OFFICE OF HEAVY VEHICLE TECHNOLOGIES' WEEKEND/WEEKDAY OZONE STUDY IN THE SOUTH COAST AIR BASIN

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Many urban locations in the United States experience higher ozone on weekends than on weekdays, despite lower ozone precursor emissions of hydrocarbons, carbon monoxide, and nitrogen oxides. This presentation summarizes the results from a study designed to test hypotheses regarding the cause(s) of high weekend ozone levels in the South Coast Air Basin (SoCAB) of Los Angeles, California. In Phase 1 we analyzed existing ambient and meteorological data for the SoCAB to refine our working hypotheses. We performed time-resolved measurements during Phase 2 to test the hypothesized relationship between emissions sources and the weekend ozone effect.

Analysis of the existing ambient data indicates that the intensity and spatial extent of the weekend ozone effect are correlated with day-of-week variations in the extent of ozone inhibition due to titration with nitrous oxide (NO) and rates of ozone accumulation. Lower NO-mixing ratios and higher NO_2/NO_x ratios on weekend mornings allows ozone to begin accumulating about an hour earlier on weekends compared to weekdays. The weekday/weekend differences in the duration of ozone accumulation have remained relatively constant from 1981 to 2000. In contrast, the rate of ozone accumulation decreased by one-third to one-half over the same period with the largest reductions occurring in the central basin on weekdays.

Trends in mixing ratios of ozone precursors show a transition in the SoCAB to lower VOC/NO_x ratios due to greater reductions in VOC emissions. Reductions in VOC/NO_x ratios were greater on weekdays resulting in higher VOC/NO_x ratios on weekends relative to weekdays. Trends in VOC/NO_x ratios parallel the downward trend in peak ozone levels, a shift in the location of peak ozone from the central to eastern portion of the SoCAB, and an increase in the magnitude and spatial extent of the weekend ozone effect in the SoCAB. Lower NO_x emissions from diesel exhaust are the most important factor in weekday-weekend differences in ambient levels of NO_x and VOC/NO_x ratios.

The decrease in weekend ozone precursor emissions of VOC and NO_x provides a natural test case for investigating the response of ozone levels to specific changes in precursor emissions. This study demonstrates that ozone will increase in the urbanized areas of the SoCAB if NO_x emissions are decreased at current levels of VOC until weekend NO_x mixing ratios are decreased by roughly 90 percent. The study also shows

weekend ozone would be even higher were it not for concomitant weekend emission reductions of VOC's.

Because the SoCAB is hydrocarbon limited and mobile sources are the predominant source of hydrocarbons, the most effective means for reducing ozone in the SoCAB is to reduce emissions from the portion of the motor vehicle fleet responsible for the greatest amount of hydrocarbon emissions. The development of accurate weekend emission inventories by government agencies is urgently needed so air quality models can accurately assess the effects of current and future ozone control regulations.