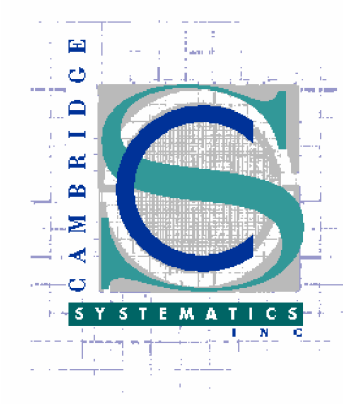

Decennial Model Update

MTC Consistency Report

final report

prepared for

Contra Costa Transportation Authority

prepared by

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with

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1.0 Introduction

The Decennial Model Update was a process to update current models being used for transportation planning applications in Contra Costa County. This process involved implementing the recommendations in the Modeling Evaluation Study, which addressed the planning and modeling needs of the Contra Costa Transportation Authority (CCTA) over the next 10 years.

This report is one of five reports written to document the work completed during the Decennial Model Update study:

1. Executive Summary,
2. CCTA Travel Model Documentation,
3. CCTA Travel Model User's Guide,
4. CCTA Travel Model Technical Appendices, and
5. MTC Consistency Report.

The purpose of this report is to compare the CCTA travel model results with the MTC model results for each of the model components required by the MTC. The purpose of the executive summary is to provide a brief overview of the study and summaries of validation and forecasting results. The purpose of the model documentation is to document the process of preparing the CCTA Travel Model and to provide results of the validation and forecasting model runs. The purpose of the user's guide is to provide technical guidance on the use of the models, including documenting new software procedures developed as part of this study. The purpose of the technical appendix report is to provide technical details required in the model documentation and user's guide that are too voluminous to be placed within these reports.

The approach to testing the trip tables from the CCTA Model Validation was based on the MTC consistency requirements[1], because the trip table results can be compared by county and by super-district directly to model results from the MTC model. As part of the CCTA Decennial Model Update, the MTC Model was converted from TP+ to TransCAD software package. Results from the TransCAD model were compared to the TP+ model to ensure that the new model accurately emulates the original MTC model. On September 26, 2002, the model development team met with the MTC staff and presented the results of the conversion process. MTC's approval of the overall approach and the results from the

[1] Metropolitan Transportation Commission, *MTC Checklist for Modeling Consistency for CMPs*, Technical Memorandum to the Model Coordination Working Group, June 2003.

TransCAD model was documented in a letter, dated November 1, 2002. The letter and the minutes from the meeting are attached to this report as Appendix A. The letter also talks about MTC's approval of CCTA's decision to conduct a Year 2000 validation model run that uses ABAG-consistent land use data and year 2000 traffic counts. The final CCTA Model has a base year of 2000, while the MTC model has a base year of 1998, creating some differences in the number of trips that are solely due to growth in this two-year timeframe rather than differences in the model outputs. MTC staff agreed that CMA consistency tolerances shall be adjusted to account for any land use and traffic changes that occurred between 1998 and 2000. Wherever possible, results are presented on a per-unit basis to enable a more direct comparison of results.

All products as noted herein are derived from the MTC consistency requirements. All of the references to county and super-district summaries assume that the county summaries will include all nine counties in the Bay Area, and the super-district summaries will include only those super-districts within Contra Costa County (20-24).

2.0 General Approach

The CCTA countywide model is run within the TransCAD software environment and the MTC model is run within the TP+ environment. There are some documented differences in the development of transit and highway travel times and transit and highway assignments that are derived from using different software platforms, but these differences are minor and not of a concern for the model consistency checks.

As expected, the significant refinements to the model zone structure and the transportation networks within Contra Costa and Tri-Valley affect how the model behaves. The overall results of the CCTA countywide model are not the same as that of the original MTC model; however, the changes that we have observed appear logical when analyzed in the comparative context of a 2,500 vs. 1,099-zone model. In Phase I, outside Contra Costa and Alameda, the results matched the MTC model reasonably well. In Phase II, the CCTA model was updated to represent year 2000 data for the nine-county region, and calibration adjustments were implemented to match traffic counts at the cordon. As a result, the results deviated from the MTC model somewhat. Some differences arise from the difference in base years, and some of these differences were caused by adjustments to match cordon counts around the CCTA study area and regional and internal screenlines.

3.0 Auto Ownership Model

MTC consistency guidelines require that the Authority use MTC's auto ownership model or submit alternative models to the MTC for review and comment. The CCTA Travel model uses MTC's procedure for auto ownership. The following summaries were prepared for the CCTA countywide model and the MTC model:

- Vehicles per household by county (Table 3.1) and super-district (Table 3.2) and;
- Households by number of vehicles available by county (Table 3.3).

Table 3.1 Vehicles Per Household by County

	Total Households		Total Vehicles		Vehicles Per Household	
	MTC	**CCTA**	**MTC**	**CCTA**	**MTC**	**CCTA**
County						
San Francisco	313,212	315,589	347,196	357,862	1.11	1.13
San Mateo	251,192	254,342	489,359	502,907	1.95	1.98
Santa Clara	555,803	567,080	1,150,257	1,188,883	2.07	2.10
Alameda	505,006	513,452	868,523	892,268	1.72	1.74
Contra Costa	331,423	344,133	651,081	660,353	1.96	1.92
Solano	126,888	130,320	251,463	261,017	1.98	2.00
Napa	45,367	46,246	89,620	92,814	1.98	2.01
Sonoma	167,320	171,524	327,618	340,833	1.96	1.99
Marin	98,553	99,504	186,650	190,590	1.89	1.92
Total Bay Area	**2,394,764**	**2,442,190**	**4,361,767**	**4,487,527**	**1.82**	**1.84**
	Difference	**% Difference**	**Difference**	**% Difference**	**Difference**	**% Difference**
San Francisco	2,377	0.8%	10,666	3.1%	0.03	2.3%
San Mateo	3,150	1.3%	13,548	2.8%	0.03	1.5%
Santa Clara	11,277	2.0%	38,626	3.4%	0.03	1.3%
Alameda	8,446	1.7%	23,745	2.7%	0.02	1.0%
Contra Costa	12,710	3.8%	9,272	1.4%	-0.05	-2.3%
Solano	3,432	2.7%	9,554	3.8%	0.02	1.1%
Napa	879	1.9%	3,194	3.6%	0.03	1.6%
Sonoma	4,204	2.5%	13,215	4.0%	0.03	1.5%
Marin	951	1.0%	3,940	2.1%	0.02	1.1%
Total Bay Area	**47,426**	**2.0%**	**125,760**	**2.9%**	**0.02**	**0.9%**

Table 3.2 Vehicles Per Household by Super-District

	Total Households		Total Vehicles		Vehicles Per Household	
	MTC	CCTA	MTC	CCTA	MTC	CCTA
Super-District						
Richmond/El Cerrito	83,493	85,503	148,689	148,386	1.78	1.74
Concord/Martinez	81,656	85,886	159,843	164,038	1.96	1.91
Walnut Creek/Lamorinda	58,127	59,170	110,808	110,933	1.91	1.87
Danville/San Ramon	40,782	41,536	95,485	93,350	2.34	2.25
Antioch/Pittsburg	67,365	72,056	136,256	143,646	2.02	1.99
Livermore/Pleasanton	58,123	60,484	127,416	132,116	2.19	2.18
Total CCTA Study Area	**389,546**	**404,635**	**778,497**	**792,469**	**2.00**	**1.96**
	Difference	**% Difference**	**Difference**	**% Difference**	**Difference**	**% Difference**
Richmond/El Cerrito	2,010	2.4%	-303	-0.2%	-0.05	-2.6%
Concord/Martinez	4,230	5.2%	4,195	2.6%	-0.05	-2.4%
Walnut Creek/Lamorinda	1,043	1.8%	125	0.1%	-0.03	-1.7%
Danville/San Ramon	754	1.8%	-2,135	-2.2%	-0.09	-4.0%
Antioch/Pittsburg	4,691	7.0%	7,390	5.4%	-0.03	-1.4%
Livermore/Pleasanton	2,361	4.1%	4,700	3.7%	-0.01	-0.4%
Total CCTA Study Area	**15,089**	**3.9%**	**13,972**	**1.8%**	**-0.04**	**-2.0%**

Table 3.3 Households by Number of Vehicles

	Zero-Vehicle Households		Single-Vehicle Households		Multi-Vehicle Households	
	MTC	CCTA	MTC	CCTA	MTC	CCTA
County						
San Francisco	90,652	88,827	128,143	127,475	94,417	99,291
San Mateo	12,625	11,548	75,122	73,268	163,445	169,526
Santa Clara	24,079	22,418	140,272	137,062	391,452	407,602
Alameda	56,770	55,898	168,903	168,790	279,333	288,764
Contra Costa	18,366	21,628	89,492	99,010	223,565	223,513
Solano	6,614	6,445	33,777	33,461	86,497	90,414
Napa	2,358	2,201	12,826	12,469	30,183	31,576
Sonoma	8,082	7,477	48,334	47,597	110,904	116,450
Marin	3,973	3,683	31,125	30,514	63,455	65,307
Total Bay Area	**223,519**	**220,125**	**727,994**	**729,646**	**1,443,251**	**1,492,443**
	Difference	**% Difference**	**Difference**	**% Difference**	**Difference**	**% Difference**
San Francisco	-1,825	-2.0%	-668	-0.5%	4,874	5.2%
San Mateo	-1,077	-8.5%	-1,854	-2.5%	6,081	3.7%
Santa Clara	-1,661	-6.9%	-3,210	-2.3%	16,150	4.1%
Alameda	-872	-1.5%	-113	-0.1%	9,431	3.4%
Contra Costa	3,262	17.8%	9,518	10.6%	-52	0.0%
Solano	-169	-2.6%	-316	-0.9%	3,917	4.5%
Napa	-157	-6.7%	-357	-2.8%	1,393	4.6%
Sonoma	-605	-7.5%	-737	-1.5%	5,546	5.0%
Marin	-290	-7.3%	-611	-2.0%	1,852	2.9%
Total Bay Area	**-3,394**	**-1.5%**	**1,652**	**0.2%**	**49,192**	**3.4%**

Tables 3.1 and 3.3 demonstrate that the results from the CCTA countywide model match the results from the MTC model within +/-2 percent. Auto ownership in Contra Costa County is -2 percent compared to the MTC model, because the CCTA model contains higher population densities (more households within the same area) and, as a result, slightly lower auto ownership per household. Total vehicles in Contra Costa County increase when comparing the CCTA and MTC models, even though the autos per household rates decrease when comparing the CCTA and MTC models.

The 2000 Census reports an auto ownership of 1.88 vehicles per household in Contra Costa; and 344,422 households for a total of 647,513 vehicles owned in the County. This is two percent lower than the CCTA model estimate of 1.92 vehicles per household and four percent lower than the MTC model estimate of 1.96 vehicles per household.

The 2000 Census also reports that there are 22,238 households with no vehicles in Contra Costa County, where the CCTA model estimates there are 21,628 households with no vehicles and the MTC model estimates there are 18,366 households with no vehicles. While the zero-vehicle households in the CCTA model are higher than the MTC model, it is closer to the 2000 Census (and still lower) and is considered reasonable.

4.0 Trip Generation

The CCTA Travel model implemented MTC's trip generation models using year 2000 land use data. MTC consistency guidelines require that differences in trip productions and attractions for total person trips and home based work trips should be no greater than one percent or 10,000 trips, whichever is higher for comparisons for Contra Costa County and overall for the region or study area. The following summary was prepared to compare the trip generation and attraction models from the CCTA countywide model and the MTC model:

- Trip productions and attractions by trip purpose by county (Table 4.1) and super-district (Table 4.2).

Table 4.1 Total Production and Attraction Models by County

	Productions		Attractions		Trips per Household	
County	**MTC**	**CCTA**	**MTC**	**CCTA**	**MTC**	**CCTA**
San Francisco	2,380,842	2,463,443	2,798,503	2,881,625	7.60	7.81
San Mateo	2,417,899	2,506,659	2,290,113	2,363,507	9.63	9.86
Santa Clara	5,638,645	5,895,626	5,819,368	6,057,300	10.15	10.40
Alameda	3,868,832	3,995,193	3,868,385	3,977,157	7.66	7.78
Contra Costa	2,573,069	2,733,076	2,293,756	2,544,314	7.76	7.94
Solano	999,184	1,031,344	894,391	902,528	7.87	7.91
Napa	353,057	365,668	351,790	363,823	7.78	7.91
Sonoma	1,256,093	1,305,409	1,209,276	1,229,756	7.51	7.61
Marin	752,322	775,254	714,358	726,804	7.63	7.79
Total Bay Area	**20,239,943**	**21,071,672**	**20,239,940**	**21,046,814**	**8.45**	**8.63**
	Difference	**% Difference**	**Difference**	**% Difference**	**Difference**	**% Difference**
San Francisco	82,601	3.5%	83,122	3.0%	0.20	2.7%
San Mateo	88,760	3.7%	73,393	3.2%	0.23	2.4%
Santa Clara	256,981	4.6%	237,932	4.1%	0.25	2.5%
Alameda	126,361	3.3%	108,773	2.8%	0.12	1.6%
Contra Costa	160,007	6.2%	250,557	10.9%	0.18	2.3%
Solano	32,160	3.2%	8,136	0.9%	0.04	0.5%
Napa	12,611	3.6%	12,033	3.4%	0.12	1.6%
Sonoma	49,316	3.9%	20,481	1.7%	0.10	1.4%
Marin	22,932	3.0%	12,446	1.7%	0.16	2.1%
Total Bay Area	**831,729**	**4.1%**	**806,874**	**4.0%**	**0.18**	**2.1%**

Table 4.2 Total Production and Attraction Models by Super-District

Super-District	Productions		Attractions		Trips per Household	
	MTC	CCTA	MTC	CCTA	MTC	CCTA
Richmond/El Cerrito	602,479	642,166	517,418	571,979	7.22	7.51
Concord/Martinez	647,218	686,319	659,013	721,292	7.93	7.99
Walnut Creek/ Lamorinda	437,088	454,205	425,010	477,291	7.52	7.68
Danville/San Ramon	354,836	377,392	289,617	321,363	8.70	9.09
Antioch/Pittsburg	531,448	572,994	403,146	452,389	7.89	7.95
Livermore/Pleasanton	523,032	542,888	547,381	603,952	9.00	8.98
Total CCTA Study Area	**3,096,101**	**3,275,964**	**2,841,585**	**3,148,265**	**7.95**	**8.10**

	Difference	% Difference	Difference	% Difference	Difference	% Difference
Richmond/El Cerrito	39,687	6.6%	54,561	10.5%	0.29	4.1%
Concord/Martinez	39,101	6.0%	62,279	9.5%	0.07	0.8%
Walnut Creek/ Lamorinda	17,117	3.9%	52,281	12.3%	0.16	2.1%
Danville/San Ramon	22,556	6.4%	31,746	11.0%	0.39	4.4%
Antioch/Pittsburg	41,546	7.8%	49,242	12.2%	0.06	0.8%
Livermore/Pleasanton	19,856	3.8%	56,571	10.3%	-0.02	-0.3%
Total CCTA Study Area	**179,863**	**5.8%**	**306,680**	**10.8%**	**0.15**	**1.9%**

Overall, trips per household in the CCTA model are within +2 percent of trips per household in the MTC model, where trip productions and attractions increase by four percent due to overall growth from 1998 to 2000. In the CCTA super-districts, trips per household are within +/-4 percent.

Average trips per household in Contra Costa County are consistent with average trips per household for seven of the nine Bay Area counties, but are low relative to national averages (the National Household Travel Survey in 2001 shows a national average of 9.54 trips per household compared to the 7.94 trips per household in Contra Costa County). This is likely a result of the fact that the trip generation model parameters affecting trips per household were derived from 1990 household survey data, where average trips per household were lower and household travel surveys frequently did not capture all trips made.

Differences in average trips per household by super-district (Table 4.3) are primarily caused by differences in non-home-based trip purposes, which are a result of differences in retail, service, and other employment between the MTC and CCTA datasets, as well as differences in total households. Differences in average trips per household are consistent across all trip purposes, as demonstrated in Table 4.3. Average trips per household in

Contra Costa County are very close to average trips per household in the MTC model for Contra Costa County for all trip purposes.

Table 4.3 Trips Per Household by County and Trip Purpose

	Home-Based Work		Home-Based Shop/Other		Home-Based Social/Rec	
	MTC	**CCTA**	**MTC**	**CCTA**	**MTC**	**CCTA**
County						
San Francisco	1.87	1.94	1.73	1.79	0.75	0.76
San Mateo	2.32	2.41	2.55	2.59	1.27	1.30
Santa Clara	2.42	2.52	2.72	2.77	1.31	1.34
Alameda	1.93	2.01	2.04	2.07	0.81	0.82
Contra Costa	2.06	2.09	2.13	2.14	0.98	0.94
Solano	1.97	2.02	2.20	2.22	0.96	0.97
Napa	1.88	1.94	2.21	2.25	0.94	0.96
Sonoma	1.93	1.99	2.07	2.13	0.94	0.94
Marin	2.04	2.12	1.94	1.97	0.95	0.96
Total Bay Area	**2.10**	**2.17**	**2.23**	**2.27**	**1.02**	**1.02**

	Home-Based School		Non-Home-Based		Trucks	
	MTC	**CCTA**	**MTC**	**CCTA**	**MTC**	**CCTA**
County						
San Francisco	0.58	0.57	2.67	2.75	0.14	0.15
San Mateo	0.76	0.75	2.72	2.81	0.11	0.11
Santa Clara	0.87	0.85	2.83	2.92	0.12	0.13
Alameda	0.80	0.80	2.07	2.09	0.10	0.10
Contra Costa	0.76	0.80	1.85	1.98	0.07	0.07
Solano	0.94	0.92	1.79	1.78	0.08	0.08
Napa	0.74	0.72	2.01	2.04	0.09	0.09
Sonoma	0.74	0.72	1.82	1.83	0.08	0.09
Marin	0.59	0.59	2.11	2.15	0.08	0.09
Total Bay Area	**0.77**	**0.77**	**2.33**	**2.39**	**0.10**	**0.11**

5.0 Trip Distribution

MTC consistency guidelines require that differences in trip productions and attractions for total person trips and for home based work trips from and to Contra Costa County should be no greater than five percent or 10,000 trips, whichever is higher for comparisons for Contra Costa County, interactions with each other county and overall for the regional interaction with Contra Costa County. The following summaries were prepared to compare the CCTA countywide model's trip distribution results to the MTC model:

- County-to-county level trip tables by trip purpose (Tables 5.1 to 5.6).

The CCTA model total county-to-county trip distribution was within +/-5 percent of MTC's trip distribution for all counties except Contra Costa, and within +/-8 percent by county for individual trip purposes, except Contra Costa. The regional differences are the result of comparing the 2000 CCTA model with the 1998 MTC model. The differences in Contra Costa County are the result of changing trip attractions within the study area. The home-based school trip attraction models have been revised to reflect the actual enrollment and location of schools, which is a different process than MTC uses for home-based school attractions. The other non-work purposes have all been modified with special generators, affecting the overall trip attraction rates in Contra Costa County.

The average trip length for Contra Costa County is presented in Table 5.7. The CCTA model slightly under-estimates home-based work travel times compared to MTC (five percent), but the CCTA model underestimates travel times compared to the 2000 Census by 11 percent (the 2000 Census reports an average trip length of 34 minutes for Contra Costa County). This can be explained because the MTC model is based on 1990 survey data and the 1990 Census reports an average trip length of 29 minutes for home-based work trips (which is within four percent of the reported average trip length in the CCTA model). The CCTA model, therefore, has a reasonable average trip length compared to the MTC model and the 1990 Census, but slightly underestimates average trip lengths compared to the 2000 Census.

Table 5.1 Home-Based Work County-to-County Trip Distribution

County	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa	Solano	Napa	Sonoma	Marin	Total
MTC Model										
San Francisco	456,391	60,997	17,900	33,947	9,475	646	289	1,104	6,243	**586,992**
San Mateo	132,875	329,835	85,001	26,817	6,161	285	32	223	2,299	**583,528**
Santa Clara	11,429	54,620	1,229,846	44,518	3,511	243	56	149	593	**1,344,965**
Alameda	95,494	49,803	107,146	663,847	52,331	1,920	465	1,084	4,855	**976,945**
Contra Costa	82,991	15,431	15,274	162,630	385,697	10,378	1,328	1,381	6,224	**681,335**
Solano	20,958	5,512	2,843	17,160	41,385	144,128	12,110	2,184	3,879	**250,160**
Napa	2,086	639	236	2,506	3,791	8,750	60,626	5,639	1,106	**85,379**
Sonoma	16,873	3,699	972	4,271	3,239	1,922	5,364	255,458	31,567	**323,364**
Marin	58,973	6,067	1,388	6,552	5,141	1,142	494	7,494	114,154	**201,404**
Total Bay Area	**878,070**	**526,603**	**1,460,607**	**962,249**	**510,730**	**169,414**	**80,764**	**274,715**	**170,920**	**5,034,072**
CCTA Countywide Model										
San Francisco	475,162	68,284	22,112	30,217	7,584	759	339	1,123	6,537	**612,116**
San Mateo	135,868	349,317	95,462	24,220	5,130	333	36	216	2,333	**612,913**
Santa Clara	10,701	55,289	1,317,648	39,808	2,919	263	58	128	550	**1,427,364**
Alameda	91,464	50,835	116,499	697,953	63,564	3,564	821	1,104	5,394	**1,031,198**
Contra Costa	93,002	18,000	18,894	178,778	382,450	15,257	2,073	1,688	7,969	**718,110**
Solano	37,281	4,957	2,993	24,118	37,353	139,329	11,681	1,973	3,411	**263,097**
Napa	2,632	618	266	4,284	4,966	8,838	61,810	5,216	1,018	**89,648**
Sonoma	18,839	4,474	1,230	4,102	2,919	2,407	6,462	265,037	35,161	**340,632**
Marin	60,363	6,585	1,656	9,614	7,085	1,296	592	7,256	116,241	**210,687**
Total Bay Area	**925,311**	**558,358**	**1,576,760**	**1,013,094**	**513,970**	**172,048**	**83,870**	**283,740**	**178,615**	**5,305,765**
% Difference Between MTC and CCTA Countywide Models										
San Francisco	4.1%	11.9%	23.5%	-11.0%	-20.0%	17.5%	17.2%	1.7%	4.7%	**4.3%**
San Mateo	2.3%	5.9%	12.3%	-9.7%	-16.7%	17.0%	10.9%	-3.3%	1.5%	**5.0%**
Santa Clara	-6.4%	1.2%	7.1%	-10.6%	-16.9%	8.6%	3.3%	-14.2%	-7.3%	**6.1%**
Alameda	-4.2%	2.1%	8.7%	5.1%	21.5%	85.7%	76.7%	1.9%	11.1%	**5.6%**
Contra Costa	12.1%	16.6%	23.7%	9.9%	-0.8%	47.0%	56.1%	22.2%	28.0%	**5.4%**
Solano	77.9%	-10.1%	5.3%	40.5%	-9.7%	-3.3%	-3.5%	-9.6%	-12.1%	**5.2%**
Napa	26.1%	-3.3%	13.0%	70.9%	31.0%	1.0%	2.0%	-7.5%	-7.9%	**5.0%**
Sonoma	11.7%	21.0%	26.5%	-4.0%	-9.9%	25.3%	20.5%	3.7%	11.4%	**5.3%**
Marin	2.4%	8.5%	19.3%	46.7%	37.8%	13.5%	19.7%	-3.2%	1.8%	**4.6%**
Total Bay Area	**5.4%**	**6.0%**	**8.0%**	**5.3%**	**0.6%**	**1.6%**	**3.8%**	**3.3%**	**4.5%**	**5.4%**

Table 5.2 Home-Based Shop County-to-County Trip Distribution

County	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa	Solano	Napa	Sonoma	Marin	Total
MTC Model										
San Francisco	472,712	52,872	3,223	7,609	1,428	119	35	287	4,296	**542,581**
San Mateo	76,504	501,921	53,915	5,621	689	56	15	71	838	**639,629**
Santa Clara	5,761	31,946	1,455,575	18,161	1,012	42	1	0	107	**1,512,605**
Alameda	33,487	21,184	33,141	924,112	19,281	683	171	379	213	**1,032,649**
Contra Costa	29,555	4,993	4,219	66,583	586,163	10,319	1,549	859	473	**704,714**
Solano	4,669	713	210	5,481	11,512	253,290	1,632	1,013	1,246	**279,766**
Napa	813	90	1	637	785	829	92,326	4,411	277	**100,169**
Sonoma	1,895	158	0	697	427	335	6,020	335,394	2,187	**347,113**
Marin	13,638	1,216	224	294	189	310	167	3,222	172,056	**191,315**
Total Bay Area	**639,035**	**615,092**	**1,550,506**	**1,029,195**	**621,485**	**265,983**	**101,916**	**345,636**	**181,693**	**5,350,541**
CCTA Countywide Model										
San Francisco	492,385	53,629	3,221	8,839	3,021	213	50	108	3,463	**564,929**
San Mateo	81,485	514,549	53,074	6,485	1,494	102	23	28	677	**657,918**
Santa Clara	6,733	36,834	1,504,782	21,919	2,499	91	3	0	92	**1,572,952**
Alameda	24,995	16,718	26,427	948,667	43,527	1,475	284	87	109	**1,062,289**
Contra Costa	15,105	2,380	1,950	54,925	649,557	10,425	1,177	144	167	**735,830**
Solano	6,557	389	97	7,515	21,035	251,791	1,432	250	534	**289,600**
Napa	973	66	0	1,390	2,796	1,038	95,139	2,332	173	**103,907**
Sonoma	4,285	333	0	1,441	1,582	1,033	9,167	343,449	3,787	**365,077**
Marin	18,294	1,583	286	654	666	720	268	1,630	172,151	**196,253**
Total Bay Area	**650,812**	**626,480**	**1,589,838**	**1,051,835**	**726,177**	**266,889**	**107,544**	**348,028**	**181,152**	**5,548,755**
% Difference Between MTC and CCTA Countywide Models										
San Francisco	4.2%	1.4%	-0.1%	16.2%	111.6%	78.8%	41.9%	-62.2%	-19.4%	**4.1%**
San Mateo	6.5%	2.5%	-1.6%	15.4%	116.7%	83.6%	53.6%	-60.2%	-19.2%	**2.9%**
Santa Clara	16.9%	15.3%	3.4%	20.7%	147.0%	117.4%	136.1%	0.0%	-14.2%	**4.0%**
Alameda	-25.4%	-21.1%	-20.3%	2.7%	125.8%	116.1%	66.3%	-77.0%	-48.8%	**2.9%**
Contra Costa	-48.9%	-52.3%	-53.8%	-17.5%	10.8%	1.0%	-24.0%	-83.3%	-64.7%	**4.4%**
Solano	40.4%	-45.4%	-53.6%	37.1%	82.7%	-0.6%	-12.3%	-75.3%	-57.2%	**3.5%**
Napa	19.7%	-27.3%	-51.4%	118.3%	256.2%	25.2%	3.0%	-47.1%	-37.6%	**3.7%**
Sonoma	126.1%	111.1%	0.0%	106.7%	270.5%	208.0%	52.3%	2.4%	73.2%	**5.2%**
Marin	34.1%	30.2%	28.1%	122.8%	253.3%	132.5%	60.9%	-49.4%	0.1%	**2.6%**
Total Bay Area	**1.8%**	**1.9%**	**2.5%**	**2.2%**	**16.8%**	**0.3%**	**5.5%**	**0.7%**	**-0.3%**	**3.7%**

Table 5.3 Home-Based Social/Recreation County-to-County Trip Distribution

County	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa	Solano	Napa	Sonoma	Marin	Total
MTC Model										
San Francisco	185,296	30,145	3,175	7,962	1,881	270	107	351	5,123	**234,309**
San Mateo	47,604	228,197	33,955	6,928	1,067	154	49	103	1,280	**319,337**
Santa Clara	7,276	22,228	682,581	14,367	1,540	126	11	1	361	**728,490**
Alameda	15,612	8,952	19,152	351,406	13,278	973	330	364	253	**410,319**
Contra Costa	10,585	2,386	3,042	28,972	270,443	6,132	1,265	642	376	**323,842**
Solano	2,022	347	161	2,687	5,826	108,460	993	628	1,060	**122,183**
Napa	259	38	2	330	390	374	38,990	2,243	219	**42,845**
Sonoma	1,507	147	1	813	501	365	3,959	146,533	2,897	**156,722**
Marin	5,296	588	172	159	114	259	151	1,124	85,339	**93,201**
Total Bay Area	**275,456**	**293,027**	**742,240**	**413,625**	**295,039**	**117,112**	**45,855**	**151,989**	**96,906**	**2,431,248**
CCTA Countywide Model										
San Francisco	188,771	29,828	2,806	9,292	3,845	457	123	272	4,529	**239,925**
San Mateo	50,739	232,843	33,512	8,287	2,470	276	62	84	1,190	**329,464**
Santa Clara	8,946	24,407	701,585	18,236	4,576	264	16	1	378	**758,409**
Alameda	11,209	6,513	13,803	356,733	29,743	1,707	413	173	145	**420,438**
Contra Costa	4,732	926	1,018	21,199	289,074	5,481	705	197	146	**323,479**
Solano	2,560	195	76	3,781	10,772	107,619	696	315	550	**126,563**
Napa	315	31	1	809	1,389	523	39,151	1,877	170	**44,267**
Sonoma	1,988	181	1	1,007	1,117	740	4,803	148,633	3,282	**161,752**
Marin	6,247	657	175	318	357	502	196	1,016	86,336	**95,805**
Total Bay Area	**275,507**	**295,582**	**752,978**	**419,662**	**343,344**	**117,569**	**46,166**	**152,567**	**96,726**	**2,500,102**
% Difference Between MTC and CCTA Countywide Models										
San Francisco	1.9%	-1.0%	-11.6%	16.7%	104.4%	69.1%	15.7%	-22.5%	-11.6%	**2.4%**
San Mateo	6.6%	2.0%	-1.3%	19.6%	131.4%	79.9%	24.5%	-18.1%	-7.0%	**3.2%**
Santa Clara	22.9%	9.8%	2.8%	26.9%	197.2%	110.1%	45.8%	-1.1%	4.8%	**4.1%**
Alameda	-28.2%	-27.2%	-27.9%	1.5%	124.0%	75.4%	25.2%	-52.4%	-42.8%	**2.5%**
Contra Costa	-55.3%	-61.2%	-66.5%	-26.8%	6.9%	-10.6%	-44.3%	-69.3%	-61.1%	**-0.1%**
Solano	26.6%	-43.9%	-52.7%	40.7%	84.9%	-0.8%	-29.9%	-49.9%	-48.1%	**3.6%**
Napa	21.7%	-18.5%	-32.1%	144.9%	256.4%	39.8%	0.4%	-16.3%	-22.1%	**3.3%**
Sonoma	31.9%	23.6%	10.6%	23.9%	123.0%	102.8%	21.3%	1.4%	13.3%	**3.2%**
Marin	18.0%	11.9%	1.8%	99.6%	214.3%	93.7%	30.5%	-9.6%	1.2%	**2.8%**
Total Bay Area	**0.0%**	**0.9%**	**1.4%**	**1.5%**	**16.4%**	**0.4%**	**0.7%**	**0.4%**	**-0.2%**	**2.8%**

Table 5.4 Home-Based School County-to-County Trip Distribution

County	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa	Solano	Napa	Sonoma	Marin	Total
MTC Model										
San Francisco	173,917	1,698	725	3,456	234	8	1	64	68	**180,171**
San Mateo	12,454	168,480	8,552	1,949	46	1	0	14	7	**191,504**
Santa Clara	673	401	476,753	3,187	56	0	0	29	0	**481,100**
Alameda	2,736	263	7,549	392,825	2,240	27	4	78	34	**405,755**
Contra Costa	1,691	42	923	11,302	236,238	334	17	131	126	**250,804**
Solano	1,622	25	702	3,624	3,534	109,401	177	415	91	**119,591**
Napa	467	11	470	564	201	325	30,593	817	7	**33,455**
Sonoma	877	13	411	603	82	10	45	121,494	37	**123,572**
Marin	2,067	32	146	1,145	147	24	4	583	54,116	**58,262**
Total Bay Area	**196,504**	**170,965**	**496,230**	**418,654**	**242,779**	**110,131**	**30,841**	**123,624**	**54,485**	**1,844,214**
CCTA Countywide Model										
San Francisco	170,961	1,018	668	4,185	3,182	20	2	59	76	**180,170**
San Mateo	12,938	166,631	7,978	3,016	933	3	0	13	13	**191,524**
Santa Clara	714	459	472,678	5,912	1,310	0	0	29	0	**481,103**
Alameda	2,353	154	5,962	393,159	7,443	28	3	62	21	**409,186**
Contra Costa	1,187	25	486	9,439	263,654	117	14	87	18	**275,028**
Solano	1,299	19	540	3,232	6,578	107,396	148	310	70	**119,591**
Napa	453	10	430	610	929	316	29,986	717	4	**33,454**
Sonoma	909	13	403	704	273	218	108	120,615	335	**123,577**
Marin	2,056	22	138	1,401	1,065	106	4	450	53,011	**58,253**
Total Bay Area	**192,868**	**168,352**	**489,282**	**421,658**	**285,366**	**108,204**	**30,266**	**122,343**	**53,547**	**1,871,886**
% Difference Between MTC and CCTA Countywide Models										
San Francisco	-1.7%	-40.1%	-7.9%	21.1%	1261.0%	150.0%	28.4%	-8.0%	11.8%	**0.0%**
San Mateo	3.9%	-1.1%	-6.7%	54.7%	1909.4%	89.6%	6.9%	-5.1%	75.3%	**0.0%**
Santa Clara	6.0%	14.6%	-0.9%	85.5%	2227.6%	-14.3%	3.8%	-1.2%	25.9%	**0.0%**
Alameda	-14.0%	-41.4%	-21.0%	0.1%	232.3%	3.2%	-8.6%	-20.3%	-37.8%	**0.8%**
Contra Costa	-29.8%	-40.1%	-47.4%	-16.5%	11.6%	-64.9%	-17.2%	-33.6%	-85.7%	**9.7%**
Solano	-19.9%	-23.0%	-23.1%	-10.8%	86.1%	-1.8%	-16.3%	-25.3%	-22.9%	**0.0%**
Napa	-3.2%	-7.4%	-8.5%	8.2%	361.6%	-2.9%	-2.0%	-12.2%	-45.5%	**0.0%**
Sonoma	3.6%	-1.5%	-2.1%	16.8%	230.9%	2126.6%	140.0%	-0.7%	812.1%	**0.0%**
Marin	-0.5%	-30.8%	-5.2%	22.4%	624.9%	341.8%	17.8%	-22.7%	-2.0%	**0.0%**
Total Bay Area	**-1.9%**	**-1.5%**	**-1.4%**	**0.7%**	**17.5%**	**-1.8%**	**-1.9%**	**-1.0%**	**-1.7%**	**1.5%**

Table 5.5 Non-Home-Based County-to-County Trip Distribution

County	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa	Solano	Napa	Sonoma	Marin	Total
MTC Model										
San Francisco	670,223	90,726	9,935	36,496	12,813	2,056	597	2,037	11,906	**836,789**
San Mateo	84,141	508,301	65,965	18,178	3,740	715	240	658	1,964	**683,901**
Santa Clara	9,564	63,887	1,459,348	32,172	4,310	586	210	721	687	**1,571,485**
Alameda	26,015	16,157	29,794	922,697	41,127	4,040	992	1,871	471	**1,043,164**
Contra Costa	8,372	2,883	3,503	31,914	550,214	11,912	1,665	1,486	425	**612,374**
Solano	1,203	442	373	2,372	10,053	209,890	1,307	1,008	836	**227,484**
Napa	306	109	108	449	987	1,037	83,006	4,957	250	**91,209**
Sonoma	844	253	291	673	626	552	3,913	296,337	1,833	**305,322**
Marin	8,497	1,531	589	344	333	964	391	3,599	191,891	**208,140**
Total Bay Area	**809,163**	**684,289**	**1,569,906**	**1,045,297**	**624,203**	**231,753**	**92,320**	**312,674**	**210,263**	**5,579,868**
CCTA Countywide Model										
San Francisco	695,610	94,624	10,239	35,917	12,241	2,253	667	2,230	12,523	**866,303**
San Mateo	87,771	533,062	68,723	17,792	3,617	791	270	725	2,090	**714,840**
Santa Clara	10,189	67,608	1,539,727	31,622	4,183	668	242	813	748	**1,655,799**
Alameda	22,051	14,189	27,009	943,025	56,452	5,936	1,548	1,493	379	**1,072,083**
Contra Costa	8,887	2,915	3,589	40,555	605,206	15,296	2,329	1,434	403	**680,615**
Solano	2,288	417	346	4,186	12,215	209,894	1,339	999	809	**232,493**
Napa	397	106	104	888	1,606	1,062	84,902	5,077	250	**94,392**
Sonoma	818	247	281	524	514	569	4,032	305,554	1,832	**314,371**
Marin	8,511	1,546	587	480	468	1,015	423	3,840	197,386	**214,256**
Total Bay Area	**836,522**	**714,715**	**1,650,605**	**1,074,990**	**696,502**	**237,483**	**95,752**	**322,165**	**216,418**	**5,845,152**
% Difference Between MTC and CCTA Countywide Models										
San Francisco	3.8%	4.3%	3.1%	-1.6%	-4.5%	9.6%	11.7%	9.5%	5.2%	**3.5%**
San Mateo	4.3%	4.9%	4.2%	-2.1%	-3.3%	10.6%	12.5%	10.2%	6.4%	**4.5%**
Santa Clara	6.5%	5.8%	5.5%	-1.7%	-2.9%	13.8%	15.2%	12.8%	8.9%	**5.4%**
Alameda	-15.2%	-12.2%	-9.3%	2.2%	37.3%	47.0%	56.1%	-20.2%	-19.5%	**2.8%**
Contra Costa	6.2%	1.1%	2.4%	27.1%	10.0%	28.4%	39.9%	-3.5%	-5.1%	**11.1%**
Solano	90.2%	-5.5%	-7.2%	76.4%	21.5%	0.0%	2.5%	-0.9%	-3.3%	**2.2%**
Napa	29.9%	-2.1%	-3.8%	97.6%	62.7%	2.4%	2.3%	2.4%	-0.2%	**3.5%**
Sonoma	-3.0%	-2.4%	-3.6%	-22.1%	-18.0%	3.0%	3.1%	3.1%	-0.1%	**3.0%**
Marin	0.2%	1.0%	-0.3%	39.7%	40.7%	5.2%	8.3%	6.7%	2.9%	**2.9%**
Total Bay Area	**3.4%**	**4.4%**	**5.1%**	**2.8%**	**11.6%**	**2.5%**	**3.7%**	**3.0%**	**2.9%**	**4.8%**

Table 5.6 County-to-County Trip Distribution – All Purposes

County	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa	Solano	Napa	Sonoma	Marin	Total
MTC Model										
San Francisco	1,958,539	236,438	34,959	89,470	25,830	3,100	1,029	3,843	27,635	**2,380,842**
San Mateo	353,577	1,736,734	247,388	59,493	11,704	1,210	337	1,068	6,387	**2,417,899**
Santa Clara	34,703	173,083	5,304,102	112,406	10,428	997	278	900	1,747	**5,638,645**
Alameda	173,343	96,358	196,782	3,254,887	128,257	7,642	1,961	3,776	5,825	**3,868,832**
Contra Costa	133,194	25,735	26,962	301,401	2,028,755	39,076	5,823	4,500	7,624	**2,573,069**
Solano	30,474	7,038	4,288	31,324	72,309	825,169	16,220	5,248	7,113	**999,184**
Napa	3,931	887	816	4,487	6,154	11,316	305,541	18,067	1,859	**353,057**
Sonoma	21,996	4,270	1,676	7,058	4,876	3,184	19,300	1,155,215	38,519	**1,256,093**
Marin	88,471	9,434	2,518	8,494	5,922	2,699	1,206	16,021	617,556	**752,322**
Total Bay Area	**2,798,227**	**2,289,977**	**5,819,490**	**3,869,020**	**2,294,236**	**894,393**	**351,696**	**1,208,638**	**714,266**	**20,239,943**
CCTA Countywide Model										
San Francisco	2,022,888	247,383	39,046	88,451	29,873	3,702	1,180	3,792	27,127	**2,463,443**
San Mateo	368,800	1,796,402	258,749	59,800	13,644	1,505	391	1,066	6,303	**2,506,659**
Santa Clara	37,283	184,597	5,536,420	117,497	15,487	1,287	319	971	1,767	**5,895,627**
Alameda	152,072	88,409	189,700	3,339,537	200,728	12,710	3,069	2,920	6,048	**3,995,193**
Contra Costa	122,913	24,247	25,937	304,896	2,189,942	46,576	6,298	3,550	8,703	**2,733,062**
Solano	49,985	5,977	4,052	42,830	87,953	816,029	15,296	3,847	5,374	**1,031,344**
Napa	4,770	831	801	7,981	11,686	11,777	310,988	15,218	1,615	**365,668**
Sonoma	26,838	5,249	1,915	7,779	6,405	4,967	24,572	1,183,288	44,397	**1,305,409**
Marin	95,471	10,393	2,842	12,468	9,641	3,640	1,484	14,191	625,124	**775,254**
Total Bay Area	**2,881,020**	**2,363,487**	**6,059,462**	**3,981,238**	**2,565,359**	**902,193**	**363,598**	**1,228,843**	**726,458**	**21,071,660**
% Difference Between MTC and CCTA Countywide Models										
San Francisco	3.3%	4.6%	11.7%	-1.1%	15.7%	19.5%	14.7%	-1.3%	-1.8%	**3.5%**
San Mateo	4.3%	3.4%	4.6%	0.5%	16.6%	24.4%	15.9%	-0.2%	-1.3%	**3.7%**
Santa Clara	7.4%	6.7%	4.4%	4.5%	48.5%	29.1%	14.5%	7.9%	1.1%	**4.6%**
Alameda	-12.3%	-8.2%	-3.6%	2.6%	56.5%	66.3%	56.5%	-22.7%	3.8%	**3.3%**
Contra Costa	-7.7%	-5.8%	-3.8%	1.2%	7.9%	19.2%	8.1%	-21.1%	14.2%	**6.2%**
Solano	64.0%	-15.1%	-5.5%	36.7%	21.6%	-1.1%	-5.7%	-26.7%	-24.5%	**3.2%**
Napa	21.3%	-6.3%	-1.8%	77.9%	89.9%	4.1%	1.8%	-15.8%	-13.1%	**3.6%**
Sonoma	22.0%	22.9%	14.3%	10.2%	31.4%	56.0%	27.3%	2.4%	15.3%	**3.9%**
Marin	7.9%	10.2%	12.9%	46.8%	62.8%	34.8%	23.0%	-11.4%	1.2%	**3.0%**
Total Bay Area	**3.0%**	**3.2%**	**4.1%**	**2.9%**	**11.8%**	**0.9%**	**3.4%**	**1.7%**	**1.7%**	**4.1%**

Table 5.7 Average Trip Length Results for Trip Distribution

Purpose	MTC Model	CCTA Model	Difference	Percent Difference
Average Trip Length (Entire Model Area)				
Home-based Work	23.4	24.9	1.5	6.6%
Home-based Shop/Other	12.3	11.8	-0.5	-3.8%
Home-based Social/Recreation	13.2	13.1	-0.1	-1.1%
Non-Home-based	11.8	11.7	-0.1	-1.1%
Home-based School	9.4	9.3	-0.1	-1.1%
Average Trip Length (CCTA Origins Only)				
Home-based Work	32.2	30.5	-1.7	-5.3%
Home-based Shop/Other	13.5	15.8	2.3	17.0%
Home-based Social/Recreation	14.3	13.6	-0.7	-5.0%
Non-Home-based	10.9	11.7	0.8	7.4%
Home-based School	9.3	9.9	0.6	6.6%
Average Trip Length (CCTA Origins and Destinations Only)				
Home-based Work	16.7	17.3	0.7	3.9%
Home-based Shop/Other	9.6	8.4	-1.3	-13.3%
Home-based Social/Recreation	9.6	8.7	-0.9	-9.4%
Non-Home-based	8.6	7.7	-0.9	-10.6%
Home-based School	7.8	7.1	-0.7	-9.0%

6.0 Mode Choice

MTC consistency guidelines require that differences in trips for drive alone for total daily person trips and for home based work trips from and to Contra Costa County should be no greater than 10 percent or 10,000 trips, whichever is higher for Contra Costa County, for each county interaction and overall for the region or study area. Differences in trips for transit, shared ride 2 and shared ride 3+ for total daily person trips and for home based work trips from and to Contra Costa County should be no greater than 10,000 trips, and 10 percent overall for the region or study area. The following summaries were prepared to test the mode choice model:

- Person trips by mode and trip purpose (Table 6.1); and
- Vehicle trips by trip purpose for each county (Table 6.2).

The home-based work trip purpose matches within +/-3 percent for all modes, and the total of all trip purposes matches within +/-8 percent for transit and within +/-3 percent for auto modes.

The MTC and CCTA models match closely the modal split for drive alone home-based work trips compared to the 2000 Census (73 percent in both models compared to 74 percent in the Census). This is also true for carpool home-based work trips (14 percent in both models compared to 14 percent in the Census). Transit and non-motorized modes also match within +/-1 percent.

Table 6.1 Person Trips by Mode and Purpose

Travel Mode	Trips by Mode				Share of Trips by Mode	
	MTC	CCTA	Difference	% Diff	MTC	CCTA
Home-Based Work						
Drive Alone	3,669,330	3,704,654	35,324	1.0%	72.9%	72.7%
Shared Ride 2	528,116	537,577	9,461	1.8%	10.5%	10.6%
Shared Ride 3+	167,763	168,397	634	0.4%	3.3%	3.3%
Transit	478,616	488,411	9,795	2.0%	9.5%	9.6%
Bicycle	44,947	43,889	-1,058	-2.4%	0.9%	0.9%
Walk	145,564	150,222	4,658	3.2%	2.9%	2.9%
Total Bay Area	**5,034,336**	**5,093,150**	**58,814**	**1.2%**	**100.0%**	**100.0%**
Home-Based Shop (Other)						
Drive Alone	2,246,978	2,326,015	79,037	3.5%	42.0%	42.1%
Shared Ride 2	1,488,333	1,544,636	56,303	3.8%	27.8%	28.0%
Shared Ride 3+	861,683	900,779	39,096	4.5%	16.1%	16.3%
Transit	206,036	221,498	15,462	7.5%	3.9%	4.0%
Bicycle	39,623	38,455	-1,168	-2.9%	0.7%	0.7%
Walk	507,896	495,004	-12,892	-2.5%	9.5%	9.0%
Total Bay Area	**5,350,549**	**5,526,387**	**175,838**	**3.3%**	**100.0%**	**100.0%**
Home-Based Social/Recreation						
Drive Alone	779,144	781,981	2,837	0.4%	32.0%	31.3%
Shared Ride 2	653,696	676,946	23,250	3.6%	26.9%	27.1%
Shared Ride 3+	572,005	584,594	12,589	2.2%	23.5%	23.4%
Transit	83,365	93,990	10,625	12.7%	3.4%	3.8%
Bicycle	72,090	76,764	4,674	6.5%	3.0%	3.1%
Walk	270,949	280,813	9,864	3.6%	11.1%	11.3%
Total Bay Area	**2,431,249**	**2,495,088**	**63,839**	**2.6%**	**100.0%**	**100.0%**
Non-Home-Based						
Vehicle Driver	3,610,273	3,750,612	140,339	3.9%	64.7%	64.2%
Vehicle Passenger	906,403	944,078	37,675	4.2%	16.2%	16.2%
Transit	188,851	211,036	22,185	11.7%	3.4%	3.6%
Bicycle	48,684	57,121	8,437	17.3%	0.9%	1.0%
Walk	825,657	878,456	52,799	6.4%	14.8%	15.0%
Total Bay Area	**5,579,868**	**5,841,303**	**261,435**	**4.7%**	**100.0%**	**100.0%**

Table 6.1 Person Trips by Mode and Purpose (continued)

Travel Mode	Trips by Mode				Share of Trips by Mode	
	MTC	CCTA	Difference	% Diff	MTC	CCTA
Home-Based School						
Vehicle Driver	303,625	301,290	-2,335	-0.8%	16.5%	16.3%
Vehicle Passenger	798,597	754,979	-43,618	-5.5%	43.3%	40.8%
Transit	206,758	238,700	31,942	15.4%	11.2%	12.9%
Bicycle	81,010	84,194	3,184	3.9%	4.4%	4.6%
Walk	454,220	469,391	15,171	3.3%	24.6%	25.4%
Total Bay Area	**1,844,210**	**1,848,554**	**4,344**	**0.2%**	**100.0%**	**100.0%**
Grand Total, All Trip Purposes						
Drive Alone	6,695,452	6,812,650	117,198	1.8%	33.1%	32.7%
Shared Ride 2	2,670,145	2,759,159	89,014	3.3%	13.2%	13.3%
Shared Ride 3+	1,601,451	1,653,770	52,319	3.3%	7.9%	7.9%
Vehicle Driver	3,913,898	4,051,902	138,004	3.5%	19.3%	19.5%
Vehicle Passenger	1,705,000	1,699,057	-5,943	-0.3%	8.4%	8.2%
Transit	1,163,626	1,253,635	90,009	7.7%	5.7%	6.0%
Bicycle	286,354	300,423	14,069	4.9%	1.4%	1.4%
Walk	2,204,286	2,273,886	69,600	3.2%	10.9%	10.9%
Total Bay Area	**20,240,212**	**20,804,482**	**564,270**	**2.8%**	**100.0%**	**100.0%**
Computed Vehicle Driver	12,401,980	12,716,637	314,657	2.5%		
Computed Vehicle Occupancy	1.337	1.335				

Table 6.2 Vehicle Trips by County and Purpose

County	MTC	CCTA	Difference	Percent Difference
Home-Based Work				
San Francisco	410,197	455,842	45,645	11%
San Mateo	455,061	477,121	22,060	5%
Santa Clara	1,269,281	1,359,770	90,489	7%
Alameda	783,038	819,969	36,931	5%
Contra Costa	449,365	444,743	-4,621	-1%
Solano	150,407	149,549	-859	-1%
Napa	71,439	72,329	891	1%
Sonoma	243,886	244,239	352	0%
Marin	148,650	152,225	3,575	2%
Total	**3,981,324**	**4,175,787**	**194,462**	**5%**
Home-Based Shop (Other)				
San Francisco	272,980	274,739	1,759	1%
San Mateo	382,895	357,899	-24,996	-7%
Santa Clara	997,720	889,751	-107,970	-11%
Alameda	580,434	557,020	-23,414	-4%
Contra Costa	419,488	438,425	18,937	5%
Solano	162,848	154,132	-8,716	-5%
Napa	62,404	64,139	1,735	3%
Sonoma	232,434	189,237	-43,197	-19%
Marin	126,127	111,440	-14,687	-12%
Total	**3,237,330**	**3,036,782**	**-200,548**	**-6%**
Home-Based Social/Recreation				
San Francisco	115,188	118,295	3,107	3%
San Mateo	160,395	149,537	-10,858	-7%
Santa Clara	389,805	382,399	-7,406	-2%
Alameda	221,340	218,410	-2,930	-1%
Contra Costa	161,390	191,959	30,568	19%
Solano	63,529	58,243	-5,287	-8%
Napa	24,100	23,234	-866	-4%
Sonoma	78,564	74,613	-3,951	-5%
Marin	55,105	54,795	-310	-1%
Total	**1,269,417**	**1,271,483**	**2,067**	**0%**

Table 6.2 Vehicle Trips by County and Purpose (continued)

County	MTC	CCTA	Difference	Percent Difference
Non-Home-Based				
San Francisco	299,918	358,385	58,467	19%
San Mateo	497,535	496,341	-1,194	0%
Santa Clara	1,137,179	1,107,939	-29,240	-3%
Alameda	684,476	676,969	-7,507	-1%
Contra Costa	427,579	465,445	37,866	9%
Solano	150,810	146,410	-4,400	-3%
Napa	64,053	56,271	-7,782	-12%
Sonoma	207,107	189,047	-18,060	-9%
Marin	141,615	143,356	1,740	1%
Total	**3,610,273**	**3,640,163**	**29,890**	**1%**
Home-Based School				
San Francisco	31,954	30,185	-1,769	-6%
San Mateo	23,146	19,774	-3,371	-15%
Santa Clara	93,394	87,303	-6,091	-7%
Alameda	74,581	70,039	-4,542	-6%
Contra Costa	38,714	44,192	5,478	14%
Solano	8,946	8,055	-891	-10%
Napa	4,535	4,030	-504	-11%
Sonoma	18,292	17,218	-1,073	-6%
Marin	10,064	8,848	-1,216	-12%
Total	**303,625**	**289,645**	**-13,980**	**-5%**
Grand Total, All Trip Purposes				
San Francisco	1,130,237	1,237,446	107,209	9%
San Mateo	1,519,032	1,500,673	-18,359	-1%
Santa Clara	3,887,379	3,827,161	-60,218	-2%
Alameda	2,343,870	2,342,407	-1,462	0%
Contra Costa	1,496,537	1,584,764	88,227	6%
Solano	536,540	516,388	-20,151	-4%
Napa	226,530	220,003	-6,527	-3%
Sonoma	780,284	714,355	-65,929	-8%
Marin	481,561	470,662	-10,899	-2%
Total	**12,401,969**	**12,413,860**	**11,891**	**0%**

7.0 Trip Assignment

The MTC consistency requirements state that the CCTA model should use a capacity restrained assignment technique for all time period assignments. The CCTA model uses a stochastic user equilibrium assignment with 10 iterations of capacity-restrained assignment for five time period assignments: a.m. peak period, p.m. peak period, off-peak period, and a.m. peak hour and p.m. peak hour.

The CCTA model adopted four-hour peak period assignments (consistent with the four-hour a.m. peak assignment that MTC uses) and has incorporated peaking factors derived from MTC data on peaking by trip purpose and hour of the day. The CCTA model assigns a.m. and p.m. peak period trips, as well as a.m. and p.m. peak hour trips. Peak-hour trip tables are based on a fixed peak-hour factor, based on the highest hour volumes at each location in the CCTA study area. Vehicle occupancy is derived from the mode choice model, with the vehicle occupancy of shared ride 3 and over equal to 3.5 persons per vehicle.

Appendix A. Communication with MTC on Model Approach and Results

On September 26, 2002, the CCTA model development team met with the MTC staff and presented results of the MTC model in TransCAD software. MTC's approval of the overall approach and the results from the TransCAD model was documented in a letter[2], dated November 1, 2002. The letter and the minutes from the meeting are attached below.

[2] Contra Costa Transportation Authority, *Chuck Purvis Letter*, submitted to the MTC on November 1, 2002.

CONTRA COSTA
TRANSPORTATION AUTHORITY

November 1, 2002

Charles M. Purvis
Metropolitan Transportation Commission
Joseph P. Bort MetroCenter
101 Eighth Street
Oakland, CA 94607-4700

Dear Chuck:

Thank you for meeting with us last September 26 to discuss CCTA's model update status and review model development and consistency issues. To summarize our understanding of your review of the Contra Costa Transportation Authority's modeling efforts:

- **Approval of Model Approach.** MTC staff approves of the overall approach CCTA is using to develop its new Countywide Model. There are some minor issues that will require additional discussion, as outlined in the attached minutes. These issues include calculation of ADT, land use assumptions, and speed-flow curves.

- **Maintaining MTC Model Data in 1099-zone Format:** MTC staff plans to disaggregate its 1099 zone model and develop a new 1500-zone model. CCTA's countywide model has already adopted MTC's current 1099-zone model structure for the Bay Area. To maintain the CCTA model, MTC shall continue to provide model input data to the CMAs in 1099-zone format.

- **Use of Year 2000 Land Use Data Set:** MTC staff approves CCTA's decision to conduct a Year 2000 validation model run that uses ABAG-consistent land use data and year 2000 traffic counts. This is different than MTC's approach, which used 1998 land use data and traffic counts for its model validation. MTC staff agrees that the CMA consistency tolerances shall be adjusted to account for any land use and traffic changes that occurred between 1998 and 2000.

Please let me know if you have any further comments regarding the MTC model conversion from TP+ to TransCAD, or the CCTA countywide model development effort.

Sincerely,

Martin R. Engelmann, P.E.
Deputy Director, Planning

cc: Chris Brittle, MTC w/ Enclosure

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MEETING MINUTES

Date and Time:	Thursday, September 26, 2002, 1:30 p.m.
Location:	MTC Offices, Oakland
Participants:	Martin Engelmann, CCTA: Maren Outwater, CSI; Rick Dowling, Dowling Associates; Howard Slavin & Andres Rabinowitz, Caliper Corp.; Chuck Purvis, MTC.

Using a laptop and projector, Howard Slavin and Andres Rabinowitz presented CCTA's conversion of the MTC model from TP+ to the TransCad software package. The following memoranda were distributed and discussed:

a. "Results of the TransCad MTC Model for 1998", April 5, 2002, by Maren Outwater and Vamsee Modugula.

b. "Results of the TransCad MTC Model for Year 2025", July 19, 2002, by Maren Outwater and Vamsee Modugula.

c. "Comparison of the MTC and CCTA land Use Datasets", September, 20, 2002, by Maren Outwater and Vamsee Modugula.

The following points were discussed and agreed upon:

1. The CCTA model development team presented the above-listed memo and described the approach for land use assumptions. Chuck Purvis agreed that it was appropriate to use Year 2000 land use for the entire region and that it was appropriate to compare the CCTA model results using this data with a draft MTC model run by Mr. Purvis for 2000 for the purpose of assessing consistency.

2. The group discussed MTC's approach for developing ADT forecasts, and noted that the methodology used by MTC does not balance directional ADT. Mr. Purvis agreed that summing the AM peak period, PM peak period, and Off-peak period assignments was an appropriate method for obtaining daily volume forecasts. He suggested that it would be nice to split the off-peak period into two periods: mid-day, and over-night, however, Mr. Engelmann preferred using a three-period estimate, which Mr. Purvis agreed to.

3. Mr. Purvis agreed that it would be acceptable to use the 1990 household survey information for time of day trip peaking factors, since that is the latest available information at this time.

4. Mr. Purvis will look into modifying the Akcelik speed-flow as suggested by Caliper staff.

5. MTC is in the process of developing a new model that will disaggregate the existing 1099 zone structure to approximately 1,500 zones. Mr. Engelmann voiced concern that the new CCTA countywide model was based upon MTC's existing 1099-zone structure, and that future updates to the model would require that MTC provide updates in 1099 format. Mr. Purvis agreed to provide the 1,500 zone model data in the 1099 format for continued use by the CMAs.