SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

THE OZONE ATTAINMENT DEMONSTRATION PLAN

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PREAMBLE

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The San Joaquin Valley Unified Air Pollution Control District (District) currently does not meet the federal health-based standard of 0.12 parts per million for ozone and is classified by the U.S. Environmental Protection Agency (EPA) as a "serious" nonattainment area. Ozone at levels above the federal standard adversely affects public health, diminishes the production and quality of many agricultural crops, reduces visibility, degrades man-made materials, and damages native and ornamental vegetation.

Since its formation in March 1991, the District has worked towards developing and adopting all possible measures and methods for controlling ozone precursors, volatile organic compounds (VOCs) and oxides of nitrogen (NOx). Examples of the District's efforts to reduce ozone in the San Joaquin Valley (Valley) include the development of a smoking vehicle program, indirect source guidelines, enhanced California Environmental Quality Act (CEQA) project review, Reasonably Available Control Technology (RACT) rules, the 1993 Rate of Progress Plan (1993 ROP Plan), and the District's 1991 Air Quality Attainment Plan (AQAP). The AQAP was prepared to fulfill the mandates of the 1988 California Clean Air Act (CCAA) and it included all feasible measures to reduce emissions that cause air pollution.

Section 182 (c) of the FCAAA requires all nonattainment areas classified as "serious" to prepare and submit three Plans. The first Plan mandated by the FCAAA, known as the 1993 Rate of Progress Plan (1993 ROP Plan), was prepared and adopted by the District on October 21, 1993. The 1993 ROP Plan was then submitted to the ARB who in turn submitted the State Implementation Plan (SIP) to the EPA by the November 15, 1993, deadline as required by the FCAAA. The 1993 ROP was found to be incomplete by EPA because it contained commitments to adopt measures. Due to changes in the 1990 Base Year inventory, substantial changes in the calculations in the amount of reductions creditable from the California automotive tailpipe emission standards, and revised on-road travel data from the Valley Transportation Planning Agencies the District revised the document. The Revised 1993 ROP Plan outlines how the District will reduce ozone forming pollution by providing a 15% reduction in the emissions of volatile organic compounds (VOC) with District adopted rules and programs. This Plan was approved by the District Governing Board on November 3, 1994, and forwarded to the California Air Resources Board (ARB).

The second plan required by the FCAAA is the Post 1996 Rate of Progress Plan (Post '96 ROP Plan). The Post '96 ROP Plan provides for a nine percent reduction in the emissions from the 1990 baseline inventory and is in addition to and separate from the 15% reduction outlined in the Revised 1993 ROP Plan. The Post '96 ROP Plan shows how the nine percent reductions are again achieved with adopted rules and programs. This Plan

was also approved by the District Governing Board on November 3, 1994, and forwarded to the ARB.

The third requirement is this Attainment Demonstration Plan. "Serious" nonattainment areas must demonstrate by computer modeling that the federal ozone standard will be obtained by 1999. This component must include all possible control measures necessary to make attainment. The Attainment Demonstration Plan uses a computer model to simulate the future air quality in the Valley while reflecting the effects of measures proposed to curb pollution. The model is complex, new, state of the art, and undergoing continuous refinement. Nevertheless, it is expected that the model will serve as the preeminent tool for local, state, and federal agencies, the public, and industry, to evaluating current and proposed air quality planning efforts. The model has predicted a District-wide attainment of the federal ozone standard by 1999.

The District is certain that over the life of this Plan that new information may be forthcoming which could impact and require modification to the Plan. Such modifications to the Plan could include: (1) updates and corrections to the District's emission inventory, (2) updates and corrections to the Ozone Model, and/or (3) elimination, additions, or substitutions of control measures based upon new technical or economic data. The District believes that the Plan should be based on the best available science and information and is committed to achieving the health-based attainment standards by the most practical and economic methods. The District will encourage ARB and the EPA to utilize all means to assure flexibility in responding to new information and making appropriate modifications.

Although the District is developing and implementing all possible control measures, the cooperation of other agencies at the federal, state, and local levels will be required for the San Joaquin Valley to achieve attainment of the federal ozone standards. In general, the District has jurisdiction over all point and area sources, except for mobile sources, consumer products, and pesticides. The cooperation of agencies such as the United States Environmental Protection Agency (EPA), the ARB, the Bay Area Air Quality Management District (BAAQMD), and the Sacramento Metropolitan Air Quality Management District (SMAQMD) is needed to control emissions which effect the ozone levels and overall air quality in the San Joaquin Valley (Valley). The District has no ability to impose controls on these agencies. The EPA and ARB are responsible for emission controls of locomotives, marine vessels, aircraft, lawn and garden equipment, consumer products, pesticides, and motor vehicles. These sources contribute significantly to the ozone problem in the Air Basin, and the EPA and ARB have the responsibility for developing controls for these sources. Without federal and state control measures, beyond those already adopted and proposed, maintenance of the federal ozone standard will not be feasible beyond 1999 as the Valley's projected high rate of growth will likely

outstrip air quality improvements. Based on the implementation of all adopted rules, between 1990 and 1999, there should be a 25% reduction in total VOC emissions and a 32% reduction in total NOx emissions. VOC and NOx emissions under District jurisdiction are expected to decline at a faster rate than those under control by the state or federal agencies. These emission reductions are anticipated in the context of a 33% increase in population and increased economic activity. In light of this anticipated growth, the reductions are still able to predict reaching NAAQS by 1999. The District believes that adopted state, federal, and District rules will provide at least 80% of the emissions reductions needed for attainment of the National Ambient Air Quality Standard for ozone.

Federal Responsibilities

Under the FCAAA, the power to regulate some sources which are significant emitters of ozone precursors in the Valley is kept by the federal government. These sources include interstate trucks, military and commercial aircraft, locomotives, ships, and non-road engines under 175 horsepower that are used in construction and agricultural activities. They make up a significant portion of the emission inventory within the District. Although these emission sources affect the ozone levels in the Valley, the District has no jurisdiction to regulate these sources. It is the responsibility of the federal government to implement regulations, standards, and/or programs which reduce the emissions of ozone precursors from sources under its jurisdiction. Emission reductions from sources under federal jurisdiction are necessary for the District to maintain attainment for ozone under the FCAAA.

Sources of emissions that are crucial to the improvement of the District's air quality include heavy-duty trucks, locomotives, aircraft, and marine vessels. These sources produce significant amounts of emissions within the District. Together, they produce 102.0 tons per day of NOx and 22.2 tons per day of VOC in the 1999 baseline year. These emissions represent approximately 21 and 5 percent respectively of the total NOx and VOC for the District's 1999 baseline inventory.

Heavy duty diesel NOx emissions within the District are anticipated to decrease slightly from 87.83 tons/day in 1990 to 72.69 tons/day in 1999. This is contrasted to other on-road mobile sources which show substantial declines in emissions during that time period. As a result, the relative proportion of on-road mobile NOx emissions for heavy duty diesel trucks rises from 35% to 41% of the total on-road motor vehicle inventory by 1999. The federal government's active and effective efforts in setting appropriate national standards for these sources is essential if the District is to achieve and maintain the NAAQS objectives.

The Valley is a major "pass-through" trip area. Interstate 5 and Highway 99 are main corridors connecting northern and southern California. As a consequence, large amounts of heavy-duty truck traffic pass through the Valley. From Caltrans data, it is estimated that 19.6 percent of all Vehicle Miles Traveled (VMT) within the Valley were attributable to truck travel in 1991. These trucks generate approximately 100.7 tons of NOx per day and 16.7 tons of VOC per day in the 1999 Base Year inventory. The EPA has proposed an enhanced compliance program for on-highway heavy-duty trucks which may produce reductions as much as 10 tons per day of NOx and 1 ton per day of VOCs by 2000. It is uncertain when this program will be implemented by the EPA, but the reductions from the program are needed by the District to maintain attainment beyond 1999.

For locomotives, the EPA has proposed a national regulation that will apply emission standards to new locomotive engines in year 2000. However, the emission reductions from this regulation will be realized too late to aid the District in reaching attainment by 1999. Reductions for this regulation can be as high as 40% of 1990 emission levels. The proposed national regulation needs to be implemented immediately.

Emission standards and controls must also be set for other mobile sources such as aircraft and marine vessels. Federal measures for aircraft, marine vessels, locomotives, and heavy-duty trucks are the exclusive responsibility of the EPA. These mobile sources are significant emitters of ozone precursors in the Valley, controls must be placed on these sources, and the EPA is the agency that must implement the controls.

State Responsibilities - Control Strategies

The State of California has the primary duty to regulate tailpipe emissions from motor vehicles. ARB has already adopted and implemented several regulations aimed at reducing vehicular emissions such as strict tailpipe emissions, basic inspection and maintenance (I & M), the clean diesel fuel program, and the low and zero emission vehicles, and clean fuels regulation. Programs such as enhanced inspection and maintenance (Enhanced I & M), emission controls for off-highway recreational vehicles and engines, and phase II reformulated gasoline have been adopted by ARB and need to be expeditiously implemented in order to aid local air districts in reaching and maintaining attainment.

The State also has jurisdiction over several area sources. The Department of Pesticide Regulation (DPR) is developing regulations affecting agricultural and non-consumer pesticide application. The District is dependent upon the effectiveness of the DPR rule in order to achieve necessary VOC reductions. The ARB, DPR, and the EPA have only provided estimated ranges of emissions reductions at this time. This regulation needs to

be implemented as soon as possible.

State Responsibilities - Transport

Another area in which the ARB has responsibilities is interbasin transport within California. The California Clean Air Act (CCAA) designates the ARB as the coordinating agency responsible for ensuring that air districts in California work together in obtaining both the federal and state ozone standards. ARB's duties include making sure that upwind transporters are held responsible for their portion of pollutants in the downwind air districts. Section 39610 (b) of the CCAA states that the ARB shall "assess the relative contribution of upwind emissions to downwind ozone ambient pollutant levels to the extent permitted by available data and shall establish mitigation requirements commensurate with the level of contribution."

ARB has identified and documented transport from the San Francisco Bay Area and the Sacramento Valley Air Basins into the Valley. In October 1989, the ARB identified the San Francisco Bay Area and the Sacramento Valley Air Basins as "significant" transporters of air pollutants to the Valley. At that time, the Valley was identified as an "overwhelming" transporter to the Great Basin Valley and the Southeast Desert. The transport contribution is considered overwhelming under the CCAA if emissions from the upwind area have independently caused an exceedance of the state ozone standard in a downwind area on a single day. On August 12, 1993, the ARB reclassified the San Francisco Bay Area Air Basin as an "overwhelming" transporter of ozone to the northern portion of the Valley.

In Spring 1994, evidence was provided by computer modeling which showed that transport from the San Francisco Bay and the Sacramento Valley Air Basins affected the entire Valley. The ARB conducted a modeling run for the Valley in which the anthropogenic (man-made) emissions from the San Francisco Bay Area and the Sacramento Valley Air Basins were taken out of the model. The initial results from this modeling run confirmed that the San Francisco Bay Area and the Sacramento Valley Air Basins are transporters of ozone to the Valley. This preliminary data indicated that the two air basins adjacent to the northern portion of the Valley, contribute up to 27 percent of the ozone concentration in northern San Joaquin Valley, ten percent in central San Joaquin Valley, and seven percent in the southern San Joaquin Valley. These results are based on air quality modeling efforts underway as part of the **S**an Joaquin Valley Air Quality Study/**A**tmospheric Utility Signatures, Predictions, and Experiments **R**egional **M**odel **A**daptation **P**roject Study (SARMAP).

The evidence of transport from the Valley's two upwind air basins is important since it demonstrates that not all air pollutants within the Valley originate here. Since the District is only able to control emissions generated from sources within the Valley, the ability of the District to reduce ozone levels to meet the federal standard is hindered.

Responsibilities of Other Air Districts

Based on the preliminary results of the transport modeling run, it is clear that the San Francisco Bay Area and the Sacramento Valley Air Basins are responsible for a portion of the ozone in the San Joaquin Valley. Enhanced I & M is an example of an additional mobile source measure that, if adopted and implemented in the San Francisco Bay Area, could result in significant emission reductions. Along with other air districts in California, the District will implement Enhanced I & M in Bakersfield and Fresno as required by FCAAA. The District is also considering expansion of the beneficial effects of Enhanced I & M to other heavily urbanized areas in the Valley, such as Stockton and Modesto. Meanwhile, the BAAQMD is prohibited, under Chapter 27 of the 1994 Statutes, Health and Safety Code 44003, from implementing Enhanced I & M.

The Valley has a critical air quality challenge which the District is trying to improve by adopting and implementing all feasible control measures. However, the Valley can only achieve and maintain attainment of the federal ozone standard by 1999 if the EPA, ARB, and the upwind districts make every effort to implement controls on sources of emissions which affect the air quality in the Valley, but are beyond the jurisdiction of the District. If the upwind air basins do not implement significant reductions, the District will be forced to develop and to implement stricter controls within the Valley in order to mitigate the effects of transport unless the state acts. As a result, industries and people of the Valley will be penalized to compensate for transported emissions produced by adjacent air basins. For the air quality to improve in the Valley, the BAAQMD, SMAQMD, and the District must all work together to minimize transport. Under current law, only the ARB has the legal authority to deal with this issue.

As previously mentioned, the District is certain that changes will need to be made to an adopted SIP or regulation as new information becomes available. All plans should be flexible and changed if necessary, when new options show a more practical and economic way to achieve attainment. To assure that the EPA and ARB understand and agree to this concept, the District spearheaded efforts to have all three agencies sign a mutually agreed letter of intent. This "Letter of Intent Concerning Dynamic And Evolving Content of The San Joaquin Valley Air Quality Attainment Plan" was sign by the District, ARB, and EPA. A copy of the letter follows.

LETTER OF INTENT CONCERNING
DYNAMIC AND EVOLVING CONTENT OF
THE SAN JOAQUIN VALLEY AIR QUALITY
ATTAINMENT PLAN
NOVEMBER 14, 1994

The United States Environmental Protection Agency (USEPA), the California Air Resources Board (ARB), and the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD), recognize the following:

The San Joaquin Valley air basin is designated a serious non-attainment area for the federal ozone standard, thereby requiring local, state, and federal agencies, public and industry groups to work cooperatively together to achieve and maintain this standard;

Under the Federal Clean Air Act Amendments (CAAA), the SJVUAPCD is required to submit an attainment and rate of progress state implementation plan (SIP) which will act to promote the health and welfare of the residents of the San Joaquin Valley Air Basin through the attainment of the federal ozone standard;

The SJVUAPCD SIP has been developed with the understanding that it is a dynamic and flexible Plan working to achieve the health based ozone attainment standard based upon the best science and information available at the time of SIP adoption, and is subject to change as better information is developed;

A key tool in developing the SIP is the use of air quality modeling. In the past, adequate modeling tools did not exist to answer the complex questions which underlie the needed comparison of different control strategy options available in formulating a SIP;

To satisfy the need for such a tool the sponsors of the San Joaquin Valley Air Quality Study banded together to develop a sophisticated modeling tool, and in so doing have created a successful partnership between the public and private sectors;

The resulting San Joaquin Valley Air Quality Model (SAQM) has achieved the federal model performance standards required for use in developing the SJVUAPCD SIP;

Model refinement and evaluation of model performance will continue into the next several years. The potential impacts of these refinements on model results and resulting planning issues are not fully known at this time;

Key planning issues, such as, but not limited to, ozone formation dynamics, regional and sub-regional transport effects, relative source contribution, and effective control strategies, are being formalized for the SIP through insight gained from available modeling analyses;

Over the life of the SJVUAPCD SIP new information may be forthcoming which could require modifications such as: (1) updates and corrections to the SJVUAPCD emission inventory, (2) updates and corrections to the SAQM, (3) modifications, elimination, additions, or substitutions of control measures based upon new information or data;

Therefore, the SIP, submitted by the SJVUAPCD and the California Air Resources Board to the U. S. Environmental Protection Agency, may be modified if the modifications meet the same criteria that today's SIP revisions must meet, and provide for further progress toward, and timely attainment of, the ozone standard consistent with other requirements of the Clean Air Act (CAA). All parties agree that any modifications identified and submitted to USEPA as SIP revisions will be judged in an equitable manner against prior submittals, and with the intent of selecting the best overall plan to meet the requirements and goals of the Federal Clean Air Act.

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Air Pollution Control District

CHAPTER 1

INTRODUCTION

INTRODUCTION

This Ozone Attainment Demonstration Plan has been prepared in response to the requirements established by Congress in the Federal Clean Air Act Amendments (FCAAA) of 1990. The FCAAA established a health-based standard for ozone and other pollutants. These standards are known as the National Ambient Air Quality Standards (NAAQS) and are based on the levels considered safe for human health.

Ozone is a strong irritant that attacks the respiratory system. At high concentrations, it can cause severe damage to lung tissue. At lower concentrations, ozone decreases the flow of oxygen in the lungs and increases resistance to air passage in lung tissue. Resulting symptoms range from coughs and chest discomfort to headaches and eye irritation. Persons suffering from asthma, bronchitis, and other respiratory ailments, as well as cardiovascular disease, are particularly susceptible to the effects of ozone. Other groups which are susceptible include children, the elderly, and persons engaged in heavy exercise.

Based on studies analyzing the impact on human health of exposure to different levels of ozone, the U.S. Environmental Protection Agency (EPA) has set the national standard at 0.12 parts per million (ppm) (or 12 parts per hundred million [pphm]) averaged over one hour. Areas in which monitoring stations record ozone levels higher than 0.12 ppm (12 pphm) are referred to as nonattainment areas. California has established a more restrictive standard of 0.09 ppm (9 pphm).

Ozone also damages vegetation and agricultural crops by interfering with the photosynthesis process. Harvests of grapes, cotton, oranges, alfalfa, and tomatoes can be shown to reduce crop yields of up to 20 percent. It is estimated that the Valley's agricultural crop losses exceed $150 million due to exposure to ozone. According to the National Park Service, in the Sierra, up to half the ponderosa and jeffrey pine exhibit injury.

The federal and state laws allow no more than one exceedance of the standard per year, averaged over three years, at any air monitoring site. Because several monitoring sites in the Valley have recorded values exceeding the 0.12 ozone standard and have experienced these exceedences in excess of once per year, the District has been designated as a nonattainment area for the federal health-based standards for ozone.

This document presents the issues related to the District's classification as nonattainment of ozone. It continues by describing ozone control strategies either underway or being developed through cooperative efforts by the District, the ARB, and the EPA. As part of the District's efforts in attaining the NAAQS for ozone, a computer modeling program has been developed to demonstrate the effectiveness of the District's control measures in reducing ozone levels. This document presents modeling results which indicate that attainment will be achieved by 1999 as required by the FCAAA.

Nonattainment Designation for Ozone

The FCAAA established a classification system for nonattainment areas based on the severity of their ozone problem (Table 1-1). As the severity of the problem increases, an area is required to implement stricter and more extensive regulations, but it is also given more time to reach attainment. Based on monitored levels of ozone in the 0.16 to 0.18 ppm (16 to 18 pphm) range, the San Joaquin Valley was designated a serious nonattainment area with an ozone design value of 0.17 parts per million (17 pphm). The ozone design value is based on an area's fourth worst exceedance during a three year period. The San Joaquin Valley ozone nonattainment area within the District covers Fresno, Kings, Madera, Merced, Stanislaus, San Joaquin, Tulare, and the Valley portion of Kern Counties.

Table 1-1
Federal Classifications and Attainment Dates

Designation	Design Value	Attainment Date
Marginal	0.120-0.138	Nov. 15, 1993
Moderate	0.138-0.160	Nov. 15, 1996
Serious	0.160-0.180	Nov. 15, 1999
Severe-1	0.180-0.190	Nov. 15, 2005
Severe-2	0.190-0.280	Nov. 15, 2007
Extreme	0.280 +	Nov. 15, 2010

OZONE ATTAINMENT DEMONSTRATION PLAN

Federal Clean Air Act Amendments of 1990 Requirements

The FCAAA requires all areas classified as "moderate" and above to show "reasonable further progress" towards attainment. Under this requirement last year, the District submitted a 1993 Rate of Progress Plan (1993 ROP Plan) covering the six years from 1990 through 1996. This year a second Rate of Progress Plan covering the years from 1996 to 1999 must be submitted by November 15. A Revised 1993 Rate of Progress Plan and the Post-1996 Rate of Progress Plan will be submitted by November 15, 1994.

Additionally, Section 182(b) of the FCAAA requires nonattainment areas classified as "moderate" or above to demonstrate that the controls included in their SIP are sufficient to attain the national ozone air quality standard. As a "serious" nonattainment area, the District is required under the FCAAA to attain the national ozone standard as expeditiously as possible, but no later than 1999. By November 15, 1994, all areas classified as "serious" and above are to submit an attainment demonstration. The attainment demonstration must use a photochemical grid model, which simulates the way in which ozone is formed under specific meteorological and geographical conditions to prove the adequacy of District controls. If attainment by 1999 is not feasible, then the District could be reclassified as a "severe" area. This re-classification, which is also known as "bump-up," would impose additional requirements but would also extend the attainment deadline by six years to 2005. The additional requirements would consist of the following:

- The definition of a major source would be lowered from the current 50 to 25 tons per year. This change in the definition of major source would impact approximately 100 additional sources in the District. These additional sources would then be subject to the Title V permit requirements and reasonably available control technology (RACT) rules.

- The offset requirement for new and modified major sources would be increased from the current 1.2 to 1 ratio, to 1.3 to 1.

- The nonattainment area would have to establish an employer-based trip reduction rule as detailed in the FCAAA. This means that the District would have to tighten its existing employer-based trip reduction rule (Rule 9001).

- Offset growth in emissions from increased vehicle miles travelled.

- Demonstrate the District has considered the implementation of Transportation Control Measures beyond 1999.

Regulatory Structure/Approval Process

Responsibility for air quality involves a wide variety of agencies and groups at the federal, state, regional and local levels. Some agencies have actual regulatory authority, while others are responsible for the development or implementation of programs and procedures aimed at reducing air pollutant levels.

The EPA is the lead federal agency and is responsible for setting the NAAQS and establishing federal motor vehicle emission standards. The EPA is also responsible for reducing emissions from a number of sources including locomotives, aircraft, heavy duty vehicles used in interstate commerce, and other such sources which are either preempted from state control or best regulated on a national level. The EPA also has the authority under the FCAAA to require preparation of state plans for air quality and may approve or disapprove state air quality plans. The California Air Resources Board (ARB) is the lead state agency for air quality. The ARB is responsible for preparing and submitting a state air quality plan to the EPA. In preparing a state plan, the ARB reviews and approves regional air quality plans and incorporates them into a State Implementation Plan (SIP). Under state authority, ARB establishes emission standards for on-road motor vehicles and for consumer products sold in California. The air pollution control districts (APCDs) and air quality management districts (AQMDs) are responsible for developing that portion of the SIP that deals with stationary and area source controls and in cooperation with the transportation planning agencies (TPAs), the development of TCMs.

The FCAAA specifies that the Attainment Demonstration Plan must be submitted as revisions to the applicable SIP. The ARB is the mandated state agency for submission of SIP revisions. Therefore, after this Plan is adopted at the District level it will be submitted to the ARB for transmittal to the EPA.

Federal Sanctions

The FCAAA directs the EPA to impose sanctions on any area that fails to comply with the requirements of the law. The two mandatory sanctions consist of the following: 1) increased emissions offsets for major stationary sources; and, 2) the cut-off of federal highway funds.

The offset sanction applies to major stationary sources. A major source in the District is any stationary source that produces 50 or more tons per year of volatile organic compounds (VOCs) or oxides of nitrogen (NOx). Under the FCAAA, major sources must obtain a construction and operation permit from the District whenever they wish to modify their facilities or construct new facilities. To obtain these permits, the source must reduce emissions within the District by more than the emissions created by the new or modified source on a 1.2 to 1 ratio. If the mandatory offset sanction is imposed, the reduction ratio will become 2 to 1.

The highway construction sanction, when implemented, prohibits the Secretary of Transportation from approving or awarding transportation projects or grants, except for projects designed to improve a demonstrated safety problem or intended to minimize air pollution. The air quality exceptions to this sanction include the following types of programs: 1) Programs for public transit, 2) bus and high occupancy lanes, 3) employer trip reduction programs, 4) ramp metering and signalization, 5) parking facilities for multiple occupancy vehicles, 6) road use charges, 7) programs for breakdown and accident scene management, and 8) other programs improving air quality.

Additional sanctions under the FCAAA relate to the requirement that federally mandated transportation plans and programs conform to the SIP. These conformity requirements date back to the 1977 amendments to the FCAAA but were substantially broadened and made more specific under the 1990 amendments. As a result, the Valley Regional Transportation Agencies (TPAs), cannot approve any transportation plan, program, or project unless these activities conform to the SIP's purpose of eliminating the severity and number of violations of the NAAQS and achieving expeditious attainment of these standards.

Transportation plan refers to the Regional Transportation Plans (RTPs), which is normally a 20-year master plan for the each county and which provides policies, actions, and financial projections to guide investment decisions. Transportation program refers to the Transportation Improvement Program (TIP), which is a financially constrained set of highway and transit projects to be funded over the next seven years; the TIP includes all projects requiring federal funding, permits, or other approvals, and in regionally significant non-federally funded projects. A transportation project is any highway or transit project which is included in the RTP and TIP, requires federal funding or action or is regionally significant, and is submitted to the TPAs for project review and fund application approval.

If the control strategy SIP (which includes the ROP Plan or Attainment Demonstration Plan) is not submitted or is found to be substantially incomplete, no new transportation plans or TIPs can be found to conform beginning 120 days after the SIP deadline or the finding of incompleteness. The conformity status of existing transportation plans and TIPs will lapse twelve months after a control strategy SIP has been submitted and must be reconformed.

Explanation of Ozone Modeling

A photochemical grid model uses information gathered when high ozone levels are observed to simulate in a computer program the episode that was observed. Ozone concentrations which are more than the federal standard of 12 pphm are considered "high ozone levels." The EPA requires that a model for a nonattainment area must be developed from observations which reflect the nonattainment status and include ozone concentrations at or near the peak value of annual monitoring. If the episode simulation performs within the accuracy requirements for modeling, then the modeling information can be used to predict the effects of future controls.

Air quality, wind, and temperature data are gathered by monitoring a high ozone level episode. Information on emissions of pollutants which were occurring during the observed event are also collected. The emissions data and weather information are used as inputs to the photochemical grid model. The model generates a prediction of the ozone levels which would form in the air under those circumstances. This prediction is compared to the observed air quality data. If the prediction is within the accuracy requirements established by the EPA, the model can then be used to predict the effect of controls.

The effect of controls is determined by running additional computer modeling simulations, changing the emissions information to reflect reductions anticipated from control programs, and increases or decreases expected to occur from future population growth, industrial trends and other available information. The projected emissions are input to the model to develop a new prediction of the formation of ozone levels.

The ozone model uses the same weather conditions to make a comparison between the observed ozone episode and the predicted level which would occur from emissions changes. Since weather conditions vary, it is desirable to analyze more than one weather pattern which leads to high ozone levels. A possibility exists that the effect of controls may vary under different weather conditions. The best control programs would be successful under any weather condition which could cause high ozone levels.

Explanation of the Ozone Model

The District's ozone model, which is currently being tested and used for attainment demonstration modeling, was developed in partnership with the EPA, state and local government, and industry. Many parties that contributed funds have participated in directing a study of an appropriate ozone event in the development a photochemical grid model appropriate for the San Joaquin Valley. The development of the model was funded by agreement between the San Joaquin Valley Air Quality Study (SJVAQS) and Atmospheric Utility Signatures, Predictions, and Experiments (AUSPEX). This modeling project was named SARMAP (SJVAQS/AUSPEX Regional Modeling Adaptation Project) and the model was subsequently named SAQM (SARMAP Air Quality Model). The model was developed in accordance with the EPA and the ARB modeling guidelines, and with the active participation of both agencies.

The purpose of the ozone model is to predict the effect of changes in emissions on ozone levels. SAQM was analyzed by the ARB by performing a series of simulations where emissions at the levels observed in 1990 were reduced to observe the effects on ozone concentrations. Further analysis was conducted by estimating the level of emissions which are expected to exist in 1999 from the effect of rules which have already been adopted by the District and the ARB. Variations from that predicted level were also evaluated to see if the model continued to reflect the same response to emissions changes as exhibited for the 1990 emissions.

SAQM predictions of future ozone levels from changes in emissions are used to determine how much additional reduction of emissions is needed to prevent exceedances of the NAAQS. Proposed reductions can be simulated by the model to observe the effect on ozone levels which can be expected to occur if the proposed reductions are implemented.

While currently meeting performance requirements, improvements to the model, emissions data, or other input files may provide refined analysis when modeling simulations are reexamined. The model performance tests established by EPA determine if a model is able to successfully simulate the ozone episode that was observed. Since the model in its current form passes these tests, model improvements may affect the intensity of response to an emissions change but are not likely to alter conclusions to a significant degree. If, however, revisions in ozone reduction strategy are indicated by model improvements, updates or revisions will be submitted to the ARB and the EPA.

CHAPTER 2

INITIAL CONDITIONS - 1990

INTRODUCTION

The base year for the Attainment Demonstration Plan is 1990. That year marks the passage of the FCAAA and serves as a baseline for modeling air quality and for planning how the District will meet the NAAQS for ozone in 1999.

This chapter describes the emissions inventory that served as "input" to the model and the results obtained when the model was run to represent those emissions. Although the model considers many factors in addition to pollutant emissions, pollution control focuses on reducing emissions. Accordingly, this chapter will discuss the 1990 Emissions Inventory, modeling, and modeling results.

EMISSIONS INVENTORY

To develop a strategy to provide healthy air, the District relies on preparation of inventories that identify the sources of emissions and their contribution to local air pollution. Since air quality is directly related to emissions, it is important to have a detailed air pollutant emissions inventory. In the case of ozone, which is formed in the atmosphere by VOCs and oxides of nitrogen (NOx), the inventory tries to identify the sources of these two ozone precursors. Man-made VOC emissions generally result from oil and gas extraction and production, solvent use, mobile sources, and waste burning. Emissions of NOx are the result of high temperature combustion. The FCAAA required the development of a 1990 Base Year Inventory.

Emissions are typically divided into two major categories: stationary source emissions and mobile source emissions. Stationary source emissions are further subdivided into point and area sources, while mobile emissions are broken down into on-road and non-road sources. Stationary point sources include identifiable pollution sources such as industrial facilities and operations. As a result of California's aggressive air quality programs during the past 20 years, emissions from many stationary sources have been substantially reduced. Most stationary point sources which emit VOCs are already regulated. Area sources are small sources which individually emit small amounts of VOC or NOx. These sources include consumer products such as deodorants and nail polish, as well as emissions from architectural coatings (paint), pesticides, and agricultural burning. While regulations have been developed to control emissions from some of the larger area sources such as gas stations and dry cleaners, the District has limited authority over many area sources. For example, the District does not have any authority to control emissions from consumer products. For many area sources, reducing emissions would likely require chemical reformulation of these products. This can only be implemented effectively on a statewide or nationwide basis by the ARB or the EPA through requirements established at the point of manufacture.

Mobile source emissions are grouped into two categories:

On-Road: Light duty passenger, light and medium duty vehicles, heavy duty passenger/utility vehicles, and motorcycles

Non-Road: Off-road vehicles such as construction equipment, farm tractors and motorcycles, trains, ships, aircraft, mobile equipment, and utility equipment such as lawn mowers and chain saws.

The ARB projects the continuation of a downward trend in emissions from mobile sources as a result of the California Motor Vehicle Control Program and the retirement of older, higher emitting vehicles through 1999. Medium- and heavy-duty trucks, as well as the non-road mobile sources, have faced few, if any, emission regulations thus far. While the ARB and the EPA are scheduled to adopt new emission standards for these sources in the next few years, they will have little impact due to the slow turnover for these types of vehicles and engines.

Emission inventories used in the District's Attainment Demonstration Plan are based on data contained in the ARB's Emission Data System (EDS). The Emissions Inventory used in the Attainment Demonstration model is "day specific." It represents the emissions that occurred each of several days in 1990 when the NAAQS for ozone were exceeded in many areas within the District. It differs from the District's Planning Inventory which represents a typical day during the ozone season and not just a specific day. Using day specific emissions allows model results to be compared to and calibrated with measured ozone levels.

Although the two inventories are based on the same data, the Planning Inventory is better suited for summary representation of emissions. Therefore, the Planning Inventory is used in this discussion and to estimate emissions reductions. Using the Planning Emissions Inventory for this purpose also enables comparison with the data included in the District's Rate of Progress Plans.

The 1990 Base Year Inventory for the District is included in the separately-prepared Post-1996 Rate of Progress Plan. Table 2-1 summarizes the 1990 Base Year Inventory and the 1999 Projected Planning Emissions Inventory. It represents typical emissions for a summer weekday in the District. These emissions reflect all federal, state, and local rules, regulations, and programs that were adopted and in effect as of 1990. The stationary source data predate the formation of the District and were prepared by the ARB in cooperation with the county air pollution control districts that exercised jurisdiction before the District was formed. The on-road mobile data were prepared by the ARB based on information provided by the Valley Transportation Planning Agenicies (TPAs), and represents the best and most recent estimated of emissions available. A county by county breakdown of the on-road emission inventory is included in Table 2-2. This breakdown establishes an emission budget for each county.

Table 2-1
1990 Base Year and 1999 Projected Planning Emissions Inventory

SOURCE CATEGORY	1990 VOC	1999 VOC	1990 NOx	1999 NOx	1990 CO	1999 CO
Stationary Sources - Area Sources						
Fuel Combustion						
Agricultural	.02	.02	.00	.00	.00	.00
Oil & Gas Production	.47	.36	11.41	9.17	1.63	1.34
Other Manufacturing/Industrial	.17	.20	10.67	12.48	2.32	2.71
Other Services and Commerce	.06	.08	1.70	2.27	.34	.45
Residential	.20	.26	4.02	3.68	2.59	3.27
Other	.00	.00	.00	.00	.00	.00
Total - Fuel Combustion	**.92**	**.92**	**27.79**	**27.59**	**6.87**	**7.77**
Waste Burning						
Agricultural-Debris	11.39	11.39	.00	.00	125.18	125.18
Range Management	1.83	2.04	.00	.00	18.35	20.45
Forest Management	.36	.39	.00	.00	12.22	13.13
Other	3.11	4.13	.40	.55	45.51	59.89
Total - Waste Burning	**16.70**	**17.96**	**.40**	**.55**	**201.26**	**218.66**
Solvent Use						
Dry Cleaning	.13	.06	.00	.00	.00	.00

Table 2-1, Continued
1990 Base Year and 1999 Projected Planning Emissions Inventory

SOURCE CATEGORY	1990 VOC	1999 VOC	1990 NOx	1999 NOx	1990 CO	1999 CO
Stationary Sources - Area Sources, Solvent Use, Continued.						
Degreasing	6.09	6.78	.00	.00	.00	.00
Arch. Coating	19.51	21.16	.00	.00	.00	.00
Other Surface Coating	17.14	15.39	.00	.00	.00	.00
Asphalt Paving	1.84	2.32	.00	.00	.00	.00
Printing	2.31	1.93	.00	.00	.00	.00
Domestic	23.12	23.66	.00	.00	.00	.00
Industrial Solvent Use	3.81	4.64	.00	.00	.00	.00
Other	1.21	1.57	.00	.00	.00	.00
Total - Solvent Use	**75.15**	**77.52**	**.00**	**.00**	**.00**	**.00**
Petroleum Process, Storage and Transfer						
Oil & Gas Extraction	108.64	47.94	.00	.00	.00	.00
Petroleum Marketing	7.96	7.30	.00	.00	.00	.00
Total - Petroleum Process, Storage and Transfer	**116.60**	**55.24**	**.00**	**.00**	**.00**	**.00**
Industrial Processes						
Chemical	.43	.32	.00	.00	.00	.00
Food and Agricultural	7.52	8.50	.00	.00	.00	.00
Mineral Processes	.00	.00	.00	.00	.00	.00

Table 2-1, Continued
1990 Base Year and 1999 Projected Planning Emissions Inventory

SOURCE CATEGORY	1990 VOC	1999 VOC	1990 NOx	1999 NOx	1990 CO	1999 CO
Stationary Sources - Area Sources, Industrial Process, Continued Metal Processes	.00	.00	.00	.00	.00	.00
Wood and Paper	.00	.00	.00	.00	.00	.00
Other	.00	.00	.00	.00	.00	.00
Total - Industrial Processes	**7.95**	**8.83**	**.00**	**.00**	**.00**	**.00**
Misc. Processes						
Pesticide Application	63.95	69.32	.00	.00	.00	.00
Farming Operations	2.32	2.32	.00	.00	.00	.00
Construction and Demolition	.00	.00	.00	.00	.00	.00
Entrained Road Dust - Paved	.00	.00	.00	.00	.00	.00
Entrained Road Dust - Unpaved	.00	.00	.00	.00	.00	.00
Unplanned Fires	.12	.13	.04	.04	1.78	1.82
Fugitive Windblown Dust	.00	.00	.00	.00	.00	.00
Waste Disposal	3.68	4.98	.00	.00	.00	.00
Other	.00	.00	.00	.00	.00	.00
Total - Misc. Processes	**70.07**	**76.74**	**.04**	**.04**	**1.78**	**1.82**
Total - Stationary Area Sources	**287.39**	**237.19**	**28.23**	**28.19**	**209.91**	**228.25**

Table 2-1, Continued
1990 Base Year and 1999 Projected Planning Emissions Inventory

SOURCE CATEGORY	1990 VOC	1999 VOC	1990 NOx	1999 NOx	1990 CO	1999 CO
Stationary Sources - Point Sources						
Fuel Combustion						
Agricultural	.00	.00	.09	.08	.02	.02
Oil & Gas Production	9.35	7.68	272.89	98.40	77.65	63.83
Petroleum Refining	.22	.22	11.40	8.41	1.72	1.72
Other Manufacturing/Industrial	.35	.40	25.44	25.23	3.57	4.11
Electric Utilities	.55	.61	18.67	19.79	5.77	6.38
Other Services and Commerce	.36	.41	15.15	9.48	2.21	2.44
Other	.01	.01	.38	.38	.12	.13
Total - Fuel Combustion	**10.85**	**9.34**	**344.02**	**161.77**	**91.06**	**78.63**
Waste Burning						
Incineration	.00	.00	.01	.01	.00	.00
Total - Waste Burning	**.00**	**.00**	**.01**	**.01**	**.00**	**.00**
Solvent Use						
Degreasing	.14	.12	.00	.00	.00	.00
Other Surface Coating	4.37	4.75	.00	.00	.00	.00
Printing	1.34	1.27	.00	.00	.00	.00
Industrial Solvent Use	.22	.25	.00	.00	.00	.00
Other	.06	.08	.00	.00	.00	.00
Total - Solvent Use	6.13	6.46	.00	.00	.00	.00

Table 2-1, Continued
1990 Base Year and 1999 Projected Planning Emissions Inventory

SOURCE CATEGORY	1990 VOC	1999 VOC	1990 NOx	1999 NOx	1990 CO	1999 CO
Petroleum Process, Storage and Transfer						
Oil & Gas Extraction	8.38	6.53	.10	.08	.01	.01
Petroleum Refining	5.25	3.09	.84	.84	.34	.34
Petroleum Marketing	.58	.54	.00	.00	.00	.00
Other	.48	.48	.02	.03	.01	.02
Total - Petroleum Process, Storage and Transfer	14.68	10.65	.96	.94	.36	.36
Industrial Processes						
Chemical	1.00	.80	.12	.15	.00	.00
Food and Agricultural	2.03	1.60	.07	.07	.02	.02
Mineral Processes	.22	.29	9.09	12.66	.13	.17
Metal Processes	.03	.05	.00	.00	.89	.90
Wood and Paper	.00	.00	.00	.00	.00	.00
Other	2.61	2.15	.00	.00	.00	.00
Total - Industrial Processes	5.89	4.88	9.28	12.89	1.03	1.09
Misc. Processes						
Misc. Processes, Cont. Waste Disposal	.38	.49	.00	.00	.00	.00
Other	.32	.42	.00	.00	.00	.00
Total - Misc. Processes	.70	.91	.00	.00	.00	.00

Table 2-1, Continued
1990 Base Year and 1999 Projected Planning Emissions Inventory

SOURCE CATEGORY	1990 VOC	1999 VOC	1990 NOx	1999 NOx	1990 CO	1999 CO
Misc.						
Misc.	.00	.00	.06	.06	.02	.02
Total Misc.	.00	.00	.06	.06	.02	.02
Total - Stationary Point Sources	38.25	32.24	354.33	175.68	92.47	80.10
Total - All Stationary Sources	325.64	269.43	382.56	203.87	302.39	308.35
Mobile Sources						
On Road Vehicles						
Light Duty Passenger	100.28	55.06	73.75	48.54	656.34	394.12
Light and Medium Duty Trucks	47.70	24.65	40.05	32.08	331.63	195.62
Heavy Duty Gas Trucks	9.88	4.47	26.05	23.87	197.99	77.09
Heavy Duty Diesel Trucks	11.26	10.17	87.33	69.80	40.15	44.79
Motorcycles	1.62	1.39	.41	.61	5.67	7.05
Heavy Duty Diesel Urban Buses	.12	.15	.94	1.03	.52	.78
Total - On Road Vehicles	170.86	95.90	228.53	175.93	1232.30	719.44
Other Mobile						
Off Road Vehicles	13.25	15.99	2.24	2.84	62.42	83.05
Trains	.97	1.02	23.88	23.99	3.11	3.30
Ships	.01	.01	.09	.10	.02	.03
Aircraft -- Government	8.96	3.96	3.52	3.52	31.59	31.59
Aircraft -- Other	5.12	6.34	1.42	1.76	42.46	51.83

Table 2-1, Continued
1990 Base Year and 1999 Projected Planning Emissions Inventory

SOURCE CATEGORY	1990 VOC	1999 VOC	1990 NOx	1999 NOx	1990 CO	1999 CO
Other Mobile, Continued	12.42	13.02	67.91	68.61	201.99	238.11
Mobile Equipment						
Utility Equipment	6.71	3.92	.22	.51	52.44	49.80
Total - Other Mobile	47.44	44.24	99.28	99.33	394.03	457.72
Total -Mobile Sources	218.28	140.14	327.80	275.80	1626.33	1177.16
TOTAL - SAN JOAQUIN VALLEY	543.9	409.1	710.4	479.11	1928.7	1485.51

(Note: Totals may be slightly off due to rounding.)

The emissions listed above represent only those that are anthropogenic (manmade) and that occur within the District. Since the District has jurisdiction over only these emissions, they have traditionally been the centerpiece of its Emissions Inventory. However, SAQM considers the effects of all biogenic and anthropogenic emissions within its domain in order to simulate observed episodes. This allows SAQM to project the effect of control measures. In addition, SAQM also considers the effects of controls applied within the entire modeling domain, which extends well beyond the District's boundaries.

MODELING

The purpose of the ozone model is to predict the effect of changes in emissions on ozone levels. But before a model can be used for that purpose, it must be shown to be valid for the area. This has been accomplished by simulating an observed episode of high ozone levels. New models like SAQM developed for the San Joaquin Valley must also be compared to the EPA approved UAM.

SAQM was analyzed by replicating the observed episode and comparing the results to an identical simulation performed with UAM. SAQM was further utilized to learn what kind of changes would reduce ozone levels by performing a series of simulations where emissions at the levels observed in 1990 were reduced within the model to observe the effects on ozone concentrations. In the following chapters, additional simulations are discussed which provide further analysis of projected conditions. The future analyses were conducted by estimating the level of emissions which are expected to exist in 1999 including the effect of rules which have already been adopted by the District and the ARB. Variations from that predicted level were also evaluated to determine if the model continued to reflect the same response to emissions changes as exhibited for the 1990 emissions.

Simulating the Observed Episode

The EPA requires that newly developed models be compared to the UAM which the EPA has approved for urban ozone modeling. UAM modeling was performed with the same data collected for the SAQM model. Both were successful in simulating a close approximation to the ozone episode which was observed in 1990, falling within the accuracy requirements established by the EPA for certification that a model demonstrates an acceptable level of performance. For Fresno County, the peak value was observed August 5, 1990; and for Kern County, the peak value was observed August 6, 1990. SAQM is under continuing development and will undergo extensive testing and improvement. Technical issues related to improvements or revisions to the model are discussed in Chapter 5. While currently meeting performance requirements, improvements to the model may provide refined analysis when modeling situations are reexamined. The model performance tests established by the EPA determine if a

model is able to successfully simulate the ozone episode that was observed. Since the model in its current form passes these tests, model improvements may affect the intensity of response to an emissions change but are not likely to alter conclusions to a significant degree. If, however, revisions in ozone reduction strategy are indicated by model improvements, updates or revisions to the District's SIP will be submitted to the ARB and the EPA.

Modeling Domain

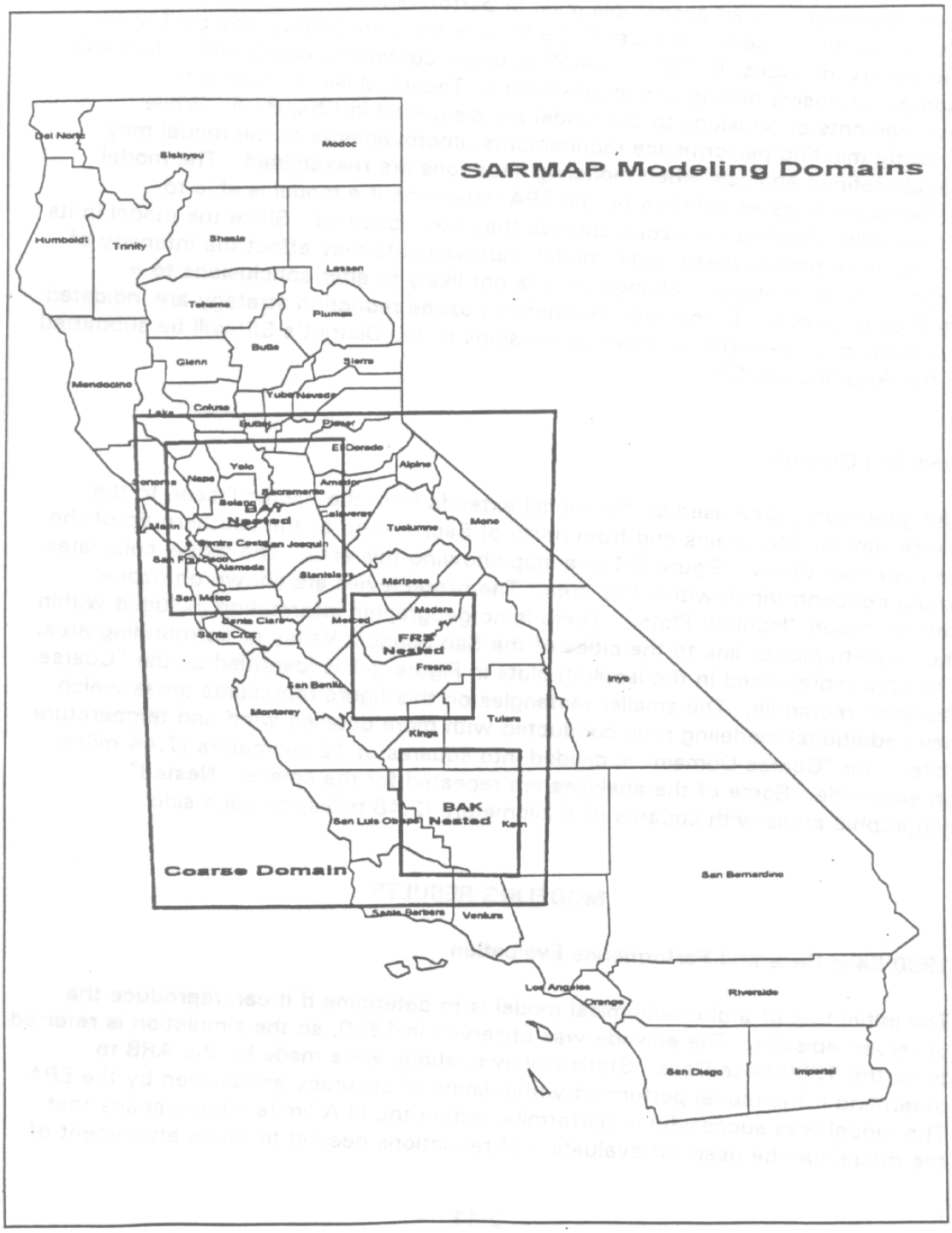
The geographic area used by the model extends from the Pacific Ocean to the Sierra Nevada Mountains and from the north of Sacramento to the southern tip of the San Joaquin Valley. Figure 2-1 is a map showing this area. The ozone levels are shown on ozone concentration "Isopleth Plots." There is no geographic information included within the isopleth plot to link to the cities of the San Joaquin Valley or surrounding area. The area represented in the isopleth plots in Figure 2-1 is identified as the "Coarse Domain" rectangle. The smaller rectangles on this figure represents areas which have additional modeling runs conducted with more detailed wind and temperature data. The "Coarse Domain" is divided into squares of 12 kilometers (7.44 miles) on each side. Some of the analyses are repeated for the smaller "Nested" geographical areas with squares of 4 kilometers (2.48 miles) on each side.

MODELING RESULTS

1990 Base Case and Performance Evaluation

The initial test of a photochemical model is to determine if it can reproduce the observed episode. The episode was observed in 1990, so the simulation is referred to as the 1990 Base Case. Statistical evaluations were made by the ARB to determine if the model performed within limits of accuracy established by the EPA. The model was successful in performing within the EPA limits which means that the model can be used for evaluation of reductions needed to reach attainment of the ozone standard. Performance statistics for SAQM have been compiled by the ARB and will be submitted to the EPA as Appendix A to this Plan. Additional testing of the model is anticipated to thoroughly evaluate the behavior of the model, and subsequent to any model revisions which occur from the model improvement projects which are being conducted in late 1994. SAQM successfully simulated the observed episode and provided additional information which could not be developed without an ozone model. Maps of the surface (ground level) concentration of ozone were produced by the ARB. These maps, known as isopleth plots, display areas of ozone concentration increases similar to the way a terrain map displays changes in elevation. A separate map is generated for each hour of the four-day episode simulation. By examining series of these maps, ozone formation can be observed, and its movement traced. By examining the highest level of ozone observed in the simulation, the extent of areas which experienced elevated ozone during the observed episode can be mapped. Shading has been added

FIGURE 2-1


SARMAP Modeling Domains
Del Norte
Siskiyou
Modoc
Humboldt
Trinity
Shasta
Lassen
Tehama
Plumas
Glenn
Butte
Sierra
Mendocino
Colusa
Yuba
Nevada
Lake
Sutter
Placer
El Dorado
Yolo
Alpine
Sonoma
Napa
Sacramento
Amador
Solano
BAY
Nested
Calaveras
Tuolumne
Mono
Marin
Contra Costa
San Joaquin
San Francisco
Alameda
Stanislaus
Mariposa
San Mateo
Madera
Santa Clara
Merced
Santa Cruz
FRE
Nested
Fresno
Inyo
San Benito
Monterey
Tulare
Kings
BAK
San Luis Obispo
Nested
Kern
Coarse Domain
San Bernardino
Santa Barbara
Ventura
Los Angeles
Orange
Riverside
San Diego
Imperial

to identify areas with high ozone concentrations between 10 and 12 pphm. The darker shading represents 12 to 14 pphm and the black areas are over 14 pphm.

When the model predicts areas over 12 pphm it represents an exceedance of the federal standard. The goal of using a model is to find ways to reduce pollution to eliminate all concentrations of the ozone above the federal standard. Reaching this goal is the objective of this Attainment Demonstration Plan.

Figure 2-2 displays a simulation of August 5, 1990, when the highest ozone level was observed in Fresno County. Figure 2-3 shows August 6, 1990 ozone conditions when the highest ozone level in Bakersfield were observed. The Fresno County ozone concentrations on Figure 2-3 are not completely accurate due to a problem in the wind information east of Fresno which has not yet been corrected. The ozone levels in the Kern County area in Figure 2-3 are comparable to the observed episode. The Fresno windfield problem in Figure 2-3 is not believed to affect the validity of the Kern County information. The ARB has advised the District to evaluate Fresno ozone levels from simulations of August 5 and Kern County from August 6.

It is important to note that these ozone predictions do not mean that the area identified always will be impacted by high ozone levels during an ozone episode. The model represents only one weather pattern, and the 1990 simulations utilize emissions rates applicable to that year which have since been considerably reduced by the implementation of state and District regulations.

UAM Comparison

As required by the EPA guidance, UAM modeling was performed to validate use of the SAQM model. The EPA criteria tests were performed on both models. Both UAM and SAQM perform within the EPA required limits. Documentation of the performance tests for UAM has been conducted by the ARB and will be provided to the EPA as Appendix B to the Attainment Demonstration Plan.

1990 Base Case – Relative Benefits of VOC and NOx Reductions

Variations from the 1990 Base Case made by reducing emissions throughout the domain showed the NOx control from 1990 levels would be required to reach attainment. This conclusion is evident from analysis of four different simulations and the ARB analysis of the full set of runs performed for the 1990 Base Case emissions.

FIGURE 2-2

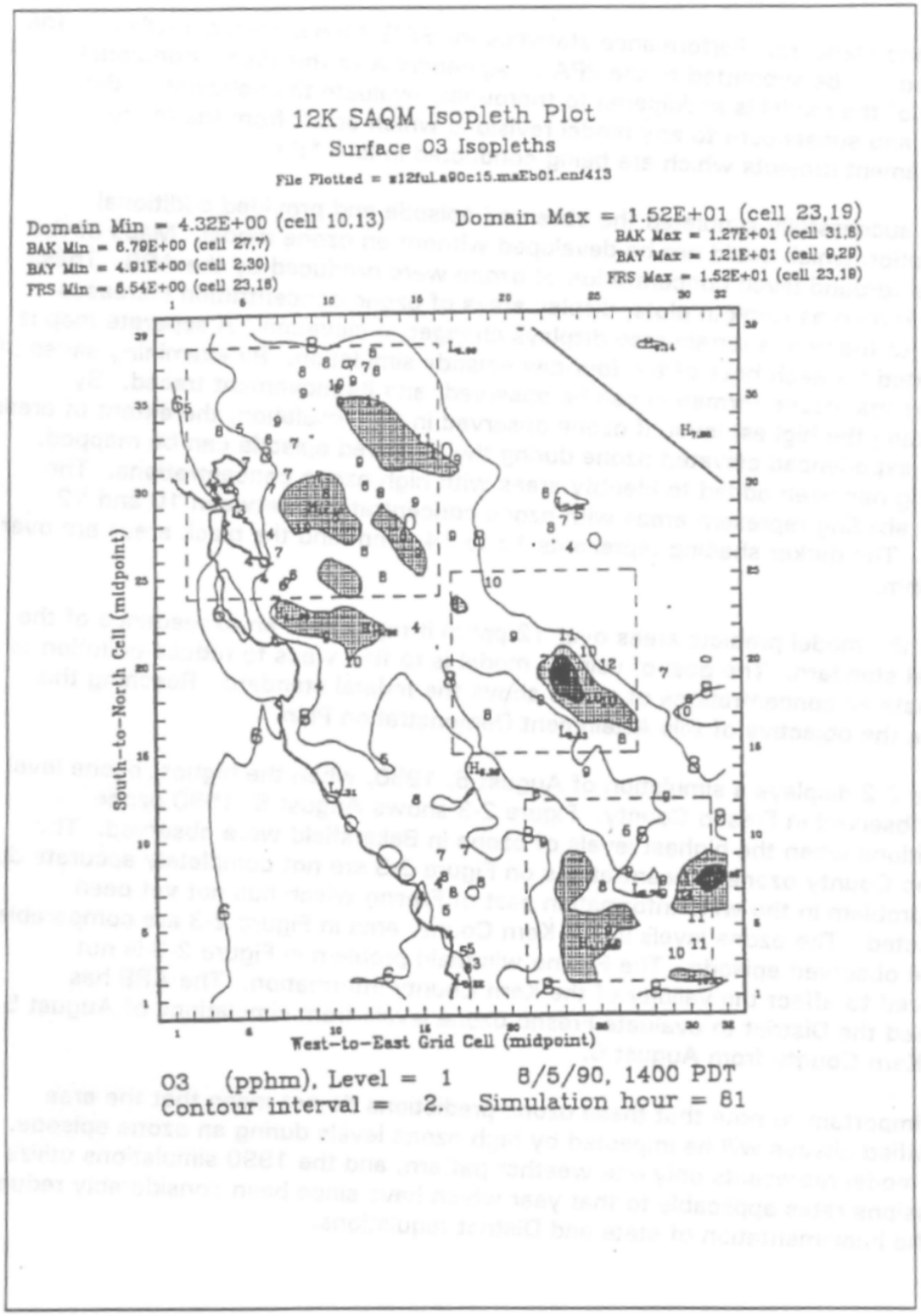
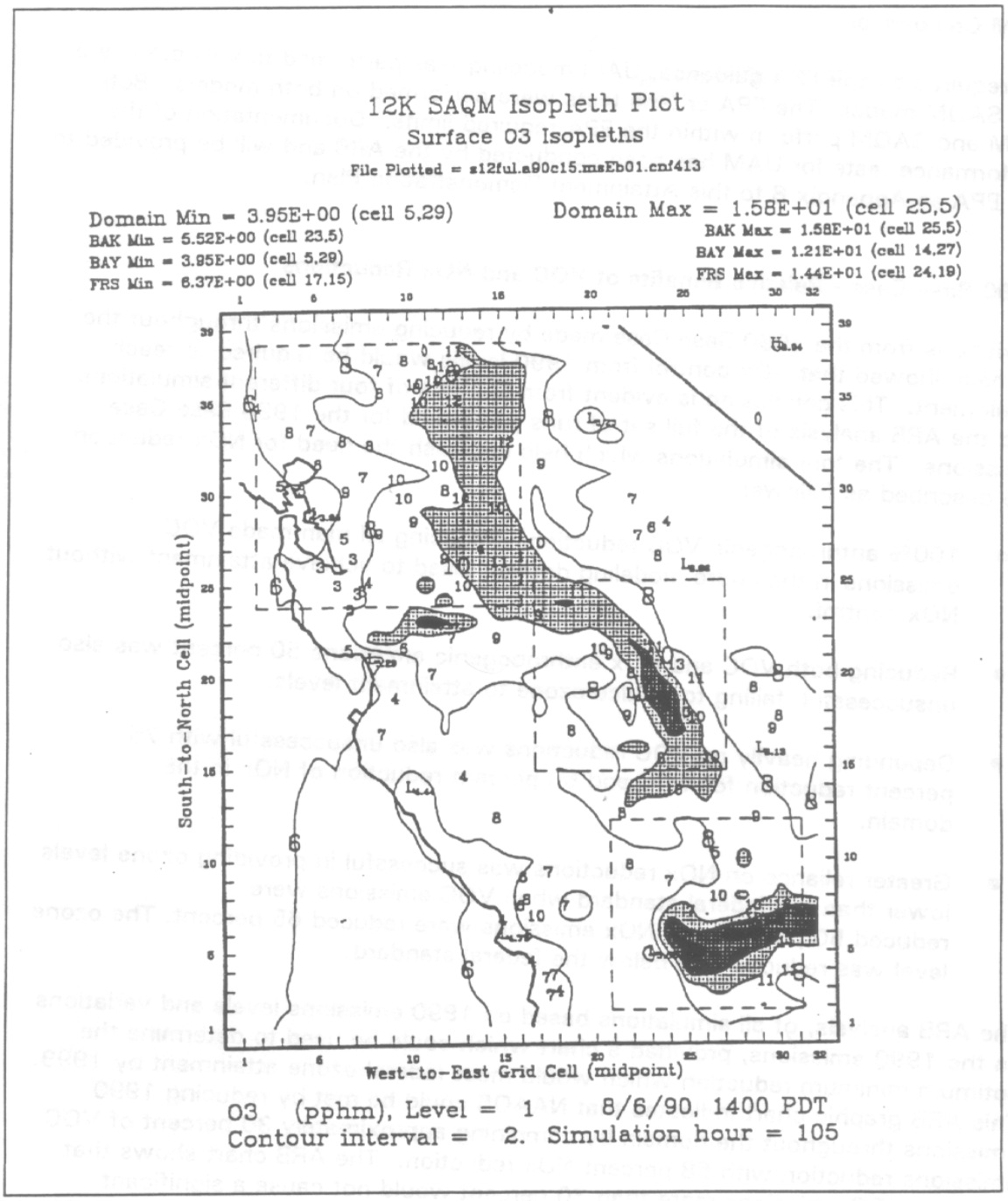

12K SAQM Isopleth Plot
Surface O3 Isopleths
File Plotted = s12fuLa90c15.maEb01.cnf413
Domain Min = 4.32E+00 (cell 10,13)
BAK Min = 6.79E+00 (cell 27,7)
BAY Min = 4.91E+00 (cell 2,30)
FRS Min = 6.54E+00 (cell 23,18)
Domain Max = 1.52E+01 (cell 23,19)
BAK Max = 1.27E+01 (cell 31,8)
BAY Max = 1.21E+01 (cell 9,29)
FRS Max = 1.52E+01 (cell 23,19)
South-to-North Cell (midpoint)
West-to-East Grid Cell (midpoint)
O3 (pphm), Level = 1 8/5/90, 1400 PDT
Contour interval = 2. Simulation hour = 81

FIGURE 2-3


12K SAQM Isopleth Plot
Surface O3 Isopleths
File Plotted = s12ful.a90c15.msEb01.cnf413
Domain Min = 3.95E+00 (cell 5,29)
BAK Min = 5.52E+00 (cell 23,5)
BAY Min = 3.95E+00 (cell 5,29)
FRS Min = 6.37E+00 (cell 17,15)
Domain Max = 1.58E+01 (cell 25,5)
BAK Max = 1.58E+01 (cell 25,5)
BAY Max = 1.21E+01 (cell 14,27)
FRS Max = 1.44E+01 (cell 24,19)
South-to-North Cell (midpoint)
West-to-East Grid Cell (midpoint)
O3 (pphm), Level = 1 8/6/90, 1400 PDT
Contour interval = 2. Simulation hour = 105

The four simulations which help establish the need for NOx reduction are described as follows:

- 100% anthropogenic VOC reduction – Reducing all man-made VOC emissions in the entire modeling domain failed to achieve attainment without NOx control.

- Reducing both VOC and NOx anthropogenic emissions 50 percent was also unsuccessful, failing to reduce ozone to attainment levels.

- Depending heavily on VOC reductions was also unsuccessful with 75 percent reduction for VOC and 50 percent reduction of NOx in the domain.

- Greater reliance on NOx reductions was successful in providing ozone levels lower than the federal standard when VOC emissions were reduced to 50 percent and NOx emissions were reduced 65 percent. The ozone level was reduced well below the federal standard.

The ARB analysis, of all simulations based on 1990 emissions levels and variations on the 1990 emissions, provided a chard which could be used to determine the optimum minimum reduction which would meet federal ozone attainment by 1999. This ARB graphic chard indicates that NAAQS could be met by reducing 1990 emissions throughout the domain by combining approximately 30 percent of VOC emissions reduction with 58 percent NOx reduction. The ARB chart shows that reducing VOC emissions more than 30 percent would not cause a significant reduction in ozone levels. Reducing NOx emissions more than 58 percent would further reduce ozone levels but is not required to meet the federal ozone standard. These reductions apply equally to all counties within the domain. This reflects the change that would be needed from emission sources which existed in 1990 but does not reflect changes in emissions which will be occurring in 1999. Rules already adopted by the ARB and the District will contribute significantly to the reductions needed; however, emissions increase also occur from population growth and increases in commercial and industrial activity. Therefore, a projection must be made of the emissions which can be expected to exist in 1999 to determine whether reduction programs are adequate to reach attainment. The emission projections for 1999 are shown in Table 2-1.

Interbasin Transport

Interbasin transport is air pollution carried by winds form one air basin to another. The importance of interbasin transport is related to the ability of the District to reduce the ozone levels in the Valley by controlling local air pollution emissions. The District is only able to control emissions generated from sources within the Valley. Unless emissions originating outside the Valley are controlled at their sources in the adjacent air basins, the District will be required to implement more stringent controls to compensate for the emissions transported into the Valley.

A modeling simulation was conducted with 1990 emissions which "turned off" the anthropogenic sources of emissions in the San Francisco Bay and Sacramento areas. Biogenic emissions and boundary conditions set at the edge of the modeling domain were not changed. This simulation was performed to look at ozone levels which would occur in the San Joaquin Valley without an influx of upwind urban emissions. This also is the best method currently available to the District to evaluate whether or not San Joaquin Valley emissions are capable of causing an exceedance of the federal ozone standard when the wind is not originating from the San Francisco Bay and Sacramento areas into the Valley.

The simulation was compared to the 1990 Base Case to quantify ozone levels impacting the Valley. According to the ARB analysis, 27 percent of the ozone observed in 1990 in the northern San Joaquin Valley was attributed to interbasin transport from the Bay Area and Sacramento, up to ten percent in the central San Joaquin Valley, and seven percent in the southern San Joaquin Valley. Ozone levels above the federal standard were predicted to occur in 1990 in Fresno and Bakersfield even without San Francisco Bay Area and Sacramento Valley emissions.

In addition to this modeling simulation, there is independent corroboration of the effect of upwind emissions on northern San Joaquin Valley ozone levels. The ARB transport analysis examined actual air monitoring data and weather patterns to determine that San Francisco Bay Area emissions had an "overwhelming" impact as far south as the Crows Landing monitoring site in Stanislaus County The ARB defines overwhelming as causing a federal exceedance directly without the contribution of local emissions. Since modeling represents only one meteorological pattern, and the ARB transport analysis focuses on days when meteorological patterns make it easy to distinguish the source of the exceedence, additional information is needed to determine if the impact on the San Joaquin Valley represented by these analyses is typical for ozone exceedance in the northern San Joaquin Valley. A research project was conducted for the ARB to classify all Bay Area weather patterns and determine ozone source-receptor relationships. This report indicates that "Highest ozone concentrations in the northern and central San Joaquin Valley are associated with the Bay Area outflow scenario. Diurnal profiles at Stockton and Modesto reveal higher late afternoon concentrations under this scenario, indicating possible transport from the Bay Area and, in some cases Sacramento. This feature is not evident in Fresno."[1]

Ozone Levels from Local Emissions

The interbasin transport simulation which simulated ozone levels in the absence of anthropogenic emissions from the San Francisco Bay and Sacramento areas, showed reduced Fresno and Bakersfield ozone levels, but continued to predict exceedance of the NAAQS in the 1990 Base Case. This means that emissions released in the San

[1] Development of an Objective Classification Procedure for Bay Area Air Flow Types Representing Ozone-Related Source-Receptor Relationships, ARB, SYSAPP94-94/022, May 24, 1994, page ES-6

Joaquin Valley were capable of generating a federal ozone exceedance in 1990 from local emissions. An additional simulation has been performed to examine this "local only" case in 1999.

The implications of the 1990 interbasin transport simulation can be summarized as follows:

- In 1990, Fresno and Bakersfield would have experienced federal ozone exceedances, even without transport from the San Francisco Bay Area and Sacramento.

- Emissions reductions from local source 1990 levels are needed to reach attainment in the San Joaquin Valley.

- Federal ozone exceedances in the northern San Joaquin Valley would not have occurred without the influx of emissions from the San Francisco Bay and Sacramento areas.

MODELING SUMMARY FOR 1990 INITIAL CONDITIONS

The SAQM model performs within the EPA guideline requirements for use in attainment demonstration modeling. It successfully simulated the observed episode and performs well in comparison to the UAM model. Domainwide NOx reductions appear to be more effective in reaching attainment than VOC reductions. Interbasin transport is significant, particularly for the northern San Joaquin Valley where federal exceedances would not have occurred in 1990 without an influx of pollution from the San Francisco Bay and Sacramento areas.

Simulations conducted using emissions predicted to occur in 1999 are discussed in Chapter 3. The 1999 predictions are compared to the 1990 simulations to see how much area of the Valley will have lower ozone levels as well as how much the peak ozone value has been decreased.

Simulations Referenced in this Chapter

1990 Base Case – ARB File: s12ful.a90c15.msEb01.cnf413; District File: A1
Note: All of the following listed simulations used this simulation as a foundation.

100% Anthropogenic VOC Emission Reduction from the 1990 Base Case – ARB file: s12fulx.a90c15x.msEb14N.cnf413a; District File: E1.

50% VOC and 50% NOx Anthropogenic Emission Reduction from 1990 Base Case – ARB File: s12ful.a90c15.msEb07.cnf413; District File: C3

75% VOC and 50% NOx Anthropogenic Emission Reduction from 1990 Base Case – ARB File: s12ful.a90c15.msEb08.cnf413; District File: D3

50% VOC and 65% NOx Anthropogenic Emission Reduction from 1990 Base Case – ARB File: s12ful.a90c15.msEb09.cnf413; District File: C4

1990 Base Case without Anthropogenic VOC and NOx from San Francisco Bay Area and Sacramento - ARB File: s12ful.a90c15x.msEbT1N.cnf413a; District File: T3

Table 2-2
Emission Budgets by County

	1999 VOC	1999 NOx
Fresno County		
Light Duty Vehicles	12.57	10.30
Light and Medium Duty Trucks	6.10	7.47
Heavy Duty Gas Trucks	0.91	4.52
Heavy Duty Diesel Truck	2.13	13.94
Motorcycles	0.25	0.10
Heavy Duty Diesel Urban Buses	0.04	0.25
Subtotal	21.99	36.58
TCM Reductions	0.53	0.40
Total	21.46	36.18
Kern County		
Light Duty Vehicles	11.58	10.64
Light and Medium Duty Trucks	3.49	4.42
Heavy Duty Gas Trucks	0.83	4.59
Heavy Duty Diesel Truck	1.17	7.70
Motorcycles	0.45	0.20
Heavy Duty Diesel Urban Buses	0.07	0.43
Subtotal	17.59	27.98
TCM Reductions	0.32	0.31
Total	17.27	27.67
Kings County		
Light Duty Vehicles	1.79	1.56
Light and Medium Duty Trucks	0.92	1.21
Heavy Duty Gas Trucks	0.18	0.98
Heavy Duty Diesel Truck	0.48	3.48
Motorcycles	0.04	0.02
Heavy Duty Diesel Urban Buses	0.00	0.00
Subtotal	3.41	7.25
TCM Reductions	0.08	0.16
Total	3.33	7.09
Madera County		
Light Duty Vehicles	2.07	1.81
Light and Medium Duty Trucks	1.22	1.62
Heavy Duty Gas Trucks	0.19	0.96
Heavy Duty Diesel Truck	0.44	3.52
Motorcycles	0.04	0.02
Heavy Duty Diesel Urban Buses	0.00	0.00
Subtotal	3.96	7.93
TCM Reductions	0.04	0.03
Total	3.92	7.90

	1999 VOC	1999 NOx
Merced County		
Light Duty Vehicles	3.99	3.92
Light and Medium Duty Trucks	1.98	2.95
Heavy Duty Gas Trucks	0.51	3.16
Heavy Duty Diesel Truck	1.39	10.87
Motorcycles	0.07	0.04
Heavy Duty Diesel Urban Buses	0.00	0.03
Subtotal	7.94	20.97
TCM Reductions	0.12	0.11
Total	7.82	20.86
San Joaquin County		
Light Duty Vehicles	9.20	8.38
Light and Medium Duty Trucks	4.07	5.42
Heavy Duty Gas Trucks	0.80	4.27
Heavy Duty Diesel Truck	2.13	13.99
Motorcycles	0.20	0.08
Heavy Duty Diesel Urban Buses	0.02	0.14
Subtotal	16.41	32.28
TCM Reductions	0.36	0.26
Total	16.05	32.02
Stanislaus County		
Light Duty Vehicles	6.69	5.91
Light and Medium Duty Trucks	3.13	4.13
Heavy Duty Gas Trucks	0.48	2.45
Heavy Duty Diesel Truck	1.26	8.16
Motorcycles	0.18	0.08
Heavy Duty Diesel Urban Buses	0.02	0.15
Subtotal	11.76	20.88
TCM Reductions	0.22	0.16
Total	11.54	20.72
Tulare		
Light Duty Vehicles	6.98	6.02
Light and Medium Duty Trucks	3.75	4.86
Heavy Duty Gas Trucks	0.58	2.94
Heavy Duty Diesel Truck	1.17	8.14
Motorcycles	0.17	0.07
Heavy Duty Diesel Urban Buses	0.00	0.03
Subtotal	12.66	22.06
TCM Reductions	0.17	0.14
Total	12.49	21.92

CHAPTER 3

EFFECTS OF ADOPTED

ACTIONS - 1999

INTRODUCTION

In order to determine if additional control measures are needed to meet the NAAQS in the District, it is necessary to project the effects of growth and existing controls on future ozone levels. The resulting simulation is referred to as the "1999 Base Case" simulation and is evaluated to determine the scope and extent of additional control that may be required.

The method used to prepare the 1999 Base Case simulation is described later in the Modeling section and the results are also interpreted in that section. The control measures considered in the simulation include all adopted federal, state, and local measures. Table 3-1 shows the effects of existing control measures. It should be noted that in general, the District has jurisdiction over all point and area sources, except for mobile sources, consumer products, and pesticides. The state and/or federal governments have jurisdiction over mobile sources, consumer products, and pesticides.

Table 3-1
Effect of Adopted Rules

Effect of Adopted Rules - 1990 to 1999 Emissions in Tons Per Day				
Pollutant	VOC		NOx	
Year	1990	1999	1990	1999
District Jurisdiction	239	176	382	204
Non-District Jurisdiction	305	233	328	277
Total	544	409	710	481

The reductions shown on Table 3-1 represent a 25% reduction in total VOC emissions between 1990 and 1999, and a 32% reduction in total NOx emissions during that time period, within the District. The VOC and NOx emissions for which the District has jurisdiction over are shown to decline by 26% and 47%, respectively. These reductions are anticipated in the context of a 33% increase in population and increased economic activity. In light of this anticipated growth, the reductions show significant progress toward reaching the NAAQS by 1999. A detailed 1999 projected emissions inventory is contained in Appendix C.

The District-implemented rules, regulations and programs that were included in the 1999 Base Case simulation include those shown in Table 3-2.

Table 3-2
Summary of District Implemented Rules
Modeled in the 1999 Base Case

Rule No.	RULE TITLE	Full Imp. Date	VOC Reductions tons/day	NOx Reductions tons/day
4401	Steam-enhanced Crude Oil Production Well Vents	5/1/95	19.32	N/A
4402	Crude Oil Production Sumps	5/1/97	20.33	N/A
4403	Components serving Light Crude Oil or Gases at Light Crude Oil and Gas Production Facilities and Natural Gas Processing Facilities	11/1/91	4.55	N/A
4451	Valves, Pressure Relief Valves, Flanges, Threaded Connection and Process Drains at Petroleum Refineries and Chemical Plants	11/1/91	0.31	N/A
4452	Pump and Compressor Seals at Petroleum Refineries and Chemical Plants	11/1/91	0.02	N/A
4453	Refinery Vacuum Producing Devices or Systems[1]	7/1/80	0[1]	N/A
4454	Refinery Process Unit Turnaround[2]	1984	0[2]	N/A
4601	Architectural Coatings	9/1/94	3.41	N/A
4602	Motor Vehicle and Mobile Equipment Refinishing Operations	1/1/95	5.58	N/A
4603	Surface Coating of Metal Parts and Products	10/1/93	0.02	N/A
4604	Can And Coil Coating Operations	11/1/92	0.02	N/A
4607	Graphic Arts	11/19/95	1.51	N/A
4621	Gasoline Transfer into Stationary Storage Containers, Delivery Vessels, and Bulk Plants	5/1/95	.22	N/A

[1] Reductions occurred prior to 1999, and are reflected in baseline emissions.
[2] Reductions occurred prior to 1990. Emissions from affected sources not specified in inventory.

Rule No.	RULE TITLE	Full Imp. Date	VOC Reductions tons/day	NOx Reductions tons/day
4624	Organic Liquid Loading[3]	5/1/93	0[3]	N/A
4625	Wastewater Separators	7/1/93	1.91	N/A
4641	Cutback, Slow Cure, and Emulsified Asphalt Paving and Maintenance Operations[4]	11/1/91	0[4]	N/A
4661	Organic Solvents[5]	5/21/92	0[5]	N/A
4662	Organic Solvent Degreasing Operations	11/1/92	1.08	N/A
4672	Petroleum Solvent Dry Cleaning	11/1/92	0.11	N/A
4681	Rubber Tire Manufacturing	5/16/91	0.03	N/A
4691	Vegetable Oil Processing	11/1/92	0.74	N/A
4605	Aerospace Assembly	1/1/94	.04	N/A
4606	Wood Products Coating Operations	7/1/96	.91	N/A
4623	Storage of Organic Liquids (Existing Rule)	1/1/96	13.2	N/A
4682	Polystyrene Foam Manufacturing Operations	6/16/96	1.71	N/A
4701	Emissions from Stationary IC Engines - Central and Western Kern County[6]	12/31/95	N/A	105.13
4902	Residential Water Heaters	12/17/93	N/A	0.59
4305	Boilers, Process Heaters and Steam Generators	12/31/ 2000	N/A	35.90
TOTAL EMISSIONS REDUCTIONS INCLUDED IN CURRENT CONTROL PROJECTION DUE TO POST-1990 ADOPTED RULES			75.02	141.62

[6] This Rule is being revised to apply to all counties within the District as a Reasonable Available Control Technology Measure.

NOTE: This table is intended to summarize emission reductions. As such,

[3] Emissions not identified in inventory.

[4] 1990 baseline emissions have been revised to reflect usage rates in that year. It is not expected that significant reductions have occurred from this rule which consolidated previous county regulations.

[5] This rule applies only to those sources that use organic solvents that are not regulated by a source specific rule. The District is unable to quantify reductions at this time.

it does not include all the information used to calculate the reductions shown for each rule.

As shown in the Table 3-2, the District has implemented rules which provide significant reductions in VOC and NOx emissions between 1990 and 1999. In addition, state and federal measures provide large reductions in mobile source emissions, especially for VOC emissions. The following sections describe how the District modeled the future benefits of the currently adopted controls on future ozone levels.

MODELING

Explanation of Ozone Modeling for 1999

A photochemical grid model uses information gathered during a high ozone episode to simulate the episode that was observed. If the episode simulation performs within acceptable limits of accuracy, the modeling information can then be used to predict the effects of controls.

The effect of controls is determined by running additional simulations, changing the emissions information to reflect reductions anticipated from control programs as well as increases or decreases expected to occur in the future from population growth, industrial trends, and other available information. The projected emissions are input to the photochemical grid model to develop a new prediction of the level of ozone which would form.

SAQM is uses the same weather conditions to make a comparison between the observed ozone episode and the predicted level which would occur from emissions changes. Since weather conditions vary, it is desirable to analyze more than one weather pattern which leads to a high ozone level. A possibility exists that the effect of controls may vary under different weather conditions and the best control plans would be successful under any weather condition which could cause high ozone levels.

Analysis was conducted by estimating the level of emissions which are expected to exist in 1999 from the effect of rules which have already been adopted by the District and the ARB. Variations from that predicted level were also evaluated to see if the model continued to reflect the same response to emissions changes as exhibited for the 1990 emissions.

Modeling Results - 1999 Base Case - Future Benefits of Currently Adopted Controls

The District and ARB, using established methodology, projected the growth and control of emissions between 1990 and 1999. The TPAs and the ARB predicted mobile source activity and emissions and used information supplied or reviewed by the District to predict other emission changes. The projection for 1999 included the anticipated effects of rules currently adopted by the state and the District. It did not include proposed or pending regulations. Predicted emissions changes were used to alter the emissions file for 1990 used by the model to simulate 1999 levels of emissions. Due to practical limitations, the method used to change 1990 emissions to 1999 emissions grouped emissions changes at the county level. A more spatially accurate representation of 1999 emissions is currently under development. With either method, projection of future emissions is inherently of limited accuracy. Predicting the future is never easy or precise. However, this is currently the best methodology available.

Simulations were performed using the 1999 emissions projection. The 1999 Base Case simulation indicated that ozone levels will be much lower than in 1990, but Fresno and Bakersfield are still predicted to experience exceedances of the NAAQS for ozone without additional reductions from implementation of programs discussed in the next chapter of this Plan. The exceedances projected to occur in 1999 from this simulation will be less severe in Fresno and Bakersfield. The reduction of Valleywide ozone levels outside of these two urban areas shows remarkable improvement, with much of the Valley apparently achieving compliance with the more stringent California ozone standard.

Figure 3-1 displays a simulation of August 5, 1999, to compare with the ozone levels of August 5, 1990, under circumstances that caused the highest level of ozone observed in Fresno County. Figure 3-2 shows August 6 ozone conditions projected for 1999 for comparison to 1990 highest levels of ozone observed in Bakersfield. As with the 1990 simulations for August 6, the Fresno County ozone concentrations on Figure 3-2 are not completely accurate due to a problem in the wind information east of Fresno which has not yet been corrected. The Fresno windfield problem in Figure 3-2 is not believed to affect the validity of the Kern County information. The ARB has advised the District to evaluate Fresno ozone levels from simulations of August 5 and Kern County from August 6.

Shading has been added to identify areas with high ozone concentrations. The lighter shading is for areas with ozone concentrations between 10 and 12 pphm. The darker shading represents 12 to 14 pphm and indicates areas exceeding the federal ozone standard. Unlike the 1990 simulation, no areas are projected to have levels over 14 pphm; therefore, no areas have been shaded black to show ozone levels over 14 pphm.

It is important to note that these ozone predictions do not mean that the area identified always will be impacted by high ozone levels during an ozone episode. The model represents only one weather pattern. All predictions made at this time used the first version of SAQM. The model is in an early stage of testing and is expected to be improved by ongoing technical projects scheduled for completion during late 1994.

1999 Base Case - Relative Benefits of VOC and NOx Reductions

A similar pattern of simulations was performed for the 1999 emissions estimate (with future benefits of currently adopted controls) as described for the 1990 analysis. Variations from 1999 Base Case by reducing emissions throughout the domain showed that NOx reductions from 1999 estimated levels is more effective in reducing ozone concentrations than an equal percentage reduction of VOC emissions.

FIGURE 3-1

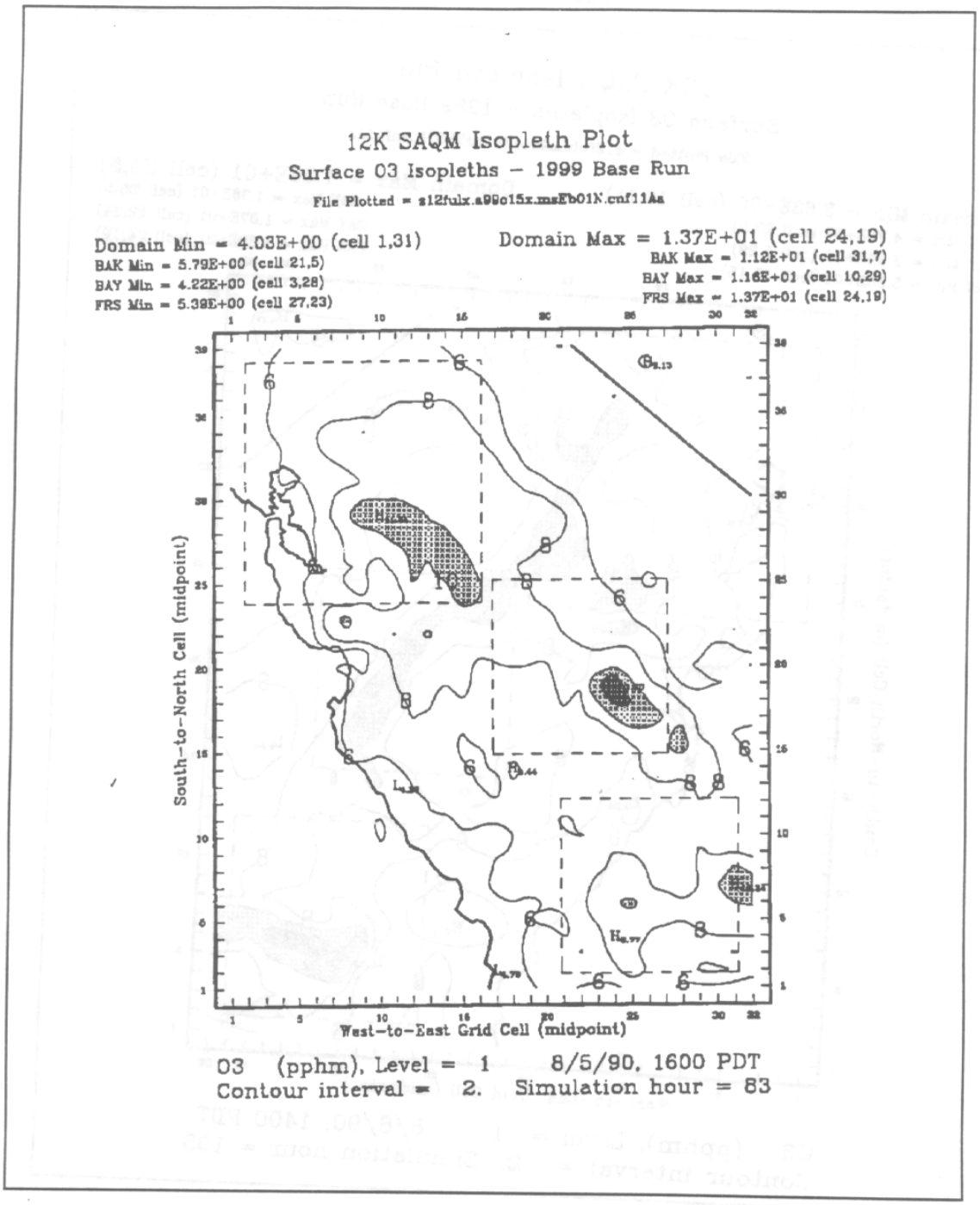
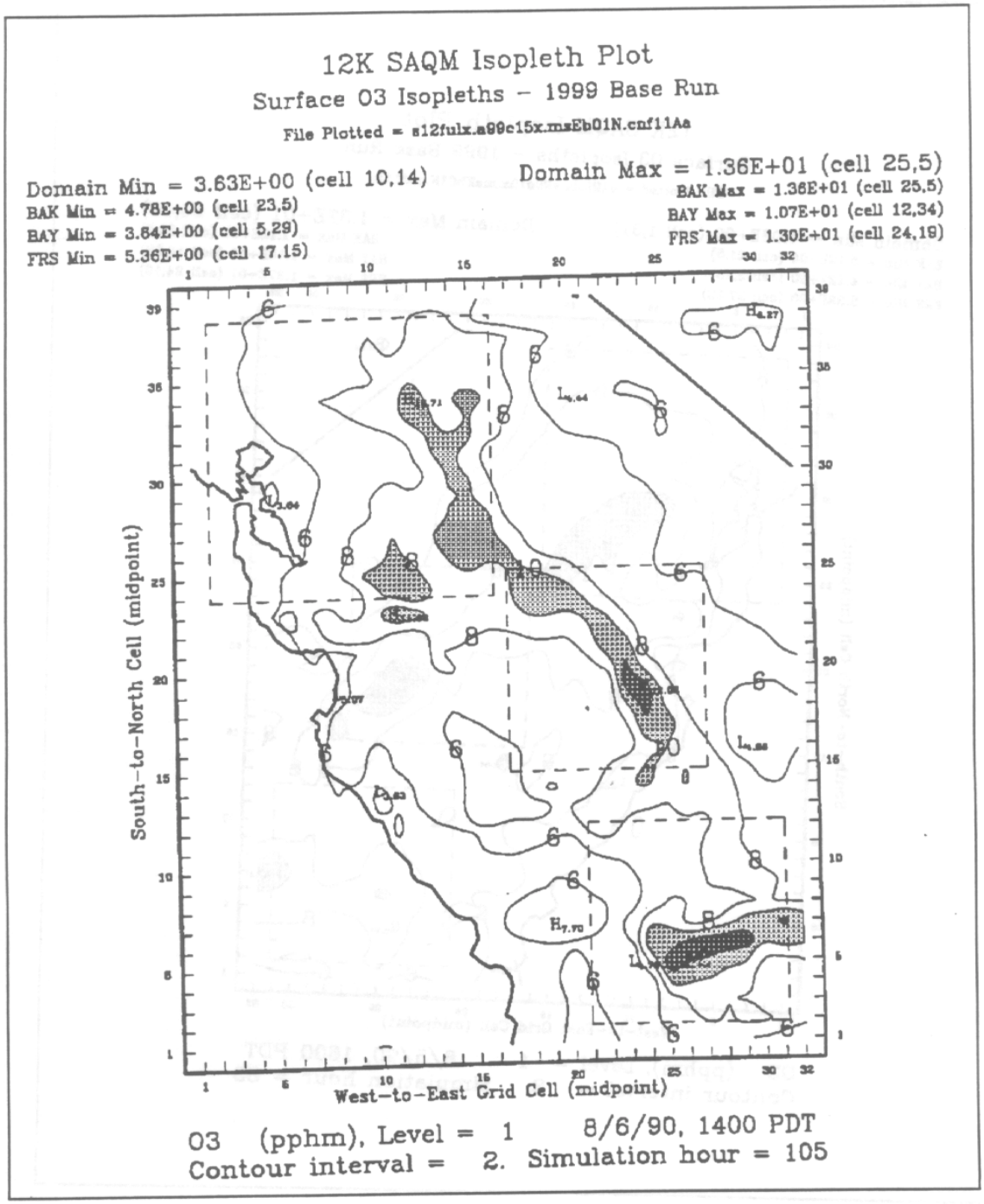

12K SAQM Isopleth Plot
Surface O3 Isopleths – 1999 Base Run
File Plotted = s12fulx.a99c15x.msEb01N.cnf11As
Domain Min = 4.03E+00 (cell 1,31)
BAK Min = 5.79E+00 (cell 21,5)
BAY Min = 4.22E+00 (cell 3,28)
FRS Min = 5.39E+00 (cell 27,23)
Domain Max = 1.37E+01 (cell 24,19)
BAK Max = 1.12E+01 (cell 31,7)
BAY Max = 1.16E+01 (cell 10,29)
FRS Max = 1.37E+01 (cell 24,19)
South-to-North Cell (midpoint)
West-to-East Grid Cell (midpoint)
O3 (pphm), Level = 1 8/5/90, 1600 PDT
Contour interval = 2. Simulation hour = 83

FIGURE 3-2


12K SAQM Isopleth Plot
Surface O3 Isopleths – 1999 Base Run
File Plotted = s12fulx.a99c15x.msEb01N.cnf11Aa
Domain Min = 3.63E+00 (cell 10,14)
BAK Min = 4.78E+00 (cell 23,5)
BAY Min = 3.64E+00 (cell 5,29)
FRS Min = 5.36E+00 (cell 17,15)
Domain Max = 1.36E+01 (cell 25,5)
BAK Max = 1.36E+01 (cell 25,5)
BAY Max = 1.07E+01 (cell 12,34)
FRS Max = 1.30E+01 (cell 24,19)
South-to-North Cell (midpoint)
West-to-East Grid Cell (midpoint)
O3 (pphm), Level = 1 8/6/90, 1400 PDT
Contour interval = 2. Simulation hour = 105

This conclusion is evident from analysis of four different simulations and the ARB analysis of the indications of the full set of runs performed for 1999 predicted emissions. The four simulations which help establish the relative benefit of NOx reduction are:

- Reduction, throughout the modeling domain, of 50% of anthropogenic NOx emissions.
- Reduction, throughout the modeling domain, of 50% of anthropogenic VOC emissions.
- Reduction, throughout the modeling domain, of 25% of all anthropogenic emissions.
- Reduction, throughout the modeling domain, of 50% of all anthropogenic emissions.

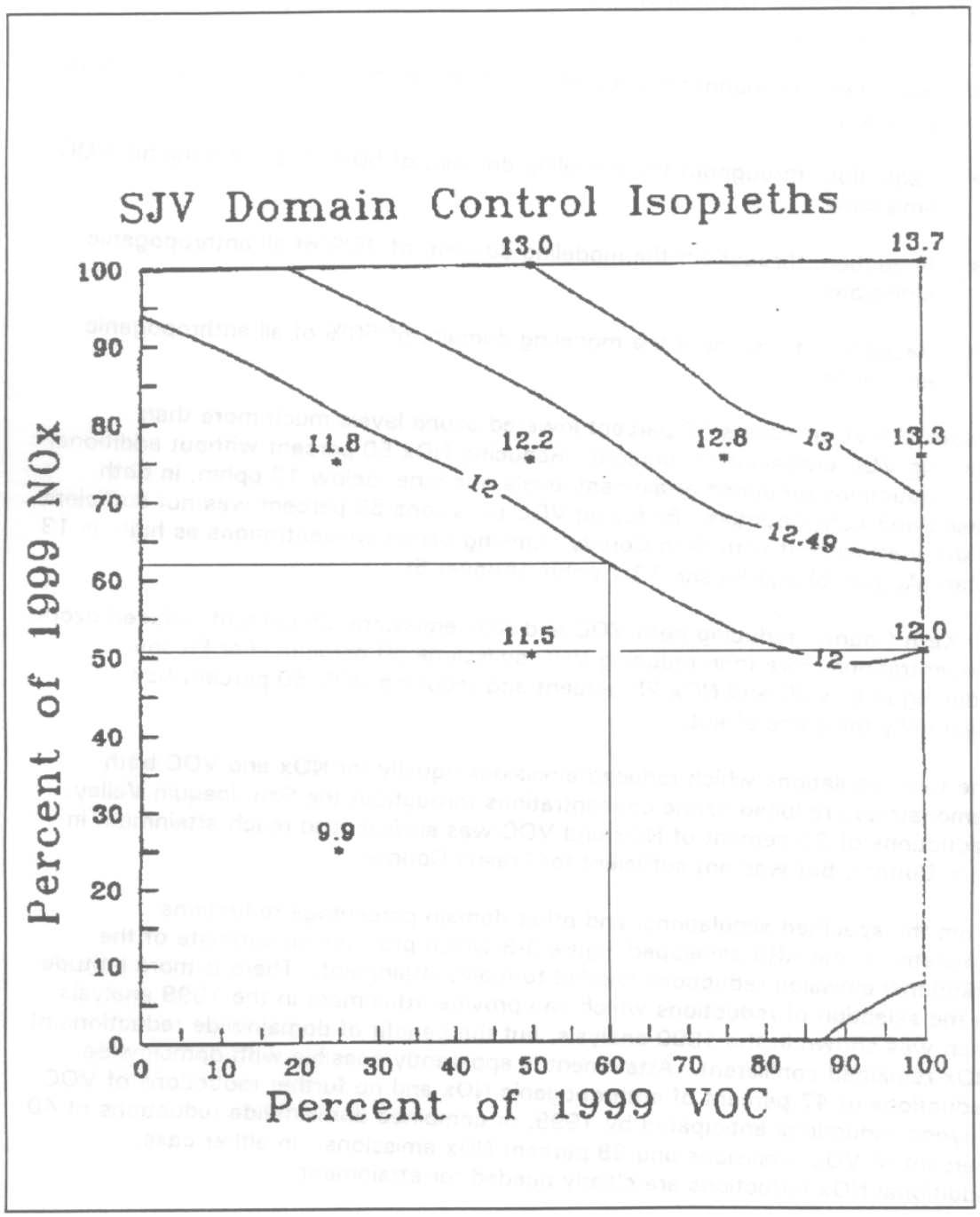
Reducing NOx emissions 50 percent lowered ozone levels much more than reducing VOC emissions 50 percent. Reducing NOx 50 percent without additional VOC reductions produced attainment levels of ozone, below 12 pphm, in both Fresno and Kern Counties. Reducing VOC emissions 50 percent was not sufficient to show attainment with Kern County showing ozone concentrations as high as 13 pphm (August 6) and Fresno 12.7 pphm (August 5).

For Kern County, reducing both VOC and NOx emissions 25 percent reduced ozone concentrations more than reducing VOC emissions 50 percent. For Fresno, reducing both VOC and NOx 25 percent and reducing VOC 50 percent had essentially the same effect.

The two simulations which reduced emissions equally for NOx and VOC both demonstrated reduced ozone concentrations throughout the San Joaquin Valley. Reductions of 25 percent of NOx and VOC was sufficient to reach attainment in Kern County, but was not sufficient for Fresno County.

From the specified simulations, and other domain percentage reductions simulations, the ARB developed Figure 3-3 which provides an estimate of the additional emission reductions needed to reach attainment. There is more latitude in the selection of reductions which can provide attainment in the 1999 analysis than was shown in the 1990 analysis, but the benefit of domainwide reductions of NOx remained consistent.

FIGURE 3-3


SJV Domain Control Isopleths
13.0
13.7
11.8
12.2
12.8
13
13.3
12
12.49
11.5
12.0
12
9.9
Percent of 1999 NOx
Percent of 1999 VOC
0
10
20
30
40
50
60
70
80
90
100

Attainment is apparently possible with domainwide reductions of 47 percent of anthropogenic NOx and no further reductions of VOC beyond reductions anticipated by 1999, or combined domainwide reductions of 40 percent of VOC emissions and 38 percent NOx emissions. In either case, additional NOx reductions are clearly needed for attainment.

Modeling simulations conducted at this time use the first version of SAQM. In all simulations conducted thus far, NOx reductions are indicated as beneficial throughout the San Joaquin Valley.

Interbasin Transport

As described in Chapter 2, interbasin transport is air pollution carried by winds from one air basin into another. The importance of interbasin transport is related to the ability of the District to reduce the level of ozone pollution in the Valley by controlling local air pollution emissions. The District is only able to control emissions generated from sources within the Valley. Emissions from outside the Valley either need to be controlled at their sources in the adjacent air basins, or more stringent controls would need to be placed on the San Joaquin Valley industry and citizens to compensate for the emissions which are transported by winds flowing into the Valley.

A modeling simulation was conducted with 1999 Base Case emissions which "turned off" the anthropogenic sources of emissions in the San Francisco Bay and Sacramento areas. Biogenic emissions and boundary conditions set at the edge of the modeling domain were not changed. This simulation was performed to look at ozone levels which would occur in the San Joaquin Valley in 1999 without an influx of upwind urban emissions. The simulation was compared to the 1990 Base Case, the 1990 Interbasin Transport Analysis, and the 1999 Base Case, to see how much the 1999 predicted ozone levels in the Valley are affected by interbasin transport. The implications of the 1999 interbasin transport simulation can be summarized as follows:

- The 1999 projection shows essentially no Fresno area exceedance, and a very small remaining area of exceedance in Kern County. However, this 1999 projection does not include reductions from implementation of scheduled District rulemaking activity for the period between 1994 to 1999. It also uses a distribution of motor vehicle emissions which concentrates the emissions on and near the highways.

- Assistance from state requirements on upwind areas and federal control programs imposed as part of Federal Implementation Plans required for upwind areas is needed to reach attainment.

- Additional reductions in the Valley are needed to supplement state and federal reductions imposed on upwind areas. Note: If tighter controls are not imposed upwind, the EPA would expect the San Joaquin Valley to achieve attainment by additional local reductions.

The 1999 Base Case simulation does show areas of federal exceedance; however, as previously discussed the 1999 Base Case includes only the effects from currently adopted rules. Additional reductions are anticipated which have not been included in the 1999 Base Case. The ARB has assisted the District in preparing an analysis of the full extent of reductions which are expected to occur by 1999 by preparing estimates of reductions anticipated for the San Francisco Bay Area and Sacramento from state, federal and local reduction programs. These reductions, along with scheduled District actions anticipated by 1999 provide a projection of the full set of reductions which can be anticipated by 1999. This simulation will be discussed in the Chapter 4 of this Plan.

Ozone Levels from Local Emissions

Analysis of local emissions in 1990 indicated that Fresno County and the District's portion of Kern County would have experienced exceedances of the federal ozone standard from local San Joaquin Valley emissions. The 1999 analysis indicates that projected reductions will be sufficient to prevent federal exceedances in the San Joaquin Valley except for very small areas in Fresno and Kern Counties. Achieving attainment in the "local only" case is a significant milestone on the path to attainment of the federal ozone standard. In most nonattainment areas in the United states this would be sufficient to demonstrate attainment, since few of the nonattainment areas are downwind of major metropolitan areas.

CONCLUSIONS

The District has modeled the effects on 1999 ozone levels of its adopted rules, including the NOx rules adopted by the District. Simulated ozone concentrations resulting from implementation of these adopted rules continue to exceed the federal standard but show considerable improvement in ozone levels. This means that the

NOx reductions from adopted rules are not in excess of reductions needed to reach attainment. Modeling demonstrates that all adopted measures which are being implemented in the District, will contribute toward attainment of the NAAQS for ozone, but will not exceed the level of reductions required to meet the standard. The evaluation of VOC and NOx reductions continues to indicate that NOx reductions are more effective in reducing ozone peak concentrations than VOC reductions of equal percentage.

The model in its present form shows minor exceedances in Fresno and Kern Counties. While currently accepting the indication that additional reductions are needed to achieve attainment, refinements to the model which are scheduled to be completed in the next few months will be used to verify or alter this conclusion.

For most of the San Joaquin Valley, rules currently adopted will provide enough reductions by 1999 to reduce local emissions to a level which would not generate exceedances of the NAAQS for ozone without an influx of air pollution from upwind areas. Fresno County and Kern County are projected to have small areas of exceedance, but the forecast for 1999 discussed in this Chapter projects conditions with no further actions taken by the District from 1994 to 1999. The District is under federal requirements to take specific additional actions, and has committed to adopt additional rules to meet state requirements. If these additional reductions are not sufficient to achieve attainment, then the District must identify and commit to adopt additional regulations sufficient to achieve attainment.

Chapter 4 of this Plan identifies the control measures and modeling of future actions to determine if the San Joaquin Valley Air Basin and surrounding air basins are taking sufficient action to reach attainment by 1999.

Simulations Referenced in this Chapter

1999 Base Case ARB File: s12fulx.a99c15x.msEb01N.cnf11Aa District File: A1-99
NOTE: All of the following listed simulations used this simulation as a foundation.

50% Anthropogenic VOC Emission Reduction from 1999 Base Case
ARB File: s12fulx.a99c15x.msEb05N.cnf11Aa District File: C1-99

50% Anthropogenic NOx Emission Reduction from 1999 Base Case
ARB File: s12fulx.a99c15x.msEb06N.cnf11Aa District File: A3-99

25% VOC and 25% NOx Anthropogenic Emission Reduction from 1999 Base Case
ARB File: s12fulx.a99c15x.msEb16N.cnf11Aa District File: B2-99

50% VOC and 50% NOx Anthropogenic Emission Reduction from 1999 Base Case
ARB File: s12fulx.a99c15x.msEb07N.cnf11Aa District File: C3-99

1999 Base Case without Anthropogenic VOC and NOx from Bay Area and Sacramento
ARB File: s12fulx.a99c15x.msEbT1N.cnf11Aa District File: T1-99

CHAPTER 4

PROPOSED ACTIONS

AND

EFFECTS - 1999

OZONE ATTAINMENT DEMONSTRATION PLAN

INTRODUCTION

As discussed in the Chapter 3, additional controls are needed to meet the NAAQS for ozone in the District by 1999. The need for these additional controls is shown in the "Base Case 1999" simulation which projects that small areas in the District may still exceed NAAQS in 1999, with currently adopted rules and control measures. Accordingly, the District needs to adopt the additional control measures described below.

In order to determine the effect that the implementation of these rules would have on the District by 1999, a scenario has been prepared to project the effect of measures proposed by the District upon future air quality. The method used to prepare the 1999 Proposed Actions simulation is described in the Modeling section and the results are also interpreted in that section.

The control measures considered in the simulation include all adopted and implemented federal, state, and local measures as well as future measures proposed within the District's jurisdiction. The scenario also addresses the effects of the state's proposed enhanced inspection and maintenance (I & M) program for motor vehicles in the Fresno and Bakersfield urban areas. Several federal controls affecting motor vehicles are not possible to model at this time due to the lack of emissions reductions estimates from the EPA. Nevertheless, it is expected that they will aid in attainment of the NAAQS in the District by 1999. It is essential, however, that the federal government take action to effective regulate those sources over which it has exclusive jurisdiction.

It is expected that the significant NOx and VOC reductions that will be provided by 1999 due to federal, state, and local controls will facilitate the attainment of NAAQS. This is considered likely given that the effects of enhanced I & M and several other control measures will occur in the areas most likely subject to potential exceedences.

CONTROL MEASURES

The following measures will provide additional emissions reductions that will help attain the ozone NAAQS by 1999. They were included in the District's 1991 Air Quality Attainment Plan, which was prepared to satisfy the mandates of the California Clean Air Act, and deemed in 1992 by the ARB to have included every feasible control measure.

These measures, taken together, can provide about 37 tons/day in VOC emissions reductions and 37 tons/day in NOx reductions between 1990 and 1999. All the control measures not yet adopted as District rules will be developed subject to the District's rule development process, which includes a cost effectiveness evaluation and socioeconomic analysis. The reductions described in this section are over and above the significant reductions described in Chapter 3. The emissions reductions shown in this chapter are based on the Valleywide implementation of the proposed control measures. A model run showing attainment in 1999 has been prepared without taking credit for reductions in oilfield NOx emissions in the area west of Interstate - 5 in Kern, Kings, and Fresno Counties, (the westside). The District is not taking credit for reductions from westside oilfield NOx emissions for control measures identified in the Attainment Demonstration Plan. Proposed NOx Rules 4306 and 4702, when submitted for inclusion in the District's SIP, will not propose federal applicability for westside oilfield NOx sources. The District will also pursue revising the federal applicability of its adopted and proposed NOx rules, which may include but not be limited to Rules 4305, 4703, 4351, 4701, and 4412, for westside oilfield NOx sources.

It is anticipated that when further analysis is completed, it will demonstrate that at least 80% of the emissions reductions required to reach attainment are provided by already-adopted rules. It is also noted that EPA has not provided emissions reductions estimates for several of those sources under its jurisdiction. These include heavy duty diesel and gasoline vehicles, off road diesel equipment, industrial equipment, pleasure craft, and locomotives. Therefore, it is not possible to estimate, or take credit for potential reductions due to EPA measures.

The following five control measures represent adopted rules or programs that have not yet been included in emissions projections for the District. They are included here because they represent additional reductions beyond those that are shown in the "1999 Base Case" described in Chapter 3. This chapter also discusses proposed AQAP measures, and future state and federally implemented measures.

COMPONENTS SERVING GASES AT GAS PRODUCTION FACILITIES RULE # 4403 (FULL IMPLEMENTATION AND ADOPTION: APRIL, 1991)

Sources Affected: Emissions related to the production of Natural Gas. Affected CES code 46441 and SCC codes 31000203, 31000207, and 31000299.

Description of Control Measure: Rule #4403 was adopted April 11, 1991. It requires control of emissions during all phases of natural gas production. Estimated emissions

reductions for 1999 are 4.55 tons/day VOC. This rule is already adopted but not currently shown in the emissions projection.

STATIONARY GAS TURBINE ENGINES
RULE #4703 (ADOPTION: 3Q/94, IMPLEMENTATION: 2Q/99)

Sources Affected: All existing stationary gas turbine engines greater than 0.3 MW used for electrical generating power. SCC 20100101, 20100201, 20200103, 20200201, 20200203.

In the San Joaquin Valley, gas turbine engines (GTEs) are used to generate electricity for in-house consumption, or for distribution in utility grids. In the Valley's oil-producing regions, GTEs provide electricity and steam for thermally enhanced oil recovery operations.

Description of Control Measure: This control measure will reduce NOx emissions from GTEs. Emission limits, when developed, will account for fuel efficiency of the turbine, and in the case of cogeneration units, fuel efficiency of the heat recovery steam generator. It is expected that this rule will provide approximately 11.92 tons/day in NOx emissions reductions by 1999. This rule is already adopted but not currently shown in the emissions projection. A recent model run shows that reductions in oilfield NOx emissions from this adopted Rule from the area west of Interstate - 5 in Kern, Kings, and Fresno Counties are not needed to reach the federal ozone standard. Although the emissions reduction estimate shown is based on the Valleywide implementation of the proposed control measure, the District is not taking credit for westside oilfield NOx reductions in its Attainment Demonstration Plan. The District will propose that this Rule not be federally enforceable for westside oilfield NOx sources.

ORGANIC LIQUID STORAGE
RULE #4623 (ADOPTION: 2Q/91, IMPLEMENTATION, 3Q/96)

Sources Affected: Organic liquid storage tanks. SCC and CES are shown below.

SCC:	40300101	40300102	40300103	40300104	40300106
40300107	40300116	40300150	40300151	40300152	40301010
40301012	40300201	40300203	40300207	40301102	40301105
40301107	40301109	40400301	40400302	40400304	CES 46458

Description of Control Measure: This control measure requires control for each applicable tank. Applicability of the control requirements is based on vapor pressure of the liquid stored, size of the tank, and operational parameters. The adopted measure is expected to provide 13.2 tons/day in VOC emissions reductions reduction by 1999. This rule is already adopted but not currently shown in the emissions projection.

ADHESIVES
RULE #4653 (ADOPTION: 1Q/94, IMPLEMENTATION, 1Q/95)

Sources Affected: Various manufacturing processes such as automotive and furniture manufacturing that use adhesives are affected.

Description of Control Measure: The primary control method for this measure is reformulation technology (add on control devices such as afterburners and carbon adsorbers can also be applied to reduce VOC emissions below the allowed limits, if reformulation is not feasible). The District's currently adopted rule affecting these sources is expected to provide approximately 1.3 tons/day in VOC emissions reductions by 1999. This rule is already adopted but not currently shown in the emissions projection.

TRANSPORTATION CONTROL MEASURES

In addition to rules affecting stationary point and area sources, several District rules and programs affect mobile sources. These include transportation control measures (TCMs), Motor Vehicle Emission Reduction Projects, and other programs.

TCMs are measures that seek to reduce the increase in the use of single passenger vehicles, and are cooperatively implemented by the District, other local agencies, and businesses. The District has entered into a Memorandum of Understanding (MOU) with the Transportation Planning Agencies (TPAs) having jurisdiction within the District to jointly develop and implement transportation plans and programs within the District. Motor Vehicle Emission Reduction Projects are implemented by the District, pursuant to Section 44220 of the state Health and Safety Code, to reduce air pollution from motor vehicles. The District also implements other programs (e.g., the Smoking Vehicle Program, public education programs) that result in emissions reductions.

The District expects that mobile source measures which have been or will be adopted and implemented prior to 1999 will result in NOx and VOC emissions reductions. These measures may include, but not be limited to, Rule 9001 - Commute Based Trip Reduction, Rule 9010 - Fleet Inventory, and Rule 9011 - Light and Medium Duty Low

Emission Fleet Vehicles. It is estimated that cumulatively, the package of Transportation Control Measures that the District and the TPAs have committed to implement by 1999 will provide approximately 1.5 tons/day in NOx and 1.8 tons/day in VOC emissions reductions. These rules are already adopted but not currently shown in the emissions projection.

CONTROL MEASURES IN 1991 AQAP

ARCHITECTURAL COATINGS
RULE #4601 (ADOPTION: 1Q/96, IMPLEMENTATION: 1Q/98)

Sources Affected: This measure would affect any person who supplies, sells, offers for sale, applies, or solicits the application of any architectural coating. CES 46763 and 46771.

Description of Control Measure**:** Options for strengthening the current rule include, but are not limited to the following:

1) Only exempt small containers of coatings with capacities of one liter or less which are marketed prior to the date of adoption of the rule;

2) Limit the VOC content of quick dry primers to 350 grams per liter (less water and exempt compounds, and excluding any colorant added to tint bases); and

3) Limit the VOC content of the following coating to 250 grams per liter, (less water and exempt compounds, and excluding any colorant added to tint bases):

    a) enamel undercoaters
    b) quick dry enamels

This control measure is expected to provide approximately 1.51 tons/day in VOC emissions reductions by 1999.

COMMERCIAL CHARBROILING
RULE #4692 (ADOPTION: 2Q/96, IMPLEMENTATION 2Q/98)

Sources Affected: Restaurants and fast-food establishments where charbroilers are used. CES 60418.

Description of Control Measure: Several technologies are available to reduce emissions from commercial charbroilers. Outlined below are examples of currently available technological options. Using a combination of options (1) through (3) or option (4) alone, as outlined below, emissions can be reduced by up to 90 percent or more. Different methods or devices which provide equivalent reductions would also be acceptable.

1) Grease extracting exhaust hoods that are at least 95 percent efficient in trapping, capturing or removing emissions.

2) Installation of an electrostatic precipitator downstream from the exhaust hood with a minimum collection efficiency of 90 percent. This will further reduce grease particle emissions while curbing smoke particle emissions as well. (For wall-mounted hoods the grease extractor and precipitator can be integrated into one unit).

3) An additional control device downstream from the precipitator (whether the precipitator is free-standing or part of a combined grease extractor/precipitator device) which will reduce VOC emissions. This device can take the form of either an adsorption filter system or an afterburner with a minimum VOC destruction efficiency of 95 percent.

4) Replace existing charbroilers with grooved griddles. Although these griddles cannot be a substitute for all methods of broiling (e.g. some fast food restaurants use a conveyor-type flame broiler), they impart a similar appearance and flavor on the hamburger patties. Although the emission reductions for these griddles are unknown at this time, a representative of Wolfe Range Company claims that their product prevents 100 percent of the dripping fat from being burned (Halliburton, 1987). Emissions confirmation testing of these griddles is necessary to further clarify the emission reduction potential of their use.

This control measure is expected to provide approximately 0.39 tons/day in VOC emissions reductions by 1999.

GLASS MELTING FURNACES
RULE #4354 (ADOPTION: 1Q/96, IMPLEMENTATION 4Q/99)

Sources Affected: Glass melting furnaces. SCC 30501401, 30501402, 30501403, 39000599, 39000699.

Description of Control Measure: The proposed control measure is expected to achieve reductions in NOx emissions from glass melting furnaces. There are four basic ways to achieve emissions reductions from these sources. Burner modifications to reduce excess air is a widely used NOx reduction technique. Electric boost is a method in which an electric current is passed through the glass in the furnace, heating the glass mixture by electrical resistance. Increased use of cullet, or scrap glass, is a third method of reducing NOx. Thermal DeNox would also require the injection of hydrogen to expand the workable temperature range. This control measure is expected to provide approximately 2.87 tons/day in NOx reductions by 1999. It should be noted that the District recently adopted a RACT rule which may provide approximately 0.80 tons/day in emission reductions. These reductions will overlap to some degree with the estimated 2.87 tons/day in emission reductions from the proposed control measure. Furthermore, the RACT rule will be implemented prior to the proposed measure. Because of the operational characteristics of glass melting furnaces, full implementation will likely extend past 1999.

GRAPHIC ARTS
RULE #4607 (ADOPTION: 4Q/95, IMPLEMENTATION: 4Q/97)

Sources Affected: This measure would affect six types of printing processes: lithography, letterpress, intaglio, gravure, screen printing, and flexographic printing. CES 66829. SCC 40201301, 40500304, 40500305, 40500511.

Description of Control Measure: Options for strengthening the current rule include, but are not limited to the following:

1. eliminating or lowering the 75 lbs VOC/day exemption;

2. increasing the efficiency of collection systems and control devices; or

3. lowering the maximum allowable VOC content of inks, coatings. adhesives, and fountain solutions.

This control measure is expected to provide approximately 0.84 tons/day in VOC emissions reductions by 1999.

LANDFILL GAS CONTROL
RULE #4642 (ADOPTION: 1Q/95, IMPLEMENTATION: 4Q/99)

Sources Affected: New and existing solid waste landfills. CES 57281.

Description of Control Measure: This control measure may require the installation of gas recovery systems at landfill sites to minimize VOC escaping through the surface of the landfill. New and existing landfill operators may be required to design and operate their facility in a manner that would allow maximum potential recovery of landfill gas. Processing of the collected gas to separate methane (to provide additional natural gas supplies) might be a requirement for new facilities. The District would encourage disposal of the non-methane portion by a method maximizing VOC destruction while minimizing other emissions. Reinjection of non-methane gas into the landfill would not be permitted. Based on the ARB's Suggested Control Measures for Landfill Gas Emissions, this control measure is expected to provide approximately 1.41 tons/day in VOC emissions reductions by 1999.

OIL WELL DRILLING RIGS
RULE #4412 (ADOPTION: 2Q/96, IMPLEMENTATION: 2Q/98)

Sources Affected: Oil well drilling rig engines. CES 82198. Drilling rigs employ diesel engines to generate electrical and mechanical power. Drilling rig engines are rated up to 850 bhp.

Description of Control Measure: This control measure would establish NOx emission standards for engines used in oil well drilling. Compliance will be achieved by retrofit of control devices; replacement of older engines with newer, cleaner-burning engines; or through the use of grid electricity. This control measure is expected to provide approximately 0.87 tons/day in NOx emissions reductions by 1999.

ORGANIC LIQUID STORAGE
RULE #4623 (ADOPTION: 1Q/95, IMPLEMENTATION, 4Q/96)

Sources Affected: Organic liquid storage tanks. SCC and CES are shown below.

SCC:	40300101	40300102	40300103	40300104	40300106	40300107
	40300116	40300150	40300151	40300152	40301010	40301012
	40300201	40300203	40300207	40301102	40301105	40301107
	40301109	40400301	40400302	40400304		

CES: 46458

Description of Control Measure: This control measure would require control for each applicable tank. Applicability of the control requirements will be based on vapor pressure of the liquid stored, size of the tank, and operational parameters. A pressure relief valve, floating roof, or vapor collection and control system would be necessary to meet the control requirement. This measure is currently under rule development and is expected to provide approximately 3 tons/day in VOC emissions reductions reduction by 1999.

ORGANIC SOLVENT DEGREASING
RULE #4662 (ADOPTION: 1Q/96, IMPLEMENTATION: 1Q/98)

Sources Affected: This measure would affect cold degreasers, remote degreasers, wipe cleaning, conveyorized degreasers, and vapor degreasers. CES 46813, 46821, 46839, 46847, 46854. SCC 40100399.

Description of Control Measure: Options for strengthening the current rule include, but are not limited to the following:

1. prohibiting the use of non-exempt compounds in solvents that are used for degreasing; this may necessitate the use of additional control equipment to reduce VOC emissions by at least 95%;
2. requiring the use of solvents with very low levels of volatility;
3. requiring the use of alkaline or emulsion type degreasers;
4. requiring the use of industrial grade detergents, which are typically used with industrial washers;
5. requiring a recycling system that is 95% or more efficient overall.

This control measure is expected to provide approximately 2.44 tons/day in VOC emissions reductions by 1999.

ORGANIC SOLVENT WASTE
RULE #4663 (ADOPTION: 2Q/96, IMPLEMENTATION: 2Q/98)

Sources Affected: This control measure would affect the disposal of any volatile organic compounds (VOC). It affects primarily those sources that use solvents for surface coating, printing, dyes, resin diluents, or adhesives. CES 82065.

Description of Control Measure: This control measure would establish more restrictive limits on evaporative emissions of waste solvents. Operators can reduce emissions by changing materials or production processes, or by disposing of waste solvent via an approved technique. Approved techniques may include destructive treatment, including thermal oxidation, and removal of toxic or flammable constituents prior to disposal in hazardous waste landfills. This control measure is expected to provide approximately 0.19 tons/day in VOC emissions reductions by 1999.

SMALLER BOILERS, STEAM GENERATORS, AND PROCESS HEATERS
RULE #4306 (ADOPTION: 3Q/95, IMPLEMENTATION: 4Q/99)

Sources Affected: Gaseous fuel or liquid fuel fired boilers, steam generators, or process heaters with rated heat input greater than 5 million Btu per hour.
The following SCC codes may be affected:

10200401	10200402	10200403	10200501	10200502	10200503
10200603	10200701	10200799	10200902	10201002	10201201
10300401	10300402	10300501	10300502	10300503	10300603
30290003	30600101	30600103	30600104	30600105	30600106
31000402	31000403	31000404	31000411	31000412	31000414
39000499	39000599	39000603	39000689	39000699	39000889
39001099					

The following CES codes may be affected:

47142	47159	47167	58727	66795	66803
82073	82081	83071			

Description of Control Measure: Draft Rule #4306 will limit emissions of oxides of nitrogen from boilers, steam generators, and process heaters for smaller units than are currently affected by District Rule No. 4305. It is expected that this rule will provide approximately 7.6 tons/day in NOx emissions reductions by 1999. A recent model run shows that reductions in oilfield NOx emissions from this proposed Rule from the area west of Interstate - 5 in Kern, Kings, and Fresno Counties are not needed to reach the federal ozone standard. Although the emissions reduction estimate shown is based on the Valleywide implementation of the proposed control measure, the District is not taking credit for westside oilfield NOx reductions in its Attainment Demonstration Plan. Any Rules implementing this control measure submitted for inclusion in the District's SIP will not propose federal applicability for westside oilfield NOx sources.

SMALLER PRINTING OPERATIONS
RULE #4611 (ADOPTION: 4Q/95, IMPLEMENTATION: 4Q/97)

Sources Affected: Photocopying shops, retail print shops, and other small industrial and commercial establishments. CES 46862.

Description of Control Measure: Several options exist for reducing VOC emissions from small printing operations:

1. limit the amount of solvents that can be used daily;

2. require 85% control of emissions;

3. require the use of ink containing non-reactive solvents (exempt compounds).

This control measure is expected to provide approximately 0.30 tons/day in VOC emissions reductions by 1999.

STATIONARY INTERNAL COMBUSTION ENGINES
RULE #4702 (ADOPTION: 2Q/95, IMPLEMENTATION: 4Q/99)

Sources Affected: This Control measure will affect stationary internal combustion engines. SCC 20200202, 20300201, 20300101.

Description of Control Measure: This control measure will establish emissions limits and reduction requirements for stationary piston engines. Specific emission limitations may be set for several engine types. It is expected that this rule will provide approximately 12.44 tons/day in NOx emissions reductions by 1999. A recent model run shows that reductions in oilfield NOx emissions from this Rule from the area west of Interstate - 5 in Kern, Kings, and Fresno Counties are not needed to reach the federal ozone standard. Although the emissions reduction estimate shown is based on the Valleywide implementation of the proposed control measure, the District is not taking credit for westside oilfield NOx reductions in its Attainment Demonstration Plan. Any rules implementing this control measure submitted for inclusion in the District's SIP will not propose federal applicability for westside oilfield NOx sources.

STATIONARY STORAGE TANKS
RULE #4621 (ADOPTION: 2Q/96, IMPLEMENTATION: 2Q/98)
and
FUEL TRANSFER INTO VEHICLE FUEL TANKS
RULE #4622 (ADOPTION: 2Q/96, IMPLEMENTATION: 2Q/98)

Sources Affected: Gasoline dispensing stations, sources with storage tanks with capacities between 250 and 2,000 gallons, or facilities served by an exempted bulk plant. CES 46532, 46540, 46557, 46565.

Description of Control Measure: Options to strengthen the current rule include the following:

Phase I - Gasoline facilities previously served by exempt bulk plants will no longer be exempt from Phase I control requirements. Reduce the capacity exemption from 2,000 to 250 gallons for all storage containers in the District. Remove the current exemptions so that most storage tanks are required to be equipped with Phase I vapor recovery systems.

Phase II - Require Phase II vapor recovery systems on tanks larger than 250 gallons in capacity. Modifications to require 95% efficient Phase II systems on all facilities regardless of monthly throughput. Requirement of all existing storage containers that have Phase II vapor recovery systems designed to achieve 90% or greater emission reduction to be replaced with 95% efficient systems during normal replacement of components or within two years, whichever occurs first. Various gasoline dispensing facilities previously served by exempt bulk plants will no longer be exempt from Phase II control requirements.

95% control of 10% of current emissions is expected from this rule. This control measure is expected to provide approximately 0.41 tons/day in VOC emissions reductions 1999.

WASTE BURNING

Open burning, including agricultural and forestry burning is included under CES codes 47241, 47258, 47282, 47266, and 47274. District emissions are shown to grow from 20.16 tons in 1990 to 21.26 tons in 1999, in the Planning Emissions Inventory. It should be noted, however, that there is much uncertainty in this area of the Emissions Inventory. A recent survey conducted by UC Davis, for the California Air Resources Board (documented in California Agriculture, Volume 45, Number 4), estimated that annual emissions from burning field crops were about 1,340 tons per year (hydrocarbons) for the District.

Using the seasonal splits provided in the UC Davis survey, spring through fall emissions for hydrocarbons in the District would be approximately 2.3 tons per day from agricultural burning. This is considerably less than the 11.4 tons per day VOC currently shown in the Planning Emissions Inventory developed by ARB. The results of the recent survey may reflect the effect of the District's agricultural burn regulations as well as the increased consumption of agricultural residue by biomass-fueled cogeneration facilities.

According to the Federal Implementation Plan (FIP) recently proposed by the EPA for Sacramento, one way to control waste burning emissions that may impact ozone levels, would be a prohibitory waste burning program. The program would allow waste burning only during the period of the year during which ozone levels are well within the state standard. It would supplement current regulations in place and prohibit burning during the ozone season, typically May through October. The EPA's second alternative is to prohibit waste burning on days when ozone concentrations are expected to be at high levels (e.g., exceed the state ambient air quality standard of 0.09 ppm).

Emissions reductions that would result from this measure within the District are undetermined at this time. These strategies represent a time shift in emissions, and may not reduce annual emissions. In the FIP, the EPA estimates a 50% reduction in VOC emissions following the daily no-burn strategy. Given that the District currently prohibits burning on days that approach the federal standards, and since the model uses a more representative emissions estimate (3.02 tons/day) for this source, it is not likely that enhancement of the Districts agricultural burn policy would provide significant emissions reductions toward attainment. The District will, however, evaluate the

feasibility of achieving VOC emissions reductions from its PM-10 waste burning control measure.

WELL CELLARS
RULE #4411 (ADOPTION: 2Q/96, IMPLEMENTATION: 2Q/98)

Sources Affected**:** Oil production well cellars. CES 82016.

Description of Control Measure: This control measure may prohibit the storage of petroleum liquids in well cellars except during periods of equipment maintenance or well workover. The District will require an operator-run inspection and maintenance (I&M) program to assure compliance.

The most effective way to control emissions from well cellars is through an impervious lining, preferably concrete, and to keep the well cellars evacuated. This control measure is expected to provide approximately 0.56 tons/day in VOC emissions reductions by 1999.

STATE IMPLEMENTED MEASURES

Enhanced I & M

The state's memorandum of agreement with the EPA requires full implementation of the enhanced inspection and maintenance program (I & M) by January 1, 1996. The program will apply to the Fresno and Bakersfield metropolitan areas. The ARB staff has provided preliminary estimates that enhanced I & M would provide approximately 5.0 tons/day in NOx emissions reductions and 5.7 tons/day in VOC emissions by 1999 in the Fresno and Bakersfield areas. The District is also proposing that enhanced I & M apply to the Stockton and Modesto urbanized areas. It is estimated that applying enhanced I & M to these areas would provide additional NOx reductions of approximately 3.2 tons/day and VOC reductions of about 3.8 tons/day if implemented by the year 1999. Total reductions would be approximately 8.2 tons/day NOx and 9.5 tons/day in VOC emissions.

Pesticides

The California Department of Pesticide Regulation has proposed a statewide measure that is to be submitted to EPA as part of California's SIP revision. Estimated emissions are 63.96 tpd in 1990 and 69.28 tpd in 1999. Assuming a 20% reductions in affected sources, the reductions are estimated at 13.2 tpd.

Pesticides are divided into three main areas: agricultural use, nonagricultural use, and consumer products. The breakdown by CES is shown as follows:

CES	1990 VOC	1999 VOC	Subject to the Proposed Rule
83212 - Agricultural Synthetic Pesticides	30.69	30.69	Yes
83220 - Agricultural Nonsynthetic Pesticides	11.81	11.81	Yes
82271 - Agricultural Residual Synthetic Pesticides	0.15	0.15	Yes
82289 - Agricultural Residual Nonsynthetic Pesticides	1.49	1.49	Yes
83329 - Creosote Application	1.17	1.54	Yes
83261 - Other (Nonagricultural) Synthetic Pesticides	1.12	1.47	Yes
83279 - Other (Nonagricultural) Nonsynthetic Pesticides	16.14	20.69	Yes
83303 - Other (Nonagricultural) Residual Synthetic Pesticides	0.00	0.00	Yes
83311 - Other (Nonagricultural) Residual Nonsynthetic Pesticides	0.00	0.00	Yes
83238 - Aerosol Consumer Product Pesticides - Propellants	0.36	0.37	No
83246 - Aerosol Consumer Product Pesticides - Ingredients	1.03	1.07	No
Totals	63.96	69.28	

FEDERAL MEASURES

Aerosol Coatings

The EPA has proposed a statewide aerosol paint rule based on a draft regulation workshopped by the ARB on November 10, 1993. According to the EPA, the proposed FIP measure will be published prior to the ARB's adoption of its regulation. In the FIP (p.234), the EPA estimates that aerosol spray paints accounted for approximately 25 tons/day of 1990 VOC emissions in California and that the control measure will achieve a 60% reduction by 2005 (50% by 1999).

If District emissions are representative of the rest of the state, they would equal 2.26 tons per day (1990) growing to 2.31 tons/day in 1999. Applying a 50% control to the projected 1999 emissions would result in a 1.15 tons/day VOC emissions reductions from the proposed state/federal measures by 1999.

Heavy-Duty Non-road Engines

The FCAAA gives the EPA exclusive jurisdiction over most new non-road farm and construction equipment and permits it to regulate those sources if their emissions are determined to be significant. District NOx emissions for 1999 from these sources (including heavy-duty farm and non-farm equipment) are projected at 46.5 tons/day, which represents a significant part of its inventory. Accordingly, the federal government's active and effective efforts in setting appropriate national standards for these sources is essential if the District is to achieve the NAAQS objectives.

The EPA has proposed to regulate heavy-duty non-road engines by phasing in new engine standards on a national basis by engine size over four years beginning January, 1996. In a letter to the ARB dated May 4, 1994, the EPA indicated that it would soon issue guidance on what assumptions SIPs may make respecting the forthcoming national non-road engine and vehicle controls. In that letter, the EPA further states that California SIPs will be allowed to claim emissions reduction credits in accordance with the national guidance for these controls.

The guidance has not been provided. Accordingly, it is not possible to estimate the reductions that will occur due to the implementation of this control measure. Although the lack of guidance from the EPA makes it difficult to assess the effectiveness of its proposed control measure, it is expected that the associated reductions will facilitate the attainment and maintenance of NAAQS in the District.

Heavy-Duty Truck and Bus Standards

Heavy-duty mobile sources (trucks and heavy duty vehicles) are large contributors, especially for NOx, to the emissions inventory in the District. NOx inventory contributions continue to be significant largely because heavy-duty engine NOx standards have been introduced relatively recently and because of continued high levels of heavy duty vehicle miles travelled. In addition, heavy-duty NOx standards are significantly less stringent than light-duty standards due to the historical inability of heavy-duty diesel engines to attain low NOx levels. The VOC contribution from heavy-duty engines, although smaller than the NOx contribution, is also a significant part of the inventory. Given the interstate nature of the trucking industry the EPA in effect sets California standards for long haul trucks.

Heavy duty diesel NOx emissions within the District are anticipated to decrease slightly from 87.83 tons/day in 1990 to 72.69 tons/day in 1999. This is contrasted to other on-road mobile sources which show substantial declines in emissions during that time period. As a result, the relative proportion of on-road mobile NOx emissions for heavy

duty diesel trucks rises from 35% to 41% of the total on-road motor vehicle inventory by 1999.

The EPA has recently proposed an enhanced in-use compliance program for on-highway heavy-duty engines which consists of several components: More stringent emission standards, new full useful life requirements, high-emitting interstate truck regulations, expanded recall scope, a fleet averaging program, and I & M for certain vehicle classes. In the recent California FIP, the EPA states that if the 1999 attainment option is selected for Sacramento, fleets registered in California would be required, after 1997, to have an average gram per brake horsepower-hour level of no more that 5 grams. It estimates that the measure, if implemented, could provide a 6 ton/day NOx reduction for the Sacramento area by 1999, but the baseline emissions estimate used to generate the NOx reduction is not clearly identified in the FIP document.

The EPA has provided no guidance on estimating the emissions reductions that might occur from its proposed measures. Further, it is not known if and when they will actually be implemented. Although the lack of guidance from the EPA makes it difficult to assess the effectiveness of its proposed control measure, it is expected that the associated reductions will facilitate the attainment and maintenance of NAAQS in the District.

Locomotives

Pursuant to Section 213(a)(5) of the Act, the EPA is required to promulgate regulations containing standards applicable to emissions from new locomotives and engines used in locomotives by November 15, 1995. These regulations will apply to newly manufactured locomotive engines beginning in the year 2000, and may also apply to the remanufacture of engines which were made since approximately 1973. According to information cited in the Draft Santa Barbara ROP/Attainment Demonstration, existing technology alone can achieve up to 30% reductions in NOx emissions. Emissions from locomotives within the District are shown under CES 47597 (Railroad Line Haul Operations) at 22.6 tpd NOx emissions per day for 1999. A 30% reduction in 1999 emissions would result in 6.8 tons/day in NOx emissions reductions. These reductions would only occur by that time, however, with an accelerated implementation of stringent standards by the EPA. It is expected, however, that reductions soon after the attainment deadline due to measures affecting locomotives will help the District to maintain its attainment post-1999. The federal government's active and effective efforts in setting appropriate national standards for these sources is essential if the District is to achieve the NAAQS objectives.

SUMMARY OF EMISSIONS REDUCTIONS

The following table summarizes the potential emissions reductions that will result from the implementation of all the control measures described in this Plan, at their expected efficiency, by 1999. The table also shows the implementation date for each listed control measure.

Table 4-1
Control Measures Proposed for Attainment Demonstration

CONTROL MEASURE	ANTICIPATED ADOPTION DATE	IMPLEMENTATION DATE	1990 Control Efficiency (%)	New Control Efficiency (%)	NOx REDUCTIONS	VOC REDUCTIONS
DISTRICT MEASURES						
Components Serving Gas Production Facilities, Rule #4403 (Adopted 2Q/91)	2Q/91	2Q/91	0	54	N/A	4.55
Stationary Gas Turbine Engines Rule #4703 (Adopted 8/18/94)	3Q/94	3Q/2000	0	24	11.92	N/A
Adhesives, Rule #4653 (Adopted 1Q/94)	1Q/94	1Q/95	0	50	N/A	1.3
Organic Liquid Storage #4623 (Adopted 2Q/91)	2Q/91	2Q/96	0	76	N/A	13.2
Transportation Control Measures	ongoing	ongoing	N/A	N/A	1.5	1.8
Architectural Coatings (AQAP), Rule #4601	1Q/96	1Q/98	52	56	N/A	1.51
Commercial Charbroiling (AQAP), Rule #4692	2Q/96	2Q/98	0	72	N/A	0.39

Table 4-1
Control Measures Proposed for Attainment Demonstration

CONTROL MEASURE	ANTICIPATED ADOPTION DATE	IMPLEMENTATION DATE	1990 Control Efficiency (%)	New Control Efficiency (%)	NOx REDUCTIONS	VOC REDUCTIONS
Glass Melting Furnaces (AQAP), Rule #4354 [3]	1Q/96	4Q/99	0	18	2.87	N/A
Graphic Arts (AQAP), Rule #4607	4Q/95	4Q/97	61	70	N/A	0.84
Landfill Gas Control (AQAP), Rule #4642[1]	1Q/95	4Q/99	0	36	N/A	1.41
Oil Workover Rigs (AQAP), Rule #4412	2Q/96	2Q/98	0	40	0.87	N/A
Organic Liquid Storage (AQAP), Rule #4623[1]	3Q/95	3Q/98	0	50	N/A	3.0
Organic Solvent Degreasing (AQAP), Rule #4662	1Q/96	1Q/98	70	77	N/A	2.44
Organic Solvent Waste (AQAP), Rule #4663	2Q/96	2Q/98	0	60	N/A	0.19
Smaller Boilers,	3Q/95	3Q/99	34	50	7.6	N/A

[3] Implementation may extend beyond 1999.

Table 4-1
Control Measures Proposed for Attainment Demonstration

CONTROL MEASURE	ANTICIPATED ADOPTION DATE	IMPLEMENTATION DATE	1990 Control Efficiency (%)	New Control Efficiency (%)	NOx REDUCTIONS	VOC REDUCTIONS
Process Heaters and Steam Generators (AQAP), Rule #4306						
Smaller Printing Operations (AQAP), Rule #4611	4Q/95	4Q/97	0	6	N/A	0.30
Stationary IC Engines (AQAP), Rule #4702 [4]	2Q/95	4Q/99	1	48	12.44	N/A
Stationary Storage Tanks/Fuel Transfer into Vehicle Fuel Tanks (AQAP), Rules #4621 & 4622	2Q/96	2Q/98	91	92	N/A	0.41
Waste Burning	ND	ND	ND	ND	ND	ND
Well Cellars (AQAP), Rule #4411	2Q/96	2Q/98	0	40	N/A	0.56
Total for District Implemented Control Measures					37.2	31.9

[4] Implementation may extend beyond 1999.

Table 4-1
Control Measures Proposed for Attainment Demonstration

CONTROL MEASURE	ANTICIPATED ADOPTION DATE	IMPLEMENTATION DATE	1990 Control Efficiency (%)	New Control Efficiency (%)	NOx REDUCTIONS	VOC REDUCTIONS
STATE MEASURES						
Enhanced I & M		1996	N/A	28	8.2	9.5
Pesticides		1996	0	20	N/A	13.2
Total for State Implemented Control Measures					8.2	22.7
FEDERAL MEASURES						
Aerosol Coatings		1996	N/A	N/A	N/A	1.1
Heavy-Duty Truck and Bus Standards [5]		1998	N/A	N/A	Not Quantified	Not Quantified
Heavy-Duty Non-road Engines[3]		1996	N/A	N/A	Not Quantified	N/A
Locomotives[3]		2000	N/A	N/A	Not Quantified	N/A
Total for Federally Implemented Control Measures					N/A	1.10

EPA has provided no guidance on estimating associated emissions reductions.

Table 4-1
Control Measures Proposed for Attainment Demonstration

CONTROL MEASURE	ANTICIPATED ADOPTION DATE	IMPLEMENTATION DATE	1990 Control Efficiency (%)	New Control Efficiency (%)	NOx REDUCTIONS	VOC REDUCTIONS
TOTALS					45.40	55.70

Note: N/A indicates not applicable. ND indicates not determined at this time. Reductions in oilfield NOx emissions from Rules 4703, and proposed Rules 4306, and 4702 in the area west of Interstate - 5 in Kern, Kings, and Fresno Counties are not needed to reach the federal ozone standard. Although the emissions reduction estimates shown are based on the Valleywide implementation of the proposed control measures, the District is not taking credit for westside oilfield NOx reductions resulting from the implementation of the existing Rule and proposed control measures in its Attainment Demonstration Plan. Any rules implementing these control measure submitted for inclusion in the District's SIP will not propose federal applicability to westside oilfield NOx sources. The District will also pursue revising the federal applicability of Rule 4703 for westside oilfield NOx sources.

CONTINGENCY MEASURES

The FCAAA require that the Attainment Demonstration include contingency measures to be implemented in the event that the District cannot show attainment by 1999. These measures must be above and beyond those measures required for the District's attainment demonstration. Since the District has included all measures currently known to be feasible in its attainment demonstration, these measures have not undergone the review afforded the proposed control measures. Accordingly, their description and estimated reductions are subject to revision.

The contingency measures proposed for potential implementation by the District are identified below. In the event that the District will need to use the contingency measures identified below to reach milestone and attainment goals, or modify the proposals due to cost effectiveness considerations, they will be replaced with new contingency measures as needed.

Additional Transportation Control Measures/Indirect Source Review

The District will investigate the feasibility of expanding and enhancing the TCMs outlined in Appendix E of the Revised 1993 ROP Plan and in the Post 1996 ROP Plan. Expansion could include increased public education through radio and television advertisements and public speaking appearances by District personnel and others which promote ridesharing, park-and-ride lots, alternative fuel vehicles, and public transit. The District will also investigate the feasibility of expanding its existing indirect source review process with the aim of reducing emissions increases resulting from the increasing vehicle miles travelled (VMT) attributed to growth in the District. It is expected that an aggressive program could reduce emissions from on road motor vehicles 1% from the current 1999 projection and provide an additional 2 tons/day in NOx reductions and 1 tons/day in VOC emissions reductions.

Architectural Coatings

The proposed statewide FIP regulation will phase in lower coating limits from 1996 to 2003. In January 1996, initial limits for approximately 40 coating categories will go into effect. This will be followed by a second reduction phase in the year 2000 with lower limits for select categories including but not limited to: all clear wood finishes [350 grams of VOC per liter (g/l)]; concrete curing compounds (250 g/l); and traffic paints (125 g/l). A third reduction phase in 2003 will lower limits for select categories such as: varnishes (250 g/l); flats (50-150 g/l); many industrial maintenance coatings (275 g/l); non-flats (150 g/l); roof coatings (250 g/l); and traffic paints (50 g/l). In addition, the small container (less than one liter) exemption will be phased out as of the year 2003. The proposed measure in the FIP is estimated to result in a 25% reduction in statewide VOC emissions from architectural coatings at full implementation.

District-based emissions from oil-based architectural coatings for 1990 are shown at 14.25 tons/day in the Planning Emissions Inventory, and are projected to decline to 13.34 tons per day in 1999. The data for 1999 accounts for existing Rule No. 4601, as well as an estimated 8-10% increase in emissions reductions from the existing Rule as envisioned in the 1991 AQAP and previously in this Plan. To some degree, the improvement already proposed in the this Plan would overlap the first phase of the proposed FIP regulation. It is expected, however that improvements to technology, and further measures (i.e., the second phase of the FIP rule) could provide additional reductions in emissions soon after the year 2000.

Assuming that the District's existing (non-contingency) proposal is equivalent to the first phase FIP proposal, and that the second and third FIP phases would provide equal portions of the FIP's proposed 25% reduction, the FIP's second phase would represent an additional 1.2 tons reduction in VOC emissions beyond what is currently anticipated from the District rule. Since the District would be mandated to comply with the statewide rule, these reductions could be reasonably anticipated to occur during the timeframe when they might be needed as a contingency measures should the District fail to achieve attainment.

Bakeries

Area source emissions from commercial bakeries for 1999 are shown in the Planning Emissions Inventory at 0.39 tons per day in the District. The FIP proposes a control measure and projects a 90% emission reduction. The District will investigate the feasibility of a similar measure, which could result in a 0.35 tons/day emissions reductions.

Fugitive Emissions Sources (Chemical/Oil)

This control measure could reduce VOC leaks or fugitive emissions from piping and other equipment at chemical plants, oil and gas fields, and other facilities that handle large amounts of petroleum and gas products. It would affect sources currently affected by District Rule Nos. 4403 (Oil and Gas Production and Gas Processing); 4451 (Petroleum Refineries and Chemical Plants); 4452 (Pump and Compressor Seals); 4621 (Bulk Plants) and others.

Emissions from production and conveying facilities addressed are categorized under Category of Emissions Source (CES) codes: 81968, 81976, 81984, 81992, 82008, 46425, 46441 and others. These sources are projected (with control) to result in 15.95 tpd VOC emissions in 1999.

The FIP and South Coast Air Quality Management District's Air Quality Management Plan (AQMP) both propose further control of these sources. South Coast AQMD estimates an 40% further reduction affecting these sources. A 40% reduction in these emissions in the District would mean 6.38 tons/day in reductions. A 20% reduction would represent approximately 3.2 tons/day in VOC emissions. The measures may be proposed as separate new rules, or could be implemented by proposing improvements to all applicable sections of all related District Rules and/or by increasing enforcement personnel.

The measure would also control fugitive emissions from gas processing plants, refineries, bulk plants, bulk terminals, and chemical plants. These sources are categorized under numerous SIC, CES and source classification codes (SCC), including: CES codes 46466, 46474, 46482, 82248, and 46961, and under standard industrial code (SIC) 2911 and the 2780 series. Remaining Emissions in 1999 are projected (with current control) at 5.63 tons/day. A further 20% reduction in emissions from these sources would result in 1.1 tons per day less VOC emissions. Total emissions reductions from this contingency measure could total approximately 4.3 tons/day in VOC reductions.

Livestock Waste

Two strategies are available to control emissions from this source. These include promoting aerobic conditions, and reducing methane (and VOC) from animal waste. The District has committed to evaluate the feasibility of a control measure affecting livestock waste, as a PM_{10} control measure, in the Serious Area PM_{10} SIP submittal. It

is not known at this time, however, to what degree livestock waste measures for PM_{10} and VOC emissions reductions could complement each other.

Methods for reducing VOC emissions by promoting aerobic decomposition of livestock waste include aerating manure storage piles by physically turning them every three to seven days, scraping feedlots at least three times per year, and spreading an oxidizing agent on feedlots. The FIP estimates that these methods would reduce VOC and methane emissions by approximately 25 percent, based on knowledge of aerobic decomposition processes. EPA-estimated costs of implementing these measures are from $7,500 to $10,000 per year per farm.

The FIP also discusses methane recovery and utilization systems, which are considered by the EPA to be the most viable options for reducing methane emissions from livestock manure. Technologies for accomplishing methane recovery include covered lagoons, plug flow digesters, and complete mix digesters. These methods are estimated to reduce methane emissions from livestock waste by 80 percent and are currently used at 23 known locations in the U.S. According to the EPA, these include a covered lagoon used at a swine facility in the Tulare area and a plug flow digester used at a dairy in the Modesto area. No complete mix digesters are currently being used in California.

Common utilization equipment includes gas-fired boilers and chillers, and generators for electricity production. Utilization of the recovered off-gas can create on-farm profits resulting from avoided energy costs and sales of excess electricity to the local utility. The profitability of selling excess electricity, however, is subject to local utility "buy back" rates.

Livestock Waste (CES 66605) shows 6.95 tons in emissions for 1990 and 1999. A control measure achieving a 25% emissions reduction will reduce VOC emissions by about 1.7 tons/day in 1999. Problems associated with implementing a related control measure will include coordination with PM_{10} related measures.

Service Stations

Affected sources are regulated by District Rule Nos. 4621 and 4622. District-wide emissions from affected sources (CES 46532, 46540, and 46557) total 3.84 tons/day in 1990, declining to 3.69 tpd in 1999. The District's 1991 AQAP proposes to strengthen the current rules affecting these sources. The FIP proposes similar improvements to rules in the FIP areas. The District anticipates a 9.5% reduction in emissions compared to the FIP's 22-40% estimate.

Improvements could include removing existing exemptions for off-highway dispensing facilities, phasing out inefficient components, and the installation of pressure vacuum valves. The EPA anticipates that the largest emission reduction will be achieved through the elimination of exempted sources, which are assumed to represent 4.4 percent of a given county's throughput. Since uncontrolled emission factors are up to 20 times higher than controlled factors, exempted facilities (in the FIP areas) are estimated to contribute 15 to 26 percent of the total service station emissions in the 1990 base year inventory.

District Rule No. 4621 has several exemptions not included in the proposed FIP rule. These include tanks under 2,000 gallons in capacity, and other tanks installed prior to 1975. If the District's proposed AQAP measure was consistent with the FIP proposal, it is expected that it would result in similar reductions. A 30% decrease in emissions would represent 1.10 tons/day less VOC emissions by 1999. This is about .83 tons more than anticipated in the AQAP.

Very Small Boilers, Steam Generators, and Process Heaters

Sources Affected: Gaseous fuel or liquid fuel fired boilers, steam generators, or process heaters with rated heat input between 2 and 5 million Btu per hour.

Description of Control Measure: Draft Rule #4306 (previously described) will limit emissions of oxides of nitrogen from boilers, steam generators, and process heaters with greater than 5 million Btu per hour. It has been proposed by at least one air district (South Coast Air Quality Management District) that much smaller devices can be controlled. Controlling very small boilers, process heaters and steam generators in the San Joaquin Valley Unified APCD will provide emissions reductions beyond those already anticipated with Draft Rule No. 4306. Draft Rule 4306 is expected to provide approximately 7.6 tons/day in NOx emissions reductions before 1996.

Given their small size, many of the sources that would be affected by a further enhancement to draft Rule 4306 are not included in the District's point source inventory. The uncertainty in the emissions inventory for related area sources also makes it difficult to estimate the emissions reductions that might result from the implementation of this measure. However, considering area sources only, potentially affected emissions for 1999 are projected to be 21.63 tons/day. Assuming that 20% of the sources within that group could achieve 50% reductions by using low NOx burners, alternate fuel, flue gas recirculation, advanced boiler design, or stack gas treatment techniques would result in an estimated NOx reductions of 2.2 tons/day by 1999. SCAQMD is proposing a similar measure in its Draft 1994 AQMP, and indicates that compliance with this control measure could be achieved through a manufacturer's

certification program. Since this measure could assist in reducing VOC emissions, the District commits to evaluate its feasibility for implementation as a contingency measure.

Westside Oilfield NOx Emissions

Sources Affected: Oilfield NOx emissions in the area west of Interstate - 5 in Kern, Kings, and Fresno Counties.

Description of Control Measure: If it is determined by attainment demonstration modeling that reductions in westside oilfield NOx emissions are needed to reach the federal ozone standard, the District will pursue federal enforceability for rules affecting oilfield NOx emissions in the area west of Interstate - 5 in Kern, Kings, and Fresno Counties. Emissions reductions are not determined at this time.

Wood Burning Boilers

Biomass boilers emit approximately .90 tons per day NOx in the District. The FIP has proposed a measure which would require emissions limits of 70 ppm NOx or a 50% reduction, whichever is less strict, for these sources. District staff will evaluate the feasibility of a proposed control measure, which could result in an additional 0.45 tons/day in NOx emissions reductions.

TABLE 4-2
Contingency Measures

CONTINGENCY MEASURE	ANTICIPATED IMPLEMENTATION DATE	NOx REDUCTIONS	VOC REDUCTIONS
DISTRICT MEASURES			
Architectural Coatings (Further Reductions)	POST 1999	N/A	1.2
Bakeries	POST 1999	N/A	0.35
Expanded TCMs	POST 1999	2	1
Fugitive Emissions Sources (Chemical/Oil)	POST 1999	N/A	4.3
Livestock Waste	POST 1999	N/A	1.7
Service Stations	POST 1999	N/A	.83
Very Small Boilers, Process Heaters and Steam Generators	POST 1999	2.2	0
Westside Oil Field NOx Emissions	POST 1999	ND	N/A
Wood Burning Boilers	POST 1999	0.45	N/A
TOTAL		4.65	9.38

Note: ND indicates not determined at this time.

PLAN IMPLEMENTATION AND TRACKING

By adoption of this attainment demonstration, the District's Governing Board commits resources to develop, adopt, and implement the control measures named in this document affecting point, area, and mobile sources within its jurisdiction. The District also commits to evaluate the feasibility of the contingency measures identified in the Plan and to implement those measures, or subsequently identified substitutes, if a failure to show attainment is determined by the EPA. In order to track emission reductions, the District will work with EPA staff to develop and implement an annual tracking program to monitor the District's progress in meeting projected annual emission reductions needed for attainment. The District Governing Board further commits to work with the EPA and the ARB to facilitate the implementation of EPA and ARB measures necessary to achieve attainment of NAAQS within the District.

If all the measures proposed in this Plan are adopted and implemented by 1999, and all projected reductions are achieved, the District will be in attainment of NAAQS for ozone by 1999. However, as discussed in the introduction to this chapter, there is uncertainty inherent in the model projections and in projecting trends forward to that time. Accordingly, the District commits to identify and implement contingency measures if attainment is not reached, and to track and monitor Plan implementation with the ARB and EPA to ensure that continued progress toward attainment is achieved.

MODELING INTRODUCTION

The purpose of the ozone model is to predict the effect of changes in emissions on the levels of ozone. SAQM was analyzed by performing a series of simulations where emissions at the levels observed in 1990 were reduced to observe the effects on ozone concentrations. Further analysis was conducted by estimating the level of emissions which are expected to exist in 1999 from the effect of rules which have already been adopted by the District and the ARB. Model predictions of future levels of ozone from changes in emissions are used to determine how much additional reduction of emissions is needed to prevent exceedances of the ozone NAAQS. Proposed reductions can be simulated by the model to observe the effect on air quality which can be expected to occur if the proposed reductions are implemented.

The control measures discussed in this chapter were introduced into the emissions projections for 1999. Projection of future emissions is inherently of limited accuracy. Differences in actual emissions changes that occur in the future may provide more or less reduction of emissions than has been estimated at this time.

To ensure that excessive reductions are not proposed, the District and the ARB reevaluated the projections used to predict emissions levels in the year 1999. Revisions were made to growth estimates for diesel emissions and oil production, where the preliminary estimates over-predicted the emissions likely to remain in 1999. The District also reviewed and made revisions for changes in Valley emissions that are not expected to follow historical trends. For example, the closure of Castle Air Force Base will decrease government-military-aircraft emissions. Technical aspects of the model were also examined. The boundary conditions established for the 1990 Base Case were reevaluated. The boundary conditions would also be expected to improve by 1999 due to reduction of emissions occurring throughout California. Modeling simulations were performed to evaluate this conservative assessment of reductions necessary to reach attainment in 1999.

MODELING RESULTS

All predictions made at this time used the first version of SAQM. The model is in early stage of testing and is expected to be improved by technical projects scheduled for completion during late 1994.

The simulations to determine attainment included the anticipated effects of rules currently adopted by the state and the District including reductions for implementation schedules for future years and all of the proposed actions discussed in this chapter.

Ozone Levels from Local Emissions

The District is directly responsible to take action sufficient to prevent exceedances of the federal ozone standard which are caused solely by local emissions, and must take additional actions in partnership with the state and upwind air districts to meet the federal ozone standard when air movement transports significant levels of emissions into the San Joaquin Valley from upwind air basins.

A modeling simulation was conducted with 1999 emissions with the proposed additional reductions with the anthropogenic sources of emissions in the San Francisco Bay and Sacramento areas "turned off". Biogenic emissions were not changed. This simulation was performed to look at ozone levels which would occur in the San Joaquin Valley without an influx of upwind urban emissions. The interbasin transport simulation which simulated ozone levels in the absence of anthropogenic emissions from the San Francisco Bay and Sacramento areas, showed attainment of federal standards by the year 1999.

The result of this simulation means that emissions released in the San Joaquin Valley are sufficiently reduced by implementation of the proposed actions. From the 1990 analysis we learned that Fresno and Bakersfield would have experienced federal ozone exceedances even without transport from the San Francisco Bay and Sacramento areas. From the 1999 analysis without further action by the District from 1994 to 1999, the model showed attainment levels throughout the Valley except for very small areas in Fresno and Kern Counties that are slightly above the federal standard. These simulations indicated that additional actions were needed, and the simulation of proposed actions indicates that the additional measures that were identified would be sufficient to reach attainment by 1999.

With the additional regulations, conservative estimates of future emissions, the model simulation for ozone levels generated by "local" emissions showed attainment of the federal ozone standard by the year 1999. Ozone levels caused by local emission are projected to be at or below the ozone NAAQS by 1999. This meets the timeframe required for attainment, but the District is responsible to take actions in partnership with the state and upwind districts to achieve attainment even when significant emissions are transported by air movement into the San Joaquin Valley from other areas of the state.

Ozone Levels with Interbasin Transport

Initial simulations for 1999, with boundary conditions well above EPA default values, show the Valley to be close to attainment. With ARB projections of actions in the upwind districts, the proposed additional regulations, and conservative estimates of future emissions in the San Joaquin Valley, and ARB recommended values for boundary conditions, the model simulations for ozone levels in the "transport" case show attainment of the federal ozone standard by the year 1999. Meeting this second test is the final goal required by the EPA for the Attainment Demonstration Plan.

The District is usually very conservative when making predictions of reductions that will be achieved by implementation of regulations. The ARB requires reductions to be substantiated before they are included in emissions projections; therefore, the future year estimates for other counties in the modeling domain may also be conservatively high. This provides additional confidence that attainment will be achieved by 1999 if the rule implementation schedules that were used by the ARB to project 1999 emissions for the upwind districts are not relaxed.

DISCUSSION

The proposed emissions reductions were used in modeling simulations to determine if the reductions are sufficient to achieve attainment. Regional air quality models are not sensitive to small changes in emissions. Therefore, unless the differences between estimated and actual reductions are a considerable tonnage change in some portion of the modeling domain, the modeling simulations should provide a reliable projection of attainment. The ongoing program of model testing and development may produce revisions to the model which could affect the findings. Model revisions may indicate that more or less reductions are needed to reach attainment. In the event that less reductions are shown needed to reach attainment, the District may propose revision to its SIP as regards the federal applicability of its adopted rules.

Modeling with the first version of SAQM for the proposed actions indicates that attainment will be achieved by 1999. Modeling demonstrates that the proposed measures will contribute toward attainment of the NAAQS, but since the ozone predictions are close to the ozone NAAQS, the proposed actions do not contain an excessive level of reductions. However, the lack of sensitivity of regional models to small emissions changes may allow some latitude in establishing the reductions required for proposed control measures which have not completed the rule development and adoption process.

A number of uncertainties remain to be evaluated to improve the performance of the model. If revisions to the model substantially change the predicted ozone levels, revision of the Attainment Demonstration Plan may be required.

CONCLUSIONS

With the additional regulations, and conservative estimates of future emissions, the model simulation for ozone levels generated by "local" emissions showed attainment of the federal ozone standard by the year 1999. With the additional regulations, and conservative estimates of future emissions, the model simulation for ozone levels in the "transport" case are expected to show attainment of the federal ozone standard by the year 1999. Meeting this second test is the final goal required by the EPA for the Attainment Demonstration Plan. Reductions in oilfield NOx emissions from Rule 4703, and proposed Rules 4306 and 4702 in the area west of Interstate - 5 in Kern, Kings, and Fresno Counties are not needed to reach the federal ozone standard. Although the emissions reduction estimates shown in this chapter, and considered in Table 2-1, are based on the Valleywide implementation of the proposed control measures, the District is not taking credit for westside oilfield NOx reductions in its Attainment Demonstration

Plan. Any rules implementing these control measures submitted for inclusion in the District's SIP will not propose federal applicability to westside oilfield NOx sources. The District will also pursue revising the federal applicability of its adopted and proposed NOx rules, which may include but not be limited to Rules 4305, 4703, 4351, 4701, and 4412, for westside oilfield NOx sources.

Simulations Referenced in this Chapter

1999 with proposed controls and revised emissions and boundary projections, without Anthropogenic VOC and NOx from Bay Area and Sacramento - ARB File: s12fulx.a99c15x.msEbTCN.cufE1Da; District File: T1-99BC.5

1999 with proposed controls and revised emissions and boundary projections - ARB File: s12fulx.a99c15x.msEb01.cnfE1Da; District File: A1-99BC.5

1999 with proposed controls and revised emissions and EPA default boundary projections - ARB File: to be determined; District File: A1-99EPA when received

1999 Attainment Demonstration Simulation (12 km) ARB
file: s12fulx.a99c15x.msEbTEN.cufH1Da District File: District Attainment 1

1999 Attainment Demonstration Simulation (4 km) Fresno ARB
file: s04frsx.a99c15x.msEbTEN.cnfH1Dd District File: Fresno Attainment 1

1999 Attainment Demonstration Simulation (4 km) Kern ARB
file: s04bakx.a99c15x.msEbTEN.cufH1Dd District File: Kern Attainment 1

1999 Attainment Demonstration Simulation, without westside NOx controls (4 km) Kern ARB file: s04bakx.a99c15x.msEbTEN.cnfI1Dd District File: Kern Attainment 2

CHAPTER 5

ANALYSIS

INTRODUCTION

This chapter contains a collection of technical issues that have been discussed in previous chapters in discussion of modeling simulations that have been performed. Further discussion is contained in this chapter for other modeling simulations that provide additional insight to the ozone problem in the San Joaquin Valley. In addition, other technical issues are presented relating to the air quality model, its performance and accuracy, and the need for further refinement of the model and emissions files used by the model.

SIMULATION RESULTS

Interbasin Transport

Modeling simulations were conducted which "turned off" the anthropogenic sources of emissions in the San Francisco Bay Area and Sacramento. Biogenic emissions and boundary conditions at the edge of the modeling domain were not changed. These simulations were performed to look at ozone levels which would occur in the San Joaquin Valley without an influx of upwind emissions. This also is the best method currently available to evaluate whether or not a non-transport meteorological ozone event is possible. In other words, could ozone exceedances happen when the wind is not coming from the San Francisco Bay and Sacramento areas into the Valley?

The importance of interbasin transport is related to the ability of the San Joaquin Valley Unified Air Pollution Control District to control air emissions in order to reduce the level of ozone pollution in the Valley. The District is only able to control emissions generated from sources within the Valley. Emissions from outside the Valley either need to be controlled at their sources in the adjacent air basins, or more stringent controls would need to be placed on the San Joaquin Valley industry and citizens to compensate for the emissions which are transported into the Valley.

One simulation was developed in comparison to the 1990 Base Case to see how much ozone levels in the Valley in 1990 were affected by emissions from upwind metropolitan areas. According to the ARB analysis, ozone was reduced 27 percent in the northern San Joaquin Valley, up to 10 percent in the central San Joaquin Valley, and seven percent in the southern San Joaquin Valley. When the transport analysis was done for 1990, the boundary condition was not changed, keeping higher ozone aloft and higher boundary conditions that resulted from San Francisco Bay Area emissions, this means that the effect of San Francisco Bay Area emissions may have been under-estimated in the transport analysis. Peak ozone values is only one method of analyzing the effect of transport. The number of 12 kilometer grid cells which experienced federal

exceedances was also examined. When San Francisco Bay Area and Sacramento emissions were "turned off" the number of grid cells with exceedances in Fresno on August 5 was unchanged, the number of grid cells in Kern County on August 6 dropped from 29 to 21.

Ozone levels above the federal standard were predicted to occur in 1990 in Fresno and Kern Counties even without San Francisco Bay Area and Sacramento emissions. A simulation comparing the effect in 1999 with no regulatory actions from 1994 to 1999 continued to show areas above the federal standard, but the simulation with proposed regulatory action demonstrated attainment. Transport projections for 1999 should also be done with the removal of San Francisco Bay Area boundary hydrocarbons as discussed above.

A simulation was performed in which all of the anthropogenic emissions generated within the Valley were "turned off." According to this simulation, the combination of biogenic emissions, boundary conditions, and 1990 level emissions from the San Francisco Bay Area and Sacramento were sufficient to cause federal exceedances in Sacramento, Santa Clara, Stockton, Modesto, and Madera Counties, and the Mountain Counties Air Basin.

A simulation with San Francisco Bay Area emissions turned off and Sacramento and San Joaquin Valley emissions turned on, eliminated exceedances in Santa Clara, Modesto, and Madera but showed almost all of the same effect in the Mountain Counties as was evident with San Joaquin Valley emissions off. With San Francisco Bay Area and Sacramento area emissions off the Mountain County exceedances were eliminated. The combination of these evaluations shows that most of the Mountain County exceedances during this episode were due to Sacramento area emissions.

In addition to these modeling simulations, there is independent corroboration of the effect of upwind emissions on northern San Joaquin Valley ozone levels. The ARB transport analysis examined actual air monitoring data and weather patterns and determined that San Francisco Bay Area emissions had an "overwhelming" impact on Crows Landing. Overwhelming is defined as causing a federal exceedance directly without the contribution of local emissions. Since modeling represents only one meteorological pattern, and the ARB transport analysis focuses on days when meteorological patterns make it easy to distinguish the source of an exceedance, additional information is needed to determine if the impact on the San Joaquin Valley represented by these analyses is typical for ozone violation in the northern San Joaquin Valley. A research project was conducted for the Air Resources Board to classify all San Francisco Bay Area weather patterns and determine ozone source-receptor relationships. This report indicates that "Highest ozone concentrations in the northern and central San Joaquin Valley are associated with the San Francisco Bay Area outflow

scenario. Diurnal profiles at Stockton and Modesto reveal higher late afternoon concentrations under this scenario, indicating possible transport from the San Francisco Bay Area and, in some cases Sacramento. This feature is not evident in Fresno.[1]

Ozone Levels from Local Emissions

The interbasin transport simulation which simulated ozone levels in the absence of anthropogenic emissions from the San Francisco Bay and Sacramento areas, showed reduced Fresno and Bakersfield ozone levels, but continued to predict exceedance of federal standards in the 1990 Base Case. This means that emissions released in the San Joaquin Valley were capable of generating a federal ozone exceedance in 1990 from local emissions. Additional simulations were performed to examine this "local only" case in 1999.

What are the implications of these simulations?

From the 1990 analysis:

- Fresno and Kern Counties would have experienced federal ozone exceedances, even without transport from the San Francisco Bay Area and Sacramento areas.
- Emissions reductions from local source 1990 levels are needed to reach attainment in the San Joaquin Valley.

From the 1999 analysis with no further action by the District from 1994 to 1999:

- Local emissions are not reduced sufficiently to prevent a federal ozone exceedance from local emissions in Fresno and Kern Counties.
- Additional actions must be taken to reduce local emissions to reach attainment in the San Joaquin Valley.

From the 1999 analysis with additional actions proposed to be taken by the District from 1994 to 1999:

- Local emissions are reduced sufficiently to prevent a federal ozone exceedance from local emissions. Beyond this level, if additional

[1] **Development of an Objective Classification Procedure for Bay Area Air Flow Types Representing Ozone-Related Source-Receptor Relationships,** ARB, SYSAPP94-94/022, May 24, 1994, page ES-6.

reductions are needed to achieve attainment of the federal ozone standard, the additional reductions should be achieved in partnership with the ARB and upwind districts that transport pollution to the San Joaquin Valley. The ARB is charged with identifying transport situations and ensuring that both the upwind and downwind districts take sufficient action to reduce emissions.

Relative Benefits of VOC and NOx Reductions

Variations from 1990 Base Case by reducing emissions throughout the domain showed that NOx control from 1990 levels would be required to reach attainment. This conclusion is evident from analysis of four different simulations and the ARB analysis of the indications of the full set of runs performed for 1990 Base Case emissions. The four simulations which help establish the need for NOx reduction are described as follows:

100% anthropogenic VOC reduction - Reducing all man-made VOC emissions in the entire modeling area (domain) failed to achieve attainment without NOx control to reduce emissions below 1990 levels.

Reducing both VOC and NOx anthropogenic emissions 50 percent was also unsuccessful, failing to reduce ozone to attainment levels.

Depending heavily on VOC reductions was also unsuccessful with 75 percent reduction for VOC and 50 percent reduction of NOx in the domain.

Greater reliance on NOx reductions was successful in providing ozone levels lower than the federal standard when VOC emissions were reduced 50 percent and NOx emissions were reduced 65 percent. The ozone level was reduced well below the federal standard.

The ARB analysis, of all simulations based on 1990 emissions levels and variations on the 1990 emissions, provided a chart which could be used to determine the optimum minimum reduction which would meet federal ozone attainment by 1999. This graphic chart indicates that federal ozone standards could be met by reducing 1990 emissions throughout the domain by combining approximately 30 percent of VOC emissions reduction with 58 percent NOx reduction.

The District has modeled the effects on 1999 ozone levels of its adopted rules, including the NOx rules which are requested for substitution in meeting the three percent rate of progress requirement. A similar pattern of simulations was performed

for this 1999 emissions estimate as described for the 1990 analysis.

From 1999 emissions levels, with no additional actions by the District from 1994 to 1999:

> Reduction, throughout the modeling domain, of 50% of anthropogenic NOx emissions.
>
> Reduction, throughout the modeling domain, of 50% of anthropogenic VOC emissions.
>
> Reduction, throughout the modeling domain, of 25% of all anthropogenic emissions.
>
> Reduction, throughout the modeling domain, of 50% of all anthropogenic emissions.

The ARB analysis again produced a graphic chart which can be used to estimate the minimum reductions necessary to achieve federal attainment. In this case there is much greater latitude in the selection of reductions which can provide attainment, but the benefit of domainwide reduction of NOx remained consistent. Attainment is apparently possible with domainwide reductions of 47 percent of anthropogenic NOx and no further reductions of VOC beyond reductions anticipated by 1999, or combined domainwide reductions of 40 percent of VOC emissions and 38 percent NOx emissions. In either case, additional NOx reductions beyond those requested for NOx substitution are clearly needed for attainment.

Table 5-1
Percentage Reductions Needed to Reach Attainment

1990 Modeling Year		1999 Modeling Year (Actions to 1994)	
VOC (%) REDUCTION	NOx (%) REDUCTION	VOC (%) REDUCTION	NOx (%) REDUCTION
30	58	40	38
		OR	
		0	47

Modeling demonstrates that the NOx reduction measures, which are adopted and being implemented in the District, will contribute toward attainment of the NAAQS, but will not exceed the level of reductions required to meet the standard since the projection of these actions continues to show that additional NOx reductions are needed. The source specific emissions changes were included in the 1999 simulation. No evidence of any area of increased peak hour ozone concentration above the federal standard was detected from modeling the implementation of these rules. The reductions are not excess of attainment needs, show no indication of causing peak hour contraindications, and are clearly a needed part of reductions to reach attainment. Additional NOx reductions from the 1990 emissions level and the emissions level for 1999 with no action by the District from 1994 to 1999 are shown as beneficial throughout the modeling domain. Percent reduction simulations are not necessary for the 1999 simulation with proposed actions, since results at and near attainment values do not require further gross estimation of additional reductions.

Point Source, Area Source, and Mobile Source Effects

Simulations which "turned off" one of the three segments of the anthropogenic emissions inventory were performed. Only turning off the Mobile Source portion was sufficient to project attainment in Fresno. Turning off Mobile Sources did not produce attainment in Kern County. These results were not unexpected since the emissions inventory in Fresno urban area is dominated by mobile emissions and Kern County has a much higher tonnage of point source emissions.

TECHNICAL ISSUES

Sulfur Emission Reductions

Ozone decreases are anticipated from sulfur reductions which are not included in modeling predictions. State regulation of sulfur content in fuels adopted as part of Phase II Reformulated Gasoline program (CP2 RFG) scheduled for implementation in 1996 will reduce fuel sulfur content of gasoline to less than 40 ppm from a current average level of 339 ppm. The effect of sulfur reductions has not been included in the ARB 1999 emissions inventory projections to reflect decreased ozone concen-trations due to this reduction of sulfur content. From Phase II Auto/Oil Air Quality Improvement Research Program (AQIRP) research on the effects of sulfur reduction on ozone, modeling was conducted to determine the effect of reducing sulfur in fuel. Modeling was conducted for Dallas-Fort Worth, New York, and Los Angeles. Reduction of light duty motor vehicle contribution to peak ozone was reduced 9 percent in Los Angeles, 16 percent in Dallas-Fort Worth, and 8 percent in New York. Light-duty vehicle contribution to population exposure to ozone above the federal standard of 120 parts per billion was reduced 17 percent in Los Angeles. The impact of sulfur reductions on San Joaquin Valley ozone concentrations has not been determined; however, the effect of hydrocarbon emissions changes associated with fuel reformulation to remove sulfur has been included in emissions projections prepared by the ARB.

Modeling Limitations

A model is not able to contain all of the factors which occur in the real world. Therefore, a model only reflects the best approximation which can be provided by analyzing the most significant factors. The predictions made by the model are only as precise as current science, technology, and information allow.

No computer model incorporates every process that occurs in nature. This model does include an estimate of biological emissions which are known to be significant. The emissions from growing plants and trees is included as "Biogenic Emissions." The reason for including biogenics in the model is not to consider controls for this category, but to make a more complete picture for the model to work with.

The model represents only one meteorological event, which may or may not be a typical weather pattern for ozone exceedances. The weather was not unusual for that time of year so the observed episode is believed to be typical. Some conditions were unusual at the time of the observed event. A large number of forest fires were

occurring. Modeling simulations have been conducted to see if this had a major influence on the episode. The ARB analysis is that the presence of forest fires did not play a major role nor does it cause significant changes in model predictions.

Motor vehicle emissions are known to be underestimated. The ARB is working on revisions to the motor vehicle emissions factors which are expected to be released early next year. The distribution of motor vehicle trips within the current version of the model concentrates the emissions along highway corridors. The over-concentration may make up for underestimated emissions factors, or may even be more significant. Better spatial representation of motor vehicle emissions is a high priority for the District since the current distribution used by the model may be requiring more reductions than necessary to reach attainment. An attempt was made to redistribute motor vehicle emissions using population distribution information; however, the method was unable to preserve all of the reductions associated with implementing the enhanced I & M program. Continued effort will be directed at developing a distribution of motor vehicle emissions which more accurately reflects the emissions distribution and emissions reductions from controls.

Emissions inventory uncertainties are always of concern, since the model's prediction of ozone is based on the emissions information provided to the model. If revisions to the emissions inventory are significant, new modeling simulations will be conducted to determine the effect.

The need to track progress, reflect improvements in science, and reflect better emissions estimates will create a continuing need for modeling simulations.

The ARB List of Modeling Caveats

The ARB issues a list of caveats which must be considered when evaluating the preliminary modeling simulations. These caveats were identified by the ARB or other members of the Technical Committee which is monitoring the development and testing of SAQM.

- There is some concern over the spatial apportionment of motor vehicle emissions, since the coarse statewide transportation model was utilized;

- The afternoon windfield in the Fresno area on August 6 is known to be incorrect;

- The winds and mixing heights in the Delta area are currently undergoing "improvement" by Penn State; the effect that this will have on the final modeling results is unknown;

- The 12 km windfield was put together by SUNYA by sampling every third point of the 4 km windfield. Until a large-scale 4 km simulation can be performed, it will remain unclear exactly what the consequences of this sampling are; and

- The emissions for the 1999 simulation included only rules adopted through early 1994 and did not include enhanced I & M. Also, the 1999 emissions were scaled from 1990 emissions based on scalars by county and pollutant for point, area, and mobile sources.

The District's Modeling Concerns

Boundary Values

The perimeter of the domain must have levels of ozone, nitrogen compounds, various species of hydrocarbons, and other chemicals set to non-zero values. When the windfield indicates that air is moving into the modeling domain across this boundary, these chemical levels are introduced. Assigning appropriate values to the boundary is not a simple process. It would be easier if the western boundary where most of the air is entering the domain were established in the mid Pacific so that the EPA default values would be clearly indicated. However, the western boundary of the model is near the coastline. This raises questions about the values which should be used, since offshore breezes may be contaminating this boundary. A number of factors must be considered when setting the boundary values.

Current boundary value issues:

- The EPA allows use of default values when insufficient information is available to set a different level for the boundaries.

- Boundary values have been set from sparse data at triple the level of a clean air boundary default values recommended by the EPA.

- Aircraft data was from morning aircraft flights. Morning levels would include unreacted hydrocarbons and the value would go down as the day progresses, therefore the average value would be much lower.

- Boundary values do not contain any diurnal variation or variation along a side of the model.

- Model locks in boundary conditions after a two day spin-up and holds value

constant for every hour of the simulation.

- Spin-up value of boundaries is contained in the model but the District has not had an opportunity to examine the locked in values at the boundary. The locked in value may be even higher than the initial condition and it is of concern to the District that the District has not yet been able to examine the boundary values subsequent to the spin-up process.

- Boundary is too close to the Western coastline prohibiting use of a clean air boundary that could be used if the boundary were moved west, having the boundary this close makes setting the boundary conditions more susceptible to error and much harder to appropriately determine.

- Simulation of reductions throughout the domain showed a resistance to emissions changes, this may be due in part to an excessive boundary condition loading.

Projection to 1999 should show decrease in boundary values:

- There is no justification for leaving boundary conditions at 1990 levels when significant reductions are being made throughout California and the boundary condition is set at an elevated level to reflect California emissions flowing out to sea.

- The EPA guidance sets standards for a clean air boundary, while the western boundary is set in too close to be clean, there is no requirement that the District maintain such a high boundary condition as is being used from such sparse data. There is insufficient data to support the tripling of clean air boundary conditions for attainment modeling. In lieu of adequate data, the EPA defaults can be utilized.

Overestimation of Ozone by the Model from Existing Emissions Estimates

The model replicated the observed levels of ozone using an emissions inventory that is known to have underestimations and omissions. This means that the model produced too much ozone either from the emissions inventory or from other supporting inputs such as the boundary conditions. Either the boundary conditions or some other element of the model formulation is artificially elevating ozone predictions with the existing emissions inventory.

When sources such as agricultural internal combustion engines are added and the upward correction of motor vehicle emissions is made by the ARB, the model will have more emissions in the inventory and will therefore predict higher ozone values. Since the model now predicts the observed peaks, the corrections to the inventory will cause an over-prediction of ozone concentrations. A sensitivity test doubling motor vehicle (MV) emissions confirms that ozone will be over-predicted with an MV increase with the existing boundary conditions.

If the problem is not related to boundary conditions but is related to the emissions inventory, then the model is overestimating the amount of ozone formed per ton of precursors introduced. This would constitute a more severe problem challenging the validity of the basic model formulation. It would also have the effect of making the model predict future year ozone concentrations higher than it should.

Whatever cause is assigned to the high prediction of ozone in 1990 from an underestimated inventory, the result is the same. Too much ozone is being predicted by the model in present and future year simulations. The prediction of 1990 episode levels of ozone leaves no room for the introduction of emissions corrections in 1990 that are known to be needed. The cause for the model's over-prediction of ozone should be identified and corrections should be made.

Modeling Response to Emissions Changes

Modeling simulations produced small or no change in ozone predictions in response to some of the changes in the emissions inventory that were expected to change ozone levels. For example, an emissions inventory change that included part of the District's scheduled rule adoptions and implementation of enhanced I & M did not change ozone concentrations. The balance of chemicals in the regional model may have been at a ratio that was unaffected by this package of reductions, or the model may be exhibiting less response than it should to emissions changes. Use of any regional model for small changes in emissions is susceptible to this kind of problem; therefore, it is difficult to be

certain if the model is performing correctly or is unduly resistant to change. The program of extensive model evaluation and development, which is ongoing and scheduled for completion within the next few months, may provide an answer or solution for this question.

Modeling Uncertainties

A number of uncertainties remain to be evaluated to improve the performance of the model. Because of the uncertainties in the model and the limited spatial accuracy of point and mobile sources which exists in current simulations, the reductions indicated as necessary to reach attainment may be significantly overestimated. If the poor spatial resolution causes an over-prediction for ozone of only one-half part per hundred million, the reduction targets will be significantly affected. Typical accuracy assumptions for similar modeling with UAM set uncertainty of model ozone predictions as high as 20 percent, or plus or minus 2 parts per hundred million if predictions are at the federal standard of 12 pphm. As previously discussed, 1999 predictions indicate that attainment can be reached by reducing domainwide VOC emissions by 40 percent and domainwide NOx emissions by 38 percent. An alternative reduction strategy that will also reach attainment requires no VOC reductions if domainwide NOx can be reduced 47 percent. If the model is over-predicting the ozone level by one-half part per hundred million, attainment could be reached by balanced domainwide VOC and NOx reductions of 30 percent, or NOx reductions alone of 36 percent.

Table 5-2
Range of Reduction Possibilities with 1/2 pphm Uncertainty for "Balanced" and "NOx Only" Strategies

VOC	NOx	>>>>>>	VOC	NOx
40 percent	38 percent	>>>>>>	30 percent	30 percent
0 percent	47 percent	>>>>>>	0 percent	36 percent

Quality Assurance

The ARB has conducted extensive quality assurance of air quality data collected during the field program and emissions files used for the modeling simulations. The quality assurance process is still in progress and may result in corrections. This could potentially require a reassessment of a simulation or simulations. The District has not completed review of emissions files used for the simulations and will continue to examine the files for errors and omissions. The Technical Committee has identified a program of evaluation to examine errors in the windfield, evaluate addition of layers at the vertical base of the model, and perform additional analysis and model improvements.

Additional Modeling and Model Development

Full performance evaluation of the model has not been completed. The Technical Committee overseeing model development and the consultant assigned to evaluate the model have developed a series of tests to analyze the model. Going far beyond performance tests required by the EPA, these evaluations are designed to evaluate whether the answers the model provides match scientific understanding of the processes involved. The tests are intended to make sure that the final version of the model does more than just simulate the observed episode, it must respond to changes in the inputs which match the best understanding of physical processes. If the model is not held to this higher standard it could make predictions which are unreliable. If the model is allowed to respond in ways which are contrary to known science it may exaggerate or underestimate the benefit of controls and the amount of reductions needed to reach attainment.

Additional simulations will be conducted with the model to learn as much as possible about the best course of action for improving air quality in the Valley. Examining changes at a sub-regional level, effects of ozone changes on population exposure to elevated levels of ozone, experiments with concentrated urban strategies and many other simulations are planned.

Current Limitations Faced when Using the Model

At this time the model can be used in two different ways. The first method is by making emissions changes by a percentage across the entire domain or rectangular segments of the domain. The second method currently takes much longer and involves the assistance of a consultant to prepare and substitute entirely new revised emission files.

When more extensive use of the gridded emissions program becomes practical for the ARB or the District, more flexibility in the design and testing of emission reduction strategies will be possible. It is not presumed, by reliance on domainwide reduction simulations for technical evaluation of the model, that equal percentages of emissions reductions are required in every part of the domain to reach attainment of the federal standards. Nor is it assumed that domainwide reductions reflect the most efficient or cost-effective approach. The domainwide reduction simulations were used to obtain some idea of the magnitude of reductions needed to reach attainment, and the source specific reductions associated with proposed regulatory actions were used to evaluate the effectiveness of the proposed actions to achieve attainment.

The following maps indicate the locations with ozone concentrations above the federal standard discussed in the Interbasin Transport and Local Emissions sections of this chapter.

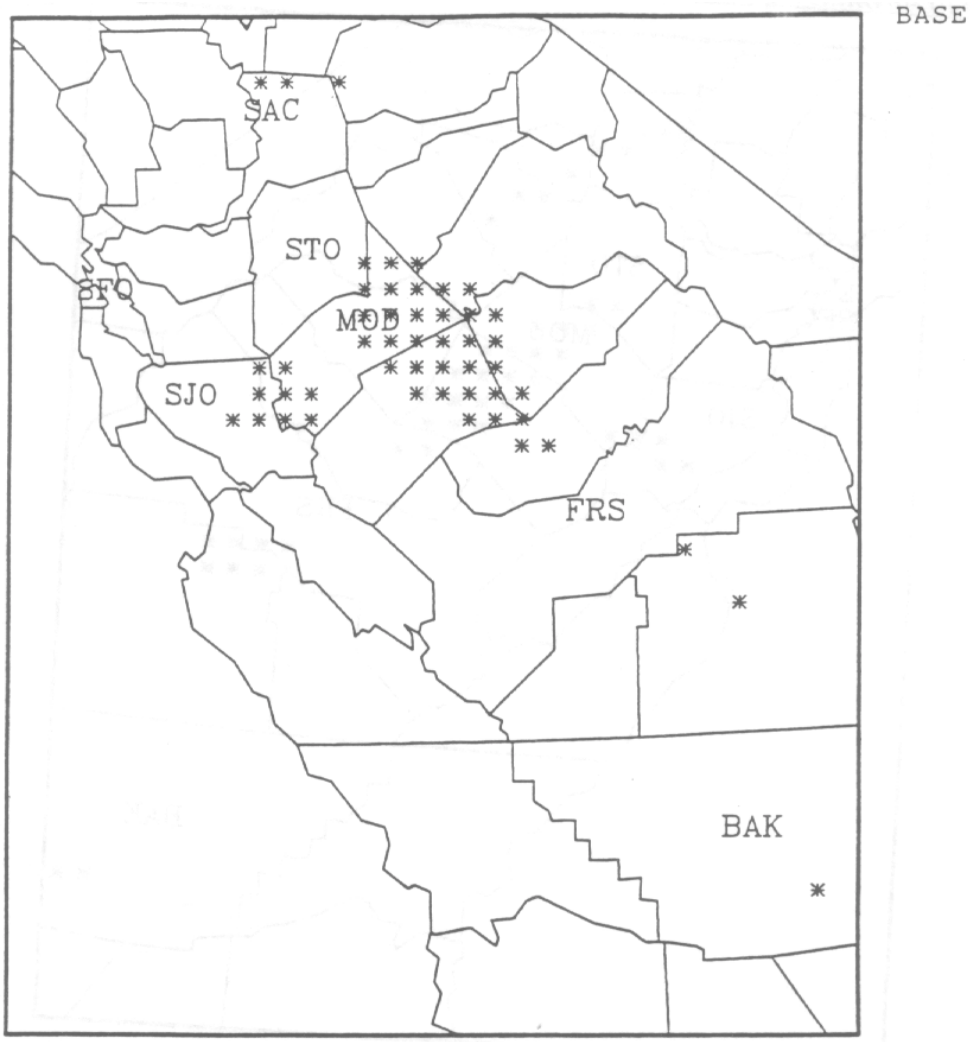


FIGURE 5-1

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 3/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

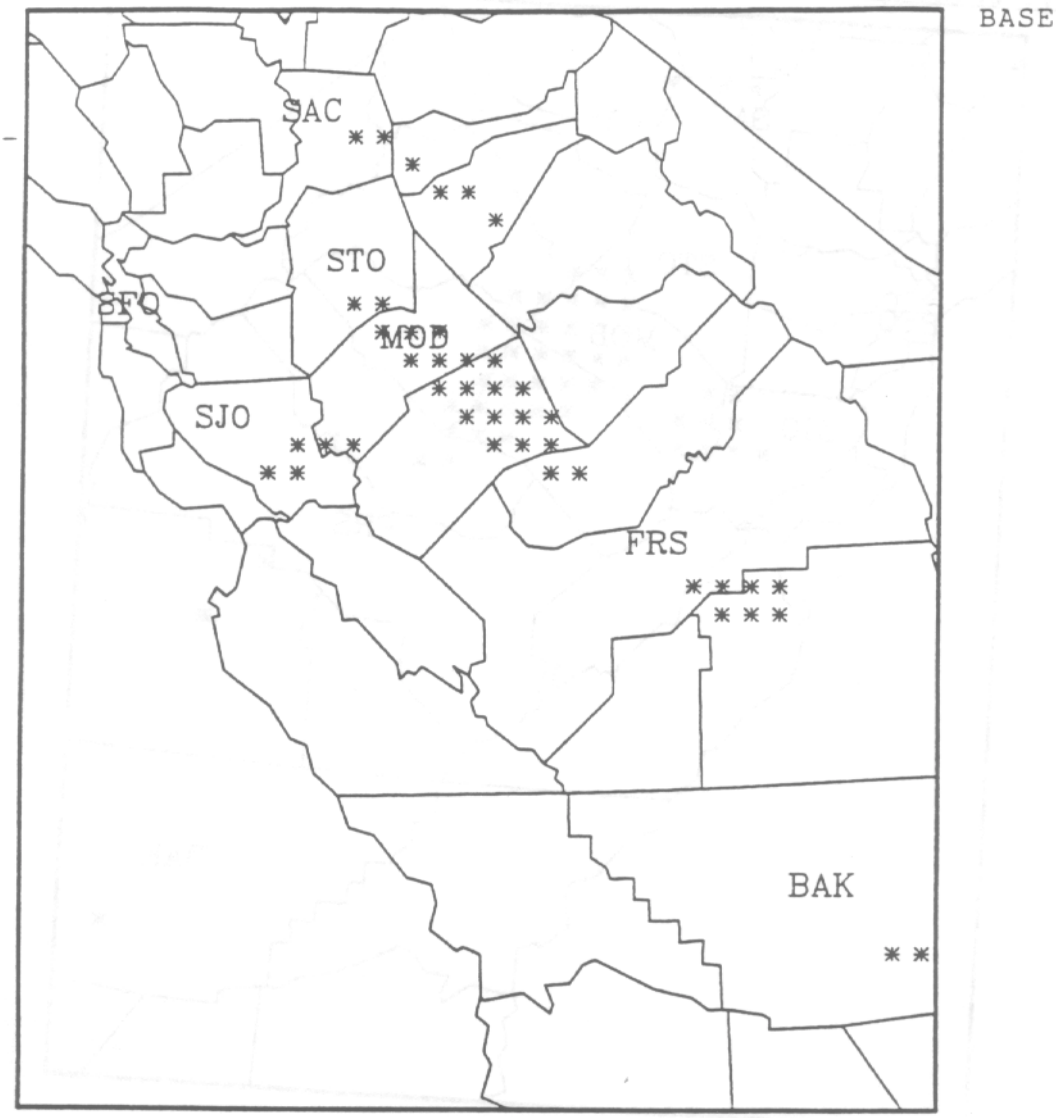


FIGURE 5-2

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 4/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

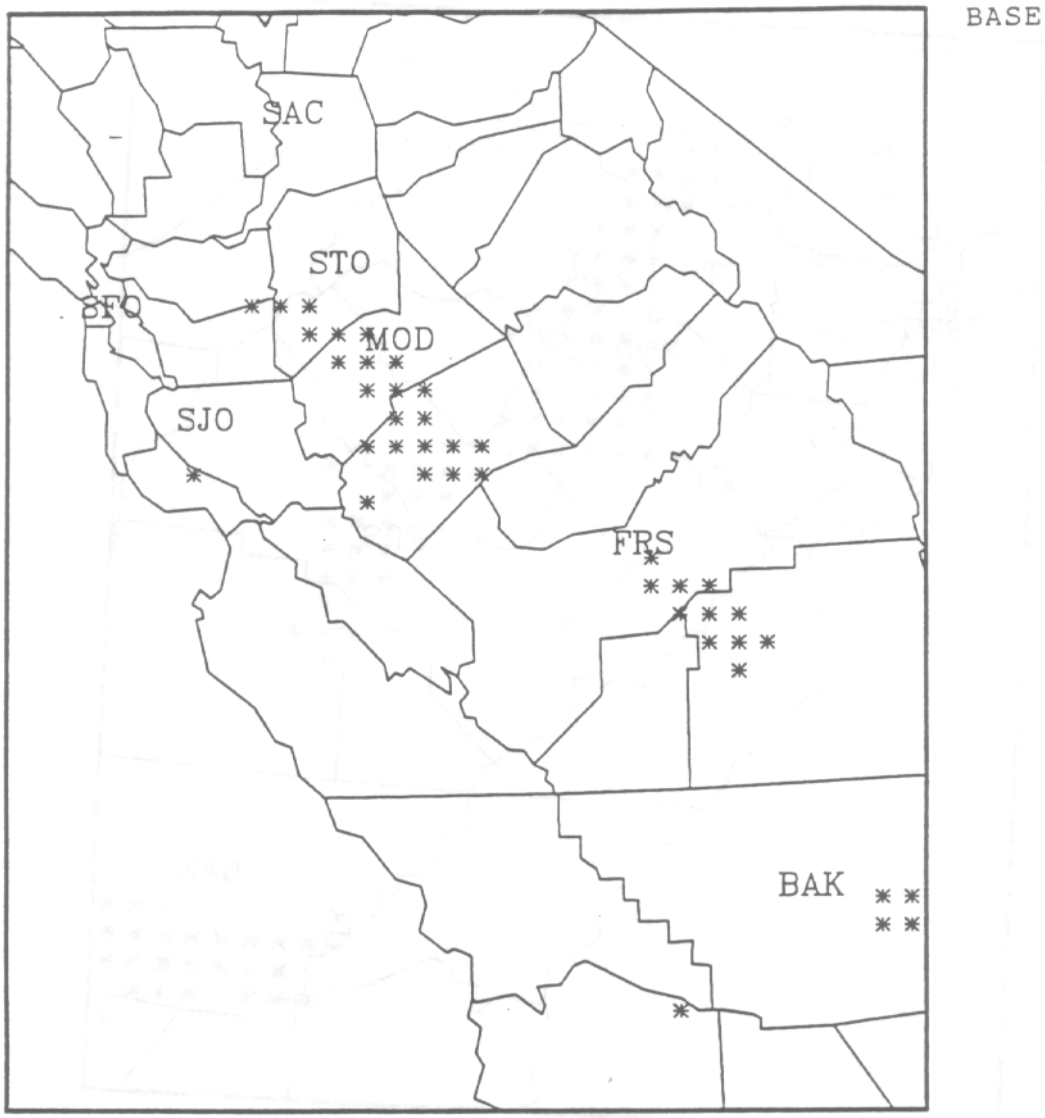


FIGURE 5-3

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 5/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

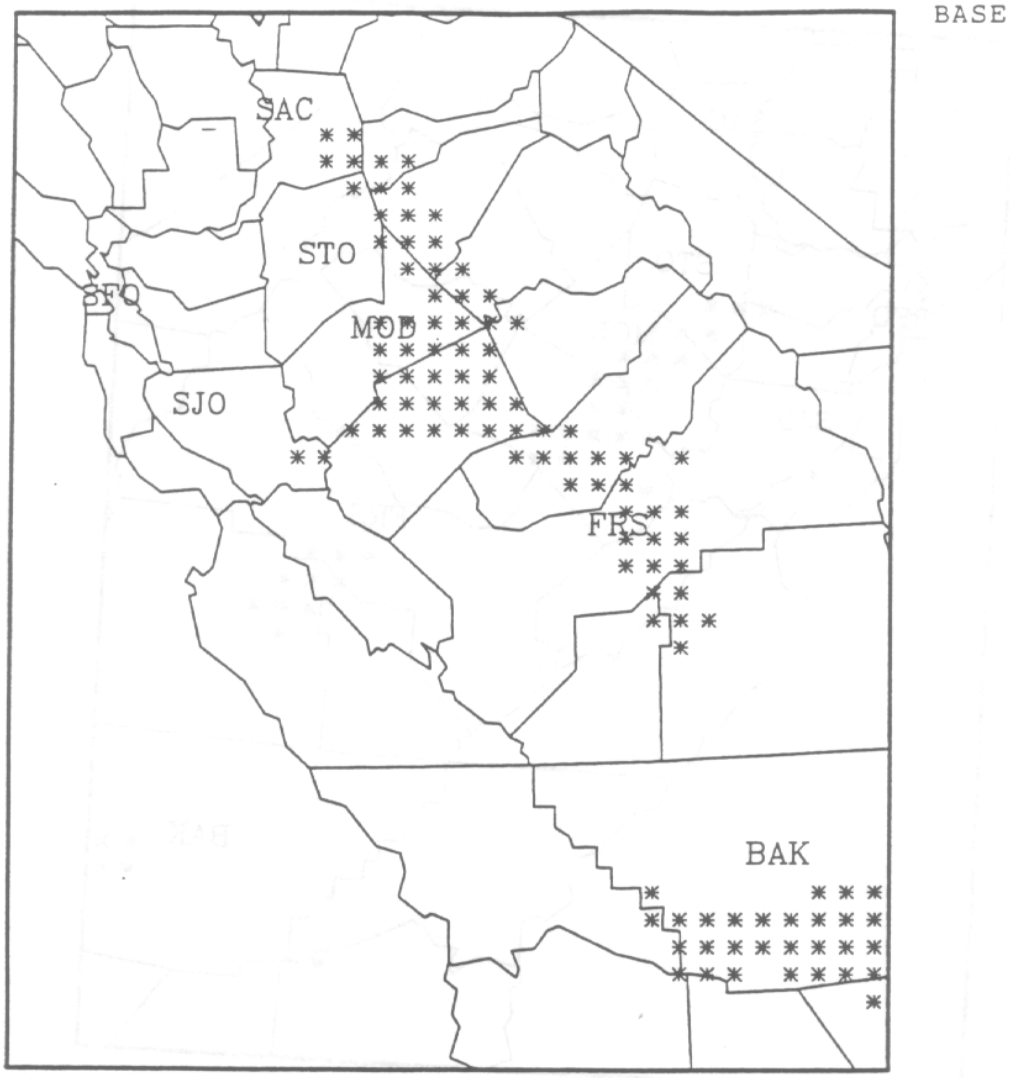


FIGURE 5-4

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 6/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

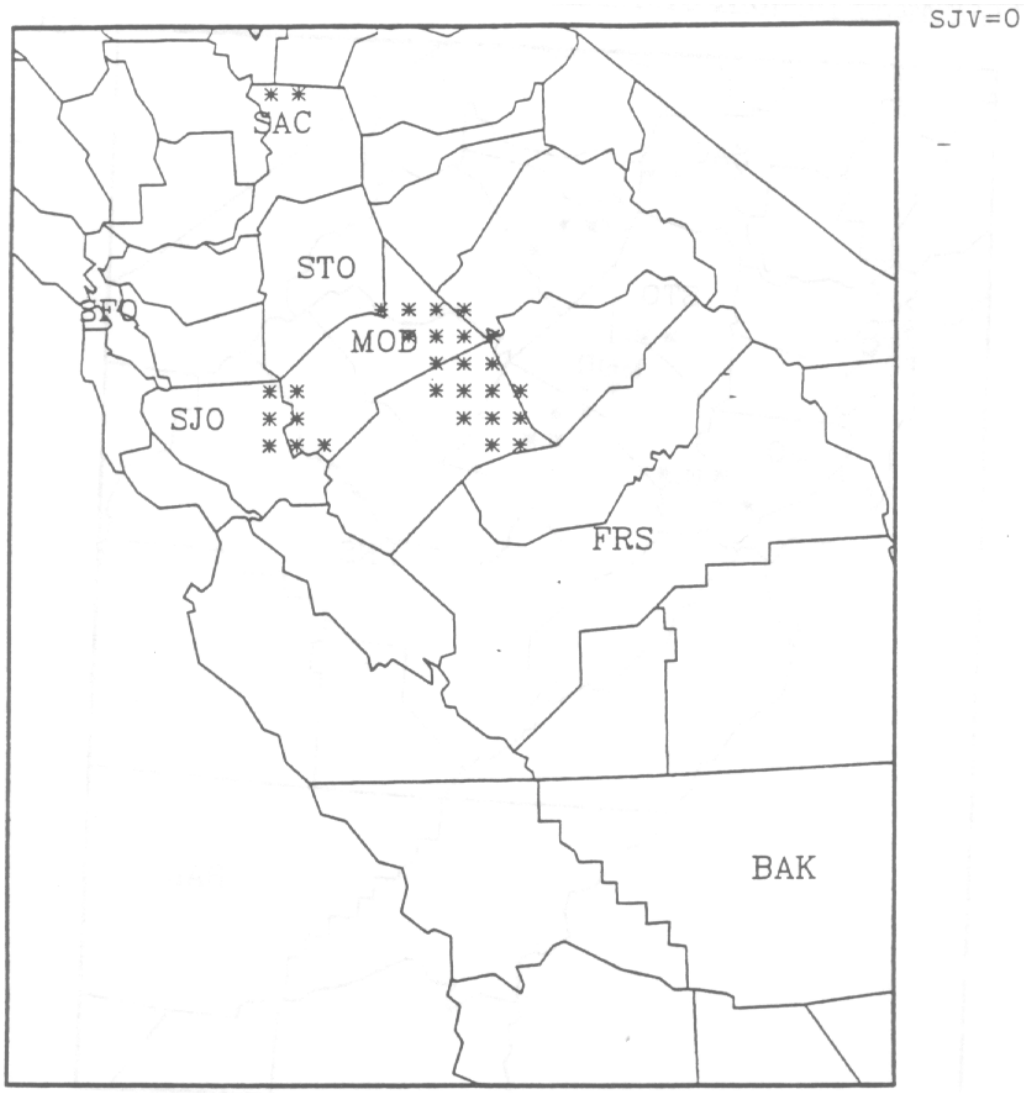


FIGURE 5-5

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 3/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

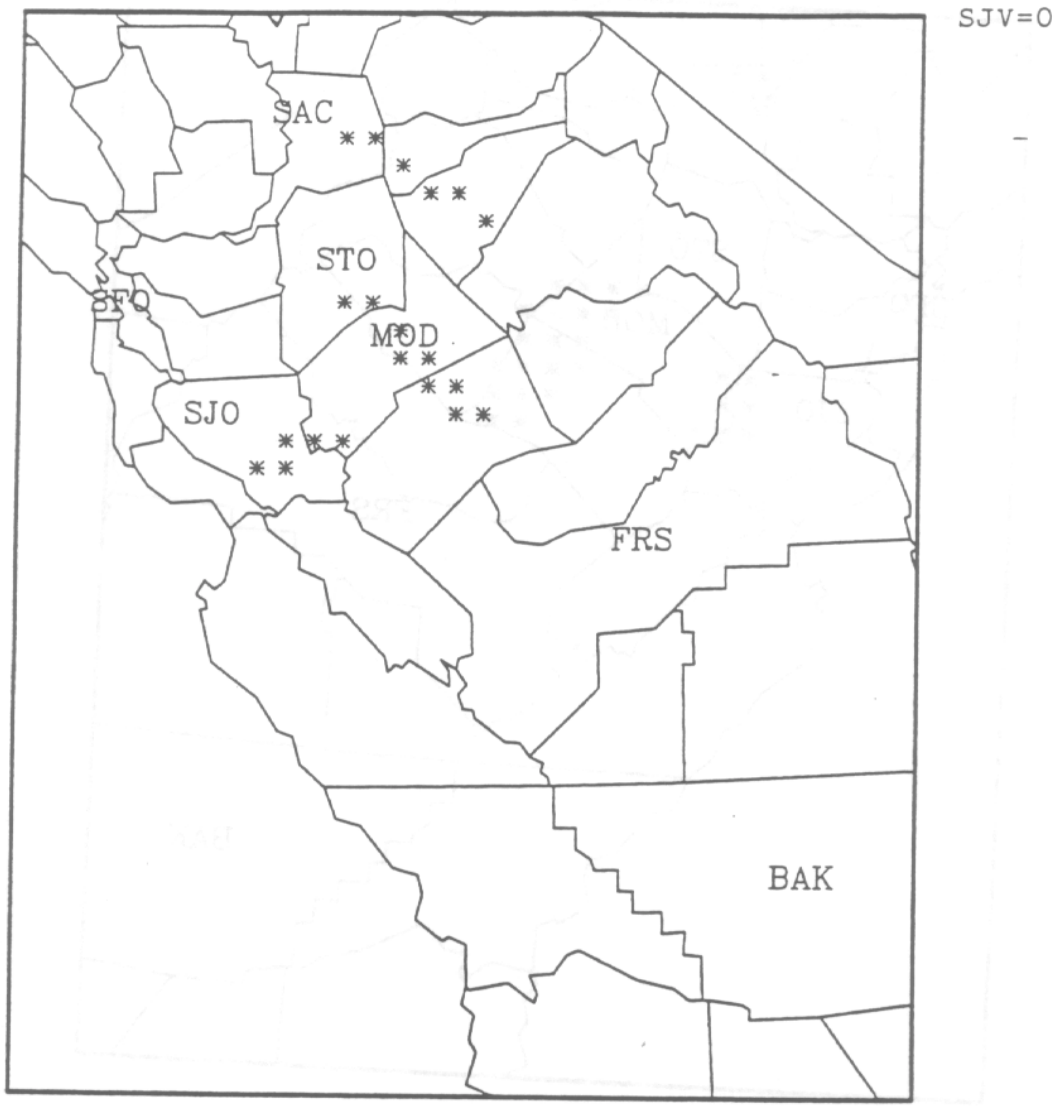


FIGURE 5-6

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 4/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

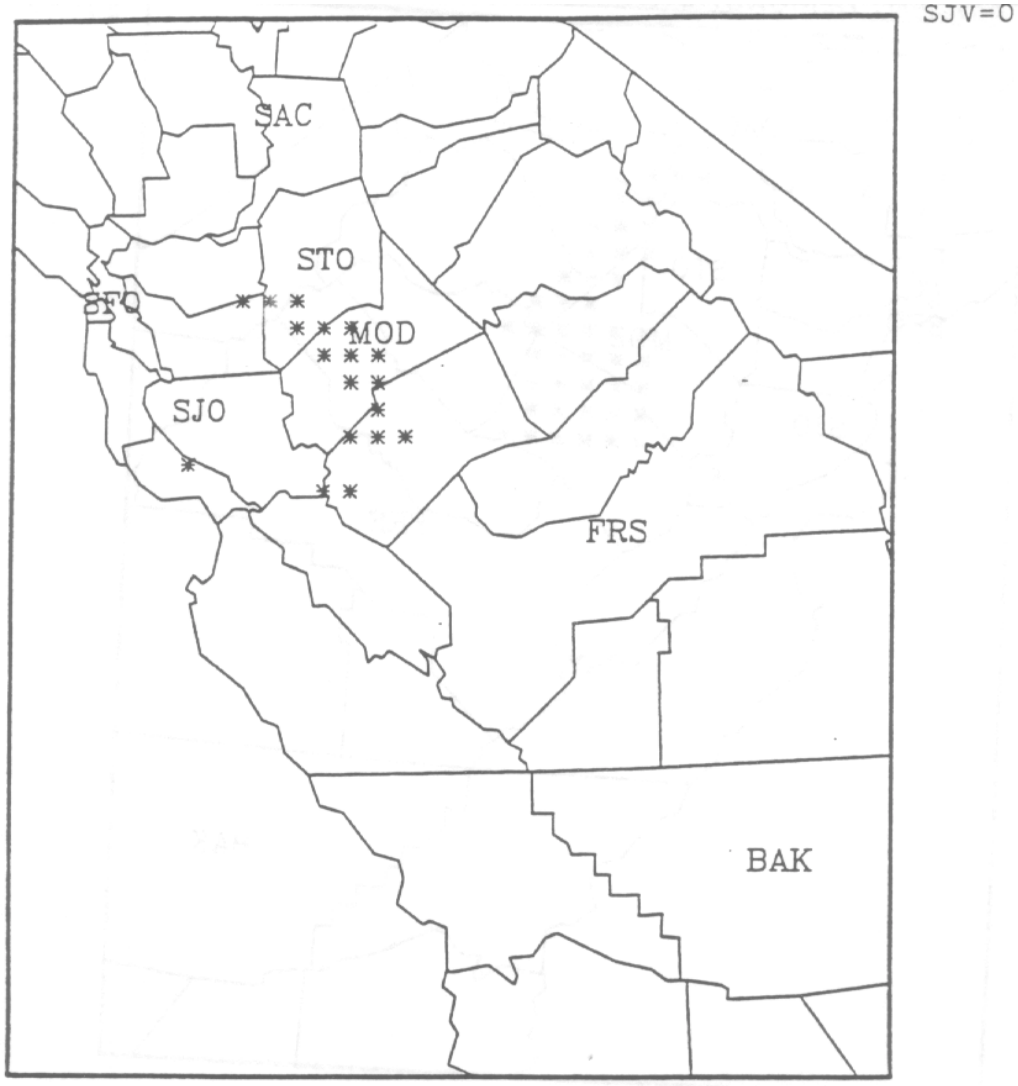


FIGURE 5-7

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 5/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

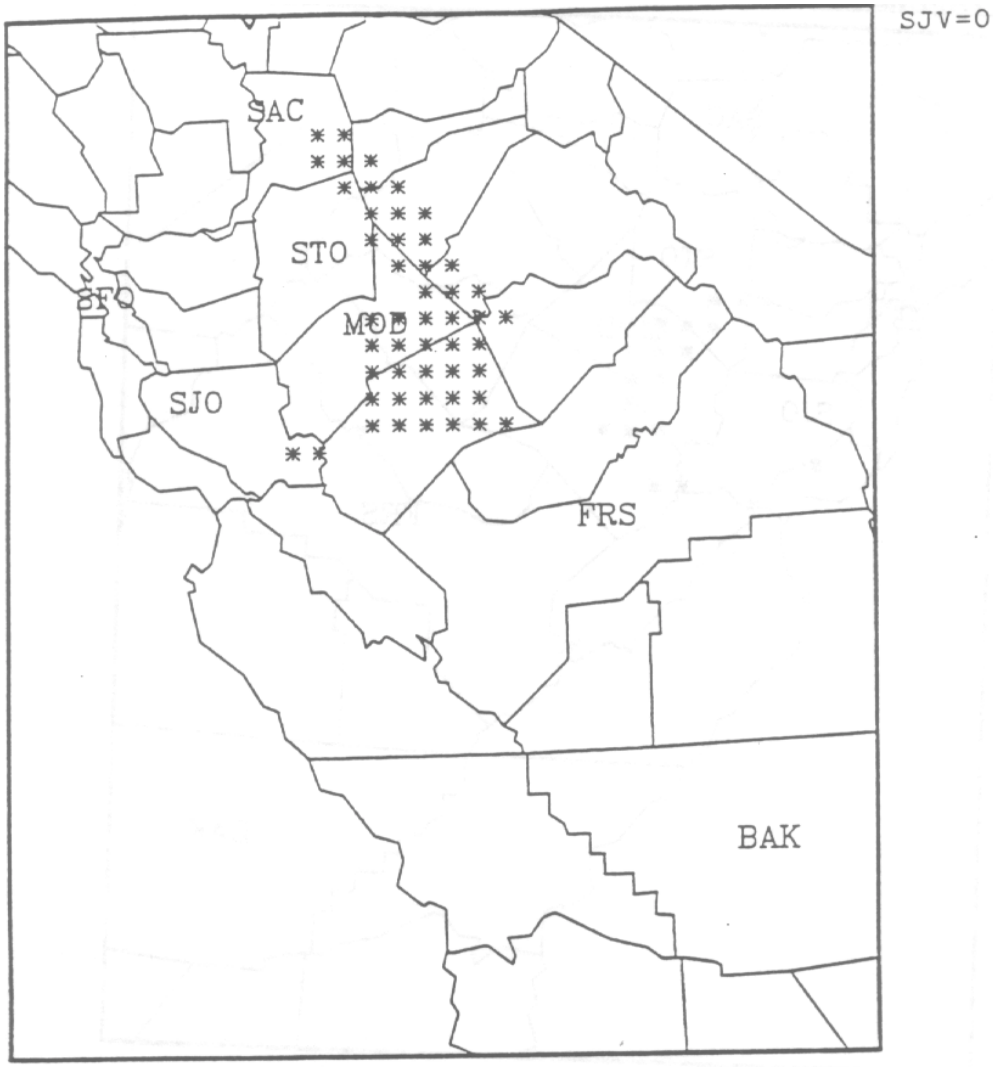


FIGURE 5-8

SAJFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 6/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

BAY=0

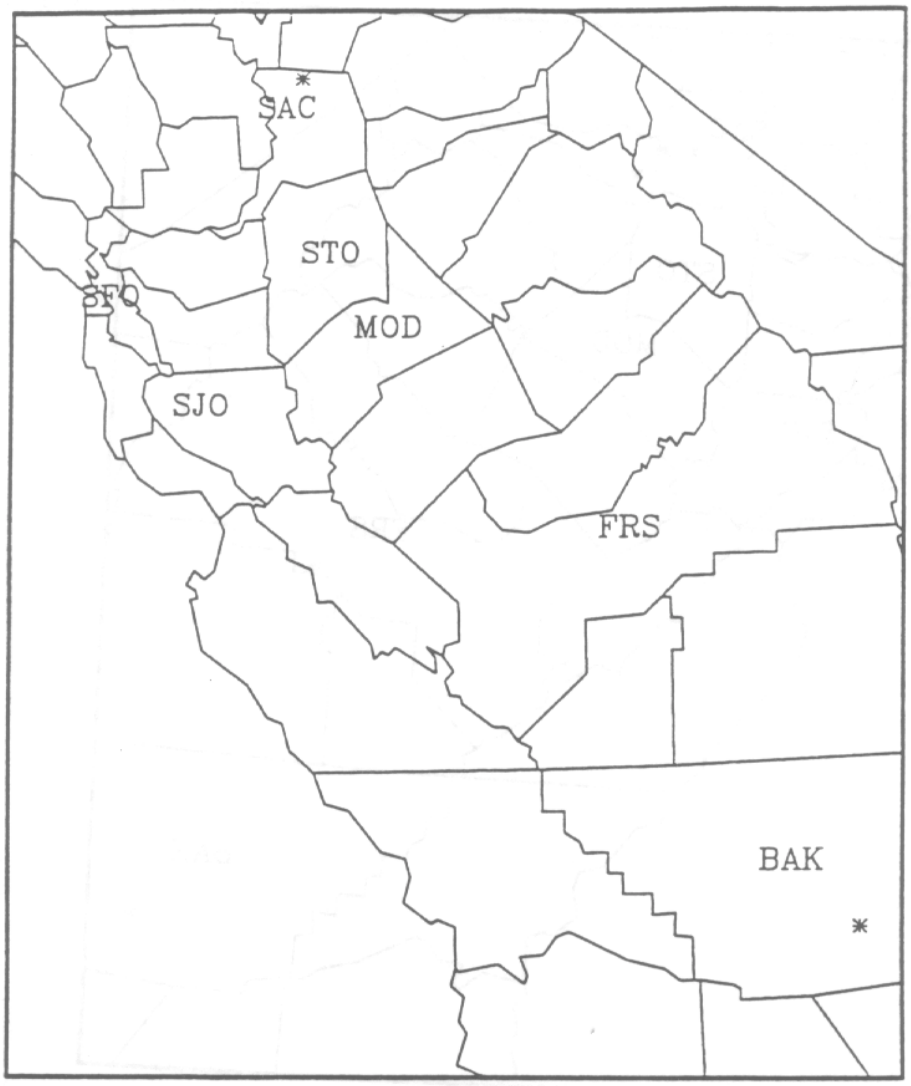


FIGURE 5-9

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 3/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

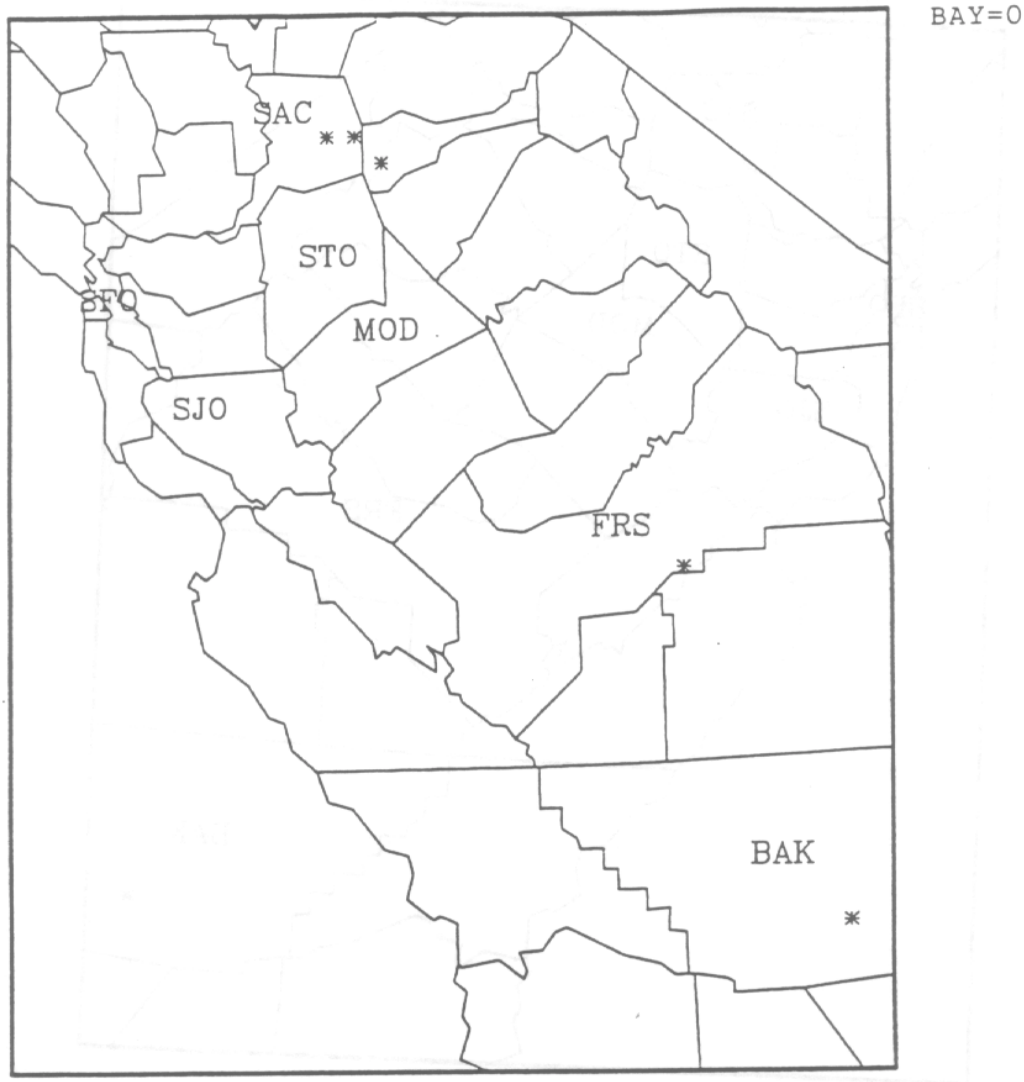


FIGURE 5-10

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 4/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

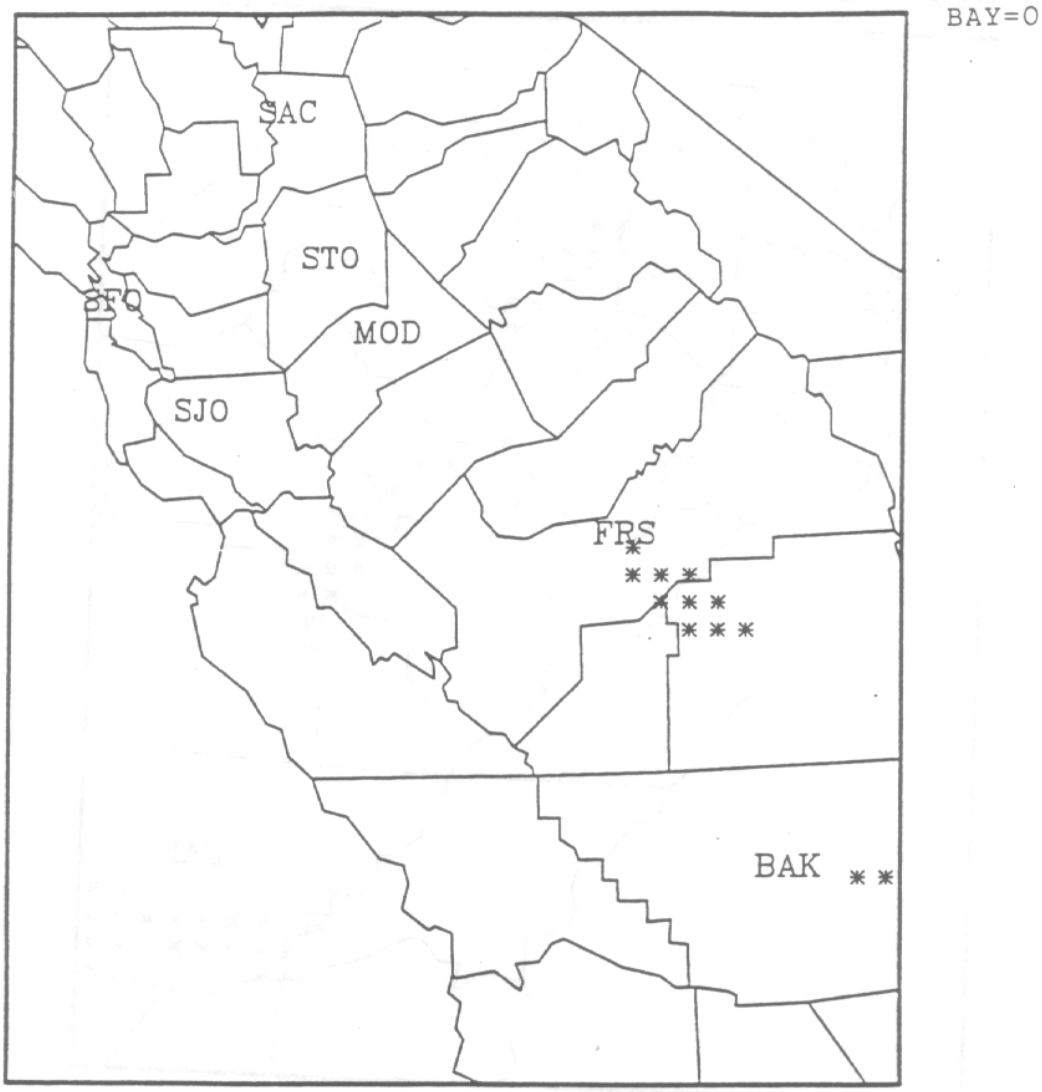


FIGURE 5-11

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 5/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

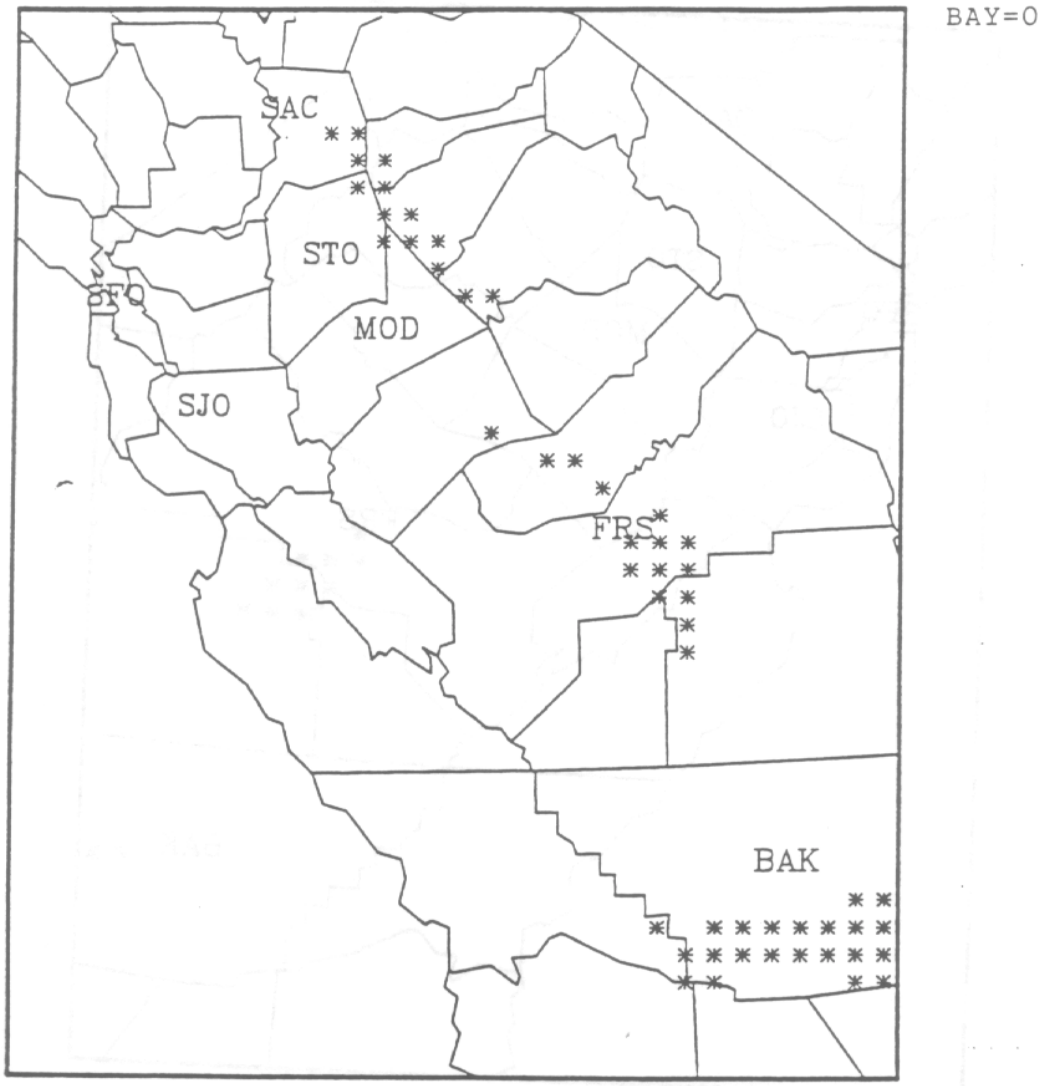


FIGURE 5-12

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 6/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

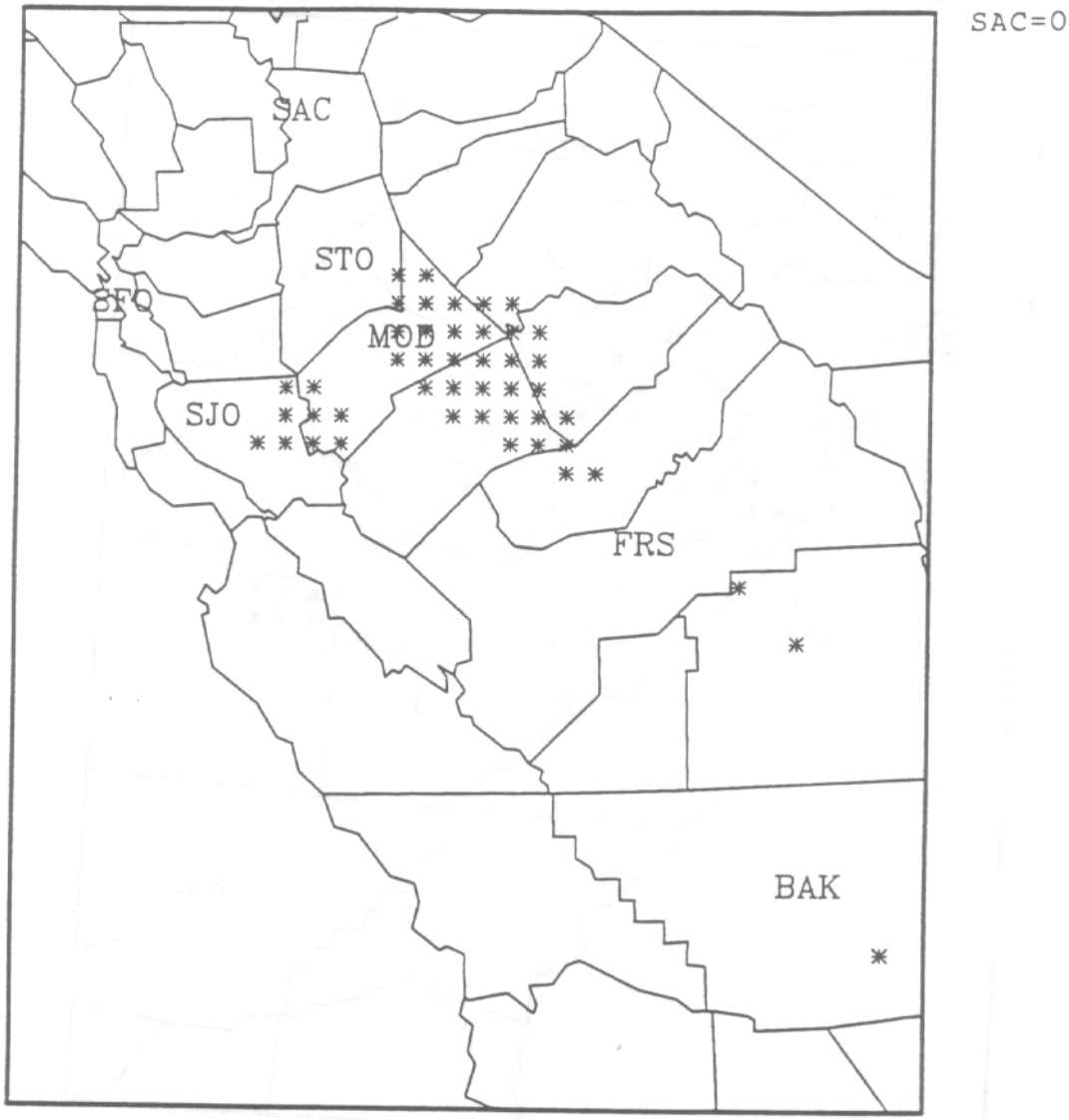


FIGURE 5-13

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 3/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

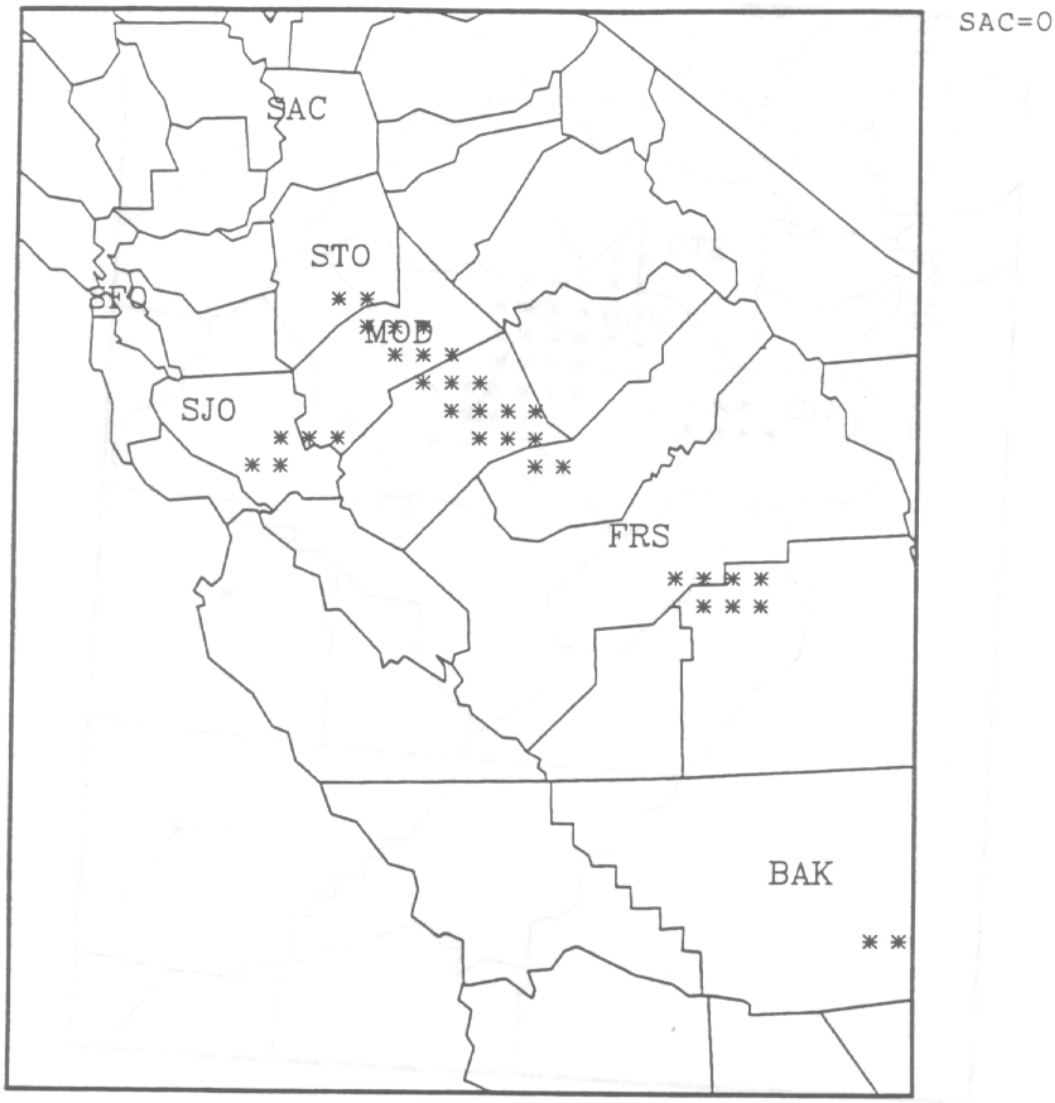


FIGURE 5-14

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 4/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

SAC=0

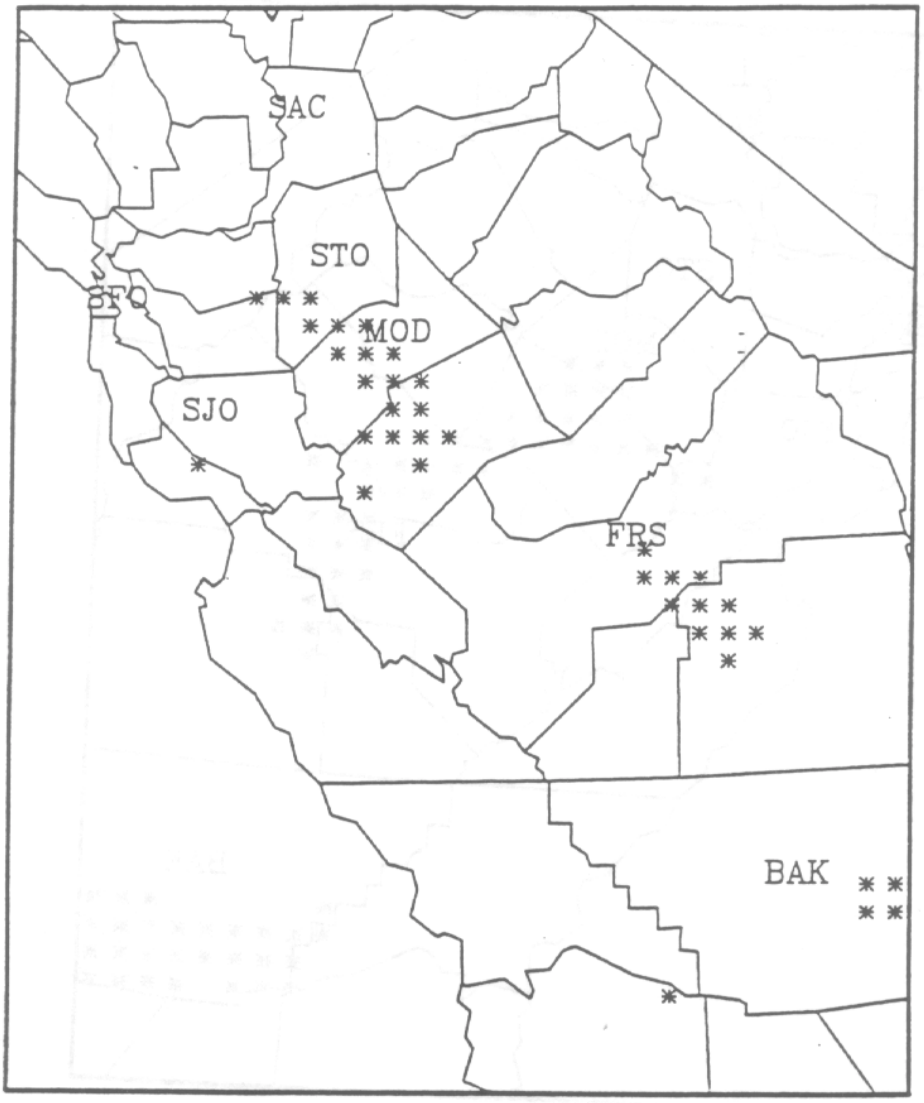


FIGURE 5-15

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 5/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

SAC=0

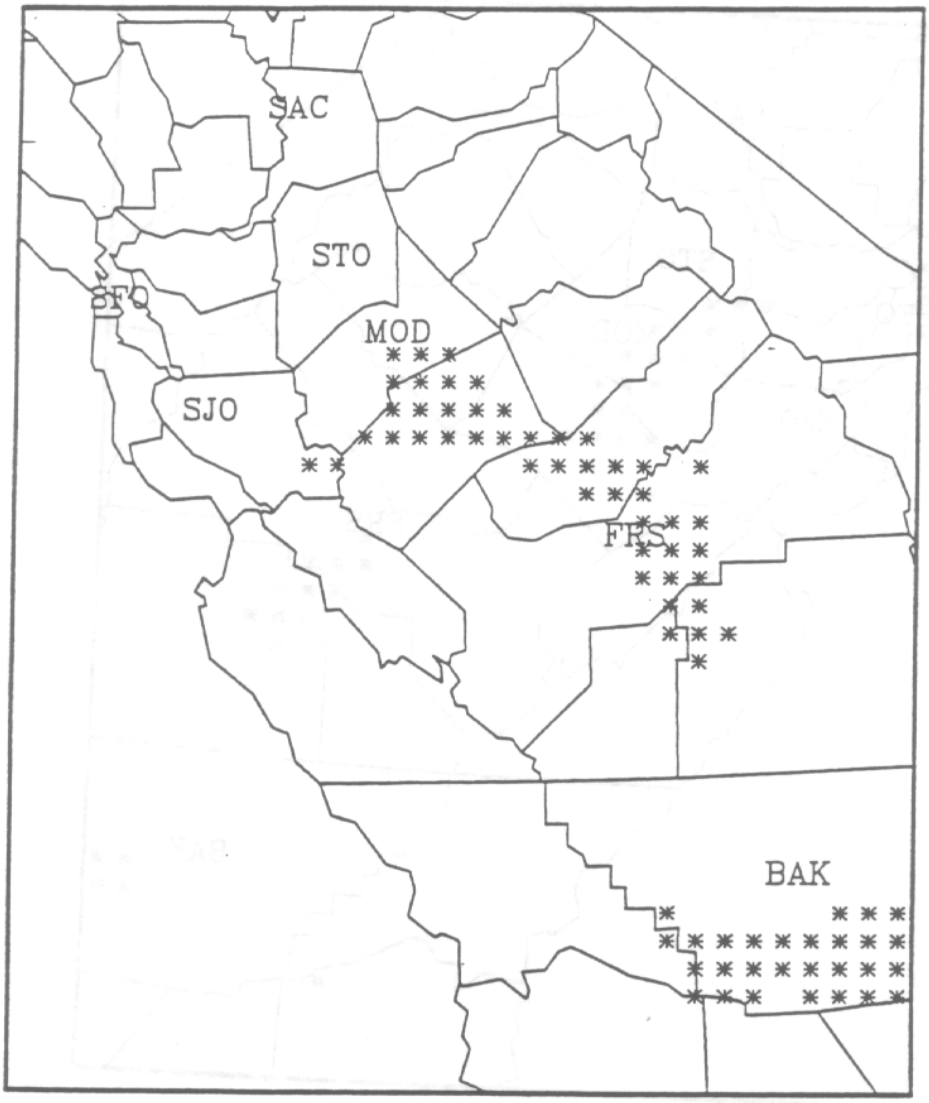


FIGURE 5-16

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 6/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

BAY + SAC=0

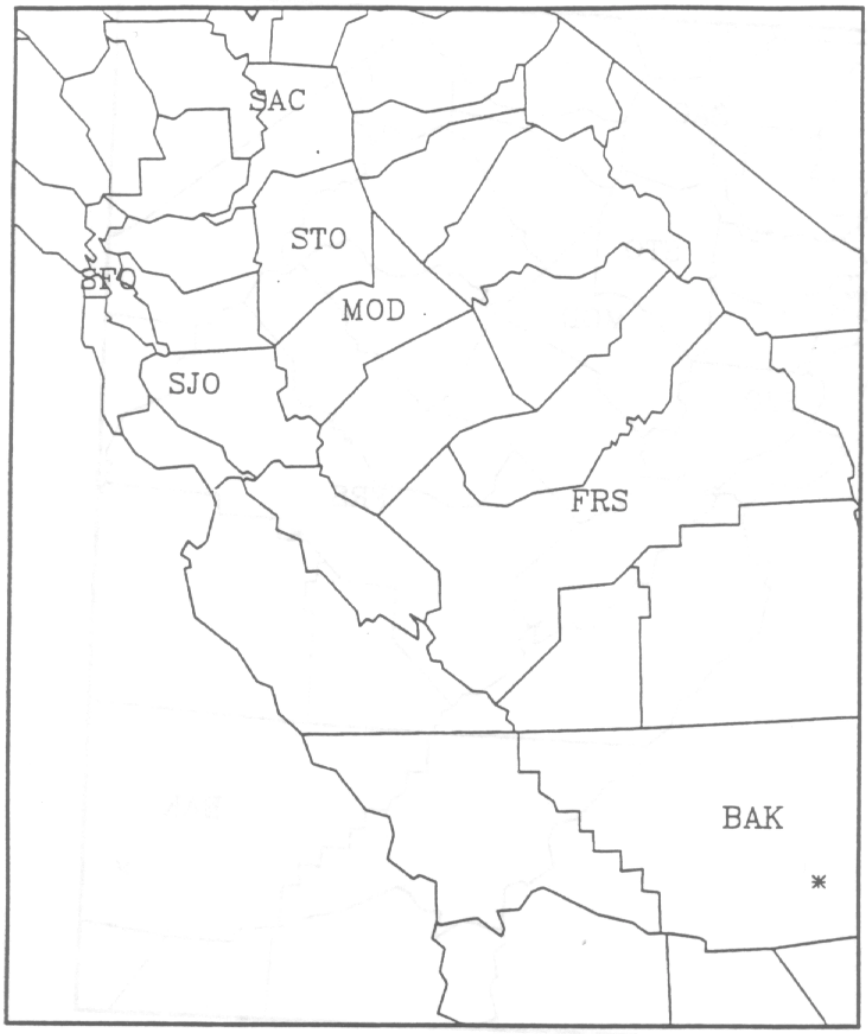


FIGURE 5-17

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 3/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

BAY + SAC=0

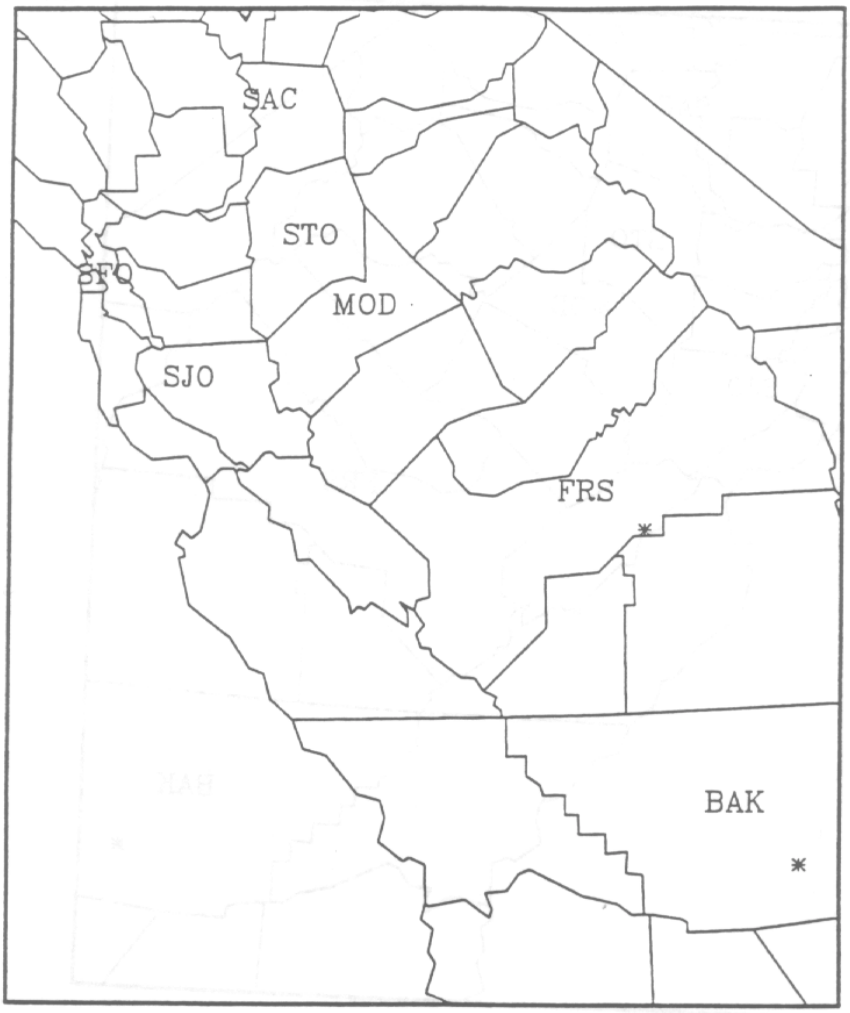


FIGURE 5-18

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 6/ 4/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

BAY + SAC=0

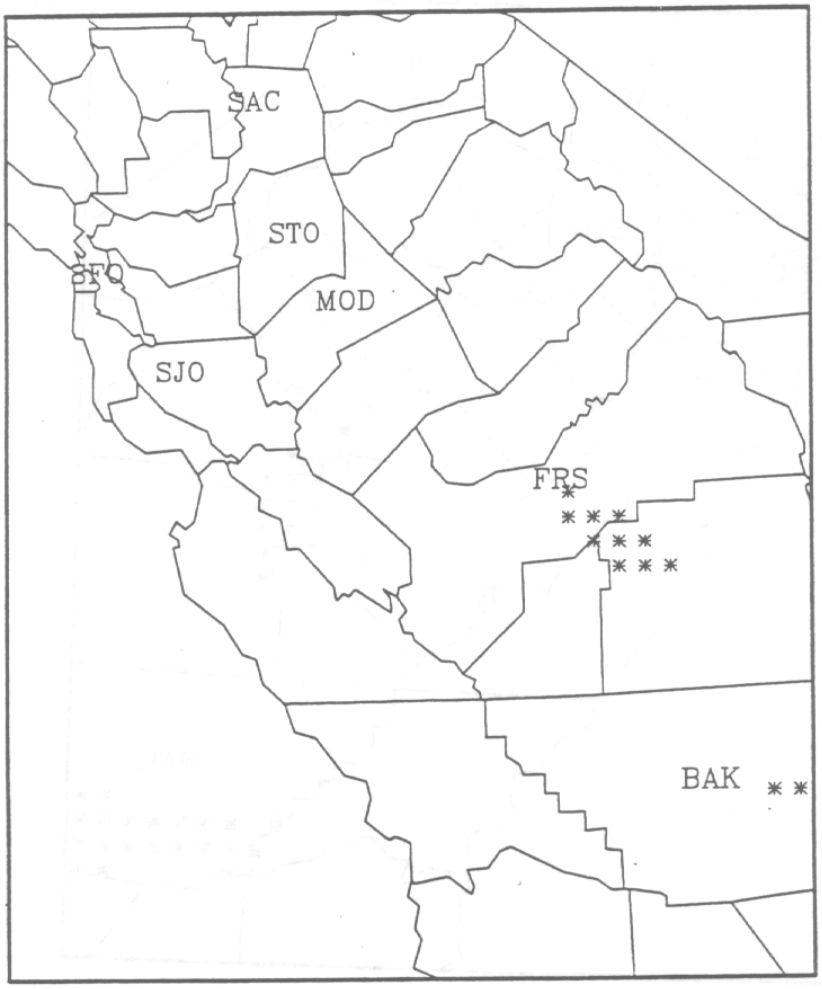


FIGURE 5-19

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 5/90

The asterisks indicate the locations with ozone concentrations above the federal standard. The base case simulation is labelled "Base." The other simulations are labelled to show the area of emissions that was "turned off" for the analysis. SJV = San Joaquin Valley, SAC = Sacramento, Bay = Bay Area, BAY + Sac = Both Bay and Sacramento Emissions are "turned off."

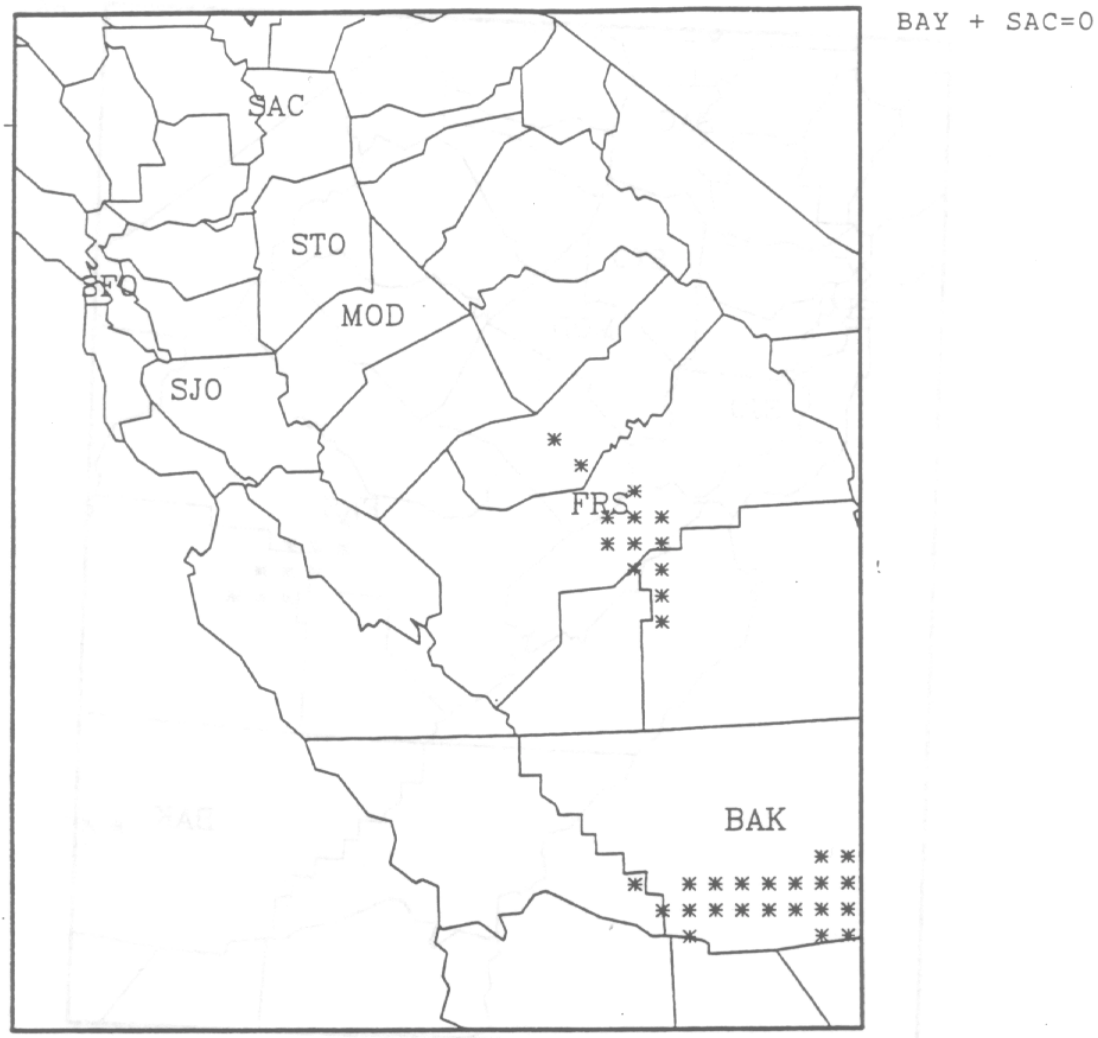


FIGURE 5-20

SAFFET

SIMULATED OZONE 120 ppb and above DATE= 8/ 6/90

Simulations Referenced in this Chapter

Boundary Condition simulation, clean air boundaries with no anthropogenic emissions - ARB File: s12fulx.a99c15x.msEb19N.cnfB1Aa; District File: BC-0-Anthro

Boundary Condition simulation, 50% NOx boundaries with no anthropogenic emissions - ARB File: s12fulx.a99c15x.msEb19N.cufB1Ba; District File: BC-0-Anthro .5NOx

Boundary Condition simulation, 50% NOx boundaries with 1999 emissions - ARB File: s12fulx.a99c15x.msEb01N.cnfB1Ba; District File: A1-99+BC.5N

1990 Base Case - ARB File: s12ful.a90c15.msEb01.cnf413; District File: A1

100% Anthropogenic VOC Emission Reduction from 1990 Base Case
ARB File: s12fulx.a90c15x.msEb14N.cnf413a; District File: E1

50% VOC and 50% NOx Anthropogenic Emission Reduction from 1990 Base Case
ARB File: s12ful.a90c15.msEb07.cnf413; District File: C3

75% VOC and 50% NOx Anthropogenic Emission Reduction from 1990 Base Case
ARB File: s12ful.a90c15.msEb08.cnf413; District File: D3

50% VOC and 65% NOx Anthropogenic Emission Reduction from 1990 Base Case
ARB File: s12ful.a90c15.msEb09.cnf413; District File: C4

1990 Base Case without Anthropogenic VOC and NOx from San Francisco Bay Area and Sacramento ARB File: s12ful.a90c15x.msEbT1N.cnf413a; District File: T1

1999 Base Case ARB File: s12fulx.a99c15x.msEb01N.cnf11Aa;
District File: A1-99

50% Anthropogenic VOC Emission Reduction from 1999 Base Case
ARB File: s12fulx.a99c15x.msEb05N.cnf11Aa; District File: C1-99

50% Anthropogenic NOx Emission Reduction from 1999 Base Case
ARB File: s12fulx.a99c15x.msEb06N.cnf11Aa; District File: A3-99

25% VOC and 25% NOx Anthropogenic Emission Reduction from 1999 Base Case
ARB File: s12fulx.a99c15x.msEb16N.cnf11Aa; District File: B2-99

50% VOC and 50% NOx Anthropogenic Emission Reduction from 1999 Base Case
ARB File: s12fulx.a99c15x.msEb07N.cnf11Aa; District File: C3-99

Zero Point source 1990 emissions - ARB File: s12fulx.a90c15x.msEb20N.cnf513a; District File: 0 Point 90

Zero Area source 1990 emissions - ARB File: s12fulx.a90c15x.msEb21N.cef513a; District File: 0 Area 90

Zero Mobile source 1990 emissions - ARB File: s12fulx.a90c15x.msEb22N. cef513a; District File: 0 Mobile 90

Zero San Francisco Bay Area 1990 emissions - ARB File: s12fulx.a90c15x.msEbT5N.cnf513a; District File: 0 Bay 90

Zero San Joaquin Valley 1990 emissions - ARB File: s12fulx.a90c15x.msEbT4N. cnf513a; District File: 0 SJV 90

Zero Sacramento 1990 emissions - ARB File: s12fulx.a90c15x.msEbT6N.cnf513a; District File: 0 Sacto 90

1999 Base Case without Anthropogenic VOC and NOx from San Francisco Bay Area and Sacramento ARB File: s12fulx.a99c15x.msEbT1N.cnf11Aa; District File: T1-99

Motor Vehicle sensitivity simulation for 1990 emissions - ARB File: s12fulx.a90c15x.msEb15N.cnf413a; District File: MV*2

1999 with proposed controls and revised emissions and boundary projections, without Anthropogenic VOC and NOx from San Francisco Bay Area and Sacramento - ARB File: s12fulx.a99c15x.msEbTCN.cufE1Da; District File: T1-99BC.5

1999 with proposed controls and revised emissions and boundary projections - ARB File: s12fulx.a99c15x.msEb01.cnfE1Da; District File: A1-99BC.5

1999 with proposed controls and revised emissions and EPA default boundary projections - ARB File: to be determined; District File: A1-99EPA when received.

CHAPTER 6

CONCLUSIONS

INTRODUCTION

The purpose of the Attainment Demonstration Plan is to identify sufficient actions to reach attainment by 1999. Photochemical grid modeling is used to project the effect of federal, state, and District actions to reduce emissions as well as projecting the growth and decline of emissions due to economic and population projections. The District is directly responsible for taking action sufficient to prevent exceedances of the federal ozone standard which are caused solely by local emissions, and must take additional actions in partnership with the state and upwind air districts to meet the federal ozone standard when air movement transports significant levels of emissions into the San Joaquin Valley from upwind air basins. Although the regional model used for the Plan is still scheduled to receive final development improvements, it passes EPA performance criteria in its current form. Simulations with the model indicate that this Plan contains sufficient reductions to achieve attainment by 1999.

REACHING ATTAINMENT

The Attainment Demonstration Plan evaluates whether actions taken through 1994 are sufficient to reach the "local" and "transport" goals. Modeling simulations initially indicated that currently adopted rules are not sufficient to reach either the "local" or "transport" goal by the year 1999. Almost all of the San Joaquin Valley will reach attainment by implementation of rules which the District has already adopted from 1991 Air Quality Attainment Plan and the federal ROP plans. Small areas in Fresno and Kern Counties are projected to remain in exceedance of the federal standard without additional reductions in both the "local" and "transport" situations. A detailed discussion of this scenario is found in Chapter 3.

Additional measures were evaluated to provide further reductions by the year 1999. These included future adoption of many proposed rules found in the 1991 AQAP and the implementation of Enhanced I & M in the Stockton and Modesto metropolitan areas. To ensure that excessive reductions are not proposed, the District and the ARB reevaluated the projections used to predict emissions levels in the year 1999. This is discussed in detail in Chapter 4.

Revisions were made to growth estimates for diesel emissions and oil production, where the preliminary estimates over-predicted the emissions likely to remain in 1999. The District also reviewed and made revisions for changes in Valley emissions that are not expected to follow historical trends. For example, the closure of Castle Air Force

Base will decrease government-military-aircraft emissions. Technical aspects of the model were also examined. The boundary conditions established for the 1990 Base Case were reevaluated. The boundary conditions would also be expected to improve by 1999 due to reduction of emissions occurring throughout California. Modeling simulations were performed to evaluate this conservative assessment of reductions necessary to reach attainment in the year 1999.

With the additional regulations, and conservative estimates of future emissions, the model simulation for ozone levels generated by "local" emissions showed attainment of the federal ozone standard by the year 1999.

Even more importantly, ozone attainment is achievable in the Valley for the "transport" case by 1999. Therefore, the District is able to meet the attainment demonstration requirements established by the 1990 FCAAA. The additional regulations and model refinements previously discussed will enable the accomplishment of this milestone achievement for the San Joaquin Valley.

ACCURACY OF MODELING PREDICTIONS

The ozone model appears to be highly resistant to change. In other words, a large change in emissions produces only a small change in the predicted ozone peak concentration. The peak ozone values proved highly resistant to domainwide and local strategies. On a domainwide basis, cuts of over thirty percent across the entire domain were needed to eliminate the two small areas of exceedance. On a local basis, both areas appeared to be essentially unaffected by implementation of the federal enhanced inspection and maintenance program.

Modeling Limitations

A model is not able to contain all of the factors which occur in the real world. Therefore, a model only reflects the best approximation which can be provided by analyzing the most significant factors. The predictions made by the model are only as precise as current science, technology, and information allow. No computer model incorporates every process that occurs in nature. This model does include an estimate of "Biogenic Emissions" which are biological emissions from growing plants and trees. The model represents only one meteorological event, which may or may not be a typical weather pattern for ozone exceedances. The weather was not unusual for that time of year so the observed episode is believed to be typical.

A number of uncertainties remain to be evaluated to improve the performance of the model. Because of the uncertainties in the model and the limited spatial accuracy of point and mobile sources which exists in current simulations, the reductions indicated as necessary to reach attainment may be significantly overestimated. Motor vehicle emissions are known to be underestimated, with revisions to the motor vehicle emissions factors expected to be released early next year. While the emissions are underestimated, the distribution of motor vehicle trips within the current version of the model concentrates the emissions along highway corridors. This may predict ozone concentrations which are higher than would occur with a better distribution of mobile emissions.

If the poor spatial resolution or any other modeling uncertainty or error causes an over-prediction for ozone of only one-half part per hundred million, the reduction targets based on percentage reductions of all anthropogenic emissions in the modeling domain can be significantly overestimated. The evaluation that, beyond adopted regulations, additional emissions reductions of nearly 40 percent of domain VOC and NOx would be needed to reach attainment would be reduced to only 30 percent.

The need to track progress, reflect improvements in science, and reflect better emissions estimates will create a continuing need for modeling simulations.

CONTINUING EXAMINATION

Additional Modeling and Model Development

The EPA requires that newly developed models be compared to the Urban Airshed Model (UAM) which the EPA has approved for urban ozone modeling. UAM modeling was performed with the same data collected for the SAQM model. Both were successful in simulating a close approximation to the ozone episode which was observed in 1990, performing within limits of error established by the EPA for certification that a model demonstrates an acceptable level of performance. SAQM is under continuing development and will undergo extensive testing and improvement. While currently meeting performance requirements, improvements to the model may provide refined analysis when modeling simulations are reexamined. The model performance tests established by the EPA determine if a model is able to successfully simulate the ozone episode that was observed. Since the model in its current form passes these tests, model improvements may affect the intensity of response to an

emissions change but are not likely to alter conclusions to a significant degree. If, however, revisions in ozone reduction strategy are indicated by model improvements, updates or revisions will be submitted to the ARB and the EPA.

Full performance evaluation of the model has not been completed. The Technical Committee overseeing model development and the consultant assigned to evaluate the model have developed a series of tests to analyze the model. Going far beyond performance tests required by EPA, these evaluations are designed to evaluate whether the answers the model provides match scientific understanding of the processes involved. The tests are intended to make sure that the final version of the model does more than just simulate the observed episode, it must respond to changes in the inputs which match the best understanding of physical processes. If the model is not held to this higher standard it could make predictions which are unreliable. If the model is allowed to respond in ways which are contrary to known science it may exaggerate or underestimate the benefit of controls and the amount of reductions needed to reach attainment. While currently meeting performance requirements, improvements may provide refined analysis which could alter conclusion that are drawn from modeling that is currently available. If revisions in an ozone reduction strategy are indicated by model improvements, updates or revisions will be submitted to the ARB and the EPA.

Additional simulations will be conducted with the model to learn as much as possible about the best course of action for improving air quality in the Valley. Examining changes at a sub-regional level, effects of ozone changes on population exposure to elevated levels of ozone, experiments with concentrated urban strategies and many other simulations are planned.

Simulations Referenced in this Chapter

1999 Attainment Demonstration Simulation (12 km) ARB
file: s12fulx.a99c15x.msEbTEN.cufH1Da District File: District Attainment 1

1999 Attainment Demonstration Simulation (4 km) Fresno ARB
file: s04frsx.a99c15x.msEbTEN.cnfH1Dd District File: Fresno Attainment 1

1999 Attainment Demonstration Simulation (4 km) Kern ARB
file: s04bakx.a99c15x.msEbTEN.cufH1Dd District File: Kern Attainment 1

1999 Attainment Demonstration Simulation, without westside NOx controls (4 km) Kern

ARB file: s04bakx.a99c15x.msEbTEN.cnfI1Dd District File: Kern Attainment 2

CHAPTER 7

MODELING EXECUTIVE SUMMARY

INTRODUCTION

As stated in the EPA "Guidance on Urban Airshed Model (UAM) Reporting Requirements for Attainment Demonstration", EPA-454/R-93-056, March 1994 Section 182(b) of the FCAAA requires nonattainment areas classified as moderate or above to demonstrate that the controls included in their SIP are sufficient to attain the national ozone air quality standard. Serious or above nonattainment areas are required to use a photochemical grid model. The San Joaquin Valley has been classified as serious and must therefore use a photochemical grid model to prove the adequacy of our controls.

The EPA guidance requires submittal of specified SIP modeling documentation. This documentation is provided in this and other chapters of the Attainment Demonstration Plan, in attached appendices, and in separate documentation reports prepared by contractors which are adopted as documentation of the Attainment Demonstration Plan by reference. Summary tables of the peak ozone values predicted in model simulations are included in the Attainment Demonstration Plan.

The full output files in electronic form, ozone iso-linear maps, tile plots, and time series plots of ozone and all chemical species are adopted as supporting documentation for the model by reference. Identification of a simulation as a reference for a chapter of this Plan, or inclusion of a summary table of a simulation establishes adoption by reference of the full data set contained in the simulation in any and all forms retained on file by the District and the ARB. Examination of these files and printouts is available to the EPA and other interested parties on request. The ARB currently retains all electronic files, printouts are retained by the ARB. The simulations related to attainment demonstration printouts are also retained at the District.

Status of Documentation

Full performance evaluation of the model has not been completed. The Technical Committee overseeing model development and the consultant assigned to evaluate the model have developed a series of tests to analyze the model. Going far beyond performance tests required by EPA, these evaluations are designed to evaluate whether the answers the model provides match scientific understanding of the processes involved. The tests are intended to make sure that the final version of the model does more than just simulate the observed episode, it must respond to changes in the inputs which match the best understanding of physical processes. If the model is not held to this higher standard it could make predictions which are unreliable. If the model is allowed to respond in ways which are contrary to known science it may exaggerate or underestimate the benefit of controls and the amount of reductions needed to reach attainment.

Additional simulations will be conducted with the model to learn as much as possible about the best course of action for improving air quality in the Valley. Examining changes at a sub-regional level, effects of ozone changes on population exposure to elevated levels of ozone, experiments with concentrated urban strategies and many other simulations are planned.

Documentation as required by the EPA guidance for attainment demonstration plans is provided for the modeling and performance analysis which has been conducted and utilized in the development of the Attainment Demonstration Plan. Many of the reports are not final reports since additional model development and performance analysis is still in progress. Final reports and supplementary documentation will be forwarded to the EPA upon completion.

Performance and Comparison to UAM

The SAQM model performs within EPA guideline requirements for use in attainment demonstration modeling. It successfully simulated the observed episode and performs well in comparison to the UAM model. A series of simulations reducing NOx and VOC on a domainwide basis from the 1990 Base Case performed with both models indicate that domainwide NOx reductions appear to be more important in reaching attainment than VOC reductions. Both models show that interbasin transport is significant, particularly for the northern San Joaquin Valley. SAQM has been evaluated for projections of conditions in 1999. These simulations indicate that reductions beyond currently adopted rules are needed to reach attainment by 1999.

A number of uncertainties remain to be evaluated to improve the performance of the model. Because of the uncertainties in the model and the limited spatial accuracy of point and mobile sources which exists in current simulations, the reductions indicated as necessary to reach attainment may be significantly overestimated. If the poor spatial resolution, use of 12 km instead of 4 km meteorology, or other factors cause an over-prediction for ozone of only one-half part per hundred million in the 1999 projections, the reduction targets to reach attainment will be significantly affected.

EPA Reporting Requirements

The reporting requirements for the Attainment Demonstration Plan are contained in the EPA document "Guidance on Urban Airshed Model (UAM) Reporting Requirements for Attainment Demonstration"; EPA-454/R-93-056, March 1994. The reporting requirements apply to use of the SAQM model that is being used instead of UAM. Substitution of SAQM for UAM requires additional documentation that the model provides comparable performance to UAM in successfully simulating the observed ozone event. This requires comparison of base case performance of both SAQM and UAM. The appropriate simulations have been performed and the performance requirements have been met to allow use of SAQM for the attainment demonstration.

The Attainment Demonstration Plan must be supported in its finding of attainment by documentation that appropriate process has been followed to gather air quality data, determine emissions during the episode, and properly use and test the accuracy of the air quality model used to predict attainment. The plan for the entire program, called the Modeling Protocol must be submitted. The purpose of the modeling protocol is to communicate the scope of the analysis. Emissions Preparations used to develop episode and projected emissions must be documented to show that the emissions data base has been appropriately tailored for the days modeled. Air Quality and Meteorological Data Preparations for the episode must be documented to assure that the data is representative and accurate. Diagnostic Analysis and Model Performance Evaluations of the model, in this case both UAM and SAQM, must be documented. The diagnostic tests are used to validate the modeling results and any adjustments made to the model in comparison to scientific understanding. Model performance evaluation includes statistical performance tests required by the EPA. To ensure public access is preserved, Data Access Procedures must be reported indicating the location of records and availability to the EPA or other interested parties.

Simulation Results demonstrating attainment must be documented to assure the EPA and the public that the Attainment Demonstration Plan meets the attainment tests set forth in the EPA guidance.

MODELING PROTOCOL

The modeling protocol was submitted to the EPA by ARB. A copy of the document and its attachments is contained in Appendix C.

EMISSIONS PREPARATIONS

Emissions preparations for the Attainment Demonstration Plan are contained in the Plan or its appendices. Documentation of the emissions preparation of data associated with the modeling episode is attached in Appendix D.

AIR QUALITY AND METEOROLOGICAL DATA PREPARATIONS

Air quality data and meteorological files are available in electronic form from the ARB. Reports from various consultants under contract to the SJVAQS or SARMAP projects are available through the ARB on request. Some of the reports may still be in draft form and are available in that form to the EPA as a member of the Policy Committee of the SJVAQS and SARMAP studies. Final reports will be publicly available.

DIAGNOSTIC ANALYSIS

Diagnostic analysis was performed by the ARB and consultants under contract to the San Joaquin Valley Air Quality Study and SARMAP projects. Many of the reports of this analysis are not yet published. Documentation which is available now is included in Appendix A and E or is included by reference.

MODEL PERFORMANCE EVALUATIONS

All model performance evaluations have been conducted by the ARB or consultants under contract to the San Joaquin Valley Air Quality Study or SARMAP projects. Performance is reported for both the UAM and SAQM models. Submissions of UAM performance is required to establish that SAQM has performance comparable to UAM for the observed episode, as well as independently passing the EPA statistical performance tests.

UAM

UAM performance evaluations are attached as Appendix B.

SAQM

SAQM performance evaluations are attached as Appendix A.

SIMULATION RESULTS

Tables of peak hour results have been prepared by the ARB and are included as documentation in Appendix E.

DATA ACCESS PROCEDURES

ARB and the District maintain files related to the Attainment Demonstration Plan. ARB retains all electronic files of data, modeling software, and output files. Data access procedures are in place for the air quality data obtained during episode monitoring. All other electronic data is available on request, with authorization from the Study Agency or its Policy Committee that it has received sufficient quality analysis and is ready for public release.

ATTAINMENT DEMONSTRATION

Results of simulations demonstrating attainment must be documented to assure the EPA and the public that the Attainment Demonstration Plan meets the attainment tests set forth in the EPA guidance. Model simulations must show that the Attainment Demonstration Plan will improve air quality levels sufficiently to comply with federal ozone NAAQS by 1999. Air quality predictions must be based on the emissions reductions contained within the attainment strategy.

The entire Attainment Demonstration Plan is submitted to comply with this documentation requirement. The Plan contains discussion of the control measures and other reductions necessary to reach attainment. Model simulations were performed to ensure that the reductions were sufficient to achieve attainment by 1999. The simulations are described, and all of the data contained within the electronic simulation files are incorporated by reference. Tables of peak hour results for most of the simulations performed have been prepared by the ARB and are included as documentation in Appendix E.

Documentation Incorporated By Reference

The quantity of documents, reports simulations and analyses prepared for the development of the SAQM model, accomplishment of UAM modeling, and preparation of the Attainment Demonstration Plan is too voluminous to submit as a single document. Two file cabinets are filled just with the SAQM simulations isopleth printouts. These records are incorporated by reference as substantiating documents for the Attainment Demonstration Plan.

The following is a list of important documents prepared by other agencies that provide additional detail related to the attainment demonstration modeling. The documents are incorporated by reference as additional documentation for the modeling executive summary required by the EPA.

Development of a Weekend Gridded "Fallback" On-Road Vehicle Emissions Inventory for the SJVAQS Study Area; Sierra Research, Inc.; July 1994.

Meteorological Analysis of the San Joaquin Valley Air Quality Study, Atmospheric Utilities Signatures, Predictions and Experiments Program (SJVAQS/AUSPEX); Technical & Business Systems, Inc.; May 1994.

SARMAP Model Evaluation Protocol; Alpine Geophysics (T. W. Tesche); April 10, 1992.

State Implementation Plan Transportation Control Measures "Rate Of Progress Plan" San Joaquin Valley Air Basin; Council of Fresno County Governments, Moy and Associates, and Valley Research & Planning Associates; July 1994

Technical Guidance Document: Photochemical Modeling; California Environmental Protection Agency, Air Resources Board; April 1992.

Urban Airshed Model Simulation of the SJVAQS August 3-6, 1990 Episode; California Air Resources Board; June 3, 1994. If the EPA determines that additional information concerning this model, the base case simulation results, or other simulations conducted with this model is required to be forwarded to the EPA for compliance with the documentation requirements for attainment demonstration plans, any and all existing documentation is hereby incorporated by reference for submission to the EPA. The modeling simulations conducted with this model are retained on file with the ARB and are available for submission.

CHAPTER 8

CALIFORNIA CLEAN AIR ACT TRIENNIAL PROGRESS REPORT AND PLAN REVISION

THIS DOCUMENT IS NOT A PART OF THE FEDERALLY MANDATED STATE IMPLEMENTATION PLAN

INTRODUCTION

The California Clean Air Act (CCAA) requires the District to report its progress in meeting state mandates for air quality improvements and to revise its 1991 AQAP by December 31, 1994, to reflect changing conditions. The Attainment Demonstration Plan and items in this chapter comply with that mandate. This Chapter will discuss each state triennial requirement and will either discuss the District's progress in meeting these requirements or refer to other District documents which contain those discussions. In order to minimize duplicative data and material, this Chapter contains discussions on requirements mandated by the state only and will refer to the federal Attainment Demonstration Plan for discussions on duplicative state requirements.

In the Valley, the air pollution problem is classified as "severe" under the CCAA. As a "severe" area, the District is required to reduce emissions as expeditiously as possible. In the AQAP, the District commits to implement all feasible measures.

PROGRESS TOWARD ATTAINMENT OF STATE AIR QUALITY STANDARDS

Pursuant to California Health and Safety Code (H&SC) section 40924, on or before December 31, 1994, the District is required to assess the extent of air quality improvement achieved during the preceding three years. The assessment of improvement should be based on: 1) ambient pollutant measurements; 2) best available modeling techniques; and 3) air quality indicators identified by the State Board for that purpose. Based on the ARB guidance document, Guidance for Using Air Quality-Related Indicators in Reporting Progress in Attaining the State Ambient Air Quality Standards, the District's assessment of improvement is based on air quality indicators and confirmed by ambient measurements and modeling.

Ambient pollutant measurements are collected from monitoring stations within the District and are incorporated into the ARB's annually-published Air Quality Data. Due to the "lag time" inherent in preparing that publication, the most recent issue includes data only through 1992. The data used to prepare the annual statistics shown in that document are reflected in the air quality indicators discussed below. As shown in the Air Quality Data, the ozone hourly peak in 1988 was 0.19 ppm. In 1992 the ozone hourly peak was 0.16 ppm. The total hours over the state standard was 943 for 1988 and 630 in 1992. This data represents considerable reductions in ambient levels of ozone.

To assist districts in the preparation of this report, the ARB prepared Guidance for Annual and Triennial Progress Reports Under the California Clean Air Act (August,

1993). The Guidance suggests that districts use the following air quality indicators to fulfill the reporting requirements for the Triennial Progress Report: 1) expected peak day concentration (EPCD); 2) per-capita annual exposure; and 3) per-unit-area annual exposure. The District has included these state-identified indicators in this report as required.

ARB staff has prepared charts showing EPDC trends, population-weighted ozone exposure and area-weighted ozone exposure for many of the monitoring sites in the District that have been in operation long enough to have the necessary data (6 years). These charts were prepared for the District using the best data available at this time. All of the charts include a confidence scale on the right hand side that incorporates the concept of native variability for each indicator. Native variability is defined by the ARB as "the spectrum of values that the indicator could have because of the influence of factors other than progress[1]." The difference between the baseline and the percentile values listed on the confidence scale equals the amount of change that can be attributed to emissions reductions at a confidence level equal to the percentile value. For example, a 1.0 part per hundred million decline in EPDC, measured from the baseline to the 95% tick mark on the confidence scale, represents the decline in exposure that can be attributed to emissions reductions with 95% confidence.

The expected peak day concentration charts (Figures 8-1 through 8-11) prepared by the ARB show that for most sites in the District, the EPDC for ozone has declined considerably between 1986 and 1993. The confidence scale or "error bar" on the right edge of the charts show that a decline in expected peak daily ozone concentration of one part per hundred million has occurred with 95% confidence in many areas. Although several of the charts show less marked improvements, none show an overall increase in expected exposure during the 1986 to 1993 time period. While several charts show apparent increases between 1991 and 1992, it must be noted that these increases are not "statistically significant" because the method used for calculating the expected values requires that they be at least three years apart to be compared to each other.

The population-weighted exposure chart (Figure 8-12) prepared by the ARB shows that it can be stated with 95% confidence that exposure to ozone (adjusted to reflect population distribution and to give more "weight" to higher ozone values) has declined approximately 100 hours per person per year within the District between 1986 and 1993. The decline is determined by taking the difference between the baseline value for the middle year, 1987, and the value at the 95 percentile of the confidence scale.

[1] Guidance for Using Air Quality-Related Indicators in Reporting Progress in Attaining the State Ambient Air Quality Standards

This represents a substantial improvement in air quality during that time period. In order to determine whether regional differences exist for these criteria, ARB staff separately evaluated the northern, central, and southern portions of the District (Figures 8-14, 8-16, and 8-18). That evaluation showed similar results for each region.

The area-based exposure chart (Figure 8-13) prepared by the ARB shows a similar improvement in air quality within the District. It can be stated with 95% confidence that the typical square kilometer within the District has seen a reduced ozone exposure of about 150 hours per year (adjusted to give more "weight" to higher values) during the 1986 to 1993 time period. This reduction is determined by taking the difference between the baseline value for the middle year, 1987, and the value at the 95 percentile of the confidence scale. In order to determine whether regional differences exist for these criteria, ARB separately evaluated the northern, central, and southern portions of the District (Figures 8-15, 8-17, and 8-19). The evaluation showed similar trends throughout the District.

In summary, the data prepared pursuant to H&SC section 40924 shows that expected "peak day" concentration, per-capita annual exposure, and per-unit-area annual exposure for ozone have declined within the District during the reporting period. These declines represent substantial progress toward meeting state ambient air quality standards.

Figure 8-1

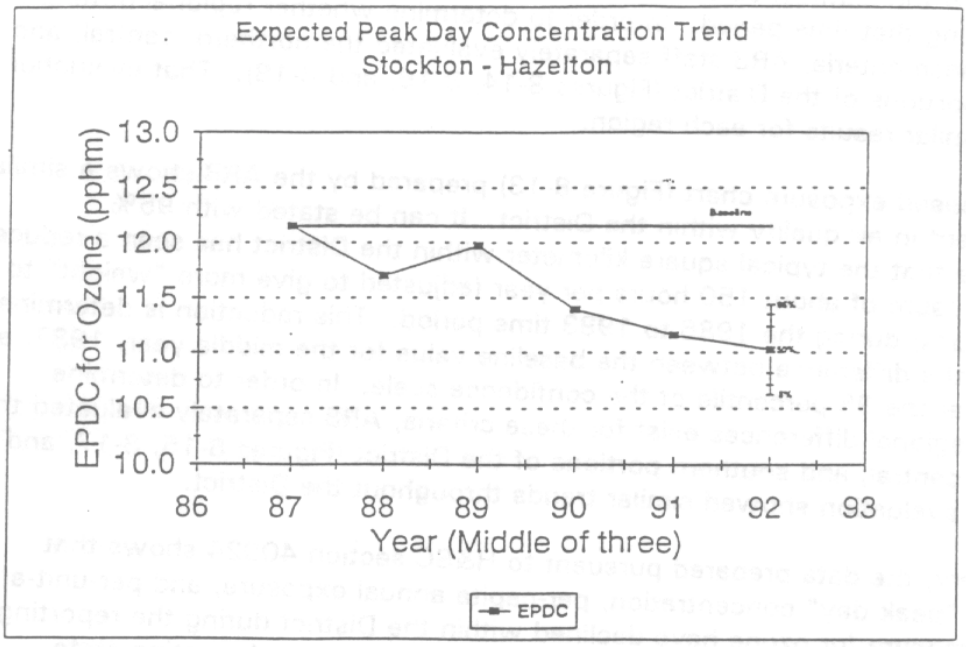
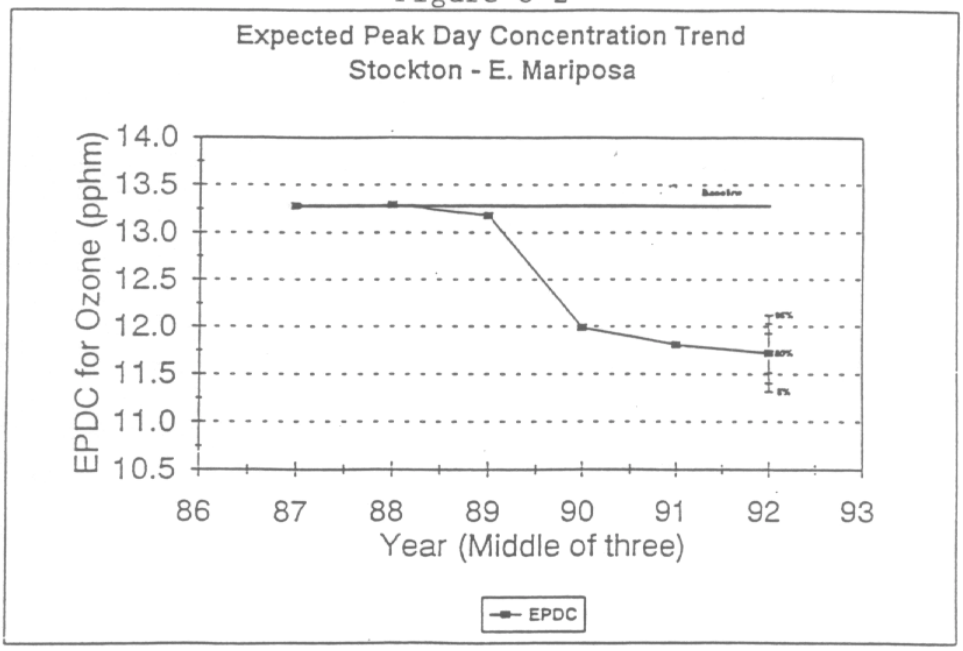


Figure 8-2



Source: ARB

Figure 8-3

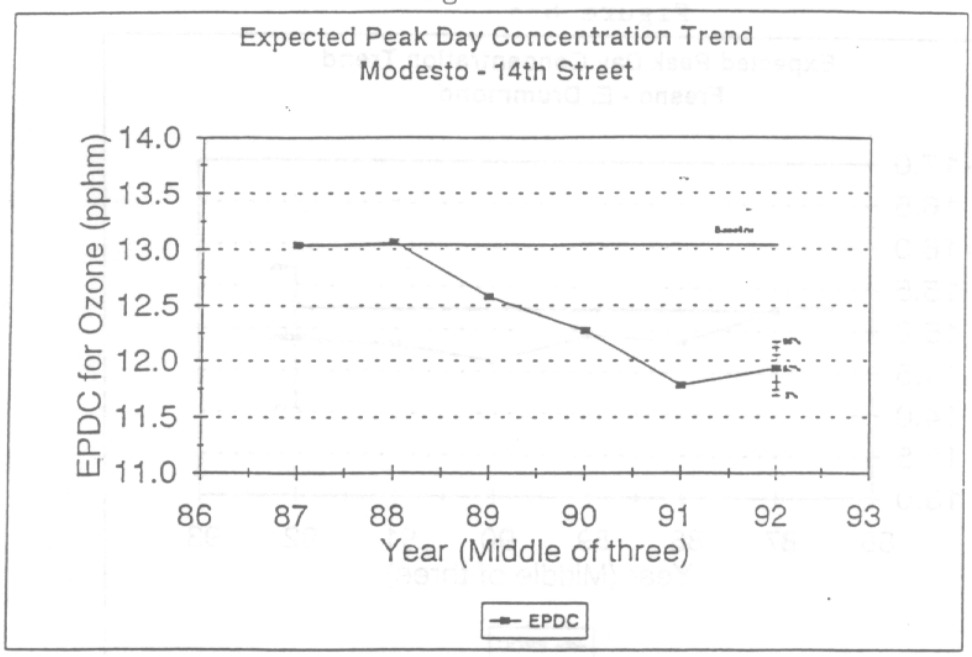
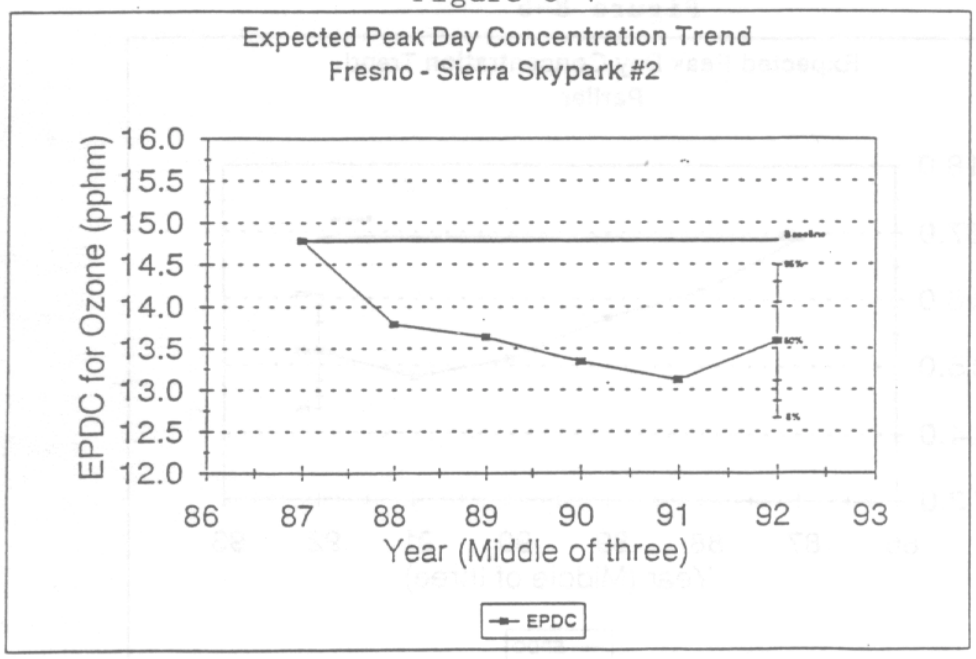


Figure 8-4



Source: ARB

Figure 8-5

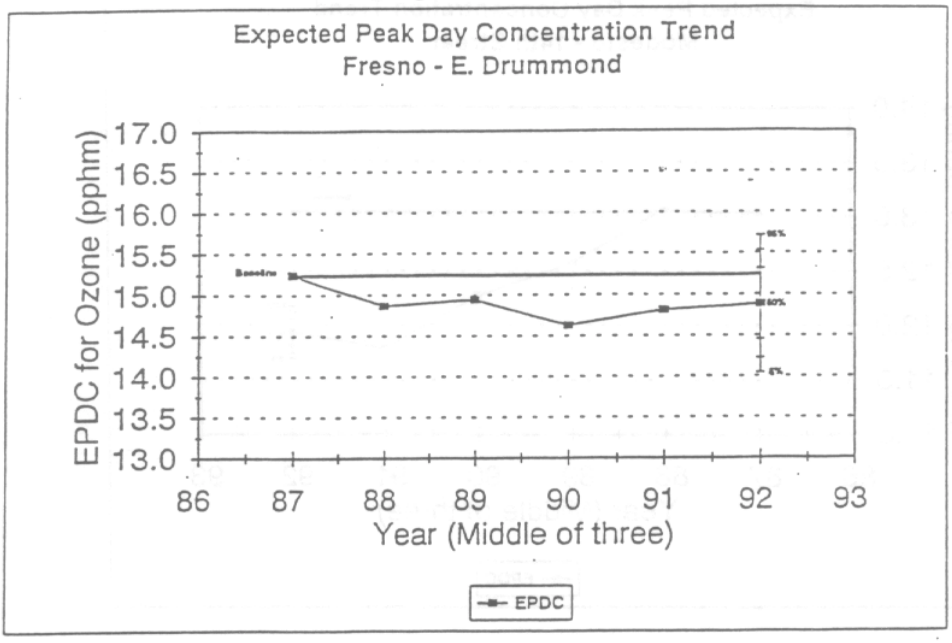
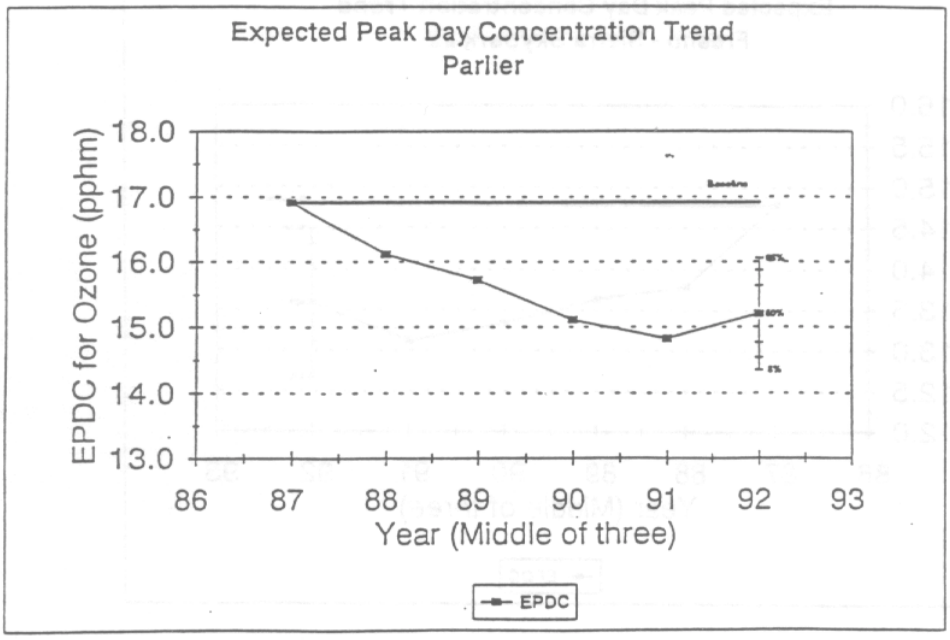


Figure 8-6



Source: ARB

Figure 8-7

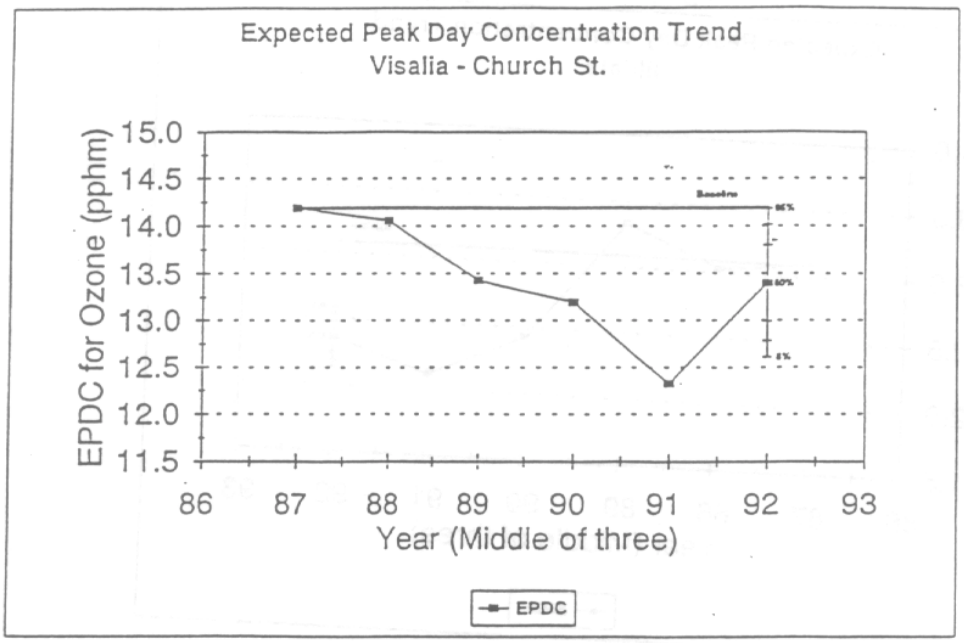
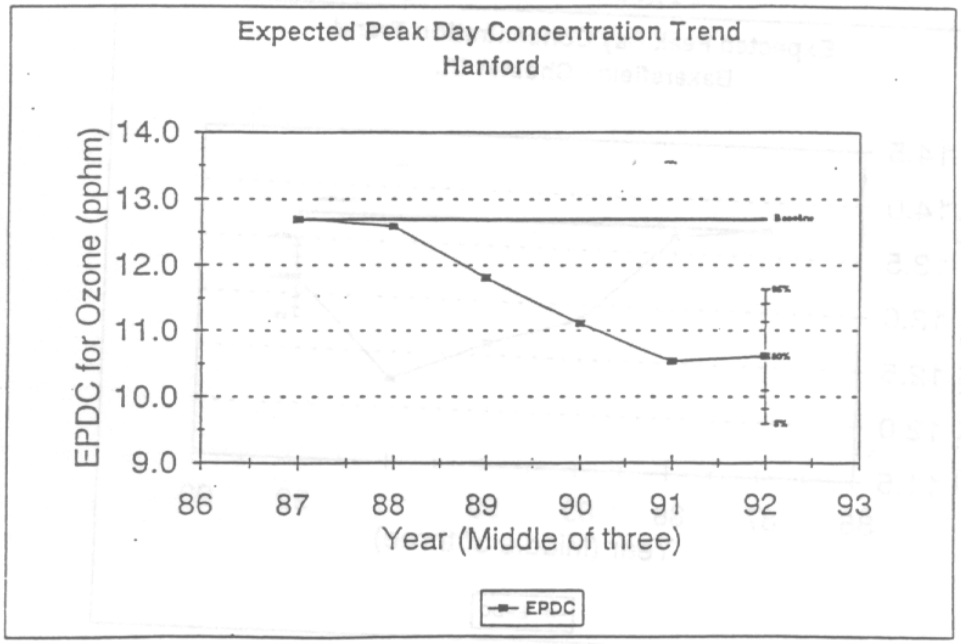


Figure 8-8



Source: ARB

Figure 8-9

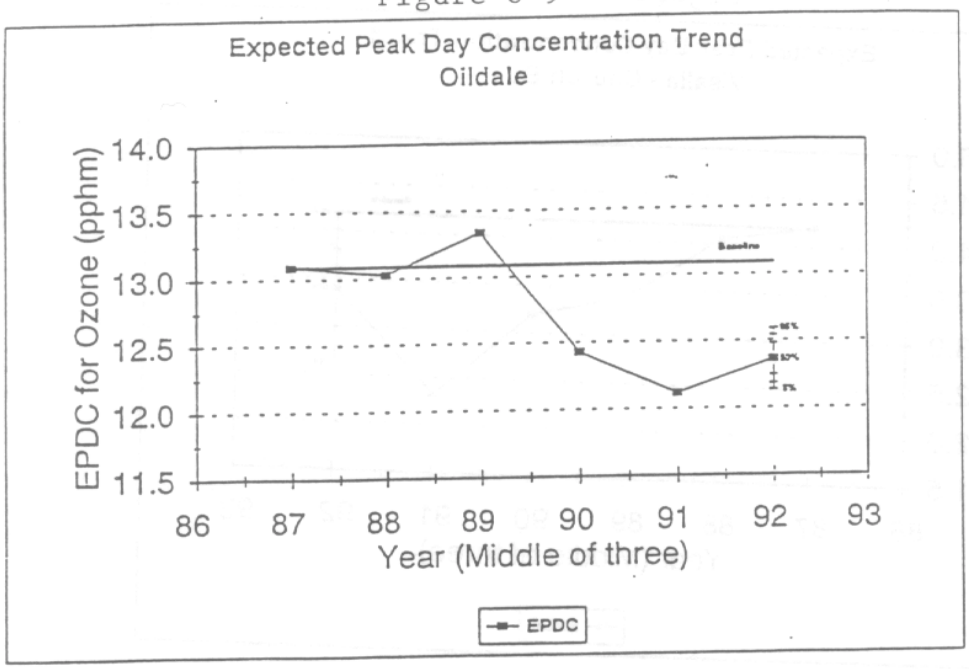
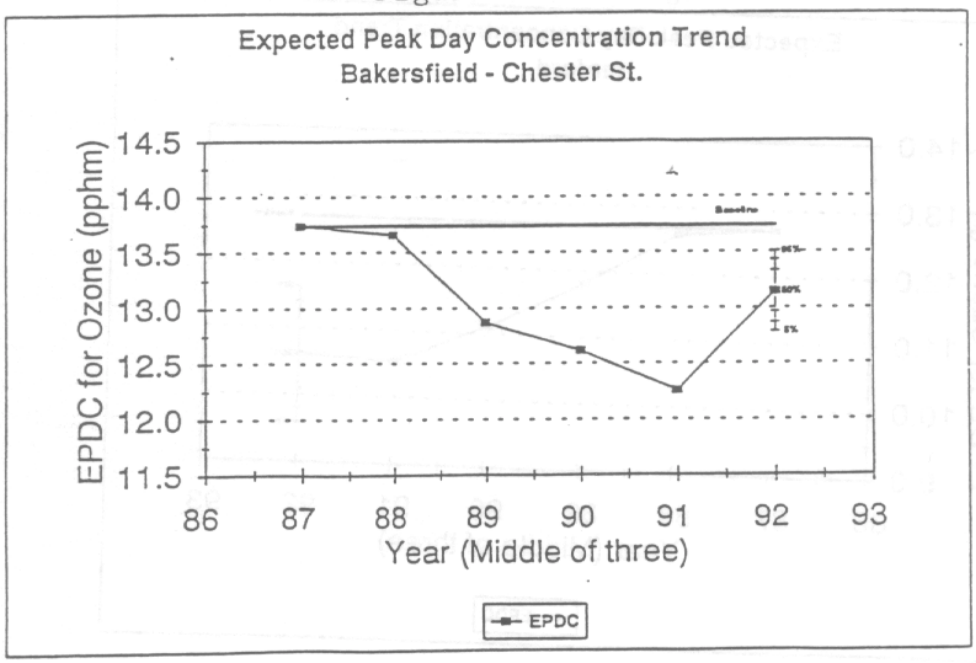
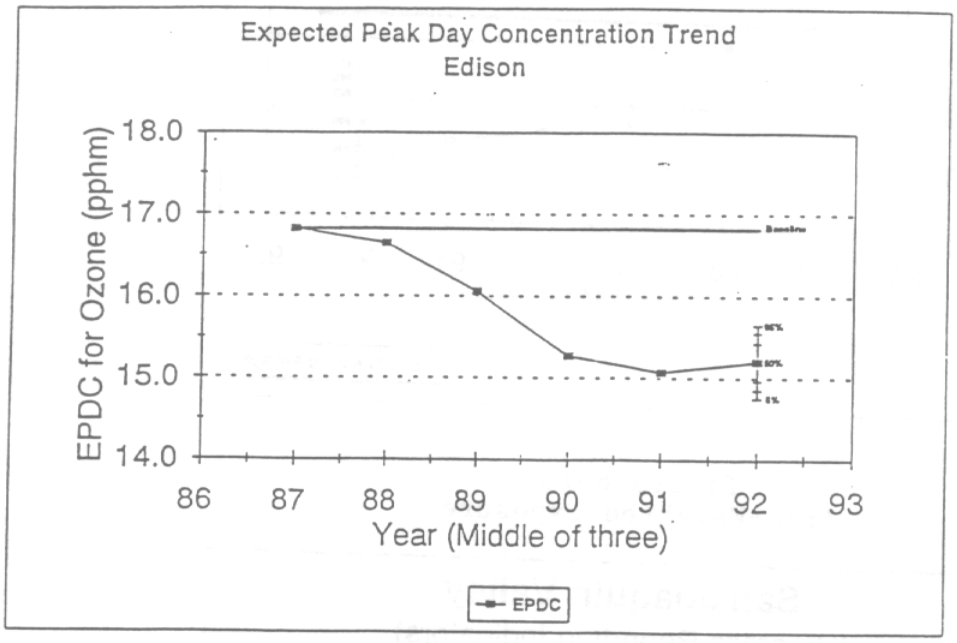


Figure 8-10



Source: ARB

Figure 8-11



Source: ARB

Figure 8-12
Population-Weighted Exposure

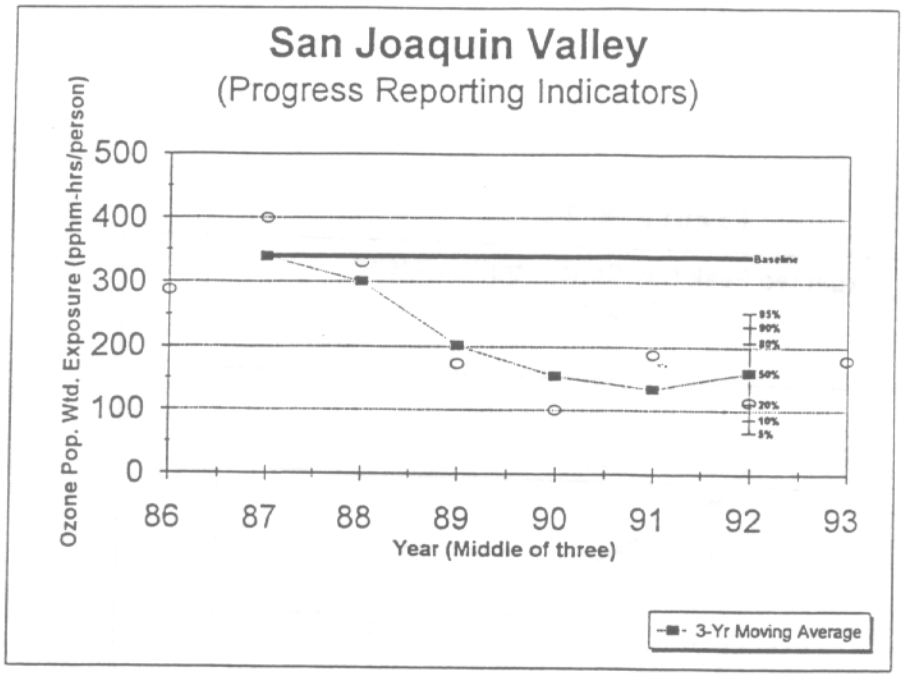
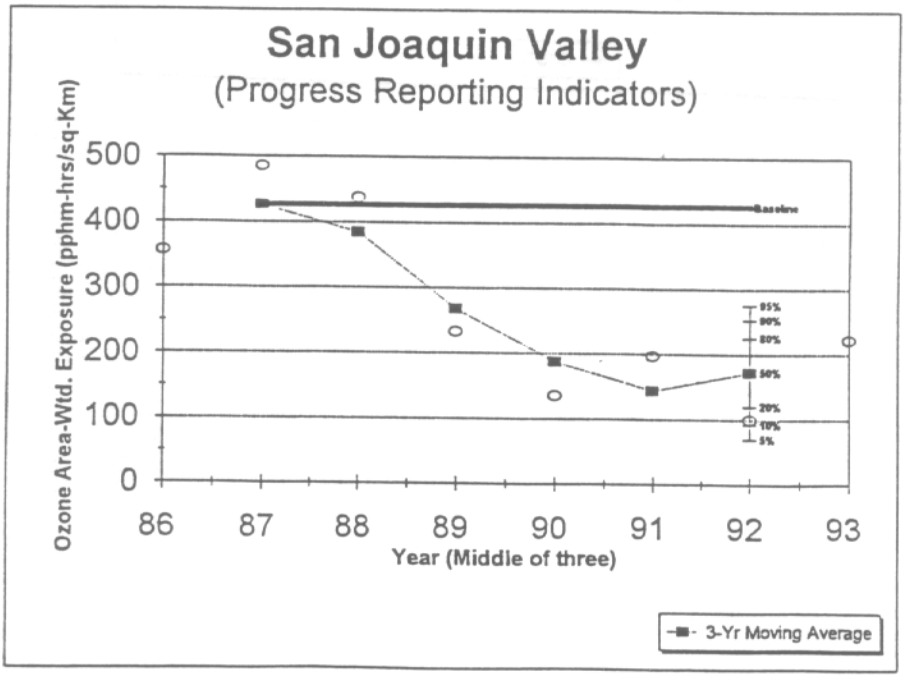


Figure 8-13
Area-Weighted Exposure



Source: ARB

Figure 8-14
Population-Weighted Exposure

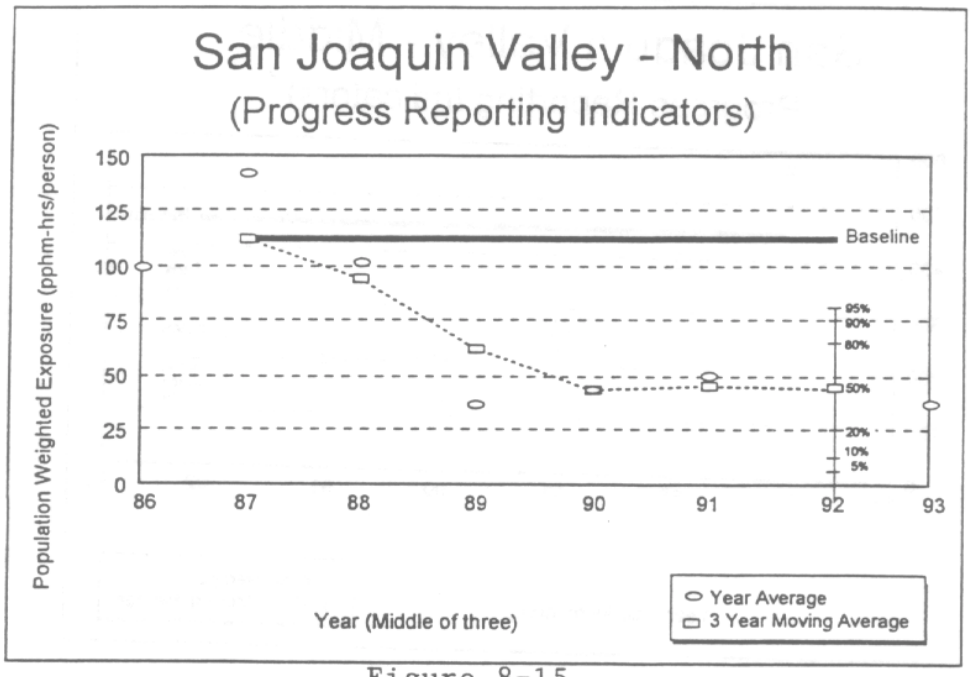
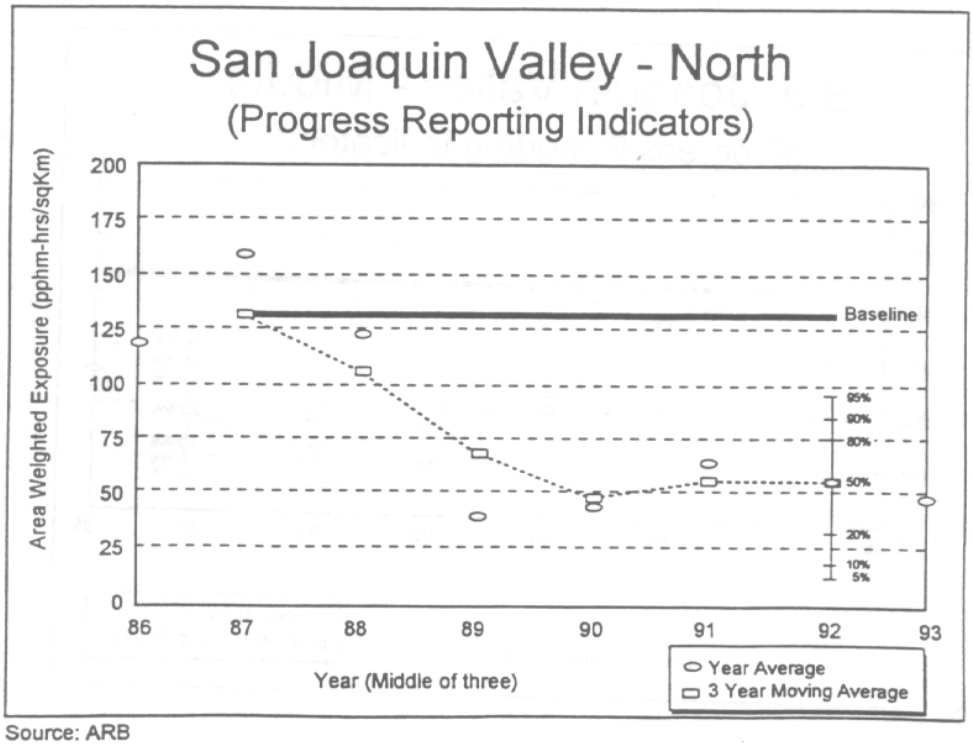


Figure 8-15
Area-Weighted Exposure



Source: ARB

Figure 8-16
Population-Weighted Exposure

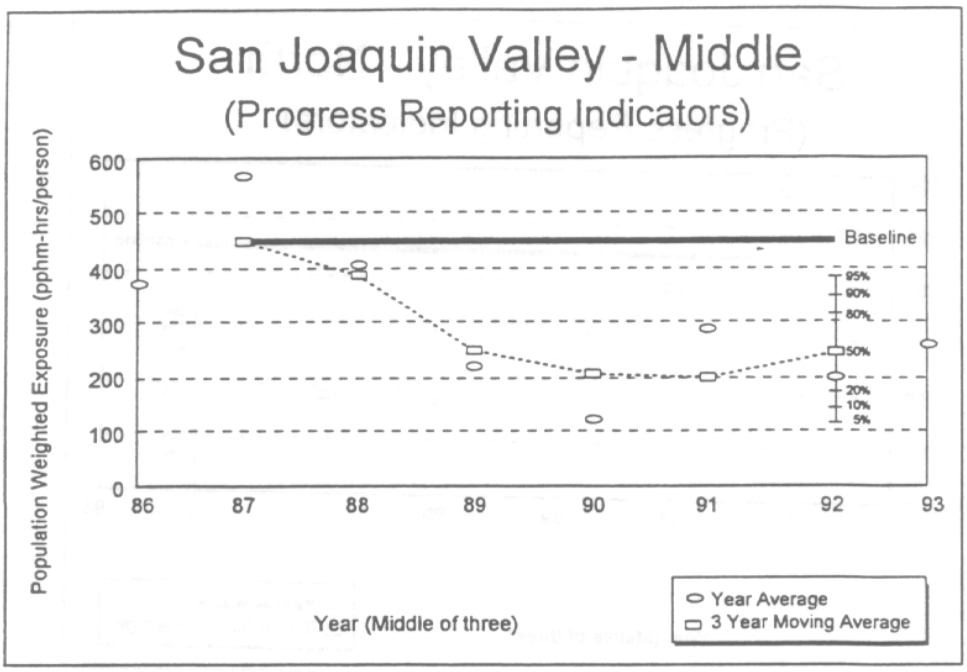
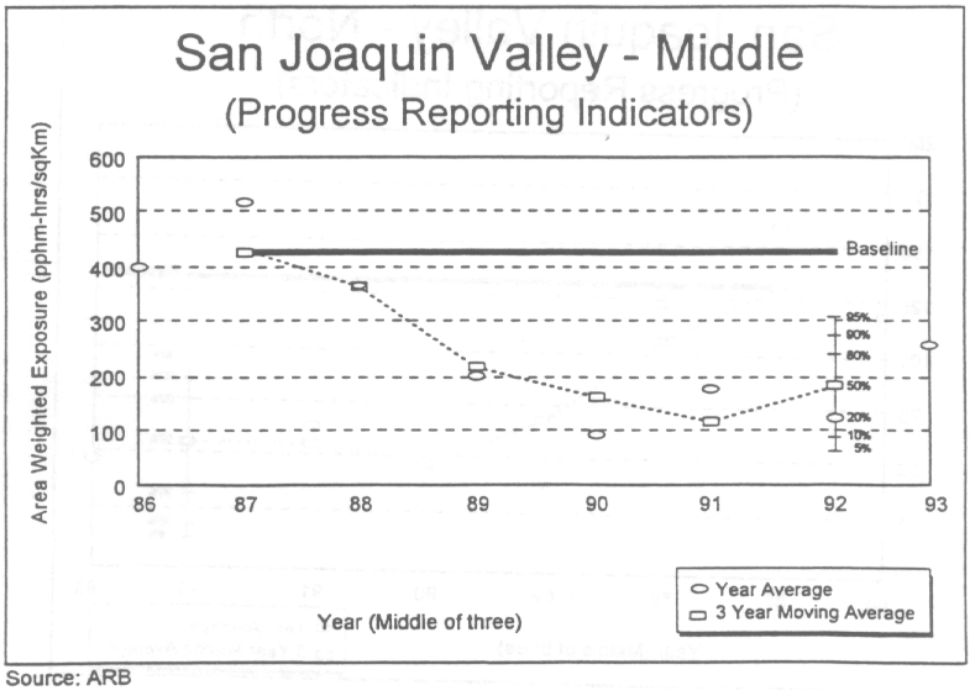


Figure 8-17
Area-Weighted Exposure



Source: ARB

Figure 8-18
Population-Weighted Exposure

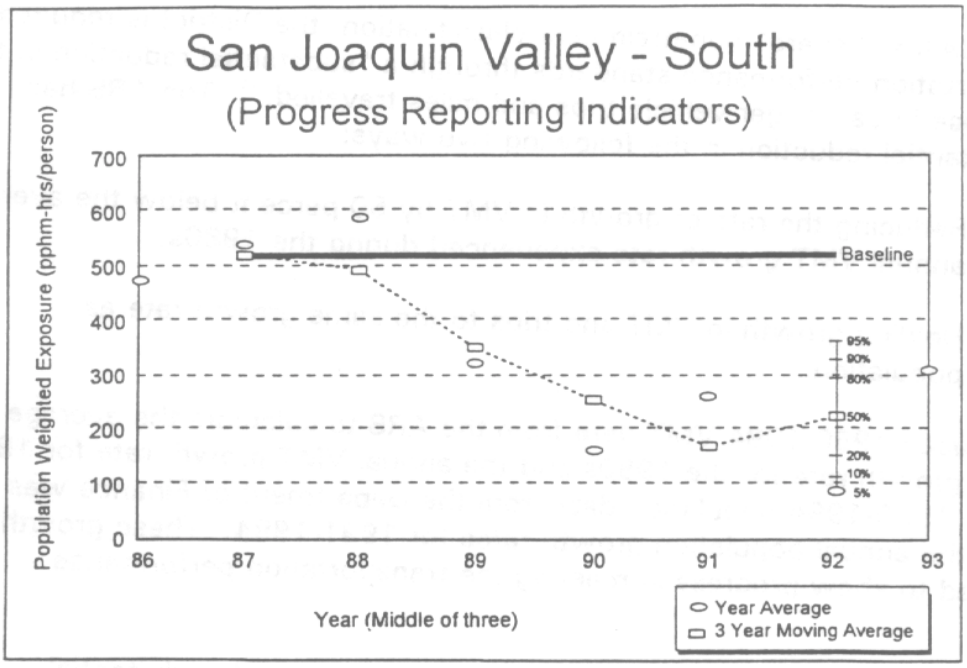
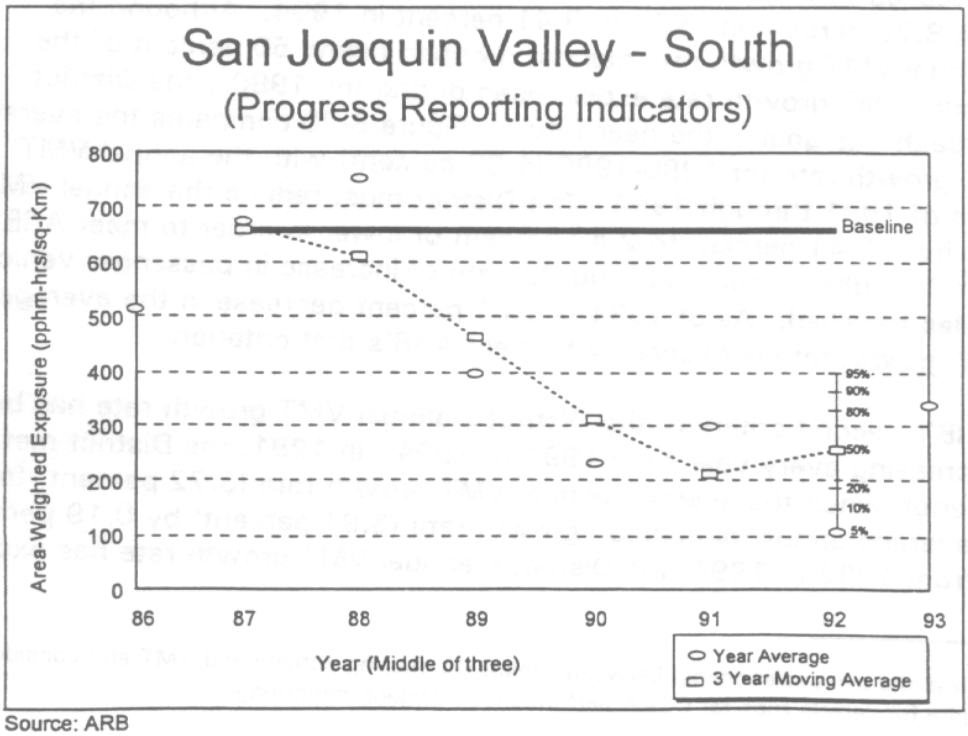


Figure 8-19
Area-Weighted Exposure



Source: ARB

TRANSPORTATION PERFORMANCE STANDARDS

Under the CCAA's "severe" nonattainment classification, the District is required to meet transportation performance standards through a "substantial reduction in the rate of increase in passenger vehicle trips and miles travelled."[2] The ARB has defined substantial reduction in the following two ways:

1) Reducing the rate of growth in VMT by 50 percent below the average annual VMT growth rate experienced during the 1980s.

2) Holding growth in VMT and trips to the same growth rate as population.

The District used 1980-1994 VMT data from the ARB to calculate the average annual VMT growth rate for the 1980s and the annual VMT growth rate for 1991-1994. Also, 1990-1994 population data from the Department of Finance was used to calculate the annual population growth rates for 1991-1994. These growth rates are used to show progress in meeting the transportation performance standards.

According to the growth rates calculated, the District has made substantial progress in meeting the two ARB criteria. Since 1991, the annual VMT growth rate has decreased each year. The annual VMT growth rate has dropped 5.35 percent from 8.76 percent in 1990 to 3.41 percent in 1994. Although the District's annual VMT growth rate has not dropped below 50 percent of the average annual VMT growth rate experienced during the 1980s, the District expects to reach this goal in the near future. Figure 8-20 compares the average annual VMT growth rate for 1980-1990 (4.80 percent) with the annual VMT growth rates of 1991 through 1994. The District must reduce the annual VMT growth rate from 3.41 percent to 2.40 percent or lower in order to meet ARB's first criterion for substantially reducing the rate of increase in passenger vehicle trips and miles travelled. As of 1994, a 1.01 percent decrease in the average annual VMT growth rate is necessary to meet ARB's first criterion.

To meet ARB's second criterion, the District's annual VMT growth rate has been steadily decreasing every year from 1991 to 1994. In 1991, the District met the second criterion when the average annual VMT growth rate (3.72 percent) fell below the average annual population growth rate (3.91 percent) by 0.19 percent. However, from 1992 to 1994, the District's annual VMT growth rate has exceeded the population annual growth rate despite continuous decreases in the annual VMT growth rate (Figure 8-21). This exceedance is due to larger decreases in the annual population

[1] ARB recognizes the close relationship between vehicle trip making activity and VMT and considers VMT a surrogate for vehicle trips for CCAA performance standard monitoring.

growth rate compared to the decreases in the average annual VMT growth rate. As of 1994, the average annual VMT growth rate is 3.41 percent and the average annual population growth rate is 2.38 percent. These numbers show that the District is within 1.03 percent of meeting the second criterion.

The District has made many accomplishments in developing and implementing programs which reduce VMT and emissions from mobile sources. A Memorandum of Understanding (MOU) was signed between the District and the eight county Transportation Planning Agencies having jurisdiction within the Valley. This MOU is an agreement for the District and TPAs to jointly develop and implement transportation and mobile control measures. Motor Vehicle Reduction projects (formally known as AB 2766 programs) are implemented by the District, pursuant to Section 44220 of the state Health and Safety Code, to reduce air pollution from motor vehicles. The District has begun the implementation of Rule 9001 (Commute Trip Reduction) which affects employers of 100 or more employees at a worksite where at least 40 employees report to work between 6 and 10 a.m. These employers are required to increase the Average Vehicle Ridership (AVR) of their worksites to 1.5 by December 31, 1998. Rule 9001 is designed to reduce trips and VMT. Smoking Vehicles Program is a District program which reduces emissions from motor vehicles that have defective emission control equipment or improperly tuned engines.

Substantial progress has been made in reducing VMT and emissions from motor vehicles in the Valley, and the District is close to achieving the two ARB criteria. The development and implementation of the TCMs discussed in the 1991 AQAP are not complete at this time. Implementation of some TCMs are not scheduled until 1994-1995 and 1995-1996 by the TPAs and the District. The TCMs are expected to produce additional reductions in VMT after they are fully implemented. The District and the TPAs will continue to expeditiously implement the TCMs outlined in Chapter 8 of the 1991 AQAP and Appendix E of the Post '96 ROP Plan. An update of the progress of these TCMs will be included in the District's 1997 Triennial Progress Report and Plan Revision.

Figure 8-20

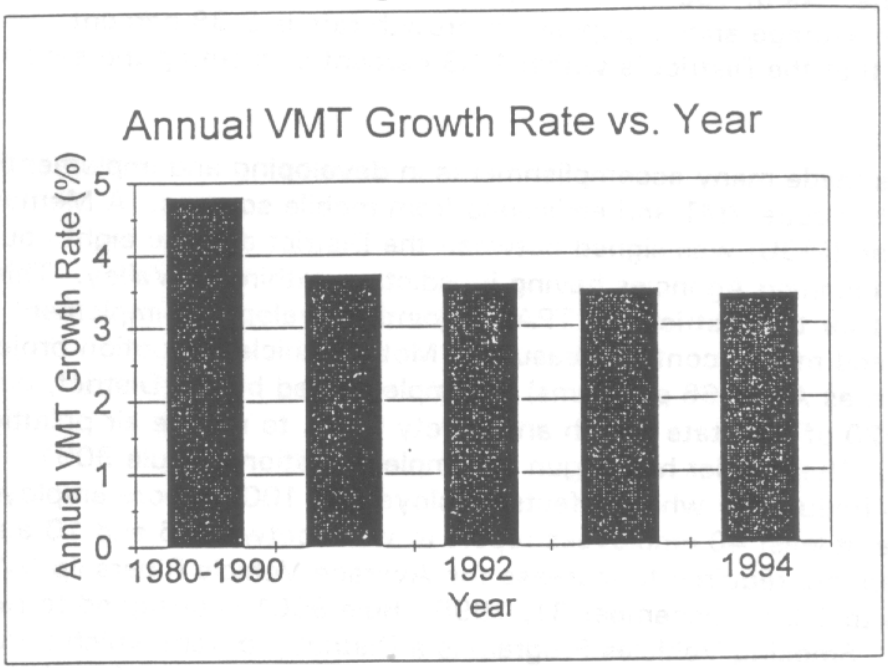
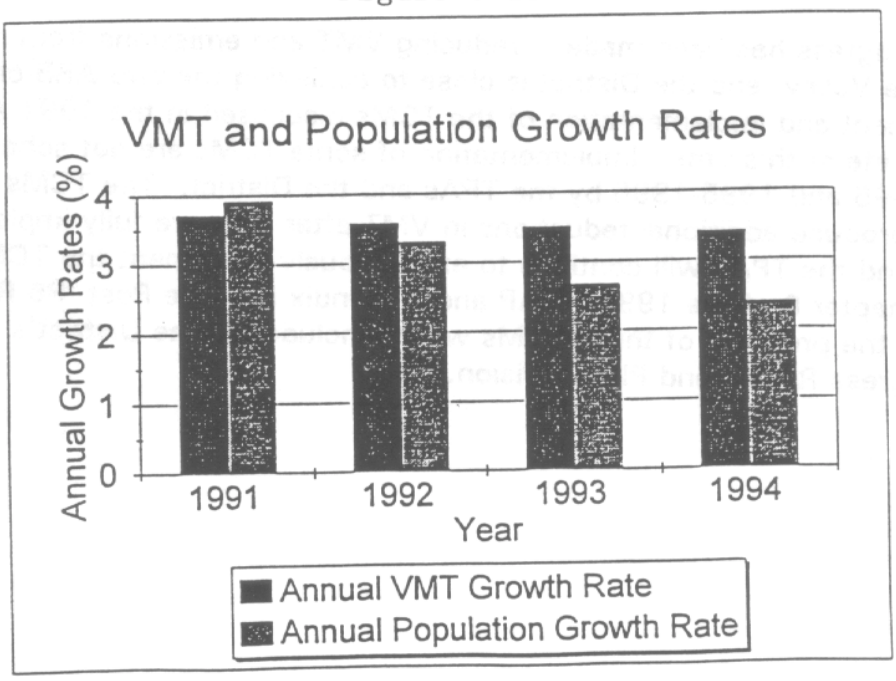


Figure 8-21



UPDATED IMPLEMENTATION STRATEGY AND EXPECTED EMISSION REDUCTIONS FOR DISTRICT CONTROL MEASURES

This section outlines the progress of implementation for the control measures required to meet CCAA mandates. Updated implementation schedules and estimates for emission reductions are also presented. Table 8-1 lists the adoption and full implementation dates of 1991 AQAP control measures which have been adopted into rules since the adoption of the 1991 AQAP. Table 8-2 outlines the adoption and implementation schedule of control measures for future development. Control measures with exact adoption and full implementation dates are measures which have been included in the federal Attainment Demonstration Plan. These measures need to be adopted as expeditiously as possible in order to meet federal mandates. Full implementation of these measures must occur before the end of 1999.

Control measures with "Post 1996" indications for adoption dates and "Post 1998" full implementation dates are not included as measures to meet the federal mandates. These measures are included to meet the "all feasible measures" requirement for the state. The adoption of the "Post 1996" control measures will begin after 1996, when the control measures mandated by the Attainment Demonstration Plan have been adopted and implemented. The District will then develop an adoption schedule for these measures. The District will use modeling to help determine which strategy will be best to reach attainment of the California Ambient Air Quality Standards (CAAQS) for ozone. It is possible that only a portion all of the feasible measures included in Table 8-2 are necessary for achieving the CAAQS for ozone.

The ARB's Guidance for Annual and Triennial Progress Reports Under the California Clean Air Act suggests that districts should include comparisons of predicted versus actual reductions for the previous three years in the Triennial Progress Report. Currently, the data to make this comparison is not available to the District for the 1994 report year. However, the District has included a comparison of the emissions reductions predicted for 2000 in the AQAP and the current updated emission reductions expected for 1999 (Table 8-3). This comparison will show the updated emission reductions and progress of each control measure. The implementation of these control measures is necessary to make attainment of the CAAQS.

Table 8-1
Rules Adopted
Since Adoption of the AQAP

Rule Number	Rule Title	Adoption Date	Full Implementation Date
4305	Boilers, Steam Generators and Process Heaters (BARCT Phases 1&2)	12/16/93	12/31/2000
4354	Glass Melting Furnaces	9/14/94	5/31/99
4401	Steam-Enhanced Crude Oil Production Well Vents	4/11/91	5/1/95
4402	Crude Oil Production Sumps	4/11/91	5/1/97
4403	Components Serving Light Crude Oil or Gases at Light Crude Oil and Gas Productions Facilities and Natural Gas Processing Facilities	4/11/91	11/1/91
4404	Heavy Oil Test Station - Kern County	5/21/92	5/21/92
4407	In-Situ Combustion Crude Oil Production Well Vents	5/19/94	5/1/96
4451	Valves, Pressure Relief Valves, Flanges, Threaded Connection and Process Drains at Petroleum Refineries and Chemical Plants	4/11/91	11/1/91
4452	Pump and Compressor Seals at Petroleum Refineries and Chemical Plants	4/11/91	11/1/91
4453	Refinery Vacuum Producing Devices or Systems	5/21/92	7/1/80
4454	Refinery Process Unit Turnaround	5/21/92	1984
4602	Motor Vehicle and Mobile Equipment Refinishing Operations	4/11/91	1/1/95
4603	Surface Coating of Metal Parts and Products	4/11/91	10/1/93
4604	Can and Coil Coating Operations	4/11/91	11/1/92
4605	Aerospace Assembly and Component Manufacturing Operations	12/19/91	1/1/97
4606	Wood Products Coating Operations	12/19/91	7/1/96

Rule Number	Rule Title	Adoption Date	Full Implementation Date
4623	Organic Liquid Storage	4/11/91	1/1/96
4624	Organic Liquid Loading	4/11/91	5/1/93
4641	Cutback, Slow Cure, and Emulsified Asphalt Paving and Maintenance Operations	4/11/91	11/01/91
4651	Volatile Organic Compound Emissions from Decontamination of Soil	4/16/92	7/1/92
4653	Adhesives	3/17/94	3/17/95
4672	Petroleum Solvent Dry Cleaning	4/11/91	11/1/92
4681	Rubber Tire Manufacturing	5/16/91	5/1/91
4682	Polystyrene Foam, Polyethylene, and Polypropylene Manufacturing	5/21/92	6/16/96
4684	Polyester Resin Operations	5/19/94	5/19/96
4691	Vegetable Oil Processing	4/11/91	11/1/92
4701	Emissions from Stationary Internal Combustion Engines - Central and Western Kern County Fields	5/21/92	12/31/95
4703	Stationary Gas Turbines	8/18/94	8/18/2000
4901	Residential Wood Burning	7/15/93	11/15/94
4902	Residential Water Heaters	6/17/93	12/17/93
9001	Commute Trip Reduction	1/20/94	12/31/98
Coast Guard	Marine Vessel - Tanker Ballasting	Adopted by Coast Guard	Implemented by Coast Guard
Various Programs	Transportation and Mobile Source Control Measures	Ongoing	Ongoing

Table 8-2
Rules for Future Development

Rule Number	Rule Title	Adoption Date	Full Implementation Date
4103	Open Burning	4Q/96	1Q/97
4306	Smaller External Combustion Devices (BARCT Phase 3)	3Q/95	3Q/99
4307	Driers (BARCT Phase 4)	1Q/96	1/Q/98
4308	Asphalt Batch Plants	Post 1996	Post 1998
4354	Glass Melting Furnaces	1Q/96	4Q/99
4408	Oil Pipeline Pumping Fugitives	Post 1996	Post 1998
4409	Discharge of Produced Oil/Flashing Losses	Post 1996	Post 1998
4410	Gas Plant Glycol Regenerators	Post 1996	Post 1998
4411	Well Cellars	2Q/96	2Q/98
4412	Oil Well Drilling and Workover Rig Piston Engines	2Q/96	2Q/98
4501	Marine Vessel Operations	Post 1996	Post 1998
4502	Marine Vessel Loading Operations	Post 1996	Post 1998
4601	Architectural Coatings	1Q/96	1Q/98
4607	Graphic Arts (Includes Paper, Fabric, and Film Coatings)	4Q/95	4Q/97
4608	Plastic Parts Coating Operations	Post 1996	Post 1998
4611	Small Printing Operations	4Q/95	4Q/97
4621	Gasoline Transfer into Stationary Storage Containers, Delivery Vessels, and Bulk Plants	2Q/96	2Q/98
4622	Transfer of Gasoline into Vehicle Fuel Tanks	2Q/96	2Q/98
4623	Storage of Organic Liquids	3Q/95	3Q/98
4625	Wastewater Separators	Post 1996	Post 1998
4626	Aircraft Fuel Storage and Refueling	Post 1996	Post 1998

Rule Number	Rule Title	Adoption Date	Full Implementation Date
4627	Tank Cleaning and Venting	Post 1996	Post 1998
4642	Land Fill Gas Control	1Q/95	4Q/99
4643	Publicly Owned Water Treatment Works	Post 1996	Post 1998
4652	Coatings and Ink Manufacturing	Post 1996	Post 1998
4661	Organic Solvents	Post 1996	Post 1998
4662	Organic Solvent Degreasing Operations	1Q/96	1Q/98
4663	Organic Solvent Waste	2Q/96	2Q/98
4671	Perchloroethylene Dry Cleaning System	Post 1996	Post 1998
4692	Commercial Charbroiling	2Q/96	2Q/98
4702	Stationary and Portable Piston Engines	2Q/95	4Q/99
4903	Residential and Commercial Space Heaters	Post 1996	Post 1998

Table 8-3
Previous Emissions Reduction Estimates from the 1991 AQAP vs. Current Updated Emissions Reduction Estimates

Rule Number	Rule Title	Pollutant	Previous Emission Reduction Estimates for 2000 in 1991 AQAP (tons/day)	Current Updated Emission Reduction Estimates for 1999 (tons/day)
4103	Agricultural Waste Burning	ROG	NQ	NQ
4305	Boilers, Steam Generators and Process Heaters (BARCT Phases 1&2)	NOx	66.98 is estimate for 4305, 4306, and 4307 combined.	35.90
4306	Smaller External Combustion Devices (BARCT Phase 3)	NOx	See 4305	7.6
4307	Driers (BARCT Phase 4)	NOx	See 4305	NQ
4308	Asphalt Batch Plants	NOx	0.08	0.03
4354	Glass Melting Furnaces	NOx	8.68	2.87
4401	Steam-Enhanced Crude Oil Production Well Vents	ROG	12.41	23.51
4402	Crude Oil Production Sumps	ROG	NQ	24.73
4403	Components Serving Light Crude Oil or Gases at Light Crude Oil and Gas Productions Facilities and Natural Gas Processing Facilities	ROG	NQ	5.55
4404	Heavy Oil Test Station - Kern County	ROG	NQ	63.06
4407	In-Situ Combustion Crude Oil Production Well Vents	ROG	7.67	NQ
4408	Oil Pipeline Pumping Fugitives	ROG	0.80	NIE
4409	Discharge of Produced Oil/Flashing Losses	ROG	61.5	NIE

Rule Number	Rule Title	Pollutant	Previous Emission Reduction Estimates for 2000 in 1991 AQAP (tons/day)	Current Updated Emission Reduction Estimates for 1999 (tons/day)
4410	Gas Plant Glycol Regenerators	ROG	12.62	NQ
4411	Well Cellars	ROG	0.57	0.57
4412	Oil Well Drilling and Workover Rig Engines	NOx	31.39	0.88
4451	Valves, Pressure Relief Valves, Flanges, Threaded Connection and Process Drains at Petroleum Refineries and Chemical Plants	ROG	NQ	0.31
4452	Pump and Compressor Seals at Petroleum Refineries and Chemical Plants	ROG	NQ	0.02
4453	Refinery Vacuum Producing Devices or Systems	ROG	NQ	NIE
4454	Refinery Process Unit Turnaround	ROG	NIA	NIE
4501	Marine Vessel Operations	ROG, NOx	NQ	NIE
4502	Marine Vessel Loading Operations	ROG	NQ	NIE
4601	Architectural Coatings	ROG	1.75	1.21
4602	Motor Vehicle and Mobile Equipment Refinishing Operations	ROG	5.09	3.67
4603	Surface Coating of Metal Parts and Products	ROG	1.92	0.01
4604	Can and Coil Coating Operations	ROG	0.18	0.02
4605	Aerospace Assembly and Component Manufacturing Operations	ROG	0.04	0.04
4606	Wood Products Coating Operations	ROG	1.01	0.73
4607	Graphics Arts (Includes Paper, Fabric, and Film Coatings	ROG	3.03	0.67

Rule Number	Rule Title	Pollutant	Previous Emission Reduction Estimates for 2000 in 1991 AQAP (tons/day)	Current Updated Emission Reduction Estimates for 1999 (tons/day)
4608	Plastic Parts Coating Operations	ROG	0.01	0.00
4611	Smaller Printing Operations	ROG	0.38	0.31
4621	Gasoline Transfer into Stationary Storage Containers, Delivery Vessels, and Bulk Plants	ROG	O.28 is estimate for 4621 and 4622 combined.	0.11
4622	Transfer of Gasoline into Vehicle Fuel Tanks	ROG	See 4621	0.17
4623	Storage of Organic Liquids	ROG	100.31	18.82
4624	Organic Liquid Loading	ROG	NIA	NIE
4625	Wastewater Separators	ROG	1.83	0.05
4626	Aircraft Fuel Storage and Refueling	ROG	0.04	0.03
4627	Tank Cleaning and Venting	ROG	3.19	NIE
4641	Cutback, Slow Cure, and Emulsified Asphalt Paving and Maintenance	ROG	NQ	Occurred prior to 1990
4642	Landfill Gas Control	ROG	2.27	2.75
4643	Publicly Owned Water Treatment Works	ROG	NQ	NIE
4651	Volatile Organic Compound Emissions from Decontamination of Soil	ROG	NQ	NIE
4652	Coatings and Ink Manufacturing	ROG	NQ	NIE
4653	Adhesives	ROG	1.33	1.29
4661	Organic Solvents	ROG	NQ	NIE
4662	Organic Solvent Degreasing Operations	ROG	8.98	1.95
4663	Organic Solvent Waste	ROG	0.14	0.13
4671	Perchloroethylene Dry Cleaning System	ROG	1.77	1.77

Rule Number	Rule Title	Pollutant	Previous Emission Reduction Estimates for 2000 in 1991 AQAP (tons/day)	Current Updated Emission Reduction Estimates for 1999 (tons/day)
4672	Petroleum Solvent Dry Cleaning	ROG	0.02	0.07
4681	Rubber Tire Manufacturing	ROG	NIA	0.03
4682	Polystyrene Foam, Polyethylene, and Polypropylene Manufacturing	ROG	0.96	1.71
4684	Polyester Resin Operations	ROG	0.11	0.67
4691	Vegetable Oil Processing	ROG	NIA	0.63
4692	Commercial Charbroiling	ROG	0.39	0.39
4701	Emissions from Stationary Internal Combustion Engines - Central and Western Kern County Fields	NOx	NIA	127.89
4702	Stationary IC Engines	NOx	15.60	15.55
4703	Stationary Gas Turbine Engines	NOx	25.58	14.90
4901	Residential Wood Burning	CO	1.85	NQ
4902	Residential Water Heaters	NOx	1.08	0.59
4903	Residential and Commercial Space Heaters	NOx	0.14	0.14
9001	Commute Trip Reduction	ROG, NOx	NQ	1.07, 1.04
Coast Guard	Marine Vessel - Tanker Ballasting	ROG	NQ	NQ
Various Programs	Transportation and Mobile Source Programs	ROG, NOx	NQ	0.73, 0.46

Note: NQ = Not Quantified
NIA = Not Included in AQAP
NIE = Not in Emissions Inventory

FURTHER STUDY MEASURES

Further study measures are measures which need to be researched in order to determine its feasibility as a control measure in the future. The District's further study measures are Electronics Manufacturing, Hot Mix Asphalt Batch Plant Fugitives, Natural Gas Pipeline Maintenance Operations (Open Venting), Oil Production Sumps, Oil Well Polish Rod Stuffing Box Fugitives, Oil Well Drilling and Workover Operations - Fugitive Emissions (ROG control), Tank Bottoms for Road Surfacing, Well Vent Condensate and Solvent Used for Cleaning Oilfield Equipment, Wine Products Distillation, and Wineries. All of the measures listed were measures originally included in the 1991 AQAP. Two further study measures from the AQAP, Agricultural Waste Burning and Commercial Bread Bakeries, have been converted to control measures in the Attainment Demonstration Plan. A feasibility determination still needs to be made on the other further study measures listed above.

SUMMARY

Table 8-4 summarizes the CCAA requirements and their locations and will serve to fulfill the mandate for a Triennial Progress Report and Plan Revision.

Table 8-4
Summary of CCAA Submittals

CCAA MANDATE	WHERE DISCUSSED
Air Quality Analysis	Discussed in Chapter 8 (pp. 8-1 to 8-13)
Contingency Measures	Chapter 4 of the Attainment Plan
Control Measures	Chapter 4 (pp. 4-1 to 4-26) and Chapter 8 (pp. 8-17 to 8-26) of the Attainment Demonstration Plan.
Cost-Effectiveness	A cost-effectiveness analysis is included for control measures in Chapter 7 (pp. 7-18 to 7-159) of the AQAP.
Emissions Inventory	A copy of the District's most current emissions inventory is included in Appendix A of the Post '96 ROP Plan.
Emission Reductions/All Feasible Measures	All feasible measures have been incorporated into the Attainment Demonstration Plan as described in Chapter 4 (pp. 4-1 to 4-26) and Chapter 8 (pp. 8-17 to 8-26).
Expeditious Adoption/Implementation	The schedule of adoption and implementation is provided in Chapter 8 (pp. 8-17 to 8-21) of the Attainment Demonstration Plan.
Population Exposure	Discussed in Chapter 8 (pp. 8-1 to 8-13) of the Attainment Demonstration Plan.
Public Education	District public education efforts are outlined in Chapter 11 of the AQAP (pp. 11-1 to 11-3).
Transport	The District's transportation strategy is outlined in Chapter 7 (pp. 7-12 to 7-16)

Table 8-4, Continued

CCAA MANDATE	WHERE DISCUSSED
	of the AQAP.
Transportation Performance Standards	Discussed in Chapter 8 (pp. 8-14 to 8-16) of the Attainment Demonstration Plan.

ACRONYMS

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GLOSSARY

ACRONYMS

1993 ROP Plan -	the adopted 1993 Rate of Progress Plan
APCD -	Air Pollution Control District
AQAP -	1991 Air Quality Attainment Plan
AQIRP -	Auto/Oil Air Quality Improvement Research Program
AQMP -	Air Quality Management Plan
ARB -	California Air Resources Board
AUSPEX -	Atmospheric Utility Signatures, Predictions, and Experiments
CCAA -	1988 California Clean Air Act
CEQA -	California Environmental Quality Act
CES -	Category of Emission Source
CO -	Carbon Monoxide
CP2RFG	California Phase II Reformulated Gasoline Program
District -	San Joaquin Valley Unified Air Pollution Control District
DMV -	Department of Motor Vehicles
EDS -	Emission Data System
EPA -	U.S. Environmental Protection Agency
ERC -	Emission Reduction Credit
FCAAA -	Federal Clean Air Act Amendments of 1990
FIP -	Federal Implementation Plan
FMVCP -	Federal Motor Vehicle Control Program
g/l	grams per liter
GTE -	Gas Turbine Engines
I&M -	Inspection and Maintenance
IC -	Internal Combustion
ISTEA -	Intermodal Surface Transportation Efficiency Act
MOU -	Memorandum of Understanding
NAAQS -	National Ambient Air Quality Standards
ND -	Not Determined at This Time
NOx -	Oxides of Nitrogen
PM_{10} -	Particulate Matter of 10 microns and smaller
Post '96 ROP Plan -	Post 1996 Rate of Progress Plan
pphm -	parts per hundred million
ppm -	parts per million
RACT -	Reasonably Available Control Technology
Revised 1993 ROP Plan -	Revised 1993 Rate of Progress Plan
RFP -	Reasonable Further Progress
ROG -	Reactive Organic Gas
RVP -	Reid Vapor Pressure
SAQM -	**S**ARMAP **A**ir **Q**uality **M**odel
SARMAP -	SJVAQS/AUSPEX Regional Modeling Adaptation Project
SCC -	Source Classification Codes
SIC -	Standard Industrial Code
SIP -	State Implementation Plan
SJVAB -	San Joaquin Valley Air Basin
SJVAQS -	San Joaquin Valley Air Quality Study
TCM -	Transportation Control Measure
TPAs -	Valley Transportation Planning Agencies (Formally RTPAs)
tpd -	tons per day
UABA -	Unified San Joaquin Valley Air Basin Authority
UAM -	Urban Airshed Model
Valley -	San Joaquin Valley
VMT -	Vehicle Miles Travelled
VOC -	Volatile Organic Compounds

GLOSSARY

Air Basin: An area of the state designated by the ARB pursuant to Subdivision (a) of Section 39606 of the CH&SC which has similar meteorological and geographic conditions.

Air Monitoring: The periodic or continuous sampling and analysis of air pollutants in ambient air or from individual pollutant sources.

Air Pollutants: Substances which are foreign to the atmosphere or are present in the natural atmosphere to the extent that they may result in adverse effects on humans, animals, vegetation, and/or materials.

Air Pollution Control Board (APCB): The governing body of an APCD/AQMD that establishes regulations and adopts plans for air quality within its jurisdictional boundaries.

Air Pollution Control District (APCD): A county agency with authority to regulate sources of air pollution, other than emissions from mobile sources, such as refineries, manufacturing facilities, and power plants within a given county, and governed by a District Air Pollution Control Board composed of elected county supervisors. (Compare AQMD and Unified District)

Air Pollution Control Officer (APCO): A person appointed by the APCB given the authority to appoint district personnel for the purpose of observing and enforcing the provisions of Part 4, Division 26 of the CH&SC.

Air Quality Attainment Plan (AQAP): A plan prepared by an APCD designated as a nonattainment area, for incorporation into the State Implementation Plan for the purpose of meeting the requirements of the California Clean Air Act or the Federal Clean Air Act Amendments of 1990.

Air Quality Management District (AQMD): A group of counties or portions of counties with authority to regulate sources of air pollution within the region and governed by a regional air pollution control board comprised mostly of elected officials from within the region. An AQMD is established by state legislation. (Compare APCD and Unified District)

Air Quality Management Plan (AQMP): A plan prepared by an AQMD, for a county or region designated as a non-attainment area, for the purpose of bringing the area into compliance with the requirements of the national and/or California Ambient Air Quality Standards. AQMPs are incorporated into the State Implementation Plan (SIP).

Ambient Air: Air occurring at a particular time and place outside of structures. Often used interchangeably with outdoor air.

Anthropogenic: Of, relating to, or influenced by the impact of man on nature; man-made.

Areawide Sources: Also known as "area" sources, are those sources which are not large enough to be tracked individually, but when added together can represent a large quantity of pollution. Examples of these sources include multiple stationary emission sources such as water heaters, gas furnaces, fireplaces, gas stations, dry cleaners and woodstoves. Area sources of pollution are identified by Category of Emission Source (CES) codes.

Attainment: Achieving and maintaining the air quality standards for a given standard. This is generally accomplished by demonstrating that there was no more than one day in a year where the ambient air exceeded the appropriate given standard.

Attainment Area: A geographic area which is in compliance with the National and/or California Ambient Air Quality Standards (NAAQS or CAAQS).

AUSPEX: Atmospheric Utilities Signatures, Predictions, and Experiments. In 1989, a study was developed by the Pacific Gas and Electric Company (PG&E), Electric Power Research Institute (EPRI) and the Bay Area Quality Management District to complement the San Joaquin Valley Air Quality Study (SJVAQS). The goal of AUSPEX has been to develop and evaluate a comprehensive air quality simulation computer model to address ozone, aerosols, acid deposition, and visibility reduction.

Auto/Oil Air Quality Improvement Research Program (AQIRP): Phase II research effort on the effects of reformulated fuel to reduce ozone. Modeling was conducted to determine the effect of reducing sulfur in fuel in Dallas-Fort Worth, New York, and Los Angeles.

Best Available Control Technology (BACT): The most up to date methods, systems, techniques, and production processes available to achieve the greatest feasible emission reductions for given regulated air pollutants and processes. BACT is a requirement of NSR (New Source Review) and PSD (Prevention of Significant Deterioration).

Best Available Retrofit Control Technology (BARCT): An emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of

source (Section 40406 CH&SC).

Biogenic: Produced by living organisms. Biogenic emissions are of extreme interest because of the predominance of agriculture in the San Joaquin Valley; however, the District has no authority to regulate biogenic emissions. Preliminary studies indicate that biogenic emissions may be at least two times the total hydrocarbon emissions already quantified in the emissions inventory (in the AQAP).

Bureau of Automotive Repair (BAR): An agency of the California Department of Consumer Affairs responsible for the implementation of the motor vehicle inspection and maintenance program (smog check).

Burn Day: A day determined by meteorologists and air pollution specialists to have favorable weather conditions which allow for good dispersal of smoke when agricultural refuse is burned.

California Air Resources Board (ARB): The State's lead air quality agency consisting of an eleven-member Governor appointed board and supporting staff fully responsible for motor vehicle pollution control, and having oversight authority over California's air pollution management program.

California Ambient Air Quality Standards (CAAQS): Specified concentrations and durations of air pollutants, recommended by the California Department of Health Services and adopted into regulation by the Air Resources Board. These standards relate the intensity and composition of air pollution to undesirable effects. CAAQS are the standards which must be met per the requirements of the California Clean Air Act.

California Clean Air Act (CCAA): A California law passed in 1988 which provides the basis for air quality planning and regulation independent of federal regulations. A major element of the CCAA is the requirement that local air districts in violation of the CAAQS must prepare attainment plans which identify air quality problems, causes, trends, and actions to be taken to attain and maintain California's air quality standards by the earliest practicable date.

California Environmental Quality Act (CEQA): A California law which sets forth a process for public agencies to make informed decisions on discretionary project approvals. The process aids decision makers to determine whether any environmental impacts are associated with a proposed project. It requires the elimination or reduction of environmental impacts associated with a proposed project and the implementation of mitigation measures to reduce or remove those impacts.

Carbon Monoxide (CO): A colorless, odorless gas resulting from the incomplete combustion of fossil fuels. Over 80% of the CO emitted in urban areas is contributed by motor vehicles. CO interferes with the blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects. CO is a criteria pollutant.

Category of Emission Sources (CES): Standardized coding system used to identify area sources of pollution.

Consumer Products: Products such as detergents, cleaning compounds, polishes, personal care products, and automotive specialty products which are part of our everyday lives and, through consumer use, may produce air emissions which contribute to air pollution.

Criteria Air Pollutant: An air pollutant for which acceptable levels of exposure can be determined and for which an federal or state ambient air quality standard has been set. Examples include: Ozone, Carbon Monoxide, Lead, Nitrogen Dioxide, Sulfur Dioxide, and PM_{10}.

Department of Motor Vehicles (DMV): The agency responsible for registering drivers and vehicles as well as collecting state and local motor vehicle fees.

Emission Data System (EDS): A computer database inventory of emissions of criteria pollutants in California, maintained by the California Air Resources Board. Includes all stationary and mobile sources emissions in the state.

Emission Offset: Actual enforceable emission reductions from existing sources sufficient to offset anticipated emission increases associated with new or modified stationary sources. A rule-making concept whereby approval of a new stationary source of air pollution or increase of emissions from an existing source of air pollution is conditional on the equal or greater reduction of emissions from other existing stationary sources of air pollution. This concept is utilized in addition to reduction in emissions by employing BACT.

Emission Projecting: Utilizing information and growth and control estimates to approximate future emissions.

Emission Reduction Credit (ERC): Credits given for actual emission reductions which are real, enforceable, permanent, quantifiable, and surplus (beyond the required reduction). An actual credit is certified via a District-issued document that specifies the date of issuance, expiration date of credit, type of pollutant, and legal owner of emission reduction credits. In some cases,

ERCs can be transferred to another owner or banked for future use.

Emission Standard: The maximum amount or rate of a pollutant that is permitted to be discharged from a polluting source such as an automobile or smoke stack.

Emissions Inventory: An estimate of the quantity of pollutants emitted into the atmosphere over a specific period such as a day or a year. Considerations that go into the inventory include type and location of sources, the processes involved, and the level of activity.

Exceedance: An air pollutant which is monitored to be above the state and/or federal ambient air quality standard for that pollutant.

Federal Clean Air Act (FCAA): A federal law passed in 1970 and amended in 1977 and 1990 which forms the basis for the national air pollution control efforts. Basic elements of the Act include national ambient air quality standards for major air pollutants, air toxics standards, acid rain control measures, and enforcement provisions.

Federal Clean Air Act Amendments of 1990 (FCAAA): The 1990 amended version of the FCAA which mandates attainment of the National Ambient Air Quality Standards (NAAQS) by specified dates for nonattainment areas. For ozone nonattainment, urban areas are now sorted into categories (marginal, moderate, serious, severe, and extreme) with deadlines established ranging from three years for marginal areas to twenty years for extreme areas.

Federal Implementation Plan (FIP): In the absence of an approved State Implementation Plan (SIP), a plan prepared by the EPA which provides measures that nonattainment areas must take to meet the requirements of the FCAA.

Federal Motor Vehicle Control Program (FMVCP): This program establishes the tailpipe emissions standards which are implemented by the Federal Government.

Hydrocarbon (HC): any of a large number of compounds containing various combinations of hydrogen and carbon atoms. They may be emitted into the air as a result of fossil fuel combustion and fuel volatilization, and are a major contributor to smog.

Indirect Source: Any facility, building, structure, or installation, or combination thereof, which generates or attracts mobile source activity that results in emissions of any pollutant (or precursor) for which there is a state or federal ambient air quality

standard. Examples of indirect sources include employment sites, shopping centers, sports facilities, housing developments, airports, educational institutions, commercial and industrial developments, and parking lots and garages.

Indirect Source Review (ISR): A rule or regulation that governs entities such as stationary facilities, buildings, structures, properties, and/or roads which, through their construction to operation indirectly contributes to air pollution. This includes projects and facilities that attract or generate mobile sources activity (autos and trucks) such as employment sites, shopping centers, sports facilities, housing developments, airports, educational institutions, commercial and industrial developments, and parking lots and garages, that results in the emissions of any regulated pollutant.

Inspection and Maintenance Program (I & M): A motor vehicle inspection program implemented by the Bureau of Automotive Repair. It is designed to identify vehicles in need of maintenance and to assure the effectiveness of their emission control systems on a biennial basis. The program enacted in 1979 and strengthened in 1990. The standard program is called Basic I & M. Enhanced I & M has more stringent testing requirements and is to be implemented in urbanized areas that are classified as "serious" and above nonattainment for ozone or "high moderate" and above for carbon monoxide and which had a population of 200,000 or more in 1980. Also known as a "smog check".

Intermodal Surface Transportation Efficiency Act (ISTEA): A federal law which authorizes programs for highways, highway safety, and mass transportation to 1997. ISTEA requires the development of a National Intermodal Transportation System that is economically efficient and environmentally sound and will move people and goods in an energy efficient manner.

Internal Combustion Engine (IC): A heat engine in which the combustion generates the heat inside the engine proper instead of in a furnace. An example of an IC engine is an automobile engine.

Inversion: A layer of warm air in the atmosphere that lies over a layer of cooler air, trapping pollutants.

Memorandum of Understanding (MOU): An agreement made among agencies for the purposes of jointly accomplishing a goal, program, etc. This agreement must be ratified by the governing boards of the involved agencies.

Mobile Sources: Sources of air pollution that are not stationary by nature such as automobiles, motorcycles, trucks, off-road vehicles, boats, and airplanes.

National Ambient Air Quality Standards (NAAQS): Standards set by the Federal EPA for the maximum levels of air pollutants which can exist in the ambient air without unacceptable effects on human health or the public welfare.

New Source Review (NSR): The mechanism to assure that new and modified stationary sources will not interfere with the attainment or maintenance of any ambient air quality standard, or prevent reasonable further progress towards the attainment or maintenance of any ambient air quality standard. A program used in a non-attainment area to permit or site new industrial facilities or modifications to existing industrial facilities which emit non-attainment criteria air pollutants. The two major requirements of NSR are Best Available Control Technology and Offsets.

Nonattainment Area: An area identified by the EPA and/or ARB as not meeting either NAAQS or CAAQS standards for a given pollutant.

Oxides of Nitrogen (NOx): A general term pertaining to compounds of nitric oxide (NO), nitrogen dioxide (NO_2), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes, and are major contributors to smog formation and acid deposition. NO_2 is a criteria pollutant, and may result in numerous adverse health effects.

Ozone (0_3): A strong smelling, bluish, reactive toxic chemical gas consisting of three oxygen atoms. It is a product of the photochemical process involving the sun's energy. It is a secondary pollutant that is formed when nitrogen oxides (NO) and reactive organic gases (ROG) react in the presence of sunlight. Ozone exists in the upper atmosphere ozone layer as well as at the earth's surface. Ozone at the earth's surface causes numerous adverse health effects and is a criteria pollutant. It is a major component of smog.

Ozone Precursors: Chemicals such as volatile organic compounds and nitrogen oxides, occurring either naturally or as a result of human activities, which contribute to the formation of ozone, a major component of smog. They are emitted directly from sources into the atmosphere.

Particulate Matter (PM_{10}): A major air pollutant consisting of tiny solid or liquid particles of soot, dust, smoke, fumes, and mists. The size of the particles (10 microns or smaller, about 0.0004 inches or less) allows them to easily enter the air sacs deep in the lungs where they may be deposited to result in adverse health effects. PM_{10} also causes visibility reduction and is a criteria air pollutant.

parts per hundred million (pphm): Standard of measurement of concentration by which ozone or other atmospheric gases may be measured. One pphm is equal to ten ppb.

parts per million (ppm): Standard of measurement of concentration by which ozone or other atmospheric gases may be measured. One ppm is equal to 100 pphm

or 1000 ppb.

Phase II Reformulated Gasoline Program (CP2 RFG): State regulation that lowers the ozone forming potential of gasolines. This is done by limiting sulfur, RVP, and using compounds of low ozone. It is scheduled for implementation in 1996 and will reduce the fuel sulfur content of gasoline to less than 40 ppm from a current average level of 339 ppm.

Photochemical Reaction: A term referring to chemical reactions brought about by the light energy of the sun. Photochemical reactions create harmful air pollutants such as ozone.

Post 1996 Rate of Progress Plan (Post '96 ROP Plan): This plan demonstrates how the District achieves a required nine percent (9%) emission reduction between 1996 and 1999.

Prevention of Significant Deterioration (PSD): A program used to permit or site new industrial facilities or modifications to existing facilities, with the intention of preventing an attainment area from becoming a nonattainment area. This program, like NSR, can require BACT and, if a NAAQS is projected to be exceeded, emissions offsets as well.

Public Workshop: A workshop held by an air district for the purpose of informing the public and obtaining its input on the development of a regulatory action or control measure by that agency.

Rate of Progress (ROP): Formally known as Reasonable Further Progress (RFP). ROP is defined as reducing air emissions by three percent (3%) a year. For example, the 1993 ROP Plan demonstrates a 15% reduction over the five years between 1990 and 1996 and the Post '96 ROP Plan demonstrates a 9% reduction over the three years of 1996-1999.

Reactive Organic Gas (ROG): A reactive chemical gas, composed of hydrocarbon compounds which may contribute to the formation of smog by their involvement in atmospheric chemical reactions. Also sometimes referred to as Non-Methane Organic Compounds (NMOCs). VOC emissions are a subset of ROG emissions.

Reasonably Available Control Technology (RACT): Devices, systems, process modifications, or other apparatus or techniques that are reasonably available taking into account the necessity of imposing such controls in order to attain and maintain a national ambient air quality standard; the social, environmental, and economic impact of such controls; and alternative means of providing for attainment and maintenance of such standard.

Reid Vapor Pressure (RVP): The absolute vapor pressure of volatile crude oil and volatile nonviscous petroleum liquids, except liquified petroleum gases.

Revised 1993 Rate of Progress Plan (Revised 1993 ROP Plan): This plan supersedes the 1993 ROP Plan as a result of revised data from the Valley TPAs and substantial changes that were made in the calculations of California automotive emissions standards.

San Joaquin Valley Air Basin: An air basin established by ARB that has similar meteorological and geographical conditions that consist of all of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare Counties, and the Valley portion of Kern County.

San Joaquin Valley Air Quality Study (SJVAQS): A research program developed to help find solutions to the complexity of ozone formation and scope of the problem in the San Joaquin Valley Air Basin. The goal of SJVAQS is to provide an improved understanding of the types of conditions which lead to high ozone in the SJV; and to provide decision makers with the information necessary to ensure the development of sound regional plans for equitable and effective emission control.

San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD or District): Also known as the "Valley Air District". The eight member counties includes Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare Counties, and the Valley portions of Kern County.

SAQM: **S**ARMAP **A**ir **Q**uality **M**odel. A computer model developed to simulate the mathematical relationship between emissions and air quality including the transport, dispersion, and transformation of compounds emitted into the air.

SARMAP: **S**an Joaquin Valley Air Quality Study/**A**tmospheric Utility Signatures, Predictions, and Experiments **R**egional **M**odeling **A**daptation **P**roject for development of an ozone model. The purpose of ozone modeling is to predict the effect of changes in emissions on the levels of ozone.

Smog: A combination of smoke, ozone, hydrocarbons, nitrogen oxides, and other chemically reactive compounds, which, under various conditions of weather and sunlight, may result in a murky brown haze that causes adverse health effects. A primary source of smog is automobiles.

Smog Check Program: A motor vehicle inspection program implemented by the Bureau of Automotive Repair. It is designed to identify vehicles in need of maintenance and to assure the effectiveness of their emission control systems on a biennial basis. The program enacted in 1979 and strengthened in 1990.

Also known as the Inspection and Maintenance Program (I & M).

Source Classification Codes (SCC): An eight-digit standardized coding system used to identify processes which produce pollution at point sources.

Standard Industrial Classification Codes (SIC): Standardized coding system used to identify the different industrial sectors.

State Implementation Plan (SIP): A document prepared by each state describing existing air quality conditions and measures which will be taken to attain and maintain national ambient air quality standards.

Stationary Sources: Non-mobile sources such as power plants, refineries, and manufacturing facilities which emit air pollutants.

Transportation Control Measure (TCM): Any control measure to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions. TCMs can include encouraging the use of carpools and mass transit.

Unified Air Pollution Control District: A specialized APCD in which two or more contiguous counties merge their county districts into one. A unified district is formed by action of the member counties. The San Joaquin Valley Unified Air Pollution Control District is a Unified District pursuant to Division 26, Part 3, Chapter 11 of the CH&SC. (Compare APCD and AQMD)

United States Environmental Protection Agency (EPA): The United States agency charged with setting policy and guidelines, and carrying out legal mandates for the protection of national interests in environmental resources.

Urban Airshed Model (UAM): A three-dimensional photochemical grid model designed to calculate the concentrations of both inert and chemically reactive pollutants by simulating the physical and chemical processes in the atmosphere that affect pollutant concentrations. The basis for the UAM is the atmospheric diffusion or species of continuity equation. This equation represents a mass balance in which all of the relevant emissions, transport, diffusion, chemical reactions, and removal processes are expressed in mathematical terms. The model is usually applied to an 8 to 72 hour period during which adverse meteorological conditions result in elevated pollutant concentrations of the chemical species of interest.

Valley: All references to the "Valley" in this plan refer to the San Joaquin Valley.

Valley Transportation Planning Agencies (TPAs): The eight governmental bodies in the San Joaquin Valley primarily responsible for transportation planning in compliance with federal and state requirements.

Vehicle Miles Travelled (VMT): A measure of both the volume and extent of motor vehicle operation; the total number of vehicle miles travelled within a specified geographical area over a given period of time.

Volatile Organic Compounds (VOC): Hydrocarbon compounds which exist in the ambient air. VOCs contribute to the formation of smog and/or may themselves be toxic. VOC emissions are a major precursor to the formation of ozone. VOCs often have an odor, and some examples include gasoline, alcohol, and the solvents used in paints.

1993 Rate of Progress Plan (1993 ROP Plan): The Federal Clean Air Act Amendments of 1990 requires that areas such as the District, which do not meet the federal health-based standard for ozone, prepare a plan for achieving that health-based standard. A major step in the preparation of that overall plan was the 1993 ROP Plan which will be incorporated into the SIP. The Plan demonstrates how the District will achieve 15% reduction in VOC emissions between 1990 and 1996.