CAMBRIDGE SYSTEMATICS

Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study

Levels-of-Service Assumptions and Forecast Alternatives

draft

report

prepared for

Metropolitan Transportation Commission and

California High-Speed Rail Authority

prepared by

Cambridge Systematics, Inc.

with

SYSTRA Consulting, Inc.
Citilabs

August 2006

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Table of Contents

1.0 Introduction 1-1
1.1 Purpose of the Report 1-1
1.2 Data Sources 1-1
1.3 Contents of This Report 1-2

2.0 Level-of-Service Assumptions 2-1
2.1 Cost Assumptions 2-1
Auto Operating Costs 2-1
Bridge Tolls 2-3
Line-Haul Fares 2-3
Air 2-3
High-Speed Rail 2-9
Conventional Rail 2-11
Access-Egress Costs 2-21
2.2 Travel Times 2-22
Line-Haul Times 2-23
Auto 2-23
Air 2-24
High-Speed Rail 2-24
Conventional Rail 2-24
Frequencies 2-33
Air 2-33
High-Speed Rail 2-33
Conventional Rail 2-38
Access-Egress Times 2-38
Wait Times 2-38
Air 2-39
Rail 2-39
Terminal Times 2-40
Air and Rail 2-40
Auto 2-41
Transfer Times 2-41
Examples of Door-to-Door Travel Time Calculations 2-42
2.3 Reliability 2-42

Auto Travel 2-44
Air 2-46
Conventional Rail 2-46
High-Speed Rail 2-49

3.0 Future Baseline Network 3-1
3.1 Project List 3-1

4.0 Forecast Alternatives 4-1
4.1 Station Locations 4-1
4.2 High-Speed Rail Train Service Patterns 4-4
4.3 Project Alternatives 4-5
4.4 Sensitivity Tests 4-6

List of Tables

Table 2.1 Automobile Operating Cost in California (in 2005 Dollars).....2-2

Table 2.2 Year 2000 Air Fares (One-Way Fares) *In 2005 Dollars*.....2-4

Table 2.3 Year 2005 Air Fares (One-Way Fares) *In 2005 Dollars*.....2-7

Table 2.4 Initial Average High-Speed Rail Fares (One-Way Fares) (in 2005 Dollars) for Pacheco Pass 2-12

Table 2.5 Initial Average High-Speed Rail Fares (One-Way Fares) (in 2005 Dollars) for Altamont Pass.....2-14

Table 2.6 Altamont Commuter Express (ACE) Fares (in 2005 Dollars).....2-16

Table 2.7 San Joaquin Line Fares (in 2005 Dollars).....2-17

Table 2.8 Capitol Corridor Fares (in 2005 Dollars).....2-18

Table 2.9 Pacific Surfliner Fares (in 2005 Dollars) 2-19

Table 2.10 Metrolink Orange County Line Fares (in 2005 Dollars).....2-20

Table 2.11 Airport Parking Charges (in 2005 Dollars) 2-21

Table 2.12 Initial High-Speed Rail Daily Parking Charges (in 2005 Dollars) 2-22

Table 2.13 Auto Travel Times between Selected City Pairs *Year 2000*.....2-23

Table 2.14 Year 2000 and 2005 Airport Line-Haul Times.....2-25

Note: Line-haul times for outbound and return flights have been averaged to produce a single run time for both directions of travel. This includes direct and connecting service for intrastate flights where demand in 2005 is greater than one trip per day (400 annual trips). 2-25

Table 2.15 High-Speed Rail Travel Times (in Minutes) for Pacheco Pass.....2-26

Table 2.16 High-Speed Rail Travel Times (in Minutes) for Altamont Pass 2-27

Table 2.17 Altamont Commuter Express Line-Haul Travel Times (in Minutes).....2-28

Table 2.18 San Joaquin Line-Haul Travel Times (in Minutes).....2-29

Table 2.19 Capitol Corridor Line-Haul Travel Times (in Minutes).....2-30

Table 2.20 Pacific Surfliner Year 2000 Line-Haul Travel Times (in Minutes)....2-31

Table 2.21 Metrolink Orange County Line Year 2000 Line-Haul Times 2-32

Table 2.22 Year 2000 Daily Airport Headways *In Minutes*.....2-34

Table 2.23 Year 2005 Peak-Period Airport Headways *In Minutes* 2-35

Table 2.24 Interregional Conventional Rail Frequencies (in Minutes) 2-38

Table 2.25 Auto Terminal Times in Minutes 2-41

Table 2.26 Selected Detailed Door-to-Door Travel Times by Interregional Mode and Trip Purpose (in Minutes) 2-43

Table 2.27 Airline Reliability 2-47

Table 3.1 San Francisco Bay Area Transit Improvements *2000 Through 2005* ... 3-2

Table 3.2 San Francisco Bay Area Highway Improvements *Differences Between Year 2000 and 2006* 3-3

Table 3.3 Sacramento Region Highway and Transit Improvements, 2000 to 2030 3-5

Table 3.4 SCAG Highway and Transit Improvements 2000 to 2030 3-6

Table 3.5 San Diego Region Transportation Improvements 2000 to 2030 3-8

Table 4.1 Draft High Speed Rail Alternatives Definitions 4-5

Table 4.2 Potential Sensitivity Tests 4-6

List of Figures

Figure 2.1 Generalized High-Speed Rail Peak Headways (in Minutes) *Southern Alignment Initial Alternative* 2-36

Figure 2.2 Generalized High-Speed Rail Peak Headways (in Minutes) *Northern Alignment Initial Alternative* 2-37

Figure 4.1 Proposed Northern California High-Speed Rail Stations and Alignments 4-2

Figure 4.2 Proposed Southern California High-Speed Rail Stations and Alignments 4-3

1.0 Introduction

1.1 PURPOSE OF THE REPORT

This report examines levels-of-service (LOS) assumptions and future alternatives for the Bay Area/California High-Speed Rail (HSR) Ridership and Revenue Forecasting Study. LOS assumptions include costs (i.e., operating costs and fare prices), service frequencies, travel and access/egress times, terminal times, and reliability measures for each of the interregional travel modes under consideration – auto, air, conventional rail (CR), and high-speed rail.

The initial draft of this report was presented to the peer review panel on June 2, 2006. In most cases, peer review panel comments and suggestions have been incorporated into this updated report. Instances where peer review panel recommendations have not been used are described in the text.

This report also examines future rail alternatives. This project calls for testing in at least 72 alternatives. This report will identify station locations for the proposed high-speed rail system, as well as transit connections in the Bay Area, train patterns, and the background future transit networks.

1.2 DATA SOURCES

Data comes from a variety of sources. Much of the information has been pre-determined from earlier bodies of work. For example, assumptions about the future background highway and transit networks generally come from existing regional and metropolitan transportation plans. As appropriate, this report identifies data sources for each assumption. Some other data were newly researched. The consultant team has compiled data on air travel times and fares between California airport pairs. This report contains three sets of data for comparison:

1. Observed travel data for the year 2000 base year,
2. Year 2005 existing conditions, and
3. Previously-developed California High-Speed Rail Authority (CHSRA) network assumptions.

All costs and incomes are reported in year 2005 dollars, unless otherwise noted.

This study also includes an extensive new data collection effort of interregional revealed- and stated-preference travel patterns. New data collection comprises 3,172 revealed and stated-preference surveys of California interregional air, auto, and rail passengers. These surveys provide a rich source of data on areas, such as access/egress times and costs, and airport terminal times.

Information on the network alternatives has been developed specifically for this study, and in cooperation with the Regional Rail Study. For the purposes of this study the initial forecast assumptions will be established to match the previous work done by the CHSRA so that a direct comparison can be made. Following this initial comparison, forecast assumptions may be modified based on new information and subjected to sensitivity analyses of key variables.

1.3 CONTENTS OF THIS REPORT

There are four sections in this report: 1) the introduction, 2) a presentation of the level-of-service assumptions, 3) a description of the future baseline network, and 4) a summary of the future alternatives. Level-of-service assumptions include cost, travel times, and reliability. The description of the future alternatives includes station locations, high-speed rail service patterns, project alternatives, and sensitivity tests.

This report builds on two other reports developed in earlier states of this project:

1. *High-Speed Rail Study Survey Documentation*, prepared for Cambridge Systematics and the Metropolitan Transportation Commission (MTC) by Corey, Canapary & Galanis Research, December 2005; and
2. *Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study Socioeconomic Data, Transportation Supply, and Base Year Travel Patterns Data*, Cambridge Systematics, December 2005.

These reports are available upon request.

2.0 Level-of-Service Assumptions

Level-of-service (LOS) assumptions have been developed for the four interregional travel modes: auto, conventional rail, high-speed rail, and air. These assumptions cover three broad categories: costs, times and reliability, and taken together are called travel skims. Costs include line-haul fares, as well as access and egress charges. Times include line-haul times, frequencies (which define wait times), access/egress time, terminal times, and transfer times.

Reliability is a newly developed measure for the new statewide model system. Reliability was included in the stated-preference (SP) survey choice experiment options, along with the more traditional time and cost variables.

The travel skims have been developed using the new Cube program Public Transport (PT). PT varies from previous transit network/assignment modules in development of paths. PT is a significant enhancement over past transit path-building and assignment modules, because the transit path finding algorithm finds all possible transit paths for the zone pairs with the specified parameters (maximum travel time, access time, number of transfers, etc.); and assigns them to each route based on probability. PT reports average skims; whereas, earlier modules used an "all-or-nothing" process to assign all trips to the best path.

2.1 COST ASSUMPTIONS

Cost assumptions include auto operating costs, as well as fares for conventional and high-speed rail and air travel. Cost assumptions also include access and egress costs, such as parking charges at airports. All cost assumptions are in 2005 constant dollars, unless otherwise specified.

Auto Operating Costs

The consultant team prepared the auto operating costs with data that MTC has compiled on an ongoing basis (up to April 2006). The auto operating costs are comprised of gasoline and non-gasoline operating costs. Gasoline operating costs are calculated on a per-mile basis from the price of average retail gasoline divided by the average fuel economy. MTC obtains monthly retail gasoline costs from the California Energy Commission (CEC). A constant average fuel economy of 21.9 miles per gallon has been assumed.

Non-gas operating costs include maintenance and repair, motor oil, parts, and accessories. The California Department of Energy used to track the non-gas operating costs, but more recently MTC has assumed that non-gas operating costs are fixed to 60 percent that of gasoline operating costs.

The year 2000 model system will use year 2000 automobile operating costs, while the 2005 model runs will use the 2005 value shown in Table 2.1. For the future

year model runs (years 2020, 2030, and 2050), April 2006 auto operating costs will be used for the model runs. The April 2006 auto operating costs account for a large part of the recent run-up in gas prices.

Table 2.1 Automobile Operating Cost in California (in 2005 Dollars)

Year	Retail Gas Price (Current $)	Annual Inflation	Gas Price	Gasoline Operating Cost (Cent/ Mile)	Non-Gas Operating Cost (Cent/ Mile)	Total Auto Operating Cost (Cent/ Mile)
1990	$1.241		$1.904	8.70	3.05	**11.75**
1991	$1.197	4.4%	$1.759	8.03	3.43	**11.46**
1992	$1.302	3.3%	$1.852	8.46	3.57	**12.03**
1993	$1.299	2.7%	$1.800	8.22	3.70	**11.92**
1994	$1.275	1.6%	$1.738	7.94	3.45	**11.39**
1995	$1.286	2.0%	$1.719	7.85	3.57	**11.42**
1996	$1.434	2.3%	$1.874	8.56	3.47	**12.03**
1997	$1.448	3.4%	$1.830	8.36	5.57	**13.93**
1998	$1.304	3.2%	$1.597	7.29	4.86	**12.15**
1999	$1.514	4.2%	$1.779	8.12	5.42	**13.54**
2000	$1.832	4.5%	$2.061	9.41	6.27	**15.68**
2001	$1.800	5.4%	$1.921	8.77	5.85	**14.62**
2002	$1.599	1.6%	$1.679	7.67	5.11	**12.78**
2003	$1.933	1.8%	$1.995	9.11	6.07	**15.18**
2004	$2.165	1.2%	$2.207	10.0	6.72	**16.80**
2005	$2.522	2.0%	$2.522	11.5	7.68	**19.19**
April 06	$2.933	2.3%	$2.868	13.11	8.73	**21.83**

Source: MTC 2005 Regional Transportation Plan Assumptions, Table 3, Historical and Projected Regional Auto Operating Costs, 1990 to 2030.

Auto operating costs were assumed to be $0.10 and $0.05 per person per mile for business and non-business travel, respectively (in 1995 dollars) in the previous CHSRA modeling effort. The 1999 CRA report indicated that the same per person/per mile auto travel costs from the 1996 model was used again with costs inflated to 1999 dollars. This translates to $0.15 and $0.12 per mile (assuming 1.42 persons per vehicle according to the California Department of Transportation (Caltrans) Statewide Model[1]), which is lower overall than the

[1] California Department of Transportation and Dowling Association, *Caltrans Statewide Model Description*, Table 13, January 20, 2004.

$0.19 per mile assumed by the MTC analysis for all trips. This lower estimate is likely due to the recent high prices in gasoline not foreseen back in 1995.

An important assumption will be future gas prices for the purposes of alternatives evaluation for 2020, 2030, and 2050 forecasts. Gasoline prices are notoriously volatile, and we assume a constant cost of gasoline (with respect to inflation), rather than a real annual increase in auto operating costs. In addition, we will test the sensitivity of ridership forecasts to changes in gas prices by increasing the cost of gasoline.

Bridge Tolls

Tolls are charged on seven California bridges – all of them in the San Francisco Bay Area. Current tolls are $3 on all seven bridges, except the Golden Gate, which is $5 in year 2000 and $4 on all seven bridges beginning in 2007. The other six bridges include the Dumbarton, San Mateo-Hayward, San Francisco Bay, Carquinez, Benicia-Martinez, and Antioch. There are two bridge facilities that no longer charge tolls. These are the Gerald Desmond Bridge (serving the Ports of Long Beach and Los Angeles) and the Coronado Bridge (serving Coronado Island in San Diego).

Line-Haul Fares

Air

Line-haul air fares were obtained the Federal Aviation Administration and supplemented with data from several web sites over several months to obtain data on air fares for origin-destination pairs in California. Year 2000 and 2005 air fares are shown in Tables 2.2 and 2.3, respectively. The fares were obtained directly for year 2000 and 2005 from the 10 percent ticket sample maintained by the FAA. Business and non-business fares were queried and summarized separately, but there was no significant difference overall in these markets between business and non-business fares, so they were averaged for the purposes of this table.

Table 2.2 Year 2000 Air Fares (One-Way Fares)
In 2005 Dollars

		SAN	SNA	LGB	LAX	ONT	BUR	SJC	SFO	OAK	SMF	PSP	OXR	SBA	BFL	FAT	MRY	ACV
San Diego	SAN																	
Santa Ana	SNA																	
Long Beach	LGB																	
Los Angeles	LAX	$127																
Ontario	ONT																	
Burbank	BUR																	
San Jose	SJC	$86	$73		$77	$85	$91											
San Francisco	SFO	$105	$112		$98	$87	$109											
Oakland	OAK	$91	$61	$68	$65	$82	$89											
Sacramento	SMF	$73	$85	$75	$74	$85	$84		$127									
Palm Springs	PSP				$100			$86	$97	$81	$118							
Oxnard	OXR								$134	$78	$82							
Santa Barbara	SBA	$130			$94			$94	$104	$140	$94							
Bakersfield	BFL								$114		$120							
Fresno	FAT	$137	$100		$120													
Monterey	MRY	$113	$151		$116							$159						
Arcata/Eureka	ACV	$91	$105		$100	$98	$99		$96			$157						
Modesto	MOD	$171	$139		$143													

Source: Federal Aviation Administration data from the 10 percent ticket sample, supplemented with internet queries conducted between March and December 2005.

Note: In some cases where growth rates between 2000 and 2005 quoted in the FAA data were unreasonable, a 20 percent average growth rate was used. This includes direct and connecting service for intrastate flights where demand in 2005 is greater than one trip per day (400 annual trips).

Table 2.3 Year 2005 Air Fares (One-Way Fares)

In 2005 Dollars

		SAN	SNA	LGB	LAX	ONT	BUR	SJC	SFO	OAK	SMF	PSP	OXR	SBA	BFL	FAT	MRY	ACV
San Diego	SAN																	
Santa Ana	SNA																	
Long Beach	LGB																	
Los Angeles	LAX	$166																
Ontario	ONT																	
Burbank	BUR																	
San Jose	SJC	$97	$92		$96	$93	$102											
San Francisco	SFO	$144	$156		$139	$126	$133											
Oakland	OAK	$103	$79	$81	$85	$95	$104											
Sacramento	SMF	$93	$102	$90	$89	$92	$98		$152									
Palm Springs	PSP				$171			$117	$119	$97	$168							
Oxnard	OXR								$152	$133	$142							
Santa Barbara	SBA	$200			$145			$113	$139	$168	$113							
Bakersfield	BFL								$137		$132							
Fresno	FAT	$166	$120		$175													
Monterey	MRY	$139	$181		$140							$171						
Arcata/Eureka	ACV	$163	$169		$120	$186	$172		$148			$188						
Modesto	MOD	$205	$170		$153													

Source: Federal Aviation Administration data from the 10 percent ticket sample.

Note: In some cases where growth rates between 2000 and 2005 quoted in the FAA data were unreasonable, a 20 percent average growth rate was used. This includes direct and connecting service for intrastate flights where demand in 2005 is greater than one trip per day (400 annual trips).

High-Speed Rail

An important part of this project will be to evaluate different high-speed rail fare policies in order to maximize benefits. As such, the study team and peer review panel has agreed that, as a **starting** point, fare assumptions similar to those developed by Charles Rivers Associates (CRA) for the previous high-speed rail model will be employed here. CRA's base fare structure for interregional trips was based on 50 percent of the average 1995 Los Angeles-Bay Area airfare of $58 (in 1995 dollars). This structure included a boarding charge of $20.00 and a distance charge of $0.10 per mile (assuming an approximate high-speed rail distance of 379 miles between Los Angeles Union Station (LAUS) and Transbay Terminal). Using the average airfare of $99 (in 2005 dollars) in our current model, the high-speed rail fare would equate to a boarding charge of $15.00 and a distance charge of $0.09 per mile.

For intraregional commuter travel, CRA assumed a $5.00 boarding charge, and a $0.06 per mile distance charge (in 1999 dollars). Intraregional high-speed rail fares were assumed to be 50 percent higher, on average, than corresponding conventional rail fares, with a $7.00 boarding fare and a per-mile charge of $0.06 cents. Both the inter- and intraregional per-mile high-speed rail charges were applied to the driving distance between stations in order to avoid different fare structures for Altamont and Pacheco high-speed rail routings. The initial high-speed rail fare assumptions are presented in Tables 2.4 and 2.5 for Pacheco Pass and Altamont Pass, respectively. The increase in the intraregional boarding charge and decrease in interregional boarding charge relative to CRA assumptions, were designed to reduce the large increase in fares between intra- and interregional fares at the borders of the regions.

Conventional Rail

Interregional conventional rail (CVR) fares for the San Joaquin, Altamont Commuter Express (ACE), Capitol Corridor, Pacific Surfliner, and Metrolink (Oceanside line) lines are shown in Tables 2.6 through 2.10, respectively. Real conventional rail fares will be held constant for all forecast years (2000, 2005, 2020, 2030, and 2050), based on these 2005 fares.

Station-to-station conventional rail fares have been determined by taking the per-ride cost of a multiride ticket (typically 10 to 20 ride tickets), where offered. Exceptions are the Pacific Surfliner and San Joaquin routes, where one-way ticket costs are used. The other three conventional rail lines offer three types of tickets: one-way (or round-trip), multiride and monthly passes. Both the multiride ticket and monthly passes offer significant discounts over single-ride tickets. Multiride fares are used because they represent the mid-cost fare, recognizing many riders are regular users. The type of fare instrument used is noted in the title of each of table.

Table 2.4 Initial Average High-Speed Rail Fares (One-Way Fares) (in 2005 Dollars) for Pacheco Pass

	SF	TWN	MLB	RDC	PA	WO7	COL	UNC	WSP	SJ	MH	GIL	SAC	STK	MOD	MER
San Francisico	N/A	$7	$8	$9	$9	N/A	N/A	N/A	N/A	$10	$11	$12	$40	$37	$34	$30
Townsend St	$7	N/A	$8	$9	$9	N/A	N/A	N/A	N/A	$10	$11	$11	$40	$36	$34	$30
Millbrae	$8	$8	N/A	$8	$8	N/A	N/A	N/A	N/A	$9	$10	$11	$39	$35	$32	$29
Redwood City	$9	$9	$8	N/A	$7	N/A	N/A	N/A	N/A	$8	$9	$10	$38	$34	$31	$28
Palo Alto	$9	$9	$8	$7	N/A	N/A	N/A	N/A	N/A	$8	$9	$10	$38	$34	$31	$28
West Oakland / 7th	N/A	N/A	N/A	N/A	N/A	N/A	$7	$8	$9	$10	$11	$11	$40	$36	$33	$30
Oakland Coliseum	N/A	N/A	N/A	N/A	N/A	$7	N/A	$8	$8	$9	$10	$11	$39	$35	$33	$29
Union City	N/A	N/A	N/A	N/A	N/A	$8	$8	N/A	$8	$8	$9	$10	$38	$34	$31	$28
Warm Springs	N/A	N/A	N/A	N/A	N/A	$9	$8	$8	N/A	$8	$9	$10	$37	$33	$30	$27
San Jose	$10	$10	$9	$8	$8	$10	$9	$8	$8	N/A	$8	$9	$36	$32	$29	$26
Morgan Hill	$11	$11	$10	$9	$9	$11	$10	$9	$9	$8	N/A	$8	$34	$30	$28	$24
Gilroy	$12	$11	$11	$10	$10	$11	$11	$10	$10	$9	$8	N/A	$33	$30	$27	$23
Sacramento	$40	$40	$39	$38	$38	$40	$39	$38	$37	$36	$34	$33	N/A	$19	$22	$25
Stockton	$37	$36	$35	$34	$34	$36	$35	$34	$33	$32	$30	$30	$19	N/A	$18	$21
Modesto (Briggsmore)	$34	$34	$32	$31	$31	$33	$33	$31	$30	$29	$28	$27	$22	$18	N/A	$18
Merced (SP Downtown)	$30	$30	$29	$28	$28	$30	$29	$28	$27	$26	$24	$23	$25	$21	$18	N/A
Fresno	$32	$32	$31	$30	$30	$32	$31	$30	$29	$28	$26	$25	$30	$26	$23	$20
Bakersfield	$42	$42	$41	$40	$40	$42	$41	$40	$39	$38	$36	$35	$40	$36	$33	$30
Palmdale Airport (PMD)	$50	$50	$49	$48	$47	$50	$49	$48	$47	$46	$44	$43	$48	$44	$41	$38
Sylmar	$54	$53	$52	$51	$51	$53	$52	$51	$50	$49	$47	$47	$51	$47	$44	$41
Burbank	$55	$54	$53	$52	$52	$54	$53	$52	$51	$50	$48	$47	$52	$48	$45	$42
Los Angeles	$55	$55	$54	$53	$53	$55	$54	$53	$52	$51	$49	$48	$53	$49	$46	$43
Norwalk	$57	$57	$55	$54	$54	$56	$56	$54	$54	$52	$51	$50	$54	$51	$48	$44
Anaheim	$58	$58	$57	$56	$55	$58	$57	$56	$55	$54	$52	$51	$56	$52	$49	$46
Irvine	$59	$59	$58	$57	$57	$59	$58	$57	$56	$55	$53	$52	$57	$53	$50	$47
City of Industry	$58	$58	$56	$55	$55	$57	$57	$55	$55	$53	$52	$51	$55	$52	$49	$45
Ontario Airport (ONT)	$59	$59	$58	$57	$56	$59	$58	$57	$56	$55	$53	$52	$57	$53	$50	$47
Riverside	$61	$61	$60	$59	$58	$61	$60	$59	$58	$57	$55	$54	$59	$55	$52	$49
Murrieta / Temecula	$64	$64	$63	$61	$61	$63	$63	$61	$61	$60	$58	$57	$62	$58	$55	$51
Escondido	$67	$67	$65	$64	$64	$66	$66	$64	$63	$62	$61	$60	$64	$60	$57	$54
University City	$69	$69	$67	$66	$66	$68	$68	$66	$66	$64	$63	$62	$66	$62	$60	$56
San Diego	$70	$70	$69	$68	$67	$69	$69	$67	$67	$66	$64	$63	$68	$64	$61	$58

Table 2.4 Initial High-Speed Rail Fares (One-Way Fares) (in 2005 Dollars) for Pacheco Pass (continued)

	FRS	BKR	PMD	SYL	BUR	LA	NWK	ANA	IRV	IND	ONT	RVR	TEM	ESC	UNI	SD
San Francisico	$32	$42	$50	$54	$55	$55	$57	$58	$59	$58	$59	$61	$64	$67	$69	$70
Townsend St	$32	$42	$50	$53	$54	$55	$57	$58	$59	$58	$59	$61	$64	$67	$69	$70
Millbrae	$31	$41	$49	$52	$53	$54	$55	$57	$58	$56	$58	$60	$63	$65	$67	$69
Redwood City	$30	$40	$48	$51	$52	$53	$54	$56	$57	$55	$57	$59	$61	$64	$66	$68
Palo Alto	$30	$40	$47	$51	$52	$53	$54	$55	$57	$55	$56	$58	$61	$64	$66	$67
West Oakland / 7th	$32	$42	$50	$53	$54	$55	$56	$58	$59	$57	$59	$61	$63	$66	$68	$69
Oakland Coliseum	$31	$41	$49	$52	$53	$54	$56	$57	$58	$57	$58	$60	$63	$66	$68	$69
Union City	$30	$40	$48	$51	$52	$53	$54	$56	$57	$55	$57	$59	$61	$64	$66	$67
Warm Springs	$29	$39	$47	$50	$51	$52	$54	$55	$56	$55	$56	$58	$61	$63	$66	$67
San Jose	$28	$38	$46	$49	$50	$51	$52	$54	$55	$53	$55	$57	$60	$62	$64	$66
Morgan Hill	$26	$36	$44	$47	$48	$49	$51	$52	$53	$52	$53	$55	$58	$61	$63	$64
Gilroy	$25	$35	$43	$47	$47	$48	$50	$51	$52	$51	$52	$54	$57	$60	$62	$63
Sacramento	$30	$40	$48	$51	$52	$53	$54	$56	$57	$55	$57	$59	$62	$64	$66	$68
Stockton	$26	$36	$44	$47	$48	$49	$51	$52	$53	$52	$53	$55	$58	$60	$62	$64
Modesto (Briggsmore)	$23	$33	$41	$44	$45	$46	$48	$49	$50	$49	$50	$52	$55	$57	$60	$61
Merced (SP Downtown)	$20	$30	$38	$41	$42	$43	$44	$46	$47	$45	$47	$49	$51	$54	$56	$58
Fresno	N/A	$25	$33	$36	$37	$38	$39	$41	$42	$40	$42	$44	$47	$49	$51	$53
Bakersfield	$25	N/A	$23	$26	$27	$28	$29	$31	$32	$30	$32	$34	$36	$39	$41	$43
Palmdale Airport (PMD)	$33	$23	N/A	$9	$10	$10	$22	$23	$24	$23	$24	$26	$29	$32	$34	$35
Sylmar	$36	$26	$9	N/A	$8	$8	$18	$20	$21	$19	$21	$23	$25	$28	$30	$31
Burbank	$37	$27	$10	$8	N/A	$8	$17	$19	$20	$18	$20	$22	$24	$27	$29	$30
Los Angeles	$38	$28	$10	$8	$8	N/A	$8	$9	$10	$9	$9	$11	$12	$26	$28	$30
Norwalk	$39	$29	$22	$18	$17	$8	N/A	$8	$9	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anaheim	$41	$31	$23	$20	$19	$9	$8	N/A	$8	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Irvine	$42	$32	$24	$21	$20	$10	$9	$8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
City of Industry	$40	$30	$23	$19	$18	$9	N/A	N/A	N/A	N/A	$8	$9	$11	$24	$26	$27
Ontario Airport (ONT)	$42	$32	$24	$21	$20	$9	N/A	N/A	N/A	$8	N/A	$8	$10	$22	$25	$26
Riverside	$44	$34	$26	$23	$22	$11	N/A	N/A	N/A	$9	$8	N/A	$9	$21	$23	$24
Murrieta / Temecula	$47	$36	$29	$25	$24	$12	N/A	N/A	N/A	$11	$10	$9	N/A	$9	$10	$11
Escondido	$49	$39	$32	$28	$27	$26	N/A	N/A	N/A	$24	$22	$21	$9	N/A	$8	$9
University City	$51	$41	$34	$30	$29	$28	N/A	N/A	N/A	$26	$25	$23	$10	$8	N/A	$8
San Diego	$53	$43	$35	$31	$30	$30	N/A	N/A	N/A	$27	$26	$24	$11	$9	$8	N/A

Note: Shaded cells show the intraregional fares; unshaded cells show the interregional fares.

Table 2.5 Initial Average High-Speed Rail Fares (One-Way Fares) (in 2005 Dollars) for Altamont Pass

	SF	WO7	COL	UNC	TWN	MLB	RDC	SHN	SJ	WSP	BRN	LVR	TCY	SACa	SAC	STK	MOD
San Fransico	N/A	N/A	N/A	N/A	$7	$8	$9	$10	N/A	N/A	$10	$10	$12	$29	$28	$24	$25
West Oakland / 7th	N/A	N/A	$7	$8	N/A	N/A	N/A	N/A	N/A	N/A	$9	$9	$11	$27	$27	$22	$23
Oakland Coliseum	N/A	$7	N/A	$8	N/A	N/A	N/A	N/A	N/A	N/A	$9	$9	$10	$27	$26	$22	$23
Union City	N/A	$8	$8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$8	$8	$9	$25	$25	$20	$21
Townsend Street	$7	N/A	N/A	N/A	N/A	$8	$9	$9	N/A	N/A	$10	$10	$11	$29	$28	$24	$25
Millbrae	$8	N/A	N/A	N/A	$8	N/A	$8	$9	N/A	N/A	$9	$9	$11	$27	$27	$23	$23
Redwood City	$9	N/A	N/A	N/A	$9	$8	N/A	$8	N/A	N/A	$8	$9	$10	$26	$26	$22	$22
Shinn	$10	N/A	N/A	N/A	$9	$9	$8	N/A	N/A	N/A	$8	$8	$9	$25	$25	$20	$21
San Jose	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$8	$9	$9	$10	$26	$26	$22	$22
Warm Springs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$8	N/A	$8	$8	$9	$25	$25	$20	$21
Bernel / I-680	$10	$9	$9	$8	$10	$9	$8	$8	$9	$8	N/A	$7	$9	$24	$24	$19	$20
Livermore (S)	$10	$9	$9	$8	$10	$9	$9	$8	$9	$8	$7	N/A	$8	$24	$23	$19	$20
Tracy (N)	$12	$11	$10	$9	$11	$11	$10	$9	$10	$9	$9	$8	N/A	$22	$21	$17	$18
Sacramento (Alt)	$29	$27	$27	$25	$29	$27	$26	$25	$26	$25	$24	$24	$22	N/A	N/A	N/A	$22
Sacramento	$28	$27	$26	$25	$28	$27	$26	$25	$26	$25	$24	$23	$21	N/A	N/A	$19	$22
Stockton	$24	$22	$22	$20	$24	$23	$22	$20	$22	$20	$19	$19	$17	N/A	$19	N/A	$18
Modesto (SP Downtown)	$25	$23	$23	$21	$25	$23	$22	$21	$22	$21	$20	$20	$18	$22	$22	$18	N/A
Merced (SP Downtown)	$28	$27	$26	$25	$28	$27	$26	$24	$26	$25	$24	$23	$21	$25	$26	$21	$18
Fresno	$33	$32	$31	$30	$33	$32	$31	$29	$31	$30	$28	$28	$26	$30	$31	$26	$23
Bakersfield	$43	$42	$41	$40	$43	$42	$41	$39	$41	$40	$39	$38	$36	$40	$41	$36	$33
Palmdale Airport (PMD)	$51	$49	$49	$47	$51	$49	$48	$47	$48	$47	$46	$46	$44	$48	$48	$44	$41
Sylmar	$54	$53	$52	$51	$54	$53	$52	$50	$52	$51	$50	$49	$47	$51	$52	$47	$45
Burbank	$55	$54	$53	$52	$55	$54	$53	$51	$53	$52	$51	$50	$48	$52	$53	$48	$46
Los Angeles	$56	$55	$54	$53	$56	$55	$54	$52	$54	$53	$52	$51	$49	$53	$54	$49	$46
Norwalk	$58	$56	$55	$54	$57	$56	$55	$54	$55	$54	$53	$52	$50	$55	$55	$51	$48
Anaheim	$59	$57	$57	$55	$59	$58	$56	$55	$57	$55	$54	$54	$52	$56	$56	$52	$49
Irvine	$60	$59	$58	$57	$60	$59	$58	$56	$58	$57	$56	$55	$53	$57	$58	$53	$50
City of Industry	$58	$57	$56	$55	$58	$57	$56	$55	$56	$55	$54	$53	$51	$56	$56	$52	$49
Ontario Airport (ONT)	$60	$58	$58	$56	$60	$59	$58	$56	$58	$56	$55	$55	$53	$57	$57	$53	$50
Riverside	$62	$60	$60	$58	$62	$61	$59	$58	$60	$58	$57	$57	$55	$59	$59	$55	$52
Murrieta / Temecula	$65	$63	$62	$61	$64	$63	$62	$61	$62	$61	$60	$59	$58	$62	$62	$58	$55
Escondido	$67	$66	$65	$64	$67	$66	$65	$64	$65	$64	$63	$62	$60	$64	$65	$60	$58
University City	$69	$68	$67	$66	$69	$68	$67	$66	$67	$66	$65	$64	$62	$67	$67	$63	$60
San Diego	$71	$69	$68	$67	$70	$69	$68	$67	$68	$67	$66	$65	$64	$68	$68	$64	$61

Table 2.5 Initial High-Speed Rail Fares (One-Way Fares) (in 2005 Dollars) for Altamont Pass (continued)

	MER	FRS	BKR	PMD	SYL	BUR	LA	NWK	ANA	IRV	IND	ONT	RVR	TEM	ESC	UNI	SD
San Fransico	$28	$33	$43	$51	$54	$55	$56	$58	$59	$60	$58	$60	$62	$65	$67	$69	$71
West Oakland / 7th	$27	$32	$42	$49	$53	$54	$55	$56	$57	$59	$57	$58	$60	$63	$66	$68	$69
Oakland Coliseum	$26	$31	$41	$49	$52	$53	$54	$55	$57	$58	$56	$58	$60	$62	$65	$67	$68
Union City	$25	$30	$40	$47	$51	$52	$53	$54	$55	$57	$55	$56	$58	$61	$64	$66	$67
Townsend Street	$28	$33	$43	$51	$54	$55	$56	$57	$59	$60	$58	$60	$62	$64	$67	$69	$70
Millbrae	$27	$32	$42	$49	$53	$54	$55	$56	$58	$59	$57	$59	$61	$63	$66	$68	$69
Redwood City	$26	$31	$41	$48	$52	$53	$54	$55	$56	$58	$56	$58	$59	$62	$65	$67	$68
Shinn	$24	$29	$39	$47	$50	$51	$52	$54	$55	$56	$55	$56	$58	$61	$64	$66	$67
San Jose	$26	$31	$41	$48	$52	$53	$54	$55	$57	$58	$56	$58	$60	$62	$65	$67	$68
Warm Springs	$25	$30	$40	$47	$51	$52	$53	$54	$55	$57	$55	$56	$58	$61	$64	$66	$67
Bernel / I-680	$24	$28	$39	$46	$50	$51	$52	$53	$54	$56	$54	$55	$57	$60	$63	$65	$66
Livermore (S)	$23	$28	$38	$46	$49	$50	$51	$52	$54	$55	$53	$55	$57	$59	$62	$64	$65
Tracy (N)	$21	$26	$36	$44	$47	$48	$49	$50	$52	$53	$51	$53	$55	$58	$60	$62	$64
Sacramento (Alt)	$25	$30	$40	$48	$51	$52	$53	$55	$56	$57	$56	$57	$59	$62	$64	$67	$68
Sacramento	$26	$31	$41	$48	$52	$53	$54	$55	$56	$58	$56	$57	$59	$62	$65	$67	$68
Stockton	$21	$26	$36	$44	$47	$48	$49	$51	$52	$53	$52	$53	$55	$58	$60	$63	$64
Modesto (SP Downtown)	$18	$23	$33	$41	$45	$46	$46	$48	$49	$50	$49	$50	$52	$55	$58	$60	$61
Merced (SP Downtown)	N/A	$20	$30	$38	$41	$42	$43	$44	$46	$47	$45	$47	$49	$51	$54	$56	$57
Fresno	$20	N/A	$25	$33	$36	$37	$38	$39	$41	$42	$40	$42	$44	$47	$49	$51	$53
Bakersfield	$30	$25	N/A	$23	$26	$27	$28	$29	$31	$32	$30	$32	$34	$36	$39	$41	$43
Palmdale Airport (PMD)	$38	$33	$23	N/A	$9	$10	$10	$22	$23	$24	$23	$24	$26	$29	$32	$34	$35
Sylmar	$41	$36	$26	$9	N/A	$8	$8	$18	$20	$21	$19	$21	$23	$25	$28	$30	$31
Burbank	$42	$37	$27	$10	$8	N/A	$8	$17	$19	$20	$18	$20	$22	$24	$27	$29	$30
Los Angeles	$43	$38	$28	$10	$8	$8	N/A	$8	$9	$10	$9	$9	$11	$12	$26	$28	$30
Norwalk	$44	$39	$29	$22	$18	$17	$8	N/A	$8	$9	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anaheim	$46	$41	$31	$23	$20	$19	$9	$8	N/A	$8	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Irvine	$47	$42	$32	$24	$21	$20	$10	$9	$8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
City of Industry	$45	$40	$30	$23	$19	$18	$9	N/A	N/A	N/A	N/A	$8	$9	$11	$24	$26	$27
Ontario Airport (ONT)	$47	$42	$32	$24	$21	$20	$9	N/A	N/A	N/A	$8	N/A	$8	$10	$22	$25	$26
Riverside	$49	$44	$34	$26	$23	$22	$11	N/A	N/A	N/A	$9	$8	N/A	$9	$21	$23	$24
Murrieta / Temecula	$51	$47	$36	$29	$25	$24	$12	N/A	N/A	N/A	$11	$10	$9	N/A	$9	$10	$11
Escondido	$54	$49	$39	$32	$28	$27	$26	N/A	N/A	N/A	$24	$22	$21	$9	N/A	$8	$9
University City	$56	$51	$41	$34	$30	$29	$28	N/A	N/A	N/A	$26	$25	$23	$10	$8	N/A	$8
San Diego	$57	$53	$43	$35	$31	$30	$30	N/A	N/A	N/A	$27	$26	$24	$11	$9	$8	N/A

Table 2.6 Altamont Commuter Express (ACE) Fares (in 2005 Dollars)

	Stckton	Lathrop	Tracy	Vasco	Livermore	Pleasanton	Fremont	Great America	Santa Clara	San Jose
Stockton	$ –									
Lathrop	$1.91	$ –								
Tracy	$3.39	$3.33	$ –							
Vasco	$4.80	$4.80	$4.73	$ –						
Livermore	$4.80	$4.80	$4.73	$1.88	$ –					
Pleasanton	$4.80	$4.80	$4.73	$1.88	$1.88	$ –				
Fremont	$6.23	$6.23	$6.23	$2.80	$2.80	$2.80	$ –			
Great America	$7.69	$7.58	$6.13	$4.73	$4.73	$4.73	$3.10	$ –		
Santa Clara	$7.69	$7.58	$6.13	$4.73	$4.73	$4.73	$3.10	$1.75	$ -	
San Jose	$7.69	$7.58	$6.13	$4.73	$4.73	$4.73	$3.10	$1.75	$-	$ –

Note: Fares based on single-ride cost of 20-trip book.

Table 2.7 San Joaquin Line Fares (in 2005 Dollars)

		JLS	EMY	RIC	MTZ	ANT	SAC	LOD	STK	MOD	TUR	MER	MAD	FSN	HAN	COR	WAS	BAK
Oakland	JLS	$ –																
Emeryville	EMY	$7	$ –															
Richmond	RIC	$7	$7	$ –														
Martinez	MTZ	$11	$11	$9.50	$ –													
Antioch	ANT	$11	$11	$9.50	$7.50	$ –												
Sacramento	SAC	$22	$22	$22	$22.50	$22.50	$ -											
Lodi	LOD	$14.50	$14.50	$14.50	$15	$15	$7.50	$ -										
Stockton	STK	$11	$11	$9	$7.50	$5	$15	$7.50	$ -									
Modesto	MOD	$22	$22	$22	$17	$16	$18	$13	$12	$ -								
Turlock	TUR	$26	$26	$22	$21	$20	$21	$16	$12	$6.50	$ -							
Merced	MER	$29	$28	$27	$24	$23	$25	$20	$17	$12	$9	$ -						
Madera	MAD	$33	$33	$30	$28	$28	$28	$23	$22	$17	$16	$12	$ -					
Fresno	FSN	$37	$37	$34	$32	$28	$31	$28	$26	$22	$19	$15	$8.50	$ -				
Hanford	HAN	$39	$39	$36	$34	$33	$36	$30	$28	$26	$24	$20	$13	$6	$ -			
Corcoran	COR	$45	$45	$42	$40	$36	$39	$33	$30	$28	$26	$22	$15	$15	$9	$ -		
Wasco	WAS	$52	$52	$49	$47	$43	$45	$40	$37	$32	$29	$28	$22	$20	$15	$12	$ -	
Bakersfield	BAK	$55	$55	$52	$51	$47	$51	$45	$42	$37	$34	$30	$27	$24	$19	$17	$4.50	$ -

Note: Fares based on one-way ticket cost.

Table 2.8 Capitol Corridor Fares (in 2005 Dollars)

		SJC	GRA	FMT	HAY	JLS	EMY	BRK	RCH	MTZ	SUI	DAV	SAC	RSV	RCK	AUB
San Jose	SJC	$ –														
Great America	GRA	$3.10	$ –													
Fremont	FMT	$4.00	$4.00	$ –												
Hayward	HAY	$6.20	$5.70	$3.30	$-											
Jack London Sq.	JLS	$7.10	$6.20	$5.30	$3.50	$ –										
Emeryville	EMY	$7.10	$6.60	$5.30	$4.20	$3.70	$ –									
Berkeley	BRK	$7.10	$7.10	$5.70	$5.30	$3.70	$3.70	$ –								
Richmond	RCH	$7.50	$7.10	$6.60	$5.30	$3.70	$3.70	$2.60	$ –							
Martinez	MTZ	$10.50	$10.50	$9.50	$8.40	$6.80	$6.80	$6.30	$5.80	$ –						
Suisun City	SUI	$13.10	$12.10	$10.50	$10.00	$8.40	$8.40	$8.40	$7.70	$5.30	$ –					
Davis	DAV	$15.20	$14.70	$13.10	$13.10	$11.00	$11.00	$11.00	$10.00	$8.40	$6.80	$ –				
Sacramento	SAC	$15.80	$15.80	$14.70	$13.70	$12.10	$12.10	$12.10	$10.50	$9.50	$8.40	$4.20	$ –			
Roseville	RSV	$17.30	$17.30	$16.80	$15.20	$13.10	$13.10	$13.10	$13.10	$10.50	$9.50	$5.10	$4.70	$ –		
Rocklin	RCK	$17.30	$17.30	$17.30	$15.20	$14.70	$14.70	$14.70	$13.50	$11.60	$8.20	$5.80	$4.70	$4.30	$ –	
Auburn	AUB	$18.40	$18.40	$17.30	$17.30	$15.20	$15.20	$15.20	$14.70	$12.60	$8.20	$7.00	$5.80	$4.70	$3.30	$ –

Note: Fares based on single ride cost of 10-trip book.

Table 2.9 Pacific Surfliner Fares (in 2005 Dollars)

	SLO	GRV	GUA	SUR	SBA	CAR	VEN	OXN	CAM	SMV	CHA	VNY	BUR	GLN	LAU	FUL	ANA	SNA	MSV	SJC	OCN	SOL	SDE
Grover Beach	$7	$ –																					
Guadalupe	$12	$7	$ –																				
Surf	$17	$17	$7	$ –																			
Santa Barbara	$28	$25	$24	$10	$ –																		
Carpentaria	$29	$29	$26	$14	$7	$ –																	
Ventura	$30	$30	$27	$17	$12	$7	$ –																
Oxnard	$30	$30	$27	$18	$14	$10	$5	$ –															
Camarillo	$30	$30	$28	$20	$15	$12	$10	$5	$ –														
Simi Valley	$31	$31	$28	$23	$17	$14	$12	$10	$5	$ –													
Chatsworth	$31	$31	$29	$25	$19	$17	$16	$12	$10	$5	$ –												
Van Nuys	$31	$31	$29	$25	$21	$18	$16	$14	$12	$8	$5	$ –											
Burbank	$32	$32	$30	$25	$22	$20	$18	$16	$14	$10	$8	$5	$ –										
Glendale	$33	$32	$30	$27	$23	$21	$19	$17	$15	$12	$10	$7	$4	$ –									
Los Angeles	$34	$32	$31	$27	$24	$22	$20	$18	$16	$14	$12	$10	$8	$4	$ –								
Fullerton	$36	$36	$32	$30	$26	$24	$23	$20	$21	$17	$17	$14	$14	$10	$5	$ –							
Anaheim	$38	$37	$35	$32	$28	$26	$25	$24	$23	$19	$18	$17	$15	$12	$8	$5	$ –						
Santa Ana	$40	$38	$36	$33	$30	$28	$27	$26	$24	$21	$19	$19	$16	$14	$12	$8	$5	$ –					
Mission Viejo	$42	$42	$37	$34	$32	$30	$29	$27	$26	$23	$22	$20	$18	$17	$15	$12	$8	$5	$ –				
San Juan Capis.	$44	$42	$38	$36	$34	$32	$30	$29	$27	$25	$24	$22	$20	$18	$16	$14	$12	$10	$5	$ –			
Oceanside	$46	$43	$39	$35	$31	$31	$30	$30	$29	$29	$27	$25	$24	$23	$21	$17	$15	$14	$10	$9	$ –		
Solana Beach	$48	$44	$40	$36	$33	$33	$32	$32	$31	$31	$30	$28	$26	$25	$25	$23	$21	$19	$17	$15	$10	$ –	
San Diego	$51	$46	$42	$38	$35	$35	$34	$34	$33	$33	$32	$30	$28	$27	$26	$25	$23	$21	$19	$17	$14	$10	$ –

Note: Fares based on one-way ticket cost.

Table 2.10 Metrolink Orange County Line Fares (in 2005 Dollars)

Fare	LAUS	Comm.	Norwalk	Fullertn	Anahm	Orange	Santa Ana	Tustin	Irvine	Laguna Nigel	S. Juan Capis.	San Clmnte	Ocnsde
LA Union Statn	$ –												
Commerce	$3.76	$ –											
Norwalk	$4.45	$3.56	$ –										
Fullerton	$5.44	$4.65	$3.86	$ –									
Anaheim	$5.63	$5.34	$4.65	$3.66	$ –								
Orange	$6.52	$5.63	$4.94	$3.96	$3.17	$ –							
Santa Ana	$6.18	$5.93	$5.24	$4.25	$3.46	$3.17	$ –						
Tustin	$6.42	$5.83	$5.73	$4.75	$3.96	$3.76	$3.46	$ –					
Irvine	$7.21	$6.32	$5.63	$4.94	$4.45	$4.15	$3.86	$3.46	$ –				
Laguna Nigel	$7.90	$7.01	$6.72	$5.73	$5.34	$5.04	$4.94	$4.35	$3.76	$ –			
San Juan Capis.	$8.20	$7.41	$6.82	$6.22	$6.03	$5.73	$5.44	$4.84	$4.25	$3.37	$ –		
San Clemente	$8.79	$8.10	$7.80	$6.82	$6.62	$6.32	$6.03	$5.44	$4.84	$3.96	$3.46	$ –	
Oceanside	$11.05	$10.27	$9.67	$9.38	$8.59	$8.29	$8.29	$7.70	$7.11	$6.22	$5.73	$5.14	$ –

Note: Fares based on single ride cost of 10-trip book.

Access-Egress Costs

Airport hourly and daily on- and off-site parking charges are shown in Table 2.11. Parking charges data were collected by MTC staff for San Francisco and Oakland and by Cambridge Systematics staff for Los Angeles and Ontario airports as part of a recent study. Parking rates for all other airports were collected from an Internet search.

Table 2.11 Airport Parking Charges (in 2005 Dollars)

Airport		Hourly	Daily On-Site	Daily Off-Site
San Diego	SAN		$18.00	
Santa Ana	SNA	$1.00	$17.00	
Long Beach	LGB		$6.00-$15.00	
Los Angeles	LAX	$3.00	$8.00-$30.00	$12.00
Ontario	ONT		$10.00	$8.50
Burbank	BUR	$2.00	$7.00-$30.00	
San Jose	SJC		$15.00-$30.00	
San Francisco	SFO	$5.00	$13.00-$38.00	$8.00-$15.00
Oakland	OAK	$4.00	$19.00-$32.00	$9.00-$13.00
Sacramento	SMF	$2.00	$7.00-$12.00	
Palm Springs	PSP		$8.00	
Oxnard	OXR		$6.00	
Santa Barbara	SBA		$8.00-$16.00	
Bakersfield	BFL		$6.50-$8.50	
Fresno	FAT		$8.00-$12.00	
Monterey	MRY		$6.00	
Arcata/Eureka	ACV		$6.00	

Note: The mid-range of daily parking charges will be assumed for business and commute trips; the hourly will be assumed for recreational and other trips.

Conventional rail parking charges are typically free with some exceptions. Parking charges apply at the Sacramento depot (serving Capitol Corridor and selected San Joaquin line trains), and at Oakland's Jack London Square (served by Capitol Corridor and San Joaquin lines); however, the lot only contains 75 parking spaces and is generally half-filled each day. In Southern California, parking at Los Angeles Union Station is $6.00 per day (served by Metrolink and Surfliner Routes).

High-speed rail is assumed to have ample market rate parking at all stations. For initial forecasts, interregional parking charges at high-speed rail stations will be set to a minimum rate of $3.00, except for areas where parking is already charged (Table 2.12).

Table 2.12 Initial High-Speed Rail Daily Parking Charges (in 2005 Dollars)

HSR Station	Daily Parking Charges	HSR Station	Daily Parking Charges
San Francisco	$25.00	Palmdale	$3.00
Millbrae	$3.00	Sylmar	$3.00
Palo Alto	$3.00	Burbank	$3.00
San Jose	$3.00	Los Angeles	$6.00
Gilroy	$3.00	Norwalk	$3.00
Oakland	$6.00	Anaheim	$3.00
Oakland Airport	$3.00	Irvine	$3.00
Union City	$3.00	E. San Gabriel Vly.	$3.00
Pleasanton	$3.00	Ontario	$3.00
Sacramento	$6.00	Riverside	$3.00
Tracy	$3.00	Temecula	$3.00
Stockton	$3.00	Escondido	$3.00
Modesto	$3.00	University City	$3.00
Merced	$3.00	San Diego	$12.00
Fresno	$3.00		
Bakersfield	$3.00		

2.2 TRAVEL TIMES

Travel times for interregional travel modes are broken down into detailed components; line-haul times (the time spent in an airplane, high-speed, or conventional train or automobile); access and egress times; terminal times; wait times; and transfer times. Each of these components are defined and discussed below.

Line-Haul Times

Auto

Auto travel times are derived by summing the travel time (based on distance and speed) in the highway network. These are available for the off-peak or free-flow condition, but peak (congested) auto travel times will not be available until the model system has been completed. As a result, only the free-flow auto travel times for the year 2000 are presented in this report in Table 2.13. Forecast year auto travel times will also be available after the forecast models are run, as these are produced by the model rather than input.

Table 2.13 Auto Travel Times between Selected City Pairs
Year 2000

	Distance (Miles)	Auto Free-Flow Times (Minutes)	Average Speed (Mile Per Hour)
Fresno-Oakland	181	170	64
Fresno-San Francisco	192	184	62
San Diego-Bakersfield	232	212	66
San Diego-San Francisco	501	450	67
San Diego-Oakland	491	436	68
Los Angeles-San Francisco	381	349	65
Los Angeles-Oakland	370	335	66
San Diego-Sacramento	504	446	68
San Francisco-Sacramento	87	83	63
Oakland – Sacramento	82	82	60
San Francisco-San Jose	50	56	54
Los Angeles-Palmdale	61	60	61
Los Angeles-Anaheim	31	30	62
Oakland-San Jose	43	44	59
Oakland-Fresno	181	175	62
San Francisco-Fresno	192	185	62
Bakersfield-San Diego	232	215	65
San Francisco-San Diego	501	453	66
Oakland-San Diego	491	435	68
San Francisco-Los Angeles	381	351	65
Oakland-Los Angeles	370	343	65
Sacramento-San Diego	504	443	68

Table 2.13 Auto Travel Times between Selected City Pairs (continued)
Year 2000

	Distance (Miles)	Auto Free-Flow Times (Minutes)	Average Speed (Mile Per Hour)
Sacramento-San Francisco	87	85	61
Sacramento-Oakland	82	80	62
San Jose-San Francisco	50	57	53
Palmdale-Los Angeles	61	60	61
Anaheim-Los Angeles	31	30	62
San Jose-Oakland	43	45	57

Air

Intra-California airport to airport line-haul times are shown in Table 2.14. Airport pairs without direct (non-stop) service show line haul times with transfer times included, since the air network represents all direct service. Travel times were estimated for both 2000 and 2005 and there were small differences in these travel times, but they were within the margin of error and there were many unexplainable anomalies, so travel times for both 2000 and 2005 were set equal.

High-Speed Rail

High-speed rail line-haul times are shown in Table 2.15 and 2.16 for Pacheco Pass and Altamont Pass, respectively. The high-speed rail times have been developed by CHSRA's rail operations consultant, Parsons Brinckerhoff.

Conventional Rail

Conventional rail times are shown in Tables 2.17 through 2.21. Conventional rail line travel times include Altamont Commuter Express, Capitol Corridor, San Joaquin, Pacific Surfliner, and Metrolink – Orange County Route.

Table 2.14 Year 2000 and 2005 Airport Line-Haul Times

		SAN	SNA	LGB	LAX	ONT	BUR	SJC	SFO	OAK	SMF	PSP	OXR	SBA	BFL	FAT	MRY	ACV	MOD
San Diego	SAN	–																	
Santa Ana	SNA	–	–																
Long Beach	LGB	–	–	–															
Los Angeles	LAX	51	–	–	–														
Ontario	ONT	–	–	–	–	–													
Burbank	BUR	–	–	–	–	–	–												
San Jose	SJC	81	76	–	73	66	68	–											
San Francisco	SFO	87	88	–	80	77	74	–	–										
Oakland	OAK	89	83	85	79	72	70	–	–	–									
Sacramento	SMF	89	83	85	83	76	73	–	45	–	–								
Palm Springs	PSP	–	–	–	51	–	–	197	178	234	220	–							
Oxnard	OXR	–	–	–	–	–	–	–	175	208	223	–	–						
Santa Barbara	SBA	202	–	–	46	–	–	63	74	237	209	–	–	–					
Bakersfield	BFL	–	–	–	–	–	–	–	123	–	241	–	–	–	–				
Fresno	FAT	223	209	–	66	–	–	–	–	–	–	–	–	–	–	–			
Monterey	MRY	242	215	–	85	–	–	–	–	–	–	253	–	–	–	–	–		
Arcata/Eureka	ACV	267	274	–	259	262	243	–	74	–	–	330	–	–	–	–	–	–	
Modesto	MOD	227	239	–	223	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Source: Federal Aviation Administration data from the 10 percent ticket sample.

Note: Line-haul times for outbound and return flights have been averaged to produce a single run time for both directions of travel. This includes direct and connecting service for intrastate flights where demand in 2005 is greater than one trip per day (400 annual trips).

Table 2.15 High-Speed Rail Travel Times (in Minutes) for Pacheco Pass

OPTIMAL EXPRESS TRAVEL TIMES (350 kph)
Pacheco Pass (1) - Caltrain / Gilroy / Henry Miller / BNSF Alignment
(Station to Station)

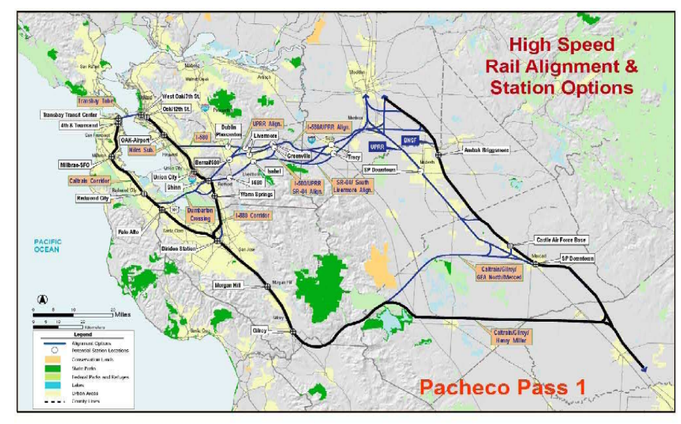
* Make all changes to the lower, left hand side of table in order to reflect on the right hand side accurately.

North ↓ South

Travel Times (hrs:min)	San Francisco	Townsend St	Millbrae	Redwood City	Palo Alto	West Oakland / 7th	Oakland Coliseum	Union City	Warm Springs	San Jose	Morgan Hill	Gilroy	Sacramento	Stockton	Modesto (Briggsmore)	Merced (SP Downtown)	Fresno	Bakersfield	Palmdale Airport (PMD)	Sylmar	Burbank	Los Angeles	Norwalk	Anaheim	Irvine	City of Industry	Ontario Airport (ONT)	Riverside	Murrieta / Temecula	Escondido	University City	San Diego
San Francisco	N/A	0:02	0:12	0:18	0:20	N/A	N/A	N/A	N/A	0:27	0:37	0:41	1:49	1:35	1:26	1:16	1:17	1:48	2:13	2:27	2:31	2:36	2:45	2:54	3:03	2:52	3:00	3:07	3:20	3:33	3:45	3:53
Townsend Street	0:02	N/A	0:10	0:16	0:18	N/A	N/A	N/A	N/A	0:25	0:35	0:39	1:47	1:33	1:25	1:14	1:15	1:46	2:11	2:25	2:29	2:34	2:43	2:52	3:01	2:50	2:58	3:06	3:18	3:31	3:43	3:51
Millbrae	0:12	0:10	N/A	0:08	0:09	N/A	N/A	N/A	N/A	0:17	0:27	0:30	1:39	1:25	1:16	1:05	1:07	1:37	2:03	2:17	2:21	2:25	2:35	2:44	2:53	2:42	2:50	2:57	3:10	3:23	3:35	3:43
Redwood City	0:18	0:16	0:08	N/A	0:04	N/A	N/A	N/A	N/A	0:12	0:22	0:25	1:34	1:20	1:11	1:01	1:02	1:32	1:58	2:12	2:16	2:20	2:30	2:39	2:48	2:37	2:45	2:52	3:05	3:18	3:30	3:38
Palo Alto	0:20	0:18	0:09	0:04	N/A	N/A	N/A	N/A	N/A	0:09	0:19	0:23	1:31	1:18	1:09	0:58	1:00	1:30	1:56	2:10	2:14	2:18	2:18	2:37	2:45	2:35	2:42	2:50	3:03	3:16	3:28	3:36
West Oakland / 7th	N/A	N/A	N/A	N/A	N/A	N/A	0:05	0:11	0:14	0:23	0:33	0:36	1:44	1:31	1:22	1:11	1:13	1:43	2:09	2:23	2:27	2:31	2:41	2:50	2:59	2:47	2:55	3:03	3:16	3:29	3:41	3:49
Oakland Coliseum	N/A	N/A	N/A	N/A	N/A	0:05	N/A	0:08	0:12	0:20	0:30	0:33	1:42	1:28	1:19	1:09	1:10	1:40	2:06	2:20	2:24	2:28	2:38	2:47	2:56	2:45	2:53	3:00	3:13	3:26	3:38	3:46
Union City	N/A	N/A	N/A	N/A	N/A	0:11	0:08	N/A	0:05	0:13	0:23	0:27	1:35	1:22	1:13	1:02	1:03	1:34	2:00	2:14	2:18	2:22	2:32	2:41	2:49	2:38	2:46	2:54	3:07	3:19	3:31	3:40
Warm Springs	N/A	N/A	N/A	N/A	N/A	0:14	0:12	0:05	N/A	0:10	0:20	0:23	1:32	1:18	1:09	0:58	1:00	1:30	1:56	2:10	2:14	2:18	2:28	2:37	2:45	2:34	2:42	2:50	3:03	3:16	3:28	3:36
San Jose	0:27	0:25	0:17	0:12	0:09	0:23	0:20	0:13	0:10	N/A	0:10	0:14	1:22	1:09	1:00	0:49	0:51	1:21	1:47	2:01	2:05	2:09	2:19	2:28	2:36	2:25	2:33	2:41	2:54	3:07	3:18	3:27
Morgan Hill	0:37	0:35	0:27	0:22	0:19	0:33	0:30	0:23	0:20	0:10	N/A	0:06	1:14	1:01	0:52	0:41	0:43	1:13	1:39	1:53	1:57	2:01	2:11	2:20	2:28	2:17	2:25	2:33	2:46	2:59	3:10	3:19
Gilroy	0:41	0:39	0:30	0:25	0:23	0:36	0:33	0:27	0:23	0:14	0:06	N/A	1:11	0:57	0:48	0:38	0:39	1:10	1:35	1:49	1:53	1:58	2:07	2:17	2:25	2:14	2:22	2:29	2:42	2:55	3:07	3:15
Sacramento	1:49	1:47	1:39	1:34	1:31	1:44	1:42	1:35	1:32	1:22	1:14	1:11	N/A	20:18 (20:46)	0:27	0:37	0:53	1:23	1:49	2:03	2:07	2:11	2:21	2:30	2:39	2:28	2:36	2:43	2:56	3:09	3:29	3:29
Stockton	1:35	1:33	1:25	1:20	1:18	1:31	1:28	1:22	1:18	1:09	1:01	0:57	20:18 (20:46)	N/A	0:14	0:24	0:40	1:10	1:36	1:50	1:54	1:58	2:08	2:17	2:25	2:14	2:22	2:30	2:43	2:56	3:16	3:16
Modesto (Briggsmore)	1:26	1:25	1:16	1:11	1:09	1:22	1:19	1:13	1:09	1:00	0:52	0:48	0:27	0:14	N/A	0:15	0:31	1:02	1:27	1:41	1:45	1:49	1:59	2:08	2:17	2:06	2:14	2:21	2:34	2:47	3:07	3:07
Merced (SP Downtown)	1:16	1:14	1:05	1:01	0:58	1:11	1:09	1:02	0:58	0:49	0:41	0:38	0:37	0:24	0:15	N/A	0:21	0:52	1:17	1:32	1:36	1:40	1:50	1:59	2:07	1:56	2:04	2:12	2:25	2:37	2:49	2:58
Fresno	1:17	1:15	1:07	1:02	1:00	1:13	1:10	1:03	1:00	0:51	0:43	0:39	0:53	0:40	0:31	0:21	N/A	0:36	1:02	1:16	1:20	1:24	1:34	1:43	1:51	1:40	1:48	1:56	2:09	2:21	2:33	2:42
Bakersfield	1:48	1:46	1:37	1:32	1:30	1:43	1:40	1:34	1:30	1:21	1:13	1:10	1:23	1:10	1:02	0:52	0:36	N/A	0:31	0:45	0:49	0:53	1:03	1:12	1:20	1:10	1:18	1:25	1:38	1:51	2:03	2:11
Palmdale Airport (PMD)	2:13	2:11	2:03	1:58	1:56	2:09	2:06	2:00	1:56	1:47	1:39	1:35	1:49	1:36	1:27	1:17	1:02	0:31	N/A	0:18	0:22	0:27	0:36	0:45	0:54	0:43	0:51	0:58	1:11	1:24	1:36	1:44
Sylmar	2:27	2:25	2:17	2:12	2:10	2:23	2:20	2:14	2:10	2:01	1:53	1:49	2:03	1:50	1:41	1:32	1:16	0:45	0:18	N/A	0:06	0:11	0:21	0:30	0:39	0:28	0:35	0:43	0:56	1:09	1:21	1:29
Burbank	2:31	2:29	2:21	2:16	2:14	2:27	2:24	2:18	2:14	2:05	1:57	1:53	2:07	1:54	1:45	1:36	1:20	0:49	0:22	0:06	N/A	0:07	0:17	0:26	0:34	0:24	0:31	0:39	0:52	1:05	1:17	1:25
Los Angeles	2:36	2:34	2:25	2:20	2:18	2:31	2:28	2:22	2:18	2:09	2:01	1:58	2:11	1:58	1:49	1:40	1:24	0:53	0:27	0:11	0:07	N/A	0:10	0:19	0:28	0:17	0:24	0:32	0:45	0:58	1:10	1:18
Norwalk	2:45	2:43	2:35	2:30	2:18	2:41	2:38	2:32	2:28	2:19	2:11	2:07	2:21	2:08	1:59	1:50	1:34	1:03	0:36	0:21	0:17	0:10	N/A	0:10	0:19	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anaheim	2:54	2:52	2:44	2:39	2:37	2:50	2:47	2:41	2:37	2:28	2:20	2:17	2:30	2:17	2:08	1:59	1:43	1:12	0:45	0:30	0:26	0:19	0:10	N/A	0:10	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Irvine	3:03	3:01	2:53	2:48	2:45	2:59	2:56	2:49	2:45	2:36	2:28	2:25	2:39	2:25	2:17	2:07	1:51	1:20	0:54	0:39	0:34	0:28	0:19	0:10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
City of Industry	2:52	2:50	2:42	2:37	2:35	2:47	2:45	2:38	2:34	2:25	2:17	2:14	2:28	2:14	2:06	1:56	1:40	1:10	0:43	0:28	0:24	0:17	N/A	N/A	N/A	N/A	0:09	0:17	0:30	0:42	0:54	1:03
Ontario Airport (ONT)	3:00	2:58	2:50	2:45	2:42	2:55	2:53	2:46	2:42	2:33	2:25	2:22	2:36	2:22	2:14	2:04	1:48	1:18	0:51	0:35	0:31	0:24	N/A	N/A	N/A	0:09	N/A	0:11	0:24	0:37	0:49	0:57
Riverside	3:07	3:06	2:57	2:52	2:50	3:03	3:00	2:54	2:50	2:41	2:33	2:29	2:43	2:30	2:21	2:12	1:56	1:25	0:58	0:43	0:39	0:32	N/A	N/A	N/A	0:17	0:11	N/A	0:14	0:27	0:39	0:47
Murrieta / Temecula	3:20	3:18	3:10	3:05	3:03	3:16	3:13	3:07	3:03	2:54	2:46	2:42	2:56	2:43	2:34	2:25	2:09	1:38	1:11	0:56	0:52	0:45	N/A	N/A	N/A	0:30	0:24	0:14	N/A	0:15	0:27	0:35
Escondido	3:33	3:31	3:23	3:18	3:16	3:29	3:26	3:19	3:16	3:07	2:59	2:55	3:09	2:56	2:47	2:37	2:21	1:51	1:24	1:09	1:05	0:58	N/A	N/A	N/A	0:42	0:37	0:27	0:15	N/A	0:14	0:23
University City	3:45	3:43	3:35	3:30	3:28	3:41	3:38	3:31	3:28	3:18	3:10	3:07	3:29	3:16	3:07	2:49	2:33	2:03	1:36	1:21	1:17	1:10	N/A	N/A	N/A	0:54	0:49	0:39	0:27	0:14	N/A	0:10
San Diego	3:53	3:51	3:43	3:38	3:36	3:49	3:46	3:40	3:36	3:27	3:19	3:15	3:29	3:16	3:07	2:58	2:42	2:11	1:44	1:29	1:25	1:18	N/A	N/A	N/A	1:03	0:57	0:47	0:35	0:23	0:10	N/A

NOTE: ALL TIMES PRELIMINARY AND SUBJECT TO CHANGE PENDING FURTHER DEFINITIONS OF ALIGNMENTS IN THE BAY AREA TO CENTRAL VALLEY STUDY.

- Extension to Sacramento
- Extension to Orange County
- Extension to Oakland / East Bay
- Not Applicable



Revised 10/9/2006 1:19 PM

Source: Parsons Brinckerhoff, Pacheco Pass 1 350 kph Travel Times.pdf, dated October 9, 2006

Table 2.16 High-Speed Rail Travel Times (in Minutes) for Altamont Pass

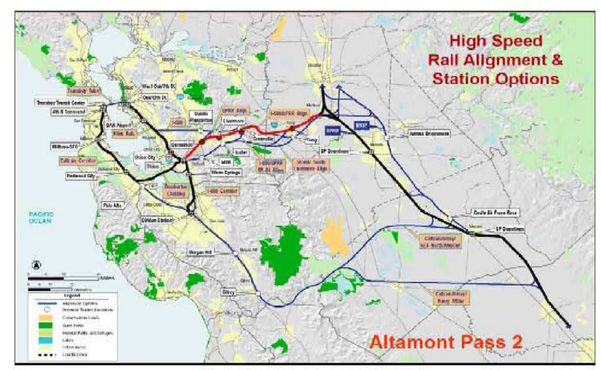
OPTIMAL EXPRESS TRAVEL TIMES (350 kph)
Altamont Pass (2) - I-680 / UPRR Alignment
(Station to Station)

* Make all changes to the lower, left hand side of table in order to reflect on the right hand side accurately.

Travel Times (hr:min)	San Francisco	West Oakland / 7th	Oakland Coliseum	Union City	Townsend St	Millbrae	Redwood City	Shinn	San Jose	Warm Springs	Bernal / I-680	Livermore (S)	Tracy (N)	Sacramento (Alt)	Sacramento	Stockton	Modesto (SP Downtown)	Merced (SP Downtown)	Fresno	Bakersfield	Palmdale Airport (PMD)	Sylmar	Burbank	Los Angeles	Norwalk	Anaheim	Irvine	City of Industry	Ontario Airport (ONT)	Riverside	Murrieta / Temecula	Escondido	University City	San Diego
San Francisco	N/A	N/A	N/A	N/A	0:02	0:12	0:18	0:24	N/A	N/A	0:28	0:51	0:41	1:08	1:06	0:43	0:49	1:01	1:17	1:47	2:18	2:27	2:31	2:35	2:45	2:54	3:00	2:52	3:00	3:07	3:10	3:33	3:45	3:53
West Oakland / 7th	N/A	N/A	0:05	0:11	N/A	N/A	N/A	N/A	N/A	N/A	0:17	0:30	0:30	0:52	0:54	0:38	0:39	0:50	1:06	1:38	2:02	2:16	2:20	2:24	2:34	2:43	2:52	2:41	2:48	2:56	3:09	3:22	3:34	3:42
Oakland Coliseum	N/A	0:05	N/A	0:08	N/A	N/A	N/A	N/A	N/A	N/A	0:14	0:17	0:27	0:50	0:51	0:33	0:35	0:47	1:00	1:33	1:59	2:13	2:17	2:21	2:31	2:40	2:49	2:39	2:46	2:53	3:06	3:19	3:31	3:39
Union City	N/A	0:11	0:08	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0:09	0:11	0:20	0:43	0:44	0:26	0:28	0:40	0:55	1:27	1:52	2:05	2:10	2:15	2:24	2:33	2:43	2:31	2:39	2:46	2:59	3:12	3:24	3:32
Townsend Street	0:02	N/A	N/A	N/A	N/A	0:10	0:16	0:22	N/A	N/A	0:26	0:50	0:39	1:02	1:00	0:45	0:47	0:59	1:15	1:45	2:11	2:25	2:29	2:33	2:43	2:52	3:01	2:50	2:58	3:05	3:18	3:31	3:43	3:51
Millbrae	0:12	N/A	N/A	N/A	0:10	N/A	0:08	0:14	N/A	N/A	0:18	0:21	0:30	0:53	0:54	0:36	0:39	0:50	1:07	1:37	2:00	2:17	2:21	2:25	2:35	2:44	2:53	2:41	2:49	2:57	3:10	3:22	3:34	3:43
Redwood City	0:18	N/A	N/A	N/A	0:16	0:08	N/A	0:06	N/A	N/A	0:12	0:15	0:25	0:48	0:49	0:31	0:33	0:45	1:01	1:31	1:57	2:11	2:15	2:19	2:29	2:38	2:47	2:36	2:44	2:51	3:04	3:17	3:29	3:37
Shinn	0:24	N/A	N/A	N/A	0:22	0:14	0:06	N/A	N/A	N/A	0:06	0:09	0:18	0:41	0:42	0:24	0:26	0:38	0:54	1:25	1:50	2:04	2:08	2:12	2:22	2:31	2:40	2:29	2:37	2:44	2:57	3:10	3:22	3:30
San Jose	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0:09	0:17	0:20	0:29	0:52	0:53	0:35	0:37	0:49	1:05	1:36	2:01	2:15	2:19	2:24	2:33	2:43	2:51	2:40	2:48	2:56	3:08	3:21	3:33	3:42
Warm Springs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0:09	N/A	0:09	0:12	0:21	0:44	0:45	0:27	0:29	0:41	0:56	1:28	1:53	2:06	2:11	2:16	2:25	2:35	2:43	2:32	2:40	2:48	3:00	3:13	3:25	3:34
Bernal / I-680	0:28	0:17	0:14	0:08	0:26	0:18	0:12	0:06	0:17	0:09	N/A	0:04	0:14	0:36	0:38	0:20	0:22	0:34	0:50	1:20	1:46	2:00	2:04	2:08	2:18	2:27	2:36	2:25	2:32	2:40	2:53	3:06	3:18	3:26
Livermore (S)	0:51	0:30	0:17	0:11	0:50	0:21	0:15	0:09	0:20	0:12	0:04	N/A	0:11	0:34	0:35	0:17	0:20	0:31	0:49	1:19	1:43	1:58	2:02	2:06	2:16	2:25	2:33	2:22	2:30	2:38	2:51	3:03	3:16	3:24
Tracy (N)	0:41	0:30	0:27	0:20	0:39	0:30	0:25	0:18	0:29	0:21	0:14	0:11	N/A	0:23	0:28	0:10	0:13	0:25	0:41	1:11	1:37	1:51	1:55	1:59	2:09	2:18	2:27	2:16	2:23	2:31	2:44	2:57	3:09	3:17
Sacramento (Alt)	1:08	0:52	0:50	0:43	1:05	0:53	0:48	0:41	0:52	0:44	0:36	0:34	0:23	N/A	N/A	N/A	0:25	0:37	0:53	1:24	1:49	2:03	2:07	2:12	2:21	2:30	2:39	2:28	2:36	2:43	2:56	3:09	3:21	3:29
Sacramento	1:06	0:54	0:51	0:44	1:08	0:54	0:49	0:42	0:53	0:45	0:38	0:35	0:28	N/A	N/A	0:20	0:31	0:43	0:59	1:29	1:55	2:09	2:13	2:17	2:27	2:36	2:44	2:33	2:41	2:49	3:02	3:15	3:27	3:35
Stockton	0:47	0:38	0:33	0:26	0:48	0:36	0:31	0:24	0:35	0:27	0:20	0:17	0:10	N/A	0:20	N/A	0:13	0:25	0:41	1:12	1:37	1:51	1:55	2:00	2:09	2:19	2:27	2:16	2:24	2:32	2:44	2:57	3:09	3:17
Modesto (SP Downtown)	0:49	0:39	0:35	0:28	0:47	0:39	0:33	0:26	0:37	0:29	0:22	0:20	0:13	0:28	0:31	0:13	N/A	0:16	0:32	1:02	1:28	1:42	1:46	1:51	2:00	2:09	2:17	2:02	2:11	2:19	2:31	2:44	2:56	3:04
Merced (SP Downtown)	1:01	0:50	0:47	0:40	0:59	0:50	0:45	0:38	0:49	0:41	0:34	0:31	0:25	0:37	0:40	0:25	0:16	N/A	0:21	0:52	1:17	1:32	1:36	1:40	1:49	1:58	2:07	1:52	2:00	2:08	2:21	2:34	2:46	2:54
Fresno	1:17	1:06	1:03	0:56	1:16	1:07	1:01	0:54	1:05	0:59	0:50	0:49	0:41	0:53	0:59	0:41	0:32	0:21	N/A	0:36	1:02	1:16	1:20	1:24	1:34	1:43	1:51	1:40	1:48	1:56	2:09	2:21	2:33	2:42
Bakersfield	1:47	1:36	1:33	1:27	1:45	1:37	1:31	1:25	1:36	1:28	1:20	1:19	1:11	1:24	1:29	1:12	1:02	0:52	0:36	N/A	0:31	0:45	0:49	0:53	1:03	1:12	1:20	1:10	1:18	1:25	1:38	1:51	2:03	2:11
Palmdale Airport (PMD)	2:18	2:02	1:59	1:52	2:11	2:03	1:57	1:50	2:01	1:53	1:46	1:40	1:37	1:49	1:55	1:37	1:28	1:17	1:02	0:31	N/A	0:18	0:22	0:27	0:34	0:43	0:54	0:43	0:51	0:59	1:11	1:24	1:36	1:44
Sylmar	2:27	2:16	2:13	2:06	2:25	2:17	2:11	2:04	2:15	2:08	2:00	1:59	1:51	2:03	2:09	1:51	1:42	1:32	1:16	0:45	0:18	N/A	0:06	0:11	0:21	0:30	0:39	0:28	0:36	0:43	0:56	1:09	1:21	1:29
Burbank	2:31	2:20	2:17	2:10	2:29	2:21	2:15	2:08	2:19	2:11	2:04	2:02	1:55	2:07	2:13	1:55	1:46	1:36	1:20	0:49	0:22	0:06	N/A	0:07	0:17	0:26	0:34	0:24	0:31	0:39	0:52	1:05	1:17	1:25
Los Angeles	2:35	2:24	2:21	2:15	2:33	2:25	2:19	2:13	2:24	2:16	2:08	2:06	1:59	2:12	2:17	2:00	1:51	1:40	1:24	0:53	0:27	0:11	0:07	N/A	0:10	0:19	0:28	0:17	0:24	0:32	0:45	0:58	1:10	1:18
Norwalk	2:45	2:34	2:31	2:24	2:43	2:35	2:29	2:22	2:33	2:25	2:18	2:16	2:09	2:21	2:27	2:09	2:00	1:49	1:34	1:00	0:36	0:21	0:17	0:10	N/A	0:10	0:19	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anaheim	2:54	2:43	2:40	2:33	2:52	2:44	2:38	2:31	2:43	2:35	2:27	2:25	2:18	2:30	2:36	2:19	2:09	1:58	1:43	1:12	0:46	0:30	0:26	0:19	0:10	N/A	0:10	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Irvine	3:00	2:53	2:49	2:42	3:01	2:52	2:47	2:40	2:51	2:43	2:36	2:39	2:27	2:39	2:44	2:27	2:17	2:07	1:51	1:20	0:54	0:39	0:34	0:28	0:19	0:10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
City of Industry	2:52	2:41	2:38	2:31	2:50	2:41	2:36	2:29	2:40	2:32	2:25	2:22	2:16	2:28	2:33	2:16	2:02	1:52	1:40	1:10	0:40	0:28	0:24	0:17	N/A	N/A	N/A	N/A	0:09	0:17	0:30	0:42	0:54	1:03
Ontario Airport (ONT)	3:00	2:48	2:45	2:39	2:58	2:49	2:44	2:37	2:48	2:40	2:32	2:30	2:23	2:36	2:41	2:24	2:11	2:00	1:48	1:18	0:51	0:35	0:31	0:24	N/A	N/A	N/A	0:09	N/A	0:11	0:24	0:37	0:49	0:57
Riverside	3:07	2:56	2:53	2:46	3:05	2:57	2:51	2:44	2:56	2:48	2:40	2:38	2:31	2:43	2:49	2:32	2:18	2:08	1:56	1:26	0:58	0:43	0:39	0:32	N/A	N/A	N/A	0:17	0:11	N/A	0:14	0:27	0:39	0:47
Murrieta / Temecula	3:20	3:09	3:06	2:59	3:18	3:10	3:04	2:57	3:08	3:00	2:53	2:51	2:44	2:56	3:02	2:44	2:31	2:21	2:09	1:38	1:11	0:55	0:52	0:45	N/A	N/A	N/A	0:30	0:24	0:14	N/A	0:13	0:27	0:35
Escondido	3:33	3:22	3:19	3:12	3:31	3:22	3:17	3:10	3:21	3:13	3:06	3:03	2:57	3:09	3:15	2:57	2:44	2:34	2:21	1:51	1:24	1:09	1:05	0:58	N/A	N/A	N/A	0:42	0:37	0:27	0:15	N/A	0:14	0:23
University City	3:45	3:34	3:31	3:24	3:43	3:34	3:29	3:22	3:33	3:25	3:18	3:15	3:09	3:21	3:27	3:09	2:56	2:46	2:33	2:03	1:36	1:21	1:17	1:10	N/A	N/A	N/A	0:54	0:49	0:39	0:27	0:14	N/A	0:10
San Diego	3:53	3:42	3:39	3:32	3:51	3:43	3:37	3:30	3:42	3:34	3:26	3:24	3:17	3:29	3:35	3:17	3:04	2:54	2:42	2:11	1:44	1:29	1:25	1:18	N/A	N/A	N/A	1:09	0:57	0:47	0:35	0:23	0:10	N/A

NOTE: ALL TIMES PRELIMINARY AND SUBJECT TO CHANGE PENDING FURTHER DEFINITIONS OF ALIGNMENTS IN THE BAY AREA TO CENTRAL VALLEY STUDY.

- Extension to Sacramento
- Extension to Orange County
- Extension to San Jose
- Extension to Oakland
- Not Applicable



Revised 10/9/2006 1:13 PM

Source: Parsons Brinckerhoff, Alttamont Pass 2 350 kph Travel Times.pdf, dated October 9, 2006

Table 2.17 Altamont Commuter Express Line-Haul Travel Times (in Minutes)

	Stcktn	Lathrp	Tracy	Vasco	Livrmr	Plsntn	Frmnt	Great Amrca	Santa Clara	San Jose
Lathrop	19	–								
Tracy	33	14	–							
Vasco	63	44	30	–						
Livermore	68	49	35	5	–					
Pleasanton	76	57	43	13	8	–				
Fremont	98	79	65	35	30	22	–			
Great America	117	98	84	54	49	41	19	–		
Santa Clara	126	112	98	68	63	55	33	14	–	
San Jose	131	107	93	63	58	50	28	9	5	–

Table 2.18 San Joaquin Line-Haul Travel Times (in Minutes)

		JLS	EMY	RIC	MTZ	ANT	SAC	LOD	STK	MOD	TUR	MER	MAD	FSN	HAN	COR	WAS	BAK
Oakland	JLS	–																
Emeryville	EMY	10	–															
Richmond	RIC	20	10	–														
Martinez	MTZ	53	43	33	–													
Antioch	ANT	72	62	52	19	–												
Sacramento	SAC	158	148	138	105	86	–											
Lodi	LOD	118	108	98	65	46	40	–										
Stockton	STK	103	93	83	50	31	55	15	–									
Modesto	MOD	136	126	116	83	64	88	48	33	–								
Turlock	TUR	150	140	130	97	78	102	62	47	14	–							
Merced	MER	173	163	153	120	101	125	85	70	37	23	–						
Madera	MAD	209	199	189	156	137	161	121	106	73	59	36	–					
Fresno	FSN	241	231	221	188	169	193	153	138	105	91	68	32	–				
Hanford	HAN	274	264	254	221	202	226	186	171	138	124	101	65	33	–			
Corcoran	COR	290	280	270	237	218	242	202	187	154	140	117	81	49	9	–		
Wasco	WAS	362	352	342	309	290	314	274	259	226	212	189	153	121	-22	31	–	
Bakersfield	BAK	403	393	383	350	331	355	315	300	267	253	230	194	162	19	72	41	–

Table 2.19 Capitol Corridor Line-Haul Travel Times (in Minutes)

		SJC	GRA	FMT	HAY	JLS	EMY	BRK	RCH	MTZ	SUI	DAV	SAC	RSV	RCK	AUB
San Jose	SJC	–														
Great America	GRA	16	–													
Fremont	FMT	35	19	–												
Hayward	HAY	51	35	16	–											
Jack London Sq.	JLS	72	56	37	21	–										
Emeryville	EMY	86	70	51	35	14	–									
Berkeley	BRK	94	78	59	43	22	8	–								
Richmond	RCH	101	85	66	50	29	15	7	–							
Martinez	MTZ	128	112	93	77	56	42	34	27	–						
Suisun City	SUI	150	134	115	99	78	64	56	49	22	–					
Davis	DAV	175	159	140	124	103	89	81	74	47	25	–				
Sacramento	SAC	197	181	162	146	125	111	103	96	69	47	22	–			
Roseville	RSV	226	210	191	175	154	140	132	125	98	76	51	29	–		
Rocklin	RCK	236	220	201	185	164	150	142	135	108	86	61	39	10	–	
Auburn	AUB	259	243	224	208	187	173	165	158	131	109	84	62	33	23	–

Table 2.20 Pacific Surfliner Year 2000 Line-Haul Travel Times (in Minutes)

	SLO	GRV	GUA	SUR	SBA	CAR	VEN	OXN	CAM	SMV	CHA	VNY	BUR	GLN	LAU	FUL	ANA	SNA	MSV	SJC	OCN	SOL	SDE
Grover Beach	27	-																					
Guadalupe	50	32	-																				
Surf	99	80	53	-																			
Santa Barbara	144	125	99	57	-																		
Carpentaria	163	144	117	76	21	-																	
Ventura	183	165	138	97	42	23	-																
Oxnard	197	179	152	111	56	37	16	-															
Camarillo	212	193	167	125	70	51	30	16	-														
Simi Valley	241	223	196	155	100	80	59	45	38	-													
Chatsworth	253	235	208	167	112	93	72	58	50	19	-												
Van Nuys	265	247	220	179	124	105	83	69	62	31	15	-											
Burbank	274	256	229	188	133	114	92	79	71	40	24	10	-										
Glendale	285	267	240	199	144	124	103	89	82	51	35	21	14	-									
Los Angeles	301	283	256	214	160	140	119	105	98	67	51	37	30	13	-								
Fullerton	334	315	288	247	192	173	152	138	130	99	84	69	63	49	33	-							
Anaheim	342	324	297	256	201	182	160	147	139	108	93	78	71	58	42	11	-						
Santa Ana	351	332	305	264	209	190	169	155	147	117	101	87	80	67	50	19	10	-					
Mission Viejo	366	348	321	280	225	206	184	171	163	132	117	102	95	82	66	35	25	16	-				
San Juan Capis.	378	359	333	291	236	217	196	182	174	144	128	114	107	94	78	46	37	27	21	-			
Oceanside	411	393	366	325	270	251	230	216	208	177	162	147	140	127	111	80	71	61	55	38	-		
Solana Beach	426	408	381	340	285	266	244	230	223	192	176	162	155	142	126	94	85	76	69	53	16	-	
San Diego	470	451	424	383	328	309	288	274	266	235	220	205	199	185	169	138	129	119	113	96	60	44	-

Table 2.21 Metrolink Orange County Line Year 2000 Line-Haul Times

Fare	LAUS	Comm.	Norwalk	Fullertn	Anahm	Orange	Santa Ana	Tustin	Irvine	Laguna Nigel	S Juan Cpstrno	San Clmnte	Ocnsde
LAUS	–												
Commerce	13	–											
Norwalk	24	11	–										
Fullerton	35	22	11	–									
Anaheim	43	30	19	8	–								
Orange	47	34	23	12	4	–							
Santa Ana	52	39	28	17	9	5	–						
Tustin	59	46	35	24	16	12	7	–					
Irvine	67	54	43	32	24	20	15	8	–				
Laguna Nigel	77	64	53	42	34	30	25	18	10	–			
San Juan Capis.	84	71	60	49	41	37	32	25	17	7	–		
San Clemente	97	84	73	62	54	50	45	38	30	20	13	–	
Oceanside	120	107	96	85	77	73	68	61	53	43	36	23	–

Frequencies

Air

Observed air travel frequencies were obtained from FAA reports. These frequencies represent only direct service within California. They were developed for both peak and off-peak conditions. Tables 2.22 and 2.23 present daily air travel frequencies for selected airport pairs that will be used in the high-speed rail study for year 2000 and 2005, respectively.

High-Speed Rail

Generalized peak period high-speed rail frequencies are shown in Figures 2.1 and 2.2 for the initial northern and southern alignment alternatives. (Section 4.0 examines study alternatives in more detail.) These frequencies are assumed as an initial starting point for forecasting purposes and may be adjusted to test official operating scenarios. Testing of altenrative service scenarios will be done in an iterative process. These figures show only the junction stations or stations with express service. For example, LAUS is the junction for the two Southern California lines (Irvine and San Diego).

High-speed rail schedules are a fairly complex mix of local, express, regional, semi-express, and suburban express trains. The headways shown in the following two figures distinguish all trains versus express trains. For example, there are projected to be four peak-period trains per hour that operate between San Francisco/San Jose to Los Angeles – split roughly equally between express and non-express services. Local and semi-express trains will stop at intermediate stations not shown in the following figures, while express trains (represented by dashed lines) run non-stop between displayed station pairs.

Table 2.22 Year 2000 Daily Airport Headways *In Minutes*

		SAN	SNA (1)	LGB (1)	LAX (1)	ONT (1)	BUR (1)	SJC	SFO	OAK	SMF	PSP	OXR	SBA	BFL	FAT	MRY	ACV	MOD
San Diego	SAN	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Santa Ana	SNA	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Long Beach	LGB	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Los Angeles	LAX	23	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ontario	ONT	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Burbank	BUR	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
San Jose (1)	SJC	35	54	–	20	131	125	–	–	–	–	–	–	–	–	–	–	–	–
San Francisco (1)	SFO	18	31	–	11	50	36	–	–	–	–	–	–	–	–	–	–	–	–
Oakland (1)	OAK	37	46	160	18	65	67	–	–	–	–	–	–	–	–	–	–	–	–
Sacramento	SMF	28	76	120	26	59	52	–	70	–	–	–	–	–	–	–	–	–	–
Palm Springs (1)	PSP	–	–	–	47	–	–	120	54	93	96	–	–	–	–	–	–	–	–
Oxnard (1)	OXR	–	–	–	–	–	–	–	144	206	144	–	–	–	–	–	–	–	–
Santa Barbara	SBA	48	–	–	50	–	–	131	76	46	111	–	–	–	–	–	–	–	–
Bakersfield	BFL	–	–	–	–	–	–	–	96	–	160	–	–	–	–	–	–	–	–
Fresno	FAT	59	47	–	37	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Monterey	MRY	60	93	–	43	–	–	–	–	–	–	137	–	–	–	–	–	–	–
Arcata	ACV	120	160	–	111	144	80	–	152	–	–	480	–	–	–	–	–	–	–
Modesto	MOD	160	160	–	103	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Source: Federal Aviation Administration data from the 10 percent ticket sample, supplemented with internet queries in August, 2006. This includes direct and connecting service for intra-state flights where demand in 2005 is greater than one trip per day (400 annual trips).

Note (1) Headways from San Francisco to Los Angeles region airports were assumed to be half the quoted headway because most travelers have more than one airport choice and therefore have twice as many air trips to choose from.

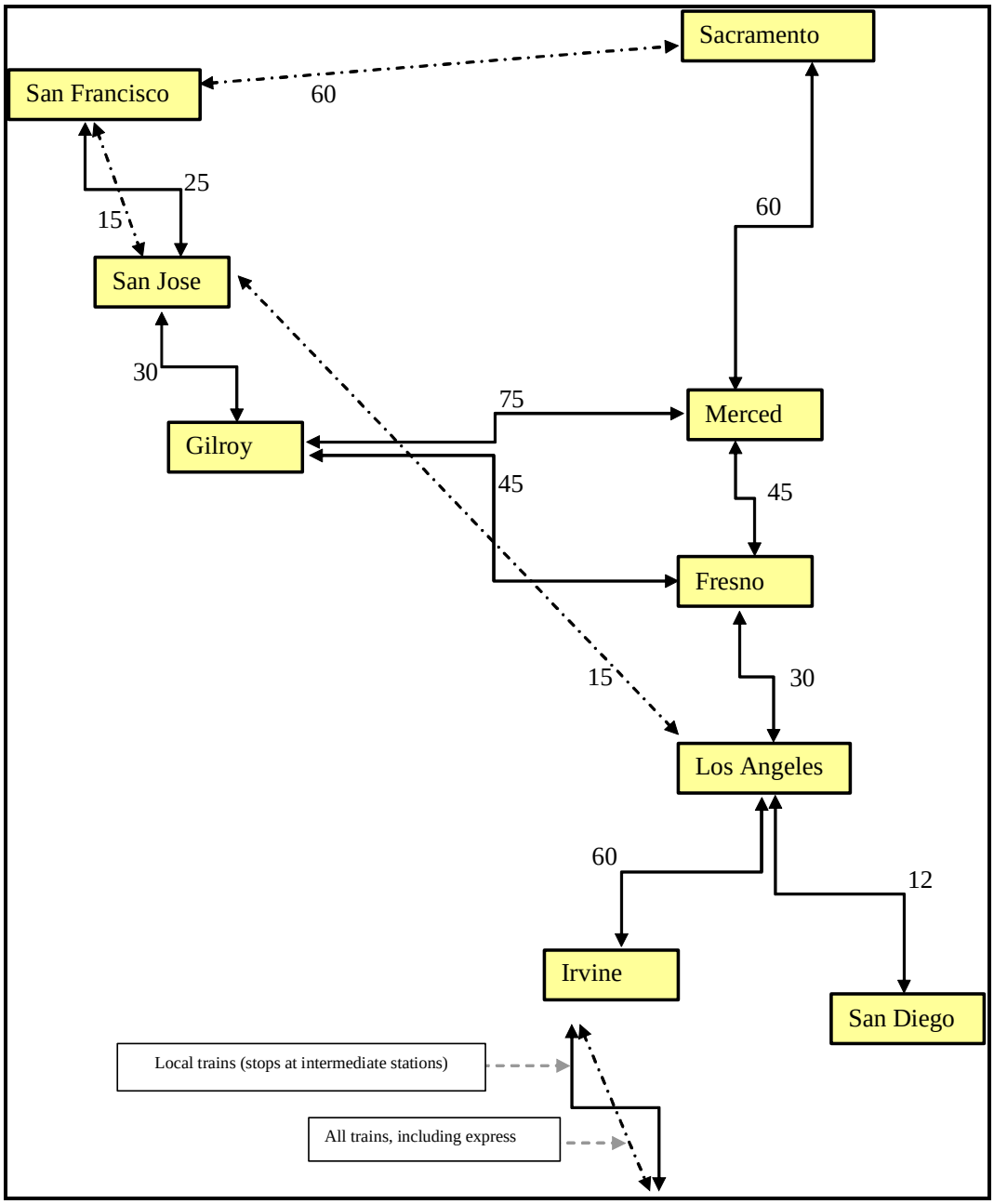
Table 2.23 Year 2005 Peak-Period Airport Headways *In Minutes*

		SAN	SNA (1)	LGB (1)	LAX (1)	ONT (1)	BUR (1)	SJC	SFO	OAK	SMF	PSP	OXR	SBA	BFL	FAT	MRY	ACV	MOD
San Diego	SAN	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Santa Ana	SNA	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Long Beach	LGB	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Los Angeles	LAX	42	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ontario	ONT	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Burbank	BUR	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
San Jose (1)	SJC	29	65	–	43	144	144	–	–	–	–	–	–	–	–	–	–	–	–
San Francisco (1)	SFO	29	65	–	18	360	90	–	–	–	–	–	–	–	–	–	–	–	–
Oakland (1)	OAK	41	45	180	51	111	85	–	–	–	–	–	–	–	–	–	–	–	–
Sacramento	SMF	23	115	120	85	59	59	–	85	–	–	–	–	–	–	–	–	–	–
Palm Springs (1)	PSP	–	–	–	169	–	–	411	111	240	262	–	–	–	–	–	–	–	–
Oxnard (1)	OXR	–	–	–	–	–	–	–	262	360	262	–	–	–	–	–	–	–	–
Santa Barbara	SBA	33	–	–	65	–	–	169	63	360	78	–	–	–	–	–	–	–	–
Bakersfield	BFL	–	–	–	–	–	–	–	125	–	288	–	–	–	–	–	–	–	–
Fresno	FAT	131	65	–	45	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Monterey	MRY	111	64	–	111	–	–	–	–	–	–	131	–	–	–	–	–	–	–
Arcata	ACV	36	411	–	40	180	76	–	103	–	–	720	–	–	–	–	–	–	–
Modesto	MOD	288	288	–	152	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Source: Federal Aviation Administration data from the 10 percent ticket sample, supplemented with internet queries in August, 2006. This includes direct and connecting service for intra-state flights where demand in 2005 is greater than 1 trip per day (400 annual trips).

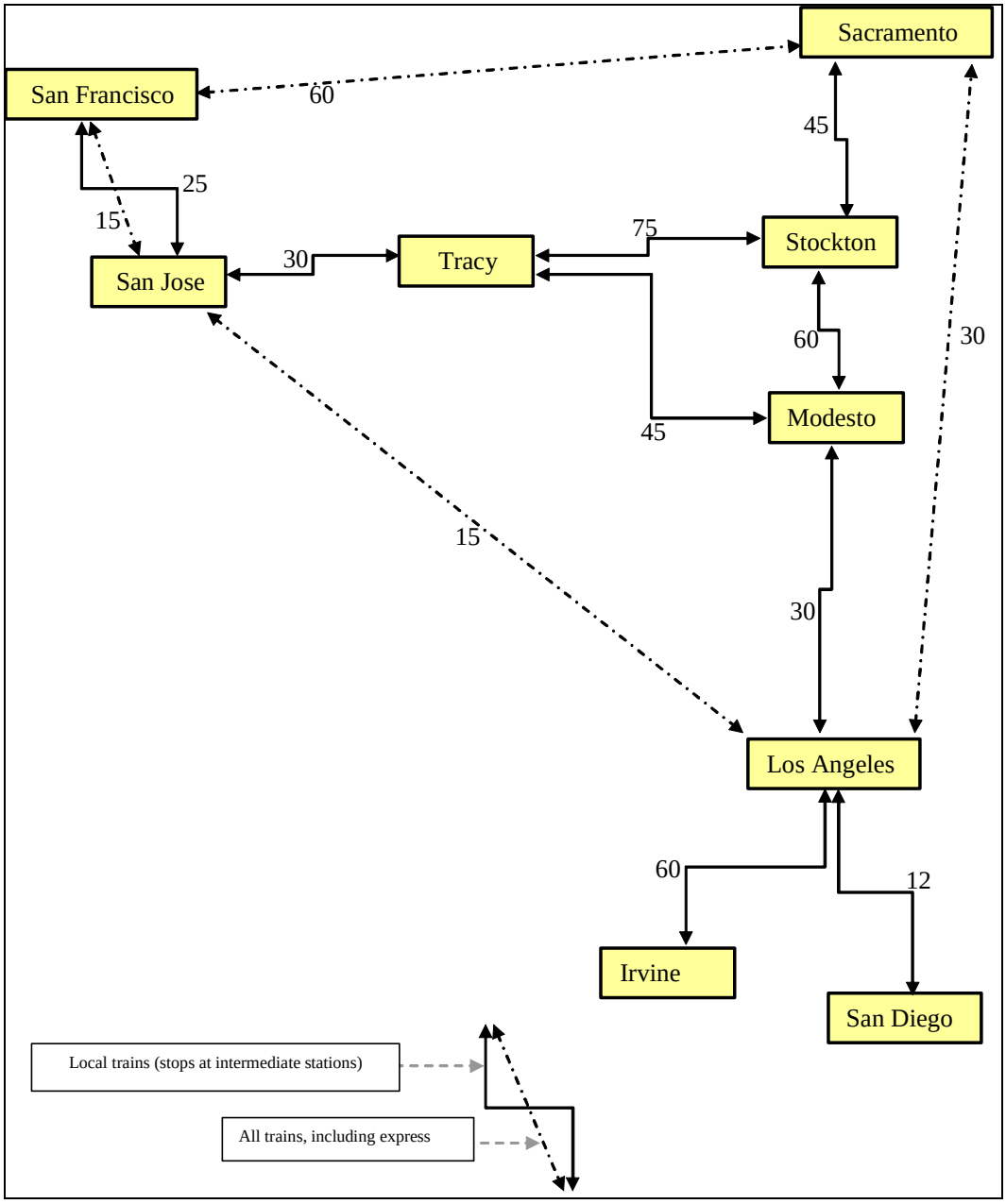
Note (1) Headways from San Francisco to Los Angeles region airports were assumed to be half the quoted headway because most travelers have more than one airport choice and therefore have twice as many air trips to choose from.

Figure 2.1 Generalized High-Speed Rail Peak Headways (in Minutes)
Southern Alignment Initial Alternative



Note: Only high-speed rail junction and express train stations shown.

Figure 2.2 Generalized High-Speed Rail Peak Headways (in Minutes)
Northern Alignment Initial Alternative



Note: Only high-speed rail junction and express train stations shown.

Conventional Rail

Conventional rail frequencies are not as complex as air or high-speed rail services. Headways for the five conventional rail lines have been coded as shown in Table 2.24 (services are in both directions).

Table 2.24 Interregional Conventional Rail Frequencies (in Minutes)

	Year 2000		Year 2005	
Line	**AM Peak**	**Off-Peak**	**AM Peak**	**Off-Peak**
San Joaquin – Oakland	180	360	180	360
San Joaquin – Sacramento	–	–	360	360
Capitol Corridor – Auburn	120	180	90	150
Capitol Corridor – Sacramento	120	180	90	150
Altamont Commuter Express	60	–	60	–
Pacific Surfliner – San Luis Obispo	180	–	180	360
Pacific Surfliner – Santa Barbara	75	120	75	90
Metrolink – Orange County Line	60	120	60	120

Access-Egress Times

Access and egress times are compiled for all mass transportation modes – air travel, and conventional and high-speed rail. There are no access-egress times for auto modes; out-of-vehicle time for auto is identified as terminal time and this is covered in a separate section below. Access-egress times cover the time required to travel from home (or activity location, such as from a workplace) to the curb of the train station/airport terminal. Times inside the stations/ terminals include both terminal and wait times, and are covered in the next two subsections.

The choice of mode to and from airports, conventional rail stations, and high-speed rail stations includes drive and park, picked-up/dropped off, rental car, taxi, transit, and walk. The auto-based modes (drive and park/picked-up/ dropped off, rental car and taxi) will all use highway network travel times for peak or off-peak travel. The walk network is based on the highway network, with freeways and expressways removed, and walk speeds are set to 3 miles per hour on all remaining arterial and collector links.

Wait Times

Wait time refers to the time between arriving at the airline gate or train platform, and closing of the airplane or train door after everyone has boarded. The time

spent prior to arriving at the airline gate or train platform is the terminal time, and is discussed further below.

Air

For air travel, the wait time includes both the time spent waiting at the gate for the plane to arrive; the actual boarding time; and the time up until the plane, loaded with passengers, leaves the gate area. Once the plane leaves the gate, line-haul time begins.

An initial review of wait times for air travelers in the surveys collected for this project revealed no significant difference between wait times for business and non-business travelers. In addition, we believe that air traveler wait times are not a function of the air service frequencies, as recommended by the peer review panel. The rationale for using set wait times is each seat must be reserved in advance, so the presence of more or less frequent service between airport pairs does not influence the wait times. As a result, air wait times for air passengers will be set based on a review of the surveys reported wait times at 55 minutes. The air wait times are derived from self-reported data on arrival time before departure in the air passenger travel surveys collected for this study, which includes both wait and terminal times.

Rail

For rail travel, the wait times are lower than air for a number of reasons. First, trains will have numerous doors, making boarding a train a much faster proposition than boarding an airplane. In addition, the hassle and time variance of getting a boarding pass, checking luggage, and getting through security requires arrival at the airport earlier than at a train station without security checkpoints. It is explicitly assumed that high-speed rail will not have the elaborate security check-in procedures, boarding passes will not be required to wait for a train, seats are not assigned, and that luggage is typically self-carried on the train.

High-speed and conventional rail wait times were discussed during the peer review panel meeting. The Peer Review Panel recommended interregional rail travel wait times in the range of 10 to 20 minutes, with higher values for non-business travel. The air passenger surveys, however, did not support separate wait times for business and non-business travelers; therefore, we propose to use a single wait time value for rail passengers as well. The rail wait time is set at 15 minutes for both high-speed and conventional rail travelers.

All of these factors combine to make train wait times much shorter than for air travel. There are currently no plans for airport security measures at high-speed rail stations, but sensitivity tests may be conducted to test the impact of additional wait times.

Terminal Times

Terminal time is the amount of time it takes someone to travel between their access mode and the airport boarding area or train platform. It also includes the time it takes an auto traveler to walk from their car to their destination. Terminal times are defined for both access and egress ends. At the origin/access end of a trip, terminal time includes the following:

- Time to walk (or ride a shuttle) between the parking area and terminal;
- Time to receive a ticket or boarding pass;
- Time to check luggage;
- Time to clear security; and
- Time to walk from security to the boarding area or platform.

Destination/egress end of a trip, terminal time includes:

- Time to de-board the airplane or train;
- Time to walk from the plane/train to baggage claim;
- Time to pick up baggage; and
- Time to walk (or ride a shuttle) between the terminal and parking area, or to other ground transportation modes.

Air and Rail

Terminal times were determined from a combination of peer review recommendations and subsequent refinements made by Cambridge Systematics. The following terminal times will be used:

- 12 minutes for downtown/terminal high-speed rail stations in San Diego, Irvine, Los Angeles, Sacramento, San Francisco, and Oakland. (These are the larger proposed high-speed rail stations, with more distant parking and longer walk times to local ground transportation.)
- 8 minutes for other high-speed rail stations;
- 24 minutes for non-business/commute trips at Los Angeles and San Francisco Airports;
- 20 minutes for non-business/commute trips at other airports;
- 22 minutes for business/commute trips at Los Angeles and San Francisco airports; and
- 18 minutes for business/commute trips at other airports.

These values average out to the 10-minute high-speed rail and 20-minute air terminal time recommendations of the peer group, but provide more differentiation that travelers generally encounter at larger airports and (presumably) high-speed rail stations.

Conventional rail terminal times are split, depending on whether high-speed rail service is also included. In the case of a station serving both conventional and high-speed rail, terminal times will be set to 10 minutes for interregional conventional rail service. In other cases, where only conventional rail service is provided, terminal times will be set to 3 minutes.

Auto

Terminal times are added to represent the average time to access one's vehicle at each end of the trip. The Caltrans Statewide Model assumes an average terminal time at the production (home) end of trips and at the trip attraction based on the area type of the zone, as demonstrated in Table 2.25. The longer terminal times in central urban areas are assumed because of the extra time involved in finding parking and walking between a parking space and the final destination.

Table 2.25 Auto Terminal Times in Minutes

Area Type	Production/ Origin Zone	Attraction/ Destination Zone
Central Urban	2	5
Urban	1	2
Small Urban	1	1
Rural	1	1

Source: California Department of Transportation and Dowling Association, *Caltrans Statewide Model Description*, Table 10, January 20, 2004.

Transfer Times

Transfer times apply when connecting from one mass transportation mode to another. In typical urban travel models, transfer wait times are defined as half the headway of the connecting modes. For interregional travel, transfer times are somewhat more complicated because local transit access/egress to/from the high-speed rail modes is part of the access/egress time.

Because the interregional travel mode will be the primary mode of travel, it is assumed the traveler will know the schedule of the interregional mode, and will plan their trip accordingly. As a result, no time will be assessed for trips that include using local transit to access the interregional mode.

For example, consider a traveler living in San Francisco and traveling to Southern California. This traveler will take Bay Area Rapid Transit (BART) to San Francisco Airport, followed by a flight to a Southern California airport. The notion of assessing a transfer time of half the airline headway (or some similar such measure) does not make sense since the traveler will obviously take a BART train that gets him/her to the airport on time for their flight. In this case, all of the relevant access travel time components are applied – a walk to the BART

station, a wait for the BART train to arrive, and the actual BART ride. From there, the traveler will walk from the BART platform to the San Francisco Airport entrance. The times, in total, comprise the access time. This traveler will have the airport terminal and wait times, as well as the airline flight time, for their trip, so an assessment of a transfer time for this trip would be redundant and unrealistic.

Nevertheless, the egress mode for the return trip would assess the typical transfer time – for the airline to BART connection. In this case, the traveler will have flown back to San Francisco Airport and will need to transfer to BART. Coming off a relatively long flight and egress terminal time, the traveler will likely to have to wait half the BART headway. The peer review panel suggested that the transfer egress time be capped at 15 minutes, and that recommendation has been implemented.

Examples of Door-to-Door Travel Time Calculations

The descriptions above of the travel time components are complex and detailed. To help illustrate the components of travel time – as well as to compare air and high-speed rail, three selected interregional trips are examined in Table 2.26. For each of these three trips, the door-to-door travel times are presented by access/ egress times, terminal times, wait times, and line-haul times. The sections above provide detailed explanations of each of these travel time components.

2.3 RELIABILITY

Reliability is a new measure that is included directly into the interregional mode choice models currently under development. Information collected was from correspondences with conventional rail system planners, FAA data, and previous high-speed rail environmental documentation (2003).

The stated-preference surveys collected for this study included the following reliability options across modes as part of the overall choice experiments. The reliability question was posed for each of four modes as the percent variations in the frequency of encountered delays.

Table 2.26 Selected Detailed Door-to-Door Travel Times by Interregional Mode and Trip Purpose (in Minutes)

Time Component	Description	Air	HSR	Auto @ 60 mph
Cupertino to Downtown Los Angeles				
Access	From origin to station/airport curb	20	20	
Terminal	Curb to waiting area	18	8	1
Wait	Wait for plane/train; board vehicle	55	15	
Line-haul	Train ride/flight; in-vehicle	65	125	350
Terminal	Seat to curb	22	12	5
Egress	Station/airport curb to destination	30	10	
Total door-to-door travel times		**210**	**190**	**356**
San Diego (Gas Lamp Quarter) to West Hollywood				
Access	From origin to station/airport curb	10	10	
Terminal	Curb to waiting area	18	8	2
Wait	Wait for plane/train; board vehicle	55	15	
Line-haul	Train ride/flight; in-vehicle	34	62	162
Terminal	Seat to curb	22	12	2
Egress	Station/airport curb to destination	30	30	
Total door-to-door travel times		**169**	**137**	**166**
Clovis to Downtown San Francisco				
Access	From origin to station/airport curb	10	20	
Terminal	Curb to waiting area	18	8	1
Wait	Wait for plane/train; board vehicle	55	15	
Line-haul	Train ride/flight; in-vehicle	46	79	185
Terminal	Seat to curb	22	12	5
Egress	Station/airport curb to destination	30	10	
Total door-to-door travel times		**181**	**144**	**191**

Note: Auto is shown here as an example of auto times at 60 miles per hour, but the model travel times will be based on congested conditions.

- **Travel by auto** – percent of the time there are no extra delays of more than **15 minutes**;
- **Travel by air** – percent of flights that arrive within **15 minutes** of schedule;
- **Travel by conventional rail** – percent of trains that arrive within **15 minutes** of schedule; and
- **Travel by high-speed rail** – percent of trains that arrive within **5 minutes** of schedule.

These data did not result in a significant parameter in the mode choice models. In conjunction with the peer review panel, we hypothesized that this was because the survey questions on reliability were too narrow (i.e., percent of flights or trains that arrive within 15 minutes), making it difficult for travelers to distinguish between the modes for longer interregional travel decisions. As a result, Cambridge Systematics modified the definition of the reliability measure to reflect the percent of flights or trains that arrive within 60 minutes, which will increase the impact this reliability has on a person's modal choice. In turn, the consultant team, in consultation with MTC and other study participants, has constrained the reliability measure in the mode choice models to reflect this change. The remainder of this section describes the development of the reliability measures for model application.

Auto Travel

Highways tend to be the least reliable of the four modes on a day-in, day-out basis. Reliability on highways is highly susceptible to incidents, weather, volume variation, and inadequate base capacity. On two of these factors (construction and special events), auto is more susceptible than the other modes. It is only when considering the influence of vehicle availability and routing that highways have a lower susceptibility than all other modes.

The measure of reliability that has been used on a series of studies by Cambridge Systematics is the freeway vehicle hours of delay. This measure indicates that as delay on the freeway increases, the overall reliability of the system would tend to decrease. The probability, expressed in decimal terms, of an auto traveler arriving within 60 minutes of the congested travel time can be found with the following function:

$$P = \left(\frac{(TC + 60)}{TC + 0.0073 * \left[\frac{(TC / TO - 1)^{0.117647}}{0.18} \right]^{5.2695} * 60 * TO} \right)$$

Where:

TO = Free-flow travel time in minutes; and

TC = Congested travel time in minutes.

The prior equation uses the concept of "travel time index," and essentially looks at the likelihood that someone's trip will be delayed by 60 minutes or more by non-recurring incident delay. The probability is referenced against congested travel time, since auto travelers presumably already account for the effects of recurring congestion in their mode choice decisions. The portion of the equation shown in bold represents the estimate of incident delay, measured in minutes.

There are a number of major simplifications and limitations with the preceding equation including, but not limited to, the following:

- The equation uses the freeway volume delay function for all origin-destination pairs. This function says that:

  $$TC = TO\ (1+0.18(Volume/Capacity)^{8.5}.$$

- Travel distance is estimated using free-flow travel time and an assumed free-flow speed of 60 mph for all origin-destination pairs.
- The equation uses an incident delay function development for the Federal Highway Administration (FHWA) ITS Deployment Analysis System (IDAS) software package for 6-lane freeways (3 lanes per direction). Linear regression was used to approximate a continuous function from the discrete look-up table in the IDAS User's Manual[2]. The IDAS "rates for off-peak or daily" reliability were used, with an additional assumption that the "1-hour level of service capacity" was equal to 1/14th of the link capacities in the high-speed rail model.
- The equation estimates incident delay uses average volume-to-capacity (V/C) ratio over the entire length of the trip. This is a limitation, as IDAS estimates incident delay from the V/C ratio on each individual link, but the equation has been scaled to account for this.

This auto reliability measure relies on existing research to define the function for determining auto reliability, but is applied on an origin-destination basis, rather than a link basis for the purposes of this study. The resulting percent reliability estimates for a trip from Los Angeles to San Francisco are in the range of 67 to 92 percent, depending on the specific details of a trip. Trips with no congestion will have 100 percent reliability.

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[2] Cambridge Systematics, Inc., *ITS Deployment Analysis System (IDAS)© User's Manual v.23*, prepared for the Federal Highway Administration, July 2003.

Air

Airline reliability data for 2000 and 2005, as well as forecasts for 2025 were compiled from the FAA data. Table 2.27 presents airport-to-airport reliability statistics for airports with the largest numbers of flights in 2000 and 2005. Airline travel shows reliability improvements since 2000, probably due to the airline practice of increasing scheduled air times to allow for better on-time performance.

Conventional Rail

To gather conventional rail data, e-mails were sent to Henning Eichler (Metrolink), Brian Schmidt (ACE), and Steve Roberts (Amtrak). There was no available on-time performance data for rail services arriving within 60 minutes of the scheduled time. The proposed measurement takes into account the same relationship that air performance has between 5 and 60 minutes, and assesses individual performance for each service. The following reliability measures were obtained and estimated:

- **ACE –** Reliability for ACE was measured within 5 minutes in the "Low 90s" through 1995. Since last year, ACE has had a number of reliability issues due to sharing track with freight rail. On-time performance within 60 minutes was estimated at 97 percent.
- **Metrolink –** Metrolink reliability is tracked monthly route. Year 2000 reliability averaged 95 percent in 2000 and 94 percent in 2005. Metrolink reliability is measured as the percentage of trains arriving within 5 minutes of scheduled time. On-time performance within 60 minutes was estimated at 98 percent.
- **San Joaquins –** The 5-year on-time performance within 5 minutes is 70 percent. On-time performance within 60 minutes was estimated at 89 percent.

Table 2.27 Airline Reliability

		Percent More than 60 Minutes late (Including Canceled and Diverted)			Flights	
Origin	Dest	2000	2005	2025	2000	2005
Los Angeles	San Francisco	12.1%	6.1%	7.7%	16,021	8,427
San Francisco	Los Angeles	11.9%	5.0%	6.3%	15,967	8,503
Oakland	Los Angeles	9.2%	5.8%	7.4%	11,944	9,646
Los Angeles	Oakland	7.7%	4.7%	6.1%	11,861	9,665
Los Angeles	San Jose	7.9%	5.3%	6.3%	10,911	10,234
San Jose	Los Angeles	10.3%	4.2%	5.5%	10,861	10,237
San Diego	San Francisco	11.1%	5.0%	6.3%	7,320	3,332
San Francisco	San Diego	10.0%	4.2%	5.3%	7,288	3,090
San Jose	Santa Ana	6.3%	3.4%	4.2%	5,450	5,290
Santa Ana	San Jose	6.1%	4.0%	4.7%	5,435	5,457
San Jose	San Diego	7.7%	4.7%	5.8%	5,253	6,588
San Diego	San Jose	9.0%	4.2%	5.0%	5,231	6,603
Sacramento	Los Angeles	10.0%	5.0%	6.1%	5,229	5,608
Los Angeles	Sacramento	8.4%	5.5%	6.9%	5,181	5,627
Burbank	Oakland	6.1%	4.7%	5.8%	5,152	4,894
Oakland	Burbank	7.7%	5.5%	6.6%	5,124	4,906
Oakland	Ontario	5.5%	5.3%	6.6%	4,512	4,471
Burbank	San Francisco	10.8%	6.9%	8.4%	4,356	2,778
San Francisco	Burbank	10.6%	5.8%	7.4%	4,356	2,416
Ontario	Oakland	7.4%	5.0%	6.3%	4,151	4,468
Santa Ana	Oakland	5.5%	4.7%	5.8%	4,135	4,545
Oakland	Santa Ana	5.5%	4.5%	5.5%	4,133	4,538
San Diego	Sacramento	7.7%	5.8%	6.9%	3,852	4,853
San Diego	Oakland	6.9%	5.8%	7.1%	3,847	6,198
Sacramento	San Diego	7.1%	5.3%	6.1%	3,847	4,852
Santa Ana	San Francisco	10.3%	5.8%	7.1%	3,840	3,832
San Francisco	Santa Ana	7.9%	4.5%	5.5%	3,826	3,753
Oakland	San Diego	6.1%	5.0%	5.8%	3,795	6,208
Sacramento	Ontario	6.1%	4.5%	5.3%	3,713	4,087

Table 2.27 Airline Reliability (continued)

		Percent More than 60 Minutes late (Including Canceled and Diverted)			Flights	
Origin	**Dest**	**2000**	**2005**	**2025**	**2000**	**2005**
Ontario	Sacramento	5.8%	4.7%	5.8%	3,686	4,072
Sacramento	Burbank	5.8%	4.5%	5.3%	3,410	3,404
Burbank	Sacramento	6.9%	4.7%	5.8%	3,389	3,406
Burbank	Santa Ana	6.3%	3.7%	4.5%	2,761	3,089
Santa Ana	Burbank	7.7%	4.5%	5.5%	2,760	3,070
Santa Ana	San Diego	8.2%	3.4%	4.5%	2,575	15,223
San Diego	Santa Ana	7.4%	3.2%	4.0%	2,573	15,237
Ontario	San Jose	7.4%	4.5%	5.5%	2,454	3,095
San Jose	Ontario	6.6%	4.5%	5.5%	2,452	3,070
Ontario	San Francisco	10.0%	7.1%	8.7%	2,163	215
San Francisco	Ontario	10.6%	5.0%	6.1%	2,161	215
San Francisco	Santa Barbara	9.2%	5.5%	6.6%	1,666	2,983
Santa Barbara	San Francisco	9.0%	6.3%	7.7%	1,620	2,869
Santa Ana	Sacramento	6.1%	5.3%	6.3%	1,560	2,461
Sacramento	Santa Ana	5.3%	4.2%	5.0%	1,560	2,459
Santa Barbara	Los Angeles	6.6%	2.6%	3.2%	981	5,911
San Francisco	Palm Springs	8.4%	8.4%	10.8%	936	965
Palm Springs	San Francisco	7.1%	6.3%	7.9%	935	947
Los Angeles	Santa Barbara	10.0%	2.6%	3.4%	932	5,692
Palm Springs	Los Angeles	7.1%	4.7%	5.8%	918	3,342
Los Angeles	Palm Springs	7.9%	4.0%	5.0%	918	3,321
San Francisco	Monterey	10.3%	5.5%	6.6%	341	2,633
Average		**8.6%**	**4.7%**	**5.8%**		

- **Capitol Corridor –** The 5-year on-time performance within 5 minutes is 82 percent. On-time performance within 60 minutes was estimated at 94 percent.
- **Surfliners –** The 5-year on-time performance within 5 minutes is 83 percent. On-time performance within 60 minutes was estimated at 94 percent.

High-Speed Rail

Typical high-speed rail reliability for European and Japanese systems was analyzed by Systra staff. On dedicated high-speed rail track, even with express and local trains, both the French and Japanese have reported average delays of 29 to 40 seconds per train (including weather and earthquake delays), which is more than 99 percent on time (within 10 minutes of schedule in European practice). This is possible since the dispatching and signal/control environment are managed as a consistent centralized unit with very few opportunities for delay. The ensemble of TGVs have been running at around 90 percent on time, because they also operate on conventional lines with different types of equipment, grade crossings, and other opportunities for slow down. About one-half of the operating mileage is on conventional lines. In Japan, almost all the mileage is on dedicated right-of-way (ROW).

In California, there will be origin-destination pairs that will have 100 percent dedicated ROWs, where a very high on-time performance (OTP) could be expected. This would include any origin-destination for San Diego-Los Angeles-Central Valley-Sacramento. Trains running into the Bay Area and Orange County would have more interaction with other operators, although there would be no grade crossings. An assumed 95 percent OTP within 5 minutes would represent a reasonable high-speed rail service assumption. OTP depends a lot on the schedule padding and assumes the standard 5 percent padding in the times. This translates to 99 percent reliability for the defined criteria of OTP within 60 minutes.

3.0 Future Baseline Network

3.1 PROJECT LIST

The future baseline networks were developed for each horizon year, including 2020, 2030, and 2050. For each of these years, assumptions about transportation infrastructure improvements must be made. The 2030 horizon year presents the best source of information, since this year is close to the horizon year for regional and metropolitan transportation plans (RTPs and MTPs, respectively). RTPs/MTPs for the four major urban areas have been identified and coded into the baseline transit and highway networks. The consultant team consulted the statewide travel model (STM) for other areas of the State – particularly the Central Valley. Assumptions about network improvements are identified by comparing the base and future networks.

MTC staff has identified planned transit and highway improvements included in MTC's current RTP. MTC has split out improvements that have been implemented since 2000, thus provided a ready list of projects that differentiate the 2000 model year from 2005 existing conditions. Transit improvements have been summarized in Table 3.1.

Table 3.2 summarizes changes in the Bay Area highway networks. Projects are summarized for 2000 to 2006 and for 2006 through 2030 (financially-constrained alternative).

Projects for other metropolitan areas were summarized more broadly. Current RTP/MTP project lists were scanned for major initiatives exceeding $100 million for the Sacramento Area Council of Governments (SACOG), SCAG, and San Diego Association of Governments (SANDAG) regions. These are summarized in Tables 3.3 through 3.5. It was not readily distinguishable which projects have already been implemented since 2000, and which are planned post-2006.

Table 3.1 San Francisco Bay Area Transit Improvements
2000 Through 2005

	Year	Improvements
AC Transit	2003	New Line M on San Mateo Bridge
	2003	San Pablo Ave Rapid Bus
	2003	Significant service cuts
	2004	Dumbarton Bridge Bus: Fremont-Stanford Univ.
	2005	Significant increase in service
ACE	2001	Santa Clara station opens
BART	2003	SFO extension; 4 new stations to SFO & Millbrae
Caltrain	2002	Elimination of four trains
	2004	Baby Bullet service kicks off; trains Increased to 86
	2005	Two more Baby Bullets runs: 88 total 88 trains
	2005	Expanded Baby Bullet – new stops at San Mateo, Redwood City, Menlo Park, Sunnyvale, and Tamien; total 96 trains
GGT	2003	14 bus routes eliminated
	2003	25% service reduction
MUNI	2005	Service reduced by 4.2%
SamTrans	2003	6 routes eliminated and 20 routes modified
	2004	Service reduced in nearly a quarter of its routes
	2004	Express bus to Millbrae from East Palo Alto, bus. Parks, hotels
VTA	2005	Vasona LRT line with 8 stations: San Fernando-Winchester
Financially-Constrained RTP Transit Projects (Post-2005)		
BART		5.4 mile Extension from Fremont to Warm Springs
		Oakland airport connector: 3.2 miles to Coliseum BART
		"E BART" commuter rail: Bay Point BART to Byron (6 stations)
AC Transit		BRT from Berkeley through Oakland to San Leandro
MUNI	2006	MUNI 3rd Street Light Rail
		Chinatown Central Subway: 3rd St LRT extension
Caltrain		Electrification to Gilroy; times reduced by 3% on Baby Bullets and by12% on all other trains
		Dumbarton Rail: Union City to Millbrae & San Jose
Amtrak		Capitol Corridor headways reduced to 60 peak and 90 minutes midday in the Oakland-San Jose Line
Ferries		Richmond to San Francisco Ferry Building added
		Redwood City to San Francisco Ferry Building added
		Redwood City to Harbor Bay added
		Berkeley to San Francisco Ferry Building added
		Oyster Point to San Francisco Ferry Building added
		Oyster Point to Harbor Bay added
		Hercules/Rodeo to San Francisco Ferry Building
CCTA		I-680 Express bus from Walnut Creek to Fremont added
Napa		New express buses to Santa Rosa, Fairfield & Vallejo ferry

Table 3.2 San Francisco Bay Area Highway Improvements
Differences Between Year 2000 and 2006

County	Route	Limits	Mixed Flow Lanes (Miles)	HOV* Lanes (Miles)
San Mateo	92	Dumbarton Bridge	5.6	
	92	101 to 280	3.75	
	280	Edgewood to 92	3.43	
	101	University to Embarcadero	1.28	
Subtotal			14.06	
Santa Clara	101	85 to Cochrane	16.79	16.81
	87	101 to 85		18.27
	880/17	Coleman to 85	5.37	
	880	Trimble to 101	4.66	
	880	Dixon to 237	2.01	5.2
	680	Scott Creek to 237		2.6
	85	El Camino Real to Fremont	1.51	
	85	101 to Middlefield		1.4
	101	University to Embarcadero	1.28	
Subtotal			31.62	44.28
Alameda	680	Vallecitos to Scott Creek		9.93
	880	Stevenson to Mission	3.88	
	92	880 to San Mateo County line	9.78	
Subtotal			13.66	9.93
Contra Costa	580	Central to Marin County Line	11.22	
	4	Cummings to 80	10.56	
	680	Rudgear to 680/24	7.73	
	680	Main Street to Solano County Line		16.3
	4	Loveridge to Bailey	7.76	
	4	Loveridge to Port Chicago		12.26
Subtotal			37.27	28.56
Solano	80	680 to 12	5.75	
Marin			-	-
Sonoma		12 to Rohnert Park		13.18
		Redwood to Oakwood	3.2	
Subtotal			3.2	13.18
Total			**105.56**	**109.13**

Table 3.2 San Francisco Bay Area Highway Improvements *Differences Between Year 2000 and 2006 (continued)*

County	Route	Limits	Mixed Flow Lanes (Miles)	HOV* Lanes (Miles)
Differences Between Year 2006 and Year 2030 (Sales Tax Conformity)				
San Mateo	280	Hickey to Fleetwood	2.62	
	101	Millbrae to University	21.94	
	92	101 to 280	4.13	
Subtotal			28.69	
Santa Clara	101	Ellis to Steyner	7.64	
	237	Mathilda to Highway 85		6.48
	237	Mathilda to Zanker	1.61	
	17	Hamilton to San Thomas	2.7	
	880	Dixon Landing to 237	4.06	
	680	Scott Creek to Jacklin	2.12	
	680	Scott Creek to Jacklin		1.82
Subtotal			18.13	8.3
Alameda	680	Scott Creek to Stoneridge		18.13
	680	Scott Creek to Mission	9.45	
	880	Dixon Landing to Warren	3.55	
	880	Dixon Landing to Warren		4.78
	580	680 to Greenville		21.51
	580	1st to Vasco	1.8	
	238	880 to 580	2.5	
Subtotal			17.3	44.42
Contra Costa	24	Broadway to Moraga	2.4	
	680	Diablo to Bollinger Canyon	6.83	
	680	Rudgear to Willow Pass		6.93
	4	Loveridge to 18th	13.79	13.79
	80	John Muir to Carquinez Bridge		10.45
Subtotal			23.02	31.17
Solano	80	680 to Air Base		12.67
Marin	101	Tamalpais to Sonoma County Line	4.26	27.91
Sonoma	101	Rohnert Park to Marin County Line		28.72
Total			**91.4**	**153.19**

*HOV = High-occupancy vehicle.

Table 3.3 Sacramento Region Highway and Transit Improvements, 2000 to 2030

Highway Projects	Description	Cost (Millions)
Route 65 Lincoln Bypass	Near Lincoln – Industrial Blvd to south Yuba Countyline – construct new 4-lane expressway/freeway on new alignment	$263
I-80	In Placer County, I-80 from east of SR 65 to west of the Sacramento Countyline: construct HOV lanes	$160
Placer Parkway	In Placer County, construct new 2-lane roadway between SR 65 and SR 99, with an extension to Sacramento International Airport	$400
Placer Parkway Phase 2	Placer Parkway from SR 65 to SR 99: widen from 2 to 4 lanes	$118
Route 99	Add a lane in each direction from I-5 to 70/99 split	$100
U.S. 50	New U.S. 50 HOV lanes from Downtown Sacramento to Sunrise Blvd	$195
I-5	Add HOV lanes from I-80 to Sacramento International Airport	$113
I-80/I-5	Revise existing interchange between I-80 and I-5	$150
American River Bridge	New American River crossing below Folsom Dam with approach	$110
Bridging I-5	Construct connection over I-5 between river esplanade and Crocker District, Capitol Ave to "O" street	$250
Feather River Bridge on Route 65	Construct 2-lane Third Feather River Bridge, with ROW for ultimate 4 lanes from Route 70 in Yuba County to Route 99 in Sutter County	$233
Wheatland Bypass	New 4-lane expressway from the future north end of Route 65 Lincoln Bypass to the existing Route 65	$184
I-80/U.S. 50	Carpool lane from Richards Blvd in Davis to Sacramento Countyline on I-80/U.S. 50	$110
Marysville Bypass (Ph. 2)	Construct a new 2- or 4-lane expressway (Marysville Bypass Ph. 2) from Route 65/70 split to Route 20, with access control	$158
Amtrak/Folsom Corridor Light-Rail Project	Folsom Corridor – Downtown Sacramento Folsom – light-rail extension (including vehicle purchase) – completed in 2005	$256
South Sacramento LRT – Ph. 2 Extension	Construct a light-rail extension from Meadowview Rd to Consumes River College	$203
South Sacramento LRT – Ph. 3 Extension	Construct a light-rail extension from Cosumnes River College to Elk Grove	$182
Antelope Light-Rail Extension	Construct an extension of light-rail line from I-80/Watt Ave to Antelope Rd	$290
Downtown-Natomas-Airport LRT	Light-rail extension from Downtown Sacramento to Sacramento International Airport	$624
Regional Commuter Rail Operations	Sacramento Metropolitan Area: operating and maintenance costs for commuter rail between Davis and Auburn	$171
Sacramento Intermodal Terminal	In Sacramento, develop intermodal transportation terminal for heavy-rail, light-rail and bus service	$225

Table 3.4 SCAG Highway and Transit Improvements 2000 to 2030

Route	Description
Imperial County	
78	Brawley Bypass Corridor – 4-lane expwy on SR 86 to 0.3 mile of Mead Rd on SR 111
Los Angeles County	
2	From Sepulveda to Moreno construct divided pkwy
5	Rte 5 from Rte 170 to Rte 118 HOV lanes (10 to 12 lanes)
5	Rte 5 from Rte 118 to Rte 14 from 10 to 12 lanes HOV lanes
5	Rte 5 from Rte 134 to Rte 170 HOV lanes (8 to 10 lanes)
10	Rte 10 from Rte 605 to Puente Ave HOV lanes (8+0 to 8+2)
10	In El Monte and Baldwin Park from Baldwin Ave to Rte 605 HOV lanes (8+0 to 8+2)
10	From Puente to Citrus HOV lanes from 8 to 10 lanes
10	I-10 from Citrus to Rte 57/210 one HOV lane in each direction
14	Near Santa Clarita, from Rte 5 to 126/s.f. Rd HOV project – add 1 HOV lane in each direction
14	Rte 14 from Vincent Ramp UC to Ave P-8 HOV lanes
71	Rte 10 to Rte 60 – expwy to freeway conversion – +1 HOV lane and 1 mixed-flow lane
138	Rte 138 widening from 2 lanes to 4 lanes – widening at Twin Bridges
138	In Palmdale at Avenue P-8 from Rte 14 to 50th St – acquire ROW for future Rte 138
138	Near Palmdale – widen freeway for one HOV in each direction
210	Foothill Blvd to San Bernardino county line – construct 8-lane freeway including 2 HOV lanes
405	Rte 405 – Waterford Ave to Rte 10, construct SB aux lane & SB HOV lane
405	In Los Angeles and Culver City from Rte 90 to Rte 10 – HOV lanes
405	Near Hawthorne and Culver City from Rte 105 to Rte 90 – 6 lane frwy plus 2 HOV lanes
Transit	Mid-City Transit Corridor BRT – Wilshire Blvd from Vermont to Santa Monica
Transit	Metro Rail Gold Line Extension – Pasadena to Montclair 24-mile, 12-station LRT
Transit	Metro Red Line Mos-3 – N. Hollywood 5.9-mile w/3 stations, Highland to N. Hollywood
Transit	Mid-City/exposition Corridor LRT Project Phase I to Venice-Robertson Station
Transit	San Fernando Valley E/W BRT (N. Hollywood to Warner Ctr)
Transit	Eastside Transit Corridor LRT – Union Station to Atlantic
Orange County	
5	I-5 from SR 91 to LA county line – 1 mixed-flow lane and 1 HOV lane in each direction
22	HOV lanes (1 each direction) btwn SR 55 & Valley View St
73	SJHC, 15-mile toll road between I-5 In San Juan Capistrano and Rte 73 In Irvine, existing 3 mixed flow each direction
90	Imperial Hwy Smart St (Iac to Harbor) – restripe 4 to 6 lanes (Iac Line to Idaho St
90	Imperial Hwy Smart St (Harbor to SR 57) – restripe 4 to 6 lanes (Harbor Blvd & Berry St)

Table 3.4 SCAG Highway and Transit Improvements 2000 to 2030 (continued)

Route	Description
90	Imperial Hwy Smart St (SR 57 to Rose) – widen EB By 1 lane from east of Valencia to city limits
133	Laguna Canyon Rd (SR 73 to SR 405) in Irvine and Laguna Beach – widen 2 to 4 lanes
405	Costa Mesa (Bristol St to Euclid) I –405 widening and ramp improvements
405	Costa Mesa (Bristol St to Euclid) I-405 widening
Transit	Buena Park Commuter Rail Station – 308 parking spaces
Transit	Fullerton Train Station – parking structure for 500 spaces
Transit	Irvine Transportation Center – 900 space parking structure
Riverside County	
60	Jct Rte 15 to Valley Way UC – add 1 HOV and 1 mixed-flow lane in each direction
60	In Riverside and Moreno Valley on SR 60 from Rte 215 to Redlands Blvd – add 2 HOV lanes
71	Near Corona/Chino Hills – widen to 4-lane divided expwy
74	In Perris and Lake Elsinore – widen and realign from 2 to 4 lanes – Jct Rte 15 to 7th St in Perris
215	RIV I215 Cor Improv Proj – widen 6 to 8 lanes, add HOV, Aux, & Sb truck climb lane
San Bernardino County	
10	In Redlands from Orange St to Ford St – add one mixed-flow lane in each direction
15	In Victorville from N/O Mojave Dr I/C to Stoddard Wells Rd – +1 N/B mixed-flow lane with aux. Lane
15	Cajon Pass, N/B from 0.1 KM S/o Rte 138 to 0.1 Km S/o Oak Hill Rd O/C – add N/B lane
15	Near Barstow from Mojave Dr I/C to Wildwash Bridge – add S/B mixed flow
30	Near Fontana construct 6-lane frwy & 2 HOV lanes
66	In Fontana from East Ave to Hemlock Ave – widen from 4 to 6 lanes
138	Near Cajon – 4-lane controlled access highway
138	Bear Valley Rd to Yucca Loma Rd – widen 2-lane road to 4-lane road (2 lanes in each direction)
220	High Desert Corridor from 1 mi w/o SR 395 to 1 mi S/o 18 – construct 4- to 6-lane freeway
Ventura County	
23	Thousand Oaks & Moorpark – widen Rte 23 from Hwy 118 to Hwy 101 (widen from 4 to 6 lanes)
118	In Simi Valley Widen Rte 118 from Tapo Cyn to LA county line

Table 3.5 San Diego Region Transportation Improvements 2000 to 2030

Project	From	To	Existing	Improvements	Cost
I-5	SR 56	Vandegrift	8F	8F + 4ML	$750
I-15	SR 94	SR 163	6F/8F	8F + 2HOV	$200
I-15	SR 163	SR 56	8F + 2ML	8F + 4ML/MB	$200
I-15	SR 56	Centre City Pkwy	8F	8F + 4ML/MB	$340
I-15	Centre City Pkwy	SR 78	8F	8F + 4ML	$120
SR 52	I-15	SR 125	4F	6F + 2ML (R)	$170
SR 241 Orange County	Orange County	I-5		4T + 2HOV	$420
I-805	SR 905	SR 54	8F	8F + 2 HOV	$150
I-805	SR 54	I-8	8F	8F + 4ML	$450
I-805	Mssn Vly Viaduct		8F	8F + 4ML	$250
I-805	I-8	I-5	8F	8F + 4ML	$380
I-5 I-805				N to N & S to S HOV	$180
I-15 SR 94				S to W & E to N HOV	$150
SR 11	SR 905	Mexico		4F	$190
SR 52	SR 125	SR 67		4F	$290
SR 56	Camino Ruiz	Carmel Country		4F	$130
SR 125**	SR 905	San Miguel Rd		4T	$400
SR 125	San Miguel Rd	SR 54		4F	$140
SR 125	Jamacha Rd	SR 94		6F	$170
SR 905	I-805	Mexico		6F	$290
I-5 Sea World Dr	SR 54	Sea World Dr	8F	Access Improvements	$170
I-5	I-805	SR 56	10F	14F	$190
SR 76	Melrose Dr	Mission Rd	2C	4C	$100
I-5	SR 56			W to N & S to E Fwy connectors	$140
I-5	SR 78			W to N & S to E Fwy connectors	$150
SR 94	SR 125			W to N & S to E Fwy connectors	$110
Transit Projects					
Mission Valley East Trolley Extension			$450		
Oceanside to Escondido Rail			$350		
Mid-Coast Light Rail			$590		
Oceanside-Escondido Rail Double Tracking and North County Fair Extension			$170		
Regional Light Rail Grade Separations			$100		
Improved/New Major Transit Stations and Centers			$470		

Projects outside the four metropolitan areas have been defined by comparing highway networks from the statewide travel model. The main projects that have been identified are the following:

- **Stockton** – I-5 widened 1 lane in each direction;
- **Tracy** – I-205 widened 1 lane in each direction to I-580;
- **Monterey County** – U.S. 101 Prunedale Bypass, plus SR 152 between Monterey and Salinas;
- **Central Valley** – Lane additions on SR 99 between Modesto and Bakersfield at various locations;
- **Central Valley** – A number of other facilities, primarily in east-west directions on both sides of SR 99, are widened throughout metropolitan areas from Stockton to Bakersfield;
- **SR 46** – Widened between Paso Robles and I-5 (just north of Bakersfield); and
- **U.S. 395** – Widening throughout Kern County, plus widenings at various locations in Inyo and Mono Counties.

There are no significant transit projects under consideration outside the four major metropolitan areas. The background highway and transit networks do not contain projects included or under consideration as part of the statewide infrastructure bond initiative (up for statewide voter approval in November 2006). Forecasting analysis will have been well underway before the election is decided. In addition, there will be project-level competition for bond funds, so the project list is not complete.

4.0 Forecast Alternatives

There will be up to 72 alternatives developed and analyzed for the high-speed rail ridership and revenue study by the consultant and additional alternatives or tests conducted by MTC. These will be defined based on station locations, high-speed rail train service patterns, and specific project alternatives. These will also include a series of sensitivity tests to ensure that the model is producing reliable and consistent ridership forecasts.

4.1 STATION LOCATIONS

Initial baseline high-speed rail system forecasts include 25 stations on the Southern Alignment and 26 stations on the Northern Alignment. Gilroy is included for the Southern Alignment baseline alternative, while Tracy and Pleasanton are included in the North Alignment baseline alternative. All discussion in this section is limited to the initial high-speed rail definitions; subsequent forecasts may be done on other alignment options. Figures 4.1 and 4.2 present locations of proposed high-speed rail stations. Final alternatives for high-speed rail will be determined through the environmental review process. Ridership is one component of this process.

Five lines are proposed for service based on CHSRA's current business plan system as of June 2000:

1. San Diego – Los Angeles – Sacramento;
2. Orange County – Los Angeles – Sacramento;
3. San Diego – Los Angeles – Bay Area;
4. Orange County – Los Angeles – Bay Area; and
5. Sacramento – Bay Area.

Figure 4.1 Proposed Northern California High-Speed Rail Stations and Alignments

Preferred Alignments and Stations - North

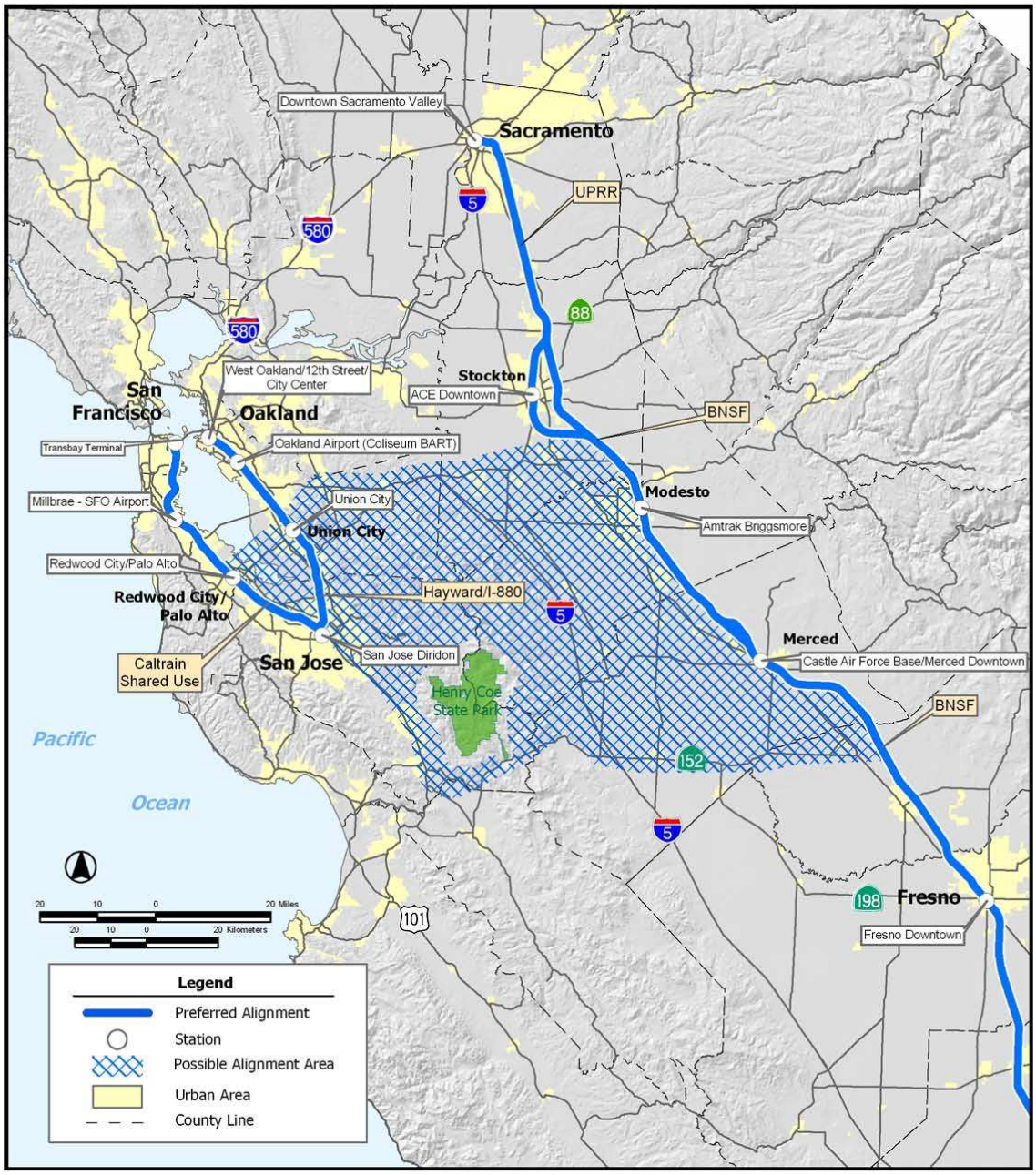

Figure 4.2 Proposed Southern California High-Speed Rail Stations and Alignments

Preferred Alignments and Stations - South

The following station locations are divided by geographic area and line:

- Northern Central Valley – Sacramento, Stockton and Modesto.
- Bay Area – San Francisco, Millbrae, Palo Alto/Redwood City, San Jose, Oakland, Oakland Airport, and Union City.
  - Southern Alignment – Gilroy/Morgan Hill; and
  - Northern Alignment – Pleasanton/Livermore, Tracy (San Joaquin County).
- Southern Central Valley – Merced, Fresno, Bakersfield, Visalia (optional).
- Los Angeles – Palmdale, Sylmar, Burbank, LAUS.
- Orange County Line – Norwalk (Los Angeles County), Anaheim, Irvine.
- Inland Empire – East San Gabriel Valley, Ontario, Riverside, Temecula.
- San Diego – Escondido, University City, San Diego.

4.2 HIGH-SPEED RAIL TRAIN SERVICE PATTERNS

Train service patterns describe the array of service options across each of the service lines. (Service lines are described in Section 4.1, above). The CHSRA envisions five service options.

1. Local stop trains stop at all stations from beginning to the end of the line. Local stop trains take 50 minutes longer to travel from Los Angeles to San Francisco (3 hours and 20 minutes vs. 2 hours and 30 minutes).
2. Express trains travel non-stop between LAUS and San Francisco or Sacramento. South of LAUS, trains either travel non-stop to San Diego, or travel all-stop (3 stations) through Orange County. Some express trains may also stop at San Jose.
3. Regional trains operate only from the Central Valley to either San Francisco or LAUS/San Diego. Most of the regional service is confined to the early hours to provide service that arrives in the large metropolitan areas during the morning peak period.
4. Semi-express trains stop at approximately one-third of the stations between San Francisco and Los Angeles. These trains tend to stop at San Jose, Fresno, and Bakersfield.
5. Suburban trains make all stops in the Bay Area and in Southern California, but bypass most or all of the Central Valley stations.

4.3 PROJECT ALTERNATIVES

Development of the project alternatives is underway. There is a need to coordinate the alternatives development activities of this project with two other ongoing projects:

1. The Regional Rail Study, and
2. The environmental report on Bay Area-Central Valley high-speed rail alignment options.

The initial forecasts include 10 alternatives defined for the third high-speed rail revenue and ridership study peer review meeting (tentatively scheduled to be complete in July 2006). Additional alternatives will include baseline forecasts for the study years supporting the high-speed rail environmental report (2000, 2005, and 2030), as presented in Table 4.1. Other alternatives supporting the Regional Rail study (2020 and 2050) will be completed at a later date. Many additional alternatives are yet to be defined, but will be developed as the Regional Rail study unfolds. In addition, the project team and the peer review panel will evaluate the baseline forecasts.

Table 4.1 Draft High Speed Rail Alternatives Definitions

	Year	Description	HSR Alignment	Bay Area Terminal	Notes
1	2000	Base Year Draft	No HSR		For Peer Review
2	2005	Draft Existing Conditions	No HSR		For Peer Review
3	2005	Existing w/HSR Southern Alignment	Southern	SF via SJ	For Peer Review
4	2005	Existing w/HSR Northern Alignment	Northern	SF + SJ	For Peer Review
5	2030	2030 Baseline Draft	No HSR		For Peer Review
6	2030	2030 w/ HSR – Pacheco	Southern	SF via SJ	For Peer Review
7	2030	2030 w/HSR – Altamont	Northern	SF + SJ	For Peer Review
8	2030	2030 w/HSR – Pacheco	Southern	SF via SJ	Peer Review – Sensitivity test
9	2030	2030 w/HSR – Altamont	Northern	SF + SJ	Peer Review – Sensitivity test
10	2030	2030 w/HSR – Pacheco	TBD		Peer Review – Sensitivity test
11	2000	Base Year Final	No HSR		Final Base Year
12	2005	Existing Conditions	No HSR		Final 2005 Existing Conditions
13	2030	2030 Baseline Final	No HSR		Final 2030 Baseline (No HSR service)

In order to support the high-speed rail forecasting schedule (running from August through December), an initial set of coordinated alternatives definitions will be defined in August. This will allow for coding and preparation of alternatives in advance of ridership forecasting.

4.4 SENSITIVITY TESTS

A number of sensitivity tests are proposed to help ensure the model performs as expected. A variety of sensitivity tests will be needed to demonstrate reliable model performance. It is likely that conventional rail fares will track high-speed rail fares, so it is recommended that these fares vary the same way as high-speed rail in most scenarios. Fuel price scenarios should also be tested, but it makes sense to vary rail and air to some extent with auto costs as they are closely related. It will also be informative to examine how airlines may compete with high-speed rail. Table 4.2 summarizes the potential sensitivity tests the project team will be considering.

Table 4.2 Potential Sensitivity Tests

Scenario Name/Description	HSR Cost	Conv. Rail Cost	Air Cost	Auto Cost
Base	Base	Base	Base	Base
Less Expensive Rail Fare	Decrease	Decrease	Base	Base
More Expensive Rail Fare	Increase	Increase	Base	Base
Less Expensive Fuel	Low Decrease	Med Decrease	Med Decrease	High Decrease
More Expensive Fuel	Low Increase	Med Increase	Med Increase	High Increase
Less Expensive Air Travel	Base	Base	Decrease	Base
More Expensive Air Travel	Base	Base	Increase	Base

As shown above in Table 4.1, the project team will evaluate initial sensitivity tests based on their impacts on mode choice only. Transit and traffic assignment impacts will not be examined. Mode choice evaluation will allow the project team to quickly evaluate sensitivity impacts, and will allow for testing of a greater number of sensitivity tests than would otherwise be possible.