ADEQ

Arizona Department of Environmental Quality

Janet Napolitano, Governor
Stephen A. Owens, ADEQ Director

2007 AIR QUALITY ANNUAL REPORT

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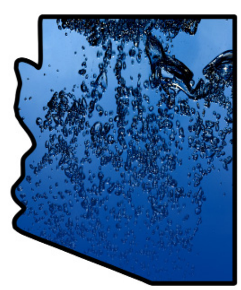

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Acknowledgments

Numerous agencies, companies, individuals and organizations have collected the ambient air quality monitoring data presented in this report. The Arizona Department of Environmental Quality (ADEQ) publishes data from these various sources to provide a picture that is as complete as possible of air quality conditions throughout Arizona and gratefully acknowledges the efforts of all involved. Generally, ambient data presented in this report are collected, processed and reported following U.S. Environmental Protection Agency (EPA) policies and procedures. Air quality data that ADEQ staff and contract operators collect have also received internal and external quality control and assurance checks. Data provided by other sources have been checked by the responsible organization but not by ADEQ.

Private individuals and companies under contract to ADEQ provided invaluable field sampler operation and data processing services in support of monitoring activities during 2006. Their efforts are appreciated as they maneuvered on rooftops and metal towers to operate monitoring equipment in uncomfortable weather conditions or review instrument performance and ambient monitoring data for technical accuracy. Field staff from other public agencies also operated numerous ambient monitoring sites in Arizona, providing spatial resolution and temporal coverage of air quality conditions statewide. ADEQ recognizes the efforts of these other monitoring and reporting agencies, and appreciates the opportunity to publish their data. Several industrial facilities collected and reported ambient air quality data to ADEQ, usually to satisfy permit requirements; their efforts are also acknowledged. Finally, ADEQ staff work daily installing, calibrating, maintaining, conducting quality control checks, collecting, processing, performing quality assurance tests and reporting data from a wide variety of ambient air monitoring instruments. ADEQ management wishes to thank these staff members for their dedication to maintaining and improving the quality of our program.

This report was prepared by ADEQ's Air Quality Assessment Section, which can be contacted at 1110 W. Washington St., Phoenix, AZ 85007, (602) 771-2274 or, toll free in Arizona at (800) 234-5677, then enter 771-2274. Our Web site is located at http://www.azdeq.gov/.

Introduction

This report presents the results of air quality monitoring conducted throughout Arizona in the 2006 calendar year. Data from more than 100 monitoring sites are included in this report. In addition to the ADEQ monitoring network, air quality agencies in Maricopa, Pima and Pinal counties also operated networks, as did several industrial facilities. Their data are summarized in this report. Many of the sites have multiple instruments measuring a variety of gaseous, particulate and visibility parameters. The majority of the air quality measurements are for criteria pollutants (ozone, particulate matter, sulfur dioxide, carbon monoxide, and nitrogen dioxide) for which EPA has established National Ambient Air Quality Standards (NAAQS). Visibility-related measurements are included from a statewide network of operators.

The report on Ambient Air Quality Monitoring Networks, which begins on Page 3, discusses the purpose, measurement methods and the specific scale of geographic resolution of each network of various air monitoring networks in Arizona.

Beginning on Page 16, the Monitoring Data report summarizes the monitoring data and shows the compliance status for criteria pollutants. It consists of three sections: measurement of traditional criteria pollutants, compliance status of the criteria pollutants, and visibility characterization. The text describes how the measurements are made and how they relate to compliance with the NAAQS.

The report on Special Projects and Accomplishments, which begins on Page 65, summarizes activities from special monitoring projects undertaken in the last few years which have continued into 2006. Some of the projects presented in this report are the Class I visibility monitoring network for larger national parks and wilderness areas, characterization of ozone precursors, and an intensive ambient monitoring and risk assessment project in the Yuma area.

The Air Quality Trends report begins on Page 78**.** Air quality trends at most of the long-term monitors reveal improved air quality. Concentrations of carbon monoxide and sulfur dioxide have improved dramatically since measurements began in the 1970s, and all monitors for these pollutants have shown compliance with health standards in recent years. Particulate matter (PM_{10}) concentrations have also improved in rural and industrial areas where controls have been implemented, while less dramatic improvements have occurred in the neighborhoods of Phoenix and Tucson. Ozone concentrations have been fairly steady in Tucson and Yuma (see Figures 11 and 12 in the Trends Section) but have generally decreased since 1997 in Phoenix. Recently, however, some sites such as West Phoenix and Apache Junction show an increasing trend (see Figure 13 in the Trends Section). On May 30, 2001, Maricopa County reached attainment for the 1-hour ozone standard. Effective June 15, 2004, the Phoenix area was designated basic nonattainment for the 8-hour ozone standard. Shorter periods of record for visibility in the urban and national parks and wilderness areas make trend assessments less definitive. Visibility trend assessments are shown for the urban areas of Phoenix and Tucson.

Ambient Air Quality Monitoring Networks

Figure 1 – Greer visibility monitoring site, located at 8,255 feet elevation in the Mt. Baldy Wilderness Area.

The federal Clean Air Act of 1970 required EPA to assist states and localities in establishing ambient air quality monitoring networks to characterize human health exposure and public welfare effects of criteria pollutants. The 1977 federal Clean Air Act (CAA) amendments required each state to implement a visibility monitoring network to cover specified national parks and wilderness areas. The Phoenix and Tucson metropolitan areas also have year-round visibility monitoring networks to assess urban haze. All of these networks are composed of individual monitoring sites; they are operated to collect ambient air quality data to ensure that Arizona citizens are able to know local air quality conditions and help ADEQ and local air quality control agencies identify the causes of polluted air.

Criteria Pollutant Monitoring Networks

The criteria pollutants are presently defined as carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), suspended particulate matter (PM), and total particulate lead (Pb). These pollutants are monitored with federal reference or equivalent methods that EPA has certified. Primarily due to the introduction of non-leaded gasoline, total particulate lead levels have been very low for years and lead is no longer monitored.

In December 2006, the Environmental Protection Agency made changes to both the PM_{10} and $PM_{2.5}$ NAAQS. The annual PM_{10} NAAQS was revoked and the 24-hour $PM_{2.5}$ NAAQS was reduced from 65 to 35 micrograms per cubic meter. In addition, EPA is currently soliciting comments on its proposed changes to the primary and secondary ozone NAAQS (see the Special Projects Section for details). The revised ozone NAAQS are scheduled to take effect in the spring of 2008.

Ambient monitoring networks for air quality are established to sample pollution in a variety of representative settings to assess health and welfare effects and to assist in determining air pollution sources. For each criteria pollutant, EPA specifies the monitoring objectives that define the parameters by which health exposure and public welfare are assessed and the measurement scale classifications that describe the influence of atmospheric movement at a given location.

The ambient monitoring networks cover both urban and rural areas of the state. The networks are designed to satisfy monitoring objectives and measurement scales defined in Tables 1 and 2. Additional monitoring network requirements were included in the revision of 40 CFR Part 58 Appendix D December 17, 2006. These requirements are based on Metropolitan Statistical Areas (MSAs) and Combined Statistical Areas (CSAs) and apply to $PM_{2.5}$, PM_{10}, and ozone. In addition, new requirements for sample frequency were made for $PM_{2.5}$ and PM_{10}.

The ambient monitoring networks are operated by government agencies and regulated companies. These networks are composed of one or more monitoring sites whose data are compared to the NAAQS for compliance and statistically analyzed in various ways for trends. The agency or company operating a monitoring network also tracks data recovery, quality control and quality assurance parameters for the instruments operated at their various sites. The agency or company may also measure meteorological variables at the monitoring site.

Table 1. Monitoring Objectives for Air Quality Monitoring Sites

Number	Definition
1	Determine highest concentrations expected to occur in the area covered by the network
2	Determine representative concentrations in areas of high population density
3	Determine the impact on ambient pollution levels of significant sources or source categories
4	Determine general background concentration levels
5	Determine the extent of regional pollutant transport among populated areas and in support of secondary standards
6	Determine the welfare-related effects in more rural and remote areas (such as visibility impairment and vegetation damage)

Table 2. Measurement Scales for Air Quality Monitoring Sites						
Measurement Scale *represents concentrations in air volumes within areas defined below*	Criteria Pollutant					
	Carbon Monoxide (CO)	Nitrogen Dioxide (NO_2)	Ozone (O_3)	Sulfur Dioxide (SO_2)	Particulate Matter (PM_{10}, $PM_{2.5}$)	Lead (Pb)
Micro (0 to 100 m)	X				X	X
Middle (~100 to 500 m)	X	X	X	X	X	X
Neighborhood (~0.5 to 4 km)	X	X	X	X	X	X
Urban (~4 to 50 km)		X	X	X	X	X
Regional (~10 to 100s of km)			X	X	X	X

In addition to sampling for criteria pollutants, some of the agencies do special continuous monitoring for the optical characteristics of the atmosphere and manual sampling of ozone-forming compounds and other hazardous air pollutants. Maricopa, Pima and Pinal counties operate networks primarily to monitor urban air pollution. In contrast, the industrial networks are operated to determine the effects of their emissions on local air quality. The National Park Service's network tracks conditions in and around national parks and monuments. The ADEQ state network monitors a wide variety of pollutant and atmospheric characteristics, including urban, industrial, rural and background surveillance.

The monitoring networks and their characteristics are shown in Table 3. A list of individual sites and monitoring parameters, based on the best available information at the time of publication, is presented in Appendix 1.

Table 3. Monitoring Networks Operating in Arizona				
Network Operator	Geographic Area Monitored	Monitoring Objective*	Measurement Scale(s)**	Pollutant(s) Monitored

Table 3. Monitoring Networks Operating in Arizona				
Network Operator	Geographic Area Monitored	Monitoring Objective*	Measurement Scale(s)**	Pollutant(s) Monitored
Arizona Department of Environmental Quality	Statewide	1, 2, 3, 4, 5, 6	Micro, Middle, Neighborhood, Urban, Regional	SO_2, O_3, NO_2, CO, PM_{10}, $PM_{2.5}$
Arizona Portland Cement Company	Rillito	1, 3	Neighborhood	PM_{10}
ASARCO LLC	Hayden	1, 2, 3	Middle, Neighborhood	SO_2
Maricopa County Air Quality Department	Phoenix urban area, Maricopa County	1, 2, 3, 4, 5, 6	Micro, Middle, Neighborhood, Urban, Regional	SO_2, O_3, NO_2, CO, PM_{10}, $PM_{2.5}$
National Park Service	National parks and monuments	3, 4, 5, 6	Urban, Regional	SO_2, O_3, NO_2, PM_{10}, $PM_{2.5}$
Phelps Dodge Miami Inc. (PDMI)	Miami	1, 2, 3	Neighborhood	SO_2, PM_{10}, $PM_{2.5}$
Phoenix Cement Company	Clarkdale	1, 3	Neighborhood	PM_{10}
Pima County Department of Environmental Quality	Tucson urban area, Pima County	1, 2, 3, 4, 5, 6	Micro, Middle, Neighborhood, Urban, Regional	SO_2, O_3, NO_2, CO, PM_{10}, $PM_{2.5}$
Pinal County Air Quality Control District	Pinal County, Phoenix urban area	1, 2, 3, 4, 5	Middle, Neighborhood, Urban, Regional	O_3, PM_{10}, $PM_{2.5}$
Salt River Project	Page	1, 3	Urban, Regional	NO_2, O_3, SO_2, PM_{10}, $PM_{2.5}$
Tucson Electric Power Company	Tucson and Springerville	1, 2, 3	Middle, Regional	SO_2, NO_2, PM_{10}, $PM_{2.5}$

**See Table 1 for a list of monitoring objectives*

***See Table 2 for a definition of measurement scales*

Visibility Monitoring Networks in National Parks and Wilderness Areas

The intent of the Class I visibility monitoring program is to characterize long-term trends as completely as possible using ambient visibility measurements within constraints of an area's size, terrain or logistics for each of the 12 federally protected Class I areas in Arizona (see Appendix 4). The objectives of the visibility monitoring network are to track short-term and long-term trends in Arizona Class I areas, to assist in identifying any visibility impairment caused by existing major industrial sources, and to provide monitoring data if necessary for new or major modifications of major industrial sources. Arizona continues to participate in the Interagency Monitoring of Protected Visual Environments (IMPROVE) Program as part of the overall national visibility monitoring effort. IMPROVE is a cooperative measurement effort between EPA, federal land management agencies and state air agencies. The objectives of IMPROVE are:

- To establish current visibility and aerosol conditions in mandatory Class I areas
- To identify chemical species and emission sources responsible for existing man-made visibility impairment
- To document long-term trends for assessing progress towards the national visibility goal
- With the enactment of the regional haze rule, to provide regional haze monitoring representing all visibility-protected federal Class I areas

Class I areas were designated based on an evaluation required by Congress in the 1977 federal Clean Air Act amendments. The evaluation, which the U.S. Forest Service and National Park Service performed, reviewed the wilderness areas of parks and national forests which were designated as wilderness before 1977 were more than 6,000 acres in size and have visual air quality as an important resource for visitors. Of the 156 Class I areas designated across the nation, 12 are located in Arizona.

The Arizona Class I visibility network consists of a combination of visibility monitoring sites established by ADEQ and those established by the IMPROVE committee. Monitoring has been conducted near or in the following Class I areas:

- Grand Canyon National Park - Hance Camp
- Grand Canyon National Park - Indian Gardens
- Petrified Forest National Park
- Mt. Baldy Wilderness - Greer Water Treatment Plant
- Sycamore Canyon Wilderness - Camp Raymond
- Mazatzal/Pine Mountain Wildernesses - Ike's Backbone
- Sierra Ancha Wilderness - Pleasant Valley Ranger Station
- Superstition Wilderness - Tonto National Monument
- Superstition Wilderness - Queen Valley

- Saguaro National Park - West Unit
- Saguaro National Park - East Unit
- Chiricahua National Monument - Entrance Station
- Galiuro Wilderness - Muleshoe Ranch (Site was closed in June of 2005)
- Hillside (Site was closed in June of 2005)
- Organ Pipe National Monument
- Meadview

Each IMPROVE site includes $PM_{2.5}$ sampling with subsequent analysis for the fine particle mass and major aerosol species, as well as PM_{10} sampling and mass analysis. Many of the sites also include optical monitoring with nephelometers or transmissometers and color photography to document scenic appearance.

More information about the IMPROVE procedures, sites and data can be found on the IMPROVE Web site at http://vista.cira.colostate.edu/improve/.

Urban Haze Networks

ADEQ monitors the Phoenix and Tucson metropolitan areas with a network of instruments to characterize and quantify the extent of urban haze. There are no established federal or state standards for acceptable levels of urban haze. ADEQ began studying the nature and causes of urban hazes by conducting a study in the winter of 1989-90 in Phoenix and the winter of 1992-93 in Tucson. These studies recommended long-term, year-round monitoring of visibility. In 1993, ADEQ began deploying visibility monitoring equipment in Phoenix and Tucson. These visibility monitoring data are needed to provide policymakers and the public with information, track short- and long-term trends, assess source contributions to urban haze and better evaluate the effectiveness of air pollution control strategies.

The current Phoenix urban haze network includes two transmissometers (located in Phoenix and Mesa) for measuring light extinction along a fixed path length of about 3 to 5 kilometers, four nephelometers for measuring light scattering, 5 digital camera systems to record visual characteristics of the urban area, and particulate filters for quantifying and characterizing particulate matter. The current Tucson urban haze network includes one transmissometer for measuring light extinction along a fixed path length of about 3 to 5 kilometers, 3 nephelometers for measuring light scattering, and a digital camera system operated by Pima County to record visual characteristics of the urban area. Operation of Phoenix and Tucson area urban haze particulate monitors was discontinued at the close of 2004. Data from active PM_{10} and $PM_{2.5}$ samplers will be used to characterize chemical composition and seasonal variation on an as needed basis.

The Web site for Phoenix area visibility is http://www.phoenixvis.net/ . The Web site for the Tucson camera system is http://www.airinfonow.org/.

Photochemical Assessment Monitoring Stations Network

Section 182(c)(1) of the 1990 Clean Air Act Amendments required the administrator to promulgate rules for the enhanced monitoring of ozone, oxides of nitrogen (NOx) and volatile organic compounds (VOCs) to obtain more comprehensive and representative data on ozone air pollution. Immediately following the promulgation of those rules, the affected states were to begin actions necessary to adopt and implement a program to improve ambient monitoring activities and the monitoring of emissions of NOx and VOCs. Each state implementation plan (SIP) for the affected areas must contain commitments to implement the appropriate ambient monitoring network for such air pollutants. The subsequent revisions to 40 CFR 58 (1993) required states to establish photochemical assessment monitoring stations (PAMS) as part of their SIP monitoring networks in ozone nonattainment areas classified as serious, severe or extreme. The principal reasons for requiring the collection of additional ambient air pollutant and meteorological data are the nationwide lack of attainment of the ozone NAAQS and the need for a more comprehensive air quality database for ozone and its precursors.

The chief objective of the enhanced ozone monitoring requirements is to provide air quality data that will assist air pollution control agencies in evaluating, tracking the progress of and, if necessary, refining control strategies for attaining the ozone NAAQS. Ambient concentrations of ozone and ozone precursors are used to make attainment and nonattainment determinations, aid in tracking VOC and NOx emission reductions, better characterize the nature and extent of the ozone problem, and examine air quality trends. In addition, data from the PAMS network provide an improved database for evaluating photochemical model performance, especially for future control strategy mid-course corrections as part of the continuing air quality management process. The data are particularly useful to states in ensuring the implementation of the most cost-effective regulatory controls.

The PAMS network array for an area should be fashioned to supply measurements that will assist states in understanding and solving ozone nonattainment problems. EPA has defined a number of important monitoring objectives with the following five site types:

- Type 1 Site: Upwind and Background Characterization
- Type 2 and 2a Sites: Maximum Ozone Precursor Emissions Impact
- Type 3 Site: Maximum Ozone Concentration
- Type 4 Site: Extreme Downwind Monitoring

PAMS data include measurements of O_3, NOx, a target list of VOCs including several carbonyls, and surface and upper air meteorology. Most PAMS sites measure 56 target hydrocarbons on either an hourly or three-hour basis during the ozone season. The Type 2 sites also collect data on three carbonyl compounds (formaldehyde, acetaldehyde and acetone) during the ozone monitoring period. Included in the monitored VOC species are 10 compounds classified as hazardous air pollutants. All stations must measure O_3, NOx and surface meteorological parameters on an hourly basis. Beginning in 2007, ADEQ will operate three PAMS sites: the ADEQ Phoenix Supersite (located near 17th Avenue and Campbell) in Central Phoenix (a Type 2 site); the wind profiler (upper air meteorology) site; and the Queen Valley site (Type 3). The South Phoenix site was changed to a toxics-monitoring site in 2007. SeeTable 4 for a history of PAMS data collection in the Phoenix metropolitan area.

Table 4: History of PAMS Monitoring in Metropolitan Phoenix

Year	VOCs	Carbonyls
2007	Phoenix Supersite Queen Valley	Phoenix Supersite
2006	Phoenix Supersite Queen Valley South Phoenix	Phoenix Supersite South Phoenix
2005	Phoenix Supersite Queen Valley South Phoenix	Phoenix Supersite South Phoenix
2004	Phoenix Supersite Queen Valley South Phoenix	Phoenix Supersite South Phoenix
2003	None	Phoenix Supersite Queen Valley South Phoenix
2002	Phoenix Supersite Queen Valley	Phoenix Supersite Queen Valley South Phoenix
2001	Phoenix Supersite Queen Valley	Phoenix Supersite Queen Valley
2000	Phoenix Supersite	Phoenix Supersite
1999	Phoenix Supersite	Phoenix Supersite

National Air Toxics Trend Sites (NATTS)

The NATTS network was designed to document the concentration of certain air toxics on a national scale. ADEQ accepted Federal funding in 2003 for participation in this program. Data from EPA's national monitoring activities will establish an estimate of national average concentrations for these air toxics compounds, allow

EPA to evaluate the need for new National Ambient Air Quality Standards (NAAQS), and establish associated limits. Data from sites in this trends network will be used to identify the probability that long-term changes or trends in ambient air concentrations are occurring. Using this information, EPA, states, and local agencies can estimate changes in the risks of human exposure. These changes can then be used to anticipate changes in environmental policy and to establish a regulatory stance. As part of the overall National Air Toxics Assessment (NATA) process, ambient air quality data are important to help assess the national toxics inventory and long-term hazardous air pollutant (HAP) trends. ADEQ's NATTS monitoring is conducted at the ADEQ Phoenix Supersite.

PM2.5 Chemical Speciation Network (CSN)

The Speciation Trends Network (STN) was established to meet the regulatory requirements for monitoring PM2.5 to determine the chemical composition of these particles. The network was established in 2000 with approximately 54 STN sites across the nation, as well as additional SLAMS speciation sites. The purpose of the network is to determine, over a period of several years, trends in concentration levels of selected ions, metals, carbon species, and organic compounds in PM2.5. Locations are primarily in or near larger Metropolitan Statistical Areas (MSAs). ADEQ operates one STN speciation sampler at the ADEQ Supersite. Two IMPROVE samplers are also operated at the ADEQ Supersite for the purpose of providing precision information for the IMPROVE network and to make comparisons between the speciation results from both programs. The STN is part of the larger Chemical Speciation Network (CSN) that includes IMPROVE sites.

Semi-continuous PM2.5 Speciation Network

ADEQ is a participant in an EPA pilot study of semi-continuous speciation monitors being evaluated at five Speciation Trends Network (STN) sites in the United States. The pilot study began early in 2002 with newly established monitoring in Seattle, Washington; Phoenix, Arizona; Houston, Texas; Chicago, Illinois; and Indianapolis, Indiana. The goals of the pilot study are to assess the operational characteristics and performance of semi-continuous carbon, nitrate, and sulfate monitors for routine application at STN sites; to work with the pilot participants and the vendors to improve the measurement technologies used; and to evaluate the use of an automated data collection and processing system for real time display and reporting. ADEQ currently operates a Sunset Labs OC/EC carbon analyzer and 8400 Nitrate analyzer at the Supersite.

Annual Ambient Air Monitoring Network Plan

In December 2006, EPA expanded the requirements of the former network review in the revisions to 40 CFR §58.10(a). The requirements describe a network plan that must be available to the public for a thirty day comment period followed by approval by EPA. The plan includes detailed descriptions of sites and monitors to determine if siting requirements are met. The plan must also ensure that the revised minimum monitoring requirements for the network are met and must describe any proposed changes to the network to be made during the coming year. This annual plan must be submitted to EPA Region 9 by July 1 of each year for approval.

40 CFR, Part 51 requires states to create, submit and adopt State Implementation Plans (SIPs) to address the various issues and responsibilities involved with creating and implementing air quality programs. Subpart J of Part 51 specifies that Part 58 Subpart C contains the requirements for establishing air quality surveillance systems to monitor ambient air quality.

Air quality surveillance systems consist of networks of monitors at carefully-chosen physical locations referred to as sites or stations. Some of the networks, sites and monitors are:

- State and Local Air Monitoring Stations (SLAMS)
- National Core multipollutant monitoring stations (NCore)
- Photochemical Assessment Monitoring Stations (PAMS)
- Speciation Trends Network (STN)
- National Air Toxics Trends Sites (NATTS)
- Special Purpose Monitors (SPM)
- Urban Haze monitoring sites
- Interagency Monitoring of PROtected Visual Environments (IMPROVE)
- ADEQ visibility stations located in or near mandatory Class I areas (national parks, wilderness areas). Class I monitoring sites are subject to specific siting and operational guidance developed by the IMPROVE Steering Committee
- AIRNow information sites
- Source-oriented monitoring sites operated independently by permittees (Industry)
- Meteorological sites.

The Annual Monitoring Network Plan identifies the purpose(s) of each monitor and provides evidence that both the siting and the operation of each monitor meet the requirements in 40 CFR Part 58 appendices A, C, D, and E as follows:

- Appendix A – Quality Assurance Requirements for SLAMS, SPMs, and PSD (Prevention of Significant Deterioration) Air Monitoring
- Appendix C – Ambient Air Quality Monitoring Methodology
- Appendix D – Network Design Criteria for Ambient Air Quality Monitoring
- Appendix E – Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring

Results of the annual network review and planning are used to determine how well the network is achieving its required air monitoring objectives, how well it meets data users' needs, and how it should be modified (through termination of existing stations, relocation of stations, establishment of new stations, monitoring of additional parameters, and/or changes to the sampling schedule) in order to continue to meet its objectives and data needs. The network review and planning are performed for the purpose of improving the network and ensuring that it provides adequate, representative, and useful air quality data.

The regulations also require a network assessment to be made every 5th year. This assessment includes specific operational details such as cost and labor to determine how effective the monitoring network is.

Monitoring Methods

The gaseous criteria pollutants (SO_2, O_3, NO_2 and CO), PM_{10} and $PM_{2.5}$ (TEOMs and BAMs), and optical characteristics of the atmosphere (total light extinction, light absorption by gases, light scattering by particles and light absorption by particles), are monitored with continuous analyzers taking approximately one pollutant sample per second. These values are averaged on an hourly basis and recorded to the correct number of significant digits, based on the form of the air quality standards and the detection limits of the instrument. In most cases, the hourly data are summarized into the appropriate multi-hour averages. The agency or company network operators conduct regular checks of the stability, reproducibility, precision, bias and accuracy of these instruments. Precision, bias and accuracy of ambient data are assessed across an entire network using statistical tests required by EPA.

Particulate matter, PM_{10} and $PM_{2.5,}$ is usually sampled for 24 hours, from midnight to midnight, most often on every sixth day. Using a timer, ambient air is drawn through an inlet of a specified design at a known flow rate onto a filter that collects all PM less than a diameter specified by the inlet design. The filters are weighed before and after the sample period to determine the difference in mass and then divided by the product of the flow rate with the elapsed time to arrive at a mass per unit volume concentration. Some filters are subjected to chemical analysis to determine the amount of various analytes and integrated with the flow rate and timer information to calculate their concentrations. These data are summarized into the appropriate quarterly or annual averages. These samplers are also certified as federal reference or equivalent methods. The agency or company network operators perform regular checks of the stability, reproducibility, precision, bias and accuracy of the samplers and laboratory procedures. Again, precision, bias and accuracy of ambient data are assessed across an entire network using statistical tests that EPA requires.

Visibility monitoring methods are generally divided into the three groups of optical, scene and aerosol (PM). Monitoring of visibility requires qualitative and quantitative information about the causes of haze (e.g., what is in the air, the formation, transport and deposition of pollutants) and the nature of haze (the optical effects of those pollutants to the observer). Scene conditions of visual air quality associated with haze are recorded with a camera. To document scene conditions in the Phoenix area, ADEQ is currently utilizing digital camera systems reported to the public via a Web site.

Quantitative measurement of light extinction (B_{ext}) has four components:

- Light scattering by gases (B_{sg})
- Light absorption by gases (B_{ag})
- Light scattering by particles (B_{sp})
- Light absorption by particles (B_{ap})

Mathematically, the relationship is expressed as $B_{ext} = B_{sg} + B_{ag} + B_{sp} + B_{ap}$, where the units are inverse megameters (Mm^{-1}), or the amount of light removed per million meters of distance a viewer looks through.

Total optical light extinction (B_{ext}) is measured directly with a device called a transmissometer. The transmissometer generates visible light in the same wavelength (550 nanometers) as the human eye detects and then transmits that light beam over a sight path of several kilometers to a photocell detector. The transmissometer's design and operation allow its data to be directly correlated with human perception of visibility through the atmosphere. Transmissometer data are also used to check the general accuracy of the sum of the components of light extinction as measured by other continuous monitors. Transmissometers have been operated in Phoenix and Tucson since 1993.

Light scattering by gases (B_{sg}) is a function of air density and is unrelated to air pollution sources. This parameter is derived and does not require measurement. In contrast, the other three components of light extinction are human-caused and require measurement with continuous monitors.

Light absorption by gases (B_{ag}) is determined by continuously measuring nitrogen dioxide (NO_2) since it is the only gas normally present in urban or Class I areas that absorbs significant quantities of visible light. Several EPA reference or equivalent method NO_2 monitors are deployed to verify maintenance of the NAAQS throughout Arizona, including monitoring at Tucson, Phoenix, Queen Valley and Tonto National Monument, while the National Park Service network tracks NO_2 at several national parks in Arizona.

Light scattering by particles (B_{sp}) is determined by continuously, directly measuring particle scattering variation in a calibrated ambient sampling chamber called a nephelometer. The nephelometer samples air at ambient temperature and relative humidity conditions. Routine monitoring with this instrument began in both the Class I area and urban haze networks during 1996.

Light absorption by particles (B_{ap}) is determined continuously utilizing an aethalometer, which measures the quantity of light transmitted through a filter tape. Routine data collection using the aethalometer began in December 1996 in Phoenix and February 1998 in Tucson. B_{ap} is also measured intermittently using the PM sample filters collected in the Class I area networks.

Monitoring Data

Introduction

Air quality measurements in Arizona can be divided into categories: criteria pollutants, visibility, and photochemical monitoring. Each category is discussed below. EPA has set National Ambient Air Quality Standards (NAAQS) for the criteria air pollutants monitored in Arizona: carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter with aerodynamic diameter ≤ 10 microns (PM_{10}), and particulate matter ≤ 2.5 microns ($PM_{2.5}$). These pollutants are monitored in Arizona by industry, county air pollution districts, the National Park Service, tribes and ADEQ. The 2006 data measurements by criteria pollutant begin below. The data tables in this section are organized by county. Site operator information can be found in the Site Index tables in Appendix 1. Data recovery information (valid samples as a percent of total scheduled samples) is included in the tables. The number and the percentage of valid samples are important for determining the representativeness of the average data calculations. Information about the compliance requirements and status for the criteria pollutants begins on Page 36. Visibility monitoring information is presented beginning on Page 58.

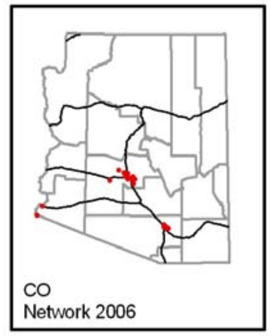
Figure 2 – ADEQ's Phoenix James L. Guyton Supersite monitoring station.

Criteria Pollutants - 2006 Data

Carbon Monoxide

Carbon monoxide (CO) - a colorless, odorless, tasteless gas that is produced in the incomplete combustion of fuels - has a variety of adverse health effects that arise from its ability to chemically bind to blood hemoglobin. CO successfully competes with oxygen for binding with hemoglobin and thereby impairs oxygen transport. This impaired transport leads to several central nervous system effects, such as the impairment of time interval discrimination, changes in relative brightness thresholds, increased reaction time, headache, fatigue, and dizziness. Chronic CO exposures also contribute to or exacerbate arteriosclerotic heart disease.

In Arizona's metropolitan areas, about half of the CO emission comes from on-road motor vehicles; somewhat less than half from off-road vehicles, construction equipment, lawn and garden equipment; with the remainder from point and area sources. This pollutant has low background levels, with highest concentrations next to busy streets, and has elevated neighborhood concentrations in locations that have significant amounts of emissions transported from upwind areas. Its concentrations peak from November to January because its emissions are highest in cold weather - automotive emissions of CO vary inversely with temperature - and because the surface layer of the atmosphere is at its most stable in wintertime. Hourly concentrations tend to be at their maximum during the morning rush hour and between 6 PM and midnight.



Controls have reduced CO emissions, and the standards have been achieved in the metropolitan Phoenix area since 1996, in stark contrast to the first half of the 1980s, when more than 100 exceedances were recorded each year. Similar improvements have occurred in Tucson, where the last eight-hour exceedances were recorded in 1988. Equipping vehicles with catalytic converters and electronic ignition systems was the most effective control, but significant reductions can also be attributed to the vehicle inspection program (beginning in 1976) and oxygenated fuels (beginning in 1989).

CO is monitored continuously with non-dispersive infrared instruments that are deployed in urban neighborhoods and near busy roadways or intersections. In 2006, 14 monitors were operated in greater Phoenix; 6 monitors were operated in metropolitan Tucson. Monitors in Apache Junction and Casa Grande were closed during 2002. Table 5 presents the 2006 CO data.

Table 5: 2006 Carbon Monoxide (in ppm) ***(NAAQS 1-hour 35 ppm, 8-hour 9 ppm)***						
Site or City	**One-Hour Average Value**		**Eight-Hour Average Value**		**Valid Data Recovery***	
	Max Value	**2nd High**	**Max Value**	**2nd High**	**No. of Obs.**	**%**
Maricopa County						
Buckeye [S]	1.2	1.2	0.7	0.6	4674	92
Central Phoenix	6.0	4.8	3.8	3.2	8576	98
Dysart [S]	1.3	1.3	0.9	0.8	5004	98
Glendale [S]	3.8	2.9	1.9	1.8	4996	98
Greenwood	6.3	5.2	3.6	3.5	8345	95
JLG Supersite	5.3	4.5	3.0	2.9	8721	99
Mesa [S]	4.1	3.5	2.8	2.0	5012	99
North Phoenix [S]	3.5	3.3	2.0	1.9	5031	99
South Phoenix [S]	5.2	4.7	3.2	2.7	5025	99
South Scottsdale [S]	5.5	3.1	2.1	1.9	5009	98
Tempe [S]	3.7	3.4	2.5	2.4	5022	99
West Chandler [S]	2.7	2.6	2.2	2.0	5027	99
West Indian School RD	7.8	7.7	5.3	4.5	8541	98
West Phoenix	7.2	6.5	5.0	4.6	8598	98
Pima County						
22nd St. & Alvernon	3.4	3.4	2.0	1.8	8716	99
22nd St. & Craycroft	3.2	2.9	1.6	1.4	8723	99
Cherry & Glenn [S]	3.4	3.3	2.3	2.0	5044	99
Children's Park	1.7	1.7	1.1	1.0	8713	99
Golf Links & Kolb [S]	3.8	2.9	1.8	1.6	5076	99
Tucson Downtown	2.9	2.6	1.4	1.2	8717	99

* **Valid Data Recovery** shows the number of valid observations and the percentage of the possible 8760 hourly samples during the year (always less than 100% due to mandatory quality assurance testing requiring the monitors to be off-line for several hours at a time).

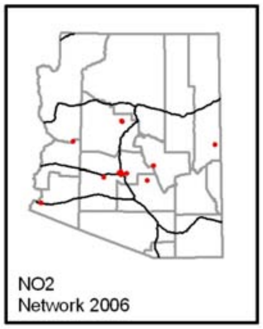
[S] Seasonal monitor, operational during January 1 to April 1 and September 1 to December 31; 5088 sampling hours in non leap years.

Exceptions:
Pima County seasonal monitors operated January 1 - April 30 and October 1 - December 31; 5088 sampling hours in non leap years.

Nitrogen Dioxide

Nitrogen dioxide (NO_2) is a reddish-brown gas that is formed by the oxidation of nitric oxide (NO) -- a byproduct of all combustion. At the lowest NO_2 exposure levels at which adverse health effects have been detected, respiratory damage has been observed: destruction of cilia, alveolar tissue disruption and obstruction of the respiratory bronchioles. Animal studies suggest that NO_2 may be a causal or aggravating agent in respiratory infections. However, community exposure studies to lower ambient levels of NO_2 have demonstrated no significant links with respiratory symptoms or disease.

This pollutant is of greater concern in its reduction of visibility (it causes 5 percent of the visibility reduction in Phoenix) and in its contributory role in the photochemical formation of ozone.



Combustion emissions of nitrogen oxides are 95 percent nitric oxide and 5 percent NO_2. Because nitric oxide is rapidly oxidized to nitrogen dioxide, nitric oxide emissions serve as a surrogate for NO_2. In a recent Phoenix emissions inventory, the transportation sector dominated nitric oxide emissions: 58 percent of the emissions came from cars and trucks, 27 percent came from off-road vehicles such as trains and diesel-powered construction vehicles, and 15 percent from other sources, including power plants, biogenic emissions from soil and stationary combustion sources. Nitric oxide and NO_2 concentrations are highest near major roadways. Nitric oxide concentrations decrease rapidly with distance from the roadway, whereas NO_2 concentrations are more evenly distributed because of their formation through oxidation and their subsequent transport. Concentrations of NO_2 are highest in the late afternoon and early evening of winter, when rush hour emissions of nitric oxide are converted to NO_2 under relatively stable atmospheric conditions. Because nitric oxide reacts rapidly with ozone, nocturnal ozone concentrations in cities are often reduced to near-zero levels. This nitric oxide scavenging of ozone does not occur in remote areas. Nocturnal ozone concentrations at background sites are high compared with the urban concentrations.

Nitrogen oxides emissions from motor vehicles have been reduced through retardation of spark timing, lowering the compression ratio, exhaust gas recirculation systems and three-way catalysts. The vehicle inspection program, with its NOx test for light-duty gasoline vehicles 1981 and newer (in Phoenix only) has also helped. Reformulated gasolines also decrease nitrogen oxides emissions: Federal Phase II gasoline, by 1.5 percent for vehicular and 0.5 percent for off-road equipment; California Phase 2 gasoline, by 6.4 percent for vehicular and 7.7 percent for off road equipment.

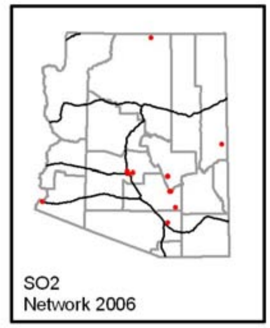
NO_2 is monitored continuously with chemiluminescence instruments, which also determine nitric oxide (NO) concentrations and NOx (the sum of NO_2 and NO) concentrations. These instruments are located in urban neighborhoods where either the emissions are dense or where ozone concentrations tend to be at their maximum. In addition, these monitors are located near major coal-fired electrical power plants. Eleven monitors were operated in Arizona in 2006. Table 6 presents the NO_2 data available in 2006.

Table 6: 2006 Nitrogen Dioxide (in ppm) ***(NAAQS Annual Mean 0.053 ppm)***				
Site or City	**Annual Average**	**Maximum Value**	**Valid Data Recovery ***	
		One-Hour Average	**No. of Obs.**	**%**
Apache County				
Springerville – Coyote Hills	0.0010	0.018	8550	98
La Paz				
Alamo Lake [S]	0.0026	0.013	5091	99
Maricopa County				
Buckeye	0.0111	0.047	8152	93
Central Phoenix	0.0251	0.085	8533	97
Greenwood	0.0306	0.111	8330	95
JLG Supersite	0.0224	0.067	8672	99
South Scottsdale	0.0192	0.065	8086	92
West Phoenix	0.0238	0.092	8474	97
Pima County				
22nd St. & Craycroft	0.0157	0.051	8643	99
Children's Park	0.0148	0.054	8611	98
Yuma County				
Yuma Game & Fish	0.0104	0.067	8483	97

* **Valid Data Recovery** shows the number of valid observations and the percentage of the possible 8760 hourly samples during the year (always less than 100% due to mandatory quality assurance testing requiring the monitors to be off-line for several hours at a time).

[S] Seasonal Monitor:
April through October – 5136 hours

Sulfur Dioxide
Exposure to sulfur dioxide (SO_2), a colorless gas with a pungent, irritating odor at elevated concentrations, alters the mechanical function of the upper airway, including increasing the nasal flow resistance and decreasing the nasal mucus flow rate. Short-term exposures result in an exaggerated air flow resistance in about 10 percent of the subjects tested and produce acute bronchioconstriction in strenuously exercising asthmatics.



In Arizona, the principal source of SO_2 emissions has been the smelting of sulfide copper ore. Most fuels contain trace quantities of sulfur, and their combustion releases both gaseous SO_2 and particulate sulfate (SO_4^{--}). A recent emissions inventory for Phoenix shows 32 percent of SO_2 emissions come from point sources, 26 percent from area sources, 23 percent from off-road vehicles and equipment, and 19 percent from on-road motor vehicles. SO_2 is removed from the atmosphere through dry deposition on plants and its conversion to sulfuric acid and eventually to sulfate. SO_2 has extremely low background levels, with elevated concentrations found downwind of large point sources. Concentrations in urban areas are low and are homogeneously distributed, with annual averages varying from 3 to 10 $\mu g/m^3$, well within the annual standard of 80 $\mu g/m^3$.

Major controls were installed in Arizona's copper smelters in the 1980s, which reduced SO_2 emissions substantially. Vehicular emissions of SO_2 and sulfate have been reduced through lowering the sulfur content in diesel fuel and gasoline.

SO_2 is monitored continuously with pulsed fluorescence instruments, most of which are clustered around copper smelters or coal-fired electric power plants. In 2006, ten reporting monitors were sited near copper smelters, one near a power plant and four in urban areas. Table 7 presents the SO_2 data collected in Arizona in 2006 from the monitors near copper smelters and in urban areas.

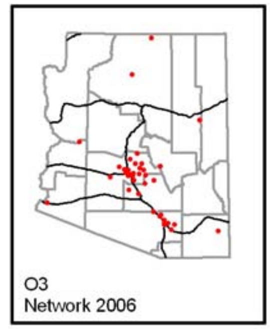
Table 7: 2006 Sulfur Dioxide (in ppm) *(Primary NAAQS Annual Average 0.030 ppm [80 µg/m³], 24-hour Average 0.14 ppm [365 µg/m³] Secondary NAAQS 3-hour 0.5 ppm [1300 µg/m³])*							
Site or City	**Annual Average**	**Maximum Value**				**Valid Data Recovery ***	
		3-Hour Average		**24-Hour Average**			
		Max Value	**2nd High**	**Max Value**	**2nd High**	**No. Obs.**	**%**
Apache County							
TEP – Springerville – Coyote Hills	0.0003	0.011	0.009	0.004	0.003	8523	97
Gila County							
ASARCO – Globe Hwy.	0.0150	0.402	0.381	0.092	0.083	8623	98
ASARCO – Hayden – Garfield AVE	0.0080	0.325	0.310	0.106	0.100	8660	99
ASARCO – Montgomery Ranch	0.0170	0.261	0.258	0.081	0.069	8606	98
Hayden– Old Jail, ADEQ	0.0084	0.170	0.161	0.045	0.039	8700	99
Hayden– Old Jail, ASARCO	0.0060	0.256	0.238	0.036	0.033	8638	99
Miami – Ridgeline	0.0048	0.111	0.099	0.032	0.031	8620	99
PDMI – Miami – Jones Ranch	0.0060	0.184	0.168	0.043	0.041	8690	99
PDMI –Miami–Town Site	0.0060	0.127	0.099	0.028	0.022	8758	99
Maricopa County							
Central Phoenix	0.0021	0.015	0.013	0.007	0.007	8421	96
JLG Supersite	0.0023	0.009	0.008	0.006	0.006	8709	99
South Scottsdale	0.0018	0.017	0.011	0.006	0.006	8350	95
Pima County							
22nd St. & Craycroft	0.0011	0.009	0.009	0.004	0.003	8669	99
Pinal County							
ASARCO - Hayden Jct.	0.0050	0.151	0.129	0.023	0.021	8605	98
San Manuel	0.0020	0.015	0.014	0.007	0.005	8668	99

* **Valid Data Recovery** shows the number of valid observations and the percentage of the possible 8760 hourly samples during the year (always less than 100% due to mandatory quality assurance testing requiring the monitors to be off-line for several hours at a time).

Note: Sulfur dioxide conversion factor: ppm = (µg/m3) / 2620.

Ozone

Ozone (O_3) - a colorless, slightly odorous gas - is both a natural component of the atmosphere, through its photochemical formation from natural sources of CO, hydrocarbons and nitrogen oxides, and an important air contaminant in urban atmospheres. In the stratosphere, O_3 blocks harmful ultraviolet radiation. In the urban atmosphere, its formation from anthropogenic emissions of hydrocarbons and nitrogen oxides leads to concentrations harmful to people, animals, plants and materials. O_3 causes significant physiological and pathological changes in both animals and humans at concentrations present in many urban environments. Short-term (one to two hours) exposures to concentrations in the range of 0.1 to 0.4 parts per million induce changes in lung function, including increased respiratory rates, increased pulmonary resistance, decreased tidal volumes and changes in lung mechanics. Symptomatic responses in exercising adults include throat dryness, chest tightness, substernal pain, cough, wheeze, pain on deep inspiration, shortness of breath and headache. These symptoms also have been observed at lower concentrations for longer exposures. Evidence suggests that O_3 exposure makes the respiratory airways more susceptible to other bronchioconstrictive challenges. Animal studies suggest that ozone exposure interferes with or inhibits the immune system. O_3 at ambient concentrations injures the stomates, which are the cells that regulate plant respiration, resulting in flecks on the upper leaf surfaces of dichotomous plants and the death of the tips of coniferous needles. O_3 is considered by plant scientists to be the most important of all of the phytotoxic air pollutants, causing over 90 percent of all plant injury from air pollution on a global basis. There is no limit below which no plant damage occurs.



O_3, formed photochemically by the reaction of volatile organic compounds and nitrogen oxides, has elevated concentrations only in the summer. Volatile organic compound (VOC) emissions in greater Phoenix come from cars and trucks (31 percent), off-road vehicles and equipment such as lawn mowers (27 percent), small stationary sources (20 percent), biogenic emissions from grass, shrubs and trees (17 percent) and point sources (5 percent). NOx comes from cars and trucks (58 percent), off-road vehicles such as construction equipment and trains (27 percent), electric power plants (7 percent), small stationary sources (4 percent) and biogenic emissions from soil (4 percent). O_3 has relatively high background levels, with the daily maximum in remote areas being about one-half to three-quarters of the daily maximum in the urban areas. In an urban area, the highest O_3 concentrations tend to occur on the downwind edge, although high concentrations do occur less frequently in the central city. High O_3 concentrations are a summer phenomenon caused when sunlight, biogenic emissions, and evaporative hydrocarbon emissions peak. Urban O_3 concentrations are low to near zero at night, rise rapidly through the morning and peak in the afternoon.

Controls to reduce the precursors of ozone - VOC and NOx - have been successfully implemented for years. NOx and VOC from vehicular exhaust have been reduced through engine modifications and three-way catalytic converters. Evaporative hydrocarbons from vehicles have been reduced through better engineered fuel tanks and auxiliary plumbing combined with carbon absorption canisters. Additional reductions of vehicular VOC have come through ADEQ's vehicle inspection program, which tests all gasoline vehicles for hydrocarbons (Phoenix and Tucson), through vapor-capturing equipment for gasoline tankers, vapor recovery systems at retail gas stations (Phoenix area only) and cleaner burning gasoline (Phoenix area only). Stationary source hydrocarbons have been reduced through a variety of better control equipment required by stricter regulations. Despite these efforts, the continued population growth in Arizona combined with the high natural background O_3, may make achieving the eight-hour standard difficult.

Ultraviolet absorption instruments monitor O_3 continuously in urban neighborhoods for population exposure, areas downwind of urban areas for maximum concentration, and remote areas for background. In 2006, 35 reporting O_3 monitors were in operation; five for background, 25 for urban neighborhoods and 10 for maximum concentrations downwind of urban areas. Tables 8 and 9 present the 2006 Arizona O_3 data.

Table 8: 2006 Ozone (in ppm), One-Hour Averages
(NAAQS 1-hour 0.12 ppm)

Site or City	Max Value	2nd High	3rd High	4th High	Valid Data Recovery*	
					No. Of Days	%
Cochise County						
Chiricahua NM Entrance	0.081	0.081	0.078	0.076	355	97
Coconino County						
Grand Canyon NP Hance	0.081	0.078	0.076	0.076	362	99
Gila County						
Tonto NM [S]	0.099	0.097	0.096	0.096	214	100
La Paz						
Alamo Lake [S]	0.079	0.078	0.078	0.075	214	99
Maricopa County						
Blue Point	0.076	0.075	0.074	0.071	363	99
Buckeye [S]	0.082	0.080	0.075	0.074	213	99
Cave Creek[S]	0.102	0.102	0.096	0.089	214	100

Table 8: 2006 Ozone (in ppm), One-Hour Averages *(NAAQS 1-hour 0.12 ppm)*						
Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Valid Data Recovery***	
					No. Of Days	**%**
Central Phoenix	0.111	0.099	0.097	0.097	364	99
Dysart [S]	0.086	0.085	0.083	0.083	214	100
Falcon Field [S]	0.104	0.100	0.099	0.098	214	100
Fountain Hills	0.105	0.102	0.101	0.100	365	100
Glendale [S]	0.097	0.094	0.091	0.091	202	94
Humboldt Mt. [S]	0.099	0.091	0.086	0.086	212	99
JLG Supersite	0.103	0.097	0.097	0.095	365	100
North Phoenix	0.111	0.109	0.103	0.099	364	99
Pinnacle Peak	0.097	0.095	0.089	0.089	357	98
Rio Verde [S]	0.118	0.101	0.100	0.098	213	99
South Phoenix	0.083	0.080	0.077	0.074	359	98
South Scottsdale	0.108	0.100	0.099	0.098	364	99
Tempe [S]	0.107	0.105	0.095	0.091	213	99
West Chandler [S]	0.103	0.100	0.099	0.099	214	100
West Phoenix	0.117	0.100	0.098	0.098	359	98
Navajo County						
Petrified Forest NP	0.093	0.080	0.079	0.077	311	85
Pima County						
22nd & Craycroft	0.082	0.079	0.078	0.078	365	100
Children’s Park	0.082	0.081	0.080	0.079	362	99
Coachline	0.083	0.082	0.080	0.079	365	100
Green Valley	0.083	0.079	0.077	0.075	365	100
Rose Elementary	0.075	0.075	0.075	0.074	362	99
Saguaro National Park East	0.087	0.086	0.085	0.081	365	100
Tangerine	0.088	0.086	0.083	0.081	365	100
Tucson Downtown	0.082	0.082	0.078	0.078	365	100
Tucson Fairgrounds	0.083	0.082	0.077	0.075	362	99
Pinal County						
Apache Junction Maintenance Yard	0.106	0.105	0.104	0.097	358	98
Casa Grande Airport	0.083	0.083	0.082	0.080	348	95
Queen Creek [S ##]	0.095	0.091	0.089	0.086	213	99

Table 8: 2006 Ozone (in ppm), One-Hour Averages *(NAAQS 1-hour 0.12 ppm)*						
Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Valid Data Recovery***	
					No. Of Days	**%**
Maricopa [S]	0.087	0.080	0.074	0.074	204	95
Pinal Air Park [S]	0.083	0.079	0.077	0.076	213	99
Queen Valley [S]	0.110	0.103	0.094	0.091	214	100
Yuma County						
Yuma Game & Fish [S]	0.088	0.087	0.083	0.080	214	100

*** Valid Data Recovery** shows the number of days with at least 75 percent (18 or more hours) of valid data recovery. It also shows the percentage of the total number of scheduled sampling days that meet that criterion. Scheduled sampling days for non-seasonal monitors in 2006 was 365.

[S] Seasonal monitor, operational during April 1 to November 1; 214 scheduled sampling days in the season.

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Table 9: 2006 Ozone (in ppm), Eight-Hour Averages *(NAAQS 8-hour 0.08 ppm)* **Bold** denotes the 4th highest value exceeds the eight-hour NAAQS.							
Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Daily Exceed-Ances**	**Valid Data Recovery ***	
						No. of Days	**%**
Cochise County							
Chiricahua NM Entrance	0.076	0.075	0.075	0.074	0	351	96
Coconino County							
Grand Canyon NP Hance	0.077	0.074	0.071	0.070	0	360	99
Gila County							
Tonto NM [S]	0.089	0.085	0.081	0.081	2	214	100
La Paz							
Alamo Lake [S]	0.076	0.074	0.073	0.073	0	214	100
Maricopa County							
Blue Point	0.064	0.063	0.062	0.062	0	363	99
Buckeye [S]	0.072	0.068	0.067	0.067	0	210	98
Cave Creek[S]	0.088	0.083	0.082	0.080	1	214	100
Central Phoenix	0.089	0.083	0.081	0.080	1	362	99
Dysart [S]	0.079	0.076	0.075	0.072	0	214	100
Falcon Field [S]	0.085	0.082	0.082	0.079	1	214	100
Fountain Hills	0.089	0.086	0.086	0.084	3	364	100
Glendale [S]	0.084	0.083	0.079	0.078	0	201	94
Humboldt Mt. [S]	0.084	0.084	0.082	0.079	0	212	99
JLG Supersite	0.085	0.084	0.083	0.076	1	365	100
North Phoenix	0.094	0.087	0.086	**0.085**	4	364	100
Pinnacle Peak	0.082	0.079	0.077	0.076	0	356	98
Rio Verde[S]	0.086	0.084	0.083	0.083	1	213	100
South Phoenix	0.075	0.072	0.072	0.069	0	359	98
South Scottsdale	0.086	0.081	0.080	0.080	1	359	98
Tempe [S]	0.087	0.082	0.081	0.079	1	213	100
West Chandler [S]	0.089	0.089	0.083	0.081	2	214	100
West Phoenix	0.096	0.088	0.085	0.082	3	359	98
Navajo County							
Petrified Forest NP	0.085	0.073	0.071	0.071	1	307	84

Table 9: 2006 Ozone (in ppm), Eight-Hour Averages ***(NAAQS 8-hour 0.08 ppm)*** **Bold** denotes the 4th highest value exceeds the eight-hour NAAQS.							
Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Daily Exceed-Ances**	**Valid Data Recovery ***	
						No. of Days	**%**
Pima County							
22nd & Craycroft	0.075	0.071	0.070	0.069	0	362	99
Children's Park	0.076	0.074	0.073	0.072	0	362	99
Coachline	0.076	0.076	0.072	0.071	0	363	99
Green Valley	0.073	0.072	0.072	0.070	0	365	100
Rose Elementary	0.069	0.069	0.067	0.067	0	360	99
Saguaro NP East	0.080	0.076	0.076	0.076	0	363	99
Tangerine	0.083	0.080	0.076	0.076	0	364	100
Tucson Downtown	0.074	0.073	0.073	0.073	0	364	100
Tucson Fairgrounds	0.075	0.070	0.068	0.068	0	361	99
Pinal County							
Apache Junction Maintenance Yard	0.094	0.090	0.087	0.084	3	358	98
Casa Grande Airport	0.077	0.076	0.074	0.073	0	344	94
Queen Creek [S ##]	0.079	0.073	0.072	0.071	0	212	99
Maricopa [S]	0.082	0.077	0.068	0.068	0	202	94
Pinal Air Park [S]	0.075	0.072	0.071	0.070	0	211	99
Queen Valley [S]	0.090	0.087	0.080	0.079	2	214	100
Yuma County							
Yuma Game & Fish [S]	0.078	0.074	0.073	0.073	0	214	100

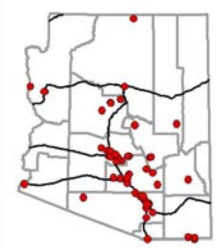
*** Valid Data Recovery** shows the number of days with at least 75 percent (18 or more hours) of valid data recovery. It also shows the percentage of the total number of scheduled sampling days that meet that criterion. Scheduled sampling days for non-seasonal monitors in 2006 was 365.

[S] Seasonal monitor, operational during April 1 to November 1; 214 scheduled sampling days in the season.

Formerly "Combs"

Particulate Matter smaller than 10 Microns (PM_{10}) and smaller than 2.5 Microns ($PM_{2.5}$)

Particulate matter is a collective term describing very small solid or liquid particles that vary considerably in size, geometry, chemical composition and physical properties. Produced by natural processes (pollen and wind erosion) and by human activity (soot, fly ash, and dust from paved and unpaved roads), particulates contribute to visibility reduction, pose a threat to public health and cause economic damage through soil disturbance. Some fine particulates ($PM_{2.5}$) are formed by the condensation of vapors or by their subsequent growth through coagulation or agglomeration. Others are emitted directly from the sources, either by combustion or from mechanical grinding of soils. Coarse particulates (2.5 to 10 microns) are formed through mechanical processes such as the grinding of matter and the atomization of liquids. Fine particulates can also be classified as primary - produced within and emitted from a source with little subsequent change - or secondary - formed in the atmosphere from gaseous emissions. Secondary particulate nitrates and sulfates, for example, form in the atmosphere from the oxidation of gaseous SO_2 and NO_2. In contrast, most atmospheric carbon is primary, having been emitted directly from combustion sources, although some of the organic carbon in the aerosol is secondary, having been formed by the complex photochemistry of gaseous volatile organic compounds.



PM10
Network 2006

The size, shape and chemical composition of particulates determine their health effects. Particles larger than 10 microns are deposited in the upper respiratory tract. Particles from 2.5 to 10 microns are inhalable and are deposited in the upper parts of the respiratory system. Particles smaller than 2.5 microns are respirable and enter the pulmonary tissues to be deposited there. Particles in the size range of 0.1 to 2.5 microns are most efficiently deposited in the alveoli, where their effective toxicity is greater than larger particles because of the higher relative content of toxic heavy metals, sulfates and nitrates. Epidemiological studies have shown causal relationships between particulates and excess mortality, aggravation of bronchitis, and, in children, small, reversible changes in pulmonary function. Acidic aerosols have been linked to the inability of the upper respiratory tract and pulmonary system to remove harmful particles.

PM2.5
Network 2006

The Arizona Comparative Environmental Risk Project - a multi-disciplinary investigation into human exposure to all environmental risks completed in 1995 - ranked outdoor air quality in general and particulate matter in particular as the highest environmental risk in the state. In this study, annual premature deaths from exposure to PM_{10} concentrations in Arizona were estimated at 963, which included 667 in Maricopa County and 88 in Tucson. Increased percentages of hospital admissions for respiratory disease (1 to 4 percent, depending on the city), of asthma episodes (5 to 14 percent), of lower respiratory symptoms (5 to 15 percent) and of coughs (2 to 6 percent) were attributed to the prevailing annual PM_{10} concentrations in 1991. Chronically high particulate concentrations in the ambient air continue to pose a serious health threat to many Arizonans.

Coarse particulate emissions are mostly geological and are dominated by dust from three activities: re-entraining dust from paved roads, driving on unpaved roads and earthmoving associated with construction. Soil dust from these sources and others contribute more than 70 percent of the coarse particulates in Phoenix. On days with winds in excess of 15 miles per hour, wind erosion of soil contributes to this loading. With a more diverse chemical composition, fine particulate ($PM_{2.5}$) emissions are more evenly distributed among a larger number of sources. At the Phoenix JLG Supersite, receptor modeling indicates gasoline and diesel engine exhaust account for more than two-thirds of the $PM_{2.5}$ emissions. Soil dust contributes another 10.5 percent.

In other urban and rural areas, this mixture of sources will vary. Agricultural and mining areas, for example, will be more heavily influenced by emissions from these activities.

$PM_{2.5}$ concentrations tend to be at their highest in the central portions of urban areas, diminishing to background levels at the urban fringe. In contrast, PM_{10} concentrations are not spatially distributed smoothly because each monitoring site is strongly influenced by the degree of localized emissions of coarse particulates. Background concentrations of PM_{10} are about 40 percent of the urban maxima (20 $\mu g/m^3$ for an annual average background versus about 50 $\mu g/m^3$ for the urban maximum). Background concentrations of $PM_{2.5}$ are about 5 $\mu g/m^3$, in contrast to the urban maxima of 12 to 15 $\mu g/m^3$. Concentrations of both size ranges of particulates tend to be higher in the late fall and winter, when atmospheric dispersion is at a seasonal low. PM_{10} maximum concentrations can occur in any season, provided nearby sources of coarse particulates are present or when strong and gusty winds suspend soil disturbed by human activities. Hourly concentrations of particulates tend to peak during those hours of the worst dispersion, which is from sunset to mid-morning.

Controls to reduce particulates have been in place for decades, beginning with an ordinance that required watering to reduce dust from construction in Pima County in the 1960s. Maricopa County's umbrella dust abatement rule, Rule 310, has been revised many times through the years and now regulates construction dust, track-out dust from construction sites, and dust from unpaved parking and vacant lots. Efforts to reduce dust resuspended from paved roads have concentrated on eliminating track-out from construction sites, curbing and stabilizing road shoulders, and investigating more efficient street sweepers. Secondary fine particulates have been reduced by vehicular emission controls, which have reduced their precursor gases. Reducing gaseous hydrocarbon emissions, for example, has led to reductions in ambient concentrations of secondary organic carbon. In Maricopa County, the Governor's Agricultural Best Management Practices Committee developed a rule containing best management practices for agricultural activities to reduce particulate emissions from tilling and harvesting activities of cropland and non-cropland. In a recent PM_{10} SIP, the Maricopa Association of Governments committed to implement 77 new measures, including enhanced enforcement of the county dust rules, implementation of agricultural best management practices, diesel engine replacement and retirement programs and requirements for cleaner burning fireplaces.

Particulates are monitored by pulling ambient air through a filter, generally for 24 hours every sixth day, weighing the filter before and after, and measuring the volume of air sampled. The monitoring instruments are fitted with different aerodynamic devices to segregate particle size fractions. Particulates can also be monitored continuously with a tapered element oscillating microbalance (TEOM) instrument or a beta attenuation mass monitor (BAM) which utilizes a beam sensing through a paper tape.

The 2006 PM_{10} data reported in Table 10 represent 60 monitors throughout Arizona and two in Mexico, located in Agua Prieta and Nogales, Sonora. TEOM data are included for those sites in the Phoenix metropolitan area that were required to change to everyday monitoring from every sixth day. BAM data are included for sites in Pima County. Data from collocated monitors are included; these data are for precision purposes as a quality control measure. The data are reported in standard conditions adjusted to 25^{o}C and 1 atmosphere pressure) as required by EPA.

EPA began a nationwide program to measure $PM_{2.5}$ using federal reference method monitors in anticipation of a new federal standard for fine particulates in 1999. Eleven federal reference method samplers were located in Arizona. The fine particulate portion of the PM_{10} measurement made by dichot monitors has been measured for many years in Arizona and has served as an approximation for the $PM_{2.5}$ measurement; however it is not exactly equivalent to that measurement. Table 11 lists only the federal reference method measurements for 2006. The data are reported in ambient conditions (local temperature and pressure) as required by EPA. Particulate data from the IMPROVE network are not included. In 2006, the EPA changed the $PM_{2.5}$ NAAQS for 24hours from 65 ug/m^3 to 35 ug/ m^3, with the effective date of December 16, 2006. The EPA also eliminated the annual standard for PM_{10} but retained the 24-hour standard of 150 ug/m^3.

Table 10: 2006 PM_{10} Data (in µg/m³)
(NAAQS 24-hour Average 150 µg/m³)
Bold denotes an exceedance, defined as any daily value greater then 150 µg/m³ after rounding to the nearest 10 µg/m³.**

Site or City	Method	Annual Average	24-Hour Average		Valid Data Recovery *	
			Max Value	2nd High	No. of Obs.	%
Apache County						
TEP – Springerville – Coalyard [2]	TEOM	19	**298**	**259**	355	97
TEP – Springerville – Coyote Hills [2]	TEOM	11	56	49	351	96
Cochise County						
Douglas Red Cross	Partisol	31	87	75	60	98
Paul Spur Chemical Lime Plant (1)	Partisol	27	76	65	59	97
Paul Spur Chemical Lime Plant (2)	Partisol	30	91	84	59	97
Coconino County						
Flagstaff Middle School	Partisol	18	37	35	59	97
Sedona Post Office	Partisol	13	36	31	58	95
Gila County						
Hayden – Old Jail, ADEQ	Partisol	33	102	68	59	97
PDMI – Miami – Golf Course (1)	Dichot	20	90	34	58	95
PDMI – Miami – Golf Course (2)	Dichot	22	42	37	59	97
Miami – Ridgeline, PDMI	Dichot	14	106	25	58	95
Payson Well Site	Partisol	24	66	62	58	95
Graham County						
Safford	Partisol	23	50	50	56	92
Maricopa County						
Bethune Elementary School	Partisol	62	140	124	57	93
Buckeye [2]	TEOM	53	**272**	**192**	363	99
Central Phoenix [2]	TEOM	42	134	99	363	99
Durango Complex [2]	TEOM	**69**	**240**	**183**	361	99
Dysart	Hi-Vol	32	67	55	59	97

Table 10: 2006 PM_{10} Data (in µg/m^3)
(NAAQS 24-hour Average 150 µg/m^3)
Bold denotes an exceedance, defined as any daily value greater then 150 µg/m^3 after rounding to the nearest 10 µg/m^3.**

Site or City	Method	Annual Average	24-Hour Average		Valid Data Recovery *	
			Max Value	2nd High	No. of Obs.	%
Glendale	Hi-Vol	36	60	59	44	72
Greenwood (changed to continuous monitoring 01/01/ 2006) [3]	TEOM	**52**	**166**	141	354	97
Higley [2]	TEOM	**60**	**170**	**166**	357	98
JLG Supersite	Partisol	35	91	70	59	97
Mesa	Hi-Vol	31	75	59	59	97
North Phoenix	Hi-Vol	34	79	62	61	100
South Phoenix	Hi-Vol	**55**	132	100	61	100
South Scottsdale	Hi-Vol	33	76	60	61	100
West Chandler	Hi-Vol	33	77	68	61	100
West Forty Third [2]	TEOM	**80**	**260**	**204**	353	97
West Phoenix [2]	TEOM	50	147	122	362	99
Mohave County						
Bullhead City	Partisol	19	72	49	61	100
Navajo County						
Show Low	Partisol	16	58	50	60	98
Pima County						
Ajo	Partisol	25	54	51	54	89
Broadway & Swan	Partisol	27	60	55	61	100
Corona De Tucson	Partisol	23	144	70	59	97
Green Valley [2]	BAM	17	81	50	361	99
Orange Grove [1]	Partisol	32	101	88	365	100
Prince Road	Partisol	35	72	71	55	90
Rillito, ADEQ	Partisol	40	122	95	58	95

Table 10: 2006 PM_{10} Data (in µg/m³)
(NAAQS 24-hour Average 150 µg/m³)
Bold denotes an exceedance, defined as any daily value greater then 150 µg/m³ after rounding to the nearest 10 µg/m³.**

Site or City	Method	Annual Average	24-Hour Average		Valid Data Recovery *	
			Max Value	2nd High	No. of Obs.	%
Rillito, APCC [4]	Hi-Vol	29	86	73	115	94
Santa Clara	Partisol	36	104	93	61	100
South Tucson [1]	Partisol	34	85	73	364	100
Tangerine	Partisol	23	104	59	59	97
Pinal County						
Apache Junction Fire Station	Hi-Vol	24	73	53	59	97
Casa Grande Downtown	Hi-Vol	36	81	81	60	98
Coolidge Maintenance Yard	Hi-Vol	44	106	84	58	95
Cowtown	RAAS	**221**	**606**	**531**	57	93
Cowtown [2]	TEOM	**231**	**1079**	**794**	310	85
Eloy City Complex	Hi-Vol	39	99	96	54	89
Mammoth County Complex	Hi-Vol	15	31	28	55	90
Pinal Air Park	Hi-Vol	30	77	67	57	93
Pinal County Housing Complex (1)	Hi-Vol	**64**	153	152	58	95
Pinal County Housing Complex (2)	Hi-Vol	**63**	**210**	**170**	58	95
Riverside Maintenance Yard	Hi-Vol	23	83	45	56	92
Stanfield	Hi-Vol	**81**	**182**	**161**	58	95
Santa Cruz County						
Nogales Post Office	Partisol	**64**	**240**	**169**	57	93
Yavapai County						
Clarkdale – NW	Dichot	15	27	24	60	98
Clarkdale – SE	Dichot	20	38	35	60	98
Prescott Valley #	Partisol	19	56	48	45	74
Yuma County						

Table 10: 2006 PM_{10} Data (in µg/m^3)						
(NAAQS 24-hour Average 150 µg/m^3)						
Bold denotes an exceedance, defined as any daily value greater then 150 µg/m^3 after rounding to the nearest 10 µg/m^3.**						
Site or City	**Method**	**Annual Average**	**24-Hour Average**		**Valid Data Recovery ***	
			Max Value	**2nd High**	**No. of Obs.**	**%**
Yuma Courthouse (1)	Partisol	40	151	114	57	93
Yuma Courthouse (2)	Partisol	39	119	115	57	93
Mexico						
Agua Prieta Fire Station	Dichot	**76**	**195**	**188**	55	90
Sonora Nogales Fire Station	Dichot	**53**	**159**	149	59	97

[1] Samples collected every day - 365 sample days in 2006.
[2] Samples collected every hour - 8760 sample hours in 2006.
[3] Samples changed from every 6th day with a Hi-Vol sampler to every hour with a TEOM.
[4] Samples collected every third day – 122 sample days in 2006.

(1) Indicates the Primary monitor (used for NAAQS compliance) in a collocated pair of monitors.
(2) Indicates the Secondary monitor (used for precision and accuracy) in a collocated pair of monitors.

***Valid data recovery** shows the number of valid observations during 2006 and the percentage of scheduled samples that were valid. There were 61 monitoring days scheduled in 2006 for monitors on the every 6th day schedule. Rillito - APCC was the only site following the every 3rd day schedule (122 observations in 2006). For continous monitors (TEOM and BAM), the number of valid days is used for data recovery.

Exceedances due to Natural Events are excluded from annual statistics.

** The NAAQS requirement for the annual average value to be less than 50 µg/m^3 was removed as of December 17, 2006.

Table 11: 2006 PM2.5 Data (in µg/m³)
(NAAQS Annual Average 15µg/m³, 24-hour Average 65 µg/m³ changed to 35 µg/m³effective December 16, 2006)

City or Site	Method	Annual Average	24-Hour Avg		Valid Data Recovery *	
			Max	2nd High	No. of Obs.	%
Cochise County						
Douglas Red Cross [2]	FRM	6.78	15.7	14.0	59	97
Coconino County						
Flagstaff Middle School [2]	FRM	6.61	28.2	13.7	59	97
Gila County						
Payson Well Site [2]	FRM	9.04	25.2	23.4	59	97
Maricopa County						
JLG Supersite [3]	FRM	10.22	54.8	39.9	118	97
Mesa [3]	FRM	9.66	29.1	22.1	116	95
South Phoenix [3]	FRM	12.69	76.2	49.1	116	95
West Phoenix [3] (1)	FRM	13.52	76.7	52.4	121	99
West Phoenix [3] (2)	FRM	13.45	66.4	55.2	120	98
Pima County						
Children's Park [3]	FRM	5.79	16	15	119	98
Coachline [4]	BAM ++	7.95	20	18	365	100
Geronimo [4]	BAM ++	8.50	23	20	361	99
Green Valley [4]	BAM ++	2.79	9	8	362	99
Orange Grove [1]	FRM	5.80	19	17	337	92
Rose Elementary [4]	BAM ++	9.02	35	29	347	95
Pinal County						
Apache Junction Fire Station [3]	FRM	5.31	10.7	10.2	106	87
Casa Grande Downtown [2]	FRM	7.55	16.1	15.4	57	93

Table 11: 2006 PM2.5 Data (in µg/m^3) (NAAQS Annual Average 15µg/m^3, 24-hour Average 65 µg/m^3 changed to 35 µg/m^3effective December 16, 2006)						
City or Site	Method	Annual Average	24-Hour Avg		Valid Data Recovery *	
			Max	2nd High	No. of Obs.	%
Santa Cruz County						
Nogales Post Office [2] (1)	FRM	16.19	79.8	56.2	61	100
Nogales Post Office [2] (2)	FRM	15.57	103.2	55.7	61	100

***Valid data recovery** shows the number of valid observations during 2006 and the percentage of scheduled samples that were valid.

++ Non Reference method.

1 Samples collected every day – 365 sample days in 2006.
2 Samples collected every sixth day - 61 sample days in 2006.
3 Samples collected every third day - 122 sample days in 2006.
4 Samples collected every hour - 8760 sample hours in 2006.

(1) Indicates the Primary monitor (used for NAAQS compliance) in a collocated pair of monitors.
(2) Indicates the Secondary monitor (used for precision and accuracy) in a collocated pair of monitors.

Criteria Pollutants - Compliance

Carbon Monoxide

There are two NAAQS for CO: an eight-hour standard (most critical for compliance) and a one-hour standard. The eight-hour standard is 9 ppm and the one-hour standard is 35 ppm. According to the Code of Federal Regulations, compliance for both standards is determined by having no more than one exceedance per calendar year. EPA determines attainment of the standard at all sites in the non-attainment (or monitoring) area by evaluating two calendar years of data from each site. The highest of the second-highest values in a two-year period must not exceed the standard of 9 ppm (greater than or equal to 9.5 ppm to adjust for rounding) for the eight-hour standard or 35 ppm (greater than or equal to 35.5 ppm) for the one-hour standard.

No exceedances of the one-hour or eight-hour standards were recorded in 2005 or 2006. The data are presented in Table 12 and Table 13.

Table 12. 2005-2006 One-Hour Carbon Monoxide Compliance (in ppm)

NAAQS for one-hour carbon monoxide: The highest of the second-highest values in a two-year period must not exceed 35 ppm. NOTE: Pinal County monitors closed in 2002.

2005-2006 One-Hour Carbon Monoxide NAAQS Compliance Values by County		
County	Exceedances	Violations
Maricopa	0	0
Pima	0	0
Summary: 20 of 20 monitors in compliance		

Table 12: 2005-2006 One-Hour Carbon Monoxide Compliance (in ppm)					
City or Site	**2005**		**2006**		**Compliance Value**
	Max Value	**2nd High**	**Max Value**	**2nd High**	
Maricopa County					
Buckeye [S]	1.1	1.1	1.2	1.2	1.2
Central Phoenix	5.2	5.1	6.0	4.8	5.1
Dysart [S]	1.7	1.7	1.3	1.3	1.7
Glendale [S]	3.2	3.1	3.8	2.9	3.1
Greenwood	5.9	5.4	6.3	5.2	5.4
JLG Supersite	5.6	5.1	5.3	4.5	5.1
Mesa [S]	3.4	3.3	4.1	3.5	3.5

Table 12: 2005-2006 One-Hour Carbon Monoxide Compliance (in ppm)					
City or Site	**2005**		**2006**		**Compliance Value**
	Max Value	**2nd High**	**Max Value**	**2nd High**	
North Phoenix [S]	3.8	3.5	3.5	3.3	3.5
South Phoenix [S]	5.5	5.2	5.2	4.7	5.2
South Scottsdale [S]	3.2	3.1	5.5	3.1	3.1
Tempe [S]	3.2	3.0	3.7	3.4	3.4
West Chandler [S]	3.5	2.7	2.7	2.6	2.7
West Indian School	6.8	6.5	7.8	7.7	7.7
West Phoenix	7.2	7.0	7.2	6.5	7.0
Pima County					
22nd St. & Alvernon	4.1	3.6	3.4	3.4	3.6
22nd St. & Craycroft	3.5	3.3	3.2	2.9	3.3
Cherry & Glenn [S]	3.8	3.4	3.4	3.3	3.4
Children's Park	2.0	1.8	1.7	1.7	1.8
Golf Links & Kolb [S]	3.3	3.2	3.8	2.9	3.2
Downtown	3.0	2.8	2.9	2.6	2.8

[S] Seasonal monitor. Maricopa County monitors operate during January 1 to April 1 and September 1 to December 31; 5088 hours in 2006. Pima County monitors operate during January 1 to May 1 and October 1 to December 31; 5088 hours in 2006.

Table 13. 2005-2006 Eight-Hour Carbon Monoxide Compliance (in ppm)

NAAQS for eight-hour carbon monoxide: The highest of the second-highest values in a two-year period must not exceed 9 ppm. NOTE: Pinal County monitors closed in 2002.

2005-2006 Eight-Hour Carbon Monoxide NAAQS Compliance Values by County		
County	Exceedances	Violations
Maricopa	0	0
Pima	0	0
Summary: 20 of 20 monitors in compliance		

Table 13: 2005-2006 Eight-Hour Carbon Monoxide Compliance (in ppm)

City or Site	2005		2006		Compliance Value
	Max Value	2nd High	Max Value	2nd High	
Maricopa County					
Buckeye [S]	0.9	0.9	0.7	0.6	0.9
Central Phoenix	4.1	3.8	3.8	3.2	3.8
Dysart [S]	1.3	1.2	0.9	0.8	1.2
Glendale [S]	2.4	2.3	1.9	1.8	2.3
Greenwood	4.2	4.1	3.6	3.5	4.1
JLG Supersite	3.7	3.6	3.0	2.9	3.6
Mesa [S]	2.4	2.4	2.8	2.0	2.4
North Phoenix [S]	2.3	2.2	2.0	1.9	2.2
South Phoenix [S]	3.8	3.2	3.2	2.7	3.2
South Scottsdale [S]	2.4	2.4	2.1	1.9	2.4
Tempe [S]	2.6	2.4	2.5	2.4	2.4
West Chandler [S]	2.4	2.0	2.2	2.0	2.0
West Indian School	5.3	4.8	5.3	4.5	4.8
West Phoenix	5.8	4.6	5.0	4.6	4.6
Pima County					
22nd St. & Alvernon	2.2	2.1	2.0	1.8	2.1
22nd St. & Craycroft	1.7	1.5	1.6	1.4	1.5
Cherry & Glenn [S]	2.5	2.4	2.3	2.0	2.4

Table 13: 2005-2006 Eight-Hour Carbon Monoxide Compliance (in ppm)					
City or Site	2005		2006		Compliance Value
	Max Value	2nd High	Max Value	2nd High	
Children's Park	1.1	1.1	1.1	1.0	1.1
Golf Links & Kolb [S]	2.2	2.1	1.8	1.6	2.1
Tucson Downtown	1.9	1.7	1.4	1.2	1.7

[S] Seasonal monitor. Maricopa County monitors operate during January 1 to April 1 and September 1 to December 31; 5088 hours in 2006. Pima County monitors operate during January 1 to May 1 and October 1 to December 31; 5088 hours in 2006 .

Nitrogen Dioxide

The NAAQS for NO_2 is 0.053 parts per million (ppm) for an annual average. The standard is attained when the annual arithmetic mean concentration in a calendar year is less than or equal to 0.053 ppm. To demonstrate attainment, the annual mean must be based upon hourly data that are at least 75 percent complete. NO_2 annual averages near Arizona power plants range from 2 percent to 17 percent of the standard; in the urban areas, from 20 percent to 60 percent. All Arizona sites were in compliance with the NAAQS. Refer to Table 6 for the 2006 averages.

Table 14: 2006 Nitrogen Dioxide NAAQS Compliance Values by County		
County	Annual Average	
	Exceedances	Violations
La Paz	0	0
Maricopa	0	0
Pima	0	0
Pinal	0	0
Summary: 11 of 11 monitors in compliance		

Sulfur Dioxide

There are three NAAQS for SO_2, two primary (annual average and 24-hour block average) and one secondary (three-hour block average). The annual average standard is 0.030 ppm (80 $\mu g/m^3$) and cannot be exceeded in a calendar year. The 24-hour block average standard is 0.14 ppm (365 $\mu g/m^3$), not to be exceeded more than once per calendar year. A 24-hour block average is considered valid if at least 75 percent of the hourly averages for the 24-hour period are available. The 24-hour averages are determined from successive non-overlapping 24-hour blocks which begin at midnight each day. To demonstrate attainment, the second highest 24-hour block average must be based on hourly data that are at least 75 percent complete in each calendar quarter. A 24-hour block average is considered valid if 18 or more valid hourly averages are available. The sum of the valid averages is divided by the number of valid hours to determine the 24-hour average.

The secondary three-hour standard is 0.5 ppm (1300 µg/m^3), not to be exceeded more than once per calendar year. The three-hour averages are determined from successive, non-overlapping three-hour blocks starting at midnight each calendar day. To demonstrate attainment the second highest three-hour average must be based upon hourly data that are at least 75 percent complete in each calendar quarter. All three hours of the block must be available to calculate a valid average. However, if only one or two hourly averages are available and the three-hour average would exceed the level of the standard when zeroes are substituted for the missing hours, the block would be considered valid.

In Arizona in 2006, the maximum concentration sites - all near copper smelters - comply with these standards; the concentrations ranging from 2 to 51 percent of the three-hour, 3 to 76 percent of the 24-hour and 1 to 57 percent of the annual average standards. Sites near power plants are close to background levels, with annual averages near 1 µg/m^3. See Table 7 for the 2006 averages.

Table 15: 2006 Sulfur Dioxide Average NAAQS Compliance Values by County

County	**Annual Average**		**Three Hour Average**		**24-Hour Average**	
	Exceedances	**Violations**	**Exceedances**	**Violations**	**Exceedances**	**Violations**
Gila	0	0	0	0	0	0
Maricopa	0	0	0	0	0	0
Pima	0	0	0	0	0	0
Pinal	0	0	0	0	0	0
Summary:15 out of 15 monitors in compliance						

Ozone -- One-hour

The NAAQS one-hour standard for ozone is 0.12 ppm. Compliance with this standard is attained when, for a three-year period, the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm (0.124 ppm for rounding) is equal to or less than one. An exceedance day is defined as any day having one or more hourly averages equal to or greater than 0.125 ppm. Hourly averages for at least 75 percent of the hours sampled (18-24 hours per day) must be present. There were no exceedances of the one hour standard in Arizona in 2006.

As there have been no violations of the one-hour O_3 standard since 1996, on May 15, 2001, EPA found that Maricopa County had reached attainment for the one-hour O_3 standard. A maintenance plan and redesignation request developed by Maricopa Association of Governments (MAG), demonstrating how the area will maintain compliance with the one-hour standard, was submitted to EPA on April 21, 2004.

Ozone -- Eight-hour

On April 15, 2004, the Phoenix area was designated nonattainment for the new, more stringent, eight-hour ozone standard. The one-hour standard was revoked one year following the effective date of the eight-hour designation or June 15, 2005. However, certain of the control measures developed and implemented for the one-hour standard are required to remain in place to ensure continued progress toward attainment of the new eight-hour standard.

EPA developed the eight-hour O_3 standard in response to human exposure studies that showed adverse health effects occur at lower ozone concentrations extending over several hours. After its proposal in 1997 and after a protracted legal battle, the eight-hour standard was officially promulgated in 2003 and nonattainment area boundaries established. The eight-hour ozone standard is 0.08 ppm (0.084 for rounding) for a daily maximum eight-hour average. This standard is met when the three-year average of the annual fourth-highest daily maximum eight-hour average O_3 concentration is less than or equal to 0.08 ppm. The data in Table 16 are for those sites in operation in 2004 – 2006.

Table 16: 2004 to 2006 Eight-Hour Ozone Compliance (in ppm)

NAAQS: The three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentration is less than or equal to 0.08 ppm.

2004 to 2006 Eight-Hour Ozone NAAQS Compliance Values by County				
County	Eight-Hour Exceedances *			Sites in Violation
	2004	2005	2006	
Cochise	0	0	0	0
Coconino	0	1	0	0
Gila	0	2	2	0
Maricopa	1	25	17	0
Navajo	0	0	1	0
Pima	0	1	0	0
Pinal	0	3	5	0
Yavapai	0	0	0	0
Yuma	0	0	0	0
Summary: 41 of 41 monitors in compliance for 2004 to 2006				

* Includes all eight-hour exceedances above fourth highest value.

Table 16: 2004 to 2006 Eight-Hour Ozone Compliance (in ppm) **Bold** denotes exceedances and sites in violation.				
City or Site	**Fourth-Highest Value**			**Three-Year Average**
	2004	**2005**	**2006**	
Cochise County				
Chiricahua NM Entrance Station	0.070	0.072	0.074	0.072
Coconino County				
Grand Canyon NP – Hance	0.072	0.079	0.070	0.073
Gila County				
Tonto NM [S]	0.077	0.084	0.081	0.080
La Paz County				
Alamo Lake (Opened 05/20/05)	N/A	0.075	0.073	N/A
Maricopa County				
Blue Point	0.075	0.081	0.062	0.072
Buckeye [S] (Opened 08/01/04)	0.058 #	0.065	0.067	N/A
Cave Creek [S]	0.076	0.082	0.080	0.079

Table 16: 2004 to 2006 Eight-Hour Ozone Compliance (in ppm)
Bold denotes exceedances and sites in violation.

City or Site	Fourth-Highest Value			Three-Year Average
	2004	2005	2006	
Central Phoenix	0.074	0.075	0.080	0.076
Dysart [S]	0.065	0.066	0.072	0.067
Falcon Field [S]	0.070	0.076	0.079	0.075
Fountain Hills	0.075	0.088	0.084	0.082
Glendale [S]	0.076	0.076	0.078	0.076
Humboldt Mt. [S]	0.078	**.087**	0.079	0.081
JLG Supersite	0.072	0.076	0.076	0.074
North Phoenix	0.080	0.084	**0.085**	0.083
Palo Verde [S] (Closed 10/31/2004)	0.072	N/A	N/A	0.072
Pinnacle Peak	0.068	0.083	0.076	0.075
Rio Verde [S]	0.074	0.087	0.083	0.081
South Phoenix	0.072	0.076	0.069	0.072
South Scottsdale	0.073	0.077	0.080	0.076
Tempe [S]	0.072	0.076	0.079	0.075
West Chandler [S]	0.070	0.075	0.081	0.075
West Phoenix	0.072	0.068	0.082	0.074
Navajo County				
Petrified Forest NP	0.071	0.070	0.071	0.070
Pima County				
22nd St. & Craycroft	0.069	0.074	0.069	0.070
Children's Park	0.068	0.075	0.072	0.071
Coachline	0.068	0.066	0.071	0.068
Green Valley	0.066	0.068	0.070	0.068
Rose Elementary	0.064	0.067	0.067	0.066
Saguaro NP East	0.073	0.079	0.076	0.076

Table 16: 2004 to 2006 Eight-Hour Ozone Compliance (in ppm) **Bold** denotes exceedances and sites in violation.				
City or Site	**Fourth-Highest Value**			**Three-Year Average**
	2004	**2005**	**2006**	
Tangerine	0.068	0.073	0.076	0.072
Tucson Downtown	0.063	0.070	0.073	0.068
Tucson Fairgrounds	0.064	0.073	0.068	0.068
Pinal County				
Apache Junction - Maintenance Yard	0.069	0.068	0.084	0.073
Casa Grande - Airport	0.070	0.072	0.073	0.071
Queen Creek [S ##]	0.059	0.067	0.071	0.065
Maricopa [S]	0.064	0.061	0.068	0.064
Pinal Air Park [S]	0.067	0.077	0.070	0.071
Queen Valley	0.073	0.084	0.079	0.078
Yavapai County				
Hillside [S] (Closed 6/3/2005)	0.077	0.074	N/A	N/A
Yuma County				
Yuma Game & Fish	0.073	0.078	0.073	0.074

[S]Seasonal monitor, operational during April 1 to Nov. 1.

[#]Indicates the data do not satisfy EPA's summary criteria, usually meaning less than 75 percent valid data recovery available.

Formerly “Combs”

N/A - Data not available

Notes:
Data follow EPA truncation and averaging rules. Data published in previous annual reports may be slightly different.

Particulate Matter - PM_{10}

The NAAQS for particulate matter 10 microns and smaller in diameter (PM_{10}) were changed December 17, 2006. The annual NAAQS was eliminated; the 24-hour NAAQS of 150 $\mu g/m^3$ was retained. In this year's report, the annual NAAQS statistics are included since the standard change occurred near the end of the three year compliance period.

The annual standard was attained when, for a three-year period, the expected annual arithmetic mean concentration was less than or equal to 50$\mu g/m^3$. Annual arithmetic means are determined by calculating quarterly (three month) averages of the samples collected during that quarter; a minimum of 75 percent of the samples must be valid to produce the annual mean. This mean is rounded to the nearest 1 $\mu g/m^3$ for comparison to the standard.

Compliance with the 24-hour PM_{10} standard is attained when the expected exceedance rate is one or less per year measured over three years. A sample value is rounded to the nearest 10 $\mu g/m^3$ for comparison with the standard to determine if it is an exceedance (i.e., a sample value of 154 $\mu g/m^3$ is not an exceedance because it round to 150 $\mu g/m^3$; a sample value of 155 $\mu g/m^3$ is an exceedance because it rounds to 160 $\mu g/m^3$). Since the majority of monitoring sites do not collect daily samples, the expected exceedance rate must be calculated by quarter following EPA guidelines. The same requirements of 75 percent completeness and three consecutive years of data apply.

Tables 17 and 18 present the 2004 to 2006 expected exceedance rates for the PM_{10} annual arithmetic means and maximum 24-hour average values.

Table 17: 2004 to 2006 Annual Average PM_{10} Compliance (in $\mu g/m^3$, Standard Conditions)

NAAQS: The expected annual arithmetic mean (average of three most recent annual means) is less than or equal to 50 $\mu g/m^3$.

The expected annual arithmetic mean is rounded to the nearest 1 $\mu g/m^3$ for comparison to the standard.

2004 to 2006 PM_{10} Annual Average NAAQS Compliance Values, By County				
County	Sites above Standard			Sites in Violation
	2004	2005	2006	
Apache	0	0	0	0
Cochise	0	0	0	0
Coconino	0	0	0	0
Gila	0	0	0	0
Graham	0	0	0	0
Maricopa	2	4	6	5
Mohave	0	0	0	0
Navajo	0	0	0	0
Pima	0	0	0	0
Pinal	2	4	4	3
Santa Cruz	0	1	1	1
Yavapai	0	0	0	0
Yuma	0	0	0	0
Summary: 51 of 59 monitors in compliance				

Table 17: 2004 to 2006 Annual Average PM_{10} Compliance (in µg/m^3)				
City or Site	**2004**	**2005**	**2006**	**Expected Annual Mean**
Apache County				
TEP – Springerville – Coalyard	13.4	15.4	19.0	16
TEP – Springerville – Coyote Hills	10.2	10.3	11.2	11
Cochise County				
Douglas – Red Cross	26.3	34.4	30.9	31
Paul Spur	14.7	27.6 #	27.3	N/A
Coconino County				
Flagstaff – Middle School	16.0	17.0 #	18.0	N/A
Sedona	11.1	12.2 #	13.3	N/A
Gila County				
Hayden – Old Jail	27.5	29.9 #	33.4	N/A
Miami – Golf Course	16.9	21.0	20.4	19
Miami – Ridgeline	10.2	12.4	14.2	12
Payson	18.9	22.1#	23.7	N/A
Graham County				
Safford	17.0	20.8#	22.6	N/A
Maricopa County				
Bethune Elementary School	42.4	**58.6**	**61.7**	**54**
Buckeye [E] (Opened 8/01/2004)	39.9 #	52.7	53.0	N/A
Central Phoenix – every 6th day monitor (Closed 12/31/2005)	32.3	38.5	N/A	N/A
Central Phoenix [E]	36.6	37.1	42.0	39
Chandler (Closed 12/31/2005)	39.6	49.4	N/A	N/A

Table 17: 2004 to 2006 Annual Average PM_{10} Compliance (in µg/m^3)				
City or Site	**2004**	**2005**	**2006**	**Expected Annual Mean**
Durango Complex [E]	**51.6**	**66.4**	**69.0**	**62**
Dysart	27.3	29.0	32.3	30
Glendale	25.7	29.0	36.3#	N/A
Greenwood – continuous monitor beginning 1/1/2006	44.3	**52.3**	**51.7**	49
Higley [E]	47.9	**51.4**	**60.4**	**53**
JLG Supersite (Closed 12/31/2003 – urban haze program; Reopened 1/1/2005)	N/A	32.3	35.4	N/A
Mesa	23.2	30.0	30.5	28
North Phoenix	24.8	29.6	34.4	30
Palo Verde (Closed 12/31/2004)	14.5	N/A	N/A	N/A
South Phoenix	45.6	**54.7**	**55.0**	**52**
South Scottsdale	26.1	34.0	32.9	31
West Chandler	29.9	34.2	33.3	32
West Forty Third [E]	**61.1**	**73.9**	**79.8**	**72**
West Phoenix – continuous monitor beginning 1/1/2006	36.9	44.5	49.8	44
Mohave County				
Bullhead City	18.2	18.6 #	19.3	N/A
Navajo County				
Show Low	14.9	13.7 #	15.5	N/A
Pima County				
Ajo	19.3	22.7	25.3	22
Broadway & Swan	20.7	23.7	26.8	24
Corona de Tucson	12.4	15.4	22.6	17
Green Valley [E]	13.6	17.4	16.8	16
Orange Grove	26.8	29.2	31.8	29

Table 17: 2004 to 2006 Annual Average PM_{10} Compliance (in µg/m³)				
City or Site	**2004**	**2005**	**2006**	**Expected Annual Mean**
Prince Road	28.4	37.0 #	35.2	N/A
Rillito, ADEQ	32.2	39.1	39.7	37
Rillito, APCC (1-in-3 day schedule)	26.9	26.8	28.5	27
Santa Clara	20.4	26.5	35.5	27
South Tucson	29.2	30.2	34.3	31
Tangerine	14.7	19.1	22.9	19
Pinal County				
Apache Junction Fire Station	18.4	19.9	23.6	21
Casa Grande Downtown	24.4	30.9	35.9	30
Coolidge Maintenance Yard	24.5	36.0	44.0	35
Cowtown (Opened August 2005)	N/A	**294.4**	**220.6**	N/A
Cowtown [E]	**132.2**	**200.4**	**230.5**	**188**
Eloy	27.8	33.4	38.8	33
Mammoth	11.8	13.6	14.8	13
Pinal Air Park	20.2	22.3	29.5	24
Pinal County Housing Complex	47.1	**56.7** #	**64.3**	**N/A**
Riverside Maintenance Yard	15.2	18.1	23.3	19
Stanfield	33.9	**52.2**	**81.4**	**56**
Santa Cruz County				
Nogales Post Office	42.6	**56.9**	**64.0**	**55**
Yavapai County				
Clarkdale – NW	14.7	14.7	15.3	15
Clarkdale – SE	19.8	21.8	19.7	20
Prescott Valley	12.9	14.8 #	18.9#	N/A
Yuma County				

Table 17: 2004 to 2006 Annual Average PM_{10} Compliance (in µg/m^3)				
City or Site	**2004**	**2005**	**2006**	**Expected Annual Mean**
Yuma – Juvenile Center/Courthouse	35.5 #	34.9	40.1	N/A
Mexico				
Agua Prieta – Fire Station	**60.5**	**68.1**	**52.7**	**60.4**
Nogales – Fire Station	50.2	**62.9**	**75.9**	**63.0**

Bold denotes value above the standard.
N/A – Not available
# Indicates the data do not satisfy EPA's summary criteria, usually meaning less than 75 percent valid data recovery available in one or more calendar quarters.

E Indicates every day monitoring.

Notes:

For collocated sites, data from the Primary monitor (POC 1) are used for the Annual Average calculations. However, if valid data recovery is between 50% and 75%, data from the Secondary (POC2) monitor can be used. If no Secondary data are available, data substitution can be made following the EPA document, 'Guideline on Exceptions to Data Requirements for Determining Attainment of Particulate Matter Standards.'

Table 18: 2004 to 2006 Maximum 24-Hour Average PM_{10} Compliance (in µg/m^3, Standard Conditions)

NAAQS: Expected occurrence of exceedances (samples equal to or greater than 150 µg/m3) is one or less over three consecutive years.

Sample values are rounded to the nearest 10 µg/m^3 to determine exceedance; values less than or equal to 154 µg/m^3 are not exceedances; values greater than or equal to 155 µg/m^3 are exceedances.

2004 to 2006 PM_{10} Maximum 24-Hour Compliance Values, By County	Sites with Exceedances 2004	2005	2006	Sites in Violation
Apache	0	1	1	0
Cochise	0	0	0	0
Coconino	0	0	0	0
Gila	0	0	0	0
Graham	0	0	0	0
Maricopa	1	6	5	6
Mohave	0	0	0	0
Navajo	0	0	0	0
Pima	0	0	0	0
Pinal	2	2	2	2
Santa Cruz	0	1	1	1
Yavapai	0	0	0	0
Yuma	0	0	0	0
Summary: 50 of 59 monitors in compliance				

Table 18: 2004 to 2006 Maximum 24-Hour Average PM_{10} Compliance (in µg/m^3)

City or Site	2004		2005		2006		3-Year Avg Expected Rate of Exceedance
	Max 24-Hr Avg	Exp. Exc.	Max 24-Hr Avg	Exp. Exc.	Max 24-Hr Avg	Exp. Exc.	
Apache County							
TEP – Springerville – Coalyard	129	0	**198**	1	**298**	1	<1
TEP – Springerville – Coyote Hills	69	0	29	0	56	0	0
Cochise County							
Douglas Red Cross	56	0	86	0	87	0	0
Paul Spur Chemical Lime Plant	44	0	76	0	76	0	0
Coconino County							
Flagstaff Middle School	42	0	38	0	37	0	0

Table 18: 2004 to 2006 Maximum 24-Hour Average PM_{10} Compliance (in µg/m^3)							
City or Site	**2004**		**2005**		**2006**		**3-Year Avg Expected Rate of Exceedance**
	Max 24-Hr Avg	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	
Sedona Post Office	32	0	34	0	36	0	0
Gila County							
Hayden – Old Jail	55	0	124	0	102	0	0
PDMI - Miami – Golf Course	40	0	40	0	90	0	0
PDMI - Miami – Ridgeline	26	0	23	0	106	0	0
Payson Well Site	52	0	81	0	66	0	0
Graham County							
Safford	99	0	50	0	50	0	0
Maricopa County							
Bethune Elementary School	122	0	**198**	**6.4**	140	0	**2.1**
Buckeye [E] (Opened 8/01/2004)	82 #	0	**169**	**2.0**	**272**	**3.0**	N/A
Central Phoenix (Closed 12/31/2005)	81	0	125	0	N/A	N/A	N/A
Central Phoenix – continuous monitor [E]	94	0	116	0	134	0	0
Chandler (Closed)	150	0	94	0	N/A	N/A	N/A
Durango Complex [E]	139	0	**206**	**13.0**	**240**	**9.0**	**7.3**
Dysart	94	0	76	0	67	0	0
Glendale	69	0	84	0	60	0	0
Greenwood [E]	100	0	**173**	**6.0**	**166**	**1.0**	**2.3**
Higley [E]	**159**	**1.0**	142	0	**170**	**2.1**	**1.0**

Table 18: 2004 to 2006 Maximum 24-Hour Average PM_{10} Compliance (in µg/m^3)							
City or Site	**2004**		**2005**		**2006**		**3-Year Avg Expected Rate of Exceedance**
	Max 24-Hr Avg	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	
JLG Supersite (Closed 12/31/2003 – urban haze program; Reopened 1/1/2005)	N/A	N/A	138	0	91	0	N/A
Maryvale (Closed 4/1/2004)	46 #	0	N/A	0	N/A	N/A	N/A
Mesa	49	0	86	0	75	0	0
North Phoenix	46	0	81	0	79	0	0
Palo Verde (Closed 01/05/2005)	42	0	N/A	0	N/A	N/A	N/A
South Phoenix	132	0	147	0	132	0	0
South Scottsdale	77	0	121	0	76	0	0
West Chandler [E]	70	0	94	0	77	0	0
West Forty Third [E]	145	0	**233**	**13.0**	**260**	**18.7**	**10.6**
West Phoenix [E] Continuous 1/1/2006	100	0	**155**	**6.0**	147	0	**2.0**
Mohave County							
Bullhead City	48	0	48	0	72	0	0
Navajo County							
Show Low	41	0	37	0	58	0	0
Pima County							
Ajo	43	0	45	0	54	0	0
Broadway & Swan	35	0	46	0	60	0	0
Corona De Tucson	37	0	33	0	144	0	0
Green Valley	127	0	54	0	81	0	0
Orange Grove [E]	119	0	98	0	101	0	0

Table 18: 2004 to 2006 Maximum 24-Hour Average PM_{10} Compliance (in µg/m^3)							
City or Site	**2004**		**2005**		**2006**		**3-Year Avg Expected Rate of Exceedance**
	Max 24-Hr Avg	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	
Prince Road	67	0	88	0	72	0	0
Rillito , ADEQ	93	0	84	0	122	0	0
Rillito, APCC (1-in-3 day schedule)	130	0	83.7	0	86	0	0
Santa Clara	41	0	82	0	104	0	0
South Tucson	149	0	73	0	109	0	0
Tangerine	125	0	34	0	104	0	0
Pinal County							
Apache Junction Fire Station	35	0	47	0	73	0	0
Casa Grande Downtown	52	0	79	0	81	0	0
Coolidge Maintenance Yard	57	0	81	0	106	0	0
Cowtown (Opened August 2005)	N/A	N/A	**787.9**	N/A	**606**	**278.2**	N/A
Eloy	46	0	73	0	99	0	0
Mammoth	30	0	33	0	31	0	0
Pinal Air Park	39	0	122	0	77	0	0
Pinal County Housing Complex	**155**	**6.0**	**179**	**12.0**	153	0	**6.0**
Riverside Maintenance Yard	34	0	35	0	83	0	0
Stanfield	80	0	**173**	**6.0**	**182**	**13.1**	**6.4**
Santa Cruz County							
Nogales Post Office	**140**	**0**	**280**	**12.0**	**240**	**20.4**	**10.8**
Yavapai County							

Table 18: 2004 to 2006 Maximum 24-Hour Average PM_{10} Compliance (in µg/m^3)							
City or Site	**2004**		**2005**		**2006**		**3-Year Avg Expected Rate of Exceedance**
	Max 24-Hr Avg	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	
Clarkdale – NW	36	0	31.5	0	27	0	0
Clarkdale – SE	41	0	43.1	0	38	0	0
Prescott Valley	31	0	53	0	56	0	0
Yuma County							
Yuma – Juvenile Center/Courthouse	114 #	0	94	0	151	0	0

Bold denotes value above the standard.

N/A – Not available

# Indicates the data do not satisfy EPA's summary criteria, usually meaning less than 75 percent valid data recovery available in one or more calendar quarters.

[E] Indicates every day monitoring. Phoenix area sites which began every day monitoring in 2004 include: Buckeye, Durango Complex, Higley, and West Forty Third.

Particulate Matter – $PM_{2.5}$

The NAAQS for particulate matter 2.5 microns and smaller in diameter ($PM_{2.5}$) are 15.0 micrograms per cubic meter (µg/m^3) for the annual arithmetic mean concentration and 65 µg/m^3 for the 24-hour average concentrations. The 24-hour NAAQS was changed to 35 µg/m^3 December 17, 2006. Appendix N to Part 50 of the 40 CFR will be used to assess the compliance of the monitors operating in Arizona during 2006.

The annual $PM_{2.5}$ standard is met when the three-year average of annual means is less than or equal to 15.0 µg/m^3. This three-year average is determined by calculating the quarterly averages for each year (with 75 percent data recovery in each quarter) to determine the calendar year average and then averaging the three years together.

The 24-hour standard is met when the three-year average of the 98th percentile values is less than or equal to 65 µg/m^3 in 2006. There must also be 75 percent data completeness for each year.

Please note that the data in Table 19 are from federal reference monitors. In prior years, the dichot fine measurement was used as an approximate equivalent for $PM_{2.5}$, but the federal reference monitors provide a more accurate measurement of this pollutant. Data are collected and reported in local conditions.

In February of 2004, Arizona requested that all parts of the State (except for Indian Country) be designated attainment/unclassifiable for the $PM_{2.5}$ NAAQS.

Table 19: 2004 to 2006 Annual Average $PM_{2.5}$ Compliance (in µg/m^3, local conditions)

NAAQS: The three-year average of annual means is less than or equal to 15 µg/m^3

2004 to 2006 $PM_{2.5}$ Annual Average NAAQS Compliance Values, By County				
	Sites with Exceedances			Sites in Violation
	2004	2005	2006	
Cochise	0	0	0	0
Coconino	0	0	0	0
Gila	0	0	0	0
Maricopa	0	0	0	0
Pima	0	0	0	0
Santa Cruz	0	0	0	0
Summary: 13 of 13 federal reference monitors in compliance				

Table 19: 2004 to 2006 Annual Average $PM_{2.5}$ Compliance (in µg/m^3)				
City or Site Federal Reference Monitors	**2004**	**2005**	**2006**	**Three-Year Average**
Cochise County				
Douglas Red Cross	7.11	7.33	6.78	7
Coconino County				
Flagstaff Middle School	6.77	6.01	6.61	6
Gila County				
Payson Well Site	9.54	8.38 #	9.04	N/A
Maricopa County				
JLG Supersite	9.73	9.72	10.22	10
Mesa (Opened 4/28/2005)	N/A	8.35 #	9.66	N/A

Table 19: 2004 to 2006 Annual Average $PM_{2.5}$ Compliance (in µg/m^3)				
City or Site Federal Reference Monitors	**2004**	**2005**	**2006**	**Three-Year Average**
South Phoenix (Opened 1/1/2005)	N/A	12.84	12.69	N/A
Tempe Community Center (Closed 7/26/2004)	7.30 #	N/A	N/A	N/A
West Phoenix	11.60	11.87	13.52	12
Pima County				
Children's Park	5.57	5.91	5.79	6
Orange Grove	5.79	6.32	5.80	6
Pinal County				
Apache Junction Fire Station	5.51 #	5.52	5.31	N/A
Casa Grande Downtown	7.13	7.33	7.55	7
Santa Cruz County				
Nogales Post Office	10.83	13.1	16.19	13

# Indicates the data do not satisfy EPA's summary criteria, usually meaning less than 75 percent valid data recovery available in one or more calendar quarters.

Table 20: 2004 to 2006 24-Hour Average $PM_{2.5}$ Compliance (in µg/m^3, local conditions)

NAAQS: The three-year average of the 98th percentile values is less than or equal to 65 µg/m3.

Note: The three-year average is rounded to the nearest 1 µg/m^3 for comparison to the standard.

2004 to 2006 $PM_{2.5}$ 24-Hour Average NAAQS Compliance Values, By County				
	Sites with Exceedances			Sites in Violation
	2003	2004	2005	
Cochise	0	0	0	0
Coconino	0	0	0	0
Gila	0	0	0	0
Maricopa	0	0	0	0
Pima	0	0	0	0
Santa Cruz	0	0	0	0
Summary: 13 of 13 federal reference monitors in compliance				

Table 20. 2004 to 2006 24-Hour Average $PM_{2.5}$ Compliance (in µg/m^3)				
City or Site Federal Reference Monitors	**98th Percentile Samples ** **			**Three-Year Average**
	2004	**2005**	**2006**	
Cochise County				
Douglas Red Cross [2]	22.5	16.0	14.0	18
Coconino County				
Flagstaff Middle School [2]	20.7	12.7	13.7	16
Gila County				
Payson [2]	19.3	22.9	23.4	22
Maricopa County				
JLG Supersite [3]	27.6	28.2	24.6	27
Mesa (Opened 4/28/2005) [3]	N/A	17.5	20.1	N/A
South Phoenix [3] (opened 1/1/2005)	N/A	36.4	28.8	N/A
Tempe Community Center (Closed 7/26/2004)	14.8	N/A	N/A	N/A
West Phoenix [3]	29.9	40.5	28.8	33
Pima County				
Children's Park [3]	10.3	10.7	12.1	11
Orange Grove [1]	13.3	13.7	16.3	14
Pinal County				
Apache Junction Fire Station [3]	10.3	10.6	9.3	10
Casa Grande Downtown [2]	13.7	16.9	15.4	15
Santa Cruz County				
Nogales – Post Office [2]	25.1	33.0	56.2	38

** The 98th percentile value will be the second highest value for sites on an every 6th day sample schedule. The 98th percentile value will be the 3rd highest value for sites on an every 3rd day sample schedule.

[1] Samples collected every day – 365 sample days in 2006.

[2] Samples collected every sixth day - 61 sample days in 2006.

[3] Samples collected every third day - 122 sample days in 2006.

Visibility Data

Visibility monitoring is conducted using methods: aerosol, optical and scene. Aerosol measurements include the physical properties of the ambient atmospheric particles (chemical composition, size, shape, concentration, temporal and spatial distribution and other physical properties) through which a scene is viewed. The chemical species that comprise a particulate sample have different extinction efficiencies. Extinction efficiency is the extent to which an individual or a specific particle will either scatter or absorb light, thus blocking the light's path to one's eye. The overall impact of particles can be estimated by summing the effect of all the component species. This method is the primary approach used in the national regional haze rule for estimating present visibility and charting trends for future plan reviews. Optical methods measure either light scattering or light extinction continuously. Scene measurements are photograph-based with subsequent analysis.

ADEQ operates several types of monitors designed to characterize different optical phenomena. Visibility data from these monitors can be expressed by several different measurement units: deciview, inverse megameters, and visual range. Inverse megameters is a representation of the ratio between how much light is not received by a sensor compared to the amount of light that leaves a source. Higher numbers mean worse visibility.

Class I Areas

In anticipation of the federal regional haze rule, ADEQ, in 1997, undertook development of a visibility monitoring program directed at Class I areas in partnership with Arizona's federal land managers. The aim is to collect data at all of Arizona's Class I areas. Based on the regional haze rule, five years of data will be needed to determine baseline and projected visibility conditions. Since the IMPROVE program consists of aerosol sampling only, ADEQ included nephelometers for measuring light scattering at its jointly operated sites. IMPROVE aerosol samplers operate every three days and represent 24-hour averages. Taking continuous measurements provides insight into variation in visibility impairment with time, along with advancing the understanding of the relationship between particles and light scattering.

Table 21 summarizes the nephelometer data from locations in or near Arizona Class I areas from 1998 to 2006. The data are summarized into three categories for all hours (24 hours a day): the average visibility of the dirtiest 20 percent of the sampled hours, the mean visibility of all hours and the average visibility of the cleanest 20 percent of the sampled hours. As natural background levels are 15 Mm^{-1}, this table shows that on average most sites are within background, with the exceptions being Tucson Mountain in 2002 – 2006 and Pleasant Valley in 2003.

Table 21: Visibility in Class I Areas (Nephelometer Data in Mm^{-1})				
		Mm^{-1} (24 hour Averages)		
Site and Wilderness Area	**Year**	**Mean of the 20% Dirtiest Sampled Hours**	**Mean of all Sampled Hours**	**Mean of the Cleanest 20% Sampled Hours**
Greer Water Treatment Plant *Mt. Baldy Wilderness*	2002	26	10	2
	2003	26	10	1
	2004	17	8	1
	2005	23	9	1
	2006	21	9	2
Humboldt Mountain *Mazatzal Wilderness and Pine Mountain Wilderness (Site closed in 2004)*	1998	24	9	0
	1999	25	12	3
	2000	28	13	3
	2001	21	9	1
	2002	24	8	0
	2003	36	16	3
Ike's Backbone *Mazatzal/Pine Mountain Wildernesses*	2002	24	10	2
	2003	30	12	2
	2004	24	11	3
	2005	26	12	4
	2006	23	12	4
Mount Ord *Mazatzal Wilderness (site closed in 2000)*	1998	28	12	2
	1999	22	11	3
McFadden Peak *Sierra Ancha Wilderness (site closed in 2000)*	1998	24	10	1
	1999	18	7	0
Muleshoe Ranch *Chiracahua National*	1998	24	11	4
	1999	20	11	3

Table 21: Visibility in Class I Areas (Nephelometer Data in Mm^{-1})				
		Mm^{-1} (24 hour Averages)		
Site and Wilderness Area	**Year**	**Mean of the 20% Dirtiest Sampled Hours**	**Mean of all Sampled Hours**	**Mean of the Cleanest 20% Sampled Hours**
Monument Wilderness, Galiuro Wilderness, Chiricahua Forest Service Wilderness	2000	22	11	3
	2001	24	12	4
	2002	25	12	4
	2003	25	11	3
	2004	20	8	1
	2005	21	10	4
Rucker Canyon *Chiricahua Wilderness (site closed in 2001)*	1998	30	12	3
	1999	20	10	4
	2000	18	8	1
Pleasant Valley Ranger Station *Sierra Ancha Wilderness*	2001	28	14	5
	2002	27	13	3
	2003	33	15	4
	2004	20	10	3
	2005	28	13	4
	2006	25	11	2
Camp Raymond *Sycamore Canyon Wilderness*	1999	28	13	4
	2000	28	13	3
	2001	28	13	3
	2002	30	13	3
	2003	32	14	3
	2004	25	12	3
	2005	33	14	3
	2006	32	14	4

Table 21: Visibility in Class I Areas (Nephelometer Data in Mm^{-1})				
		Mm^{-1} (24 hour Averages)		
Site and Wilderness Area	**Year**	**Mean of the 20% Dirtiest Sampled Hours**	**Mean of all Sampled Hours**	**Mean of the Cleanest 20% Sampled Hours**
Tucson Mountain *Saguaro National Park (Includes both the West facilities support building and the National Park Service well site)*	1998	30	12	2
	1999	24	13	6
	2000	23	12	5
	2001	22	11	3
	2002	31	16	6
	2003	35	17	6
	2004	32	16	5
	2005	31	16	5
	2006	27	15	6
Chiricahua National Monument	2004	18	9	3
	2005	21	10	2
	2006	18	7	0
Organ Pipe National Monument	2004	21	10	3
	2005	23	12	4
	2006	21	9	1
Petrified Forest National Park	2004	20	9	3
	2005	24	11	3
	2006	23	9	1

Urban Haze

Besides the Class I areas, ADEQ also operates transmissometers and nephelometers in Phoenix and Tucson. Data from these instruments through 2006 are presented in Table 22. The data are separated into categories for all hours and for 6-hours. Each category is further summarized into the average visibility for the dirtiest 20 percent of the sampled hours, the mean visibility of all hours and the cleanest 20 percent of the sampled hours. As visual range in miles may be a more familiar unit, the values in inverse megameters (Mm^{-1}) in

Table 22 can be converted to visual range in miles by the expression ($2431/b_{ext}$). A few conversions are given here:

Mm^{-1}	Miles	Comment
133	18	Highest in Table 22
100	24	
50	48	
7	347	Lowest in the Table

Table 22. Phoenix and Tucson Urban Haze Data 1998 to 2006 (in Mm^{-1})

Site	Year	24 Hour Samples			5 a.m. to 11 a.m.		
		Dirtiest 20%	Mean	Cleanest 20%	Dirtiest 20%	Mean	Cleanest 20%
Mesa Transmissometer	2004	106	60	24	110	65	29
	2005	121	72	35	123	78	44
	2006	115	70	37	117	75	42
Phoenix Transmissometer	1998	133	78	45	136	84	50
	1999	127	72	38	128	77	42
	2000	131	74	38	134	80	42
	2001	118	69	36	118	73	42
	2002	124	75	42	125	79	46
	2003	131	72	36	135	78	42
	2004	121	69	35	126	75	42
	2005	126	72	36	128	78	43
	2006	125	69	32	126	76	40
Phoenix Nephelometer (Supersite)	1998	91	35	10	77	34	13
	1999	87	36	11	74	36	14
	2000	93	39	12	80	39	15
	2001	73	32	12	66	33	15

Table 22. Phoenix and Tucson Urban Haze Data 1998 to 2006 (in Mm^{-1})							
Site	**Year**	**24 Hour Samples**			**5 a.m. to 11 a.m.**		
		Dirtiest 20%	**Mean**	**Cleanest 20%**	**Dirtiest 20%**	**Mean**	**Cleanest 20%**
	2002	72	33	12	62	33	14
	2003	79	34	11	73	35	14
	2004	72	30	9	61	30	11
	2005	80	33	9	73	33	11
	2006	88	39	12	80	40	14
Phoenix Nephelometer (Dysart)	2004	46	22	7	52	27	9
	2005	41	20	8	41	23	10
	2006	44	21	6	49	25	9
Phoenix Nephelometer (Estrella Mountain)	2004	54	24	7	68	32	10
	2005	76	35	12	77	39	14
	2006	50	23	7	64	31	10
Phoenix Nephelometer (Vehicle Emissions)	2004	69	29	9	64	31	12
	2005	76	35	12	73	37	15
	2006	56	26	8	53	27	11
Tucson Transmissometer	1998	102	57	28	119	69	34
	1999	90	57	35	107	65	38
	2000	98	56	27	114	66	31
	2001	96	55	26	109	66	33
	2002	87	49	24	109	61	29
	2003	88	52	26	107	62	30
	2004	97	58	27	113	67	32

Table 22. Phoenix and Tucson Urban Haze Data 1998 to 2006 (in Mm^{-1})							
Site	**Year**	**24 Hour Samples**			**5 a.m. to 11 a.m.**		
		Dirtiest 20%	**Mean**	**Cleanest 20%**	**Dirtiest 20%**	**Mean**	**Cleanest 20%**
	2005	101	61	31	125	76	39
	2006	83	47	22	100	56	28
Tucson Nephelometer (U of A Central)	1998	45	21	4	47	23	7
	1999	43	23	10	41	24	11
	2000	40	20	8	40	22	9
	2001	42	23	10	44	25	13
	2002	38	20	7	42	22	9
	2003	43	23	9	45	25	11
	2004	38	20	8	42	22	10
	2005	45	24	10	47	27	12
	2006	39	19	5	40	21	7
Tucson Nephelometer (Craycroft)	2001	38	19	8	N/A	N/A	N/A
	2002	37	18	7	N/A	N/A	N/A
	2003	52	25	7	N/A	N/A	N/A
	2004	42	21	8	43	22	9
	2005	35	19	7	44	25	11
	2006	41	22	9	40	23	11
Tucson Nephelometer (Children's Park)	2004	41	20	8	43	23	10
	2005	35	19	7	35	20	8
	2006	38	20	8	40	23	11

N/A – Not available

Special Projects and Accomplishments

Introduction

Figure 3 - Yuma West Monitoring Station, Western Arizona/Sonora Border Air Quality Study

This section summarizes some of ADEQ's accomplishments and special projects during 2006 and the first half of 2007. A discussion of EPA's proposed changes to the ozone NAAQS is also included.

In addition to ADEQ's statewide regulatory ambient air monitoring program, the Air Quality Division undertook several special projects. All of these studies go beyond data collection and seek to provide a better understanding of air pollutant science in Arizona and the Southwest. Data are employed in advanced computer models that help to explain and predict the relationship between emissions and air pollutant concentrations under a variety of conditions. Control strategies are modeled to predict the most effective methods to attain and maintain the National Ambient Air Quality Standards in Arizona. Issues related to the international border, identification of potential air pollution hotspots, improved visibility and reduction of regional haze, and appropriate responses to smoke and other air pollution hazards to protect public health fall under special projects. The knowledge gained from these studies can then be used by decision-makers to choose the most effective control strategies that will continue to improve the State's air quality.

Douglas Sulfur Dioxide (SO_2) Planning Area Redesignation to Attainment

On December 18, 2001, ADEQ submitted a plan demonstrating attainment of the National Ambient Air Quality Standard for SO_2 in the Douglas area. EPA subsequently advised ADEQ that alternative test methods employed by Phelps Dodge at its smelter, the primary source of SO_2 in this planning area, would have to be included in ADEQ's rules. The Air Quality Division updated its rules to include an Alternative Test Methods Rule and submitted it on December 23, 2005. EPA approved the redesignation effective May 1, 2006 [February 28, 2006; 71 FR 9941]. This was the third of five Arizona SO_2 areas officially redesignated to attainment status, reflecting improved air quality and matching the official label to monitored air quality.

Miami Sulfur Dioxide (SO_2) Planning Area Redesignation to Attainment

On June 27, 2002, ADEQ submitted a plan demonstrating attainment of the National Ambient Air Quality Standard for SO_2 in the Miami area. EPA subsequently advised ADEQ that alternative test methods employed by Phelps Dodge would have to be included in ADEQ's rules.

The Air Quality Division updated its rules to include an Alternative Test Methods Rule and submitted it on December 23, 2005. ADEQ also worked with EPA to correct the boundary description for this planning area to remove T1N, R16E from the description; to correct T1S, R14 ¼ E to T1S, R14 ½ E, and to remove Indian Country because Arizona does not have jurisdiction over Indian Country. EPA approved the redesignation and the boundary correction pursuant to Section 110(k)(6) of the Clean Air Act effective March 26, 2007 [January 24, 2007; 72 FR 3061]. This was the fourth of five Arizona SO_2 areas officially redesignated to attainment status, reflecting improved air quality and matching the official label to monitored air quality.

San Manuel Sulfur Dioxide (SO_2) Planning Area Pending Redesignation to Attainment

On June 20, 2002, ADEQ submitted a plan demonstrating attainment of the National Ambient Air Quality Standard for SO_2 in the San Manuel area. Subsequently, the operator of the smelter that was the primary source of SO_2 emissions in this planning area canceled its air quality permits for the smelter in March 2005. The stacks were dismantled thereafter. The Air Quality Division updated the Emission Inventory by removing all the emissions related to the smelter, revised portions of the plan affected by closure of the smelter, and submitted a Supplement to EPA on June 7, 2007. ADEQ has also proposed in its Annual Monitoring Network Plan, submitted to EPA in September 2007, removal of its ambient air quality monitor in San Manuel on December 31, 2007. Upon EPA's expected approval of that request, ADEQ expects EPA to publish a Direct Final redesignation to attainment status for this planning area, the fifth of the five Arizona SO_2 planning areas.

Ajo PM_{10} Clean Data Finding

Effective April 10, 2006, EPA published a Clean Data Finding for the 2002-2004 data period for this planning area [February 8, 2006; 71 FR 6352]. Therefore, no reasonable further progress requirements, attainment demonstration, or nonattainment area contingency measures are necessary. The Air Quality Division is developing a 10-year Maintenance Plan and a redesignation request for submittal in FY 2008.

Miami PM_{10} Planning Area Boundary Redesignation and Clean Data Finding

In 1987, EPA designated the combined Hayden/Miami area as a single Group I PM_{10} nonattainment area. On October 16, 1989, ADEQ submitted a nonattainment plan for the Hayden portion only and asked that the Miami portion be excluded. EPA did not act on the submittal. On November 10, 1994, ADEQ submitted a Petition for rulemaking to realign the Hayden/Miami PM_{10} nonattainment area boundary by correcting EPA's 1987 inclusion of the Miami area in the Group I area in 1987 to EPA and instead excluding the Miami portion from the Hayden/Miami planning requirements. EPA did not act on the Petition and instead proposed a limited approval for the Hayden portion and a limited disapproval for the Miami portion, which the Plan had not addressed, on July 15, 1994, that was never finalized [59 FR 36116]. On June 20, 2006, the Air Quality Division submitted a request for boundary redesignation pursuant to

Clean Air Act Section 107(d)(3)(D), superseding the 1994 Petition. The supporting documentation covered meteorology, topography, locations of emission sources, local air transport patterns, and overall planning considerations. This request was to divide the single PM_{10} nonattainment area into two separate PM_{10} nonattainment areas roughly along the ridgeline of the Pinal Mountains. Effective May 29, 2007, EPA finalized the boundary redesignation [March 28, 2007; 72 FR 14422].

No violations had been monitored in the Miami PM_{10} nonattainment area since monitoring began there in 1987. ADEQ discontinued its last Miami PM_{10} monitoring site (known as Nolan Ranch, Miami South or Jones Ranch) in 1994. Since 1991, two monitors have continued operating in this area, both Special Purpose Monitors (SPMs) operated by Phelps Dodge Corporation. Monitoring data collected at SPMs are not routinely certified and entered into the EPA Air Quality System (AQS). To provide for the Clean Data Finding, ADEQ worked with Phelps Dodge Corporation to certify the SPM data and enter it into AQS for the 2003-2005 period. The data met EPA's requirements in Title 40 CFR Part 50, Appendix K, and ADEQ certified that the data met EPA's quality assurance requirements. Phelps Dodge Corporation has also made a written commitment to ADEQ to submit its Miami monitoring data that complies with EPA's regulatory requirements to ADEQ on a quarterly basis in the future. EPA finalized its Clean Data Finding for this area in the same Federal Register notice as the boundary redesignation. This finding means that reasonable further progress requirements, an attainment demonstration, and nonattainment area contingency measures are not required. The Air Quality Division will develop a 10-year Maintenance Plan to submit with a redesignation request in FY 2009.

5% Annual Reasonable Further Progress Maricopa Serious PM_{10} Nonattainment Area Emission Inventory and Attainment Demonstration Development

On June 6, 2007, EPA published in the Federal Register [72 FR 31183] a Finding of Failure to Attain the PM_{10} standard by December 31, 2006, for Maricopa County. The area had obtained a 5-year extension of the attainment deadline for Serious Areas pursuant to Section 188(e) to December 31, 2006. The Finding requires Arizona to submit by December 31, 2007, a SIP revision to provide for attainment and 5% annual reductions in PM_{10} or PM_{10} precursor emissions until attainment is achieved, as required by Clean Air Act Section 189(d). Maricopa County is only the second PM_{10} nonattainment area in the nation subject to the 5% annual RFP requirement. San Joaquin Valley was the first, and Owens Valley, California, is the third. San Joaquin Valley's exceedances occur during high wind events, and Owens Valley exceedances have resulted from the draining of Owens Lake. In contrast, Maricopa County PM_{10} exceedances occur primarily during stagnant wintertime morning conditions. ADEQ worked with the Maricopa Association of Governments (MAG) and the Maricopa County Air Quality Department (MCAQD) on MCAQD's new base case emissions inventory to improve the Windblown Dust and Agricultural source category emissions estimates.

On August 21, 2007, EPA published in the Federal Register [72 FR 43537] a Final Rule effective September 20, 2007, approving a number of Maricopa County rules and measures as Best Available Control Measures and Most Stringent Measures. Although the measures address exceedances that occurred in the 32-square-mile Salt River sub-area of the Maricopa Serious PM_{10} Nonattainment Area, the control measures apply to the entire Nonattainment Area. ADEQ worked with EPA, MCAQD, MAG, and Sierra Research to refine the attainment modeling demonstration to simulate ambient conditions and to show the air quality benefits of the strategies adopted to achieve the NAAQS. Control strategies were developed by stakeholders through the MAG committee process and the 2007 Arizona legislative session, culminating in adoption of Senate Bill 1552. Stakeholders included Pinal County, as one of its townships is in the planning area. Selected control measures target many categories of pollution sources: agriculture; commercial and residential construction; road construction; sand and gravel mining; leaf blowing; off-road vehicles; open burning, including residential, hospitality industry, outdoor fires; primary and secondary paved roads; unpaved parking lots, ingress and egress areas at residential and commercial buildings meeting size thresholds; unpaved public roads and shoulders; and windblown dust from disturbed land (including areas in the river bottom) and vacant lots.

Public education, training of paid leaf blower operators, basic training of water truck and water pull drivers as well as superintendents of sites meeting size thresholds, comprehensive training of Dust Control Coordinators at sites meeting other size thresholds, and expanded distribution of High Pollution Advisories are other important control strategies. MCAQD is also improving enforcement by adding 51 inspectors for construction sites and vacant lands and 40 additional support employees, including supervisors.

Yuma PM_{10} Nonattainment Area Pending Redesignation

Yuma was designated nonattainment for PM_{10} (particulate matter 10 microns or smaller) in 1990. ADEQ developed a State Implementation Plan (SIP) for Yuma in 1991 that demonstrated the area could meet the federal NAAQS by December 1994. After several consecutive years of clean monitoring data, a stakeholder process to prepare an attainment demonstration and maintenance plan was convened in July 2001. ADEQ met with local stakeholders to review the control measures already in place and hired a contractor to assist in developing an emissions inventory for the 1999 base year and future year emissions estimates. After air quality modeling for 1999 was completed successfully, ADEQ staff learned that incomplete monitoring data for 2001 would necessitate using the 2002-2004 monitoring data for the attainment demonstration, with a SIP submittal in early 2005.

On August 18, 2002, however, an unusually large and intense thunderstorm with blowing dust over east-central Sonora moved northwesterly through Yuma. For this day there were three hours with wind speeds above the dust re-suspension threshold of 15 mph. The Yuma PM_{10} monitor registered 170 ug/m3, exceeding the National Ambient Air Quality Standard of 150 $\mu g/m^3$. Data from nearby meteorological sites were tested to determine whether the exceedance date in question was considered meteorologically exceptional. These tests are described in an ADEQ document, “Technical Criteria Document for Determination of Natural Exceptional Events for Particulate Matter Equal to or Less than Ten Microns in Aerodynamic Diameter (PM_{10})”, May 31, 2000. The August 18, 2002 date met the criteria for a natural exceptional event in EPA's policy, and qualified for treatment through a Natural Events Action Plan (NEAP). ADEQ submitted a NEAP to EPA on February 19, 2004, which did not require EPA approval.

EPA made a Clean Data Finding for 1998-2001 and subsequent years for Yuma on March 14, 2006 [71 FR 13021] that became effective May 16, 2006. As a result, reasonable further progress requirements, an attainment demonstration and nonattainment contingency measures were not required. ADEQ continued to work with the stakeholder group and submitted the request for redesignation and 10-year Maintenance Plan to EPA on August 16, 2006. All Best Available Control Measures (BACM) in the NEAP were adopted and implemented by August 18, 2005, and have been included in the Maintenance Plan. Best Available Control Measures for all significant sources of PM_{10} contributing to the PM_{10} concentrations in Yuma County include enforcement to prevent traffic and trespass on unpaved Irrigation District canal roads, Agricultural Best Management Practices (AgBMP) for windblown dust, control measures for other disturbed land and vacant lots, and requirements for uncovered trucks hauling particulate matter. A public outreach campaign was developed involving bilingual brochures, a public service announcement, and a video for the general public. Dust Control Action Forecasts are provided 3 days in advance by ADEQ to sources, including construction site contractors, public works, and agricultural sources notified by the Department of Agriculture, to enable them to re-schedule activities that would disturb soils or to add control measures.

Additional analyses were prepared by the Air Quality Division to quantify the emission reductions from the implementation of Agricultural Best Management Practices, which began in Yuma August 1, 2005. This work was accomplished with the help of Yuma farmers, conservation agents, and Arizona Department of Agriculture personnel.

In 2007, ADEQ adopted the Yuma AgBMP rule as a supplemental contingency measure in the Maintenance Plan to meet the requirements of Clean Air Act Section 175A(d). This was necessary because the requirement for a NEAP ended after EPA promulgated an Exceptional Events Rule to replace its Exceptional Events Policy and its Natural Events Policy. Also in 2007, EPA noted that sixteen exceedances of the 24-hour PM10 standard had occurred at the Special Purpose BAMS monitor in Yuma. Because the Special Purpose Monitor had been in operation since November 2004, more than 24 months, EPA could compare its ambient monitoring data to the National Ambient Air Quality Standards [October 17, 2006. 71 FR 61302 revising Title 40 CFR § 58.20(c)]. The Air Quality Division has evaluated each of these sixteen exceedances for data flagging pursuant to EPA's Exceptional Events Rule. ADEQ anticipates that all eleven events will qualify for exception and has conducted a Natural Events Stakeholder meeting in Yuma on November 13, 2007. If the stakeholders concur with ADEQ's analysis, ADEQ would submit the documentation to EPA. Thereafter, EPA would be able to complete the redesignation process.

Maricopa 8-Hour Ozone Nonattainment Area Plan

MAG developed a Plan that included the Apache Junction township in Pinal County and submitted it to ADEQ on June 12, 2007. ADEQ submitted it to EPA on June 14, 2007, with the understanding that it would have to be supplemented after EPA responds to a court remand of its Phase I Implementation Rule (*South Coast Air Quality Management District, et al. v. U.S. EPA,* No. 04-1200, issued December 22, 2006). Preliminary monitoring data for 2007 indicated no exceedances or violations through September 30th. If quality assurance confirms the data, then 2005-2007 air quality data would demonstrate attainment of this National Ambient Air Quality Standard.

Western Arizona/Sonora Border Air Quality Study (WASBAQS)

The purpose of this study is to determine the sources and movement of air pollutants as well as assess their health impacts on residents of far southwestern Arizona and adjacent regions of Mexico. To accomplish this, ADEQ, in partnership with local, state, federal, and tribal governments will follow methodology similar to the Ambos Nogales and Douglas/Agua Prieta risk assessments. This study consists of four components: measuring meteorological variables and sampling air pollutant concentrations, constructing an inventory of the emissions, simulating the concentrations with an air quality model, and conducting personal exposure and risk assessment analyses. Its area of interest is from Yuma, Arizona to the border, San Luis, Rio Colorado, Sonora, and portions of Baja California del Norte and California.

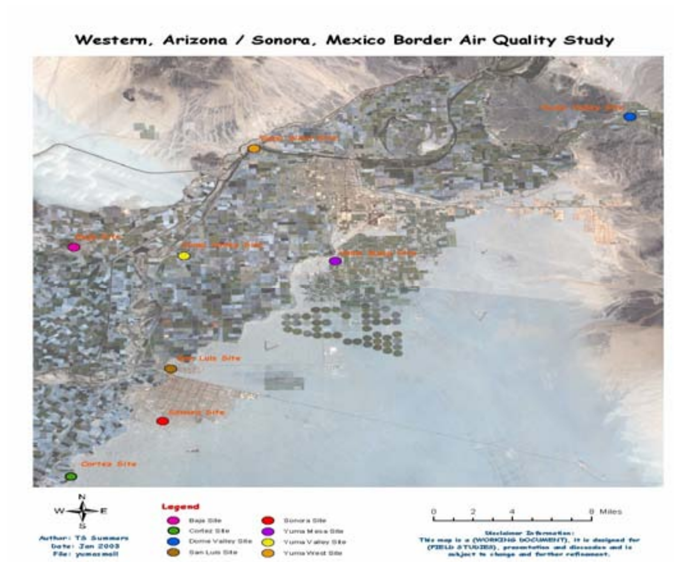


Figure 4 – Map of Western Arizona/Sonora Border Air Quality Study monitoring locations.

This project began with the establishment of meteorological sites in the Yuma/San Luis area, with five Arizona sites in summer 2003 and three Mexico sites in June 2004. Measurements consisted of wind speed, wind direction, solar radiation, pressure, temperature, relative humidity, and delta-T. In addition to this meteorological network, two "supersites" with both gaseous and particulate monitoring were established in March 2006: one in northeastern Yuma and the other in northwestern San Luis, Rio Colorado. These sites were run until April 2007. In 2006 ADEQ staff and its contractor began building the emissions inventory, completed in November, 2007.

The WASBAQS also included three special purpose monitoring studies: the pollution from the brick kilns of San Luis, elevated particulates associated with unpaved roads, and the spatial distribution of pollutants in neighborhoods.

As envisioned by ADEQ staff, the WASBAQS, or "Yuma/San Luis border study," then, would incorporate the elements of the Nogales and Douglas/Aqua Prieta studies, but will expand to issues of cross-border transport, brick kilns, and agricultural emissions.

Rillito PM_{10} Clean Data Finding

Effective October 10, 2006, EPA published a Clean Data Finding for the 1992-1994 data period and subsequent years [August 8, 2006; 71 FR 44920]. The Air Quality Division is developing a 10-year Maintenance Plan and redesignation request for submittal to EPA in FY 2008.

EPA's Proposed Revisions to 8-Hour Ozone Standard

National Primary Ambient Air Quality Standards (NAAQS) are reviewed periodically to incorporate current scientific knowledge and to provide a review process for public and scientific input. The last review of the ozone standards was completed July 18, 1997, at which time the 8-hour standard was set at level of 0.08. The average of the most recent three year's fourth highest measurements is compared to 0.084. The secondary standard was set equal to the primary standard.

The EPA initiated the current review in September 2000. After a series of delays for study workgroups, public review and comment, and litigation, the Court decreed that a final rulemaking by EPA must be completed no later than March 12th, 2008. Written comments on the proposed rule were required to be submitted to the EPA by October 9th, 2007. ADEQ was one of thousands of organizations, government agencies and individuals to submit comments by this deadline.

Primary Standard – 0.070 to 0.079 ppm Ozone

As stated in the Code of Federal Regulations Part 50.2, "the national primary ambient air quality standards define levels of air quality which the Administrator judges are necessary, with an adequate margin of safety, to protect the public health. The selection of any particular approach to providing an adequate margin of safety is a policy choice left specifically to the Administrator's judgment". Choosing an adequate margin of safety is subjective and requires consideration of available scientific evidence drawn from clinical studies as well as the size and risk levels of the various at-risk populations such as asthmatics and persons with pulmonary function deficiencies.

Based on research that has been done on ozone-related adverse health effects since the standard was last revised, EPA proposed strengthening the current 0.08 parts-per-million 8-hour annual primary standard to one that is within a range of 0.070 to 0.079 ppm. The three-year averaging of the fourth highest measurement would not be changed. Because of the rounding convention adopted in 1997, ozone concentrations up to and including 0.084 meet the current standard. The proposed standards do not permit the "extra" 0.004. An 8-hour standard of either 0.070 or 0.075 ppm, would change the attainment status of many areas in Arizona, since the monitors that represent conditions in those areas are currently just slightly below the current 0.08 ppm standard. Table 16: 2004-2006 Eight-Hour Ozone Compliance shows that only a small percentage of the sites in Arizona would meet the 0.075 standard and many more would likely not meet a 0.070 standard.

Secondary Standard – 7 to 21 ppm-hours in Highest 3-Month Period

EPA proposed to revise the secondary standard for ozone to provide increased protection against ozone-induced adverse impacts on vegetation and forested ecosystems. These include growth impairment of the seedlings of sensitive tree species, visible foliar damage, impaired root growth in mature trees such as Ponderosa pine, and reduced crop yields.

Two proposals are being considered:

1. Make the new secondary standard the same as the new primary standard. This approach would ignore the considerable amount of evidence derived from studies of agricultural yields and documented impacts on non-agricultural herbs, shrubs and trees.
2. Base the secondary standard on a method designed to estimate the total effect of cumulative exposure of plants and wildlife to ozone during daylight hours over the ozone season. The "W126" function was recommended for the estimation measure of ozone exposure.

The members of EPA's Clean Air Scientific Advisory Committee (CASAC) were unanimous in recommending a secondary standard different than the primary standard and one that adequately gauged ozone exposure. They recommended a secondary standard based on the sum of the weighted hourly ozone concentrations at a site over the highest 3-month period of the season. The sigmoidal (S-shaped) weighting function, W126, is defined for the daytime hours as:

$$W126 = \max \sum_{8\text{ am}}^{7\text{ pm}} w^{*}C_i \quad \text{where } C_i = \text{hourly ozone concentration over 3 consecutive months,} \quad w = 1/(1 + 4403e^{-126C_i})$$

While this function looks complicated, it is widely accepted as a preferred approach because it measures total ozone exposure during daylight hours and weights hourly ozone concentrations lowest at lower concentrations and increases the weight as ozone concentration increases. To illustrate this, experiments on plants have shown that an ozone concentration of 0.07 ppm does more than two times as much damage as a concentration of 0.035 ppm. So the W126 function assigns the weight for a 0.07 ppm concentration more than twice that for a 0.035 ppm concentration.

The recommended secondary standard range for the W126 sum is 7 to 21 ppm hours for the three months during ozone season that maximizes the W126 sum. For most sites in Arizona, the maximum months are May through July, but some maximize in the April through June period. Unfortunately, many of the sites in Arizona do not meet the 21 ppm-hour total and few would be likely to meet a secondary standard of 7 ppm-hours total for the maximum consecutive three-month ozone monitoring season.

For each ozone-monitoring site in Arizona, Table 23 shows that site's 2004-2006 data to compare its 3-year average of the 4th highest concentrations with the proposed range of primary standards. It also shows each site's 2006 data to compare its maximum 3-consecutive-months sum of W126 values with the proposed range of 7 to 21.

Table 23: 2004 - 2006 Eight-Hour Ozone Average vs. Proposed Primary Standard And 2006 Maximum 3-Month W126 Totals vs. Proposed Secondary Standard

Site	Proposed Primary Range	3-Yr Avg. 4th Highest	Proposed Secondary Range	Max 3-Mo W126
Cochise County				
Chiricahua NM Entrance Station	.070 – .079	0.072	7 - 21	12.5
Coconino County				
Grand Canyon NP : Hance	.070 – .079	0.073	7 - 21	21.7
Gila County				
Tonto NM	.070 – .079	0.080	7 - 21	26.5
La Paz County				
Alamo Lake (Opened 05/20/05)	.070 – .079	N/A	7 - 21	21.5
Maricopa County				
Blue Point	.070 – .079	0.072	7 - 21	6.2
Buckeye (Opened 08/01/04)	.070 – .079	N/A	7 - 21	8.8
Cave Creek	.070 – .079	0.079	7 - 21	27.1
Central Phoenix	.070 – .079	0.076	7 - 21	22.1
Dysart	.070 – .079	0.067	7 - 21	N/A
Falcon Field	.070 – .079	0.075	7 - 21	8.1
Fountain Hills	.070 – .079	0.082	7 - 21	33.1
Glendale	.070 – .079	0.076	7 - 21	17.3

Table 23: 2004 - 2006 Eight-Hour Ozone Average vs. Proposed Primary Standard And 2006 Maximum 3-Month W126 Totals vs. Proposed Secondary Standard				
Site	**Proposed Primary Range**	**3-Yr Avg. 4th Highest**	**Proposed Secondary Range**	**Max 3-Mo W126**
Humboldt Mt.	.070 – .079	0.081	7 - 21	27.9
JLG Supersite	.070 – .079	0.074	7 - 21	19.3
North Phoenix	.070 – .079	0.083	7 - 21	29.2
Pinnacle Peak	.070 – .079	0.075	7 - 21	7.5
Rio Verde	.070 – .079	0.081	7 - 21	32.0
South Phoenix	.070 – .079	0.072	7 - 21	12.1
South Scottsdale	.070 – .079	0.076	7 - 21	22.0
Tempe	.070 – .079	0.075	7 - 21	23.0
West Phoenix	.070 – .079	0.074	7 - 21	23.7
Navajo County				
Petrified Forest NP	.070 – .079	0.070	7 - 21	21.1
Pima County				
22nd St. & Craycroft	.070 – .079	0.070	7 - 21	11.8
Children's Park	.070 – .079	0.071	7 - 21	15.2
Coachline	.070 – .079	0.068	7 - 21	14.3
Green Valley	.070 – .079	0.068	7 - 21	13.2
Rose Elementary	.070 – .079	0.066	7 - 21	8.8
Saguaro NP East	.070 – .079	0.076	7 - 21	19.4
Tangerine	.070 – .079	0.072	7 - 21	20.6
Tucson Downtown	.070 – .079	0.068	7 - 21	12.1
Tucson Fairgrounds	.070 – .079	0.068	7 - 21	12.3
Pinal County				
Apache Junction - Maintenance Yard	.070 – .079	0.073	7 - 21	23.3
Casa Grande - Airport	.070 – .079	0.071	7 - 21	17.8
Queen Creek	.070 – .079	0.065	7 - 21	12.0
Maricopa	.070 – .079	0.064	7 - 21	9.3

Table 23: 2004 - 2006 Eight-Hour Ozone Average vs. Proposed Primary Standard And 2006 Maximum 3-Month W126 Totals vs. Proposed Secondary Standard				
Site	**Proposed Primary Range**	**3-Yr Avg. 4th Highest**	**Proposed Secondary Range**	**Max 3-Mo W126**
Pinal Air Park	.070 – .079	0.071	7 - 21	12.8
Queen Valley	.070 – .079	0.078	7 - 21	27.5
Yavapai County				
Hillside	.070 – .079	N/A	7 - 21	N/A
Yuma County				
Yuma Game & Fish	.070 – .079	0.074	7 - 21	12.4

Trends

Introduction

Figure 5 - Average Best & Average Worst Visibility Impairment in the Phoenix Area

Whether air quality meets the standards is a central question, explored at length in the second chapter of this report, but one posed more often is whether it is improving or deteriorating. In Arizona, because of the phasing out of leaded gasoline in the mid-1970s and the installation of effective controls on copper smelters in the 1980s, the concentrations of both lead and SO_2 decreased rapidly. Although improvements have also been made in the concentrations of CO, O_3 and particulates, O_3 concentrations in the greater Phoenix area are virtually equal to the maximum allowed by the NAAQS standard. PM_{10} concentrations exceed the standards in Nogales, Phoenix, Buckeye, and Casa Grande. Visibility - the aspect of the atmosphere most obvious to the population - has been measured continuously in urban and pristine parts of the state long enough to establish trends. The following discussions examine the trends in these three common air pollutants and visibility in Arizona.

Carbon Monoxide

Since the mid to late 1970s, CO concentrations have declined dramatically. In Tucson, the maximum annual eight-hour concentration at 22nd Street and Alvernon declined from 12.0 in 1978 to 2.0 parts per million (ppm) in 2006 – a decrease of 82% (Figure 6).

In Phoenix at 18th Street and Roosevelt (Central Phoenix), the decline was from 23.0 ppm in 1975 to 3.8 ppm in 2006 – a decrease of 83% (Figure 7). The number of exceedances of the eight-hour standard in Phoenix decreased from 75 to 0 at Central Phoenix. The entire Phoenix network of CO monitors recorded over 100 exceedances each year from 1981 through 1986, with an average of 134 per year. The last recorded exceedance was in 1999. Most of this improvement can be attributed to Federal new-vehicle emission standards, augmented by emission reductions from the vehicle inspection and maintenance program, which began in 1976, the use of oxygenated fuels in the winter, beginning in 1989, and cleaner burning gasoline, beginning in 1997. As of 2006, the maximum concentration measured in the Phoenix Area CO network was 5.3 ppm, 41% below the NAAQS.

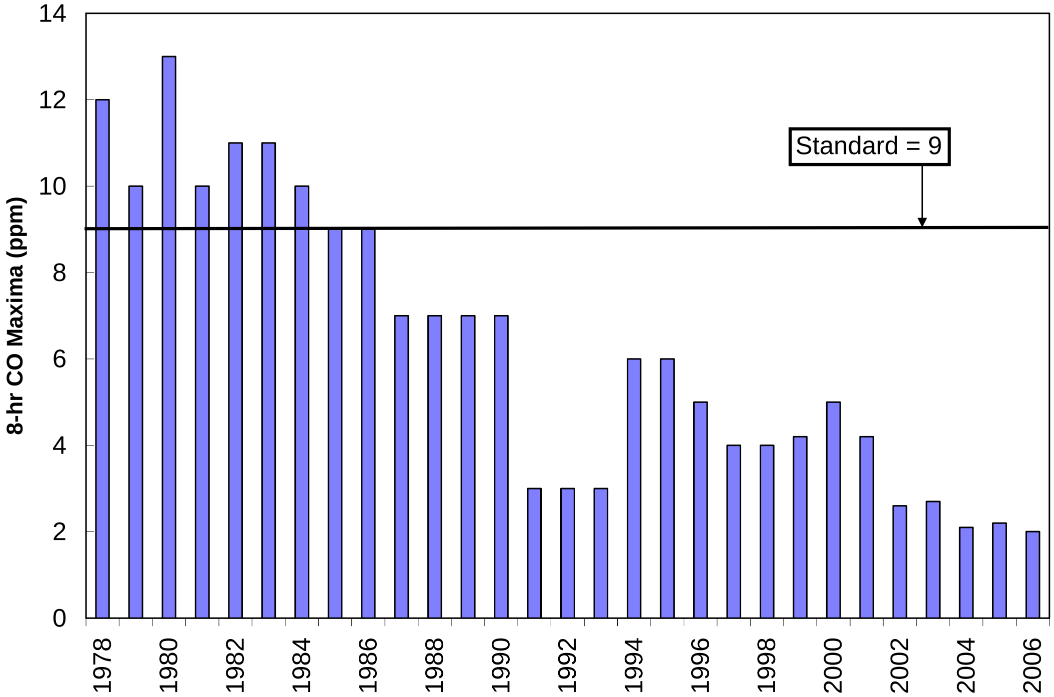


Figure 6 - Eight-hour carbon monoxide maxima at 22nd Street and Alvernon Way in Tucson

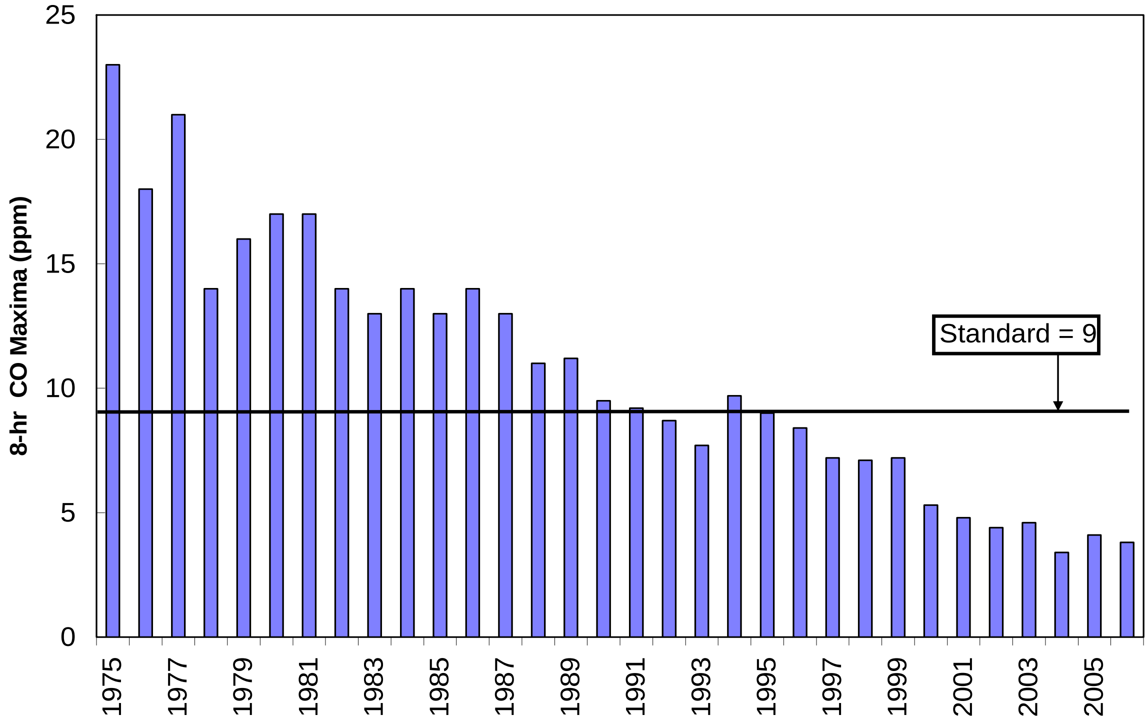


Figure 7 - Eight-hour carbon monoxide maxima at 18th Street and Roosevelt in Central Phoenix

Ozone

One-Hour Ozone Concentrations

Maximum one-hour O_3 concentrations have remained steady in Yuma, but have declined in Phoenix and Tucson since 1980 (Figure 8). These decreases have been 30% and 23%, for Phoenix and Tucson, respectively. The Phoenix decrease in O_3 concentrations since 1980 has been nowhere near as pronounced as its declining CO trend, but the net result has been similar: Only one exceedance of the O_3 standard has been recorded after 1996. The one-hour standard was officially declared attained on May 16, 2001. Changes in emissions would not be expected to produce proportional changes in concentration because of the relatively high background level of O_3 and its photochemical formation from hydrocarbons and nitrogen oxides. Yuma and Tucson have met the one-hour standard consistently since monitoring began. In the Phoenix airshed, the standard was exceeded regularly through the mid 1990s, with a gradual decrease to 1996, after which the concentrations remained steady and just below the standard until 2005. In 2005, the network maximum one-hour O_3 concentration increased in the Phoenix area beyond the exceedance level (but did not constitute a violation, see Chapter 2, 1-hr O_3 standard) at one site in the Phoenix area. It decreased below the standard again in 2006.

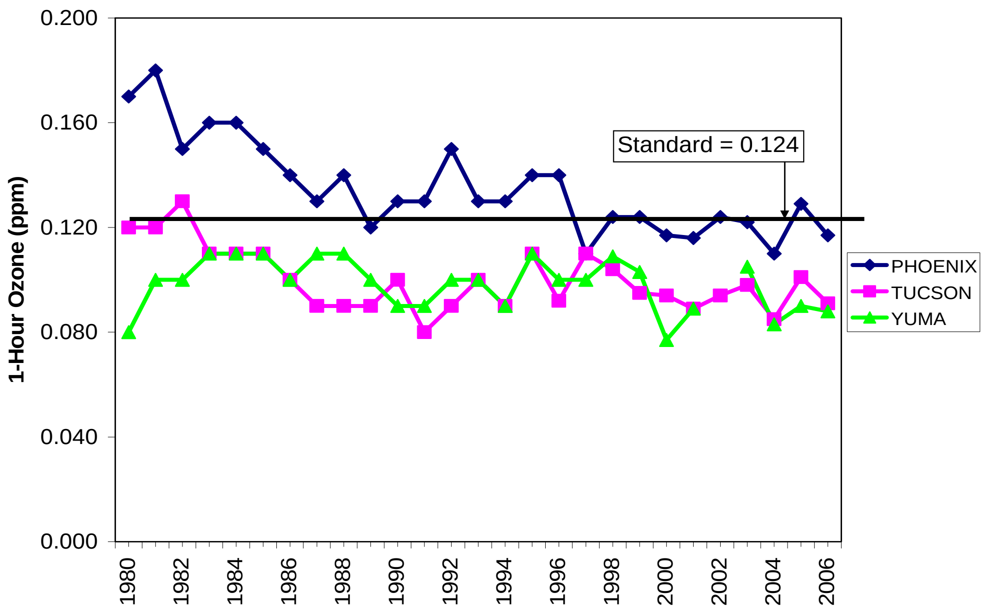


Figure 8 - Maximum one-hour ozone concentrations in three cities

Eight-Hour Ozone Concentrations

The eight-hour O_3 standard, adopted by EPA in 1997, but not officially implemented until 2003 because of litigation, is expressed as the three-year average of the annual fourth-highest concentration, not to exceed 0.08 parts per million. Due to instrument precision and rounding, however, this standard translates into a numerical value of 0.085 ppm: any value 0.085 ppm and above is an exceedance. Long-term trends of the fourth-highest ozone concentrations in Tucson fluctuate between 0.060 and 0.080 ppm, but, overall, are steady (Figure 9). A similar pattern in eight-hour ozone trends also characterizes Yuma, where, although the values are slightly higher than Tucson's, the nearly constant trend is apparent (Figure 10).

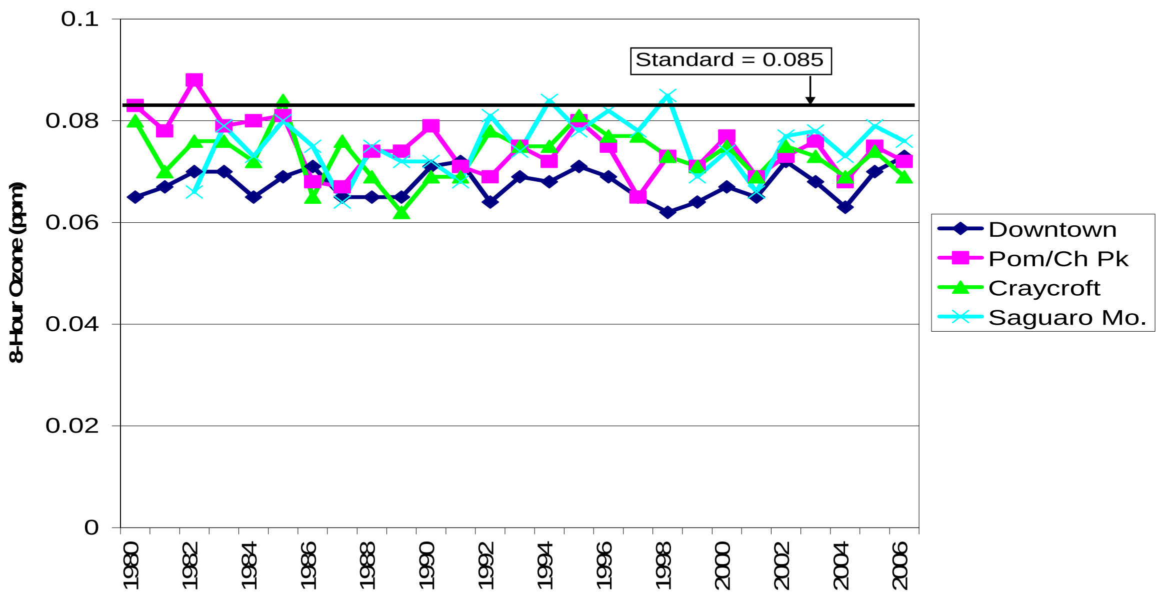


Figure 9 - Annual fourth-highest eight-hour ozone concentrations in Tucson

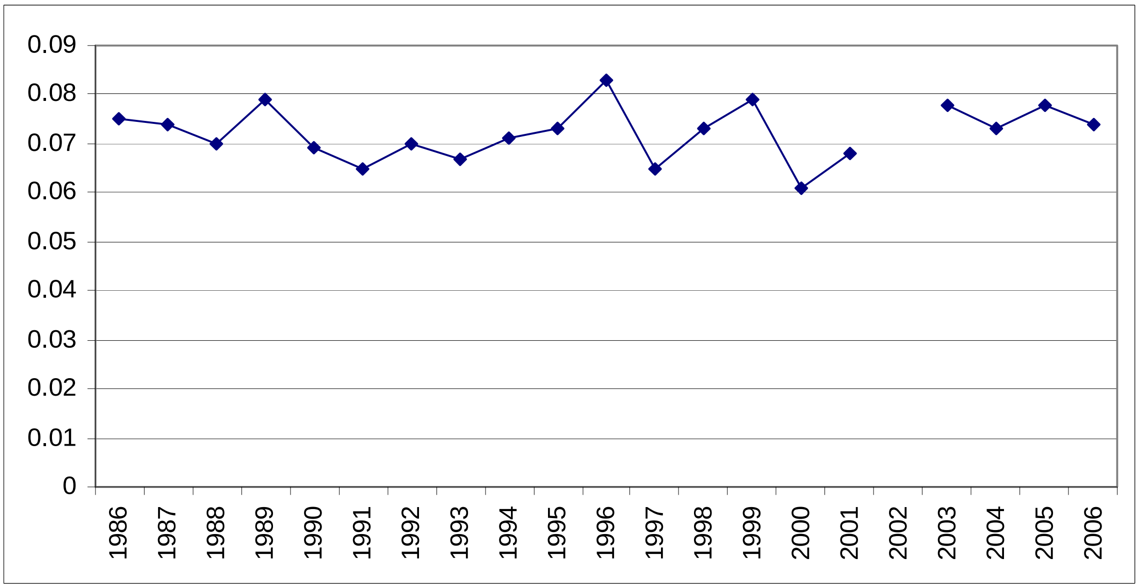


Figure 10 - Annual fourth-highest eight-hour ozone concentrations in Yuma

In contrast to the within-standard concentrations in Tucson and Yuma, 20 of the 33 sites in greater Phoenix recorded annual fourth-highest O_3 values in excess of 0.084 ppm from 1996 to 2006. In metropolitan Phoenix, there was one site with an annual fourth-highest eight-hour O_3 concentration in excess of 0.084 ppm in 2006. On the bright side, elevated values of the annual fourth-highest eight-hour O_3 concentration occurred at fewer monitoring sites and at lower values in 2006 than in 1996, with most of the improvement taking place since the 2000 to 2002 period. For instance, of the nine sites operational both in 1996 and 2006, six recorded fourth-highest values greater than 0.084 ppm in 1996, but there was only one in 2006. The values have decreased through time as well, with typical fourth-highest concentrations decreasing from 1996 to 2006: Phoenix Supersite, 0.087 ppm to 0.076 ppm; South Phoenix, 0.084 ppm to 0.069 ppm; South Scottsdale, 0.089 ppm to 0.080 ppm, and North Phoenix, 0.092 ppm to 0.085 ppm.

Looking at the specific statistical form of the standard -- the three-year average of the annual fourth-highest eight-hour ozone concentration -- metropolitan Phoenix did not exceed the standard in the three year period from 2004 to 2006, and, as with the annual fourth-highest values, the extent and severity have been decreasing with time.

ADEQ reviewed the three-year periods ending with 1998 through 2006: the first being 1996 to 1998 and the last being 2004 to 2006. In the first two three-year periods 1996 to1998, and 1997 to1999 (Table 24); thirteen and five monitoring sites, respectively, had average fourth-highest values equal to or exceeding 0.085 ppm. In the last two periods, the numbers of such sites had decreased to zero. The magnitude of these three-year averages has decreased substantially, as well. The highest average for the period ending in 1998 was 0.0923 ppm; the highest average in 2006 was ten percent lower at 0.083 ppm. These trends are consistent with the decreasing one-hour maximum ozone trends; however, most of the decrease in eight-hour ozone concentrations occurred since 2000, five years later than the decrease in the one-hour concentrations. This trend suggests that, barring unfavorable meteorological conditions or exceptional events (like major wildfires), attainment of the standard will continue.

Table 24. Three-Year Averages of the Annual Fourth Highest Eight-Hour Ozone Concentrations in Phoenix and Environs
(Units are in parts per million (ppm). Bold values in yellow cells equal or exceed the operational standard of 0.085 ppm)

Site	1997-1999	1998-2000	1999-2001	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006
North Phoenix	**0.0880**	**0.0863**	**0.0853**	**0.0857**	**0.0856**	0.0837	0.083	0.083
Phoenix Supersite	0.0737	0.0727	0.0723	0.0770	0.0766	0.0743	0.074	0.075
Blue Point	**0.0860**	**0.0887**	**0.0853**	0.0843	0.0840	0.0823	0.080	0.072
Apache Junction	0.0817	0.0813	0.0797	0.0797	0.0763	0.0737	0.069	0.073
Pinnacle Peak	0.0810	0.0817	0.0820	**0.0850**	0.0840	0.0783	0.078	0.075
Fountain Hills	0.0823	0.0817	0.0810	0.0847	0.0840	0.0813	0.082	0.082
Falcon Field	0.0823	0.0817	0.0810	0.0800	0.0813	0.0777	0.075	0.075
South Scottsdale	0.0753	0.0760	0.0760	0.0787	0.0783	0.0763	0.076	0.076
West Phoenix	**0.0853**	**0.0860**	0.0823	0.0800	0.0786	0.0777	0.072	0.074
Maryvale	0.0813	0.0830	0.0783	0.0790	0.0800	0.0835	0.083	Closed
Humboldt Mt.	**0.0860**	**0.0863**	0.0847	**0.0850**	**0.0873**	**0.0850**	0.084	0.081
Tonto Monument				**0.0870**	**0.0855**	0.0827	0.081	0.080
Queen Valley			0.0790	0.0810	0.0830	0.0810	0.081	0.078
Cave Creek			0.0830	0.0845	0.0840	0.0817	0.080	0.079
Hillside	0.0810	0.0833	0.0810	0.0827	0.0773	0.0777	0.072	Closed
Rio Verde	0.0833	0.0837	**0.0850**	0.0847	0.0837	0.0840	0.081	0.081
West Chandler	0.0733	0.0733	0.0747	0.0793	0.0797	0.0770	0.074	0.075
Maximum	**0.0880**	**0.0887**	**0.0853**	**0.0857**	**0.0873**	**0.0850**	0.084	0.083
n ≥ 0.085 ppm	5	5	3	4	3	1	0	0

Illustrated in Figure 11 are the three-year averages from nine monitoring sites, listed in Table 24, that have a long period of operation and have recorded one or more averages above the standard. Although there is considerable site-to-site variability, the overall trend was downward until recently. While a few sites have continued this downward trend, others have leveled out or slightly increased in the most recent three-year periods.

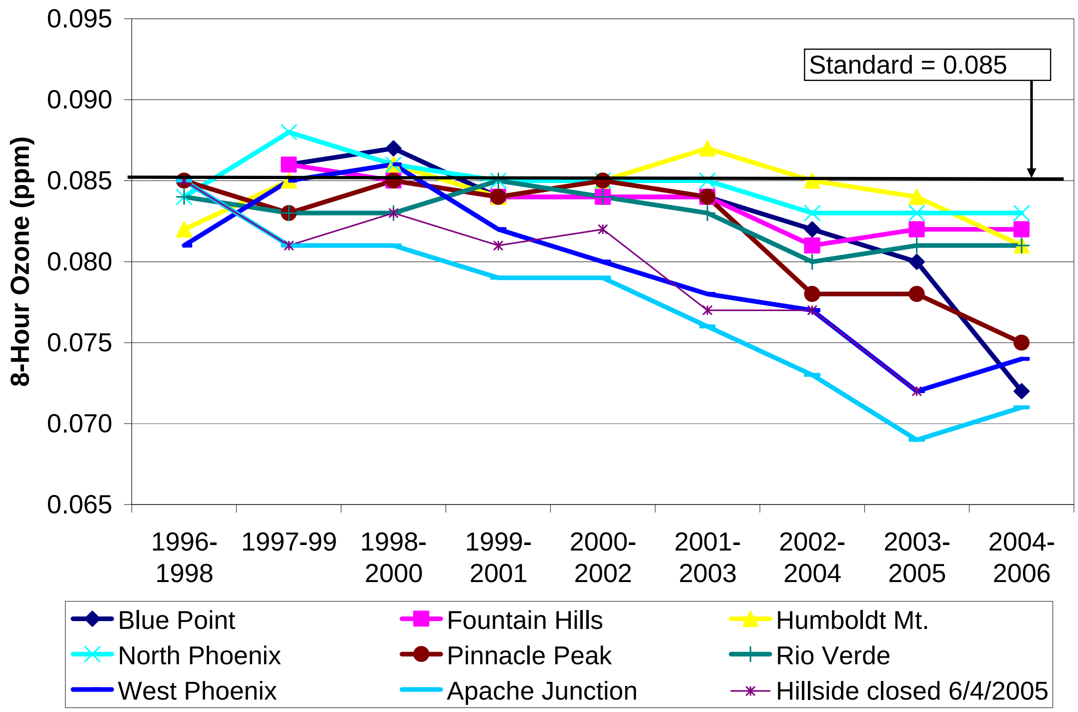


Figure 11 - Phoenix area eight-hour ozone trends: three-year averages of the annual fourth highest concentrations

Reviewing these sites together (Figure 12), the maximum value fluctuates at or just above the standard for all of the periods except the first, with a range from 0.085 to 0.088 ppm. The average of these sites, after a steady trend for the first half of the record, moves decidedly down in the latter half. These sites seem capable of producing maximum values at or slightly above the standard throughout the period of record; but their average is displaying a robust decline since 2000 to 2002.

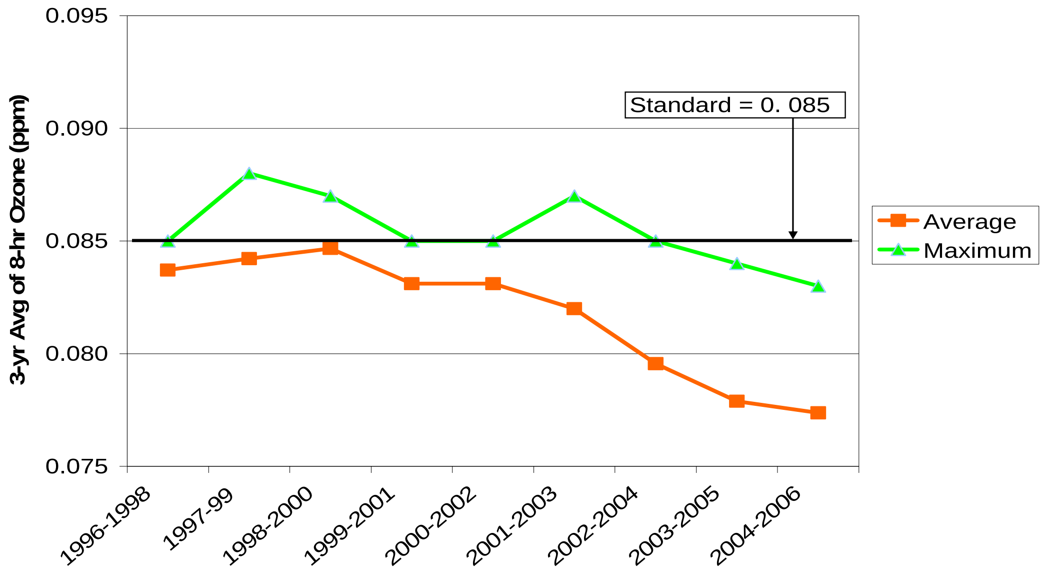


Figure 12 - Phoenix area eight-hour ozone trends: three-year averages of the annual fourth-highest concentrations, expressed as the average and maximum of nine long-term sites

While the trend of the maximum values has been clearly downward, the slope of the trend line of the average values is becoming less negative, indicating that the rate of decrease is slowing.

Particulates

PM_{10}

PM_{10} concentrations have decreased considerably at most sites throughout the state in both urban and rural settings. Nonetheless, this pollutant, more than any other, continues to exceed its standards and there is a small reversal of the long-term trend at several sites in the Phoenix metropolitan area – notably in the west valley. For example, annual PM_{10} concentrations in South Phoenix averaged 68.7 $\mu g/m^3$ from 1985 to 1987, but only 52.0 $\mu g/m^3$ in 2004 to 2006, a decrease of 26 percent. Figures 13 and 14, which show the three-year moving averages, have two distinct similarities: First, one or more sites shows dramatic improvement in the earliest part of the record; and, second, all sites show improvement in the latter part until the most recent three-year period where the downward trend flattens.

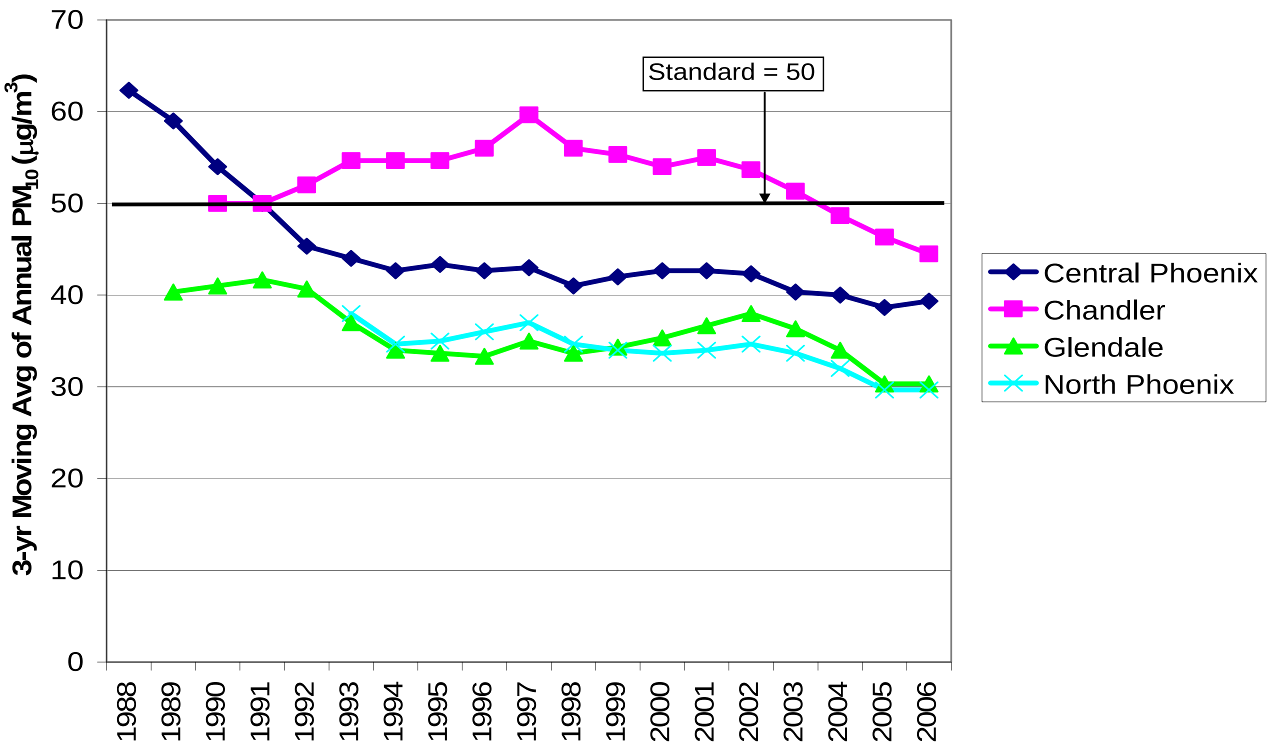


Figure 13 - Three-Year Moving Averages of Annual Average PM_{10} at four metropolitan Phoenix sites with moderate PM_{10} levels (each data point is the average of the three years ending in that year (e.g. "2006" is the average of 2004, 2005, and 2006).

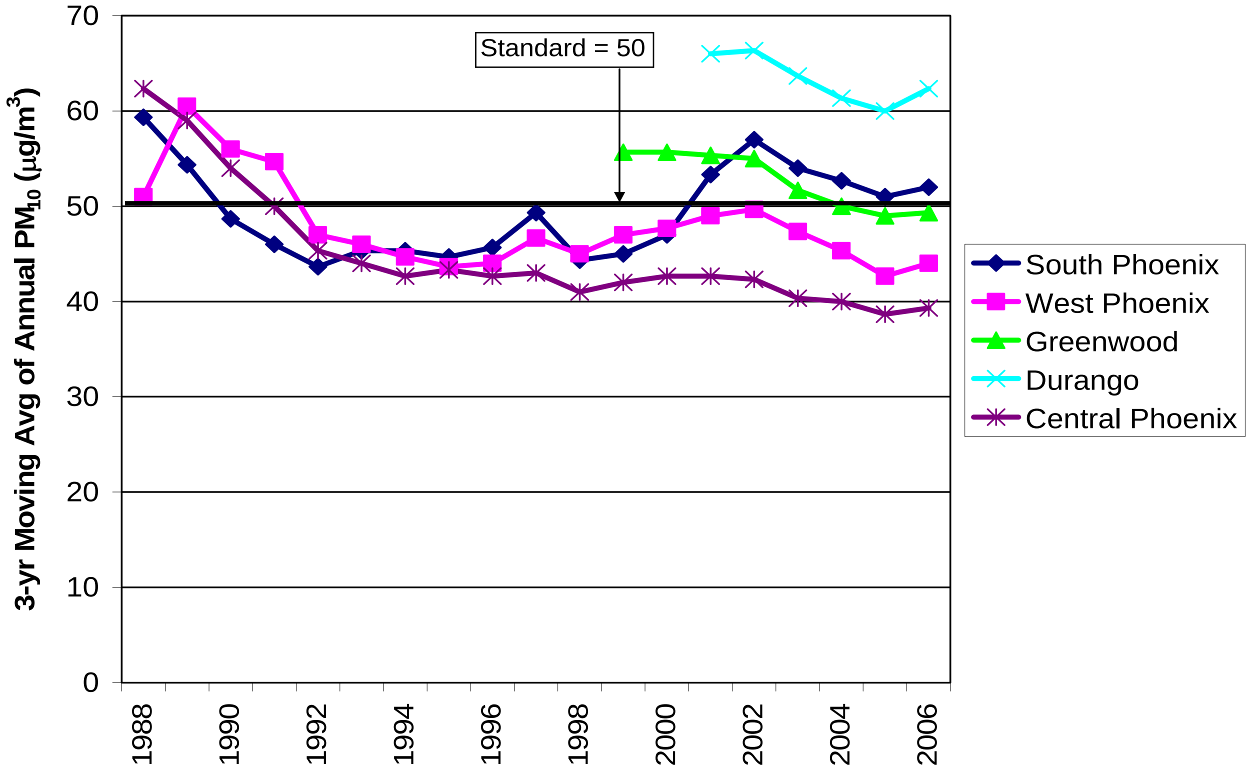


Figure 14 - Three-Year Moving Averages of PM_{10} at four metropolitan Phoenix sites with higher PM_{10} concentrations

Despite these improvements, unlike the trends for CO and O_3, PM_{10} standards continue to be violated. Annual concentrations for the last 14 years, presented in Table 25, demonstrate that some sites in metropolitan Phoenix have been above the standard for one or more years: Chandler, South Phoenix, West Phoenix and Greenwood. Of these four sites there have been 17 exceedances of the annual standard over the last 9 years (1998 to 2006). Each of these sites presents a different mix of localized emission sources. Chandler's emissions had gone from agricultural to earthmoving for residential and road construction so the site was closed at the end of 2005 and replaced by the more agricultural Higley monitor. South Phoenix and Durango, near the industrial Salt River area, are influenced by emissions from the industrial sources there. Without any nearby industrial or earthmoving activity, West Phoenix PM_{10} concentrations would appear to be the result of the transport of metropolitan wide emissions into this part of town. Two miles southeast of West Phoenix, Greenwood combines the high regional concentrations with its close proximity to a major arterial street and freeway.

Table 25: Annual PM_{10} Concentrations in Metropolitan Phoenix ($\mu g/m^3$)										
Year	***Central Phoenix***	***Chandler***	***Glendale***	***North Phoenix***	***South Phoenix***	***West Phoenix***	***Mesa***	***South Scottsdale***	***Greenwood***	***Durango***
1992	42	**56**	34	35	48	47	29	34		
1993	43	**58**	35	34	44	44	35	34		
1994	43	50	33	35	44	43	36	38		
1995	44	**56**	33	36	46	44	35	36		
1996	41	**62**	34	37	47	45	33	35		
1997	44	**61**	38	38	**55**	**51**	43	41	**61**	
1998	38*	45	29	29	31*	39	29	34	50	
1999	44	**60**	36	35	49	**51**	35	40	**56**	**69**
2000	46	**57**	41	37	**61**	**53**	37	40	**61**	**70**
2001	38	48	33	30	50	43	30	33	49	**59**
2002	43	**56**	40	37	**60**	**53**	36	37	**55**	**70**
2003	40	50	36	34	**52**	46	34	36	**51**	**62**
2004	37	40	26	25	46	37	23	26	44	**52**
2005	39	49	29	30	**55**	45	30	34	**52**	**66**
2006	42	*Closed in 2005*	36	34	**55**	50	31	33	**52**	**69**

Bold values in yellow cells exceed the annual standard of 50 µg/m3.
*** Does not satisfy EPA summary criteria of 75% data recovery.**

The highest PM_{10} concentrations in metropolitan Phoenix are in southwest Phoenix, along the Salt River from about 7th Street to 59th Avenue. Although most of the area is industrial, there are many residential areas. The PM_{10} record in this area since 1994 is shown in Figure 15. The West 43rd Avenue site is the replacement for the Salt River site. Concentrations have exceeded the standard every year of monitoring in this area.

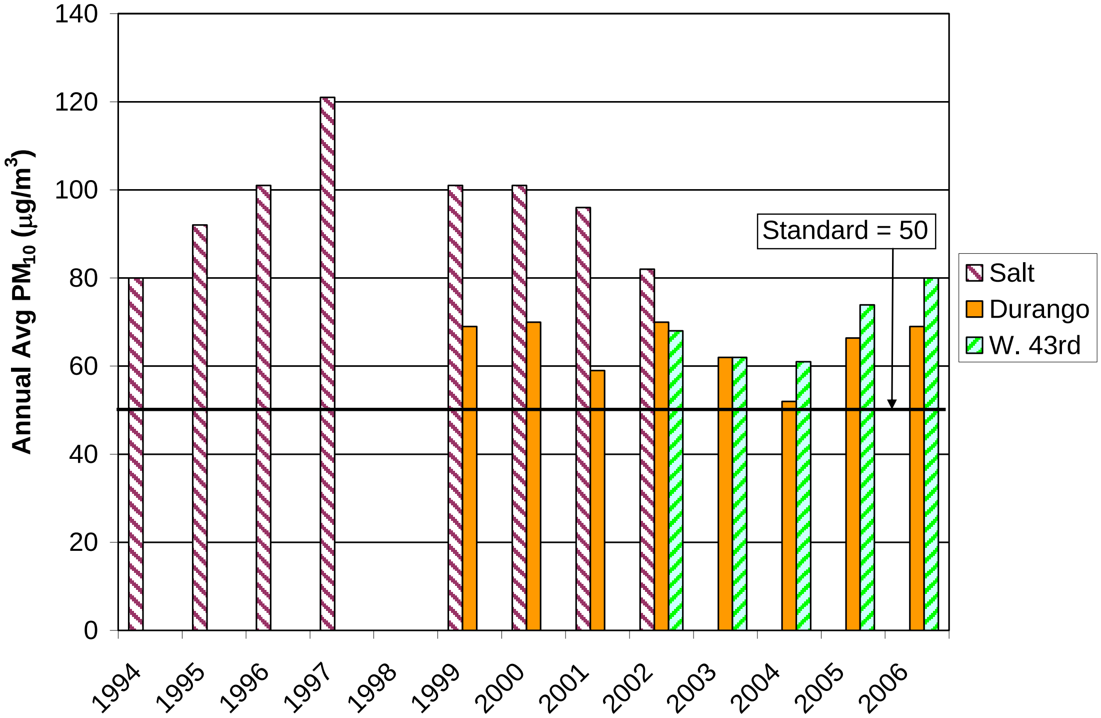


Figure 15 - Annual PM_{10} concentrations in the Salt River area

In Tucson, the background site of Corona de Tucson and the rural site of Green Valley have had fairly constant average concentrations of PM_{10}, but the four long-term urban sites all show substantial decreases since the mid 1980s. Orange Grove had a three year average of 43.3 $\mu g/m^3$ in 1985 to 1987, but decreased 35 percent to a concentration of 28.3 $\mu g/m^3$ by 2003-2005. It increased very slightly to 29.3 in 2004-2006. South Tucson, Prince Road and Broadway/Swan showed smaller, but substantial, decreases (Figure 16), with similar patterns of an early decrease, followed by a period of gradual increases, and ending with decreasing trends in the last five years. They also experienced slight increases in the most recent three-year period.

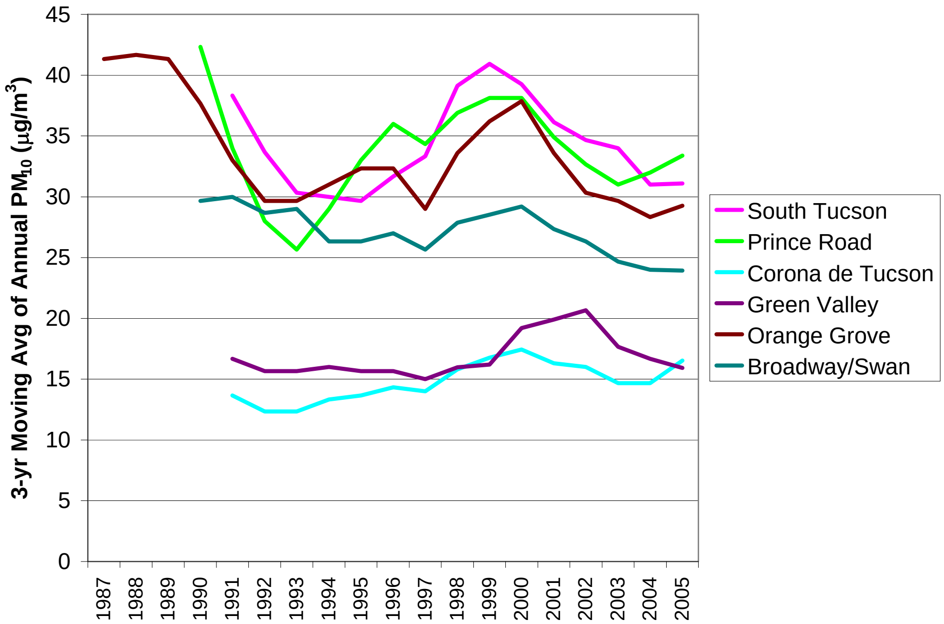


Figure 16 - Three-year moving averages of annual average PM_{10} at six metropolitan Tucson sites

These PM_{10} reductions in the urban settings can be attributed to a reduction of coarse particulate emissions from paving roads, alleys and road shoulders, and better controls of dust emissions from construction sites.

Throughout the rest of the state, PM_{10} concentrations have declined since 1985 at many sites. Figure 17 presents these trends as three-year moving averages. Favorable trends over the last 20 years for a group of high concentration sites outside of the Phoenix area include Payson and Paul Spur where concentrations have been reduced by more than 70 percent, Douglas where concentrations have been reduced by nearly half, Rillito which has decreased 40 percent and Yuma which has decreased 26 percent. For most of the sites, nearly all of the improvement took place from the mid 1980s to the mid 1990s. The percentage improvement during this ten-year period varied from 24% to 65%, depending on the site, a remarkable decrease. After this point, two sites continued to decrease (Paul Spur and Payson); three sites (Nogales, Yuma, and Rillito) increased until the early part of 2000; and two sites have remained about the same (Douglas and Hayden). Between 2001 and 2005 Nogales and Yuma have had a deceasing trend, and Rillito has leveled out. At the beginning of the period, six of the seven sites were above the standard; all have been within the standard since the mid 1990s. In each of these localities, road paving, better industrial dust controls, and (in Payson only) cleaner fireplaces and woodstoves can be given credit for the improvement. All of these PM_{10} emission reductions were accomplished through State Implementation Plan activities led by the Air Quality Division.

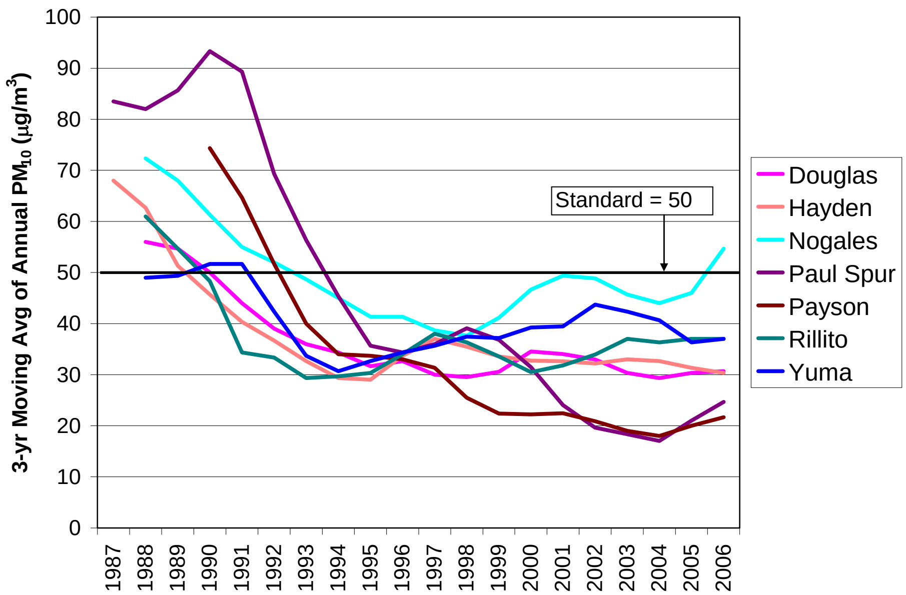


Figure 17 - Three-year moving averages of the annual average PM_{10} concentrations at sites with higher concentrations

PM_{10} concentrations at sites with lower concentrations have also decreased with Ajo concentrations reduced by 44 percent, Bullhead City by 56 percent, and Safford by 50 percent. Other sites with lower concentrations at lower elevations were steady or slightly decreasing until recently (Figure 18).

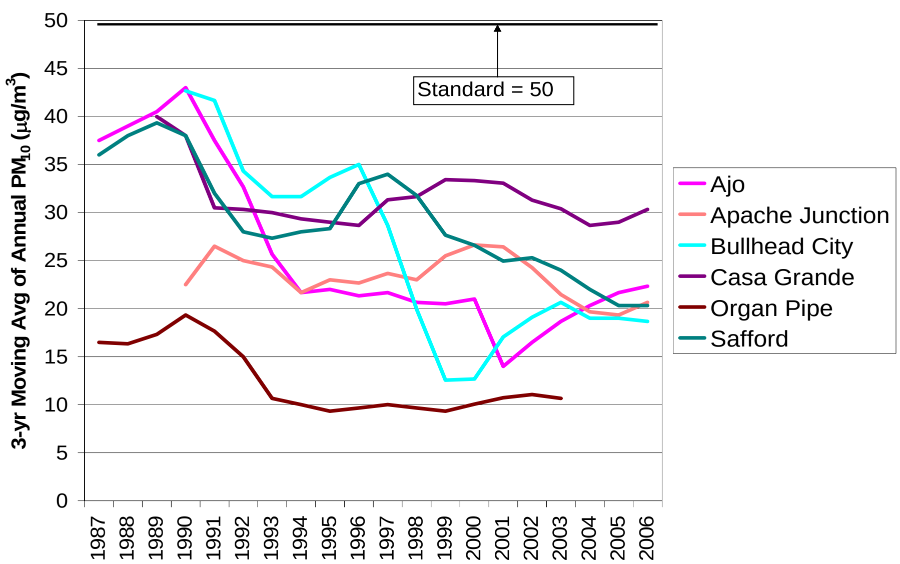


Figure 18 - Three-year moving averages of annual average PM_{10} concentrations at lower concentration sites at lower elevations

Low-concentration sites at higher elevations - all within the 50 µg/m^3 annual standard for their periods of record - have also noticeably declined since the mid 1980s. Clarkdale decreased 20%; Flagstaff, 50%; Prescott, 17%; and Show Low, 38%. (The site in Prescott was moved to Prescott Valley in 2002.) Part of these decreases can be attributed to cleaner-burning wood stoves and fireplaces (Figure 19). A shift toward a neutral or positive trend is seen in Figure 19, however.

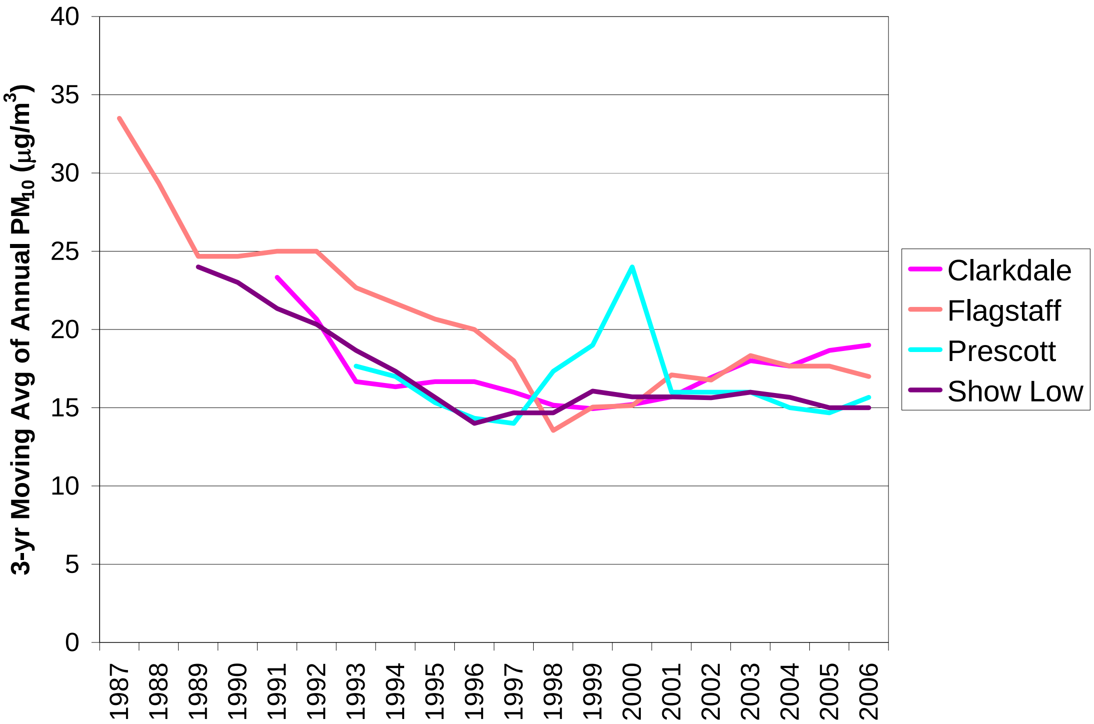


Figure 19 - Three-year moving averages of annual average PM_{10} concentrations at sites with low concentration at higher elevations.

$PM_{2.5}$

As was discussed earlier, $PM_{2.5}$ has not been monitored as long as PM_{10}. Measurements of this fine particle fraction were taken with dichotomous samplers at all sites until the late 1990s, when monitoring with $PM_{2.5}$ reference instruments began. The dichotomous samplers give an approximate cutpoint between fine and coarse particles somewhere in the range of 2.5 to 3.0 microns. Consequently, measurements taken with these samplers should be termed “fine particulates” or “PM_{fine}”, and not “$PM_{2.5}$.” In Arizona, the earliest measurements began in 1991 towns in rural areas, in 1994 in Tucson, and the following year in Phoenix. These data are presented in Tables 26a, b, and c, and Figures 21, 22, and 23.

Table 26a. Annual PM_{fine} and $PM_{2.5}$ Concentrations Throughout Arizona (in $\mu g/m^3$)					
Statewide					
Year	**Yuma**	**Flagstaff**	**Payson**	**Nogales**	**Douglas**
1991	7.6	N/A	**17.9**	12.3	8.5
1992	5.7	N/A	**17.2**	12.6	7.9
1993	6.1	5.4	13.0	9.7	7.9
1994	8.3	4.9	**15.8**	10.4	8.1
1995	7.2	5.8	**15.7**	14.3	7.7
1996	8.7	11.2	14.4	13.3	8.3
1997	6.0	5.0	12.2	11.3	6.0
1998	8.3	4.7	10.9	12.5	6.8
1999	7.9	8.4	9.8	12.5	7.9
2000	8.7	6.9	10.0	12.8	7.1
2001	10.0	7.1	8.8	10.7	7.2
2002	N/A	7.1	10.0	12.1	7.4
2003	N/A	5.6	8.9	11.3	6.4
2004	N/A	6.8	9.5	10.8	7.1
2005	N/A	6.0	8.3	13.1	7.3
2006	N/A	6.6	9.0	**15.6**	6.8

Bold values in yellow exceed the annual standard of 15 $\mu g/m^3$.
N/A - Data are not available.

Table 26b. Annual PM_{fine} and $PM_{2.5}$ Concentrations in the Phoenix Metropolitan Area ($\mu g/m^3$)							
Year	**Higley**	**Tempe**	**Supersite**	**ASU West**	**Estrella**	**West PHX**	**Apache Junction**
1995	**15.4**	10.0	12.6	11.1	11.7	N/A	N/A
1996	11.1	10.0	13.4	10.5	11.1	N/A	N/A
1997	10.4	9.8	12.1	9.1	7.9	N/A	N/A
1998	9.4	9.4	10.9	8.3	7.1	N/A	N/A
1999	11.1	10.7	12.2	9.1	8.9	N/A	7.4
2000	10.0	10.3	11.4	8.5	7.7	13.8	7.2
2001	N/A	9.3	9.2	N/A	7.4	10.8	6.2
2002	N/A	10.3	11.6	N/A	6.7	12.5	6.3
2003	N/A	9.6	11.2	N/A	7.3	10.6	6.3
2004	N/A	N/A	9.7	N/A	N/A	11.6	5.5
2005	N/A	N/A	9.7	N/A	N/A	12.9	5.5
2006	N/A	N/A	10.2	N/A	N/A	13.5	5.3

Bold values in yellow exceed the annual standard of 15 $\mu g/m^3$.
N/A - Data are not available.

Table 26c. Annual PM_{fine} and $PM_{2.5}$ Concentrations in the Tucson Metropolitan Area ($\mu g/m^3$)						
Year	**Orange Grove**	**22/Cray-croft**	**Tangerine**	**Fairgrounds**	**Central**	**Children's Park**
1994	9.4	7.9	5.3	5.8	8.9	N/A
1995	8.9	8.6	5.3	5.1	8.9	N/A
1996	8.2	6.4	4.9	4.7	7.7	N/A
1997	8.7	7.3	5.1	5.5	8.4	N/A
1998	7.3	6.3	5.0	5.0	7.5	N/A
1999	9.6	7.5	N/A	N/A	7.2	8.7
2000	7.7	N/A	N/A	N/A	7.8	6.8
2001	7.6	6.0	N/A	N/A	7.6	6.8
2002	6.3	8.6	N/A	N/A	8.3	6.6
2003	6.4	7.5	N/A	N/A	9.7	6.5
2004	5.8	N/A	N/A	N/A	N/A	6.6
2005	6.3	N/A	N/A	N/A	N/A	5.9
2006	5.8	N/A	N/A	N/A	N/A	5.8

Bold values in yellow exceed the annual standard of 15 $\mu g/m^3$.
N/A - Data are not available.

Figure 20 shows the three-year moving averages of five sites located at various locations throughout the state. Douglas has shown a flat trend, while Payson's trend is significantly down by 54 percent but has now flattened. Nogales shows an increase in $PM_{2.5}$ concentration from 2005 to 2006 and it now exceeds the standard. Exceedances of the annual $PM_{2.5}$ standard occurred for four years in Payson and for one year in Higley (Figure 21). Phoenix Supersite, Nogales, and the central area of Phoenix have the highest concentrations of fine particulates. Flagstaff and the urban fringe of Tucson (the Tangerine and Fairgrounds sites) have the lowest concentrations. Fine particulate trends in metropolitan Phoenix decreased from 1995 through 1998 but increased thereafter through 2006, as seen in Figure 21. Inconsistent with this latter trend, Apache Junction concentrations have decreased steadily since 1999. In metropolitan Tucson (Figure 22), records show that the $PM_{2.5}$ concentrations at Orange Grove and Children's Park have decreased significantly since monitoring began and that the Central site concentrations increased from 2001 to 2004.

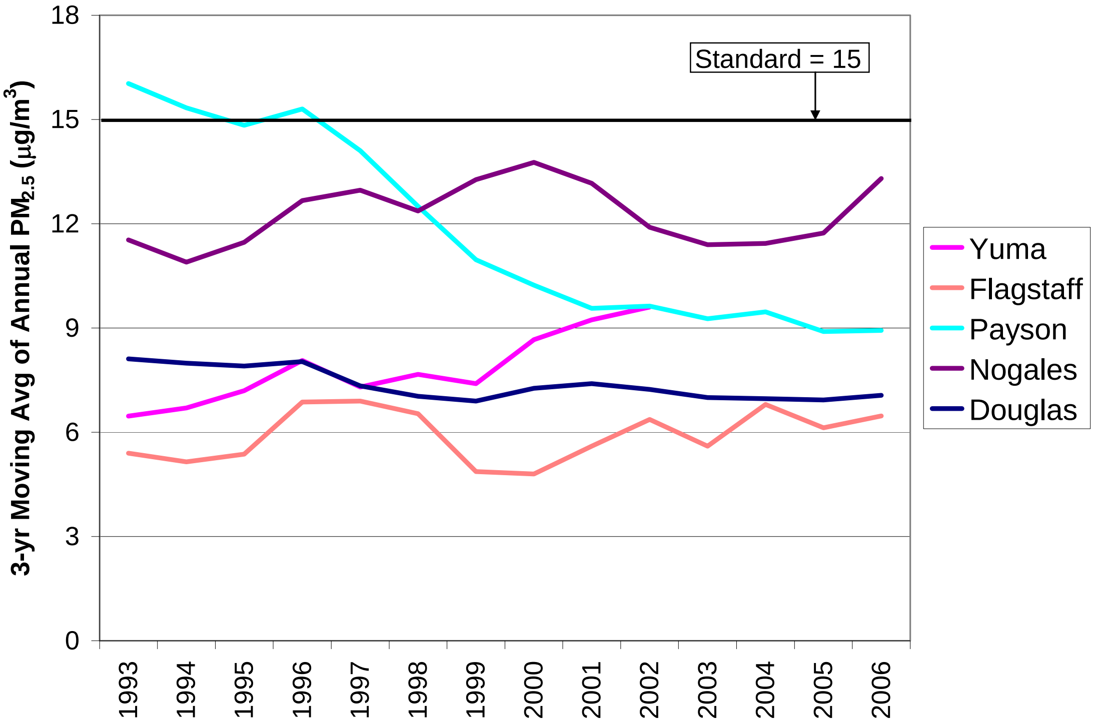


Figure 20 - Statewide three-year moving averages of annual averages of $PM_{2.5}$

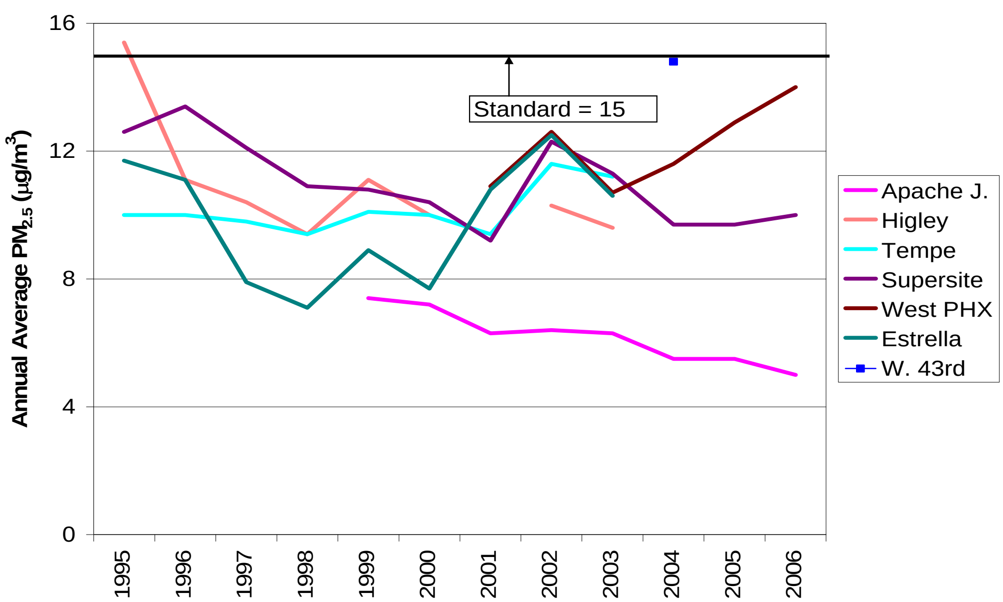


Figure 21 – Metropolitan Phoenix annual averages of $PM_{2.5}$

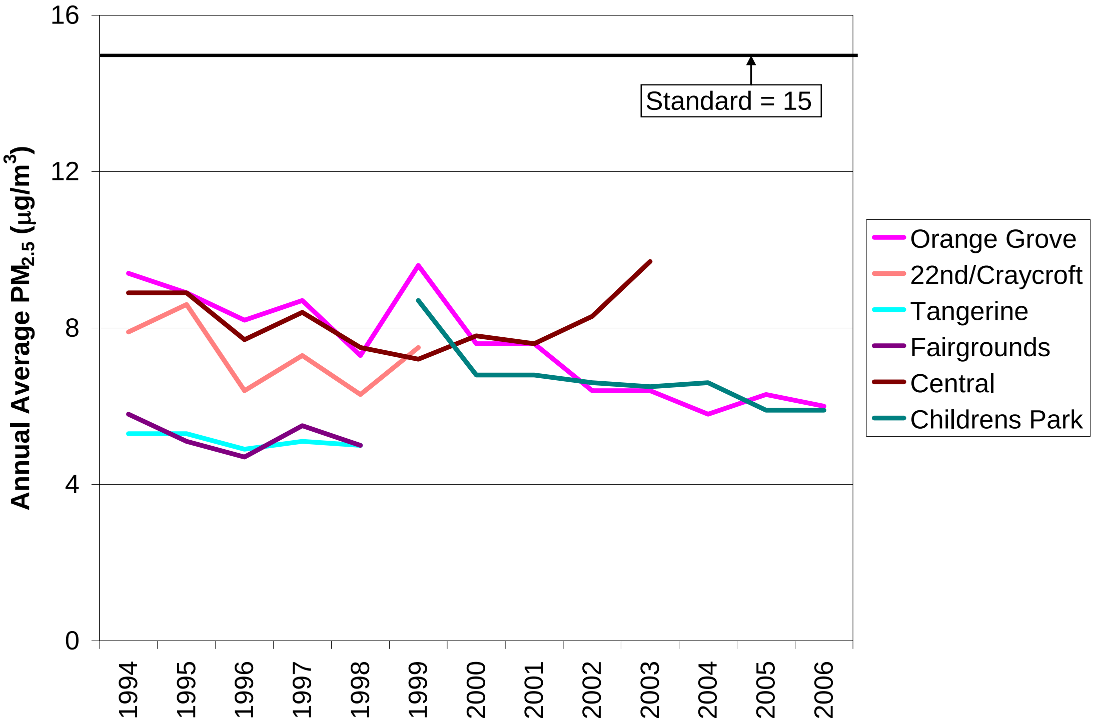


Figure 22 – Metropolitan Tucson annual averages of $PM_{2.5}$

Visibility

Optical measurements of visibility have been made continuously since 1993 in Tucson and since 1994 in Phoenix. Light extinction, the degree to which light is reduced by its interaction with particles and gases in the atmosphere, is measured continuously with transmissometers. These measurements have been divided into six categories: the mean of the dirtiest 20% of all hours, the mean of all hours and the mean of the cleanest 20% of all hours, for both the entire day and the 5 to 11 a.m. period. The units of measurement are inverse megameters (Mm^{-1}): The higher the light extinction value in Mm^{-1}, the more visibility is reduced. Tables 27a and b present these light extinction data, while Figures 23 and 24 illustrate visibility trends in more practical measures of Visual Range in miles.

Table 27a: Annual Average Light Extinction in Phoenix (Mm^{-1})						
Year	**All Hours**			**5-11 a.m.**		
	Dirtiest 20%	**Mean**	**Cleanest 20%**	**Dirtiest 20%**	**Mean**	**Cleanest 20%**
1994	N/A	64	29	N/A	70	33
1995	141	77	38	137	80	43
1996	134	78	43	130	80	45
1997	131	81	48	136	87	53
1998	133	78	45	136	84	50
1999	127	72	38	128	77	42
2000	131	74	38	134	80	42
2001	118	69	36	118	73	42
2002	124	75	42	125	79	46
2003	131	72	36	135	78	42
2004	121	69	35	126	75	42
2005	126	72	36	128	78	43
2006	125	69	32	126	76	40

Table 27b: Annual Average Light Extinction in Tucson (Mm^{-1})						
	All Hours			**5-11 a.m.**		
Year	**Dirtiest 20%**	**Mean**	**Cleanest 20%**	**Dirtiest 20%**	**Mean**	**Cleanest 20%**
1993	101	60	34	139	74	37
1994	95	59	36	109	68	41
1995	104	62	35	116	69	38
1996	99	62	37	113	71	40
1997	93	60	36	108	68	38
1998	102	57	28	119	69	34
1999	90	57	35	107	65	38
2000	98	56	27	114	66	31
2001	96	55	26	109	66	33
2002	87	49	24	109	61	29
2003	88	52	26	107	62	30
2004	97	58	27	113	67	32
2005	101	61	31	125	76	39
2006	83	47	22	100	56	28

Distinct trends from these tabular data are somewhat difficult to discern, partly because of the year-to-year variability and partly because the long-term changes for most categories are rather small. In Figures 23 and 24, these light extinction data have been plotted as three-year moving averages and converted to the more practical units of Visual Range in miles. The first year shown, 1996, is the average of 1994, 1995, and 1996, and so on.

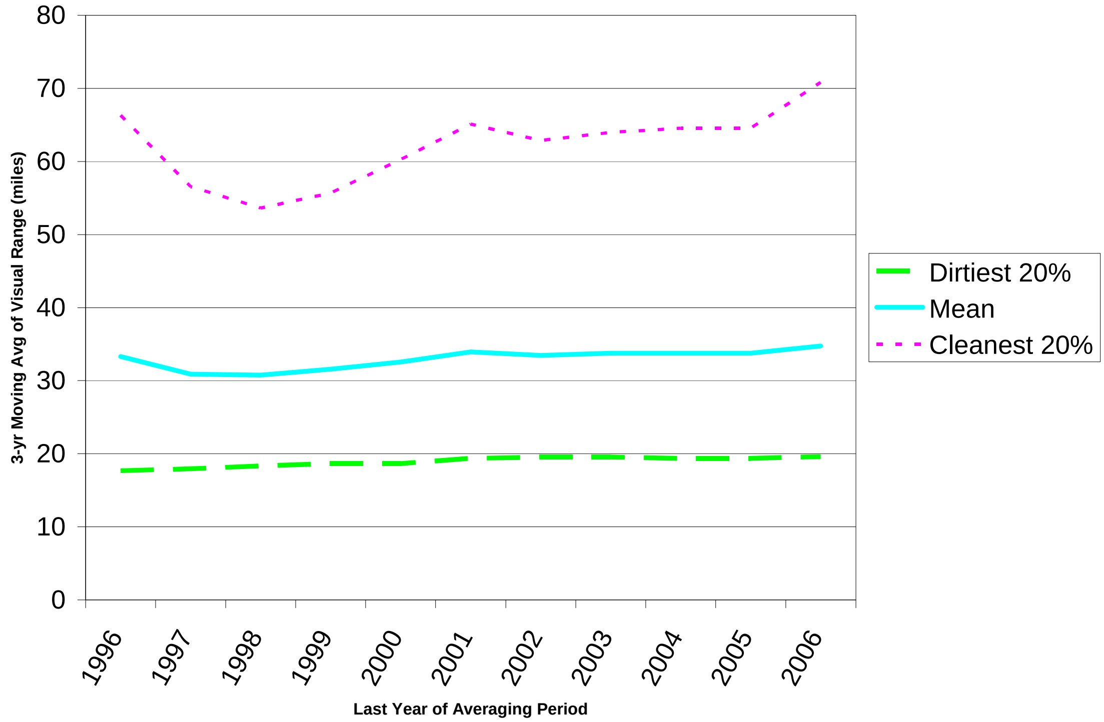


Figure 23 – Visibility trends for Phoenix, shown as three-year moving averages, for all hours

In Phoenix, the steady improvement through 2002 in the 20% dirtiest category is evident. The most recent period (2004 to 2006) in this category is 8% higher than the first full three-year period. For both the mean and 20% cleanest days, however, the steady upward trend of the dirtiest 20% category is replaced by a more complicated trend – one in which the first two three-year periods decrease through 1998, but the subsequent periods gradually increase and eventually level out by 2001. What has happened in this thirteen-year period (1994 to 1996 compared to 2004 to 2006) is that visibility has gotten somewhat better with 8% increase for the dirtiest 20%, 11% increase for the mean, and 20% increase in the cleanest 20%.

Visibility in Tucson has improved over the fourteen-year period when considering the three-year averages for all three statistics: the dirtiest, the mean, and the cleanest (Figure 24). The improvement in the 20% dirtiest days was 6%, which is 2% less than the improvement in Phoenix. Comparable improvement has been realized in the 20% cleanest category with a 20% increase.

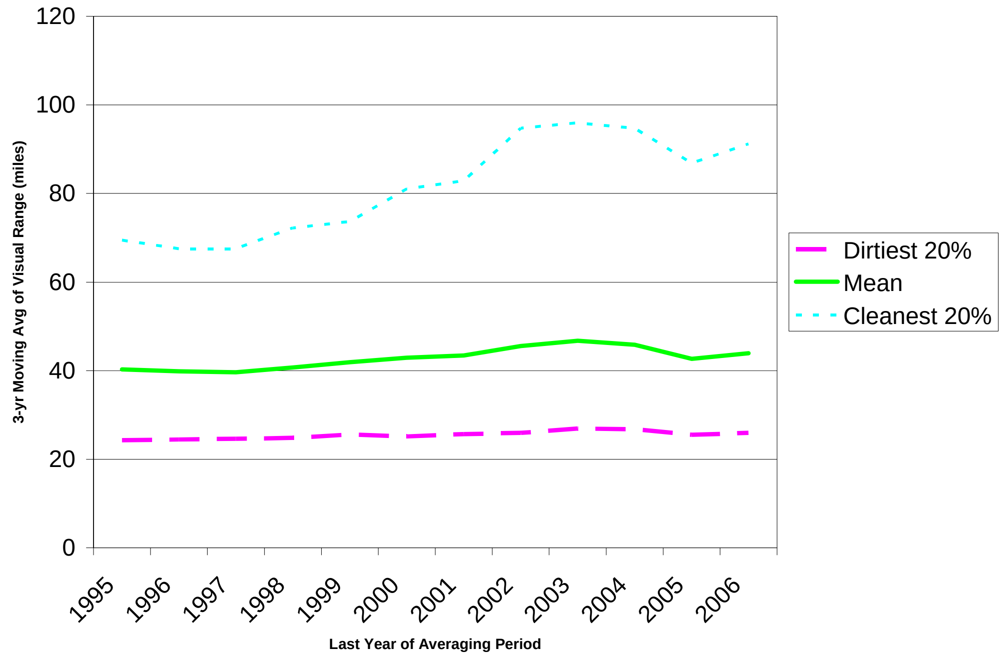


Figure 24 – Visibility trends for Tucson, shown as three-year moving averages, for all hours

Since it is impossible for an observer to distinguish between the various grades of the cleanest 20%, perhaps the overall Phoenix-Tucson trends appear the same to their respective residents. That is, over this 12 or 13 year period, there has been an 8% increase in visibility for the dirtiest days in Phoenix and a 6% increase in Tucson. While the worst of the brown clouds are still quite evident, especially on winter mornings, their frequency and severity over both cities have diminished slightly.

An interesting intercity trend (Figure 25) appears in the cleanest 20% category, where, in the first years of monitoring, Tucson and Phoenix had equal values. As the 1990s progressed, however, Tucson's cleanest days grew decidedly cleaner, while Phoenix's cleanest days saw decreased visibility for the first half of the period, followed by a gradual increase and leveling off in the later part of the record. In 2004 – 2006, Tucson's cleanest days were 33% cleaner than in Phoenix.

Figure 25 – Visibility trends for all hours for Phoenix and Tucson, shown as three-year moving averages

Seasonal patterns also vary between the two cites, with the mean and dirtiest 20% of all hourly light extinction values in Phoenix showing more pronounced winter and fall maxima than the Tucson counterparts (Figure 26). Both cities show little seasonal variation in the cleanest 20% of all hours. Seasonal visibility in Phoenix is considerably lower than Tucson's: for the dirtiest 20% of all hours, 52% lower in winter, 19% lower in spring, 13% lower in summer and 49% lower in fall. The poorer visibility in Phoenix comes as no surprise to those Arizonans familiar with both airsheds.

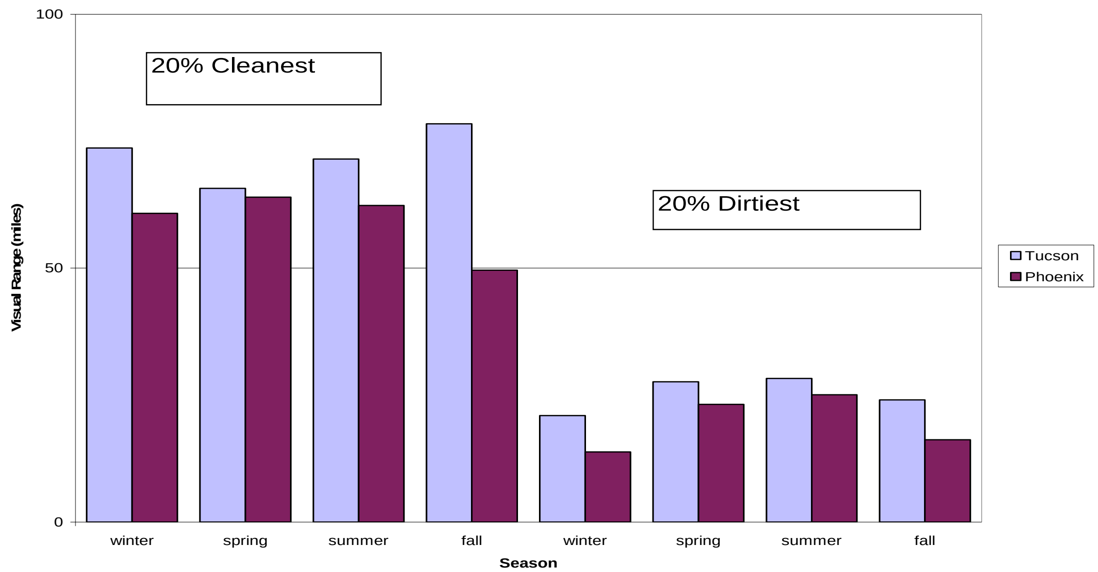


Figure 26 – Seasonal variation in visibility of the 20% cleanest and 20% dirtiest days in Tucson and Phoenix

In the following, final, discussion of visibility, light scattering is compared between the urban and rural areas of the state (Figure 27). In each statistical category rural light scattering is considerably lower than urban light scattering. On the dirtiest 20% days, light scattering values in Phoenix are 3.5 times higher than in the rural areas, while values in Tucson are nearly twice as high as rural areas. Values for the mean and 20% cleanest days show similar results. An interesting comparison between urban and rural areas is that the light scattering values on the worst 20% days in the rural areas are roughly equal to the mean of the urban areas.

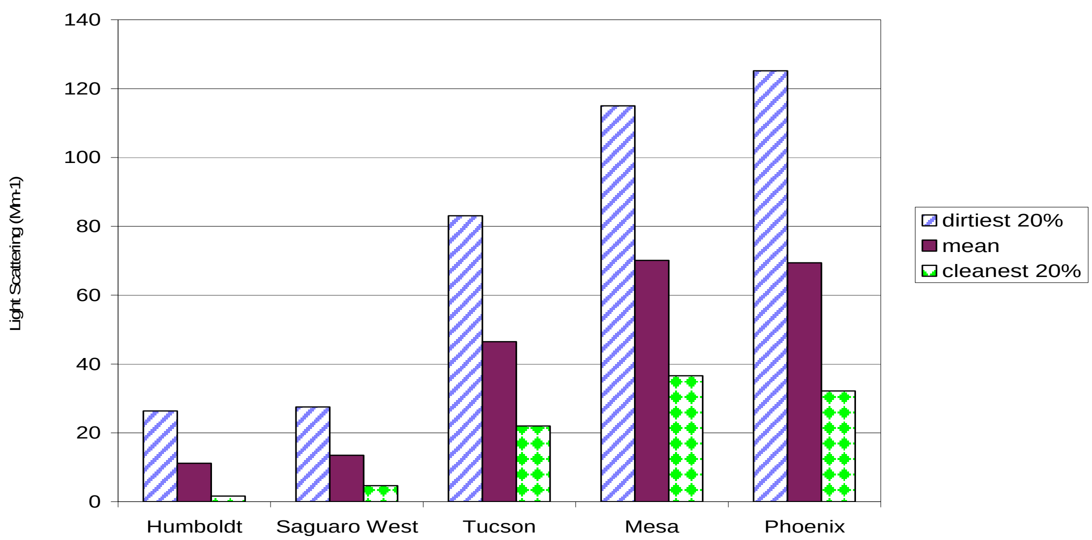


Figure 27 – Comparison of light scattering on the 20% cleanest, mean, and 20% dirtiest days for urban and rural areas.

Conclusions

Since monitoring of air pollutants began in the late 1960s in Arizona, considerable progress has been made in reducing concentrations of lead, SO_2, and CO. Lead has been reduced to near background levels; SO_2 concentrations near copper smelters, which chronically exceeded the standards until the mid-1980s, are now well within these standards; and CO concentrations, which regularly exceeded standards in neighborhoods and near busy intersections in Phoenix (and to a far lesser extent in Tucson), now meet the standards. One-hour O_3 concentrations in Phoenix have met the standard since 1997, the first years since monitoring began. Phoenix one-hour ozone concentrations in the 1980s and early 1990s ranged as high as 0.18 parts per million (the standard was 0.12 ppm), in contrast to the highest, most recent reading of 0.14 ppm in 1996. In 1995-1997, 12 monitoring sites in greater Phoenix exceeded the eight-hour O_3 standard; in 2004 - 2006 no sites exceeded the standard.

Elevated concentrations of PM_{10} have been reduced substantially since the mid-1980s, with decreases of 20 to 70% in the urban areas and in most rural towns. PM_{10} concentrations have been reduced by as much as two-thirds in Payson and at some industrial sites. By 2006, monitored violations of the PM_{10} standard -- a once common occurrence at many sites only ten years ago were limited to a few sites in southwest Phoenix, Pinal County, and in Nogales. The severity of the PM_{10} problems in these areas, exemplified by the 24 expected exceedances of the 24-hour standard in southwest Phoenix in 2006 and the total of 48 in the three areas mentioned, points out the need for further controls on emissions. Fine particulate concentrations ($PM_{2.5}$) have decreased in Phoenix and Tucson since the mid 1990s: comparing three-year averages, for example, at the centrally located Phoenix Supersite, the decrease has been 23%; at Children's Park in Tucson, the decrease has been 17% and 30% at Orange Grove north of Tucson. Fine particulate trends in rural Arizona, however, have not shown consistency from site to site: Nogales has increased by 16%, Yuma increased by 48% (prior to closure in 2003) and Flagstaff increased by 23%. Douglas and Payson have decreased by 12% and 44%, respectively.

In spite of the continued growth in Arizona, not a single air pollutant at any site showed a consistent upward trend through 2005. At a few sites, however, 2006 values are higher than 2005 and could signal a shift in the trend. Most standards are met all of the time, with the exceptions being the eight-hour O_3 standard on occasional summer days in Phoenix and the PM_{10} standards on both an episodic and annual basis at those sites affected by localized dense emissions. This improved air quality -- resulting from emission control programs at the federal, state and local levels -- has benefited the respiratory health of the citizenry and can be considered a consequence of the public support for a cleaner environment.

Appendix 1 – Site Index

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Apache County										
Greer Water Treatment Plant (Mt Baldy)	34.058	-109.44	8252	Bscat, MET, IMPROVE	ADEQ, USFS	Class I	Regional	Visibility	16323	N/A
Petrified Forest NP	35.08	-109.77	5796	Bscat, MET, IMPROVE	NPS	Class I	Regional	Visibility	16473	N/A
TEP – Springerville - Coalyard	34.33	-109.154	6898	PM_{10}	TEP	SPM	Unknown	Source Impact	16637	N/A
TEP – Springerville - Coyote Hills	34.172	-109.229	6599	NO_2, PM_{10}, SO_2	TEP	SPM	Unknown	Source Impact	16638	N/A
Cochise County										
Chiricahua NM Entrance Station (3.5 miles west of monument headquarters)	32.009	-109.388	5130	CASTNET, Bscat, IMPROVE, MET, O_3	NPS	Class I	Regional	Visibility	16679	04-003-8001
Douglas Red Cross (1445E 15th St.)	31.348	-109.538	4100	IMPROVE, PM_{10}, $PM_{2.5}$	ADEQ	SLAMS (PM_{10}, $PM_{2.5}$), Class I	Neighbor-hood	Population	16503	04-003-1005

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Paul Spur Chemical Lime Plant	31.365	-109.73	4192	PM_{10}	ADEQ	SLAMS (PM_{10})	Middle	Source Impact	16391	04-003-0011
Paul Spur Chemical Lime Plant - South	31.353	109.736	4101	MET	ADEQ	SLAMS (PM_{10})	Middle	Source Impact	16392	N/A
Coconino County										
Flagstaff Middle School (755 N. Bonito)	35.206	-111.652	6904	PM_{10}, $PM_{2.5}$	ADEQ	SLAMS	Neighbor-hood	Population	16707	04-005-1008
Grand Canyon NP Hance (South Rim, 2.5 miles west of village)	35.97	-111.98	7436	O_3, MET, Bscat, IMPROVE, CASTNET	NPS	Class I	Regional	Visibility	16682	N/A
Grand Canyon NP Indian Garden (4.5 miles from Bright Angel trailhead)	36.077	-112.128	3795	IMPROVE, Bscat,	NPS	Class I	Regional	Visibility	16683	N/A
Ike's Backbone (Pine Mountain Wilderness)	34.340	111.682	5232	IMPROVE, Bscat	ADEQ, USFS	Class I	Regional	Visibility	16421	N/A

City/Site and Address	Lat.	Long.	Elev. (feet)	Parameters Measured	Operator	Classification	Scale	Objective	AAAD ID Number	AQS ID Number
Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
SRP – Page – Navajo Generating Station (3 miles east of Page)	36.90	-111.391	3647	O_3, NO_2, PM_{10}, SO_2	SRP	SPM	Urban	Source Impact	16634	N/A
Sedona Post Office (190 W. Highway 89A)	34.866	-111.76	4195	PM_{10}	ADEQ	SPM	Neighbor-hood	Population	16512	04-005-1010
Sycamore Canyon (Camp Raymond)	35.140	-111.968	6691	Bscat, IMPROVE, MET	ADEQ, USFS	Class I	Regional	Visibility	16476	N/A
Gila County										
ASARCO - Globe Highway	32.999	-110.766	1948	SO_2	ASARCO	SPM	Regional	Source Impact	16593	N/A
ASARCO - Hayden - Garfield AVE	33.004	-110.783	2089	SO_2	ASARCO	SPM	Neighbor-hood	Source Impact	16590	N/A
ASARCO - Montgomery Ranch	33.012	-110.798	2326	SO_2	ASARCO	SPM	Regional	Source Impact	16591	N/A
Hayden - Old Jail (Canyon Drive)	33.006	-110.785	2050	PM_{10}, SO_2	ADEQ, ASARCO	SLAMS (ADEQ SO_2 and PM_{10}) SPM (ASARCO SO_2)	Neighbor-hood	Source Impact	16326	04-007-1001

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
PDMI - Miami - Golf Course	33.413	-110.830	3319	PM_{10}	PDMI	SPM	Neighbor-hood	Source Impact	16629	04-007-8000
PDMI - Miami - Jones Ranch (Cherry Flats Rd.)	33.385	-110.866	4093	SO_2	PDMI	SPM	Neighbor-hood	Source Impact	16631	N/A
PDMI - Miami - Town Site (Sullivan St.)	33.396	-110.873	3388	SO_2	PDMI	SPM	Neighbor-hood	Source Impact	16632	N/A
Miami - Ridgeline (4030 Linden St.)	33.399	-110.858	3559	PM_{10}, SO_2	ADEQ, PDMI	SLAMS (ADEQ SO_2) SPM (PDMI PM_{10})	Neighbor-hood	Source Impact	16382	04-007-0009
Payson Well Site (204 W. Aero Dr.)	34.229	-111.329	4910	PM_{10}, $PM_{2.5}$	ADEQ	SLAMS	Neighbor-hood	Population	16317	04-007-0008
Pleasant Valley - Ranger Station (Sierra Ancha USFS Wilderness)	34.090	110.941	5133	IMPROVE, Bscat, MET	ADEQ, USFS	Class I	Regional	Visibility	16446	N/A

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Tonto NM (Tonto Natl Park)	33.654	-111.106	2460	IMPROVE, NO_{TL}, O_3	ADEQ, NPS	Class I	Regional	Visibility	16447	04-007-0010
Graham County										
Safford (523 Tenth Ave.)	32.833	-109.718	2949	PM_{10}	ADEQ	SLAMS	Neighbor-hood	Population	16508	04-009-0001
La Paz County										
Alamo Lake	34.243	-113.558	1282	NO_{TL}, O_3	ADEQ	SLAMS	Regional	Background	34961	04-012-8000
Maricopa County										
ADEQ Building (1110 W Washington)	33.448	-112.087	1082	Visibility (camera)	ADEQ	SPM (Urban Haze)	Urban	Urban Haze	21737	N/A
Banner Mesa Medical Center (525 W Brown AVE)	33.433	-111.842	1489	Visibility (camera & Bext)	ADEQ	SPM (Urban Haze)	Urban	Urban Haze	19489	N/A
Bethune Elementary School (1310 S. 15th Ave.)	33.436	-112.091	1063	PM_{10}, Speciated $PM_{2.5}$	ADEQ	SPM, STN	Neighbor-hood	Population	17786	04-013-8006

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Blue Point (Usery Pass and Bush Highway)	33.552	-111.606	1574	MET, O_3	MCAQD	SLAMS (MET) NAMS (O_3)	Urban	Maximum Concentration	16417	04-013-9702
Buckeye (SR 85 & Buckeye RD)	33.369	-112.620	840	CO, MET, NO_2, O_3, PM_{10}	MCAQD	SLAMS	Neighbor-hood	Population	21525	04-013-4011
Cave Creek (37109 N. Lava Lane)	33.825	-112.017	1916	MET, O_3	MCAQD	SLAMS	Urban	Maximum Concentration	16368	04-013-4008
Central Phoenix (1845 E. Roosevelt)	33.458	-112.041	1115	CO, MET, NO_2, O_3, PM_{10}, SO_2	MCAQD	SLAMS (MET) NAMS (CO, NO_2, O_3, PM_{10}, SO_2)	Neighbor-hood	Population	16329	04-013-3002
Durango Complex 2702 AC Esterbrook Blvd.	33.426	-112.118	1574	MET, $PM_{10,}$ $PM_{2.5}$	MCAQD	SLAMS	Middle	Maximum Concentration	16375	04-013-9812
Dysart 16825 N Dysart	33.637	-112.339	1099	CO, O3, ADEQ(Bscat)	MCAQD ADEQ	SPM, Bscat (Urban Haze)	Neighbor-hood	Population	19550	04-013-4010
Estrella 15099 W. Casey Abbott Dr., Goodyear	33.383	-112.372	1000	Bscat	ADEQ	SPM (Urban Haze)	Neighbor-hood	Population	16506	04-013-8005
Estrella Community College 3000 N Dysart Rd.	33.483	-112.350	1000	Visibility (camera)	ADEQ	SPM (Urban Haze)	Urban	Urban Haze	21736	N/A

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Falcon Field (4530 E. McKellips)	33.452	-111.732	1017	MET, O_3	MCAQD	SLAMS	Urban	Population	16381	04-013-1010
Fountain Hills (16426 E. Palisades)	33.610	-111.724	1443	MET, O_3	MCAQD	SLAMS (MET) NAMS (O_3)	Neighbor-hood	Maximum Concentration	16376	04-013-9704
Glendale (6000 W. Olive)	33.569	-112.190	1171	CO, MET, O_3, PM_{10}	MCAQD	SLAMS (CO, MET, O_3), NAMS (PM_{10})	Neighbor-hood	Population	16378	04-013-2001
Greenwood (I-10 and 27th Avenue)	33.460	-112.116	1109	CO, MET, NO_2, PM_{10}	MCAQD	SLAMS	Microscale	Maximum Concentration	16372	04-013-3010
Higley (15500 S. Higley Rd.)	33.310	-111.722	1250	MET, PM_{10}	MCAQD	SLAMS (MET) SPM (PM_{10})	Neighbor-hood	Population	16505	04-013-4006
Humboldt Mountain (Pine Mountain Wilderness)	33.980	-111.796	5228	O_3	MCAQD	SLAMS	Regional	Background/ Transport	16416	04-013-9508
JLG Supersite (4530 N. 17 Ave.)	33.503	-112.09	1135	Bscat, CO, NO_2, Met, O_3, PM_{10}, $PM_{2.5}$, VOC, Speciated $PM_{2.5}$	ADEQ	SPM (Urban Haze) SLAMS (CO, NO_2, O_3, $PM_{2.5}$) PAMS (Type 2) STN	Neighbor-hood	Population	16328	04-013-9997
Mesa (370 S. Brooks)	33.410	-111.864	1220	CO, MET, PM_{10}, $PM_{2.5}$,	MCAQD	SLAMS	Neighbor-hood	Population	16380	04-013-1003

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Mesa Transmissometer Receiver - City Building (Lewis & Main)	33.415	-111.830	1378	Bext	ADEQ	SPM (Urban Haze)	Urban	Urban Haze	19686	N/A
Mesa Transmissometer Transmissometer – Banner Mesa Medical Center	33.433	-111.842	1489	Bext	ADEQ	SPM (Urban Haze)	Urban	Urban Haze	19489	N/A
North Mountain Summit (North Mountain)	33.585	-112.071	1640	Visibility (camera)	ADEQ	SPM (Urban Haze)	Urban	Urban Haze	16480	N/A
North Phoenix (601 E. Butler)	33.560	-112.065	1243	CO, MET,O_3, PM_{10},	MCAQD	SLAMS	Neighbor-hood	Population	16390	04-013-1004
Phoenix Transmissometer Receiver (3600 N 2nd AVE)	33.490	-112.076	1106	Bext	ADEQ	SPM (Urban Haze)	Urban	Urban Haze	16829	N/A

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Phoenix Transmissometer Transmitter (2000 W Bethany RD)	33.53	-112.10	1115	Bext	ADEQ	SPM (Urban Haze)	Urban	Urban Haze	16330	N/A
Pinnacle Peak (25000 N. Windy Walk)	33.711	-111.851	2624	MET, O_3	MCAQD	SLAMS	Urban	Maximum Concentration	16406	04-013-2005
Rio Verde (25608 N. Forest Rd.)	33.718	-111.671	1640	O_3	MCAQD	SLAMS	Urban	High Downwind Concentration	16396	04-013-9706
Salt River Pima DOAZ (N. Pima Road)	33.443	-111.891	1197	Multiple pollutants	ADEQ	SPM	Urban	Source	128640	N/A
South Phoenix (33 W. Tamarisk)	33.403	-112.074	1082	CO, MET, O_3, PM_{10}	MCAQD	NAMS (PM_{10}) SLAMS (CO, MET, O_3)	Neighbor-hood	Population	16377	04-013-4003
South Scottsdale (2857 N. Miller)	33.479	-111.916	1227	CO, MET, NO_2, O_3, PM_{10}, SO_2	MCAQD	SLAMS (CO, MET) NAMS (NO_2, O_3, PM_{10}, SO_2)	Urban/ Neighbor-hood	Population	16398	04-013-3003
Tempe (1525 S College AVE)	33.411	-111.93	1181	CO, MET, O_3	MCAQD	SPM	Neighbor-hood	Population	16405	04-013-4005

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Vehicle Emissions Laboratory (600 N 40th ST)	33.455	-111.996	1050	MET, Bscat	ADEQ	SPM Urban Haze (Bscat)	Urban	Meteorology	16363	04-013-9998
West Chandler (163 S. Price)	33.298	-111.883	1181	CO, MET, O_3, PM_{10}	MCAQD	SLAMS	Neighbor-hood	Population	16478	04-013-4004
West Forty Third (3940 W Broadway)	33.406	-112.144	1030	MET, PM_{10},	MCAQD	SPM (PM_{10}),	Neighbor-hood	Maximum Concentration	16659	04-013-4009
West Indian School (3315 W. Indian School Rd.)	33.494	-112.130	1115	CO, MET	MCAQD	NAMS (CO) SLAMS (MET)	Neighbor-hood	Maximum Concentration/ Source Impact	16393	04-013-0016
West Phoenix (3847 W. Earll)	33.483	-112.141	1096	CO, MET, NO_2, O_3, PM_{10}, $PM_{2.5}$,	MCAQD	SPM (ADEQ $PM_{2.5}$) SLAMS (MET, NO_2, O_3) NAMS (CO, PM_{10})	Neighbor-hood	Population	16477	04-013-0019
Mohave County										
Bullhead City (990 Hwy 95)	35.153	-114.566	561	PM_{10}	ADEQ	SLAMS	Neighbor-hood	Population	16365	04-015-1003
Meadview	36.019	-114.068	2959	Bscat, MET, IMPROVE	ADEQ	Class I	Regional	Visibility	21298	N/A

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Kingman - Praxair NE #1 (I-40 and Griffith Road)	35.029	-114.133	2401	PM_{10}	Praxair	SPM	Middle	Source Impact	16554	N/A
Kingman - Praxair SW #2 (I-40 and Griffith Road)	35.027	-114.135	2358	PM_{10}	Praxair	SPM	Middle	Source Impact	16555	N/A
Navajo County										
Petrified Forest National Park - south portion	34.82	-109.89	5778	O_3	NPS	Class I	Regional	Visibility	16473	04-017-0119
Show Low (561 E Deuce of Clubs)	34.252	-110.036	6311	PM_{10}	ADEQ	SLAMS	Neighbor-hood	Population	16603	04-017-0007
Pima County										
22nd St. & Alvernon (3895 E. 22nd)	32.206	-110.909	2516	CO	PDEQ	NAMS	Neighbor-hood	Maximum Concentration	16676	04-019-1014
22nd St. & Craycroft (1237 S. Beverly)	32.204	-110.877	2581	Bscat, CO, O_3, NO_2, SO_2, MET	ADEQ, PDEQ	SPM (ADEQ Urban Haze Bscat) SLAMS (PDEQ CO, O_3, NO_2, SO_2)	Neighbor-hood	Population	16410	04-019-1011
Ajo (Well Road)	32.382	-112.857	1801	PM_{10}, MET	ADEQ	SLAMS (PM_{10})	Neighbor-hood	Population	16316	04-019-0001

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Broadway & Swan (4625 E. Broadway)	32.222	-110.892	2516	PM_{10}	PDEQ	NAMS	Middle	Maximum Concentration	16550	04-019-1023
Cherry & Glenn (2745 N. Cherry)	32.261	-110.947	2401	CO	PDEQ	SPM	Neighbor-hood	Population	16675	04-019-1021
Children's Park (400 W. River Rd.)	32.295	-110.981	2286	Bscat, CO, NO_2, O_3, $PM_{2.5}$, Speciated $PM_{2.5}$	ADEQ, PDEQ	SPM ($PM_{2.5}$ & ADEQ Urban Haze Bscat) SLAMS (NO_2, O_3) NAMS (CO), STN	Urban, Neighbor-hood	Population	16551	04-019-1028
Coachline (9597 N Coachline Blvd)	32.380	-111.127	2227	O_3, $PM_{2.5}$	PDEQ	SPM	Neighbor-hood	Population	21580	04-019-1034
Corona De Tucson (22000 S. Houghton Rd.)	32.004	-110.791	3077	PM_{10}	PDEQ	SLAMS (PDEQ)	Regional	Background	16677	04-019-0008
Geronimo (2498 N. Geronimo)	32.248	-110.965	2578	PM_{10}	PDEQ	SPM (For AQI Purposes Only)	Neighbor-hood	Population	16678	N/A
Golf Links & Kolb (2601 S. Kolb Rd)	32.191	-110.841	2660	CO	PDEQ	SPM	Neighbor-hood	Population	19531	04-019-1031

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Green Valley (601 N. La Canada Dr.)	31.875	-110.993	2903	O_3, $PM_{2.5}$, PM_{10}	PDEQ	SLAMS	Neighbor-hood	Population Exposure	16685	04-019-1030
Orange Grove (3401 W. Orange Grove Road)	32.322	-111.036	2175	PM_{10}, $PM_{2.5}$	PDEQ	SLAMS (PDEQ PM_{10}, $PM_{2.5}$)	Neighbor-hood	Maximum Concentration/ Population	16510	04-019-0011
Organ Pipe Cactus NM (1 mile SSW of visitor center)	31.949	-112.801	1847	IMPROVE, Bscat	ADEQ	SLAMS (PM_{10})	Regional	Background/ Transport, Visibility	16681	04-019-0005
Prince Road (1016 W. Prince Rd.)	32.270	-110.987	2316	PM_{10}	PDEQ	NAMS	Neighbor-hood	Source Impact	16597	04-019-1009
Rillito (8820 W. Water)	32.414	-111.154	2053	PM_{10}, MET	ADEQ, APCC	SLAMS (ADEQ) SPM (APCC)	Neighbor-hood	Source Impact	16499	04-019-0020
Rose Elementary (710 W. Michigan St.)	32.170	-110.98	2299	O_3, PM_{10}	PDEQ	SPM	Urban	Population	16670	04-019-1032
Saguaro NP East (3905 S. Old Spanish Trail)	32.174	-110.686	3080	O_3, IMPROVE	PDEQ, NPS	SPM, Class I	Urban	Visibility	16474	04-019-0021
Saguaro NP West	32.254	-110.193	2621	Bscat, MET, IMPROVE	ADEQ, NPS	Class I	Regional	Visibility	16475	N/A

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Santa Clara (6910 S. Santa Clara Ave.)	32.133	-110.975	2539	PM_{10}	PDEQ	SLAMS	Neighbor-hood	Population	16569	04-019-1026
South Tucson (1601 S. 6th Ave.)	32.202	-110.967	2440	PM_{10}	PDEQ	SLAMS (PDEQ)	Neighbor-hood	Population	16635	04-019-1001
Tangerine (12101 N. Camino De Oeste)	32.425	-111.070	2637	O_3, PM_{10}	PDEQ	SLAMS	Urban	Population	16669	04-019-1018
Tucson Downtown (190 W. Pennington)	32.222	-110.977	2365	CO, O_3	PDEQ	SLAMS	Neighbor-hood	Population	16671	04-019-0002
Tucson Fairgrounds (11330 S. Houghton)	32.040	-110.773	3077	O_3	PDEQ	SLAMS	Neighbor-hood	Population	16672	04-019-1020
Tucson Transmissometer Receiver (150 W. Congress)	32.221	-110.973	N/A	Bext	PDEQ, ADEQ	SPM (Urban Haze)	Urban	Urban Haze	16826	N/A

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Tucson Transmissometer Transmitter (1501 N. Campbell AVE)	32.240	-110.945	N/A	Bext	PDEQ, ADEQ	SPM (Urban Haze)	Urban	Urban Haze	16655	N/A
Tucson - U of A Central (1100 N. Fremont Ave.)	32.24	-110.955	2578	Bscat, MET	ADEQ	SPM (Urban Haze)	Neighbor-hood	Population	16662	04-019-1027
Pinal County										
Apache Junction Fire Station (3955 E. Superstition Blvd. TE)	33.421	-111.502	1748	$PM_{2.5}$, PM_{10}	PCAQCD	SLAMS	Neighbor-hood	Population	16358	04-021-3002
Apache Junction Maintenance Yard (305 E. Superstition)	33.421	-111.543	1750	O_3, MET, PM_{10}	PCAQCD	SLAMS	Neighbor-hood	Population	16589	04-021-3001
ASARCO - Hayden Junction (Hwy 177)	33.01	-110.808	1925	SO_2	ASARCO	SPM	Unknown	Source Impact	16592	N/A

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Casa Grande Airport 660 W. Aero Dr.	32.954	-111.761	1410	O_3, MET	PCAQCD	SLAMS	Neighbor-hood	Population/ Transport	16367	04-021-3003
Casa Grande Downtown (401 Marshall Rd.)	32.877	-111.751	1378	PM_{10}, $PM_{2.5}$	PCAQCD	SLAMS	Neighbor-hood	Population	16588	04-021-0001
Combs (301 E. Combs Rd.)	33.219	-111.561	1178	O_3	PCAQCD	SPM	Neighbor-hood	Population	16657	04-021-3009
Coolidge Maintenance Yard (212 E. Broadway)	32.978	-111.513	1460	PM_{10}	PCAQCD	SLAMS	Neighbor-hood	Population	7446	04-021-3004
Cowtown Road (37580 W. Maricopa)	33.01	-111.99	1214	MET, PM_{10}	PCAQCD	SPM	Neighbor-hood	Population	19347	04-021-3013
Eloy City Complex (620 N. Main St.)	32.755	-111.554	1548	PM_{10}	PCAQCD	SLAMS	Neighbor-hood	Population	16594	04-021-3005
Mammoth County Complex (118 S. Catalina)	32.719	-110.642	2919	PM_{10}	PCAQCD	SLAMS	Neighbor-hood	Population/ Background	16600	04-021-3006

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Maricopa (44625 W. Garvey Rd.)	33.054	-112.047	1178	O_3	PCAQCD	SPM	Neighbor-hood	Population/Exposure	16656	04-021-3010
Pinal Air Park (Water Well # 2, Marana)	32.508	-111.307	1906	O_3, PM_{10}	PCAQCD	SLAMS	Regional	Background/ Transport	16552	04-021-3007
Pinal County Housing Complex (970 N Eleven Mile Corner Rd.)	32.89	-111.57	1443	PM_{10}	PCAQCD	SPM	Microscale	Source Impact	18079	04-021-3011
Queen Valley (10 S. Queen Anne Dr.)	33.293	-111.285	2080	Bscat, IMPROVE, VOC, NO_{TL}, O_3	PCAQCD, ADEQ	SPM (NO_{TL}, O_3) PAMS (VOC),Class I	Regional	Visibility	16394	04-021-8001
Riverside Maintenance Yard (56964 E. Florence)	33.105	-110.974	1771	PM_{10}	PCAQCD	SPM	Neighbor-hood	Source Impact	21429	04-021-3012
San Manuel (1st & Douglas Ave.)	32.598	-110.633	1089	SO_2	ADEQ	SPM	Neighbor-hood	Source Impact	16397	04-021-2001
Stanfield (36697 W. Papago Dr.)	32.881	-111.961	1296	PM_{10}	PCAQCD	SPM	Neighbor-hood	Population	16636	04-021-3008

City/Site and Address	Lat.	Long.	Elev. (feet)	Parameters Measured	Operator	Classification	Scale	Objective	AAAD ID Number	AQS ID Number
Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
Santa Cruz										
Nogales Post Office (300 N. Morley Ave.)	31.337	-110.936	3857	PM_{10}, $PM_{2.5}$, MET	ADEQ	SLAMS	Neighbor-hood	Population	16511	04-023-0004
Yavapai County										
Phoenix Cement Clarkdale - NW (#2) (northwest of cement plant)	34.782	-112.092	4198	PM_{10}, NO_x, MET	PCC	SPM	Unknown	Source Impact	16626	N/A
Phoenix Cement Clarkdale - SE (#1) (southeast of CTI fly ash silo)	34.773	-112.073	3598	PM_{10}, NO_x, MET	PCC	SPM	Unknown	Source Impact	16628	N/A
Prescott Valley (7601 E. Civic Circle)	34.594	-112.331	5104	PM_{10}	ADEQ	SPM	Neighbor-hood	Population	18392	04-025-2002
Yuma County										
Dome Valley (5110 S. Avenue 18 E)	32.750	-114.332	180	MET	ADEQ	SPM	N/A	Special Study	19483	N/A

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
San Luis (767 N. 1st Ave.)	32.491	-114.78	112	MET	ADEQ	SPM	N/A	Special Study	18250	N/A
Yuma - Courthouse (2440 W. 28th St.)	32.677	-114.648	98	PM_{10}	ADEQ	SLAMS	Neighbor-hood	Population	17027	04-027-0004
Yuma Game & Fish (9140 E. 28th St.)	32.677	-114.475	197	O_3, NO_x	ADEQ	SLAMS	Neighbor-hood	Maximum Concentration	18690	04-027-0006
Yuma Mesa (2186 W. County 15th St.)	32.611	-114.633	190	MET	ADEQ	SPM	N/A	Special Study	19040	N/A
Yuma Supersite (2323 S Arizona Ave)	32.690	-114.614	167	CO, SO2, PM_{10}, VOCs	ADEQ	SPM	N/A	Special Study	113219	N/A
Yuma Valley (11486 S. Farm Rd.)	32.620	-114.765	89	MET	ADEQ	SPM	N/A	Special Study	19041	N/A
Yuma West	32.736	-114.700	118	MET	ADEQ	SPM	N/A	Special Study	18247	N/A
Mexico										
Agua Prieta Fire Station (Calle 6 & AVE 15)	31.328	-109.547	3936	PM_{10}, MET	ADEQ	SPM	Neighbor-hood	Population	16361	80-026-1000

Site Index - Ambient Air Monitoring Locations in Arizona in 2006										
City/Site and Address	**Lat.**	**Long.**	**Elev. (feet)**	**Parameters Measured**	**Operator**	**Classification**	**Scale**	**Objective**	**AAAD ID Number**	**AQS ID Number**
Baja	32.570	-115.000	45	MET	ADEQ	SPM	Neighbor-hood	Population	22242	N/A
Cortez	32.376	-114.866	69	MET	ADEQ	SPM	Neighbor-hood	Population	22240	N/A
Mexico Supersite	32.466	-114.768	125	MET, CO, PM_{10}	ADEQ	SPM	N/A	Special Study	113221	N/A
Sonora Nogales Fire Station (Northwest corner of Lopaz and Mantels)	31.325	-110.944	3943	PM_{10}, MET	ADEQ	SPM	Neighbor-hood	Population	16399	80-026-0005
Sonora	32.424	-114.797	109	MET	ADEQ	SPM	Neighbor-hood	Population	22243	N/A

Sites shown in the site index table are based on the best information available at the date of publication.
N/A – Not available

Appendix 2 – Acronyms and Abbreviations

ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
AgBMP	Agricultural Best Management Practices
APCC	Arizona Portland Cement Co.
APS	Arizona Public Service
Area A	Designated Phoenix metropolitan area
ASARCO	ASARCO LLC - U.S. operating subsidiary of Grupo Mexico
ASU	Arizona State University
B_{abs}	Light absorption
B_{ag}	Light absorption by gasses
B_{ap}	Light absorption by particles
B_{ext}	Light extinction
B_{scat}	Light scattering
B_{sg}	Light scattering by gasses
B_{sp}	Light scattering by particles
BACM	Best Available Control Measures
BHP	BHP Copper, Inc.
CAAA	1990 Clean Air Act Amendments
CASTNET	Clean Air Status and Trends Network
CFR	Code of Federal Regulations
Class I	Federally designated park or wilderness area with mandated visibility protection
CMSA	Consolidated Metropolitan Statistical Area
CO	Carbon monoxide
CTOC	Cap and Trade Oversight Committee
Delta T	Difference between two levels of temperature measurements
EPA	U.S. Environmental Protection Agency
FMIC	Ft. McDowell Indian Community
FRM	Federal Reference Method
GRIC	Gila River Indian Community
HAPs	Hazardous Air Pollutants
HART	Hazardous Air Response Team
HC	Hydrocarbon
IMPROVE	Interagency Monitoring of Protected Visual Environments
ITEP	Institute for Tribal Environmental Professionals
km	Kilometers
m	Meters
MAG	Maricopa Association of Governments
MCAQD	Maricopa County Air Quality Division
MET	Meteorological measurements (wind, temperature, relative humidity)
mm	Millimeter
Mm^{-1}	Inverse megameter
MSA	Metropolitan Statistical Area

$\mu g/m^3$	Micrograms per cubic meter
MSM	Most Stringent Measures
NAAQS	National Ambient Air Quality Standards
NAMS	National Air Monitoring Station
NEAP	Natural Event Action Plan
NM	National Monument
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_X	Sum of NO and NO_2
NPS	National Park Service
O_3	Ozone
PAMS	Photochemical Assessment Monitoring Station
Pb	Lead
PCC	Phoenix Cement Company
PDEQ	Pima County Department of Environmental Quality
PDMI	Phelps Dodge Miami Inc.
PCAQCD	Pinal County Air Quality Control District
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter $\leq$ 2.5 microns
PM_{10}	Particulate Matter $\leq$ 10 microns
ppb	parts per billion
ppm	parts per million
Pressure	Barometric air pressure
RH	Relative Humidity
SCE	Southern California Edison
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Station
SO_2	Sulfur Dioxide
SO_4^{--}	Sulfate
SPM	Special Purpose Monitor
SRP	Salt River Project
SRPMIC	Salt River Pima-Maricopa Indian Community
STN	Speciation Trends Network
TEOM	Tapered Element Oscillating Microbalance
TEP	Tucson Electric Power
TSP	Total Suspended Particulates
U of A	University of Arizona
USFS	U.S. Forest Service
VOC	Volatile Organic Compounds
VIOC	Visibility Index Oversight Committee
Wind	Wind speed and direction
WMAT	White Mountain Apache Tribe

Appendix 3 – Related Web Sites

Air Explorer (http://www.epa.gov/airexplorer/) Air Explorer is a collection of user-friendly visualization tools for air quality analysts. It is linked directly to the EPA's Air Quality Subsystem database.

AirWeb: Protecting Air Quality (http://www2.nature.nps.gov/air/)
Learn about how the National Park Service Air Resources Division and the Fish and Wildlife Service Air Quality Branch strive to preserve, protect, enhance and understand the air quality and other resources of our national parks and refuges.

Arizona Department of Environmental Quality (www.azdeq.gov)
ADEQ's Web site contains information on air quality, news releases, public meetings and many other services that can provided that help to protect a safe and healthy environment.

Earth 911: Making Every Day Earth Day! (www.earth911.org)
That's their mission "to make every day an earth day!" so you can act on today's environmental issues, in order to preserve and maintain for today and tomorrow.

Earth's Biggest Environment Search Engine (www.webdirectory.com)
This Web site is a directory to numerous environmental subjects, from air to wildlife.

Environmental Protection Agency (www.epa.gov)
On EPA's Web site, you can find information about the federal government's role in environmental protection.

EPA – Air and Radiation (www.epa.gov/oar/oaqps)
You'll breathe easier when you see EPA's air quality planning and standards Web site. They have from what's new in air to the latest projects, programs and contracts.

EPA's – AIRNow (airnow.gov/)
Easy access to local air quality forecasts, real-time data, air quality index (AQI), animated color contours of measured AQI values for geographic areas and more.

EPA's Air Quality Database (www.epa.gov/air/data/index.html)
EPA's air quality database contains extensive air data. On this site, you can find the sources that contribute to emissions, the equipment and facilities that monitor the air, maps on air-related information, and contact information for experts on specific issues regarding air and environment.

EPA – Region 9 (http://www.epa.gov/region09/)
Learn about EPA activities in Arizona, California, Hawaii, Nevada and the Pacific Islands at the Region 9 website.

FirstGov (www.firstgov.gov)
Through this Web site, you can find more than 1,000 federal and state environmental agencies with details about the environment.

The Interagency Monitoring of Protected Visual Environments Project (http://vista.cira.colostate.edu/improve/)
On this site, you can take a look at photos of what haze (pollution) can do to the beautiful views of our nation. You can also take a look at what is being done and how you can get involved to improve the views of our nation.

Inter Tribal Council of Arizona, Inc. (www.itcaonline.com)
The site lists the member tribes and includes information about environmental monitoring programs.

Maricopa County Air Quality Information (http://www.maricopa.gov/aq/)
Maricopa County's Environmental Services' Web site has specific descriptions plus current and historical data on the county's air monitors.

National Tribal Environmental Council (www.ntec.org)
NTEC is a tribal government membership organization with 160 member tribes that work to protect and preserve the reservation environment.

National Weather Service (www.nws.noaa.gov)
Dive into the latest occurrences and studies of your weather and atmosphere. There are links to local weather service agencies in each state.

Visibility Web Cameras (http://www.phoenixvis.net)
This page provides an overview of all Phoenix Visibility Web Cameras. Digital images from Web-based cameras are updated every 15 minutes.

Pima County Air Quality Information (www.deq.co.pima.az.us)
The Pima County Department of Environmental Quality's Web site has information about air, water and waste programs, and the latest news and regulations that affect Pima County.

Pinal County Air Quality Information (http://co.pinal.az.us/airqual/monitoring.asp)
Current air quality information from the Pinal County Air Quality Control District.

Pollen Information (www.pollen.com)
Does it feel like something is in the air? Visit pollen.com to find out about what kinds of allergens are in your air and when they are there.

The United States National Park Service (www.nps.gov)
Information about our national parks.

Visibility Information Exchange Web System (VIEWS)
(http://vista.cira.colostate.edu/views/)
The Visibility Information Exchange Web System is an online exchange of visibility data, research, and ideas designed to support the Regional Haze Rule enacted by the U.S. Environmental Protection Agency (EPA) to reduce regional haze in national parks and wilderness areas. In addition to this primary goal, VIEWS supports global efforts to better understand the effects of air pollution on visibility and to improve air quality in general.

Weather and Air Quality in the Southwest (www.weathersmith.com)
This site contains weather forecasts and air quality information for Phoenix and Tucson.

Western States Air Resources Council (www.westar.org)
WESTAR is composed of 15 western states that have come together to discuss and exchange information on western regional air quality issues.

Appendix 4 – Maps

This section contains maps displaying monitor locations and location information.

Ambient Air Monitors
This map shows the location of monitors operated by ADEQ, county agencies, private industry and federal agencies.

Criteria Pollutant Monitoring (Phoenix and Tucson Metropolitan Areas)
These maps identify the locations of monitors of criteria pollutants in Arizona's two largest metropolitan areas.

Nonattainment and Attainment Areas
This map identifies the areas in Arizona that are nonattainment for PM_{10}, SO_2, CO and O_3.

Ozone Network
This map shows the location of ozone monitors operated by ADEQ, private industry, county agencies, and the National Park Service.

PM10 Network
The location of PM_{10} particulate monitors is shown on this map.

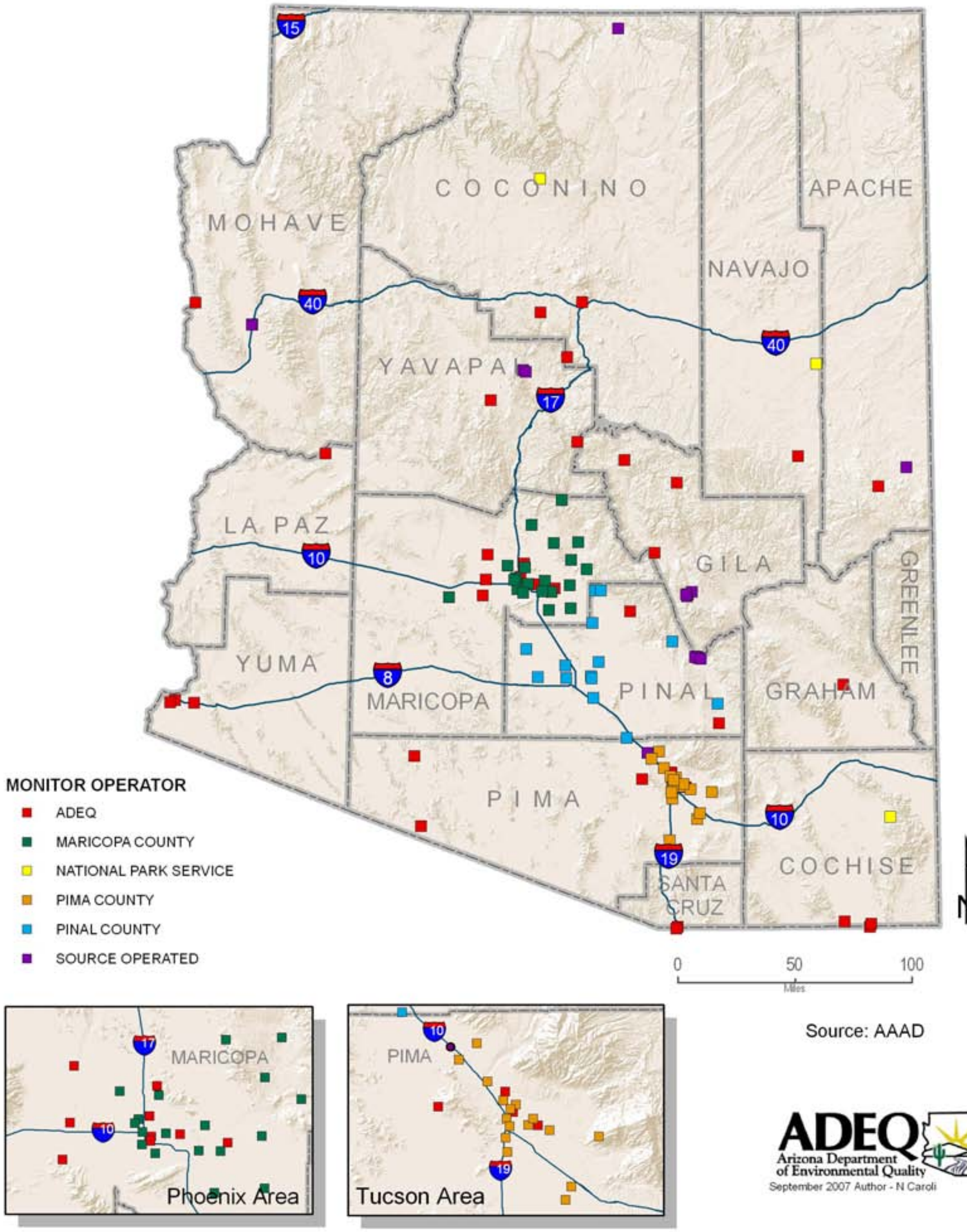
PM2.5 Network
The location of $PM_{2.5}$ particulate monitors is shown on this map.

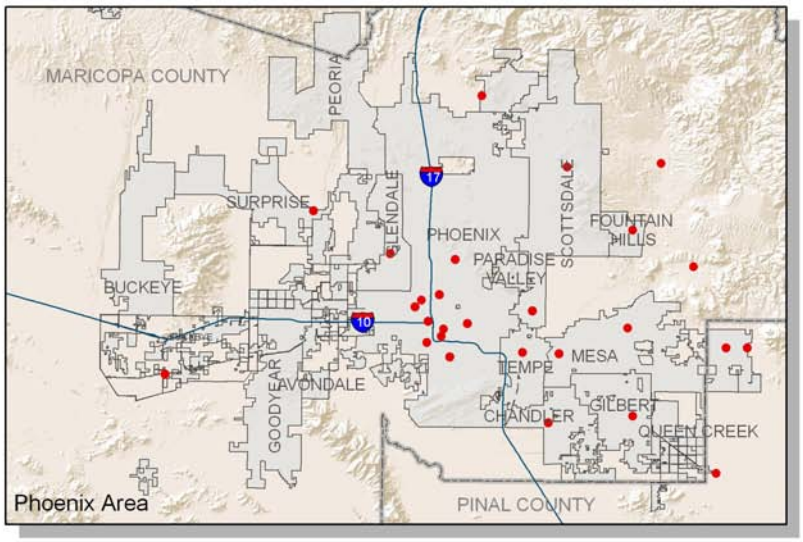
SO2 Network
This map shows the location of the SO2 monitors and includes the maintenance and nonattainment areas.

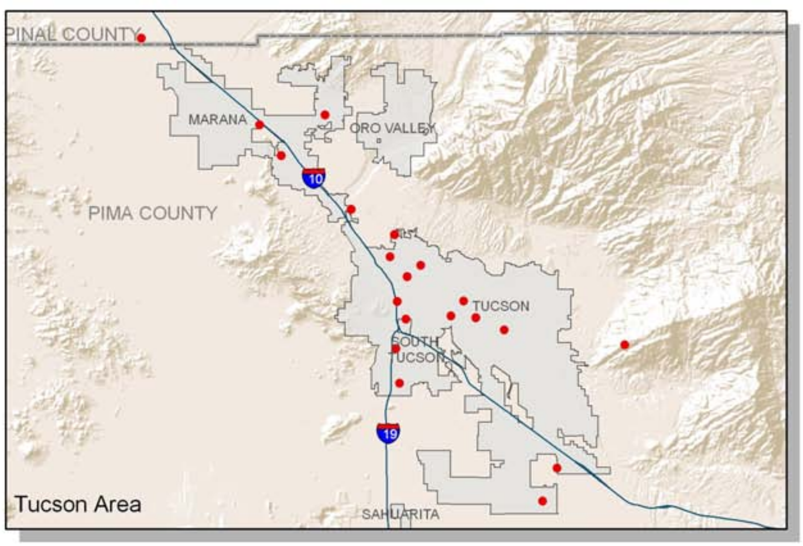
Visibility Network
Urban and regional haze visibility monitoring sites are shown on this map.

Nephelometers, Transmissometers, Cameras
This map shows the location of each of these types of monitors that ADEQ operates for the study of urban and regional visibility.

AMBIENT AIR MONITORS







Source: AAAD

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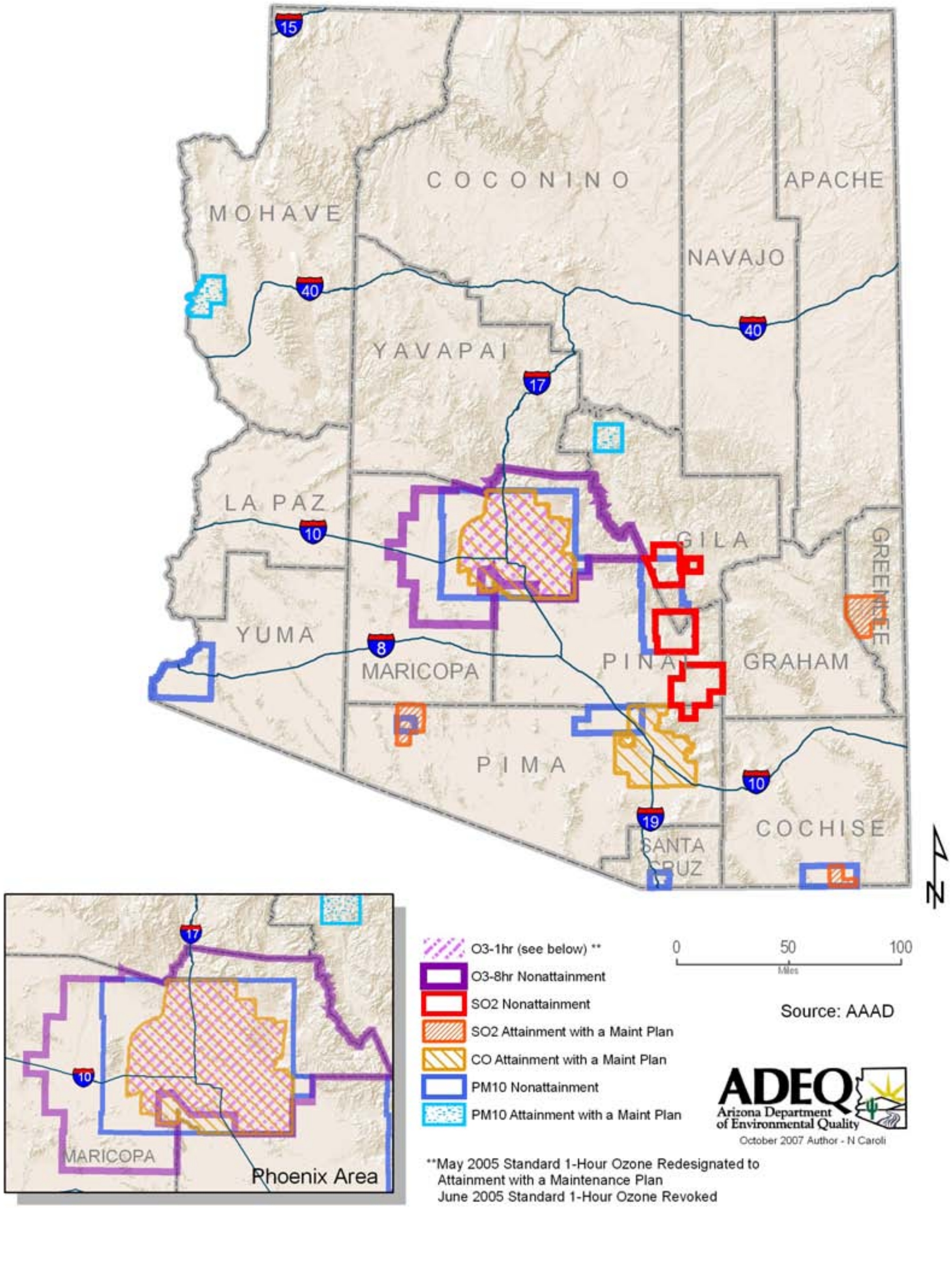
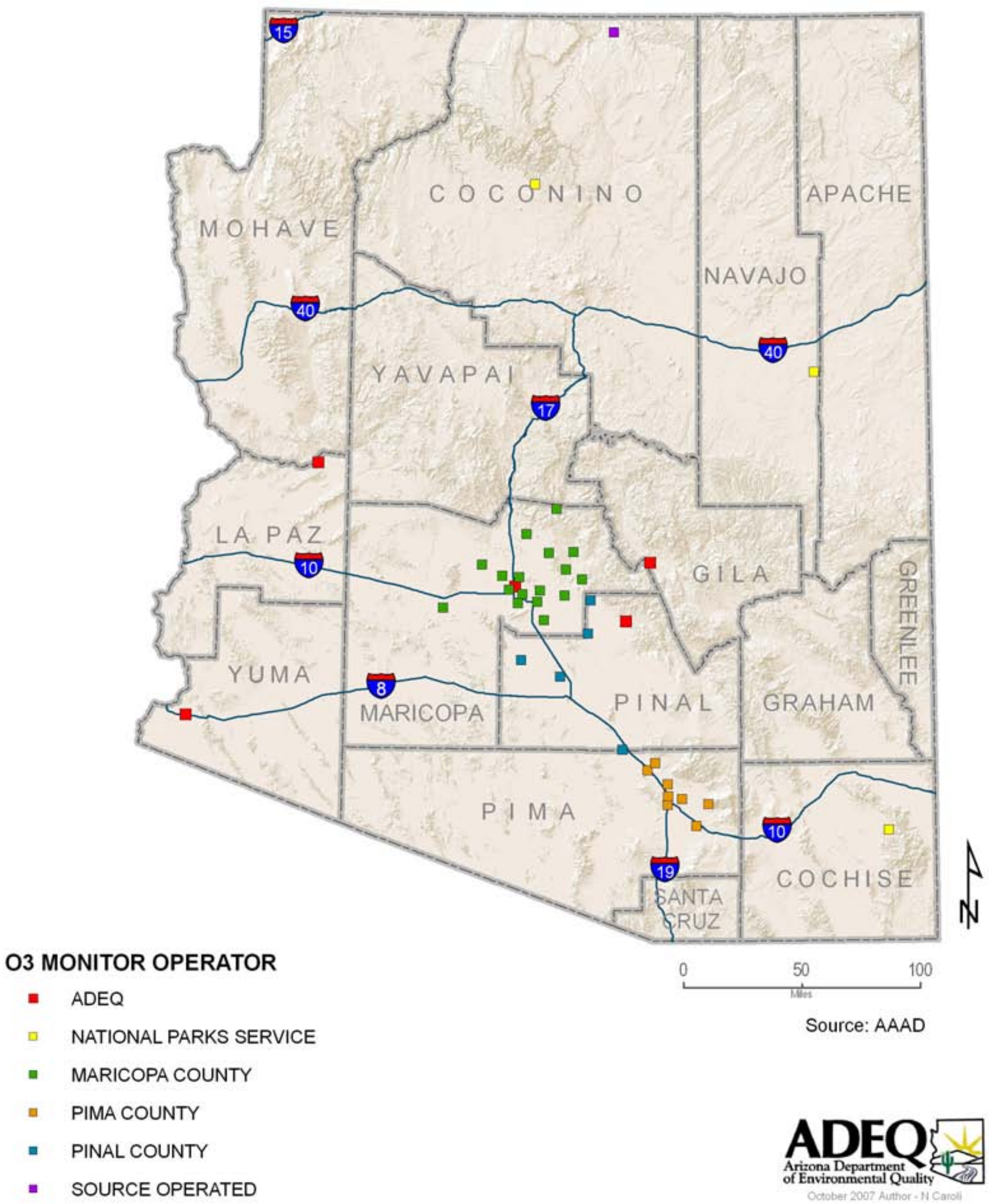
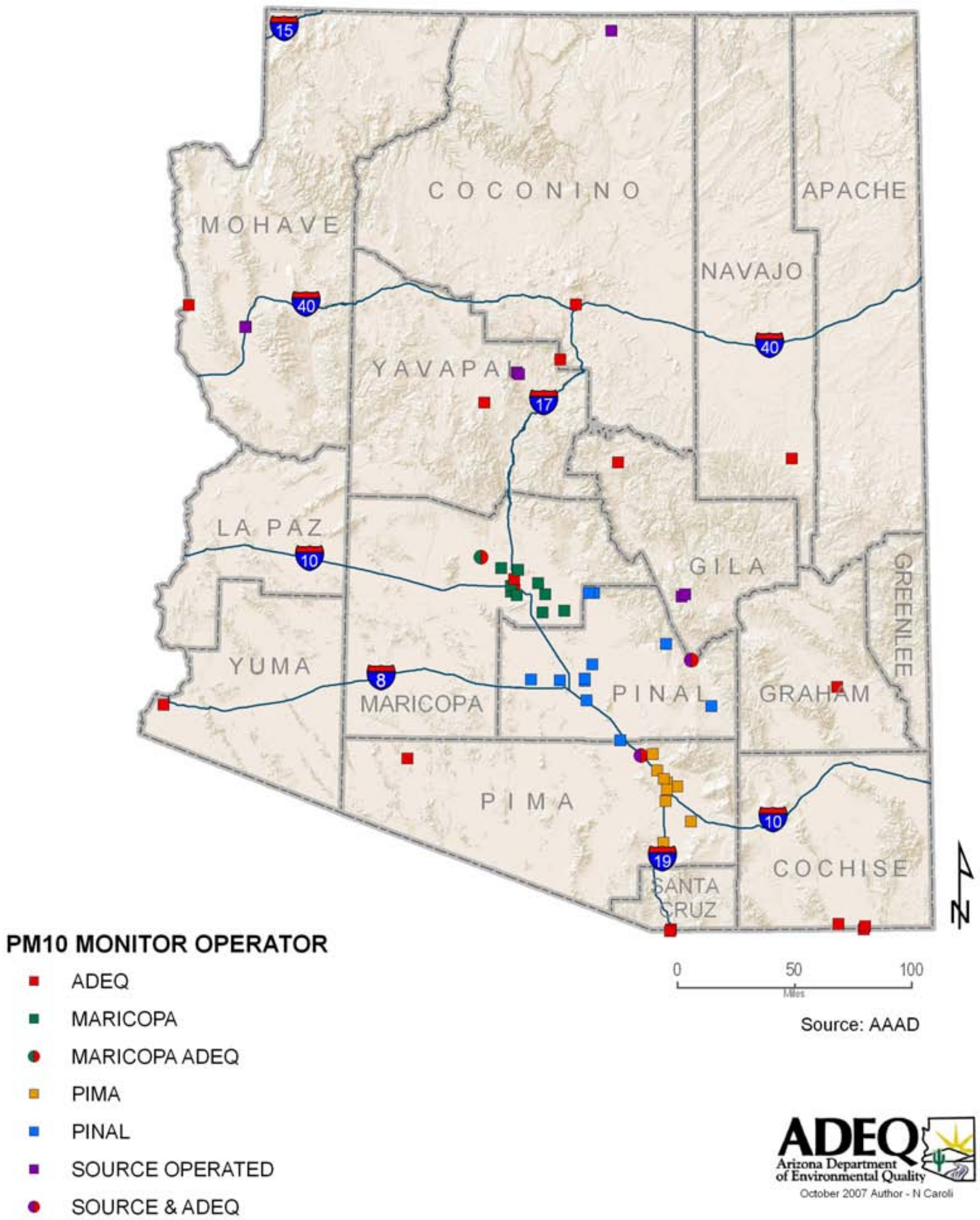
Nonattainment and Attainment Areas



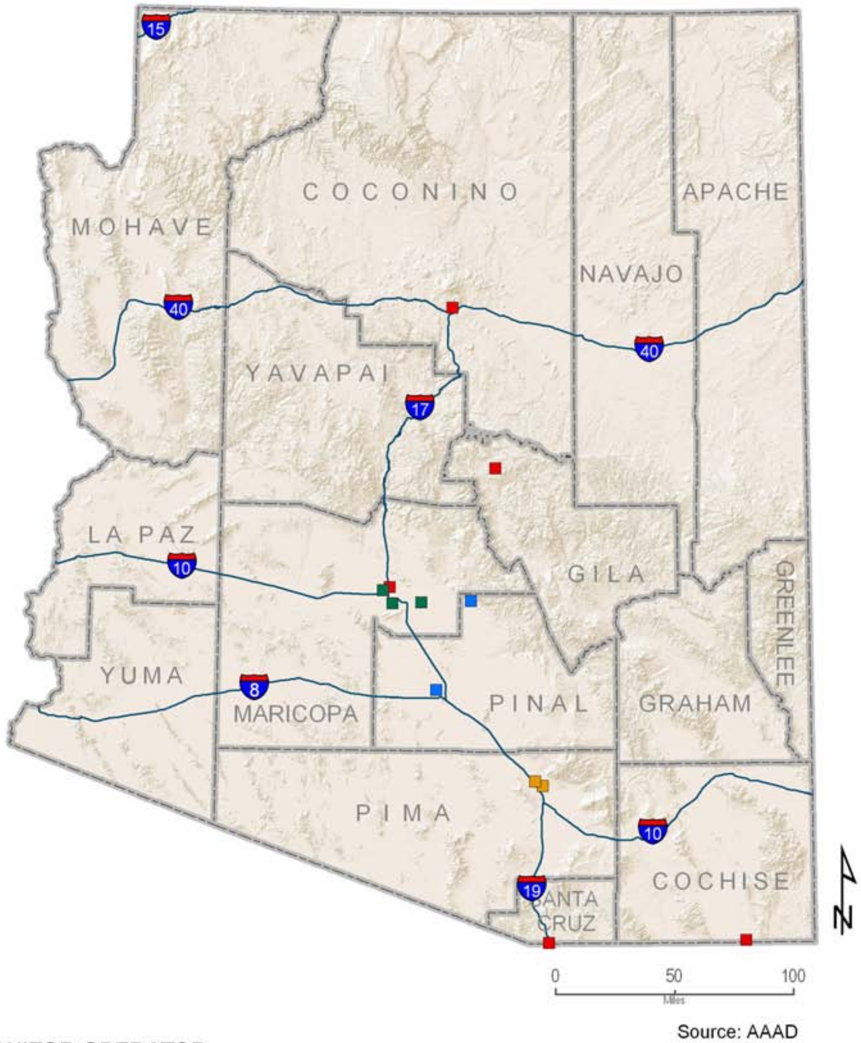
Ozone Network



PM10 Network



PM 2.5 Network



PM 2.5 MONITOR OPERATOR

- ADEQ
- MARICOPA COUNTY
- PIMA COUNTY
- PINAL COUNTY

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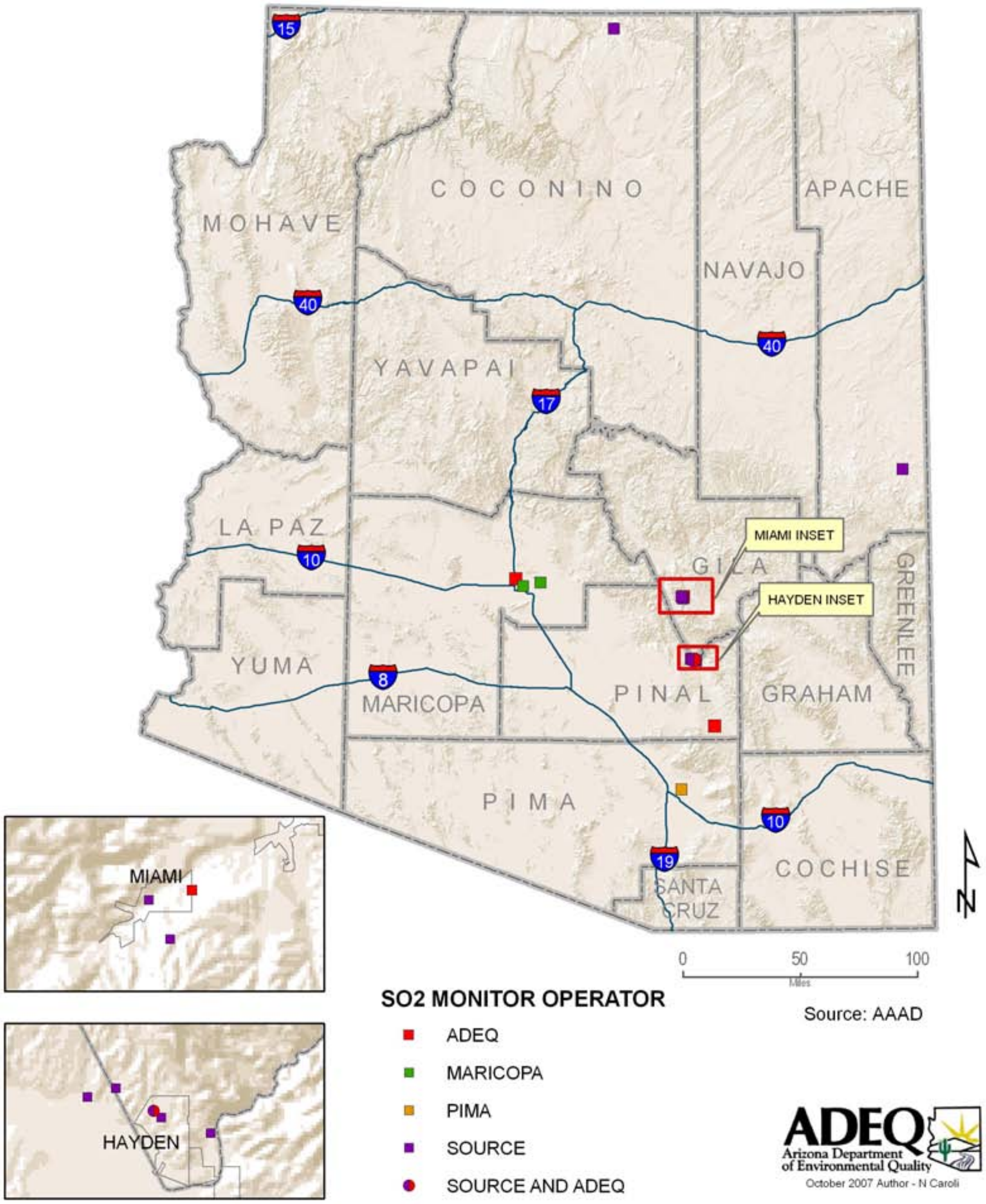
SO2 Network



15
COCONINO
APACHE
MOHAVE
NAVAJO
40
40
YAVAPAI
17
LA PAZ
10
MIAMI INSET
GILA
HAYDEN INSET
GREENLEE
YUMA
8
MARICOPA
PINAL
GRAHAM
PIMA
10
19
COCHISE
SANTA CRUZ
MIAMI
HAYDEN
0
50
100
Miles
SO2 MONITOR OPERATOR
ADEQ
MARICOPA
PIMA
SOURCE
SOURCE AND ADEQ
Source: AAAD
ADEQ
Arizona Department of Environmental Quality
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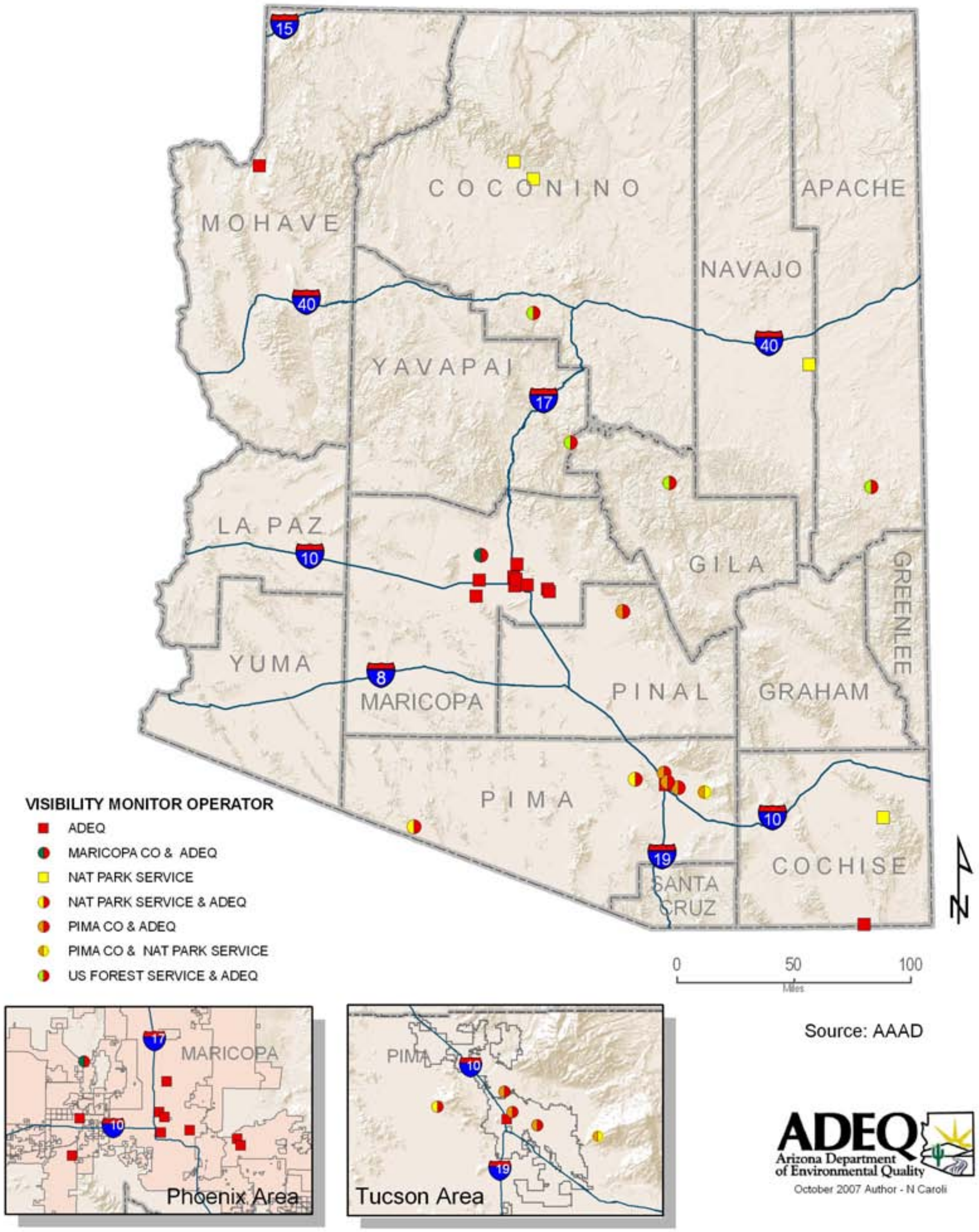
VISIBILITY NETWORK



NEPHELOMETER, TRANSMISSOMETER, CAMERA NETWORK