EMFAC Modeling Change Technical Memo

**SUBJECT:** UPDATING ESTIMATES OF VEHICLE MILES TRAVELED (SCAG)

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# Summary

# In June of 2002, staff received new forecasts of vehicle miles traveled (VMT) from the Southern California Association Governments (SCAG). Table 1 lists the areas and calendar years with new forecasts of VMT. In addition to the South Coast Air Basin, SCAG is also responsible for modeling Ventura County, the Mojave Desert Air Basin portions of Los Angeles and San Bernardino Counties, and the Riverside County portion of the Salton Sea Air Basin.

# Table 1 Areas With New Forecasts Of VMT

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# Updating the Emfac2001 ver. 2.08 model with new forecasts of VMT from SCAG affects the statewide total and regional emission inventories. To quantify the impact on emissions, staff selected 2000, 2010 and 2020 calendar years because these are milestone years. Incremental versions were run (2.097 and 2.098) for summertime episodic emissions. The effects of these changes are small, as indicated in Tables 2-4.

## Table 2 Area Specific Changes in VMT And Emissions In 2000

(Emissions in tons/day)



## Table 3 Area Specific VMT Changes And Emissions In 2010

(Emissions in tons/day)



## Table 4 Area Specific VMT Changes And Emissions In 2020

(Emissions in tons/day)



# Reason for change

Since the draft release of Emfac2001 version 2.08, staff has received updated estimates of vehicle activity from SCAG. SCAG provides estimates of vehicle miles traveled (VMT) for a base[[1]](#footnote-1) year and several forecast years, for areas under their jurisdiction. In addition, they also provide speed distributions, which are estimates of miles traveled at various average speeds. The speed distributions can reflect an increase in congestion by reducing the overall average speed or a reduction in congestion by increasing the overall speed. This memorandum details updates to VMT estimates supplied by SCAG and quantifies their impact on the emission inventory.

# Background

The Emfac2000 and Emfac2001 ver. 2.08 models contain vehicle population data for calendar years 1997 and 1998. In the model, these years are referred to as base years since the model only contains population data for these calendar years. The population data varies by calendar year, geographic area, vehicle class, fuel type, and vehicle age. The model also contains mileage accrual rates, which vary by geographic area, vehicle class, fuel type, and vehicle age. The VMT per weekday for a given area and **base** years (1997 and 1998) is simply calculated using the product of accrual rates, vehicle population, and the weekday VMT adjustment factors. For **future** calendar years, VMT per weekday is calculated using the product of accrual rates, forecasted vehicle population and the weekday VMT adjustment factors. The forecasted population is a function of the base year population and the population growth rates. For example, the 2000 calendar population is a function of the 1998 base year vehicle population and the population growth rates for the 1999 and 2000 calendar years.

The planning departments of the various COGs use transportation models to estimate overall VMT for a base year and several forecast years. Throughout this document, this data is commonly referred to as target VMT. Depending on the calendar year, the target VMT estimates are matched by modifying the population growth rates and/or mileage accrual rates in the Emfac2001 model. It is important to note that changes to mileage accrual rates will affect both forecasted and back cast VMT estimates. Whereas, changes to population growth rates will affect forecast VMT and vehicle population estimates. This is important, because, in the model, increases in the forecasted VMT will also be accompanied by increases in vehicle population. This means that in addition to emission processes dependant on vehicle mileage (running exhaust); emission processes that are dependant on per-vehicle estimates (starting, idle, evaporative emissions) will also change. Similarly, vehicle population is lowered in areas where there are decreases in the forecasted VMT estimates.

The next section details the VMT data provided by SCAG. Although SCAG reports Light-Duty and Heavy-Duty VMT separately, they do not provide the information by weight class. Therefore, the total VMT is reported. These data are then matched using the VMT matching algorithm. The files generated by the VMT algorithm were inserted into the Emfac model and another comparison of the target VMTs and VMTs from the Emfac model are presented. Because of rounding concerns, it was necessary to compare the VMTs to assure that both models are working as intended. Finally, the last section shows the effect on emissions from changes in VMT.

# VMT Data

Table 5 shows the Total VMT submissions provided by SCAG. These are the Total VMTs by area. To maintain the same growth rates as indicated in SCAG’s VMT submissions, the VMT estimates in Table 5 were all normalized to the 2000 calendar year. Figure 1 shows the normalized growth rates for areas in SCAG.

Table 5 Total VMT Submissions From SCAG



## Figure 1 VMT Normalized Growth Rates for Areas in the SCAG Region



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The growth rates from figure 1 were applied to 2000 calendar year VMT estimates from Emfac2001 ver. 2.08 to calculate target VMTs for calendar years, 2006, 2010, 2020, 2025 and 2030. The target VMTs are the same as the submitted VMTs as shown in Table 5 and match the VMT growth in the SCAG region.

# Impact on Emissions Inventory

This section details the change in the emission inventories for each of the 8 geographic areas. Emission inventories are only presented for calendar years 2000, 2010 and 2020.

To facilitate incremental analysis, the VMT changes were made to an existing working model (Emfac2001 version 2.097) that contained changes to school bus activity, LEVII evaporative technology groups, fuel RVP, VMT, HDDT/SBUS Idle times, and speed distribution changes for SACOG, AMBAG, and ABAG regions. The model’s version number was changed to 2.098 and is tentatively titled Emfac2002 version 2.098. This incremental analysis is useful for isolating the effect on emissions from individual changes. In this case, comparing similar inventories from 2.097 and 2.098 isolates the impact that changes in VMT have on emissions.

Table 6 shows a comparison of the target VMTs (from COGs) and VMTs from Emfac2002 version 2.098 for calendar years 2000, 2010 and 2020. This table shows that there is very little (less than 0.1%) difference between the target VMTs and modeled VMTs.

## Table 6 Comparison of Target VMTs and Modeled VMTs



Tables 7 and 8 show the summarized emission inventories, calculated using Emfac2001 ver. 2.097, and ver 2.098, respectively, for calendar years 2000, 2010 and 2020. Similarly, Table 9 shows the absolute change (2.098 estimates minus 2.097 estimates) in emissions for calendar years 2000, 2010 and 2020. Note that although these are statewide summaries, the effect would be the same for the SCAG regions since changes were made only to the SCAG areas. Table 10 shows the differences on a percentage basis. As indicated, these updates result in no significant change in VMT, population, or emissions

## Table 7 Effect of SCAG Region VMT Changes on Summer Episodic Inventories Calculated Using Version 2.097

(Statewide Emissions are in Tons/Day)



## Table 8 Effect of SCAG Region VMT Changes on Summer Episodic Inventories Calculated Using Version 2.098

(Statewide Emissions are in Tons/Day)



## Table 9 Net Change In Emissions From SCAG Region VMT Changes

(Emissions are in Tons/Day)



### Table 10 Percentage Change In Total

### On-Road, Statewide Summer Episodic Emissions



1. Note the base year used by a COG may not be the same as that used in the Emfac model. [↑](#footnote-ref-1)