EMFAC Modeling Change Technical Memo

SUBJECT: REDISTRIBUTION OF HEAVY-HEAVY DUTY DIESEL TRUCK VEHICLE MILES TRAVELED IN CALIFORNIA

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Background

The EMFAC model requires information about the activity and emission factors from a wide range of vehicle types in order to estimate emissions. One of the vehicle types that EMFAC estimates emissions for is heavy-heavy duty diesel trucks. A heavy heavy-duty diesel truck (HHDDT) is defined in EMFAC as a truck having a gross vehicle weight (GVW) equal to or greater than 33,000 pounds, that operates on diesel fuel. These vehicles are generally sixteen wheel, five-axle big rigs that pull containers, flatbeds, or other large cargo. The majority of these trucks are used for long-hauls (>100 miles) although some, such as those servicing the Ports of Los Angeles, Long Beach, and Oakland may travel shorter distances per trip.

In the EMFAC model, councils of government (COGs) or municipal planning organizations (MPOs) provide assumptions for vehicle miles traveled (VMT) in all vehicle classes in each region. These total VMT estimates are generated using socio-economically based travel demand models, and validated using regional traffic count data. The estimates are generated for all vehicle classes, and do not provide estimates for individual vehicle classes.

The Air Resources Board is responsible for allocating regional VMT to each vehicle class, including HHDDTs. The current version of EMFAC allocates HHDDT VMT based upon where trucks are registered. While the registration VMT distribution is appropriate for passenger cars as well as light and medium heavy duty trucks and heavy-heavy duty gasoline trucks, HHDDTs travel extensively outside their registration counties either picking up or delivering goods. The goal of this technical change is to generate a VMT distribution for HHDDTs that more accurately reflects their driving patterns in California. This memorandum details the analysis performed by ARB staff to generate a HHDDT VMT distribution to support this technical change.

Summary of Changes

This technical memorandum describes the redistribution of HHDDT VMT from a registration to a travel basis. The redistribution of HHDDT VMT was estimated using a combination of data from a survey conducted by California Department of Transportation (Caltrans) in 1999, and modeled information from MVSTAFF, an annual report developed by Caltrans.

Table 1 compares the distribution of total statewide VMT by air basin. Throughout the document “Current” refers to EMFAC2007 draft version 2.221 and “Proposed” refers to EMFAC2007 draft version 2.222. As the table shows, the allocation of VMT to each air basin changed as a result of the redistribution. There is also a change in the total HHDDT VMT for the State as there was a change in the accrual rates for HHDDT. Generally, less populated air basins with considerable through traffic, such as Mojave Desert, North East Plateau, Salton Sea and Great Basin Valleys, showed the greatest increase in HHDDT VMT as a result of the distribution. HHDDT VMT in the San Joaquin Valley increased by 83% in 2000. After the redistribution, the San Joaquin Valley now has nearly a third of the statewide total HHDDT VMT. More heavily populated areas, such as the San Diego, San Francisco, South Central Coast and South Coast air basins showed decreases in HHDDT VMT. In general, EMFAC2002 is likely to allocate more HHDDT VMT to urban areas where the vehicles are registered. The proposed redistribution correctly allocates more HHDDT VMT to areas with high heavy-heavy duty diesel truck traffic volumes, which tend to be rural areas with heavy through traffic. Figure 1 shows the Percent change in HHDDT VMT for all Air Basins for the year 2010.

Table 1. Comparison of Current and the Proposed HHDDT VMT (1000 miles/day) by Air Basin

Air Basin	2000			2010			2020		
	Current	Proposed	Percent Difference	Current	Proposed	Percent Difference	Current	Proposed	Percent Difference
Great Basin Valley	35	152	334%	49	128	161%	69	172	149%
Lake County	23	12	-48%	32	13	-59%	50	20	-60%
Lake Tahoe	13	19	46%	19	25	32%	18	37	106%
Mojave Desert	362	4063	1022%	589	4547	672%	1003	6949	593%
Mountain Counties	254	481	89%	406	516	27%	537	745	39%
North Central Coast	600	477	-21%	783	543	-31%	1057	814	-23%
North Coast	316	375	19%	346	414	20%	454	554	22%
Northeast Plateau	74	393	431%	143	325	127%	236	431	83%
Sacramento Valley	2229	2576	16%	2679	2937	10%	2927	4258	45%
Salton Sea	444	1762	297%	619	2007	224%	958	3345	249%
San Diego	1807	1016	-44%	2704	1302	-52%	3511	1827	-48%
San Francisco	4164	2107	-49%	4680	2542	-46%	5572	3397	-39%
San Joaquin	4245	7780	83%	5950	8636	45%	8075	12885	60%
South Central Coast	634	351	-45%	934	421	-55%	1224	604	-51%
South Coast	8900	5389	-39%	11677	6733	-42%	16127	9508	-41%
Total	24100	26953	12%	31610	31089	-2%	41818	45546	9%

Tables 2, 3 and 4 provide the NOx, PM, and ROG emissions impact of the redistribution on HHDDT emissions by air basin in 2000, 2010, and 2020, respectively. As shown in Table 2, year 2010 NOx emissions decrease by 44% in the South Coast Air Basin and 49% in the Bay Area as a result of the distribution. At the same time, NOx emissions in the San Joaquin Valley increase by 46%, in the Mojave Desert increase by 557%, and in the Salton Sea Air Basin increase by 161%. HHDDT emissions of other pollutants, and of all pollutants in future years, follow these trends. As a result of the redistribution, the San Joaquin Valley has the highest HHDDT emissions between 2000 and 2020.

Figure 1. Proposed Heavy-Heavy Duty Diesel VMT (x1000) and Percent Change Relative to EMFAC 2002 for the Year 2010

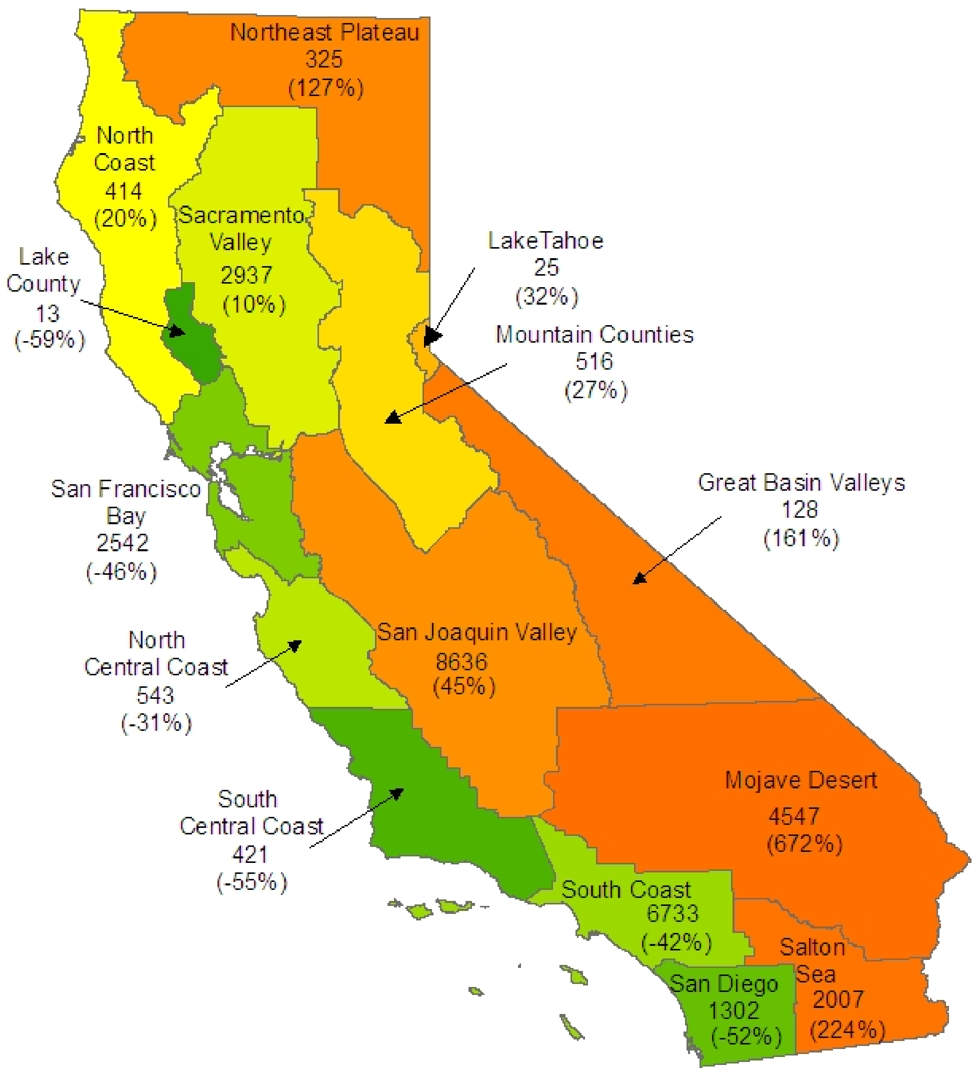

Table 2. Impact of Proposed Redistribution on Annual Average NOx Emissions (Tons/Day) from HHDDT by Air Basin

Air Basin	2000			2010			2020		
	Current	Proposed	Diff, %	Current	Proposed	Diff, %	Current	Proposed	Diff, %
Great Basin Valleys	0.87	3.66	321%	0.69	2.05	197%	0.30	0.73	143%
Lake County	0.59	0.27	-54%	0.56	0.18	-68%	0.26	0.07	-73%
Lake Tahoe	0.31	0.44	42%	0.21	0.36	71%	0.07	0.14	100%
Mojave Desert	10.05	110.4	999%	10.62	69.81	557%	5.46	25.91	375%
Mountain Counties	6.26	11.08	77%	5.73	7.03	23%	2.32	2.61	13%
North Central Coast	14.06	11.07	-21%	10.40	7.31	-30%	3.96	2.76	-30%
North Coast	7.73	8.77	13%	6.46	5.74	-11%	3.08	2.01	-35%
Northeast Plateau	1.86	9.11	390%	2.04	5.10	150%	1.18	1.87	58%
Sacramento Valley	50.25	58.38	16%	35.22	39.96	13%	12.94	15.01	16%
Salton Sea	11.12	47.02	323%	11.88	31.01	161%	7.33	12.45	70%
San Diego	41.07	23.11	-44%	34.36	17.38	-49%	15.32	8.87	-42%
San Francisco	95.57	48.4	-49%	68.47	34.58	-49%	23.81	12.10	-49%
San Joaquin Valley	95.64	174.38	82%	78.43	114.32	46%	32.39	43.78	35%
South Central Coast	16.04	8.92	-44%	13.60	6.32	-54%	5.21	2.26	-57%
South Coast	226.43	139.88	-38%	181.95	102.43	-44%	67.44	35.83	-47%
Total	577.85	654.89	13%	460.62	443.58	-4%	181.07	166.40	-8%

Table 3. Impact of Proposed Redistribution on Annual Average PM Emissions (Tons/Day) from HHDDT by Air Basin

Air Basin	2000			2010			2020		
	Current	Proposed	Diff, %	Current	Proposed	Diff, %	Current	Proposed	Diff, %
Great Basin Valleys	0.03	0.12	300%	0.02	0.06	200%	0.01	0.04	300%
Lake County	0.02	0.01	-50%	0.02	0.01	-50%	0.01	0.00	-100%
Lake Tahoe	0.01	0.01	0%	0.01	0.01	0%	0.00	0.01	NA
Mojave Desert	0.30	2.78	827%	0.28	1.64	486%	0.24	1.25	421%
Mountain Counties	0.24	0.37	54%	0.18	0.21	17%	0.11	0.14	27%
North Central Coast	0.48	0.37	-23%	0.32	0.21	-34%	0.22	0.16	-27%
North Coast	0.29	0.29	0%	0.20	0.17	-15%	0.12	0.11	-8%
Northeast Plateau	0.08	0.30	275%	0.07	0.15	114%	0.05	0.09	80%
Sacramento Valley	1.62	1.98	22%	1.02	1.19	17%	0.61	0.83	36%
Salton Sea	0.41	1.27	210%	0.35	0.75	114%	0.28	0.60	114%
San Diego	1.46	0.82	-44%	1.06	0.53	-50%	0.74	0.40	-46%
San Francisco	2.95	1.62	-45%	1.94	1.02	-47%	1.14	0.67	-41%
San Joaquin Valley	3.25	5.99	84%	2.42	3.46	43%	1.70	2.48	46%
South Central Coast	0.46	0.26	-43%	0.34	0.16	-53%	0.23	0.11	-52%
South Coast	5.93	3.83	-35%	4.30	2.54	-41%	2.98	1.79	-40%
Total	17.53	20.02	14%	12.53	12.11	-3%	8.44	8.68	3%

Table 4. Impact of Proposed Redistribution on Annual Average ROG Emissions (Tons/Day) from HHDDT by Air Basin

Air Basin	2000			2010			2020		
	Current	Proposed	Diff, %	Current	Proposed	Diff, %	Current	Proposed	Diff, %
Great Basin Valleys	0.03	0.12	300%	0.02	0.07	250%	0.02	0.04	100%
Lake County	0.02	0.01	-50%	0.02	0.01	-50%	0.01	0	-100%
Lake Tahoe	0.01	0.01	0%	0.01	0.01	0%	0	0.01	NA
Mojave Desert	0.31	2.81	806%	0.37	2.05	454%	0.28	1.33	375%
Mountain Counties	0.24	0.37	54%	0.21	0.26	24%	0.13	0.16	23%
North Central Coast	0.50	0.37	-26%	0.41	0.27	-34%	0.25	0.17	-32%
North Coast	0.29	0.29	0%	0.25	0.21	-16%	0.15	0.12	-20%
Northeast Plateau	0.08	0.31	288%	0.08	0.19	138%	0.06	0.11	83%
Sacramento Valley	1.63	2.02	24%	1.25	1.53	22%	0.69	0.92	33%
Salton Sea	0.41	1.28	212%	0.43	0.93	116%	0.34	0.63	85%
San Diego	1.47	0.83	-44%	1.27	0.65	-49%	0.79	0.42	-47%
San Francisco	3.02	1.65	-45%	2.5	1.3	-48%	1.31	0.74	-44%
San Joaquin Valley	3.41	6.10	79%	3.08	4.41	43%	1.95	2.72	39%
South Central Coast	0.46	0.26	-43%	0.4	0.21	-48%	0.25	0.12	-52%
South Coast	5.81	3.87	-33%	5.28	3.22	-39%	3.25	1.95	-40%
Total	17.69	20.30	15%	15.58	15.32	-2%	9.48	9.44	0%

Data Analysis Approach

To generate a HHDDT VMT distribution that more accurately reflects real-world driving patterns in California, a combination of survey and modeled data were used. The primary data source for the HHDDT VMT redistribution was a heavy duty truck survey conducted for Caltrans in 1999 (Caltrans, 2001a). Survey data were used to estimate the fraction of HHDDT VMT traveled in each county in California. These data were evaluated against MVSTAFF, an annual publication by Caltrans. Results compared well. To apply this new HHDDT VMT distribution, the total VMT traveled by HHDDT in California was estimated, as well as the accrual rates and age distribution by model year in EMFAC for the state as a whole. The potential for changes in the VMT distribution over time was also assessed, and a forecasting/backcasting methodology for the VMT redistribution was developed. This methodology is described below.

Survey Data and Analysis

Caltrans conducted a Heavy Duty Truck travel survey to collect representative truck travel data in California. Truck survey data collection took place through assisted interviews of 8,287 truck drivers at a total of 33 locations including weight stations, agricultural inspection stations, and roadside rest areas (Caltrans, 2001a). The survey included origin/destination data for each truck trip, but did not include measured VMT for each trip or the truck as a whole. Origin/destination data were analyzed to estimate VMT in each county of California associated with survey responses. Approximately, 7300 out of 8287 records had valid origins and destinations for HHDDT (Caltrans, 2001a). Non-valid records were omitted if it was impossible to determine a logical route between origin and destination. Using the valid truck trip records, trip routes, truck trip miles and total truck VMT by county using ESRI Network Analyst GIS software were estimated. The ARB methodology assumed the shortest path calculated by Network Analyst on the State Highway network provided by Caltrans. Based on recommendations from Caltrans, the following functional classes were used: Principal Arterial-Interstate, Other Principal Arterial, Minor Arterial, Major Collector and Minor Collector for Rural Areas and Principal Arterial-Interstate, Principal Arterial/Other freeways or Express ways, Other Principal Arterial, Minor Arterial, and Collector for Urban areas. Caltrans suggested that the roadways included in the above network would represent nearly all the roadways that would be used by the HHDD trucks. Table 5 provides the proposed VMT distribution percentage by county estimated using the Caltrans survey.

To validate the accuracy of the network analysis results, the results from a report titled “Heavy-Duty Truck Activity Data” by Battelle Memorial Institute (1999) were used. The report included second by second GPS data for various trips made in California. A subset of survey data with trip distances longer than 100 miles were selected. The mileage for these trips were calculated based on the second by second GPS data. ESRI Network Analyst GIS software was than used to map the predicted route based on the origination-destination locations for the same trip. Fig. 2 shows the correlation between the calculated mileage versus the estimated mileage by the Network Analyst for various trips. The VMT from surveyed data and the instrumented data were highly correlated, with a coefficient of 0.98. This indicated the approach using network analysis on the entire dataset of surveyed trucks was reasonable.

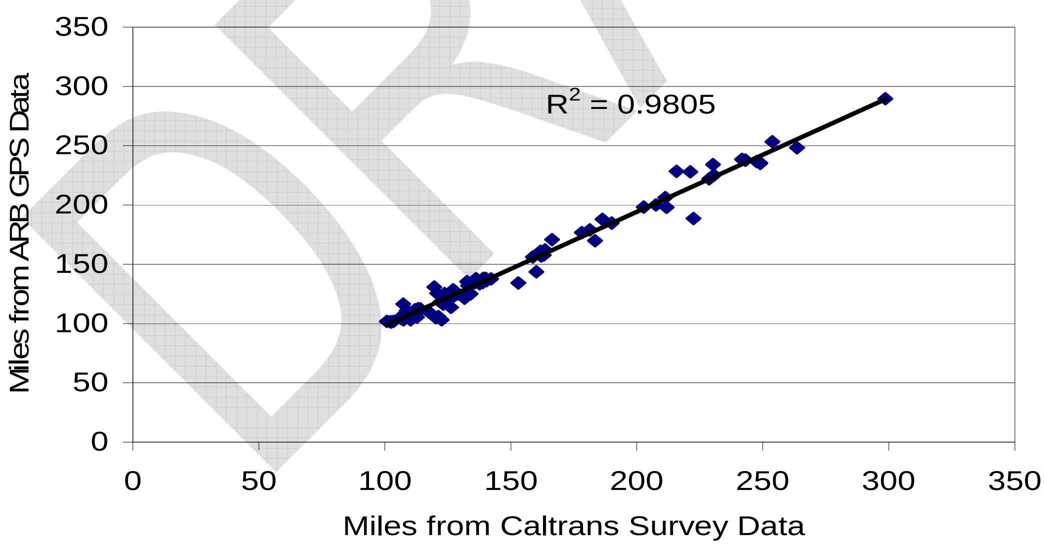

Figure 2. Correlation of Trip Distance between ARB GPS Data and Caltrans Survey Data

Table 5. Proposed HHDDT VMT Redistribution by County in 2000

County Code	County	Proposed Redistribution, Percent of Total Statewide VMT	County Code	County	Proposed Redistribution, Percent of Total Statewide VMT
1	Alameda	3.61%	30	Orange	2.04%
2	Alpine	0.05%	31	Placer	1.46%
3	Amador	0.02%	32	Plumas	0.02%
4	Butte	0.90%	33	Riverside	10.79%
5	Calaveras	0.07%	34	Sacramento	1.91%
6	Colusa	0.45%	35	San Benito	1.06%
7	Contra Costa	1.17%	36	San Bernardino	12.84%
8	Del Norte	0.01%	37	San Diego	2.70%
9	El Dorado	0.06%	38	San Francisco	0.07%
10	Fresno	5.54%	39	San Joaquin	3.30%
11	Glenn	0.36%	40	San Luis Obispo	0.32%
12	Humboldt	0.41%	41	San Mateo	0.14%
13	Imperial	1.87%	42	Santa Barbara	0.33%
14	Inyo	0.30%	43	Santa Clara	1.64%
15	Kern	12.39%	44	Santa Cruz	0.08%
16	Kings	1.96%	45	Shasta	1.77%
17	Lake	0.04%	46	Sierra	0.01%
18	Lassen	0.01%	47	Siskiyou	1.44%
19	Los Angeles	11.94%	48	Solano	1.27%
20	Madera	1.01%	49	Sonoma	0.34%
21	Marin	0.14%	50	Stanislaus	2.57%
22	Mariposa	0.00%	51	Sutter	0.81%
23	Mendocino	0.61%	52	Tehama	1.34%
24	Merced	3.21%	53	Trinity	0.22%
25	Modoc	0.01%	54	Tulare	2.09%
26	Mono	0.21%	55	Tuolumne	0.00%
27	Monterey	0.63%	56	Ventura	0.65%
28	Napa	0.22%	57	Yolo	0.79%
29	Nevada	0.76%	58	Yuba	0.05%

Validation of Survey Data with MVSTAFF

The next step in estimating the distribution of HHDDT VMT in California was to compare staff's results with other published reports. The only report identified by staff was the Motor Vehicle Stock, Travel, and Fuels Forecast Report (MVSTAFF; Caltrans, 2001b). MVSTAFF is a recursive model maintained by Caltrans that predicts statewide VMT, fuel economy, and fuel consumption based on a variety of model inputs including the past 25-years of vehicle information (registration, fuel consumption, fuel economy, etc.) and socioeconomic parameters (population, income, economic growth rates, etc.). MVSTAFF provides VMT estimates by vehicle type and county; Caltrans generates an

MVSTAFF report on an annual basis. To evaluate results from the Caltrans survey, the VMT distribution estimated by the survey was compared to estimates published in MVSTAFF. Table 6 compares county-specific VMT contributions. Results show that agreement between the two approaches is generally good.

Table 6. County Specific VMT Contributions (Percent of Total): MVSTAFF vs. Caltrans Survey

County	MVSTAFF	Survey	County	MVSTAFF	Survey
Alameda	3.73	3.61	Orange	3.36	2.04
Alpine	0.02	0.05	Placer	1.20	1.46
Amador	0.10	0.02	Plumas	0.12	0.02
Butte	0.32	0.90	Riverside	7.83	10.79
Calaveras	0.07	0.07	Sacramento	2.96	1.91
Colusa	0.82	0.45	San Benito	0.29	1.06
Contra Costa	1.68	1.17	San Bernardino	11.64	12.84
Del Norte	0.07	0.01	San Diego	3.81	2.70
El Dorado	0.24	0.06	San Francisco	0.24	0.07
Fresno	3.57	5.54	San Joaquin	4.93	3.30
Glenn	0.54	0.36	San Luis Obispo	0.88	0.32
Humboldt	0.39	0.41	San Mateo	0.81	0.14
Imperial	1.22	1.87	Santa Barbara	1.02	0.33
Inyo	0.28	0.30	Santa Clara	2.20	1.64
Kern	8.32	12.39	Santa Cruz	0.20	0.08
Kings	0.88	1.96	Shasta	1.58	1.77
Lake	0.10	0.04	Sierra	0.07	0.01
Lassen	0.29	0.01	Siskiyou	1.38	1.44
Los Angeles	15.43	11.94	Solano	1.87	1.27
Madera	1.22	1.01	Sonoma	0.84	0.34
Marin	0.33	0.14	Stanislaus	1.83	2.57
Mariposa	0.03	0.00	Sutter	0.18	0.81
Mendocino	0.29	0.61	Tehama	1.02	1.34
Merced	2.52	3.21	Trinity	0.10	0.22
Modoc	0.11	0.01	Tulare	2.17	2.09
Mono	0.17	0.21	Tuolumne	0.11	0.00
Monterey	1.37	0.63	Ventura	0.96	0.65
Napa	0.30	0.22	Yolo	1.25	0.79
Nevada	0.55	0.76	Yuba	0.23	0.05

Caltrans survey and MVSTAFF data were analyzed statistically to more fully evaluate differences between the two approaches. Figures 3 and 4 display county specific HHDDT VMT percentages based on the survey data and MVSTAFF, respectively. The figures demonstrate the distribution of VMT using both methods is skewed, with only a few counties contributing a substantial portion of the total HHDDT VMT. Because county-level VMT distributions were not normally distributed, a natural-log transformation of county specific HHDDT VMT percentages was used to form a normal distribution and facilitate statistical analysis.

Then, a linear regression analysis was performed between surveyed HHDDT VMT percentages and MVSTAFF VMT percentages. Figure 5 shows the relationship between HHDDT survey VMT and MVSTAFF VMT. Regression residuals from the relationship were normally distributed as shown in Figure 6, and homogeneously scattered as shown in Figure 7. These results support the statistical validity of the overall regression analysis.

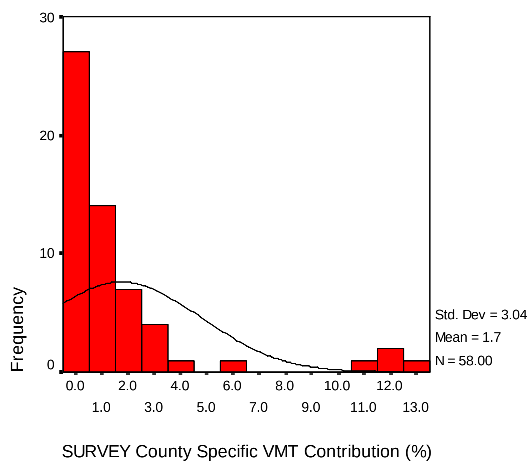

Figure 3. Survey County Specific VMT Contribution Distribution

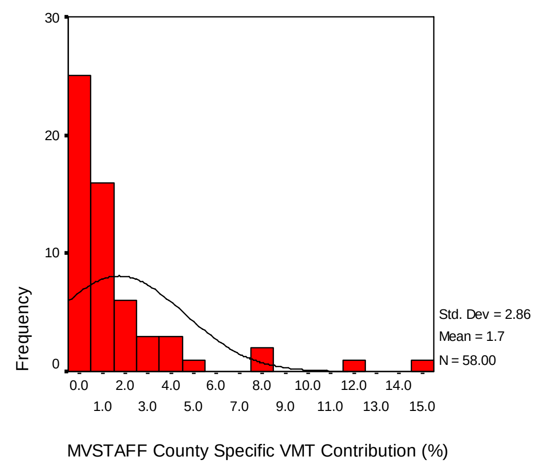

Figure 4. MVSTAFF County Specific VMT Contribution Distribution

If the Caltrans survey data and MVSTAFF provided identical results, the slope and R^2 values in Figure 5 would be 1.0. The regression analysis displayed in Figure 5 demonstrates that the slope is 1.19 with an R^2 value of 0.75. Results show MVSTAFF tends to weigh low traffic counties more heavily than the Caltrans survey data, and that the Caltrans survey data tends to weigh high traffic counties more heavily than MVSTAFF.

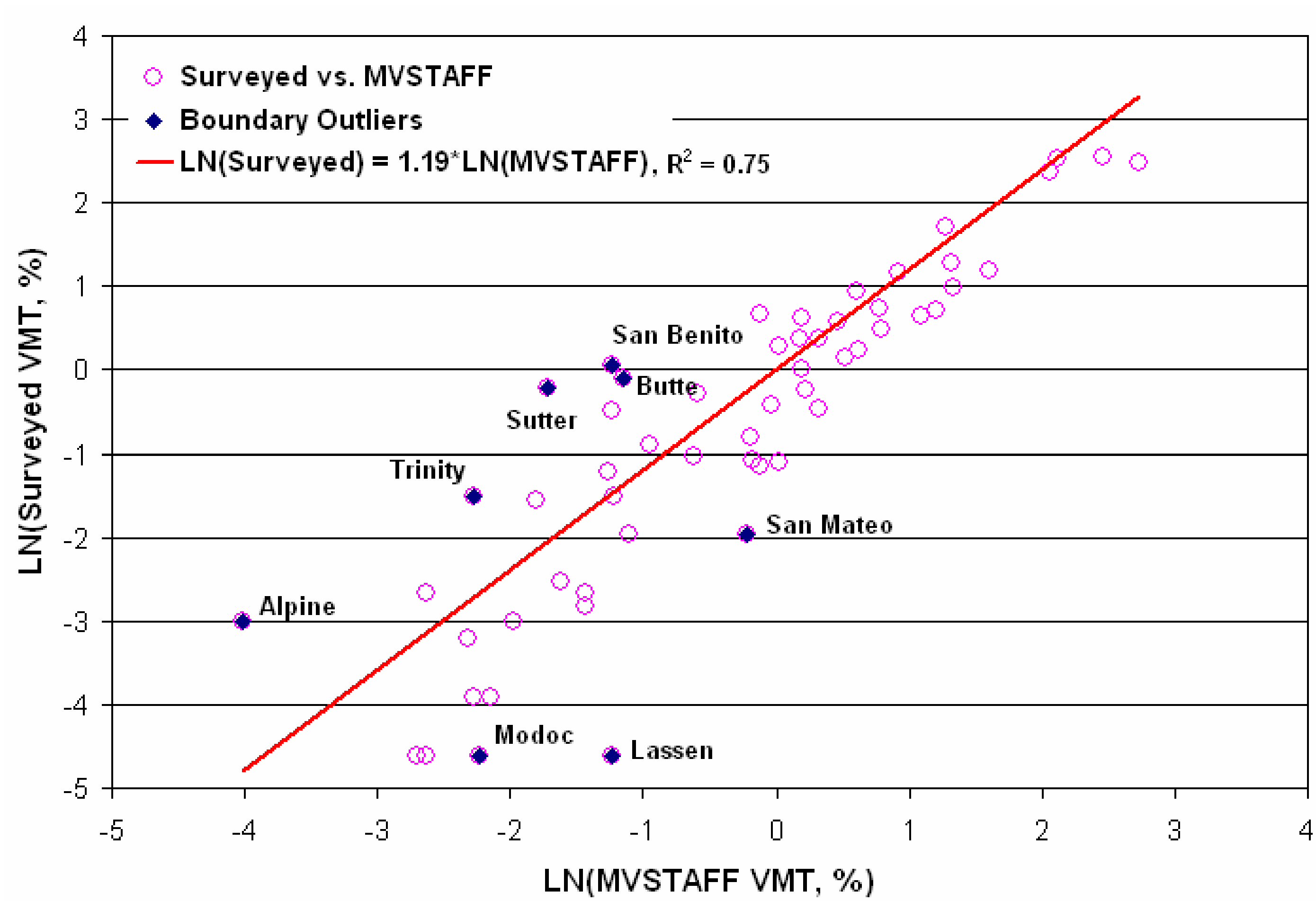

Figure 5. Correlation of County Specific VMT: Survey Data and MVSTAFF

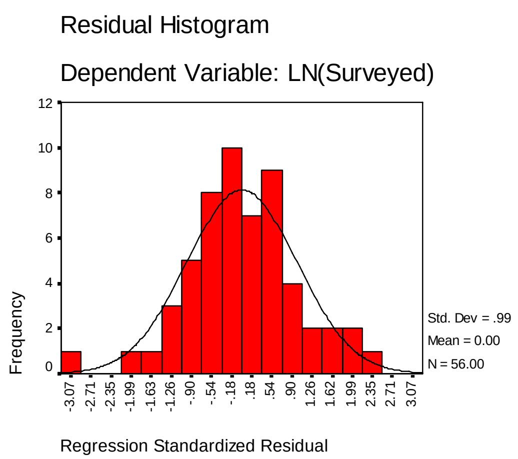

Figure 6. Residual Distribution of MVSTAFF-Survey Data Regression Model

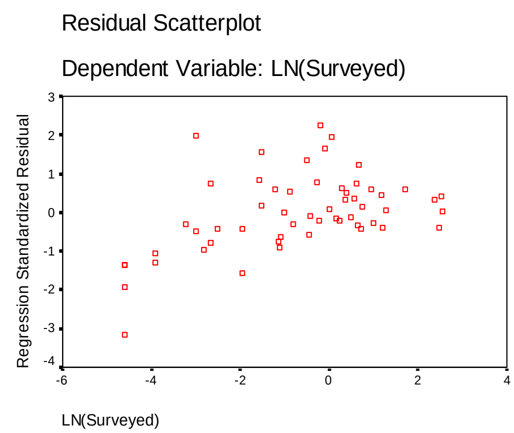

Figure 7. Residual Scatter Distribution of MVSTAFF-Survey Data Regression Model

Staff observed two outliers that exceeded 2 standard deviations (SD) from the regression: Lassen and Sutter Counties. Surveyed HHDDT VMT for Sutter County was 4.5 times greater than MVSTAFF VMT, while MVSTAFF HHDDT VMT for Lassen County was 29 times greater than surveyed VMT. There are many potential reasons for this discrepancy: small sample size in the survey may lead to a sample that does not represent the overall population, the highway network on which trucks travel in these areas may be relatively short, total VMT may be small, and other factors. In fact, total HHDDT VMT in these two counties represents less than one percent of total statewide HHDDT VMT, so while relative differences appear significant, absolute discrepancies are relatively small.

In general, counties that contributed a small percentage of overall statewide HHDDT VMT exhibited a higher standard deviation, and absolute differences between the survey and MVSTAFF were greater than for areas that received a relatively greater amount of traffic. Overall 22 of 58 counties contribute 88% of HHDDT VMT in California. As shown in Figure 8, survey data representing these counties correlate very strongly with MVSTAFF, with a nearly one to one relationship between the two data sources, and a correlation coefficient (R^2) of 0.85. These results further validate the proposed HHDDT VMT redistribution using the Caltrans survey.

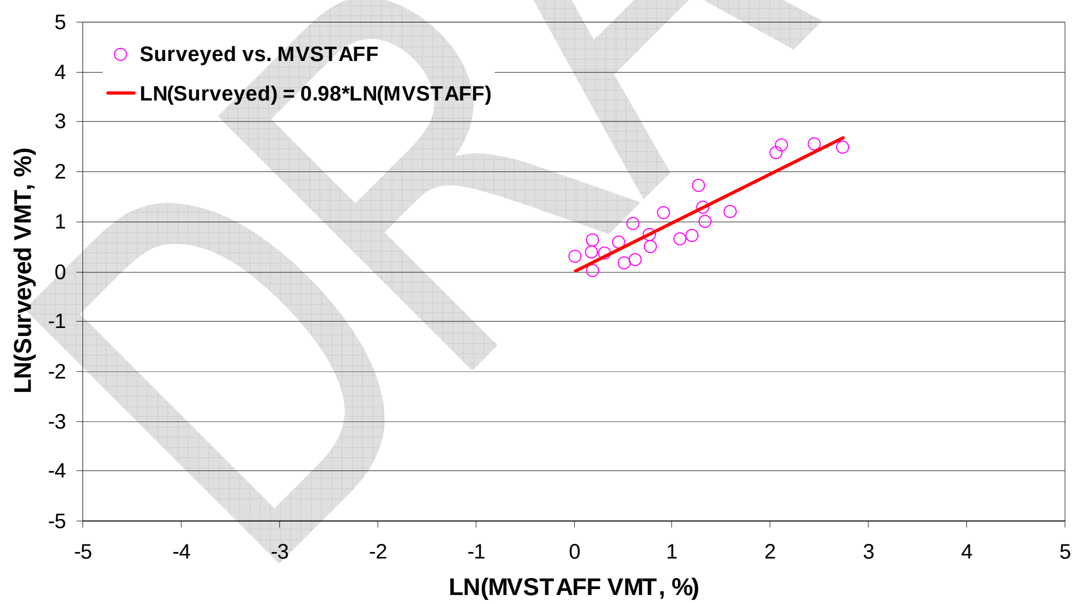

Figure 8. Correlation of County Specific VMT Contribution More than 1% between Caltrans Survey Data and MVSTAFF

Backcasting and Forecasting

The Caltrans survey provides a VMT distribution that represents one moment in time. However, emissions modeling requires understanding the distribution of HHDDT VMT both in the past and in the future. The proposed HHDDT distribution generated using the Caltrans survey was consistent with MVSTAFF. MVSTAFF generates both backcasts and forecasts for HHDDT VMT estimates, and accounts for different growth rates in different parts of the state. Staff evaluated MVSTAFF results for representing the years 1986 to 2001 for each county in California. Table 7 shows the percent of HHDDT VMT for several large counties in California for the years 1986, 1991, 1996 and 2001. Table 7 demonstrates that in general regional shares of statewide VMT are expected to decrease in urban areas such as Los Angeles and San Francisco, and increase in areas that experience significant through traffic such as the San Joaquin, Riverside, and San Bernardino Counties. Growth data are provided in Appendix A.

Table 7. Percent of HHDDT VMT by Geographic Area and Calendar Year (Caltrans Motor Vehicle Stock, Travel and Fuel Forecast, 2001)

	1986	1991	1996	2001
Los Angeles	21.00%	18.21%	18.45%	16.70%
San Bernardino	9.50%	10.39%	9.79%	10.86%
Riverside	6.14%	8.35%	8.01%	8.02%
Orange	5.51%	5.13%	5.18%	4.90%
Kern	6.02%	6.26%	6.32%	7.35%
San Diego	4.93%	5.21%	5.55%	5.50%
San Joaquin	2.46%	3.18%	3.82%	4.28%
San Francisco	0.50%	0.39%	0.35%	0.25%

Recommended Modeling Changes

To integrate the proposed distribution of HHDDT VMT estimated using the Caltrans survey, the following changes to the model are proposed. First, the estimated total statewide population of trucks operating in California was estimated. Then a statewide accrual rate by age for HHDDT was developed. Finally, the redistribution based upon the Caltrans survey data and estimated growth rates was applied. This methodology is described below.

First, a statewide model year distribution of HHDDT based on registration data was generated. For EMFAC, vehicle population is estimated using vehicle registration that the ARB receives from the DMV annually. The 1999, 2000 and 2001 calendar year extractions were analyzed and population estimates updated in EMFAC2002 (ARB, 2002).

DMV entries of GVW were used, where available, to group vehicles into different classes. However, because this information is often not entered, vehicle reference books and vehicle identification number (VIN) data were used to match body type descriptions to manufacturer specified gross vehicle weights (ARB, 2002). In the final analysis, the class-specific vehicle population data is divided according to age (1-45) and geographic area (1-69) for inclusion in the model (ARB, 2002).

In EMFAC2002, the HHDDT VMT in each area was calculated by taking the product of the registered truck population, out of state fraction, and accrual rates. This calculation was done on a model-year specific basis by region. The EMFAC2002 model assumed that 25% of total HHDDT VMT in California was generated by out-of-state trucks, based on a study by Jack Faucett Associates (1998). Since accrual rates were held constant in the model, the population was adjusted by a factor, 1.33, so that 25% of trucks operating in California were out-of-state trucks. EMFAC2002 also assumed that California trucks accrue all of their miles within California. Future updates to EMFAC will benefit from a current ARB re-evaluation of mileage accrual for in-state and out-of-state activity in California based on the Interstate Registration Program in progress.

Next, HHDDT accrual rates, as shown in Table 8, were developed. These accrual rates were generated based on data in the 1992 Truck Activity and Use Survey (U.S. Census Bureau, 1992), as cited in Jack Faucett Associates (1998). The total HHDDT VMT for a calendar year is the summation of the HHDDT VMT for each model year. The HHDDT VMT for each model year is the product of the number of HHDDT registered in a given area and the mileage accrual rates. Table 8 presents the HHDDT mileage accrual rates for each model year. The total truck population, adjusted for out-of-state trucks, was then redistributed based on the expected distribution of VMT in each county.

Table 8. HHDDT Mileage Accrual Rates by Age

HHDDT Age	Average miles/yr	HHDDT Age	Average miles/yr	HHDDT Age	Average miles/yr
1	80705	13	43854	25	16662
2	85152	14	39965	26	15164
3	86460	15	36504	27	13653
4	85386	16	33452	28	12136
5	82571	17	30772	29	10629
6	78547	18	28417	30	9159
7	73755	19	26335	31	7759
8	68546	20	24469	32	6467
9	63199	21	22764	33	5324
10	57926	22	21171	34	4369
11	52881	23	19645	35	3636
12	48169	24	18150	36-45	3636

Statewide population and VMT is allocated in accordance with the VMT distribution derived from the Caltrans survey for the year 2000 and allocated to previous and future years based on growth rates derived from MVSTAFF. Table 9 provides the VMT distribution by county for the year 2000 that was integrated into the model.

Table 9. Percentage of HHDDT VMT by County and Air Basin for the Year 2000

GAI	County	% VMT	GAI	County	% VMT
39	Alameda	3.61	30	Placer (SV)	0.55
1	Alpine	0.05	13	Plumas	0.02
7	Amador	0.02	66	Riverside (MD)	1.20
27	Butte	0.90	67	Riverside (MD/SCAB)	1.27
8	Calaveras	0.07	64	Riverside (SS/SCAB)	4.41
28	Colusa	0.45	61	Riverside (SCAB)	3.91
40	Contra Costa	1.17	31	Sacramento	1.91
19	Del Norte	0.01	17	San Benito	1.06
5	El Dorado (LT)	0.05	69	San Bernardino (MD)	9.69
9	El Dorado (MC)	0.01	62	San Bernardino (SCAB)	3.15
48	Fresno	5.54	38	San Diego	2.70
29	Glenn	0.36	43	San Francisco	0.07
20	Humboldt	0.41	53	San Joaquin	3.30
63	Imperial	1.87	56	San Luis Obispo	0.32
2	Inyo	0.30	44	San Mateo	0.14
66	Kern (MD)	2.08	57	Santa Barbara	0.33
49	Kern (SJV)	10.31	45	Santa Clara	1.64
50	Kings	1.96	18	Santa Cruz	0.08
4	Lake	0.04	32	Shasta	1.77
24	Lassen	0.01	14	Sierra	0.01
68	Los Angeles (MD)	0.94	26	Siskiyou	1.44
59	Los Angeles (SCAB)	11.00	33	Solano (SV)	0.64
51	Madera	1.01	46	Solano (SF)	0.63
41	Marin	0.14	22	Sonoma (NC)	0.14
10	Mariposa	0.00	47	Sonoma (SF)	0.20
21	Mendocino	0.61	54	Stanislaus	2.57
52	Merced	3.21	34	Sutter	0.81
25	Modoc	0.01	35	Tehama	1.34
3	Mono	0.21	23	Trinity	0.22
16	Monterey	0.63	55	Tulare	2.09
42	Napa	0.22	15	Tuolumne	0.00
11	Nevada	0.76	58	Ventura	0.65
60	Orange	2.04	36	Yolo	0.79
6	Placer (LT)	0.02	37	Yuba	0.05
12	Placer (MC)	0.89			

Table 10 provides HHDDT VMT redistribution estimates by air basin, and compares the old and proposed distributions for the year 2000. Appendix A provides the population growth rates for the years 1969 to 2020.

Table 10. Current and Proposed VMT for HHDDT (Year 2000)

Air Basin	Current		Proposed		Percent Change From Current
	VMT	Percent Total State VMT	VMT	Percent Total State VMT	
Great Basin Valley	35,000	0.15%	152,000	0.56%	334%
Lake County	23,000	0.10%	12,000	0.04%	-48%
Lake Tahoe	13,000	0.05%	19,000	0.07%	46%
Mojave Desert	362,000	1.50%	4,063,000	15.07%	1022%
Mountain Counties	254,000	1.05%	481,000	1.78%	89%
North Central Coast	600,000	2.49%	477,000	1.77%	-21%
North Coast	316,000	1.31%	375,000	1.39%	19%
Northeast Plateau	74,000	0.31%	393,000	1.46%	431%
Sacramento Valley	2,229,000	9.25%	2,576,000	9.56%	16%
Salton Sea	444,000	1.84%	1,762,000	6.54%	297%
San Diego	1,807,000	7.50%	1,016,000	3.77%	-44%
San Francisco	4,164,000	17.28%	2,107,000	7.82%	-49%
San Joaquin	4,245,000	17.61%	7,780,000	28.87%	83%
South Central Coast	634,000	2.63%	351,000	1.30%	-45%
South Coast	8,900,000	36.93%	5,389,000	19.99%	-39%
Total	24,100,000	100.00%	26,953,000	100.00%	12%

<u>**Incremental Impacts**</u>

COGs and MPOs are responsible for estimating VMT within their jurisdictions, but the detail in VMT estimates varies by organization. For example, the Southern California Association of Governments provides explicit VMT estimates for heavy-duty trucks together, while several other organizations provide VMT for limited vehicle classes, and the majority of organizations provide total VMT unclassified by vehicle type.

For purposes of this analysis, the term "Other" vehicle classes refers to all classes of vehicles other than HHDDT modeled by EMFAC, which includes passenger cars, light-trucks, medium duty vehicles, buses and motorcycles. In this technical change, the estimates of VMT for classes of vehicles other than HHDDT for each air basin were not changed. Table 10 shows the Current and Proposed HHDDT VMT for all the air basins in California for the year 2000. There is a net increase of 12 percent in the Statewide HHDDT VMT for the year 2000. This was due to the change in the accrual rates for HHDDT. More significant are the changes in the distribution of HHDDT VMT for various air basins. For example, for Mojave Desert air basin, the current model predicts HHDDT VMT of 362,000 miles per day. The proposed model would increase the HHDDT VMT to 4,063,000 miles per day, for 1022 percent increase from the current estimate.

Tables 11, 12 and 13 respectively show the current and proposed NOx, PM and ROG emissions for all the air basins in California for the year 2000. The HHDDT NOx and PM emissions for many air basins have changed dramatically.

Table 11. Total Impact of Proposed Changes for NOx (Year 2000 – Tons per Day)

	Current			Proposed		
Air Basin	HHDDV	Other	Total	HHDDV	Other	Total
Great Basin Valley	0.87	2.85	3.72	3.66	2.85	6.51
Lake County	0.59	4.12	4.71	0.27	4.11	4.38
Lake Tahoe	0.31	2.66	2.97	0.44	2.65	3.09
Mojave Desert	10.05	35.52	45.57	110.40	35.49	145.89
Mountain Counties	6.26	24.66	30.92	11.08	24.63	35.71
North Central Coast	14.06	35.90	49.96	11.07	35.90	46.97
North Coast	7.73	20.66	28.39	8.77	20.64	29.41
Northeast Plateau	1.86	6.10	7.96	9.11	6.09	15.20
Sacramento Valley	50.25	119.33	169.58	58.38	119.24	177.62
Salton Sea	11.12	20.58	31.70	47.02	20.62	67.64
San Diego	41.07	116.61	157.68	23.11	116.61	139.72
San Francisco	95.57	289.83	385.40	48.40	289.78	338.18
San Joaquin	95.64	146.89	242.53	174.38	147.00	321.38
South Central Coast	16.04	67.75	83.79	8.92	67.76	76.68
South Coast	226.43	596.69	823.12	139.88	596.74	736.62
Total	577.85	1490.15	2068.00	654.89	1490.11	2145.00

Table 12. Total Impact of Proposed Changes on PM (Year 2000 – Tons per Day)

	Current			Proposed		
Air Basin	HHDDV	Other	Total	HHDDV	Other	Total
Great Basin Valley	0.03	0.06	0.09	0.12	0.05	0.17
Lake County	0.02	0.09	0.11	0.01	0.09	0.10
Lake Tahoe	0.01	0.07	0.08	0.01	0.07	0.08
Mojave Desert	0.30	0.89	1.19	2.78	0.90	3.68
Mountain Counties	0.24	0.59	0.83	0.37	0.59	0.96
North Central Coast	0.48	0.90	1.38	0.37	0.90	1.27
North Coast	0.29	0.45	0.74	0.29	0.45	0.74
Northeast Plateau	0.08	0.14	0.22	0.30	0.14	0.44
Sacramento Valley	1.62	3.16	4.78	1.98	3.16	5.14
Salton Sea	0.41	0.56	0.97	1.27	0.56	1.83
San Diego	1.46	3.33	4.79	0.82	3.33	4.15
San Francisco	2.95	7.99	10.94	1.62	7.99	9.61
San Joaquin	3.25	3.86	7.11	5.99	3.86	9.85
South Central Coast	0.46	1.63	2.09	0.26	1.62	1.88
South Coast	5.93	16.56	22.49	3.83	16.56	20.39
Total	17.53	40.28	57.81	20.02	40.27	60.29

Table 13. Total Impact of Proposed Changes on ROG (Year 2000 – Tons per Day)

	Current			Proposed		
Air Basin	HHDDV	Other	Total	HHDDV	Other	Total
Great Basin Valley	0.03	2.61	2.64	0.12	2.61	2.73
Lake County	0.02	4.49	4.51	0.01	4.49	4.50
Lake Tahoe	0.01	3.01	3.02	0.01	3.01	3.02
Mojave Desert	0.31	32.86	33.17	2.81	32.94	35.75
Mountain Counties	0.24	25.72	25.96	0.37	25.73	26.10
North Central Coast	0.50	30.91	31.41	0.37	30.92	31.29
North Coast	0.29	19.37	19.66	0.29	19.37	19.66
Northeast Plateau	0.08	6.87	6.95	0.31	6.87	7.18
Sacramento Valley	1.63	112.83	114.46	2.02	112.88	114.90
Salton Sea	0.41	21.82	22.23	1.28	21.74	23.02
San Diego	1.47	101.10	102.57	0.83	101.10	101.93
San Francisco	3.02	251.49	254.51	1.65	251.51	253.16
San Joaquin	3.41	138.42	141.83	6.10	138.46	144.56
South Central Coast	0.46	54.31	54.77	0.26	54.32	54.58
South Coast	5.81	542.38	548.19	3.87	542.41	546.28
Total	17.69	1348.19	1365.88	20.30	1348.36	1368.66

Tables 14, 15 and 16 show the total impact of the proposed changes for NOx, PM and ROG emissions for selected air basins for the years 2010, 2015 and 2020. There is a large decrease in NOx and PM emissions in the South Coast Air Basin while there is corresponding large increase in the neighboring Mojave Desert and Salton Sea Air Basins. This is expected, as the HHDDT vehicles travel large distances in each of those air basins before arriving or leaving the South Coast Air Basin. The South Coast Air Basin is the hub of much of the commerce between Asia and other States. There is also a large increase in NOx and PM emissions for San Joaquin Valley Air Basin, as that air basin has major freeways (Interstate 5 and Highway 99) connecting the San Francisco Bay Area Air Basin and the South Coast Air Basin. It also provides a connecting route for other northern states and the South Coast Air Basin.

Table 14. Impact of Proposed Changes on NOx for Selected Areas (TPD)

	2010		2015		2020	
Air Basin	Current	Proposed	Current	Proposed	Current	Proposed
Mojave Desert	35.67	94.84	26.45	60.5	19.24	39.68
Sacramento Valley	103.35	108.06	67.71	70.94	45.03	47.08
Salton Sea	26.6	45.76	20.87	30.77	15.98	21.12
San Diego	98.35	81.37	67.69	57.14	48.19	41.74
San Francisco	225.36	191.46	150.31	128.97	100.94	89.22
San Joaquin	164.24	200.17	110.43	130.91	75.41	86.83
South Coast	480.49	400.99	319.4	267.42	215.68	184.07

Table 15. Impact of Proposed Changes on PM for Selected Areas (TPD)

	2010		2015		2020	
Air Basin	Current	Proposed	Current	Proposed	Current	Proposed
Mojave Desert	1.56	2.92	1.76	2.85	1.96	2.98
Sacramento Valley	5.14	5.3	5.17	5.35	5.35	5.58
Salton Sea	1.12	1.51	1.15	1.47	1.21	1.53
San Diego	5.29	4.76	5.31	4.89	5.39	5.05
San Francisco	12.06	11.14	12.24	11.58	12.58	12.11
San Joaquin	7.41	8.45	7.37	8.17	7.67	8.45
South Coast	24.42	22.67	25.19	23.76	25.98	24.79

Table 16. Impact of Proposed Changes on ROG for Selected Areas (TPD)

	2010		2015		2020	
Air Basin	Current	Proposed	Current	Proposed	Current	Proposed
Mojave Desert	21.97	23.69	17.15	18.43	13.95	15.03
Sacramento Valley	67.23	67.54	49.84	50.09	38.35	38.6
Salton Sea	13.92	14.4	11.3	11.62	9.72	10
San Diego	55.37	54.75	42.48	42.02	34.73	34.36
San Francisco	132.3	131.12	95.2	94.35	71.06	70.5
San Joaquin	80.78	82.11	60.31	61.22	47.03	47.81
South Coast	260.88	258.82	196.93	195.22	154.82	153.53

Table 17 shows the impact of the proposed changes on the statewide motor vehicle inventory for the years 1980 through 2020. As seen, there is a little less than a five percent change from the present inventory for NOx and PM. The estimation of other pollutants more or less remains the same as present estimate.

Table 17. Impact of Proposed Changes on Statewide Inventories

Statewide Summer Episodic On-Road Motor Vehicle Inventories
Current

Cal. Year	Population	VMT*(1000)	ROG_Tot[1]	CO_Tot	NOx_Tot	CO2_Tot	PM10_Tot[2]
1980	14821227	496881440	3589.98	33188.16	2755.58	333398.80	56.39
1990	22553796	789931010	2508.37	26429.58	3017.09	495757.80	83.77
2000	26785744	894706620	1347.93	13441.29	2061.54	516162.40	57.73
2002	28178674	955366530	1101.30	10810.53	1826.37	547364.40	57.51
2005	30919498	1032574900	936.86	8985.67	1668.89	596595.10	62.22
2010	33989452	1122305500	702.90	6449.98	1254.78	653732.80	62.95
2015	36813744	1217291300	526.47	4481.53	845.44	718996.60	64.16
2020	39685376	1314728200	410.25	3190.11	577.04	781208.30	66.30

Statewide Summer Episodic On-Road Motor Vehicle Inventories With HDT Redistribution
Proposed

Cal. Year	Population	VMT*(1000)	ROG_Tot[1]	CO_Tot	NOx_Tot	CO2_Tot	PM10_Tot[2]
1980	14817641	497419840	3594.92	33242.95	2776.34	334666.40	58.53
1990	22515972	786020420	2505.02	26389.80	2925.35	486745.50	80.92
2000	26785744	897559680	1351.70	13472.36	2141.43	523115.70	60.27
2002	28178674	958260290	1105.50	10844.68	1907.85	554386.10	59.98
2005	30910260	1034734700	940.41	9008.88	1731.54	601749.20	63.91
2010	33960136	1121785100	703.24	6452.69	1240.23	652419.00	62.56
2015	36789816	1219000600	526.46	4482.87	825.49	723144.30	63.95
2020	39667496	1318458400	410.67	3194.08	563.10	790286.30	66.57

Difference (Current - Proposed) in Statewide Emission Inventories (tons per day)

Cal. Year	Population	VMT(miles)	ROG_Tot[1]	CO_Tot	NOx_Tot	CO2_Tot	PM10_Tot[2]
1980	-3586	538400	4.95	54.79	20.76	1267.60	2.14
1990	-37824	-3910590	-3.35	-39.78	-91.74	-9012.30	-2.85
2000	0	2853060	3.77	31.07	79.89	6953.30	2.54
2002	0	2893760	4.20	34.15	81.48	7021.70	2.47
2005	-9238	2159800	3.54	23.22	62.65	5154.10	1.70
2010	-29316	-520400	0.34	2.71	-14.55	-1313.80	-0.39
2015	-23928	1709300	-0.01	1.34	-19.95	4147.70	-0.22
2020	-17880	3730200	0.42	3.97	-13.94	9078.00	0.27

Percentage Change in Statewide Emission Inventories

Cal. Year	Population	VMT	ROG_Tot[1]	CO_Tot	NOx_Tot	CO2_Tot	PM10_Tot[2]
1980	-0.02%	0.11%	0.14%	0.17%	0.75%	0.38%	3.80%
1990	-0.17%	-0.50%	-0.13%	-0.15%	-3.04%	-1.82%	-3.41%
2000	0.00%	0.32%	0.28%	0.23%	3.88%	1.35%	4.40%
2002	0.00%	0.30%	0.38%	0.32%	4.46%	1.28%	4.30%
2005	-0.03%	0.21%	0.38%	0.26%	3.75%	0.86%	2.73%
2010	-0.09%	-0.05%	0.05%	0.04%	-1.16%	-0.20%	-0.63%
2015	-0.06%	0.14%	0.00%	0.03%	-2.36%	0.58%	-0.34%
2020	-0.05%	0.28%	0.10%	0.12%	-2.42%	1.16%	0.41%

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APPENDIX A: Population Growth rates for the years 1969 - 2020

Population Growth Rates for the years 1969 - 2020

GAI	County (Air Basin/AQMD)	1969	1970	1971	1972	1973	1974	1975
1	Alpine (GBV)	-0.14189	-0.14189	-0.14189	-0.14189	-0.14189	-0.14189	-0.14189
2	Inyo (GBV)	0.00563	0.00563	0.00563	0.00563	0.00563	0.00563	0.00563
3	Mono (GBV)	0.01147	0.01147	0.01147	0.01147	0.01147	0.01147	0.01147
4	Lake (LC)	-0.05021	-0.05021	-0.05021	-0.05021	-0.05021	-0.05021	-0.05021
5	El Dorado (LT)	-0.05536	-0.05536	-0.05536	-0.05536	-0.05536	-0.05536	-0.05536
6	Placer (LT)	-0.00340	-0.00340	-0.00340	-0.00340	-0.00340	-0.00340	-0.00340
7	Amador (MC)	-0.17054	-0.17054	-0.17054	-0.17054	-0.17054	-0.17054	-0.17054
8	Calaveras (MC)	-0.10371	-0.10371	-0.10371	-0.10371	-0.10371	-0.10371	-0.10371
9	El Dorado (MC)	-0.05536	-0.05536	-0.05536	-0.05536	-0.05536	-0.05536	-0.05536
10	Mariposa (MC)	0.01352	0.01352	0.01352	0.01352	0.01352	0.01352	0.01352
11	Nevada (MC)	0.00650	0.00650	0.00650	0.00650	0.00650	0.00650	0.00650
12	Placer (MC)	-0.00340	-0.00340	-0.00340	-0.00340	-0.00340	-0.00340	-0.00340
13	Plumas (MC)	-0.04285	-0.04285	-0.04285	-0.04285	-0.04285	-0.04285	-0.04285
14	Sierra (MC)	0.01765	0.01765	0.01765	0.01765	0.01765	0.01765	0.01765
15	Tuolumne (MC)	-0.04788	-0.04788	-0.04788	-0.04788	-0.04788	-0.04788	-0.04788
65	Kern (MD)	-0.03090	-0.03090	-0.03090	-0.03090	-0.03090	-0.03090	-0.03090
66	Riverside (MD/MDAQMD)	-0.07119	-0.07119	-0.07119	-0.07119	-0.07119	-0.07119	-0.07119
67	Riverside (MD/SCAQMD)	-0.07119	-0.07119	-0.07119	-0.07119	-0.07119	-0.07119	-0.07119
68	Los Angeles (MD)	-0.04667	-0.04667	-0.04667	-0.04667	-0.04667	-0.04667	-0.04667
69	San Bernardino (MD)	-0.02766	-0.02766	-0.02766	-0.02766	-0.02766	-0.02766	-0.02766
19	Del Norte (NC)	0.01296	0.01296	0.01296	0.01296	0.01296	0.01296	0.01296
20	Humboldt (NC)	0.02256	0.02256	0.02256	0.02256	0.02256	0.02256	0.02256
21	Mendocino (NC)	-0.06377	-0.06377	-0.06377	-0.06377	-0.06377	-0.06377	-0.06377
22	Sonoma (NC)	-0.23184	-0.23184	-0.23184	-0.23184	-0.23184	-0.23184	-0.23184
23	Trinity (NC)	0.02228	0.02228	0.02228	0.02228	0.02228	0.02228	0.02228
16	Monterey (NCC)	-0.08203	-0.08203	-0.08203	-0.08203	-0.08203	-0.08203	-0.08203
17	San Benito (NCC)	0.01086	0.01086	0.01086	0.01086	0.01086	0.01086	0.01086
18	Santa Cruz (NCC)	0.01301	0.01301	0.01301	0.01301	0.01301	0.01301	0.01301
24	Lassen (NEP)	-0.02538	-0.02538	-0.02538	-0.02538	-0.02538	-0.02538	-0.02538
25	Modoc (NEP)	-0.00299	-0.00299	-0.00299	-0.00299	-0.00299	-0.00299	-0.00299
26	Siskiyou (NEP)	-0.07311	-0.07311	-0.07311	-0.07311	-0.07311	-0.07311	-0.07311
59	Los Angeles (SC)	-0.04667	-0.04667	-0.04667	-0.04667	-0.04667	-0.04667	-0.04667
60	Orange (SC)	-0.03209	-0.03209	-0.03209	-0.03209	-0.03209	-0.03209	-0.03209

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	1969	1970	1971	1972	1973	1974	1975
61	Riverside (SC)	-0.07119	-0.07119	-0.07119	-0.07119	-0.07119	-0.07119	-0.07119
62	San Bernardino (SC)	-0.02766	-0.02766	-0.02766	-0.02766	-0.02766	-0.02766	-0.02766
56	San Luis Obispo (SCC)	0.01721	0.01721	0.01721	0.01721	0.01721	0.01721	0.01721
57	Santa Barbara (SCC)	-0.01970	-0.01970	-0.01970	-0.01970	-0.01970	-0.01970	-0.01970
58	Ventura (SCC)	-0.04744	-0.04744	-0.04744	-0.04744	-0.04744	-0.04744	-0.04744
38	San Diego (SD)	-0.00497	-0.00497	-0.00497	-0.00497	-0.00497	-0.00497	-0.00497
39	Alameda (SF)	-0.14295	-0.14295	-0.14295	-0.14295	-0.14295	-0.14295	-0.14295
40	Contra Costa (SF)	-0.25580	-0.25580	-0.25580	-0.25580	-0.25580	-0.25580	-0.25580
41	Marin (SF)	-0.11197	-0.11197	-0.11197	-0.11197	-0.11197	-0.11197	-0.11197
42	Napa (SF)	-0.16862	-0.16862	-0.16862	-0.16862	-0.16862	-0.16862	-0.16862
43	San Francisco (SF)	-0.01631	-0.01631	-0.01631	-0.01631	-0.01631	-0.01631	-0.01631
44	San Mateo (SF)	-0.01446	-0.01446	-0.01446	-0.01446	-0.01446	-0.01446	-0.01446
45	Santa Clara (SF)	-0.02922	-0.02922	-0.02922	-0.02922	-0.02922	-0.02922	-0.02922
46	Solano (SF)	-0.07545	-0.07545	-0.07545	-0.07545	-0.07545	-0.07545	-0.07545
47	Sonoma (SF)	-0.23184	-0.23184	-0.23184	-0.23184	-0.23184	-0.23184	-0.23184
48	Fresno (SJV)	-0.09666	-0.09666	-0.09666	-0.09666	-0.09666	-0.09666	-0.09666
49	Kern (SJV)	-0.03090	-0.03090	-0.03090	-0.03090	-0.03090	-0.03090	-0.03090
50	Kings (SJV)	-0.11681	-0.11681	-0.11681	-0.11681	-0.11681	-0.11681	-0.11681
51	Madera (SJV)	-0.10372	-0.10372	-0.10372	-0.10372	-0.10372	-0.10372	-0.10372
52	Merced (SJV)	-0.02307	-0.02307	-0.02307	-0.02307	-0.02307	-0.02307	-0.02307
53	San Joaquin (SJV)	0.05027	0.05027	0.05027	0.05027	0.05027	0.05027	0.05027
54	Stanislaus (SJV)	0.00141	0.00141	0.00141	0.00141	0.00141	0.00141	0.00141
55	Tulare (SJV)	0.00059	0.00059	0.00059	0.00059	0.00059	0.00059	0.00059
63	Imperial (SS)	-0.09211	-0.09211	-0.09211	-0.09211	-0.09211	-0.09211	-0.09211
64	Riverside (SS)	-0.07119	-0.07119	-0.07119	-0.07119	-0.07119	-0.07119	-0.07119
27	Butte (SV)	0.04071	0.04071	0.04071	0.04071	0.04071	0.04071	0.04071
28	Colusa (SV)	-0.18829	-0.18829	-0.18829	-0.18829	-0.18829	-0.18829	-0.18829
29	Glenn (SV)	-0.01350	-0.01350	-0.01350	-0.01350	-0.01350	-0.01350	-0.01350
30	Placer (SV)	-0.00340	-0.00340	-0.00340	-0.00340	-0.00340	-0.00340	-0.00340
31	Sacramento (SV)	-0.04134	-0.04134	-0.04134	-0.04134	-0.04134	-0.04134	-0.04134
32	Shasta (SV)	-0.06339	-0.06339	-0.06339	-0.06339	-0.06339	-0.06339	-0.06339
33	Solano (SV)	-0.07545	-0.07545	-0.07545	-0.07545	-0.07545	-0.07545	-0.07545
34	Sutter (SV)	0.02439	0.02439	0.02439	0.02439	0.02439	0.02439	0.02439
35	Tehama (SV)	0.07342	0.07342	0.07342	0.07342	0.07342	0.07342	0.07342
36	Yolo (SV)	-0.16509	-0.16509	-0.16509	-0.16509	-0.16509	-0.16509	-0.16509
37	Yuba (SV)	-0.05552	-0.05552	-0.05552	-0.05552	-0.05552	-0.05552	-0.05552

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	1976	1977	1978	1979	1980	1981	1982
1	Alpine (GBV)	-0.14189	-0.14189	-0.14189	-0.14189	-0.09042	-0.00187	-0.04526
2	Inyo (GBV)	0.00563	0.00563	0.00563	0.00563	0.10342	-0.02424	-0.00061
3	Mono (GBV)	0.01147	0.01147	0.01147	0.01147	0.01689	0.05673	0.13477
4	Lake (LC)	-0.05021	-0.05021	-0.05021	-0.05021	0.06370	-0.19181	-0.01824
5	El Dorado (LT)	-0.05536	-0.05536	-0.05536	-0.05536	0.06416	0.00182	0.00483
6	Placer (LT)	-0.00340	-0.00340	-0.00340	-0.00340	-0.11534	-0.00505	-0.07671
7	Amador (MC)	-0.17054	-0.17054	-0.17054	-0.17054	-0.10119	-0.00384	-0.07960
8	Calaveras (MC)	-0.10371	-0.10371	-0.10371	-0.10371	-0.08126	-0.00385	-0.00359
9	El Dorado (MC)	-0.05536	-0.05536	-0.05536	-0.05536	0.06416	0.00182	0.00483
10	Mariposa (MC)	0.01352	0.01352	0.01352	0.01352	-0.16689	0.07536	-0.11542
11	Nevada (MC)	0.00650	0.00650	0.00650	0.00650	0.02329	-0.01797	-0.16052
12	Placer (MC)	-0.00340	-0.00340	-0.00340	-0.00340	-0.11534	-0.00505	-0.07671
13	Plumas (MC)	-0.04285	-0.04285	-0.04285	-0.04285	0.00421	-0.03983	-0.07098
14	Sierra (MC)	0.01765	0.01765	0.01765	0.01765	-0.02915	0.01666	-0.03489
15	Tuolumne (MC)	-0.04788	-0.04788	-0.04788	-0.04788	0.04314	-0.01851	-0.00025
65	Kern (MD)	-0.03090	-0.03090	-0.03090	-0.03090	-0.17035	-0.00754	-0.04128
66	Riverside (MD/MDAQMD)	-0.07119	-0.07119	-0.07119	-0.07119	-0.00510	0.05774	-0.06306
67	Riverside (MD/SCAQMD)	-0.07119	-0.07119	-0.07119	-0.07119	-0.00510	0.05774	-0.06306
68	Los Angeles (MD)	-0.04667	-0.04667	-0.04667	-0.04667	-0.04069	-0.03257	-0.02269
69	San Bernardino (MD)	-0.02766	-0.02766	-0.02766	-0.02766	-0.05264	0.08301	-0.09570
19	Del Norte (NC)	0.01296	0.01296	0.01296	0.01296	-0.10914	0.11767	-0.03195
20	Humboldt (NC)	0.02256	0.02256	0.02256	0.02256	0.03935	0.07734	-0.05278
21	Mendocino (NC)	-0.06377	-0.06377	-0.06377	-0.06377	0.15545	-0.03570	-0.00739
22	Sonoma (NC)	-0.23184	-0.23184	-0.23184	-0.23184	-0.03976	0.09285	-0.03724
23	Trinity (NC)	0.02228	0.02228	0.02228	0.02228	0.01758	0.02262	0.00294
16	Monterey (NCC)	-0.08203	-0.08203	-0.08203	-0.08203	-0.07992	0.01185	-0.11900
17	San Benito (NCC)	0.01086	0.01086	0.01086	0.01086	-0.04052	-0.02188	-0.05897
18	Santa Cruz (NCC)	0.01301	0.01301	0.01301	0.01301	-0.33935	-0.01327	-0.04161
24	Lassen (NEP)	-0.02538	-0.02538	-0.02538	-0.02538	0.05729	-0.03680	-0.14222
25	Modoc (NEP)	-0.00299	-0.00299	-0.00299	-0.00299	0.01120	0.05058	-0.04024
26	Siskiyou (NEP)	-0.07311	-0.07311	-0.07311	-0.07311	-0.01881	0.00286	-0.04640
59	Los Angeles (SC)	-0.04667	-0.04667	-0.04667	-0.04667	-0.04069	-0.03257	-0.02269
60	Orange (SC)	-0.03209	-0.03209	-0.03209	-0.03209	-0.05722	0.04871	-0.07924

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	1976	1977	1978	1979	1980	1981	1982
61	Riverside (SC)	-0.07119	-0.07119	-0.07119	-0.07119	-0.00510	0.05774	-0.06306
62	San Bernardino (SC)	-0.02766	-0.02766	-0.02766	-0.02766	-0.05264	0.08301	-0.09570
56	San Luis Obispo (SCC)	0.01721	0.01721	0.01721	0.01721	-0.02319	-0.04373	-0.04470
57	Santa Barbara (SCC)	-0.01970	-0.01970	-0.01970	-0.01970	-0.01308	-0.08862	-0.04816
58	Ventura (SCC)	-0.04744	-0.04744	-0.04744	-0.04744	0.07873	-0.13682	-0.14069
38	San Diego (SD)	-0.00497	-0.00497	-0.00497	-0.00497	-0.01620	0.00606	-0.07101
39	Alameda (SF)	-0.14295	-0.14295	-0.14295	-0.14295	-0.03230	-0.05846	0.04294
40	Contra Costa (SF)	-0.25580	-0.25580	-0.25580	-0.25580	-0.07237	-0.03535	0.15183
41	Marin (SF)	-0.11197	-0.11197	-0.11197	-0.11197	-0.02005	0.01991	-0.03026
42	Napa (SF)	-0.16862	-0.16862	-0.16862	-0.16862	-0.05616	0.10221	-0.04449
43	San Francisco (SF)	-0.01631	-0.01631	-0.01631	-0.01631	-0.01731	-0.01334	-0.05730
44	San Mateo (SF)	-0.01446	-0.01446	-0.01446	-0.01446	-0.27651	0.00088	-0.01084
45	Santa Clara (SF)	-0.02922	-0.02922	-0.02922	-0.02922	-0.31478	-0.02135	-0.11267
46	Solano (SF)	-0.07545	-0.07545	-0.07545	-0.07545	0.03767	-0.03134	-0.02476
47	Sonoma (SF)	-0.23184	-0.23184	-0.23184	-0.23184	-0.03976	0.09285	-0.03724
48	Fresno (SJV)	-0.09666	-0.09666	-0.09666	-0.09666	-0.03862	-0.08809	-0.00635
49	Kern (SJV)	-0.03090	-0.03090	-0.03090	-0.03090	-0.17035	-0.00754	-0.04128
50	Kings (SJV)	-0.11681	-0.11681	-0.11681	-0.11681	0.01930	-0.17145	-0.15866
51	Madera (SJV)	-0.10372	-0.10372	-0.10372	-0.10372	0.04460	-0.02901	0.07336
52	Merced (SJV)	-0.02307	-0.02307	-0.02307	-0.02307	-0.02160	-0.04147	-0.06523
53	San Joaquin (SJV)	0.05027	0.05027	0.05027	0.05027	-0.15719	-0.00885	-0.07291
54	Stanislaus (SJV)	0.00141	0.00141	0.00141	0.00141	-0.04779	0.00619	0.02773
55	Tulare (SJV)	0.00059	0.00059	0.00059	0.00059	-0.16846	-0.10164	-0.03405
63	Imperial (SS)	-0.09211	-0.09211	-0.09211	-0.09211	0.04501	0.02932	-0.00487
64	Riverside (SS)	-0.07119	-0.07119	-0.07119	-0.07119	-0.00510	0.05774	-0.06306
27	Butte (SV)	0.04071	0.04071	0.04071	0.04071	-0.05430	-0.00744	-0.26634
28	Colusa (SV)	-0.18829	-0.18829	-0.18829	-0.18829	-0.11214	-0.00485	-0.05405
29	Glenn (SV)	-0.01350	-0.01350	-0.01350	-0.01350	-0.03406	-0.00397	-0.02226
30	Placer (SV)	-0.00340	-0.00340	-0.00340	-0.00340	-0.11534	-0.00505	-0.07671
31	Sacramento (SV)	-0.04134	-0.04134	-0.04134	-0.04134	-0.18059	-0.02908	-0.08168
32	Shasta (SV)	-0.06339	-0.06339	-0.06339	-0.06339	-0.03060	0.00217	-0.01633
33	Solano (SV)	-0.07545	-0.07545	-0.07545	-0.07545	0.03767	-0.03134	-0.02476
34	Sutter (SV)	0.02439	0.02439	0.02439	0.02439	0.00441	-0.00390	-0.09360
35	Tehama (SV)	0.07342	0.07342	0.07342	0.07342	-0.03552	0.01886	-0.03246
36	Yolo (SV)	-0.16509	-0.16509	-0.16509	-0.16509	-0.05043	0.00244	-0.14779
37	Yuba (SV)	-0.05552	-0.05552	-0.05552	-0.05552	-0.02793	0.02103	0.08625

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	1983	1984	1985	1986	1987	1988	1989
1	Alpine (GBV)	-0.14195	0.01154	-0.01357	-0.00371	-0.05620	-0.06649	0.00347
2	Inyo (GBV)	-0.02341	-0.01125	-0.04788	0.07248	-0.07969	0.06897	0.05886
3	Mono (GBV)	-0.17974	0.06366	-0.01591	-0.01407	0.00615	0.00847	-0.06754
4	Lake (LC)	-0.09857	-0.04354	-0.00841	-0.02879	-0.03917	-0.03153	-0.02141
5	El Dorado (LT)	0.04482	-0.05673	0.00123	-0.10165	-0.05041	-0.04747	0.02703
6	Placer (LT)	-0.04621	-0.05474	0.00804	-0.05171	-0.04414	-0.07872	0.01174
7	Amador (MC)	-0.17481	0.04619	-0.01154	-0.17540	-0.05602	0.05433	0.03288
8	Calaveras (MC)	-0.13133	0.15196	-0.02616	-0.11709	-0.05320	-0.12842	0.00040
9	El Dorado (MC)	0.04482	-0.05673	0.00123	-0.10165	-0.05041	-0.04747	0.02703
10	Mariposa (MC)	-0.06887	-0.01946	0.03679	-0.08292	-0.09628	-0.03676	0.07738
11	Nevada (MC)	-0.02492	-0.18333	-0.02002	-0.05412	-0.08013	0.04857	0.07859
12	Placer (MC)	-0.04621	-0.05474	0.00804	-0.05171	-0.04414	-0.07872	0.01174
13	Plumas (MC)	-0.06311	-0.00010	-0.12474	-0.03206	-0.02997	-0.17083	0.01511
14	Sierra (MC)	0.05332	-0.11160	-0.03574	-0.05366	-0.08257	-0.01221	-0.04567
15	Tuolumne (MC)	-0.10804	0.00444	-0.10231	-0.15366	-0.13276	0.05239	0.28669
65	Kern (MD)	-0.04911	-0.01177	0.00981	-0.10270	-0.02706	-0.03859	-0.02166
66	Riverside (MD/MDAQMD)	-0.11536	-0.06407	-0.06878	-0.11762	-0.08983	-0.16927	-0.12347
67	Riverside (MD/SCAQMD)	-0.11536	-0.06407	-0.06878	-0.11762	-0.08983	-0.16927	-0.12347
68	Los Angeles (MD)	-0.02170	-0.04336	-0.05801	-0.09521	-0.01633	-0.00101	-0.00627
69	San Bernardino (MD)	-0.34402	-0.04552	-0.06231	-0.09633	-0.09477	-0.09993	0.01815
19	Del Norte (NC)	-0.02652	-0.12274	0.23576	-0.00240	-0.13548	-0.09706	0.02128
20	Humboldt (NC)	-0.01365	0.04503	-0.02698	-0.05722	-0.07214	-0.05121	-0.03215
21	Mendocino (NC)	-0.12691	-0.07057	-0.08264	-0.05190	-0.01303	0.01228	0.30901
22	Sonoma (NC)	-0.08278	-0.04276	-0.01054	-0.09343	-0.05432	-0.06967	-0.01990
23	Trinity (NC)	-0.01512	-0.16183	-0.00076	-0.05389	-0.20506	-0.04821	-0.10143
16	Monterey (NCC)	-0.06039	-0.04557	-0.02311	-0.03668	-0.06980	-0.05524	-0.04302
17	San Benito (NCC)	-0.05119	-0.07277	-0.03603	-0.08128	-0.03715	-0.05004	0.10459
18	Santa Cruz (NCC)	-0.09196	0.06976	-0.03577	-0.05284	-0.02158	-0.01647	0.11168
24	Lassen (NEP)	0.20692	-0.01832	-0.15883	-0.03443	-0.03316	-0.04739	-0.05168
25	Modoc (NEP)	-0.01962	-0.03239	-0.05715	-0.07395	-0.01328	-0.02714	-0.07111
26	Siskiyou (NEP)	0.03187	0.01176	-0.05217	-0.08906	-0.08512	-0.03461	-0.05476
59	Los Angeles (SC)	-0.02170	-0.04336	-0.05801	-0.09521	-0.01633	-0.00101	-0.00627
60	Orange (SC)	-0.04050	-0.01126	-0.09597	-0.07412	-0.06525	-0.02013	-0.03354

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	1983	1984	1985	1986	1987	1988	1989
61	Riverside (SC)	-0.11536	-0.06407	-0.06878	-0.11762	-0.08983	-0.16927	-0.12347
62	San Bernardino (SC)	-0.34402	-0.04552	-0.06231	-0.09633	-0.09477	-0.09993	0.01815
56	San Luis Obispo (SCC)	-0.07959	-0.04494	-0.02069	-0.04612	-0.04075	-0.05826	0.03103
57	Santa Barbara (SCC)	-0.06485	-0.02029	-0.01207	-0.06349	-0.06045	-0.05304	-0.04040
58	Ventura (SCC)	-0.00432	-0.03368	-0.04665	-0.07129	-0.07469	-0.05536	-0.03721
38	San Diego (SD)	-0.10261	-0.07222	-0.08493	-0.06996	-0.08848	-0.08690	-0.03173
39	Alameda (SF)	-0.03694	-0.15263	-0.06994	-0.04542	-0.02361	-0.06414	-0.00549
40	Contra Costa (SF)	0.00756	-0.15136	0.13069	-0.05907	-0.02353	-0.08434	-0.09717
41	Marin (SF)	-0.07873	-0.00589	-0.07803	-0.04909	-0.01929	0.00342	0.06135
42	Napa (SF)	-0.06638	-0.04536	-0.01992	-0.05433	-0.11420	-0.06300	-0.02774
43	San Francisco (SF)	-0.02772	-0.03787	-0.04352	-0.04189	0.00330	-0.03516	0.08610
44	San Mateo (SF)	0.11581	-0.17320	-0.03998	-0.03179	0.06607	-0.07310	0.01515
45	Santa Clara (SF)	-0.00988	-0.02371	-0.03562	-0.05166	-0.01862	-0.04694	-0.02117
46	Solano (SF)	-0.03515	-0.10225	-0.03630	-0.09505	-0.01332	0.02946	-0.09379
47	Sonoma (SF)	-0.08278	-0.04276	-0.01054	-0.09343	-0.05432	-0.06967	-0.01990
48	Fresno (SJV)	-0.06704	-0.03420	0.02910	-0.11534	0.01276	-0.04244	-0.01933
49	Kern (SJV)	-0.04911	-0.01177	0.00981	-0.10270	-0.02706	-0.03859	-0.02166
50	Kings (SJV)	0.02137	-0.02709	-0.07041	-0.15897	-0.01271	-0.05443	-0.01500
51	Madera (SJV)	-0.09918	-0.04114	0.00628	0.02491	-0.05550	0.01484	-0.02625
52	Merced (SJV)	-0.10043	-0.09484	0.01757	-0.11447	-0.06900	0.02470	-0.13354
53	San Joaquin (SJV)	-0.12088	0.00262	-0.07025	-0.15403	-0.09554	-0.06331	-0.11164
54	Stanislaus (SJV)	-0.06489	-0.01526	-0.11574	-0.14797	-0.07156	0.07614	-0.27879
55	Tulare (SJV)	0.02150	0.06916	-0.00666	0.05144	-0.05044	-0.02268	-0.07212
63	Imperial (SS)	-0.02829	-0.04322	-0.05490	-0.07930	-0.06965	-0.14246	0.10527
64	Riverside (SS)	-0.11536	-0.06407	-0.06878	-0.11762	-0.08983	-0.16927	-0.12347
27	Butte (SV)	-0.09323	-0.01535	-0.03668	-0.09374	-0.02565	-0.07576	0.13507
28	Colusa (SV)	-0.08327	0.00829	-0.02463	-0.23821	-0.00658	-0.04178	-0.11303
29	Glenn (SV)	-0.08810	-0.01821	-0.06016	-0.26499	-0.00842	-0.03199	-0.08452
30	Placer (SV)	-0.04621	-0.05474	0.00804	-0.05171	-0.04414	-0.07872	0.01174
31	Sacramento (SV)	-0.09784	-0.05125	-0.06252	-0.12028	-0.04175	-0.05541	-0.06929
32	Shasta (SV)	-0.06331	-0.04141	-0.02494	-0.02749	-0.10933	-0.06559	-0.06927
33	Solano (SV)	-0.03515	-0.10225	-0.03630	-0.09505	-0.01332	0.02946	-0.09379
34	Sutter (SV)	-0.03628	0.00072	-0.04769	-0.07075	-0.03734	-0.04965	-0.08428
35	Tehama (SV)	-0.04043	-0.05540	-0.08468	-0.08941	-0.07104	-0.07874	-0.05489
36	Yolo (SV)	-0.07924	-0.09693	-0.01075	-0.16454	-0.03512	-0.04326	-0.03490
37	Yuba (SV)	0.03512	-0.06657	-0.05336	0.07665	-0.08614	-0.03258	0.02774

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	1990	1991	1992	1993	1994	1995	1996
1	Alpine (GBV)	0.00797	-0.16178	-0.20996	0.03339	0.20930	-0.14069	-0.07249
2	Inyo (GBV)	0.04411	0.03468	-0.02324	-0.06497	-0.02785	-0.11672	0.05016
3	Mono (GBV)	0.01558	0.03883	-0.26937	0.01324	0.00770	-0.18545	-0.01578
4	Lake (LC)	-0.01543	-0.01834	0.19489	-0.02102	-0.00273	-0.02518	-0.01084
5	El Dorado (LT)	0.00117	-0.02152	0.00093	-0.01386	0.00900	-0.00469	-0.02404
6	Placer (LT)	-0.03693	-0.03719	0.03862	-0.02153	-0.00550	-0.04322	-0.05201
7	Amador (MC)	-0.03810	-0.00541	0.02379	-0.00238	-0.01232	-0.03863	0.06382
8	Calaveras (MC)	0.02739	-0.18917	0.14906	0.00000	0.19543	-0.04403	-0.00415
9	El Dorado (MC)	0.00117	-0.02152	0.00093	-0.01386	0.00900	-0.00469	-0.02404
10	Mariposa (MC)	-0.01863	-0.04071	0.01059	-0.09090	0.00217	-0.00906	-0.03772
11	Nevada (MC)	-0.02971	-0.02093	0.00514	0.02695	-0.00680	-0.04214	-0.02530
12	Placer (MC)	-0.03693	-0.03719	0.03862	-0.02153	-0.00550	-0.04322	-0.05201
13	Plumas (MC)	-0.03510	0.15076	-0.01856	0.00611	-0.04991	-0.01835	-0.00579
14	Sierra (MC)	0.05337	0.03968	-0.00024	0.01728	-0.02018	-0.03218	-0.06080
15	Tuolumne (MC)	-0.04296	-0.09228	-0.08029	0.03947	0.22646	-0.01286	-0.04253
65	Kern (MD)	-0.05859	-0.01289	0.07594	-0.02820	-0.01427	-0.05444	-0.02644
66	Riverside (MD/MDAQMD)	0.01201	-0.03908	0.10461	0.01822	-0.04706	-0.01830	-0.02480
67	Riverside (MD/SCAQMD)	0.01201	-0.03908	0.10461	0.01822	-0.04706	-0.01830	-0.02480
68	Los Angeles (MD)	0.05060	-0.00272	-0.00001	0.00528	-0.01560	-0.03004	-0.00533
69	San Bernardino (MD)	-0.01808	-0.04167	0.06784	0.00985	-0.02911	0.02663	-0.08461
19	Del Norte (NC)	-0.01112	0.06911	0.01633	-0.03556	0.20811	0.00747	0.00029
20	Humboldt (NC)	0.07155	-0.01043	0.09690	0.04533	0.00083	-0.02055	0.02802
21	Mendocino (NC)	0.06467	0.03773	-0.00018	0.06616	0.05375	-0.00694	0.00958
22	Sonoma (NC)	0.00411	-0.08896	-0.03691	0.06463	0.16373	0.07736	-0.00683
23	Trinity (NC)	0.05860	-0.03868	0.01224	0.05394	0.04802	0.00098	0.00586
16	Monterey (NCC)	-0.00749	-0.00667	0.02529	-0.00107	-0.00607	-0.06973	-0.00264
17	San Benito (NCC)	-0.00551	-0.03170	0.00177	-0.03041	-0.04454	-0.04446	0.03825
18	Santa Cruz (NCC)	-0.02099	-0.10266	0.00406	-0.00053	0.10147	-0.03119	-0.00852
24	Lassen (NEP)	-0.04616	0.03379	-0.05740	-0.01876	0.04241	-0.01565	0.00732
25	Modoc (NEP)	0.01226	-0.01175	0.05565	-0.01105	0.00413	-0.17638	-0.00359
26	Siskiyou (NEP)	-0.01415	-0.03432	-0.00638	0.13929	-0.05770	0.03517	-0.05820
59	Los Angeles (SC)	0.05060	-0.00272	-0.00001	0.00528	-0.01560	-0.03004	-0.00533
60	Orange (SC)	0.05343	0.00856	-0.00793	0.00379	-0.00392	-0.03934	-0.01148

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	1990	1991	1992	1993	1994	1995	1996
61	Riverside (SC)	0.01201	-0.03908	0.10461	0.01822	-0.04706	-0.01830	-0.02480
62	San Bernardino (SC)	-0.01808	-0.04167	0.06784	0.00985	-0.02911	0.02663	-0.08461
56	San Luis Obispo (SCC)	-0.00511	-0.05738	0.07067	-0.00114	-0.00980	-0.04509	-0.01614
57	Santa Barbara (SCC)	-0.00428	0.00137	-0.00351	0.00425	-0.01320	-0.00137	-0.04449
58	Ventura (SCC)	0.27822	0.00688	-0.00687	-0.09023	-0.02359	-0.00233	-0.12085
38	San Diego (SD)	0.01577	-0.01247	0.00422	-0.03652	-0.01092	-0.03656	-0.04321
39	Alameda (SF)	0.03465	0.00661	0.13879	0.00023	0.01111	-0.01755	-0.00086
40	Contra Costa (SF)	0.08897	-0.01081	-0.00066	-0.01746	-0.00063	-0.00594	-0.09219
41	Marin (SF)	-0.00373	0.07487	-0.05941	-0.00003	-0.09258	0.01820	0.00244
42	Napa (SF)	-0.00258	-0.01735	-0.09747	-0.04018	-0.00591	0.28877	-0.01064
43	San Francisco (SF)	0.02658	-0.03138	-0.01173	0.06110	0.05543	0.00720	0.03625
44	San Mateo (SF)	-0.00845	-0.00175	0.05632	0.03881	-0.00472	-0.04503	0.01002
45	Santa Clara (SF)	-0.03275	0.15569	0.03911	0.01371	-0.04882	0.00714	-0.00452
46	Solano (SF)	-0.00133	-0.04344	0.00276	-0.03973	-0.00327	0.02160	-0.10824
47	Sonoma (SF)	0.00411	-0.08896	-0.03691	0.06463	0.16373	0.07736	-0.00683
48	Fresno (SJV)	-0.02225	-0.02034	0.01448	-0.05129	-0.00623	-0.04896	-0.01814
49	Kern (SJV)	-0.05859	-0.01289	0.07594	-0.02820	-0.01427	-0.05444	-0.02644
50	Kings (SJV)	-0.02371	0.04535	0.00974	-0.03131	0.08350	-0.13670	-0.08119
51	Madera (SJV)	-0.02051	-0.05549	0.00396	-0.00672	-0.14037	-0.03532	-0.05322
52	Merced (SJV)	0.03011	-0.04240	0.01869	0.04130	-0.03135	0.00580	-0.03869
53	San Joaquin (SJV)	-0.02425	-0.01086	-0.10100	-0.06463	0.00683	-0.03471	-0.04358
54	Stanislaus (SJV)	0.00668	-0.01300	-0.02052	-0.03088	-0.00401	-0.02053	-0.05040
55	Tulare (SJV)	-0.03690	-0.01119	-0.04106	-0.04724	-0.00093	-0.06405	-0.02633
63	Imperial (SS)	-0.03105	-0.05436	0.06818	0.03260	-0.13455	0.02396	-0.10992
64	Riverside (SS)	0.01201	-0.03908	0.10461	0.01822	-0.04706	-0.01830	-0.02480
27	Butte (SV)	-0.00994	-0.01075	-0.01233	-0.04900	0.01303	0.00731	-0.01652
28	Colusa (SV)	-0.05449	-0.04807	-0.00015	-0.00899	0.03041	-0.03381	-0.05006
29	Glenn (SV)	-0.01688	-0.05469	-0.03020	0.00009	0.08100	0.01177	-0.00853
30	Placer (SV)	-0.03693	-0.03719	0.03862	-0.02153	-0.00550	-0.04322	-0.05201
31	Sacramento (SV)	-0.02572	-0.12024	0.10586	-0.03575	0.00114	-0.02238	-0.03506
32	Shasta (SV)	0.00810	-0.00408	-0.08863	0.14534	-0.01316	-0.07895	-0.01168
33	Solano (SV)	-0.00133	-0.04344	0.00276	-0.03973	-0.00327	0.02160	-0.10824
34	Sutter (SV)	-0.02715	-0.02392	-0.00299	-0.08363	0.01060	0.14214	0.10735
35	Tehama (SV)	-0.00049	-0.01177	0.00663	-0.03700	0.06553	-0.05092	0.00175
36	Yolo (SV)	-0.05431	0.02088	-0.02667	0.01963	-0.03862	-0.00289	-0.04043
37	Yuba (SV)	-0.00316	-0.02504	0.00126	-0.01602	-0.00114	-0.00466	-0.05585

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	1997	1998	1999	2000	2001	2002	2003
1	Alpine (GBV)	-0.00832	0.02572	0.02572	0.00000	0.00000	0.00000	0.00000
2	Inyo (GBV)	0.13725	-0.03051	-0.03051	0.00000	0.00000	0.00000	0.00000
3	Mono (GBV)	0.19855	0.06205	0.06205	0.00000	0.00000	0.00000	0.00000
4	Lake (LC)	-0.00235	0.01886	0.01886	0.00000	0.00000	0.00000	0.00000
5	El Dorado (LT)	-0.02811	0.01134	0.01134	0.00000	0.00000	0.00000	0.00000
6	Placer (LT)	0.02275	-0.00814	-0.00814	0.00000	0.00000	0.00000	0.00000
7	Amador (MC)	-0.00822	-0.00506	-0.00506	0.00000	0.00000	0.00000	0.00000
8	Calaveras (MC)	-0.03728	-0.00919	-0.00919	0.00000	0.00000	0.00000	0.00000
9	El Dorado (MC)	-0.02811	0.01134	0.01134	0.00000	0.00000	0.00000	0.00000
10	Mariposa (MC)	0.00251	-0.05004	-0.05004	0.00000	0.00000	0.00000	0.00000
11	Nevada (MC)	-0.11680	0.19879	0.19879	0.00000	0.00000	0.00000	0.00000
12	Placer (MC)	0.02275	-0.00814	-0.00814	0.00000	0.00000	0.00000	0.00000
13	Plumas (MC)	0.08001	-0.12809	-0.12809	0.00000	0.00000	0.00000	0.00000
14	Sierra (MC)	0.07850	-0.05371	-0.05371	0.00000	0.00000	0.00000	0.00000
15	Tuolumne (MC)	0.04767	-0.05336	-0.05336	0.00000	0.00000	0.00000	0.00000
65	Kern (MD)	-0.01267	-0.05025	-0.05025	0.00000	0.00000	0.00000	0.00000
66	Riverside (MD/MDAQMD)	-0.05111	-0.04206	-0.04206	0.00000	0.00000	0.00000	0.00000
67	Riverside (MD/SCAQMD)	-0.05111	-0.04206	-0.04206	0.00000	0.00000	0.00000	0.00000
68	Los Angeles (MD)	-0.01054	-0.02189	-0.02189	0.00000	0.00000	0.00000	0.00000
69	San Bernardino (MD)	-0.00293	-0.02143	-0.02143	0.00000	0.00000	0.00000	0.00000
19	Del Norte (NC)	0.00700	-0.02754	-0.02754	0.00000	0.00000	0.00000	0.00000
20	Humboldt (NC)	0.01906	-0.01346	-0.01346	0.00000	0.00000	0.00000	0.00000
21	Mendocino (NC)	0.10457	-0.00038	-0.00038	0.00000	0.00000	0.00000	0.00000
22	Sonoma (NC)	-0.14953	-0.01614	-0.01614	0.00000	0.00000	0.00000	0.00000
23	Trinity (NC)	0.06041	-0.08953	-0.08953	0.00000	0.00000	0.00000	0.00000
16	Monterey (NCC)	-0.06629	0.00414	0.00414	0.00000	0.00000	0.00000	0.00000
17	San Benito (NCC)	-0.24136	0.23165	0.23165	0.00000	0.00000	0.00000	0.00000
18	Santa Cruz (NCC)	-0.04244	-0.02345	-0.02345	0.00000	0.00000	0.00000	0.00000
24	Lassen (NEP)	-0.06291	0.01436	0.01436	0.00000	0.00000	0.00000	0.00000
25	Modoc (NEP)	0.07343	-0.17252	-0.17252	0.00000	0.00000	0.00000	0.00000
26	Siskiyou (NEP)	0.04950	-0.02954	-0.02954	0.00000	0.00000	0.00000	0.00000
59	Los Angeles (SC)	-0.01054	-0.02189	-0.02189	0.00000	0.00000	0.00000	0.00000
60	Orange (SC)	0.03310	-0.06496	-0.06496	0.00000	0.00000	0.00000	0.00000

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	1997	1998	1999	2000	2001	2002	2003
61	Riverside (SC)	-0.05111	-0.04206	-0.04206	0.00000	0.00000	0.00000	0.00000
62	San Bernardino (SC)	-0.00293	-0.02143	-0.02143	0.00000	0.00000	0.00000	0.00000
56	San Luis Obispo (SCC)	-0.00596	-0.05848	-0.05848	0.00000	0.00000	0.00000	0.00000
57	Santa Barbara (SCC)	0.00508	-0.02451	-0.02451	0.00000	0.00000	0.00000	0.00000
58	Ventura (SCC)	0.02786	-0.07857	-0.07857	0.00000	0.00000	0.00000	0.00000
38	San Diego (SD)	0.05875	-0.07084	-0.07084	0.00000	0.00000	0.00000	0.00000
39	Alameda (SF)	-0.02722	-0.04478	-0.04478	0.00000	0.00000	0.00000	0.00000
40	Contra Costa (SF)	0.05415	0.00363	0.00363	0.00000	0.00000	0.00000	0.00000
41	Marin (SF)	-0.15938	-0.02130	-0.02130	0.00000	0.00000	0.00000	0.00000
42	Napa (SF)	0.01543	-0.12648	-0.12648	0.00000	0.00000	0.00000	0.00000
43	San Francisco (SF)	0.10867	-0.14024	-0.14024	0.00000	0.00000	0.00000	0.00000
44	San Mateo (SF)	-0.13368	-0.02117	-0.02117	0.00000	0.00000	0.00000	0.00000
45	Santa Clara (SF)	-0.11562	-0.00751	-0.00751	0.00000	0.00000	0.00000	0.00000
46	Solano (SF)	0.08778	-0.02205	-0.02205	0.00000	0.00000	0.00000	0.00000
47	Sonoma (SF)	-0.14953	-0.01614	-0.01614	0.00000	0.00000	0.00000	0.00000
48	Fresno (SJV)	-0.06826	0.03332	0.03332	0.00000	0.00000	0.00000	0.00000
49	Kern (SJV)	-0.01267	-0.05025	-0.05025	0.00000	0.00000	0.00000	0.00000
50	Kings (SJV)	0.00779	-0.04999	-0.04999	0.00000	0.00000	0.00000	0.00000
51	Madera (SJV)	-0.02153	-0.03513	-0.03513	0.00000	0.00000	0.00000	0.00000
52	Merced (SJV)	0.03740	-0.05552	-0.05552	0.00000	0.00000	0.00000	0.00000
53	San Joaquin (SJV)	-0.00369	-0.02803	-0.02803	0.00000	0.00000	0.00000	0.00000
54	Stanislaus (SJV)	-0.12838	0.04974	0.04974	0.00000	0.00000	0.00000	0.00000
55	Tulare (SJV)	0.09722	-0.08362	-0.08362	0.00000	0.00000	0.00000	0.00000
63	Imperial (SS)	-0.02641	-0.05619	-0.05619	0.00000	0.00000	0.00000	0.00000
64	Riverside (SS)	-0.05111	-0.04206	-0.04206	0.00000	0.00000	0.00000	0.00000
27	Butte (SV)	0.02303	-0.03085	-0.03085	0.00000	0.00000	0.00000	0.00000
28	Colusa (SV)	-0.02091	-0.00320	-0.00320	0.00000	0.00000	0.00000	0.00000
29	Glenn (SV)	0.02620	-0.00664	-0.00664	0.00000	0.00000	0.00000	0.00000
30	Placer (SV)	0.02275	-0.00814	-0.00814	0.00000	0.00000	0.00000	0.00000
31	Sacramento (SV)	-0.01390	-0.01228	-0.01228	0.00000	0.00000	0.00000	0.00000
32	Shasta (SV)	-0.05961	0.00187	0.00187	0.00000	0.00000	0.00000	0.00000
33	Solano (SV)	0.08778	-0.02205	-0.02205	0.00000	0.00000	0.00000	0.00000
34	Sutter (SV)	0.01304	0.00724	0.00724	0.00000	0.00000	0.00000	0.00000
35	Tehama (SV)	-0.13251	-0.03517	-0.03517	0.00000	0.00000	0.00000	0.00000
36	Yolo (SV)	-0.03063	-0.00833	-0.00833	0.00000	0.00000	0.00000	0.00000
37	Yuba (SV)	-0.08293	0.00255	0.00255	0.00000	0.00000	0.00000	0.00000

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	2004	2005	2006	2007	2008	2009	2010
1	Alpine (GBV)	-0.02068	-0.02111	-0.02157	-0.02204	-0.02254	-0.02306	-0.02361
2	Inyo (GBV)	-0.02762	-0.02840	-0.02923	-0.03011	-0.03105	-0.03204	-0.03310
3	Mono (GBV)	-0.02485	-0.02548	-0.02615	-0.02685	-0.02759	-0.02837	-0.02920
4	Lake (LC)	0.00876	0.00868	0.00861	0.00854	0.00846	0.00839	0.00832
5	El Dorado (LT)	0.04544	0.04346	0.04165	0.03999	0.03845	0.03702	0.03570
6	Placer (LT)	-0.00189	-0.00190	-0.00190	-0.00191	-0.00191	-0.00191	-0.00192
7	Amador (MC)	-0.02197	-0.02247	-0.02298	-0.02352	-0.02409	-0.02468	-0.02531
8	Calaveras (MC)	0.00461	0.00459	0.00456	0.00454	0.00452	0.00450	0.00448
9	El Dorado (MC)	0.04544	0.04346	0.04165	0.03999	0.03845	0.03702	0.03570
10	Mariposa (MC)	0.01410	0.01390	0.01371	0.01353	0.01335	0.01317	0.01300
11	Nevada (MC)	-0.01271	-0.01287	-0.01304	-0.01321	-0.01339	-0.01357	-0.01376
12	Placer (MC)	-0.00189	-0.00190	-0.00190	-0.00191	-0.00191	-0.00191	-0.00192
13	Plumas (MC)	0.00182	0.00182	0.00181	0.00181	0.00181	0.00180	0.00180
14	Sierra (MC)	-0.02779	-0.02859	-0.02943	-0.03032	-0.03127	-0.03228	-0.03335
15	Tuolumne (MC)	0.01554	0.01530	0.01507	0.01485	0.01463	0.01442	0.01421
65	Kern (MD)	-0.00910	-0.00918	-0.00927	-0.00935	-0.00944	-0.00953	-0.00962
66	Riverside (MD/MDAQMD)	0.00264	0.00263	0.00263	0.00262	0.00261	0.00260	0.00260
67	Riverside (MD/SCAQMD)	0.00264	0.00263	0.00263	0.00262	0.00261	0.00260	0.00260
68	Los Angeles (MD)	0.02727	0.02655	0.02586	0.02521	0.02459	0.02400	0.02344
69	San Bernardino (MD)	-0.00481	-0.00483	-0.00485	-0.00488	-0.00490	-0.00492	-0.00495
19	Del Norte (NC)	-0.00696	-0.00701	-0.00706	-0.00711	-0.00716	-0.00721	-0.00726
20	Humboldt (NC)	-0.00656	-0.00661	-0.00665	-0.00670	-0.00674	-0.00679	-0.00683
21	Mendocino (NC)	0.00164	0.00164	0.00164	0.00163	0.00163	0.00163	0.00163
22	Sonoma (NC)	0.02884	0.02803	0.02726	0.02654	0.02585	0.02520	0.02458
23	Trinity (NC)	-0.01871	-0.01907	-0.01944	-0.01983	-0.02023	-0.02065	-0.02108
16	Monterey (NCC)	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056
17	San Benito (NCC)	-0.00097	-0.00097	-0.00097	-0.00097	-0.00097	-0.00097	-0.00097
18	Santa Cruz (NCC)	0.03540	0.03419	0.03306	0.03200	0.03101	0.03007	0.02920
24	Lassen (NEP)	0.00844	0.00837	0.00830	0.00823	0.00817	0.00810	0.00804
25	Modoc (NEP)	0.00222	0.00221	0.00221	0.00220	0.00220	0.00219	0.00219
26	Siskiyou (NEP)	-0.02812	-0.02893	-0.02980	-0.03071	-0.03169	-0.03272	-0.03383
59	Los Angeles (SC)	0.02727	0.02655	0.02586	0.02521	0.02459	0.02400	0.02344
60	Orange (SC)	0.02663	0.02594	0.02528	0.02466	0.02407	0.02350	0.02296

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	2004	2005	2006	2007	2008	2009	2010
61	Riverside (SC)	0.00264	0.00263	0.00263	0.00262	0.00261	0.00260	0.00260
62	San Bernardino (SC)	-0.00481	-0.00483	-0.00485	-0.00488	-0.00490	-0.00492	-0.00495
56	San Luis Obispo (SCC)	0.00282	0.00281	0.00280	0.00279	0.00279	0.00278	0.00277
57	Santa Barbara (SCC)	-0.00379	-0.00380	-0.00382	-0.00383	-0.00385	-0.00386	-0.00388
58	Ventura (SCC)	0.02219	0.02170	0.02124	0.02080	0.02038	0.01997	0.01958
38	San Diego (SD)	0.01594	0.01569	0.01545	0.01521	0.01498	0.01476	0.01455
39	Alameda (SF)	0.00118	0.00117	0.00117	0.00117	0.00117	0.00117	0.00117
40	Contra Costa (SF)	0.02087	0.02044	0.02003	0.01964	0.01926	0.01889	0.01854
41	Marin (SF)	0.02096	0.02053	0.02011	0.01972	0.01934	0.01897	0.01862
42	Napa (SF)	0.00469	0.00467	0.00465	0.00463	0.00460	0.00458	0.00456
43	San Francisco (SF)	0.08759	0.08053	0.07453	0.06936	0.06486	0.06091	0.05742
44	San Mateo (SF)	0.00103	0.00103	0.00102	0.00102	0.00102	0.00102	0.00102
45	Santa Clara (SF)	0.03215	0.03114	0.03020	0.02932	0.02848	0.02769	0.02695
46	Solano (SF)	-0.00692	-0.00697	-0.00702	-0.00707	-0.00712	-0.00717	-0.00722
47	Sonoma (SF)	0.02884	0.02803	0.02726	0.02654	0.02585	0.02520	0.02458
48	Fresno (SJV)	0.00957	0.00948	0.00939	0.00930	0.00921	0.00913	0.00905
49	Kern (SJV)	-0.00910	-0.00918	-0.00927	-0.00935	-0.00944	-0.00953	-0.00962
50	Kings (SJV)	-0.00471	-0.00474	-0.00476	-0.00478	-0.00480	-0.00483	-0.00485
51	Madera (SJV)	-0.00433	-0.00435	-0.00436	-0.00438	-0.00440	-0.00442	-0.00444
52	Merced (SJV)	-0.01668	-0.01697	-0.01726	-0.01756	-0.01788	-0.01820	-0.01854
53	San Joaquin (SJV)	-0.00696	-0.00701	-0.00706	-0.00711	-0.00716	-0.00721	-0.00726
54	Stanislaus (SJV)	0.02289	0.02238	0.02189	0.02142	0.02097	0.02054	0.02013
55	Tulare (SJV)	0.00641	0.00637	0.00633	0.00629	0.00625	0.00621	0.00617
63	Imperial (SS)	-0.00351	-0.00352	-0.00353	-0.00355	-0.00356	-0.00357	-0.00358
64	Riverside (SS)	0.00264	0.00263	0.00263	0.00262	0.00261	0.00260	0.00260
27	Butte (SV)	0.06342	0.05963	0.05628	0.05328	0.05058	0.04815	0.04594
28	Colusa (SV)	-0.01291	-0.01308	-0.01326	-0.01343	-0.01362	-0.01381	-0.01400
29	Glenn (SV)	-0.01122	-0.01135	-0.01148	-0.01161	-0.01175	-0.01189	-0.01203
30	Placer (SV)	-0.00189	-0.00190	-0.00190	-0.00191	-0.00191	-0.00191	-0.00192
31	Sacramento (SV)	0.02225	0.02177	0.02130	0.02086	0.02043	0.02002	0.01963
32	Shasta (SV)	-0.00855	-0.00862	-0.00869	-0.00877	-0.00885	-0.00893	-0.00901
33	Solano (SV)	-0.00692	-0.00697	-0.00702	-0.00707	-0.00712	-0.00717	-0.00722
34	Sutter (SV)	0.00248	0.00247	0.00247	0.00246	0.00245	0.00245	0.00244
35	Tehama (SV)	-0.01510	-0.01533	-0.01557	-0.01582	-0.01607	-0.01633	-0.01660
36	Yolo (SV)	-0.01718	-0.01748	-0.01779	-0.01812	-0.01845	-0.01880	-0.01916
37	Yuba (SV)	0.01559	0.01535	0.01512	0.01490	0.01468	0.01446	0.01426

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	2011	2012	2013	2014	2015	2016	2017
1	Alpine (GBV)	0.02168	0.02122	0.02078	0.02036	0.01995	0.01956	0.01919
2	Inyo (GBV)	0.01248	0.01233	0.01218	0.01203	0.01189	0.01175	0.01161
3	Mono (GBV)	0.01814	0.01782	0.01751	0.01720	0.01691	0.01663	0.01636
4	Lake (LC)	0.02919	0.02837	0.02758	0.02684	0.02614	0.02547	0.02484
5	El Dorado (LT)	0.02892	0.02811	0.02734	0.02661	0.02592	0.02527	0.02464
6	Placer (LT)	0.02776	0.02701	0.02630	0.02562	0.02498	0.02437	0.02379
7	Amador (MC)	0.01126	0.01114	0.01102	0.01090	0.01078	0.01066	0.01055
8	Calaveras (MC)	0.02596	0.02530	0.02468	0.02408	0.02352	0.02298	0.02246
9	El Dorado (MC)	0.02892	0.02811	0.02734	0.02661	0.02592	0.02527	0.02464
10	Mariposa (MC)	0.02293	0.02241	0.02192	0.02145	0.02100	0.02057	0.02015
11	Nevada (MC)	0.02211	0.02163	0.02118	0.02074	0.02032	0.01991	0.01952
12	Placer (MC)	0.02776	0.02701	0.02630	0.02562	0.02498	0.02437	0.02379
13	Plumas (MC)	0.01087	0.01076	0.01064	0.01053	0.01042	0.01031	0.01021
14	Sierra (MC)	0.00737	0.00732	0.00726	0.00721	0.00716	0.00711	0.00706
15	Tuolumne (MC)	0.02228	0.02179	0.02133	0.02088	0.02045	0.02004	0.01965
65	Kern (MD)	0.03167	0.03070	0.02978	0.02892	0.02811	0.02734	0.02661
66	Riverside (MD/MDAQMD)	0.03691	0.03559	0.03437	0.03323	0.03216	0.03116	0.03022
67	Riverside (MD/SCAQMD)	0.03691	0.03559	0.03437	0.03323	0.03216	0.03116	0.03022
68	Los Angeles (MD)	0.01532	0.01509	0.01487	0.01465	0.01444	0.01423	0.01403
69	San Bernardino (MD)	0.03168	0.03070	0.02979	0.02893	0.02811	0.02734	0.02662
19	Del Norte (NC)	0.02245	0.02196	0.02149	0.02104	0.02060	0.02019	0.01979
20	Humboldt (NC)	0.01044	0.01034	0.01023	0.01013	0.01002	0.00992	0.00983
21	Mendocino (NC)	0.02096	0.02053	0.02012	0.01972	0.01934	0.01897	0.01862
22	Sonoma (NC)	0.02136	0.02091	0.02048	0.02007	0.01968	0.01930	0.01893
23	Trinity (NC)	0.01266	0.01250	0.01235	0.01220	0.01205	0.01191	0.01177
16	Monterey (NCC)	0.02744	0.02671	0.02602	0.02536	0.02473	0.02413	0.02356
17	San Benito (NCC)	0.03000	0.02912	0.02830	0.02752	0.02678	0.02608	0.02542
18	Santa Cruz (NCC)	0.02638	0.02570	0.02506	0.02445	0.02386	0.02331	0.02278
24	Lassen (NEP)	0.02489	0.02429	0.02371	0.02316	0.02264	0.02214	0.02166
25	Modoc (NEP)	0.01695	0.01666	0.01639	0.01613	0.01587	0.01562	0.01538
26	Siskiyou (NEP)	0.01496	0.01474	0.01453	0.01432	0.01412	0.01392	0.01373
59	Los Angeles (SC)	0.01532	0.01509	0.01487	0.01465	0.01444	0.01423	0.01403
60	Orange (SC)	0.01608	0.01583	0.01558	0.01534	0.01511	0.01489	0.01467

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	2011	2012	2013	2014	2015	2016	2017
61	Riverside (SC)	0.03691	0.03559	0.03437	0.03323	0.03216	0.03116	0.03022
62	San Bernardino (SC)	0.03168	0.03070	0.02979	0.02893	0.02811	0.02734	0.02662
56	San Luis Obispo (SCC)	0.02919	0.02836	0.02758	0.02684	0.02614	0.02547	0.02484
57	Santa Barbara (SCC)	0.02397	0.02341	0.02287	0.02236	0.02187	0.02141	0.02096
58	Ventura (SCC)	0.02065	0.02024	0.01983	0.01945	0.01908	0.01872	0.01838
38	San Diego (SD)	0.02158	0.02113	0.02069	0.02027	0.01987	0.01948	0.01911
39	Alameda (SF)	0.01584	0.01560	0.01536	0.01513	0.01490	0.01468	0.01447
40	Contra Costa (SF)	0.01438	0.01417	0.01398	0.01378	0.01360	0.01341	0.01324
41	Marin (SF)	0.01120	0.01107	0.01095	0.01083	0.01072	0.01060	0.01049
42	Napa (SF)	0.01711	0.01682	0.01654	0.01627	0.01601	0.01576	0.01552
43	San Francisco (SF)	0.00354	0.00353	0.00351	0.00350	0.00349	0.00348	0.00347
44	San Mateo (SF)	0.01358	0.01340	0.01322	0.01305	0.01288	0.01272	0.01256
45	Santa Clara (SF)	0.01818	0.01786	0.01754	0.01724	0.01695	0.01667	0.01639
46	Solano (SF)	0.02238	0.02189	0.02142	0.02097	0.02054	0.02013	0.01973
47	Sonoma (SF)	0.02136	0.02091	0.02048	0.02007	0.01968	0.01930	0.01893
48	Fresno (SJV)	0.02378	0.02323	0.02270	0.02220	0.02172	0.02126	0.02081
49	Kern (SJV)	0.03167	0.03070	0.02978	0.02892	0.02811	0.02734	0.02661
50	Kings (SJV)	0.02798	0.02722	0.02650	0.02582	0.02517	0.02455	0.02396
51	Madera (SJV)	0.03743	0.03608	0.03482	0.03365	0.03255	0.03153	0.03056
52	Merced (SJV)	0.02702	0.02631	0.02564	0.02500	0.02439	0.02381	0.02325
53	San Joaquin (SJV)	0.02761	0.02686	0.02616	0.02549	0.02486	0.02426	0.02368
54	Stanislaus (SJV)	0.02889	0.02808	0.02732	0.02659	0.02590	0.02525	0.02463
55	Tulare (SJV)	0.02938	0.02854	0.02775	0.02700	0.02629	0.02562	0.02498
63	Imperial (SS)	0.04504	0.04310	0.04132	0.03968	0.03817	0.03676	0.03546
64	Riverside (SS)	0.03691	0.03559	0.03437	0.03323	0.03216	0.03116	0.03022
27	Butte (SV)	0.02857	0.02778	0.02703	0.02632	0.02564	0.02500	0.02439
28	Colusa (SV)	0.04582	0.04381	0.04197	0.04028	0.03872	0.03728	0.03594
29	Glenn (SV)	0.03664	0.03534	0.03414	0.03301	0.03195	0.03097	0.03004
30	Placer (SV)	0.02776	0.02701	0.02630	0.02562	0.02498	0.02437	0.02379
31	Sacramento (SV)	0.02151	0.02106	0.02062	0.02021	0.01981	0.01942	0.01905
32	Shasta (SV)	0.02101	0.02058	0.02016	0.01976	0.01938	0.01901	0.01866
33	Solano (SV)	0.02238	0.02189	0.02142	0.02097	0.02054	0.02013	0.01973
34	Sutter (SV)	0.02417	0.02360	0.02305	0.02253	0.02204	0.02156	0.02111
35	Tehama (SV)	0.02699	0.02628	0.02561	0.02497	0.02436	0.02378	0.02323
36	Yolo (SV)	0.02132	0.02088	0.02045	0.02004	0.01964	0.01927	0.01890
37	Yuba (SV)	0.02133	0.02088	0.02045	0.02004	0.01965	0.01927	0.01891

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	2018	2019	2020
1	Alpine (GBV)	0.01883	0.01848	0.01814
2	Inyo (GBV)	0.01148	0.01135	0.01122
3	Mono (GBV)	0.01610	0.01584	0.01559
4	Lake (LC)	0.02424	0.02367	0.02312
5	El Dorado (LT)	0.02405	0.02349	0.02295
6	Placer (LT)	0.02324	0.02271	0.02221
7	Amador (MC)	0.01044	0.01033	0.01023
8	Calaveras (MC)	0.02197	0.02149	0.02104
9	El Dorado (MC)	0.02405	0.02349	0.02295
10	Mariposa (MC)	0.01976	0.01937	0.01901
11	Nevada (MC)	0.01915	0.01879	0.01844
12	Placer (MC)	0.02324	0.02271	0.02221
13	Plumas (MC)	0.01010	0.01000	0.00990
14	Sierra (MC)	0.00701	0.00696	0.00691
15	Tuolumne (MC)	0.01927	0.01891	0.01856
65	Kern (MD)	0.02592	0.02527	0.02465
66	Riverside (MD/MDAQMD)	0.02933	0.02849	0.02771
67	Riverside (MD/SCAQMD)	0.02933	0.02849	0.02771
68	Los Angeles (MD)	0.01384	0.01365	0.01347
69	San Bernardino (MD)	0.02593	0.02527	0.02465
19	Del Norte (NC)	0.01940	0.01903	0.01868
20	Humboldt (NC)	0.00973	0.00964	0.00955
21	Mendocino (NC)	0.01828	0.01795	0.01763
22	Sonoma (NC)	0.01858	0.01824	0.01791
23	Trinity (NC)	0.01163	0.01150	0.01137
16	Monterey (NCC)	0.02302	0.02250	0.02201
17	San Benito (NCC)	0.02479	0.02419	0.02362
18	Santa Cruz (NCC)	0.02227	0.02178	0.02132
24	Lassen (NEP)	0.02120	0.02076	0.02034
25	Modoc (NEP)	0.01515	0.01492	0.01470
26	Siskiyou (NEP)	0.01354	0.01336	0.01318
59	Los Angeles (SC)	0.01384	0.01365	0.01347
60	Orange (SC)	0.01446	0.01425	0.01405

Population Growth Rates for the years 1969 – 2020 (continued)

GAI	County (Air Basin/AQMD)	2018	2019	2020
61	Riverside (SC)	0.02933	0.02849	0.02771
62	San Bernardino (SC)	0.02593	0.02527	0.02465
56	San Luis Obispo (SCC)	0.02424	0.02367	0.02312
57	Santa Barbara (SCC)	0.02053	0.02011	0.01972
58	Ventura (SCC)	0.01805	0.01773	0.01742
38	San Diego (SD)	0.01875	0.01840	0.01807
39	Alameda (SF)	0.01426	0.01406	0.01387
40	Contra Costa (SF)	0.01306	0.01290	0.01273
41	Marin (SF)	0.01038	0.01028	0.01017
42	Napa (SF)	0.01528	0.01505	0.01483
43	San Francisco (SF)	0.00345	0.00344	0.00343
44	San Mateo (SF)	0.01240	0.01225	0.01210
45	Santa Clara (SF)	0.01613	0.01587	0.01562
46	Solano (SF)	0.01935	0.01898	0.01863
47	Sonoma (SF)	0.01858	0.01824	0.01791
48	Fresno (SJV)	0.02039	0.01998	0.01959
49	Kern (SJV)	0.02592	0.02527	0.02465
50	Kings (SJV)	0.02340	0.02287	0.02235
51	Madera (SJV)	0.02966	0.02880	0.02800
52	Merced (SJV)	0.02272	0.02222	0.02174
53	San Joaquin (SJV)	0.02314	0.02261	0.02211
54	Stanislaus (SJV)	0.02403	0.02347	0.02293
55	Tulare (SJV)	0.02437	0.02379	0.02324
63	Imperial (SS)	0.03425	0.03311	0.03205
64	Riverside (SS)	0.02933	0.02849	0.02771
27	Butte (SV)	0.02381	0.02326	0.02273
28	Colusa (SV)	0.03469	0.03353	0.03244
29	Glenn (SV)	0.02916	0.02833	0.02755
30	Placer (SV)	0.02324	0.02271	0.02221
31	Sacramento (SV)	0.01870	0.01835	0.01802
32	Shasta (SV)	0.01832	0.01799	0.01767
33	Solano (SV)	0.01935	0.01898	0.01863
34	Sutter (SV)	0.02067	0.02025	0.01985
35	Tehama (SV)	0.02270	0.02220	0.02172
36	Yolo (SV)	0.01855	0.01821	0.01789
37	Yuba (SV)	0.01856	0.01822	0.01789