AECOM Transportation

April 8, 2011

Current and Projected Conditions Report

San Francisco Bay Crossings Study Update

Prepared for the Bay Area Toll Authority

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1.0 Executive Summary

The purpose of this report is to define the existing and projected conditions on the various San Francisco Bay transportation crossings for the Bay Area Toll Authority. This work will serve as a baseline and an input to upcoming phases of the San Francisco Bay Crossings Study Update, such as the development of conceptual alternatives.

Introduction

The San Francisco Bay Crossings study area, generally defined as the area of the San Francisco Bay between the Bay Bridge and SR 237, is crossed by three primary travel corridors. These include the Bay Bridge, San Mateo Bridge, and Dumbarton Bridge corridors. To properly assess existing transbay constraints and opportunities within these corridors, and gain input into the potential value of different improvement alternatives and locations, the following information has been obtained:

- Origins and destinations of transbay trips;
- Transbay transit ridership;
- Transbay vehicular volumes;
- Truck traffic characteristics;
- Travel speeds; and
- Identification and location of system constraints.

The data collection assembly effort made use of a wide range of recent information gathered by Caltrans, PeMS, AC Transit, BART and other agencies. The study area is shown in **Figure 1**.

Vehicle Travel

A summary of the daily number of transbay vehicle person-trips within each of the three (3) corridors is included in **Table 1**.

Table 1: Daily Person-Trips Comparison – Vehicle Travel (2010)

Mode	Bay Bridge		San Mateo Bridge		Dumbarton Bridge		Total	
	2000	2010	2000	2010	2000	2010	2000	2010
Vehicle – SOV (1 person)	194,100	202,800	75,400	79,300	73,300	66,500	342,800	348,600
Vehicle – HOV (2 persons)	69,000	40,600	-	-	-	-	69,000	40,600
Vehicle – HOV (carpool)	136,300	46,300	34,000	23,600	32,300	23,700	202,600	93,600
Vehicle – Truck (1 person)	10,300	6,400	2,900	6,300	1,500	3,600	14,700	16,300
Total Person-Trips	**409,700**	**296,100**	**112,300**	**109,200**	**107,100**	**93,800**	**629,100**	**499,100**
Total Vehicle-Trips	**276,600**	**247,500**	**92,200**	**97,000**	**88,100**	**81,800**	**456,900**	**426,300**

Source: 2000 Bay Crossings Study; AECOM, 2011.
Note:
- Carpool requires 3+ persons on the Bay Bridge; Carpool requires 2+ persons on the San Mateo Bridge and Dumbarton Bridge.

The decrease in average weekday daily person-trips can largely be attributed to current economic conditions. Historical traffic volume data from 2006 to 2010 show an annual decrease in vehicle-trips throughout the Bay Area. Additionally, carpool usage has decreased approximately 30 percent since the introduction of the carpool charge and lane usage enforcement. Additionally, average vehicle occupancy rates have decreased. The combination of these factors – lower traffic volumes, lower rates of carpool usage, and lower rates of vehicle occupancy – results in a reduction in person-trips currently crossing the bridge corridors compared to 2000.

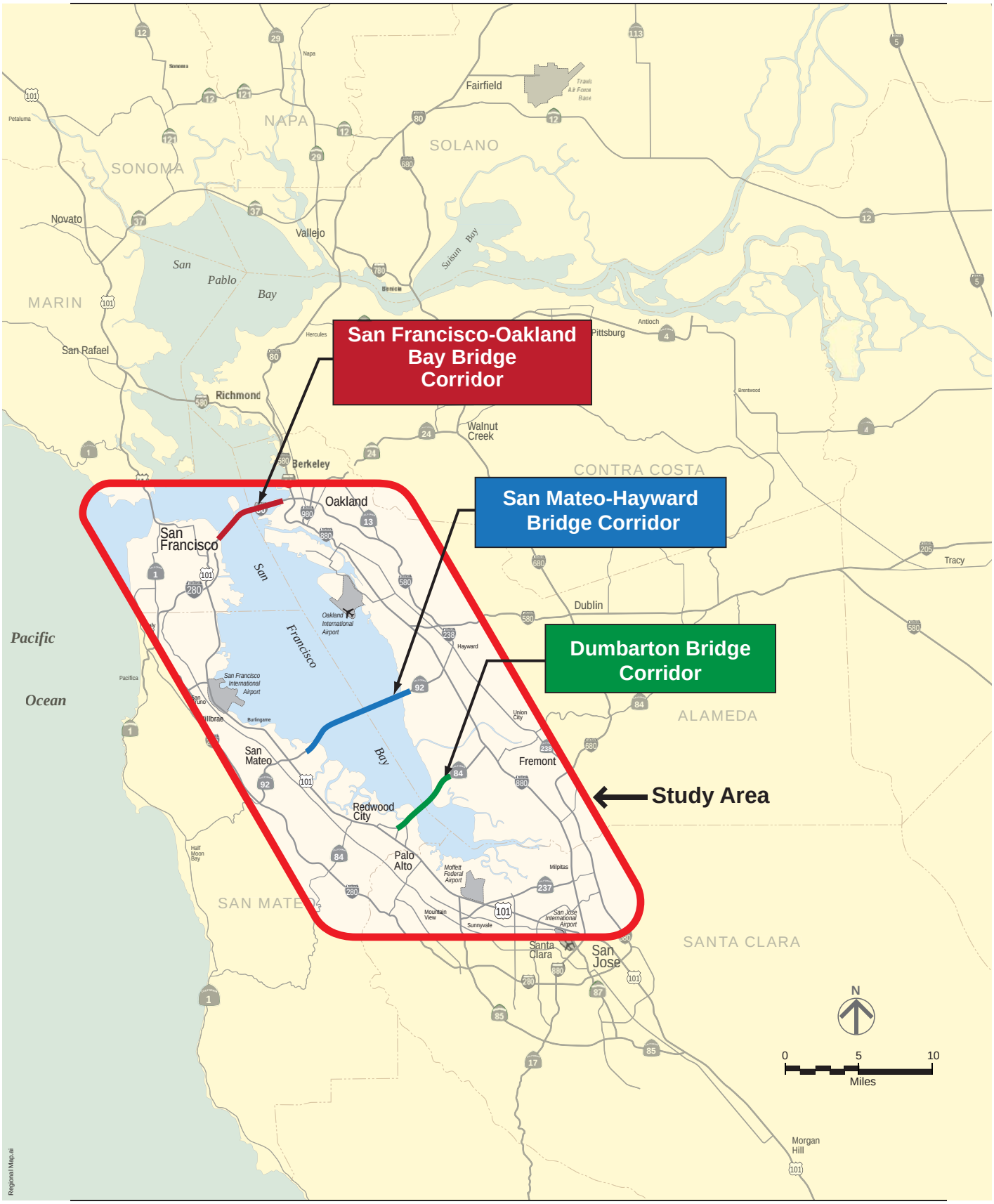

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Figure 1
Study Area

Rail
Currently, BART is the only form of rail crossing the Bay. BART crosses the San Francisco Bay within the Bay Bridge corridor. A summary of the daily number of transbay BART person-trips is included in **Table 2**.

Table 2: Daily Person-Trips Comparison – Rail (2010)

Mode	Bay Bridge		San Mateo Bridge		Dumbarton Bridge		Total	
	2000	2010	2000	2010	2000	2010	2000	2010
Rail – BART	160,700	175,500	-	-	-	-	160,700	175,500
Total	**160,700**	**175,500**	**-**	**-**	**-**	**-**	**160,700**	**175,500**

Source: 2000 Bay Crossings Study; AECOM, 2011.

Despite decreases in travel in the Bay Area due to the current economic conditions, transbay ridership on BART increased. The increase in daily transbay passenger ridership could be partially attributed to the expansion of the BART system into San Mateo County. Since 2000, BART has expanded from 39 stations to 43 stations and from 95 miles of track to 104 miles of track. The new stations, which were not in service in 2000, are South San Francisco, San Bruno, San Francisco International Airport, and Millbrae.

Bus
A summary of the daily number of transbay bus person-trips within each of the three (3) corridors is included in **Table 3**.

Table 3: Daily Person-Trips Comparison – Bus (2010)

Mode	Bay Bridge		San Mateo Bridge		Dumbarton Bridge		Total	
	2000	2010	2000	2010	2000	2010	2000	2010
Bus	15,200	9,900	100	300	1,000	1,400	16,300	11,600
Total	**15,200**	**9,900**	**100**	**300**	**1,000**	**1,400**	**16,300**	**11,600**

Source: 2000 Bay Crossings Study; AECOM, 2011.

The decrease in weekday daily bus transbay ridership in the Bay Bridge corridor can be attributed to current economic conditions and reduced service. The increase in weekday daily bus transbay ridership along the San Mateo Bridge and Dumbarton Bridge corridors can likely be attributed to service changes along the corridors.

Ferry
A summary of the daily number of transbay ferry person-trips within each of the three (3) corridors is included in **Table 4**.

Table 4: Daily Person-Trips Comparison – Ferry (2010)

Mode	Bay Bridge		San Mateo Bridge		Dumbarton Bridge		Total	
	2000	2010	2000	2010	2000	2010	2000	2010
Ferry	4,900	4,500	-	-	-	-	4,900	4,500
Total	**4,900**	**4,500**	**-**	**-**	**-**	**-**	**4,900**	**4,500**

Source: 2000 Bay Crossings Study; AECOM, 2011.

The decrease in weekday daily transbay ferry ridership along the Bay Bridge corridor can be attributed to current economic conditions, as ferry service has not changed significantly.

Other Transit Services
The ridership on other transit services that are currently in operation and cross the San Francisco Bay is minimal. Currently, Amtrak offers infrequent service across the Bay Bridge between Oakland and San Francisco. Future development of Dumbarton Rail is currently underway.

Bicycles / Pedestrians
Currently, the only bridge that provides pathways for bicycles and pedestrians is the Dumbarton Bridge. All of the corridors provide some form of transportation service for bicyclists, including bus racks and shuttles. Bicycle and pedestrian facilities are currently in study / construction phases for the Bay Bridge.

Transbay Travel Summary
The total number of daily crossings of the San Francisco Bay is approximately 15 percent less in 2010 than in 2000. Of these person-trips, approximately 486,000 travel the Bay Bridge corridor, 109,500 travel the San Mateo Bridge corridor, and 95,200 travel the Dumbarton Bridge corridor. A summary of the daily person-trips traveling across the study area, disaggregated by bridge corridor and service type, is shown in **Figure 2**.

Of the three (3) primary travel corridors, only the Bay Bridge corridor experiences a significant modal split to transit. Within the Bay Bridge corridor, BART currently serves approximately 175,500 daily transbay riders, representing roughly 36 percent of transbay travel within the corridor. Buses serve approximately 9,900 daily transbay riders, or two (2) percent of corridor travel, across the Bay Bridge daily. The three (3) ferry providers that operate in the study area serve approximately 4,500 patrons daily, or one (1) percent of corridor travel, between the East Bay and San Francisco.

Limited transit service is provided on the San Mateo Bridge and Dumbarton Bridge, which accommodates less than one (1) percent of daily traffic within these corridors.

Proposed Transportation Improvements
Several transportation improvements are currently in varying stages of development within the vicinity of the San Francisco Bay. These improvements include BART extensions, new ferry routes, interchange improvements, and other improvements to the existing infrastructure.

In addition to planned improvements, several new plans, laws, policies, strategies, and studies will be incorporated into the planning landscape and guide future transportation improvements.

Projected Conditions
Future travel demand forecasts for all transbay travel modes, using the newly developed SCS / RTP travel demand model (version 0.1). This model includes the updated ABAG Projections 2011 and MTC's 2035 Transportation Plan network. Average vehicle occupancy rates from 2010 were applied to model traffic volumes to obtain 2035 daily person-trips.

The number of daily person-trips crossing the Bay Bridge, San Mateo Bridge, and Dumbarton Bridge corridors is expected to increase by approximately 33 percent, 22 percent, and 41 percent, respectively, between 2010 and 2035. The total number of daily-person trips crossing the three (3) corridors is expected to increase by more than 220,000. A summary of the daily person-trips traveling across the study area, disaggregated by bridge corridor and service type, is shown in **Figure 3**.

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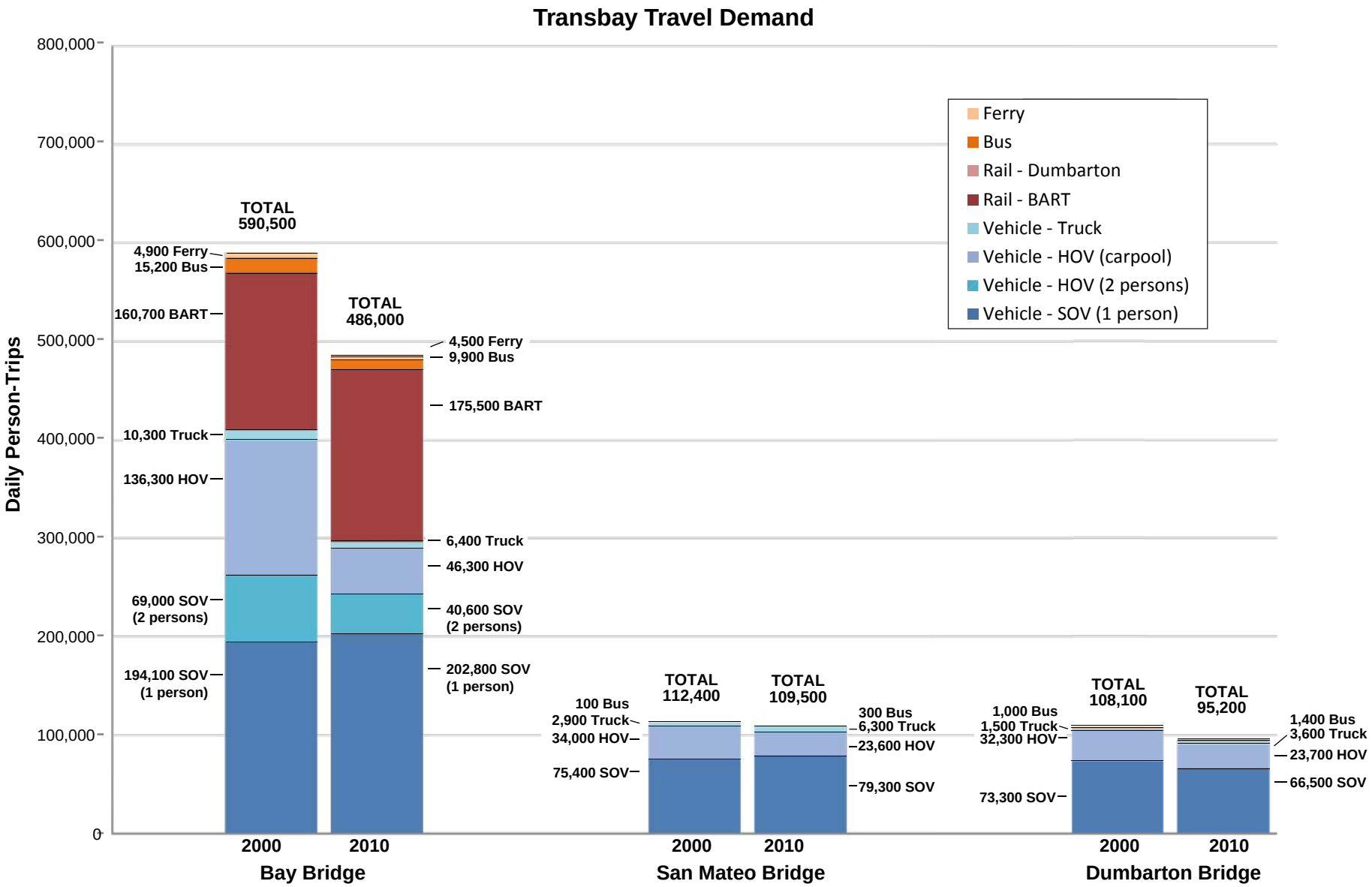

Transbay Travel Demand Summary rev1.ai

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Figure 2

Current Conditions Transbay Travel Demand Summary

Daily Person Trips

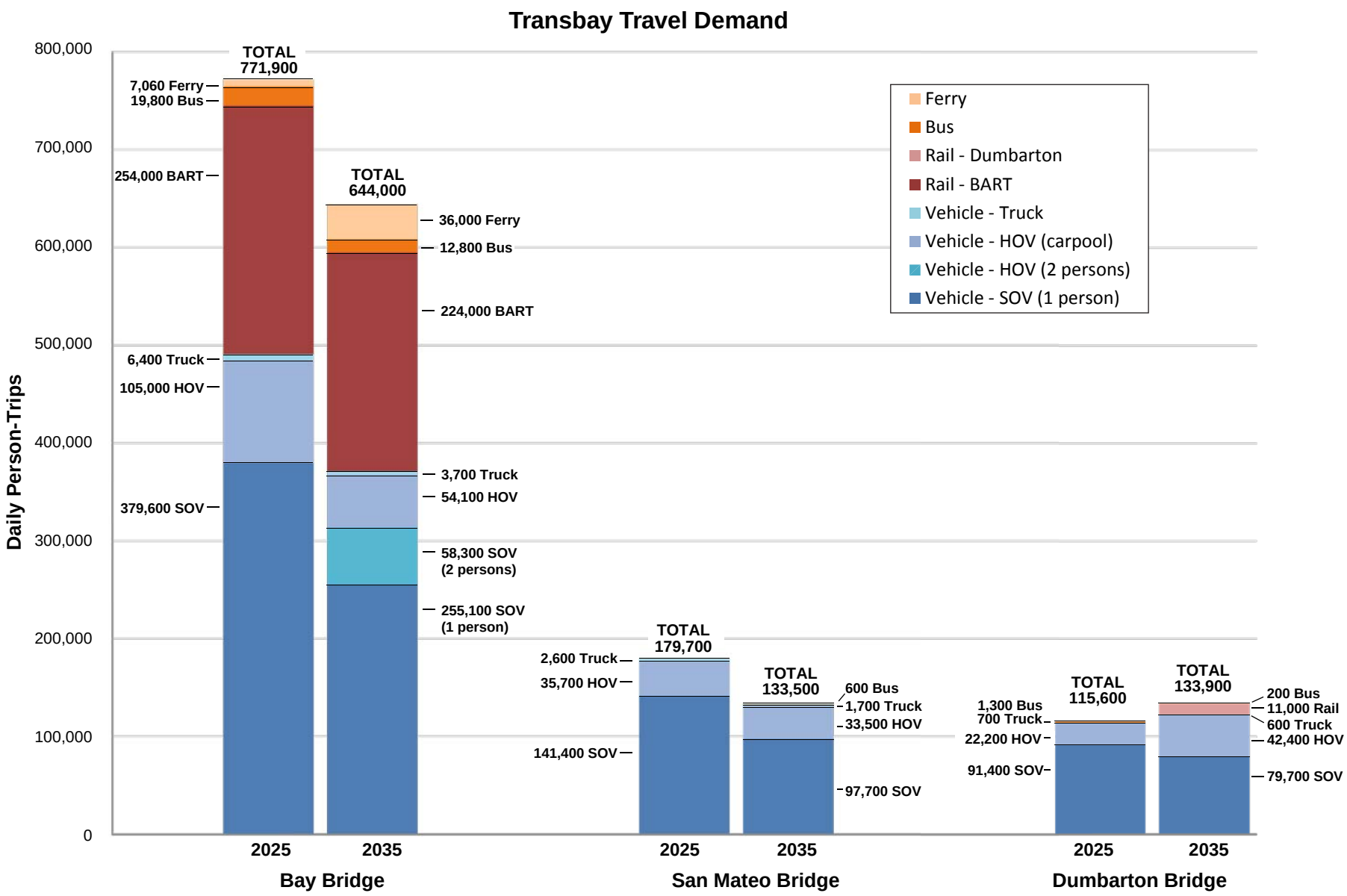

Figure 3

Projected Conditions Transbay Travel Demand Summary

Daily Person Trips

The 2000 Bay Crossings Study included Year 2025 traffic demand forecast model projections. In general the 2025 projections were higher than the 2035 projections. The number of daily person-trips crossing the Bay Bridge and San Mateo Bridge corridors is projected to be approximately 17 percent and 26 percent less, respectively, in 2035 than was projected in 2025. For the Dumbarton Bridge, the 2035 projections are 16 percent higher than the 2025 projections. The total number of daily-person trips crossing the three (3) corridors is projected to be approximately 155,800 less in 2035 than was projected in 2025.

Vehicle Travel

A summary of the daily number of transbay vehicle person-trips within each of the three (3) corridors is included in **Table 5**.

Table 5: Daily Person-Trips Comparison – Vehicle Travel (2035)

Mode	Bay Bridge		San Mateo Bridge		Dumbarton Bridge		Total	
	2025	2035	2025	2035	2025	2035	2025	2035
Vehicle – SOV (1 person)	379,600	255,100	141,400	97,700	91,400	79,700	612,400	432,500
Vehicle – HOV (2 persons)	-	58,300	-	-	-	-	-	58,300
Vehicle – HOV (carpool)	105,000	54,100	35,700	33,500	22,200	42,400	162,900	130,000
Vehicle – Truck (1 person)	6,400	3,700	2,600	1,700	700	600	9,700	6,000
Total Person-Trips	**491,000**	**371,200**	**179,700**	**132,900**	**114,300**	**122,700**	**785,000**	**626,800**
Total Vehicle-Trips	**422,900**	**309,000**	**158,600**	**115,900**	**101,300**	**101,400**	**682,800**	**526,300**

Source: 2000 Bay Crossings Study; AECOM, 2011.
Note:
- Carpool requires 3+ persons on the Bay Bridge; Carpool requires 2+ persons on the San Mateo Bridge and Dumbarton Bridge.
- Specific HOV (2 persons) results were not provided in the 2000 Bay Crossings Study and are combined with the SOV (1 person) results.

The decrease in average weekday daily person-trips can largely be attributed to current and projected economic conditions. Historical traffic volume data from 2006 to 2010 show an annual decrease in vehicle-trips throughout the Bay Area. Additionally, carpool usage has decreased approximately 30 percent since the introduction of the carpool charge and lane usage enforcement. Additionally, average vehicle occupancy rates have decreased. The combination of these factors – lower traffic volumes, lower rates of carpool usage, and lower rates of vehicle occupancy – results in a reduction in person-trips projected to cross the bridge corridors in 2035 compared to 2025.

Rail

The development of Dumbarton Rail is currently underway and is expected to be fully operational by 2035. A summary of the daily number of transbay BART and Dumbarton Rail person-trips within each of the three (3) corridors is included in **Table 6**.

Table 6: Daily Person-Trips Comparison – Rail (2035)

Mode	Bay Bridge		San Mateo Bridge		Dumbarton Bridge		Total	
	2025	2035	2025	2035	2025	2035	2025	2035
Rail – BART	254,000	224,000	-	-	-	-	254,000	224,000
Rail – Dumbarton	-	-	-	-	-	11,000	-	11,000
Total	**254,000**	**224,000**	**-**	**-**	**-**	**11,000**	**254,000**	**235,000**

Source: 2000 Bay Crossings Study; AECOM, 2011.

According to 2035 projections, BART ridership is expected to be approximately 12 percent lower than 2025 projections.

Bus
A summary of the daily number of transbay bus person-trips within each of the three (3) corridors is included in **Table 7**.

Table 7: Daily Person-Trips Comparison – Bus (2035)

Mode	Bay Bridge		San Mateo Bridge		Dumbarton Bridge		Total	
	2025	2035	2025	2035	2025	2035	2025	2035
Bus	19,800	12,800	0	600	1,300	200	21,100	13,600
Total	**19,800**	**12,800**	**0**	**600**	**1,300**	**200**	**21,100**	**13,600**

Source: 2000 Bay Crossings Study; AECOM, 2011.

According to 2035 projections, bus ridership along the three (3) corridors is expected to be approximately 36 percent lower than 2025 projections.

Ferry
A summary of the daily number of transbay ferry person-trips within each of the three (3) corridors is included in **Table 8**.

Table 8: Daily Person-Trips Comparison – Ferry (2035)

Mode	Bay Bridge		San Mateo Bridge		Dumbarton Bridge		Total	
	2025	2035	2025	2035	2025	2035	2025	2035
Ferry	7,100	36,000	-	-	-	-	7,100	36,000
Total	**7,100**	**36,000**	**-**	**-**	**-**	**-**	**7,100**	**36,000**

Source: 2000 Bay Crossings Study; AECOM, 2011.

The increase in weekday daily transbay ferry ridership along the Bay Bridge corridor can be attributed to service changes and new routes.

Other Transit Services
The ridership on other transit services that are currently in operation and cross the San Francisco Bay is minimal and is not expected to increase significantly. Future development of Dumbarton Rail is currently underway and the ridership projections are summarized provided in the Rail section.

Bicycles / Pedestrians
Currently, the only bridge that provides pathways for bicycles and pedestrians is the Dumbarton Bridge. All of the corridors provide some form of transportation service for bicyclists, including bus racks and shuttles. Bicycle and pedestrian facilities are currently in study / construction phases for the Bay Bridge, however the facility is planned for the Eastern Span and would not continue across the bridge, therefore there are no transbay bicycle / pedestrian projections for 2035.

Transbay Travel Summary
The total number of daily crossings of the San Francisco Bay is expected to increase from 690,700 in 2010 to 911,400 in 2035 – a 32 percent increase. Of these 911,400 person-trips projected in 2035, approximately 644,400 would travel the Bay Bridge corridor, 133,500 would travel the San Mateo Bridge corridor, and 133,900 would travel the Dumbarton Bridge corridor. A summary of the 2010 and forecasted 2035 daily person-trips in the study area, disaggregated by bridge corridor and service type, is included in **Table 9**.

A summary of the 2010 and forecasted 2035 daily person-trips in the study area, disaggregated by bridge corridor and service type, is shown in **Figure 4**.

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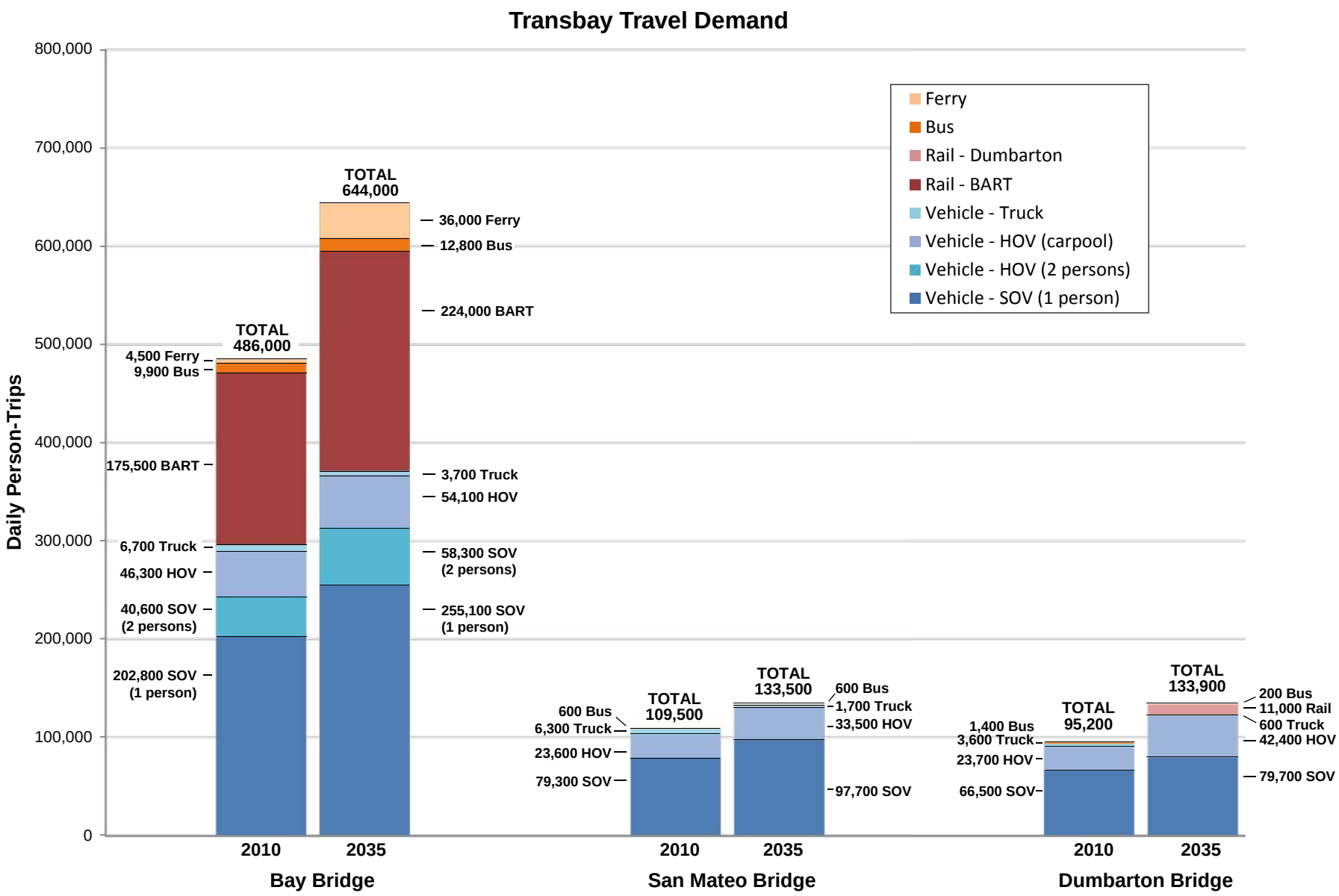

Figure 4

Transbay Travel Demand Summary

Daily Person Trips

Table 9: Daily Transbay Demand

Mode	Bay Bridge		San Mateo Bridge		Dumbarton Bridge		Total	
	2010	2035	2010	2035	2010	2035	2010	2035
Vehicle – SOV (1 person)	202,800	255,100	79,300	97,700	66,500	79,700	348,600	432,500
Vehicle – HOV (2 persons)	40,600	58,300	-	-	-	-	40,600	58,300
Vehicle – HOV (carpool)	46,300	54,100	23,600	33,500	23,700	42,400	93,600	130,000
Vehicle – Truck	6,400	3,700	6,300	1,700	3,600	600	16,300	6,000
Rail – BART	175,500	224,000	-	-	-	-	175,500	224,000
Rail – Dumbarton	-	-	-	-	-	11,000	-	11,000
Bus	9,900	12,800	300	600	1,400	200	11,600	13,600
Ferry	4,500	36,000	-	-	-	-	4,500	36,000
Total Person-Trips	**486,000**	**644,000**	**109,500**	**133,500**	**95,200**	**133,900**	**690,700**	**911,400**
Total Vehicle-Trips	**247,500**	**309,000**	**97,000**	**115,900**	**81,800**	**101,400**	**426,300**	**526,300**
Total Transit-Trips	**189,900**	**272,800**	**300**	**600**	**1,400**	**11,200**	**191,600**	**284,600**

Source: AECOM, 2011.

2.0 Introduction

The purpose of this report is to define the existing conditions on the various San Francisco Bay transportation crossings for the Bay Area Toll Authority (BATA). Additionally, Year 2035 travel demand forecasts have been developed and are included in the report. This report is an update of the *2000 San Francisco Bay Crossings Study Existing Conditions Report*, which was prepared for the Metropolitan Transportation Commission (MTC). This document is herein referred to as the "2000 Bay Crossings Study".[1] This study will serve as a baseline and an input to upcoming phases of the project, such as the development of conceptual alternatives. The primary study area for this analysis has been defined as the San Francisco Bay bounded by the Bay Bridge (north) and State Route (SR) 237 (south). The study area is shown in **Figure 5**.

Within the primary study area, there are three (3) transportation corridors crossing the San Francisco Bay. These are the San Francisco-Oakland Bay Bridge (Interstate 80), San Mateo-Hayward Bridge (SR 92), and Dumbarton Bridge (SR 84) corridors. Herein these bridges are referred to as the Bay Bridge, San Mateo Bridge, and Dumbarton Bridge, respectively. A large number of users and transit modes operate within these three (3) transportation corridors, including:

- Vehicles – Single Occupancy (SOV);
- Vehicles – High Occupancy (HOV);
- Vehicles – Trucks
- Bay Area Rapid Transit (BART);
- Bus – Alameda-Contra Costa Transit District (AC Transit);
- Ferry; and
- Other Services (including transit shuttles).

For each of the users and transit modes operating in the primary study area, specific data have been assembled and is presented in graphical and tabular form in this study. This information includes, but is not limited to, the following:

- Service / Facility Descriptions;
- Ridership / Travel Volumes;
- Travel Schedules / Speeds;
- FasTrak / Carpool Usage; and
- Origins / Destinations.

Additionally, this study is intended to define system and network constraints as well as potential opportunities for improvement.

[1] *2000 San Francisco Bay Crossings Study Existing Conditions Report*. Prepared by Korve Engineering, Inc. Prepared for the Metropolitan Transportation Commission. Submitted August 8, 2001.

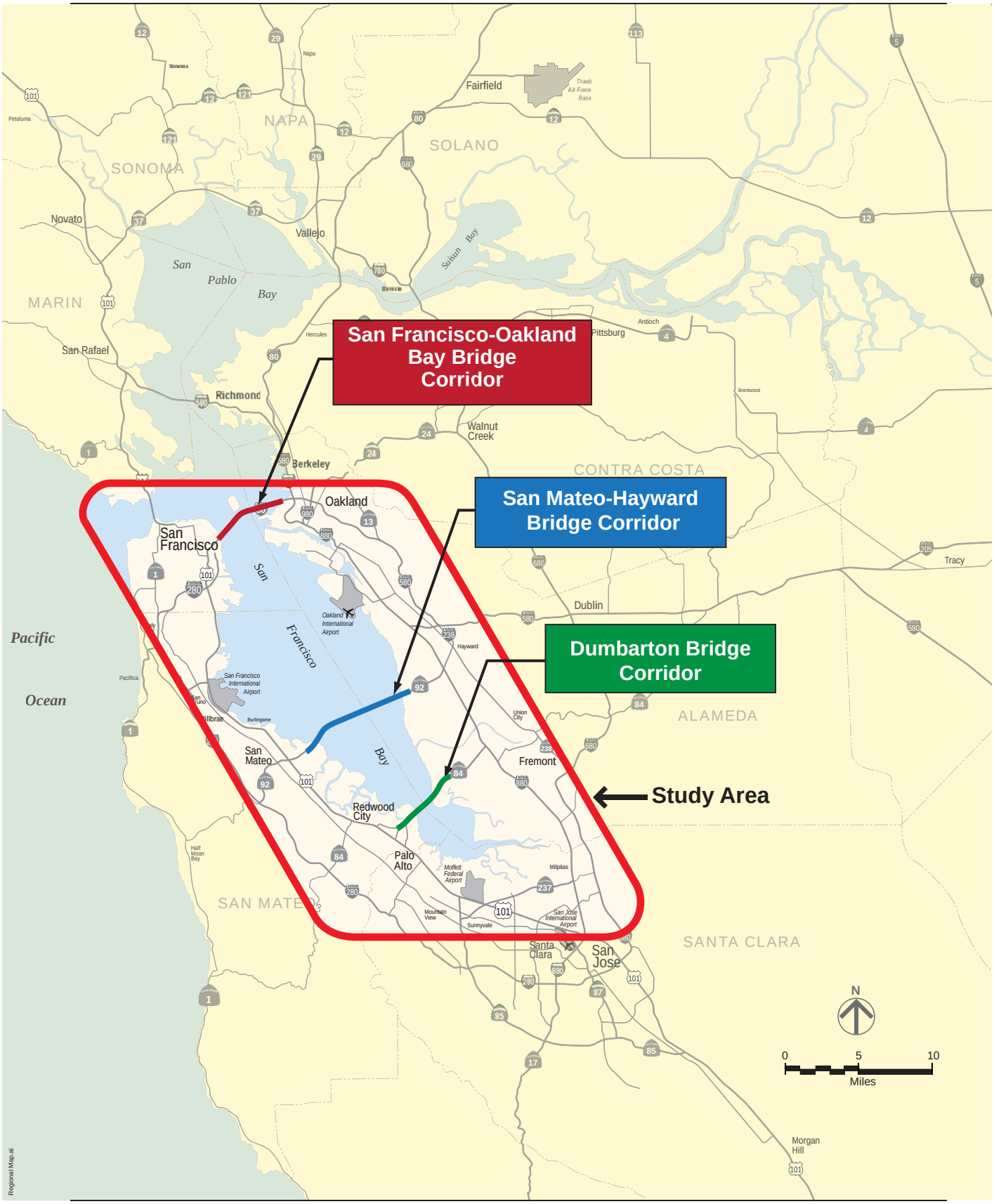

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Figure 5
Study Area

3.0 Vehicle Travel

Within the primary study area, vehicles may cross the San Francisco Bay by utilizing either the Bay Bridge, San Mateo Bridge, or Dumbarton Bridge. Existing vehicular travel characteristics for these three (3) bridges is discussed in the following sections.

3.1 Bay Bridge

The Bay Bridge (I-80) connects Oakland, Treasure / Yerba Buena Island, and San Francisco. The Bay Bridge was constructed in 1936 and was the longest bridge in existence at the time of its construction. In 1963, the Bridge was converted to vehicular traffic only (originally, the Bay Bridge also served rail traffic in addition to vehicle traffic). Currently, the upper deck serves westbound traffic and the lower deck serves eastbound traffic. The eastern crossing is being replaced by an entirely new self-anchored suspension (SAS) bridge, to be finished in late 2013. The SAS and the rest of the new eastern crossing is being built to the north of the existing bridge.

Bridge Description

The Bay Bridge is comprised of two (2) spans. The eastern truss span, which connects the Oakland toll plaza with Treasure / Yerba Buena Island, is approximately 2.2 miles long. The viaduct sections east of the tunnel are at present being modified, bypassed, and replaced as part of the seismic safety work that will eventually transition traffic onto and off of the of the new eastern bay crossing. A short tunnel section on Yerba Buena Island connects the eastern span with the 1.9-mile long western suspension span, which connects to San Francisco. Both spans of the Bay Bridge are comprised of two decks. The lower deck provides five (5) eastbound lanes while the upper deck provides five (5) westbound lanes. The off-ramps for Treasure / Yerba Buena Island are on the left-hand side both in the eastbound and westbound directions. Eastbound and westbound on-ramps are on the right-hand side, but they do not have dedicated merge lanes; drivers must accelerate from a stop sign to freeway speeds within a short distance.

During the morning commute hours, traffic congestion on the Oakland (westbound) approach occasionally propagates back onto the three (3) approach highways (I-580, I-880, and I-80). Since the number of lanes on the San Francisco approach is structurally restricted, queuing is frequent in the eastbound direction during evening commute hours. Eastbound, the Bay Bridge is accessed by a number of ramps from San Francisco's Central Business District, as well as northbound through lanes from the US 101 / I-80 interchange. HOV lanes are not provided in the eastbound approach. Since the number of lanes on the San Francisco approach is structurally restricted, queuing often occurs on city streets during evening commute hours.

The Yerba Buena Island Detour, also known as the "S-curve" is part of the temporary replacement roadway of the Bay Bridge east span detour. Safety measures such as electronic speed limit signs, reduced speed limits (40-mph for cars, 35-mph for trucks) and reflective striping have been installed on the new alignment of the bridge. The new Bay Bridge east span detour will be in place through 2013.

The Bridge is currently restricted to motorized freeway traffic. Pedestrians, bicycles, and other non-freeway vehicles are not allowed; however, the new eastern crossing will feature a 15-foot wide cantilevered bicycle and pedestrian path on the south side of the Bridge for travel between Oakland and Yerba Buena Island. A Caltrans bicycle shuttle operates during peak commute hours for $1.00 each way. The shuttle picks up / drops off in Oakland at the MacArthur BART Station and in San Francisco at the Transbay Terminal. The shuttle makes four (4) trips from Oakland and three (3) trips from San Francisco between 6:30am and 8:30am. The shuttle makes four (4) trips from San Francisco and three (3) trips from Oakland between 3:50pm and 6:15pm.[2]

[2] Caltrans, District 4 Bicycle Resources. http://www.dot.ca.gov/dist4/shuttle.htm. Page accessed on February 5, 2011.

Toll Plaza

The Bay Bridge is a tolled facility in the westbound direction. The toll plaza is located on the Oakland side and has 20 approach lanes, of which six (6) are variable FasTrak-only lanes. All six (6) lanes typically function as FasTrak-only lanes during the peak hours. Beginning July 1, 2010, a variable pricing scheme based on the time of day and high congestion levels was implemented for two (2)-axle vehicles. The Bay Bridge congestion pricing scheme charges a $6.00 toll from 5:00am to 10:00am and 3:00pm to 7:00pm, Monday through Friday. During non-peak weekday periods the toll is $4.00. During weekends the toll is $5.00. During the weekday peak periods, vehicles carrying three (3) or more people, motorcycles, or hybrid vehicles with permits to pass are charged a toll of $2.50. The carpool toll discount is only available to drivers with FasTrak electronic toll devices.[3]

Three (3) freeways (I-80 from the north, I-580 from the east, and I-880 from the south), approach the Bay Bridge toll plaza. High Occupancy Vehicle (HOV) lanes of various lengths exist on all three (3) freeway approaches. Mainline metering signals are located approximately 1,000 feet west of the toll plaza. Two (2) full-time bus-only lanes bypass the toll booths and metering lights around the north side of the toll plaza; other HOVs are permitted to use these lanes during weekday morning and afternoon commute periods. The two (2) southernmost toll lanes are operated as HOV lanes during weekday morning and afternoon commute periods. Weekday morning peak period (5:00am to 10:00am) toll plaza lane assignments by payment type are as follows:

- Lanes 1 – 2: HOV (serves I-880 and I-580)
- Lanes 3 – 6: Cash / FasTrak (serves I-580)
- Lanes 7 – 11: FasTrak (serves I-80 and I-580)
- Lanes 12 – 17: Cash / FasTrak (serves I-80 and I-580)
- Lane 18: FasTrak (serves I-880 and Grand Avenue)
- Lane 19 – 20: HOV (serves I-880, Grand Avenue, and I-80 HOV)

Based on the findings of the *Draft Bay Bridge Corridor Congestion Study*, the toll plaza metering lights are activated once the hourly flow rate through the toll plaza approaches approximately 9,300 vph. This document is herein referred to as the "Corridor Congestion Study". Once the metering lights are activated, Caltrans adjusts the rate to maintain this level of traffic flow onto the Bridge. This effectively minimizes congestion and queuing on the structure. Once activated, the metering lights are the controlling factor for vehicle capacity in the corridor. Based on these observations, a lane capacity of approximately 1,850 vph is assumed for the Bridge in both directions.[4] This rate results in a daily capacity of 222,000 vehicles per direction.

Based on toll plaza surveys conducted for other bridges in the Bay Area, FasTrak tollbooths can accommodate a demand of at least 1,100 vph. Tollbooths that exclusively serve cash and carpool transactions can accommodate a demand of approximately 380 vph. Tollbooths that accommodate FasTrak, cash, and carpool transactions have been observed to accommodate up to 400 vph.[5]

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(3) Toll Schedule for State-Owned Toll Bridges, BATA. http://bata.mtc.ca.gov/tolls/schedule.htm. Page accessed on February 8, 2011.

(4) *Draft Bay Bridge Corridor Congestion Study*. Prepared for the Transbay Joint Powers Authority and AC Transit. Prepared by ARUP, Cambridge Systematics, and LCW Consulting. Submitted October 2010.

(5) *Golden Gate Bridge Moveable Median Barrier Study: Draft Traffic Engineering and Analysis Report*. Federal Project Number STPL-6003(0307). Prepared for the Golden Gate Highway and Transportation District. Prepared by AECOM. Submitted July 20, 2010.

Traffic Volumes
The mainline freeway traffic volumes (eastbound and westbound) were obtained from the Freeway Performance Measurement System (PeMS). PeMS collects and stores data from loop detectors operated by Caltrans, which record the flow and speed of vehicles on the mainline freeway.[6]

Comparisons of data collected after July 1, 2010 (after the introduction of variable tolling on the Bay Bridge and when no major events were occurring), were evaluated to determine an average day to represent current weekday traffic volumes. In September and October 2010, weekday AM peak hour traffic volumes in the westbound direction ranged from 8,600 vph to 9,300 vph. Weekday PM peak hour traffic volumes in the westbound direction ranged from 6,800 vph to 8,000 vph. Daily traffic volumes on the Bay Bridge ranged from 240,000 vehicles to 260,000 vehicles. Based on the evaluation, Tuesday, September 21, 2010 represented an average weekday.

A similar comparison of weekend data showed that Saturday, September 25, 2010 and Sunday, September 26, 2010 represented an average weekend. For the purpose of consistency, weekday data from Tuesday, September 21, 2010, and weekend data from Saturday, September 25, 2010 and Sunday, September 26, 2010 were utilized for the data collection.

Several mainline freeway data locations on the Bay Bridge were evaluated based on detector health, consistency with other PeMS detectors on the corridor, and consistency with mainline freeway data provided by Caltrans. Based on this evaluation, the mainline I-80 freeway volume data collected by the PeMS detector located at California Postmile (CA PM) 3.30 were utilized in the eastbound and westbound directions.

Currently, average weekday traffic volumes are approximately 123,000 vehicles in the eastbound direction and 125,000 vehicles in the westbound direction (248,000 total daily vehicles). During the morning peak period the predominant commute direction is westbound while during the evening peak period the predominant commute direction is eastbound. In general, weekday traffic peaks between 6:00am and 10:00am in the westbound direction and between 4:00pm and 7:00pm in the eastbound direction. During the morning peak period, the peak direction (westbound) serves approximately 59 percent of total traffic volume. During the evening peak period, the peak direction (eastbound) serves between approximately 54 percent of total traffic volume.

Westbound traffic volume peaks at approximately 9,200 vehicles between 8:00am and 9:00am. Eastbound traffic volume peaks at approximately 8,400 vehicles between 5:00pm and 6:00pm.

On Saturdays, the Bay Bridge serves approximately 258,000 vehicles. On Sundays, the Bay Bridge serves approximately 235,000 vehicles.

A summary of current weekday and weekend traffic volumes on the Bay Bridge is shown in **Figure 6**.

Truck Traffic
Annual average daily truck traffic data are collected by Caltrans. Heavy vehicle percentages for two (2)-axle, three (3)-axle, four (4)-axle, and five (5) or more axle vehicles on the Bay Bridge are summarized below:

- Two (2)-axle – 1.4 percent
- Three (3)-axle – 0.2 percent
- Four (4)-axle – 0.1 percent
- Five (5) or more axles – 0.9 percent

[6] Freeway Performance Measurement System (PeMS). The Department of Electrical Engineering and Computer Sciences at the University of California, Berkeley, Caltrans, California Partners for Advanced Transit and Highways (PATH), and Berkeley Transportation Systems (BTS). http://pems.dot.ca.gov. Page accessed on February 8, 2011.

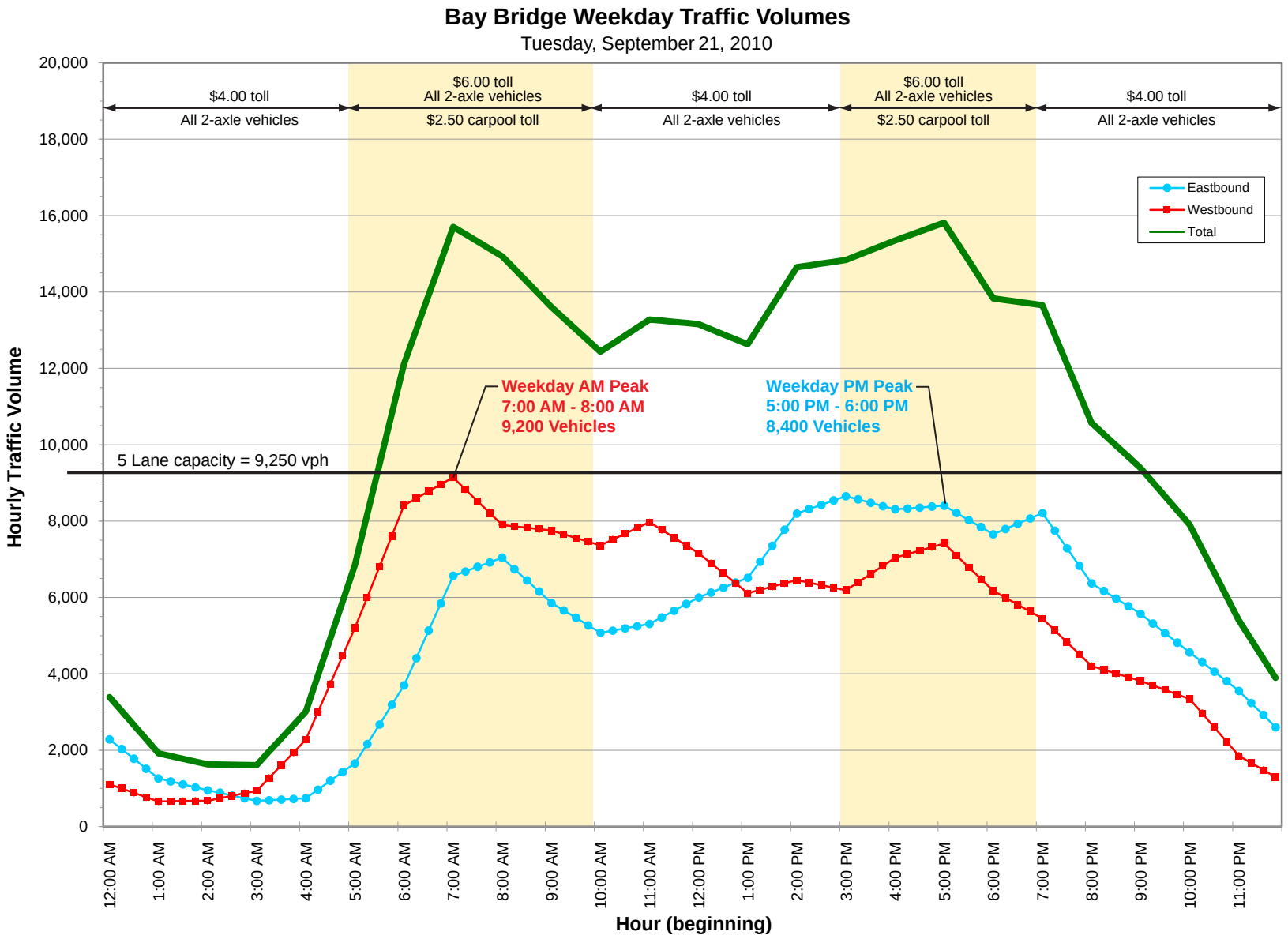
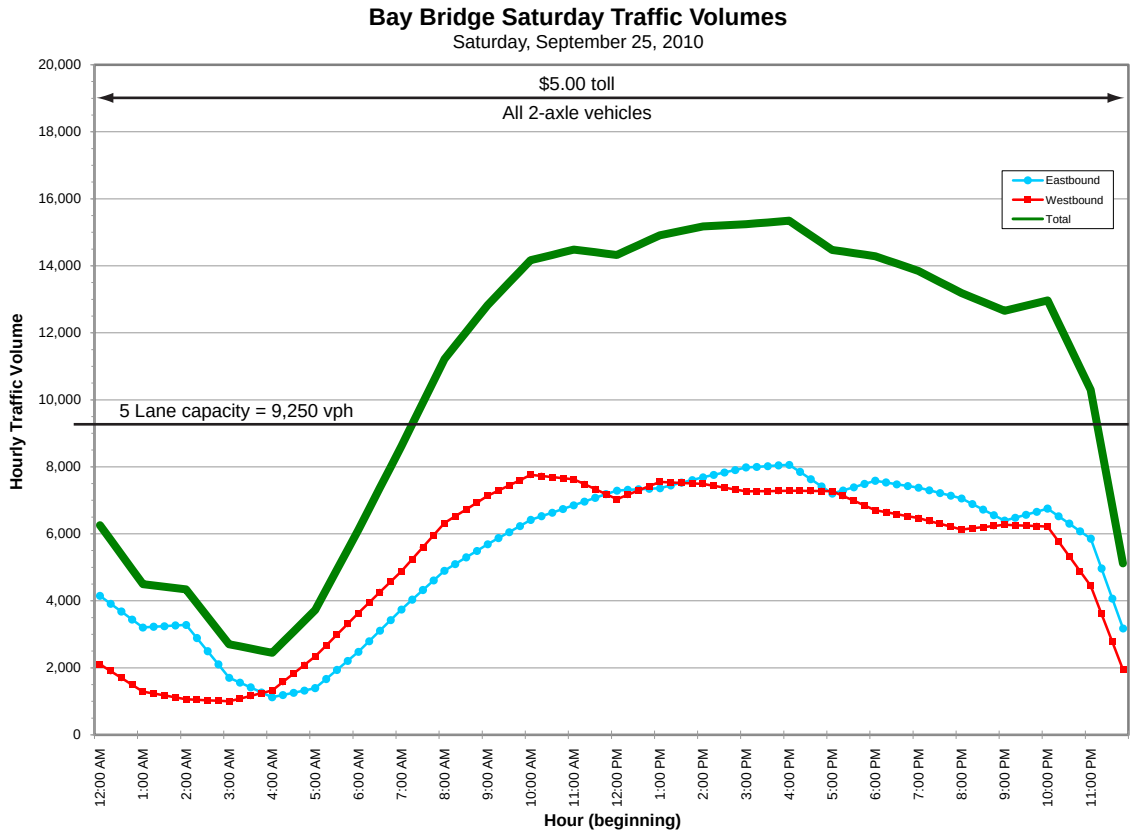
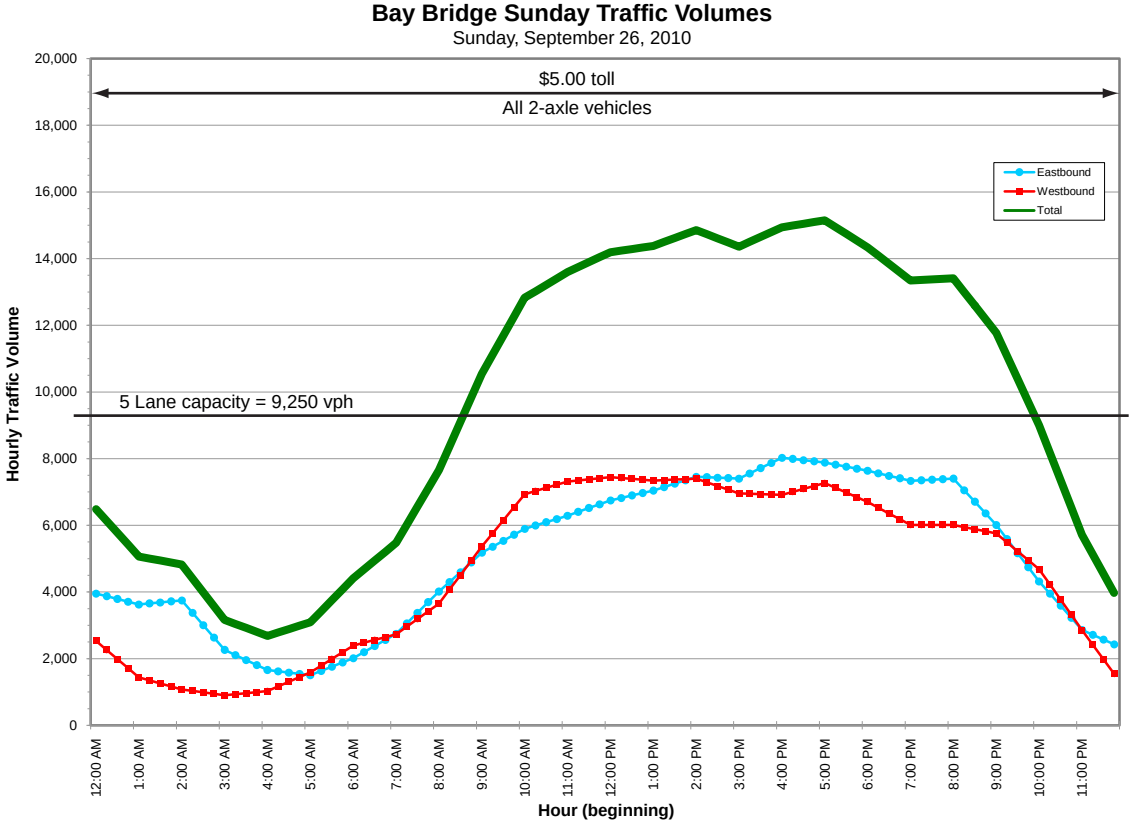


Figure 6a

Bay Bridge Weekday Traffic Volumes
Hourly Volume





Bay Bridge Weekend Traffic Volumes.ai

Figure 6b

Bay Bridge Weekend Traffic Volumes

Hourly Volume

Three (3)-axle trucks are generally bobtails and delivery vans while trucks with four (4) or more axles are generally semi-trailers. Trucks comprise approximately 2.6 percent of total traffic on the Bay Bridge.[7]

Of the westbound traffic on the Bay Bridge, 49 percent originated from I-80, 43 percent originated from I-880, four (4) percent originated from SR 24, and four (4) percent originated from I-580. Of this Bay Bridge traffic, 42 percent were destined for the San Francisco / Daly City area, 30 percent were destined for the Peninsula / South Bay area, 20 percent were destined for the North San Francisco / Marin area, and eight (8) percent were destined for the Port of San Francisco.

Most trucks avoid peak transbay periods of congestion. Typically, trucks will cross the Bay outside of these hours. Deliveries bound for San Francisco will typically cross the Bay Bridge prior to the morning peak period. Truck restrictions in San Francisco also reinforce this truck travel pattern.

Origins / Destinations

Origin-destination data were provided by the MTC travel demand forecasting staff based on the 2005 travel demand forecasting model.[8] The results from the 2005 travel demand model were aggregated by time period and MTC Superdistrict to determine the major travel patterns within the study area. This effort is herein referred to as the "Origin-Destination Modeling". The Origin-Destination Modeling effort resulted in origin-destination findings in the eastbound and westbound directions during the weekday AM and PM peak periods.

Based on the findings of the Origin-Destination Modeling, origin-destination pairs that represent more than four (4) percent of eastbound traffic on the Bay Bridge during the weekday AM peak hour are included in **Table 10**.

Table 10: Bay Bridge Origin-Destination Pairs – Weekday AM Peak Hour – Eastbound

Origin	Destination	Percentage
Downtown San Francisco	Oakland / Alameda / Piedmont / Emeryville	18.4%
	Berkeley	8.7%
Daly City / South San Francisco / San Bruno	Oakland / Alameda / Piedmont / Emeryville	8.5%
	Berkeley	4.3%
Total		**39.9%**

Source: Origin-Destination Modeling, 2011.

The origin-destination pairs that represent more than four (4) percent of westbound traffic on the Bay Bridge during the weekday AM peak hour are included in **Table 11**.

[7] *2009 Annual Average Daily Truck Traffic on the California State Highway System*. Compiled by Traffic Data Branch Division of Traffic Operations. State of California Business, Transportation and Housing Agency Department of Transportation. December 2010.

[8] Based on an email from Shimon Israel, MTC. Data extracted from the 2005 Travel Demand Forecasting Model. Email received February 23, 2011.

Table 11: Bay Bridge Origin-Destination Pairs – Weekday AM Peak Hour – Westbound

Origin	Destination	Percentage
Oakland / Alameda / Piedmont / Emeryville	Downtown San Francisco	29.8%
Richmond		12.4%
Berkeley		12.4%
Hayward		8.6%
Walnut Creek / Lafayette		5.0%
Concord / Pleasant Hill		4.8%
Total		**73.0%**

Source: Origin-Destination Modeling, 2011.

The origin-destination pairs that represent more than four (4) percent of eastbound traffic on the Bay Bridge during the weekday PM peak hour are included in **Table 12**.

Table 12: Bay Bridge Origin-Destination Pairs – Weekday PM Peak Hour – Eastbound

Origin	Destination	Percentage
Downtown San Francisco	Oakland / Alameda / Piedmont / Emeryville	24.2%
	Berkeley	10.4%
	Richmond	9.2%
Total		**43.8%**

Source: Origin-Destination Modeling, 2011.

The origin-destination pairs that represent more than four (4) percent of westbound traffic on the Bay Bridge during the weekday PM peak hour are included in **Table 13**.

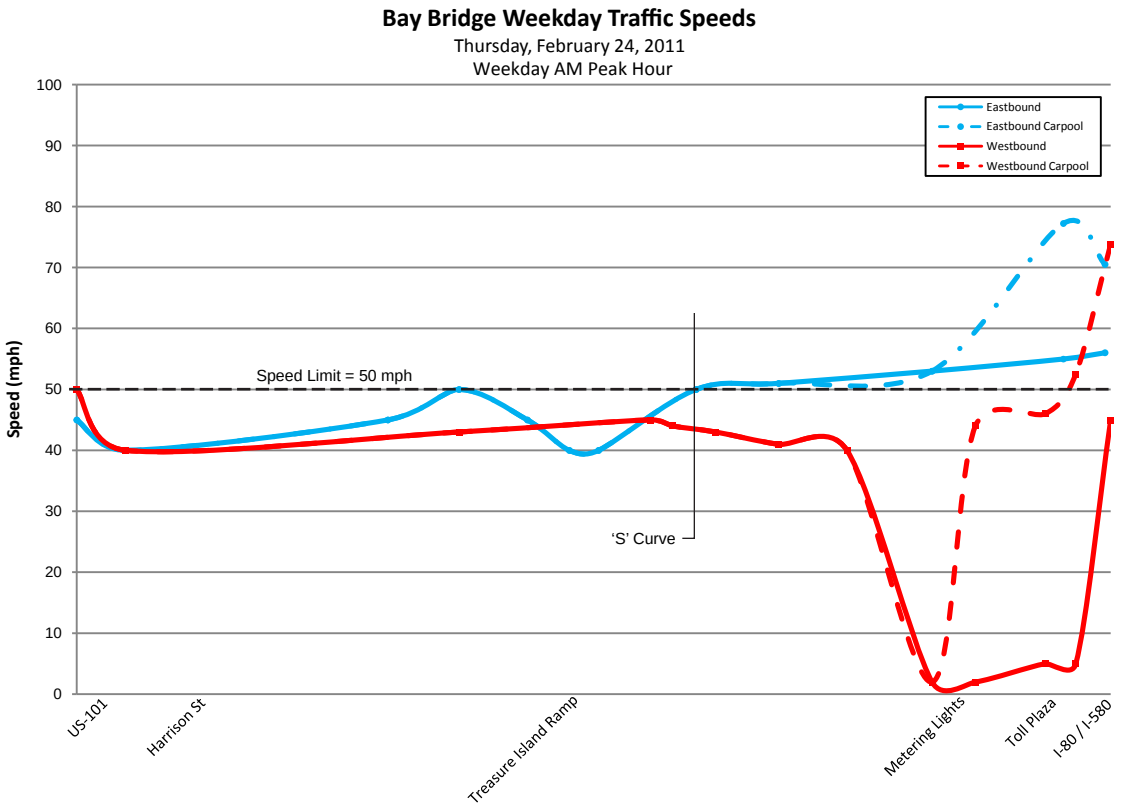
Table 13: Bay Bridge Origin-Destination Pairs – Weekday PM Peak Hour – Westbound

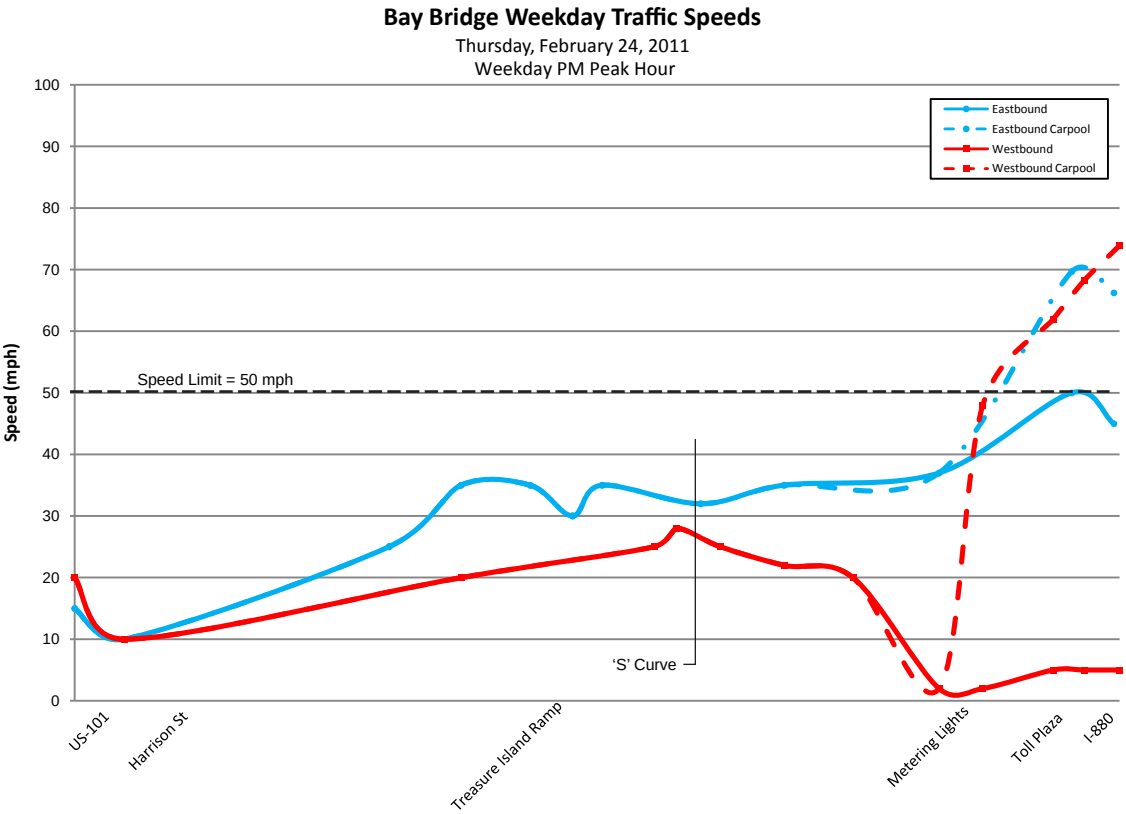
Origin	Destination	Percentage
Oakland / Alameda / Piedmont / Emeryville	Downtown San Francisco	39.3%
Berkeley		17.8%
Richmond		8.3%
Hayward		6.5%
Total		**71.9%**

Source: Origin-Destination Modeling, 2011.

Travel Speeds

Travel speed data were collected by AECOM by using floating car runs on Thursday, February 24, 2011. A summary of the weekday peak hour (8:00am to 9:00am and 5:00pm to 6:00pm) travel speeds on the Bay Bridge by direction is shown in **Figure 7**.





Bay Bridge Traffic Speeds.ai

Figure 7

Bay Bridge Traffic Speeds

Travel Times
Travel time data were collected by AECOM by using floating car runs on Thursday, February 24, 2011. A summary of the weekday peak hour (8:00am to 9:00am and 5:00pm to 6:00pm) travel times on the Bay Bridge in the eastbound direction is included in **Table 14**.

Table 14: Bay Bridge Travel Times – Eastbound

Location	Distance	Weekday Time Period	
		AM Peak Hour	PM Peak Hour
US 101 / I-80	0.0 miles	0 min 0 sec	0 min 0 sec
Harrison Street	2.2 miles	2 min 54 sec	3 min 23 sec
Treasure Island Ramp	3.6 miles	4 min 31 sec	7 min 50 sec
Toll Plaza	8.2 miles	10 min 5 sec	11 min 7 sec
Maritime Avenue Ramp	8.4 miles	10 min 33 sec	13 min 44 sec
I-80 / I-580	8.6 miles	11 min 5 sec	14 min 25 sec

Source: AECOM, 2011.

A summary of the weekday peak hour travel times on the Bay Bridge in the westbound direction is included in **Table 15**.

Table 15: Bay Bridge Travel Times – Westbound

Location	Distance	Weekday Time Period	
		AM Peak Hour	PM Peak Hour
SR 13 / I-80	0.0 miles	0 min 0 sec	0 min 0 sec
I-80 / I-580	0.3 miles	1 min 48 sec	2 min 0 sec
Maritime Avenue Ramp	0.5 miles	6 min 56 sec	3 min 29 sec
Toll Plaza	0.7 miles	15 min 47 sec	5 min 49 sec
Metering Lights	0.9 miles	23 min 21 sec	11 min 49 sec
Treasure Island Ramp	5.3 miles	27 min 2 sec	22 min 37 sec
Harrison Street Ramp	6.7 miles	30 min 21 sec	29 min 33 sec
US 101 / I-80	8.9 miles	31 min 22 sec	35 min 59 sec

Source: AECOM, 2011.

Vehicle Queuing
Vehicle queuing observations were conducted by AECOM within the vicinity of the Bay Bridge on Thursday, February 24, 2011. A summary of the observed weekday peak hour queuing on the Bay Bridge is shown in **Figure 8**.

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Bay Bridge Vehicle Queuing.ai

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Figure 8

Bay Bridge Vehicle Queuing

Capacity Constraints
The primary source of congestion in the westbound direction on the Bay Bridge is the toll plaza / metering lights. At this location, three freeways (I-80, I-580 and I-880) converge into the toll plaza. Queues generally develop on the westbound approach to the toll plaza during the weekday AM peak hour. At the toll plaza, westbound vehicles pay the toll and are metered by a bank of metering lights that are located just west of the toll booths. Connector ramps from each freeway into the toll plaza area include dedicated HOV transit lanes that bypass the toll plaza and metering lights. The length of the queue typically does not extend beyond the distribution structure, therefore the HOV bypass lanes are not typically blocked. The HOV lanes serve as a queue jump for HOVs and buses around the congestion that develops at the toll plaza during a typical weekday morning commute. The locations of several of the capacity constraints in the Bay Bridge corridor are shown in **Figure 9**.

Capacity constraints also exist upstream and downstream of the Bridge and on the Bay Bridge itself. Due to the construction of the SAS, a temporary double-deck replacement roadway was constructed on the stretch of Bridge just east of Yerba Buena Island on September 8, 2009. The posted speed limit on the "S-curve" detour drops from 50 mph to 40 mph through the 0.5 mile stretch, which results in slowing on the Bridge as motorists maneuver through the segment.

The primary eastbound capacity constraint exists at the western end of the Bay Bridge, where heavily traveled ramps from Downtown San Francisco (Bryant Street and 5th Street) enter the mainline. Mainline I-80 eastbound traffic speeds average approximately 30 mph and occasionally below 25 mph during the weekday PM peak hour, and there is often some amount of queuing on City streets. At the eastern end of the Bay Bridge, I-80 eastbound traffic speeds average between six (6) and 15 mph at Powell Street during the weekday PM peak hour.

Several freeway weaving sections within the vicinity of the Bay Bridge result in increased travel time and delay for Bay Bridge drivers. During the weekday AM and PM peak hours, frequent lane change maneuvers occur through the westbound I-80 weaving section between the Fourth Street On-Ramp and Eighth Street Off-Ramp in San Francisco as motorists position themselves to enter and exit the freeway via the densely-spaced ramps. Reduced speeds and congestion through this segment constrain the flow of vehicles from the Bridge and result in increases in delay for westbound motorists. Additionally, the westbound I-580 weaving section between the I-880 / I-80 interchange and the I-980 / SR 24 interchange causes an increase in vehicle density and vehicle maneuvers and a subsequent reduction in traffic speeds.

The three-lane eastbound I-80 approach constrains capacity on the west end of the Bridge. During the weekday PM peak period, eastbound I-80 traffic exiting San Francisco queues on local streets prior to entering the mainline freeway. Additionally, congestion on parallel facilities and approach roadways (US 101, I-880, and I-80 / I-580) constrains the flow of vehicles to the Bridge during the weekday AM and PM peak hours.

Vehicle Occupancy
Information concerning High Occupancy Vehicle (HOV) lanes on the San Francisco Bay Area freeway system was obtained from the *2009 Bay Area HOV Lanes Report*. This document is herein referred to as the "HOV Lanes Report". Traffic performance data for mainline HOV lanes and HOV toll gates are provided for year 2009. Data included in this report are used to determine vehicle occupancies and peak hour HOV lane usage on I-80 and the Bay Bridge.[(9)]

[(9)] *2009 Bay Area HOV Lanes Report: Volumes, Occupancies, and Violation Rates for Freeway High Occupancy Vehicle Lanes in the San Francisco Bay Area*. Prepared by Caltrans District 4, Oakland: Office of Highway Operations.

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Bay Bridge Capacity Constraints.ai

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Figure 9

Bay Bridge Capacity Constraints

Approximately 1.1 HOV lane miles exist on westbound I-80 east of the Bay Bridge toll plaza, approximately 4.2 HOV lane miles exist on westbound I-80 from the Contra Costa County line to Powell Street, and approximately 1.4 HOV lane miles exist on northbound I-880 from 16th Street to the Bay Bridge toll plaza. The HOV facilities on westbound I-80 require a minimum occupancy of three (3) passengers per vehicle (two (2)-seat vehicles with two (2) persons, motorcycles, trucks, and hybrids with DMV issued decals are permitted). HOV lanes are in operation between the hours of 5:00am to 10:00am and 3:00pm to 7:00pm on weekdays.

Based on the HOV Lanes Report, vehicle occupancy in the HOV lanes approaching the Bay Bridge toll plaza is approximately 2.6 persons per vehicle during the morning peak period and approximately 2.5 persons per vehicle during the evening peak period. Vehicle occupancy calculations include motorcycles, three (3)-plus carpool vehicles, two (2)-seaters, hybrid vehicles, vanpools, and carpool lane violators, but does not include buses. The carpool violation rate on the Bay Bridge is approximately 11 percent of all vehicles in the carpool lane. Average vehicle occupancy on the Bay Bridge during non-carpool periods is 2.6 persons per vehicle.

Carpool vehicles comprise approximately 11 percent of westbound traffic during the morning peak period and 3.4 percent of westbound traffic during the evening peak period on the Bay Bridge. Carpool vehicles comprise approximately 7.3 percent of daily traffic during non-carpool periods. Average daily carpool traffic has decreased approximately 30 percent (from 9.5 percent to 7.3 percent) between 2008 and 2010.[10]

Casual carpool is available at more than 25 locations in the East Bay and locations are active between 6:00am and 9:00am. During the morning peak period many westbound commuters form casual carpools and drivers drop passengers off at Fremont and Mission Street (or nearby) in Downtown San Francisco. During the evening peak period, home-bound casual carpools form on Beale Street in San Francisco, serving destinations in the East Bay including Hercules, Vallejo, and Fairfield. These are generally active between 4:00pm and 6:00pm.[11]

BATA reported that by October 2010 fewer users are driving during the peak hours and more vehicles are crossing the Bay Bridge before and after the 5:00am to 10:00am period in which the congestion toll goes into effect. According to a study prepared by University of California at Berkeley transportation researchers, commute delays in the first six (6) months decreased by an average of 15 percent compared with 2009.[12]

FasTrak
In 2009, approximately 77 percent of vehicles crossing the Bay Bridge during the weekday morning peak period were FasTrak users. Approximately 69 percent of vehicles crossing the bridge during the evening commute hours were FasTrak users. In general, FasTrak usage has increased by approximately 40 percent (from 35 percent to 48 percent) on the Bay Bridge over the last five (5) years.[13]

Trip Purpose and Frequency
Based on the results of the Origin-Destination Modeling, the purpose of the majority of trips across the Bay Bridge are work related. When commuting and other work related trips are combined, the percentages of work related trips exceed 90 percent of total traffic in both the eastbound and westbound directions during the morning peak period. Additionally, the majority of drivers travel the Bay Bridge five (5) or more times per week. A travel summary of Bay Bridge traffic is shown in **Figure 10**.

[10] Bay Area Toll Bridges Carpool Summary FY06-FY11. Based on an email from Jeff Gerbracht, MTC. Email received February 9, 2011.
[11] Casual Carpool News. http://www.ridenow.org/carpool/faq.htm. Page accessed on February 8, 2011.
[12] CBS San Francisco News. http://sanfrancisco.cbslocal.com/2011/01/12/slight-traffic-decrease-at-bay-bridge-following-congestion-pricing/. Page accessed on February 5, 2011.
[13] Percent FasTrak Usage: FY02-FY09. Based on an email from John Goodwin, MTC. Email received February 9, 2011.

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Bay Bridge Corridor.ai

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Figure 10

Bay Bridge Travel Summary

Weekday AM (PM) Peak Hour

Comparison to 2000 Bay Crossings Study
Current average weekday daily person-trips are approximately 28 percent lower in 2010 compared to average weekday daily person-trips presented in the 2000 Bay Crossings Study; however, the average weekday daily vehicle-trips are only 11 percent lower. A comparison of average weekday daily person-trips traveling across the Bay Bridge corridor in 2000 and 2010, disaggregated by vehicle type, is included in **Table 16**.

Table 16: Bay Bridge Daily Person-Trips Comparison

Mode	Year	
	2000	**2010**
Vehicle – SOV (1 person)	194,100	202,800
Vehicle – HOV (2 persons)	69,000	40,600
Vehicle – HOV (carpool)	136,300	46,300
Vehicle – Truck (1 person)	10,300	6,400
Total Person-Trips	**409,700**	**296,100**
Total Vehicle-Trips	**276,600**	**247,500**

Source: 2000 Bay Crossings Study; AECOM, 2011.
Note:
- Carpool requires 3+ persons on the Bay Bridge.

The decrease in average weekday daily person-trips can largely be attributed to current economic conditions. Historical traffic volume data from 2006 to 2010 show an annual decrease in vehicle-trips on the Bay Bridge. Additionally, peak period travel has decreased since the introduction of the congestion-pricing scheme, which charges a $6.00 toll from 5:00am to 10:00am and 3:00pm to 7:00pm, Monday through Friday. During non-peak weekday periods the toll is $4.00. Likewise, carpool usage has decreased approximately 25 percent since the congestion-pricing scheme was implemented. Vehicles carrying three (3) or more people, motorcycles, or hybrid vehicles with permits to pass are charged a toll of $2.50, and this discount is only available to drivers with FasTrak electronic toll devices. Additionally, average vehicle occupancy rates have decreased. The combination of these factors – lower traffic volumes, lower rates of carpool usage, and lower rates of vehicle occupancy – results in a reduction in person-trips currently crossing the Bay Bridge corridor compared to 2000.

3.2 San Mateo Bridge

The San Mateo Bridge (SR 92) connects Hayward / San Leandro with Foster City, bisecting the primary study area. The existing Bridge, which opened in 1967, was expanded from four (4) to six (6) lanes in 2004, and currently provides three (3) lanes of travel in both the eastbound and westbound directions.

Bridge Description
Currently the San Mateo Bridge is six (6) lanes wide and consists of two (2) distinctive sections. The total length of the bridge is approximately seven (7) miles. The eastern, low-level causeway section is approximately five (5) miles long. The causeway section is six (6) lanes wide with full left and right shoulders. A standard concrete jersey barrier separates the eastbound and westbound lanes. On the western end, a two (2)-mile long high bridge, extending over the bay shipping channel, has been constructed. The high bridge is six (6) lanes wide, providing three (3) travel lanes in either direction.

To the east, SR 92 is generally a four (4)-lane facility connecting to I-880. The western approach is six (6) lanes wide from US 101 to the high bridge section. To the west, an approximately two (2)-mile long HOV lane has been constructed on the Bridge's eastern approach. Additionally, the SR 92 / I-880 Interchange Reconstruction Project will provide direct connectors from eastbound SR 92 to northbound I-880 and from westbound SR 92 to southbound I-880. The project will widen the eastern approach to provide six (6) travel lanes from I-880 to the Bridge. The project will also include the reconstruction of the Eldridge Avenue pedestrian overcrossing, improvements at the Hesperian Boulevard interchange, and the addition of new auxiliary lanes on I-880 in both directions. The HOV lane on the eastern approach will be extended eastward, to a point 300 feet west of Hesperian Boulevard. The project is expected to be completed in Fall 2011.[14]

Toll Plaza
The San Mateo Bridge is a toll facility. As of July 1, 2010, a $5.00 toll is collected in the westbound direction at a toll plaza at the Bridge's eastern end. During peak traffic hours the two (2) left lanes are designated HOV lanes, which allows vehicles carrying three (3) or more people (two (2) persons in two (2)-seat vehicles), motorcycles, or hybrid vehicles with permits to pass for a toll of $2.50. Carpool restrictions are in effect during weekday morning and afternoon commute hours (5:00am to 10:00am and 4:00pm to 7:00pm). The three (3) adjacent lanes are designated FasTrak only lanes. During non-peak hours, the two (2) HOV lanes become FasTrak-only lanes. The carpool toll discount is only available to drivers with FasTrak electronic toll devices.

Mainline metering signals are located approximately 400 feet west of the toll plaza and are typically inactive. The San Mateo Bridge has an estimated capacity of 1,850 vehicles per lane per hour, or a peak hour capacity of 5,550 vehicles per direction, and a daily capacity of 133,200 vehicles per direction.

Traffic Volumes
The mainline freeway traffic volumes (eastbound and westbound) were obtained from PeMS. Weekday data from Tuesday, September 21, 2010, and weekend data from Saturday, September 25, 2010 and Sunday September 26, 2010 were utilized for traffic volumes. The mainline SR 92 freeway volume data collected by the PeMS detector located at CA PM 18.48 were utilized in the eastbound and westbound directions.

Currently, average weekday traffic volumes are 51,000 vehicles in the eastbound direction and 46,000 vehicles in the westbound direction (97,000 total daily vehicles). In the morning peak hour the predominant commute direction is westbound and in the evening peak hour the predominant commute direction is eastbound. In general, weekday traffic peaks between 6:00am and 10:00am in the westbound direction and between 4:00pm and 7:00pm in the eastbound direction. During the morning peak period, the peak direction serves approximately 65 percent of total traffic volume.

During the evening peak period, the peak direction serves approximately 65 percent of total traffic volume. Westbound traffic volume peaks at approximately 5,000 vehicles between 8:00am and 9:00am. Eastbound traffic volume peaks at approximately 4,900 vehicles between 5:00pm and 6:00pm.

On Saturdays, the San Mateo Bridge serves approximately 88,000 vehicles. On Sundays, the San Mateo Bridge serves approximately 69,000 vehicles.

A summary of current weekday and weekend traffic volumes on the San Mateo Bridge is shown in **Figure 11**.

(14) I-880 Corridor Improvement Project, Caltrans. http://i880corridor.com. Page accessed on February 3, 2011.

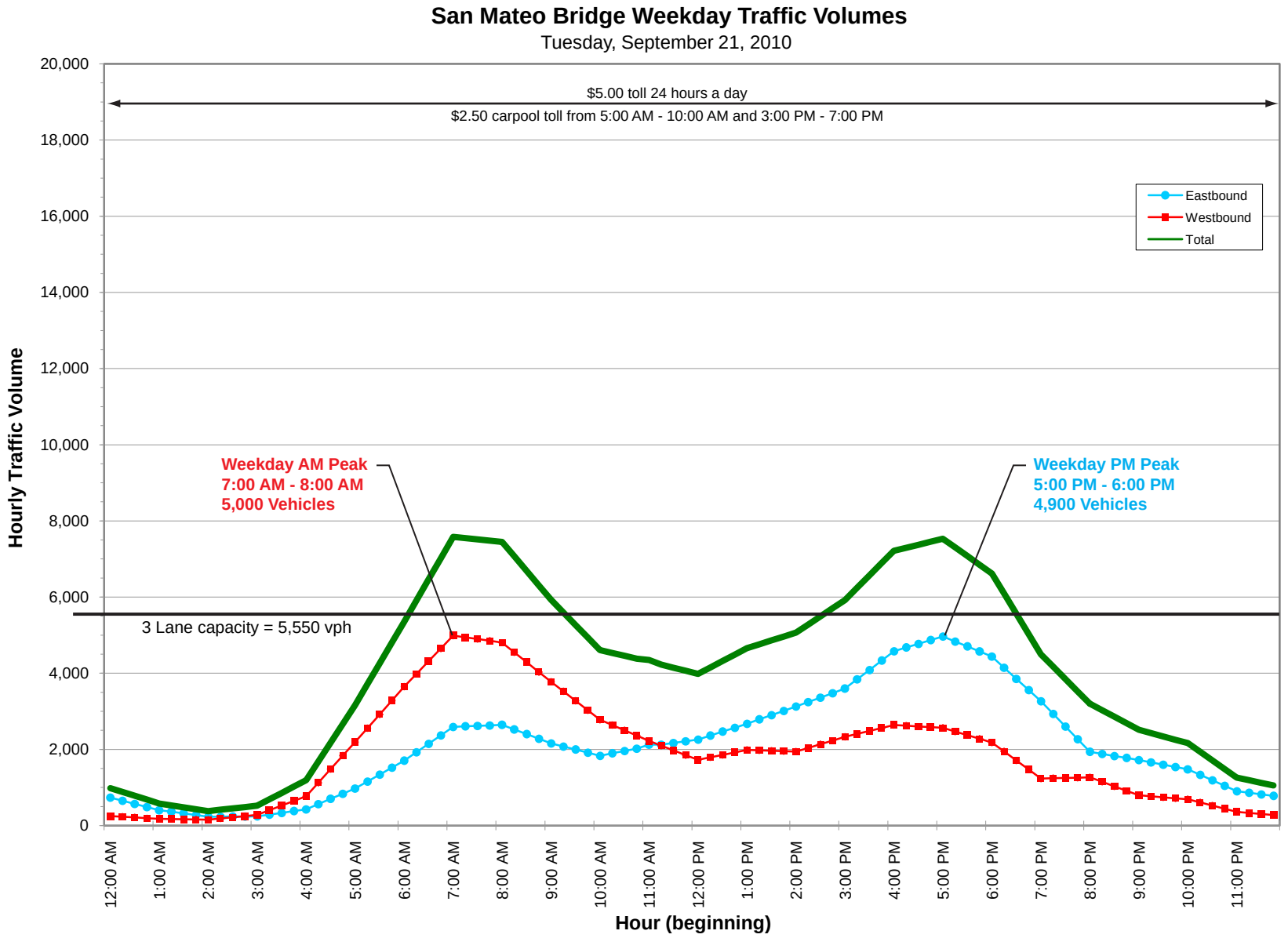
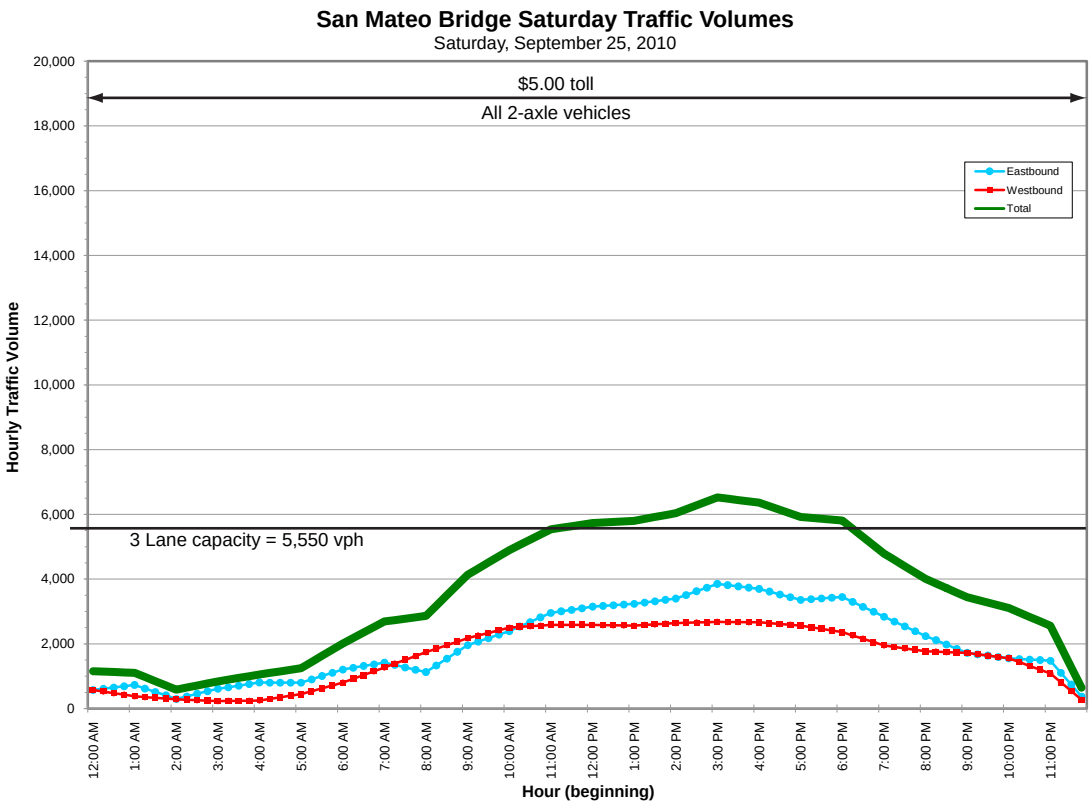
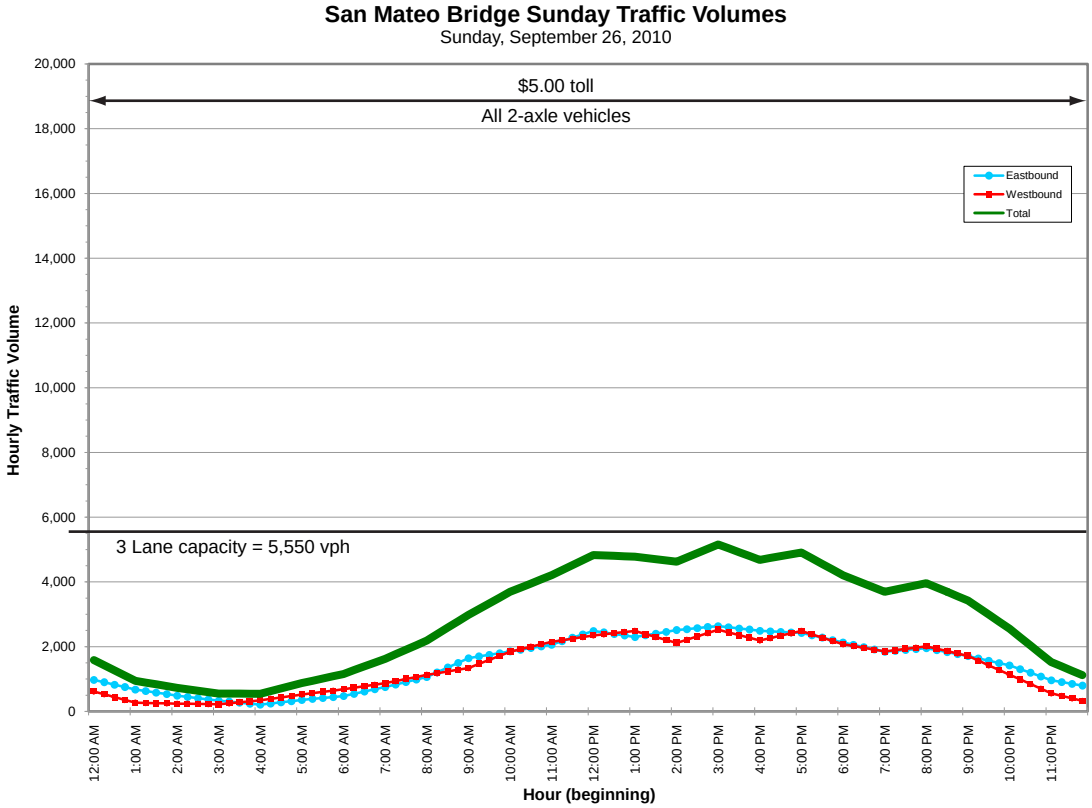


Figure 11a

San Mateo Bridge Weekday Traffic Volumes
Hourly Volumes





San Mateo Bridge Weekend Traffic Volumes.ai

Figure 11b

San Mateo Bridge Weekend Traffic Volumes

Hourly Volumes

Truck Traffic
Annual average daily truck traffic data are collected by Caltrans. Heavy vehicle percentages for two (2)-axle, three (3)-axle, four (4)-axle, and five (5) or more axle vehicles on the San Mateo Bridge are summarized below:

- Two (2)-axle – 3.2 percent
- Three (3)-axle – 0.6 percent
- Four (4)-axle – 0.1 percent
- Five (5) or more axles – 2.7 percent

Three-axle trucks are generally bobtails and delivery vans while trucks with four (4) or more axles are generally semi-trailers. Trucks comprise approximately 6.6 percent of total traffic on the San Mateo Bridge.

Origins / Destinations
Based on the findings of the Origin-Destination Modeling, origin-destination pairs that represent more than four (4) percent of eastbound traffic on the San Mateo Bridge during the weekday AM peak hour are included in **Table 17**.

Table 17: San Mateo Bridge Origin-Destination Pairs – Weekday AM Peak Hour – Eastbound

Origin	Destination	Percentage
Redwood City / Menlo Park	Hayward	17.2%
	Oakland / Alameda / Piedmont / Emeryville	7.0%
San Mateo	Hayward	12.9%
	Oakland / Alameda / Piedmont / Emeryville	11.1%
	Fremont	6.7%
Daly City / South San Francisco / San Bruno	Hayward	4.8%
Total		**59.7%**

Source: Origin-Destination Modeling, 2011.

The origin-destination pairs that represent more than four (4) percent of westbound traffic on the San Mateo Bridge during the weekday AM peak hour are included in **Table 18**.

Table 18: San Mateo Bridge Origin-Destination Pairs – Weekday AM Peak Hour – Westbound

Origin	Destination	Percentage
Hayward	San Mateo	9.5%
	Redwood City / Menlo Park	8.8%
	Daly City / South San Francisco / San Bruno	5.3%
Oakland / Alameda / Piedmont / Emeryville	San Mateo	6.2%
	Redwood City / Menlo Park	5.7%
Total		**35.5%**

Source: Origin-Destination Modeling, 2011.

The origin-destination pairs that represent more than four (4) percent of eastbound traffic on the San Mateo Bridge during the weekday PM peak hour are included in **Table 19**.

Table 19: San Mateo Bridge Origin-Destination Pairs – Weekday PM Peak Hour – Eastbound

Origin	Destination	Percentage
Redwood City / Menlo Park	Hayward	9.5%
	Oakland / Alameda / Piedmont / Emeryville	5.3%
San Mateo	Hayward	23.9%
	Oakland / Alameda / Piedmont / Emeryville	6.6%
	Fremont	5.7%
Daly City / South San Francisco / San Bruno	Hayward	5.2%
Total		**56.2%**

Source: Origin-Destination Modeling, 2011.

The origin-destination pairs that represent more than four (4) percent of westbound traffic on the San Mateo Bridge during the weekday PM peak hour are included in **Table 20**.

Table 20: San Mateo Bridge Origin-Destination Pairs – Weekday PM Peak Hour – Westbound

Origin	Destination	Percentage
Hayward	San Mateo	15.3%
	Redwood City / Menlo Park	9.0%
	Daly City / South San Francisco / San Bruno	5.0%
Oakland / Alameda / Piedmont / Emeryville	San Mateo	10.1%
	Redwood City / Menlo Park	5.9%
Total		**45.3%**

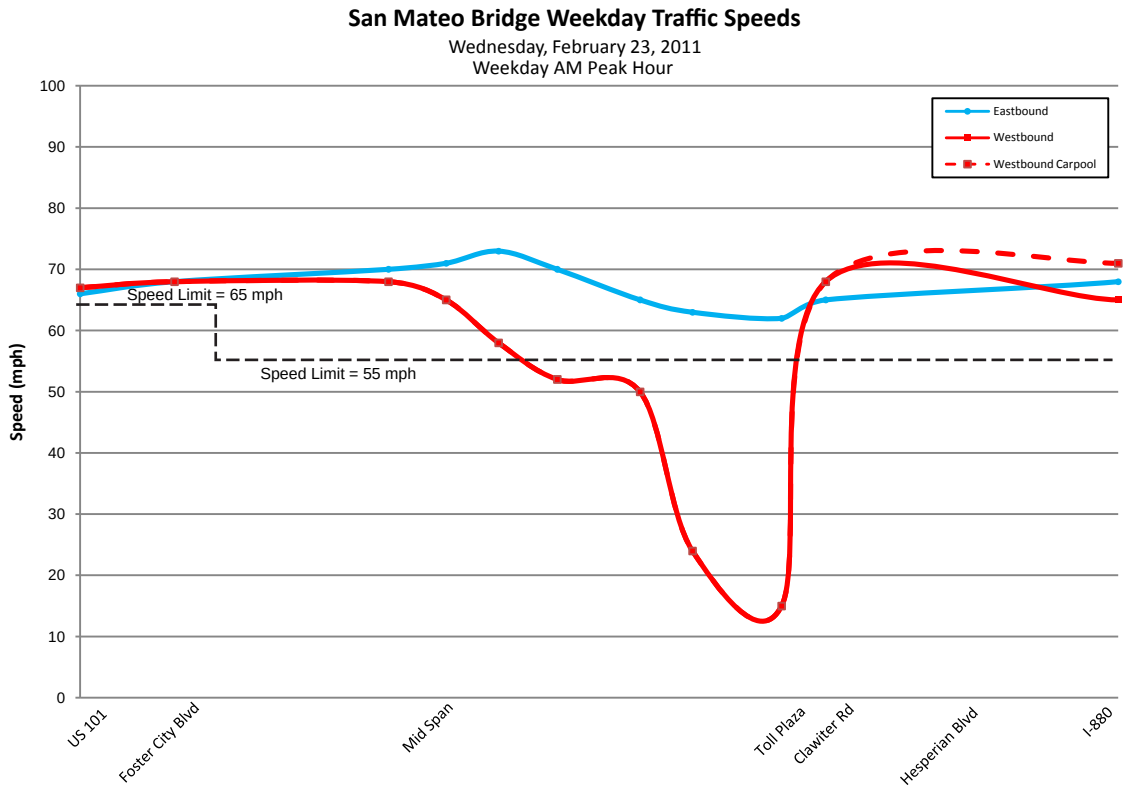
Source: Origin-Destination Modeling, 2011.

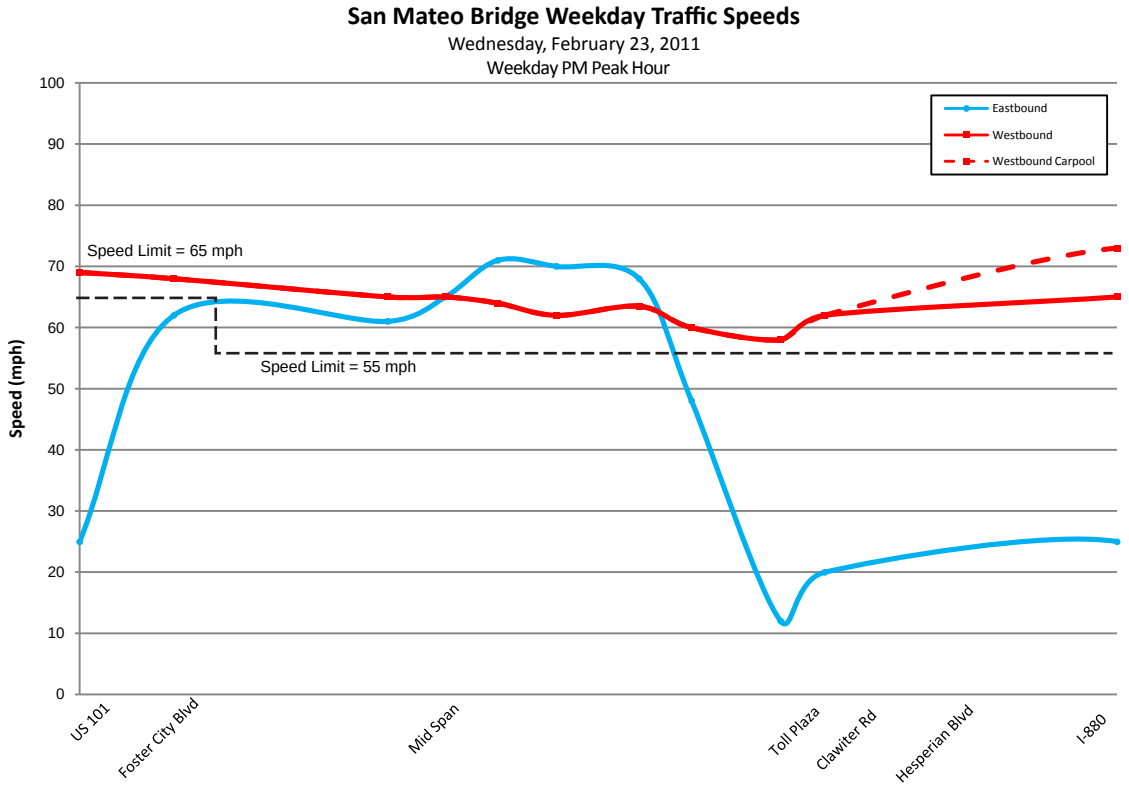
Travel Speeds

Travel speed data were collected by AECOM by using floating car runs on Wednesday, February 23, 2011. A summary of the weekday peak hour (8:00am to 9:00am and 5:00pm to 6:00pm) travel speeds on the San Mateo Bridge by direction is shown in **Figure 12**.

Travel Times

Travel time data were collected by AECOM by using floating car runs on Wednesday, February 23, 2011. A summary of the weekday peak hour (8:00am to 9:00am and 5:00pm to 6:00pm) travel times on the San Mateo Bridge in the eastbound direction is included in **Table 21**.





San Mateo Bridge Traffic Speeds.ai

Figure 12

San Mateo Bridge Traffic Speeds

Table 21: San Mateo Bridge Travel Times – Eastbound

Location	Distance	Weekday Time Period	
		AM Peak Hour	PM Peak Hour
US 101 / SR 92	0.0 miles	0 min 0 sec	0 min 0 sec
Foster City Boulevard	1.4 miles	1 min 39 sec	2 min 44 sec
Mid Span	3.8 miles	4 min 34 sec	5 min 46 sec
Toll Plaza	9.1 miles	8 min 34 sec	11 min 17 sec
Clawiter Road	10.8 miles	9 min 55 sec	15 min 18 sec
Hesperian Boulevard	12.0 miles	11 min 15 sec	19 min 17 sec
I-880 / SR 92	12.8 miles	11 min 46 sec	31 min 20 sec

Source: AECOM, 2011.

A summary of the weekday peak hour travel times on the San Mateo Bridge in the westbound direction is included in **Table 22**.

Table 22: San Mateo Bridge Travel Times – Westbound

Location	Distance	Weekday Time Period	
		AM Peak Hour	PM Peak Hour
I-880 / SR 92	0.0 miles	0 min 0 sec	0 min 0 sec
Hesperian Boulevard	0.8 miles	1 min 26 sec	1 min 42 sec
Clawiter Road	2.0 miles	2 min 28 sec	3 min 0 sec
Toll Plaza	3.7 miles	5 min 48 sec	5 min 7 sec
Mid Span	9.0 miles	9 min 48 sec	9 min 12 sec
Foster City Boulevard	11.4 miles	12 min 42 sec	12 min 36 sec
US 101 / SR 92	12.8 miles	14 min 11 sec	13 min 56 sec

Source: AECOM, 2011.

Vehicle Queuing

Vehicle queuing observations were conducted by AECOM within the vicinity of the San Mateo Bridge on Wednesday, February 23, 2011. A summary of the observed weekday peak hour queuing on the San Mateo Bridge is shown in **Figure 13**.

Capacity Constraints

The primary capacity constraint in the westbound direction on the San Mateo Bridge is the toll plaza. Queues generally develop on the westbound approach to the toll plaza during the weekday AM peak hour. The SR 92 / I-880 Interchange Reconstruction Project will provide direct connectors from eastbound SR 92 to northbound I-880 and from westbound SR 92 to southbound I-880. The project will widen the eastern approach to provide six (6) travel lanes from I-880 to the San Mateo Bridge. The HOV lane on the eastern approach will be extended eastward, to a point 300 feet west of Hesperian Boulevard. The project is expected to be complete in Fall 2011. The locations of several of the capacity constraints in the San Mateo Bridge corridor are shown in **Figure 14**.

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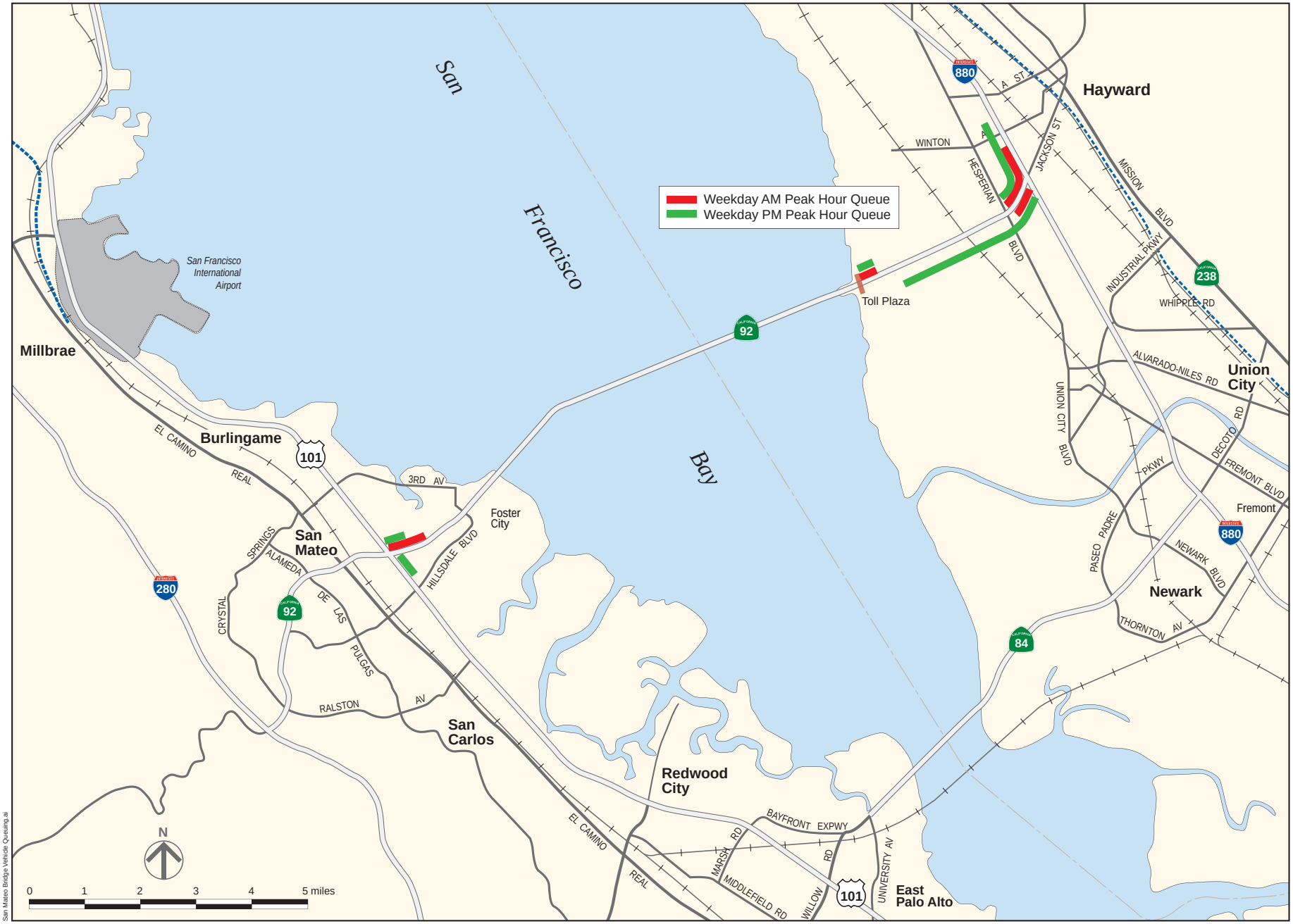

San Mateo Bridge Vehicle Queuing.ai

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Figure 13

San Mateo Bridge Vehicle Queuing

San Mateo Bridge Capacity Constraints.ai

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Figure 14

San Mateo Bridge Capacity Constraints

Limited capacity on the SR 92 / I-880 interchange constrains travel on the westbound approach. Currently, a single-lane, low speed loop ramp connects eastbound SR 92 to northbound I-880. This high demand, low capacity facility results in significant delays for all vehicles, regardless of destination, on eastbound SR 92. As discussed previously, the SR 92 / I-880 Interchange Reconstruction Project will significantly increase capacity at this interchange and reduce congestion.

Additionally, congestion on parallel facilities, including US 101 west of the San Mateo Bridge, constrain the flow of vehicles onto the Bridge during the weekday AM and PM peak periods.

Vehicle Occupancy
Approximately 2.8 HOV lane miles exist on westbound SR 92 from Hesperian Boulevard to the San Mateo Bridge toll plaza. The HOV facilities on westbound SR 92 require a minimum occupancy of two (2) passengers per vehicle (two (2)-seat vehicles with two (2) persons, motorcycles, trucks, and hybrids with DMV issued decal are permitted). HOV lanes are in operation between the hours of 5:00am to 10:00am and 3:00pm to 7:00pm on weekdays.

Based on the HOV Lanes Report, vehicle occupancy in the HOV lanes is approximately 2.1 persons per vehicle during the morning and the evening peak periods. Vehicle occupancy in the mixed flow lanes is approximately 1.0 persons per vehicle during the morning peak period and 1.1 persons per vehicle during the evening peak period. Vehicle occupancy calculations include motorcycles, three (3)-plus carpool vehicles, two (2)-seaters, hybrid vehicles, vanpools, and carpool lane violators, but do not include buses. The carpool violation rate on the San Mateo Bridge is less than two (2) percent. Average vehicle occupancy on the San Mateo Bridge during non-carpool periods is 2.2 persons per vehicle.

In 2009, approximately 72 percent of vehicles crossing the Bridge during the weekday morning peak period were FasTrak users. Approximately 66 percent of vehicles crossing the Bridge during the evening peak period were FasTrak users. FasTrak usage has increased by approximately 40 percent (from 33 percent to 48 percent) on the San Mateo Bridge over the last five (5) years.

Carpool vehicles comprise approximately 9.7 percent of westbound traffic during the morning peak period and 4.8 percent of westbound traffic during the evening peak period on the San Mateo Bridge. Carpool vehicles comprise approximately 7.3 percent of daily traffic. Average daily carpool traffic has decreased approximately 35 percent (from 10.0 percent to 7.3 percent) between 2008 and 2010.

Trip Purpose and Frequency
Based on the results of the Origin-Destination Modeling, the purpose of the majority of weekday peak period trips across the San Mateo Bridge are work-related. When commuting and other work related trips are combined, the percentages of work-related trips exceed 90 percent of total traffic in both the eastbound and westbound directions during the morning peak period. Additionally, the majority of drivers travel the San Mateo Bridge five (5) or more times per week.

A travel summary of San Mateo Bridge traffic is shown in **Figure 15**.

Comparison to 2000 Bay Crossings Study
Current weekday average daily person-trips are approximately three (3) percent lower compared to weekday average daily person-trips presented in the 2000 Bay Crossings Study; however, the average weekday daily vehicle-trips have increased by five (5) percent. A comparison summary of weekday average daily person-trips traveling across the San Mateo Bridge corridor in 2000 and 2010, disaggregated by vehicle type, is included in **Table 23**.

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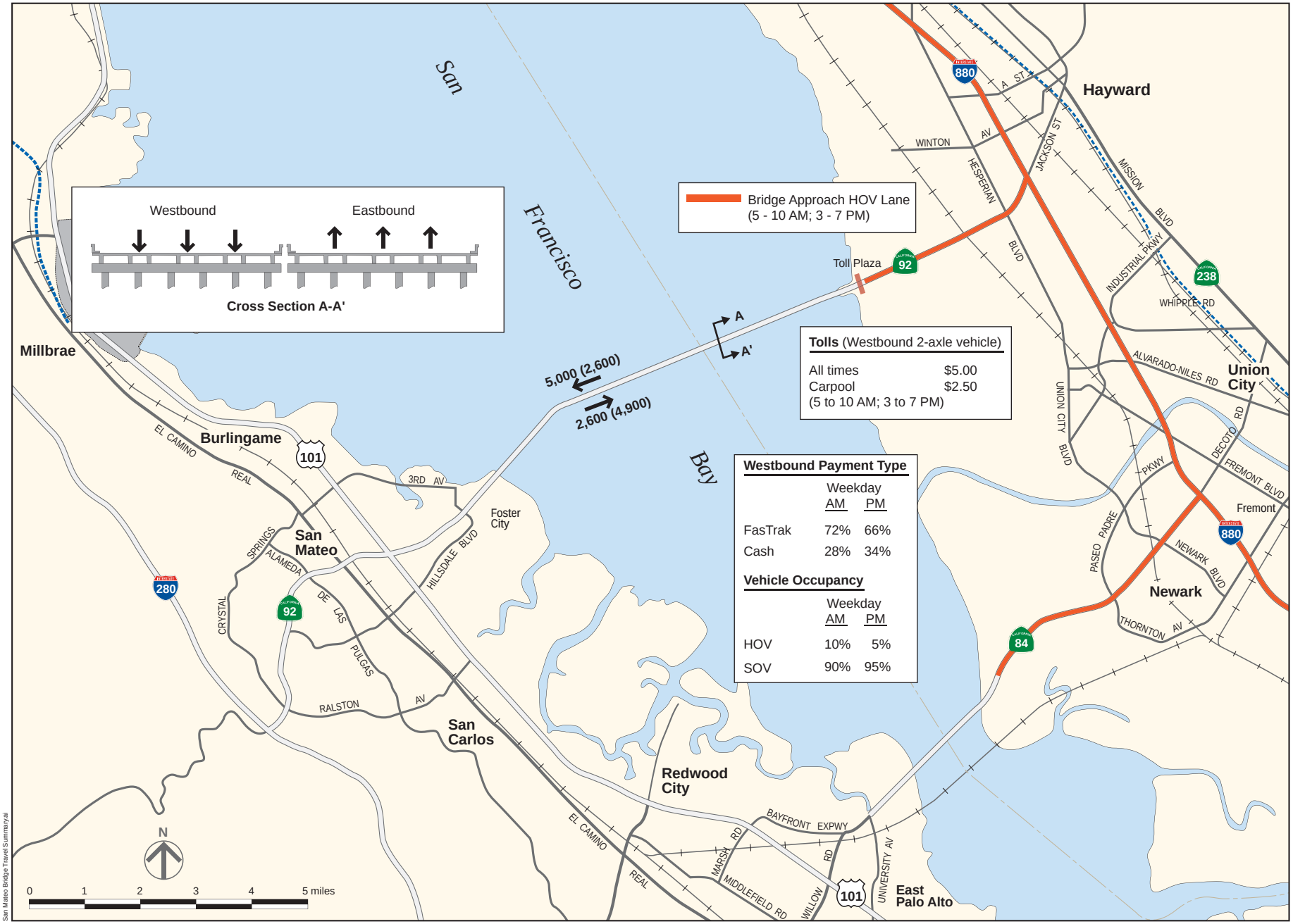

San Mateo Bridge Travel Summary.ai

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Figure 15

San Mateo Bridge Travel Summary

Weekday AM (PM) Peak Hour

Table 23: San Mateo Bridge Daily Person-Trips Comparison

Mode	Year	
	2000	2010
Vehicle – SOV (1 person)	75,400	79,300
Vehicle – HOV (carpool)	34,000	23,600
Vehicle – Truck (1 person)	2,900	6,300
Total Person-Trips	**112,300**	**109,200**
Total Vehicle-Trips	**92,200**	**97,000**

Source: 2000 Bay Crossings Study; AECOM, 2011.
Note:
- Carpool requires 2+ persons on the San Mateo Bridge.

Although the San Mateo Bridge was widened from four (4) lanes to six (6) lanes in 2004, average weekday daily person-trips has declined. The decrease in average weekday daily person-trips can largely be attributed to current economic conditions. Historical traffic volume data from 2006 to 2010 show an annual decrease in vehicle-trips throughout the Bay Area. Additionally, carpool usage has decreased approximately 30 percent since the introduction of the carpool charge and lane usage enforcement. Vehicles carrying two (2) or more people, motorcycles, or hybrid vehicles with permits to pass are charged a toll of $2.50 and the carpool toll discount is only available to drivers with FasTrak electronic toll devices. Additionally, average vehicle occupancy rates have decreased. The combination of these factors – lower traffic volumes, lower rates of carpool usage, and lower rates of vehicle occupancy – results in a reduction in person-trips currently crossing the San Mateo Bridge corridor compared to 2000.

3.3 Dumbarton Bridge

The Dumbarton Bridge (SR 84) connects San Mateo and Fremont Counties, spanning the narrowest portion of San Francisco Bay, between Menlo Park on the west shore and Newark on the east. The present structure is the second Dumbarton Bridge. The original structure was built by the Dumbarton Bridge Company and opened in January 1927, but no longer accommodates vehicles. The current Dumbarton Bridge, a high-level structure with six (6) lanes (three (3) lanes in each direction), separated by a concrete median barrier, and a bicycle / pedestrian path, was opened to traffic in October 1982. The western approach to the Dumbarton Bridge from US 101 — the Bayfront Expressway — was widened from four (4) lanes to six (6) lanes as part of BATA's RM 1 program. Widening of the expressway was completed in July 2003.

Bridge Description

The Dumbarton Bridge is approximately 1.6 miles in length with a shoulder in each direction for emergency use and a two-way bicycle and pedestrian path on the eastbound side. A 340-foot center span provides 85 feet of vertical clearance for shipping. The Dumbarton Bridge provides three (3) lanes of travel in both the eastbound and westbound directions.

On the Bridge's eastern end, three (3) lanes of eastbound traffic are provided from the Bridge to I-880. Two (2) mixed flow and one (1) HOV lane are provided on the westbound approach to the Dumbarton Bridge from Newark Boulevard to the toll plaza. The Bridge is directly connected to I-880 by a freeway segment north of the Fremont end. The Bridge is not directly connected to US 101 at its southwestern end in Menlo Park. The University Avenue / SR 84 intersection on the western end of the Dumbarton Bridge is signalized. West of this location, SR 84 is a signalized arterial / expressway providing connections to Willow Road, the Bayfront Expressway, and Marsh Road for westbound trips. Motorists must traverse one of three (3) at-grade routes to connect from the Bayshore Freeway to the Bridge. These are (from northwest to southeast):

- Bayfront Expressway (SR 84) – an expressway route linking to US 101 at Marsh Road, Atherton
- Willow Road (SR 114) – an approximately one (1)-mile expressway through east Menlo Park to US 101
- University Avenue (SR 109) – an arterial road and the main commercial street of East Palo Alto

Currently, bicyclists can ride across the Dumbarton Bridge toll-free, subject to posted regulations.

Toll Plaza
Tolls are collected in the westbound direction at the toll plaza, which is located on the eastern side of the Bay. As of July 2010, the toll is $5.00. There are six (6) toll lanes at the toll plaza; the leftmost two (2) lanes are dedicated FasTrak lanes. Carpools pay $2.50 and this discount is only available to drivers with FasTrak electronic toll devices. Carpool restrictions are in effect during weekday morning and afternoon commute hours (5:00am to 10:00am and 4:00pm to 7:00pm) for vehicles carrying three (3) or more people (two (2) persons in two (2)-seat vehicles), motorcycles, or hybrid vehicles with a permit decal.

Mainline metering signals are located approximately 400 feet west of the toll plaza and are typically inactive. The Dumbarton Bridge has an estimated capacity of 1,850 vehicles per lane per hour, or a peak hour capacity of 5,550 vehicles per direction, and a daily capacity of 133,200 vehicles per direction.

Traffic Volumes
The mainline freeway traffic volumes (eastbound and westbound) were obtained from PeMS. Weekday data from Tuesday, September 21, 2010, and weekend data from Saturday, September 25, 2010 and Sunday, September 26, 2010 were utilized for traffic volumes. The mainline SR 84 freeway volume data collected by the PeMS detector located at CA PM 0.89 were utilized in the eastbound and westbound directions.

Currently, average weekday traffic volumes are 49,000 vehicles in the eastbound direction and 31,000 vehicles in the westbound direction (80,000 total daily vehicles). In the morning peak hour the predominant commute direction is westbound and in the evening peak hour the predominant commute direction is eastbound. In general, weekday traffic peaks between 6:00am and 10:00am in the westbound direction and between 4:00pm and 7:00pm in the eastbound direction. During the morning peak period, the peak direction (westbound) serves approximately 68 percent of total traffic. During the evening peak period, the peak direction (eastbound) serves between approximately 80 percent of total traffic volume.

Westbound traffic volume peaks at approximately 4,500 vehicles between 8:00am and 9:00am. Eastbound traffic volume peaks at approximately 5,400 vehicles between 5:00pm and 6:00pm.

On Saturdays, the Dumbarton Bridge serves approximately 50,000 vehicles. On Sundays, the Dumbarton Bridge serves approximately 45,000 vehicles.

On the Bridge's western end, the at-grade intersection at University Avenue constrains the amount of eastbound and westbound traffic that may pass through that location.

A summary of current weekday and weekend traffic volumes on the Dumbarton Bridge is shown in **Figure 16**.

Truck Traffic
Annual average daily truck traffic data are collected by Caltrans. Heavy vehicle percentages for two (2)-axle, three (3)-axle, four (4)-axle, and five (5) or more axle vehicles on the Dumbarton Bridge is summarized below:

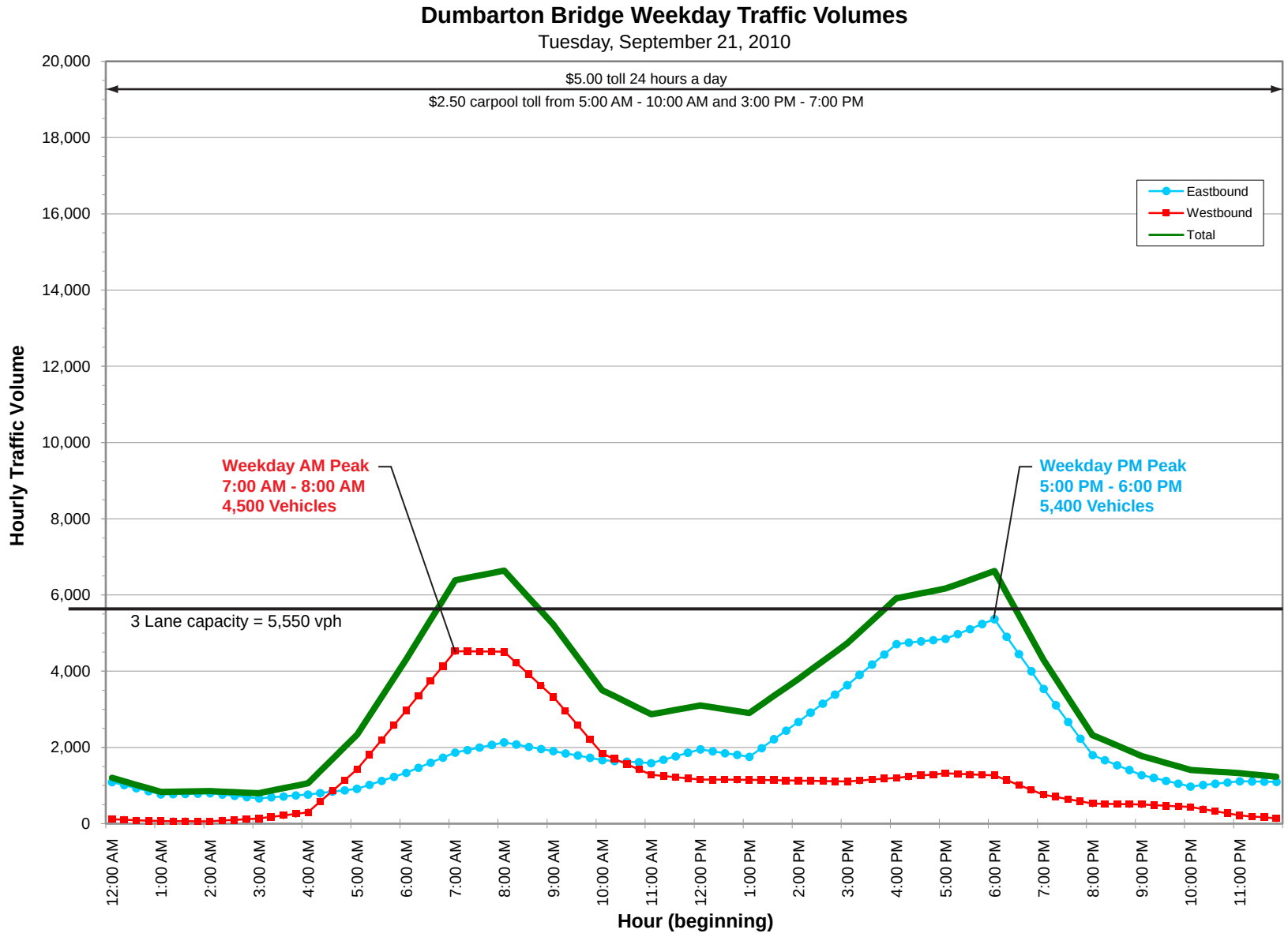
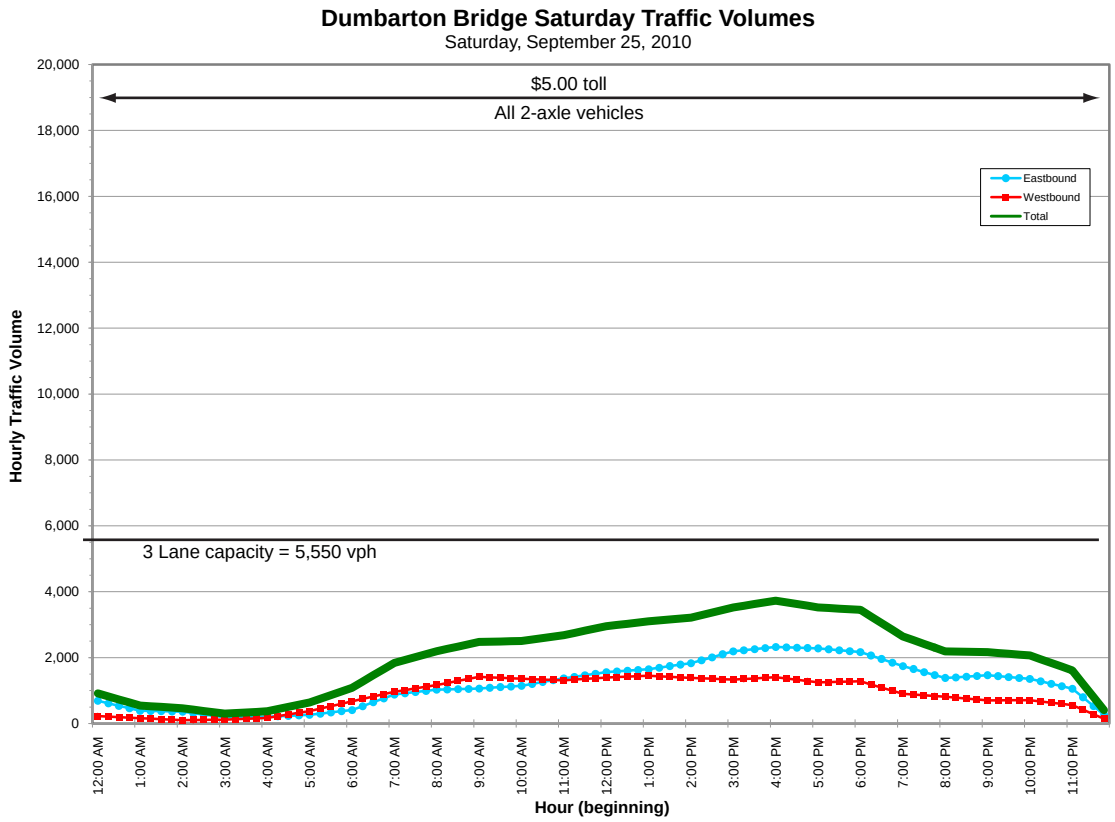
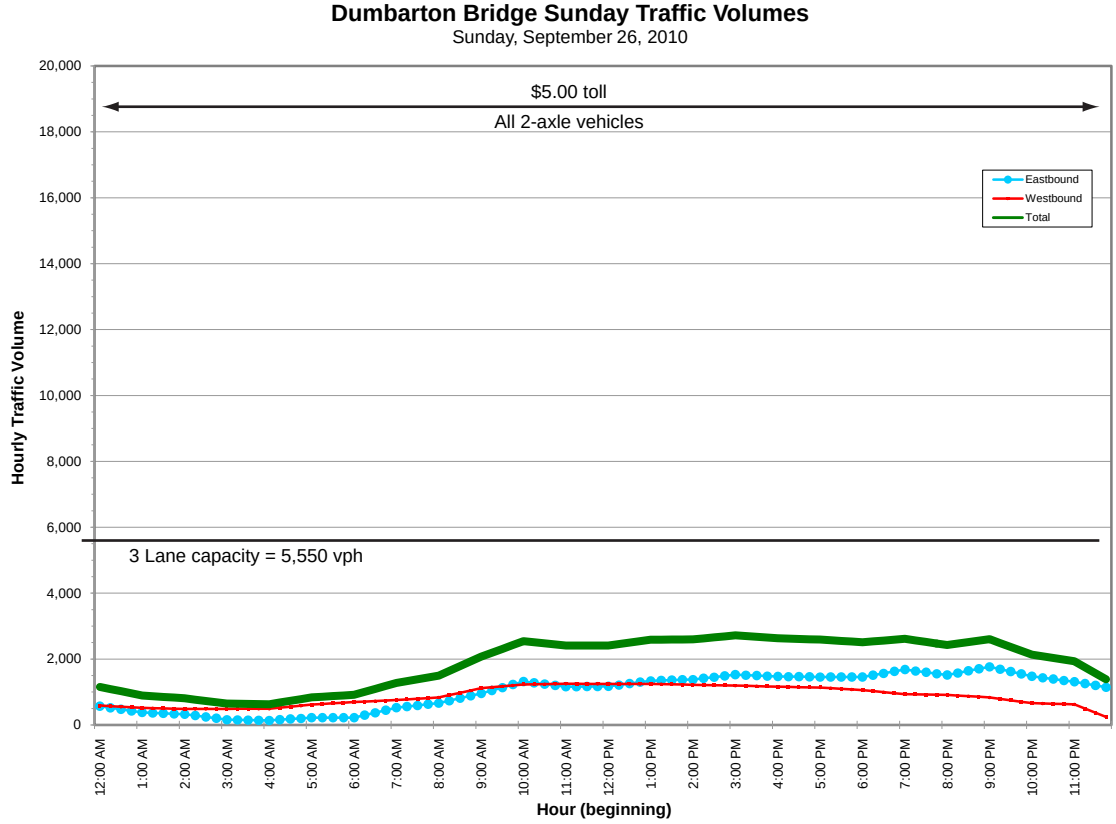


Figure 16a

Dumbarton Bridge Weekday Traffic Volumes

Hourly Volumes





Dumbarton Bridge Weekend Traffic Volumes.ai

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Figure 16b

Dumbarton Bridge Weekend Traffic Volumes

Hourly Volumes

- Two (2)-axle – 2.1 percent
- Three (3)-axle – 0.4 percent
- Four (4)-axle – 0.1 percent
- Five (5) or more axles – 1.9 percent

Three (3)-axle trucks are generally bobtails and delivery vans while trucks with four (4) or more axles are generally semi-trailers. Trucks comprise approximately 4.5 percent of total traffic on the Dumbarton Bridge.

Origins / Destinations
Based on the findings of the Origin-Destination Modeling, origin-destination pairs that represent more than four (4) percent of eastbound traffic on the Dumbarton Bridge during the weekday AM peak hour are included in **Table 24**.

Table 24: Dumbarton Bridge Origin-Destination Pairs – Weekday AM Peak Hour – Eastbound

Origin	Destination	Percentage
Redwood City / Menlo Park	Fremont	21.2%
	Hayward	11.4%
Total		**32.6%**

Source: Origin-Destination Modeling, 2011.

The origin-destination pairs that represent more than four (4) percent of westbound traffic on the Dumbarton Bridge during the weekday AM peak hour are included in **Table 25**.

Table 25: Dumbarton Bridge Origin-Destination Pairs – Weekday AM Peak Hour – Westbound

Origin	Destination	Percentage
Fremont	Redwood City / Menlo Park	16.1%
	San Mateo	5.7%
Hayward	San Mateo	10.3%
Total		**32.1%**

Source: Origin-Destination Modeling, 2011.

The origin-destination pairs that represent more than four (4) percent of eastbound traffic on the Dumbarton Bridge during the weekday PM peak hour are included in **Table 26**.

Table 26: Dumbarton Bridge Origin-Destination Pairs – Weekday PM Peak Hour – Eastbound

Origin	Destination	Percentage
Redwood City / Menlo Park	Fremont	17.0%
	Hayward	10.2%
Total		**27.2%**

Source: Origin-Destination Modeling, 2011.

The origin-destination pairs that represent more than four (4) percent of westbound traffic on the Dumbarton Bridge during the weekday PM peak hour are included in **Table 27**.

Table 27: Dumbarton Bridge Origin-Destination Pairs – Weekday PM Peak Hour – Westbound

Origin	Destination	Percentage
Fremont	San Mateo	19.4%
	Redwood City / Menlo Park	8.2%
Hayward	San Mateo	10.3%
Total		**37.9%**

Source: Origin-Destination Modeling, 2011.

Travel Speeds
Travel speed data were collected by AECOM by using floating car runs on Wednesday, February 23, 2011. A summary of the weekday peak hour (8:00am to 9:00am and 5:00pm to 6:00pm) travel speeds on the Dumbarton Bridge by direction is shown in **Figure 17**.

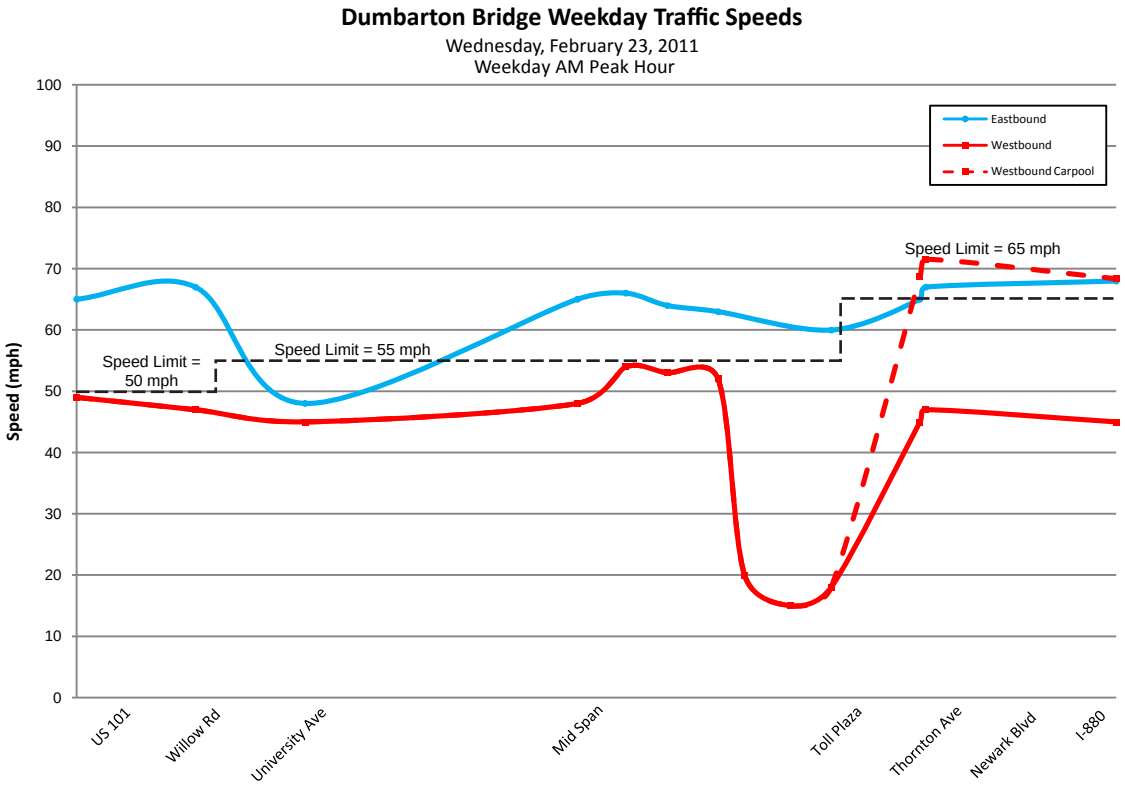
Travel Times
Travel time data were collected by AECOM by using floating car runs on Wednesday, February 23, 2011. A summary of the weekday peak hour (8:00am to 9:00am and 5:00pm to 6:00pm) travel times on the Dumbarton Bridge in the eastbound direction is included in **Table 28**.

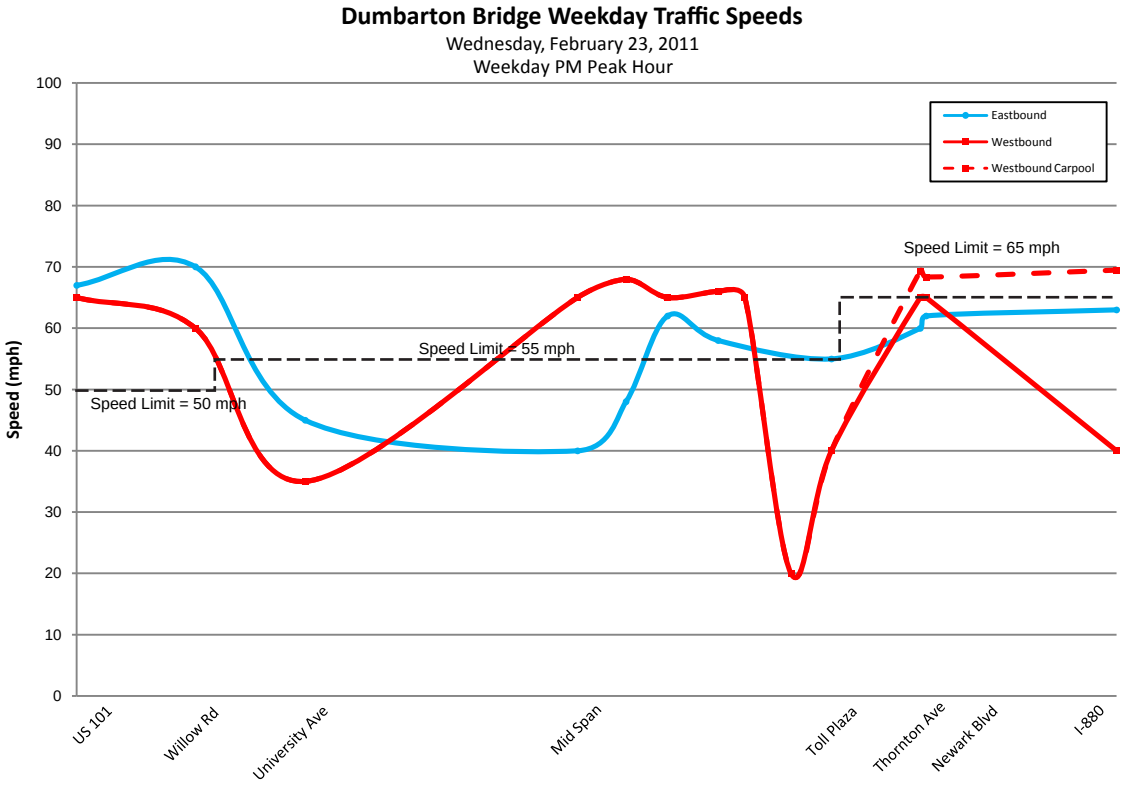
Table 28: Dumbarton Bridge Travel Times – Eastbound

Location	Distance	Weekday Time Period	
		AM Peak Hour	PM Peak Hour
US 101	0.0 miles	0 min 0 sec	0 min 0 sec
Willow Road	1.6 miles	3 min 21 sec	3 min 0 sec
University Avenue	2.1 miles	5 min 57 sec	7 min 17 sec
Toll Plaza	7.3 miles	9 min 57 sec	13 min 11 sec
Thornton Avenue Ramp	7.6 miles	10 min 13 sec	13 min 31 sec
Newark Boulevard Ramp	8.8 miles	11 min 26 sec	14 min 38 sec
I-880	9.9 miles	12 min 22 sec	18 min 36 sec

Source: AECOM, 2011.

A summary of the weekday peak hour travel times on the Dumbarton Bridge in the westbound direction is included in **Table 29**.





Dumbarton Bridge Traffic Speeds.ai

Figure 17

Dumbarton Bridge Traffic Speeds

Table 29: Dumbarton Bridge Travel Times – Westbound

Location	Distance	Weekday Time Period	
		AM Peak Hour	PM Peak Hour
I-880	0.0 miles	0 min 0 sec	0 min 0 sec
Newark Boulevard Ramp	1.1 miles	0 min 43 sec	0 min 41 sec
Thornton Avenue Ramp	2.3 miles	2 min 21 sec	1 min 39 sec
Toll Plaza	2.6 miles	3 min 13 sec	2 min 47 sec
Metering Lights	2.7 miles	3 min 21 sec	4 min 2 sec
University Avenue	7.9 miles	9 min 31 sec	7 min 37 sec
Willow Road	8.4 miles	10 min 48 sec	8 min 7 sec

Source: AECOM, 2011.

Vehicle Queuing
Vehicle queuing observations were conducted by AECOM within the vicinity of the Dumbarton Bridge on Wednesday, February 23, 2011. A summary of the observed weekday peak hour queuing on the Dumbarton Bridge is shown in **Figure 18**.

Capacity Constraints
One of the capacity constraints in the westbound direction on the Dumbarton Bridge is the toll plaza. Queues generally develop on the westbound approach to the toll plaza during the weekday AM peak hour. The locations of several of the capacity constraints in the Dumbarton Bridge corridor are shown in **Figure 19**.

The Bayfront Expressway serves as the western approach to the Dumbarton Bridge from US 101. The expressway has been widened to six (6) lanes, three (3) in each direction, with full standard shoulders and lane widths. Capacity of the Expressway and the Bridge is constrained by the at-grade, signalized intersections. Two (2) local arterial roadways – University Avenue and Willow Road – converge onto the Expressway before continuing eastbound to the Bridge. The capacity of SR 84 between the Dumbarton Bridge and US 101 is constrained by these arterial roadways.

Additionally, peak hour congestion on parallel facilities west of the Dumbarton Bridge, including I-880 and US 101, constrain the flow of vehicles onto the bridge during the weekday AM and PM peak hours.

Vehicle Occupancy
Approximately 2.8 HOV lane miles exist on westbound SR 84 from I-880 to the Dumbarton Bridge toll plaza. The HOV facilities on westbound SR 84 require a minimum occupancy of two (2) passengers per vehicle (two (2)-seat vehicles with two (2) persons, motorcycles, trucks, and hybrids with DMV issued decal are permitted). HOV lanes are in operation between the hours of 5:00am to 10:00am and 3:00pm to 7:00pm on weekdays.

Based on the HOV Lanes Report, vehicle occupancy in the HOV lanes is approximately 2.0 persons per vehicle during the morning peak period, and is slightly higher during the evening peak hour, with approximately 2.2 persons per vehicle. Vehicle occupancy in the mixed flow lanes is approximately 1.0 persons per vehicle during the morning peak period and 1.1 persons per vehicle during the evening peak period. Vehicle occupancy calculations include motorcycles, three (3)-plus carpool vehicles, two (2)-seaters, hybrid vehicles, vanpools, and carpool lane violators, but do not include buses. The carpool violation rate on the Dumbarton Bridge is less than one (1) percent. Average vehicle occupancy on the Dumbarton Bridge during non-carpool periods is 2.1 persons per vehicle.

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Figure 18

Dumbarton Bridge Vehicle Queuing

AECOM

Dumbarton Bridge Capacity Constraints.ai

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Figure 19

Dumbarton Bridge Capacity Constraints

In 2009, approximately 73 percent of vehicles crossing the Bridge during the weekday morning peak period were FasTrak users. Approximately 58 percent of vehicles crossing the Bridge during the evening peak period were FasTrak users. FasTrak usage has increased by approximately 30 percent (from 34 percent to 45 percent) on the Dumbarton Bridge over the last five (5) years.

Carpool vehicles compose approximately 13 percent of westbound traffic during the morning peak period and 3.7 percent of westbound traffic during the evening peak period on the Dumbarton Bridge. Carpool vehicles compose approximately 8.4 percent of daily traffic during non-carpool periods. Average daily carpool traffic has decreased approximately 40 percent (from 13.2 percent to 8.4 percent) between 2008 and 2010.

Trip Purpose and Frequency
Based on the results of the Origin-Destination Modeling, the purpose of the majority of trips across the Dumbarton Bridge is work-related. When commuting and other work related trips are combined, the percentages of work related trips exceed 90 percent of total traffic in both the eastbound and westbound directions during the morning peak period. Additionally, the majority of drivers travel the Dumbarton Bridge five (5) or more times per week.

A travel summary of Dumbarton Bridge traffic is shown in **Figure 20**.

Comparison to 2000 Bay Crossings Study
Current average weekday daily person-trips are approximately 12 percent lower compared to average daily person-trips presented in the 2000 Bay Crossings Study; however, the average weekday daily vehicle-trips are only seven (7) percent lower. A comparison summary of average weekday daily person-trips traveling across the Dumbarton Bridge corridor in 2000 and 2010, disaggregated by vehicle type, is included in **Table 30.**

Table 30: Dumbarton Bridge Daily Person-Trips Comparison

Mode	Year	
	2000	**2010**
Vehicle – SOV (1 person)	73,300	66,500
Vehicle – HOV (carpool)	32,300	23,700
Vehicle – Truck (1 person)	1,500	3,600
Total Person-Trips	**107,100**	**93,800**
Total Vehicle-Trips	**88,100**	**81,800**

Source: 2000 Bay Crossings Study; AECOM, 2011.
Note:
- Carpool requires 2+ persons on the San Mateo Bridge.

The average weekday daily person-trips on the Dumbarton Bridge has declined since 2000. The decrease in average weekday daily person-trips can largely be attributed to current economic conditions. Historical traffic volume data from 2006 to 2010 show an annual decrease in vehicle-trips throughout the Bay Area. Additionally, carpool usage has decreased by approximately 40 percent since the introduction of the carpool charge and lane usage enforcement. Vehicles carrying two (2) or more people, motorcycles, or hybrid vehicles with permits to pass are charged a toll of $2.50 and the discount is only available to drivers with FasTrak electronic toll devices. Additionally, average vehicle occupancy rates have decreased. The combination of these factors – lower traffic volumes, lower rates of carpool usage, and lower rates of vehicle occupancy – results in a reduction in person-trips currently crossing the Dumbarton Bridge corridor compared to 2000.

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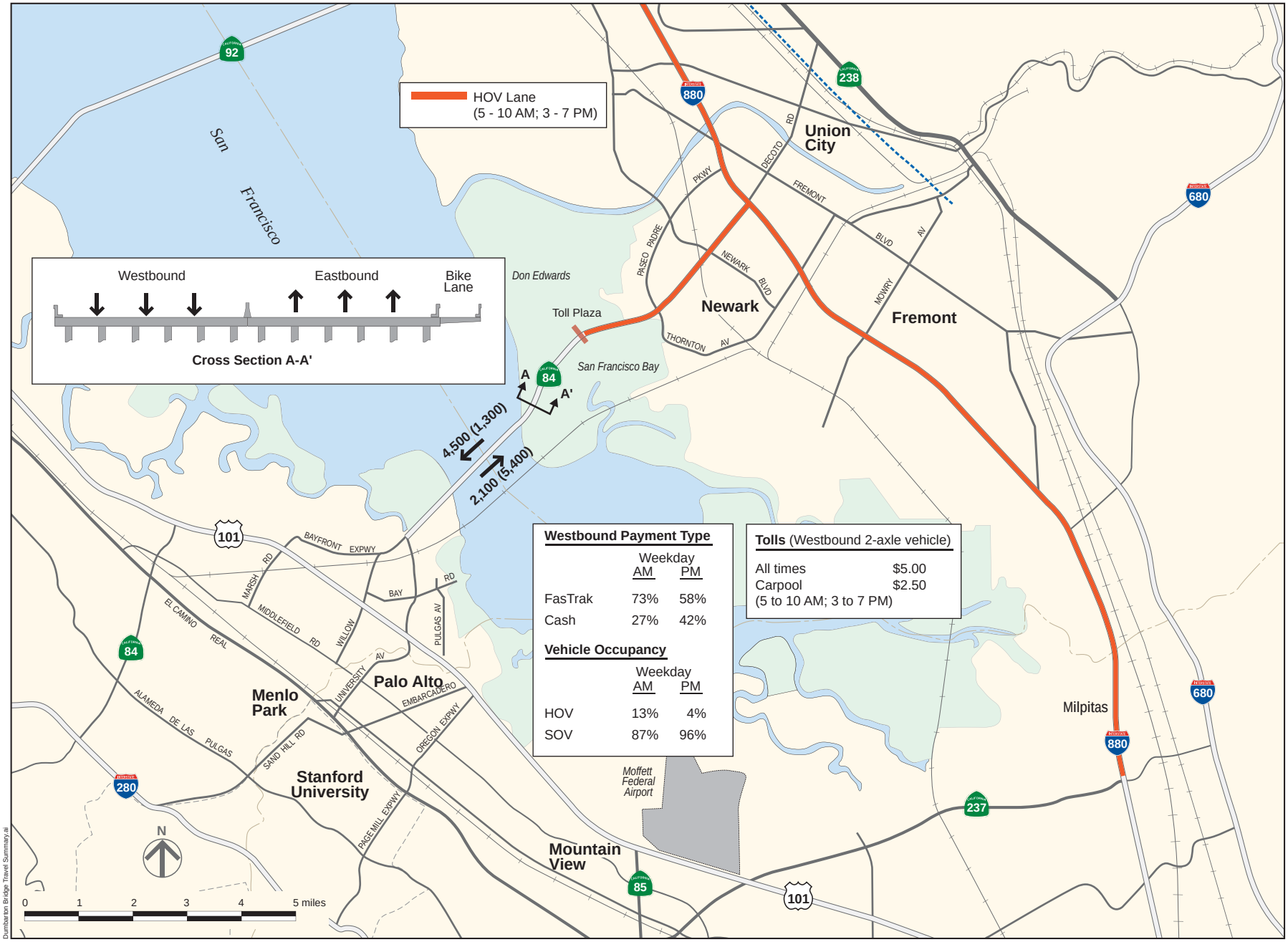

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Figure 20

Dumbarton Bridge Travel Summary

Weekday AM (PM) Peak Hour

3.4 Vehicle Congestion Summary

Since 2001, MTC and Caltrans, District 4 have gathered data and statistics summarizing the performance of the Bay Area transportation system, including annually monitoring freeway congestion. Most recently, these data were summarized in 2008 in the *State of the System: Congested Freeway Locations*. This document is herein referred to as the "Congested Freeway Report". Congestion is defined as a condition where the average speed is below 25 mph for 15 minutes or more on a typical weekday. This information is gathered through a large number of morning and evening peak period floating car studies conducted around the Bay Area. The locations where floating car runs were conducted, along with the duration and extent of congestion and the total estimated vehicular delay, are included for the weekday AM peak period in **Table 31**.[15]

Table 31: Congestion Summary – Weekday AM Peak Period

County	Route	Direction	Delay (veh-hr)	Duration	Location
Ala / CC	80	West	340	0650-0900	Central Ave to Powell St
Ala	84	South	70	0645-0825	Dumbarton Bridge Toll Plaza
Ala	92	West	80	0710-0800	Foster City Blvd to San Mateo Bridge Toll Plaza
Ala	580	West	210	0720-0940	I-980 to I-80
Ala	880 S	North	1,370	0605-0920	West Grand Ave to I-80
Ala	880	South	1,130	0735-0950	Hesperian Blvd to High St

Source: Congested Freeway Report, 2008.

The locations where floating car runs were conducted, along with the duration and extent of congestion and the total estimated vehicular delay, are included for the weekday PM peak period in **Table 32**.

Table 32: Congestion Summary – Weekday PM Peak Period

County	Route	Direction	Delay (veh-hr)	Duration	Location
Ala	80	East	1,030	1520-1810	MacArthur Maze to University Ave
Ala	80	West	2,230	1500-1850	Gilman St to MacArthur Maze
Ala / SF	80	West	3,020	1620-1900	MacArthur Maze to 5th Street (SF)
Ala	84	North	290	1525-1855	Newark Blvd to I-880
Ala / SM	92	East	3,200	1510-1935	Clawiter Rd to I-880
Ala	880	North	290	1715-1905	SR 92 to Hesperian Blvd
Ala	880	South	660	1515-1900	At Decoto Rd / SR 84

Source: Congested Freeway Report, 2008.

[15] State of the System: Measuring Bay Area Transportation Performance. Congested Freeway Locations – Morning and Evening Commutes, 2008. Prepared by MTC and Caltrans, District 4.

4.0 Rail

Currently, only one rail operator provides transbay service: the Bay Area Rapid Transit District (BART) operates a 104-mile, automated rapid transit system serving four of the Bay Area counties (Alameda, Contra Costa, San Francisco, and San Mateo). There are 43 stations served in the BART system.

Since opening in September 1972, BART has carried over 1.5 billion passengers more than 18 billion miles. BART's current average systemwide weekday ridership is approximately 360,000 passengers. All BART stations are fully accessible to disabled persons.

Routes

BART currently operates five (5) lines, totaling 104 miles of track:

- Richmond – Daly City – Millbrae (red)
- Fremont – Richmond (orange)
- Fremont – Daly City (green)
- Pittsburg / Bay Point – SFO – Millbrae (yellow)
- Dublin / Pleasanton – Daly City (blue)

The existing BART system and planned BART extensions are shown in **Figure 21**. Current projects and future improvements include the Warm Springs extension, San Jose extension, Oakland Airport Connector, and eBART.

Stations and Parking

There are currently 43 stations in the BART system. Four (4) of these stations are joint BART and San Francisco Municipal Railway (MUNI) Metro stations in Downtown San Francisco along the Market Street corridor. Stations have elevators, ramps, platform edge warning tiles for the visually-impaired, and stations with parking have specifically marked stalls permitting full access to the system by elderly and handicapped persons. Bicycle racks and motorcycle stalls are provided, plus bicycle lockers, and available at some BART stations.

According to the *2008 BART Station Profile Study*, BART currently provides 46,071 total parking spaces throughout the region.[16] This document is herein referred to as the "BART Station Study". Parking fees vary by station and parking lot location. Generally, three types of parking are available at BART stations – free spaces, daily fee spaces (passengers pay a daily fee for parking), and monthly permit spaces (passengers pay monthly). The number of parking spaces available at each BART station, including a breakdown of free spaces, daily fee spaces, and monthly permit spaces, is included in **Table 33**. The 11 BART stations with no parking, such as those located in Downtown San Francisco and Downtown Oakland, are not listed.

Service Characteristics

BART typically operates from 4:00am to approximately 1:00am Monday through Friday, 6:00am to approximately 1:00am on Saturday, and 8:00am to approximately 1:00am on Sunday. Individual stations are closed following the departure of the last train.

[16] *2008 BART Station Profile Study*. Prepared for BART Marketing & Research Department. Prepared by Corey, Canapary & Galanis Research (CC&G). Submitted 2008.

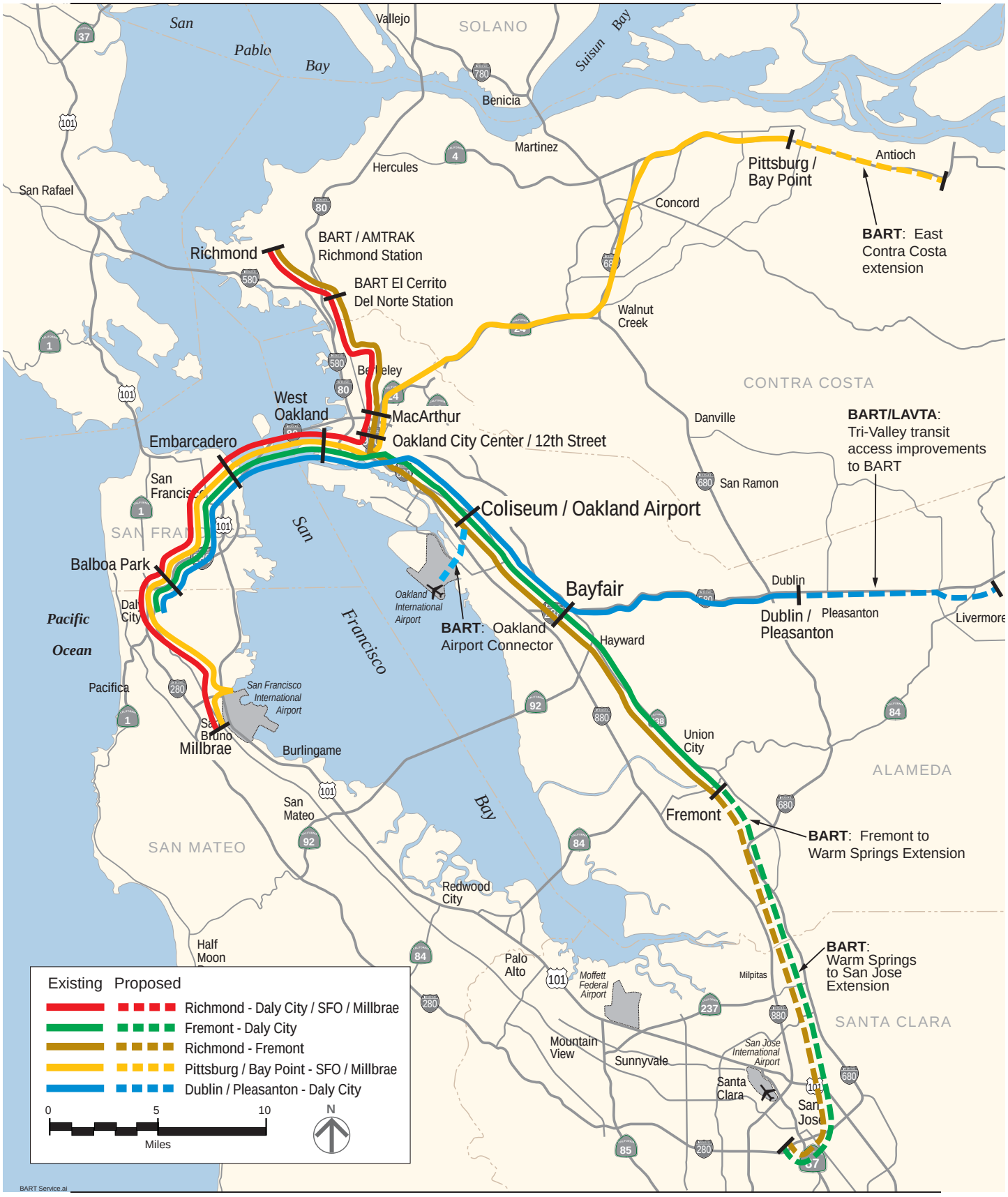

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Figure 21

BART System Map

Table 33: BART Station Parking

BART Station	Free Spaces	Fee Spaces	Permit Spaces	Total Spaces
Ashby	0	514	88	602
Bay Fair	1,578	0	77	1,655
Castro Valley	963	0	135	1,098
Coliseum / Oakland Airport	937	0	15	952
Colma	0	1,473	283	1,756
Concord	2,316	0	19	2,335
Daly City	0	1,619	434	2,053
Dublin / Pleasanton	0	2,918	1,170	4,088
El Cerrito Del Norte	2,037	0	122	2,159
El Cerrito Plaza	0	585	162	747
Fremont	0	1,556	557	2,113
Fruitvale	0	541	225	766
Glen Park	53	0	0	53
Hayward	1,385	0	52	1,437
Lafayette	0	1,146	380	1,526
Lake Merritt	0	99	99	198
MacArthur	0	443	178	621
Millbrae	0	2,538	434	2,972
North Berkeley	0	626	166	792
North Concord / Martinez	1,901	0	74	1,975
Orinda	0	979	380	1,359
Pittsburg / Bay Point	1,780	0	221	2,001
Pleasant Hill	2,465	0	457	2,922
Richmond	596	0	30	626
Rockridge	0	491	394	885
San Bruno	770	0	240	1,010
San Leandro	1,101	0	165	1,266
South Hayward	1,038	0	39	1,077
South San Francisco	1,291	0	83	1,374
Union City	921	0	220	1,141
Walnut Creek	0	1,693	380	2,073
West Oakland	0	256	183	439
Total (32 Stations)	**21,132**	**17,477**	**7,462**	**46,071**

Source: BART Station Study, 2008.

BART trains generally operate every 15 minutes, except on Saturdays between 6:00am and 7:00pm, when trains operate every 20 minutes. Transbay train intervals between Downtown Oakland stations and San Francisco stations are 3.75 minutes during the commute hours, every 2.5 minutes during the peak commute hours, and every five (5) minutes during the mid-day.

Currently, BART schedules approximately 22 trains per hour through the through the 3.6-mile Transbay Tube in the peak direction on weekday mornings.

Ridership
BART ridership fluctuates throughout the year; however, the general historical trend suggests that ridership is increasing. Over the years, BART has expanded capacity through system expansion, reconfiguration of existing parking lots, and construction of additional parking capacity at various locations.

Data contained in this report were derived from the September 2010 BART Monthly Ridership Report. This data set is herein referred to as the "BART Ridership Report".[17] Ridership volumes presented in this report were provided by BART and represent data collected on Tuesday, September 21, 2010.[18] Currently, there are approximately 360,000 systemwide daily BART trips, of which 175,500 are transbay trips. Currently, BART serves approximately 88,700 daily eastbound transbay trips, and approximately 86,800 daily westbound transbay trips.

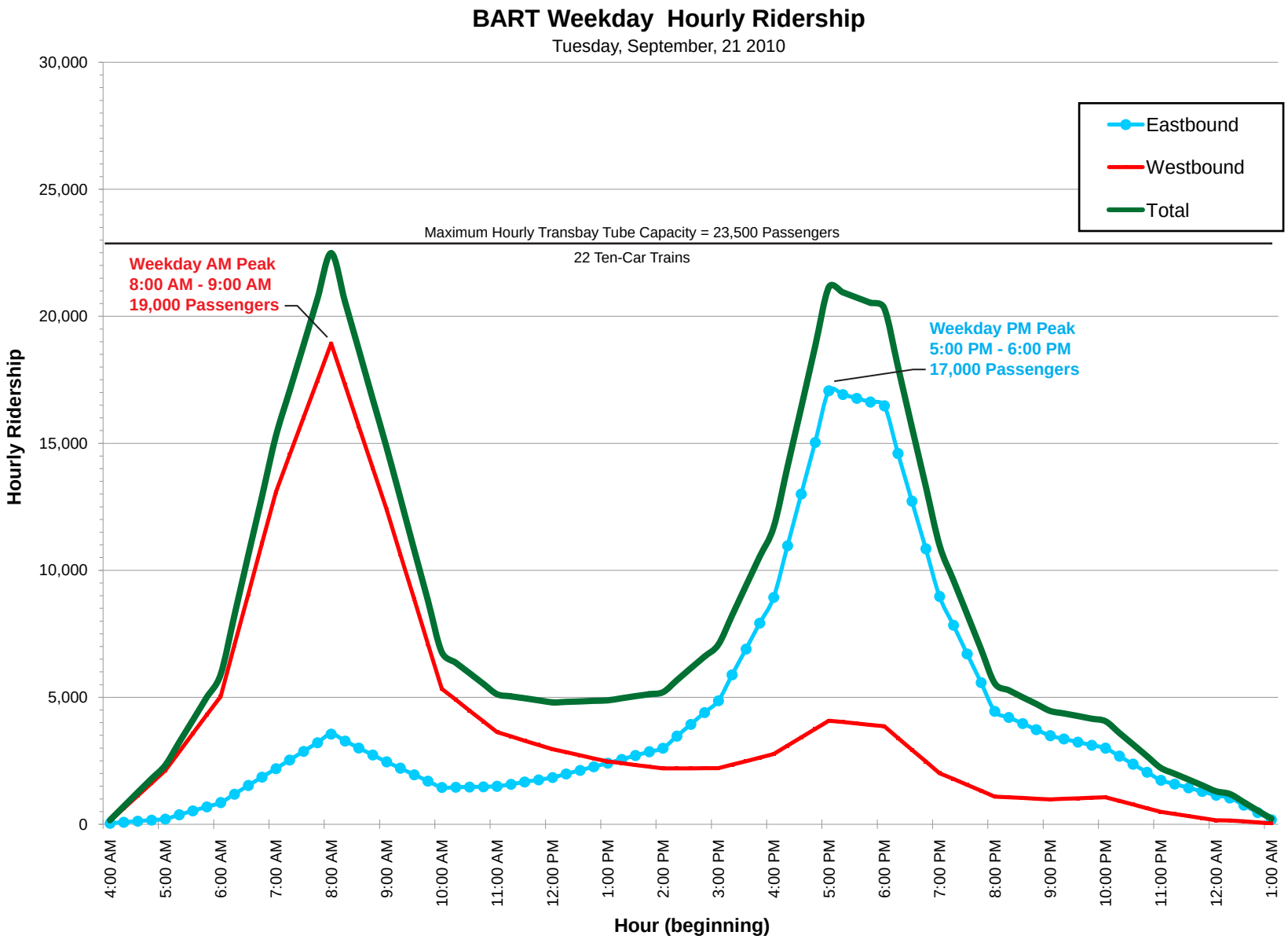
Peak hour transbay trips account for 44 percent of all BART trips during the weekday AM peak hour (8:00am to 9:00am), and 40 percent during the weekday PM peak hour (5:00pm to 6:00pm). A summary of current weekday transbay BART ridership volumes is shown in **Figure 22**.

Passenger Load Factors
Due to the variability in the number of seats per car across the BART fleet, BART no longer expresses vehicle load levels using passenger load factors. BART has adopted a policy to use passengers per car. Maximum allowable peak hour passengers per car is as follows:

- 107 passengers per car for the peak hours;
- 75 passengers per car for peak shoulder periods; and
- 67 passengers per car for off-peak.

Based on current BART operations, maximum daily passenger capacity for the Transbay Tube was estimated based on data from September 21, 2010. A basic estimation of capacity was conducted by comparing the maximum number of Transbay Tube trips in the peak direction with the maximum allowable number of passengers per car under BART standards. Current maximum capacity was estimated to be 23,500 daily passengers per direction in the Transbay Tube. This assumes 107 passengers per car and 22 trains per direction each with 10 cars.

[17] BART Monthly Ridership Report, September 2010. http://www.bart.gov/about/reports/ridership.aspx. Page accessed on February 4, 2011.
[18] Based on origin-destination matrix provided by Robert Mitroff, BART. Data collected from September 21, 2010. Email received February 15, 2011.



BART Transbay Ridership Volumes.ai

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Figure 22

BART Transbay Ridership Volumes

Hourly Ridership

Origins and Destinations
Approximately 50 percent of daily transbay trips originate in the East Bay and are destined for the West Bay, and 50 percent in the opposite direction (West Bay to East Bay). Approximately 24 percent of East Bay to West Bay daily trips originate in Downtown Oakland. For the purposes of this report, stations in Downtown Oakland include 12th Street, 19th Street, MacArthur, Lake Merritt, and West Oakland (MacArthur and West Oakland are typically not considered Downtown Oakland). The remaining 76 percent of East Bay to West Bay daily trips originate from other stations in the East Bay along the Richmond, Fremont, Dublin / Pleasanton, and Pittsburg / Bay Point lines.

Approximately 67 percent of West Bay to East Bay daily trips originate in Downtown San Francisco. Stations in Downtown San Francisco include Embarcadero, Montgomery, Powell, and Civic Center. The remaining 33 percent of West Bay to East Bay trips originate from other stations in the West Bay, including Colma, San Francisco Airport, and Millbrae.

Access Mode
The BART Station Study was based on over 50,000 surveys completed by BART passengers. Based on the BART Station Study findings, the car is the primary access mode for passengers travelling from home or non-home origins to BART. However, compared to the previous BART Station Study (conducted in 1998), the number of passengers walking or bicycling to BART stations has increased, while passengers that took transit to BART stations has decreased. The systemwide mode of access and egress for BART is included in **Table 34**.

Table 34: BART Station Access

BART Station	Car	Walked	Transit	Bicycle	Total
Access (home origin)	50%	31%	15%	4%	100%
Egress (non-home destination)	6%	75%	17%	2%	100%

Source: BART Station Study, 2008.

Travel Time
The existing travel times between selected BART stations on a typical weekday is included in **Table 35**. These travel times do not reflect waiting times, but do take into account transfer time.[19]

Table 35: BART Travel Times – Average Weekday

BART Station	West Oakland	Embarcadero	Millbrae
12th Street Oakland	5 minutes	12 minutes	45 minutes
Lake Merritt	5 minutes	12 minutes	50 minutes[a]
West Oakland	-	7 minutes	40 minutes
Dublin / Pleasanton	40 minutes	47 minutes	1 hour, 25 minutes[a]
Fremont	38 minutes	45 minutes	1 hour, 31 minutes[a]
Pittsburg / Bay Point	46 minutes	53 minutes	1 hour, 34 minutes[a]
Richmond	28 minutes	35 minutes	1 hour, 8 minutes

Source: BART Station Study, 2008.
Notes:
[a] Requires transfer

[19] BART Quickplanner. http://www.bart.gov/. Page accessed on February 4, 2011.

Transbay Constraints
BART has done extensive studies regarding increasing Transbay Tube train throughput. Various BART studies have concluded that the constraint for transbay trips is not the Transbay Tube itself, but the stations on either end of the Tube.[20] On the San Francisco side, BART has found that the Market Street stations constrain train throughput, as well as slow average speeds due to relatively close station spacing. BART has also found that the system is further constrained by insufficient vertical circulation within several stations and limitations due to the two-door car design on BART's existing fleet. The current two-door design does not allow for optimal passenger boarding and alighting operations.

To address these operational shortfalls, BART has considered several alternatives. These include having trains skip San Francisco stations, implementing advanced automation train control (AATC), diverting trains prior to the Embarcadero station, and construction of an additional tube. BART is also currently planning station improvements at Embarcadero and Montgomery stations.[21] These improvements include adding additional side platforms and vertical circulation elements, such as new emergency stairways, escalators, and elevators. The additional elements would be accommodated by expanded subway boxes constructed on the sides of the existing stations and would expand each station's circulation area. These elements would allow trains to be boarded from both sides and would increase the number of passengers each station is able to process.

In addition, BART currently has plans to replace its entire fleet of trains. BART plans to test new trains beginning in 2013, with pilot trains delivered between 2014 and 2015. Complete acceptance of the first order of trains is scheduled for 2018. BART's new trains will have three (3) doors, and this would expand capacity along with station improvements.

Comparison to 2000 Bay Crossings Study
Current weekday daily transbay passenger ridership for BART is approximately 10 percent higher in 2010 when compared to weekday daily transbay passenger ridership for BART presented in the 2000 Bay Crossings Study. A comparison summary of weekday daily transbay passenger ridership for BART is included in **Table 36**.

Table 36: BART Transbay Daily Person-Trips Comparison

Mode	Year	
	2000	2010
Rail – BART	160,700	175,500
Total	**160,700**	**175,500**

Source: 2000 Bay Crossings Study; AECOM, 2011.

The increase in daily transbay passenger ridership could be attributed in part to the expansion of the BART system into San Mateo County. Since 2000, BART has expanded from 39 stations to 43 stations and from 95 miles of track to 104 miles of track. The new stations, which were not in service in 2000, are South San Francisco, San Bruno, San Francisco International Airport, and Millbrae.

[20] *Analysis of Transbay Capacity Memorandum*. Prepared by BART. Submitted August 8, 2001.
[21] *Core Station Improvement Study: Phase II Report: Constructability and Construction Staging Analysis for Embarcadero and Montgomery Station Capacity Study Draft Report Revision 1*. Prepared by PGH Wong Engineering, Inc. and Dr. G. Sauer Corporation. Prepared for BART. Submitted October 2009.

5.0 Bus

AC Transit is the public bus system serving the 13 cities and adjacent unincorporated communities in a 390-square–mile service area along the eastern shores of San Francisco and San Pablo Bays. This includes Alameda, Albany, Berkeley, Castro Valley, El Cerrito, Emeryville, Fremont, Hayward, Newark, Oakland, Piedmont, Richmond, San Leandro, San Lorenzo, and San Pablo. AC Transit also serves San Francisco's temporary Transbay Terminal. According to AC Transit, total daily ridership currently reaches 177,000. Of the total daily ridership, lines with transbay routes account for approximately seven (7) percent, or approximately 11,600 passengers.[22]

Ninety-eight (98) percent of AC Transit routes connect with BART; many also connect with the Jack London Waterfront and Alameda ferry terminals, and with East Bay Amtrak stations.

Route / Service Summary

AC Transit provides 33 transbay routes from various parts of Alameda County. All westbound AC Transit trips to San Francisco end at the temporary Transbay Terminal. The temporary Transbay Terminal is located on the block bounded by Beale Street, Folsom Street, Howard Street, and Main Street in Downtown San Francisco. The temporary Transbay Terminal will remain in service until the new, permanent Transbay Transit Center is completed in August 2017.[23]

In addition to transbay service from the East Bay to and from San Francisco, AC Transit serves the Peninsula cities of Redwood City, Menlo Park, San Mateo and Palo Alto in coordination with San Mateo County Transit District (SamTrans) and Santa Clara County Transportation Authority (VTA). AC Transit line DA runs between Oracle Headquarters in Redwood City and Union City via the Dumbarton Bridge. Lines DB, DB1, and DB3 run between Palo Alto and Union City BART via the Dumbarton Bridge. Line M runs between San Mateo's Hillsdale Shopping Center (near the Hillsdale Caltrain station) and Hayward BART via the San Mateo Bridge. Line U runs between Stanford University and Hayward BART via the Dumbarton Bridge.

MUNI line 108 runs on the western span of the Bay Bridge between Downtown San Francisco and Treasure Island.

The transbay bus routes are shown in **Figure 23**.

Ridership

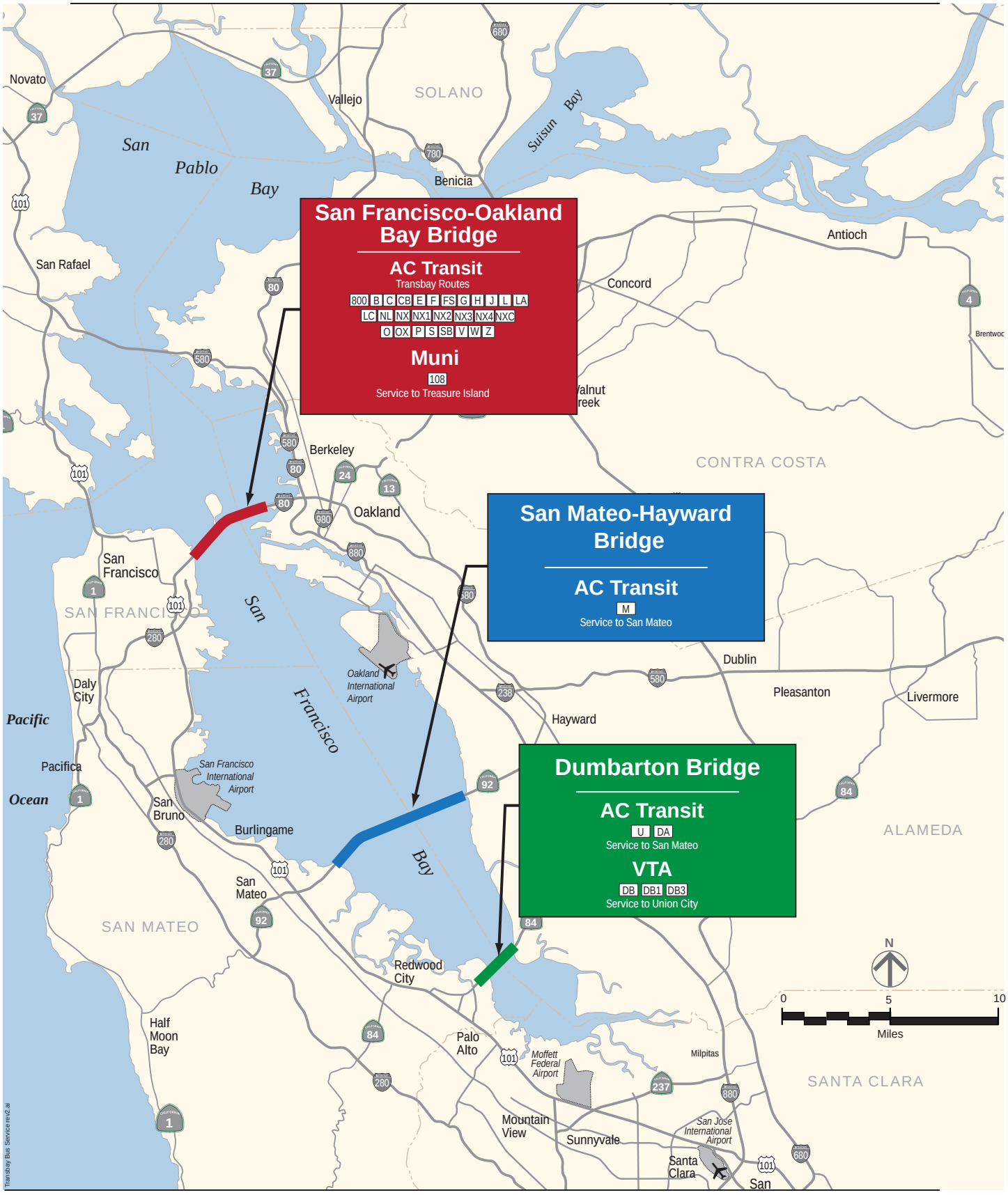
The average daily AC Transit ridership on lines with transbay service are included in **Table 37**. The data presented reflects averaged / aggregated data from multiple non-holiday weekdays between August 2010 and October 2010. Additionally, the total number of daily transbay trips per line is provided. A summary of current weekday transbay bus ridership volumes is shown in **Figure 24**.

Travel Times

A summary of AC Transit bus travel times for transbay routes is included in **Table 387**. The travel times range from 20 minutes to 1 hour and 15 minutes.

[22] Based on an email from Howard Der, AC Transit. Data collected from August 8, 2010 to October 30, 2010. Email received February 8, 2011.

[23] AC Transit Maps & Schedules. http://www.actransit.org/maps/. Page accessed on February 8, 2011.



SAN FRANCISCO BAY CROSSINGS STUDY UPDATE - CURRENT AND PROJECTED CONDITIONS REPORT

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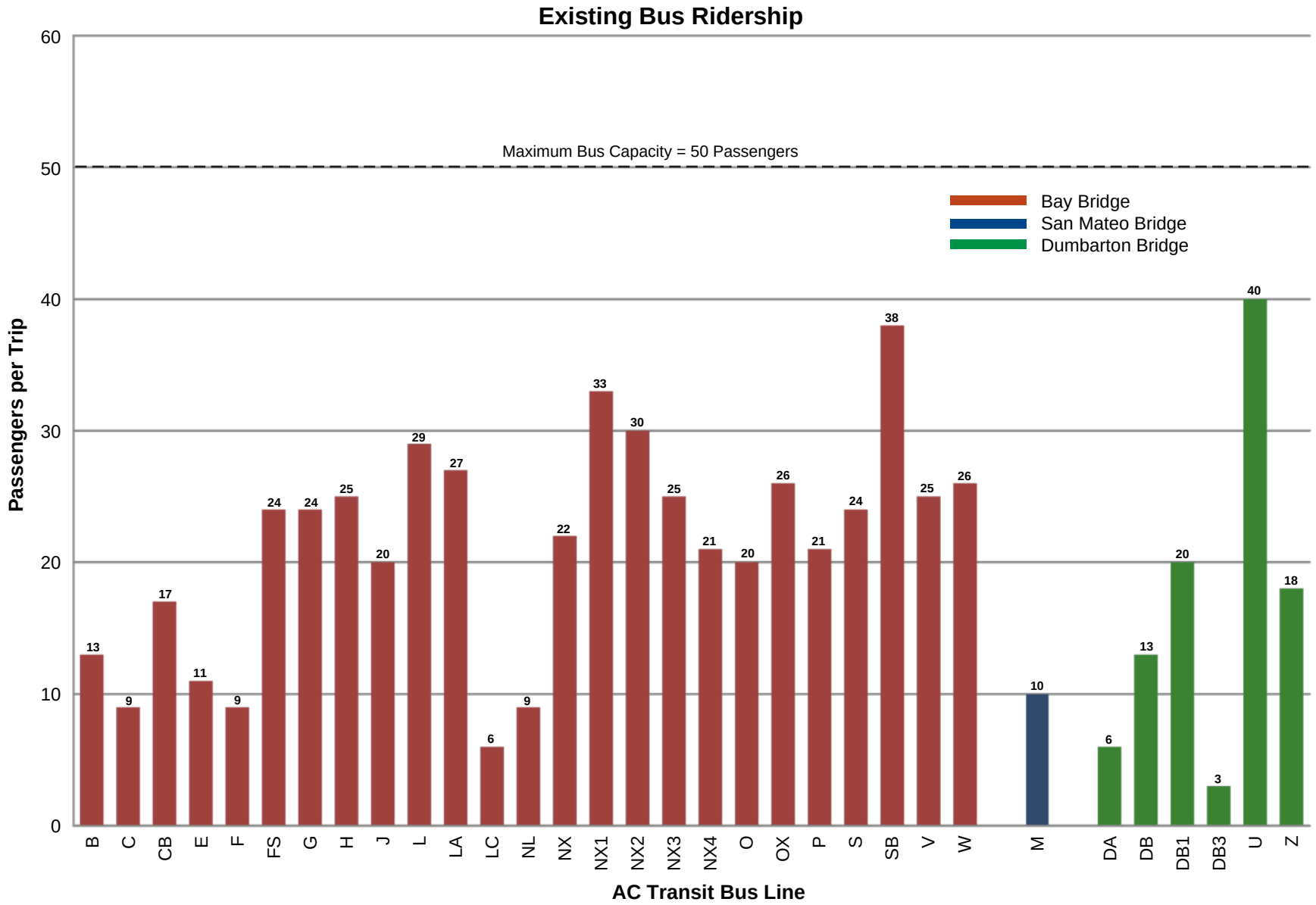
Figure 23

Bus Transbay System Map



Bus Transbay Ridership Volumes.ai

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Figure 24

Bus Transbay Ridership Volumes
Average Number of Passengers Per Bus

Table 37: Bus Transbay Ridership – Daily

Transit Line	Daily Ridership	Total Daily Bus Trips	Average Passengers per Trip
B	165	13 (7 eastbound, 6 westbound)	13
C	131	14 (9 eastbound, 5 westbound)	9
CB	134	8(4 eastbound, 4 westbound)	17
DA	34	6 (3 eastbound, 3 westbound)	6
DB	524	39 (18 eastbound,21 westbound)	13
DB1	265	13(8 eastbound, 5 westbound)	20
DB3	31	9(5 eastbound, 4 westbound)	3
E	155	14 (9 eastbound, 5 westbound)	11
F	687	77 (37 eastbound, 40 westbound)	9
FS	193	8 (4 eastbound, 4 westbound)	24
G	239	10 (5 eastbound, 5 westbound)	24
H	425	17 (10 eastbound, 7 westbound)	25
J	257	13 (7 eastbound, 6 westbound)	20
L	549	19 (11 eastbound 8 westbound)	29
LA	653	24 (15 eastbound, 9 westbound)	27
LC	17	3 (eastbound only)	6
M	341	34 (17 eastbound, 17 westbound)	10
NL	827	93 (47 eastbound, 46 westbound)	9
NX	194	9 (westbound only)	22
NX1	229	7 (eastbound only)	33
NX2	267	9 (eastbound only)	30
NX3	305	12 (7 eastbound, 5 westbound)	25
NX4	274	13 (7 eastbound, 6 westbound)	21
O	1,235	63 (33 eastbound, 30 westbound)	20
OX	554	21 (13 eastbound, 8 westbound)	26
P	502	24 (19 eastbound, 5 westbound)	21
S	264	11 (6 eastbound, 5 westbound)	24
SB	500	13 (7 eastbound, 6 westbound)	28
U	520	13 (6 eastbound, 7 westbound)	40
V	566	23 (16 eastbound, 7 westbound)	25
W	502	19 (11 eastbound, 8 westbound)	26
Z	72	4 (2 eastbound, 2 westbound)	18
Total (32 Lines)	**11,611**	**655 (362 eastbound, 293 westbound)**	**18**

Source: AC Transit, 2011

Table 38: Bus Travel Times – Average Weekday

Transit Line	Route Description	Total Travel Time (minutes)
B	SF-Trestle Glen	30
C	SF-Piedmont	35-40
CB	SF-Montclair	40-45
DA	Oracle HQ (Redwood Shores)-Union City	35-40
DB	Palo Alto-Union City BART	60
DB1	Palo Alto-Union City BART	60
DB3	Palo Alto-Union City BART	60
E	SF-Parkwood Apts.	35-40
F	SF-Berkeley	45
FS	SF-Berkeley	40
G	SF-El Cerrito	60
H	SF-Richmond	45
J	SF-Emeryville	40
L	SF-Richmond	65
LA	SF-Richmond	55-60
LC	SF-Richmond	55-60
M	San Mateo-Hayward BART	40
NL	SF-San Leandro	45
NX	SF-Oakland	40
NX1	SF-Oakland	30
NX2	SF-Oakland	35
NX3	SF-Oakland	45-50
NX4	SF-Castro Valley	65
O	SF-Fruitvale BART	45
OX	SF-Fruitvale BART	45-50
P	SF-Piedmont	30
S	SF-Hayward	45
SB	SF-Newark	75
U	Stanford Univ-Fremont BART	65
V	SF-Oakland	40
W	SF-Alameda	45
Z	SF-Albany	35

Source: AC Transit, 2011.

Load Factors
AC Transit Board Policy No. 550 has established the load factor threshold for AC Transit transbay lines as 1.00.[24] This threshold has been established for all transbay lines, including service during the weekday AM and PM peak periods, midday, and evening.

Generally, AC Transit buses crossing the three (3) corridors have a seating capacity ranging from approximately 40 to 60 passengers. Based on this range, the average seating capacity of transbay buses is assumed to be 50 passengers.

Comparison to 2000 Bay Crossings Study
Current weekday daily transbay ridership for AC Transit is lower for the Bay Bridge corridor but is higher for the San Mateo Bridge corridor and Dumbarton Bridge corridors than in 2000.

A comparison summary of weekday daily transbay ridership traveling across each corridor is included in **Table 39**.

Table 39: Bus Transbay Daily Person-Trips Comparison

Corridor	Year	
	2000	**2010**
Bay Bridge	15,200	9,900
San Mateo Bridge	100	300
Dumbarton Bridge	1,000	1,400
Total	**16,300**	**11,600**

Source: 2000 Bay Crossings Study; AECOM, 2011.

The decrease in weekday daily transbay ridership along the Bay Bridge corridor can be attributed to current economic conditions, reduced service, and a possible shift in mode for transbay passengers from buses to BART.

The increase in weekday daily transbay ridership along the San Mateo Bridge corridor can be attributed to service changes along the San Mateo Bridge corridor. In 2000, bus service along the San Mateo Bridge corridor operated between the Hayward BART station and various office parks in Foster City. Currently, AC Transit's M-Line operates between the Hillsdale Shopping Center in San Mateo and the Hayward BART station. The M-Line still makes stops at various locations in Foster City and San Mateo, but has been expanded to include the Oracle headquarters in Redwood Shores.

The increase in weekday daily transbay ridership along the Dumbarton Bridge corridor can also be attributed to service changes. In 2000, AC Transit operated three (3) lines across the Dumbarton Bridge (DB, DB1 and DB2). Since 2000, this has been expanded to include six (6) lines operating across the Dumbarton Bridge (DB, DB1, DB2, DB3, DA, and U).

[24] *AC Transit Board Policy No. 550: Service Standards and Design Policy*. AC Transit. Adopted June, 1994; Amendments July, 2004; January, 2008.

6.0 Ferry

Within the study area, the following three (3) transbay ferry services are currently in operation:

- Alameda / Oakland Ferry, with departures to / from Alameda / Oakland and San Francisco
- Alameda Harbor Bay Ferry, with departures to / from Harbor Bay Isle and San Francisco
- Vallejo Baylink Ferry, with departures to / from Vallejo and San Francisco

The corresponding routes for these three (3) transbay ferry services – and proposed future routes – are shown in **Figure 25**. During the peak hours, buses supplement service provided by the Vallejo ferries.

Route / Service Summary

Alameda / Oakland Ferry

The Alameda / Oakland ferry operates between Main Street in Alameda, Jack London Square in Oakland, and the San Francisco Ferry Building, with limited service to San Francisco's Pier 39 (Fisherman's Wharf), Angel Island State Park, and AT&T Park.

There are currently 25 weekday trips to and from San Francisco and the East Bay. Departures are scheduled every 65 minutes in the AM peak hour, and every 25-65 minutes in the PM peak hour depending on origin location and destination location.[25]

Alameda / Oakland ferry passengers can purchase one-way adult tickets for $6.25. A "Short Hop" ticket for a one-way trip between Alameda and Oakland can be purchased for $1.50. Free MUNI and AC Transit Transfers are provided.

Public transit connections are available at or near all San Francisco and East Bay ferry docks. Taxis, shuttles, and pedicabs are options at a number of locations.

Alameda Harbor Bay Ferry

The Alameda Harbor Bay Ferry operates from the Harbor Bay Isle Ferry Landing located on Bay Farm Island in Alameda to the San Francisco Ferry Building.

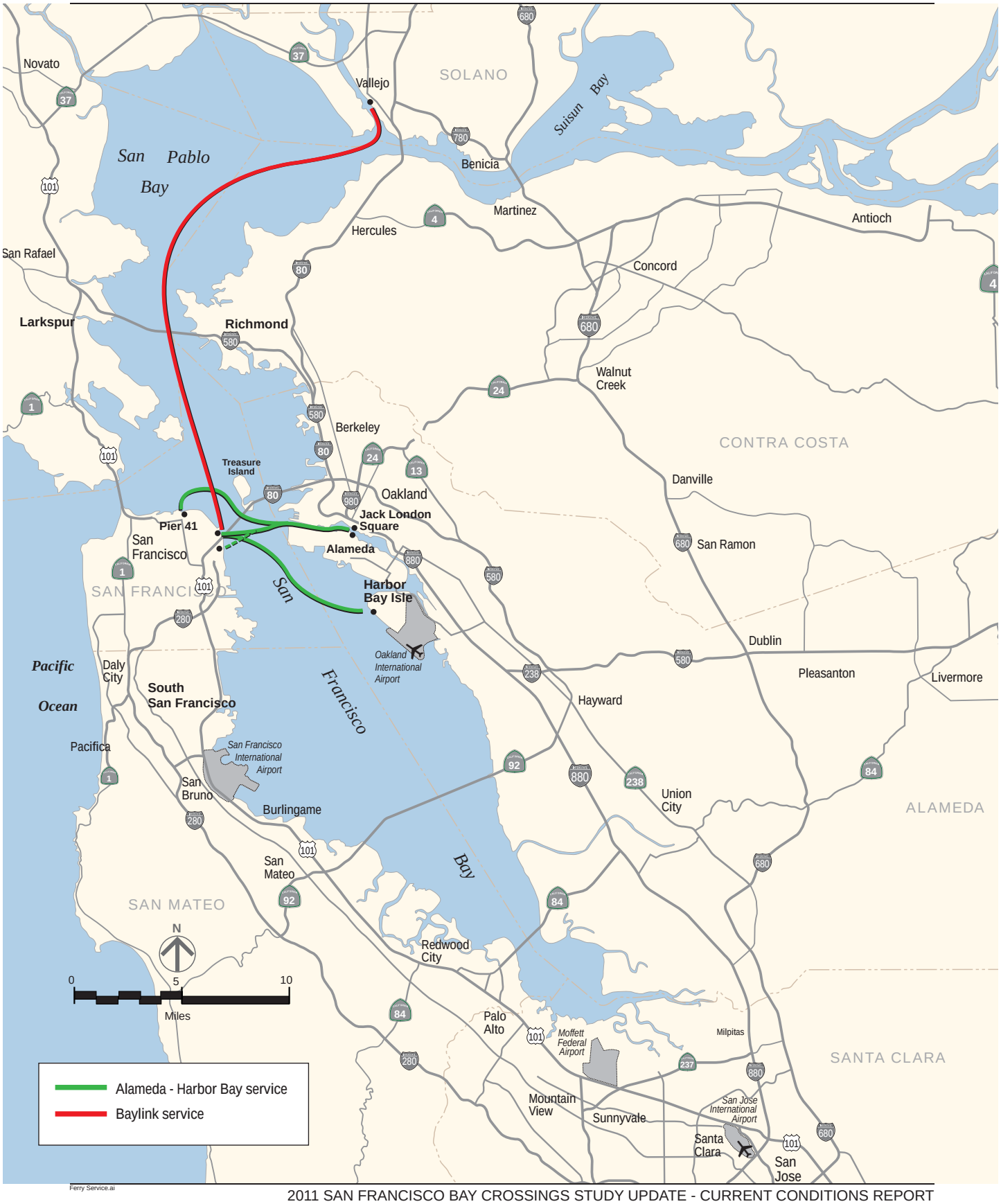
Weekdays, departures are every hour between 6:30am and 8:30am and between 5:05pm and 7:05pm for trips from Alameda to San Francisco. In the reverse direction (San Francisco to Alameda), departures occur at 7:00am, 8:00am, and every hour between 4:35pm and 7:35pm. The ferry trip between Alameda and San Francisco takes approximately 25 minutes.

Alameda / Oakland ferry passengers can purchase one-way adult tickets for $6.50. Free MUNI and AC Transit Transfers are provided.

Vallejo Baylink Ferry

The Vallejo Baylink Ferry provides service between Mare Island Way in Vallejo, the San Francisco Ferry Building and limited service to San Francisco's Pier 39 (Fisherman's Wharf). The Vallejo Baylink Ferry also provides bus service.

[25] East Bay Ferries Schedule. East Bay Ferries. http://www.eastbayferry.com/. Page accessed on February 4, 2011.



Ferry Service.ai

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Figure 25

Existing Ferry Route Map

Weekdays, there are currently 12 trips to / from San Francisco to Vallejo, operating between the hours of 5:30am and 7:45pm.[26]

Vallejo Baylink ferry passengers can purchase one-way adult tickets (ages 13 to 64) for $13.00. Additionally, day passes can be purchased for $24.00. Additionally, a 10-ride card, offering commuters and frequent riders extra convenience and savings, can be purchased for $103.00. A monthly pass can be purchased for $290.00.

Ridership
Current projected annual ridership, average daily ridership, total daily trips, and daily ridership per trip for each ferry service is included in **Table 40**. The ferry ridership data were collected between October 2009 and September 2010 and was provided by the Water Emergency Transportation Authority (WETA).[27]

Table 40: Ferry Ridership

Service Provider	Annual Ridership	Daily Ridership	Total Daily Ferry Trips	Average Passengers per Trip
Alameda / Oakland Ferry	442,200	2,000	25	80
Alameda / Harbor Bay Ferry	148,300	500	12	42
Vallejo Baylink Ferry	580,000	2,000	24	74
Total	**1,170,500**	**4,500**	**61**	**65**

Source: WETA, 2011.

A summary of current weekday ferry ridership volumes is shown in **Figure 24**.

Future Service
WETA is planning to expand ferry service in the Bay Area to the following transbay ferry routes.[28]

- Antioch/Martinez to San Francisco: 95 minutes one-way from Antioch and 60 minutes one-way from Martinez to San Francisco's Ferry Terminal. WETA anticipates approximately 1,100 daily passengers from Martinez, and 800 daily passengers from Antioch.
- Berkeley to San Francisco: 20 minutes one-way from Berkeley to San Francisco's Ferry Terminal. WETA anticipates 1,700 daily passengers by 2025.
- Hercules to San Francisco: 40 minutes one-way from Hercules to San Francisco's Ferry Terminal. WETA anticipates 1,000 daily passengers by 2025.
- Richmond to San Francisco: 30 minutes one-way from Richmond to San Francisco's Ferry Terminal. WETA anticipates 1,900 daily passengers by 2025.
- Oakland to South San Francisco: 30 minutes one-way from Oakland to a new ferry terminal in South San Francisco. WETA anticipates 1,000 daily trips by 2025.

Comparison to 2000 Bay Crossings Study
Current weekday daily passenger ridership for ferries is approximately eight (8) percent lower in 2010 compared to weekday daily passenger ridership for ferries presented in the 2000 Bay Crossings Study.

A comparison summary of weekday daily passenger ridership is included in **Table 41**.

[26] Baylink Ferry Schedule. Baylink Ferry. http://www.baylinkferry.com/schedule/index.php. Page accessed on February 4, 2011.
[27] Based on an email from Mike Gougherty, WETA. Email received January 31, 2011.
[28] WETA Proposed Routes. WETA. http://www.watertransit.org/proposedRoutes. Page accessed on February 24,2011.

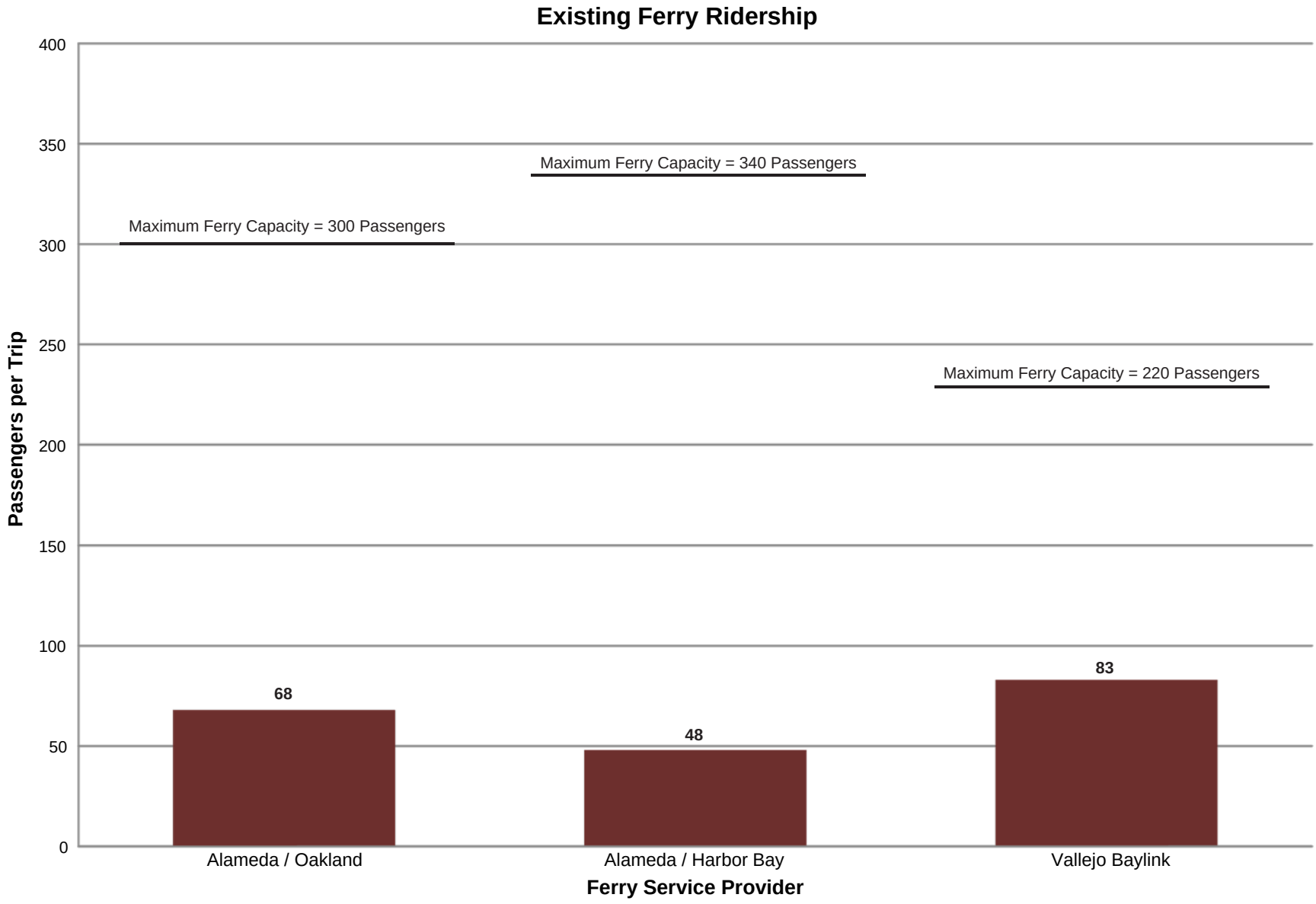

Figure 26
Ferry Ridership Volumes
Average Number of Passengers per Ferry

Table 41: Ferry Transbay Daily Person-Trips Comparison

Mode	Year	
	2000	2010
Ferry	4,900	4,500
Total	**4,900**	**4,500**

Source: 2000 Bay Crossings Study; AECOM, 2011.

The decrease in weekday daily passenger ferry ridership can be attributed to current economic conditions.

7.0 Other Transit Services

This section discusses other transit services. These transit services include Altamont Corridor Express (ACE), Amtrak, and Dumbarton Rail. The other transit services are shown in **Figure 27**. Additionally, an assessment of travel patterns to the San Francisco and Oakland airports is included.

7.1 Altamont Commuter Express

The Altamont Commuter Express is a commuter rail service connecting Stockton with San Jose. Intermediate stops are made at Lathrop / Manteca, Tracy, Vasco Road, Livermore, Pleasanton, Fremont, Great America, and Santa Clara. ACE was developed through a Joint Powers Agreement between the San Joaquin Regional Rail Commission (SJRRC), the Alameda County Congestion Management Agency (ACCMA) and the VTA in May 1997. This agreement made the SJRRC the day-to-day managing agency for ACE.

Three (3) ACE round-trips are made daily. In the morning, westbound trains leave Stockton at 4:20am, 5:35am, and 6:40am, arriving at San Jose at 6:30am, 7:45am, and 8:50am, respectively. In the evening, eastbound trains leave San Jose at 3:35pm, 4:35pm, and 5:35pm, arriving at Stockton at 5:45pm, 6:45pm, and 7:45pm, respectively.[29]

Future Improvements

The *Regional Rail Plan for the San Francisco Bay Area* recommended expanded and improved passenger service along the ACE corridor. This document is herein referred to as the "Regional Rail Plan". Recommendations include adding trackage to the existing Union Pacific Railroad (UPRR) line and / or reactivating segments of the Southern Pacific Railroad (SPRR), providing ACE greater capacity for trains. Under this scenario, hourly service would be provided in both directions with 30 minute service for peak period direction trains. Running time would be improved to approximately 100 minutes between Stockton and San Jose, an improvement of approximately 30 minutes from current ACE service.[30]

7.2 Amtrak

The primary Amtrak stations with train service in the study area are located in Oakland and Emeryville. There are also Amtrak station bus stops in San Francisco, including the Ferry Building, that does not have train service. The San Francisco bus stops are served by regular connecting bus service, which operates between San Francisco and the Emeryville and Oakland Amtrak stations.

7.3 Dumbarton Rail

The Regional Rail Plan recommends the implementation of passenger rail service in the Dumbarton Rail Corridor adjacent to the Dumbarton Bridge. The Dumbarton Rail Corridor is 20.5 miles long, beginning at the former Southern Pacific Centerville rail line in Redwood City, crossing over the Bay using the Dumbarton and Newark Slough Railroad Bridges to Union City, where it continues north via a new connection to the UPRR Oakland Subdivision rail corridor.

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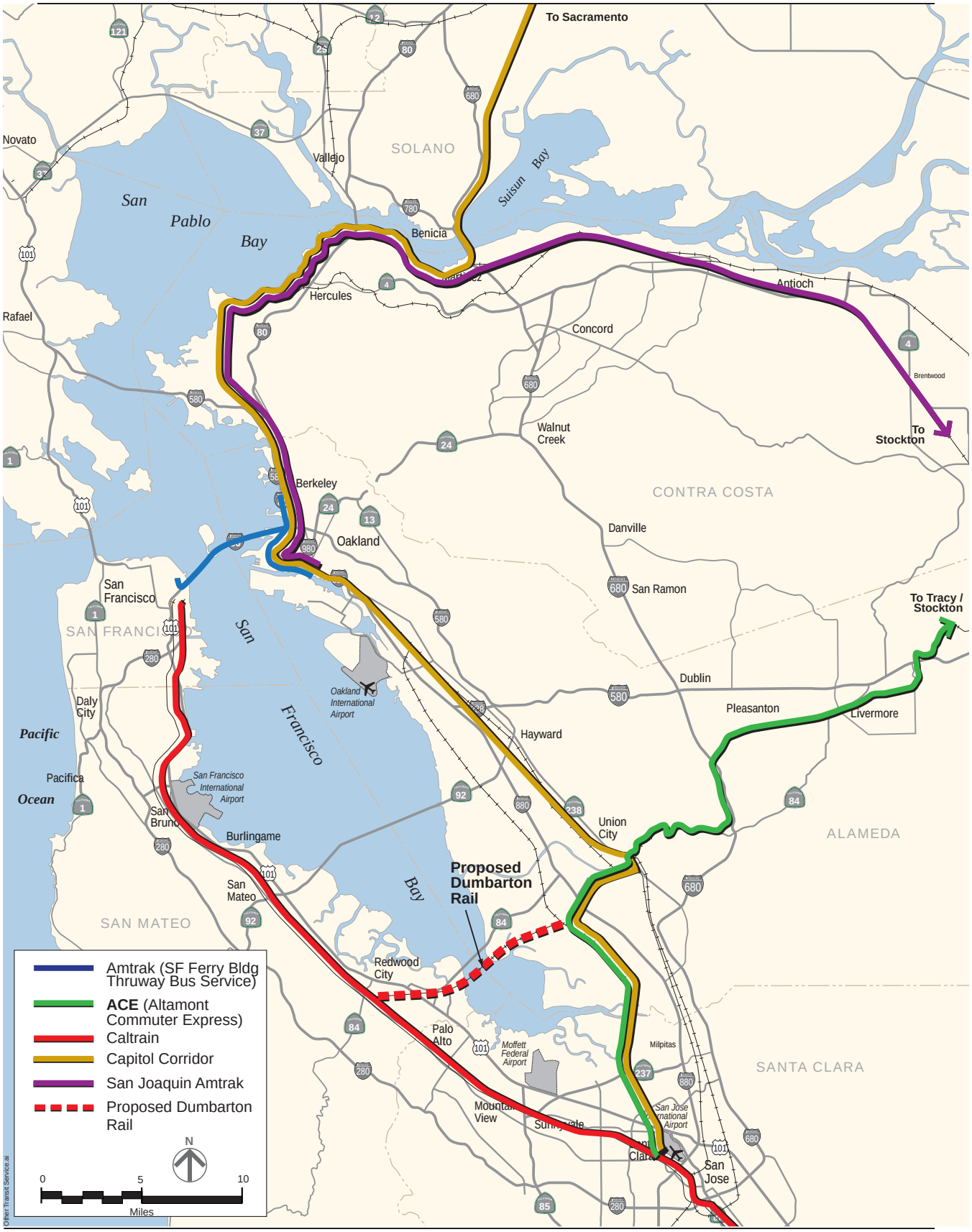
[29] Train Schedules. Altamont Commuter Express. http://www.acerail.com/ridingace/trainschedules.aspx. Page accessed on February 4, 2011.

[30] *Regional Rail Plan for the San Francisco Bay Area, Final Report.* Prepared by EarthTech and DMJM Harris | AECOM. Prepared for the Metropolitan Transportation Commission, BART, and Caltrain. Submitted September 2007.



SAN FRANCISCO BAY CROSSINGS STUDY UPDATE - CURRENT AND PROJECTED CONDITIONS REPORT

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Figure 27

Other Transit Services Route Map

The Dumbarton Rail service would connect between Redwood City and Union City utilizing conventional railroad equipment. Trains would operate at 30-minute headways. A total of six (6) trains would operate during each weekday peak hour. All trains would run between Union City and Redwood City. During the weekday AM peak hour, three (3) trains would divert at Redwood Junction north to San Francisco, while the other three (3) would continue south to San Jose. Trains would operate in the reverse direction during the weekday PM peak hour.

Daily ridership in the Dumbarton Rail Corridor has been forecasted at approximately 11,000 boardings per day in 2035. Rail service in the Dumbarton Rail Corridor is expected to enhance regional connectivity between BART, AC Transit, ACE, Capitol Corridor and Union City Transit in Alameda County, and Caltrain and SamTrans in San Mateo County. Additional benefits include improved access to public transit service, operational efficiency by decreasing delays to existing passenger and freight services, alleviating traffic congestion on the Dumbarton Bridge and adjacent highways, improving regional air quality by increasing transit ridership and decreasing auto usage, and accommodating future travel demands while improving transit options.[31]

7.4 Regional Airports

Traffic destined for the San Francisco and Oakland airports frequently requires transbay travel. Improvements in connectivity between these two (2) airports may be evaluated in later stages of this study. To evaluate the effectiveness of potential connections, available information regarding the origins and destinations of airport trips was collected in the 2006 MTC Airline Passenger Survey. This document is herein referred to as the "Airport Survey".[32]

The airport trip origins survey data for the San Francisco and Oakland airports are included in **Table 42**.

Table 42: Airport Counties of Origin

County of Origin	San Francisco International Airport (SFO)	Oakland International Airport (OAK)
Alameda	13.1%	40.1%
Contra Costa	9.1%	22.7%
Marin	6.6%	4.7%
Napa	1.1%	1.4%
San Francisco	29.9%	15.2%
San Mateo	17.1%	3.5%
Santa Clara	15.8%	2.3%
Solano	2.1%	2.5%
Sonoma	5.2%	7.6%
Total	**100.0%**	**100.0%**

Source: Airport Survey, 2006.

[31] *Summary of the Dumbarton Rail Corridor Project Study Report.* Prepared by HNTB Corporation, Earth Tech, Jones & Stokes, and Korve Engineering. Prepared for the ACCMA, ACTIA, Silicon Valley Manufacturing Group, Capitol Corridor, MTC, VTA, and San Mateo County Transportation Authority. Submitted May 2004.

[32] 2006 MTC Airline Passenger Survey: Draft Final Report. Prepared for MTC. Prepared by J.D Franz Research. Submitted December 2007.

8.0 Bicycles / Pedestrians

As discussed previously, bicycle / pedestrian facilities are provided on the Dumbarton Bridge and will be provided on the eastern span of the Bay Bridge. Although dedicated bicycle / pedestrian facilities are not provided on all of the bridges, transit service is equipped with bicycle racks and can accommodate bicycles on all three (3) bridges. In addition, bicycles can be brought aboard BART trains at certain times.

Bay Bridge Corridor

Pedestrians, bicycles, and other non-freeway vehicles and devices are not allowed on the Bay Bridge; however, the new eastern crossing will feature a 15-foot wide cantilevered bicycle and pedestrian path on the eastbound side of the Bridge for travel between Oakland and Yerba Buena Island. Alternatives for a bicycle / pedestrian pathway on the western span are currently being studied and preliminary designs are being prepared.[33]

A Caltrans bicycle shuttle operates during peak commute hours for $1.00 each way. The shuttle picks up / drops off in Oakland at the MacArthur BART Station and in San Francisco at the Transbay Terminal. The shuttle makes four (4) trips from Oakland and three (3) trips from San Francisco between 6:30am and 8:30am. The shuttle makes four (4) trips from San Francisco and three (3) trips from Oakland between 3:50pm and 6:15pm.

Bicycles are permitted on BART in the non-peak direction during the weekday peak hours. Additionally, bicycle racks are provided on AC Transit and MUNI buses. Any bicycle ridership within the Bay Bridge corridor is considered to be transit ridership.

San Mateo Bridge Corridor

Currently no bicycle / pedestrian facilities are provided on the San Mateo Bridge; however, bicycle racks are provided on AC Transit buses. Any bicycle ridership within the San Mateo Bridge corridor is considered to be transit ridership.

Dumbarton Bridge Corridor

The Dumbarton Bridge is approximately 1.6 miles in length with a two-way bicycle and pedestrian path on the eastbound side. Currently, bicyclists can ride across the Dumbarton Bridge toll-free, subject to posted regulations. Bicycle racks are provided on AC Transit and VTA buses.

The bicycle / pedestrian path demand is significantly less than capacity.

[33] San Francisco-Oakland Bay Bridge West Span Bicycle, Pedestrian, & Maintenance Pathway Project Study Report Preparation Memorandum. Prepared by BATA. Prepared for TY Lin. Submitted April 1, 2009.

9.0 Transbay Travel Summary

A summary of the 2000 and 2010 daily person-trips in the study area, disaggregated by bridge corridor and service type, is included in **Table 43**.

Table 43: Daily Transbay Demand – Current Conditions

Mode	Bay Bridge		San Mateo Bridge		Dumbarton Bridge		Total	
	2000	2010	2000	2010	2000	2010	2000	2010
Vehicle – SOV (1 person)	194,100	202,800	75,400	79,300	73,300	66,500	342,800	348,600
Vehicle – HOV (2 persons)	69,000	40,600	-	-	-	-	69,000	40,600
Vehicle – HOV (carpool)	136,300	46,300	34,000	23,600	32,300	23,700	202,600	93,600
Vehicle – Truck	10,300	6,400	2,900	6,300	1,500	3,600	14,700	16,300
Rail – BART	160,700	175,500	-	-	-	-	160,700	175,500
Bus	15,200	9,900	100	300	1,000	1,400	16,300	11,600
Ferry	4,900	4,500	-	-	-	-	4,900	4,500
Total Person-Trips	**590,500**	**486,000**	**112,400**	**109,500**	**108,100**	**95,200**	**811,000**	**690,700**
Total Vehicle-Trips	**276,600**	**247,500**	**92,200**	**97,000**	**88,100**	**81,800**	**456,900**	**426,300**
Total Transit-Trips	**180,800**	**189,900**	**100**	**300**	**1,000**	**1,400**	**181,900**	**191,600**

Source: 2000 Bay Crossings Study; AECOM, 2011.

Volume-to-Capacity Ratios

The capacity of each facility was calculated based on observed capacities and load factors. Bus and ferry calculations are not included since peak hour ridership data were not available. The volume-to-capacity (v/c) ratios for each of the transportation modes crossing the San Francisco Bay in the eastbound direction is included in **Table 44**.

Table 44: Volume-to-Capacity Ratio – Eastbound

Mode	Corridor	Weekday AM			Weekday PM			Daily Vol.
		Vol.	Cap.	v/c	Vol.	Cap.	v/c	
Vehicle – All	Bay Bridge	7,000	9,250	0.76	8,400	9,250	0.91	123,000
	San Mateo Bridge	2,600	5,550	0.47	4,900	5,550	0.88	51,000
	Dumbarton Bridge	2,100	5,550	0.38	5,400	5,550	0.97	49,000
	Total	**11,700**	**20,350**	**0.57**	**18,700**	**20,350**	**0.92**	**223,000**
Rail – BART	Bay Bridge	3,500	23,500	0.15	17,000	23,500	0.72	90,000
	Total	**3,500**	**23,500**	**0.15**	**17,000**	**23,500**	**0.72**	**90,000**

Source: AECOM, 2011.

The v/c ratios for each of the transportation modes crossing the San Francisco Bay in the westbound direction is included in **Table 45**.

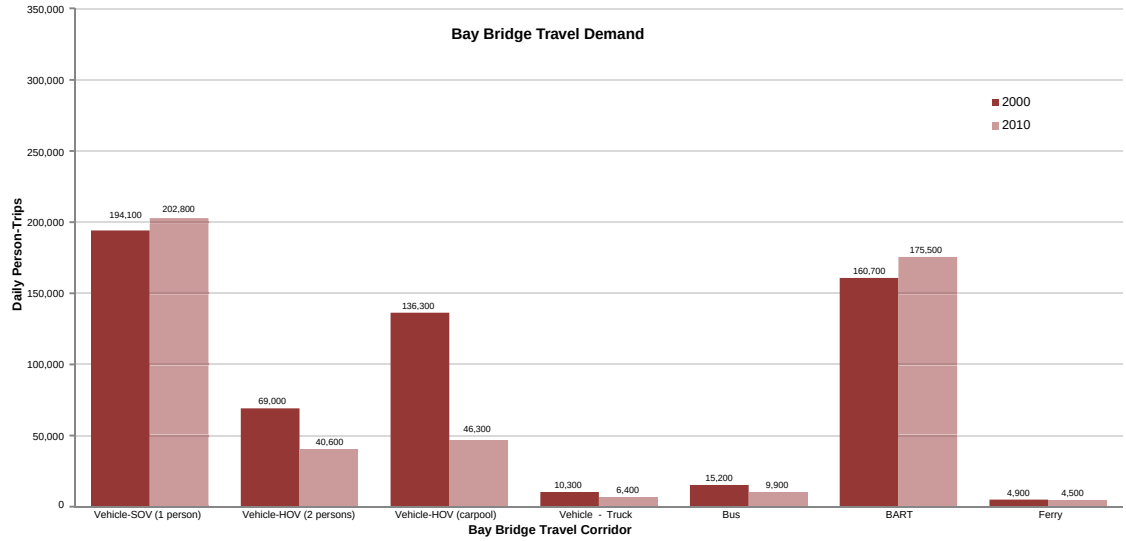
Table 45: Volume-to-Capacity Ratio – Westbound

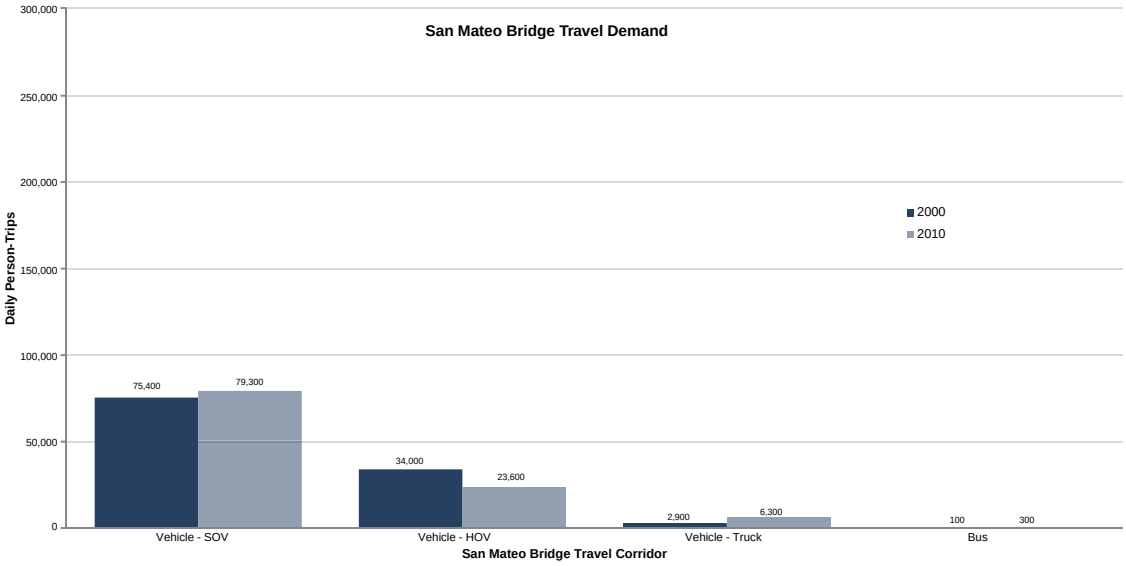
Mode	Corridor	Weekday AM			Weekday PM			Daily
		Vol.	Cap.	v/c	Vol.	Cap.	v/c	Vol.
Vehicle – All	Bay Bridge	9,200	9,250	0.99	7,400	9,250	0.80	124,500
	San Mateo Bridge	5,000	5,550	0.90	2,600	5,550	0.47	45,500
	Dumbarton Bridge	4,500	5,550	0.81	1,300	5,550	0.23	31,500
	Total	**18,700**	**20,350**	**0.92**	**11,300**	**20,350**	**0.56**	**201,500**
Rail – BART	Bay Bridge	19,000	23,500	0.81	4,100	23,500	0.17	87,000
	Total	**19,000**	**23,500**	**0.81**	**4,100**	**23,500**	**0.17**	**87,000**

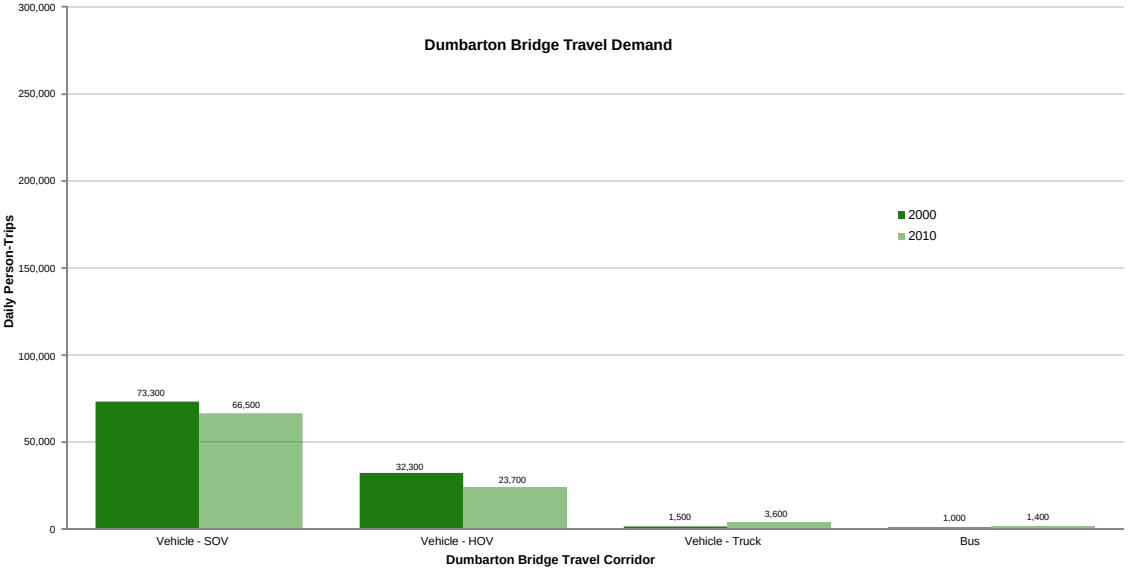
Source: AECOM, 2011.

Comparison to 2000 Bay Crossings Study

A comparison of weekday transbay person-trips for 2000 and 2010 is shown in **Figure 28**. A summary of weekday transbay person-trips for 2000 and 2010 is shown in **Figure 29**.







Current Conditions Transbay Travel Demand Comparison rev1.ai

April 8, 2011

Figure 28

Current Conditions Transbay Travel Demand Comparison

Daily Person-Trips

AECOM

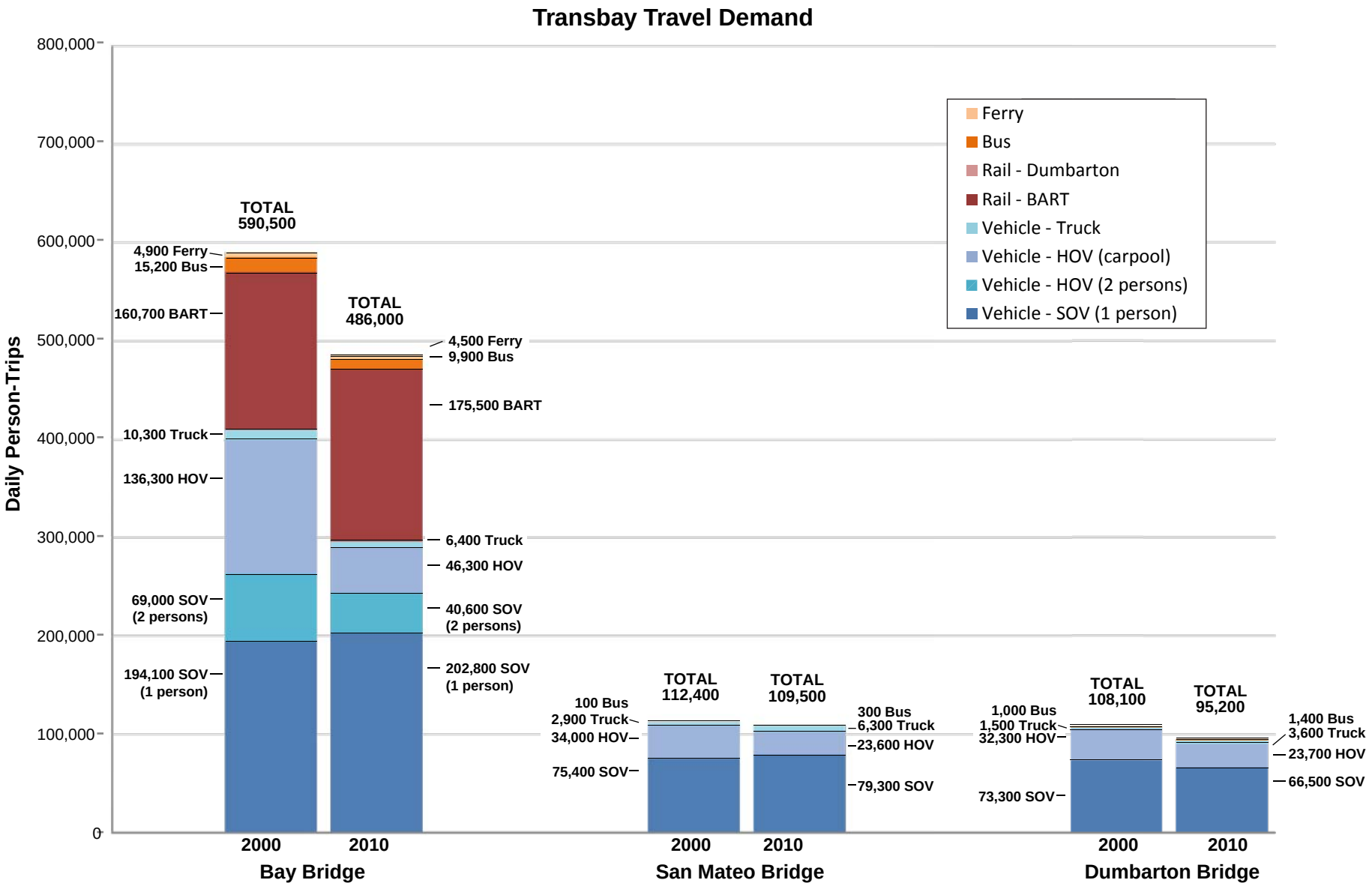


Figure 29

Current Conditions Transbay Travel Demand Summary

Daily Person Trips

10.0 Proposed Transportation Improvements

A brief summary of the transportation improvement projects in the study area that are presented in the *Transportation 2035 Plan for the San Francisco Bay Area* are included in **Table 46**. This document is herein referred to as the "Transportation 2035 Plan".[34]

Table 46: Proposed Transportation Improvements

Proposed Improvement	Location (County)	Notes
Procure buses for AC Transit Transbay, express / local service	Regional	
Extend Caltrain to Transbay Transit Center	Regional	Resolution 3434 / RM 2
Implement commuter rail service on Dumbarton Bridge	Regional	Resolution 3434
Improve ferry facilities / equipment including Downtown Ferry Terminal and procuring additional spare ferry vessels	Regional	Resolution 3434 / RM 2 / Prop. 1B
BART Transbay Tube Earthquake Safety Improvements	Regional	RM 2
I-80 from Alameda County line to Bay Bridge – convert HOV to Express Lanes	Alameda	
Expand ferry service between Alameda / Oakland and SF	Alameda	
Ferry service between Berkeley / Albany and SF	Alameda	
I-880 at SR 92 Interchange Improvements	Alameda	
Implement ferry service between Richmond and SF	Contra Costa	
Implement ferry service between Hercules and SF	Contra Costa	
I-80 new or upgraded corridor management and real-time traveler information improvements (Carquinez Bridge to Bay Bridge)	Contra Costa	
Bay Bridge ramp reconstruction at Yerba Buena Island tunnel	San Francisco	
Improve SF Ferry Infrastructure	San Francisco	
BART station improvements (safety, accessibility, capacity)	San Francisco	Proposition K
Improve Dumbarton Bridge access (includes flyovers, interchange improvements, conversion of Willow Rd between SR 84 and US 101 to expressway)	San Mateo	2004 Measure A
Improve SR 92 from San Mateo Bridge to I-280 (includes widening)	San Mateo	2004 Measure A
Construct ferry terminal at Redwood City	San Mateo	
Implement ferry service between South SF and Alameda/Oakland	San Mateo	Resolution 3434
Improve US 101 operations near SR 92	San Mateo	2004 Measure A
Improve station facilities and other rail improvements in Redwood City, Menlo Park, East Palo Alto in conjunction with Dumbarton Rail Corridor	San Mateo	2004 Measure A
Extend BART from Fremont (Warm Springs) to San Jose / Santa Clara	Santa Clara	

Source: Transportation 2035 Plan, 2009.

[34] *Transportation 2035 Plan for the San Francisco Bay Area: Change In Motion.* Prepared for the Metropolitan Transportation Commission. Prepared in collaboration with Association of Bay Area Governments (ABAG), Bay Area Air Quality Management District, and the Bay Conservation and Development Commission. Submitted April 2009.

Based on the Transportation 2035 Plan, the anchors of future planning in the Bay Area are the "Three E" principles of sustainability – economy, environment, and equity. The focus has shifted from the concept of developing infrastructure to support growth to guiding growth to maximize the existing facilities and future investments. The following is a brief summary of the plans, policies, laws, strategies, and studies that will shape the future of transportation in the Bay Area over the next several decades:

Transportation 2035 Plan provides the framework for improving transportation maintenance, safety, reliability, efficient freight travel, security, emergency management, clean air, climate protection, equitable access, and livable communities. The goals set the direction for the future, measure progress, evaluate transportation projects and programs needed to maintain the system, improve system efficiency, and strategically expand the system. The goals are supported by performance objectives, such as reducing the daily per-capita vehicle miles traveled by 10 percent in 2035 from today.

Assembly Bill (AB) 32 / Senate Bill (SB) 375 will allow the California Air Resources Board authority over sources of greenhouse gases (GHG) emissions, including cars and light trucks. Within urban regions, transportation accounts for 40 percent of GHG emissions, with cars and light trucks accounting for almost three-quarters of those emissions. AB 32 mandates a reduction in GHG emissions to 1990 levels by the year 2020. This equates to a 15 percent reduction in GHG emissions from today's levels in the next 10 years. The implementation of AB 32 and SB 375 will affect the prioritization and feasibility of potential transportation improvements in the Bay Area.

Resolution 3434 is a long-term, multifaceted funding strategy for directing local, regional, state, and federal dollars to nearly two dozen high-priority bus, rail, and ferry expansions. In addition to providing a framework for new transit facilities, Resolution 3434 includes a transit-oriented development policy that will help stimulate the construction of at least 42,000 new housing units along the Bay Area's major transit corridors and help the region boost transit ridership by over 50 percent by 2035.

Sustainable Communities Strategy (SCS) is a regional transportation plan that seeks to achieve targeted reductions in GHG emissions from cars and light trucks. The reduction targets for the Bay Area region were established at seven (7) percent and 15 percent under today's levels for 2020 and 2035, respectively. With the reduction targets established, the MTC will begin to develop a SCS with assistance from local and regional agencies, elected officials and the public.

FOCUS is a regional development and conservation strategy that promotes a more compact land use pattern for the Bay Area. This strategy is intended to link land use and transportation by encouraging the development of complete, livable communities in areas served by transit, and promotes conservation of the region's most significant resource lands. Through FOCUS, regional agencies will support local government commitments to these goals by working to direct existing and future incentives to infill development areas near transit facilities.

Mobility, Access, and Pricing Study is assessing the effects of charging motorists a user fee to access specific areas or routes within San Francisco during congested periods. Congestion pricing will be evaluated in combination with the improvements to transit, carpooling, bicycling, and walking that can be funded by congestion pricing proceeds.

Regional Airport Study is intended to assess when Bay Area airports will reach their capacities and what types of solutions will be most effective in addressing future capacity problems while responding to regional environmental and economic issues. The preferred alternatives will likely focus on a combination of new technologies and the redistribution of demand rather than the expansion of primary airport facilities and capacity. The redistribution of passenger demand at airports will require improved infrastructure as local travel patterns adapt to changes in service offered for regional travel.

With this framework defining the future of transportation network development in the Bay Area, many multi-modal transportation solutions are currently in progress, which range from initial study to construction. Furthermore, many concepts are available for consideration that are intended to relieve congestion by augmenting and rehabilitating the existing infrastructure.

11.0 Projected Conditions

Future travel demand forecasts have been developed for all transbay travel modes using the newly developed SCS / RTP travel demand model (version 0.1). This model includes the updated Association of Bay Area Governments (ABAG) Projections 2011 and MTC's 2035 Transportation Plan network. Average vehicle occupancy rates from 2010 were applied to model traffic volumes to obtain 2035 daily person-trips. A summary of the forecasted 2025 and 2035 daily person-trips in the study area, disaggregated by bridge corridor and service type, is included in **Table 47**.

Table 47: Daily Transbay Demand – Projected Conditions

Mode	Bay Bridge		San Mateo Bridge		Dumbarton Bridge		Total	
	2025	2035	2025	2035	2025	2035	2025	2035
Vehicle – SOV (1 person)	379,600	255,100	141,400	97,700	91,400	79,700	612,400	432,500
Vehicle – HOV (2 persons)	-	58,300	-	-	-	-	-	58,300
Vehicle – HOV (carpool)	105,000	54,100	35,700	33,500	22,200	42,400	162,900	130,000
Vehicle – Truck	6,400	3,700	2,600	1,700	700	600	9,700	6,000
Rail – BART	254,000	224,000	-	-	-	-	254,000	224,000
Rail – Dumbarton	-	-	-	-	-	11,000	-	11,000
Bus	19,800	12,800	0	600	1,300	200	21,100	13,600
Ferry	7,100	36,000	-	-	-	-	7,100	36,000
Total Person-Trips	**771,900**	**644,000**	**179,700**	**133,500**	**115,600**	**133,900**	**1,067,200**	**911,400**
Total Vehicle-Trips	**422,900**	**309,000**	**158,600**	**115,900**	**101,300**	**101,400**	**682,800**	**526,300**
Total Transit-Trips	**280,900**	**272,800**	**0**	**600**	**1,300**	**11,200**	**282,200**	**284,600**

Source: 2000 Bay Crossings Study; AECOM, 2011.

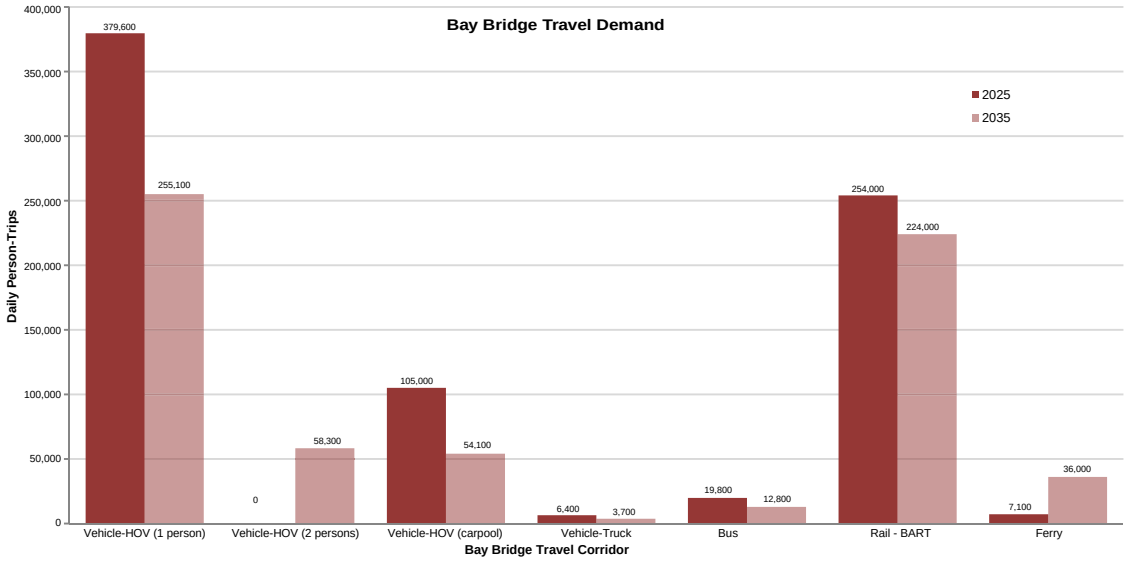
Specific HOV (2 persons) results were not provided in the 2000 Bay Crossings Study and are combined with the SOV (1 person) results. In general the 2025 projections were higher than the 2035 projections. The number of daily person-trips crossing the Bay Bridge and San Mateo Bridge corridors is projected to be approximately 17 percent and 26 percent less, respectively, in 2035 than was projected in 2025. For the Dumbarton Bridge, the 2035 projections are 16 percent higher than the 2025 projections. The total number of daily-person trips crossing the three (3) corridors is projected to be approximately 155,800 less in 2035 than was projected in 2025.

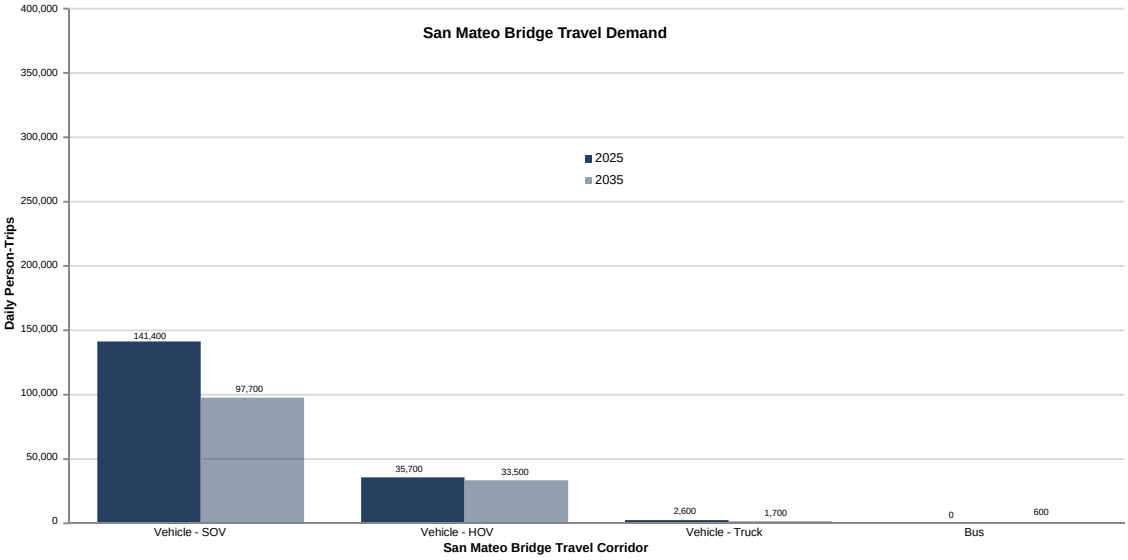
A comparison of weekday transbay person-trips for 2025 and 2035 is shown in **Figure 30**. A summary of weekday transbay person-trips for 2000 and 2010 is shown in **Figure 31**.

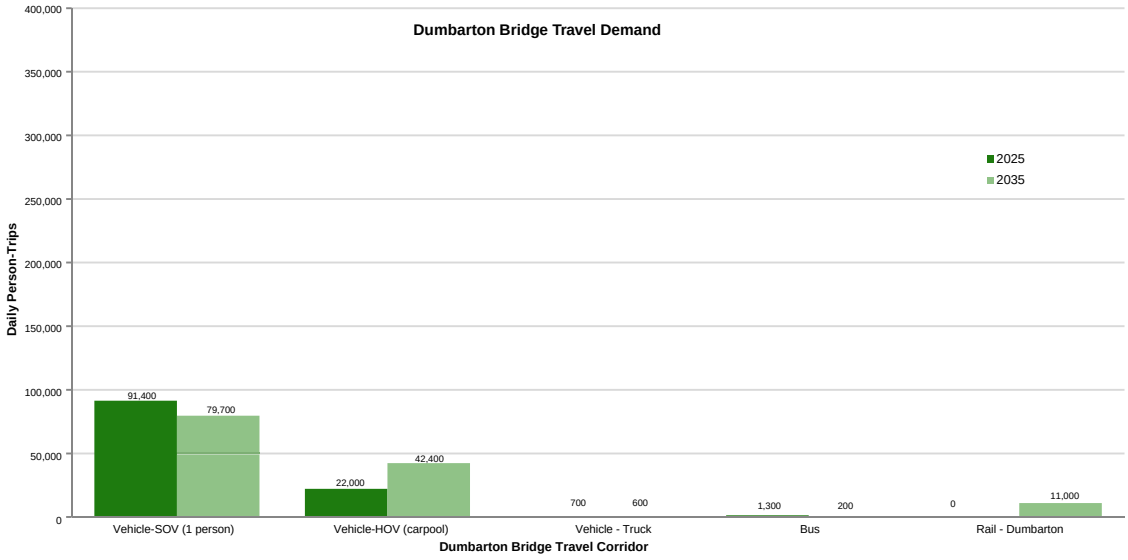
Transbay Travel Summary

The total number of daily crossings of the San Francisco Bay is expected to increase from 690,700 in 2010 to 911,400 in 2035 – a 32 percent increase. Of these 911,400 person-trips projected in 2035, approximately 644,000 would travel the Bay Bridge corridor, 133,500 would travel the San Mateo Bridge corridor, and 133,900 would travel the Dumbarton Bridge corridor. A summary of the 2010 and forecasted 2035 daily person-trips in the study area, disaggregated by bridge corridor and service type, is included in **Table 48**.

A summary of the 2010 and forecasted 2035 daily person-trips in the study area, disaggregated by bridge corridor and service type, is shown in **Figure 32**.







Projected Conditions Transbay Travel Demand Comparison rev1.ai

Figure 30

Projected Conditions Transbay Travel Demand Comparison

Daily Person-Trips

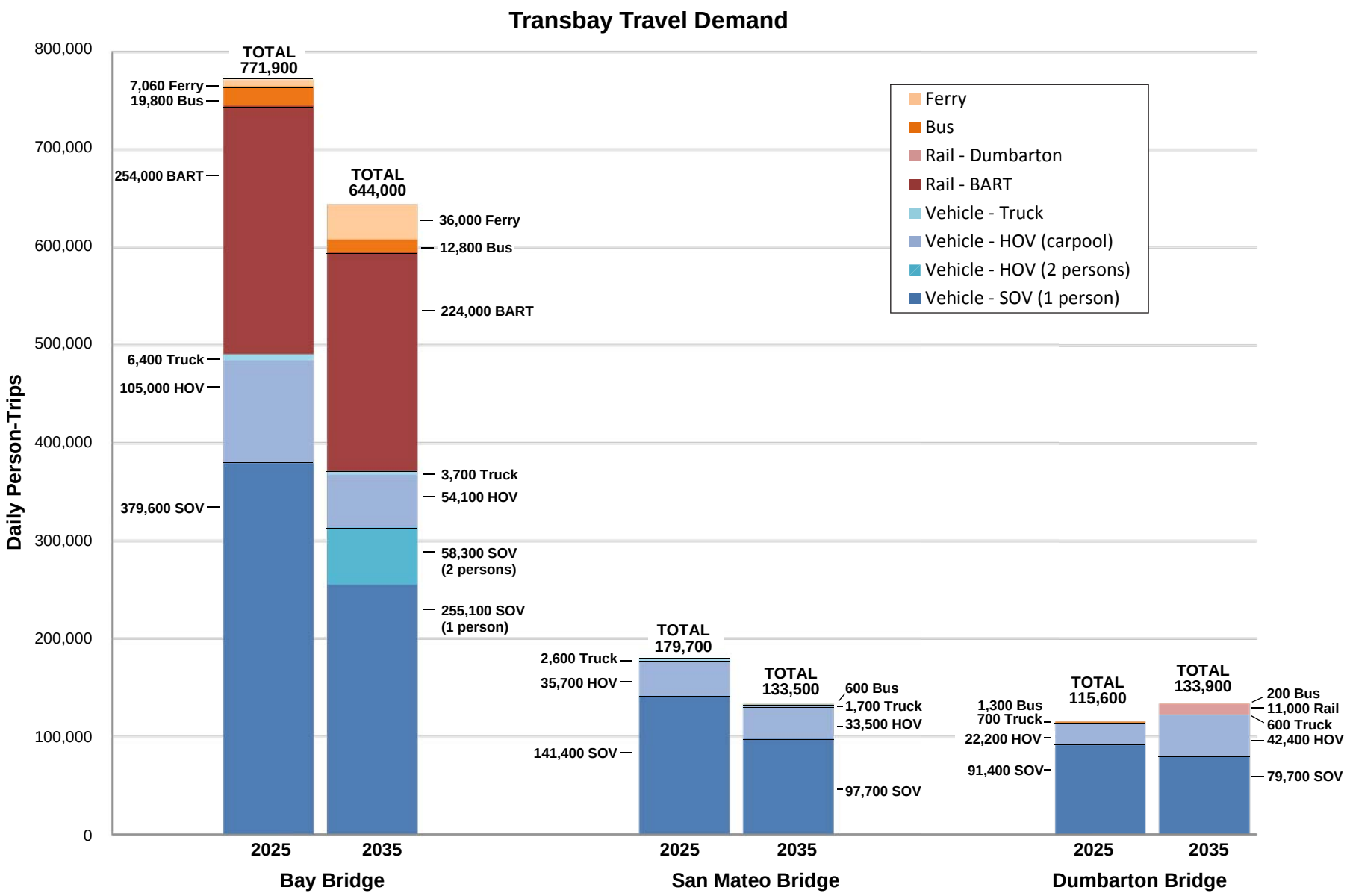


Figure 31

Projected Conditions Transbay Travel Demand Summary

Daily Person Trips

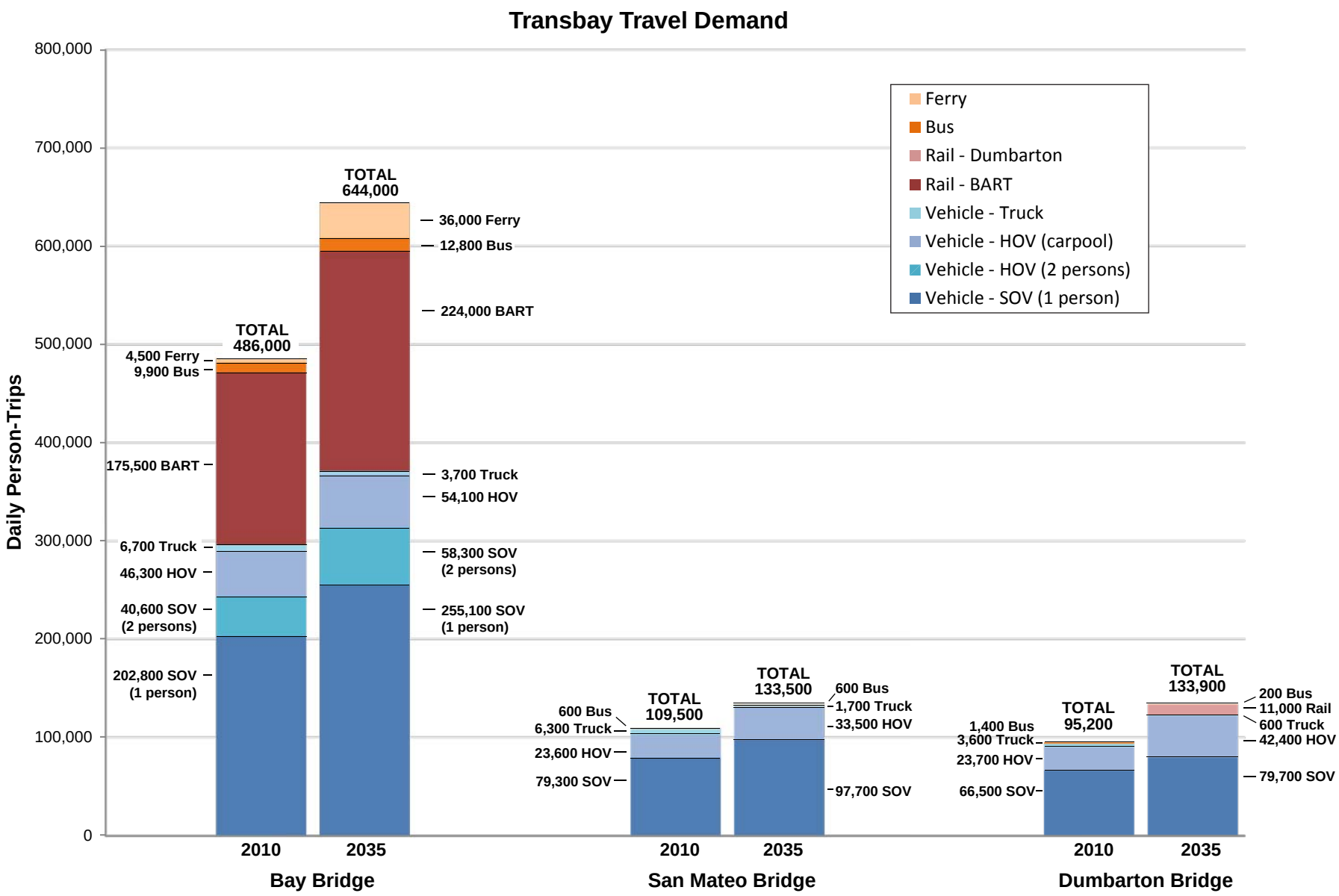


Figure 32

Transbay Travel Demand Summary

Daily Person Trips

Table 48: Daily Transbay Demand

Mode	Bay Bridge		San Mateo Bridge		Dumbarton Bridge		Total	
	2010	2035	2010	2035	2010	2035	2010	2035
Vehicle – SOV (1 person)	202,800	255,100	79,300	97,700	66,500	79,700	348,600	432,500
Vehicle – HOV (2 persons)	40,600	58,300	-	-	-	-	40,600	58,300
Vehicle – HOV (carpool)	46,300	54,100	23,600	33,500	23,700	42,400	93,600	130,000
Vehicle – Truck	6,400	3,700	6,300	1,700	3,600	600	16,300	6,000
Rail – BART	175,500	224,000	-	-	-	-	175,500	224,000
Rail – Dumbarton	-	-	-	-	-	11,000	-	11,000
Bus	9,900	12,800	300	600	1,400	200	11,600	13,600
Ferry	4,500	36,000	-	-	-	-	4,500	36,000
Total Person-Trips	**486,000**	**644,000**	**109,500**	**133,500**	**95,200**	**133,900**	**690,700**	**911,400**
Total Vehicle-Trips	**247,500**	**309,000**	**97,000**	**115,900**	**81,800**	**101,400**	**426,300**	**526,300**
Total Transit-Trips	**189,900**	**272,800**	**300**	**600**	**1,400**	**11,200**	**191,600**	**284,600**

Source: AECOM, 2011.