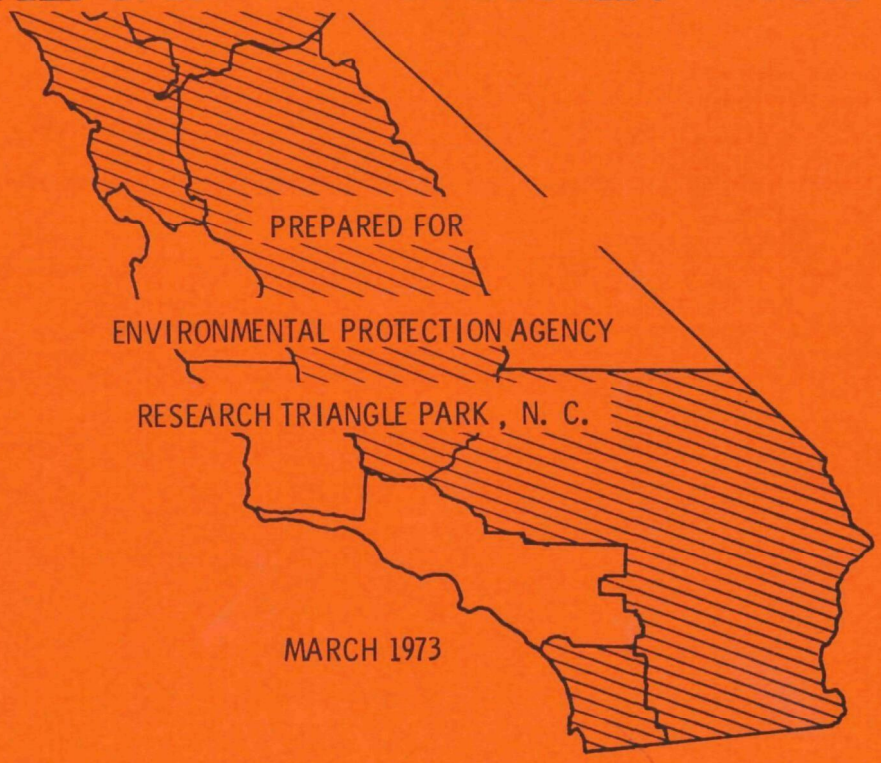
A SURVEY OF AIR POLLUTION IN CRITICAL CALIFORNIA AIR BASINS



PREPARED FOR

ENVIRONMENTAL PROTECTION AGENCY

RESEARCH TRIANGLE PARK, N. C.

MARCH 1973

TRW | TRANSPORTATION & ENVIRONMENTAL OPERATIONS

A SURVEY OF AIR POLLUTION
IN
CRITICAL CALIFORNIA AIR BASINS

Contract No. 68-02-0048

March 1973

Prepared by

TRANSPORTATION AND ENVIRONMENTAL OPERATIONS OF TRW INC.

One Space Park
Redondo Beach, California

For the

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF LAND USE PLANNING

Research Triangle Park, North Carolina

This report was furnished to the Environmental Protection Agency by TRW Transportation and Environmental Operations in fulfillment of Contract Number 68-02-0048, Task Order 14. The contents of this report are reproduced herein as received from the contractor. The opinions, findings, and conclusions are those of TRW and not necessarily those of the Environmental Protection Agnecy. The results and conclusions developed herein are based, in part, on the limited nature of the methodology used in forecasting air quality. Mention of company or product names does not constitute endorsement by the Environmental Protection Agency.

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
1.1	Purpose of the Survey	2
1.2	Limitations of the Analysis	
2.0	CONCLUSIONS AND RECOMMENDATIONS	6
3.0	SURVEY RESULTS	11
3.1	San Francisco Intrastate AQCR	11
3.1.1	Air Quality Data	13
3.1.2	Air Quality Monitoring	13
3.1.3	Emission Inventory	13
3.1.4	Transportation Data Base	17
3.1.5	Select Bibliography	19
3.1.6	Agency and Personnel Contacts	20
3.1.7	Discussion	20
3.1.8	Recommendations	21
3.2	Sacramento Valley Intrastate AQCR	22
3.2.1	Air Quality Data	22
3.2.2	Air Quality Monitoring	25
3.2.3	Emission Inventory	26
3.2.4	Transportation Data Base	28
3.2.5	Select Bibliography	30
3.2.6	Agency and Personnel Contacts	31
3.2.7	Discussion	31
3.2.8	Recommendations	32
3.3	San Joaquin Valley Intrastate AQCR	33
3.3.1	Air Quality Data	33
3.3.2	Air Quality Monitoring	35
3.3.3	Emission Inventory	36
3.3.4	Transportation Data Base	37
3.3.5	Select Bibliography	40

TABLE OF CONTENTS
(Cont'd)

		Page
3.3.6	Agency and Personnel Contacts	40
3.3.7	Discussion	42
3.3.8	Recommendations	43
3.4	Southeast Desert Intrastate AQCR	45
3.4.1	Air Quality Data	45
3.4.2	Air Quality Monitoring	47
3.4.3	Emission Inventory	48
3.4.4	Transportation Data Base	50
3.4.5	Select Bibliography	51
3.4.6	Agency and Personnel Contacts	51
3.4.7	Discussion	52
3.4.8	Recommendations	52
3.5	San Diego Intrastate AQCR	54
3.5.1	Air Quality Data	54
3.5.2	Air Quality Monitoring	54
3.5.3	Emission Inventory	56
3.5.4	Agency and Personnel Contacts	58
3.5.5	Discussion	58
3.5.6	Recommendations	58
BIBLIOGRAPHY		60
APPENDIX - AIR QUALITY STANDARDS		61

LIST OF TABLES

Page

1. Air Pollution in the Bay Area (1971-72) 14

2. Bay Area Emission Inventory-1971. 16

3. Summary of Air Quality Violations in the Sacramento Valley Air Basin (1970-72) 24

4. Annual Average NO_2 Concentrations in Sacramento County (1963-71). 25

5. Principal Air Quality Monitoring Stations-Sacramento Valley Air Basin 25

6. Sacramento Valley Air Basin-Emissions by Major Counties-1970. . . 28

7. Sacramento County Emission Inventory-1970 29

8. Air Quality Violations in the San Joaquin Valley. 35

9. Air Quality Monitoring in the San Joaquin Valley. 35

10. Air Quality Levels Monitored in the Southeast Desert AQCR (1970-71) 47

11. Principal Air Quality Monitoring Stations-Southeast Desert AQCR. 48

12. Southeast Desert Intrastate AQCR-Average Emissions for Each County-1970 50

13. San Diego County APCD Monitoring Network. 56

14. Summary of Air Quality Violations in the San Diego Air Basin (1970-72) 57

LIST OF FIGURES

Page

1. California AQCR's Surveyed 3
2. San Francisco Bay Intrastate AQCR 12
3. Bay Area Air Pollution Control Monitoring Network. . . . 15
4. Sacramento Valley Intrastate AQCR 23
5. Sacramento Valley Air Basin-Emission Inventory (1970). 27
6. San Joaquin Valley Intrastate AQCR 34
7. Southeast Desert Intrastate AQCR 46
8. Southeast Desert Air Basin-Emission Inventory (1970). 49
9. San Diego Intrastate AQCR. 55

1.0 INTRODUCTION

In response to the requirements of the Clean Air Act of 1970[1], all states are to submit implementation plans to the Environmental Protection Agency, describing how the promulgated National Ambient Air Quality Standards (NAAQS) are to be achieved within their states by 1975, or at the latest 1977. For certain critical Air Quality Control Regions (AQCR's), the development of definitive transportation control strategies has been required to demonstrate attainment of the air quality standards by the required dates.

In an attempt to assist the states engaged in these planning activities, the EPA Office of Land Use Planning has funded a series of transportation control studies for the major metropolitan areas with acute air pollution problems (14 Cities Study). See, for example, Transportation Controls to Reduce Motor Vehicle Emissions in Major Metropolitan Areas prepared by GCA Corporation (Technology Division) and TRW, Inc. (Transportation and Environmental Operations) for a summary of the results of these studies.

In California, where air pollution is a problem in numerous AQCR's, only the Metropolitan Los Angeles Intrastate AQCR (South Coast Air Basin) was examined in some detail in the 14 Cities Study (Transportation Control Strategy Development for the Metropolitan Los Angeles Region prepared by Transportation and Environmental Operations of TRW, Inc. In an extension of the work performed in the 14 Cities Study and specifically, the Los Angeles study, it was necessary for the EPA to evaluate the severity

[1]Clean Air Amendments of 1970 - P.L.91-604 (December 31, 1970)

of air pollution in other California AQCR's and, if warranted, to develop transportation control strategies for these areas as well.

1.1 Purpose of the Survey

The purpose of this report is to provide a preliminary assessment of the air pollution problems and the degree of transportation controls required (if any) for five (5) California AQCR's[1] which the EPA has designated as critical. Figure 1 shows the location of each of the five AQCR's under consideration. To accomplish this task, a number of subtasks were undertaken:

- review of the emission inventory for each AQCR
- review of the most recently available air quality data
- contact with local agencies, both air pollution and transportation, to discuss the air pollution situation
- assessment of the transportation data base to determine if sufficient data are available to perform a detailed transportation study

In view of the very limited time allotted for this preliminary survey, no technical analysis of the data collected has been performed. It is proposed for the detailed studies which will follow that a close examination be given to many of the data sources and projections used by the State and local officials in estimating the air pollution problem. Specific recommendations have been provided for each AQCR regarding which elements should be carefully analyzed in the formulation of a transportation control strategy.

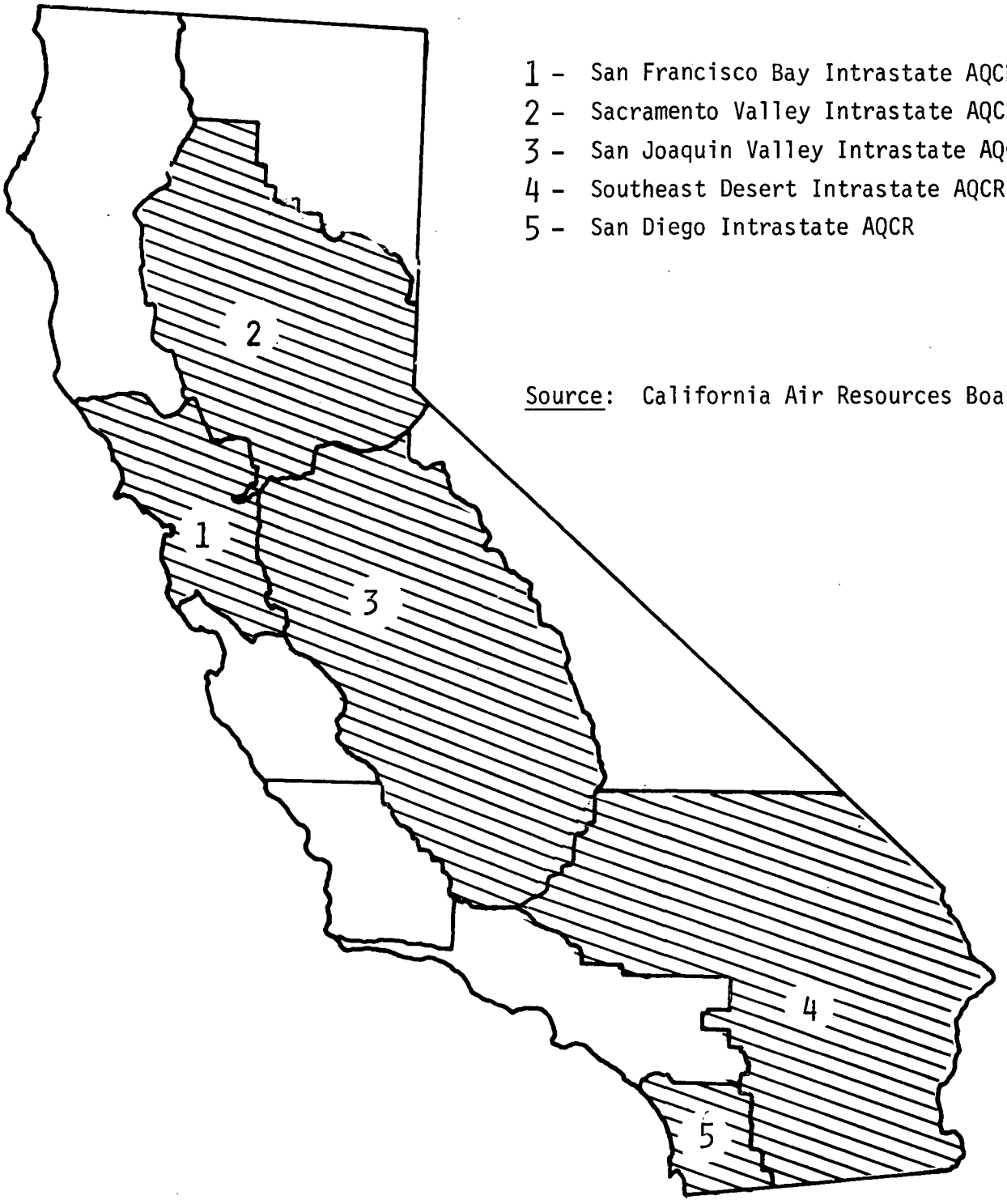
1.2 Limitations of the Analysis

The California Air Resources Board (CARB) has long been a leader in the field of air pollution control. However, for years there has been controversy

[1] Sacramento Valley Intrastate AQCR, San Diego Intrastate AQCR, San Francisco Bay Intrastate AQCR, San Joaquin Valley Intrastate AQCR, and Southeast Desert Intrastate AQCR.

FIGURE 1

California AQCR's Surveyed



1 - San Francisco Bay Intrastate AQCR
2 - Sacramento Valley Intrastate AQCR
3 - San Joaquin Valley Intrastate AQCR
4 - Southeast Desert Intrastate AQCR
5 - San Diego Intrastate AQCR

Source: California Air Resources Board

STAVE ANDERSON
642-2619

POWER PLANT

over some of the methods used by the CARB in estimating and projecting pollutant emissions. This report has assumed the CARB estimates for mobile and stationary source emissions as given for 1970. These estimates were given in The State of California Implementation Plan for Achieving and Maintaining the National Ambient Air Quality Standards, submitted to EPA in January, 1972. Since that time, the CARB has significantly revised many of their original estimates, especially those in the mobile source categories. It is recommended in any future work that many of the underlying assumptions made by the CARB in their analyses be carefully examined and revised where warranted. Furthermore, it is recommended that more recent data, where available, be used for development of transportation control strategies in the other critical California AQCR's. This will ensure the development of up-to-date transportation control plans.

Specific data sources which the CARB use and should be validated include:

- population data and forecasts - especially how these figures are arrived at for specific AQCR's
- motor vehicle data - both HDV and LDV, current and projected
- annual vehicle mileage estimates
- exhaust emission, deterioration, and speed correction factors
- gasoline consumption estimates, current and projected

Much of the air quality data provided in this report on frequency violations have been compiled on the basis of California air quality standards. As such, they serve as a lower limit for the number of violations on the basis of NAAQS, s-nce the latter are generally more stringent.

A key source of transportation data for each of the regions is the District Office of the California Division of Highways. Time did not

allow for a visit to each of these regional offices to solicit and explore the data available. However, in the development of detailed transportation control plans, these local offices will be contacted for their contributions. Similarly, many of the regions surveyed have local traffic departments and/or universities and colleges who have conducted pertinent studies on air pollution and transportation problems. These sources have not been contacted in this initial survey, but will be in any follow-on activities.

2.0 CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the findings of the preliminary assessment of air pollution in critical California AQCR's. The conclusions are based on a limited amount of information collected during visits to each of the regions; they do provide, however, a rough order approximation of the severity of air pollution present in the regions and an estimate of the controls which will be necessary to achieve the NAAQS by 1975 or 1977. Similarly, based on a brief visit with the local transportation planning organizations, a preliminary assessment has been made regarding the adequacy or inadequacy of transportation data within the regions in the event detailed transportation control strategies are to be developed.

The recommendations are based on a summary of all the data collected, data gaps identified, and specific situations which exist in the AQCR's surveyed which will have a bearing on any recommended future studies.

In each of the critical AQCR's surveyed, the predominant air pollution problem was photochemical oxidants. This implies of course, more stringent controls of the hydrocarbons and nitrogen oxides which lead to their formation. For a rough estimate of the degree of controls necessary to achieve the NAAQS of 0.08 ppm oxidant, a linear rollback of the reactive hydrocarbons emissions was used. It appears from this simplistic analysis that all of the AQCR's surveyed will have difficulty in achieving the promulgated air quality standards by the required dates. In several regions, it is unlikely that transportation controls alone will result in sufficient reductions to allow attainment of the NAAQS for oxidants. For

these areas, a closer examination of stationary sources and their potential for control will be essential.

San Francisco Bay Intrastate AQCR

A detailed study should be carried out in the San Francisco Bay Area Air Basin to formulate a definitive transportation control strategy for achieving the NAAQS. This study should use 1971 as a base year and incorporate the latest emission inventory, and 1971 air quality data.

The study should incorporate in its analysis the following items:

- a revision, where possible, of outdated transportation data to incorporate the effect of more recent population, employment, and land use trends
- a review of studies which are presently underway to monitor the impact of BART on the regional transportation system
- an analysis of alternative modes of transportation and their potential for reducing VMT in the region
- a categorization of potential control options and an estimate of their relative impact on VMT
- a review of stationary source emissions and their potential for control

Sacramento Valley Intrastate AQCR

Since the highest air pollution levels occur in the City of Sacramento, it is recommended that a detailed study be carried out in the Sacramento region to formulate a definitive transportation control strategy for achieving the NAAQS. This study should use 1970 as a base year and adjust all data to reflect this baseline.

The Sacramento study recommended should incorporate in its analysis the following items:

- any additional inputs or insights which SRAPC may be in a position to add
- a review of the entire FASTRIP program to determine which of the reports in this series will be useful in follow-on activities
- a review of existing transit improvement programs and their relative impact
- an analysis of alternative modes of transportation and their potential for reducing private auto usage
- a categorization of potential control options and an estimate of their relative impact on VMT

San Joaquin Valley Intrastate AQCR

It is recommended that cities in the San Joaquin Valley Intrastate AQCR be studied separately with respect to any analysis of air pollution problems and the development of transportation control plans. It is further recommended that the cities of Fresno, Bakersfield, and Stockton be given top priority in any such studies, and that Modesto and Visalia be given secondary priority. The assignment of priorities is based on population and the standards exceeded.

The base year for these studies should be 1971, and the studies should include the following:

- an update of transportation data, where necessary, to reflect changes in population, employment, and land use
- the assembly of supplementary and revisionary stationary source inventory data as received from the respective APCD's to be incorporated, where appropriate, into the development of control strategies

- a review of all land use and transportation studies currently underway to prevent duplication of effort and to promote consistency and continuity of planning efforts
- an analysis of the impact of the proposed transportation implementation plan on other planning studies

Southeast Desert Intrastate AQCR

It is recommended that the Southeast Desert Intrastate AQCR be given a relatively low priority compared to the other air basins being considered for transportation control implementation plan studies because of the lack of comprehensive air quality and transportation data. At most, it is recommended that a pollutant transport analysis be made to relate air pollution problems in the six Southeast Desert cities cited to the air pollution problems and sources in the South Coast Intrastate AQCR. This study would most likely take the form of a statistical analysis of the existing air quality data and possibly meteorological data, where available.

San Diego Intrastate AQCR

The RAND study should currently underway as part of the IREM Project, should provide all the information necessary for a transportation control plan in the San Diego region. In fact, its intent is to provide for an "optimal" solution to the air pollution control alternatives.

Other than to insure that a consistent set of assumptions are used for many of the emission, reactivity, deterioration factors, etc., it does not appear any additional studies in the area are warranted at this time. Given the guidelines used by the EPA for estimating vehicular emissions are appropriate, any transportation control plan developed in the

RAND effort will be consistent and compatible with the development of transportation controls in the other critical California AQCR's.

3.0 SURVEY RESULTS

The results presented in this section are generally a summary of information gathered from a trip to the local region and discussions with members of the air pollution control districts and regional planning organizations. The actual agencies and personnel contacted have been listed. Ambient air quality and monitoring data have been provided both by the CARB and the local APCD's. The stationary source emission inventory for 1970 was gathered by the CARB; any updated revisions were supplied by the local APCD's.

Transportation data were gathered in interviews with regional planning or transportation agencies. Some examples of specific studies conducted within each region have been noted. These lists are by no means complete but only illustrative of information readily available.

3.1 San Francisco Bay Intrastate AQCR

The San Francisco Bay Intrastate AQCR, also known as the San Francisco Bay Area Air Basin, is comprised of all of seven counties, namely Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, and Napa, and portions of two others -- southwestern Solano and southern Sonoma. Geographically, the region covers some 5600 square miles and has within its bounds approximately 4.6 million people and 2.7 million motor vehicles. A map of the AQCR is given in Figure 2.

Air pollution control in the region falls under the jurisdiction of the Bay Area Air Pollution Control District (BAAPCD), created by the California Legislature in 1955. The BAAPCD is the first regional agency created in California to handle air pollution. As in the rest of California, the local agencies deal primarily with stationary sources while the CARB deals with mobile source controls.

FIGURE 2

San Francisco Bay
Intrastate AQCR

Source: California Air Resources Board

3.1.1 Air Quality Data

During 1971, the Bay Area experienced numerous violations of both Federal and State air quality standards. Table 1 summarizes these violations by specific areas for oxidant, carbon monoxide and nitrogen dioxide. Based on a linear rollback model and a maximum one-hour oxidant reading at San Leandro of 0.36 ppm, a 78 percent reduction in reactive hydrocarbon emissions is required to achieve the air quality goal.

3.1.2 Air Quality Monitoring

The Bay Area has a rather extensive air quality monitoring network, capable of measuring and characterizing both the localized and regional extent of air pollution problems. Figure 3 illustrates the location of both complete and partial (oxidant and coefficient of haze measurements only) stations in the Bay Area. Data from approximately 12 of these stations are regularly transmitted to the CARB for the Statewide summaries. Both the extent and number of air quality monitoring stations appear adequate for the region. As more urban development takes place into some of the lower density areas of the region, it will be necessary to expand the present monitoring system to incorporate these areas. The Bay Area APCD is presently planning expansions to its monitoring network.

3.1.3 Emission Inventory

The most recent emission inventory for the Bay Area is for 1971. Table 2 summarizes the stationary and mobile source contributions and compares them to the total pollutant load in the region. As the table illustrates, 58 percent of the organics, 70% of the nitrogen oxides, and 96 percent of the carbon monoxide emissions come from mobile sources. Although mobile sources presently account for the majority of these emissions, it does not appear that their control alone will be sufficient to allow for

TABLE 1

Air Pollution in the Bay Area
(1971 - 1972)

Location of Stations	OXIDANT				CARBON MONOXIDE				NITROGEN DIOXIDE
	1971		1972		1971		1972		1971
	Maximum[1]	Violations[2]	Maximum	Violations	Maximum[3]	Violations[4]	Maximum	Violations	Annual Average
San Francisco	.19	2	.08	0	11	3	11.7	1	.027
San Rafael	.18	9	.17	5	8	0	7.7	0	.024
Richmond	.28	7	.12	7	13	1	9.1	0	.021
Pittsburg	.20	23	.19	25	6	0	5.1	0	.022
Walnut Creek	.23	36	.17	30	-	-	-	-	-
Oakland	.31	10	.12	1	11	2	7.2	0	.040
San Leandro	.36	21	.17	15	-	-	-	-	-
Fremont	.33	45	.34	44	9	0	6.5	0	-
Livermore	.23	52	.22	27	8	0	6.5	0	.025
San Jose	.15	14	.20	19	14	12	13.8	11	.034
Redwood City	.28	17	.28	17	7	0	9.2	0	.030
Burlingame	.17	5	.14	8	10	1	9.9	0	-
Petaluma	.12	6	.07	0	-	-	-	-	.013
Napa	.14	9	.18	20	9	0	7.4	0	
Vallejo	.19	11	.26	15	13	6	12.1	5	.018
Fairfield	.18	12	.13	4	-	-	-	-	-
Los Gatos	-	-	.21	15	-	-	-	-	-
Mountain View	-	-	.19	10	-	-	-	-	-
Santa Rosa	-	-	-	-	-	-	-	-	.020

[1] Highest hourly average in ppm

[2] Number of days one hour average of 0.10 ppm was exceeded

[3] Highest 12-hour average in ppm

[4] Number of days 12-hour average of 10 ppm was exceeded

Source: Bay Area Air Pollution Control District

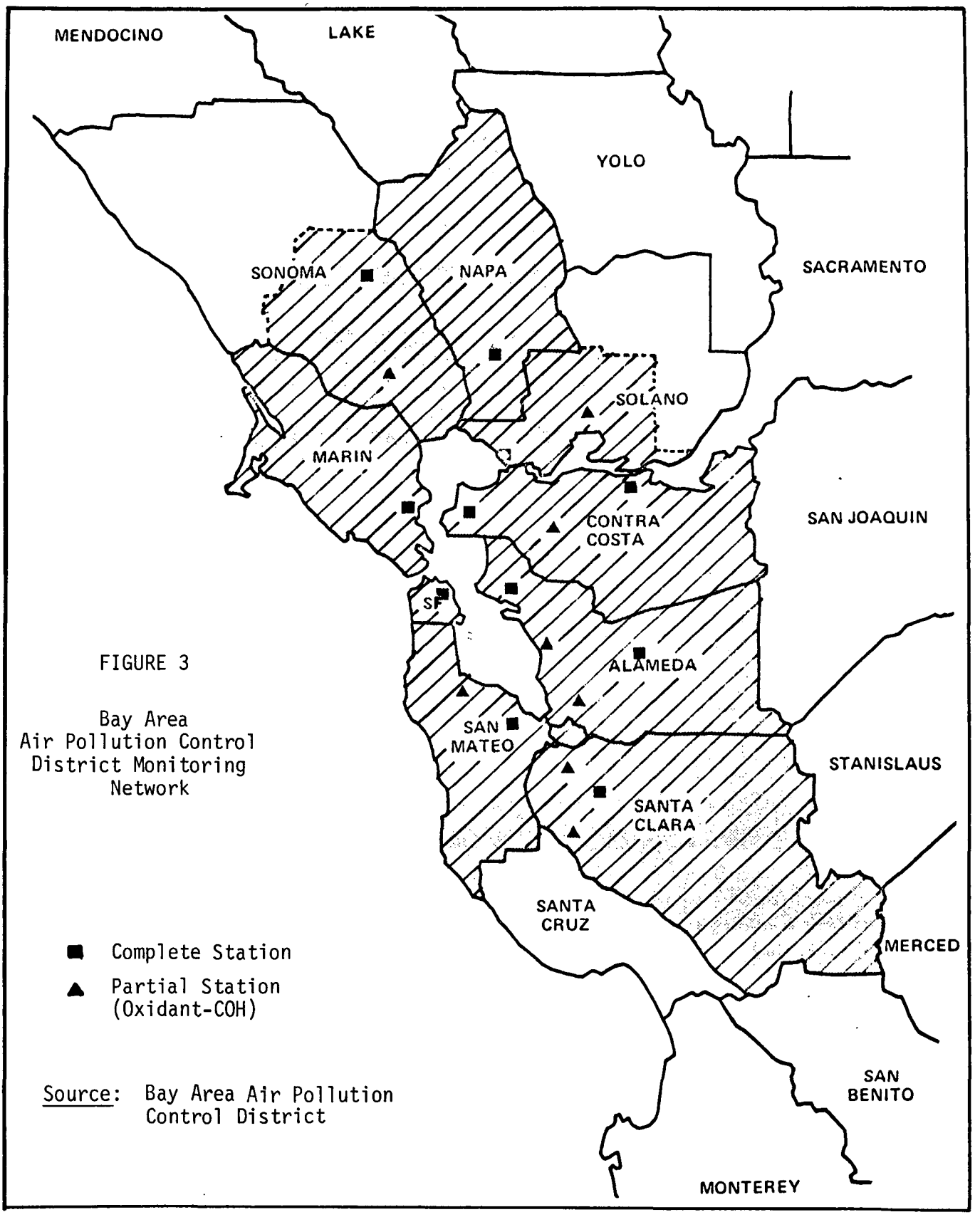


FIGURE 3

Bay Area Air Pollution Control District Monitoring Network

Source: Bay Area Air Pollution Control District

TABLE 2

Bay Area Emission Inventory - 1971

TOTAL EMISSIONS	Organics	Nitrogen Oxides	Carbon Monoxide	Particulate
	1,500 Tons/Day	720 Tons/Day	5,000 Tons/Day	160 Tons/Day

% Distribution of Emissions

SOURCE CATEGORY	ORG.	NOx	CO	PART.
Petroleum	5.3	7.7	0.2	5.0
Chemical	1.4	0.4	0.5	17.0
Metallurgical and Mineral	0.2	0.2	0.1	19.0
Combustion - Fuels	0.1	4.6	0.4	1.6
Food	0.9	(-)	0.1	3.7
Organic Solvent Users	17.0	(-)	0	3.9
Incineration	(-)	(-)	(-)	0.2
Utility Power Plants	0.1	8.4	(-)	1.9
SUB-TOTAL INDUSTRIAL	25%	21%	1%	52%
Service Station Tanks & Bulk Terminals	3.7	0	0	0
Motor Vehicle Tank Filling	3.0	0	0	0
Painting & Printing	5.3	0	0	(-)
Dry Cleaning	1.5	0	0	0
Combustion	(-)	1.2	(-)	1.3
Incineration	(-)	0.1	(-)	0.4
SUB-TOTAL COMMERCIAL	14%	1%	<1%	2%
Domestic Fuel Combustion	(-)	3.1	(-)	2.7
Residential Incineration	0.3	(-)	0.3	1.3
Domestic Solvent Usage	0.8	0	0	(-)
SUB-TOTAL DOMESTIC	1%	3%	<1%	4%
Agricultural Burning	1.3	0.1	0.8	5.0
Construction & Agricultural Equipment	1.2	3.3	1.4	2.1
Ships	(-)	0.7	(-)	0.9
Locomotives	(-)	0.5	0.1	0.4
SUB-TOTAL OTHER	2%	5%	2%	8%
DISTRICT JURISDICTION TOTAL	42%	30%	4%	66%
Aircraft	1.9	1.6	1.3	10.0
Motor Vehicles - Cars	55.0	61.0	94.0	22.0
- Buses	0.1	1.9	0.2	0.4
- Trucks	0.6	4.7	0.4	1.1
SUB-TOTAL TRANSPORTATION	58%	70%	96%	34%
GRAND TOTAL	100%	100%	100%	100%

Source: Bay Area Air Pollution Control District

attainment of the NAAQS. In view of the large reductions necessary to achieve the air quality goals, additional stationary source controls will probably be required.

3.1.4 Transportation Data Base

A considerable transportation data base exists for the San Francisco Bay Area. Unfortunately, much of these data are relatively old and in the process of being updated. Some of these revisions will not be complete for approximately a year or so. Much of these activities are the result of BART's impact on the transportation system in the Bay Area.

Base year transportation information was obtained in 1965 in the Bay Area Transportation Study (BATS). Travel forecasts were made for both 1980 and 1990. Due to the environmental concern of vastly expanded freeway systems, many of the originally projected freeways have not and probably will not be built. Consequently, many of the original highway travel forecasts are high. Included in the 1965 BATS study are data on traffic networks, population, employment, and land use patterns, existing and projected.

Comprehensive transportation planning in the Bay Area falls under the jurisdiction of the Metropolitan Transportation Commission (MTC), an agency created in 1970 by the California Legislature. Their responsibilities are primarily to coordinate and plan for the transportation needs of the region on a permanent basis. MTC is in the midst of preparing a "Regional Transportation Plan", the first phase of which is due for adoption by June, 1973. If adopted, it will be MTC's responsibility to guide future transportation development in the region and to ensure that the development proceeds according to the regional plan. MTC has explicitly stated that its decision-making process will be dictated by a series of four key policy concerns:

1) regional vs. local concerns
2) land use transportation relationships
3) environmental impacts
4) financial and institutional constraints

In the area of environmental impacts, decisions on transportation facilities are to insure that, when balanced against other evaluation criteria, air pollution is minimized.

The most obvious data gap in the region is the lack of an appropriate mode choice model. Such a model, of course, would allow for more accurate prediction of elasticity demands for alternative transportation systems. This is especially important in a region such as the Bay Area where a diversified transportation system exists and a variety of alternative travel modes are available.

In view of the limited time which BART has been operating within the area, a detailed, definitive assessment of its impact on the region is impossible at this time. However, several studies are monitoring its "progress" and evaluating the number of riders being attracted to the system and/or diverted from alternative modes of travel. It is recommended that any future study of transportation controls review the status of on-going studies which are monitoring BART and its impact on the regional transportation system.

A variety of other studies on transportation or related issues have been carried out in the Bay Area. The next section very briefly cites some of these studies as examples of reports to be examined closely in any follow-on effort. Also cited are the agencies involved in the particular studies or which have additional information which would be pertinent in the development of transportation controls for the region.

3.1.5 Select Bibliography

- Center for Real Estate, University of California, Berkeley, Bay Area Simulation Study (BASS), 1968 - study covers the nine county area divided into census tract zones and has information on land use, population, and employment.

- County of Santa Clara, Santa Clara County Transportation Study - 1969 base year transportation study with projections to 1990 on transportation in Santa Clara County.

- DeLeuw, Cather, and Co., San Mateo County Transit Study - 1965 base year transportation study with projections to 1990; data also available on population and employment in San Mateo County.

- County of Marin, Balanced Transportation Study, 1972 - 1970 base year transportation study with projections to 1990; also contains a land use inventory and projects population and employment within the county.

- State of California, Division of Highways, East Bay Traffic Study and West Bay Traffic Study - 1970 base year studies with traffic projections to 1995.

3.1.6 Agency and Personnel Contacted

Bay Area Air Pollution Control District (BAAPCD)
939 Ellis Street
San Francisco, California
(415) 771-6000

Judd Callahan, Air Pollution Control Officer

Milt Feldstein, Head of Technical Division

Michael Macomber, Chief of Research and Planning

Wayman Siu, Chief of Air Monitoring

Metropolitan Transportation Commission (MTC)
Hotel Claremont
Berkeley, California
(415) 849-3223

Peter A Stromberg, Environmental Planner

3.1.7 Discussion

Overall, the data base required for the development of a transportation control strategy in the Bay Area is adequate. Air quality data are fairly extensive and up to date. The emission inventory has been revised as of 1971. Transportation data, while outdated somewhat, are available in many categories. One major problem will be updating some portions of the data base required for a study. Also, the lack of a good mode choice model for the region will make it difficult to accurately assess many impacts of specific transportation controls. Reliance on results from other studies in other regions may be necessary. Nevertheless, a detailed study of control strategy options should allow for the prioritizing or grouping into relative effectiveness categories.

The agencies contacted in this initial survey have expressed sincere interest in having a detailed transportation control strategy study conducted for the Bay Area and pledged full cooperation in the event such a study is initiated.

3.1.8 Recommendations

A detailed study should be carried out in the San Francisco Bay Area Basin to formulate a definitive transportation control strategy for achieving the NAAQS. This study should use 1971 as a base year and incorporate the latest emission inventory, and 1971 air quality data. All other pertinent baseline data should be adjusted to 1971 to ensure a consistent starting point for strategy development.

The study should incorporate in its analysis the following items:

- a revision, where possible, of outdated transportation data to incorporate the effect of more recent population, employment, and land use trends
- a review of studies which are presently underway to monitor the impact of BART on the regional transportation system
- an analysis of alternative modes of transportation and their potential for reducing VMT in the region
- a categorization of potential control options and an estimate of their relative impact on VMT

3.2 Sacramento Valley Intrastate AQCR

The Sacramento Valley Intrastate AQCR, also known as the Sacramento Valley Air Basin, lies in the center of northern California bounded on the west by the Coast Range, on the north and east by the Cascade Range and Sierra Nevada Range, and on the south by the San Joaquin Valley. This basin is comprised of all or portions of 15 counties as illustrated in Figure 4. Geographically, the region consists of some 21,300 square miles and has within its boundaries approximately 1.2 million people and 840,000 motor vehicles.

Air pollution control in the region falls under the jurisdiction of the local APCD's. Within the region each of the 15 counties also has a Sacramento Valley Air Basin Coordinating Council representative. This Basin Coordinating Council meets regularly to discuss regional air pollution problems and control strategies. As in the rest of the State, the local and regional organizations deal primarily with stationary source controls leaving mobile source controls to the CARB.

3.2.1 Air Quality Data

During the time period from 1970-1972, the Sacramento Valley Air Basin has experienced numerous violations of both Federal and State air quality standards. Table 3 summarizes air quality data transmitted to the CARB for the time periods indicated. As evidenced from the data, photochemical oxidants are the predominant problem, and it appears from the limited data evaluated that the problem has increased in recent years, both in the number of violations which occur and the maximum oxidant levels experienced. Based on a one hour maximum oxidant reading during 1971 in Sacramento of 0.24 ppm, a 67 per cent reduction of reactive hydrocarbons would be required to meet the NAAQS using proportional rollback. Table 4 summarizes the annual arithmetic means for NO_2 from 1963-1971 and shows that the NO_2 standard has never been exceeded within the given time period (NAAQS for NO_2 is an annual arithmetic mean of 0.05.

FIGURE 4

Sacramento Valley
Intrastate AQCR

Source: California Air Resources Board

TABLE 3

Summary of Air Quality Violations in the Sacramento Valley Air Basin (1970-1972)

Month / Year	Carbon Monoxide		Oxidant	
	Violations[1]	Maximum Level[2]	Violations[1]	Maximum Level[3]
April, 1970	--	--	--	--
May, 1970	--	--	9	.24
June, 1970	--	--	10	.19
July, 1970	--	--	13	.21
Aug., 1970	--	--	12	.18
Sept., 1970	--	--	11	.17
Oct., 1970	1	10	8	.15
Nov., 1970	2	10	--	--
Dec., 1970	--	--	--	--
	3	10	63	.24
Jan., 1971	--	--	--	--
Feb., 1971	--	--	--	--
March, 1971	--	--	3	.10
April, 1971	1	9	7	.12
May, 1971	--	--	9	.13
June, 1971	--	--	12	.11
July, 1971	--	--	29	.18
Aug., 1971	--	--	29	.19
Sept., 1971	--	--	15	.24
Oct., 1971	12	10	14	.18
Nov., 1971	11	26	1	.09
Dec., 1971	3	10	--	--
	27	26	119	.24
Jan., 1972	2	10	--	--
Feb., 1972	1	9	--	--
March, 1972	--	--	4	.20
April, 1972	--	--	5	.13
May, 1972	--	--	15	.14
June, 1972	--	--	25	.18
July, 1972	--	--	31	.28
Aug., 1972	--	--	22	.20
Sept., 1972	--	--	20	.17
	3	10	122	.28

[1]Number of days per month the specified standard was exceeded in the air basin.

[2]Based on exceeding a 12-hour average of 10 ppm <u>or</u> an 8-hour average of 9 ppm; data compiled using both standards

[3]Based on exceeding a 1-hour average of 0.08 ppm <u>or</u> 0.10 ppm; data compiled using both standards

<u>Source</u>: California Air Resources Board

TABLE 4

Annual NO_2 Concentrations in Sacramento County (1963-1971)[1]

	NO_2 Average (ppm)
1963	0.037
1964	0.040
1965	0.039
1966	0.027
1967	0.035
1968	0.025
1969	0.030
1970	0.029
1971	0.025

[1]Monitored in Sacramento (13th and J Street)

Source: Sacramento County Air Pollution Control District

3.2.2 Air Quality Monitoring

Presently, the number of air quality monitoring stations and pollutants being measured in the Sacramento Valley Air Basin are limited. Only four stations within the region monitor the majority of the gaseous pollutants. Table 5 summarizes the location and pollutants monitored at these stations.

TABLE 5

Principal Air Quality Monitoring Stations
Sacramento Valley Air Basin

Location	O_3	CO	NO	NO_2	NO_X	HC
Butte County - Chico	X	X	X	X	X	X
Sacramento County - Sacramento	X	X	X	X	X	X
Shasta County - Redding	X	X	X	X	X	X
Sutter County - Yuba City	X	X	X	X	X	X

Source: California Air Resources Board

Sacramento, the city with the most severe air pollution problems in the Basin, has only two stations recording photochemical oxidants. There are, however, a variety of stations throughout the entire Basin recording particulate matter either through "hi-vol" sampling or coefficient of haze (COH) measurements.

In view of the high oxidant readings recorded in Sacramento, it is certainly desirable to have more extensive air quality data to verify and determine the regional extent of the problem. In the absence of such data, it may be difficult to justify extensive transportation controls for the entire region.

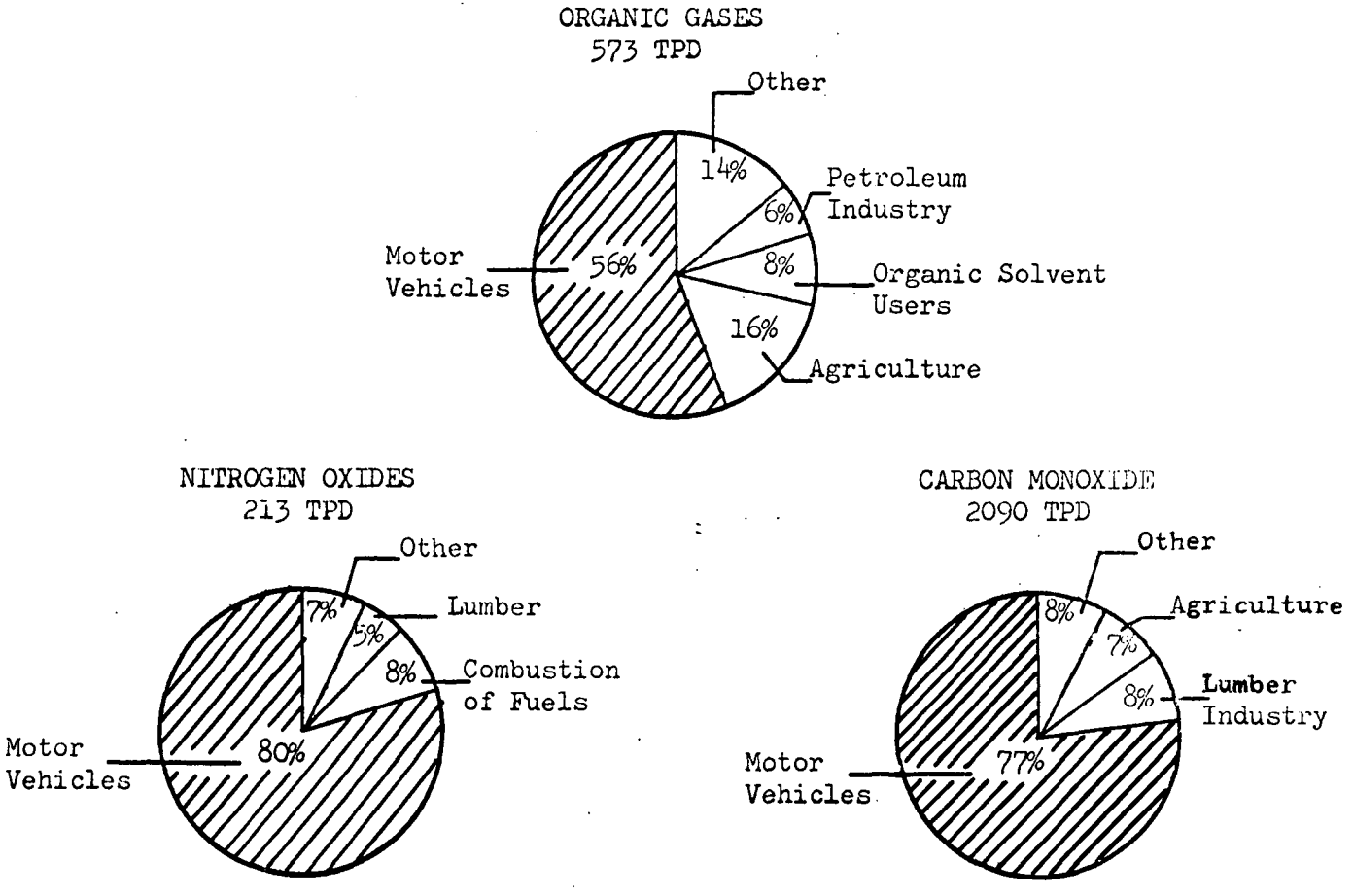
3.2.3 Emission Inventory

The most current emission inventory for the air basin was taken in 1970 by the CARB. No revisions have been made since or are contemplated this year. Figure 5 presents an approximate breakdown of emission for the entire AQCR. Table 6 delineates the contributions from the major counties to the basinwide emissions. It is apparent from this table that Sacramento County emits a disproportionate share of the pollutant emissions in the region. Table 7 summarizes the emissions estimated for Sacramento County alone. In this county, mobile vehicles account for 71 per cent of the hydrocarbons, 89 per cent of the nitrogen oxides, and 88 per cent of the carbon monoxide. Since the air quality levels are most severe for Sacramento County, it appears appropriate to attempt to solve the airshed's problems by developing a control strategy specifically for Sacramento County and its immediate vicinity.

Based on estimates from a linear rollback of reactive hydrocarbons, extensive controls will be necessary in order to achieve the NAAQS. In all probability, additional stationary source controls will also be required.

FIGURE 5

Sacramento Valley Air Basin-Emission Inventory (1970)



Source: California Air Resources Board

A more detailed analysis of the various emission source categories and their potential for controls is needed to arrive at an optimum set of control strategies for this region.

TABLE 6

Sacramento Valley Air Basin Emissions by Major Counties - 1970

	Hydrocarbons		Carbon Monoxide		Nitrogen Oxides	
County	Tons/Day	Per Cent	Tons/Day	Per Cent	Tons/Day	Per Cent
Sacramento	212.0	36.9	871	41.6	94.8	44.4
Butte	50.7	8.8	178	8.5	16.5	7.7
Shasta	45.3	7.9	201	9.6	21.8	10.2
Yolo	44.0	7.7	125	6.0	14.0	6.6
Sutter	33.5	5.8	85	4.7	7.3	2.9
Placer	31.3	5.5	110	5.3	12.2	5.7
All Others	157.0	27.4	520	24.9	46.0	21.8
TOTAL	574	100	2090	100	213	100

Source: California Air Resources Board

3.2.4 Transportation Data Base

The largest and most comprehensive transportation agency in the Sacramento Valley Air Basin is the Sacramento Regional Area Planning Commission (SRAPC). SRAPC is a council of six counties and seventeen city governments. It serves all of Sacramento, Sutter, Yolo, and Yuba Counties and portions of El Dorado and Placer Counties. SRAPC has a variety of functions within the region, including the provision of comprehensive transit planning for the Sacramento Regional Transit District. Despite its major role in regional planning for the area, SRAPC serves strictly as an advisory agenty which means it has no direct authority to implement

the programs it advocates or to stop programs it opposes. In July of 1972, SRAPC proposed its Regional General Plan-Transit Plan and Program. With the adoption of this Plan, it is hoped that the development of all future transportation systems within the region will be made in the framework set forth by the Plan.

TABLE 7

Sacramento County Emission Inventory - 1970
(Tons/Day)

Stationary Sources	Hydrocarbons	Nitrogen Oxides	Carbon Monoxides
Petroleum	12.6	1.0	--
Organic Solvent Users	14.9	--	--
Chemical	--	0.4	1.0
Incineration	10.4	0.6	17.7
Combustion of Fuels	0.8	7.8	0.7
Lumber Industry	--	0.1	0.5
Agriculture	3.0	0.1	4.8
Total Stationary Sources	43.0	10.0	24.7
Mobile Sources			
Motor Vehicles	151.0	81.5	767.0
Aircraft	16.9	1.8	77.5
Ships & Railroads	1.2	1.5	1.4
Total Mobile Sources	169	84.8	846
Total Emissions	212	94.8	871

Source: California Air Resources Board

The most current base year transportation data for the Sacramento area is the SATS Base Year Report, Volumes I and II, conducted by The State of California, Division of Highways, District 3 (Sacramento Area Transportation Study). Volume II of the SATS Base Year Report is the results of a home interview survey conducted in 1968 and 1969. In addition to these key documents, a number of pertinent studies have been carried out by the Sacramento State College under a Federally funded FASTRIP program (Federally Assisted Sacramento Transit Research and Improvement Project). Several of these reports are noted in Section 3.2.5 and would serve as valuable resource materials in the development of transportation controls for the area.

3.2.5 Select Bibliography

The reports cited below were all carried out under FASTRIP (Federally Assisted Sacramento Transit Research and Improvement Program) at Sacramento State College. The reports are only samples of work available on the Sacramento region.

- Barnes, C.W., Service Changes and Their Effects on Revenue, Ridership, and Riders per Mile, April, 1970, CAL-MTD-10, Interim Technical Report #1
- Barnes, C.W., Who Rides the Bus? Passenger Characteristics and Riding Patterns of the Sacramento Transit Authority, May 1968, August 1970, CAL-MTD-10 Interim Technical Report #3
- Tomlinson, G., Rides, Trips and Moves on a Bus, December, 1970 CAL-MTD-10, Interim Technical Report #6
- Barnes, C.W., A. Gutowsky and S. Mewhart, Crosstown Line 9 - An Evaluation of a New Route, January, 1971, CAL-MTD-10, Interim Technical Report #8.

3.2.6 Agency and Personnel Contacted

California Air Resources Board
1025 "P" Street
Sacramento, California
(916) 445-5296

Harmon Wong-Woo, Chief, Implementation Planning and Enforcement Division

Terry McGuire, Senior Air Sanitation Engineer

Donald Bratton, Associate Air Sanitation Engineer

Sacramento County Air Pollution Control District
2221 Stockton Blvd.
Sacramento, California
(916) 454-5458

Philip Tow, Chief, Air Pollution Control and Environmental Health Services

Sacramento Regional Area Planning Commission
1225 Eighth Street
Sacramento, California
(916) 446-9171

Robert Koski, Senior Physical Planner

3.2.7 Discussion

Overall, the data base required for the development of a transportation control strategy in the Sacramento area is adequate. The lack of comprehensive air quality data outside of Sacramento County and the rather extensive transportation data base centering around Sacramento, both point to the need for a closer examination of the transportation planning/air quality impact relationship in Sacramento. The high oxidant readings in the region further point up the necessity to investigate alternative methods of reducing vehicular emissions in the next few years in order to achieve the NAAQS.

Since the emission inventory has not been revised since 1970, it is recommended that any follow-on work use 1970 as a base year for all data sources. Since the maximum oxidant reading in 1970 and 1971 was the same, the use of either year for a baseline will not affect the development of control strategies. However, the use of 1972 ambient air quality data, with its higher oxidant readings would significantly affect the development of a viable transportation control plan since a more stringent set of controls would then become necessary.

3.2.8 Recommendation

Since the highest air pollution levels occur in the City of Sacramento, it is recommended that a detailed study be carried out in the Sacramento region to formulate a definitive transportation control strategy for a achieving the NAAQS. This study should use 1970 as a base year and adjust all data to reflect this baseline. Based on the limited amount of air quality data available from other regions in the airshed and their markedly lower readings, it does not appear that a study in any other location of the air basin is warranted or desirable.

The Sacramento study recommended should incorporate in its analysis the following items:

- any additional inputs or insights which SRAPC may be in a position to add
- a review of the entire FASTRIP program to determine which of the reports in this series will be useful in follow-on activities
- a review of existing transit improvement programs and their relative impact
- an analysis of alternative modes of transportation and their potential for reducing private auto usage
- a categorization of potential control options and an estimate of their relative impact on VMT.

3.3 San Joaquin Valley Intrastate AQCR

The San Joaquin Valley Intrastate AQCR, also known as the San Joaquin Valley Air Basin, consists of all of the counties of Amador, Calaveras, Fresno, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, Tulare, and Tuolumne, and the western portion of Kern County. This AQCR lies in the southern portion of the Great Valley and extends into the neghboring mountain slopes. It is bounded on the west by the Coastal Range, on the east and south by the Sierra Nevada and Tehachapi Mountains, respectively, and on the north by the Sacramento Valley Intrastate AQCR. Figure 6 gives the location of the Basin in California.

3.3.1 Air Quality Data

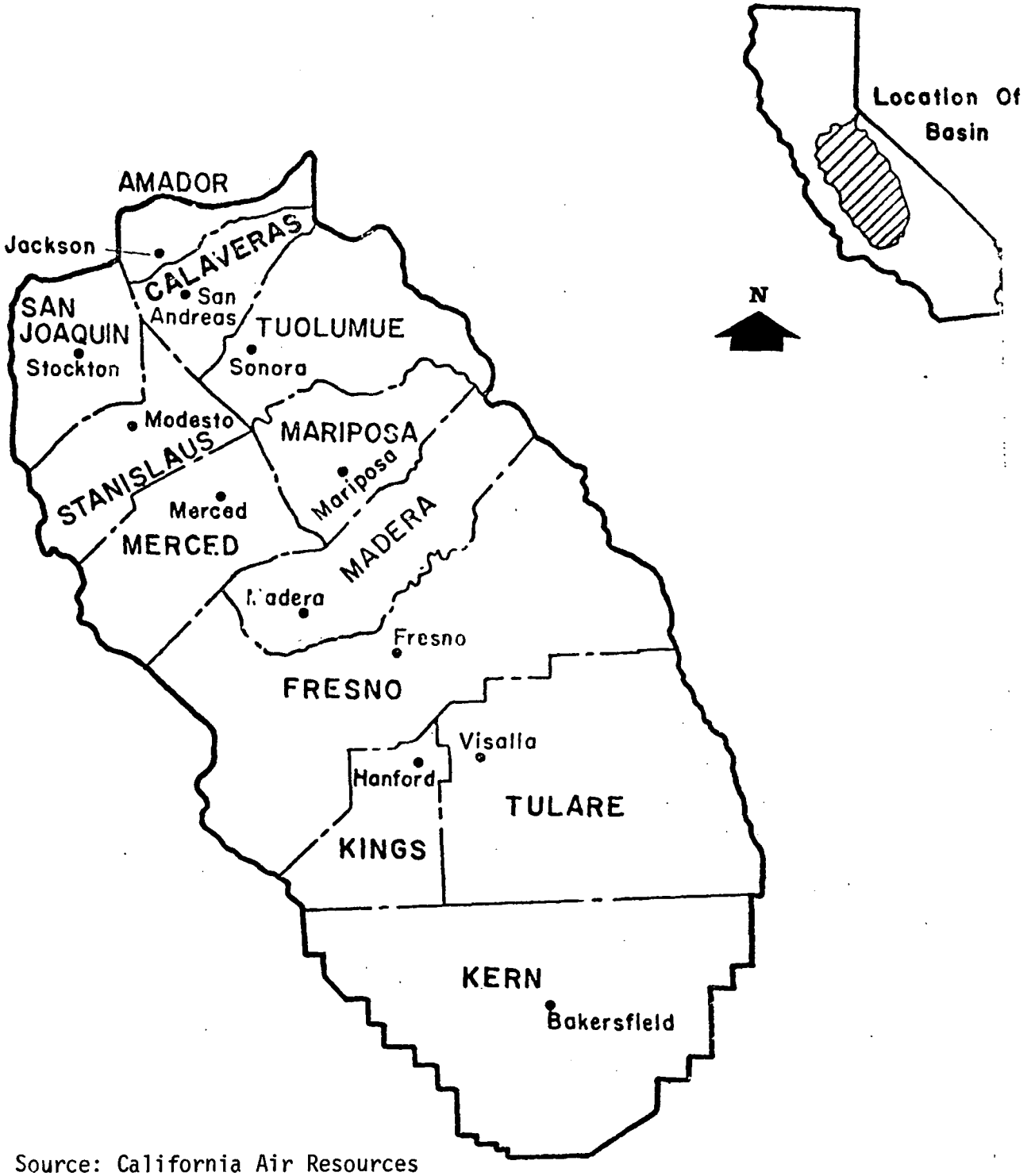
In recent years, NAAQS have been exceeded in several locations of the Basin, as shown in Table 8. In 1971 photochemical oxidants were exceeded by the greatest margin and assuming a linear rollback of hydrocarbons for reducing oxidant implies approximately 67 percent reduction would be necessary for Modesto to achieve the NAAQS for oxidant.

Although less of a problem, carbon monoxide levels are also frequently violated within the region. It is estimated, however, that the alleviation of this problem will result primarily from the presently planned and existing motor vehicle control programs of the CARB. Oxidant controls will prove to be much more elusive.

Since 1970, two additional San Joaquin Valley cities have exceeded the NAAQS for oxidant; they are Parlier and Five Points. These areas presently monitor air quality continuously and have done so since 1972.

FIGURE 6

San Joaquin Valley
Intrastate AQCR



Source: California Air Resources Board

TABLE 8

Air Quality Violations in the San Joaquin Valley

Location	Oxidant[1] 1970	Oxidant[1] 1971	Carbon Monoxide[2] 1970	Carbon Monoxide[2] 1971
Fresno	0.21	0.18	11	9
Bakersfield	0.15	0.22	15	10
Modesto	0.20	0.24	-	-
Stockton	0.18	0.20	12	12
Visalia	0.19	0.16	-	12

[1]Maximum one hour average in ppm

[2]Maximum eight hour average in ppm

Source: California Air Resources Board

3.3.2 Air Quality Monitoring

The following cities have monitoring stations which send air quality data to the CARB each month (Table 9). Also listed is the cooperating agency which operates the monitoring station.

TABLE 9

Air Quality Monitoring in the San Joaquin Valley

City	Operator
Fresno	CARB
Bakersfield	CARB
Modesto	CARB
Stockton	San Joaquin County APCD/CARB
Visalia	CARB
Parlier	Fresno County APCD
Five Points	Fresno County APCD

Source: California Air Resources Board

within the county, and the APCD expects the resulting data will be used in compiling a new inventory in 1973.

Stockton

The 1970 inventory published by the CARB is the primary data source for emissions in Stanislaus County, although some supplementary and revised materials are available from the APCD. In addition, the APCD publishes an annual report; the 1971 report is currently available, and the 1972 report is due to be published by the end of March, 1973.

Visalia

The Tulare County APCD and the CARB have recently completed a survey of stationary sources of pollutants in Tulare County. The CARB is currently in the process of applying emission factors to the collected data to estimate emission values. It will probably be a couple months before the complete inventory is published. However, the APCD has some information on sources of organics, and can provide additional data to supplement the 1970 inventory.

3.3.4 Transportation Data Base

Transportation studies have been conducted in all five major cities of the San Joaquin Valley AQCR--Fresno, Bakersfield, Modesto, Stockton, and Visalia. In most cases, this information is available from the appropriate district office of the State Division of Highways. Fresno, Bakersfield, and Visalia are in District 6 and Stockton and Modesto are in District 10. Brief descriptions of the transportation data available in each city are provided below.

Fresno

Basic transportation data for Fresno is contained in a California Division of Highways study conducted in 1971. This study includes origin-destination (O-D) information and the results of a transportation

opinion survey. The raw data are available in District 6 office in Fresno. many of these data are being updated with the revisions due for completion by Fall, 1973. Projections of VMT for the region have not been made and would have to be estimated in any follow-on activities.

The Fresno Community Council has used the Division of Highways' 1971 O-D study in analyzing the current transportation system in Fresno, and has used the 1971 transportation opinion survey to assess local attitudes toward alternate systems. The Council has analyzed for such things as traffic density due to work trips, density of travel within census tracts, and the volume of inter-census tract trips. Results of these analyses have been tabulated and graphically displayed on city census tract maps.

Bakersfield

An urban transportation study for Bakersfield is currently underway by the Division of Highways. This study will probably provide data projections which can be used in an air pollution study. Otherwise, data are available for base year 1970. These data were updated from an original report for base year 1965. The data include, for example, tables on travel frequency within and between traffic zones. Most of the other data required for a study relating motor vehicle travel to air pollution seem to be available.

Stockton

A 1967 O-D survey comprised of roadside and home interviews was made by the Division of Highways for the city of Stockton, based on a grid of over 300 traffic zones as subdivisions of 51 census tract numbers. The study included model development, trip assignment and traffic projections to 1995.

This study is probably due for updating. The Federal Highway Act of 1962 requires all districts to have transportation plans in order to be

eligible for Federal funds. Stockton must have a plan by July, 1973. According to personnel from the district office, the updating is not difficult.

Alan M. Vorhees and Associates is currently collecting information from various highway agencies (including District 10) for a study of the San Francisco Bay Area-Stockton-Sacramento corridor. This study is sponsored by six agencies, including the Federal Government, the State Senate, and certain transportation planning agencies in the area. However, although the data collected by Vorhees may include some pertinent information for an air pollution study, their interests are primarily in inter-city traffic.

Modesto (Stanislaus County)

A 1970 O-D survey similar to the Stockton study discussed previously was conducted by the Division of Highway-District 10 Office. The two studies differ in that no forecasts were provided for Stanislaus, although plans are underway to supply these projections. This county has 304 traffic zones and is scheduled to complete a transportation plan, as a prerequisite for Federal funding by December, 1973.

Visalia

Work on a small-scale urban transportation study has recently been completed and will be published soon. The study was sponsored by the City and State jointly and uses 1972 as the base year for transportation data in Visalia. It is not anticipated that the data will be as accurate or as comprehensive as the data compiled in Fresno and Bakersfield. Follow-on activities for an air pollution study would probably require additional projections to be made with the assistance of the District 6 office.

3.3.5 Select Bibliography

- State of California, Division of Highways, Urban Planning Department, Stockton Area Transportation Study, 1967
- State of California, Division of Highways and Stanislaus Area Association of Governments, Stanislaus Area Transportation Study, 1970
- State of California, Division of Highways, District 6, Metropolitan Area Transportation Study - Bakersfield, California
- San Joaquin Valley Air Basin Implementation Plan, 1971
- Fresno Community Council, Transportation Committee, A Community Project for Viable Mass Transportation and Clean Air: Work Program Plan, 1972
- Fresno Community Council, "Transportation Dollars and Sense: A Public Workshop Report," November 13, 1972
- County of San Joaquin, Air Pollution Control District, Annual Report - 1971

3.3.6 Agency and Personnel Contacts

Fresno

Fresno County Air Pollution Control District
1246 "L" Street
Fresno, California
(209) 488-3779

Clayton Auernheim, Assistant Director of Environmental Health

Fresno County Planning Department
4499 East Kings Canyon Road
Fresno, California
(209) 488-3848

Kerry L. McCants, Senior Planner

Fresno Community Council
208 Crocker Citizens Bank Bldg.
Fresno, California
(209) 237-8359

Nathaniel Edwards
Paul Maier
Jesse Delgadillo

Fresno (Cont'd)

California Division of Highways - District 6
1352 West Olive Avenue
Fresno, California
(209) 488-4088

M. E. Parlier, District Urban Planning Engineer

Bakersfield

Kern County Air Pollution Control District
P. O. Box 997
Bakersfield, California
(805) 861-3682

Citron Toy, Supervising Air Sanitation Officer

Stockton

California Division of Highways - District 10
1976 E. Charter Way
P. O. Box 2048
Stockton, California
(209) 446-5271, Ext. 238

E. J. Walker, District Urban Planning Engineer

San Joaquin County APCD
P. O. Box 2009
Stockton, California
(209) 466-6781

Gordon Ballard, Inspector

Modesto

Stanislaus County APCD
820 Scenic Drive
Modesto, California
(209) 526-6908

Wayne Morgan, Supervisor, Air Pollution Section

Visalia

Tulare County APCD
County Civic Center
Visalia, California
(209) 732-5511, Ext. 345

Bill Kerstan

3.3.7 Discussion

The five major cities of the San Joaquin Valley Intrastate AQCR-- Fresno, Bakersfield, Modesto, Stockton, and Visalia -- are independent from each other in all pertinent respects: air quality measurements, air pollutant emissions, and transportation systems. Each city has its own set of air pollution problems, and each city (or county) performs planning studies and exercises in essentially an independent manner. There is a sufficient base of air quality, emissions, and transportation data in each city to develop a transportation control plan for that city. In the cases of Parlier and Five Points, it is conceivable that reasonable sets of air quality and emissions data could be isolated, but there is not a sufficient transportation data base to conduct studies in these towns.

Three complete years (1970 - 1972) of oxidant and carbon monoxide data are available for Bakersfield and Stockton, whereas monitoring in Modesto and Visalia began in mid- 1970, and in Fresno in late 1970. In all five cases, however, air quality data are now being collected on a continuous basis. The 1970 Statewide inventory can be used as a basis for stationary source information in each city, while supplementary and revised data are available from the individual local APCD's. Recent transportation data (typically 1970, 1971, or 1972) are available from the California Division of Highways studies in four of the cities sited.

Most of the counties concerned have active planning agencies and community organizations which are currently involved in transportation and land use studies. Perhaps the most relevant of these is the work being done by the Fresno County Planning Department and the Fresno Community Council. These agencies are carrying out a study to develop a viable mass transportation system for the Fresno community. One of the goals

of this program is to alleviate air pollution generated by automobile operation. The study is partially funded by a small Federal grant, which will terminate on 30 June, the scheduled completion date for the study. At that time the Council expects to have a proposal for a mass transportation plan. Both the goals and the schedules are complementary to those of a transportation control implementation plan. In all cases, the county agencies have neither the expertise nor the facilities to include a satisfactory analysis of the impact of their transportation and land use plans on local air pollution, although alleviation of air pollution problems is typically a major objective of the agencies' studies.

3.3.8 Recommendations

It is recommended that cities in the San Joaquin Valley Intrastate AQCR be studied separately with respect to any analysis of air pollution problems and the development of transportion control plans. It is further recommended that the cities of Fresno, Bakersfield, and Stockton be given top priority in any such studies, and that Modesto and Visalia be given secondary priority. This division of priorities is regarded as necessary in view of the budgetary and scheduling constraints imposed by a comprehensive California AQCR study. The assignment of priorities is based on population and the standards exceeded.

The base year for these studies should be 1971, and the studies should include the following:

- an update of transportation data, where necessary, to reflect changes in population, employment, and land use
- the assembly of supplementary and revisionary stationary source inventory data as received from the respective APCD's to be

incorporated, where appropriate, into the development of control strategies

- a review of all land use and transportation studies currently underway to prevent duplication of effort and to promote consistency and continuity of planning efforts
- an analysis of the impact of the proposed transportation implementation plan on other planning studies

3.4 Southeast Desert Intrastate AQCR

The Southeast Desert Intrastate AQCR, also known as the Southeast Desert Air Basin is located in the southeast portion of the State. It is comprised of all of Imperial County and the eastern portions of San Bernardino, Riverside, Kern, Los Angeles, and San Diego Counties. Geographically, this AQCR covers some 33,600 square miles and is separated from the coastal regions by a series of mountain ranges. These mountains also serve as a climatalogical boundary. Elevations within the region vary from 235 feet below sea level at the Salton Sea to over 11,000 feet, at the peak of Mount San Gorgonio. Figure 7 presents a map of the region and its location in the State.

By and large, the region is of low population density with approximately 447,000 residents in 1970. Motor vehicle registrations for 1970 numbered slightly more than 300,000 with the vehicles consuming some 400 million gallons of gasoline and 14 million gallons of diesel fuel.

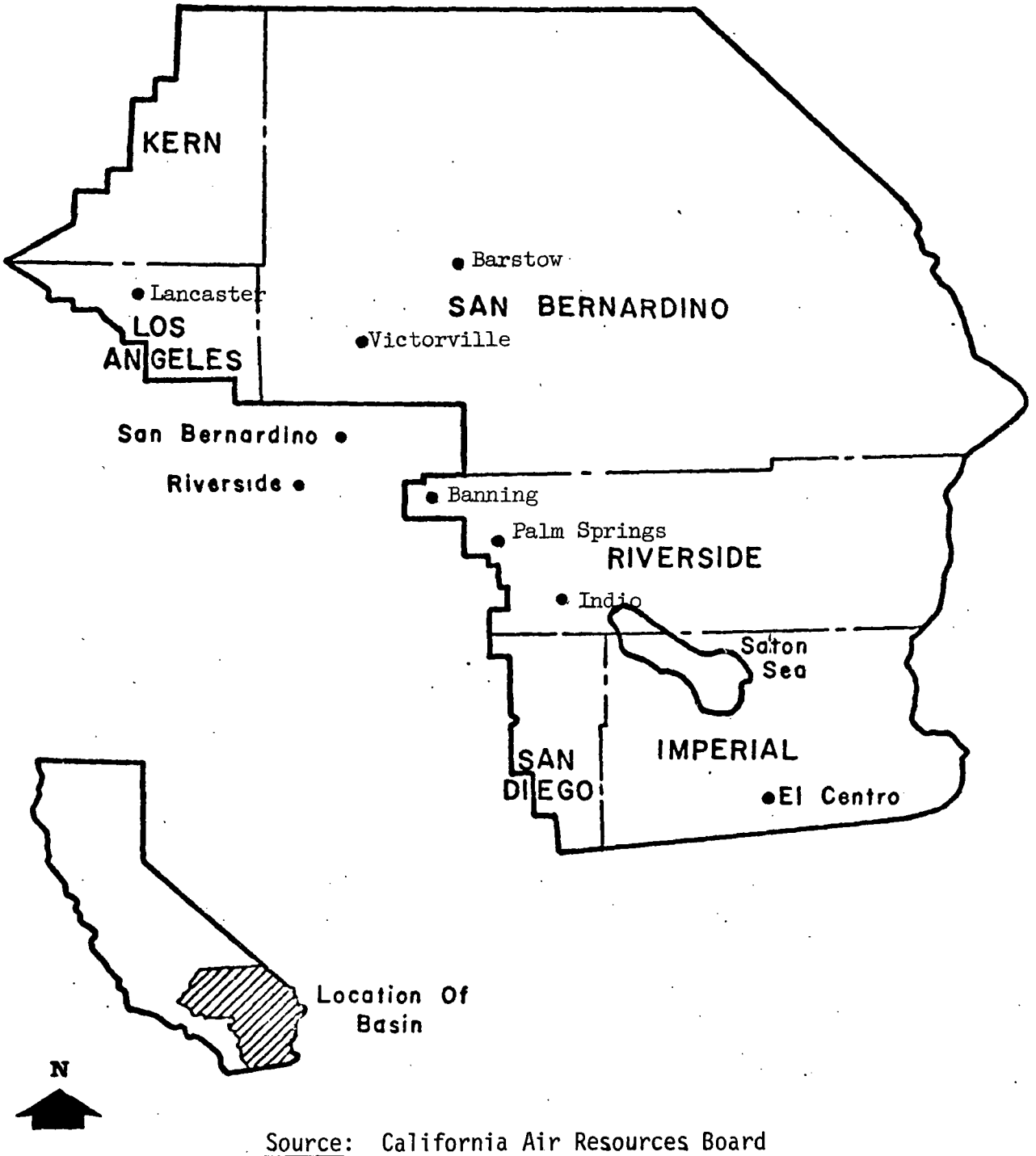
3.4.1 Air Quality Data

In recent years, the NAAQS have been exceeded in numerous sites throughout this AQCR. Table 10 lists six locations in the region and the maximum recorded levels of oxidant and carbon monoxide for 1970 - 1971. The available data indicate that the NO_2 standard has not been exceeded. No significant, overall air quality trends for the AQCR were deduced from an initial evaluation of the data.

The overall 1971 maximum readings for the Basin are 0.38 ppm oxidant (recorded in Palm Springs) and 17 ppm for CO (recorded in Indio). Using simple rollback and assuming a linear relationship between reactive hydrocarbons and oxidant concentrations, the required reductions to achieve the NAAQS are 70 percent of the reactive hydrocarbons and 47 percent of the

FIGURE 7

Southeast Desert Intrastate AQCR



Source: California Air Resources Board

TABLE 10

Air Quality Levels Monitored in the Southeast Desert AQCR (1970 - 1971)

Location	Oxidant 1970	(1-Hr. Maximum) 1971	CO 1970	(8 Hr. Maximum) 1971
Lancaster	0.06	0.20	12	9
Banning	0.46	0.24	NM	NM
Palm Springs	NM	0.38	NM	14
Indio	NM	0.32	NM	17
Barstow	0.14	ND	NM	NM
Victorville	0.22	0.14	NM	NM

ND - No recorded data
NM - Not monitored

Source: California Air Resources Board

carbon monoxide. Since the Southeast Desert is generally downwind of the South Coast Air Basin (Los Angeles region), it is not clear what amounts of pollutants are transported into the region and added to the locally generated pollution problem. Defining what fraction of the Southeast Desert's air pollution is the result of transport and what portion results from activities within the Basin would require a major research effort. Such a study is beyond the scope of the anticipated transportation control strategy developments.

3.4.2 Air Quality Monitoring

There are six stations in the Southeast Desert AQCR for which 1970 and 1971 data on ambient levels of pollutants are available. These stations are listed in Table 11 along with the pollutant species measured and the operating agency.

The monitoring systems in this air basin are relatively new, and as a result, discontinuities in the air quality data are prevalent. None of the stations have a full year of continuous data for 1970. Banning comes

TABLE 11

Principal Air Quality Monitoring Stations
Southeast Desert Intrastate AQCR

Location	POLLUTANT						Operator
	OX	CO	NO	NO_2	NO_X	HC	
Lancaster	X	X	X	X	X	X	Los Angeles County APCD
Banning	X		X	X	X		Riverside County APCD
Palm Springs	X	X	X	X	X		Riverside County APCD
Indio	X	X	X	X	X	X	Riverside County APCD
Barstow	x						San Bernardino County APCD
Victorville	x						San Bernardino County APCD

Source: California Air Resources Board

closest, with data from 1 February 1970 through 31 December, but all the other data are extremely sketchy. For 1971, essentially continuous data exist for the following stations and pollutant species:

- Banning Oxidant and CO
- Lancaster Oxidant and CO
- Victorville Oxidant and CO

Continuous data from March, 1971 to the present are available for:

- Palm Springs Oxidant
- Indio Oxidant

A continuous full year of data for Barstow is not yet available.

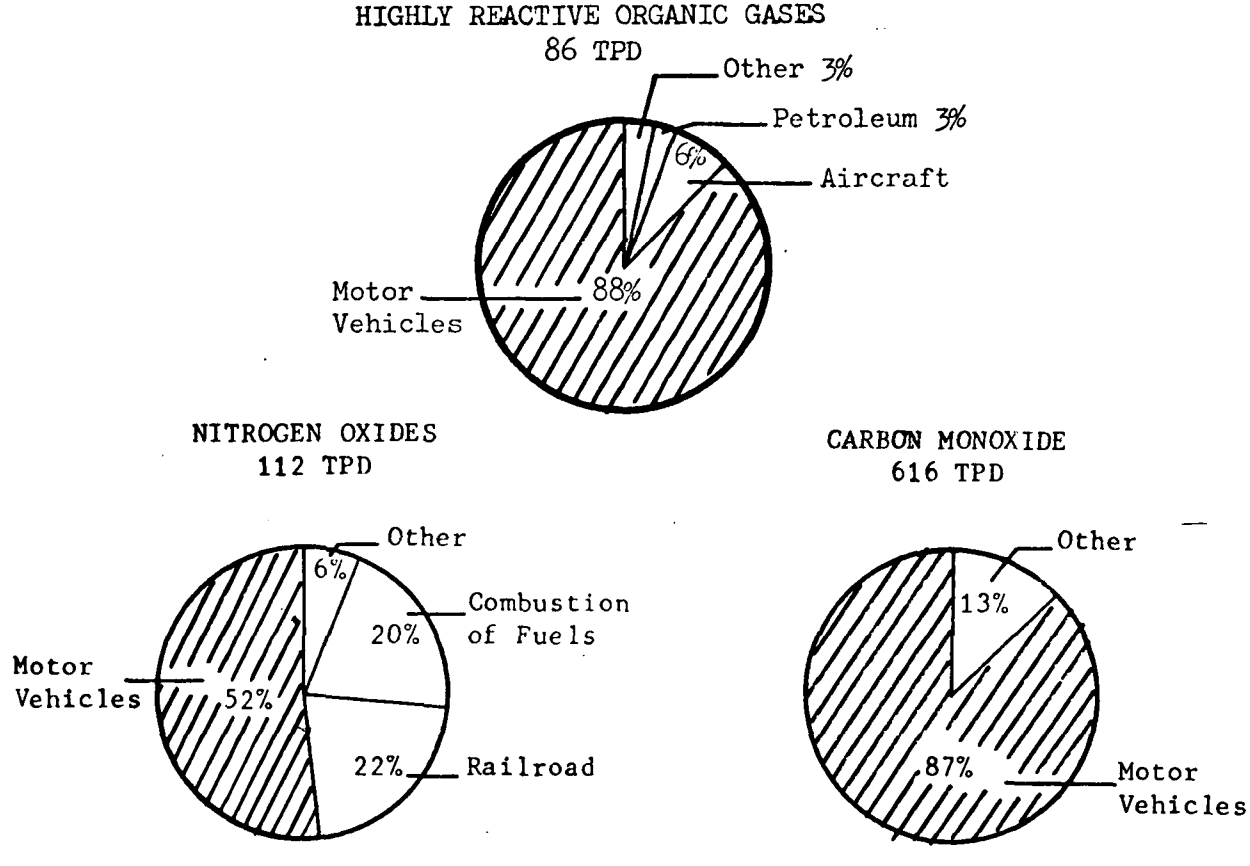
3.4.3 Emission Inventory

The 1970 emission inventory as published by the CARB is the most comprehensive reference for information on stationary sources in the Southeast Desert Intrastate AQCR. Additional data may be obtained from the APCD's in the respective counties. In particular, the San Bernardino County APCD publishes an annual report which provides more recent data on the sources in the San Bernardino County portion of the air basin.

Figure 8 illustrates the contribution by major source type of reactive

FIGURE 8

Southeast Desert Air Basin - Emission Inventory
(1970)



Source: California Air Resources Board

hydrocarbons, carbon monoxide, and nitrogen oxides in the air basin. Motor vehicles contribute 88 percent of the highly reactive organics, 87 percent of the carbon monoxide, and 52 percent of the nitrogen oxides. Table 12 summarizes the estimated emissions (tons/day) for these pollutants within the region. San Diego County contributes significantly less of all the pollutants listed than the other five counties whereas San Bernardino County contributes the greatest share of emissions.

TABLE 12

Southeast Desert Air Basin
Average Emissions for Each County - 1970
(Tons Per Day)

County	Organic Gases Highly Reactive	Organic Gases Total	Oxides of Nitrogen	Carbon Monoxide
Imperial	14.9	28.5	15.7	107
Kern	9.1	16.4	11.8	71.5
Los Angeles	14.9	26.9	10.4	96.5
Riverside	23.0	38.0	19.6	166
San Bernardino	23.9	57.6	54.4	173
San Diego	0.4	0.7	0.2	1.8
Total	86.0	168.0	112.0	616.0

Source: California Air Resources Board

3.4.4 Transportation Data Base

Two transportation studies have produced data which would be useful in a study of the Southeast Desert Intrastate AQCR LARTS, a regional transportation study of Los Angeles conducted by the California Division of Highways and a study currently underway by Wilbur Smith and Associates for the city of Barstow under the TOPICS Program. LARTS is a complete study with respect to usable data for the development of control strategies, but it includes only one of the Southeast Desert cities (i.e. Lancaster) for which air quality standards were exceeded. Available data in raw form

are available from the Barstow study and includes O-D information, existing and forecasted trip miles, network assignments and average running speeds by street type in the city. The results of the analysis of these data should be forthcoming by the end of April. Little or no urban transportation data exist for the cities of Banning, Victorville, Palm Springs, and Indio.

3.4.5 Select Bibliography

- Annual Report, 1971, San Bernardino County Air Pollution Control District, San Bernardino, California
- LARTS Base Year Report -- 1967 Origin-Destination Survey, California Division of Highways, District Seven, December, 1971
- County of San Bernardino, Air Pollution Control District, Annual Report - 1971, San Bernardino, California 1972
- State of California, Division of Highways, District 7, LARTS Base Year Report - 1967 Origin - Destination Survey, December, 1971

3.4.6 Agency and Personnel Contacts

San Bernardino County APCD
172 West Third Street
San Bernardino, California
(714) 383-1661

Donald M. Thomas, Air Pollution Control Officer

J. A. Stuart, Chief Enforcement Officer

Robert Hillovsky, Emission Source Section

Bob Nishimura, Junior Engineer

California Division of Highways, District 8
247 West Third Street
P. O. Box 231
San Bernardino, California 92402
(714)383-4578

Robert Stribling, Project Monitor for Barstow Study

City of Barstow, California
(714) 256-3531

Juan Mijares, City Engineer

Wilbur Smith and Associates
5900 Wilshire Boulevard
Los Angeles, California
(213) 938-2188

William Shepherd, Project Officer for Barstow Study

3.4.7 Discussion

The NAAQS for vehicle-related pollutants have been exceeded by significant amounts in six locations in the Southeast Desert Intrastate AQCR. Five of these locations -- Banning, Lancaster, Victorville, Palm Springs, and Indio -- are in close proximity to the Los Angeles - San Bernardino - Riverside area. Air quality data for 1971 are available in some detail for these last five cities; the Barstow data are not complete. Urban transportation data are available for Barstow and Lancaster, but not the other four cities.

Due to the proximity of the five cities mentioned to the South Coast Air Basin, it seems likely that many of the air pollution problems in these five cities are related to similar problems in the South Coast. It is likely that a correlation can be made relating the air pollution levels of the South Coast region to those of the Southeast Desert. On the other hand, Barstow is likely to be an independent problem because of the distance and topography separating it from the other hot spots of the Southeast Desert and the South Coast. A sufficient air quality data base does not exist for a thorough transportation control implementation study of Barstow as in independent problem.

3.4.8 Recommendations

It is recommended that the Southeast Desert Intrastate AQCR be given a relatively low priority compared to the other air basins being considered

for transportation control implementation plan studies because of the lack of comprehensive air quality and transportation data. At most, it is recommended that a pollutant transport analysis be made to relate air pollution problems in several of the Southeast Desert cities cited to the air pollution problems and sources in the South Coast Intrastate AQCR. This study would most likely take the form of a statistical analysis of the existing air quality data and possible meteorological data, where available.

3.5 San Diego Intrastate AQCR

The San Diego Intrastate AQCR, also known as the San Diego Air Basin, is located in the southwest corner of the State and consists of the western two-thirds of San Diego County. It is bounded on the east by the summit of the peninsular range, on the north by Orange County, on the south and west by Mexico and the Pacific Ocean, respectively. The airshed has a land area of approximately 3040 square miles, and, as of 1970, a population of some 1.24 million people and 790,000 motor vehicles. The population is concentrated primarily in the city of San Diego and the incorporated areas along the coast. Figure 9 illustrates the location and area covered by the air basin.

Air pollution control in the region is the responsibility of the San Diego County APCD. Since the airshed is contained within one county, no additional regional coordinating council is required for stationary source controls.

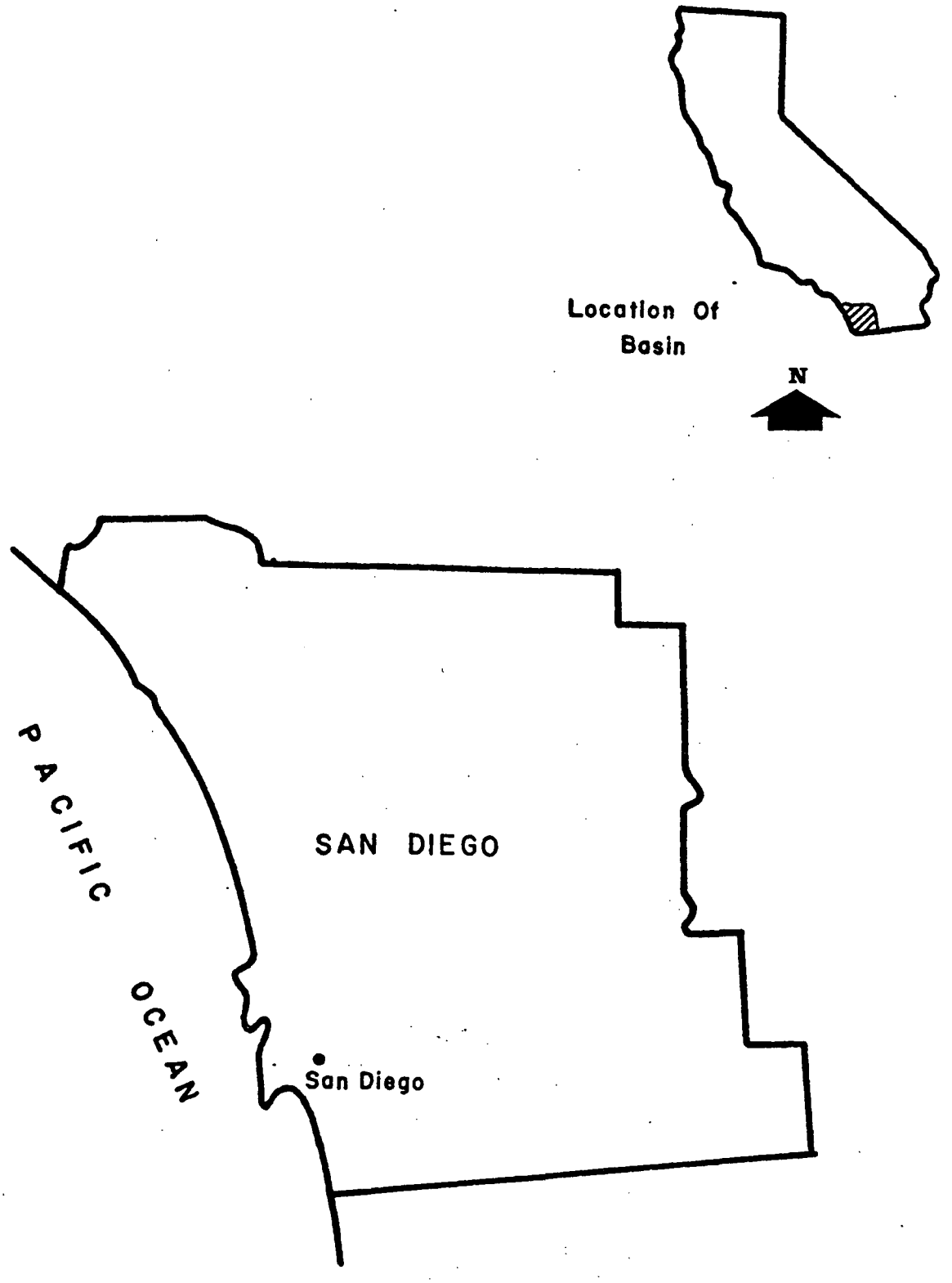
3.5.1 Air Quality Data

As in many areas of California, the predominant air pollution problem has been photochemical oxidants. A review of air quality data for 1970 - 1972 shows both oxidant and carbon monoxide standards frequently exceeded (Table 13). Both the frequency of violations and the maximum levels of oxidant experienced indicate the need for extensive mobile and stationary source controls if the NAAQS are to be achieved. The limiting constraint for the attainment of these standards is clearly the oxidant problem.

3.5.2 Air Quality Monitoring

The San Diego County APCD monitors air quality at seven locations within the region. However, only one of these stations is complete with the remaining sites measuring only selected pollutants (Table 14).

FIGURE 9
San Diego Intrastate AQCR



Source: California Air Resources Board

TABLE 13

San Diego County APCD Monitoring Network

Location	Oxidant	CO	NO	NO_2	NO_x	HC	Particulate
San Diego	X	X	X	X	X	X	X
Chollas Heights	X						
El Cajon	X		X	X	X		X
Mission Valley	X	X	X	X			
Oceanside	X						
Chula Vista	X						
Escondido	X						

Source: California Air Resources Board

The monitoring network appears very appropriate for the nature of the problem. A review of the air quality data affirms the regional extent and severity of the photochemical oxidants. The development of any transportation control strategies for this airshed will be most effective if they are applied regionally, rather than in specific areas.

3.5.3 Emission Inventory

The emission inventory for San Diego County is currently undergoing revision to update the emission estimates prepared by the CARB for 1970. The CARB, as noted previously, is currently revising all motor vehicle estimates within the State, including those for San Diego County. Also, as part of the Integrated Regional Environmental Management Project (IREM Project)[1], RAND Corporation has been engaged in a study to evaluate alternative air pollution control strategies for the region. The RAND

[1] The IREM Project is a comprehensive, two-year study aimed at providing planning agencies in San Diego with comprehensive, accurate environmental information for use in their decision-making activities. It is jointly sponsored by the Ford Foundation and the Office of Research and Monitoring-EPA. Along with its other programs is the IREM Clean Air Project.

TABLE 14

Summary of Air Quality Violations in the San Diego Air Basin (1970-1972)

Month / Year	Carbon Monoxide		Oxidant	
	Violations[1]	Maximum Level[2]	Violations[1]	Maximum Level[3]
Jan., 1970	--	--	6	.13
Feb., 1970	--	--	9	.25
March, 1970	--	--	14	.30
April, 1970	--	--	17	.22
May, 1970	--	--	21	.40
June, 1970	--	--	15	.20
July, 1970	--	--	16	.18
Aug., 1970	--	--	13	.25
Sept., 1970	1	10	7	.15
Oct., 1970	--	--	2	.13
Nov., 1970	2	10	3	.14
Dec., 1970	3	10	1	.14
	6	10	104	.40
Jan., 1971	7	11	10	.27
Feb., 1971	--	--	15	.22
March, 1971	--	--	28	.18
April, 1971	1	9	23	.18
May, 1971	--	--	18	.14
June, 1971	--	--	18	.15
July, 1971	--	--	25	.27
Aug., 1971	--	--	27	.24
Sept., 1971	2	15	18	.22
Oct., 1971	11	12	23	.24
Nov., 1971	10	9	21	.14
Dec., 1971	4	4	4	.09
	35	15	230	.27
Jan., 1972	12	18	5	.10
Feb., 1972	8	11	16	.24
March, 1972	3	11	25	.15
April, 1972	1	10	20	.15
May, 1972	--	--	16	.25
June, 1972	--	--	12	.16
July, 1972	--	--	19	.24
Aug., 1972	--	--	15	.29
Sept., 1972	--	--	17	.32
	24	18	145	.32

[1] Number of days per month the specified standard was exceeded in the air basin

[2] Based on exceeding a 12-hour average of 10 ppm or an 8-hour average of 9 ppm; data compiled using both standards

[3] Based on exceeding a 1-hour average of 0.08 ppm or 0.10 ppm; data compiled using both standards

Source: California Air Resources Board

study is due for completion approximately May, 1973; included in their study will be a revision of pollutant emissions for the San Diego area, both stationary and mobile sources.

3.5.4 Agency and Personnel Contacts

Integrated Regional Environmental Management Project
1600 Pacific Highway
San Diego, California
(714) 236-2011

L. Edwin Coate, Director, IREM Project

Larry Taylor, Manager IREM Clean Air Project and Pollution Management Group

San Diego County Air Pollution Control District
1600 Pacific Highway
San Diego, California
(714) 236-2237

Norman Schell, Acting Chief, Air Pollution Control Services

3.5.5 Discussion

The current IREM Project is extensive in its scope, and is attempting to provide answers which will allow for comprehensive, regional environmental management. Controlling air pollution is only one phase of the Project, but one to which a considerable effort is being devoted. Completion of the RAND study should provide an ample data base on the costs and effectiveness of alternative stationary and mobile source control strategies.

3.5.6 Recommendations

The RAND study should provide all the information necessary for a transportation control plan in the San Diego region. In fact, its intent is to provide for an "optimal" solution to the air pollution control alternatives.

Other than to insure that a consistent set of assumptions are used for many of the emission, reactivity, deterioration factors, etc., it does not appear any additional studies in the area are warranted at this time. Given

the guidelines used by the EPA for estimating vehicular emissions are appropriate, any transportation control plan developed in the RAND effort will be consistent and compatible with the development of transportation controls in the other critical California AQCR's.

BIBLIOGRAPHY

State of California, The Resources Agency, Air Resources Board, The State of California Implementation Plan for Achieving and Maintaining the National Ambient Air Quality Standards, January 30, 1972.

_____, California Emission Inventory, 1970, July, 1972.

_____, California Air Quality Data, Volumes II-IV, 1970-1972.

Bay Area Air Pollution Control District, Air Pollution and the San Francisco Bay Area, Seventh Edition, September, 1972.

APPENDIX: Air Quality Standards

TABLE A

NATIONAL AMBIENT AIR QUALITY STANDARDS

(Primary-protective of public health)

POLLUTANT	LEVEL NOT TO BE EXCEEDED[1]
Sulfur Dioxide (SO_2)	80 $\mu g/m^3$ (0.03 ppm)[2]
	365 $\mu g/m^3$ (0.14 ppm)[3]
Particulate Matter	75 $\mu g/m^3$[4]
	260 $\mu g/m^3$[3]
Carbon Monoxide (CO)	10 mg/m^3 (9 ppm)[5]
	40 mg/m^3 (35 ppm)[6]
Photochemical Oxidants	160 $\mu g/m^3$ (0.08 ppm)[6]
Hydrocarbons	160 $\mu g/m^3$ (0.24 ppm)[7]
Nitrogen Oxides	100 $\mu g/m^3$ (0.05 ppm)[2]

[1] $\mu g/m^3$ (micrograms per cubic meter of air, $10^{-6} g/m^3$); ppm (parts per million of air); mg/m^3 (milligrams per cubic meter of air, $10^{-3} g/m^3$)

[2] Annual arithmetic mean.

[3] Maximum 24-hour concentration not to be exceeded more than once a year.

[4] Annual geometric mean.

[5] Maximum 8 -hour concentration not to be exceeded more than once a year.

[6] Maximum one-hour concentration not to be exceeded more than once a year.

[7] Maximum 3-hour concentration (6-9 a.m.) not to be exceeded more than once a year.

TABLE B

CALIFORNIA AMBIENT AIR QUALITY STANDARDS

POLLUTANT	CONCENTRATION	DURATION OF AVERAGING PERIOD
Oxidant, including ozone (O_3)	0.10 ppm	1 hour
Carbon Monoxide (CO)	10 ppm	12 hours
	40 ppm	1 hour
Sulfur Dioxide (SO_2)	0.5 ppm	1 hour
	0.04 ppm	24 hours
Visibility-Reducing Particulates	Insufficient amount to reduce the prevailing visibility to 10 miles when relative humidity is less than 70%*	1 observation
Suspended Particulate Matter	60 $\mu g/m^3$	24-hour sample, annual geometric mean
	100 $\mu g/m^3$	24-hour sample
Lead (particulate)	1.5 $\mu g/m^3$	30-day average
Hydrogen Sulfide (H_2S)	0.03 ppm	1 hour
Nitrogen Dioxide (NO_2)	0.25 ppm	1 hour

*Prevailing visibility is defined as the greatest visibility which is attained or surpassed around at least half of the horizon circle, but not necessarily in continuous sectors.