1981

AIR QUALITY CONTROL FOR ARIZONA

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A I R Q U A L I T Y C O N T R O L

F O R A R I Z O N A

Annual Report

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HONORABLE BRUCE BABBITT
Governor
State of Arizona

ARIZONA DEPARTMENT OF HEALTH SERVICES
James E. Sarn, M.D., M.P.H., Director

Prepared by The Division of Environmental Health Services,
Bureau of Air Quality Control

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I. Introduction

Introduction

The State Bureau of Air Quality Control, within the Division of Environmental Health Services of the Department of Health Services has primary responsibility for the control of air pollution associated with the original State jurisdiction sources and in counties where jurisdiction has been asserted. Original jurisdiction sources include:

1. Major sources, which are defined as those capable individually of generating more than 75 tons of air contaminants per day, or that are involved in copper smelting or the refining of crude oil.

2. Mobile sources, which are those capable of being operated in more than one county.

3. Activities of agencies of the State and its political subdivisions.

The State has asserted jurisdiction for all air pollution control matters in Apache, Cochise, Navajo, Santa Cruz, Yavapai, and Mohave Counties.

The purpose of the Bureau of Air Quality Control is to carry out the Legislature's intent "to exercise the police power of this state in a coordinated statewide program to control present and future sources of emission of air contaminants to the end that air polluting activities of every type shall be regulated in a manner that insures the health, safety, and general welfare of all of the citizens of the state; protects property values; and, protects plant and animal life." The Rules and Regulations for Air Pollution control provide for the attainment and maintenance of ambient air quality standards in accordance with the mandate of the Clean Air Act. To accomplish its purpose and fulfill United States Environmental Protection Agency program objectives for the State of Arizona, the Bureau of Air Quality Control is divided into sections with the responsibilities indicated below.

1. Planning and Special Projects

One of the primary responsibilities of this Section is the development and management of the State Implementation Plan (SIP), the plan which the State follows to attain and maintain National Ambient Air Quality Standards (NAAQS). The SIP which is required by federal

law is composed of State and County rules and regulations for air pollution control, plus certain plans and strategies.

A major portion of the State planning activity is directed towards nonattainment areas, areas in which violations of NAAQS occur. In Arizona, where there are eleven nonattainment areas, a Nonattainment Plan (NAP) must be developed for each area. The State devises each NAP in coordination with counties, councils of government, local officials, and the U. S. Environmental Protection Agency (EPA).

In order to check the effectiveness of each NAP, the Section reviews air pollution data in each nonattainment area for trends. The results of each review are summarized in an annual report, referred to as a reasonable further progress (RFP) report, and submitted to EPA.

The Section also coordinates the preparation, review, and recording of rules and regulations. This activity involves holding public hearings to review regulations. Subsequently, the hearing panel formulates recommendations and the regulations are certified by the Attorney General and filed with the Secretary of State.

Administration and management of the federal grant is an important task of this Section. Closely associated with this activity is the administration of fiscal matters such as budgets, contracts, and purchasing.

The Planning and Special Projects Section develops and maintains a statewide emissions inventory of all criteria pollutants; that is, pollutants for which there is an ambient air quality standard.

2. Engineering Services

Operation and administration of the State permit system is a vital function of Engineering Services. This includes the review of applications for installation permits for new or modifed sources and operating permits for existing sources. In the case of installation permits, technical data submitted with the application must be evaluated to assure that the planned facility is capable of meeting all regulations. In regards to operating permits, Engineering reviews emission tests and inspection reports to determine if the source is in compliance with rules and regulations.

Pursuant to the permitting activity, Engineering Services maintains the master file for all sources under State permit. Also, the Section keeps abreast of the state of the art in air pollution control equipment by inspection of newly constructed facilities and by survey of literature.

Tax relief certification is another responsibility which involves certification of equipment as air pollution control devices for the purpose of special amortization.

Environmental impact statements for federally funded construction projects such as sewage treatment plants, airports, and highways are reviewed to assure that applicable regulations will be met.

3. Compliance

Determining the capability of sources to comply with rules and regulations is a major responsibility of the Compliance Section. This is done by conducting or evaluating mass emissions tests or observing visible emissions for each source. Compliance with applicable regulations must be demonstrated in these tests before a source can obtain an operating permit. Conditions deemed necessary to assure continuing compliance may be included in the operating permit.

In addition to checking emissions, the Compliance Section must evaluate each source's impact on air quality to verify compliance. This entails the review of air quality data obtained by State and industrial monitoring stations. Also, the Section must perform quality assurance checks on the monitors to validate the data.

If a source is found to be violating regulations, the Complaince Section initiates enforcement action by the issuance of a notice of violation (NOV) to the source operator. An effort is made to obtain voluntary action by the operator to correct the non-complying conditions.

Beyond this a number of forms of enforcement action appropriate to the case may be taken such as:

1. Referral of the NOV to the responsible officer of the source with a written request for corrective action and response.

2. Administrative conferences designed to obtain voluntary corrective action commitments from the source.

3. Permit Denial.

4. Modification of Permit conditions to require additional pollution controls or improved work practices.

5. Orders of Abatement imposing conditions designed to resolve or mitigate the non-compliance condition(s). These orders are subject to appeal to the Air Pollution Control Hearing Board which may dismiss, uphold or modify the terms of the order.

6. Injunctive relief from the Superior Court of the county concerned may be sought against any source in violation of the terms of an Order of Abatement.

Misdemeanor criminal charges may be filed against a non-complying source which would subject the sources to fines of up to $1,000 per day for each day that violation(s) are proven.

The investigation of citizen complaints in those areas where the State has jurisdiction is another function of compliance. These investigations sometimes require development and operation of special monitoring techniques.

The Compliance Section trains and certifies visible emissions observers from control agencies and industry in accordance with the approved method for determining the opacity of industrial plumes.

4. Technical Services

The operation of the State air quality monitoring network is the basic task of the Technical Services Section. Included in this task are the procurement, installation, calibration and servicing of monitoring instruments, plus auxiliary equipment and housing. The monitoring instruments include anemometers, wind vanes, continuous gas analyzers, gas bubbler samplers, high volume particulate samplers, and data recording devices.

The training of private citizens to operate the high volume samplers in order to collect particulate samples is another task handled by the Section. It is very cost effective for the Bureau to utilize local citizens such as school teachers, firemen, county health department personnel, and park rangers for this activity.

In support of field calibration activities, Technical Services maintains a laboratory which provides standards for flow, temperature, mass, pressure, voltage, and pollutant concentrations. These standards are also utilized by various counties and private industries.

Technical Services is also responsible for the support engineering associated with the Bureau's automated data acquisition systems, including systems design, equipment procurement, and programming.

5. Monitoring

The validation, processing, and reporting of ambient air quality data from the State monitoring network is the chief function of the Monitoring Section. Referring to the data reports, the Bureau determines the compliance status of each source with respect to state and federal air quality standards, and develops and evaluates strategies.

The Monitoring Section also computes and reports quality assurance data indicating the accuracy and precision of the monitoring data.

Particulate samples are received from the field operators, checked for validity, and forwarded to the State Health Laboratory for analysis. Subsequently, laboratory analysis data are utilized to compute particulate concentrations.

The Monitoring Section conducts mathematical modeling studies of air pollutant dispersion, from both point and area sources. This activity is a vital part of the review of permit applications submitted by proposed industrial plants. If modeled projections indicate that the source will not meet applicable standards, the plant design or operating procedures must be modified to demonstrate compliance.

Another function of modeling is the assessment and projection of vehicular-related air quality trends in urban areas to evaluate the effectiveness of current and proposed control strategies. Modeling is also performed to delineate the spatial variation in pollutant concentrations in point and urban source areas to determine monitoring site locations and assess population exposure.

The Monitoring Section keeps abreast of research activities and the latest findings concerning the effects of air pollution on public health, property, and visibility. This is necessary to ensure that State regulations and Bureau enforcement actions are adequate for protection of public health and welfare. In performing this task an air pollution effects information file, which includes correspondence, technical literature, and regulations is maintained.

The management and coordination of emergency episode prevention activities is the responsibility of this section. This entails close observation of meteorological and air quality conditions, forecasting air quality, issuing air pollution alerts, and determining appropriate curtailment actions.

In addition to the above sections, the Bureau has technical staff members permanently assigned to the Northern and Southern Regional Offices located in Flagstaff and Tucson, respectively, to aid in enforcement and more adequately provide Bureau services on a statewide basis. Also, funding is provided by the Bureau for Legal Services and Laboratory personnel.

6. Bureau of Vehicular Emissions Inspection

The Bureau of Vehicular Emissions Inspection conducts an annual comprehensive emissions inspection program in the nonattainment areas of Pima and Maricopa Counties. This program identifies those vehicles, both old and new, which are emitting carbon monoxide and hydrocarbons well above the design levels. Repairs are then required that will return emission levels back to or close to design values for those vehicles so identified.

II. Summary of 1981 Activities

Summary of 1981 Activities

Several public hearings on rules and regulation development were held in 1981. Major regulatory revisions involved implementation of New Source Review/Prevention of Significant Deterioration (NSR/PSD) regulations evolving from the protracted "Alabama Power" case which culminated in the EPA promulgation published in the Federal Register of August 7, 1980. Proposed regulations were filed with the Secretary of State for a January, 1982, hearing regarding revisions to particulate and sulfur dioxide (multi-point-rollback) emission limits applicable to copper smelters. By the Federal Register dated November 30, 1981, EPA tentatively approved Arizona's implementation of EPA's earlier promulgated NSR/PSD rules.

Regulation of industrial facilities under State jurisdiction in 1981 resulted in the following activities:

Installation Permits issued	23
Operating Permits issued	124
Source Inspections	546
Visible Emissions Observations	284
Mass Emissions Tests	105
Monitoring Performance Demonstrations	12
Source Ambient Monitor Audits	5
Complaint Investigations	118
Notices of Violation served	17

The State air quality monitoring network consisted of the following numbers of monitoring sites:

	Number of Sites
Carbon Monoxide	4
Lead	33
Nitrogen dioxide	2

	Number of Sites
Ozone	4
Particulates	34
Sulfur dioxide	13

Data summaries for these sites plus all county and industrial sites operated in 1981 are included in Appendix A. Trends in air quality data for 1977 through 1981 are also discussed in Appendix A.

In conjunction with the Bureau's quality assurance program, the capability to perform field audits on monitoring instruments was developed. In order to accomplish this, it was necessary to modify a van to carry the necessary gas cylinders and equipment to perform field audits and calibrations. Also, two technicians visited Rockwell International's Audit Verification Center in Newberry Park, California to demonstrate their proficiency in conducting field audits.

The Arizona Department of Health Services declared an air pollution alert for Phoenix on November 20 due to excessive levels of carbon monoxide resulting from atmospheric stagnation conditions. It was requested that the general public restrict motor vehicle usage as much as possible, particularly during evening hours. Persons sensitive to air pollution were advised to remain indoors and avoid strenuous activity. In order to further alleviate conditions, all scheduled forestry burns affecting the area were suspended. On November 25, 1981 the alert was terminated due to improved atmospheric dispersion associated with the passage of a cold front.

In December two more carbon monoxide episodes occurred in Phoenix, but they did not reach the alert stage. Accordingly, the Maricopa County Health Department issued air quality advisories for December 3-10 and 17-21, cautioning sensitive persons to refrain from exercise.

The following special air quality study reports were prepared in 1981:

"Ambient Visibility and Particulates in Arizona During the 1980 Copper Smelter Strike," Gary R. Neuroth.

"Emissions and Air Quality Analysis of Carbon Monoxide Concentrations in the Phoenix Area," Gary R. Neuroth and Glenn J. Rigdon.

The Bureau of Vehicular Emissions Inspection determined that, of the 1.3 million vehicles tested in 1981, approximately 20 percent were identified as gross polluters. Repairs to these vehicles improved the idle vehicle emissions of vehicles tested by 29 percent in carbon monoxide and 34 percent in hydrocarbons.

APPENDICES

APPENDIX A. Air Quality Data

Air Quality Data

Table 1 lists the counties and towns monitored in the state, including the pollutants monitored and the monitoring network operator. For references purposes a map of Arizona is shown in Figure 1.

1981 data summaries which are tabulated in Tables 2 through 11 consist of annual mean and maximum and second highest short-term average concentrations, numbers of exceedances of short-term air quality standards, and numbers of samples collected or hours monitored. The following abbreviations and footnotes were used in these data summaries:

GENERAL

NA	Not Applicable
NR	Not Reported

OPERATORS

AEPCO	Arizona Electric Power Cooperative, Incorporated
APS	Arizona Public Service Company
ICCC	Inspiration Consolidated Copper Company
JCC	Joint Control Center - a jointly owned system operated by ASARCO Incorporated and Kennecott Minerals Company
Magma	Magma Copper Company
Maricopa	Maricopa County Department of Health Services, Bureau of Air Pollution Control
Noranda	Noranda Lakeshore Mines, Incorporated
PD	Phelps Dodge Corporation
Pima	Pima County Health Department, Air Quality Control District
P-G	Pinal-Gila Counties Air Quality Control District
SRP	Salt River Project
SCE	Southern California Edison Company
State	Arizona Department of Health Services, Bureau of Air Quality Control
TEP	Tucson Electric Power Company

EQUIPMENT

Carbon Monoxide

NDIR	Non-dispersive infrared
GC	Gas chromatograph

EQUIPMENT (Cont'd)

Hydrocarbons	
GC	Gas chromatograph
Nitrogen Dioxide	
Color	Colorimetric
Chem	Chemiluminescent
Bubbler	Bubbler sampler, 24-hour
Ozone	
Coul	Coulometric
Chem	Chemiluminescent
UV	Ultraviolet absorption
Particulates	
Hi-Vol	High volume air sampler, 24-hour
Sulfur Dioxide	
Coul	Coulometric
Flame	Flame photometric
Bubbler	Bubbler sampler, 24-hour
Fluor	Fluorescent

Footnotes:

a. All monitoring sites conform with federal monitoring criteria.

b. New site.

c. Site terminated.

d. Annual mean based on a limited number of samples.

e. Site operated on a seasonal schedule.

f. Phelps Dodge used cyclohexane rather than benzene to extract organics from monthly composite samples.

An examination of trends follows the 1981 data summaries, presenting monitoring data for the last five years, 1977 through 1981.

Table 1

Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	HYDROCARBONS (NON-METHANE)	LEAD	NITROGEN DIOXIDE	OZONE	PARTICULATES	SULFUR DIOXIDE
APACHE:							
Eagar			State			State	
Petrified Forest (N.P.)				APS		APS	
St. Johns				SRP	SRP	SRP	SRP
Springerville				TEP		TEP	TEP
COCHISE:							
Bisbee			State			State	
Douglas			PD			PD	PD
Douglas			State			State	State
Dragoon				AEPCO		AEPCO	AEPCO
Hereford			PD			PD	PD
Kansas Settlement						AEPCO	AEPCO
Paul Spur			State			State	
St. David				State			
Sierra Vista	State		State		State	State	
COCONINO:							
Flagstaff	State		State		State	State	
Grand Canyon			State	State		State	State
Lechee						SRP	
Lees Ferry				SRP	SRP	SRP	SRP
Page				SRP	SRP	SRP	SRP
Page			State			State	

Table 1 (Cont'd)

Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	HYDROCARBONS (NON-METHANE)	LEAD	NITROGEN DIOXIDE	OZONE	PARTICULATES	SULFUR DIOXIDE
GILA:							
Hayden			State			State	State
Hayden							JCC
Meadows							JCC
Miami			State			State	State
Montgomery Ranch							JCC
Payson						P-G	
Roosevelt						P-G	
Winkelman							JCC
GRAHAM:							
Safford			State			State	
GREENLEE:							
Morenci			PD			PD	PD
Morenci			State			State	State
MARICOPA:							
Boys Ranch			PD			PD	PD
Buckeye			PD			PD	PD
Glendale	Maricopa		Maricopa		Maricopa	Maricopa	
Mesa	Maricopa		Maricopa		Maricopa	Maricopa	
Phoenix	Maricopa		Maricopa	Maricopa	Maricopa	Maricopa	Maricopa
Phoenix	PD	PD	PD	PD	PD	PD	PD
Scottsdale	Maricopa		Maricopa	Maricopa	Maricopa	Maricopa	
MOHAVE:							
Bullhead City				SCE		SCE	SCE
Davis Dam				SCE	SCE	SCE	SCE
Kingman			State			State	

Table 1 (Cont'd)

Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	HYDROCARBONS (NON METHANE)	LEAD	NITROGEN DIOXIDE	OZONE	PARTICULATES	SULFUR DIOXIDE
MOHAVE: (Cont'd)							
Lake Havasu City			State			State	
Riviera				SCE	SCE	SCE	SCE
NAVAJO:							
Joseph City				APS		APS	APS
Joseph City			State			State	
Show Low			State			State	
PIMA:							
Ajo			PD			PD	PD
Ajo			State			State	State
Corona de Tucson						Pima	
Green Valley			PD			PD	PD
Green Valley						Pima	
Mescal						PD	
Organ Pipe (N.M.)			State			State	
Redington							Magma
Rillito			State			State	
Tucson			PD	PD	PD	PD	PD
Tucson	Pima	Pima	Pima	Pima	Pima	Pima	Pima
Vail			PD			PD	PD
PINAL:							
Apache Junction						P-G	
Casa Grande			State			State	
Casa Grande						Noranda	
Coolidge			PD	PD		PD	PD
Florence			State			State	

Table 1 (Cont'd)

Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	HYDROCARBONS (NON-METHANE)	LEAD	NITROGEN DIOXIDE	OZONE	PARTICULATES	SULFUR DIOXIDE
PINAL: (Cont'd)							
Mammoth							Magma
Mammoth						P-G	
Marana						P-G	
Maricopa	PD	PD	PD	PD		PD	PD
Oracle							Magma
Oracle Junction			PD			PD	PD
San Manuel						Magma	Magma
San Manuel			State			State	State
Stanfield						P-G	
Superior			State			State	
SANTA CRUZ:							
Nogales			State			State	
YAVAPAI:							
Clarkdale			State			State	
Montezuma Castle (N.M.)			State			State	
Nelson			State			State	
Prescott	State		State			State	
YUMA:							
Parker			State			State	
Yuma	State		State		State	State	

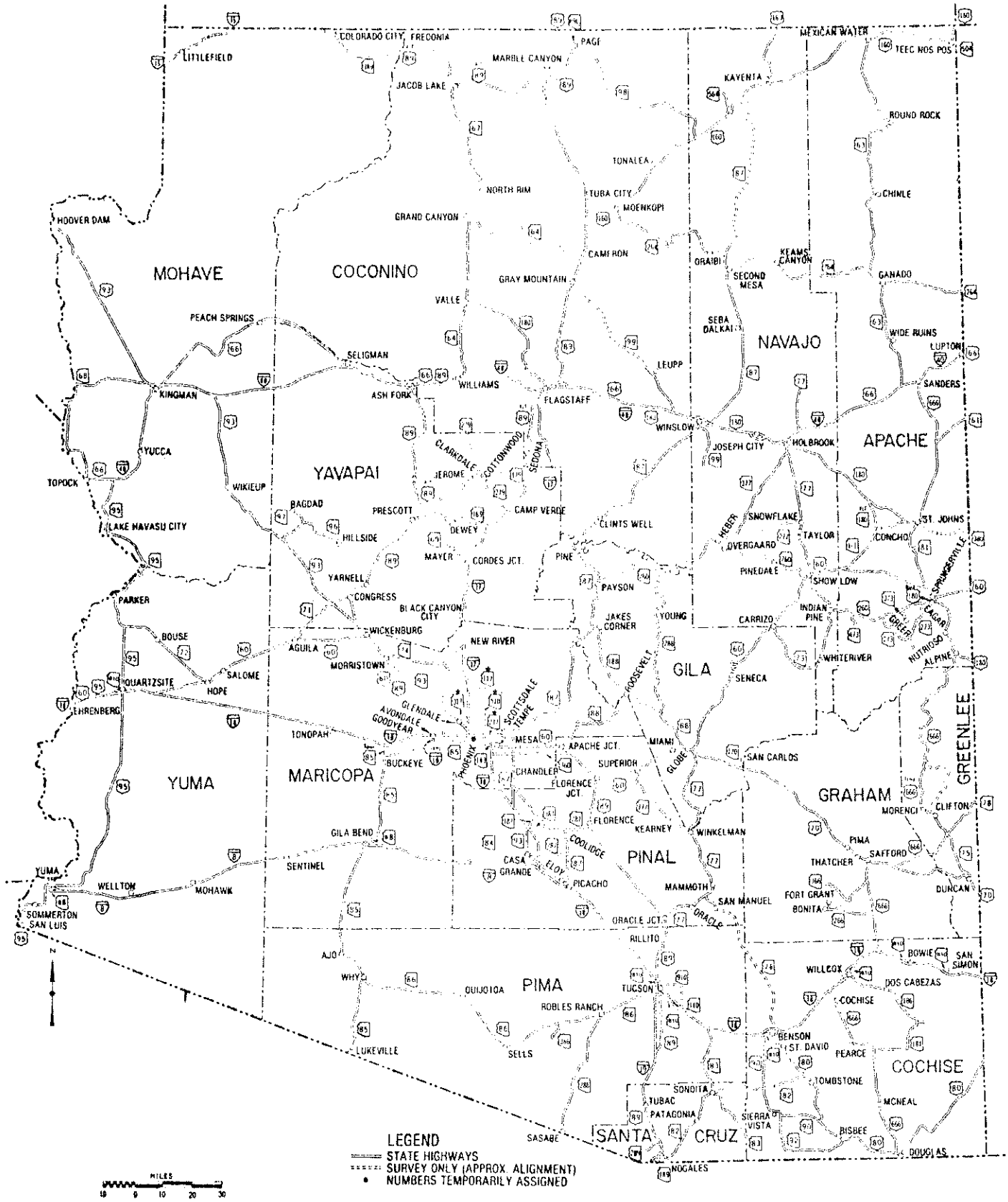

Figure 1 1980 State Highway System of Arizona prepared by Arizona Department of Transporation, Transportation Planning Division, January 1, 1981.

Table 2

1981 Carbon Monoxide Data Summary[a] (in mg/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HR. AVERAGE MAX.	1-HR. AVERAGE 2ND HIGH	8-HR. AVERAGE MAX	8-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 8-HR. STANDARD DAYS	NO. OF EXCEEDANCES OF 8-HR. STANDARD TIMES	NO. OF SAMPLES
APACHE:										
None										
COCHISE:										
Sierra Vista[e]	Fry Blvd.	State	NDIR	22	21	6	6	0	0	3587
COCONINO:										
Flagstaff[e]	2501 N. 4th St.	State	NDIR	19	18	10	9	0	0	4095
GILA:										
None										
GRAHAM:										
None										
GREENLEE:										
None										
MARICOPA:										
Glendale	6000 W. Olive	Maricopa	NDIR	16	15	9	8	0	0	7821
Mesa	Broadway & Brooks	Maricopa	NDIR	19	18	10	9	0	0	7758
Phoenix[c]	3300 W. Camelback	Maricopa	NDIR	21	18	14	13	4	4	3562

Table 2 (Cont'd)

1981 Carbon Monoxide Data Summary[a] (in mg/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HR. AVERAGE MAX.	1-HR. AVERAGE 2ND HIGH	8-HR. AVERAGE MAX.	8-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 8-HR. STANDARD DAYS	NO. OF EXCEEDANCES OF 8-HR. STANDARD TIMES	NO. OF SAMPLES
MARICOPA: (Cont'd)										
Phoenix	4732 S. Central	Maricopa	NDIR	17	15	10	9	0	0	7870
Phoenix	8531 N. 6th St.	Maricopa	NDIR	23	23	11	10	1	1	7601
Phoenix	1845 E. Roosevelt	Maricopa	NDIR	24	24	20	18	37	46	8460
Phoenix	15 E. Monroe	PD	GC	38	33	20	20	30	31	7336
Phoenix[b]	3315 W. Ind. Sch.	Maricopa	NDIR	32	30	23	22	69	89	8104
Scottsdale	2857 N. Miller	Maricopa	NDIR	22	18	14	14	5	5	8307
Scottsdale	13665 N. Sctsdl.	Maricopa	NDIR	9	9	5	4	0	0	7809
MOHAVE:										
None										
NAVAJO:										
None										
PIMA:										
Tucson	151 W. Congress St.	Pima	NDIR	20	20	11	11	2	2	8234
Tucson	22nd & Craycroft	Pima	NDIR	13	12	7	5	0	0	7709
Tucson	22nd & Alvernon	Pima	NDIR	24	22	14	12	4	4	8497

Table 2 (Cont'd)

1981 Carbon Monoxide Data Summary[a] (in mg/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HR. AVERAGE MAX.	1-HR. AVERAGE 2ND HIGH	8-HR. AVERAGE MAX.	8-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 8-HR. STANDARD DAYS	NO. OF EXCEEDANCES OF 8-HR. STANDARD TIMES	NO. OF SAMPLES
PINAL:										
Maricopa	6.5 mi NW of Town	PD	GC	3	3	1	1	0	0	6962
SANTA CRUZ:										
None										
YAVAPAI:										
Prescott[e]	Co. Maint. Yard	State	NDIR	16	15	9	8	0	0	3594
YUMA:										
Yuma[e]	1485 Second Ave.	State	NDIR	18	13	7	6	0	0	4103

STATE AND FEDERAL STANDARD (mg/m^3): (Primary and Secondary)	1-Hour Average	8-Hour Average
	40	10

Table 3

1981 Hydrocarbons (Non-Methane) Data Summary[a] (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	3-HR. AVERAGE (6-9 A.M.) MAX.	3-HR. AVERAGE (6-9 A.M.) 2ND HIGH	NO. OF EXCEEDANCES OF 3-HR. STANDARD	NO. OF 3-HR. (6-9 A.M.) SAMPLES
APACHE:							
None							
COCHISE:							
None							
COCONINO:							
None							
GILA:							
None							
GRAHAM:							
None							
GREENLEE:							
None							
MARICOPA							
Phoenix	15 E. Monroe	PD	GC	5509	2979	236	286
MOHAVE:							
None							
NAVAJO:							
None							

Table 3 (Cont'd)

1981 Hydrocarbons (Non-Methane) Data Summary[a] (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	3-HR. AVERAGE (6-9 A.M.) MAX.	3-HR. AVERAGE (6-9 A.M.) 2ND HIGH	NO. OF EXCEEDANCES OF 3-HR. STANDARD	NO. OF 3-HR. (6-9 A.M.) SAMPLES
PIMA:							
Tucson	151 W. Congress St.	Pima	GC	685	599	31	157
PINAL:							
Maricopa	6.5 mi. N.W. of Town	PD	GC	446	433	63	309
SANTA CRUZ:							
None							
YAVAPAI:							
None							
YUMA:							
None							

STATE AND FEDERAL STANDARD (ug/m^3): (Primary and Secondary) — 3-Hr. Average (6-9 a.m.): 160

Table 4

1981 Lead Data Summary
High Volume Sampler (in ug/m^3)

CITY AND COUNTY	SITE LOCATION	OPERATOR	QUARTERLY AVERAGE 1	2	3	4	NO. OF SAMPLES 1	2	3	4
APACHE:										
Eagar	Town Hall	State	.15	.11	.21	.19	6	7	1	6
COCHISE:										
Bisbee	Warren-City Hall	State	.10	.08	.49	.13	14	9	13	14
Douglas	1.2 mi. N. of Smelter	State	.13	.41	.26	.28	11	5	10	12
Douglas	0.8 mi. N. of Smelter	PD	.17	.15	.15	.26	15	12	13	15
Douglas	1012 G. Avenue	PD	.48	.53	.36	-	15	13	13	0
Douglas	Pirtleville	PD	.51	.20	.13	.29	15	11	9	14
Douglas	City Park	State	.45	.29	.31	.37	3	5	5	7
Hereford	PD Exper. Farm	PD	.08	.08	.05	.04	14	15	15	16
Paul Spur	Housing Area	State	.10	.09	.08	.07	11	8	9	16
Sierra Vista	Bartow Drive	State	.19	.13	.13	.14	14	12	13	12
COCONINO:										
Flagstaff	218 N. Leroux	State	.19	.14	.21	.18	14	11	14	12
Grand Canyon	Hopi Point	State	.01	.00	.03	.02	6	7	8	6
Grand Canyon	Visitors Center	State	-	.03	.11	.03	0	15	13	12
Page	Airport	State	.08	.04	.06	.07	15	15	15	16

Table 4 (Cont'd)

1981 Lead Data Summary
High Volume Sampler (in ug/m^3)

CITY AND COUNTY	SITE LOCATION	OPERATOR	QUARTERLY AVERAGE 1	2	3	4	NO. OF SAMPLES 1	2	3	4
GILA:										
Hayden	Jail	State	.30	.42	.23	.26	10	10	11	14
Hayden	M-R Ranch	State	.29	.28	.19	.15	10	12	14	12
Miami	Fire Station	State	.19	.20	.25	.26	14	13	12	14
Miami	Jones Ranch	State	.15	.08	.14	.21	10	10	11	13
GRAHAM:										
Safford	523 10th Avenue	State	.13	.09	.10	.16	13	12	15	13
GREENLEE:										
Morenci	Cadillac Point	PD	.07	.03	.04	.05	14	14	13	16
Morenci	Fina Station	PD	.19	.11	.05	.17	12	14	14	13
Morenci	Fairbanks	PD	.05	.04	.02	.04	15	14	14	14
Morenci	Standpipe	PD	.03	.04	.03	.03	12	14	14	16
Morenci	Stargo	PD	.08	.05	.02	.05	15	14	13	15
Morenci	Stargo	State	.04	.06	.11	.05	10	10	6	16
MARICOPA:										
Boys Ranch	GM Prov. Ground	PD	.09	.04	.02	.10	13	15	13	16
Buckeye	North 4th Street	PD	.14	.08	.06	.24	15	15	13	16

Table 4 (Cont'd)

1981 Lead Data Summary
High Volume Sampler (in ug/m^3)

CITY AND COUNTY	SITE LOCATION	OPERATOR	QUARTERLY AVERAGE 1	2	3	4	NO. OF SAMPLES 1	2	3	4
MARICOPA: (Cont'd)										
Glendale	6000 W. Olive	Maricopa	.50	.20	.20	.50	13	15	15	13
Mesa	Broadway	Maricopa	.40	.20	.20	.60	15	13	15	14
Phoenix	15 E. Monroe	PD	.62	.33	.25	1.10	15	15	14	15
Phoenix	1845 E. Roosevelt	Maricopa	1.00	.30	.30	1.40	15	15	13	16
Phoenix	201 N. Central	PD	.28	.20	.08	.26	15	14	14	15
Phoenix	8531 N. 6th Street	Maricopa	.70	.50	.30	1.00	14	14	15	16
Phoenix	4732 S. Central	Maricopa	.70	.30	.30	.90	14	15	11	15
Scottsdale	2857 N. Miller Road	Maricopa	.60	.30	.30	1.10	14	13	15	16
Scottsdale	13665 N. Scottsdale Road	Maricopa	.40	.20	.20	.50	12	14	10	16
MOHAVE:										
Kingman	305 W. Beale Street	State	.12	.05	.25	.09	9	12	12	6
Lake Havasu City	Community Hospital	State	.09	.09	.08	.11	8	14	15	11
NAVAJO:										
Joseph City	S.E. Joseph City	State	.03	.01	.05	.05	8	9	7	10
Show Low	Deuce of Clubs Avenue	State	.15	.09	.12	.18	13	13	13	15

Table 4 (Cont'd)

1981 Lead Data Summary
High Volume Sampler (in ug/m^3)

CITY AND COUNTY	SITE LOCATION	OPERATOR	QUARTERLY AVERAGE 1	2	3	4	NO. OF SAMPLES 1	2	3	4
PIMA:										
Ajo	Well Road	State	.09	.04	.07	.12	14	15	14	15
Ajo	Camelback Mountain	PD	.03	.02	.01	.02	15	15	15	16
Ajo	Oxidation Pond	PD	.08	.03	.03	.07	15	14	15	16
Ajo	South of Tailings Dam	PD	.03	.02	.02	.03	15	15	14	16
Ajo	Town Square	PD	.13	.05	.06	.16	15	15	15	16
Green Valley	2 mi. N. of Townsite	PD	.14	.13	.08	.20	15	15	10	16
Organ Pipe	Visitors Center	State	.04	.02	.02	.03	12	13	8	12
Rillito	Miller's Market	State	.24	.16	.19	.30	15	13	15	8
Tucson	East Tanque Verde Road	Pima	.18	.14	.16	.33	15	15	15	15
Tucson	32 North Stone	PD	.20	.15	.11	.17	15	14	13	16
Tucson	Pomona Road	PD	.45	.23	.16	.45	13	15	15	15
Tucson	Prince Road	Pima	.40	.25	.15	.52	14	13	14	15
Vail	El Paso Natural Gas. Co. Sta.	PD	.06	.02	.02	.06	14	15	15	14
PINAL:										
Casa Grande	401 N. Marshall Road	State	.22	.10	.11	.33	15	15	14	12
Coolidge	2 mi. North	PD	.10	.04	.05	.13	14	15	15	14

Table 4 (Cont'd)

1981 Lead Data Summary
High Volume Sampler (in ug/m^3)

CITY AND COUNTY	SITE LOCATION	OPERATOR	QUARTERLY AVERAGE 1	2	3	4	NO. OF SAMPLES 1	2	3	4
PINAL: (Cont'd)										
Florence	22nd St. & Willow	State	.17	.12	.09	.18	15	8	12	12
Maricopa	6.5 mi. N.W. of Town	PD	.06	.03	.02	.08	15	15	15	16
Oracle Junction	Highways 89 & 77	PD	.13	.11	.06	.12	15	14	15	16
San Manuel	LDS Church	State	.07	.04	.04	.07	15	15	12	10
Superior	951 Main Street	State	.11	.10	.12	.10	15	11	10	9
SANTA CRUZ:										
Nogales	U. S. Post Office	State	.73	.41	.56	.54	15	4	14	5
YAVAPAI:										
Clarkdale	Football Stadium	State	.03	.02	.06	-	8	9	5	0
Montezuma Castle	Maint. Building	State	.04	.04	.08	.05	14	12	12	11
Nelson	1 mi. N. of Lime Plant	State	.00	.02	.07	.01	13	13	11	11
Prescott[b]	Co. Maint. Yard	State	.29	.17	.25	.31	12	7	13	13
YUMA:										
Parker	914 Arizona Avenue	State	.19	.09	.09	.19	13	14	9	11
Yuma	201 S. 2nd Avenue	State	.17	.15	.14	.26	15	15	14	12

STATE AND FEDERAL STANDARD (ug/m^3): Calendar Quarter Average
(Primary and Secondary) 1.5

Table 5

1981 Nitrogen Dioxide Data Summary (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	AVERAGE	MAXIMUM 1-HOUR	MAXIMUM 24-HOUR	NO. OF SAMPLES 1-HOUR	NO. OF SAMPLES 24-HOUR
APACHE:								
Petrified Forest	Visitors Center	APS	Bubbler	12	NA	27	NA	62
St. Johns	Airport	SRP	Bubbler	6	NA	20	NA	58
St. Johns	Sewage Dump	SRP	Bubbler	6	NA	15	NA	54
St. Johns	Mesa Parada	SRP	Bubbler	5	NA	22	NA	59
Springerville	Airport	TEP	Chem.	3	21	8	8558	NA
Springerville	4 mi. Northeast	TEP	Chem.	3	24	13	8312	NA
COCHISE:								
Dragoon	N. Dragoon Mts.	AEPCO	Bubbler	NR	NA	9	NA	51
St. David	1.8 mi. S.W. Town	State	Bubbler	20	NA	122	NA	46
COCONINO:								
Grand Canyon	Hopi Point	State	Bubbler	10	NA	77	NA	49
Lees Ferry	Vermilion Cliffs	SRP	Chem.	3[d]	79	14	3892	NA
Page	Water Tower	SRP	Chem.	18[d]	124	69	5338	NA
GILA:								
None								

Table 5 (Cont'd)

1981 Nitrogen Dioxide Data Summary (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	AVERAGE	MAXIMUM 1-HOUR	MAXIMUM 24-HOUR	NO. OF SAMPLES 1-HOUR	NO. OF SAMPLES 24-HOUR
GRAHAM:								
None								
GREENLEE:								
None								
MARICOPA:								
Phoenix	1845 E. Roosevelt	Maricopa	Chem.	48[d]	263	98	5155	NA
Phoenix	15 E. Monroe	PD	Chem.	75	394	176	7921	NA
Scottsdale	2847 N. Miller Road	Maricopa	Chem.	5[d]	94	13	4492	NA
MOHAVE:								
Bullhead City	224 N. Main St.	SCE	Chem.	30	103	56	6662	NA
Davis Dam[c]	Dri. Mt. (1 mi. N.E.)	SCE	Chem.	NR	70	43	2014	NA
Davis Dam[c]	Katherine's Landing	SCE	Chem.	NR	90	34	1874	NA
NAVAJO:								
Joseph City	Environmental Lab	APS	Bubbler	40	NA	115	NA	60
Joseph City	Leroux Substation	APS	Bubbler	27	NA	65	NA	62
Joseph City	Cholla Power Plant	APS	Bubbler	13	NA	31	NA	61

Table 5 (Cont'd)

1981 Nitrogen Dioxide Data Summary (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	AVERAGE	MAXIMUM 1-HOUR	MAXIMUM 24-HOUR	NO. OF SAMPLES 1-HOUR	NO. OF SAMPLES 24-HOUR
PIMA:								
Tucson	22nd & Craycroft	Pima	Chem.	55	451	338	7183	NA
Tucson	151 W. Congress	Pima	Chem.	70	395	320	8322	NA
Tucson	32 N. Stone	PD	Chem.	54	555	105	7591	NA
PINAL:								
Coolidge	2 mi. N. of Town	PD	Chem.	13	106	40	8492	NA
Maricopa	6.5 mi. N.W. of Town	PD	Chem.	7	69	33	8315	NA
SANTA CRUZ:								
None								
YAVAPAI:								
None								
YUMA:								
None								

STATE AND FEDERAL STANDARD (ug/m^3): Annual Average
(Primary and Secondary) 100

Table 6

1981 Ozone Data Summary (in ppm)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HOUR AVERAGE MAX.	1-HOUR AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF STD.	COMPLIANCE STATUS EXCEEDANCES	NO. OF SAMPLES
APACHE:								
St. Johns	Mesa Parada	SRP	U.V.	.09	.09	0	0	5547
COCHISE:								
Sierra Vista[e]	Fry Boulevard	State	U.V.	.07	.07	0	0	3465
COCONINO:								
Flagstaff[e]	2501 N. 4th St.	State	U.V.	.07	.07	0	0	3918
Page	Water Tower	SRP	U.V.	.07	.06	0	0	6946
Lees Ferry	Vermilion Cliffs	SRP	U.V.	.06	.06	0	0	3631
GILA:								
None								
GRAHAM:								
None								
GREENLEE:								
None								

Table 6 (Cont'd)

1981 Ozone Data Summary (in ppm)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HOUR AVERAGE MAX.	1-HOUR AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF STD.	COMPLIANCE STATUS EXCEEDANCES	NO. OF SAMPLES
MARICOPA:								
Glendale	6000 W. Olive	Maricopa	U.V.	.12	.11	0	1.3	7819
Mesa	Broadway & Brooks	Maricopa	U.V.	.12	.12	0	0	6497
Phoenix	15 E. Monroe	PD	U.V.	.05	.04	0	0	8724
Phoenix	2035 N. 52nd St.	Maricopa	U.V.	.15	.14	2	4.5	6497
Phoenix[b]	3315 W. Ind. Sch.	Maricopa	U.V.	.07	.07	0	0	1696
Phoenix	1845 E. Roosevelt	Maricopa	U.V.	.18	.16	6	4.3	8148
Phoenix	8531 N. 6th St.	Maricopa	U.V.	.16	.15	4	5.0	7590
Phoenix	4732 S. Central	Maricopa	U.V.	.16	.15	1	.3	7698
Phoenix[c]	3300 W. Camelback	Maricopa	U.V.	.08	.08	0	0	2285
Scottsdale	2857 N. Miller Rd.	Maricopa	U.V.	.11	.10	0	1.3	7266
Scottsdale[b]	13665 N. Sctsdl. Rd.	Maricopa	U.V.	.13	.10	1	1.0	4752
MOHAVE:								
Davis Dam[e]	Katherine Landing	SCE	U.V.	.05	.05	0	0	721
Riviera[e]	Ft. Mohave	SCE	U.V.	.07	.07	0	0	2589
NAVAJO:								
None								

Table 6 (Cont'd)

1981 Ozone Data Summary (in ppm)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HOUR AVERAGE MAX.	1-HOUR AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF STD.	COMPLIANCE STATUS EXCEEDANCES	NO. OF SAMPLES
PIMA:								
Tucson	151 W. Congress	Pima	U.V.	.09	.09	0	0	8585
Tucson	22nd & Craycroft	Pima	U.V.	.12	.12	0	0	8147
Tucson	9101 N. Thornydale	Pima	U.V.	.10	.09	0	0	7796
Tucson	4591 N. Pomona	Pima	U.V.	.10	.10	0	0	7796
Tucson[c]	32 N. Stone	PD	U.V.	.08	.07	0	0	2959
PINAL:								
None								
SANTA CRUZ:								
None								
YAVAPAI:								
Prescott[e]	Co. Maint. Yard	State	U.V.	.08	.07	0	0	3135
YUMA:								
Yuma[e]	1485 2nd Avenue	State	U.V.	.10	.10	0	0	4355

STATE AND FEDERAL STANDARD (Primary and Secondary): The standard is .12 ppm (235 ug/m^3) for the maximum daily 1-hour concentration. Compliance status is determined by computing the average number of days that the 1-hour standard has been exceeded per year for the past three years. No more than 1.0 exceedances per year over the last three years is permitted.

Table 7

1981 Particulates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HR. AVERAGE MAX.	24-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
APACHE:								
Eagar	Town Hall	State	90[d]	188	158	0	3	20
Petrified Forest	Visitors Center	APS	15	124	73	0	0	265
St. Johns	Airport	SRP	23	62	37	0	0	57
St. Johns	Mesa Parada	SRP	15	71	36	0	0	94
St. Johns	Patterson Wellfield	SRP	15[d]	37	32	0	0	16
Springerville	#1, Airport	TEP	25	100	86	0	0	342
Springerville	4 mi. N.E.	TEP	20	100	93	0	0	332
COCHISE:								
Bisbee[b]	Warren-City Hall	State	41	69	67	0	0	50
Douglas	1.2 mi. N. of Smelter	State	65[d]	381	158	1	2	38
Douglas	0.8 m. N. of Smelter	PD	49	228	208	0	3	81
Douglas	1012 G. Avenue	PD	96	364	298	3	14	83
Douglas	Pirtleville	PD	53	259	230	0	5	73
Douglas	City Park	State	128[d]	503	242	1	15	44
Dragoon	N. Dragoon Mts.	AEPCO	35	178	176	0	2	215

Table 7 (Cont'd)

1981 Particulates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HR. AVERAGE MAX.	24-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
COCHISE: (Cont'd)								
Hereford	Phelps Dodge Exper. Farm.	PD	44	254	181	0	3	61
Kansas Settlement	W. of Cotton Gin	AEPCO	44	220	213	0	6	218
Paul Spur	Housing Area	State	352	1046	1034	32	42	45
Sierra Vista	Bartow Drive	State	53	97	96	0	0	51
COCONINO:								
Flagstaff	218 N. Leroux Street	State	81	246	181	0	5	51
Grand Canyon	Hopi Point	State	16	48	36	0	0	53
Grand Canyon	Visitors Center	State	23	48	47	0	0	53
Lechee	Coppermine Road	SRP	27	99	94	0	0	60
Lees Ferry	Vermilion Cliffs	SRP	25[d]	47	43	0	0	33
Page	Water Tower	SRP	35	173	86	0	1	63
Page	Airport	State	38	103	83	0	0	61
GILA:								
Hayden	Jail	State	287	708	568	29	40	47
Hayden	Montgomery Ranch	State	70	148	134	0	0	50

Table 7 (Cont'd)

1981 Particulates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HR. AVERAGE MAX.	24-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
GILA: (Cont'd)								
Miami	Fire Station	State	88	160	160	0	2	53
Miami	Jones Ranch	State	47[d]	153	112	0	1	44
Payson	Courthouse	P-G	110	357	313	2	15	59
Roosevelt	Ranger Station	P-G	38	115	112	0	0	59
GRAHAM:								
Safford	523 - 10th Avenue	State	107	250	216	0	12	53
GREENLEE:								
Morenci	Cadillac Point	PD	41	168	85	0	1	75
Morenci	Fina Station	PD	42	177	106	0	1	74
Morenci	Fairbanks	PD	47	284	188	1	3	73
Morenci	Stargo	PD	48	159	153	0	2	69
Morenci	Standpipe	PD	22	227	65	0	1	73
Morenci	Stargo	State	55[d]	131	115	0	0	42
MARICOPA:								
Boys Ranch	G. M. Proving Grounds	PD	73	236	216	0	3	58

Table 7 (Cont'd)

1981 Particulates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HR. AVERAGE MAX.	24-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
MARICOPA: (Cont'd)								
Buckeye	N. 4th Street	PD	127	409	343	5	21	59
Glendale	6000 W. Olive Avenue	Maricopa	100	243	183	0	6	56
Mesa	Broadway & Brooks	Maricopa	93	194	181	0	3	57
Phoenix	15 E. Monroe Street	PD	95	298	202	1	13	60
Phoenix	1845 E. Roosevelt	Maricopa	113	231	216	0	9	59
Phoenix	201 N. Central	PD	76	181	153	0	2	80
Phoenix	8531 N. 6th Street	Maricopa	108	222	218	0	11	59
Phoenix	4732 S. Central	Maricopa	176	348	313	9	41	58
Scottsdale	2857 N. Miller Road	Maricopa	97	210	197	0	7	58
Scottsdale	13665 N. Scottsdale Road	Maricopa	115	287	216	1	12	52
MOHAVE:								
Bullhead City	224 N. Main Street	SCE	87	310	250	1	5	56
Davis Dam	Dri. Mt. (1 mi. N.E.)	SCE	17[d]	66	34	0	0	17
Davis Dam	Katherine Landing	SCE	30	122	67	0	0	59
Kingman	305 W. Beale Street	State	39[d]	104	88	0	0	39
Lake Havasu City	Community Hospital	State	42	106	98	0	0	49

Table 7 (Cont'd)

1981 Particulates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HR. AVERAGE MAX.	24-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
MOHAVE: (Cont'd)								
Riviera	Camera Site	SCE	41[d]	595	118	1	1	15
Riviera	Ft. Mohave	SCE	50	277	203	1	3	60
Riviera	Hancock	SCE	46[d]	256	134	0	1	20
NAVAJO:								
Joseph City	3.25 mi. S.E. of Town	State	37[d]	95	87	0	0	35
Joseph City	Environmental Laboratory	APS	34	341	257	1	5	242
Joseph City	Leroux Substation	APS	23	240	153	0	2	249
Joseph City	Cholla Plant	APS	19	123	108	0	0	244
Show Low	Deuce of Clubs Avenue	State	66	213	175	0	2	55
PIMA:								
Ajo	Well Road	State	86	971	245	1	6	58
Ajo	Camelback Mountain	PD	31	208	111	0	1	81
Ajo	Oxidation Pond	PD	77	756	397	2	11	78
Ajo	South Tailings Dam	PD	60	348	269	2	7	80
Ajo	Town Square	PD	102	863	472	3	11	81

Table 7 (Cont'd)

1981 Particulates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HR. AVERAGE MAX.	24-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
PIMA: (Cont'd)								
Corona de Tucson	21 mi. S.E. of Tucson	Pima	35	72	68	0	0	45
Green Valley	2 mi. N. of Townsite	PD	48	159	93	0	1	61
Green Valley	245 W. Esperanza	Pima	46	84	83	0	0	56
Organ Pipe	Visitors Center	State	34	181	76	0	0	45
Rillito	Miller's Market	State	112	348	208	1	11	51
Tucson	Ft. Lowell Road	Pima	98	273	238	1	7	50
Tucson	Davis-Monthan A. F. B.	Pima	68	119	105	0	0	51
Tucson	7920 E. Tanque Verde Rd.	Pima	62	154	141	0	1	61
Tucson	Golf Links Road	Pima	67	255	199	0	2	57
Tucson	Hughes Access	Pima	54	173	126	0	1	58
Tucson	32 N. Stone	PD	44	119	109	0	0	57
Tucson	Orange Grove	Pima	108	324	251	1	10	56
Tucson	Pima College West	Pima	47	86	80	0	0	60
Tucson	Prince Road	Pima	101	247	187	0	7	57
Tucson	1810 S. 6th Avenue	Pima	112	218	218	0	10	59
Tucson	University	Pima	76	157	136	0	1	53

Table 7 (Cont'd)

1981 Particulates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HR. AVERAGE MAX.	24-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
PIMA: (Cont'd)								
Tucson	1970 W. Ajo Way	Pima	58	101	91	0	0	51
Tucson	151 W. Congress	Pima	67	167	150	0	1	148
Tucson[b]	Pomona Road	PD	96	217	205	0	9	58
Vail	El Paso Nat. Gas Co.	PD	34	77	61	0	0	58
PINAL:								
Apache Junction	County Yard	P-G	65	245	186	0	3	63
Casa Grande	401 N. Marshall Road	State	93	294	276	3	9	56
Casa Grande[b]	Indian Hwy. 6	Noranda	24[d]	167	70	0	1	38
Coolidge	2 mi. N. of Town	PD	92	253	253	0	9	59
Florence	22nd St. & Willow	State	91	241	196	0	5	47
Mammoth[b]	County Courthouse	P-G	56	146	107	0	0	55
Marana	Marana Air Park	P-G	45	147	84	0	0	61
Maricopa	6.5 mi. N.W. of Town	PD	54	155	142	0	1	61
Oracle Junction	Highways 89 & 77	PD	29	75	52	0	0	59
San Manuel	3-C Ranch WSW	Magma	24[d]	48	46	0	0	43

Table 7 (Cont'd)

1981 Particulates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HR. AVERAGE MAX.	24-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
PINAL: (Cont'd)								
San Manuel	Dormsite	Magma	36	63	57	0	0	56
San Manuel	E. Peppersauce Wash	Magma	37	91	90	0	0	54
San Manuel	Golf Course	Magma	31	71	55	0	0	55
San Manuel	LDS Church	State	49	95	74	0	0	52
San Manuel	Townsite	Magma	39	84	78	0	0	57
Stanfield	County Courthouse	P-G	103	348	309	3	16	60
Superior	951 Main Street	State	54	138	121	0	0	45
SANTA CRUZ:								
Nogales	U. S. Post Office	State	121[d]	404	322	4	14	38
YAVAPAI:								
Clarkdale	Football Stadium	State	46[d]	81	74	0	0	22
Montezuma Castle	Maint. Building	State	31	57	56	0	0	49
Nelson	1 mi. N. of Lime Plant	State	42	129	105	0	0	48
Prescott	Co. Maint. Yard	State	76	196	184	0	3	45

Table 7 (Cont'd)

1981 Particulates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HR. AVERAGE MAX.	24-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
YUMA:								
Parker	914 Arizona Avenue	State	76	176	145	0	1	47
Yuma	201 S. 2nd Avenue	State	121	301	261	2	12	56

STATE AND FEDERAL STANDARDS (ug/m^3):	Annual Geometric Mean	24-Hr. Average
Primary	75	260
Secondary	60	150

Table 8

1981 Sulfur Dioxide Data Summary (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. AVERAGE 3-HR.	MAX. AVERAGE 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	NO. OF SAMPLES 1-HR.	NO. OF SAMPLES 24-HR.
APACHE:											
Petrified Forest	Visitors Cntr.	APS	Bubbler/Flame	0	28	5	0	0	0	7470	311
St. Johns	Mesa Parada	SRP	Bubbler	1	NA	10	NA	NA	0	NA	60
St. Johns	Mesa Parada	SRP	Bubbler/Fluor.	1	16	2	0	0	0	8526	344
St. Johns	Airport	SRP	Bubbler	1	NA	12	NA	NA	0	NA	60
St. Johns	Plant Site	SRP	Bubbler	1	NA	12	NA	NA	0	NA	60
Springerville	4 mi. N.E.	TEP	Flame	0	42	8	0	0	0	8602	NA
Springerville	Airport	TEP	Flame	1	39	13	0	0	0	8639	NA
COCHISE:											
Douglas	0.8 mi. N. of Smelter	PD	Coul	59	2201	328	3	3	0	8720	NA
Douglas	Curtis	PD	Coul	37	1826	270	2	2	0	8720	NA
Douglas	Fir	PD	Coul	25	1056	170	0	0	0	8715	NA
Douglas	1012 G. Street	PD	Coul	34	1729	262	1	1	0	8722	NA
Douglas	Queen	PD	Coul	39	1284	222	0	0	0	8706	NA
Douglas[c]	Mobile III	PD	Coul	35	1467	265	1	1	0	7177	NA
Douglas[b]	Mobile IV	PD	Coul	43[d]	1467	225	1	1	0	1523	NA
Douglas	County Hospital	PD	Coul	67	2245	341	4	4	0	8705	NA

Table 8 (Cont'd)

1981 Sulfur Dioxide Data Summary (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. AVERAGE 3-HR.	MAX. AVERAGE 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	NO. OF SAMPLES 1-HR.	NO. OF SAMPLES 24-HR.
COCHISE: (cont'd)											
Douglas	Pirtleville	PD	Coul	46	1501	369	1	1	1	8700	NA
Douglas	1.2 N.of Smelter	State	Fluor.	62	1529	425	7	7	1	7716	NA
Douglas	County Hospital	State	Fluor.	44	2058	309	2	2	0	6909	NA
Dragoon	N. Dragoon Mts.	AEPCO	Bubbler	6	NA	24	NA	NA	0	NA	226
Hereford	PD Exper. Farm	PD	Coul	1	346	45	0	0	0	8680	NA
Kansas Settlement	W. of Cotton Gin	AEPCO	Bubbler	4	NA	24	NA	NA	0	NA	226
McNeal[e]	Pinedo Farm	PD	Coul	5[d]	755	126	0	0	0	5011	NA
COCONINO:											
Grand Canyon	Hopi Point	State	Bubbler	7	NA	35	NA	NA	0	NA	51
Lees Ferry	Vermilion Cliffs	SRP	Fluor.	10[d]	244	46	0	0	0	3776	NA
Page	Water Tower	SRP	Flame	7	223	93	0	0	0	6362	NA
GILA:											
Hayden	Garfield Ave.	JCC	Coul	45	1355	225	1	1	0	8615	NA
Hayden	Fire Station	JCC	Coul	83	2161	355	6	7	0	8607	NA
Hayden	Hayden Junction	JCC	Coul	40	1491	322	1	1	0	8461	NA

Table 8 (Cont'd)

1981 Sulfur Dioxide Data Summary (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. AVERAGE 3-HR.	MAX. AVERAGE 24-HR.	NO. OF STANDARDS OF STANDARDS 3-HR. DAYS	NO. OF STANDARDS OF STANDARDS 3-HR. TIMES	NO. OF STANDARDS OF STANDARDS 24-HR. TIMES	NO. OF SAMPLES 1-HR.	NO. OF SAMPLES 24-HR.
GILA:											
Hayden	Montgomery Ranch	JCC	U.V.	139	2283	498	6	7	7	8651	NA
Hayden	Montgomery Ranch	State	Fluor.	132	2403	531	4	5	9	8354	NA
Hayden	Jail	State	Fluor.	75	2334	382	5	5	2	8351	NA
Miami	Cities Serv. Bldg.	State	Fluor.	48	1400	327	1	1	0	8484	NA
Miami	Jones Ranch	State	Fluor.	76	6177	1084	7	22	9	8614	NA
Miami	Lower Miami School	State	Fluor.	25	2412	344	2	2	0	7878	NA
Miami	Landfill	State	Fluor.	28	1727	1605	2	2	0	8147	NA
Miami	Burch Pump Station	ICCC	Fluor.	18	720	170	0	0	0	NR	NA
Miami	Town Site	ICCC	Fluor.	45	1800	360	3	3	0	NR	NA
Winkelman	School	JCC	Coul	27	966	231	0	0	0	8603	NA
Winkelman	1 mi. N Jct. 77 & 177	JCC	U.V.	86	1269	302	0	0	0	8350	NA
Winkelman	1 mi. S Jct. 77 & 177	JCC	Coul	19	690	151	0	0	0	8619	NA
GRAHAM:											
None											
GREENLEE:											
Morenci	Cadillac Point	PD	Coul	83	4079	605	7	7	4	8644	NA

Table 8 (Cont'd)

1981 Sulfur Dioxide Data Summary (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. AVERAGE 3-HR.	MAX. AVERAGE 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	NO. OF SAMPLES 1-HR.	NO. OF SAMPLES 24-HR.
GREENLEE: (Cont'd)											
Morenci	Fina Station	PD	Coul	63	1381	498	1	1	4	8677	NA
Morenci[b]	Mobile-Lower Stargo	PD	Coul	75[d]	1695	362	3	3	0	5076	NA
Morenci	Metcalf	PD	Coul	68	1527	432	1	1	1	8674	NA
Morenci	Oroville	PD	Coul	25[d]	700	81	0	0	0	3510	NA
Morenci	Standpipe	PD	Coul	62	2392	390	5	5	1	8503	NA
Morenci	Stargo	PD	Coul	112	2455	453	22	23	10	8673	NA
Morenci	Fairbanks	PD	Coul	15	846	210	0	0	0	8686	NA
Morenci	Mobile-Newtown	PD	Coul	108	2114	403	11	11	1	8527	NA
Morenci	Stargo	State	Fluor.	138	2661	555	40	43	19	8651	NA
Morenci	Cadillac Point	State	Fluor.	122	3556	636	16	20	16	8058	NA
MARICOPA:											
Boys Ranch	GM Prov. Grounds	PD	Coul	10	107	35	0	0	0	8321	NA
Buckeye	N. 4th Street	PD	Coul	2[d]	31	14	0	0	0	6150	NA
Phoenix	201 N. Central	PD	Coul	8	92	49	0	0	0	8311	NA
Phoenix	15 E. Monroe	PB	Coul	9	129	44	0	0	0	8307	NA
Phoenix	1845 E. Roosevelt	Maricopa	Coul	16	NR	328	NR	NR	0	6589	NA

Table 8 (Cont'd)

1981 Sulfur Dioxide Data Summary (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. AVERAGE 3-HR.	MAX. AVERAGE 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	NO. OF SAMPLES 1-HR.	NO. OF SAMPLES 24-HR.
MOHAVE:											
Bullhead City	224 N. Main St.	SCE	Flame	27	204	52	0	0	0	7465	NA
Davis Dam	Katherine Landing	SCE	Flame	29	128	45	0	0	0	7823	NA
Riviera	Ft. Mohave	SCE	Flame	27	113	42	0	0	0	8180	NA
Riviera	Hancock	SCE	Flame	NR	89	37	0	0	0	2304	NA
NAVAJO:											
Joseph City	Environ. Lab.	APS	Bubbler/Flame	2	160	22	0	0	0	7347	306
Joseph City	Leroux Substation	APS	Bubbler/Flame	3	123	25	0	0	0	7100	296
Joseph City	Cholla Plant	APS	Bubbler/Flame	3	186	83	0	0	0	6880	287
PIMA:											
Ajo	Town Square	PD	Coul	27	1441	223	1	1	0	8601	NA
Ajo	Oxidation Pond	PD	Coul	65	1617	346	1	1	0	8696	NA
Ajo	S. Tailings Dam	PD	Coul	17	4855	681	2	2	1	8700	NA
Ajo	Camelback Mt.	PD	Coul	18	943	293	0	0	0	8662	NA
Ajo	Gibson	PD	Coul	14	1284	236	0	0	0	8678	NA
Ajo	Shelton	PD	Coul	13	988	131	0	0	0	8685	NA
Ajo	Miller	PD	Coul	4	296	50	0	0	0	8673	NA

Table 8 (Cont'd)

1981 Sulfur Dioxide Data Summary (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. AVERAGE 3-HR.	MAX. AVERAGE 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	NO. OF SAMPLES 1-HR.	NO. OF SAMPLES 24-HR.
PIMA:(Cont'd)											
Ajo	Hotshot	PD	Coul	9	700	136	0	0	0	8678	NA
Ajo	Well Road	State	Fluor.	41	1660	313	1	1	0	8374	NA
Green Valley	2 mi. N. of Townsite	PD	Coul	1	260	40	0	0	0	7833	NA
Redington	E. of Main Ranch	Magma	Fluor.	9	699	145	0	0	0	8676	NA
Tucson	32 N. Stone	PD	Coul	2	202	66	0	0	0	7941	NA
Tucson	Pomona Road	PD	Coul	1	79	24	0	0	0	8599	NA
Tucson	151 W. Congress	Pima	Flame	3[d]	131	34	0	0	0	2540	NA
Tucson	1721 N. Tanque Verde	Pima	Fluor.	5	349	70	0	0	0	7534	NA
Tucson	22nd & Craycroft	Pima	Fluor.	8	333	64	0	0	0	8059	NA
Vail	El Paso Nat. Gas Co.	PD	Coul	1	252	66	0	0	0	8608	NA
PINAL:											
Coolidge	2 mi. N. of Town	PD	Coul	4	145	74	0	0	0	8152	NA
Kearny[c]	Crescent Ranch	JCC	Coul	0[d]	487	113	0	0	0	835	NA
Maricopa	6.5 mi. N. of Maricopa	PD	Coul	2	49	17	0	0	0	8082	NA
Mammoth	Courthouse	Magma	Fluor.	13	433	83	0	0	0	8688	NA
Mammoth	Aravaipa Canyon	Magma	Fluor.	NR	63	21	0	0	0	629	NA

Table 8 (Cont'd)

1981 Sulfur Dioxide Data Summary (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. AVERAGE 3-HR.	MAX. AVERAGE 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	NO. OF SAMPLES 1-HR.	NO. OF SAMPLES 24-HR.
PINAL: (Cont'd)											
Oracle	New Courthouse	Magma	Fluor.	5	924	192	0	0	0	8516	NA
Oracle Junc't.	Junction 89 & 77	PD	Coul	5	820	183	0	0	0	8206	NA
San Manuel	3-C Ranch House	Magma	Fluor.	NR	1110	219	0	0	0	2201	NA
San Manuel	Townsite	Magma	Fluor.	42	1641	312	1	1	0	8663	NA
San Manuel	Golf Course	Magma	Fluor.	75	1507	313	1	1	0	8661	NA
San Manuel	Dormsite	Magma	Fluor.	74	1656	275	1	1	0	8679	NA
San Manuel	Minesite	Magma	Fluor.	44	1700	410	2	2	1	8630	NA
San Manuel	LDS Church	State	Fluor.	66	1602	284	1	1	0	8130	NA
San Manuel	Industrial Hygiene (Mobile Monitor)	Magma	Fluor.	NR	931	213	0	0	0	4279	NA
SANTA CRUZ:											
None											
YAVAPAI:											
None											
YUMA:											
None											

STATE AND FEDERAL STANDARDS (ug/m^3):	Annual Average	24-Hr. Average	3-Hr. Average
Primary	80	365	-
Secondary	-	-	1300

Table 9

1981 Benzene Soluble Organics Data Summary[f]
High Volume Sampler (in ug/m3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
APACHE:					
Eagar	Town Hall	State	9.1[d]	28.8	20
COCHISE:					
Bisbee	Warren City Hall	State	1.9	3.7	50
Douglas	1.2 mi. N. of Smelter	State	1.9[d]	4.8	38
Douglas	0.8 mi. N. of Smelter	PD	.5	NR	47
Douglas	1012 G Avenue	PD	1.1	NR	46
Douglas	Pirtleville	PD	.9[d]	NR	44
Douglas	City Park	State	3.1[d]	6.2	21
Hereford	P.D. Experimental Farm	PD	1.1	NR	61
Paul Spur	Housing Area	State	2.0[d]	3.7	44
Sierra Vista	Bartow Drive	State	2.3	6.7	51
COCONINO:					
Flagstaff	218 N. Leroux Street	State	8.0	39.4	51
Grand Canyon	Hopi Point	State	1.1[d]	2.7	28
Page	Airport	State	5.4	26.4	61

Table 9 (Cont'd)

1981 Benzene Soluble Organics Data Summary[f]
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
GILA:					
Hayden	Jail	State	4.4	11.8	47
Hayden	Montgomery Ranch	State	1.5	3.7	50
Miami	Fire Station	State	2.4	4.5	53
Miami	Jones Ranch	State	1.5[d]	3.8	44
GRAHAM:					
Safford	523 10th Avenue	State	2.9	7.3	53
GREENLEE:					
Morenci	Cadillac Point	PD	1.0	NR	52
Morenci	Fina Station	PD	.8	NR	52
Morenci	Fairbanks	PD	1.0	NR	50
Morenci	Stargo	PD	1.5	NR	57
Morenci	Stargo	State	2.4[d]	14.2	42
Morenci	Standpipe	PD	1.0	NR	52

Table 9 (Cont'd)

1981 Benzene Soluble Organics Data Summary[f]
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
MARICOPA:					
Boys Ranch	GM Proving Ground	PD	1.9	NR	54
Buckeye	N. 4th Street	PD	2.2	NR	49
Glendale	6000 W. Olive Avenue	Maricopa	2.4	18.7	56
Mesa	Broadway & Brooks	Maricopa	1.4	9.8	57
Phoenix	15 E. Monroe Street	PD	3.1	NR	60
Phoenix	1845 E. Roosevelt	Maricopa	5.0	30.1	56
Phoenix	201 N. Central	PD	2.0	NR	60
Phoenix	8531 N. 6th Street	Maricopa	2.8	16.5	59
Phoenix	4732 S. Central	Maricopa	3.9	20.1	56
Scottsdale	2857 N. Miller Road	Maricopa	2.3	15.5	56
Scottsdale	13665 N. Scottsdale Road	Maricopa	1.0	7.1	52
MOHAVE:					
Kingman	305 W. Beale Street	State	1.8[d]	7.2	39
Lake Havasu City	Community Hospital	State	1.7	4.3	49

Table 9 (Cont'd)

1981 Benzene Soluble Organics Data Summary[f]
High Volume Sampler (in ug/m3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
NAVAJO:					
Joseph City	S.E. Joseph City	State	2.0[d]	19.1	35
Show Low	Deuce of Clubs Avenue	State	6.6	84.0	55
PIMA:					
Ajo	Well Road	State	2.1	4.8	58
Ajo	Camelback Mt.	PD	.6	NR	49
Ajo	Oxidation Pond	PD	.5	NR	50
Ajo	S. Tailings Dam	PD	.6	NR	54
Ajo	Town Square	PD	1.1	NR	50
Green Valley	2 mi. N. of Townsite	PD	1.1	NR	61
Organ Pipe	Visitors Center	State	1.1	2.5	45
Rillito	Miller's Market	State	2.7	8.6	51
Tucson	32 N. Stone	PD	1.2	NR	57
Tucson	Pomona Road	PD	1.3	NR	58
Vail	El Paso Nat. Gas Co.	PD	.7	NR	48

Table 9 (Cont'd)

1981 Benzene Soluble Organics Data Summary[f]
High Volume Sampler (in ug/m3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
PINAL:					
Casa Grande	401 N. Marshall Road	State	3.3	14.8	56
Coolidge	2 mi. N. of Coolidge	PD	1.5	NR	54
Florence	22nd Street & Willow	State	2.5	6.7	47
Maricopa	6.5 mi. N.W. of Town	PD	1.0	NR	59
Oracle Junction	Highways 89 & 77	PD	.8	NR	49
San Manuel	LDS Church	State	1.4	3.7	50
Superior	951 Main Street	State	1.7[d]	4.0	44
SANTA CRUZ:					
Nogales	U. S. Post Office	State	6.0[d]	22.9	38
YAVAPAI:					
Clarkdale	Football Stadium	State	0.9[d]	2.1	22
Montezuma Castle	Maint. Building	State	1.8	5.3	49
Nelson	1 mi. N. of Lime Plant	State	1.1	2.3	48
Prescott	Co. Maint. Yard	State	6.2	22.6	45

Table 9 (Cont'd)

1981 Benzene Soluble Organics Data Summary[f]
High Volume Sampler (in ug/m3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
YUMA:					
Parker	914 Arizona Avenue	State	2.7	8.8	47
Yuma	201 S. 2nd Avenue	State	4.6	54.8	56

Table 10

1981 Nitrates Data Summary
High Volume Sampler (in ug/m3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24 HOUR AVERAGE	NO. OF SAMPLES
APACHE:					
Eagar	Town Hall	State	1.8[d]	14.0	20
COCHISE:					
Bisbee	Warren-City Hall	State	2.0	5.9	50
Douglas	City Park	State	2.7[d]	6.7	21
Douglas	1.2 mi. N. of Smelter	State	1.8[d]	11.5	38
Paul Spur	Housing Area	State	4.8[d]	19.7	44
Sierra Vista	Bartow Drive	State	2.2	4.9	51
COCONINO:					
Flagstaff	218 N. Leroux Street	State	2.4	6.4	51
Grand Canyon	Hopi Point	State	1.7[d]	4.1	27
Page	Airport	State	2.9	12.2	61
GILA:					
Hayden	Jail	State	2.6	6.5	47
Hayden	Montgomery Ranch	State	2.7	6.3	50

Table 10 (Cont'd)

1981 Nitrates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
GILA: (Cont'd)					
Miami	Fire Station	State	2.1	5.7	53
Miami	Jones Ranch	State	2.4[d]	5.2	44
GRAHAM:					
Safford	523 10th Avenue	State	1.7	4.4	53
GREENLEE:					
Morenci	Stargo	State	1.8[d]	5.7	42
MARICOPA:					
Glendale	6000 W. Olive Avenue	Maricopa	2.9	8.5	51
Mesa	Broadway & Brooks	Maricopa	2.7	7.1	53
Phoenix	1845 E. Roosevelt	Maricopa	3.1	9.7	53
Phoenix	4732 S. Central	Maricopa	2.9	7.7	51
Phoenix	8531 N. 6th Street	Maricopa	3.2	9.1	55
Scottsdale	2857 N. Miller Road	Maricopa	2.6	11.9	52
Scottsdale	13665 N. Scottsdale Road	Maricopa	2.7	11.3	48

Table 10 (Cont'd)

1981 Nitrates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
MOHAVE:					
Kingman	305 W. Beale Street	State	2.2[d]	7.1	39
Lake Havasu	Community Hospital	State	3.0	7.7	49
NAVAJO:					
Joseph City	3.25 mi. S.E. of Town	State	1.3[d]	4.5	35
Show Low	Deuce of Clubs Avenue	State	2.1	23.2	55
PIMA:					
Ajo	Well Road	State	2.6	6.0	58
Organ Pipe	Visitors Center	State	2.6	7.2	45
Rillito	Miller's Market	State	3.3	6.8	51
PINAL:					
Casa Grande	401 N. Marshall Road	State	3.8	15.6	56
Florence	22nd Street & Willow	State	3.3	11.6	47
San Manuel	LDS Church	State	2.0	4.7	52
Superior	951 Main Street	State	2.6	9.3	45

Table 10 (Cont'd)

1981 Nitrates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
SANTA CRUZ:					
Nogales	U. S. Post Office	State	2.1[d]	5.8	38
YAVAPAI:					
Clarkdale	Football Stadium	State	1.8[d]	4.5	22
Montezuma Castle	Maint. Building	State	1.6	4.7	49
Nelson	1 mi. N. of Lime Plant	State	1.8	6.4	48
Prescott	Co. Maint. Yard	State	2.4	9.4	45
YUMA:					
Parker	914 Arizona Avenue	State	2.9	6.6	47
Yuma	201 S. 2nd Avenue	State	4.0	15.1	56

Table 11

1981 Sulfates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
APACHE:					
Eagar	Town Hall	State	4.2[d]	12.6	20
COCHISE:					
Bisbee	Warren-City Hall	State	8.6	18.8	50
Douglas	1.2 mi. N. of Smelter	State	10.4[d]	35.0	38
Douglas	City Park	State	10.4[d]	18.8	21
Paul Spur	Housing Area	State	11.8[d]	30.8	44
Sierra Vista	Bartow Drive	State	6.7	15.1	51
COCONINO:					
Flagstaff	218 N. Leroux	State	4.7	9.6	51
Grand Canyon	Hopi Point	State	2.9[d]	7.1	27
Page	Airport	State	4.9	12.0	61
GILA:					
Hayden	Jail	State	14.5	27.0	47
Hayden	Montgomery Ranch	State	14.6	42.0	50

Table 11 (Cont'd)

1981 Sulfates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
GILA: (Cont'd)					
Miami	Fire Station	State	10.3	20.9	53
Miami	Jones Ranch	State	11.0[d]	80.8	44
GRAHAM:					
Safford	523 10th Avenue	State	6.7	15.0	53
GREENLEE:					
Morenci	Stargo	State	9.0[d]	21.7	42
MARICOPA:					
Glendale	6000 W. Olive Avenue	Maricopa	6.3	17.2	56
Mesa	Broadway & Brooks	Maricopa	6.8	14.5	56
Phoenix	1845 E. Roosevelt	Maricopa	7.1	16.8	59
Phoenix	4732 S. Central	Maricopa	7.5	20.3	58
Phoenix	8531 N. 6th Street	Maricopa	6.3	16.3	59
Scottsdale	2857 N. Miller Road	Maricopa	6.2	14.3	58
Scottsdale	13665 N. Scottsdale Road	Maricopa	5.9	14.4	52

Table 11 (Cont'd)

1981 Sulfates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
MOHAVE:					
Kingman	305 W. Beale Street	State	3.8[d]	16.0	39
Lake Havasu City	Community Hospital	State	3.6	9.4	49
NAVAJO:					
Joseph City	3.25 mi. S.E. of Town	State	6.5[d]	20.1	35
Show Low	Deuce of Clubs Avenue	State	4.9	16.6	55
PIMA:					
Ajo	Well Road	State	8.4	19.5	58
Green Valley	245 W. Esperanza	Pima	4.3[d]	11.4	23
Organ Pipe	Visitors Center	State	4.4	14.8	45
Rillito	Miller's Market	State	7.5	13.0	51
Tucson	Ft. Lowell	Pima	4.6[d]	10.8	23
Tucson	151 W. Congress	Pima	4.7[d]	10.7	23
Tucson	Davis-Montham A.F.B.	Pima	5.4[d]	9.4	20
Tucson	1810 S. 6th Avenue	Pima	5.5[d]	11.8	23

Table 11 (Cont'd)

1981 Sulfates Data Summary
High Volume Sampler (in ug/m3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
PIMA: (Cont'd)					
Tucson	Orange Grove	Pima	5.7[d]	13.6	23
Tucson	Prince Road	Pima	4.7[d]	9.8	24
PINAL:					
Casa Grande	401 N. Marshall	State	6.2	25.5	56
Florence	22nd & Willow Street	State	7.5	18.2	47
San Manuel	LDS Church	State	9.9	22.9	52
Superior	951 Main Street	State	5.3	20.4	45
SANTA CRUZ:					
Nogales	U. S. Post Office	State	7.8[d]	33.6	38
YAVAPAI:					
Clarkdale	Football Stadium	State	2.1[d]	7.4	22
Montezuma Castle	Maint. Building	State	3.5	7.9	49
Nelson	1 mi. N. of Lime Plant	State	3.2	25.0	48
Prescott	Co. Maint. Yard	State	4.5	8.1	45

Table 11 (Cont'd)

1981 Sulfates Data Summary
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
YUMA:					
Parker	914 Arizona Avenue	State	4.2	8.0	47
Yuma	201 S. 2nd Avenue	State	5.5	11.0	56

Data Trends

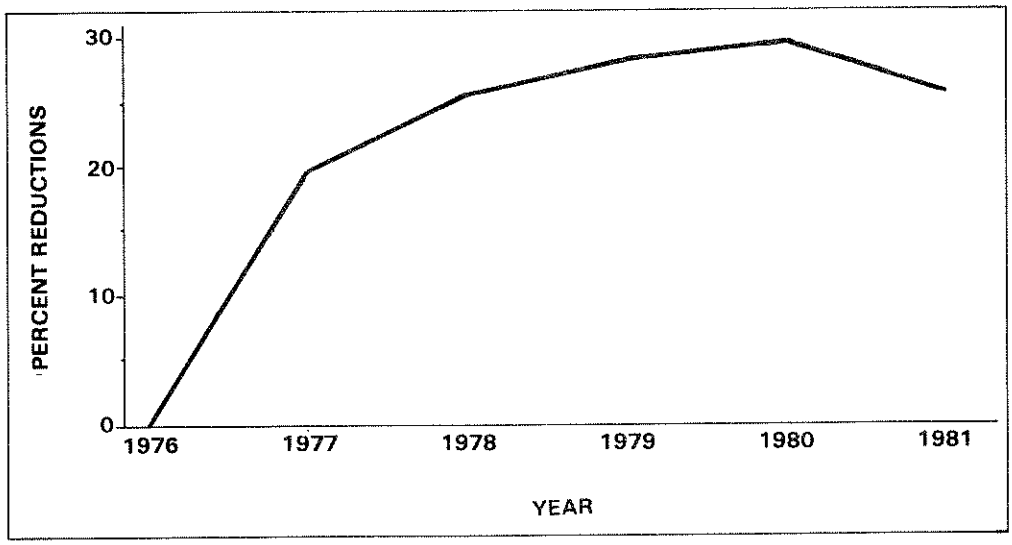

Figure 2. Percent reductions in 8-hour carbon monoxide concentrations relative to 1976.

A meteorological index was developed which was used to adjust ambient carbon monoxide data to common meteorological conditions. The resultant percent reductions in eight-hour concentrations of carbon monoxide in Phoenix are presented in Figure 2. Reductions in the concentrations of carbon monoxide were computed relative to the 1976 concentrations.

Incremental reductions were shown for 1977 through 1980. In 1981, the percent reductions in eight-hour concentrations of carbon monoxide dropped to the 1978 level of 26 percent.

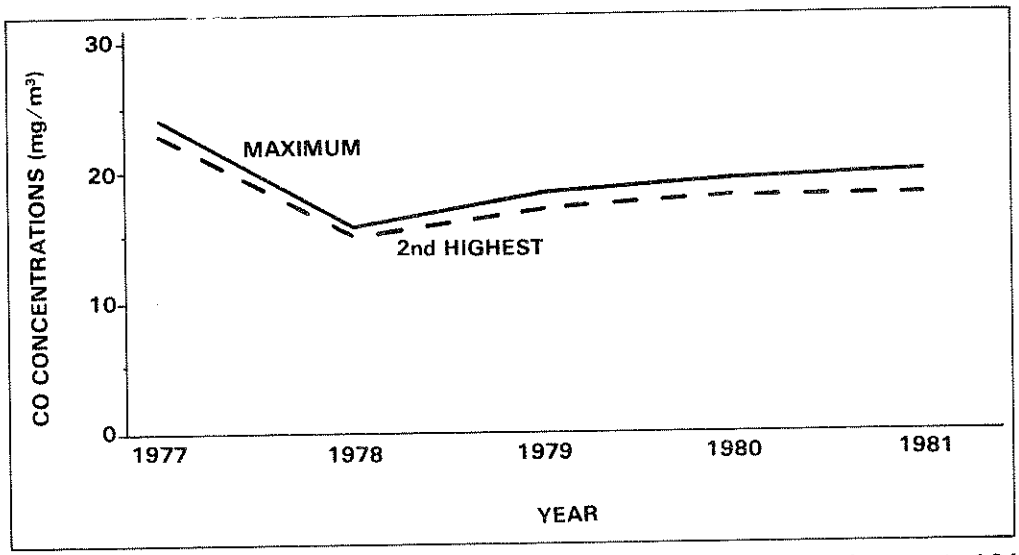

Figure 3. Highest 8-hour carbon monoxide concentrations at 1845 E. Roosevelt, Phoenix during 1977 through 1981.

Maximum eight-hour concentrations of carbon monoxide in Phoenix decreased 33 percent from 1977 to 1981 (Figure 3). A gradual increase is shown from 16 mg/m^3 in 1978 to 20 mg/m^3 in 1981. Second highest concentrations followed a similar pattern.

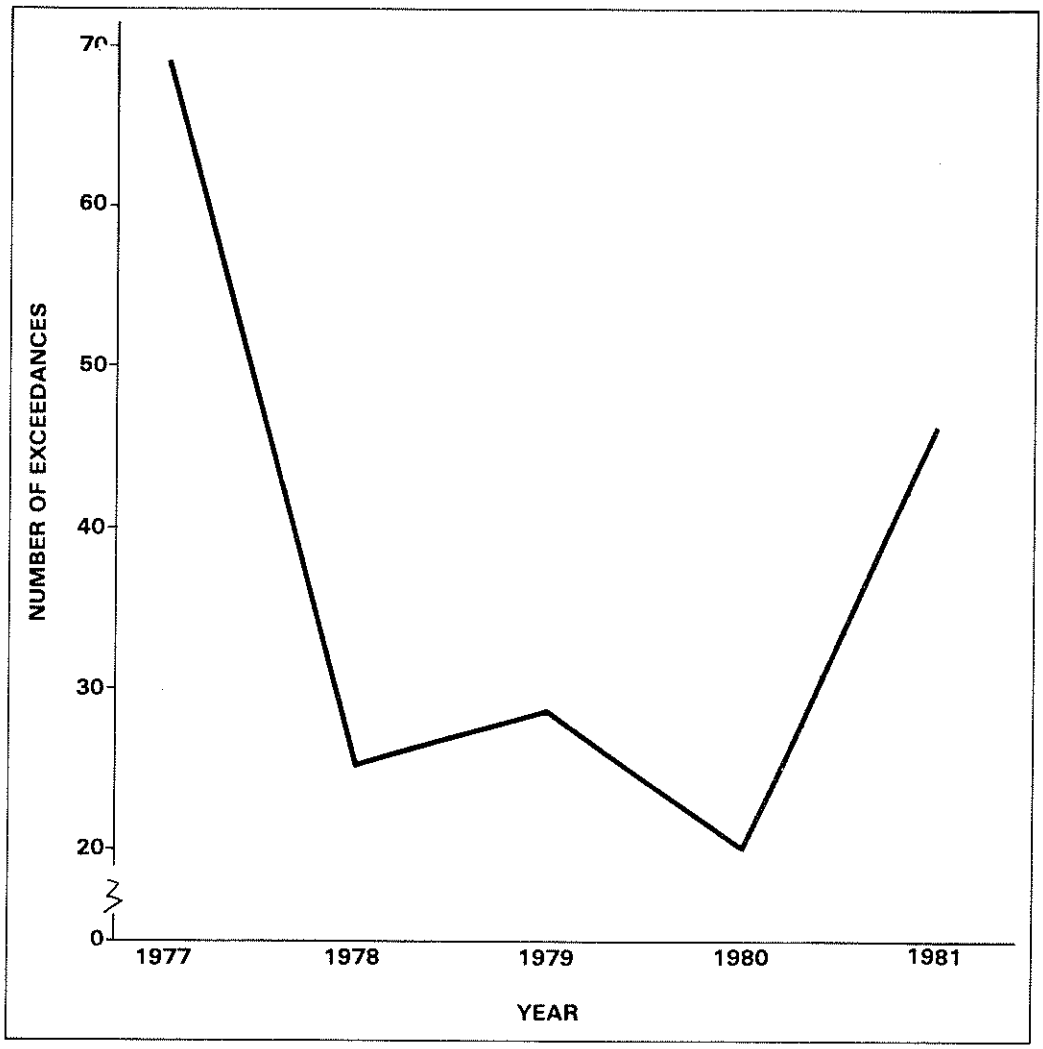

Figure 4. Carbon monoxide exceedances of the 8-hour standard (10 mg/m^3) at 1845 E. Roosevelt, Phoenix during 1977-1981.

In 1981, 46 exceedances of the 8-hour standard were reported (Figure 4). Number of exceedances decreased 33 percent from 1977 to 1980. However, the 46 exceedances in 1981 represent a 130 percent increase from 1980.

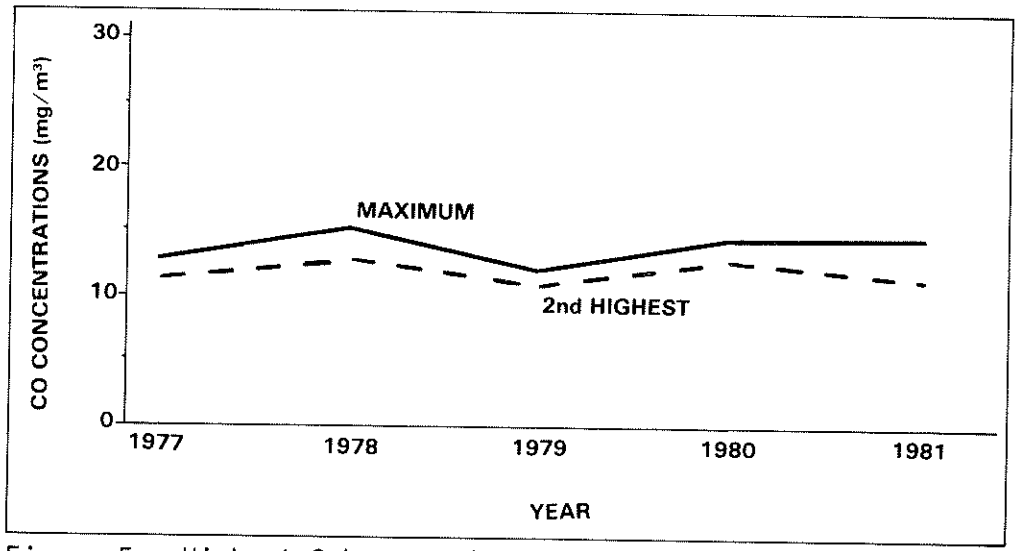

Figure 5. Highest 8-hour carbon monoxide concentrations at 22nd Street and Alvernon Way, Tucson, during 1977 through 1981.

In Tucson, the maximum eight-hour carbon monoxide concentrations have remained relatively stable from 1977 through 1981 (Figure 5). Concentrations ranged from 12 mg/m^3 (1979) to 15 mg/m^3 (1978). Second highest concentrations presented a similar pattern.

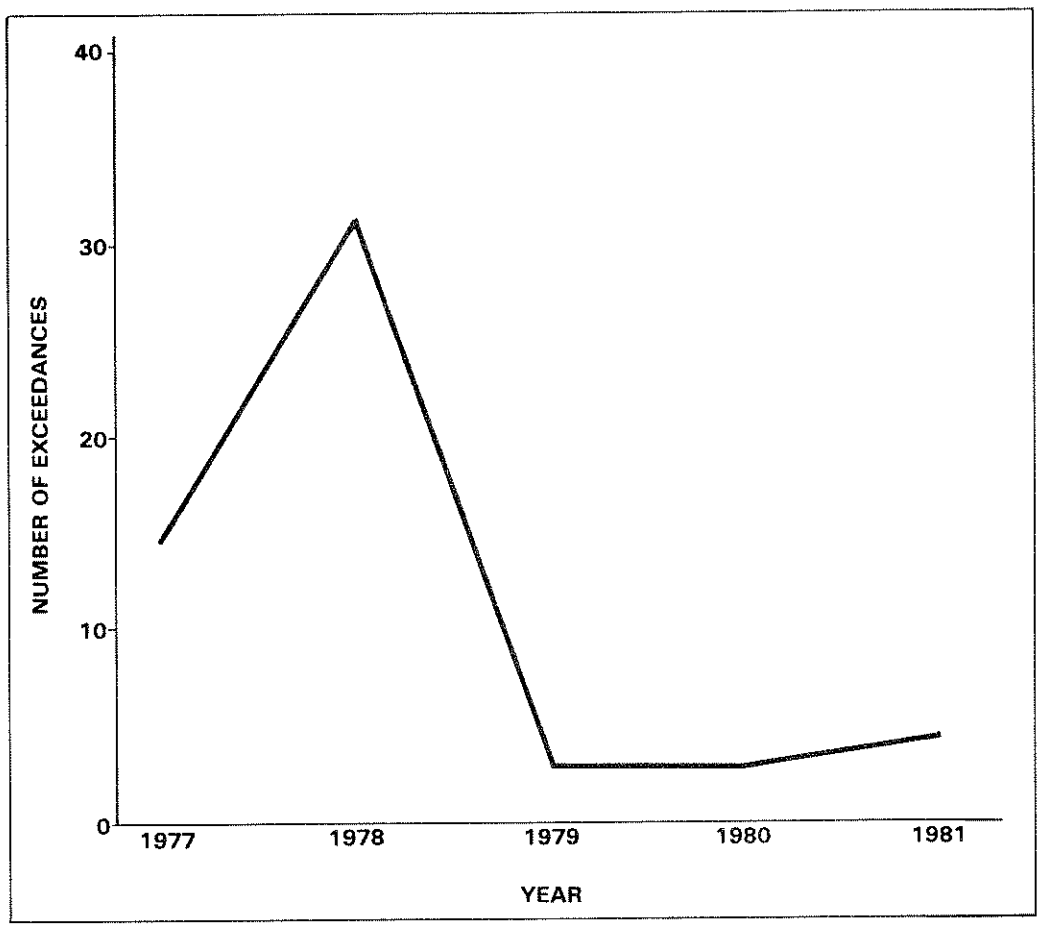

Figure 6. Carbon monoxide exceedances of the 8-hour standard (10 mg/m^3) at 22nd Street and Alvernon Way, Tucson.

In Tucson, four carbon monoxide exceedances of the eight-hour standard were reported during 1981 (Figure 6). Exceedances peaked in 1978 (31 reported), decreased to four in 1979, and remained essentially stable to the present.

Carbon monoxide concentrations in Flagstaff, Prescott, Sierra Vista and Yuma are shown in Table 13. From 1977 to 1978 there was a 100 percent increase in 8-hour maximum concentrations in Flagstaff. This level was generally maintained through 1981. In Prescott, there was an 18 percent decrease in 8-hour maximum concentrations from 1980 to 1981. In Sierra Vista and Yuma, maximum 8-hour concentrations remained relatively stable from 1977 to 1981. All concentrations were below the standard (10 mg/m^3) with the exceptions of Flagstaff in 1979 (11 mg/m^3) and Prescott in 1980 (11 mg/m^3).

Table 12

Carbon Monoxide Concentrations

in Flagstaff, Prescott, Sierra Vista, and Yuma

City	Year	8-Hour Concentration (mg/m^3) Maximum	2nd High
Flagstaff	1977	5	5
	1978	10	10
	1979	11	10
	1980	10	8
	1981	10	9
Prescott	1980	11	6
	1981	9	8
Sierra Vista	1977	7	7
	1978	7	6
	1979	7	6
	1980	5	5
	1981	6	6
Yuma	1977	7	7
	1978	-	-
	1979	6	5
	1980	8	7
	1981	7	6

Hydrocarbons

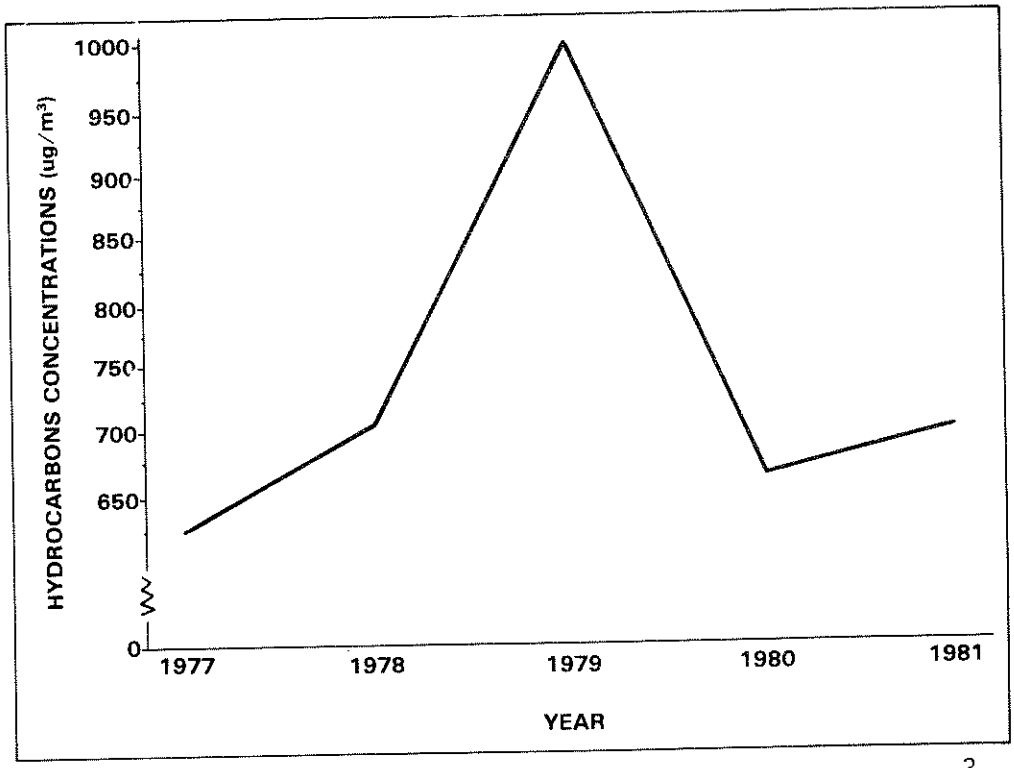

Figure 7. Annual average hydrocarbons concentrations (ug/m^3) at 15 E. Monroe (Phelps Dodge Corporation), Phoenix, during 1977 through 1981.

Annual averages of hydrocarbons concentrations in Phoenix peaked in 1979 (998.1 ug/m^3). A 33 percent decrease was reported in 1980, followed by a 5 percent increase in 1981 (Figure 7).

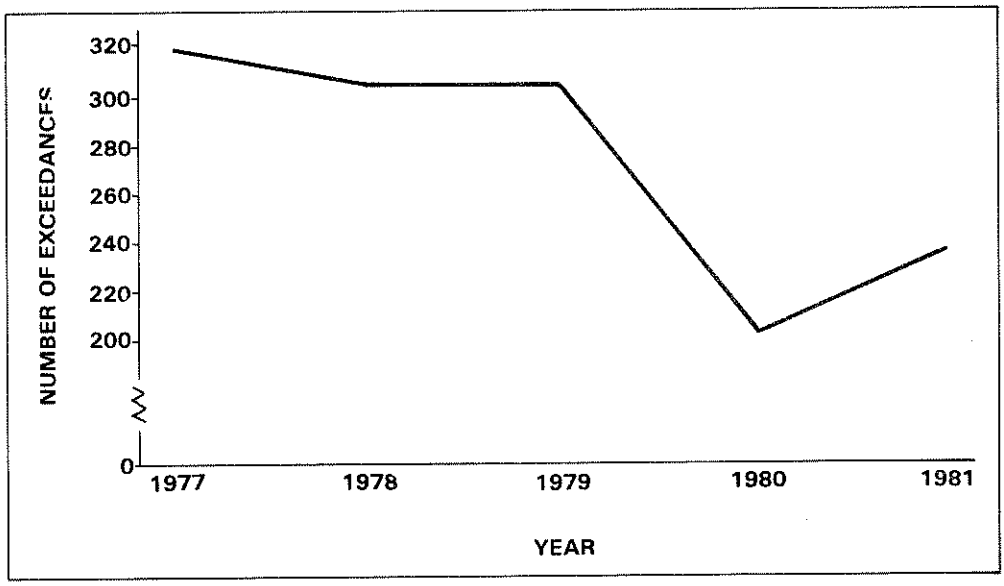

Figure 8. Three-hour average (6-9 a.m.) hydrocarbons exceedances (Standard 160 ug/m^3) at 15 E. Monroe (Phelps Dodge Corporation), Phoenix, 1977 through 1981.

The number of 3-hour average hydrocarbons exceedances are shown in Figure 8 for the years 1977 through 1981. While the number of exceedances have decreased since 1977, between the years 1980 and 1981, an increase was noted corresponding to the increase in annual averages shown in Figure 7.

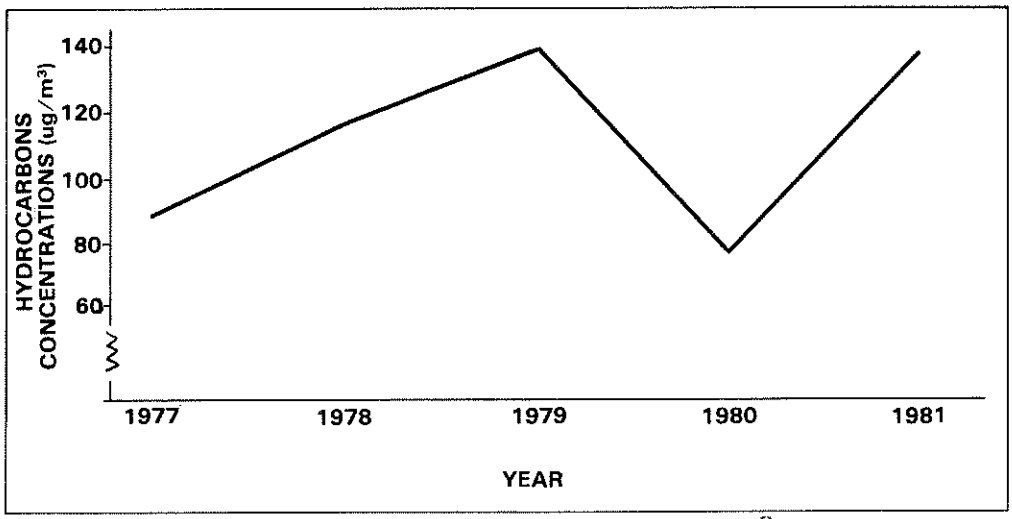

Figure 9. Annual averages concentrations (ug/m^3) at 151 W. Congress, Tucson, 1977 through 1981.

In Tucson, annual average concentrations of hydrocarbon concentrations (ug/m^3) tended to vary across the five years (Figure 9). As shown in Figure 10, the number of exceedances peaked in 1979 and decreased sharply in 1980.

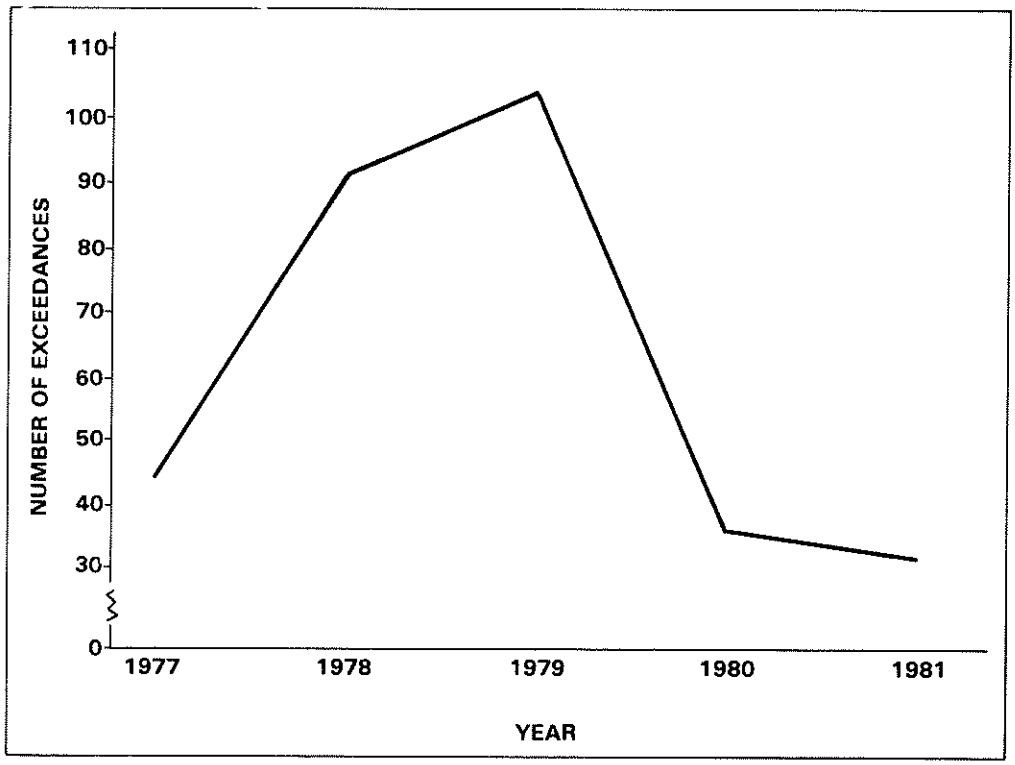

Figure 10. Three-hour (6-9 a.m.) average hydrocarbons exceedances (Standard 160 ug/m^3) at 151 W. Congress, Tucson, 1977 through 1981.

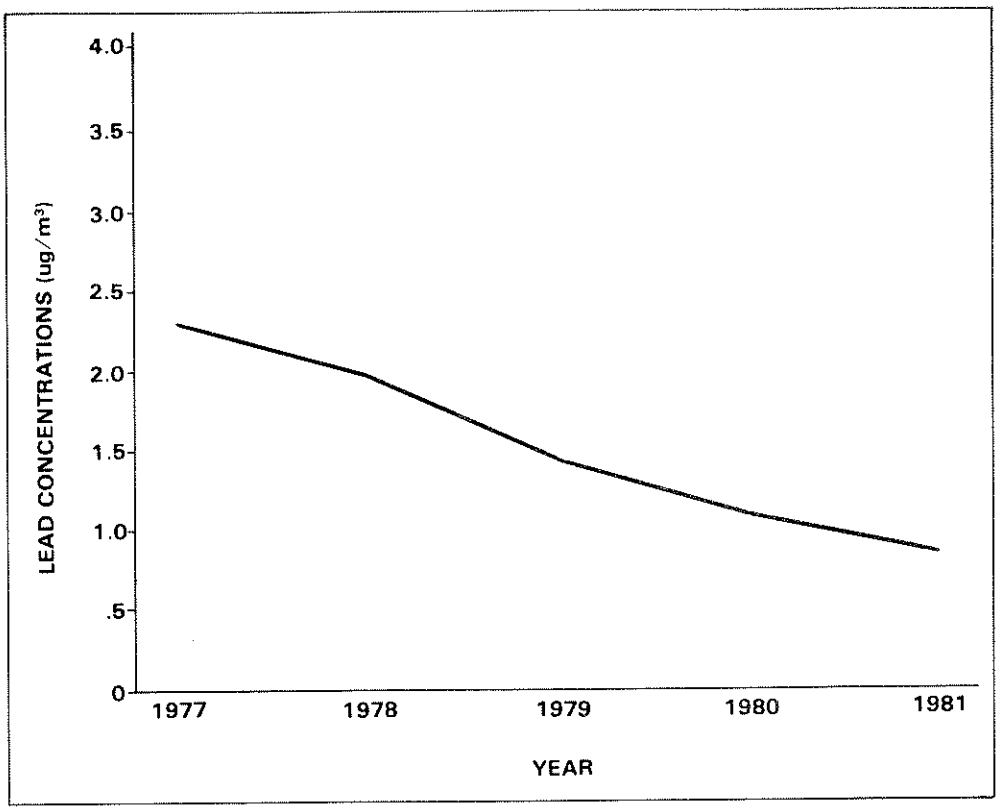

Figure 11. Annual average lead concentrations (ug/m^3) at 1845 E. Roosevelt, Phoenix, 1977 through 1981.

The Phoenix annual average lead concentrations have steadily decreased over the five years (Figure 11). In 1977, the average lead concentration was 2.3 ug/m^3 compared to 0.8 ug/m^3 in 1981.

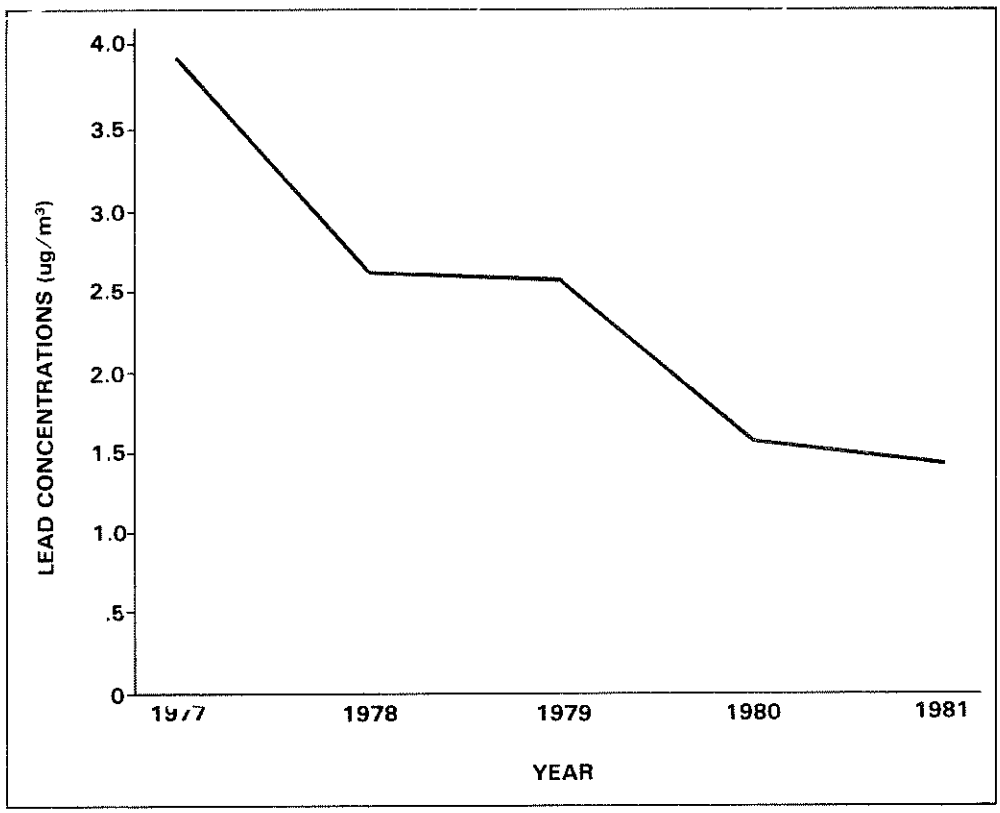

Figure 12. Maximum quarterly average lead concentrations (Standard 1.5 ug/m^3) at 1845 E. Roosevelt, Phoenix, 1977 through 1981.

Maximum quarterly average lead concentrations in Phoenix also decreased during five years (Figure 12). In 1977, the maximum quarterly average was 3.9 ug/m^3 and in 1981, 1.4 ug/m^3, which was just below the standard (1.5 ug/m^3).

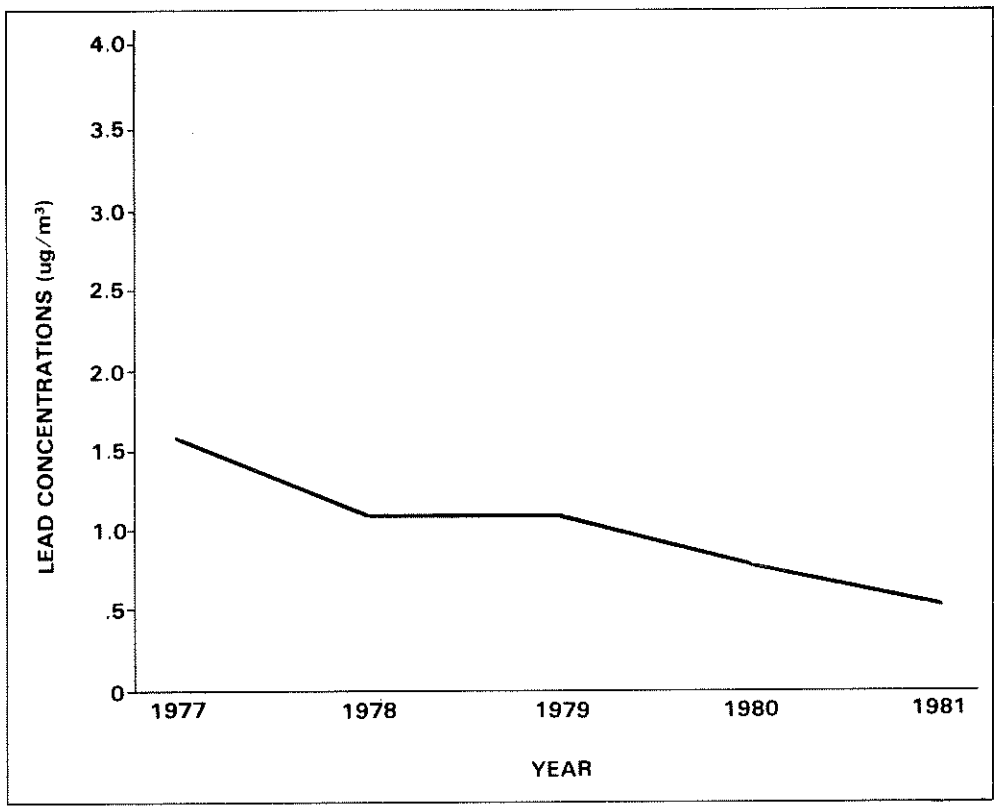

Figure 13. Maximum quarterly average lead concentrations (ug/m^3) at 1016 W. Prince Road, Tucson, 1977 through 1981.

In Tucson, maximum quarterly average lead concentrations ranged from 1.62 ug/m^3, just slightly above the standard, to a low of 0.52 ug/m^3 in 1981 (Figure 13). Thus, the trend in lead concentrations in both cities was very similar, that is, a 64-68 percent reduction from 1977 to 1981.

Nitrogen Dioxide

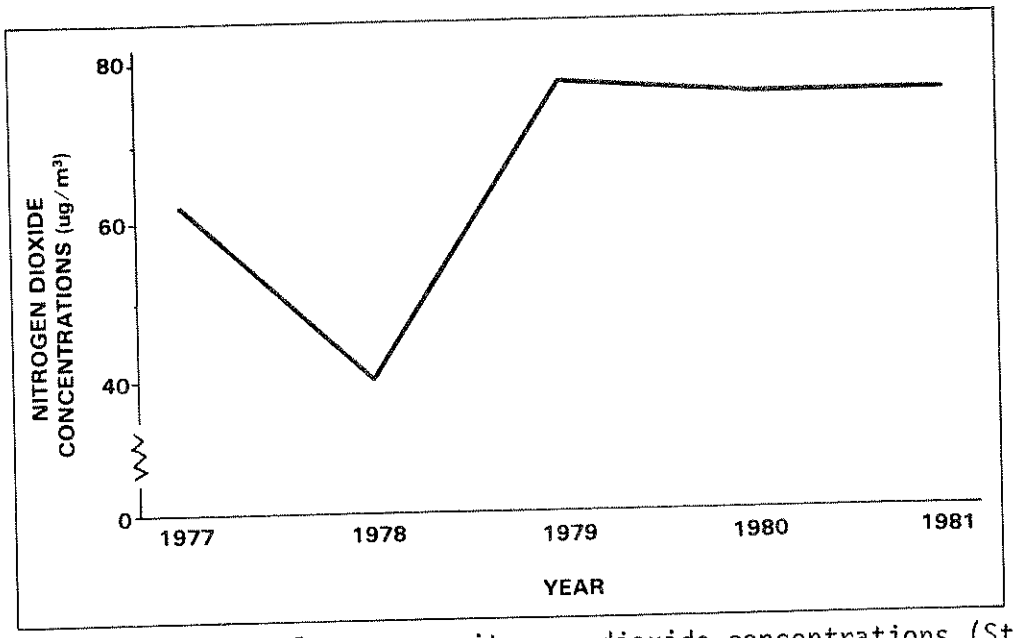

Figure 14. Annual average nitrogen dioxide concentrations (Standard 100 ug/m^3) at 15 E. Monroe (Phelps Dodge Corporation), Phoenix, 1977 through 1981.

Annual average nitrogen dioxide concentrations in Phoenix peaked in 1979 and maintained essentially the same level through 1981 (Figure 14). All annual averages were below the standard of 100 ug/m^3.

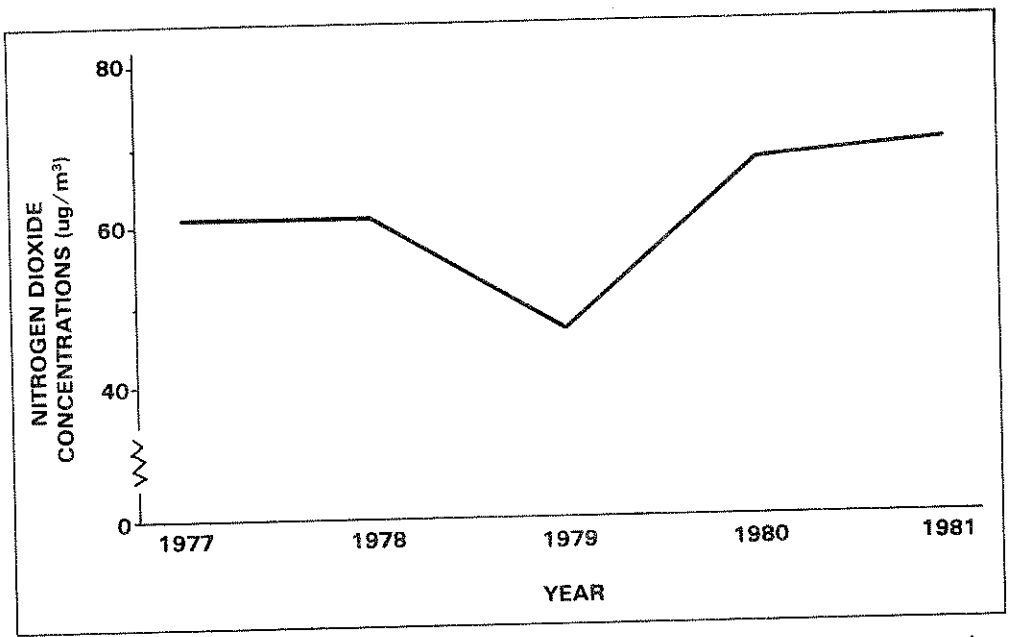

Figure 15. Annual average nitrogen dioxide concentrations (Standard 100 ug/m^3) at 151 W. Congress, Tucson, 1977 through 1981.

In Tucson, the annual average nitrogen dioxide concentrations were also maintained below the standard (100 ug/m^3) during the five years (Figure 15). An increase was noted in 1980 and continued during 1981.

Ozone

As shown in Table 14, the maximum 1-hour ozone concentration in the Phoenix area increased from .16 ppm to .18 ppm from 1977 to 1981, an increase of 13 percent. A 7 percent increase, from .15 ppm to .16 ppm, was detected for the second highest concentration. The Roosevelt Street and S. Central Avenue sites recorded more exceedances in 1981 than in 1980 whereas all of the other 1980 sites detected fewer exceedances in 1981 (Table 15). In regards to the 3-year running average number of exceedances, higher values were noted for the Roosevelt Street and N. 6th Street sites in 1981, no change for the N. Miller Road site, and a lower value for the W. Olive Avenue site.

Table 13

Highest Ozone Concentrations in Phoenix

Year	Max. 1-Hr. Avg. (ppm)	Site	2nd Highest 1-Hr. Avg. (ppm)	Site
1977	.16	Roosevelt St.	.15	Roosevelt St.
1978	.16	Roosevelt St.	.15	W. Olive (Glendale)
1979	.16	N. 6th St.	.14	N. 6th St.
1980	.17	Papago Park and Roosevelt St.	.15	Roosevelt St., Miller Rd. (Scottsdale), W. Olive (Glendale), and N. 6th St.
1981	.18	Roosevelt St.	.16	Roosevelt St., S. Central, and N. 6th St.

Table 14

Number of Exceedances of Ozone Standard in Phoenix

Site	1977	1978	1979	1980	1981
1845 E. Roosevelt St.	4	4	4	3	6
8531 N. 6th St.	0	0	1	10	4
2857 N. Miller Rd. (Scottsdale)	0	0	1	3	0
6000 W. Olive Ave. (Glendale)	0	2	1	3	0
4732 S. Central	0	0	0	0	1
*13665 N. Scottsdale Rd. (Scottsdale)	-	-	-	-	1
**2035 N. 52nd St.	-	-	-	7	2

*Start April, 1981
**Start June, 1980

Standard: .12ppm, daily maximum 1-hour average, not to be exceeded more than 1.0 times per year, based on a 3-year running average.

Table 15

Ozone Compliance Status Exceedances in Phoenix
(3-Year Running Avg. No. of Exceedances)

Site	1977	1978	1979	1980	1981
1845 E. Roosevelt St.	2.0	3.0	4.0	3.7	4.3
8531 N. 6th St.	0	0	.3	3.7	5.0
2857 N. Miller Rd. (Scottsdale)	0	0	.3	1.3	1.3
6000 W. Olive Ave. (Glendale)	0	.7	1.0	2.0	1.3

In Tucson, both the maximum and second highest ozone 1-hour concentrations increased 20 percent across the five years (Table 17). An even larger increase was reported from Yuma, 67 percent for maximum and 100 percent for second highest concentrations (Table 18). Sierra Vista and Flagstaff reported a general decrease in 1-hour ozone concentrations: 13 percent and 22 percent, respectively.

Table 16

Highest Ozone Concentrations in Tucson

Year	Max. 1-Hr. Avg. (ppm)	Site	2nd Highest 1-Hr. Avg. (ppm)	Site
1977	.10	Downtown and 22nd & Craycroft	.10	22nd & Craycroft
1978	.11	22nd & Craycroft	.11	22nd & Craycroft
1979	.11	Downtown	.10	Downtown, 22nd & Craycroft and Arthur Park G.C.
1980	.12	Downtown	.11	Downtown, 22nd & Craycroft, and Pomona Ave.
1981	.12	22nd & Craycroft	.12	22nd & Craycroft

Standard: .12 ppm, daily maximum 1-hour average, not to be exceeded more than 1.0 times per year, based on a 3-year running average.

Table 17

Ozone Data for Flagstaff, Sierra Vista and Yuma

City	Year	Highest 1-Hr. Concentrations (ppm) Maximum	2nd Highest
Flagstaff	1977	.09	.09
	1978	.08	.08
	1979	.07	.06
	1980	.08	.07
	1981	.07	.07
Sierra Vista	1978	.08	.08
	1979	.09	.08
	1980	.10	.09
	1981	.07	.07
Yuma	1977	.06	.05
	1978	.12	.11
	1979	.12	.11
	1980	.08	.08
	1981	.10	.10

Standard: .12 ppm, daily maximum 1-hour average, not to be exceeded more than 1.0 times per year, based on a 3-year running average.

Particulates

All sites registered excess concentrations of particulates in the Phoenix area during the past five years (Table 19). Also, concentrations of particulates at all sites tended to decrease over the five years with the exception of the South Central site. A constant decrease was reported at the Roosevelt Street site. Geometric means formed a consistent pattern with peaks on alternate years at all sites except Roosevelt Street and South Central. The South Central pattern of concentrations was the obverse of the others.

Table 18

Concentrations of Particulates in the Phoenix Area

	Annual Geometric Mean Concentration (ug/m^3)				
Site	1977	1978	1979	1980	1981
Glendale (6000 W. Olive)	112	97	105	88	100
Mesa (Broadway & Brooks)	-	86	87	86	93
Scottsdale (2857 N. Miller)	118	92	99	87	97
Phoenix (1845 E. Roosevelt)	144	120	121	120	113
Phoenix (4732 S. Central)	155	218	171	182	176
Phoenix (8531 N. 6th St.)	109	106	117	100	108
Scottsdale (13665 N. Scottsdale Rd.)	179	128	147	115	115

Standard: 75 mg/m^3, annual geometric mean.

Annual geometric mean concentations of particulates in Tucson are presented in Table 20. Four sites consistently reported concentrations exceeding the standard (75 ug/m^3): South Tucson, Prince Road, Orange Grove, and Alvernon-Ft. Lowell. The four sites reported lower geometric means for particulates in 1981 than in 1977, with the exception of Orange Grove. Alvernon-Ft. Lowell reported a decrease in concentrations each year.

Table 19

Concentrations of Particulates in Tucson

Site	Annual Geometric Mean Concentration (ug/m^3)				
	1977	1978	1979	1980	1981
Downtown	68	56	70	61	67
University of Arizona	71	61	89	75	76
South Tucson	119	117	101	97	112
Prince Road	122	110	129	117	101
Magnetic Observatory	67	56	61	56	62
Corona de Tucson	24	20	28	22	35
Davis-Monthan	76	69	69	67	68
Green Valley	56	45	54	39	46
Border Patrol	72	66	69	61	58
Hughes-Nogales	50	43	54	54	54
Orange Grove	85	87	109	108	108
Alvernon-Ft. Lowell	155	126	120	101	98
Pima College	50	42	47	43	47
Golf Links	63	55	65	59	67

Standard: 75 ug/m^3, annual geometric mean

Table 20

Concentrations of Particulates in Non-Urban Areas of Arizona

Site	Annual Geometric Mean Concentration (ug/m^3)				
	1977	1978	1979	1980	1981
Ajo	72[d]	69	67[d]	85	86
Casa Grande	118[d]	98	100	105	94
Clarkdale	51	47[d]	100[d]	71[d]	46[d]
Douglas (U.S. 666)	46	20[d]	48	57	65[d]
Douglas (City Park)	82	74	121	136	128[d]
Eagar	74	82	114[d]	83	90[d]
Flagstaff	79[d]	104[d]	82[b]	81[d]	81
Florence	93	67	88	106[d]	91
Grand Canyon (Hopi Point)	-	-	22[b]	11[d]	16
Grand Canyon (Visitors Center)	18[d]	11[d]	20[c]	21[b]	23
Hayden (Jail)	92[d]	134[d]	172	152[d]	287
Hayden (Ranch)	57[b]	46[d]	53	50	74
Joseph City	54[d]	31[d]	31	50[d]	37[d]
Kingman	51	55[d]	83[d]	43[d]	39[d]
Lake Havasu City	44	31[d]	31[d]	27	42
Miami (Jones Ranch)	43	20[d]	30	17[d]	47[d]
Miami (Fire Station)	99[d]	85	118	86	75
Montezuma Castle National Monument	30[d]	24[d]	33	27[d]	31
Morenci	47[d]	37	55	50	55[d]
Nelson	22[b]	18[d]	12[d]	37[d]	42
Nogales	88[d]	85[d]	85[d]	147[d]	121[d]

Table 20 (Cont'd)

Concentrations of Particulates in Non-Urban Areas of Arizona

Site	Annual Geometric Mean Concentration (ug/m^3)				
	1977	1978	1979	1980	1981
Organ Pipe Cactus National Monument	33	28[d]	31	36[d]	34
Page	37	25[d]	34	36	38
Parker	119[d]	114	44[d]	82[d]	76
Paul Spur (Housing Area)	-	-	395	381	354[d]
Prescott (Marina Street)	47	38[d]	41	39[c]	-
Prescott (CO. Maint. Yard)	-	-	-	-	76
Rillito	143[d]	100	132	114	112
Safford	143[d]	123	159	125	107
San Manuel	50	26	30	29	49
Show Low	64	70	93	62	66
Sierra Vista	63[d]	53	65	52[d]	53
Superior	96	69[d]	76	62[d]	54
Yuma	133	112[d]	139	126	121

Standard: 75 ug/m^3, annual geometric mean

Annual geometric mean concentrations of particulates reported from non-urban areas are shown in Table 21. Means below the standard of 75 ug/m^3 were reported for approximately 53 percent of the sites for all five years. An increase in concentrations from 1977 to 1981 was noted for Ajo, Douglas (City Park), Eagar, Hayden Jail and Nogales. Particulate concentrations decreased in Clarkdale, Miami (Fire Station), Parker, Paul Spur, Rillito, Safford, and Yuma over the five years. No definite trends were noted for Flagstaff and Florence.

Sulfur Dioxide

Annual average concentrations of sulfur dioxide for the past five years are presented in Table 22. Ajo, Douglas, and San Manuel reported no annual averages above the standard of 80 ug/m3. Montgomery Ranch at Hayden reported the highest annual averages across the five years. However, the annual averages at Hayden decreased 23 percent from 1977 to 1981. A 75 percent increase in sulfur dioxide concentrations was noted across the five years in Morenci.

Table 21

Average Concentrations of Sulfur Dioxide
in Smelter Areas of Arizona (ug/m3)

Site	1977	1978	1979	1980	1981
Ajo (Oxidation Pond)	24	43	51	42	65
Douglas (County Hospital)	48	55	67	45	67
Hayden (Montgomery Ranch)	180	133	158	93	139
Miami (Jones Ranch)	84	64	79	30	76
Morenci (Stargo)	80	78	75	98	138
San Manuel (Golf Course)	79	62	65	36	75

Standard: 80 ug/m^3, annual average

The number of 3-hour and 24-hour exceedances of sulfur dioxide air quality standards are presented in Table 23. An increased number of 3-hour exceedances in 1981 as compared to 1977 were reported for Douglas (+43%) and Morenci (+46%). Fewer numbers of 3-hour exceedances were noted for Hayden (-83%), Miami (-38%), and San Manuel (-55%) across the five years. In terms of 24-hour exceedances, Morenci showed a 147 percent increase from 1977 to 1981. Hayden and Miami reported 86 percent and 55 percent decreases, respectively.

Statewide, the number of exceedances of the sulfur dioxide standards decreased from 1977 to 1981. The 3-hour exceedances decreased by 31 percent, and the 24-hour exceedances decreased by 47 percent.

Table 22

Exceedances of Sulfur Dioxide Air Quality Standards*

City	Year	Number of 3-Hr. Exceedances	Number of 24-Hr. Exceedances
Ajo	1977	2	1
	1978	5	2
	1979	0	2
	1980	8	2
	1981	5	1
Douglas	1977	14	1
	1978	7	0
	1979	12	6
	1980	8	0
	1981	20	1
Hayden	1977	102	84
	1978	13	9
	1979	40	21
	1980	13	6
	1981	17	12
Miami	1977	50	22
	1978	34	14
	1979	56	21
	1980	13	5
	1981	31	10
Morenci	1977	61	17
	1978	44	11
	1979	27	5
	1980	73	28
	1981	89	42
San Manuel	1977	22	2
	1978	24	3
	1979	19	6
	1980	7	0
	1981	10	1
Statewide	1977	251	127
	1978	127	39
	1979	154	61
	1980	122	41
	1981	172	67

*Standards: 3-hour = 1300 ug/m^3
24-hour = 365 ug/m^3

APPENDIX B. Summary of Air Quality Standards and Emergency Episode Levels

SUMMARY OF AMBIENT AIR QUALITY STANDARDS - STATE AND FEDERAL STDS. (a)

In ug/m^3 (and ppm)

Pollutant	Averaging Time	Primary	Secondary
Carbon monoxide (b)	1-hr.	40 (35)	40 (35)
	8-hr.	10 (9)	10 (9)
Hydrocarbons	3-hr. (6-9 a.m.)	160 (.24)	160 (.24)
Nitrogen dioxide	Annual	100 (.05)	100 (.05)
Ozone	1-hr.	235 (.12)	235 (.12)
Particulates	24-hr.	260 (-)	150 (-)
	Annual (Geom. Mean)	75 (-)	60 (-)
Sulfur dioxide	3-hr.	---	1300 (.5)
	24-hr.	365 (.14)	---
	Annual	80 (.03)	---
Lead	Calendar Quarter	1.5 (-)	1.5 (-)

SUMMARY OF EMERGENCY EPISODE LEVELS - STATE AND FEDERAL

In ug/m^3 (and ppm)

Pollutant	Averaging Time	Alert	Warning	Emergency	Significant Harm
Carbon monoxide(b)	1-hr.	---	---	---	144 (125)
	4-hr.	---	---	---	86.3 (75)
	8-hr.	17 (15)	34 (30)	46 (40)	57.5 (50)
Nitrogen dioxide	1-hr.	1130 (.6)	2260 (1.2)	3000 (1.6)	3750 (2.0)
	24-hr.	282 (.15)	565 (.3)	750 (.4)	938 (.5)
Ozone	1-hr. State	400 (.2)	800 (.4)	1000 (.5)	1200 (.6)
	Federal	200 (.1)			
Particulates	24-hr.	375 (-)	625 (-)	875 (-)	1000 (-)
Sulfur dioxide	24-hr.	800 (.3)	1600 (.6)	2100 (.8)	2620 (1.0)
Sulfur dioxide(c) and particulates combined	24-hr.	65000 (-)	261000 (-)	393000 (-)	490000 (-)

(a) Standards are not be exceeded more than once per year with one exception. In the case of ozone, compliance is determined by the number of days on which the ozone standard is exceeded. The number of ozone exceedance days per year, based on a 3-year running average, is not to exceed 1.0.

(b) In mg/m^3 rather ug/m^3

(c) In $(ug/m^3)^2$

APPENDIX C. Glossary of Pollutants in the Ambient Air

Glossary of Pollutants Found In The Ambient Air

Benzene Soluble Organics

"Benzene soluble organics" is a term referring to that fraction of particulate matter which is soluble in benzene. Organic compounds which are formed during incomplete fuel combustion comprise the majority of benzene soluble organics. In Arizona the prime sources of these compounds are motor vehicle operation and wood burning.

Carbon Monoxide

Carbon monoxide is a colorless, odorless gas formed by incomplete combustion of fuels. The major source of carbon monoxide in the urban air is motor vehicle operation. Aggravation of angina pectoris and other cardiovascular diseases is its major effect on human health.

Hydrocarbons

Hydrocarbons, which are a group of compounds composed of carbon and hydrogen, are the constituents of gaseous and liquid fuels. As a result, motor vehicles, service stations and bulk fuel storage tanks are the chief origins of hydrocarbon emissions. At the concentrations found in ambient air, hydrocarbons are not harmful, but they react with nitrogen oxides to form ozone and other oxidants, substances known to be at deleterious levels in the atmosphere.

Lead

In Arizona lead originates primarily from motor vehicle operation due to the use of lead anti-knock compounds in gasoline. Lead concentrations are expected to stay at acceptable levels in the Phoenix area due to increased usage of unleaded gasoline stead of leaded gasoline. The health effects of lead include damage to the blood, the kidneys, and the nervous and reproductive systems in humans, resulting in anemia, brain and kidney diseases, and infertility.

Nitrates

Nitrates is a term referring to nitric acid and salts of nitric acid which are formed in the atmosphere by various complex reactions of nitrogen oxides with other substances. Nitrates exist as finely divided particulates which inhibit visibility, damage the respiratory system, exacerbate respiratory diseases, and soil and damage materials.

Nitrogen Dioxide

Nitrogen dioxide is a reddish-brown corrosive gas produced during high temperature fuel combustion. Power plants and motor vehicles generate the bulk of nitrogen dioxide in the atmosphere. It causes pulmonary edema and bronchitis in children.

Nitrogen Oxides

In air pollution terminology, nitrogen oxides include nitrogen dioxide and nitric oxide only. Both of these gases are emitted by the same major sources, namely, motor vehicles and power plants, as a result of high temperature fuel combustion. Nitrogen oxides react with hydrocarbons in the atmosphere to produce ozone and other oxidants.

Oxidants (Ozone)

Oxidants are oxygen-containing gases or vapors that are formed in the atmosphere by the reaction of hydrocarbons with nitrogen oxides. Since sunlight accelerates this reaction, it is referred to as the photochemical reaction and the products formed are sometimes referred to as photochemical oxidants. The principal oxidant is ozone, a pungent, bluish gas which is a triatomic form of oxygen. Oxidants irritate the eyes, nose, and throat, impair breathing, and limit physical exercise. These effects are more severe in persons with chronic lung and cardiovascular diseases.

Particulates

They are small solid particles or liquid droplets which are suspended in the atmosphere. Examples of particulates include dust, smoke, mist and fog. Particulates reduce visibility in the atmosphere, damage the respiratory system, aggravate respiratory diseases, and soil and damage materials. Major sources of particulates in Arizona are motor vehicle traffic on paved and unpaved roads and streets, construction activity, agriculture, wood burning, industrial and power generating plants, and windblown desert lands.

Sulfates

Sulfates are a group of compounds including sulfuric acid and salts of sulfuric acid which are emitted by power plants and copper smelters. They are also produced in the atmosphere by the oxidation of sulfur dioxide. Sulfates exist as small particles which cause the same effects on visibility, human health, and materials as noted above for nitrates and particulates.

Sulfur Dioxide

Sulfur dioxide is a heavy, acrid, colorless gas generated by combustion of sulfur-containing fuels in power generating and industrial plants. Another important source in Arizona is the smelting of sulfide ore in the copper industry. Aggravation of respiratory diseases is the primary health effect of sulfur dioxide. In addition, sulfur dioxide is a precursor for sulfates.

APPENDIX D. Air Sampling Techniques

AIR SAMPLING TECHNIQUES

Benzene Soluble Organics

Concentrations of benzene soluble organics are measured by subjecting particulate samples to a hot benzene extraction and determining the amount of particulates which dissolves in the benzene.

Carbon Monoxide

Carbon monoxide concentrations are monitored by two methods, infrared absorption or gas chromatography. The infrared absorption method is based on the fact that carbon monoxide absorbs infrared radiation at a wavelength at which other gases do not absorb infrared radiation.

The gas chromatographic technique utilizes a chromatographic column which separates carbon monoxide from other gases. Carbon monoxide is extracted from the column and converted to methane and the resulting methane is measured in a flame ionization detector.

Hydrocarbons (Non-methane)

Hydrocarbons (non-methane) are monitored by a gas chromatograph using a flame ionization detector. Ambient air is drawn into the chromatograph and divided into two air streams. One stream is passed directly into the flame ionization detector so that total hydrocarbons are measured. The other stream is passed through a chromatographic column in which methane is separated from other gases. Methane is then extracted from the column and measured in the flame ionization detector. Non-methane hydrocarbon concentrations are calculated by subtracting methane concentrations from total hydrocarbon concentrations. The reason for removing methane from consideration is that it is photochemically non-reactive. That is, it does not contribute to the formation of ozone and other oxidants.

Lead

Concentrations of lead are determined by means of nitric acid extraction of particulate samples followed by atomic absorption analysis of the nitric acid extract.

Nitrates

Nitrates analysis is performed through water extraction of particulate samples and specific ion electrode analysis of the water extract.

Nitrogen Dioxide

Three methods: bubbler, chemiluminescent and colorimetric, are utilized for nitrogen dioxide sampling. The bubbler method is a manual, non-continuous procedure whereas the other two methods are automated and continuous. In the bubbler method the air sample is bubbled through an impinger tube filled with an aqueous solution of sodium arsenite and sodium hydroxide for 24 hours. The impinger tube is delivered to the laboratory and the absorbing solution is analyzed colorimetrically.

The chemiluminescent technique is based on the catalytic conversion of nitrogen dioxide in the air sample to nitric oxide followed by chemiluminescent analysis of the effluent from the convertor for nitric oxide. This measurement represents the concentration of nitrogen dioxide plus nitric oxide in the sample. It is necessary to concurrently monitor the concentration of nitric oxide only by chemiluminescent analysis of that part of the air sample which bypasses the catalytic convertor. The nitric oxide concentration is substracted from the concentration of nitrogen dioxide plus nitric oxide to give the nitrogen dioxide concentration.

Oxidants (Ozone)

There are two acceptable methods for oxidants or ozone monitoring, ultraviolet (UV) absorption - photometry and chemiluminescence. In the UV analyzer, concentrations are determined by measuring the quantity of UV radiation absorbed by ozone in the air sample.

The chemiluminescent analyzer monitors ozone by detecting the amount of light emitted due to the reaction of ozone with ethylene.

Particulates

Particulate concentrations are measured by passing a metered flow of air for 24 hours through a pre-weighed 8 x 10 inch glass fiber filter. Particulates in the air sample are trapped on the filter which is delivered to the laboratory for reweighing. The gain in weight of the filter during sampling represents the quantity of particulates collected. The concentration is calculated by dividing the weight of particulates by the volume of air passed through the filter.

The filter is then divided into sections for chemical analysis for benzene soluble organics, sulfates, nitrates, lead and other metals.

Sulfates

Concentrations of sulfates are determined by water extraction of particulate samples followed by turbidimetric analysis of the water extract.

Sulfur Dioxide

In Arizona four methods of sampling are used, including the bubbler, coulometric, fluorescent and flame photometric methods. The bubbler method is a manual, non-continuous technique. The three other methods are continuous and automated. In the bubbler the sample is bubbled through an impinger tube filled with an aqueous solution of potassium chloride and mercuric chloride for 24 hours. After sampling, the solution is analyzed colorimetrically.

The coulometric method consists of scrubbing sample air in an aqueous solution of potassium bromide, bromine and sulfuric acid. Sulfur dioxide in the air sample reacts with bromine, causing a change in electrical potential at the anode. This voltage change is proportional to the amount of bromine which has reacted with sulfur dioxide. Thus, the voltage change is a direct indication of the sulfur dioxide concentration in the air sample.

In the fluorescent analyzer, sample air is drawn into a chamber and irradiated with ultraviolet light. Any sulfur dioxide in the air stream is excited to a higher energy state. The excited sulfur dioxide then reverts to a lower energy state by emitting radiation which is measured by a photomultiplier tube.

The flame photometer technique is similar to the fluorescent in that emitted radiation is proportional to the sulfur dioxide concentration. In the flame photometer, however, the radiation is emitted by excited sulfur molecules rather than sulfur dioxide molecules. Sulfur molecules are produced by passing sample air into a hydrogen flame where sulfur dioxide is converted to elemental sulfur. Sulfides must be removed by a scrubber before the air sample is passed into the hydrogen flame because they will also convert to elemental sulfur.