San L	2.48	C	3	3765	22.3	(F30)	2920	21.4	(F30)	
F17	I-580 - EB	I-580/I-238 changed fm (I-238/Fthl Off)	Grove	Uninc	2.68	C	5	3538	55.5	B	3149	37.4	E	
F18	I-580 EB	Grove	Eden Canyon	Uninc - Plea	2.19	E	4	3775	51.3	C	3156	46.0	D	
F19	I-580 EB	Eden Canyon	San Ramon/ Foothill	Uninc - Plea	4.82	E	4	3428	59.4	B	2910	57.7	B	
F20	I-580 EB	San Ramon/ Foothill	I-680	Plea	0.71	E	4	3662	63.6	A	-	-	-	[3]
F21	I-580 EB	I-680	Hopyard	Plea	0.87	E	6	3781	65.4	A	-	-	-	[3]
F22	I-580 EB	Hopyard	Santa Rita	Plea	1.9	E	6	3900	65.4	A	-	-	-	[3]
F23	I-580 EB	Santa Rita	El Charro	Uninc-Pleas	1.25	E	6	3900	66.1	A	-	-	-	[3]
F24	I-580 EB	El Charro	SR 84/Airway Blvd.	Uninc	1.72	E	6	3900	65.6	A	-	-	-	[3]
F25	I-580 EB	SR 84/Airway Blvd.	Portola	Liv	1.73	E	5	3900	65.4	A	-	-	-	[3]
F26	I-580 - EB	Portola	1st St	Liv	2.56	E	5	3900	66.1	A	-	-	-	[3]
F27	I-580 - EB	1st St	Greenville	Liv	2.13	E	6	3900	61.7	A	-	-	-	[3]
F28	I-580 - EB	Greenville	N.Flynn	Uninc	2.73	E	4	3543	63.4	A	2786	64.2	A	
F29	I-580 - EB	N.Flynn	Grant Line	Uninc	4.32	E	4	3067	67.3	A	2795	67.7	A	
F30	I-580 - EB	Grant Line	I-205 (SJ Co) Off	Uninc	0.87	E	5	3737	65.9	A	3199	66.2	A	

Table B-2: 2016 LOS Monitoring Results for Freeways (Tier 1) - AM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F31	I-580 - WB	I-205 (SJ Co)	Grant Line	Uninc	0.72	E	5	3514	48.9	D	3367	26.7	(F30)	
F32	I-580 - WB	Grant Line	N Flynn	Uninc	4.59	E	4	3424	39.7	E	2563	34.8	E	
F33	I-580 - WB	N Flynn	Greenville Rd	Liv - Uninc	2.43	E	5	3666	34.6	E	2908	53.5	C	
F34	I-580 - WB	Greenville Rd	1st St	Liv	2.21	E	4	3547	23.5	(F30)	-	-	-	[3]
F35	I-580 - WB	1st St	Portola Ave	Liv	2.56	E	4	3781	26.5	(F30)	-	-	-	[3]
F36	I-580 - WB	Portola	SR 84/Airway Blvd	Liv	1.73	E	4	3781	27.1	(F30)	-	-	-	[3]
F37	I-580 - WB	SR 84/Airway Blvd	Fallon Rd/El Charro	Liv - Uninc	1.73	E	4	3664	35.0	E	-	-	-	[3]
F38	I-580 - WB	Fallon Rd/El Charro	Tassajara	Plea	1.23	E	4	3664	42.6	D	-	-	-	[3]
F39	I-580 - WB	Tassajara Rd	I-680	Plea	2.78	E	4	3425	44.6	D	-	-	-	[3]
F40	I-580 - WB	I-680	San Ramon Rd	Plea	0.71	E	4	3425	61.3	A	-	-	-	[3]
F41	I-580 - WB	San Ramon Rd	Eden Caynon	Plea - Uninc	4.82	E	4	3308	64.3	A	3029	63.7	A	
F42	I-580 - WB	Eden Canyon	Center St	Uninc	2.5	E	4	3537	61.3	A	3275	62.7	A	
F43	I-580 - WB	Center	I-580/238	Uninc	2.26	C	5	3538	53.1	C	3267	53.4	C	
F44	I-580 - EB	I-80	I-980	Oak	1.27	N	5	3528	56.5	B	3384	57.5	B	
F45	I-580 - EB	I-980	Harrison	Oak	1.02	N	5	3759	63.8	A	3136	64.8	A	
F46	I-580 - EB	Harrison	Lakeshore	Oak	0.84	N	4	3765	66.3	A	3382	66.8	A	
F47	I-580 - EB	Lakeshore	Coolidge	Oak	2.21	N	5	3760	65.5	A	3265	66.2	A	
F48	I-580 - EB	Coolidge	SH 13 Off	Oak	2.2	N	4	3348	66.4	A	3363	67.5	A	
F49	I-580 - EB	SH 13 Off	MacArthur	Oak	4.08	N	4	3098	67.6	A	2558	68.6	A	
F50	I-580 - EB	MacArthur	I-580/238	San L - Uninc	3.78	C	4	3673	67.8	A	3033	66.2	A	
F51	I-580 - WB	I-238	Foothill/MacArthur	Uninc	3.86	C	4	3291	58.2	B	3030	43.9	D	
F52	I-580 - WB	Foothill/MacArthur	SH 13 Off	Oak	4.04	N	4	3656	36.9	E	2562	27.7	(F30)	
F53	I-580 - WB	SH 13 Off	Fruitvale	Oak	2.63	N	4	3412	29.4	(F30)	3384	23.9	(F30)	
F54	I-580 - WB	Fruitvale	Harrison	Oak	2.68	N	4	3539	45.5	D	3149	45.5	D	
F55	I-580 - WB	Harrison	SH 24 On-ramp	Oak	1.24	N	5	3658	41.2	D	3156	49.4	C	
F56	I-580 - WB	SH-24 On-ramp	I-80/580 Split	Oak	1.17	N	5	3646	24.3	(F30)	3069	24.6	(F30)	
F57	I-580 - EB	Central (County Line)	I-80 Jct	Alb	0.7	N	2	7	28.1	(F30)	3305	23.1	(F30)	[2]
F58	I-580 - WB	I-80 Jct	Central (County Line)	Alb	0.86	N	3	7	59.5	B	3304	60.8	A	[2]
F59	I-680 - NB	Scott Creek Rd	Rt 262/Mission	Fre	2.26	S	3	3772	65.0	A	3484	63.9	A	
F60	I-680 - NB	Rt 262/Mission	Durham Rd	Fre	1.62	S	3	3542	66.1	A	3245	66.3	A	

Table B-2: 2016 LOS Monitoring Results for Freeways (Tier 1) - AM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F61	I-680 - NB	Durham Rd	Washington Blvd	Fre	1.3	S	3	3772	65.7	A	3273	65.8	A	
F62	I-680 - NB	Washington Blvd	Rt 238/Mission	Fre	1.14	S	3	3653	63.9	A	3152	63.8	A	
F63	I-680 NB	SR 238/Mission	Vargas Rd	Fre	1.1	S	4	3653	64.1	A	3504	63.5	A	
F64	I-680 NB	Vargas Rd	Andrade Rd	Uninc	2.21	S	4	3898	64.9	A	2905	65.9	A	
F65	I-680 NB	Andrade Rd	Calaveras	Uninc	1.15	S	3	3900	66.3	A	3140	65.9	A	
F66	I-680 NB	Calaveras	Rt.84/Vallecitos	Uninc	0.39	S	3	3900	65.4	A	3026	64.9	A	
F67	I-680 NB	SR 84	Sunol Blvd	Plea - Uninc	3.52	E	3	3898	67.5	A	3024	67.5	A	
F68	I-680 NB	Sunol Blvd.	Bernal Ave	Plea - Uninc	1.49	E	3	3897	67.6	A	3143	67.1	A	
F69	I-680 NB	Bernal Ave	Stoneridge Dr	Plea	2.53	E	3	3897	67.2	A	3023	63.6	A	
F70	I-680 NB	Stoneridge Dr	I-580	Plea	0.74	E	4	3900	61.1	A	2904	42.7	D	
F71	I-680 - NB	I-580	Alcosta	Dub	1.85	E	4	3663	52.9	C	2912	37.3	E	
F72	I-680 - SB	Alcosta	I-580	Dub	1.85	E	5	3900	62.4	A	2912	62.7	A	
F73	I-680 SB	I-580	Stoneridge Dr	Plea	0.73	E	4	3662	40.6	E	2904	39.9	E	
F74	I-680 SB	Stoneridge Dr	Bernal	Plea	2.54	E	3	3664	36.7	E	3023	31.0	E	
F75	I-680 SB	Bernal Ave.	Sunol Blvd	Uninc	1.49	E	3	3426	34.0	E	3143	30.6	E	
F76	I-680 SB	Sunol Blvd.	SR 84	Uninc	3.71	E	3	3900	42.8	D	3024	44.4	D	
F77	I-680 SB	SR 84 (Niles Canyon)	Andrade Rd	Uninc	1.33	S	4	3900	51.7	C	3026	56.4	B	
F78	I-680 SB	Andrade Rd	Sheridon Rd	Uninc	1.4	S	5	3898	50.8	C	3259	56.7	B	
F79	I-680 SB	Sheridon Rd	Vargas Rd	Uninc	0.81	S	4	3900	53.2	C	2905	58.9	B	
F80	I-680 SB	Vargas Rd	SR 238/Mission	Fre	1.11	S	4	3772	57.2	B	3504	62.4	A	
F81	I-680 - SB	Rt 238/Mission	Washington Blvd	Fre	1.14	S	4	3534	57.5	B	3152	60.5	A	
F82	I-680 - SB	Washington Blvd	Durham Rd	Fre	1.35	S	4	3305	43.9	D	3273	48.3	D	
F83	I-680 - SB	Durham Rd	Rt 262/Mission	Fre	1.63	S	4	3190	43.4	D	3265	45.7	D	
F84	I-680 - SB	Rt 262/Mission	Scott Creek Rd	Fre	2.25	S	4	3772	66.3	A	3504	66.2	A	
F85	I-880 - NB	Dix Landing	SR 262/Mission	Fre	2.09	S	6	3772	66.7	A	3504	67.5	A	
F86	I-880 - NB	SR 262/Mission	AutoMall Pkwy	Fre	2.43	S	4	3419	63.4	A	3384	65.3	A	[1]
F87	I-880 - NB	AutoMall Pkwy	Stevenson	Fre	1.53	S	4	3536	64.7	A	3504	64.4	A	[1]
F88	I-880 - NB	Stevenson	Decoto	Fre	4.06	S	4	3772	61.8	A	2444	63.8	A	[1]
F89	I-880 - NB	Decoto	Alvarado Blvd	Fre	1.17	S	4	3543	51.9	C	2795	60.5	A	[1]
F90	I-880 - NB	Alvarado Blvd	Alvarado-Niles Blvd	Fre- Uni Cty	1.57	S	4	3307	47.9	D	3028	58.6	B	[1]

Table B-2: 2016 LOS Monitoring Results for Freeways (Tier 1) - AM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F91	I-880 - NB	Alv-Niles	Tennyson	Uni Cty - Hay	2.6	S	4	3191	38.9	E	2672	43.5	D	[1]
F92	I-880 - NB	Tennyson	SR 92	Hay	1.02	C	5	3539	49.4	C	2919	47.2	D	[1]
F93	I-880 - NB	SR 92	A St	Hay	1.68	C	5	3184	50.8	C	2680	45.8	D	[1]
F94	I-880 - NB	A St	I-238 (Marina before 06)	Uninc	1.95	C	5	3539	48.0	D	2911	38.8	E	[1]
F95	I-880 - NB	I-880/I238 (split)	Marina Blvd	San L	2.54	C	5	2945	28.5	(F30)	3182	23.2	(F30)	[1]
F96	I-880 - NB	Marina Blvd	SR 112/Davis	San L	0.82	C	4	3299	27.9	(F30)	3388	22.8	(F30)	[1]
F97	I-880 - NB	SR 112/Davis	Hegenberger	Oak - San L	1.83	C	4	3539	31.4	E	3273	24.4	(F30)	[1]
F98	I-880 - NB	Hegenberger	High/42nd	Oak	2.34	N	4	3656	24.3	(F30)	3145	19.7	(F20)	[1]
F99	I-880 - NB	High/42nd	23rd (1st on)	Oak	1.25	N	4	3195	26.5	(F30)	3384	24.9	(F30)	
F100	I-880 - NB	23RD (1ST on)	Jct 980 (off)	Oak	2.63	N	4	3305	45.0	D	3149	48.1	D	
F101	I-880 - NB	Jct 980 (off)	I-880/I-80 split	Oak	2.43	N	4	3652	63.1	A	3268	63.4	A	
F102	I-880 - NB	I-880/I-80 (split)	I-880/I-80 (merge)	Oak	1.44	N	4	3770	60.2	A	2953	60.3	A	
F103	I-880 - SB	I-880/I-80 split	I-880/I-80 merge	Oak	1.28	N	4	3773	56.9	B	3069	56.8	B	
F104	I-880 - SB	I-880/I-80 merge	Jct 980	Oak	2.51	N	4	3775	58.9	B	3033	65.3	A	
F105	I-880 - SB	I-980	23rd	Oak	2.74	N	5	3311	59.4	B	2909	55.3	B	
F106	I-880 - SB	23rd St	High/42nd	Oak	1.1	N	5	3775	60.0	A	3384	54.1	C	
F107	I-880 - SB	High/42nd	Hegenberger	Oak	2.36	N	4	3775	61.8	A	3145	62.2	A	[1]
F108	I-880 - SB	Hegenberger	SR 112/Davis	Oak - San L	1.82	N	4	3538	60.3	A	3273	63.9	A	[1]
F109	I-880 - SB	SR 112/Davis	Marina Blvd	San L	0.82	N	4	3656	52.1	C	3388	60.8	A	[1]
F110	I-880 - SB	Marina Blvd	SR 238 WB (merge)	Oak - San L	2.55	N	4	3537	39.8	E	3182	45.4	D	[1]
F111	I-880 - SB	I-238 (Marina before 06)	A St	Uninc	1.91	C	5	3182	22.4	(F30)	2911	25.0	(F30)	[1]
F112	I-880 - SB	A St	Rt 92	Hay	1.7	C	5	3537	29.6	(F30)	2680	25.5	(F30)	[1]
F113	I-880 - SB	Rt 92	Tennyson	Hay	1.01	C	5	3421	28.0	(F30)	2919	23.4	(F30)	[1]
F114	I-880 - SB	Tennyson	Alv-Niles	Hay - Uni Cty	2.6	C	4	2954	27.2	(F30)	2672	22.9	(F30)	[1]
F115	I-880 - SB	Alvarado-Niles	Alvarado	Uni Cty - Fre	1.56	C	4	3424	24.8	(F30)	3028	25.2	(F30)	[1]
F116	I-880 - SB	Alvarado	Decoto	Fre	1.19	C	4	3424	29.1	(F30)	2911	28.6	(F30)	[1]
F117	I-880 - SB	Decoto	Stevenson	Fre	4.06	S	4	3308	29.8	(F30)	2560	30.3	E	[1]
F118	I-880 - SB	Stevenson	AutoMall Pkwy	Fre	1.52	C	4	3653	40.3	E	3504	43.6	D	[1]
F119	I-880 - SB	AutoMall Pkwy	Rt 262/Mission	Fre	2.83	C	4	3536	42.5	D	3384	47.5	D	[1]
F120	I-880 - SB	SR 262/Mission	Dix Landing(off)	Fre	1.69	S	4	3772	54.1	C	3504	46.1	D	

Table B-2: 2016 LOS Monitoring Results for Freeways (Tier 1) - AM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F121	I-980 - WB	SR 24 @ 580	I-880	Oak	2.49	N	4	3775	59.5	B	2681	59.9	B	
F122	I-980 - EB	I-880	SR 24 @ 580	Oak	2.44	N	4	3656	61.1	A	3036	62.0	A	
F123	SR 13 - NB	Mountain On	Carson/Redwood (1) (off)	Oak	1.27	N	2	3259	55.3	B	3403	39.2	E	
F124	SR 13 - NB	Carson/Redwood (1) (off)	Joaquin Miller	Oak	1.08	N	2	3371	47.5	D	3444	30.0	E	
F125	SR 13 - NB	Joa Miller/Linc	Moraga Ave	Oak	1.83	N	2	3182	40.5	E	3359	31.9	E	
F126	SR 13 - NB	Moraga Ave	Hiller (Sig)	Oak	1.63	N	2	1776	33.8	E	2402	33.9	E	
F127	SR 13 - SB	Hiller Sig	Moraga Ave	Oak	1.6	N	2	753	54.0	C	933	53.7	C	
F128	SR 13 - SB	Moraga Ave	Joa Miller/Linc	Oak	1.85	N	2	3025	62.8	A	3008	62.9	A	
F129	SR 13 - SB	Joaq Miller/Lincoln	Redwood	Oak	1.07	N	2	3221	64.1	A	3117	66.0	A	
F130	SR 13 - SB	Redwood	Jct I-580 (EB Merge)	Oak	1.4	N	2	3130	56.5	B	3066	57.4	B	
F131	SR 24 - EB	Jct I-580 (on)	Broadway/SR 13	Oak	1.84	N	4	3775	62.8	A	3388	64.3	A	
F132	SR 24 - EB	Broadway/SR 13	Caldecott (enter)	Oak	1.65	N	4	3538	54.5	C	3384	58.8	B	
F133	SR 24 - EB	Caldecott (enter)	Fish Ranch Road	Oak	1.04	N	4	3506	46.0	D	2683	53.0	C	
F134	SR 24 - WB	Fish Ranch Road (CC)	Caldecott (exit)	Oak	0.99	N	4	2603	48.7	D	3362	55.0	B	
F135	SR 24 - WB	Caldecott (exit)	Broadway	Oak	1.73	N	4	3537	52.6	C	3362	60.2	A	
F136	SR 24 - WB	Broadway	Jct I-580 (on)	Oak	1.86	N	4	3656	43.0	D	3504	53.3	C	
F137	SR 84 - EB	San M CL	Toll Plaza	Fre	3.29	S	3	3765	64.7	A	3385	65.4	A	
F138	SR 84 - EB	Toll Plaza	Thornton	Fre	0.54	S	3	3762	63.5	A	3378	67.1	A	
F139	SR 84 - EB	Thornton Ave/Pascon Padre	Newark Blvd/Ardenwood Blvd	New	1.16	S	3	3696	63.1	A	3165	64.4	A	
F140	SR 84 - EB	Newark Blvd/Ardenwood Blvd	I-880 NB (off)	New	1.2	S	2	3703	45.6	D	3119	49.6	C	
F141	SR 84 - WB	I-880 NB (off)	Ardenwood/Newark	New	1.21	S	3	3772	39.3	E	3386	37.2	E	
F142	SR 84 - WB	Ardenwood/Newark	Paseo Padre Pkwy	New	1.15	S	3	3757	36.7	E	3384	29.0	(F30)	
F143	SR 84 - WB	Paseo Padre Pkwy	Toll Gate	Fre	0.54	S	3	3649	29.8	(F30)	3386	22.3	(F30)	
F144	SR 84 - WB	Toll Plaza	San M CL	Fre	3.29	C	3	3653	44.1	D	3386	32.2	E	
F145	SR 92 - EB	San M CL	Toll Plaza	Hay	2.78	C	3	3752	66.0	A	3271	67.2	A	
F146	SR 92 - EB	Toll Plaza	Clawiter	Hay	1.87	C	3	3724	65.7	A	3009	67.1	A	[1]
F147	SR 92 - EB	Clawiter	I-880	Hay	2.07	C	4	2668	58.2	B	1737	58.7	B	[1]
F148	SR 92 - WB	I-880	Clawiter	Hay	2.05	C	4	3536	30.5	E	2916	21.6	(F30)	[1]
F149	SR 92 - WB	Clawiter	Toll Plaza	Hay	1.88	C	4	2954	25.4	(F30)	3038	20.2	(F30)	[1]
F150	SR 92 - WB	Toll Plaza	San M CL	Hay	2.79	C	3	2954	43.5	D	3274	39.9	E	

Notes
[1] Data impacted by long term construction and recurrent lane closures
[2] Monitored in 2014 with floating car surveys
[3] Express Lane Ramp Up Period

Table B-3: 2016 LOS Monitoring Results for Freeways (Tier 1) – Weekend Midday Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F1	I-80 - EB	SF County Line	Toll Plaza	Oak	2.01	N	5	3092	58.5	B	2397	58.1	B	
F2	I-80 - EB	Toll Plaza	I-580 SB Merge	Oak	1.3	N	6	3092	48.2	D	2387	41.6	D	
F3	I-80 - EB	I-80/I-580 (Merge)	Powell	Emery	0.54	N	6	3092	21.8	(F30)	2397	21.2	(F30)	
F4	I-80 - EB	Powell	Ashby	Emery - Berk	0.72	N	6	3092	21.6	(F30)	2397	21.5	(F30)	
F5	I-80 - EB	Ashby	University	Berk	1.3	N	5	3092	38.4	E	2397	37.6	E	
F6	I-80 - EB	University	Jct I-580 (off)	Berk - Alb	1.37	N	5	3092	58.8	B	2397	57.5	B	
F7	I-80 - EB	Jct I-580 (off)	Central (County Line)	Alb	0.84	N	4	3092	60.9	A	2393	63.5	A	
F8	I-80 - WB	Central (County Line)	Jct I-580	Alb	0.7	N	4	3092	26.0	(F30)	2397	25.7	(F30)	
F9	I-80 - WB	Jct I-580	University	Berk - Alb	1.51	N	6	3088	22.7	(F30)	2397	21.1	(F30)	
F10	I-80 - WB	University	Ashby	Berk	1.31	N	5	3092	27.3	(F30)	2397	24.6	(F30)	
F11	I-80 - WB	Ashby	Powell	Emery	0.71	N	5	2526	23.7	(F30)	2397	22.6	(F30)	
F12	I-80 - WB	Powell	I-80/I-580 (Split)	Emery	0.47	N	6	2748	34.7	E	2397	28.1	(F30)	
F13	I-80 - WB	I-580 Split	Toll Plaza	Oak	1.31	N	8	2933	24.9	(F30)	2393	14.3	(F20)	
F14	I-80 - WB	Toll Plaza	SF County	Oak	2.01	N	4	3078	31.8	E	2397	27.9	(F30)	
F15	I-238 - EB	I-880	I-580	Uninc-San L	2.59	C	3	2940	60.5	A	2395	57.7	B	
F16	I-238 - WB	I-580	I-880	Uninc-San L	2.48	C	3	2496	42.6	D	2328	41.4	D	
F17	I-580 - EB	I-580/I-238 changed fm (I-238/Fthl Off)	Grove	Uninc	2.68	C	5	3092	61.1	A	2389	56.8	B	
F18	I-580 EB	Grove	Eden Canyon	Uninc - Plea	2.19	E	4	3092	54.7	C	2397	54.5	C	
F19	I-580 EB	Eden Canyon	San Ramon/ Foothill	Uninc - Plea	4.82	E	4	3092	52.0	C	2397	63.6	A	
F20	I-580 EB	San Ramon/ Foothill	I-680	Plea	0.71	E	4	3092	66.3	A	-	-	-	[3]
F21	I-580 EB	I-680	Hopyard	Plea	0.87	E	6	3092	67.6	A	-	-	-	[3]
F22	I-580 EB	Hopyard	Santa Rita	Plea	1.9	E	6	3092	67.1	A	-	-	-	[3]
F23	I-580 EB	Santa Rita	El Charro	Uninc-Pleas	1.25	E	6	3092	68.9	A	-	-	-	[3]
F24	I-580 EB	El Charro	SR 84/Airway Blvd.	Uninc	1.72	E	6	3092	69.3	A	-	-	-	[3]
F25	I-580 EB	SR 84/Airway Blvd.	Portola	Liv	1.73	E	5	3092	68.8	A	-	-	-	[3]

Table B-3: 2016 LOS Monitoring Results for Freeways (Tier 1) – Weekend Midday Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F26	I-580 - EB	Portola	1st St	Liv	2.56	E	5	3092	69.6	A	-	-	-	[3]
F27	I-580 - EB	1st St	Greenville	Liv	2.13	E	6	3092	69.2	A	-	-	-	[3]
F28	I-580 - EB	Greenville	N.Flynn	Uninc	2.73	E	4	3076	65.1	A	2397	46.6	D	
F29	I-580 - EB	N.Flynn	Grant Line	Uninc	4.32	E	4	3074	69.9	A	2397	64.2	A	
F30	I-580 - EB	Grant Line	I-205 (SJ Co) Off	Uninc	0.87	E	5	3016	68.7	A	2159	65.4	A	
F31	I-580 - WB	I-205 (SJ Co)	Grant Line	Uninc	0.72	E	5	2453	65.8	A	1860	65.0	A	
F32	I-580 - WB	Grant Line	N Flynn	Uninc	4.59	E	4	3045	66.5	A	2397	58.3	B	
F33	I-580 - WB	N Flynn	Greenville Rd	Liv - Uninc	2.43	E	5	3092	68.8	A	2397	68.6	A	
F34	I-580 - WB	Greenville Rd	1st St	Liv	2.21	E	4	3092	66.6	A	-	-	-	[3]
F35	I-580 - WB	1st St	Portola Ave	Liv	2.56	E	4	3092	58.8	B	-	-	-	[3]
F36	I-580 - WB	Portola	SR 84/Airway Blvd	Liv	1.73	E	4	3092	48.5	D	-	-	-	[3]
F37	I-580 - WB	SR 84/Airway Blvd	Fallon Rd/El Charro	Liv - Uninc	1.73	E	4	3092	49.2	C	-	-	-	[3]
F38	I-580 - WB	Fallon Rd/El Charro	Tassajara	Plea	1.23	E	4	3092	50.2	C	-	-	-	[3]
F39	I-580 - WB	Tassajara Rd	I-680	Plea	2.78	E	4	3092	38.6	E	-	-	-	[3]
F40	I-580 - WB	I-680	San Ramon Rd	Plea	0.71	E	4	3092	64.4	A	-	-	-	[3]
F41	I-580 - WB	San Ramon Rd	Eden Caynon	Plea - Uninc	4.82	E	4	3092	67.7	A	2397	68.1	A	
F42	I-580 - WB	Eden Canyon	Center St	Uninc	2.5	E	4	3092	68.1	A	2397	68.7	A	
F43	I-580 - WB	Center	I-580/238	Uninc	2.26	C	5	3092	65.7	A	2363	66.2	A	
F44	I-580 - EB	I-80	I-980	Oak	1.27	N	5	3086	55.6	B	2396	54.7	C	
F45	I-580 - EB	I-980	Harrison	Oak	1.02	N	5	3092	62.4	A	2397	61.3	A	
F46	I-580 - EB	Harrison	Lakeshore	Oak	0.84	N	4	3092	64.3	A	2395	62.8	A	
F47	I-580 - EB	Lakeshore	Coolidge	Oak	2.21	N	5	3092	64.2	A	2393	63.2	A	
F48	I-580 - EB	Coolidge	SH 13 Off	Oak	2.2	N	4	2909	66.6	A	2370	66.1	A	
F49	I-580 - EB	SH 13 Off	MacArthur	Oak	4.08	N	4	2881	67.6	A	2383	67.0	A	
F50	I-580 - EB	MacArthur	I-580/238	San L - Uninc	3.78	C	4	2829	67.3	A	2386	65.3	A	
F51	I-580 - WB	I-238	Foothill/MacArthur	Uninc	3.86	C	4	2789	68.1	A	2371	68.1	A	
F52	I-580 - WB	Foothill/MacArthur	SH 13 Off	Oak	4.04	N	4	2874	67.2	A	2350	66.5	A	
F53	I-580 - WB	SH 13 Off	Fruitvale	Oak	2.63	N	4	3061	67.8	A	2369	64.2	A	
F54	I-580 - WB	Fruitvale	Harrison	Oak	2.68	N	4	3092	64.4	A	2387	62.1	A	
F55	I-580 - WB	Harrison	SH 24 On-ramp	Oak	1.24	N	5	3092	46.8	D	2397	48.1	D	

Table B-3: 2016 LOS Monitoring Results for Freeways (Tier 1) – Weekend Midday Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F56	I-580 - WB	SH-24 On-ramp	I-80/580 Split	Oak	1.17	N	5	3083	25.0	(F30)	2397	25.1	(F30)	
F57	I-580 - EB	Central (County Line)	I-80 Jct	Alb	0.7	N	2	6	45.8	D	2384	37.8	E	[2]
F58	I-580 - WB	I-80 Jct	Central (County Line)	Alb	0.86	N	3	2944	31.2	E	2344	58.8	B	[2]
F59	I-680 - NB	Scott Creek Rd	Rt 262/Mission	Fre	2.26	S	3	3092	64.8	A	2393	59.1	B	
F60	I-680 - NB	Rt 262/Mission	Durham Rd	Fre	1.62	S	3	3092	61.5	A	2393	41.7	D	
F61	I-680 - NB	Durham Rd	Washington Blvd	Fre	1.3	S	3	3092	56.8	B	2397	37.4	E	
F62	I-680 - NB	Washington Blvd	Rt 238/Mission	Fre	1.14	S	3	3092	58.6	B	2396	47.2	D	
F63	I-680 NB	SR 238/Mission	Vargas Rd	Fre	1.1	S	4	3026	62.0	A	2397	61.7	A	
F64	I-680 NB	Vargas Rd	Andrade Rd	Uninc	2.21	S	4	2963	65.0	A	2397	66.2	A	
F65	I-680 NB	Andrade Rd	Calaveras	Uninc	1.15	S	3	3002	64.9	A	2397	64.4	A	
F66	I-680 NB	Calaveras	Rt.84/Vallecitos	Uninc	0.39	S	3	2976	65.3	A	2397	63.5	A	
F67	I-680 NB	SR 84	Sunol Blvd	Plea - Uninc	3.52	E	3	2956	68.4	A	2389	63.7	A	
F68	I-680 NB	Sunol Blvd.	Bernal Ave	Plea - Uninc	1.49	E	3	2984	67.3	A	2394	55.6	B	
F69	I-680 NB	Bernal Ave	Stoneridge Dr	Plea	2.53	E	3	2994	65.6	A	2394	61.3	A	
F70	I-680 NB	Stoneridge Dr	I-580	Plea	0.74	E	4	3092	62.7	A	2394	63.7	A	
F71	I-680 - NB	I-580	Alcosta	Dub	1.85	E	4	3092	63.4	A	2397	66.8	A	
F72	I-680 - SB	Alcosta	I-580	Dub	1.85	E	5	3092	68.9	A	2397	69.1	A	
F73	I-680 SB	I-580	Stoneridge Dr	Plea	0.73	E	4	3092	66.6	A	2397	65.1	A	
F74	I-680 SB	Stoneridge Dr	Bernal	Plea	2.54	E	3	3070	67.8	A	2392	66.5	A	
F75	I-680 SB	Bernal Ave.	Sunol Blvd	Uninc	1.49	E	3	3065	67.3	A	2392	66.2	A	
F76	I-680 SB	Sunol Blvd.	SR 84	Uninc	3.71	E	3	3058	67.6	A	2397	67.7	A	
F77	I-680 SB	SR 84 (Niles Canyon)	Andrade Rd	Uninc	1.33	S	4	3065	67.6	A	2397	67.3	A	
F78	I-680 SB	Andrade Rd	Sheridon Rd	Uninc	1.4	S	5	3074	62.1	A	2397	64.0	A	
F79	I-680 SB	Sheridon Rd	Vargas Rd	Uninc	0.81	S	4	3073	65.7	A	2397	65.8	A	
F80	I-680 SB	Vargas Rd	SR 238/Mission	Fre	1.11	S	4	3074	68.9	A	2397	68.5	A	
F81	I-680 - SB	Rt 238/Mission	Washington Blvd	Fre	1.14	S	4	3092	69.1	A	2397	68.9	A	
F82	I-680 - SB	Washington Blvd	Durham Rd	Fre	1.35	S	4	3092	64.6	A	2397	67.9	A	
F83	I-680 - SB	Durham Rd	Rt 262/Mission	Fre	1.63	S	4	3092	58.3	B	2376	54.9	C	
F84	I-680 - SB	Rt 262/Mission	Scott Creek Rd	Fre	2.25	S	4	3092	67.6	A	2374	68.7	A	
F85	I-880 - NB	Dix Landing	SR 262/Mission	Fre	2.09	S	6	3092	67.9	A	2394	67.8	A	

Table B-3: 2016 LOS Monitoring Results for Freeways (Tier 1) – Weekend Midday Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F86	I-880 - NB	SR 262/Mission	AutoMall Pkwy	Fre	2.43	S	4	3092	66.1	A	2393	64.8	A	
F87	I-880 - NB	AutoMall Pkwy	Stevenson	Fre	1.53	S	4	3092	64.9	A	2397	62.4	A	
F88	I-880 - NB	Stevenson	Decoto	Fre	4.06	S	4	3092	66.4	A	2397	63.3	A	
F89	I-880 - NB	Decoto	Alvarado Blvd	Fre	1.17	S	4	3092	64.1	A	2397	52.9	C	
F90	I-880 - NB	Alvarado Blvd	Alvarado-Niles Blvd	Fre- Uni Cty	1.57	S	4	3092	59.9	B	2397	48.6	D	
F91	I-880 - NB	Alv-Niles	Tennyson	Uni Cty - Hay	2.6	S	4	3092	49.5	C	2397	40.5	E	
F92	I-880 - NB	Tennyson	SR 92	Hay	1.02	C	5	3088	57.9	B	2397	47.4	D	
F93	I-880 - NB	SR 92	A St	Hay	1.68	C	5	3092	56.5	B	2397	45.7	D	
F94	I-880 - NB	A St	I-238 (Marina before 06)	Uninc	1.95	C	5	3092	57.8	B	2397	53.2	C	
F95	I-880 - NB	I-880/I238 (split)	Marina Blvd	San L	2.54	C	5	3092	64.1	A	2397	60.4	A	
F96	I-880 - NB	Marina Blvd	SR 112/Davis	San L	0.82	C	4	3092	62.5	A	2397	55.9	B	
F97	I-880 - NB	SR 112/Davis	Hegenberger	Oak - San L	1.83	C	4	3092	61.4	A	2397	55.7	B	
F98	I-880 - NB	Hegenberger	High/42nd	Oak	2.34	N	4	3092.0	57.5	B	2397	53.8	C	
F99	I-880 - NB	High/42nd	23rd (1st on)	Oak	1.25	N	4	3092.0	58.9	B	2397	57.5	B	
F100	I-880 - NB	23RD (1ST on)	Jct 980 (off)	Oak	2.63	N	4	3090	58.5	B	2394	59.4	B	
F101	I-880 - NB	Jct 980 (off)	I-880/I-80 split	Oak	2.43	N	4	3092	63.1	A	2385	61.7	A	
F102	I-880 - NB	I-880/I-80 (split)	I-880/I-80 (merge)	Oak	1.44	N	4	3092	45.6	D	2386	38.6	E	
F103	I-880 - SB	I-880/I-80 split	I-880/I-80 merge	Oak	1.28	N	4	3092	58.5	B	2397	55.8	B	
F104	I-880 - SB	I-880/I-80 merge	Jct 980	Oak	2.51	N	4	3092	61.9	A	2395	64.9	A	
F105	I-880 - SB	I-980	23rd	Oak	2.74	N	5	3092	54.0	C	2397	54.2	C	
F106	I-880 - SB	23rd St	High/42nd	Oak	1.1	N	5	3092	50.8	C	2397	46.4	D	
F107	I-880 - SB	High/42nd	Hegenberger	Oak	2.36	N	4	3092	49.1	C	2397	47.1	D	
F108	I-880 - SB	Hegenberger	SR 112/Davis	Oak - San L	1.82	N	4	3092	51.0	C	2397	62.9	A	
F109	I-880 - SB	SR 112/Davis	Marina Blvd	San L	0.82	N	4	3092	60.1	A	2397	63.0	A	
F110	I-880 - SB	Marina Blvd	SR 238 WB (merge)	Oak - San L	2.55	N	4	3092	59.9	B	2397	59.7	B	
F111	I-880 - SB	I-238 (Marina before 06)	A St	Uninc	1.91	C	5	3092	52.7	C	2397	37.9	E	
F112	I-880 - SB	A St	Rt 92	Hay	1.7	C	5	3092	55.9	B	2397	46.2	D	
F113	I-880 - SB	Rt 92	Tennyson	Hay	1.01	C	5	3092	57.4	B	2397	45.7	D	
F114	I-880 - SB	Tennyson	Alv-Niles	Hay - Uni Cty	2.6	C	4	3092	58.5	B	2397	49.5	C	
F115	I-880 - SB	Alvarado-Niles	Alvarado	Uni Cty - Fre	1.56	C	4	3092	59.2	B	2397	51.7	C	

Table B-3: 2016 LOS Monitoring Results for Freeways (Tier 1) – Weekend Midday Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F116	I-880 - SB	Alvarado	Decoto	Fre	1.19	C	4	3092	51.8	C	2397	42.5	D	
F117	I-880 - SB	Decoto	Stevenson	Fre	4.06	S	4	3092	50.9	C	2397	44.7	D	
F118	I-880 - SB	Stevenson	AutoMall Pkwy	Fre	1.52	C	4	3092	65.4	A	2397	61.1	A	
F119	I-880 - SB	AutoMall Pkwy	Rt 262/Mission	Fre	2.83	C	4	3092	67.1	A	2396	65.5	A	
F120	I-880 - SB	SR 262/Mission	Dix Landing(off)	Fre	1.69	S	4	3092	67.9	A	2397	66.9	A	
F121	I-980 - WB	SR 24 @ 580	I-880	Oak	2.49	N	4	3092	61.3	A	2338	63.6	A	
F122	I-980 - EB	I-880	SR 24 @ 580	Oak	2.44	N	4	3092	62.1	A	2350	60.9	A	
F123	SR 13 - NB	Mountain On	Carson/Redwood (1) (off)	Oak	1.27	N	2	1781	61.5	A	1849	60.6	A	
F124	SR 13 - NB	Carson/Redwood (1) (off)	Joaguin Miller	Oak	1.08	N	2	2129	61.2	A	1845	61.9	A	
F125	SR 13 - NB	Joa Miller/Linc	Moraga Ave	Oak	1.83	N	2	2014	62.1	A	1828	61.3	A	
F126	SR 13 - NB	Moraga Ave	Hiller (Sig)	Oak	1.63	N	2	980	50.9	C	1338	47.2	D	
F127	SR 13 - SB	Hiller Sig	Moraga Ave	Oak	1.6	N	2	635	53.5	C	902	52.9	C	
F128	SR 13 - SB	Moraga Ave	Joa Miller/Linc	Oak	1.85	N	2	1895	62.1	A	1811	61.7	A	
F129	SR 13 - SB	Joaq Miller/Lincoln	Redwood	Oak	1.07	N	2	2057	65.2	A	1945	65.6	A	
F130	SR 13 - SB	Redwood	Jct I-580 (EB Merge)	Oak	1.4	N	2	1944	62.4	A	1857	60.8	A	
F131	SR 24 - EB	Jct I-580 (on)	Broadway/SR 13	Oak	1.84	N	4	3092	63.2	A	2370	63.9	A	
F132	SR 24 - EB	Broadway/SR 13	Caldecott (enter)	Oak	1.65	N	4	3092	58.4	B	2381	54.7	C	
F133	SR 24 - EB	Caldecott (enter)	Fish Ranch Road	Oak	1.04	N	4	2895	49.6	C	1969	44.9	D	
F134	SR 24 - WB	Fish Ranch Road (CC)	Caldecott (exit)	Oak	0.99	N	4	1390	55.1	B	2019	58.8	B	
F135	SR 24 - WB	Caldecott (exit)	Broadway	Oak	1.73	N	4	2982	62.5	A	2014	65.5	A	
F136	SR 24 - WB	Broadway	Jct I-580 (on)	Oak	1.86	N	4	3092	54.8	C	2389	59.3	B	
F137	SR 84 - EB	San M CL	Toll Plaza	Fre	3.29	S	3	3092	65.3	A	2355	65.3	A	
F138	SR 84 - EB	Toll Plaza	Thornton	Fre	0.54	S	3	3092	65.5	A	2293	66.4	A	
F139	SR 84 - EB	Thornton Ave/Pascon Padre	Newark Blvd/Ardenwood Blvd	New	1.16	S	3	3092	63.9	A	2178	64.7	A	
F140	SR 84 - EB	Newark Blvd/Ardenwood Blvd	I-880 NB (off)	New	1.2	S	2	2992	47.9	D	2136	46.0	D	
F141	SR 84 - WB	I-880 NB (off)	Ardenwood/Newark	New	1.21	S	3	1979	49.5	C	2211	47.5	D	
F142	SR 84 - WB	Ardenwood/Newark	Paseo Padre Pkwy	New	1.15	S	3	1933	64.0	A	2069	63.3	A	
F143	SR 84 - WB	Paseo Padre Pkwy	Toll Gate	Fre	0.54	S	3	3092	46.9	D	2316	47.9	D	
F144	SR 84 - WB	Toll Plaza	San M CL	Fre	3.29	C	3	2160	61.0	A	2360	61.2	A	
F145	SR 92 - EB	San M CL	Toll Plaza	Hay	2.78	C	3	2989	66.9	A	2380	66.1	A	

Table B-3: 2016 LOS Monitoring Results for Freeways (Tier 1) – Weekend Midday Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F146	SR 92 - EB	Toll Plaza	Clawiter	Hay	1.87	C	3	2933	67.2	A	2363	66.3	A	
F147	SR 92 - EB	Clawiter	I-880	Hay	2.07	C	4	2306	60.1	A	1392	58.4	B	
F148	SR 92 - WB	I-880	Clawiter	Hay	2.05	C	4	2878	63.4	A	2265	61.2	A	
F149	SR 92 - WB	Clawiter	Toll Plaza	Hay	1.88	C	4	3045	56.8	B	2387	53.8	C	
F150	SR 92 - WB	Toll Plaza	San M CL	Hay	2.79	C	3	3043	66.6	A	2387	65.2	A	

Notes
[1] Data impacted by long term construction and recurrent lane closures
[2] Monitored in 2014 with floating car surveys
[3] Express Lane Ramp Up Period

B.2 | Ramps and Special Segments (Tier 1)

Table B-4: 2016 LOS Monitoring Results for Ramps and Special Segments (Tier 1) - PM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Plan Area	Length (mi)	No of lanes	Free flow speed	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
R1	I-80/I-580 Interchange	I-80 SB	I-580 EB	Oak	N	0.4	2	38.0	3779	31.7	B	3679	28.5	C	
R2	I-80/I-580 Interchange	I-580 WB	I-80 NB	Oak	N	0.45	2	40.0	3774	23.8	E	3675	18.9	F	
R3	SR 24 WB/I-580 WB	SR 24 Off	I-580 On	Oak	N	0.77	2	Weaving	2690	36.9	N/A	7	49.8	N/A	[1]
R4	I-580/SR 24 Interchange	I-580 WB	SR-24 EB	Oak	N	0.53	2	45.0	3720	20.7	F	3352	17.5	F	
R5	I-580/SR 24 Interchange	SR-24 WB	I-580 EB	Oak	N	0.75	2	51.0	2400	30.7	D	3168	16.2	F	
R6	SR13/SR 24 Interchange	SR-13 NB	SR-24 EB	Oak	N	0.33	1	40.0	3558	12.0	F	3591	11.4	F	
R7	SR13/SR 24 Interchange	SR-24 WB	SR-13 SB	Oak	N	0.16	1	31.0	2382	42.8	A	3332	24.9	B	
R8	I-880/I-238 Interchange	I-880 SB	I-238 EB	San L	C	0.75	2	47.0	2480	44.4	A	2150	26.0	E	
R9	I-880/I-238 Interchange	I-238 WB	I-880 NB	San L	C	0.51	2	54.0	2454	55.8	A	2150	52.9	A	
R10	I-880/I-238 Interchange	I-880 NB	I-238 EB	San L	C	0.42	2	32.0	3750	28.4	B	3679	21.2	D	
R11	I-880/I-238 Interchange	I-238 WB	I-880 SB	San L	C	0.81	2	53.0	3774	51.4	A	3676	47.4	B	
R12	I-580 /I-238 Interchange	I-580 SB	I-238 WB	Hay	C	0.7	1	37.0	N/A - segment correction			3679	52.0	A	
R13	I-580 /I-238 Interchange	I-238 EB	I-580 NB	Hay	C	0.36	1	38.0	N/A - segment correction			3679	64.4	A	
R14	I-580/I-680 Interchange	I-580 EB	I-680 NB	Plea	E	0.52	1	35.0	3037	38.0	A	3285	33.6	A	
R15	I-580/I-680 Interchange	I-580 EB	I-680 SB	Plea	E	0.29	1	42.0	2082	44.4	A	2685	39.5	A	
R16	I-580/I-680 Interchange	I-680 NB	I-580 EB	Plea	E	0.92	2	63.8	3813	55.5	B	3666	53.8	B	
R17	I-580/I-680 Interchange	I-680 NB	I-580 WB	Plea	E	0.62	1	41.0	1453	39.9	A	2919	37.6	A	
R18	I-580/I-680 Interchange	I-580 WB	I-680 NB	Plea	E	0.42	2	51.5	3582	47.9	A	3550	50.1	A	
R19	I-580/I-680 Interchange	I-580 WB	I-680 SB	Plea	E	0.64	1	39.0	3420	34.1	B	3426	37.4	A	
R20	I-580/I-680 Interchange	I-680 SB	I-580 EB	Plea	E	1.22	2	68.1	3836	58.2	B	3630	58.1	B	
R21	I-580/I-680 Interchange	I-680 SB	I-580 WB	Plea	E	0.44	2	58.4	3633	53.7	A	3621	48.6	B	
R22	I-880/SR 260 Connection	I-880 SB	SR-260 WB	Oak	N	0.99	varies	32.0	6	15.4	F	6	16.6	E	[1]
R23	I-880/SR 260 Connection	SR-260 EB	I-880 NB	Oak	N	0.41	varies	35.0	6	15.8	F	6	17.2	F	[1]

[1] Conducted with Floating Car Surveys

Table B-5: 2016 LOS Monitoring Results for Ramps and Special Segments (Tier 1) - AM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Plan Area	Length (mi)	# Lanes	Free Flow Speed	2014 Results			2016 Results			Note
		From	To						Sample	Speed	LOS	Sample	Speed	LOS	
R1	I-80/I-580 Interchange	I-80 SB	I-580 EB	Oak	N	0.4	2	38.0	3775	45.6	A	3619	46.1	A	
R2	I-80/I-580 Interchange	I-580 WB	I-80 NB	Oak	N	0.45	2	40.0	3765	34.1	B	3617	37.4	A	
R3	SR 24 WB/I-580 WB	SR 24 off	I-580 on	Oak	N	0.77	2	Weaving	3632	15.6	N/A	7	30.7	N/A	[1]
R4	I-580/SR 24 Interchange	I-580 WB	SR-24 EB	Oak	N	0.53	2	45.0	2490	55.8	A	2998	53.5	A	
R5	I-580/SR 24 Interchange	SR-24 WB	I-580 EB	Oak	N	0.75	2	51.0	2303	36.9	C	2914	42.7	B	
R6	SR13/SR 24 Interchange	SR-13 NB	SR-24 EB	Oak	N	0.33	1	40.0	2551	36.8	A	3065	43.9	A	
R7	SR13/SR 24 Interchange	SR-24 WB	SR-13 SB	Oak	N	0.16	1	31.0	2914	39.9	A	3219	37.3	A	
R8	I-880/I-238 Interchange	I-880 SB	I-238 EB	San L	C	0.75	2	47.0	3775	51.3	A	3608	50.0	A	
R9	I-880/I-238 Interchange	I-238 WB	I-880 NB	San L	C	0.51	2	54.0	3765	15.3	F	3619	13.0	F	
R10	I-880/I-238 Interchange	I-880 NB	I-238 EB	San L	C	0.42	2	32.0	3766	48.4	A	3619	46.8	A	
R11	I-880/I-238 Interchange	I-238 WB	I-880 SB	San L	C	0.81	2	53.0	3775	28.1	E	3619	29.6	E	
R12	I-580 /I-238 Interchange	I-580 SB	I-238 WB	Hay	C	0.7	1	37.0	N/A - Segment Correction			3619	45.6	A	
R13	I-580 /I-238 Interchange	I-238 EB	I-580 NB	Hay	C	0.36	1	38.0	N/A - Segment Correction			3619	64.7	A	
R14	I-580/I-680 Interchange	I-580 EB	I-680 NB	Plea	E	0.52	1	35.0	2958	37.5	A	3480	30.5	B	
R15	I-580/I-680 Interchange	I-580 EB	I-680 SB	Plea	E	0.29	1	42.0	2191	29.2	D	3081	21.5	E	
R16	I-580/I-680 Interchange	I-680 NB	I-580 EB	Plea	E	0.92	2	63.8	3774	58.0	A	3575	55.4	B	
R17	I-580/I-680 Interchange	I-680 NB	I-580 WB	Plea	E	0.62	1	41.0	2556	38.1	A	3340	33.8	B	
R18	I-580/I-680 Interchange	I-580 WB	I-680 NB	Plea	E	0.42	2	51.5	3866	45.9	B	3557	46.1	B	
R19	I-580/I-680 Interchange	I-580 WB	I-680 SB	Plea	E	0.64	1	39.0	3898	20.0	E	3594	16.3	F	
R20	I-580/I-680 Interchange	I-680 SB	I-580 EB	Plea	E	1.22	2	68.1	3703	61.8	A	3556	61.8	A	
R21	I-580/I-680 Interchange	I-680 SB	I-580 WB	Plea	E	0.44	2	58.4	3725	57.2	A	3555	58.5	A	
R22	I-880/SR 260 Connection	I-880 SB	SR-260 WB	Oak	N	0.99	varies	32.0	6	22.8	C	6	39.0	A	[1]
R23	I-880/SR 260 Connection	SR-260 EB	I-880 NB	Oak	N	0.41	varies	35.0	6	14.6	F	6	4.3	F	[1]

[1] Conducted with Floating Car Surveys

B.3 | Arterials (Tier 1)

Table B-6: 2016 LOS Monitoring Results for Arterials (Tier 1) - PM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A1	150th St - EB	Hesperian	I-580	San L	0.49	II	C	2	6	12.5	E	6	13.0	E	
A2	150th St - WB	I-580	Hesperian	San L	0.49	II	C	2	6	13.4	E	6	12.9	E	
A3	A Street - EB	I-880	Western	Hay	1.08	II	C	2	9	20.8	C	6	21.7	C	
A4	A Street - EB	Western	SR 185 (previously SR 238)	Hay	0.31	III	C	2	9	14.7	C	6	11.9	D	
A5	A Street - WB	SR 238	Western	Hay	0.54	III	C	2	6	10.7	D	6	17.2	C	
A6	A Street - WB	Western	I-880	Hay	1.07	II	C	2	6	20.6	C	6	19.1	C	
A7	Atlantic - EB	Main	Webster	Ala	0.81	II	N	2	6	20.6	C	6	23.3	C	
A8	Atlantic - WB	Webster	Main	Ala	0.81	II	N	2	6	22.1	C	6	23.4	C	
A9	Hegenberger - EB	SR 61	Edgewater	Oak	0.77	I	N	3	6	16.5	E	6	24.2	C	
A10	Hegenberger - EB	Edgewater	Baldwin	Oak	0.73	I	N	3	6	21.6	D	6	24.7	C	
A11	Hegenberger - EB	Baldwin	E 14th	Oak	1.02	I	N	3	6	22.1	C	6	25.3	C	
A12	Hegenberger - WB	E 14th	Baldwin	Oak	1.02	I	N	3	6	17.7	D	6	24.7	C	
A13	Hegenberger - WB	Baldwin	Edgewater	Oak	0.72	I	N	3	6	18.2	D	6	21.9	D	
A14	Hegenberger - WB	Edgewater	SR 61	Oak	0.77	I	N	3	6	20.2	D	6	22.6	C	
A15	Hesperian - NB	Tennyson	SH 92 - WB	Hay	0.49	I	C	3	7	13.8	E	8	13.5	E	
A16	Hesperian - NB	SH 92	La Playa	Hay	0.78	II	C	3	7	16.0	D	8	18.0	C	
A17	Hesperian - NB	La Playa	W.Winton Ave.	Hay	0.43	II	C	3	7	7.0	F	8	4.1	F	
A18	Hesperian - NB	W.Winton Ave	A St	Hay	0.97	II	C	3	7	18.5	C	8	22.4	C	
A19	Hesperian - NB	A St	Hacienda	Uninc	0.67	II	C	3	7	21.9	C	8	16.1	D	
A20	Hesperian - NB	Hacienda	Grant	Uninc	0.66	II	C	3	7	20.3	C	8	22.9	C	
A21	Hesperian - NB	Grant	Llewelling	Uninc	0.27	II	C	3	7	10.2	E	8	9.8	F	
A22	Hesperian - NB	Llewelling	Springlake	Uninc	0.39	II	C	3	7	17.1	D	8	19.1	C	
A23	Hesperian - NB	Springlake	Fairmont	San L	0.66	II	C	3	7	16.3	D	8	10.7	E	
A24	Hesperian - NB	Fairmont	14th	San L	0.31	II	C	2	7	10.1	E	8	12.9	E	
A25	Hesperian - SB	14th	Fairmont	San L	0.31	II	C	2	6	10.9	E	8	12.2	E	
A26	Hesperian - SB	Fairmont	Springlake	San L	0.66	II	C	3	6	19.1	C	8	14.1	D	
A27	Hesperian - SB	Springlake	Llewelling	Uninc	0.39	II	C	3	6	12.4	E	8	9.7	F	
A28	Hesperian - SB	Llewelling	Grant	Uninc	0.27	II	C	3	6	11.3	E	8	10.3	E	

Table B-6: 2016 LOS Monitoring Results for Arterials (Tier 1) - PM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A29	Hesperian - SB	Grant	Hacienda	Uninc	0.66	II	C	3	6	21.5	C	8	28.4	B	
A30	Hesperian - SB	Hacienda	A St	Uninc	0.67	II	C	3	6	19.3	C	8	16.5	D	
A31	Hesperian - SB	A St	W.Winton Ave.	Hay	0.97	II	C	3	6	19.2	C	8	28.9	B	
A32	Hesperian - SB	W.Winton Ave	La Playa	Hay	0.43	II	C	3	6	18.1	C	8	14.6	D	
A33	Hesperian - SB	La Playa	SH 92	Hay	0.78	II	C	3	6	18.9	C	8	19.1	C	
A34	Hesperian - SB	SH 92 - WB	Tennyson	Hay	0.49	I	C	3	6	20.6	D	8	20.5	D	
A35	Mowry - EB	I-880	Farwell	Fre	0.28	II	S	3	7	26.1	B	6	13.7	E	
A36	Mowry - EB	Farwell	SH 84	Fre	2.48	II	S	3	7	23.0	C	6	18.4	C	
A37	Mowry - WB	SH 84	Farwell	Fre	2.53	II	S	3	7	21.0	C	6	19.4	C	
A38	Mowry - WB	Farwell	I-880	Fre	0.28	II	S	3	7	20.1	C	6	36.3	A	
A39	Park/23rd - EB	Encinal	Santa Clara	Ala	0.23	III	N	2	6	9.3	D	6	11.1	D	
A40	Park/23rd - EB	Santa Clara	Kennedy	Ala	0.68	III	N	2	6	14.0	C	6	13.6	C	
A41	Park/23rd - EB	Kennedy	E 11th	Oak	0.45	II	N	2	6	18.4	C	6	17.4	D	
A42	Park/23rd - WB	E 11th	Kennedy	Oak	0.45	II	N	2	6	15.8	D	6	22.9	C	
A43	Park/23rd - WB	Kennedy	Santa Clara	Ala	0.74	III	N	2	6	10.6	D	6	12.6	D	
A44	Park/23rd - WB	Santa Clara	Encinal	Ala	0.23	III	N	2	6	11.8	D	6	10.2	D	
A45	MLK Jr Way - NB	SH 24	Adeline	Oak	1.48	II	N	3	6	21.7	C	9	10.5	E	
A46	Adeline - NB	MLK Jr – South	MLK Jr – North	Berk	0.28	II	N	3	6	12.1	E	10	9.7	F	
A47	Adeline - NB	MLK Jr - North	Shattuck/Adeline	Berk	0.61	II	N	3	6	18.9	C	10	16.0	D	
A48	Shattuck NB	Shattuck/Adeline	Dwight	Berk	0.31	II	N	2	6	16.1	D	6	13.3	E	
A49	Shattuck NB	Dwight	University	Berk	0.57	III	N	2	6	15.0	C	6	12.9	D	
A50	Shattuck SB	University	Dwight	Berk	0.57	III	N	2	6	12.4	D	6	11.1	D	
A51	Shattuck SB	Dwight	Shattuck/Adeline	Berk	0.30	II	N	2	6	23.4	C	6	16.8	D	
A52	Adeline - SB	Shattuck/Adeline	MLK Jr – North	Berk	0.61	II	N	3	6	12.6	E	6	15.7	D	
A53	Adeline - SB	MLK Jr - North	MLK Jr - South	Berk	0.29	II	N	3	6	15.3	D	6	10.6	E	
A54	MLK Jr Way - SB	Adeline	SH 24	Oak	1.39	II	N	3	6	12.7	E	6	11.3	E	
A55	Tennyson - EB	Hesperian	I-880	Hay	0.86	I	C	2	8	14.2	E	6	19.2	D	
A56	Tennyson - EB	I-880 NB	Rt 238	Hay	1.54	II	C	2	8	10.7	E	6	20.9	C	
A57	Tennyson - WB	Rt 238	I-880	Hay	1.54	II	C	2	6	16.5	D	6	16.8	D	
A58	Tennyson - WB	I-880	Hesperian	Hay	0.86	I	C	2	6	27.3	C	6	24.2	C	

Table B-6: 2016 LOS Monitoring Results for Arterials (Tier 1) - PM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A59	University - EB	I-80 SB	6th	Berk	0.40	II	N	2	6	19.6	C	6	26.4	B	
A60	University - EB	6th	San Pablo	Berk	0.32	II	N	2	6	11.5	E	6	10.4	E	
A61	University - EB	San Pablo	Sacramento	Berk	0.56	II	N	2	6	20.8	C	6	14.9	D	
A62	University - EB	Sacramento	ML King	Berk	0.49	II	N	2	6	17.5	D	6	14.7	D	
A63	University - EB	ML King	Shattuck Pl	Berk	0.29	III	N	2	6	21.5	B	6	15.2	C	
A64	University - WB	Shattuck Pl	ML King	Berk	0.29	III	N	2	7	8.6	E	6	13.8	C	
A65	University - WB	ML King	Sacramento	Berk	0.49	II	N	2	7	18.3	C	6	20.6	C	
A66	University - WB	Sacramento	San Pablo	Berk	0.56	II	N	2	7	10.3	E	6	13.3	E	
A67	University - WB	San Pablo	6th	Berk	0.32	II	N	2	7	7.6	F	6	8.1	F	
A68	University - WB	6th	I-80 SB	Berk	0.40	II	N	2	7	33.7	A	6	25.1	B	
A69	SR 13 Ashby - WB	Hiller	Domingo	Oak - Berk	0.81	II	N	1	6	21.8	C	6	21.9	C	
A70	SR 13 Ashby - WB	Domingo	College	Berk	0.52	III	N	2	6	20.9	B	6	17.5	C	
A71	SR 13 Ashby - WB	College	Telegraph	Berk	0.37	III	N	2	6	14.4	C	6	13.4	C	
A72	SR 13 Ashby - WB	Telegraph	Shattuck	Berk	0.38	III	N	2	6	12.3	D	6	11.3	D	
A73	SR 13 Ashby - WB	Shattuck	ML King	Berk	0.26	III	N	2	6	13.1	C	6	11.0	D	
A74	SR 13 Ashby - WB	ML King	San Pablo	Berk	0.86	III	N	2	6	12.3	D	6	13.9	C	
A75	SR 13 Ashby - WB	San Pablo	I-80 Ramps	Berk	0.64	II	N	2	6	11.8	E	6	18.0	D	
A76	SR 13 Ashby - EB	I-80	San Pablo	Berk	0.62	II	N	2	8	24.6	B	6	21.2	C	
A77	SR 13 Ashby - EB	San Pablo	ML King	Berk	0.86	III	N	2	8	17.0	C	6	19.7	B	
A78	SR 13 Ashby - EB	ML King	Shattuck	Berk	0.26	III	N	2	8	9.8	D	6	9.3	D	
A79	SR 13 Ashby - EB	Shattuck	Telegraph	Berk	0.38	III	N	2	8	13.2	C	6	18.2	C	
A80	SR 13 Ashby - EB	Telegraph	College	Berk	0.37	III	N	2	8	9.5	D	6	7.7	E	
A81	SR 13 Ashby - EB	College	Domingo	Berk	0.52	III	N	2	8	9.8	D	6	9.5	D	
A82	SR 13 Ashby - EB	Domingo	Hiller	Berk - Oak	0.81	II	N	1	8	13.3	E	6	19.9	C	
A83	SR 61 - SB	Atlantic	Cent/Webster	Ala	0.57	III	N	2	6	12.3	D	6	13.0	C	
A84	SR 61 - SB	Cent/Webster	Sher/Encino	Ala	0.74	II	N	2	6	15.3	D	6	18.4	C	
A85	SR 61 - SB	Sher/Encino	Park	Ala	1.20	II	N	2	6	17.9	D	6	21.1	C	
A86	SR 61 - SB	Park	High/Otis	Ala	1.05	II	N	2	6	16.2	D	6	17.4	D	
A87	SR 61 (Doolittle) - SB	High	Island Dr	Ala	0.44	II	N	2	6	18.9	C	6	22.1	C	
A88	SR 61 (Doolittle) - SB	Island Dr	Harbor Bay Pkwy	Ala	0.51	I	N	2	6	22.4	C	6	30.5	B	

Table B-6: 2016 LOS Monitoring Results for Arterials (Tier 1) - PM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A89	SR 61 - SB	Harbor Bay	Airport Dr	Oak	2.17	I	N	2	6	32.5	B	6	31.4	B	
A90	SR 61 (Doolittle) - SB	Airport	Davis	Oak - San L	0.94	I	N	2	6	24.2	C	6	25.6	C	
A91	SR 61 (Doolittle) - NB	Davis	Airport	San L - Oak	0.94	I	C	2	6	27.2	C	6	25.5	C	
A92	SR 61 - NB	Airport Dr	Harbor Bay	Oak	2.17	I	N	2	6	31.4	B	6	37.7	A	
A93	SR 61 (Doolittle) - NB	Harbor Bay	Island Dr	Ala	0.51	I	N	2	6	29.0	B	6	32.8	A	
A94	SR 61 (Doolittle) - NB	Island Dr	High/Otis	Ala	0.44	II	N	2	6	19.6	C	6	16.3	D	
A95	SR 61 - NB	High/Otis	Park	Ala	1.05	II	N	2	6	18.4	C	6	17.5	D	
A96	SR 61 - NB	Park/Encinal	Sher/Cent	Ala	1.20	II	N	2	6	18.9	C	6	21.4	C	
A97	SR 61 - NB	Sher/Cent	Web/Cent	Ala	0.74	II	N	2	6	16.2	D	6	15.0	D	
A98	SR 61 - NB	Cent/Web	Atlantic	Ala	0.57	III	N	2	6	13.9	C	6	11.1	D	
A99	SR 77 (42nd) - EB	I-880 NB	E 14th	Oak	0.36	I	N	2	6	29.3	B	6	28.2	B	
A100	SR 77 (42nd) - WB	E 14 th	I-880 NB	Oak	0.36	I	N	2	6	26.8	C	6	30.8	B	
A101	Decoto - WB	SH 238/Mission	Union Square	Uni Cty	0.86	II	S	2	6	21.9	C	6	23.0	C	
A102	Decoto - WB	Union Square	Alv-Niles Rd	Uni Cty	0.24	II	S	2	6	12.6	E	6	8.0	F	
A103	Decoto - WB	Alv-Niles Rd	Fremont CL	Uni Cty	0.65	II	S	2	6	15.9	D	6	24.2	B	
A104	Decoto - WB	Fremont CL	I-880 NB (off)	Fre	1.15	II	S	2	6	26.5	B	6	24.8	B	
A105	Decoto - EB	I-880 NB (off)	Union City CL	Fre	1.15	II	S	2	6	14.9	D	6	19.0	C	
A106	Decoto - EB	Union City CL	Alv-Niles Rd	Uni Cty	0.66	II	S	2	6	20.8	C	8	12.8	E	
A107	Decoto - EB	Alv-Niles Rd	Union Square	Uni Cty	0.24	II	S	2	6	14.5	D	8	10.6	E	
A108	Decoto - EB	Union Square	SH 238/Mission	Uni Cty	0.85	II	S	2	6	15.5	D	6	18.1	C	
A109	SR 84/Mowry (Fre)-WB	SH 238	Peralta	Fre	0.81	I	S	2	6	28.5	B	6	26.6	C	
A110	SR 84/Peralta (Fre)-WB	Mowry	Fremont	Fre	1.66	I	S	1	6	32.0	B	6	25.7	C	
A111	SR 84/Fremont(Fre)-WB	Peralta	Thornton	Fre	0.33	II	S	2	6	25.8	B	8	9.3	F	
A112	SR 84/Thornton(Fre)-WB	Fremont	I-880 SB	Fre	1.26	II	S	3	6	16.3	D	6	23.5	C	
A113	SR 84/Thornton (Fre)-EB	I-880 SB	Fremont	Fre	1.26	II	S	3	6	22.6	C	6	22.9	C	
A114	SR 84/Fremont (Fre)-EB	Thornton	Peralta	Fre	0.32	II	S	2	6	18.9	C	6	10.6	E	
A115	SR 84/Peralta (Fre) - EB	Fremont	Mowry	Fre	1.64	I	S	1	6	20.9	D	6	22.8	C	
A116	SR 84/Mowry (Fre) - EB	Peralta	SH 238	Fre	0.86	I	S	2	6	23.4	C	6	18.0	D	

Table B-6: 2016 LOS Monitoring Results for Arterials (Tier 1) - PM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A117	1st Street - SB	I-580 Off	N Mines	Liv	0.60	I	E	3	7	25.8	C	6	13.9	E	
A118	1st Street - SB	N Mines	Inman	Liv	1.06	I	E	2	7	26.4	C	6	29.7	B	
A119	1st Street - NB	Inman	N Mines	Liv	1.06	I	E	2	7	34.9	B	6	31.7	B	
A120	1st Street - NB	N Mines	I-580 Off	Liv	0.60	I	E	3	7	24.9	C	6	21.6	D	
A121	SR 84 - EB	SR 238/Mission	Union City Limit	Fre	1.35	42	S	1	8	43.7	A	8	18.4	F	
A122	SR 84 - EB	Union City Limit	Palomares	Fre	0.86	45	S	1	8	37.6	B	6	26.3	E	
A123	SR 84 - EB	Palomares	Niles Cnyn Quarry	Fre	2.16	44	S	1	8	46.8	A	6	34.0	C	
A124	SR 84 - EB	Niles Cnyn Quarry	Sunol Rd	Fre	1.74	47	S	1	8	44.4	A	6	40.5	B	
A125	SR 84 - EB	Sunol Rd	Plea-Sunol Rd	Fre	0.55	28	S	1	8	4.5	F	8	5.0	F	
A126	SR 84 - EB	Ple-Sunol Rd	SR 84 (Off)/I-680	Uninc	0.80	43	E	1	8	37.1	B	8	37.0	B	
A127	SR 84 - EB	SR 84 (Off)/I-680	Vallecitos Ln	Uninc	1.05	51	E	1	8	12.1	F	8	10.8	F	
A128	SR 84 - EB	Vallecitos Ln	Vallecitos Nuc.Cntr	Uninc	1.13	58	E	1	8	34.0	E	8	28.4	F	
A129	SR 84 - EB	Vallecitos Nuc Center Ent.	Culvert (Lat/Long: 37.613854,-121.817224)	Uninc	1.66	58	E	1	8	37.3	D	6	45.3	C	
A130	SR 84 - EB	Culvert (Lat/Long: 37.613854,-121.817224)	Ruby Hill /Kaithoff	Uninc	1.63	59	E	2	8	61.7	A	6	61.9	A	[1]
A131	SR 84 - EB	Ruby Hill./Kaithoff	Isabel/Vallecitos	Liv	0.38	I	E	1	8	46.0	A	6	33.3	A	[1]
A132	SR 84 (Liv) - NB	Isabel/Vallecitos	Vineyard	Liv	1.12	I	E	1	6	43.9	A	6	29.9	B	[1]
A133	SR 84 (Liv) - NB	Vineyard	Concannon	Liv	0.60	I	E	1	6	31.4	B	6	26.3	C	[1]
A134	SR 84 (Liv) - NB	Concannon	Stanley	Liv	1.05	I	E	1	6	29.9	B	6	39.5	A	[1]
A135	SR 84 (Liv) - NB	Stanley	W. Jack London Blvd.	Liv	0.90	I	E	1	6	46.1	A	6	41.6	A	
A136	SR 84 (Liv) - NB	W. Jack London Blvd.	Airway/Kitty Hawk	Liv	0.49	I	E	3	6	19.6	D	6	40.7	A	
A137	Airway Blvd (old SR 84) - NB	SR 84	I-580 EB off ramp	Liv	1.06	I	E	1	6	33.0	B	6	33.2	B	
A138	Airway Blvd (old SR 84) - SB	I-580 EB off ramp	SR 84	Liv	1.06	I	E	1	6	26.7	C	6	37.0	A	
A139	SR 84 (Liv) - SB	Airway/Kitty	W. Jack London Blvd.	Liv	0.49	I	E	3	6	19.1	D	6	30.2	B	
A140	SR 84 (Liv) - SB	W. Jack London Blvd.	Stanley	Liv	0.90	I	E	1	6	27.9	C	6	42.4	A	
A141	SR 84 (Liv) - SB	Stanley	Concannon	Liv	1.05	I	E	1	6	39.5	A	6	28.3	B	[1]
A142	SR 84 (Liv) - SB	Concannon	Vineyard	Liv	0.60	I	E	1	6	33.3	B	6	14.7	E	[1]
A143	SR 84 (Liv) - SB	Vineyard	Isabel/Vallecitos	Liv	1.12	I	E	1	6	34.6	B	6	34.5	B	[1]

Table B-6: 2016 LOS Monitoring Results for Arterials (Tier 1) - PM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A144	SR 84 - WB	Isabel/Vallecitos	Ruby Hill /Kaithoff	Liv	0.38	I	E	1	6	44.6	A	6	32.9	B	[1]
A145	SR 84 - WB	Ruby Hill /Kaithoff	Culvert (Lat/Long: 37.613854,-121.817224)	Uninc	1.63	56	E	2	6	54.2	A	6	57.2	A	[1]
A146	SR 84 - WB	Culvert (Lat/Long: 37.613854,-121.817224)	Vallecitos Nuc.Cntr	Uninc	1.65	57	E	1	6	55.4	A	6	56.6	A	
A147	SR 84 - WB	Vallecitos Nuc.Cntr	Vallecitos Ln	Uninc	1.14	53	S	1	6	48.6	A	6	52.9	A	
A148	SR 84 - WB	Vallecitos Ln	SR 84/I-680 On	Uninc	0.86	55	S	1	6	47.4	A	6	52.8	A	
A149	SR 84 - WB	SR 84/I-680 On	Ple-Sunol Rd	Uninc	0.62	41	S	1	6	32.5	C	6	36.0	B	
A150	SR 84 - WB	Ple-Sunol Rd	Sunol Rd	Fre	0.55	42	S	1	6	39.1	A	6	34.0	B	
A151	SR 84 - WB	Sunol Rd	Niles Canyon Quarry	Fre	1.74	49	S	1	6	48.1	A	6	46.9	A	
A152	SR 84 - WB	Niles Canyon Quarry	Eastern Fremont City Limit	Fre	1.00	48	S	1	6	42.0	B	6	45.0	A	
A153	SR 84 - WB	Eastern Fremont City Limit	Union City Limit	Fre	2.03	42	S	1	6	40.6	A	6	42.4	A	
A154	SR 84 - WB	Union City Limit	SR 238	Fre	1.35	32	S	1	6	32.3	A	6	32.7	A	
A155	SR 92 - EB	I-880	Mission	Hay	1.71	II	C	3	6	14.5	D	6	10.6	E	
A156	SR 92 - WB	Mission	I-880	Hay	1.71	II	C	3	6	18.4	C	6	22.8	C	
A157	SR 112 (Davis) - EB	Doolittle	I-880	San L	0.52	II	C	2	9	6.5	F	6	12.6	E	
A158	SR 112 (Davis) - EB	I-880	San Leandro	San L	0.99	II	C	2	9	14.8	D	6	13.0	E	
A159	SR 112 (Davis) - EB	San Leandro	14th	San L	0.28	III	C	2	9	15.5	C	6	11.9	D	
A160	SR 112 (Davis) - WB	E 14th	San Leandro	San L	0.28	III	C	2	6	7.2	E	6	11.4	D	
A161	SR 112 (Davis) - WB	San Leandro	I-880	San L	0.99	II	C	2	6	24.4	B	6	19.1	C	
A162	SR 112 (Davis) - WB	I-880	Doolittle	San L	0.52	II	C	2	6	15.0	D	6	19.0	C	
A163	SR 123 San Pablo - SB	Carlson	Washington	Alb	0.51	II	N	2	8	17.5	D	8	21.9	C	
A164	SR 123 San Pablo - SB	Washington	Marin	Alb	0.36	III	N	2	8	13.6	C	8	10.5	D	
A165	SR 123 San Pablo - SB	Marin	Gilman	Alb - Berk	0.45	II	N	2	8	14.7	D	8	9.6	F	
A166	SR 123 San Pablo - SB	Gilman	University	Berk	0.81	II	N	2	8	17.6	D	8	17.9	D	
A167	SR 123 San Pablo - SB	University	Allston	Berk	0.19	III	N	2	8	13.7	C	8	11.6	D	
A168	SR 123 San Pablo - SB	Allston	Dwight	Berk	0.38	II	N	2	8	18.3	C	8	20.7	C	
A169	SR 123 San Pablo - SB	Dwight	Ashby	Berk	0.64	II	N	2	8	13.3	E	8	14.2	D	
A170	SR 123 San Pablo - SB	Ashby	Stanford	Oak	0.80	II	N	2	8	17.4	D	8	20.1	C	
A171	SR 123 San Pablo - SB	Stanford	53rd	Oak	0.27	II	N	2	8	18.4	C	8	13.6	E	

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CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A172	SR 123 San Pablo - SB	53rd	Park	Emery	0.34	II	N	2	8	14.5	D	8	10.1	E	[1]
A173	SR 123 San Pablo - SB	Park	35th	Emery - Oak	0.44	II	N	2	8	9.7	F	8	6.4	F	[1]
A174	SR 123 San Pablo - NB	35th	Park	Oak - Emery	0.42	II	N	2	6	10.4	E	6	24.5	B	[1]
A175	SR 123 San Pablo - NB	Park	53rd	Emery	0.34	II	N	2	6	28.2	B	6	18.9	C	[1]
A176	SR 123 San Pablo - NB	53rd	Stanford	Oak	0.27	II	N	2	6	23.0	C	8	7.1	F	
A177	SR 123 San Pablo - NB	Stanford	Ashby	Oak	0.80	II	N	2	6	12.8	E	8	14.7	D	
A178	SR 123 San Pablo - NB	Ashby	Dwight	Berk	0.64	II	N	2	6	14.5	D	8	13.2	E	
A179	SR 123 San Pablo - NB	Dwight	Allston	Berk	0.38	II	N	2	6	15.7	D	8	19.4	C	
A180	SR 123 San Pablo - NB	Allston	University	Berk	0.19	III	N	2	6	11.5	D	8	12.9	D	
A181	SR 123 San Pablo - NB	University	Gilman	Berk	0.81	II	N	2	6	11.9	E	8	12.9	E	
A182	SR 123 San Pablo - NB	Gilman	Marin	Alb - Berk	0.45	II	N	2	6	15.0	D	8	16.5	D	
A183	SR 123 San Pablo - NB	Marin	Washington	Alb	0.36	III	N	2	6	12.3	D	8	10.7	D	
A184	SR 123 San Pablo - NB	Washington	Carlson	Alb	0.51	II	N	2	6	16.7	D	8	6.8	F	
A185	SR 185 (International Blvd) - SB	42nd	46th St	Oak	0.29	II	N	2	8	9.2	F	6	20.9	C	
A186	SR 185 (International Blvd) - SB	46th St	Seminary	Oak	0.78	II	N	2	8	22.3	C	6	19.6	C	
A187	SR 185 (International Blvd) - SB	Seminary	73rd	Oak	0.80	II	N	2	8	14.4	D	6	12.2	E	
A188	SR 185 (International Blvd) - SB	73rd Ave	98th Ave	Oak	1.41	II	N	2	8	19.1	C	6	16.1	D	
A189	SR 185 (International Blvd) - SB	98th	Broadmoor	Oak	0.75	II	N	2	8	14.1	D	6	17.6	D	
A190	SR 185 (14th) - SB	Broadmoor	Davis	San L	0.73	II	C	2	8	19.3	C	6	15.1	D	
A191	SR 185 (14th) - SB	Davis	San Leandro	San L	1.06	III	C	2	6	18.8	C	6	17.1	C	
A192	SR 185 (14th) - SB	San L Blvd	Hesperian	San L	0.94	II	C	2	6	20.9	C	6	20.7	C	
A193	SR 185 (14th) - SB	Hesperian	Bayfair	San L	0.47	II	C	2	6	12.4	E	6	17.9	D	
A194	SR 185 (14th) - SB	Bayfair	170th	Uninc	1.19	II	S	2	6	12.1	E	6	17.4	D	
A195	SR 185 (14th) - SB	170th	Llewelling	Uninc	0.20	II	S	2	6	23.8	C	6	13.5	E	
A196	SR 185 (14th) - SB	Llewelling	Sunset	Uninc	1.05	II	S	2	6	16.4	D	6	15.8	D	

Table B-6: 2016 LOS Monitoring Results for Arterials (Tier 1) - PM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A197	SR 185 Hayward - SB	Sunset	SR 92/238	Hay	0.84	III	C	2	6	11.7	D	6	17.1	C	
A198	SR 185 Hayward - NB	A Street (SR 92/238 until 2012)	Sunset	Hay	0.43	III	C	2	6	9.7	D	6	19.3	B	
A199	SR 185 (14th) - NB	Sunset	Llewelling	Uninc	1.05	II	S	2	6	20.7	C	6	21.1	C	
A200	SR 185 (14th) - NB	Llewelling	170th	Uninc	0.20	II	S	2	6	20.4	C	6	22.7	C	
A201	SR 185 (14th) - NB	170th	Bayfair	Uninc	1.19	II	S	2	6	18.4	C	6	17.6	D	
A202	SR 185 (14th) - NB	Bayfair	Hesperian	San L	0.47	II	C	2	6	18.2	C	6	20.4	C	
A203	SR 185 (14th) - NB	Hesperian	San L Blvd	San L	0.94	II	C	2	6	20.7	C	6	17.8	D	
A204	SR 185 (14th) - NB	San Leandro	Davis	San L	1.06	III	C	1	6	14.2	C	6	14.8	C	
A205	SR 185 (14th) - NB	Davis	Broadmoor	San L	0.73	II	C	2	6	15.8	D	6	17.1	D	
A206	SR 185 (International Blvd) - NB	Broadmoor	98th	Oak	0.75	II	N	2	6	16.9	D	6	14.7	D	
A207	SR 185 (International Blvd) - NB	98th Ave	73rd Ave	Oak	1.41	II	N	2	6	15.1	D	6	17.0	D	
A208	SR 185 (International Blvd) - NB	73rd Ave	Seminary	Oak	0.80	II	N	2	6	14.1	D	6	21.4	C	
A209	SR 185 (International Blvd) - NB	Seminary	46th St	Oak	0.78	II	N	2	6	22.2	C	6	20.0	C	
A210	SR 185 (International Blvd) - NB	46th St	42nd	Oak	0.29	II	N	2	6	15.6	D	8	6.6	F	
A211	SR 238 (Foothill) - NB	Jackson	City Center	Hay	0.63	III	C	4	6	12.3	D	6	16.0	C	[2]
A212	SR 238 (Foothill) - NB	City Center	I-580	Hay	0.73	II	S	3	6	13.5	E	6	14.3	D	[2]
A213	SR 238 (Foothill) - NB	I-580 Ramp	I-580 Merge	Uninc	0.68	I	S	1	6	36.2	A	6	28.0	C	[2]
A214	SR 238 (Foothill) - SB	I-580	Cstro V Blvd	Uninc	0.73	I	S	3	6	52.9	A	6	34.1	B	[2]
A215	SR 238 (Foothill) - SB	Cstro V Blvd	City Center	Hay-Uninc	1.04	II	C	3	6	24.5	B	6	26.7	B	[2]
A216	SR 238 (Foothill) - SB	City Center	A Street	Hay	0.16	III	C	3	6	24.0	B	6	7.3	E	[2]
A217	SR 238 (Mission) - NB	680 NB Rmp	Stevenson	Fre	2.35	I	S	2	6	32.5	B	6	32.6	B	[2]
A218	SR 238 (Mission) - NB	Stevenson	Nursery	Fre	2.43	I	S	2	6	28.2	B	6	17.3	D	[2]
A219	SR 238 (Mission) - NB	Nursery	Tamarack	Uni Cty	2.63	I	S	3	6	35.9	A	6	27.0	C	[2]
A220	SR 238 (Mission) - NB	Tamarack	Industrial	Uni Cty - Hay	1.96	I	S	3	6	24.0	C	6	21.8	D	[2]
A221	SR 238 (Mission) - NB	Industrial	Sorenson	Hay	1.46	II	C	2	6	21.4	C	6	14.3	D	[2]

Table B-6: 2016 LOS Monitoring Results for Arterials (Tier 1) - PM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A222	SR 238 (Mission) - NB	Sorenson	Jackson	Hay	1.83	II	C	2	6	23.5	C	6	16.8	D	[2]
A223	SR 238 (Mission) - SB	Jackson	Sorenson	Hay	1.83	II	C	2	6	16.9	D	6	19.1	C	[2]
A224	SR 238 (Mission) - SB	Sorenson	Industrial	Hay	1.46	II	C	2	6	21.3	C	6	21.0	C	[2]
A225	SR 238 (Mission) - SB	Industrial	Tamarack	Hay - Uni Cty	1.96	I	C	3	6	18.2	D	6	25.8	C	[2]
A226	SR 238 (Mission) - SB	Tamarack	Nursery	Uni Cty	2.63	I	S	3	6	18.8	D	6	31.1	B	[2]
A227	SR 238 (Mission) - SB	Nursery	Stevenson	Fre	2.43	I	S	2	6	16.8	E	6	23.2	C	[2]
A228	SR 238 (Mission) - SB	Stevenson	680 NB Rmp	Fre	2.35	I	S	2	6	15.4	E	6	24.7	C	[2]
A229	SR 260 (Tubes) - NB	Atlantic	7th/Web	Oak	1.35	I	N	2	6	29.1	A	6	30.6	A	
A230	SR 260 (Tubes) - SB	7th/Web	Atlantic	Oak	1.43	I	N	2	7	23.8	B	6	26.3	A	
A231	SR 262 (Mission) - EB	I-880 NB	I-680 NB	Fre	1.48	I	S	2	8	13.4	E	6	26.0	C	
A232	SR 262 (Mission) - WB	I-680 NB	I-880 SB	Fre	1.67	I	S	2	6	20.5	D	6	26.0	C	
A233	SR 84 (Liv) - NB - realign	Airway	I-580 WB (off)	Liv	0.52	I	E	3	6	37.5	A	6	26.5	C	
A234	SR 84 (Liv) - NB - realign	I-580 WB (off)	Airway)	Liv	0.53	I	E	3	6	32.6	B	6	25.1	C	

Notes
[1] Data impacted by long term construction and recurrent lane closures
[2] Maintenance work conducted within monitoring period

Table B-7: 2016 LOS Monitoring Results for Arterials (Tier 1) - AM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A1	150th St - EB	Hesperian	I-580	San L	0.49	II	C	2	6	15.3	D	6	16.1	D	
A2	150th St - WB	I-580	Hesperian	San L	0.49	II	C	2	6	13.6	E	6	14.8	D	
A3	A Street - EB	I-880	Western	Hay	1.08	II	C	2	6	20.2	C	6	20.5	C	
A4	A Street - EB	Western	SR 185 (previously SR 238)	Hay	0.31	III	C	2	6	13.0	D	6	11.2	D	
A5	A Street - WB	SR 238	Western	Hay	0.54	III	C	2	7	11.3	D	6	18.3	C	
A6	A Street - WB	Western	I-880	Hay	1.07	II	C	2	7	16.8	D	6	17.0	D	
A7	Atlantic - EB	Main	Webster	Ala	0.81	II	N	2	6	23.0	C	6	21.0	C	
A8	Atlantic - WB	Webster	Main	Ala	0.81	II	N	2	6	25.0	B	6	28.5	B	
A9	Hegenberger - EB	SR 61	Edgewater	Oak	0.77	I	N	3	6	16.0	E	6	18.9	D	

Table B-7: 2016 LOS Monitoring Results for Arterials (Tier 1) - AM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A10	Hegenberger - EB	Edgewater	Baldwin	Oak	0.73	I	N	3	6	22.2	C	6	22.2	C	
A11	Hegenberger - EB	Baldwin	E 14th	Oak	1.02	I	N	3	6	32.9	B	6	24.1	C	
A12	Hegenberger - WB	E 14th	Baldwin	Oak	1.02	I	N	3	7	25.7	C	6	25.6	C	
A13	Hegenberger - WB	Baldwin	Edgewater	Oak	0.72	I	N	3	7	20.4	D	6	27.5	C	
A14	Hegenberger - WB	Edgewater	SR 61	Oak	0.77	I	N	3	7	23.2	C	6	27.3	C	
A15	Hesperian - NB	Tennyson	SH 92 - WB	Hay	0.49	I	C	3	6	14.8	E	6	17.7	D	
A16	Hesperian - NB	SH 92	La Playa	Hay	0.78	II	C	3	6	27.8	B	6	23.8	C	
A17	Hesperian - NB	La Playa	W.Winton Ave.	Hay	0.43	II	C	3	6	29.5	B	6	18.2	C	
A18	Hesperian - NB	W.Winton Ave	A St	Hay	0.97	II	C	3	6	18.6	C	6	22.4	C	
A19	Hesperian - NB	A St	Hacienda	Uninc	0.67	II	C	3	6	20.9	C	6	21.4	C	
A20	Hesperian - NB	Hacienda	Grant	Uninc	0.66	II	C	3	6	22.3	C	6	31.9	A	
A21	Hesperian - NB	Grant	Llewelling	Uninc	0.27	II	C	3	6	26.4	B	6	11.3	E	
A22	Hesperian - NB	Llewelling	Springlake	Uninc	0.39	II	C	3	6	20.6	C	6	24.3	B	
A23	Hesperian - NB	Springlake	Fairmont	San L	0.66	II	C	3	6	18.9	C	6	16.1	D	
A24	Hesperian - NB	Fairmont	14th	San L	0.31	II	C	2	6	18.2	C	6	13.0	E	
A25	Hesperian - SB	14th	Fairmont	San L	0.31	II	C	2	6	13.4	E	6	17.4	D	
A26	Hesperian - SB	Fairmont	Springlake	San L	0.66	II	C	3	6	18.2	C	6	17.0	D	
A27	Hesperian - SB	Springlake	Llewelling	Uninc	0.39	II	C	3	6	21.8	C	6	16.8	D	
A28	Hesperian - SB	Llewelling	Grant	Uninc	0.27	II	C	3	6	12.9	E	6	15.5	D	
A29	Hesperian - SB	Grant	Hacienda	Uninc	0.66	II	C	3	6	20.5	C	6	26.8	B	
A30	Hesperian - SB	Hacienda	A St	Uninc	0.67	II	C	3	6	17.7	D	6	24.3	B	
A31	Hesperian - SB	A St	W.Winton Ave.	Hay	0.97	II	C	3	6	9.3	F	6	16.8	D	
A32	Hesperian - SB	W.Winton Ave	La Playa	Hay	0.43	II	C	3	6	12.8	E	6	21.4	C	
A33	Hesperian - SB	La Playa	SH 92	Hay	0.78	II	C	3	6	18.9	C	6	16.6	D	
A34	Hesperian - SB	SH 92 - WB	Tennyson	Hay	0.49	I	C	3	6.0	24.0	C	6	26.0	C	
A35	Mowry - EB	I-880	Farwell	Fre	0.28	II	S	3	7	26.6	B	6	26.4	B	
A36	Mowry - EB	Farwell	SH 84	Fre	2.48	II	S	3	7	23.4	C	6	24.6	B	
A37	Mowry - WB	SH 84	Farwell	Fre	2.53	II	S	3	7	20.8	C	6	24.4	B	
A38	Mowry - WB	Farwell	I-880	Fre	0.28	II	S	3	7	18.1	C	6	22.8	C	
A39	Park/23rd - EB	Encinal	Santa Clara	Ala	0.23	III	N	2	6	20.3	B	6	12.1	D	

Table B-7: 2016 LOS Monitoring Results for Arterials (Tier 1) - AM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A40	Park/23rd - EB	Santa Clara	Kennedy	Ala	0.68	III	N	2	6	9.5	D	6	10.4	D	
A41	Park/23rd - EB	Kennedy	E 11th	Oak	0.45	II	N	2	6	17.3	D	6	19.2	C	
A42	Park/23rd - WB	E 11th	Kennedy	Oak	0.45	II	N	2	6	20.2	C	6	26.8	B	
A43	Park/23rd - WB	Kennedy	Santa Clara	Ala	0.74	III	N	2	6	19.0	B	6	17.1	C	
A44	Park/23rd - WB	Santa Clara	Encinal	Ala	0.23	III	N	2	6	14.3	C	6	11.8	D	
A45	MLK Jr Way - NB	SH 24	Adeline	Oak	1.48	II	N	3	6	32.3	A	6	18.7	C	
A46	Adeline - NB	MLK Jr – South	MLK Jr - North	Berk	0.28	II	N	3	6	12.9	E	6	11.3	E	
A47	Adeline - NB	MLK Jr - North	Shattuck/Adeline	Berk	0.61	II	N	3	6	17.3	D	6	19.1	C	
A48	Shattuck NB	Shattuck/Adeline	Dwight	Berk	0.31	II	N	2	6	16.1	D	6	19.2	C	
A49	Shattuck NB	Dwight	University	Berk	0.57	III	N	2	6	20.3	B	6	21.5	B	
A50	Shattuck SB	University	Dwight	Berk	0.57	III	N	2	6	13.0	C	6	14.2	C	
A51	Shattuck SB	Dwight	Shattuck/Adeline	Berk	0.30	II	N	2	6	15.6	D	6	21.2	C	
A52	Adeline - SB	Shattuck/Adeline	MLK Jr – North	Berk	0.61	II	N	3	6	19.6	C	6	18.4	C	
A53	Adeline - SB	MLK Jr - North	MLK Jr - South	Berk	0.29	II	N	3	6	11.7	E	6	8.1	F	
A54	MLK Jr Way - SB	Adeline	SH 24	Oak	1.39	II	N	3	6	14.4	D	6	13.6	E	
A55	Tennyson - EB	Hesperian	I-880	Hay	0.86	I	C	2	7	24.7	C	6	19.2	D	
A56	Tennyson - EB	I-880 NB	Rt 238	Hay	1.54	II	C	2	7	17.6	D	6	20.6	C	
A57	Tennyson - WB	Rt 238	I-880	Hay	1.54	II	C	2	7	15.2	D	6	17.9	D	
A58	Tennyson - WB	I-880	Hesperian	Hay	0.86	I	C	2	7	24.9	C	6	21.2	D	
A59	University - EB	I-80 SB	6th	Berk	0.40	II	N	2	7	18.6	C	6	13.2	E	
A60	University - EB	6th	San Pablo	Berk	0.32	II	N	2	7	16.7	D	6	14.0	D	
A61	University - EB	San Pablo	Sacramento	Berk	0.56	II	N	2	7	18.6	C	6	22.4	C	
A62	University - EB	Sacramento	ML King	Berk	0.49	II	N	2	7	21.8	C	6	19.1	C	
A63	University - EB	ML King	Shattuck Pl	Berk	0.29	III	N	2	7	19.5	B	6	21.1	B	
A64	University - WB	Shattuck Pl	ML King	Berk	0.29	III	N	2	7	14.7	C	6	17.4	C	
A65	University - WB	ML King	Sacramento	Berk	0.49	II	N	2	7	21.3	C	6	20.7	C	
A66	University - WB	Sacramento	San Pablo	Berk	0.56	II	N	2	7	18.6	C	6	21.0	C	
A67	University - WB	San Pablo	6th	Berk	0.32	II	N	2	7	17.0	D	6	19.1	C	
A68	University - WB	6th	I-80 SB	Berk	0.40	II	N	2	7	25.6	B	6	38.8	A	
A69	SR 13 Ashby - WB	Hiller	Domingo	Oak - Berk	0.81	II	N	1	7	23.4	C	6	20.5	C	

Table B-7: 2016 LOS Monitoring Results for Arterials (Tier 1) - AM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A70	SR 13 Ashby - WB	Domingo	College	Berk	0.52	III	N	2	7	17.3	C	6	17.9	C	
A71	SR 13 Ashby - WB	College	Telegraph	Berk	0.37	III	N	2	7	16.3	C	6	14.4	C	
A72	SR 13 Ashby - WB	Telegraph	Shattuck	Berk	0.38	III	N	2	7	18.4	C	6	14.8	C	
A73	SR 13 Ashby - WB	Shattuck	ML King	Berk	0.26	III	N	2	7	10.8	D	6	10.0	D	
A74	SR 13 Ashby - WB	ML King	San Pablo	Berk	0.86	III	N	2	7	26.1	A	6	20.1	B	
A75	SR 13 Ashby - WB	San Pablo	I-80 Ramps	Berk	0.64	II	N	2	7	13.8	E	6	19.9	C	
A76	SR 13 Ashby - EB	I-80	San Pablo	Berk	0.62	II	N	2	6	24.2	B	6	29.8	B	
A77	SR 13 Ashby - EB	San Pablo	ML King	Berk	0.86	III	N	2	6	16.8	C	6	18.8	C	
A78	SR 13 Ashby - EB	ML King	Shattuck	Berk	0.26	III	N	2	6	15.1	C	6	11.2	D	
A79	SR 13 Ashby - EB	Shattuck	Telegraph	Berk	0.38	III	N	2	6	18.6	C	6	16.5	C	
A80	SR 13 Ashby - EB	Telegraph	College	Berk	0.37	III	N	2	6	18.9	C	6	22.4	B	
A81	SR 13 Ashby - EB	College	Domingo	Berk	0.52	III	N	2	6	21.6	B	6	19.1	B	
A82	SR 13 Ashby - EB	Domingo	Hiller	Berk - Oak	0.81	II	N	1	6	22.0	C	6	30.7	A	
A83	SR 61 - SB	Atlantic	Cent/Webster	Ala	0.57	III	N	2	7	14.4	C	6	16.8	C	
A84	SR 61 - SB	Cent/Webster	Sher/Encino	Ala	0.74	II	N	2	7	18.5	C	6	17.4	D	
A85	SR 61 - SB	Sher/Encino	Park	Ala	1.20	II	N	2	7	18.6	C	6	19.2	C	
A86	SR 61 - SB	Park	High/Otis	Ala	1.05	II	N	2	7	19.6	C	6	20.4	C	
A87	SR 61 (Doolittle) - SB	High	Island Dr	Ala	0.44	II	N	2	7	21.4	C	6	20.7	C	
A88	SR 61 (Doolittle) - SB	Island Dr	Harbor Bay Pkwy	Ala	0.51	I	N	2	7	28.0	B	6	30.6	B	
A89	SR 61 - SB	Harbor Bay	Airport Dr	Oak	2.17	I	N	2	7	29.7	B	6	35.3	A	
A90	SR 61 (Doolittle) - SB	Airport	Davis	Oak - San L	0.94	I	N	2	7	25.2	C	6	28.3	B	
A91	SR 61 (Doolittle) - NB	Davis	Airport	San L - Oak	0.94	I	C	2	6	25.3	C	6	28.8	B	
A92	SR 61 - NB	Airport Dr	Harbor Bay	Oak	2.17	I	N	2	6	34.1	B	6	35.9	A	
A93	SR 61 (Doolittle) - NB	Harbor Bay	Island Dr	Ala	0.51	I	N	2	6	24.8	B	6	30.9	A	
A94	SR 61 (Doolittle) - NB	Island Dr	High/Otis	Ala	0.44	II	N	2	6	15.9	D	6	17.3	D	
A95	SR 61 - NB	High/Otis	Park	Ala	1.05	II	N	2	6	17.7	D	6	15.9	D	
A96	SR 61 - NB	Park/Encinal	Sher/Cent	Ala	1.20	II	N	2	6	16.5	D	6	18.6	C	
A97	SR 61 - NB	Sher/Cent	Web/Cent	Ala	0.74	II	N	2	6	16.7	D	6	14.9	D	

Table B-7: 2016 LOS Monitoring Results for Arterials (Tier 1) - AM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A98	SR 61 - NB	Cent/Web	Atlantic	Ala	0.57	III	N	2	6	13.1	C	6	14.0	C	
A99	SR 77 (42nd) - EB	I-880 NB	E 14th	Oak	0.36	I	N	2	6	28.3	B	6	26.5	C	
A100	SR 77 (42nd) - WB	E 14 th	I-880 NB	Oak	0.36	I	N	2	6	25.8	C	6	27.3	C	
A101	Decoto - WB	SH 238/Mission	Union Square	Uni Cty	0.86	II	S	2	6	17.4	D	6	17.5	D	
A102	Decoto - WB	Union Square	Alv-Niles Rd	Uni Cty	0.24	II	S	2	6	17.1	D	6	15.1	D	
A103	Decoto - WB	Alv-Niles Rd	Fremont CL	Uni Cty	0.65	II	S	2	6	13.9	E	6	25.0	B	
A104	Decoto - WB	Fremont CL	I-880 NB (off)	Fre	1.15	II	S	2	6	18.2	C	6	14.1	D	
A105	Decoto - EB	I-880 NB (off)	Union City CL	Fre	1.15	II	S	2	6	26.3	B	6	20.0	C	
A106	Decoto - EB	Union City CL	Alv-Niles Rd	Uni Cty	0.66	II	S	2	6	31.5	A	6	22.0	C	
A107	Decoto - EB	Alv-Niles Rd	Union Square	Uni Cty	0.24	II	S	2	6	23.1	C	6	12.2	E	
A108	Decoto - EB	Union Square	SH 238/Mission	Uni Cty	0.85	II	S	2	6	14.8	D	6	17.6	D	
A109	SR 84/Mowry (Fre)-WB	SH 238	Peralta	Fre	0.81	I	S	2	6	22.5	C	6	20.6	D	
A110	SR 84/Peralta (Fre)-WB	Mowry	Fremont	Fre	1.66	I	S	1	6	33.0	B	6	26.6	C	
A111	SR 84/Fremont(Fre)-WB	Peralta	Thornton	Fre	0.33	II	S	2	6	19.7	C	6	10.6	E	
A112	SR 84/Thornton(Fre)-WB	Fremont	I-880 SB	Fre	1.26	II	S	3	6	13.3	E	6	9.7	F	
A113	SR 84/Thornton (Fre)-EB	I-880 SB	Fremont	Fre	1.26	II	S	3	6	21.4	C	6	20.3	C	
A114	SR 84/Fremont (Fre)-EB	Thornton	Peralta	Fre	0.32	II	S	2	6	6.3	F	6	14.9	D	
A115	SR 84/Peralta (Fre) - EB	Fremont	Mowry	Fre	1.64	I	S	1	6	24.7	C	6	21.3	D	
A116	SR 84/Mowry (Fre) - EB	Peralta	SH 238	Fre	0.86	I	S	2	6	27.6	C	6	21.6	D	
A117	1st Street - SB	I-580 Off	N Mines	Liv	0.60	I	E	3	7	19.9	D	6	24.2	C	
A118	1st Street - SB	N Mines	Inman	Liv	1.06	I	E	2	7	30.7	B	6	29.7	B	
A119	1st Street - NB	Inman	N Mines	Liv	1.06	I	E	2	7	31.5	B	6	28.1	B	
A120	1st Street - NB	N Mines	I-580 Off	Liv	0.60	I	E	3	7	15.8	E	6	21.3	D	
A121	SR 84 - EB	SR 238/Mission	Union City Limit	Fre	1.35	41.9	S	1	6.0	44.1	A	6	33.6	B	
A122	SR 84 - EB	Union City Limit	Palomares	Fre	0.86	44.5	S	1	6.0	47.4	A	6	44.0	A	
A123	SR 84 - EB	Palomares	Niles Cnyn Quarry	Fre	2.16	43.8	S	1	6.0	45.9	A	6	43.3	A	
A124	SR 84 - EB	Niles Cnyn Quarry	Sunol Rd	Fre	1.74	46.7	S	1	6.0	50.0	A	6	36.3	C	
A125	SR 84 - EB	Sunol Rd	Plea-Sunol Rd	Fre	0.55	27.6	S	1	6.0	11.8	F	6	21.1	C	
A126	SR 84 - EB	Ple-Sunol Rd	SR 84 (Off)/I-680	Uninc	0.80	42.9	E	1	6.0	36.7	B	6	40.2	A	
A127	SR 84 - EB	SR 84 (Off)/I-680	Vallecitos Ln	Uninc	1.05	50.8	E	1	6.0	44.6	B	6	53.7	A	

Table B-7: 2016 LOS Monitoring Results for Arterials (Tier 1) - AM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A128	SR 84 - EB	Vallecitos Ln	Vallecitos Nuc.Cntr	Uninc	1.13	57.5	E	1	6.0	56.1	A	6	54.0	A	
A129	SR 84 - EB	Vallecitos Nuc Center Ent.	Culvert (Lat/Long: 37.613854,-121.817224)	Uninc	1.66	58.3	E	1	6.0	53.5	A	6	58.1	A	
A130	SR 84 - EB	Culvert (Lat/Long: 37.613854,-121.817224)	Ruby Hill /Kaithoff	Uninc	1.63	59.2	E	2	6.0	60.3	A	6	51.1	B	[1]
A131	SR 84 - EB	Ruby Hill./Kaithoff	Isabel/Vallecitos	Liv	0.38	I	E	1	6.0	39.2	A	6	22.3	C	[1]
A132	SR 84 (Liv) - NB	Isabel/Vallecitos	Vineyard	Liv	1.12	I	E	1	6.0	35.5	A	6	34.8	B	[1]
A133	SR 84 (Liv) - NB	Vineyard	Concannon	Liv	0.60	I	E	1	6.0	43.3	A	6	35.2	A	[1]
A134	SR 84 (Liv) - NB	Concannon	Stanley	Liv	1.05	I	E	1	6.0	29.2	B	6	41.2	A	[1]
A135	SR 84 (Liv) - NB	Stanley	W. Jack London Blvd.	Liv	0.90	I	E	1	6.0	44.4	A	6	40.1	A	
A136	SR 84 (Liv) - NB	W. Jack London Blvd.	Airway/Kitty Hawk	Liv	0.49	I	E	3	6.0	30.4	B	6	32.6	B	
A137	Airway Blvd (old SR 84) - NB	SR 84	I-580 EB off ramp	Liv	1.06	I	E	1	6.0	26.0	C	6	30.3	B	
A138	Airway Blvd (old SR 84) - SB	I-580 EB off ramp	SR 84	Liv	1.06	I	E	1	6.0	31.0	B	6	36.2	A	
A139	SR 84 (Liv) - SB	Airway/Kitty	W. Jack London Blvd.	Liv	0.49	I	E	3	6.0	18.7	D	6	42.7	A	
A140	SR 84 (Liv) - SB	W. Jack London Blvd.	Stanley	Liv	0.90	I	E	1	6.0	29.4	B	6	46.4	A	
A141	SR 84 (Liv) - SB	Stanley	Concannon	Liv	1.05	I	E	1	6.0	37.7	A	6	29.6	B	[1]
A142	SR 84 (Liv) - SB	Concannon	Vineyard	Liv	0.60	I	E	1	6.0	28.4	B	6	22.9	C	[1]
A143	SR 84 (Liv) - SB	Vineyard	Isabel/Vallecitos	Liv	1.12	I	E	1	6.0	14.9	E	6	31.8	B	[1]
A144	SR 84 - WB	Isabel/Vallecitos	Ruby Hill /Kaithoff	Liv	0.38	I	E	1	6.0	24.3	C	6	49.5	A	[1]
A145	SR 84 - WB	Ruby Hill /Kaithoff	Culvert (Lat/Long: 37.613854,-121.817224)	Uninc	1.63	55.8	E	2	6.0	16.0	F	6	24.8	F	[1]
A146	SR 84 - WB	Culvert (Lat/Long: 37.613854,-121.817224)	Vallecitos Nuc.Cntr	Uninc	1.65	56.5	E	1	6.0	29.4	E	6	37.3	D	
A147	SR 84 - WB	Vallecitos Nuc.Cntr	Vallecitos Ln	Uninc	1.14	52.5	S	1	6.0	50.4	A	6	47.4	A	
A148	SR 84 - WB	Vallecitos Ln	SR 84/I-680 On	Uninc	0.86	55.3	S	1	6.0	45.5	A	6	33.5	C	
A149	SR 84 - WB	SR 84/I-680 On	Ple-Sunol Rd	Uninc	0.62	41.4	S	1	6.0	32.8	C	6	38.0	B	
A150	SR 84 - WB	Ple-Sunol Rd	Sunol Rd	Fre	0.55	41.9	S	1	6.0	43.6	A	6	46.1	A	
A151	SR 84 - WB	Sunol Rd	Niles Canyon Quarry	Fre	1.74	48.5	S	1	6.0	47.1	A	6	33.6	D	
A152	SR 84 - WB	Niles Canyon Quarry	Eastern Fremont City Limit	Fre	1.00	47.5	S	1	6.0	45.2	A	6	22.8	F	
A153	SR 84 - WB	Eastern Fremont City Limit	Union City Limit	Fre	2.03	41.8	S	1	6.0	33.9	B	6	42.6	A	

Table B-7: 2016 LOS Monitoring Results for Arterials (Tier 1) - AM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A154	SR 84 - WB	Union City Limit	SR 238	Fre	1.35	31.7	S	1	6.0	22.9	C	6	54.7	A	
A155	SR 92 - EB	I-880	Mission	Hay	1.71	II	C	3	6	25.5	B	6	21.6	C	
A156	SR 92 - WB	Mission	I-880	Hay	1.71	II	C	3	6	12.5	E	6	19.5	C	
A157	SR 112 (Davis) - EB	Doolittle	I-880	San L	0.52	II	C	2	6	15.9	D	6	13.5	E	
A158	SR 112 (Davis) - EB	I-880	San Leandro	San L	0.99	II	C	2	6	18.0	D	6	18.1	C	
A159	SR 112 (Davis) - EB	San Leandro	14th	San L	0.28	III	C	2	6	16.2	C	6	11.3	D	
A160	SR 112 (Davis) - WB	E 14th	San Leandro	San L	0.28	III	C	2	6	6.3	F	6	10.1	D	
A161	SR 112 (Davis) - WB	San Leandro	I-880	San L	0.99	II	C	2	6	19.6	C	6	18.4	C	
A162	SR 112 (Davis) - WB	I-880	Doolittle	San L	0.52	II	C	2	6	15.2	D	6	19.7	C	
A163	SR 123 San Pablo - SB	Carlson	Washington	Alb	0.51	II	N	2	6	17.4	D	6	19.2	C	
A164	SR 123 San Pablo - SB	Washington	Marin	Alb	0.36	III	N	2	6	10.4	D	6	12.0	D	
A165	SR 123 San Pablo - SB	Marin	Gilman	Alb - Berk	0.45	II	N	2	6	20.0	C	6	23.4	C	
A166	SR 123 San Pablo - SB	Gilman	University	Berk	0.81	II	N	2	6	19.4	C	6	14.7	D	
A167	SR 123 San Pablo - SB	University	Allston	Berk	0.19	III	N	2	6	16.1	C	6	10.4	D	
A168	SR 123 San Pablo - SB	Allston	Dwight	Berk	0.38	II	N	2	6	23.0	C	6	20.1	C	
A169	SR 123 San Pablo - SB	Dwight	Ashby	Berk	0.64	II	N	2	6	19.0	C	6	20.6	C	
A170	SR 123 San Pablo - SB	Ashby	Stanford	Oak	0.80	II	N	2	6	21.0	C	6	16.1	D	
A171	SR 123 San Pablo - SB	Stanford	53rd	Oak	0.27	II	N	2	6	15.1	D	6	18.2	C	
A172	SR 123 San Pablo - SB	53rd	Park	Emery	0.34	II	N	2	6	28.7	B	6	16.7	D	[1]
A173	SR 123 San Pablo - SB	Park	35th	Emery - Oak	0.44	II	N	2	6	21.9	C	6	13.4	E	[1]
A174	SR 123 San Pablo - NB	35th	Park	Oak - Emery	0.42	II	N	2	7	14.7	D	6	18.6	C	[1]
A175	SR 123 San Pablo - NB	Park	53rd	Emery	0.34	II	N	2	7	24.3	B	6	24.8	B	[1]
A176	SR 123 San Pablo - NB	53rd	Stanford	Oak	0.27	II	N	2	7	21.0	C	6	23.0	C	
A177	SR 123 San Pablo - NB	Stanford	Ashby	Oak	0.80	II	N	2	7	17.8	D	6	15.5	D	
A178	SR 123 San Pablo - NB	Ashby	Dwight	Berk	0.64	II	N	2	7	20.7	C	6	22.4	C	
A179	SR 123 San Pablo - NB	Dwight	Allston	Berk	0.38	II	N	2	7	23.4	C	6	26.4	B	
A180	SR 123 San Pablo - NB	Allston	University	Berk	0.19	III	N	2	7	9.0	E	6	12.7	D	
A181	SR 123 San Pablo - NB	University	Gilman	Berk	0.81	II	N	2	7	20.1	C	6	21.5	C	

Table B-7: 2016 LOS Monitoring Results for Arterials (Tier 1) - AM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A182	SR 123 San Pablo - NB	Gilman	Marin	Alb - Berk	0.45	II	N	2	7	22.1	C	6	22.1	C	
A183	SR 123 San Pablo - NB	Marin	Washington	Alb	0.36	III	N	2	7	14.8	C	6	13.0	C	
A184	SR 123 San Pablo - NB	Washington	Carlson	Alb	0.51	II	N	2	7	24.4	B	6	22.5	C	
A185	SR 185 (International Blvd) - SB	42nd	46th St	Oak	0.29	II	N	2	6.0	11.6	E	6	19.4	C	
A186	SR 185 (International Blvd) - SB	46th St	Seminary	Oak	0.78	II	N	2	6.0	24.3	B	6	24.2	B	
A187	SR 185 (International Blvd) - SB	Seminary	73rd	Oak	0.80	II	N	2	6.0	21.1	C	6	16.9	D	
A188	SR 185 (International Blvd) - SB	73rd Ave	98th Ave	Oak	1.41	II	N	2	6.0	23.3	C	6	22.1	C	
A189	SR 185 (International Blvd) - SB	98th	Broadmoor	Oak	0.75	II	N	2	6.0	21.9	C	6	19.3	C	
A190	SR 185 (14th) - SB	Broadmoor	Davis	San L	0.73	II	C	2	6.0	29.9	B	6	21.2	C	
A191	SR 185 (14th) - SB	Davis	San Leandro	San L	1.06	III	C	2	6.0	19.0	C	6	22.2	B	
A192	SR 185 (14th) - SB	San L Blvd	Hesperian	San L	0.94	II	C	2	6.0	31.2	A	6	20.8	C	
A193	SR 185 (14th) - SB	Hesperian	Bayfair	San L	0.47	II	C	2	6.0	17.3	D	6	18.4	C	
A194	SR 185 (14th) - SB	Bayfair	170th	Uninc	1.19	II	S	2	6.0	12.5	E	6	17.5	D	
A195	SR 185 (14th) - SB	170th	Llewelling	Uninc	0.20	II	S	2	6.0	27.3	B	6	17.4	D	
A196	SR 185 (14th) - SB	Llewelling	Sunset	Uninc	1.05	II	S	2	6.0	16.4	D	6	16.7	D	
A197	SR 185 Hayward - SB	Sunset	SR 92/238	Hay	0.84	III	C	2	6.0	14.9	C	6	11.9	D	
A198	SR 185 Hayward - NB	A Street (SR 92/238 until 2012)	Sunset	Hay	0.43	III	C	2	6.0	12.8	D	6	26.8	A	
A199	SR 185 (14th) - NB	Sunset	Llewelling	Uninc	1.05	II	S	2	6.0	21.3	C	6	22.5	C	
A200	SR 185 (14th) - NB	Llewelling	170th	Uninc	0.20	II	S	2	6.0	28.8	B	6	32.3	A	
A201	SR 185 (14th) - NB	170th	Bayfair	Uninc	1.19	II	S	2	6.0	25.9	B	6	19.7	C	
A202	SR 185 (14th) - NB	Bayfair	Hesperian	San L	0.47	II	C	2	6.0	33.3	A	6	23.1	C	
A203	SR 185 (14th) - NB	Hesperian	San L Blvd	San L	0.94	II	C	2	6.0	31.7	A	6	17.1	D	
A204	SR 185 (14th) - NB	San Leandro	Davis	San L	1.06	III	C	1	6.0	19.8	B	6	14.2	C	
A205	SR 185 (14th) - NB	Davis	Broadmoor	San L	0.73	II	C	2	6.0	25.7	B	6	21.2	C	
A206	SR 185 (International Blvd) - NB	Broadmoor	98th	Oak	0.75	II	N	2	6.0	23.7	C	6	15.3	D	

Table B-7: 2016 LOS Monitoring Results for Arterials (Tier 1) - AM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A207	SR 185 (International Blvd) - NB	98th Ave	73rd Ave	Oak	1.41	II	N	2	6.0	16.2	D	6	17.3	D	
A208	SR 185 (International Blvd) - NB	73rd Ave	Seminary	Oak	0.80	II	N	2	6.0	11.4	E	6	11.6	E	
A209	SR 185 (International Blvd) - NB	Seminary	46th St	Oak	0.78	II	N	2	6.0	25.0	B	6	16.6	D	
A210	SR 185 (International Blvd) - NB	46th St	42nd	Oak	0.29	II	N	2	6.0	16.5	D	6	6.7	F	
A211	SR 238 (Foothill) - NB	Jackson	City Center	Hay	0.63	III	C	4	6.0	19.8	B	6	24.4	B	[2]
A212	SR 238 (Foothill) - NB	City Center	I-580	Hay	0.73	II	S	3	6.0	25.9	B	6	30.9	A	[2]
A213	SR 238 (Foothill) - NB	I-580 Ramp	I-580 Merge	Uninc	0.68	I	S	1	6.0	39.6	A	6	44.6	A	[2]
A214	SR 238 (Foothill) - SB	I-580	Cstro V Blvd	Uninc	0.73	I	S	3	6.0	53.7	A	6	37.2	A	[2]
A215	SR 238 (Foothill) - SB	Cstro V Blvd	City Center	Hay-Uninc	1.04	II	C	3	6.0	23.3	C	6	28.1	B	[2]
A216	SR 238 (Foothill) - SB	City Center	A Street	Hay	0.16	III	C	3	6.0	32.3	A	6	9.1	D	[2]
A217	SR 238 (Mission) - NB	680 NB Rmp	Stevenson	Fre	2.35	I	S	2	6.0	35.4	A	6	34.6	B	[2]
A218	SR 238 (Mission) - NB	Stevenson	Nursery	Fre	2.43	I	S	2	6.0	36.1	A	6	30.7	B	[2]
A219	SR 238 (Mission) - NB	Nursery	Tamarack	Uni Cty	2.63	I	S	3	6.0	35.7	A	6	32.8	B	[2]
A220	SR 238 (Mission) - NB	Tamarack	Industrial	Uni Cty - Hay	1.96	I	S	3	6.0	29.0	B	6	29.8	B	[2]
A221	SR 238 (Mission) - NB	Industrial	Sorenson	Hay	1.46	II	C	2	6.0	28.6	B	6	24.0	B	[2]
A222	SR 238 (Mission) - NB	Sorenson	Jackson	Hay	1.83	II	C	2	6.0	31.1	A	6	19.1	C	[2]
A223	SR 238 (Mission) - SB	Jackson	Sorenson	Hay	1.83	II	C	2	6.0	25.4	B	6	23.8	C	[2]
A224	SR 238 (Mission) - SB	Sorenson	Industrial	Hay	1.46	II	C	2	6.0	27.6	B	6	21.3	C	[2]
A225	SR 238 (Mission) - SB	Industrial	Tamarack	Hay - Uni Cty	1.96	I	C	3	6.0	28.0	B	6	24.8	C	[2]
A226	SR 238 (Mission) - SB	Tamarack	Nursery	Uni Cty	2.63	I	S	3	6.0	33.2	B	6	22.6	C	[2]
A227	SR 238 (Mission) - SB	Nursery	Stevenson	Fre	2.43	I	S	2	6.0	22.6	C	6	17.6	D	[2]
A228	SR 238 (Mission) - SB	Stevenson	680 NB Rmp	Fre	2.35	I	S	2	6.0	15.8	E	6	24.7	C	[2]
A229	SR 260 (Tubes) - NB	Atlantic	7th/Web	Oak	1.35	I	N	2	6.0	25.9	A	6	9.1	D	
A230	SR 260 (Tubes) - SB	7th/Web	Atlantic	Oak	1.43	I	N	2	6.0	33.0	A	6	31.4	A	
A231	SR 262 (Mission) - EB	I-880 NB	I-680 NB	Fre	1.48	I	S	2	6.0	33.9	B	6	33.0	B	
A232	SR 262 (Mission) - WB	I-680 NB	I-880 SB	Fre	1.67	I	S	2	6.0	11.6	F	6	23.6	C	

Table B-7: 2016 LOS Monitoring Results for Arterials (Tier 1) - AM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Arterial Class	Plan Area	# Lanes	2014 Results			2016 Results			Note
		From	To						# Runs	Speed	LOS	# Runs	Speed	LOS	
A233	SR 84 (Liv) - NB - realign	Airway	I-580 WB (off)	Liv	0.52	I	E	3	6.0	29.9	B	6	30.6	B	
A234	SR 84 (Liv) - SB - realign	I-580 WB (off)	Airway)	Liv	0.53	I	E	3	6.0	26.2	C	6	11.8	F	

Notes
[1] Data impacted by long term construction and recurrent lane closures
[2] Maintenance work conducted within monitoring period

B.4 | Arterials (Tier 2)

Table B-8: 2016 LOS Monitoring Results for Arterials (Tier 2) - PM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T1	W.Grand Ave - Grand Ave -EB	I-80/Maritime St	San Pablo Ave	Oak	1.63	N	26.6	2 / 3	INRIX	779	25.8	B / B	INRIX	696	19.4	C / C	
T2	W.Grand Ave - Grand Ave -EB	San Pablo Ave	Broadway	Oak	0.40	N	19.9	3 / 4	INRIX	2504	16.6	C / C	INRIX	1684	12.2	D / D	
T3	W.Grand Ave - Grand Ave -EB	Broadway	I-580	Oak	1.08	N	21.6	3 / 4	INRIX	1546	16.4	C / C	INRIX	809	11.4	D / D	
T4	W.Grand Ave - Grand Ave -WB	I-580	Broadway	Oak	1.08	N	21.5	3 / 4	INRIX	852	18.9	C / C	INRIX	505	14.0	C / C	
T5	W.Grand Ave - Grand Ave -WB	Broadway	San Pablo Ave	Oak	0.40	N	20.8	3 / 4	INRIX	1682	17.1	C / C	INRIX	1506	11.2	D / D	
T6	W.Grand Ave - Grand Ave -WB	San Pablo Ave	I-80/Maritime St	Oak	1.63	N	28.3	2 / 3	INRIX	983	25.9	B / B	INRIX	1042	22.2	C / C	
T7	11th St - Lake Merritt Blvd - Lakeshore Ave-EB	I-980 ON Ramp/Brush St	Webster	Oak	0.60	N	14.4	3 / 4	FC	6	15.1	C / C	FC	6	15.5	C / C	
T8	11th St - Lake Merritt Blvd - Lakeshore Ave-EB	Webster	East side of Lake Merritt Channel	Oak	0.66	N	14.7	3 / 4	FC	6	16.8	C / C	FC	6	11.9	D / D	
T9	11th St - Lake Merritt Blvd - Lakeshore Ave-EB	East side of Lake Merritt Channel	MacArthur Blvd/I-580 ON Ramp	Oak	1.15	N	16.7	3 / 4	FC	7	15.6	C / C	FC	6	13.6	C / C	
T10	12th St - Lake Merritt Blvd - Lakeshore Ave-WB	MacArthur Blvd/I-580 ON Ramp	East side of Lake Merritt Channel	Oak	1.15	N	16.8	3 / 4	FC	7	15.8	C / C	FC	6	16.1	C / C	
T11	12th St - Lake Merritt Blvd - Lakeshore Ave-WB	East side of Lake Merritt Channel	Webster	Oak	0.64	N	15.9	3 / 4	FC	8	19.3	B / B	FC	6	11.9	D / D	
T12	12th St - Lake Merritt Blvd - Lakeshore Ave-WB	Webster	I-980 OFF Ramp/Brush St	Oak	0.60	N	17.4	3 / 4	FC	8	17.1	C / C	FC	6	10.1	D / D	
T13	Telegraph Ave-NB	51st Street	Russell St	Oak - Berk	1.41	N	15.0	3 / 4	FC	6	14.9	C / C	FC	6	12.1	D / D	
T14	Telegraph Ave-NB	Russell St	Bancroft Way	Berk	0.77	N	13.5	3 / 4	FC	6	17.4	C / C	FC	6	13.5	C / C	
T15	Dana-Dwight-Telegraph-SB	Bancroft Way	Russell St	Berk	0.90	N	13.9	3 / 4	FC	6	15.2	C / C	FC	6	15.0	C / C	
T16	Telegraph Ave-SB	Russell St	51st Street	Oak - Berk	1.41	N	18.5	3 / 4	FC	6	16.9	C / C	FC	6	13.5	C / C	
T17	Broadway-SB	Broadway/College Ave	Grand Ave	Oak	1.91	N	20.8	2 / 3	INRIX	367	17.6	D / D	INRIX	718	13.6	E / E	
T18	Broadway-SB	Grand Ave	14th St	Oak	0.55	N	18.2	3 / 4	INRIX	1186	16.8	C / C	INRIX	1039	11.0	D / D	[1]

Table B-8: 2016 LOS Monitoring Results for Arterials (Tier 2) - PM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T19	Broadway-SB	14th St	5th St/Broadway	Oak	0.48	N	17.9	3 / 4	INRIX	1487	14.0	C / C	INRIX	1505	8.1	E / E	
T20	Broadway (Connection to I-880)-SB	5th St/Broadway	I-880 ON Ramp	Oak	0.21	N	62.9	1 / 1	INRIX	3779	14.9	E / F	FC	6	16.4	E / E	
T21	Broadway (Connection to I-880)-NB	I-880 OFF Ramp	5th St/Broadway	Oak	1.26	N	23.0	1 / 2	FC	6	15.0	E / E	FC	6	13.6	E / F	
T22	Broadway-NB	5th St/Broadway	14th St	Oak	0.48	N	17.1	3 / 4	INRIX	1265	15.0	C / C	INRIX	658	8.7	E / E	
T23	Broadway-NB	14th St	Grand Ave	Oak	0.55	N	18.3	3 / 4	INRIX	1181	16.7	C / C	INRIX	974	11.1	D / D	[1]
T24	Broadway-NB	Grand Ave	Broadway/College Ave	Oak	1.91	N	21.9	2 / 3	INRIX	995	16.2	D / D	INRIX	1257	12.6	E / E	
T25	Durant-EB	Shattuck	College Ave.	Berk	0.73	N	16.0	3 / 4	FC	6	13.4	C / C	FC	6	16.5	C / C	
T26	College Avenue-SB	Bancroft Way/College Ave	Ashby Ave	Berk	0.85	N	16.8	3 / 4	INRIX	951	13.2	C / C	INRIX	1224	8.9	E / E	
T27	College Avenue-SB	Ashby Ave	Miles Ave/SR 24 OFF Ramp	Oak - Berk	0.83	N	19.7	3 / 4	INRIX	436	14.8	C / C	INRIX	674	10.2	D / D	
T28	College Avenue-SB	Miles Ave/SR 24 OFF Ramp	Broadway/College Ave	Oak	0.61	N	16.7	3 / 4	INRIX	864	15.4	C / C	INRIX	953	11.9	D / D	
T29	College Avenue-NB	Broadway/College Ave	Miles Ave/SR 24 OFF Ramp	Oak	0.61	N	17.0	3 / 4	INRIX	832	15.2	C / C	INRIX	1063	10.8	D / D	
T30	College Avenue-NB	Miles Ave/SR 24 OFF Ramp	Ashby Ave	Oak - Berk	0.83	N	18.3	3 / 4	INRIX	569	15.5	C / C	INRIX	518	10.0	D / D	
T31	College Avenue-NB	Ashby Ave	Bancroft Way/College Ave	Berk	0.85	N	16.8	3 / 4	INRIX	656	15.2	C / C	INRIX	1049	10.5	D / D	
T32	Bancroft-WB	College Ave.	Shattuck	Berk	0.73	N	12.5	3 / 4	FC	6	9.9	D / D	FC	6	11.4	D / D	
T33	51st Street-EB	SR 24 Off Ramp/52nd St	Broadway	Oak	0.75	N	15.0	3 / 4	FC	6	12.9	D / D	FC	6	13.0	C / C	
T34	51st Street-WB	Broadway	SR 24 Off Ramp/52nd St	Oak	0.75	N	15.7	3 / 4	FC	6	17.1	C / C	FC	6	14.3	C / C	
T35	Shattuck Avenue-NB	51st	Alcatraz Ave.	Oak - Berk	0.81	N	22.8	3 / 4	FC	7	18.2	C / C	FC	6	16.4	C / C	
T36	Shattuck Avenue-NB	Alcatraz Ave.	Adeline St.	Berk	0.70	N	16.7	3 / 4	FC	7	11.9	D / D	FC	6	12.1	D / D	
T37	Shattuck Avenue-SB	Adeline St.	Alcatraz Ave.	Berk	0.70	N	17.1	3 / 4	FC	6	10.6	D / D	FC	6	11.6	D / D	
T38	Shattuck Avenue-SB	Alcatraz Ave.	51st	Oak	0.81	N	17.3	3 / 4	FC	6	18.5	C / C	FC	6	15.8	C / C	
T39	Powell Street-Stanford Avenue-EB	NB I-80 OFF Ramp	San Pablo Ave	Emery	0.75	N	15.5	2 / 3	FC	7	20.3	C / C	FC	6	16.1	D / D	[1]

Table B-8: 2016 LOS Monitoring Results for Arterials (Tier 2) - PM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T40	Powell Street-Stanford Avenue-EB	San Pablo Ave	MLK Jr Way	Oak - Berk	0.76	N	17.0	2 / 3	FC	7	17.2	D / D	FC	6	19.0	C / C	
T41	Powell Street-Stanford Avenue-WB	MLK Jr Way	San Pablo Ave	Oak - Berk	0.76	N	19.1	2 / 3	FC	7	20.8	C / C	FC	6	18.5	C / C	
T42	Powell Street-Stanford Avenue-WB	San Pablo Ave	NB I-80 OFF Ramp	Emery - Oak	0.75	N	15.3	2 / 3	FC	7	14.0	D / D	FC	6	13.8	E / E	[1]
T43	40thStreet-Shellmound Avenue-EB	Shellmound Way (North of Powell St)	40th St	Emery	0.73	N	24.6	2 / 3	FC	6	17.9	D / D	FC	6	20.9	C / C	
T44	40thStreet-Shellmound Avenue-EB	40th St	San Pablo Ave	Emery	0.68	N	16.5	3 / 4	FC	6	12.4	D / D	FC	6	13.4	C / C	
T45	40thStreet-Shellmound Avenue-WB	San Pablo Ave	40th St	Emery	0.68	N	22.0	3 / 4	FC	6	24.7	B / B	FC	6	18.8	C / C	
T46	40thStreet-Shellmound Avenue-WB	40th St	Shellmound Way (North of Powell St)	Emery	0.73	N	29.0	2 / 3	FC	6	21.3	C / C	FC	6	25.4	B / B	
T47	International Boulevard-NB	42nd Ave	Fruitvale Ave	Oak	0.62	N	21.9	3 / 4	INRIX	1287	16.8	C / C	INRIX	1329	12.2	D / D	
T48	International Boulevard-NB	Fruitvale Ave	14th Ave	Oak	1.38	N	22.9	3 / 4	INRIX	979	21.5	B / B	INRIX	630	18.7	C / C	
T49	International Boulevard-NB	14th Ave	Lake Merritt Blvd	Oak	0.88	N	22.5	3 / 4	INRIX	1218	20.7	B / B	INRIX	475	18.1	C / C	
T50	International Boulevard-SB	Lake Merritt Blvd	14th Ave	Oak	0.88	N	21.5	3 / 4	INRIX	2067	20.3	B / B	INRIX	2011	17.4	C / C	
T51	International Boulevard-SB	14th Ave	Fruitvale Ave	Oak	1.38	N	22.9	3 / 4	INRIX	2535	19.4	B / B	INRIX	2459	17.3	C / C	
T52	International Boulevard-SB	Fruitvale Ave	42nd Ave	Oak	0.62	N	21.4	3 / 4	INRIX	2868	12.5	D / D	INRIX	2863	8.4	E / E	
T53	73d Ave-NB	International Blvd/73rd Ave	73rd Ave/Foothill Blvd	Oak	1.07	N	28.1	2 / 3	INRIX	695	23.0	C / C	INRIX	1935	19.1	C / C	
T54	Foothill Boulevard-NB	73rd Ave/Foothill Blvd	Seminary Ave	Oak	1.02	N	20.3	3 / 4	INRIX	302	21.4	B / B	INRIX	52	20.2	B / B	
T55	Foothill Boulevard-NB	Seminary Ave	High Street	Oak	1.22	N	21.5	3 / 4	INRIX	332	21.2	B / B	INRIX	748	18.1	C / C	
T56	Foothill Boulevard-NB	High Street	Fruitvale Ave	Oak	0.90	N	19.8	3 / 4	INRIX	431	17.5	C / C	INRIX	517	11.1	D / D	
T57	Foothill Boulevard-NB	Fruitvale Ave	14th Ave	Oak	1.32	N	22.9	2 / 3	INRIX	226	23.7	C / C	INRIX	692	16.1	D / D	
T58	Foothill Boulevard-NB	14th Ave	1st Ave/Lake Shore Blvd	Oak	0.88	N	20.5	3 / 4	INRIX	555	19.8	B / B	INRIX	177	14.7	C / C	

Table B-8: 2016 LOS Monitoring Results for Arterials (Tier 2) - PM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T60	Foothill Boulevard-SB	14th Ave	Fruitvale Ave	Oak	1.32	N	21.8	2 / 3	INRIX	129	20.4	C / C	INRIX	844	15.2	D / D	
T61	Foothill Boulevard-SB	Fruitvale Ave	High Street	Oak	0.90	N	20.8	3 / 4	INRIX	498	16.3	C / C	INRIX	778	11.1	D / D	
T62	Foothill Boulevard-SB	High Street	Seminary Ave	Oak	1.22	N	20.2	3 / 4	INRIX	590	19.7	B / B	INRIX	1340	18.2	C / C	
T63	Foothill Boulevard-SB	Seminary Ave	73rd Ave/Foothill Blvd	Oak	1.02	N	21.2	3 / 4	INRIX	355	20.3	B / B	INRIX	772	16.4	C / C	
T64	73d Ave-SB	73rd Ave/Foothill Blvd	International Blvd/73rd Ave	Oak	1.07	N	26.9	2 / 3	INRIX	738	23.8	C / C	INRIX	1569	20.1	C / C	
T65	E. 15th Street-SB/14th Avenue	1st Avenue	Foothill Blvd/14th Avenue	Oak	0.98	N	14.8	3 / 4	FC	6	14.5	C / C	FC	6	17.8	C / C	
T66	High Street-EB	Otis Drive	Central Ave	Ala	0.58	N	19.7	3 / 4	FC	6	16.9	C / C	INRIX	162	20.2	B / B	
T67	High Street-EB	Central Ave	Fernside Blvd	Ala	0.48	N	19.3	3 / 4	FC	6	14.3	C / C	INRIX	758	17.4	C / C	
T68	High Street-EB	Fernside Blvd	NB I-880 OFF Ramp	Ala - Oak	0.50	N	14.8	2 / 3	FC	6	9.7	F / F	INRIX	310	12.0	E / E	
T69	High Street-EB	NB I-880 OFF Ramp	Foothill Blvd	Oak	0.61	N	16.3	3 / 4	FC	6	11.5	D / D	INRIX	577	11.3	D / D	
T70	High Street-EB	Foothill Blvd	MacArthur Blvd/WB I-580 OFF Ramp	Oak	1.29	N	20.9	3 / 4	FC	6	15.9	C / C	INRIX	614	17.6	C / C	
T71	High Street-WB	MacArthur Blvd/WB I-580 OFF Ramp	Foothill Blvd	Oak	1.29	N	21.2	3 / 4	FC	6	13.8	C / C	INRIX	440	20.3	B / B	
T72	High Street-WB	Foothill Blvd	NB I-880 OFF Ramp	Oak	0.61	N	16.9	3 / 4	FC	6	10.4	D / D	INRIX	593	11.5	D / D	
T73	High Street-WB	NB I-880 OFF Ramp	Fernside Blvd	Ala - Oak	0.50	N	21.6	2 / 3	FC	6	14.3	D / D	INRIX	609	17.3	D / D	
T74	High Street-WB	Fernside Blvd	Central Ave	Ala	0.48	N	16.8	3 / 4	FC	6	19.6	B / B	INRIX	1018	19.5	B / B	
T75	High Street-WB	Central Ave	Otis Drive	Ala	0.58	N	24.5	3 / 4	FC	6	17.5	C / C	INRIX	542	17.8	C / C	
T76	Crow Canyon Road/Grove Way-NB	A Street/Redwood Road	EB I-580 ON Ramp/Grove Way	Uninc	0.95	C	29.0	2 / 3	INRIX	1987	24.3	B / B	INRIX	1638	18.6	C / C	
T77	Crow Canyon Road/Grove Way-NB	EB I-580 ON Ramp/Grove Way	Cull Canyon	Uninc	0.81	C	32.1	1 / 2	INRIX	2288	25.9	C / C	INRIX	3078	23.1	C / C	
T78	Crow Canyon Road-NB	Cull Canyon	Cold Water Dr	Uninc	0.88	C	42.3	1 / 2	INRIX	2106	39.2	A / A	INRIX	3197	38.4	A / A	
T79	Crow Canyon Road-NB	Cold Water Dr	0.43 miles North of Norris Canyon Rd	Uninc	2.41	C	42.0	Rural / Rural	INRIX	3039	38.9	A / -	INRIX	3546	38.2	A / -	
T80	Crow Canyon Road-NB	0.43 miles North of Norris Canyon Rd	County Line	Uninc	2.97	C	42.0	Rural / Rural	INRIX	3708	39.0	A / -	INRIX	3546	38.2	A / -	

Table B-8: 2016 LOS Monitoring Results for Arterials (Tier 2) - PM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T81	Crow Canyon Road-SB	County Line	0.43 miles North of Norris Canyon Rd	Uninc	2.97	C	41.4	Rural / Rural	INRIX	3728	38.6	A / -	INRIX	3536	38.1	A / -	
T82	Crow Canyon Road-SB	0.43 miles North of Norris Canyon Rd	Cold Water Dr	Uninc	2.40	C	41.4	Rural / Rural	INRIX	3608	38.6	A / -	INRIX	3536	38.1	A / -	
T83	Crow Canyon Road-SB	Cold Water Dr	Cull Canyon	Uninc	0.89	C	41.6	1 / 2	INRIX	1631	38.0	A / A	INRIX	2512	36.2	A / A	
T84	Crow Canyon Road/Grove Way-SB	Cull Canyon	EB I-580 ON Ramp/Grove Way	Uninc	0.82	C	36.1	1 / 2	INRIX	785	30.6	B / B	INRIX	1475	23.7	C / C	
T85	Crow Canyon Road/Grove Way-SB	EB I-580 ON Ramp/Grove Way	A Street/Redwood Road	Uninc	0.94	C	30.7	2 / 3	INRIX	427	27.2	B / B	INRIX	487	23.9	C / C	
T86	Winton Avenue - D Street-EB	Hesperian Blvd.	SB I-880 ON Ramp	Hay	0.39	C	25.7	2 / 3	INRIX	3612	16.6	D / D	INRIX	3533	16.5	D / D	
T87	Winton Avenue - D Street-EB	SB I-880 ON Ramp	Santa Clara St	Hay	0.35	C	33.5	2 / 3	INRIX	3031	20.7	C / C	INRIX	3447	19.3	C / C	
T88	Winton Avenue - D Street-EB	Santa Clara St	Soto Rd	Hay	0.55	C	24.1	2 / 3	INRIX	3337	18.1	C / C	INRIX	3505	14.9	D / D	
T89	Winton Avenue - D Street-EB	Soto Rd	Foothill Boulevard/D St	Hay	0.92	C	24.5	2 / 3	INRIX	1824	20.0	C / C	INRIX	2382	12.9	E / E	
T90	Winton Avenue - D Street-WB	Foothill Boulevard/D St	Soto Rd	Hay	0.92	C	27.2	2 / 3	INRIX	802	20.5	C / C	INRIX	948	17.6	D / D	
T91	Winton Avenue - D Street-WB	Soto Rd	Santa Clara St	Hay	0.55	C	23.0	2 / 3	INRIX	2407	19.7	C / C	INRIX	3155	18.4	C / C	
T92	Winton Avenue - D Street-WB	Santa Clara St	SB I-880 ON Ramp	Hay	0.35	C	34.7	2 / 3	INRIX	1820	34.1	A / A	INRIX	2717	29.5	B / B	
T93	Winton Avenue - D Street-WB	SB I-880 ON Ramp	Hesperian Blvd.	Hay	0.39	C	24.1	2 / 3	INRIX	3363	19.9	C / C	INRIX	3474	18.5	C / C	
T94	A Street-EB	Foothill Boulevard/A St	Redwood Rd/Grove Way	Hay - Uninc	0.80	C	23.6	2 / 3	FC	7	17.6	D / D	INRIX	3202	19.9	C / C	
T95	A Street-EB	Redwood Rd/Grove Way	EB I-580 ON Ramp/Grove Way	Uninc	0.42	C	18.5	2 / 3	FC	7	15.8	D / D	INRIX	2684	20.2	C / C	
T96	A Street-WB	EB I-580 ON Ramp/Grove Way	Redwood Rd/Grove Way	Uninc	0.42	C	28.8	2 / 3	FC	7	28.1	B / B	INRIX	2627	21.0	C / C	
T97	A Street-WB	Redwood Rd/Grove Way	Foothill Boulevard/A St	Uninc	0.80	C	15.8	2 / 3	FC	7	27.9	B / B	INRIX	2634	19.5	C / C	

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CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T98	Hesperian Boulevard-Union City Blvd-NB	Union City/Alvarado Blvd	Whipple Rd	Uni Cty	0.98	S	26.5	1 / 2	FC	6	15.2	E / E	INRIX	3085	12.9	F / F	
T99	Hesperian Boulevard-Union City Blvd-NB	Whipple Rd	Hesperian/Union City Blvd/overbridge	Uni Cty	0.30	S	32.9	1 / 2	FC	6	13.5	E / E	INRIX	3315	12.5	F / F	
T100	Hesperian Boulevard-Union City Blvd-NB	Hesperian/Union City Blvd/overbridge	Industrial Blvd	Hay	0.57	S	26.4	1 / 2	FC	6	22.2	C / C	INRIX	3178	13.7	E / E	
T101	Hesperian Boulevard-Union City Blvd-NB	Industrial Blvd	Tennyson/Hesperian	Hay	1.05	S	25.2	2 / 3	FC	6	22.6	C / C	INRIX	3473	25.3	B / B	
T102	Hesperian Boulevard-Union City Blvd-SB	Tennyson/Hesperian	Industrial Blvd	Hay	1.05	S	26.8	2 / 3	FC	6	13.4	E / E	INRIX	2555	24.9	B / B	
T103	Hesperian Boulevard-Union City Blvd-SB	Industrial Blvd	Hesperian/Union City Blvd/overbridge	Hay	0.57	S	19.3	1 / 2	FC	6	12.2	F / F	INRIX	1034	21.0	D / D	
T104	Hesperian Boulevard-Union City Blvd-SB	Hesperian/Union City Blvd/overbridge	Whipple Rd	Uni Cty	0.30	S	22.1	1 / 2	FC	6	15.4	E / E	INRIX	3196	24.1	C / C	
T105	Hesperian Boulevard-Union City Blvd-SB	Whipple Rd	Union City/Alvarado Blvd	Uni Cty	0.98	S	29.5	1 / 2	FC	6	28.0	B / B	INRIX	1504	24.0	C / C	
T106	Alvarado Blvd.-NB	NB I-880 ON Ramp	Deep Creek Rd/SB I-880 OFF Ramp	Fre	0.22	S	30.6	1 / 2	INRIX	1536	28.0	B / B	INRIX	2640	26.9	C / C	
T107	Alvarado Blvd.-NB	Deep Creek Rd/SB I-880 OFF Ramp	Fair Ranch Rd	Uni Cty - Fre	1.42	S	32.4	1 / 2	INRIX	1233	28.3	B / B	INRIX	520	25.3	C / C	
T108	Alvarado Blvd.-NB	Fair Ranch Rd	Union City/Alvarado Blvd	Uni Cty	0.51	S	28.5	1 / 2	INRIX	327	26.7	C / C	INRIX	183	18.5	D / D	[2]
T109	Alvarado Blvd.-SB	Union City/Alvarado Blvd	Fair Ranch Rd	Uni Cty	0.51	S	28.1	1 / 2	INRIX	1456	25.6	C / C	INRIX	1740	17.2	D / D	
T110	Alvarado Blvd.-SB	Fair Ranch Rd	Deep Creek Rd/SB I-880 OFF Ramp	Uni Cty - Fre	1.42	S	31.2	1 / 2	INRIX	1231	28.2	B / B	INRIX	1457	24.3	C / C	
T111	Alvarado Blvd.-SB	Deep Creek Rd/SB I-880 OFF Ramp	NB I-880 ON Ramp	Fre	0.22	S	31.6	1 / 2	INRIX	1934	25.5	C / C	INRIX	2001	22.3	C / C	
T112	Fremont Boulevard-NB	NB I-880 OFF Ramp	Automall Parkway	Fre	1.28	S	34.7	1 / 2	INRIX	2024	27.4	C / C	INRIX	2723	21.8	D / D	
T113	Fremont Boulevard-NB	Automall Parkway	Blacow Rd	Fre	0.91	S	34.2	1 / 2	INRIX	2263	31.9	B / B	INRIX	3293	28.3	B / B	
T114	Fremont Boulevard-NB	Blacow Rd	Adams Ave	Fre	0.38	S	28.0	1 / 2	INRIX	3591	23.2	C / C	INRIX	3515	19.8	D / D	
T115	Fremont Boulevard-NB	Adams Ave	Stevenson Rd	Fre	1.17	S	27.9	2 / 3	INRIX	2308	23.1	C / C	INRIX	2507	19.7	C / C	
T116	Fremont Boulevard-NB	Stevenson Rd	Mowry Ave	Fre	1.00	S	30.2	2 / 3	INRIX	1336	27.1	B / B	INRIX	1643	23.4	C / C	

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		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T117	Fremont Boulevard-NB	Mowry Ave	Peralta Blvd	Fre	1.21	S	30.0	2 / 3	INRIX	1742	26.1	B / B	INRIX	2174	21.0	C / C	
T118	Fremont Boulevard-NB	Peralta Blvd	Thornton Ave	Fre	0.33	S	30.9	2 / 3	INRIX	1724	24.0	B / B	INRIX	2488	15.7	D / D	
T119	Fremont Boulevard-NB	Thornton Ave	Decoto Rd	Fre	1.33	S	32.0	1 / 2	INRIX	1262	28.7	B / B	INRIX	2325	22.7	C / C	
T120	Fremont Boulevard-NB	Decoto Rd	Paseo Padre Pkwy	Fre	0.56	S	31.0	1 / 2	INRIX	2020	28.6	B / B	INRIX	2511	22.4	C / C	
T121	Fremont Boulevard-NB	Paseo Padre Pkwy	NB I-880 OFF Ramp	Fre	0.39	S	31.0	1 / 2	INRIX	1336	29.2	B / B	INRIX	2165	25.0	C / C	
T122	Fremont Boulevard-SB	NB I-880 OFF Ramp	Paseo Padre Pkwy	Fre	0.39	S	32.0	1 / 2	INRIX	1110	29.6	B / B	INRIX	1316	24.5	C / C	
T123	Fremont Boulevard-SB	Paseo Padre Pkwy	Decoto Rd	Fre	0.56	S	29.7	1 / 2	INRIX	1563	27.9	C / C	INRIX	1230	24.4	C / C	
T124	Fremont Boulevard-SB	Decoto Rd	Thornton Ave	Fre	1.33	S	30.2	1 / 2	INRIX	1692	28.7	B / B	INRIX	1589	24.1	C / C	
T125	Fremont Boulevard-SB	Thornton Ave	Peralta Blvd	Fre	0.32	S	29.3	2 / 3	INRIX	2634	24.5	B / B	INRIX	2544	17.0	D / D	
T126	Fremont Boulevard-SB	Peralta Blvd	Mowry Ave	Fre	1.21	S	29.4	2 / 3	INRIX	2176	27.3	B / B	INRIX	1543	23.8	C / C	
T127	Fremont Boulevard-SB	Mowry Ave	Stevenson Rd	Fre	1.00	S	32.3	2 / 3	INRIX	1896	30.0	A / A	INRIX	1227	24.5	B / B	
T128	Fremont Boulevard-SB	Stevenson Rd	Adams Ave	Fre	1.17	S	27.8	2 / 3	INRIX	2423	24.8	B / B	INRIX	2216	22.1	C / C	
T129	Fremont Boulevard-SB	Adams Ave	Blacow Rd	Fre	0.38	S	27.9	1 / 2	INRIX	3557	24.6	C / C	INRIX	3480	22.3	C / C	
T130	Fremont Boulevard-SB	Blacow Rd	Automall Parkway	Fre	0.91	S	33.1	1 / 2	INRIX	862	32.9	B / B	INRIX	1462	29.2	B / B	
T131	Fremont Boulevard-SB	Automall Parkway	NB I-880 OFF Ramp	Fre	1.28	S	34.9	1 / 2	INRIX	553	33.8	B / B	INRIX	738	30.0	B / B	
T132	Automall Parkway-EB	NB I-880 OFF Ramp	Fremont Blvd	Fre	0.85	S	23.1	1 / 2	FC	8	19.5	D / D	FC	6	25.8	C / C	
T133	Automall Parkway-EB	Fremont Blvd	NB I-680 ON Ramp	Fre	0.74	S	29.5	1 / 2	FC	8	22.8	C / C	FC	6	24.6	C / C	
T134	Automall Parkway-WB	NB I-680 ON Ramp	Fremont Blvd	Fre	0.75	S	21.1	1 / 2	FC	8	20.3	D / D	FC	6	20.3	D / D	
T135	Automall Parkway-WB	Fremont Blvd	NB I-880 OFF Ramp	Fre	0.85	S	27.1	1 / 2	FC	8	28.0	B / B	FC	6	25.5	C / C	
T136	Vasco Road-NB	WB I-580 OFF Ramp	Scenic Ave	Liv	0.44	E	36.3	1 / 2	INRIX	3723	18.0	D / D	INRIX	3168	15.4	E / E	
T137	Vasco Road-NB	Scenic Ave	Dalton Ave/City-County Line	Liv	0.68	E	37.4	1 / 2	INRIX	3821	17.7	D / D	INRIX	3255	14.6	E / E	
T138	Vasco Road-NB	Dalton Ave/City-County Line	N. Vasco Rd/Vasco Rd	Liv	3.11	E	53.0	Rural / Rural	INRIX	3856	40.8	C / -	INRIX	3320	34.2	D / -	
T139	Vasco Road-NB	N. Vasco Rd/Vasco Rd	Local Road underpass/County Line	Liv	2.25	E	53.0	Rural / Rural	INRIX	3856	40.8	C / -	INRIX	3320	34.2	D / -	
T140	Vasco Road-SB	Local Road underpass/County Line	N. Vasco Rd/Vasco Rd	Liv	2.25	E	46.8	Rural / Rural	INRIX	2985	53.1	A / -	INRIX	3132	57.1	A / -	

Table B-8: 2016 LOS Monitoring Results for Arterials (Tier 2) - PM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T141	Vasco Road-SB	N. Vasco Rd/Vasco Rd	Dalton Ave/City-County Line	Liv	3.11	E	46.8	Rural / Rural	INRIX	2985	53.1	A / -	INRIX	3132	57.1	A / -	
T142	Vasco Road-SB	Dalton Ave/City-County Line	Scenic Ave	Liv	0.68	E	34.3	1 / 2	INRIX	2641	32.6	B / B	INRIX	3067	30.2	B / B	
T143	Vasco Road-SB	Scenic Ave	WB I-580 OFF Ramp	Liv	0.44	E	32.0	1 / 2	INRIX	1569	32.9	B / B	INRIX	1616	30.9	B / B	
T144	Dublin Blvd.-EB	San Ramon Road	Village Parkway	Dub	0.73	E	26.5	2 / 3	INRIX	993	20.6	C / C	INRIX	2445	16.8	D / D	
T145	Dublin Blvd.-EB	Village Parkway	Dougherty Rd	Dub	0.81	E	29.5	2 / 3	INRIX	2209	24.9	B / B	INRIX	2541	22.7	C / C	
T146	Dublin Blvd.-EB	Dougherty Rd	Hacienda Dr	Dub	1.21	E	34.1	1 / 2	INRIX	2187	28.8	B / B	INRIX	2020	25.0	C / C	
T147	Dublin Blvd.-EB	Hacienda Dr	Tassajara Dr	Dub	0.89	E	30.2	1 / 2	INRIX	1592	25.2	C / C	INRIX	2219	20.1	D / D	
T148	Dublin Blvd.-WB	Tassajara Dr	Hacienda Dr	Dub	0.89	E	29.1	1 / 2	INRIX	462	25.7	C / C	INRIX	453	22.4	C / C	
T149	Dublin Blvd.-WB	Hacienda Dr	Dougherty Rd	Dub	1.21	E	32.8	1 / 2	INRIX	885	28.0	B / B	INRIX	827	24.1	C / C	
T150	Dublin Blvd.-WB	Dougherty Rd	Village Parkway	Dub	0.81	E	29.5	2 / 3	INRIX	2770	23.6	C / C	INRIX	3004	21.7	C / C	
T151	Dublin Blvd.-WB	Village Parkway	San Ramon Road	Dub	0.73	E	24.5	2 / 3	INRIX	588	21.4	C / C	INRIX	1404	14.1	D / D	
T152	San Ramon Road-NB	WB I-580 OFF ramp	Silvergate Dr	Dub	0.64	E	30.8	1 / 2	INRIX	1201	26.6	C / C	INRIX	1615	21.4	D / D	
T153	San Ramon Road-NB	Silvergate Dr	Alcosta Blvd/Westside Dr/County Line	Dub	0.99	E	35.1	1 / 2	INRIX	2194	33.5	B / B	INRIX	2495	32.4	B / B	
T154	San Ramon Road-SB	Alcosta Blvd/Westside Dr/County Line	Silvergate Dr	Dub	0.99	E	35.8	1 / 2	INRIX	2171	35.1	A / A	INRIX	2264	31.9	B / B	
T155	San Ramon Road-SB	Silvergate Dr	WB I-580 OFF ramp	Dub	0.64	E	32.7	1 / 2	INRIX	810	29.9	B / B	INRIX	1042	23.3	C / C	
T156	Dougherty Road-NB	WB I-580 OFF ramp	Amador Valley Blvd on SB	Dub	1.12	E	35.4	1 / 2	INRIX	2844	28.1	B / B	INRIX	2901	22.1	C / C	
T157	Dougherty Road-NB	Amador Valley Blvd on SB	Fallcreek Rd on SB/County Line	Dub	0.80	E	44.1	1 / 2	INRIX	1953	43.6	A / A	INRIX	2744	43.1	A / A	
T158	Dougherty Road-SB	Fallcreek Rd on SB/County Line	Amador Valley Blvd on SB	Dub	0.80	E	43.1	1 / 2	INRIX	2386	39.4	A / A	INRIX	2774	38.3	A / A	
T159	Dougherty Road-SB	Amador Valley Blvd on SB	WB I-580 OFF ramp	Dub	1.12	E	33.1	1 / 2	INRIX	2351	27.1	C / C	INRIX	2702	23.3	C / C	
T160	Tassajara Road-NB	WB I-580 OFF ramp	Central Parkway	Dub	0.49	E	24.7	1 / 2	FC	6	14.6	E / E	FC	6	13.9	E / E	
T161	Tassajara Road-NB	Central Parkway	Somerset Ln/N Dublin Ranch Dr	Dub	0.68	E	34.3	1 / 2	FC	6	19.2	D / D	FC	6	34.5	B / B	

Table B-8: 2016 LOS Monitoring Results for Arterials (Tier 2) - PM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T162	Tassajara Road-NB	Somerset Ln/N Dublin Ranch Dr	Fallon Rd	Dub	1.04	E	38.4	1 / 2	FC	6	31.1	B / B	FC	6	32.4	B / B	
T163	Tassajara Road-NB	Fallon Rd	County Line	Uninc	0.51	E	35.2	1 / 1	FC	6	34.5	B / B	FC	6	36.7	A / B	
T164	Tassajara Road-SB	County Line	Fallon Rd	Uninc	0.51	E	45.2	1 / 1	FC	6	36.1	A / B	FC	6	40.0	A / B	
T165	Tassajara Road-SB	Fallon Rd	Somerset Ln/N Dublin Ranch Dr	Dub	1.04	E	38.7	1 / 2	FC	6	34.8	B / B	FC	6	37.8	A / A	
T166	Tassajara Road-SB	Somerset Ln/N Dublin Ranch Dr	Central Parkway	Dub	0.68	E	33.8	1 / 2	FC	6	43.1	A / A	FC	6	19.0	D / D	
T167	Tassajara Road-SB	Central Parkway	WB I-580 OFF ramp	Dub	0.49	E	25.7	1 / 2	FC	6	29.6	B / B	FC	6	14.9	E / E	
T168	E. Stanley Blvd - Railroad Avenue - 1st Street-NB	SR 84/Isabel Ave	Murrita Blvd	Liv	0.91	E	31.5	1 / 2	FC	6	28.1	B / B	INRIX	3184	24.3	C / C	
T169	E. Stanley Blvd - Railroad Avenue - 1st Street-NB	Murrita Blvd	S Livermore Ave	Liv	1.07	E	23.4	2 / 3	FC	6	26.3	B / B	INRIX	2225	21.6	C / C	
T170	E. Stanley Blvd - Railroad Avenue - 1st Street-NB	S Livermore Ave	Inman St	Liv	0.46	E	21.7	2 / 3	FC	6	24.8	B / B	INRIX	404	19.0	C / C	
T171	E. Stanley Blvd - Railroad Avenue - 1st Street-SB	Inman St	S Livermore Ave	Liv	0.46	E	20.1	2 / 3	FC	6	15.2	D / D	INRIX	99	14.6	D / D	
T172	E. Stanley Blvd - Railroad Avenue - 1st Street-SB	S Livermore Ave	Murrita Blvd	Liv	1.07	E	26.6	2 / 3	FC	6	24.4	B / B	INRIX	772	21.1	C / C	
T173	E. Stanley Blvd - Railroad Avenue - 1st Street-SB	Murrita Blvd	SR 84/Isabel Ave	Liv	0.91	E	21.9	1 / 2	FC	6	15.3	E / E	INRIX	2226	35.6	A / A	
T174	Stoneridge Drive-EB	SB I-680 OFF Ramp	Hopyard Rd	Plea	0.93	E	33.2	1 / 2	INRIX	3380	29.0	B / B	INRIX	3248	27.0	C / C	
T175	Stoneridge Drive-EB	Hopyard Rd	Hacienda Dr	Plea	0.49	E	29.8	1 / 2	INRIX	2374	28.4	B / B	INRIX	2370	24.9	C / C	
T176	Stoneridge Drive-EB	Hacienda Dr	W. Las Positas Blvd	Plea	0.63	E	31.1	1 / 2	INRIX	2180	28.7	B / B	INRIX	2917	21.9	D / D	
T177	Stoneridge Drive-EB	W. Las Positas Blvd	Santa Rita Road	Plea	0.44	E	30.0	1 / 2	INRIX	1668	26.6	C / C	INRIX	1714	19.9	D / D	
T178	Santa Rita Road-EB	Stoneridge Dr/Santa Rita Road	W. Los Positas Blvd	Plea	0.29	E	31.1	1 / 2	INRIX	2944	29.5	B / B	INRIX	2401	29.1	B / B	
T179	Santa Rita Road-EB	W. Los Positas Blvd	WB I-580 OFF Ramp	Plea	0.88	E	30.3	1 / 2	INRIX	3123	26.3	C / C	INRIX	3073	24.7	C / C	
T180	Santa Rita Road-WB	WB I-580 OFF Ramp	W. Los Positas Blvd	Plea	0.88	E	31.3	1 / 2	INRIX	2361	28.5	B / B	INRIX	2450	26.1	C / C	
T181	Santa Rita Road-WB	W. Los Positas Blvd	Santa Rita Road	Plea	0.29	E	31.5	1 / 2	INRIX	2868	30.1	B / B	INRIX	2823	26.8	C / C	
T182	Stoneridge Drive-WB	Santa Rita Road	W. Las Positas Blvd	Plea	0.44	E	31.8	1 / 2	INRIX	547	29.1	B / B	INRIX	430	22.4	C / C	
T183	Stoneridge Drive-WB	W. Las Positas Blvd	Hacienda Dr	Plea	0.63	E	33.8	1 / 2	INRIX	1473	30.5	B / B	INRIX	2329	29.0	B / B	

Table B-8: 2016 LOS Monitoring Results for Arterials (Tier 2) - PM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T184	Stoneridge Drive-WB	Hacienda Dr	Hopyard Rd	Plea	0.49	E	28.8	1 / 2	INRIX	2218	24.6	C / C	INRIX	1739	18.5	D / D	
T185	Stoneridge Drive-WB	Hopyard Rd	SB I-680 OFF Ramp	Plea	0.93	E	32.9	1 / 2	INRIX	2401	27.5	C / C	INRIX	2159	25.7	C / C	
T186	Sunol Blvd.- 1st Street-Stanley Blvd.-NB	NB I-680 OFF	Bernal Ave	Plea	1.23	E	31.2	1 / 2	INRIX	1583	27.5	C / C	INRIX	1975	26.3	C / C	
T187	Sunol Blvd.- 1st Street-Stanley Blvd.-NB	Bernal Ave	Ray/Vineyard	Plea	0.63	E	26.1	3 / 4	INRIX	3232	21.0	B / B	INRIX	3194	17.2	C / C	
T188	Sunol Blvd.- 1st Street-Stanley Blvd.-NB	Ray/Vineyard	Bernal Ave/Valley Ave	Plea	0.86	E	32.1	2 / 3	INRIX	1858	27.2	B / B	INRIX	2453	23.6	C / C	
T189	Sunol Blvd.- 1st Street-Stanley Blvd.-NB	Bernal Ave/Valley Ave	SR 84/Isabel Ave	Plea - Uninc	2.98	E	44.9	1 / 1	INRIX	3738	47.6	A / A	INRIX	3312	45.2	A / A	
T190	Sunol Blvd.- 1st Street-Stanley Blvd.-SB	SR 84/Isabel Ave	Bernal Ave/Valley Ave	Plea - Uninc	2.98	E	51.0	1 / 1	INRIX	2660	47.8	A / A	INRIX	2488	50.9	A / A	
T191	Sunol Blvd.- 1st Street-Stanley Blvd.-SB	Bernal Ave/Valley Ave	Ray/Vineyard	Plea	0.86	E	34.6	2 / 3	INRIX	552	30.2	A / A	INRIX	694	26.0	B / B	
T192	Sunol Blvd.- 1st Street-Stanley Blvd.-SB	Ray/Vineyard	Bernal Ave	Plea	0.63	E	25.4	3 / 4	INRIX	1910	22.3	B / B	INRIX	1255	18.5	C / C	
T193	Sunol Blvd.- 1st Street-Stanley Blvd.-SB	Bernal Ave	NB I-680 OFF	Plea	1.23	E	35.6	1 / 2	INRIX	727	32.8	B / B	INRIX	1013	31.8	B / B	

Notes
[1] Data impacted by long term construction and recurrent lane closures
[2] Complete Road Closure for part of the Monitoring Period

Table B-9: 2016 LOS Monitoring Results for Arterials (Tier 2) - AM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T1	W.Grand Ave - Grand Ave -EB	I-80/Maritime St	San Pablo Ave	Oak	1.63	N	26.6	2 / 3	INRIX	519	24.3	B / B	INRIX	653	20.2	C / C	
T2	W.Grand Ave - Grand Ave -EB	San Pablo Ave	Broadway	Oak	0.40	N	19.9	3 / 4	INRIX	2305	15.8	C / C	INRIX	1411	12.2	D / D	
T3	W.Grand Ave - Grand Ave -EB	Broadway	I-580	Oak	1.08	N	21.6	3 / 4	INRIX	672	19.5	B / B	INRIX	462	15.4	C / C	
T4	W.Grand Ave - Grand Ave -WB	I-580	Broadway	Oak	1.08	N	21.5	3 / 4	INRIX	706	18.9	C / C	INRIX	767	15.6	C / C	

Table B-9: 2016 LOS Monitoring Results for Arterials (Tier 2) - AM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T5	W.Grand Ave - Grand Ave -WB	Broadway	San Pablo Ave	Oak	0.40	N	20.8	3 / 4	INRIX	1615	17.0	C / C	INRIX	1158	11.2	D / D	
T6	W.Grand Ave - Grand Ave -WB	San Pablo Ave	I-80/Maritime St	Oak	1.63	N	28.3	2 / 3	INRIX	1892	20.0	C / C	INRIX	2161	23.7	C / C	
T7	11th St - Lake Merritt Blvd - Lakeshore Ave-EB	I-980 ON Ramp/Brush St	Webster	Oak	0.60	N	14.4	3 / 4	FC	6	14.5	C / C	FC	6	17.0	C / C	
T8	11th St - Lake Merritt Blvd - Lakeshore Ave-EB	Webster	East side of Lake Merritt Channel	Oak	0.66	N	14.7	3 / 4	FC	6	15.0	C / C	FC	6	14.9	C / C	
T9	11th St - Lake Merritt Blvd - Lakeshore Ave-EB	East side of Lake Merritt Channel	MacArthur Blvd/I-580 ON Ramp	Oak	1.15	N	16.7	3 / 4	FC	6	11.0	D / D	FC	6	16.1	C / C	
T10	12th St - Lake Merritt Blvd - Lakeshore Ave-WB	MacArthur Blvd/I-580 ON Ramp	East side of Lake Merritt Channel	Oak	1.15	N	16.8	3 / 4	FC	6	16.0	C / C	FC	6	16.1	C / C	
T11	12th St - Lake Merritt Blvd - Lakeshore Ave-WB	East side of Lake Merritt Channel	Webster	Oak	0.64	N	15.9	3 / 4	FC	8	13.3	C / C	FC	6	11.9	D / D	
T12	12th St - Lake Merritt Blvd - Lakeshore Ave-WB	Webster	I-980 OFF Ramp/Brush St	Oak	0.60	N	17.4	3 / 4	FC	8	11.1	D / D	FC	6	10.1	D / D	
T13	Telegraph Ave-NB	51st Street	Russell St	Oak - Berk	1.41	N	15.0	3 / 4	FC	6	18.1	C / C	FC	6	16.3	C / C	
T14	Telegraph Ave-NB	Russell St	Bancroft Way	Berk	0.77	N	13.5	3 / 4	FC	6	19.9	B / B	FC	6	22.5	B / B	
T15	Dana-Dwight-Telegraph-SB	Bancroft Way	Russell St	Berk	0.90	N	13.9	3 / 4	FC	6	17.4	C / C	FC	6	13.3	C / C	
T16	Telegraph Ave-SB	Russell St	51st Street	Oak - Berk	1.41	N	18.5	3 / 4	FC	6	19.7	B / B	FC	6	17.8	C / C	
T17	Broadway-SB	Broadway/College Ave	Grand Ave	Oak	1.91	N	20.8	2 / 3	INRIX	143	18.1	C / C	INRIX	372	15.5	D / D	
T18	Broadway-SB	Grand Ave	14th St	Oak	0.55	N	18.2	3 / 4	INRIX	885	18.3	C / C	INRIX	1140	14.5	C / C	[1]
T19	Broadway-SB	14th St	5th St/Broadway	Oak	0.48	N	17.9	3 / 4	INRIX	1198	16.8	C / C	INRIX	1058	9.1	D / D	
T20	Broadway (Connection to I-880)-SB	5th St/Broadway	I-880 ON Ramp	Oak	0.21	N	62.9	1 / 1	INRIX	3775	49.2	A / A	FC	6	17.4	D / D	
T21	Broadway (Connection to I-880)-NB	I-880 OFF Ramp	5th St/Broadway	Oak	1.26	N	23.0	1 / 2	FC	6	15.1	E / E	FC	6	21.9	D / D	
T22	Broadway-NB	5th St/Broadway	14th St	Oak	0.48	N	17.1	3 / 4	INRIX	1687	15.1	C / C	INRIX	532	10.9	D / D	
T23	Broadway-NB	14th St	Grand Ave	Oak	0.55	N	18.3	3 / 4	INRIX	1181	16.0	C / C	INRIX	1164	13.2	C / C	[1]
T24	Broadway-NB	Grand Ave	Broadway/College Ave	Oak	1.91	N	21.9	2 / 3	INRIX	516	17.4	D / D	INRIX	234	15.9	D / D	
T25	Durant-EB	Shattuck	College Ave.	Berk	0.73	N	16.0	3 / 4	FC	6	16.3	C / C	FC	6	15.0	C / C	

Table B-9: 2016 LOS Monitoring Results for Arterials (Tier 2) - AM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T26	College Avenue-SB	Bancroft Way/College Ave	Ashby Ave	Berk	0.85	N	16.8	3 / 4	INRIX	501	16.7	C / C	INRIX	807	14.6	C / C	
T27	College Avenue-SB	Ashby Ave	Miles Ave/SR 24 OFF Ramp	Oak - Berk	0.83	N	19.7	3 / 4	INRIX	146	18.9	C / C	INRIX	302	14.6	C / C	
T28	College Avenue-SB	Miles Ave/SR 24 OFF Ramp	Broadway/College Ave	Oak	0.61	N	16.7	3 / 4	INRIX	408	15.2	C / C	INRIX	706	13.6	C / C	
T29	College Avenue-NB	Broadway/College Ave	Miles Ave/SR 24 OFF Ramp	Oak	0.61	N	17.0	3 / 4	INRIX	885	16.8	C / C	INRIX	1149	15.0	C / C	
T30	College Avenue-NB	Miles Ave/SR 24 OFF Ramp	Ashby Ave	Oak - Berk	0.83	N	18.3	3 / 4	INRIX	477	16.5	C / C	INRIX	747	13.1	C / C	
T31	College Avenue-NB	Ashby Ave	Bancroft Way/College Ave	Berk	0.85	N	16.8	3 / 4	INRIX	780	16.4	C / C	INRIX	1079	14.4	C / C	
T32	Bancroft-WB	College Ave.	Shattuck	Berk	0.73	N	12.5	3 / 4	FC	6	14.1	C / C	FC	6	13.8	C / C	
T33	51st Street-EB	SR 24 Off Ramp/52nd St	Broadway	Oak	0.75	N	15.0	3 / 4	FC	9	17.2	C / C	FC	6	16.7	C / C	
T34	51st Street-WB	Broadway	SR 24 Off Ramp/52nd St	Oak	0.75	N	15.7	3 / 4	FC	8	17.9	C / C	FC	6	18.9	C / C	
T35	Shattuck Avenue-NB	51st	Alcatraz Ave.	Oak - Berk	0.81	N	22.8	3 / 4	FC	7	20.9	B / B	FC	6	18.2	C / C	
T36	Shattuck Avenue-NB	Alcatraz Ave.	Adeline St.	Berk	0.70	N	16.7	3 / 4	FC	7	16.7	C / C	FC	6	16.1	C / C	
T37	Shattuck Avenue-SB	Adeline St.	Alcatraz Ave.	Berk	0.70	N	17.1	3 / 4	FC	6	17.1	C / C	FC	6	17.6	C / C	
T38	Shattuck Avenue-SB	Alcatraz Ave.	51st	Oak	0.81	N	17.3	3 / 4	FC	6	18.1	C / C	FC	6	19.9	B / B	
T39	Powell Street-Stanford Avenue-EB	NB I-80 OFF Ramp	San Pablo Ave	Emery	0.75	N	15.5	2 / 3	FC	7	18.5	C / C	FC	6	21.7	C / C	[1]
T40	Powell Street-Stanford Avenue-EB	San Pablo Ave	MLK Jr Way	Oak - Berk	0.76	N	17.0	2 / 3	FC	7	17.4	D / D	FC	6	20.3	C / C	
T41	Powell Street-Stanford Avenue-WB	MLK Jr Way	San Pablo Ave	Oak - Berk	0.76	N	19.1	2 / 3	FC	6	23.0	C / C	FC	6	24.7	B / B	
T42	Powell Street-Stanford Avenue-WB	San Pablo Ave	NB I-80 OFF Ramp	Emery - Oak	0.75	N	15.3	2 / 3	FC	6	15.0	D / D	FC	6	16.9	D / D	[1]
T43	40thStreet-Shellmound Avenue-EB	Shellmound Way (North of Powell St)	40th St	Emery	0.73	N	24.6	2 / 3	FC	7	24.6	B / B	FC	6	29.3	B / B	
T44	40thStreet-Shellmound Avenue-EB	40th St	San Pablo Ave	Emery	0.68	N	16.5	3 / 4	FC	7	25.7	A / A	FC	6	21.9	B / B	

Table B-9: 2016 LOS Monitoring Results for Arterials (Tier 2) - AM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T45	40thStreet-Shellmound Avenue-WB	San Pablo Ave	40th St	Emery	0.68	N	22.0	3 / 4	FC	7	20.6	B / B	FC	6	29.9	A / A	
T46	40thStreet-Shellmound Avenue-WB	40th St	Shellmound Way (North of Powell St)	Emery	0.73	N	29.0	2 / 3	FC	7	29.0	B / B	FC	6	24.7	B / B	
T47	International Boulevard-NB	42nd Ave	Fruitvale Ave	Oak	0.62	N	21.9	3 / 4	INRIX	2602	16.7	C / C	INRIX	2696	11.8	D / D	
T48	International Boulevard-NB	Fruitvale Ave	14th Ave	Oak	1.38	N	22.9	3 / 4	INRIX	2309	22.3	B / B	INRIX	2071	19.5	B / B	
T49	International Boulevard-NB	14th Ave	Lake Merritt Blvd	Oak	0.88	N	22.5	3 / 4	INRIX	2168	20.3	B / B	INRIX	1532	17.3	C / C	
T50	International Boulevard-SB	Lake Merritt Blvd	14th Ave	Oak	0.88	N	21.5	3 / 4	INRIX	441	20.4	B / B	INRIX	295	17.8	C / C	
T51	International Boulevard-SB	14th Ave	Fruitvale Ave	Oak	1.38	N	22.9	3 / 4	INRIX	815	21.9	B / B	INRIX	643	19.7	B / B	
T52	International Boulevard-SB	Fruitvale Ave	42nd Ave	Oak	0.62	N	21.4	3 / 4	INRIX	1170	18.7	C / C	INRIX	1228	14.7	C / C	
T53	73d Ave-NB	International Blvd/73rd Ave	73rd Ave/Foothill Blvd	Oak	1.07	N	28.1	2 / 3	INRIX	2518	23.1	C / C	INRIX	2144	21.3	C / C	
T54	Foothill Boulevard-NB	73rd Ave/Foothill Blvd	Seminary Ave	Oak	1.02	N	20.3	3 / 4	INRIX	261	20.2	B / B	INRIX	151	18.1	C / C	
T55	Foothill Boulevard-NB	Seminary Ave	High Street	Oak	1.22	N	21.5	3 / 4	INRIX	658	21.0	B / B	INRIX	717	18.5	C / C	
T56	Foothill Boulevard-NB	High Street	Fruitvale Ave	Oak	0.90	N	19.8	3 / 4	INRIX	519	16.3	C / C	INRIX	586	10.4	D / D	
T57	Foothill Boulevard-NB	Fruitvale Ave	14th Ave	Oak	1.32	N	22.9	2 / 3	INRIX	113	21.9	C / C	INRIX	804	18.9	C / C	
T58	Foothill Boulevard-NB	14th Ave	1st Ave/Lake Shore Blvd	Oak	0.88	N	20.5	3 / 4	INRIX	267	19.4	B / B	INRIX	103	14.2	C / C	
T60	Foothill Boulevard-SB	14th Ave	Fruitvale Ave	Oak	1.32	N	21.8	2 / 3	INRIX	120	21.9	C / C	INRIX	323	16.9	D / D	
T61	Foothill Boulevard-SB	Fruitvale Ave	High Street	Oak	0.90	N	20.8	3 / 4	INRIX	119	19.6	B / B	INRIX	339	13.8	C / C	
T62	Foothill Boulevard-SB	High Street	Seminary Ave	Oak	1.22	N	20.2	3 / 4	INRIX	292	19.8	B / B	INRIX	413	18.0	C / C	
T63	Foothill Boulevard-SB	Seminary Ave	73rd Ave/Foothill Blvd	Oak	1.02	N	21.2	3 / 4	INRIX	169	21.2	B / B	INRIX	315	16.2	C / C	
T64	73d Ave-SB	73rd Ave/Foothill Blvd	International Blvd/73rd Ave	Oak	1.07	N	26.9	2 / 3	INRIX	783	24.3	B / B	INRIX	1346	21.5	C / C	
T65	E. 15th Street-SB/14th Avenue	1st Avenue	Foothill Blvd/14th Avenue	Oak	0.98	N	14.8	3 / 4	FC	6	13.8	C / C	FC	6	20.0	B / B	
T66	High Street-EB	Otis Drive	Central Ave	Ala	0.58	N	19.7	3 / 4	FC	6	15.9	C / C	INRIX	487	17.3	C / C	

Table B-9: 2016 LOS Monitoring Results for Arterials (Tier 2) - AM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T67	High Street-EB	Central Ave	Fernside Blvd	Ala	0.48	N	19.3	3 / 4	FC	6	11.5	D / D	INRIX	1717	17.4	C / C	
T68	High Street-EB	Fernside Blvd	NB I-880 OFF Ramp	Ala - Oak	0.50	N	14.8	2 / 3	FC	6	14.0	D / D	INRIX	895	12.2	E / E	
T69	High Street-EB	NB I-880 OFF Ramp	Foothill Blvd	Oak	0.61	N	16.3	3 / 4	FC	6	15.2	C / C	INRIX	1629	13.0	C / D	
T70	High Street-EB	Foothill Blvd	MacArthur Blvd/WB I-580 OFF Ramp	Oak	1.29	N	20.9	3 / 4	FC	6	16.2	C / C	INRIX	1196	18.5	C / C	
T71	High Street-WB	MacArthur Blvd/WB I-580 OFF Ramp	Foothill Blvd	Oak	1.29	N	21.2	3 / 4	FC	6	15.6	C / C	INRIX	514	20.1	B / B	
T72	High Street-WB	Foothill Blvd	NB I-880 OFF Ramp	Oak	0.61	N	16.9	3 / 4	FC	6	12.1	D / D	INRIX	1122	11.6	D / D	
T73	High Street-WB	NB I-880 OFF Ramp	Fernside Blvd	Ala - Oak	0.50	N	21.6	2 / 3	FC	6	18.9	C / C	INRIX	887	17.7	D / D	
T74	High Street-WB	Fernside Blvd	Central Ave	Ala	0.48	N	16.8	3 / 4	FC	6	17.9	C / C	INRIX	1504	20.9	B / B	
T75	High Street-WB	Central Ave	Otis Drive	Ala	0.58	N	24.5	3 / 4	FC	6	19.9	B / B	INRIX	810	16.6	C / C	
T76	Crow Canyon Road/Grove Way-NB	A Street/Redwood Road	EB I-580 ON Ramp/Grove Way	Uninc	0.95	C	29.0	2 / 3	INRIX	1094	23.2	C / C	INRIX	678	22.8	C / C	
T77	Crow Canyon Road/Grove Way-NB	EB I-580 ON Ramp/Grove Way	Cull Canyon	Uninc	0.81	C	32.1	1 / 2	INRIX	1544	24.3	C / C	INRIX	2248	18.4	D / D	
T78	Crow Canyon Road-NB	Cull Canyon	Cold Water Dr	Uninc	0.88	C	42.3	1 / 2	INRIX	1485	39.7	A / A	INRIX	2581	37.8	A / A	
T79	Crow Canyon Road-NB	Cold Water Dr	0.43 miles North of Norris Canyon Rd	Uninc	2.41	C	42.0	Rural / Rural	INRIX	2957	39.3	A / -	INRIX	3342	38.4	A / -	
T80	Crow Canyon Road-NB	0.43 miles North of Norris Canyon Rd	County Line	Uninc	2.97	C	42.0	Rural / Rural	INRIX	3613	39.5	A / -	INRIX	3342	38.4	A / -	
T81	Crow Canyon Road-SB	County Line	0.43 miles North of Norris Canyon Rd	Uninc	2.97	C	41.4	Rural / Rural	INRIX	3686	40.3	A / -	INRIX	3437	40.7	A / -	
T82	Crow Canyon Road-SB	0.43 miles North of Norris Canyon Rd	Cold Water Dr	Uninc	2.40	C	41.4	Rural / Rural	INRIX	3602	40.2	A / -	INRIX	3437	40.7	A / -	
T83	Crow Canyon Road-SB	Cold Water Dr	Cull Canyon	Uninc	0.89	C	41.6	1 / 2	INRIX	2064	39.5	A / A	INRIX	2636	39.0	A / A	
T84	Crow Canyon Road/Grove Way-SB	Cull Canyon	EB I-580 ON Ramp/Grove Way	Uninc	0.82	C	36.1	1 / 2	INRIX	979	30.8	B / B	INRIX	2348	27.5	C / C	
T85	Crow Canyon Road/Grove Way-SB	EB I-580 ON Ramp/Grove Way	A Street/Redwood Road	Uninc	0.94	C	30.7	2 / 3	INRIX	855	27.2	B / B	INRIX	1471	22.4	C / C	

Table B-9: 2016 LOS Monitoring Results for Arterials (Tier 2) - AM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T86	Winton Avenue - D Street-EB	Hesperian Blvd.	SB I-880 ON Ramp	Hay	0.39	C	25.7	2 / 3	INRIX	3475	22.2	C / C	INRIX	3491	22.4	C / C	
T87	Winton Avenue - D Street-EB	SB I-880 ON Ramp	Santa Clara St	Hay	0.35	C	33.5	2 / 3	INRIX	2523	28.5	B / B	INRIX	3183	25.2	B / B	
T88	Winton Avenue - D Street-EB	Santa Clara St	Soto Rd	Hay	0.55	C	24.1	2 / 3	INRIX	3026	19.7	C / C	INRIX	3350	18.9	C / C	
T89	Winton Avenue - D Street-EB	Soto Rd	Foothill Boulevard/D St	Hay	0.92	C	24.5	2 / 3	INRIX	1410	18.2	C / C	INRIX	2203	13.5	E / E	
T90	Winton Avenue - D Street-WB	Foothill Boulevard/D St	Soto Rd	Hay	0.92	C	27.2	2 / 3	INRIX	1322	19.5	C / C	INRIX	2290	16.6	D / D	
T91	Winton Avenue - D Street-WB	Soto Rd	Santa Clara St	Hay	0.55	C	23.0	2 / 3	INRIX	3445	17.6	D / D	INRIX	3469	17.1	D / D	
T92	Winton Avenue - D Street-WB	Santa Clara St	SB I-880 ON Ramp	Hay	0.35	C	34.7	2 / 3	INRIX	2988	32.9	A / A	INRIX	3243	26.2	B / B	
T93	Winton Avenue - D Street-WB	SB I-880 ON Ramp	Hesperian Blvd.	Hay	0.39	C	24.1	2 / 3	INRIX	3697	14.9	D / D	INRIX	3496	13.5	E / E	
T94	A Street-EB	Foothill Boulevard/A St	Redwood Rd/Grove Way	Hay - Uninc	0.80	C	23.6	2 / 3	FC	6	13.5	E / E	INRIX	2440	21.8	C / C	
T95	A Street-EB	Redwood Rd/Grove Way	EB I-580 ON Ramp/Grove Way	Uninc	0.42	C	18.5	2 / 3	FC	6	14.6	D / D	INRIX	2038	25.7	B / B	
T96	A Street-WB	EB I-580 ON Ramp/Grove Way	Redwood Rd/Grove Way	Uninc	0.42	C	28.8	2 / 3	FC	6	22.0	C / C	INRIX	3405	21.1	C / C	
T97	A Street-WB	Redwood Rd/Grove Way	Foothill Boulevard/A St	Uninc	0.80	C	15.8	2 / 3	FC	6	16.9	D / D	INRIX	3448	15.8	D / D	
T98	Hesperian Boulevard-Union City Blvd-NB	Union City/Alvarado Blvd	Whipple Rd	Uni Cty	0.98	S	26.5	1 / 2	FC	6	22.3	C / C	INRIX	1693	26.4	C / C	
T99	Hesperian Boulevard-Union City Blvd-NB	Whipple Rd	Hesperian/Union City Blvd/overbridge	Uni Cty	0.30	S	32.9	1 / 2	FC	6	25.0	C / C	INRIX	3129	28.9	B / B	
T100	Hesperian Boulevard-Union City Blvd-NB	Hesperian/Union City Blvd/overbridge	Industrial Blvd	Hay	0.57	S	26.4	1 / 2	FC	6	27.8	C / C	INRIX	3021	21.4	D / D	
T101	Hesperian Boulevard-Union City Blvd-NB	Industrial Blvd	Tennyson/Hesperian	Hay	1.05	S	25.2	2 / 3	FC	6	31.3	A / A	INRIX	3303	25.8	B / B	
T102	Hesperian Boulevard-Union City Blvd-SB	Tennyson/Hesperian	Industrial Blvd	Hay	1.05	S	26.8	2 / 3	FC	8	17.7	D / D	INRIX	3427	19.1	C / C	

Table B-9: 2016 LOS Monitoring Results for Arterials (Tier 2) - AM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T103	Hesperian Boulevard-Union City Blvd-SB	Industrial Blvd	Hesperian/Union City Blvd/overbridge	Hay	0.57	S	19.3	1 / 2	FC	8	18.9	D / D	INRIX	1946	25.6	C / C	
T104	Hesperian Boulevard-Union City Blvd-SB	Hesperian/Union City Blvd/overbridge	Whipple Rd	Uni Cty	0.30	S	22.1	1 / 2	FC	8	21.8	D / D	INRIX	3255	27.2	C / C	
T105	Hesperian Boulevard-Union City Blvd-SB	Whipple Rd	Union City/Alvarado Blvd	Uni Cty	0.98	S	29.5	1 / 2	FC	8	22.4	C / C	INRIX	3069	26.5	C / C	
T106	Alvarado Blvd.-NB	NB I-880 ON Ramp	Deep Creek Rd/SB I-880 OFF Ramp	Fre	0.22	S	30.6	1 / 2	INRIX	1740	27.7	C / C	INRIX	1553	28.9	B / B	
T107	Alvarado Blvd.-NB	Deep Creek Rd/SB I-880 OFF Ramp	Fair Ranch Rd	Uni Cty - Fre	1.42	S	32.4	1 / 2	INRIX	998	29.5	B / B	INRIX	192	20.8	D / D	
T108	Alvarado Blvd.-NB	Fair Ranch Rd	Union City/Alvarado Blvd	Uni Cty	0.51	S	28.5	1 / 2	INRIX	306	26.6	C / C	INRIX	70	15.1	E / E	[2]
T109	Alvarado Blvd.-SB	Union City/Alvarado Blvd	Fair Ranch Rd	Uni Cty	0.51	S	28.1	1 / 2	INRIX	1826	25.7	C / C	INRIX	1918	18.2	D / D	
T110	Alvarado Blvd.-SB	Fair Ranch Rd	Deep Creek Rd/SB I-880 OFF Ramp	Uni Cty - Fre	1.42	S	31.2	1 / 2	INRIX	1766	28.2	B / B	INRIX	1836	24.2	C / C	
T111	Alvarado Blvd.-SB	Deep Creek Rd/SB I-880 OFF Ramp	NB I-880 ON Ramp	Fre	0.22	S	31.6	1 / 2	INRIX	2639	26.0	C / C	INRIX	2758	26.9	C / C	
T112	Fremont Boulevard-NB	NB I-880 OFF Ramp	Automall Parkway	Fre	1.28	S	34.7	1 / 2	INRIX	789	30.6	B / B	INRIX	882	27.1	C / C	
T113	Fremont Boulevard-NB	Automall Parkway	Blacow Rd	Fre	0.91	S	34.2	1 / 2	INRIX	1431	31.2	B / B	INRIX	2640	28.4	B / B	
T114	Fremont Boulevard-NB	Blacow Rd	Adams Ave	Fre	0.38	S	28.0	1 / 2	INRIX	3532	25.1	C / C	INRIX	3300	22.7	C / C	[1]
T115	Fremont Boulevard-NB	Adams Ave	Stevenson Rd	Fre	1.17	S	27.9	2 / 3	INRIX	2848	24.5	B / B	INRIX	2350	22.3	C / C	[1]
T116	Fremont Boulevard-NB	Stevenson Rd	Mowry Ave	Fre	1.00	S	30.2	2 / 3	INRIX	1997	27.4	B / B	INRIX	1316	24.0	B / C	
T117	Fremont Boulevard-NB	Mowry Ave	Peralta Blvd	Fre	1.21	S	30.0	2 / 3	INRIX	1939	25.7	B / B	INRIX	1359	21.4	C / C	
T118	Fremont Boulevard-NB	Peralta Blvd	Thornton Ave	Fre	0.33	S	30.9	2 / 3	INRIX	1608	26.6	B / B	INRIX	1115	16.2	D / D	
T119	Fremont Boulevard-NB	Thornton Ave	Decoto Rd	Fre	1.33	S	32.0	1 / 2	INRIX	1508	28.0	C / C	INRIX	1422	24.4	C / C	[1]
T120	Fremont Boulevard-NB	Decoto Rd	Paseo Padre Pkwy	Fre	0.56	S	31.0	1 / 2	INRIX	1767	30.0	B / B	INRIX	1413	26.7	C / C	[1]
T121	Fremont Boulevard-NB	Paseo Padre Pkwy	NB I-880 OFF Ramp	Fre	0.39	S	31.0	1 / 2	INRIX	1722	30.2	B / B	INRIX	1102	26.2	C / C	[1]
T122	Fremont Boulevard-SB	NB I-880 OFF Ramp	Paseo Padre Pkwy	Fre	0.39	S	32.0	1 / 2	INRIX	1143	29.5	B / B	INRIX	2245	26.5	C / C	
T123	Fremont Boulevard-SB	Paseo Padre Pkwy	Decoto Rd	Fre	0.56	S	29.7	1 / 2	INRIX	1400	23.7	C / C	INRIX	1899	19.7	D / D	[1]
T124	Fremont Boulevard-SB	Decoto Rd	Thornton Ave	Fre	1.33	S	30.2	1 / 2	INRIX	1499	25.5	C / C	INRIX	2119	21.4	D / D	
T125	Fremont Boulevard-SB	Thornton Ave	Peralta Blvd	Fre	0.32	S	29.3	2 / 3	INRIX	1624	22.0	C / C	INRIX	2610	15.4	D / D	

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		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T126	Fremont Boulevard-SB	Peralta Blvd	Mowry Ave	Fre	1.21	S	29.4	2 / 3	INRIX	1030	24.9	B / B	INRIX	1765	21.8	C / C	
T127	Fremont Boulevard-SB	Mowry Ave	Stevenson Rd	Fre	1.00	S	32.3	2 / 3	INRIX	872	31.7	A / A	INRIX	1516	26.2	B / B	
T128	Fremont Boulevard-SB	Stevenson Rd	Adams Ave	Fre	1.17	S	27.8	2 / 3	INRIX	2047	23.9	C / C	INRIX	2120	22.9	C / C	
T129	Fremont Boulevard-SB	Adams Ave	Blacow Rd	Fre	0.38	S	27.9	1 / 2	INRIX	3497	24.2	C / C	INRIX	3158	23.0	C / C	
T130	Fremont Boulevard-SB	Blacow Rd	Automall Parkway	Fre	0.91	S	33.1	1 / 2	INRIX	900	28.0	C / C	INRIX	2445	23.1	C / C	
T131	Fremont Boulevard-SB	Automall Parkway	NB I-880 OFF Ramp	Fre	1.28	S	34.9	1 / 2	INRIX	1146	29.3	B / B	INRIX	2281	29.3	B / B	
T132	Automall Parkway-EB	NB I-880 OFF Ramp	Fremont Blvd	Fre	0.85	S	23.1	1 / 2	FC	6	23.1	C / C	FC	6	31.9	B / B	
T133	Automall Parkway-EB	Fremont Blvd	NB I-680 ON Ramp	Fre	0.74	S	29.5	1 / 2	FC	6	29.5	B / B	FC	6	17.9	D / D	
T134	Automall Parkway-WB	NB I-680 ON Ramp	Fremont Blvd	Fre	0.75	S	21.1	1 / 2	FC	7	15.1	E / E	FC	6	14.0	E / E	
T135	Automall Parkway-WB	Fremont Blvd	NB I-880 OFF Ramp	Fre	0.85	S	27.1	1 / 2	FC	7	27.1	C / C	FC	6	28.5	B / B	
T136	Vasco Road-NB	WB I-580 OFF Ramp	Scenic Ave	Liv	0.44	E	36.3	1 / 2	INRIX	2818	28.5	B / B	INRIX	2755	28.3	B / B	
T137	Vasco Road-NB	Scenic Ave	Dalton Ave/City-County Line	Liv	0.68	E	37.4	1 / 2	INRIX	3139	31.0	B / B	INRIX	3022	32.2	B / B	
T138	Vasco Road-NB	Dalton Ave/City-County Line	N. Vasco Rd/Vasco Rd	Liv	3.11	E	53.0	Rural / Rural	INRIX	3146	51.5	A / -	INRIX	3136	55.8	A / -	
T139	Vasco Road-NB	N. Vasco Rd/Vasco Rd	Local Road underpass/County Line	Liv	2.25	E	53.0	Rural / Rural	INRIX	3146	51.5	A / -	INRIX	3136	55.8	A / -	
T140	Vasco Road-SB	Local Road underpass/County Line	N. Vasco Rd/Vasco Rd	Liv	2.25	E	46.8	Rural / Rural	INRIX	3894	38.7	B / -	INRIX	3259	35.3	C / -	
T141	Vasco Road-SB	N. Vasco Rd/Vasco Rd	Dalton Ave/City-County Line	Liv	3.11	E	46.8	Rural / Rural	INRIX	3894	38.7	B / -	INRIX	3259	35.3	C / -	
T142	Vasco Road-SB	Dalton Ave/City-County Line	Scenic Ave	Liv	0.68	E	34.3	1 / 2	INRIX	3697	28.6	B / B	INRIX	3254	33.0	B / B	
T143	Vasco Road-SB	Scenic Ave	WB I-580 OFF Ramp	Liv	0.44	E	32.0	1 / 2	INRIX	3371	27.1	C / C	INRIX	2960	32.9	B / B	
T144	Dublin Blvd.-EB	San Ramon Road	Village Parkway	Dub	0.73	E	26.5	2 / 3	INRIX	623	22.9	C / C	INRIX	1476	19.3	C / C	
T145	Dublin Blvd.-EB	Village Parkway	Dougherty Rd	Dub	0.81	E	29.5	2 / 3	INRIX	1681	26.9	B / B	INRIX	1736	24.0	B / C	
T146	Dublin Blvd.-EB	Dougherty Rd	Hacienda Dr	Dub	1.21	E	34.1	1 / 2	INRIX	1264	29.3	B / B	INRIX	983	25.0	C / C	
T147	Dublin Blvd.-EB	Hacienda Dr	Tassajara Dr	Dub	0.89	E	30.2	1 / 2	INRIX	660	28.3	B / B	INRIX	694	22.4	C / C	

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CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T148	Dublin Blvd.-WB	Tassajara Dr	Hacienda Dr	Dub	0.89	E	29.1	1 / 2	INRIX	479	28.3	B / B	INRIX	841	24.7	C / C	
T149	Dublin Blvd.-WB	Hacienda Dr	Dougherty Rd	Dub	1.21	E	32.8	1 / 2	INRIX	1281	28.2	B / B	INRIX	1035	21.1	D / D	
T150	Dublin Blvd.-WB	Dougherty Rd	Village Parkway	Dub	0.81	E	29.5	2 / 3	INRIX	3593	26.3	B / B	INRIX	2927	23.5	C / C	
T151	Dublin Blvd.-WB	Village Parkway	San Ramon Road	Dub	0.73	E	24.5	2 / 3	INRIX	858	24.7	B / B	INRIX	1650	19.4	C / C	
T152	San Ramon Road-NB	WB I-580 OFF ramp	Silvergate Dr	Dub	0.64	E	30.8	1 / 2	INRIX	996	26.7	C / C	INRIX	1678	22.1	C / C	
T153	San Ramon Road-NB	Silvergate Dr	Alcosta Blvd/Westside Dr/County Line	Dub	0.99	E	35.1	1 / 2	INRIX	1663	31.3	B / B	INRIX	2284	31.9	B / B	
T154	San Ramon Road-SB	Alcosta Blvd/Westside Dr/County Line	Silvergate Dr	Dub	0.99	E	35.8	1 / 2	INRIX	1542	35.0	A / A	INRIX	2238	33.0	B / B	
T155	San Ramon Road-SB	Silvergate Dr	WB I-580 OFF ramp	Dub	0.64	E	32.7	1 / 2	INRIX	478	28.3	B / B	INRIX	1270	23.3	C / C	
T156	Dougherty Road-NB	WB I-580 OFF ramp	Amador Valley Blvd on SB	Dub	1.12	E	35.4	1 / 2	INRIX	3485	29.8	B / B	INRIX	2751	24.4	C / C	
T157	Dougherty Road-NB	Amador Valley Blvd on SB	Fallcreek Rd on SB/County Line	Dub	0.80	E	44.1	1 / 2	INRIX	3430	42.4	A / A	INRIX	2653	42.4	A / A	
T158	Dougherty Road-SB	Fallcreek Rd on SB/County Line	Amador Valley Blvd on SB	Dub	0.80	E	43.1	1 / 2	INRIX	2366	35.4	A / A	INRIX	3041	33.2	B / B	
T159	Dougherty Road-SB	Amador Valley Blvd on SB	WB I-580 OFF ramp	Dub	1.12	E	33.1	1 / 2	INRIX	2291	25.5	C / C	INRIX	2998	21.0	D / D	
T160	Tassajara Road-NB	WB I-580 OFF ramp	Central Parkway	Dub	0.49	E	24.7	1 / 2	FC	6	21.6	D / D	FC	6	16.6	E / E	
T161	Tassajara Road-NB	Central Parkway	Somerset Ln/N Dublin Ranch Dr	Dub	0.68	E	34.3	1 / 2	FC	6	18.5	D / D	FC	6	25.2	C / C	
T162	Tassajara Road-NB	Somerset Ln/N Dublin Ranch Dr	Fallon Rd	Dub	1.04	E	38.4	1 / 2	FC	6	35.2	A / A	FC	6	37.8	A / A	
T163	Tassajara Road-NB	Fallon Rd	County Line	Uninc	0.51	E	35.2	1 / 1	FC	6	35.9	A / B	FC	6	29.6	B / C	
T164	Tassajara Road-SB	County Line	Fallon Rd	Uninc	0.51	E	45.2	1 / 1	FC	6	29.2	B / C	FC	6	42.4	A / A	
T165	Tassajara Road-SB	Fallon Rd	Somerset Ln/N Dublin Ranch Dr	Dub	1.04	E	38.7	1 / 2	FC	6	32.4	B / B	FC	6	39.8	A / A	
T166	Tassajara Road-SB	Somerset Ln/N Dublin Ranch Dr	Central Parkway	Dub	0.68	E	33.8	1 / 2	FC	6	34.3	B / B	FC	6	21.9	D / D	
T167	Tassajara Road-SB	Central Parkway	WB I-580 OFF ramp	Dub	0.49	E	25.7	1 / 2	FC	6	25.7	C / C	FC	6	15.9	E / E	
T168	E. Stanley Blvd - Railroad Avenue - 1st Street-NB	SR 84/Isabel Ave	Murrita Blvd	Liv	0.91	E	31.5	1 / 2	FC	6	31.5	B / B	INRIX	2045	25.9	C / C	

Table B-9: 2016 LOS Monitoring Results for Arterials (Tier 2) - AM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T169	E. Stanley Blvd - Railroad Avenue - 1st Street-NB	Murrita Blvd	S Livermore Ave	Liv	1.07	E	23.4	2 / 3	FC	6	24.3	B / B	INRIX	910	21.7	C / C	
T170	E. Stanley Blvd - Railroad Avenue - 1st Street-NB	S Livermore Ave	Inman St	Liv	0.46	E	21.7	2 / 3	FC	6	22.8	C / C	INRIX	865	19.4	C / C	
T171	E. Stanley Blvd - Railroad Avenue - 1st Street-SB	Inman St	S Livermore Ave	Liv	0.46	E	20.1	2 / 3	FC	6	21.7	C / C	INRIX	495	18.7	C / C	
T172	E. Stanley Blvd - Railroad Avenue - 1st Street-SB	S Livermore Ave	Murrita Blvd	Liv	1.07	E	26.6	2 / 3	FC	6	26.6	B / B	INRIX	2416	23.1	C / C	
T173	E. Stanley Blvd - Railroad Avenue - 1st Street-SB	Murrita Blvd	SR 84/Isabel Ave	Liv	0.91	E	21.9	1 / 2	FC	6	18.0	D / D	INRIX	3168	35.2	A / A	
T174	Stoneridge Drive-EB	SB I-680 OFF Ramp	Hopyard Rd	Plea	0.93	E	33.2	1 / 2	INRIX	2027	29.6	B / B	INRIX	2023	28.1	B / B	
T175	Stoneridge Drive-EB	Hopyard Rd	Hacienda Dr	Plea	0.49	E	29.8	1 / 2	INRIX	2018	25.7	C / C	INRIX	1397	21.3	D / D	
T176	Stoneridge Drive-EB	Hacienda Dr	W. Las Positas Blvd	Plea	0.63	E	31.1	1 / 2	INRIX	1729	29.7	B / B	INRIX	2134	25.5	C / C	
T177	Stoneridge Drive-EB	W. Las Positas Blvd	Santa Rita Road	Plea	0.44	E	30.0	1 / 2	INRIX	1203	30.6	B / B	INRIX	479	21.6	D / D	
T178	Santa Rita Road-EB	Stoneridge Dr/Santa Rita Road	W. Los Positas Blvd	Plea	0.29	E	31.1	1 / 2	INRIX	3221	31.9	B / B	INRIX	2682	30.2	B / B	
T179	Santa Rita Road-EB	W. Los Positas Blvd	WB I-580 OFF Ramp	Plea	0.88	E	30.3	1 / 2	INRIX	3263	31.4	B / B	INRIX	2653	29.8	B / B	
T180	Santa Rita Road-WB	WB I-580 OFF Ramp	W. Los Positas Blvd	Plea	0.88	E	31.3	1 / 2	INRIX	2822	30.3	B / B	INRIX	2636	29.4	B / B	
T181	Santa Rita Road-WB	W. Los Positas Blvd	Santa Rita Road	Plea	0.29	E	31.5	1 / 2	INRIX	3196	29.7	B / B	INRIX	2856	25.8	C / C	
T182	Stoneridge Drive-WB	Santa Rita Road	W. Las Positas Blvd	Plea	0.44	E	31.8	1 / 2	INRIX	1027	28.9	B / B	INRIX	1401	23.7	C / C	
T183	Stoneridge Drive-WB	W. Las Positas Blvd	Hacienda Dr	Plea	0.63	E	33.8	1 / 2	INRIX	2408	31.4	B / B	INRIX	2896	29.2	B / B	
T184	Stoneridge Drive-WB	Hacienda Dr	Hopyard Rd	Plea	0.49	E	28.8	1 / 2	INRIX	2202	23.6	C / C	INRIX	2361	18.1	D / D	
T185	Stoneridge Drive-WB	Hopyard Rd	SB I-680 OFF Ramp	Plea	0.93	E	32.9	1 / 2	INRIX	2129	28.1	B / B	INRIX	2603	27.9	C / C	
T186	Sunol Blvd.- 1st Street-Stanley Blvd.-NB	NB I-680 OFF	Bernal Ave	Plea	1.23	E	31.2	1 / 2	INRIX	1222	30.4	B / B	INRIX	607	28.1	B / B	[1]
T187	Sunol Blvd.- 1st Street-Stanley Blvd.-NB	Bernal Ave	Ray/Vineyard	Plea	0.63	E	26.1	3 / 4	INRIX	1473	23.6	B / B	INRIX	2035	23.7	B / B	
T188	Sunol Blvd.- 1st Street-Stanley Blvd.-NB	Ray/Vineyard	Bernal Ave/Valley Ave	Plea	0.86	E	32.1	2 / 3	INRIX	231	26.4	B / B	INRIX	618	28.3	B / B	
T189	Sunol Blvd.- 1st Street-Stanley Blvd.-NB	Bernal Ave/Valley Ave	SR 84/Isabel Ave	Plea - Uninc	2.98	E	44.9	1 / 1	INRIX	1934	42.2	A / A	INRIX	2442	47.4	A / A	

Table B-9: 2016 LOS Monitoring Results for Arterials (Tier 2) - AM Peak Period (INRIX or Floating Car Surveys)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	FFS	Class 1985/ 2000	2014 Results				2016 Results				Note
		From	To						Method	n	Speed	LOS 85/00	Method	n	Speed	LOS 85/00	
T190	Sunol Blvd.- 1st Street-Stanley Blvd.-SB	SR 84/Isabel Ave	Bernal Ave/Valley Ave	Plea - Uninc	2.98	E	51.0	1 / 1	INRIX	3810	47.9	A / A	INRIX	3246	47.4	A / A	
T191	Sunol Blvd.- 1st Street-Stanley Blvd.-SB	Bernal Ave/Valley Ave	Ray/Vineyard	Plea	0.86	E	34.6	2 / 3	INRIX	2233	27.9	B / B	INRIX	2762	27.3	B / B	
T192	Sunol Blvd.- 1st Street-Stanley Blvd.-SB	Ray/Vineyard	Bernal Ave	Plea	0.63	E	25.4	3 / 4	INRIX	3361	18.1	C / C	INRIX	3080	16.3	C / C	
T193	Sunol Blvd.- 1st Street-Stanley Blvd.-SB	Bernal Ave	NB I-680 OFF	Plea	1.23	E	35.6	1 / 2	INRIX	2491	27.4	C / C	INRIX	3185	25.6	C / C	[1]

Notes
[1] Data impacted by long term construction and recurrent lane closures
[2] Complete Road Closure for part of the Monitoring Period

B.5 | HOV and Express Lanes

Table B-10: 2016 LOS Monitoring Results for HOV/Express Lanes - PM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Type	Segment Limits		Jurisdiction	Plan Area	Length (mi)	# Lanes	2014 LOS Results			2016 LOS Results			Note
			From	To					# Runs	Speed	LOS	# Runs	Speed	LOS	
H1	I-80 - EB	HOV	Begin of HOV	I-80 HOV/GP Gore	Oak	N	0.7	1	4	21.1	F	6	7.2	F	
H2	I-80 - EB	HOV	I-80 HOV/GP Gore	Powell (Overhead bridge)	Emery - Berk	N	0.6	1	4	10.2	F	6	4.7	F	
H3	I-80 - EB	HOV	Powell (Overhead bridge)	Ashby (Interchange Center Point)	Emery - Berk	N	0.7	1	4	27.7	F	6	17.0	F	
H4	I-80 - EB	HOV	Ashby (Interchange Center Point)	University (Overhead bridge)	Emery - Berk	N	1.3	1	4	32.2	E	6	25.7	F	
H5	I-80 - EB	HOV	University (Overhead bridge)	I-80/580 Split (Divider)	Berk - Alb	N	1.4	1	4	46.2	D	6	44.6	D	
H6	I-80 - EB	HOV	I-80/580 Split (Divider)	County Line	Berk - Alb	N	0.8	1	4	50.3	C	6	58.6	B	
H7	I-80 - WB	HOV	County Line	I-580/80 Merge (Concrete Barrier)	Berk - Alb	N	0.7	1	6	54.9	C	6	64.5	A	
H8	I-80 - WB	HOV	I-580/80 Merge (Concrete Barrier)	University (Overhead Bridge)	Berk - Alb	N	1.5	1	6	49.1	C	6	61.8	A	
H9	I-80 - WB	HOV	University (Overhead Bridge)	Ashby (Interchange Center Point)	Emery - Berk	N	1.3	1	6	42.8	D	6	43.8	D	
H10	I-80 - WB	HOV	Ashby (Interchange Center Point)	Powell (Overhead Bridge)	Emery - Berk	N	0.7	1	6	39.1	E	6	41.5	D	
H11	I-80 - WB	HOV	Powell (Overhead Bridge)	I-80/I-580 (GP Lanes Split)	Emery - Berk	N	0.5	1	6	48.0	D	6	51.5	C	
H12	I-80 - WB	HOV	I-580 Split (ramp)	Toll Plaza	Oak	N	1.3	1	6	50.4	C	6	49.9	C	
H13	I-80 - WB	HOV	Toll Plaza	End of HOV	Oak	N	0.2	1	6	44.8	D	6	14.0	F	
H14	SR 84 - WB	HOV	I-880 NB (off)	Ardenwood/Newark	New	S	1.0	1	6	56.9	B	6	63.0	A	
H15	SR 84 - WB	HOV	Ardenwood/Newark	Paseo Padre Pkwy	New	S	1.2	1	6	62.2	A	6	72.4	A	
H16	SR 84 - WB	HOV	Paseo Padre Pkwy	Toll Gate	Fre	S	0.5	1	6	56.5	B	6	65.6	A	
H17	SR 92 - WB	HOV	Begin of HOV (Hesperian Blvd)	Clawiter	Hay	C	1.2	1	6	69.8	A	6	68.9	A	
H18	SR 92 - WB	HOV	Clawiter	Toll Plaza	Uninc - Hay	C	1.9	1	6	69.6	A	6	67.2	A	
E5	I-580 - EB	HOV	Hacienda	Santa Rita	Plea	E	1.9	1	6	34.4	E	-	-	-	[2]
E6	I-580 - EB	HOV	Santa Rita	El Charro	Uninc - Plea	E	1.3	1	6	40.6	E	-	-	-	[2]
E7	I-580 - EB	HOV	El Charro	SR 84/Airway Blvd.	Uninc	E	1.7	1	6	50.6	C	-	-	-	[2]
E8	I-580 - EB	HOV	SR 84/Airway Blvd.	Portola	Uninc	E	1.7	1	6	48.8	D	-	-	-	[2]
E9	I-580 - EB	HOV	Portola	1st St	Liv	E	2.6	1	6	44.9	D	-	-	-	[2]
E10	I-580 - EB	HOV	1st St	Greenville	Liv - Uninc	E	2.1	1	6	15.5	F	-	-	-	[2]
E1	I-680 - SB	Express Ln	Begin of HOV (Rt 84)	Washington Blvd Entry Point	Uninc - Fre	S	5.8	1	6	66.4	A	5	67.0	A	

Table B-10: 2016 LOS Monitoring Results for HOV/Express Lanes - PM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Type	Segment Limits		Jurisdiction	Plan Area	Length (mi)	# Lanes	2014 LOS Results			2016 LOS Results			Note
			From	To					# Runs	Speed	LOS	# Runs	Speed	LOS	
E2	I-680 - SB	Express Ln	Washington Blvd Entry Point	Auto Mall Pkwy Exit Point	Fre	S	1.3	1	6	68.6	A	5	68.6	A	
E3	I-680 - SB	Express Ln	Auto Mall Pkwy Exit Point	Mission Blvd Entry Point	Fre	S	1.1	1	6	68.5	A	5	69.2	A	
E4	I-680 - SB	Express Ln	Mission Blvd Entry Point	Ala border (S of Scott Creek Rd)	Fre	S	3.0	1	6	68.5	A	5	70.6	A	
H25	I-880 - NB	HOV	Begin HOV	I-880/I-80 Split (16th Street)	Oak	N	0.2	1	6	61.7	A	6	67.9	A	
H26	I-880 - NB	HOV	I-880/I-80 Split (16th Street)	Toll Plaza	Oak	N	1.4	1	6	58.0	B	6	62.6	A	
H27	I-880 - NB	HOV	Begin HOV (W Grand Ave)	I-880/I-80 Merge	Oak - Emery	N	1.1	1	6	43.8	D	6	36.8	E	
H28	I-880 - NB	HOV	SCL County Line	SR 262/Mission (450 ft s/o Warren Ave Overhead Bridge)	Fre	S	2.0	1	6	24.3	F	6	28.7	F	
H29	I-880 - NB	HOV	SR262/Mission (450 ft s/o Warren Ave Overhead Bridge)	AutoMall Pkwy (Overhead Bridge)	Fre	S	2.4	1	6	36.4	E	6	38.5	E	[1]
H30	I-880 - NB	HOV	AutoMall Pkwy (Overhead Bridge)	Stevenson Blvd (Overhead Bridge)	Fre	S	1.5	1	6	50.7	C	6	42.1	D	
H31	I-880 - NB	HOV	Stevenson Blvd (Overhead Bridge)	Decoto (Overhead Bridge)	Fre	S	4.1	1	6	42.5	D	6	20.3	F	
H32	I-880 - NB	HOV	Decoto (Overhead Bridge)	Alvarado Blvd (Overhead Bridge)	Fre	S	1.2	1	6	32.3	E	6	18.9	F	
H33	I-880 - NB	HOV	Alvarado Blvd (Overhead Bridge)	Alvarado-Niles Rd (Overhead Bridge)	Fre- Uni Cty	S	1.6	1	6	30.4	E	6	24.0	F	
H34	I-880 - NB	HOV	Alvarado-Niles Rd (Overhead Bridge)	Tennyson (Overhead Bridge)	Uni Cty - Hay	S	2.6	1	6	27.2	F	6	21.1	F	
H35	I-880 - NB	HOV	Tennyson (Overhead Bridge)	SR 92 (Overhead Bridge)	Hay	C	1.0	1	6	38.9	E	6	26.2	F	
H36	I-880 - NB	HOV	SR 92 (Overhead Bridge)	A St (Overhead Bridge)	Hay	C	1.7	1	6	41.6	D	6	35.9	E	
H37	I-880 - NB	HOV	A St (Overhead Bridge)	End of HOV	Uninc	C	0.8	1	6	53.0	C	6	52.2	C	
H38	I-880 - SB	HOV	Marina Blvd (Overhead Bridge)	SR 238 WB (Merge)	San L	N	2.6	1	6	63.8	A	6	55.8	B	[1]
H39	I-880 - SB	HOV	SR 238 WB (Merge)	A St (Overhead Bridge)	San L-Uninc	C	1.9	1	6	68.2	A	6	53.1	C	
H40	I-880 - SB	HOV	A St (Overhead Bridge)	Rt 92/Jackson (Overhead Bridge)	Hay	C	1.7	1	6	66.4	A	6	53.7	C	
H41	I-880 - SB	HOV	Rt 92/Jackson (Overhead Bridge)	Tennyson (Overhead Bridge)	Hay	C	1.0	1	6	63.8	A	6	47.4	D	
H42	I-880 - SB	HOV	Tennyson (Overhead Bridge)	Alvarado-Niles (Overhead Bridge)	Hay - Uni Cty	C	2.6	1	6	57.3	B	6	53.6	C	
H43	I-880 - SB	HOV	Alvarado-Niles (Overhead Bridge)	Alvarado (Overhead Bridge)	Uni Cty - Fre	C	1.6	1	6	67.7	A	6	65.6	A	

Table B-10: 2016 LOS Monitoring Results for HOV/Express Lanes - PM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Type	Segment Limits		Jurisdiction	Plan Area	Length (mi)	# Lanes	2014 LOS Results			2016 LOS Results			Note
			From	To					# Runs	Speed	LOS	# Runs	Speed	LOS	
H44	I-880 - SB	HOV	Alvarado (Overhead Bridge)	Decoto (Overhead Bridge)	Fre	C	1.2	1	6	66.2	A	6	59.7	B	
H45	I-880 - SB	HOV	Decoto (Overhead Bridge)	Stevenson (Overhead Bridge)	Fre	S	4.1	1	6	65.7	A	6	67.4	A	
H46	I-880 - SB	HOV	Stevenson (Overhead Bridge)	AutoMall Pkwy (Overhead Bridge)	Fre	C	1.5	1	6	68.6	A	6	71.1	A	
H47	I-880 - SB	HOV	AutoMall Pkwy (Overhead Bridge)	Rt 262/Mission (Painted Gore)	Fre	C	2.8	1	6	68.8	A	6	69.9	A	[1]
H48	I-880 - SB	HOV	SR 262/Mission (Painted Gore)	SCL County Line	Fre	S	1.6	1	6	70.2	A	6	71.7	A	
H49	I-880 - SB	HOV	Begin HOV (South of Hegenberger)	SR 112/Davis	Oak-San L	N	1.6	1	New Segments			6	62.4	A	
H50	I-880 - SB	HOV	SR 112/Davis	Marina Blvd	San L	N	0.8	1				6	56.4	B	

Notes
[1] Data impacted by longer term construction or recurrent lane closures
[2] I-580 Express Lane Ramp Up Period

Table B-11: 2016 LOS Monitoring Results for HOV/Express Lanes - AM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Type	Segment Limits		Jurisdiction	Plan Area	Length (mi)	# Lanes	2014 LOS Results			2016 LOS Results			Note
			From	To					# Runs	Speed	LOS	# Runs	Speed	LOS	
H1	I-80 - EB	HOV	Begin of HOV	I-80 HOV/GP Gore	Oak	N	0.7	1	6	55.1	B	6	62.2	A	
H2	I-80 - EB	HOV	I-80 HOV/GP Gore	Powell (Overhead bridge)	Emery - Berk	N	0.6	1	6	59.6	B	6	63.2	A	
H3	I-80 - EB	HOV	Powell (Overhead bridge)	Ashby (Interchange Center Point)	Emery - Berk	N	0.7	1	6	61.4	A	6	67.4	A	
H4	I-80 - EB	HOV	Ashby (Interchange Center Point)	University (Overhead bridge)	Emery - Berk	N	1.3	1	6	60.8	A	6	70.8	A	
H5	I-80 - EB	HOV	University (Overhead bridge)	I-80/580 Split (Divider)	Berk - Alb	N	1.4	1	6	64.1	A	6	70.8	A	
H6	I-80 - EB	HOV	I-80/580 Split (Divider)	County Line	Berk - Alb	N	0.8	1	6	61.4	A	6	66.2	A	
H7	I-80 - WB	HOV	County Line	I-580/80 Merge (Concrete Barrier)	Berk - Alb	N	0.7	1	6	20.4	F	6	37.1	E	
H8	I-80 - WB	HOV	I-580/80 Merge (Concrete Barrier)	University (Overhead Bridge)	Berk - Alb	N	1.5	1	6	28.1	F	6	33.3	E	
H9	I-80 - WB	HOV	University (Overhead Bridge)	Ashby (Interchange Center Point)	Emery - Berk	N	1.3	1	6	34.2	E	6	34.3	E	
H10	I-80 - WB	HOV	Ashby (Interchange Center Point)	Powell (Overhead Bridge)	Emery - Berk	N	0.7	1	6	42.3	D	6	31.5	E	
H11	I-80 - WB	HOV	Powell (Overhead Bridge)	I-80/I-580 (GP Lanes Split)	Emery - Berk	N	0.5	1	6	31.5	E	6	32.6	E	
H12	I-80 - WB	HOV	I-580 Split (ramp)	Toll Plaza	Oak	N	1.3	1	6	30.1	E	6	34.5	E	
H13	I-80 - WB	HOV	Toll Plaza	End of HOV	Oak	N	0.2	1	6	44.9	D	6	48.2	D	

Table B-11: 2016 LOS Monitoring Results for HOV/Express Lanes - AM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Type	Segment Limits		Jurisdiction	Plan Area	Length (mi)	# Lanes	2014 LOS Results			2016 LOS Results			Note
			From	To					# Runs	Speed	LOS	# Runs	Speed	LOS	
H14	SR 84 - WB	HOV	I-880 NB (off)	Ardenwood/Newark	New	S	1.0	1	6	57.6	B	6	57.6	B	
H15	SR 84 - WB	HOV	Ardenwood/Newark	Paseo Padre Pkwy	New	S	1.2	1	6	57.9	B	6	58.0	B	
H16	SR 84 - WB	HOV	Paseo Padre Pkwy	Toll Gate	Fre	S	0.5	1	6	31.8	E	6	54.3	C	
H17	SR 92 - WB	HOV	Begin of HOV (Hesperian Blvd)	Clawiter	Hay	C	1.2	1	6	25.4	F	6	34.6	E	
H18	SR 92 - WB	HOV	Clawiter	Toll Plaza	Uninc - Hay	C	1.9	1	6	42.1	D	6	39.5	E	
E5	I-580 - EB	HOV	Hacienda	Santa Rita	Plea	E	1.9	1	6	67.4	A	-	-	-	[2]
E6	I-580 - EB	HOV	Santa Rita	El Charro	Uninc - Plea	E	1.3	1	6	74.4	A	-	-	-	[2]
E7	I-580 - EB	HOV	El Charro	SR 84/Airway Blvd.	Uninc	E	1.7	1	6	74.9	A	-	-	-	[2]
E8	I-580 - EB	HOV	SR 84/Airway Blvd.	Portola	Uninc	E	1.7	1	6	73.6	A	-	-	-	[2]
E9	I-580 - EB	HOV	Portola	1st St	Liv	E	2.6	1	6	70.5	A	-	-	-	[2]
E10	I-580 - EB	HOV	1st St	Greenville	Liv - Uninc	E	2.1	1	6	73.3	A	-	-	-	[2]
E1	I-680 - SB	Express Ln	Begin of HOV (Rt 84)	Washington Blvd Entry Point	Uninc - Fre	S	5.8	1	6	64.5	A	6	65.6	A	
E2	I-680 - SB	Express Ln	Washington Blvd Entry Point	Auto Mall Pkwy Exit Point	Fre	S	1.3	1	6	64.0	A	6	66.2	A	
E3	I-680 - SB	Express Ln	Auto Mall Pkwy Exit Point	Mission Blvd Entry Point	Fre	S	1.1	1	6	56.8	B	6	53.3	C	
E4	I-680 - SB	Express Ln	Mission Blvd Entry Point	Ala border (S of Scott Creek Rd)	Fre	S	3.0	1	6	69.0	A	6	68.3	A	
H25	I-880 - NB	HOV	Begin HOV	I-880/I-80 Split (16th Street)	Oak	N	0.2	1	12	54.0	C	6	70.3	A	
H26	I-880 - NB	HOV	I-880/I-80 Split (16th Street)	Toll Plaza	Oak	N	1.4	1	12	44.5	D	6	60.8	A	
H27	I-880 - NB	HOV	Begin HOV (W Grand Ave)	I-880/I-80 Merge	Oak - Emery	N	1.1	1	7	52.5	C	6	60.1	A	
H28	I-880 - NB	HOV	SCL County Line	SR 262/Mission (450 ft s/o Warren Ave Overhead Bridge)	Fre	S	2.0	1	6	70.1	A	6	71.1	A	
H29	I-880 - NB	HOV	SR262/Mission (450 ft s/o Warren Ave Overhead Bridge)	AutoMall Pkwy (Overhead Bridge)	Fre	S	2.4	1	6	70.3	A	6	69.0	A	[1]
H30	I-880 - NB	HOV	AutoMall Pkwy (Overhead Bridge)	Stevenson Blvd (Overhead Bridge)	Fre	S	1.5	1	6	70.1	A	6	70.4	A	
H31	I-880 - NB	HOV	Stevenson Blvd (Overhead Bridge)	Decoto (Overhead Bridge)	Fre	S	4.1	1	6	70.3	A	6	70.2	A	
H32	I-880 - NB	HOV	Decoto (Overhead Bridge)	Alvarado Blvd (Overhead Bridge)	Fre	S	1.2	1	6	69.2	A	6	71.5	A	
H33	I-880 - NB	HOV	Alvarado Blvd (Overhead Bridge)	Alvarado-Niles Rd (Overhead Bridge)	Fre- Uni Cty	S	1.6	1	6	67.2	A	6	69.3	A	

Table B-11: 2016 LOS Monitoring Results for HOV/Express Lanes - AM Peak Period (Floating Car Surveys)

CMP ID	CMP Route	Type	Segment Limits		Jurisdiction	Plan Area	Length (mi)	# Lanes	2014 LOS Results			2016 LOS Results			Note
			From	To					# Runs	Speed	LOS	# Runs	Speed	LOS	
H34	I-880 - NB	HOV	Alvarado-Niles Rd (Overhead Bridge)	Tennyson (Overhead Bridge)	Uni Cty - Hay	S	2.6	1	6	59.0	B	6	67.9	A	
H35	I-880 - NB	HOV	Tennyson (Overhead Bridge)	SR 92 (Overhead Bridge)	Hay	C	1.0	1	6	60.0	B	6	65.1	A	
H36	I-880 - NB	HOV	SR 92 (Overhead Bridge)	A St (Overhead Bridge)	Hay	C	1.7	1	6	61.6	A	6	66.7	A	
H37	I-880 - NB	HOV	A St (Overhead Bridge)	End of HOV	Uninc	C	0.8	1	6	63.1	A	6	67.3	A	
H38	I-880 - SB	HOV	Marina Blvd (Overhead Bridge)	SR 238 WB (Merge)	San L	N	2.6	1	6	46.0	D	6	59.6	B	[1]
H39	I-880 - SB	HOV	SR 238 WB (Merge)	A St (Overhead Bridge)	San L-Uninc	C	1.9	1	6	31.2	E	6	56.9	B	
H40	I-880 - SB	HOV	A St (Overhead Bridge)	Rt 92/Jackson (Overhead Bridge)	Hay	C	1.7	1	5	51.0	C	6	56.1	B	
H41	I-880 - SB	HOV	Rt 92/Jackson (Overhead Bridge)	Tennyson (Overhead Bridge)	Hay	C	1.0	1	5	44.8	D	6	44.1	D	
H42	I-880 - SB	HOV	Tennyson (Overhead Bridge)	Alvarado-Niles (Overhead Bridge)	Hay - Uni Cty	C	2.6	1	5	45.6	D	6	51.8	C	
H43	I-880 - SB	HOV	Alvarado-Niles (Overhead Bridge)	Alvarado (Overhead Bridge)	Uni Cty - Fre	C	1.6	1	5	43.5	D	6	52.4	C	
H44	I-880 - SB	HOV	Alvarado (Overhead Bridge)	Decoto (Overhead Bridge)	Fre	C	1.2	1	5	49.9	C	6	50.2	C	
H45	I-880 - SB	HOV	Decoto (Overhead Bridge)	Stevenson (Overhead Bridge)	Fre	S	4.1	1	5	51.0	C	6	46.4	D	
H46	I-880 - SB	HOV	Stevenson (Overhead Bridge)	AutoMall Pkwy (Overhead Bridge)	Fre	C	1.5	1	5	54.3	C	6	54.0	C	
H47	I-880 - SB	HOV	AutoMall Pkwy (Overhead Bridge)	Rt 262/Mission (Painted Gore)	Fre	C	2.8	1	5	55.3	B	6	56.4	B	[1]
H48	I-880 - SB	HOV	SR 262/Mission (Painted Gore)	SCL County Line	Fre	S	1.6	1	5	58.9	B	6	73.6	A	
H49	I-880 - SB	HOV	Begin HOV (South of Hegenberger)	SR 112/Davis	Oak-San L	N	1.6	1	New Segments			6	68.3	A	
H50	I-880 - SB	HOV	SR 112/Davis	Marina Blvd	San L	N	0.8	1				6	67.5	A	

Notes
[1] Data impacted by longer term construction or recurrent lane closures
[2] I-580 Express Lane Ramp Up Period

B.6 | Bridges to SF/Peninsula

Table B-12: 2016 LOS Monitoring Results for Bridges - PM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F151	SR 92 - WB	San M CL	Foster City Boulevard	SM	4.97	C	3	3641	66.0	A	3200	65.8	A	
F152	SR 92 - EB	Foster City Boulevard	San M CL	SM	4.97	C	3	3430	41.0	D	3200	34.4	E	
F153	SR 84 - WB	San M CL	Ravenswood Slough	SM	1.31	S	3	2639	61.7	A	3101	60.0	A	
F154	SR 84 - EB	Ravenswood Slough	San M CL	SM	1.31	S	3	3775	52.3	C	3200	45.3	D	
F155	I-80 - WB	SF County Line	Fremont St Off Ramp	SF	3.32	N	5	3543	28.2	(F30)	2960	25.8	(F30)	
F156	I-80 - EB	Bryant St On Ramp	SF County Line	SF	3.29	N	5	3299	37.0	E	2960	33.5	E	

Notes [1] Data impacted by long term construction and recurrent lane closures

Table B-13: 2016 LOS Monitoring Results for Bridges - AM Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Sample	Speed	LOS	
F151	SR 92 - WB	San M CL	Foster City Boulevard	SM	4.97	C	3	3656	47.8	D	2914	44.4	D	
F152	SR 92 - EB	Foster City Boulevard	San M CL	SM	4.97	C	3	3772	65.9	A	2675	67.4	A	
F153	SR 84 - WB	San M CL	Ravenswood Slough	SM	1.31	S	3	3772	37.5	E	3026	30.0	E	
F154	SR 84 - EB	Ravenswood Slough	San M CL	SM	1.31	S	3	3290	60.1	A	2895	59.4	B	
F155	I-80 - WB	SF County Line	Fremont St Off Ramp	SF	3.32	N	5	3775	46.3	D	2797	35.4	E	
F156	I-80 - EB	Bryant St On Ramp	SF County Line	SF	3.29	N	5	3540	50.4	C	2797	52.5	C	[1]

Notes [1] Data impacted by long term construction and recurrent lane closures

Table B-14: 2016 LOS Monitoring Results for Bridges - Weekend Peak Period (INRIX data)

CMP ID	CMP Route	Segment Limits		Jurisdiction	Length (mi)	Plan Area	# Lanes	2014 results			2016 results			Note
		From	To					Sample	Speed	LOS	Samples	Speed	LOS	
F151	SR 92 - WB	San M CL	Foster City Boulevard	SM	4.97	C	3	3081	67.0	A	2397	66.1	A	
F152	SR 92 - EB	Foster City Boulevard	San M CL	SM	4.97	C	3	3056	66.7	A	2387	66.1	A	
F153	SR 84 - WB	San M CL	Ravenswood Slough	SM	1.31	S	3	2047	61.8	A	2233	59.4	B	
F154	SR 84 - EB	Ravenswood Slough	San M CL	SM	1.31	S	3	2272	60.7	A	2288	60.7	A	
F155	I-80 - WB	SF County Line	Fremont St Off Ramp	SF	3.32	N	5	3082	38.3	E	2397	35.0	E	
F156	I-80 - EB	Bryant St On Ramp	SF County Line	SF	3.29	N	5	3089	51.6	C	2397	48.6	D	

Notes [1] Data impacted by long term construction and recurrent lane closures

Appendix C | 2016 Updates to the CMP network

This appendix documents changes to the CMP network observed during the 2016 LOS monitoring cycle. Other minor descriptions were updated as appropriate, but are not recorded here. There were no major changes to the Tier 1 Arterials or Tier 2 Arterials this analysis cycle.

C.1 | Tier 1 Freeways

While there were no changes to the Tier 1 Freeway network, it is noted that the I-580 in both directions between the I-680 and Greenville were not monitored as this section of freeway was in a ramp up period due to the recent opening of express lanes. Monitoring will continue as normal next cycle.

C.2 | Tier 1 Arterials

The changes to the Tier 1 Arterials network are shown in Table C-1.

Table C-1: 2016 Tier 1 Arterials

Route / Direction	Description	Length (mi)
Park Street / EB*	GIS alignment change from the Park St. bridge to 23rd Ave. and Kennedy St.	0.7

* GIS segment alignment change only. Length unchanged to 0.1 precision level.

C.3 | HOV and Express Lanes

In the 2014 monitoring cycle, HOV and express lanes were added to the CMP network for performance monitoring (information only). In 2016, monitoring continued on these segments, however the updates in Table C-2 are noted.

Table C-2: 2016 HOV and Express Lanes

Route / Direction	HOV	EL*	Description	Length (mi)
880/SB	✓		Begin of HOV South of Hegenberger to Marina Blvd.	2.4

* EL: Express Lane

Similar to the comment above in the freeway section, the new express lanes on I-580 were not monitored because they are still in the ramp up period. In the next monitoring cycle, monitoring will continue as normal in the Eastbound direction. For the westbound direction, the new express lanes were constructed anew, rather than by converting existing HOV lanes. For this reason, in the next monitoring cycle, new CMP segments should be developed to cover this new section of managed lane. Consistent with the 2014 monitoring cycle, HOV lanes on arterials or ramps were considered out of scope.

C.4 | Origin Destination Surveys

Table C-3 lists the changes to origin destination surveys.

Table C-3: Changes to Origin Destination Surveys

ID	Description	Length (mi)	Modes Impacted	Details
2	Emeryville to Berkeley	4.8	Transit	Transit route updated to quicker option.
3	Hayward to Livermore	20.6	Transit	Transit route was modified to use express bus 12X instead of 12 because it was a quicker option.
6	Fremont to San Jose	14.3	Transit	Route description was updated to reflect recently modified VTA 330 bus boarding location after transfer from ACE Great America Station

Appendix D | Corridor Analysis

This appendix compares the afternoon peak period travel time and speed data on selected freeway and arterials corridors.

Table D-1: Comparison of PM Peak Period Travel Time & Speed on Selected Freeway Routes (1991-2016)

CMP Route	Dir	From	To	Length (miles)	1991	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2016	Note
I-80	EB	Tollgate	Central	6.35	15:56	18:24	17:19	18:23	18:50	14:18	19:45	12:03	17:05	18:52	13:51	17:53	15:48	19:33	
					23.5	20.4	21.7	20.8	20.2	26.6	19.3	31.6	23.1	20.9	28.5	22.1	23.0	18.6	
	WB	Central	Tollgate	6.11	14:27	15:26	15:41	14:53	13:07	20:52	16:33	13:10	12:38	9:38	12:51	11:52	14:01	13:08	
					25.3	23.7	23.3	24.6	28.0	17.6	22.2	27.8	27.7	36.2	27.2	25.9	25.7	27.4	
I-580	EB	SR 238/Foothill	I-205	30.33	32:55	33:40	33:37	33:04	n/a	49:25	59:43	53:22	45:46	47:41	51:57	39:36	44:13	-	[1]
					56.3	55.0	55.1	55.0	n/a	40.5	30.5	34.1	36.8	34.5	30.8	40.4	41.4	-	[1]
	WB	I-205	SR 238/Foothill	30.15	32:10	33:05	32:07	29:30	n/a	33:09	33:10	30:02	30:35	29:03	27:13	27:04	28:47	-	[1]
					57.2	55.6	55.1	55.0	n/a	55.0	54.5	60.2	58.6	61.4	65.6	64.7	63.1	-	[1]
I-580	EB	I-80/I-580 Split	I-238	15.88	18:18	18:35	21:53	18:13	16:16	15:21	17:45	22:15	0:26	19:27	22:55	22:07	23:08	26:59	
					52.6	51.8	44.0	53.2	60.0	62.7	54.7	42.8	39.3	47.0	41.8	40.6	39.9	34.2	
	WB	I-238	I-80	14.73	16:11	16:50	18:20	15:36	14:58	14:36	15:25	15:37	15:58	14:05	15:16	15:59	15:33	16:34	
					57.7	55.5	51.0	52.2	61.2	62.8	59.5	56.6	55.2	62.6	59.9	53.9	60.3	56.6	
I-680	NB	Scott Creek	Alcosta (on)	21.13	21:59	22:59	22:31	24:16	25:07	21:54	24:39	30:21	23:48	29:14	31:39	30:19	42:54	54:50	
					58.1	56.7	56.7	52.2	50.5	58.2	51.4	41.8	52.9	43.4	40.1	41.8	29.8	23.3	
	SB	Alcosta (on)	Scott Creek	21.3	21:45	22:05	23:23	21:04	19:06	20:13	20:44	19:27	21:51	20:10	19:24	19:30	19:10	19:19	
					59.0	58.1	54.9	60.6	66.8	63.2	61.6	65.7	58.5	63.4	65.9	65.6	66.8	66.3	
I-880	NB	Dixon Landing	I-980	31.41	16:49	17:15	18:37	2:26	1:21	17:26	2:20	14:23	17:50	19:10	20:20	20:19	47:41	4:46	
					44.8	44.4	42.9	45.5	38.8	47.5	37.5	49.1	44.6	43.2	42.1	42.1	39.6	29.2	
	SB	I-980	Dixon Landing	30.85	17:55	20:41	23:36	16:31	13:19	16:48	21:46	21:57	1:53	14:53	16:06	13:59	41:00	46:36	
					43.0	40.4	37.9	45.8	49.7	49.1	40.5	38.6	37.1	47.6	46.2	48.1	46.0	40.5	
SR 13	NB	Mountain	Hiller	5.43	6:12	6:40	6:51	6:45	6:06	6:24	6:27	9:25	8:42	6:10	7:38	8:58	11:27	11:01	
					53.6	49.9	48.5	48.1	53.2	50.9	50.4	34.6	38.8	51.0	41.3	35.1	30.4	31.6	
	SB	Hiller	Jct I-580	5.45	6:04	5:46	6:31	6:55	5:31	5:59	5:58	6:03	7:19	7:15	9:02	5:43	8:29	11:09	
					56.4	59.4	52.5	47.2	59.1	59.5	54.6	54.1	48.7	49.0	39.4	42.7	41.9	31.9	

Table D-1: Comparison of PM Peak Period Travel Time & Speed on Selected Freeway Routes (1991-2016)

CMP Route	Dir	From	To	Length (miles)	1991	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2016	Note
SR 24	EB	I-580 (on)	Fish Ranch	4.52	9:19	9:35	9:25	11:10	6:59	8:08	12:41	6:48	10:39	11:32	15:31	15:32	17:36	19:54	
					30.1	29.2	29.8	24.3	38.9	33.4	21.4	39.9	25.5	23.5	17.5	17.5	15.4	13.7	
	WB	Fish Ranch	I-580 (Off)	4.47	5:00	4:58	5:01	5:24	4:30	4:41	4:26	4:34	5:03	5:05	4:11	4:15	4:53	4:28	
					54.0	58.0	54.0	50.0	60.0	57.0	60.5	58.7	58.8	58.4	66.6	59.5	56.4	61.5	

Notes
[1] Express Lane Ramp Up Period

Table D-2: Comparison of PM Peak Period Travel Time & Speed on Selected Arterial Routes (1991-2016)

CMP Route	Dir	From	To	Length (miles)	1991	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2016
Hesperian	NB	Tennyson	14th St.	5.5	19:35	19:19	18:40	16:06	17:18	18:10	22:00	22:10	0:55	1:09	22:04	23:33	22:53	25:56
					17.2	17.5	18.1	20.5	19.5	17.3	15.3	14.9	13.4	13.4	14.8	14.3	14.8	13.0
	SB	14th St.	Tennyson	5.6	17:20	16:05	17:38	16:10	16:13	16:41	17:24	17:33	18:13	20:29	21:44	20:19	19:24	19:49
					19.4	20.9	19.1	20.7	20.7	19.5	19.3	19.1	18.5	16.4	15.5	16.8	17.4	17.0
SR 13 Ashby	EB	I-80	Hiller	3.77	15:17	13:19	13:40	13:40	14:26	16:57	15:04	16:47	15:44	14:08	17:52	16:16	17:02	15:54
					14.7	16.9	16.5	16.5	15.6	13.4	15.0	13.5	14.4	16.0	16.0	13.9	13.5	14.4
	WB	Hiller	I-80	3.8	14:13	13:09	13:49	15:09	14:06	5:16	16:36	15:27	14:00	13:29	14:30	16:14	15:46	14:58
					16.0	17.2	16.4	15.0	16.1	15.9	13.8	14.7	16.3	16.9	15.7	14.0	14.6	15.4
SR 61	SB	Atlantic	Davis	7.57	18:40	18:07	18:30	19:36	19:01	17:41	19:47	20:59	18:46	17:25	19:25	20:05	22:42	20:37
					24.9	25.0	24.5	23.1	23.9	29.4	23.0	21.6	24.2	26.1	23.4	22.6	20.1	22.2
	NB	Davis	Atlantic	7.57	19:32	18:38	18:41	18:58	19:24	19:17	18:49	20:20	19:29	16:55	18:21	19:01	21:04	21:14
					24.3	25.5	25.5	24.1	23.4	25.6	24.1	22.3	23.3	26.9	24.7	23.9	21.7	21.5
SR 84 Fremont	WB	SR-238	I-880 SB	4.3	10:07	8:27	10:56	6:28	11:42	10:23	11:33	9:48	9:49	9:51	10:33	9:41	10:13	11:03
					25.0	30.5	23.5	24.1	22.0	24.9	22.3	26.3	26.3	26.2	23.1	25.1	23.9	22.0
	EB	I-880 SB	SR-238	4.3	11:21	10:24	11:45	11:38	12:56	14:31	11:58	10:43	11:29	11:15	12:17	11:57	11:17	12:17
					24.3	24.8	21.9	18.7	19.9	16.6	21.5	24.1	22.5	22.9	20.1	20.7	21.7	19.9
SR 84 Livermore (Old Alignment on Airway Blvd.)	WB	I-580 WB	Isabel/Vallecitos	*5.23 / -4.14	9:20	10:36	9:27	11:03	11:01	10:20	10:45	5:30	7:43	7:25	7:51	7:54	10:29	10:36
					32.4	28.5	32.0	27.4	27.5	10.2	23.1	38.5	40.7	38.2	39.9	39.7	29.9	29.6
	EB	Isabel/Vallecitos	I-580 WB	*5.23 -4.14	11:32	10:32	10:23	10:46	11:12	11:57	11:25	5:46	8:34	8:25	9:30	9:46	9:23	9:09
					26.2	28.7	29.1	28.1	27.0	22.6	21.8	36.8	36.6	35.8	33.0	32.1	33.4	34.2
SR 84 Livermore	WB	I-580 WB	Isabel/Vallecitos	*5.23 -4.14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9:04	10:09
					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	31.0	27.7

Table D-2: Comparison of PM Peak Period Travel Time & Speed on Selected Arterial Routes (1991-2016)

CMP Route	Dir	From	To	Length (miles)	1991	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2016
(New Alignment which continues on Isabel Ave.)	EB	Isabel/Vallecitos	I-580 WB	*5.23 -4.14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8:18	8:24
					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	33.9	33.4
SR 123	SB	Carlson	35th St.	5.45	16:26	16:32	14:22	18:09	18:15	18:48	17:22	17:38	22:38	19:53	17:37	20:08	20:40	23:29
					19.0	19.7	22.7	18.0	17.9	17.4	18.8	18.5	14.5	16.5	18.6	16.2	15.1	13.3
	NB	35th St.	Carlson	5.46	16:56	15:32	18:12	17:42	2:00	18:36	22:39	19:56	22:53	23:36	17:59	20:53	22:11	24:31
					20.1	21.1	18.0	18.5	12.6	17.6	14.4	16.4	14.3	13.9	18.2	15.7	14.0	12.7
SR 185	SB	42nd ST	SR 92/238	10.46	18:55	4:47	n/a	6:31	5:12	8:11	6:56	6:00	5:31	10:22	10:41	12:00	40:07	37:50
					14.1	21.8	n/a	20.6	21.5	19.3	20.3	18.8	18.3	18.0	18.1	17.4	15.7	16.7
	NB	A Street	42nd St	10.31	14:34	4:54	n/a	4:40	7:02	5:34	5:36	10:36	10:50	7:08	8:27	11:22	36:37	35:36
					18.6	21.7	n/a	21.8	20.2	21.3	21.2	17.9	17.8	20.0	19.1	17.5	16.6	17.0
SR 238 Mission	NB	I-680 NB	Jackson	12.39	0:05	n/a	3:30	3:10	3:04	2:37	6:05	6:30	3:55	3:55	3:45	7:32	27:34	36:36
					30.7	n/a	26.9	27.3	27.4	29.2	24.6	24.4	26.6	26.6	26.8	23.6	27.5	20.8
	SB	Jackson	I-680 NB	12.36	0:28	n/a	4:15	2:45	3:20	0:26	2:13	4:27	2:45	8:04	3:09	5:05	43:19	31:32
					30.3	n/a	26.2	27.7	27.1	31.0	28.2	26.1	27.7	23.1	27.3	24.9	17.5	24.1
MLK/Shattuck Ave	NB	SR 24	University	2.78	7:02	6:43	6:07	12:01	11:41	11:16	11:54	11:47	11:50	12:05	10:02	10:44	10:52	16:32
					17.2	18.3	20.1	13.7	14.3	14.8	14.0	14.2	14.1	13.8	16.6	15.6	18.0	11.8
	SB	University	SR 24	2.76	10:07	9:12	9:59	6:14	10:45	12:01	12:45	10:50	9:55	11:11	9:53	10:53	14:09	15:30
					16.4	18.0	16.6	15.7	15.4	13.8	13.0	15.3	16.7	14.8	16.8	15.2	13.4	12.2
University Ave	EB	I-80 Off	Shattuck Pl	2.05	7:02	6:43	6:07	7:07	5:02	8:05	7:36	7:43	7:31	7:31	7:23	7:48	7:00	8:09
					17.5	18.3	20.1	17.2	16.7	15.2	16.2	15.9	16.4	16.4	16.7	15.8	17.7	15.2
	WB	Shattuck Pl	I-80 Off	2.05	6:38	6:30	7:07	6:28	9:51	7:45	7:01	8:23	7:24	7:00	7:08	8:39	10:07	8:31
					18.5	18.9	17.3	16.5	12.5	15.9	17.5	14.7	16.6	17.6	17.3	14.2	12.2	14.5
Decoto Rd/Dumbarton Bridge	WB	Hwy 238	County Line	8.97	11:46	12:43	13:56	16:30	13:58	14:54	17:25	16:12	15:51	15:21	14:21	14:44	15:14	14:52
					45.7	42.3	38.6	32.6	38.5	37.3	30.9	33.2	33.9	35.1	37.3	36.5	35.8	36.7
	EB	County Line	Hwy 238	8.36	12:41	14:01	14:40	17:49	17:06	15:50	14:35	17:01	16:32	19:23	16:30	6:14	20:59	21:28
					42.3	28.3	36.6	30.0	31.4	34.9	36.8	29.5	30.3	25.9	30.4	27.2	26.0	25.4
SR 84 Niles Canyon	EB	SR 238	Isabel	*13.27 -15.35	n/a	n/a	4:48	1:17	n/a	5:20	14:08	13:02	6:13	3:01	5:20	4:49	28:58	33:18
					n/a	n/a	36.4	34.3	n/a	31.4	24.2	24.4	26.4	29.4	27.8	28.3	27.6	24.0
	WB	Isabel	SR 238	*12:93 -15.01	n/a	n/a	8:52	13:55	n/a	19:56	22:41	0:42	21:55	16:28	17:49	17:28	17:42	17:20
					n/a	n/a	42.7	41.4	n/a	45.9	39.7	40.8	35.4	40.9	44.7	45.6	43.9	44.8

Appendix E | 2016 OD Pairs Results

Table E-1 shows the OD results between 1998 and 2016. **Table E-2** shows the corresponding origins, destinations and routes taken by each mode.

Table E-1: 2016 OD Pair Results

ID	Origin	Destination	Mode	Distance (mi)	1998	2000	2002	2004	2006	2008	2010	2012	2014	2016			
					Av. Travel time (min)									# Runs	Av. Travel Time (min)	Range	Av. Travel Time: Change from 2014 (min)
1 PM	Hayward	Newark	Auto	7.9	24	22	22	16	19	14	15	14	18	4	24	16-29	6
			Transit		88	92	79	90	86	74	57	76	62	2	71	58-83	9
			Desktop											2	67	55-78	
2 PM	Emeryville	Berkeley	Auto	4.8	25	26	25	28	22	22	24	---	22	4	28	20-34	6
			Transit		61	---	56	53	45	70	59	---	61	2	103	87-118	41
			Bike		33	30	30	33	30	32	47	---	48	2	57	55-58	8
3 PM	Hayward	Livermore	Auto	20.6	53	45	49	61	61	54	51	38	53	4	80	65-94	27
			Transit		144	152	141	120	---	143	---	112	126	2	104	102-106	-22
4 PM	Oakland	San Leandro	Auto	11.3	35	29	32	41	34	27	27	24	36	4	24	15-30	-12
			Transit		74	64	56	70	66	78	67	76	51	2	63	50-75	12
			Desktop											2	51	49-52	
5 PM	Fremont	Pleasanton	Auto	15.7	31	34	33	27	39	26	37	---	39	4	44	37-52	5
			Transit		130	122	125	146	181	145	154	---	103	2	134	107-161	31
6 AM 7 AM	Fremont	San Jose	Auto	14.3	39	55	49	30	33	27	28	28	45	4	54	47-64	9
			Transit		129	104	118	94	111	82	73	93	56	2	66	55-78	10
			HOV	14.3	---	35	34	27	25	23	23	25	38	4	36	28-44	-2
8 PM	Oakland	Pleasanton	Auto	29.1	58	60	62	45	57	41	52	---	51	4	59	55-66	8
			Transit		81	96	91	77	75	107	74	---	78	2	89	67-110	11
9 PM	Fremont	Alameda	Auto	22.6	50	57	53	64	52	43	48	40	53	4	60	52-66	6
			Transit		86	74	70	123	102	94	91	88	79	2	85	70-100	6
10 PM	Alameda	Oakland	Auto	5.7	21	17	21	22	21	22	24	---	22	4	35	23-52	13
			Transit		51	47	45	45	43	51	52	---	52	2	45	44-45	-8

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Table E-2: Descriptions of Origins, Destinations & Routes

#	Origin	Destination	Transit Route	Highway Travel	Bicycle Travel
1 (PM)	**Hayward** Kaiser Medical Ctr., 27400 Hesperian Blvd.	**Newark** 2004-2016: Residence near Thornton Ave. & Ruschin Dr.	2008-2016: Walk to Hesperian, AC 97 to AC Transbay SB Line/SB Newark at Union City Blvd./Whipple Rd. to Newark Blvd./Mayhews Landing Rd., walk to door.	2004-2016: Walk to parking; Hesperian to Tennyson to I-880; exit Thornton to Ruschin; park & walk to door.	
2 (PM)	**Emeryville** Chiron Office Building, 4560 Horton St.	**Berkeley** Residence near Marin Circle at Los Angeles Ave.	2016: Walk to San Pablo and 54th St. AC Transit 72 M to San Pablo and Gilman St. AC Transbay H to Sutter St. and Hopkins St. Walk to door.	1996-2016: Walk to parking; 53rd St., San Pablo Ave., Hopkins St., Marin Circle; park & walk to door.	2014-2016: Bicycle to 59th St., Doyle St., Murray St., 9th St., Cedar St., Hopkins St., Sutter St., Del Norte St., Los Angeles Ave.; dismount & walk to door.
3 (PM)	**Hayward** Cal State University at Carlos Bee Ave	**Livermore** Residence near Delaware Way & North Murrieta. (2004 onwards)	2004-2016: Walk to AC 92 (AC 60 since 2012), to Hayward BART, BART to Dub/Pleas Station, Wheels 12, 12X or 12 V to N. Murietta & Portola (DelNorte in 2008-2014); walk to door.	2014-2016: Walk to parking; Carlos Bee, to Mission Blvd., to A St., Redwood Rd., I-580 EB, Livermore Ave., Portola Ave., Murrieta Blvd., Hurton Rd., Delaware Way; park & walk to door.	
4 (PM)	**Oakland** Downtown Oakland 1333 Broadway Bldg.	**San Leandro** Residence near Farnsworth St. & Chapel Ave.	2010-2016: Walk to BART 12th St. Station; BART to Bayfair BART Station, AC 89 to Farnsworth/Manor Blvd.; walk to door.	1996-2016: Walk to parking; local streets to I-880, Marina Blvd., Merced St., Wicks Blvd., Manor Blvd., Wiley St.; park & walk to door.	
5 (PM)	**Fremont** Tesla Plant 45500 Fremont Blvd.	**Pleasanton** 2004-2016: Residence near Hansen/Valley Ave.	2010-2016: Walk to AC 212, 218 or 218 to Fremont BART, BART to Dublin/Pleasanton Station, walk to WHEELS 8 to Hansen & Valley; walk to door.	2014-2016: Walk to parking; Fremont Blvd., Auto Mall Pkwy., I-680, Bernal Ave., Valley Ave., Hansen; park & walk to door.	
6 (AM)	**Fremont** Residence near Thornton Ave. at Fremont Blvd.	**San Jose** Cisco, 3801 Zanker Rd. at Tasman	2014-2016: Walk to ACE Fremont Station, ACE to Great America Station; walk to Tasman/Centennial, VTA 330 to Tasman and Zanker; walk to door.	1998-2016: From residential driveway, Thornton Ave., CA-84, I-880, SR 237, Zanker; park & walk to door.	
7 (AM) HOV route	**Fremont** Residence near Thornton Ave at Fremont Blvd.	**San Jose** Cisco, 3801 Zanker Rd. at Tasman		1998-2016: From residential driveway, Thornton Ave, CA-84, I-880 HOV lanes, SR 237, Zanker; park & walk to door.	
8 (PM)	**Oakland** Federal Building, Jefferson St. at 14th St	**Pleasanton** 2004-2016: Residence near Hansen/Valley Ave.	2010-2016: Walk to BART 12th St. Station; BART to Richmond/Fremont, transfer at Bayfair for BART to Dublin/Pleas Station, Wheels 8, 8A, 54 to Valley near Hansen Dr.; walk to door.	2010-2016: local streets to I-980 E, I-580 E, Hopyard Rd., Valley Ave., Hansen Dr.; park & walk to door.	
9 (PM)	**Fremont** Washington Hospital at Mowry Ave.	**Alameda** Bay Farm Island Residence near Sea Bridge at Robert Davey Jr.	2012-2016: Walk to Fremont BART; BART to Fruitvale, AC 0 or 21 to Robert Davey Jr & Packet Landing Rd.; walk to door.	2004-2016: Walk to parking; Mowry to I-880, 98th Ave., Doolittle Dr., Island Dr.; park & walk to door.	
10 (PM)	**Alameda** Naval Air Station, Atlantic at Main	**Oakland** Business near College Avex at Lawton	2014-2016: Walk to Transit stop; AC 31 to 12th Street & Broadway, BART 12th St Station to Rockridge; walk to door.	2010-2016: Main St. Appezzato Pkwy., CA-260 N/CA-61 N/Webster St., Posey Tube, Broadway, Telegraph, College Ave.; park & walk to door.	

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Appendix F | Technical Details for Commercial Speed Data Processing

The commercial speed data processing, which ultimately converted the raw Traffic Message Channel (TMC) link data into average peak period speeds on every CMP segment, consisted of four steps described below.

Figure F-1: Data Analysis Procedures for Commercial Speed Data

Further explanation of each step is provided below.

F.1 | Step 1. Mapping TMC links onto CMP Segments

Commercial speed data collected by INRIX was reported against lengths of roadway called TMC links. TMC links are typically short links of roadway averaging 0.4 miles in length (range: 19 feet to 4.2 miles)[38].

For this project, it was required that the average speed be reported against an Alameda CTC CMP segment. CMP segments are typically longer segments of roadway averaging approximately 1.2 mile in length (range: 0.2 to 5.0 miles).

Therefore, TMC links needed to be aligned against or mapped onto the CMP segments. This mapping was created as a part of the 2013 validation project and updated for the 2014 and 2016 TMCs.

It should be noted that for some CMP segments, the ends of the CMP did not align with the ends of the TMCs. **Figure F-2** shows a schematic example to explain this concept. It shows one CMP segment that is made up of four TMC links. However the end of the last TMC link does not align with the end of the CMP segment. In these instances, only the overlapping portion of the TMC length was used to calculate the average speed.

Figure F-2: End points of CMP and TMC do not align

[38] TMC length statistics are based on TMCs used in this monitoring project.

F.2 | Step 2. Filter Raw Data

The raw INRIX data was filtered to remove:

- Times outside the morning and afternoon peak periods;
- Days other than Tuesdays to Thursdays;
- Data points impacted by special events i.e. spring break, incidents, construction, major sporting events; and
- Data points with lower data quality scores.

INRIX includes a data quality score that accompanies every INRIX data point. The score value is defined as:

- Score of 30: Data are exclusively generated from real-time sources.
- Score of 20: A mix of historical and real-time sources are used.
- Score of 10: Data are exclusively generated from historical data.

Only raw speeds that were directly measured were used for computing LOS in the CMP network. As such, data points with scores of 10 and 20 were removed, and only data with a score of 30 were used.

The quantity of remaining data points was tracked so the sample size of score 30 was known. The sample sizes are presented in conjunction with all associated commercial speed data results.

Note that Steps 2 and 3 were undertaken using the open source software R. This software is widely used in data analytics and statistics for managing medium size quantities of data (as was the case in this project). Datasets of this size would be difficult to manipulate in a spreadsheet program. Iteris wrote R scripts that performed these processes.

F.3 | Step 3. Spatial and Temporal Data Aggregation - Average Speed Computations

This section discusses the methodology of aggregating the data both spatially and temporally. The input to this step was 11 million data points of INRIX speed data. **Table F-1** displays two such sample data points. The output from this were the average speed and sample size of each CMP segment. A sample of the output is included in **Table F-2**.

Table F-1: Sample INRIX Input Data

TMC Code	Time Stamp	Speed (mph)	Travel time (min)	Score
105+04359	2016-03-01 07:00:39	69	1.17	30
105N04358	2016-03-01 07:00:39	65	0.59	30

Table F-2: Sample Output from Step 3 – Average Speed on CMP Link

ID	CMP Route	Jurisdiction	Length (mi)	Sample Size	Speed (mph)
F1	I-80 – EB: SF County Line to Toll Plaza	Oak	2.01	2795	62.2
F2	I-80 – EB: Toll Plaza to I-580 SB Merge	Oak	1.3	1889	63.2

The following steps describe how the dataset was restructured to obtain the results in **Table F-2**. This involved spatial and temporal aggregation.

F.3.1 | Spatial Aggregation

Using the mapping created in Step 1 and the filtered INRIX data from Step 2, the TMC data was spatially aggregated on the CMP segments. In cases where multiple TMC links span a single CMP segment, the travel time was summed for all TMCs.

$$CMP\ Travel\ Time = TMC_1 + TMC_2 + \cdots + TMC_n$$

F.3.2 | Temporal Aggregation

Temporal aggregation involved the translation of the CMP travel time metric for each minute of data into one average speed value corresponding to each CMP segment for the entire monitoring period. The following formula was used for this:

$$Average\ CMP\ Speed = \frac{\sum CMP\ Length}{\sum CMP\ Travel\ time}$$

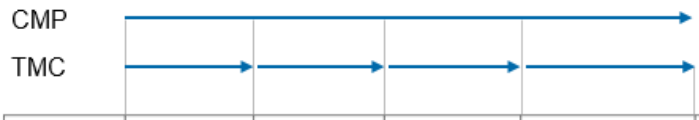
Sample size information was retained to assess the confidence level in the computed statistics.

F.3.3 | Sample Size

The sample size is the number of data points that contributed to the final calculation of average speed. The sample size varied on each TMC through removal of data points during the filtering process and through the processes discussed below.

Removal of TMC data points with scores of 20 and 10 (Step 2 above) eliminated data for particular one-minute time periods from one or more of the TMCs that comprise certain CMP segments. The example shows a longer CMP segment which is comprised of four TMCs. The table shows the data scores for each TMC for each one minute time period. In time periods 1, 2, and 7, one of the TMCs had a data score of 20 and therefore the record from that TMC was excluded for those

minutes. In time period 6, two of the TMCs had data scores of 20 and similarly, these TMC records were also excluded for time period 6 (**Figure F-3**).



Time period	TMC1	TMC2	TMC3	TMC4	Length
1	20	30	30	30	¾
2	20	30	30	30	¾
3	30	30	30	30	1
4	30	30	30	30	1
5	30	30	30	30	1
6	20	30	20	30	½
7	30	30	20	30	¾

Figure F-3: Example of Filtering Process

Iteris performed a check to ensure that any time periods that had too many TMCs removed were not included in the analysis. Where TMC data were available for less than 99% of the TMCs that were chosen for mapping, that one-minute time period was removed. To extend the above example further, if TMC1 was less than 1% of the CMP segment length, then it would still be possible to use the data in Time periods 1 and 2 (in addition to time periods 3, 4 and 5). This can be justified, because TMC1 does not contribute significantly to the distance-based average speed calculation.

In a small minority of cases, using the 99% threshold resulted in removal of too many time periods and an inadequate sample size. In these cases, the threshold was lowered to 70% to ensure that the sample size was adequate. A minimum sample size of 50 was used.

The remainder of this section gives information about the sample sizes observed on all CMPs. Note that there are 327 CMP segments measured with commercial speed data each having an AM and PM measurement of average speed. This totals 654 measurements.[39] **Figure F-4** shows a frequency plot of the sample sizes obtained for each CMP (AM and PM recorded separately). For example, there were 78 CMP measurements that had a sample size between 1000 and 2000 data points. The data points with lower sample sizes were typically located on the arterial network (Tier 2).

[39] Segments measured using floating car surveys were excluded from this analysis of sample size.

The assumptions made by Iteris in this section have been confirmed with Alameda CTC for their reasonableness.

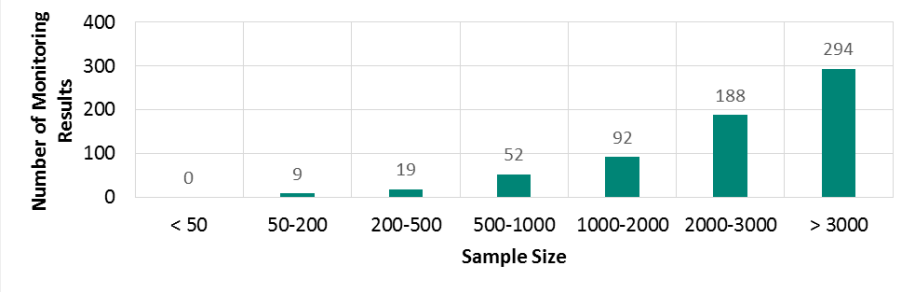


Figure F-4: Histogram of Sample Sizes for CMP Segments Monitored using Commercial Speed Data (Tuesday to Thursday time period)

Appendix G | Technical details for Field Surveys

G.1 | Approach for Arterials (Tier 1 and 2), Ramps and HOV

Floating car surveys were conducted on arterials (Tier 1), HOV lanes, a portion of arterials (Tier 2), and three ramp segments.

Floating car runs were completed using the industry accepted approach of attempting to represent the average vehicle. Drivers aimed to pass as many vehicles as passed them. Six surveys were conducted in each of the morning (7 a.m. to 9 a.m.) and afternoon (4 p.m. to 6 p.m.) peak periods. Surveys were only undertaken on Tuesdays, Wednesdays, and/or Thursdays. For a particular segment, the surveys were scheduled so they spanned a range of days and times. The aim of this is to ensure that a range of representative traffic conditions are surveyed.

As discussed in **Section 2.1**, floating car surveys were scheduled to avoid certain conditions that could be expected to lead to irregular traffic patterns such as school holidays, incidents and short term construction etc.

Drivers were instructed to comply with all road rules. This includes the speed limit, traffic signal displays and not stopping within intersections. In this respect, it is noted that there may be some minor differences between the results from these professional floating car surveys and normal driving behavior; however these differences are unavoidable.

Once the field data was collected for each route, it was downloaded from the survey device and processed in PC Travel[40] software. Technicians specified the check points at the beginning/end of each CMP segment and the software extracted the timestamp of when the survey vehicle passed the check point. The timestamps were transferred to spreadsheets (developed previously by Alameda CTC) and the spreadsheets calculated the travel time (in minutes), average speed (mph) and LOS according to the appropriate HCM look up table in **Section 2.3**.

The software also provided the associated length between check points and, as a quality check, these were compared to the reported CMP segment length. Where necessary, the PC Travel processing was refined to ensure the lengths surveyed matched the lengths reported. As a further quality check, the average speed values were reviewed for reasonableness against:

[40] PC Travel http://www.pc-travel.com/

- Data from previous monitoring efforts;
- Adjacent CMP segments; and/or
- Congestion trends in Google Maps.

G.2 | Approach for OD Surveys

OD surveys were conducted in a similar manner to other floating car surveys, except considering the following additional requirements. OD surveys consisted of a simultaneous survey of up to three modes of travel in the following quantities:

- Four floating car surveys for the auto mode;
- Four floating car surveys for the HOV mode;
- Two transit surveys, where the surveyor rode transit as a passenger;
- Two transit surveys, where the surveyor makes a synthesized transit trip using real time transit information from a desktop computer; and
- Two bike surveys using the same bike rider.

Note that the desktop transit survey is considered as a pilot study and is used in 2016 only. As a complement to the in-field surveys which were conducted at the same time, in the desktop survey the bus arrivals, travel times, and departures, as well as walking times were taken from online transit information and navigation websites. This method or other methods are up for further consideration in later study cycles.

The start times of two of the survey runs were coordinated to begin at the same time for each mode. The two additional auto/HOV surveys were undertaken separately.

Appendix H | Big Data Performance Analysis

H.1 | Reliability Analysis

The Reliability Segments which are defined for all freeways in Alameda County as described in Chapter 7 of the main report. Table H-1 lists the Reliability Segments by their ID (N1 to N38). This table also gives their results.

Additionally the following collections of graphs are presented.

- Figure H-1 gives the travel time distributions of all Reliability Segments.
- Figures H-2 and H-3 show the reliability on the entire freeway network, for the morning and afternoon peak periods respectively.

Summaries of the performance measures used in these tables are provided below:

- 95% Travel Time: 95th Percentile Travel time
- Free Flow Travel Time: Equal to the travel time at 65 mph.
- PTI – Planning Time Index: 95th percentile travel time divided by the free flow travel time
- Mean Travel Time: Mean of travel times.
- BTI – Buffer Time Index – (95th Percentile Travel Time – Mean Travel Time) / Mean Travel time

Table H-1: Reliability Segment Results

Reliability Segment ID	Description	Peak Period	Direction	New ID	Segment Length (mi)	95% Travel Time (min)	Free Flow Travel Time (min)	PTI	Mean Travel Time (min)	BTI	Note
N1	I-80 - EB from SF County Line to Toll Plaza	AM	EB	1	5.3	6.7	4.9	1.4	5.7	0.2	
N1	I-80 - EB from SF County Line to Toll Plaza	PM	EB	1	5.3	9.7	4.9	2.0	7.4	0.3	
N4	I-80 - WB from Toll Plaza to SF County Line	AM	WB	1	5.3	15.3	4.9	3.1	10.5	0.4	
N4	I-80 - WB from Toll Plaza to SF County Line	PM	WB	1	5.3	21.0	4.9	4.3	11.4	0.8	
N2	I-80 - EB from Toll Plaza to Contra Costa County Line	AM	EB	2	6.1	6.0	5.6	1.1	5.0	0.2	
N2	I-80 - EB from Toll Plaza to Contra Costa County Line	PM	EB	2	6.1	24.9	5.6	4.5	17.9	0.4	
N3	I-80 - WB from Contra Costa County Line to Toll Plaza	AM	WB	2	6.0	32.1	5.5	5.8	19.7	0.6	
N3	I-80 - WB from Contra Costa County Line to Toll Plaza	PM	WB	2	6.0	25.4	5.5	4.6	12.0	1.1	
N6	I-238 - WB from I-580 to I-880	AM	NB	3	2.5	12.6	2.3	5.5	6.9	0.8	
N6	I-238 - WB from I-580 to I-880	PM	NB	3	2.5	4.6	2.3	2.0	3.0	0.5	
N5	I-238 - EB from I-880 to I-580	AM	SB	3	2.6	5.9	2.4	2.5	3.3	0.8	
N5	I-238 - EB from I-880 to I-580	PM	SB	3	2.6	6.6	2.4	2.8	4.7	0.4	

Table H-1: Reliability Segment Results

Reliability Segment ID	Description	Peak Period	Direction	New ID	Segment Length (mi)	95% Travel Time (min)	Free Flow Travel Time (min)	PTI	Mean Travel Time (min)	BTI	Note
N15	I-580 - EB from Contra Costa County Line to I-80	AM	EB	4	0.7	2.7	0.6	4.1	1.8	0.5	
N15	I-580 - EB from Contra Costa County Line to I-80	PM	EB	4	0.7	1.9	0.6	3.0	0.9	1.2	
N16	I-580 - WB from I-80 to Contra Costa County Line	AM	WB	4	0.9	0.9	0.8	1.1	0.8	0.1	
N16	I-580 - WB from I-80 to Contra Costa County Line	PM	WB	4	0.9	1.0	0.8	1.3	0.9	0.1	
N11	I-580 - EB from I-80 to SR 13	AM	EB	5	7.5	7.4	7.0	1.1	6.8	0.1	
N11	I-580 - EB from I-80 to SR 13	PM	EB	5	7.5	28.7	7.0	4.1	17.8	0.6	
N14	I-580 - WB from SR 13 to I-80	AM	WB	5	7.7	20.8	7.1	2.9	13.9	0.5	
N14	I-580 - WB from SR 13 to I-80	PM	WB	5	7.7	11.9	7.1	1.7	8.7	0.4	
N12	I-580 - EB from SR 13 to I-238	AM	EB	6	7.9	7.4	7.3	1.0	7.0	0.1	
N12	I-580 - EB from SR 13 to I-238	PM	EB	6	7.9	9.0	7.3	1.2	8.2	0.1	
N13	I-580 - WB from I-238 to SR 13	AM	WB	6	7.9	23.8	7.3	3.3	14.1	0.7	
N13	I-580 - WB from I-238 to SR 13	PM	WB	6	7.9	9.7	7.3	1.3	7.4	0.3	
N7	I-580 - EB from I-238 to I-680	AM	EB	7	10.4	18.4	9.6	1.9	12.3	0.5	
N7	I-580 - EB from I-238 to I-680	PM	EB	7	10.4	27.9	9.6	2.9	16.4	0.7	
N10	I-580 - WB from I-680 to I-238	AM	WB	7	10.3	12.4	9.5	1.3	9.8	0.3	
N10	I-580 - WB from I-680 to I-238	PM	WB	7	10.3	12.7	9.5	1.3	10.1	0.3	
N8	I-580 - EB from I-680 to I-205	AM	EB	8	20.0	-	-	-	-	-	[1]
N8	I-580 - EB from I-680 to I-205	PM	EB	8	20.0	-	-	-	-	-	[1]
N9	I-580 - WB from I-205 to I-680	AM	WB	8	19.9	-	-	-	-	-	[1]
N9	I-580 - WB from I-205 to I-680	PM	WB	8	19.9	-	-	-	-	-	[1]
N17	I-680 - NB from Santa Clara County Line to SR 238 (Mission Blvd)	AM	NB	9	6.3	6.2	5.8	1.1	5.7	0.1	
N17	I-680 - NB from Santa Clara County Line to SR 238 (Mission Blvd)	PM	NB	9	6.3	42.6	5.8	7.3	28.3	0.5	
N22	I-680 - SB from SR 238 (Mission Blvd) to Santa Clara County Line	AM	SB	9	6.4	8.8	5.9	1.5	6.8	0.3	
N22	I-680 - SB from SR 238 (Mission Blvd) to Santa Clara County Line	PM	SB	9	6.4	6.1	5.9	1.0	5.5	0.1	
N18	I-680 - NB from SR 238 (Mission Blvd) to I-580	AM	NB	10	13.1	13.5	12.1	1.1	11.5	0.2	
N18	I-680 - NB from SR 238 (Mission Blvd) to I-580	PM	NB	10	13.1	28.2	12.1	2.3	23.3	0.2	
N21	I-680 - SB from I-580 to SR 238 (Mission Blvd)	AM	SB	10	13.1	27.2	12.1	2.2	17.6	0.5	

Table H-1: Reliability Segment Results

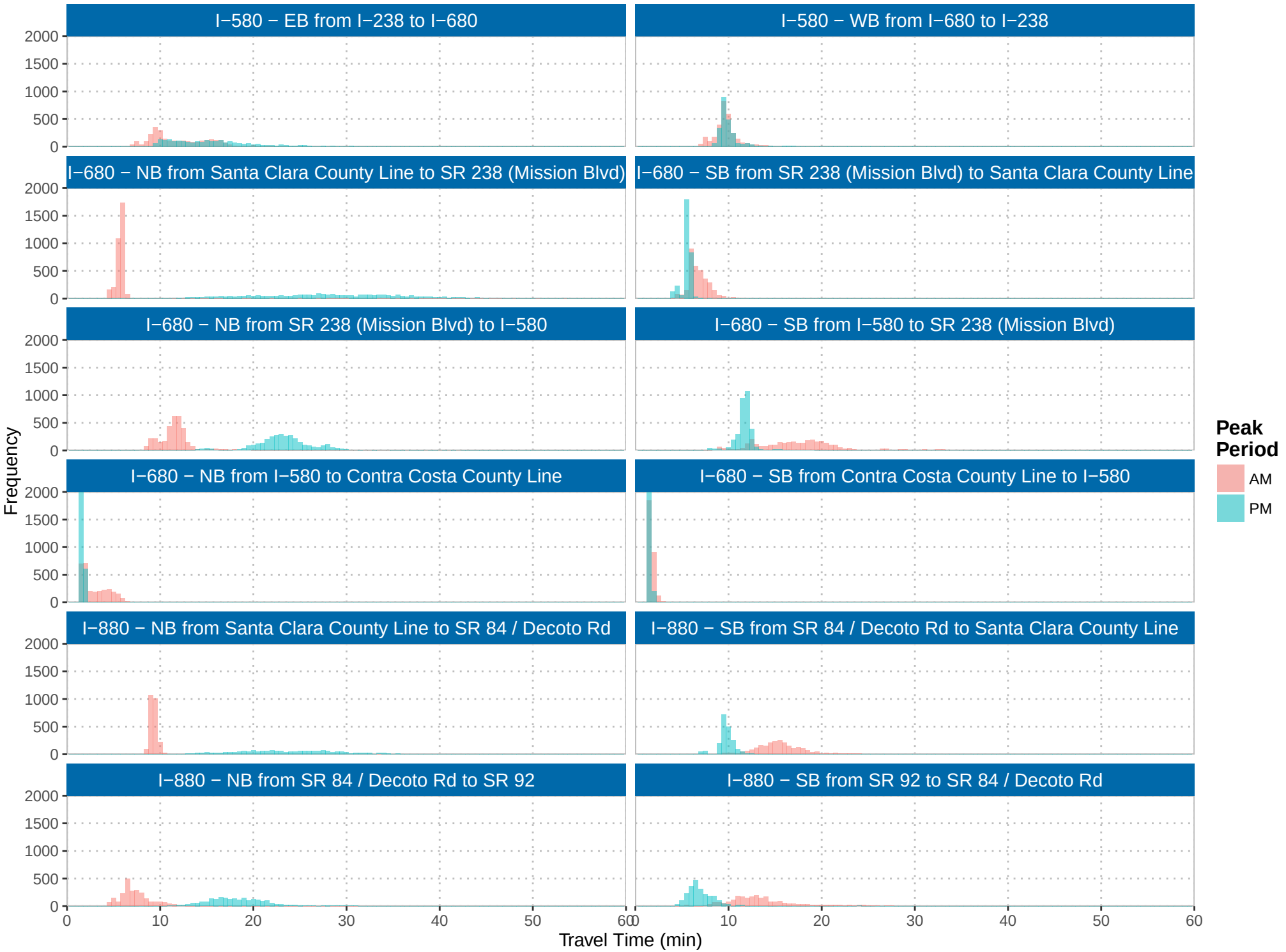
Reliability Segment ID	Description	Peak Period	Direction	New ID	Segment Length (mi)	95% Travel Time (min)	Free Flow Travel Time (min)	PTI	Mean Travel Time (min)	BTI	Note
N21	I-680 - SB from I-580 to SR 238 (Mission Blvd)	PM	SB	10	13.1	12.7	12.1	1.1	11.7	0.1	
N19	I-680 - NB from I-580 to Contra Costa County Line	AM	NB	11	1.9	5.5	1.7	3.2	3.0	0.9	
N19	I-680 - NB from I-580 to Contra Costa County Line	PM	NB	11	1.9	1.9	1.7	1.1	1.7	0.1	
N20	I-680 - SB from Contra Costa County Line to I-580	AM	SB	11	1.9	2.3	1.7	1.3	1.8	0.3	
N20	I-680 - SB from Contra Costa County Line to I-580	PM	SB	11	1.9	1.8	1.7	1.0	1.7	0.1	
N23	I-880 - NB from Santa Clara County Line to SR 84 / Decoto Rd	AM	NB	12	10.1	10.0	9.3	1.1	9.3	0.1	
N23	I-880 - NB from Santa Clara County Line to SR 84 / Decoto Rd	PM	NB	12	10.1	35.5	9.3	3.8	24.6	0.4	
N28	I-880 - SB from SR 84 / Decoto Rd to Santa Clara County Line	AM	SB	12	10.1	21.8	9.3	2.3	15.8	0.4	
N28	I-880 - SB from SR 84 / Decoto Rd to Santa Clara County Line	PM	SB	12	10.1	11.1	9.3	1.2	9.7	0.1	
N24	I-880 - NB from SR 84 / Decoto Rd to SR 92	AM	NB	13	6.4	10.9	5.9	1.9	7.4	0.5	
N24	I-880 - NB from SR 84 / Decoto Rd to SR 92	PM	NB	13	6.4	27.4	5.9	4.7	18.8	0.5	
N27	I-880 - SB from SR 92 to SR 84 / Decoto Rd	AM	SB	13	6.4	25.1	5.9	4.3	14.8	0.7	
N27	I-880 - SB from SR 92 to SR 84 / Decoto Rd	PM	SB	13	6.4	9.7	5.9	1.6	7.2	0.3	
N25	I-880 - NB from SR 92 to I-80	AM	NB	14	18.9	48.0	17.5	2.7	31.8	0.5	
N25	I-880 - NB from SR 92 to I-80	PM	NB	14	18.9	40.5	17.5	2.3	27.4	0.5	
N26	I-880 - SB from I-80 to SR 92	AM	SB	14	18.8	30.9	17.3	1.8	21.9	0.4	
N26	I-880 - SB from I-80 to SR 92	PM	SB	14	18.8	55.3	17.3	3.2	32.9	0.7	
N30	I-980 - EB from I-880 to I-580	AM	EB	15	2.4	2.6	2.2	1.1	2.4	0.1	
N30	I-980 - EB from I-880 to I-580	PM	EB	15	2.4	6.0	2.2	2.7	3.4	0.8	
N29	I-980 - WB from I-580 to I-880	AM	WB	15	2.5	3.1	2.3	1.3	2.5	0.2	
N29	I-980 - WB from I-580 to I-880	PM	WB	15	2.5	3.3	2.3	1.5	2.4	0.4	
N31	SR 13 - NB from I-580 to SR 24	AM	NB	16	5.8	17.9	5.4	3.3	10.0	0.8	
N31	SR 13 - NB from I-580 to SR 24	PM	NB	16	5.8	15.7	5.4	2.9	10.4	0.5	
N32	SR 13 - SB from SR 24 to I-580	AM	SB	16	5.9	6.7	5.5	1.2	5.6	0.2	
N32	SR 13 - SB from SR 24 to I-580	PM	SB	16	5.9	16.4	5.5	3.0	10.6	0.6	
N33	SR 24 - EB from I-580 to Contra Costa County Line	AM	EB	17	4.5	4.9	4.2	1.2	4.4	0.1	
N33	SR 24 - EB from I-580 to Contra Costa County Line	PM	EB	17	4.5	27.3	4.2	6.5	19.6	0.4	

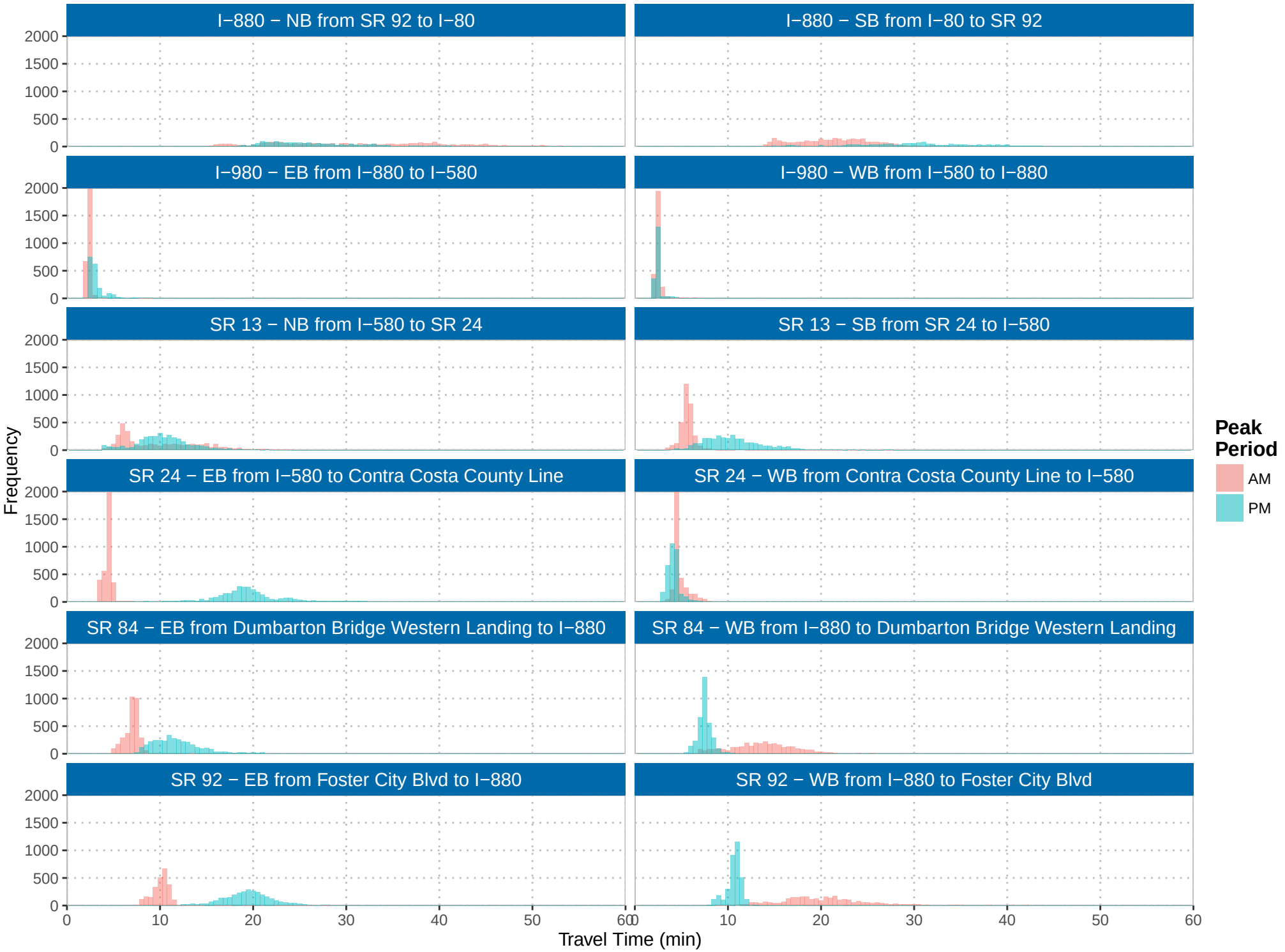
Table H-1: Reliability Segment Results

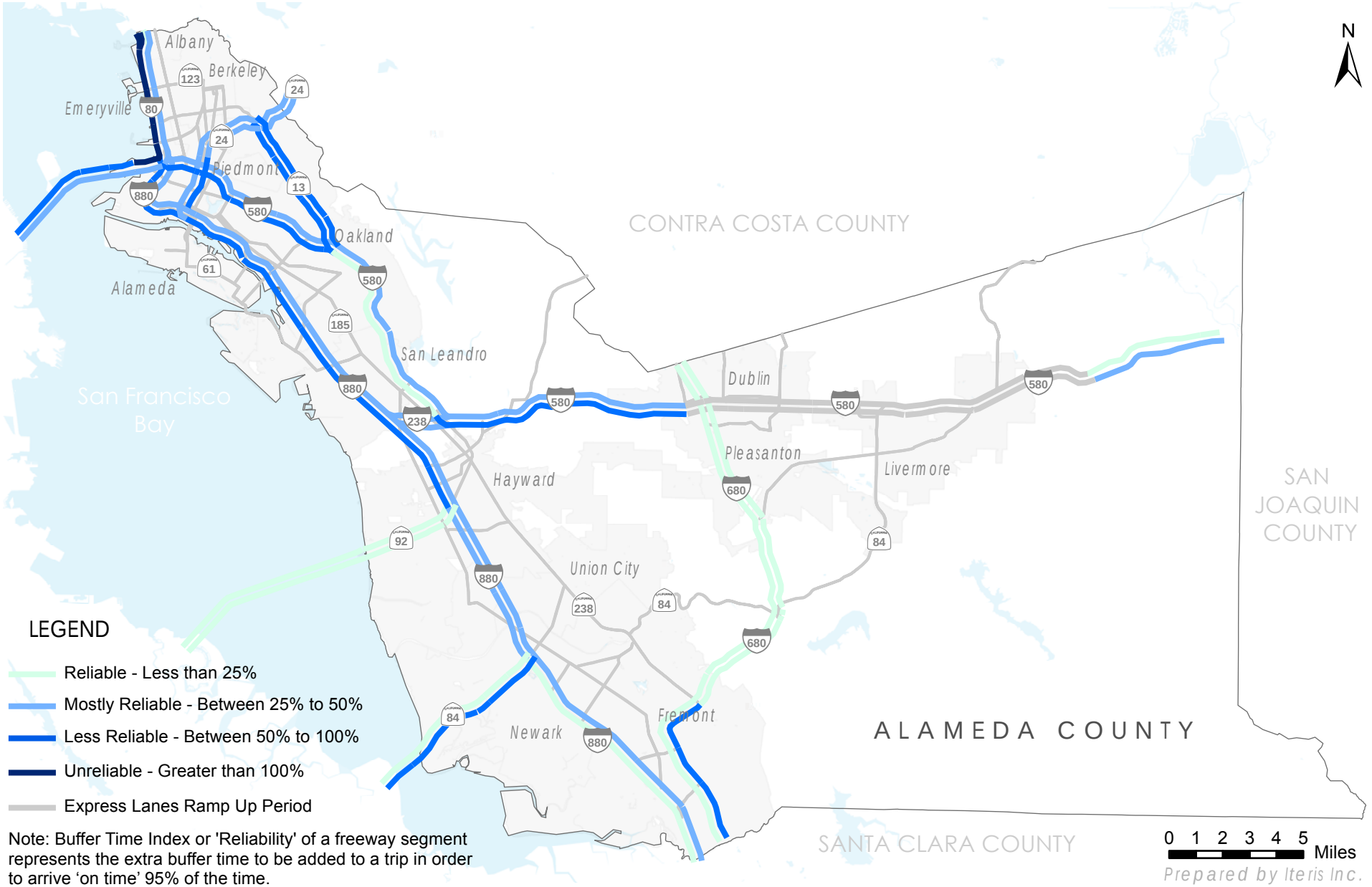
Reliability Segment ID	Description	Peak Period	Direction	New ID	Segment Length (mi)	95% Travel Time (min)	Free Flow Travel Time (min)	PTI	Mean Travel Time (min)	BTI	Note
N34	SR 24 - WB from Contra Costa County Line to I-580	AM	WB	17	4.6	6.7	4.2	1.6	4.9	0.4	
N34	SR 24 - WB from Contra Costa County Line to I-580	PM	WB	17	4.6	5.4	4.2	1.3	4.2	0.3	
N35	SR 84 - EB from Dumbarton Bridge Western Landing to I-880	AM	EB	18	7.5	8.0	6.9	1.2	7.0	0.1	
N35	SR 84 - EB from Dumbarton Bridge Western Landing to I-880	PM	EB	18	7.5	18.3	6.9	2.6	12.1	0.5	
N36	SR 84 - WB from I-880 to Dumbarton Bridge Western Landing	AM	WB	18	7.5	20.2	6.9	2.9	13.9	0.5	
N36	SR 84 - WB from I-880 to Dumbarton Bridge Western Landing	PM	WB	18	7.5	8.8	6.9	1.3	7.5	0.2	
N37	SR 92 - EB from Foster City Blvd to I-880	AM	EB	19	11.7	11.2	10.8	1.0	10.0	0.1	
N37	SR 92 - EB from Foster City Blvd to I-880	PM	EB	19	11.7	23.8	10.8	2.2	19.4	0.2	
N38	SR 92 - WB from I-880 to Foster City Blvd	AM	WB	19	11.7	30.5	10.8	2.8	20.8	0.5	
N38	SR 92 - WB from I-880 to Foster City Blvd	PM	WB	19	11.7	11.7	10.8	1.1	10.7	0.1	

Notes
[1] Express Lane Ramp Up Period

Figure H-1: Reliability Travel Time Distributions


I−580 − EB from I−238 to I−680
I−580 − WB from I−680 to I−238
I−680 − NB from Santa Clara County Line to SR 238 (Mission Blvd)
I−680 − SB from SR 238 (Mission Blvd) to Santa Clara County Line
I−680 − NB from SR 238 (Mission Blvd) to I−580
I−680 − SB from I−580 to SR 238 (Mission Blvd)
I−680 − NB from I−580 to Contra Costa County Line
I−680 − SB from Contra Costa County Line to I−580
I−880 − NB from Santa Clara County Line to SR 84 / Decoto Rd
I−880 − SB from SR 84 / Decoto Rd to Santa Clara County Line
I−880 − NB from SR 84 / Decoto Rd to SR 92
I−880 − SB from SR 92 to SR 84 / Decoto Rd
Frequency
0
500
1000
1500
2000
Travel Time (min)
0
10
20
30
40
50
60
Peak Period
AM
PM

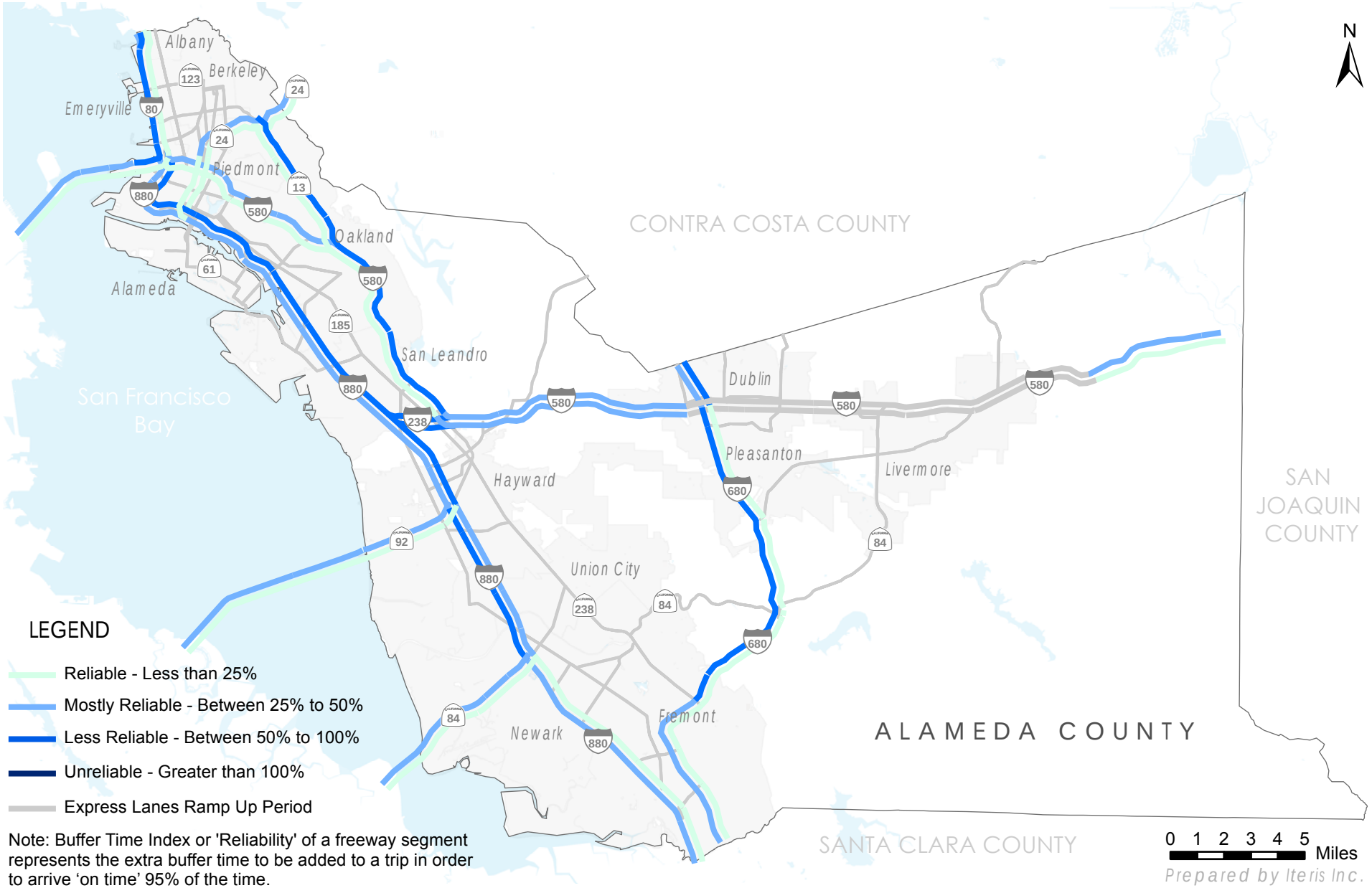

I−880 − NB from SR 92 to I−80
I−880 − SB from I−80 to SR 92
I−980 − EB from I−880 to I−580
I−980 − WB from I−580 to I−880
SR 13 − NB from I−580 to SR 24
SR 13 − SB from SR 24 to I−580
SR 24 − EB from I−580 to Contra Costa County Line
SR 24 − WB from Contra Costa County Line to I−580
SR 84 − EB from Dumbarton Bridge Western Landing to I−880
SR 84 − WB from I−880 to Dumbarton Bridge Western Landing
SR 92 − EB from Foster City Blvd to I−880
SR 92 − WB from I−880 to Foster City Blvd
Frequency
0
500
1000
1500
2000
Travel Time (min)
0
10
20
30
40
50
60
Peak Period
AM
PM



Note: Buffer Time Index or 'Reliability' of a freeway segment represents the extra buffer time to be added to a trip in order to arrive 'on time' 95% of the time.

H.2

2016 LEVEL OF SERVICE MONITORING ADDITIONAL RESULTS: RELIABILITY/BUFFER TIME INDEX - PM PEAK PERIOD



Note: Buffer Time Index or 'Reliability' of a freeway segment represents the extra buffer time to be added to a trip in order to arrive 'on time' 95% of the time.

H.3

2016 LEVEL OF SERVICE MONITORING ADDITIONAL RESULTS: RELIABILITY/BUFFER TIME INDEX - AM PEAK PERIOD

H.2 | Duration of Congestion

The duration of congestion throughout the day is given for all freeway CMP segments in Table H-3, and shown on the map in Figure H-5.

Table H-2: Duration of Congestion Analysis Results

CMP	Description	Length (mi)	Duration of Congestion (Avg. mins per day)	Note
F1	I-80 - EB from SF County Line to Toll Plaza	2.0	7	
F2	I-80 - EB from Toll Plaza to I-580 SB Merge	1.3	145	
F3	I-80 - EB from I-80/I-580 (Merge) to Powell	0.5	238	
F4	I-80 - EB from Powell to Ashby	0.7	223	
F5	I-80 - EB from Ashby to University	1.3	174	
F6	I-80 - EB from University to Jct I-580 (off)	1.4	96	
F7	I-80 - EB from Jct I-580 (off) to Central (County Line)	0.8	46	
F8	I-80 - WB from Central (County Line) to Jct I-580	0.7	214	
F9	I-80 - WB from Jct I-580 to University	1.5	310	
F10	I-80 - WB from University to Ashby	1.3	394	
F11	I-80 - WB from Ashby to Powell	0.7	442	
F12	I-80 - WB from Powell to I-80/I-580 (Split)	0.5	276	
F13	I-80 - WB from I-580 Split to Toll Plaza	1.3	286	
F14	I-80 - WB from Toll Plaza to SF County	2.0	291	
F15	I-238 - EB from I-880 to I-580	2.6	58	
F16	I-238 - WB from I-580 to I-880	2.5	122	
F17	I-580 - EB from I-580/I-238 changed fm (I-238/Fthl Off) to Grove	2.7	58	
F18	I-580 EB from Grove to Eden Canyon	2.2	33	
F19	I-580 EB from Eden Canyon to San Ramon/ Foothill	4.8	36	
F20	I-580 EB from San Ramon/ Foothill to I-680	0.7	-	[1]
F21	I-580 EB from I-680 to Hopyard	0.9	-	[1]
F22	I-580 EB from Hopyard to Santa Rita	1.9	-	[1]
F23	I-580 EB from Santa Rita to El Charro	1.2	-	[1]
F24	I-580 EB from El Charro to SR 84/Airway Blvd.	1.7	-	[1]
F25	I-580 EB from SR 84/Airway Blvd. to Portola	1.7	-	[1]
F26	I-580 - EB from Portola to 1st St	2.5	-	[1]

Table H-2: Duration of Congestion Analysis Results

CMP	Description	Length (mi)	Duration of Congestion (Avg. mins per day)	Note
F27	I-580 - EB from 1st St to Greenville	2.1	-	[1]
F28	I-580 - EB from Greenville to N.Flynn	2.7	65	
F29	I-580 - EB from N.Flynn to Grant Line	4.3	13	
F30	I-580 - EB from Grant Line to I-205 (SJ Co) Off	0.9	2	
F31	I-580 - WB from I-205 (SJ Co) to Grant Line	0.7	177	
F32	I-580 - WB from Grant Line to N Flynn	4.6	107	
F33	I-580 - WB from N Flynn to Greenville Rd	2.4	5	
F34	I-580 - WB from Greenville Rd to 1st St	2.2	-	[1]
F35	I-580 - WB from 1st St to Portola Ave	2.5	-	[1]
F36	I-580 - WB from Portola to SR 84/Airway Blvd	1.7	-	[1]
F37	I-580 - WB from SR 84/Airway Blvd to Fallon Rd/El Charro	1.7	-	[1]
F38	I-580 - WB from Fallon Rd/El Charro to Tassajara	1.2	-	[1]
F39	I-580 - WB from Tassajara Rd to I-680	2.8	-	[1]
F40	I-580 - WB from I-680 to San Ramon Rd	0.7	-	[1]
F41	I-580 - WB from San Ramon Rd to Eden Caynon	4.8	1	
F42	I-580 - WB from Eden Canyon to Center St	2.5	3	
F43	I-580 - WB from Center to I-580/238	2.3	11	
F44	I-580 - EB from I-80 to I-980	1.3	116	
F45	I-580 - EB from I-980 to Harrison	1.0	134	
F46	I-580 - EB from Harrison to Lakeshore	0.8	136	
F47	I-580 - EB from Lakeshore to Coolidge	2.2	46	
F48	I-580 - EB from Coolidge to SH 13 Off	2.2	89	
F49	I-580 - EB from SH 13 Off to MacArthur	4.1	1	
F50	I-580 - EB from MacArthur to I-580/238	3.8	0	
F51	I-580 - WB from I-238 to Foothill/MacArthur	3.9	17	
F52	I-580 - WB from Foothill/MacArthur to SH 13 Off	4.0	55	
F53	I-580 - WB from SH 13 Off to Fruitvale	2.6	99	
F54	I-580 - WB from Fruitvale to Harrison	2.7	10	
F55	I-580 - WB from Harrison to SH 24 On-ramp	1.2	18	
F56	I-580 - WB from SH-24 On-ramp to I-80/580 Split	1.2	289	
F57	I-580 - EB from Central (County Line) to I-80 Jct	0.7	157	

Table H-2: Duration of Congestion Analysis Results

CMP	Description	Length (mi)	Duration of Congestion (Avg. mins per day)	Note
F58	I-580 - WB from I-80 Jct to Central (County Line)	0.9	1	
F59	I-680 - NB from Scott Creek Rd to Rt 262/Mission	2.3	50	
F60	I-680 - NB from Rt 262/Mission to Durham Rd	1.6	251	
F61	I-680 - NB from Durham Rd to Washington Blvd	1.3	262	
F62	I-680 - NB from Washington Blvd to Rt 238/Mission	1.1	240	
F63	I-680 NB from SR 238/Mission to Vargas Rd	1.1	221	
F64	I-680 NB from Vargas Rd to Andrade Rd	2.2	270	
F65	I-680 NB from Andrade Rd to Calaveras	1.2	142	
F66	I-680 NB from Calaveras to Rt.84/Vallecitos	0.4	4	
F67	I-680 NB from SR 84 to Sunol Blvd	3.5	0	
F68	I-680 NB from Sunol Blvd. to Bernal Ave	1.5	3	
F69	I-680 NB from Bernal Ave to Stoneridge Dr	2.5	2	
F70	I-680 NB from Stoneridge Dr to I-580	0.7	22	
F71	I-680 - NB from I-580 to Alcosta	1.9	38	
F72	I-680 - SB from Alcosta to I-580	1.9	2	
F73	I-680 SB from I-580 to Stoneridge Dr	0.7	31	
F74	I-680 SB from Stoneridge Dr to Bernal	2.5	78	
F75	I-680 SB from Bernal Ave. to Sunol Blvd	1.5	102	
F76	I-680 SB from Sunol Blvd. to SR 84	3.7	10	
F77	I-680 SB from SR 84 (Niles Canyon) to Andrade Rd	1.3	1	
F78	I-680 SB from Andrade Rd to Sheridon Rd	1.4	0	
F79	I-680 SB from Sheridon Rd to Vargas Rd	0.8	2	
F80	I-680 SB from Vargas Rd to SR 238/Mission	1.1	1	
F81	I-680 - SB from Rt 238/Mission to Washington Blvd	1.1	2	
F82	I-680 - SB from Washington Blvd to Durham Rd	1.4	24	
F83	I-680 - SB from Durham Rd to Rt 262/Mission	1.6	9	
F84	I-680 - SB from Rt 262/Mission to Scott Creek Rd	2.2	0	
F85	I-880 - NB from Dix Landing to SR 262/Mission	2.1	136	
F86	I-880 - NB from SR 262/Mission to AutoMall Pkwy	2.4	86	
F87	I-880 - NB from AutoMall Pkwy to Stevenson	1.5	19	
F88	I-880 - NB from Stevenson to Decoto	4.1	123	

Table H-2: Duration of Congestion Analysis Results

CMP	Description	Length (mi)	Duration of Congestion (Avg. mins per day)	Note
F89	I-880 - NB from Decoto to Alvarado Blvd	1.2	243	
F90	I-880 - NB from Alvarado Blvd to Alvarado-Niles Blvd	1.6	231	
F91	I-880 - NB from Alv-Niles to Tennyson	2.6	253	
F92	I-880 - NB from Tennyson to SR 92	1.0	223	
F93	I-880 - NB from SR 92 to A St	1.7	122	
F94	I-880 - NB from A St to I-238 (Marina before 06)	1.9	36	
F95	I-880 - NB from I-880/I238 (split) to Marina Blvd	2.5	97	
F96	I-880 - NB from Marina Blvd to SR 112/Davis	0.8	137	
F97	I-880 - NB from SR 112/Davis to Hegenberger	1.8	108	
F98	I-880 - NB from Hegenberger to High/42nd	2.3	167	
F99	I-880 - NB from High/42nd to 23rd (1st on)	1.2	146	
F100	I-880 - NB from 23RD (1ST on) to Jct 980 (off)	2.6	2	
F101	I-880 - NB from Jct 980 (off) to I-880/I-80 split	2.4	10	
F102	I-880 - NB from I-880/I-80 (split) to I-880/I-80 (merge)	1.4	196	
F103	I-880 - SB from I-880/I-80 split to I-880/I-80 merge	1.3	0	
F104	I-880 - SB from I-880/I-80 merge to Jct 980	2.5	106	
F105	I-880 - SB from I-980 to 23rd	2.7	158	
F106	I-880 - SB from 23rd St to High/42nd	1.1	43	
F107	I-880 - SB from High/42nd to Hegenberger	2.4	13	
F108	I-880 - SB from Hegenberger to SR 112/Davis	1.8	6	
F109	I-880 - SB from SR 112/Davis to Marina Blvd	0.8	12	
F110	I-880 - SB from Marina Blvd to SR 238 WB (merge)	2.5	24	
F111	I-880 - SB from I-238 (Marina before 06) to A St	1.9	169	
F112	I-880 - SB from A St to Rt 92	1.7	99	
F113	I-880 - SB from Rt 92 to Tennyson	1.0	158	
F114	I-880 - SB from Tennyson to Alv-Niles	2.6	102	
F115	I-880 - SB from Alvarado-Niles to Alvarado	1.6	101	
F116	I-880 - SB from Alvarado to Decoto	1.2	68	
F117	I-880 - SB from Decoto to Stevenson	4.1	58	
F118	I-880 - SB from Stevenson to AutoMall Pkwy	1.5	11	
F119	I-880 - SB from AutoMall Pkwy to Rt 262/Mission	2.8	30	

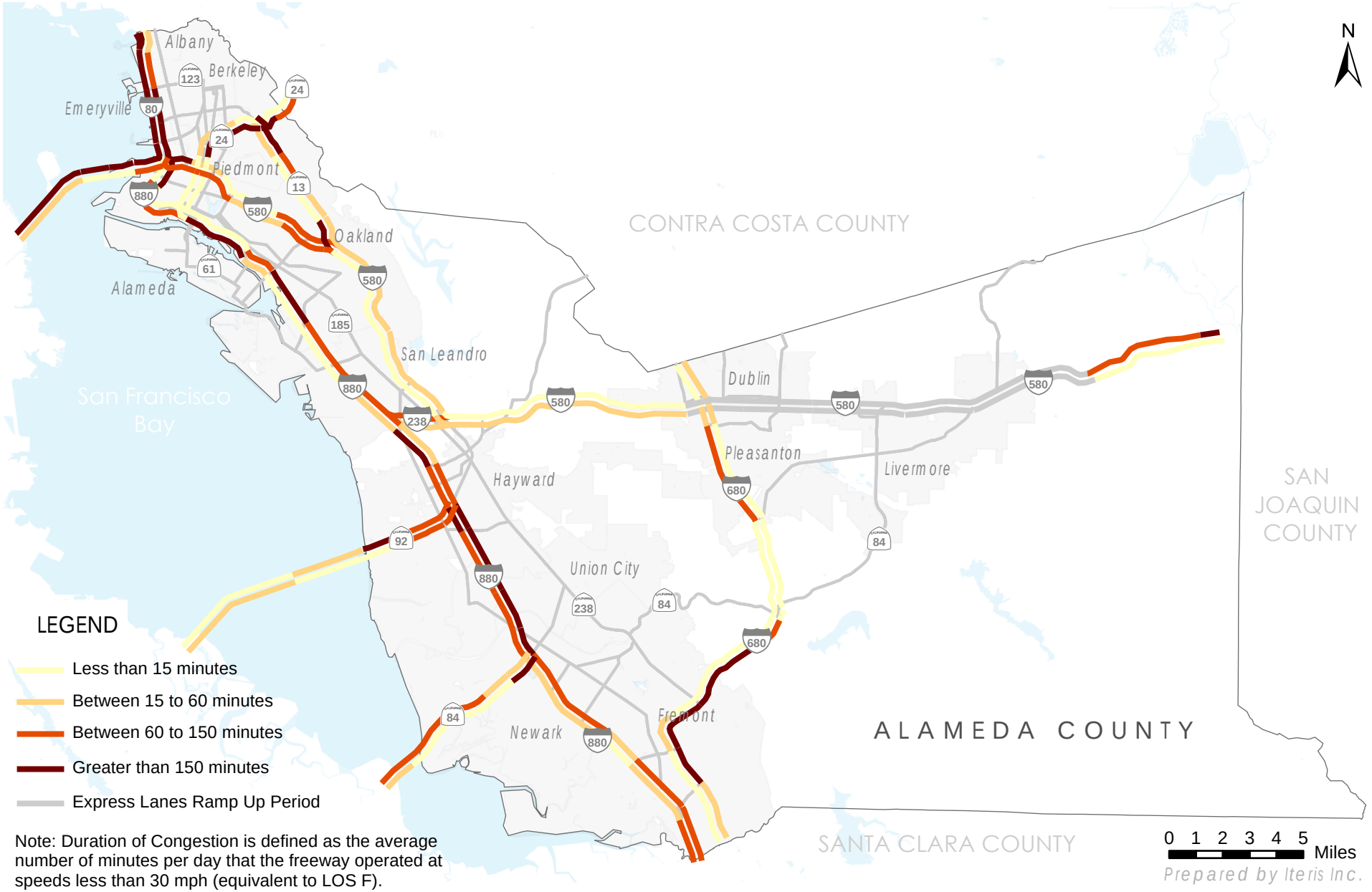
Table H-2: Duration of Congestion Analysis Results

CMP	Description	Length (mi)	Duration of Congestion (Avg. mins per day)	Note
F120	I-880 - SB from SR 262/Mission to Dix Landing(off)	1.7	66	
F121	I-980 - WB from SR 24 @ 580 to I-880	2.5	2	
F122	I-980 - EB from I-880 to SR 24 @ 580	2.4	7	
F123	SR 13 - NB from Mountain On to Carson/Redwood (1) (off)	1.3	27	
F124	SR 13 - NB from Carson/Redwood (1) (off) to Joaquin Miller	1.1	53	
F125	SR 13 - NB from Joa Miller/Linc to Moraga Ave	1.8	116	
F126	SR 13 - NB from Moraga Ave to Hiller (Sig)	1.6	217	
F127	SR 13 - SB from Hiller Sig to Moraga Ave	1.6	28	
F128	SR 13 - SB from Moraga Ave to Joa Miller/Linc	1.9	6	
F129	SR 13 - SB from Joaq Miller/Lincoln to Redwood	1.1	5	
F130	SR 13 - SB from Redwood to Jct I-580 (EB Merge)	1.4	178	
F131	SR 24 - EB from Jct I-580 (on) to Broadway/SR 13	1.8	190	
F132	SR 24 - EB from Broadway/SR 13 to Caldecott (enter)	1.6	242	
F133	SR 24 - EB from Caldecott (enter) to Fish Ranch Road	1.0	118	
F134	SR 24 - WB from Fish Ranch Road (CC) to Caldecott (exit)	1.0	10	
F135	SR 24 - WB from Caldecott (exit) to Broadway	1.7	5	
F136	SR 24 - WB from Broadway to Jct I-580 (on)	1.9	15	
F137	SR 84 - EB from San M CL to Toll Plaza	3.3	12	
F138	SR 84 - EB from Toll Plaza to Thornton	0.5	3	
F139	SR 84 - EB from Thornton Ave/Pascon Padre to Newark Blvd/Ardenwood Blvd	1.2	14	
F140	SR 84 - EB from Newark Blvd/Ardenwood Blvd to I-880 NB (off)	1.2	244	
F141	SR 84 - WB from I-880 NB (off) to Ardenwood/Newark	1.2	34	
F142	SR 84 - WB from Ardenwood/Newark to Paseo Padre Pkwy	1.1	55	
F143	SR 84 - WB from Paseo Padre Pkwy to Toll Gate	0.5	113	
F144	SR 84 - WB from Toll Plaza to San M CL	3.3	69	
F145	SR 92 - EB from San M CL to Toll Plaza	2.8	7	
F146	SR 92 - EB from Toll Plaza to Clawiter	1.9	8	
F147	SR 92 - EB from Clawiter to I-880	2.1	67	
F148	SR 92 - WB from I-880 to Clawiter	2.0	89	
F149	SR 92 - WB from Clawiter to Toll Plaza	1.9	157	
F150	SR 92 - WB from Toll Plaza to San M CL	2.8	15	

Table H-2: Duration of Congestion Analysis Results

CMP	Description	Length (mi)	Duration of Congestion (Avg. mins per day)	Note
F151	SR 92 - WB from San M CL to Foster City Boulevard	5.0	14	
F152	SR 92 - EB from Foster City Boulevard to San M CL	5.0	25	
F153	SR 84 - WB from San M CL to Ravenswood Slough	1.3	111	
F154	SR 84 - EB from Ravenswood Slough to San M CL	1.3	19	
F155	I-80 - WB from SF County Line to Fremont St Off Ramp	3.3	196	
F156	I-80 - EB from Bryant St On Ramp to SF County Line	3.3	33	

Notes
[1] Express Lane Ramp Up Period



Note: Duration of Congestion is defined as the average number of minutes per day that the freeway operated at speeds less than 30 mph (equivalent to LOS F).

H.4

2016 LEVEL OF SERVICE MONITORING ADDITIONAL RESULTS: DURATION OF CONGESTION (BETWEEN 4:00 AM to 10:00 PM)

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ALAMEDA
County Transportation Commission

prepared by **Iteris**