ADEQ
Arizona Department of Environmental Quality

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2009 Air Quality Annual Report

(A.R.S. 49-424.10)

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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, which 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. In addition, air quality data that ADEQ staff and contract operators collect have received internal and external quality control and quality 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 2008. Their efforts are appreciated as they maneuvered on rooftops and metal towers to operate monitoring equipment in uncomfortable weather conditions and reviewed 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 works daily installing, calibrating, maintaining, conducting quality control checks, collecting, processing, performing quality assurance tests, and reviewing and reporting data from a wide variety of ambient air monitoring instruments. These activities are necessary to provide the highest quality data to Arizona's population and to meet EPA program requirements. 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. The phone number is (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.

Report Introduction

This report presents the results of air quality monitoring conducted throughout Arizona in 2008. 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 and federal agencies such as the National Park Service and the U.S. Forest Service. Their data are summarized in this report too. 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 for each air monitoring network in Arizona.

Beginning on Page 15, 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 Accomplishments and Special Projects, which begins on Page 59, summarizes activities from special monitoring projects undertaken in the last few years for specific purposes. It also includes status reports on the air quality planning areas of the state, describing any changes in classification that have occurred.

The Air Quality Trends report begins on Page 72. Trends of carbon monoxide, ozone, particulate matter, and visibility are discussed. EPA changed the NAAQS for particulate matter (both PM_{10} and $PM_{2.5}$) in December 2007 and for ozone in June 2008. These changes affect how trends of these pollutants are viewed.

Ambient Air Quality Monitoring Networks

This section describes the ambient air quality monitoring networks currently operating in Arizona. Monitoring networks for ambient 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. The ambient monitoring networks cover both urban and rural areas of the state. These networks are operated by government agencies and regulated companies. They 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.

Figure 1 – South Phoenix monitoring station

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 network monitors a wide variety of pollutant and atmospheric characteristics including urban, industrial, rural, transport, and background surveillance.

The monitoring networks are operated to collect ambient air quality data to ensure that Arizona citizens are able to know local air quality conditions and to help ADEQ and local air quality control agencies identify the causes of polluted air. The networks and their characteristics are shown in Table 1. A list of individual sites and monitoring parameters, based on the best available information at the time of publication, is presented in Appendix 1, page 92.

Table 1: Monitoring Networks Operating in Arizona				
Network Operator	Geographic Area Monitored	Monitoring Objective*	Measurement Scale(s)**	Criteria 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}, $PM_{2.5}$
Freeport McMoRan Copper and Gold Inc.	Miami	1, 2, 3	Neighborhood	SO_2, PM_{10}
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}, $PM_{2.5}$
Tucson Electric Power Company	Springerville	1, 2, 3	Middle, Regional	SO_2, NO_2, PM_{10}

**See Table 2 for a list of monitoring objectives*
***See Table 3 for a definition of measurement scales*

Criteria Pollutant Monitoring Networks

The federal Clean Air Act (CAA) 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. 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 1977 federal 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.

The networks are designed to satisfy the monitoring objectives and measurement scales defined in Tables 2 and 3. EPA updates monitoring network requirements as necessary in 40 CFR Part 58 Appendix D. On December 17, 2006 requirements based on Metropolitan Statistical Areas (MSA) as well as Combined Statistical Areas (CSA) were revised. They apply to $PM_{2.5}$, PM_{10}, and ozone (O_3). In addition, new requirements for sample frequency were made for $PM_{2.5}$ and PM_{10}. In 2008, EPA made revisions to 40 CFR Parts 50 and 58 to include the new requirements for the revised NAAQS for lead (Pb) and O_3.

Table 2: EPA 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 3: EPA 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

Criteria Pollutants – Monitoring Network and NAAQS Changes

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 (FRM) or equivalent (FEM) methods that EPA has approved.

In October 2008, EPA established a new primary and secondary NAAQS for Pb. The standards, primary and secondary, are both 0.15 micrograms per cubic meter ($\mu g/m^3$); the previous standard was 1.5 $\mu g/m^3$. Primarily due to the introduction of non-leaded gasoline, total particulate Pb levels in Arizona have been very low for years; therefore Pb in total particulates has not been measured. However, Pb in fine particulates ($PM_{2.5}$) has been monitored as part of the Interagency Monitoring of Protected Visual Environments (IMPROVE) program and Chemical Speciation Network (CSN). Recently, EPA has added PM_{10} metals to the National Air Toxics Trends Sites (NATTS) program. Pb is one of the metals analyzed in these samples. The new NAAQS will require Pb monitoring near sources emitting more than one ton of lead compounds per year and in urban areas with populations greater than 500,000.

In June 2008, EPA lowered the eight-hour O_3 standard from 0.08 parts per million (ppm) to 0.075 ppm. Recommendations for nonattainment areas were submitted to EPA by March of 2009. EPA also updated a secondary standard to the O_3 NAAQS which is identical to the primary standard. The secondary standard is meant to protect plants from O_3 damage. EPA provided monitoring guidance for the new O_3 NAAQS in March of 2009; however, in September 2009, EPA decided to review the 2008 NAAQS and may subsequently review the monitoring guidance.

In December 2006, EPA 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 $\mu g/m^3$. Nogales was the only designated nonattainment area in Arizona for $PM_{2.5}$ based on the new NAAQS.

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 the constraints of an area's size, terrain, or logistics for each of the 12 federally-protected Class I areas in Arizona (see visibility maps in 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 for new or modifications of industrial sources. Arizona continues to participate in the 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 manmade 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 CAA 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:

- Meadview
- 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
- Hillside (Site was closed in June of 2005)
- 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)
- Organ Pipe National Monument

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 website 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 with a study during the winter of 1989-1990 in Phoenix and during the winter of 1992-1993 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-term 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 (km), four nephelometers for measuring light scattering, and five digital camera systems to record visual characteristics of the urban area. The current Tucson urban haze network includes one transmissometer for measuring light extinction along a fixed path length of about 3 to 5 km, three nephelometers for measuring light scattering, and one 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 are 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 area visibility is http://www.airinfonow.org/.

Photochemical Assessment Monitoring Stations Network (PAMS)

Section 182(c)(1) of the 1990 CAA Amendments required the administrator to promulgate rules for the enhanced monitoring of O_3, oxides of nitrogen (NO_x), and volatile organic compounds (VOCs) to obtain more comprehensive, and representative data on O_3 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 NO_x 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 O_3 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 O_3 NAAQS and the need for a more comprehensive air quality database for O_3 and its precursors. The 2006 40 CFR 58 revisions reduced the monitoring requirements for the number of sites (only two sites required for the Phoenix area). The length of the PAMS monitoring season was changed from April through October to June through August.

The chief objective of the enhanced O_3 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 O_3 NAAQS. Ambient concentrations of O_3 and O_3 precursors are used to make attainment and nonattainment determinations, aid in tracking VOC and NO_x emission reductions, better characterize the nature and extent of the O_3 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 midcourse 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 O_3 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, NO_x, a target list of VOCs (including several carbonyls), and surface and upper air meteorology. PAMS sites measure 56 target hydrocarbons (HC) on either a daily, hourly, or three-hour basis during the O_3 season.

The Type 2 sites also collect data on three carbonyl compounds (formaldehyde, acetaldehyde, and acetone) during the O_3 monitoring period. Included in the monitored VOC species are 10 compounds classified as hazardous air pollutants. All stations must measure O_3, NO_x, and surface meteorological parameters on an hourly basis. Beginning in 2007, ADEQ was required to operate three PAMS sites: the ADEQ JLG Supersite 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. See Table 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
2008	JLG Supersite Queen Valley	JLG Supersite
2007	JLG Supersite Queen Valley	JLG Supersite
2006	JLG Supersite Queen Valley South Phoenix	JLG Supersite South Phoenix
2005	JLG Supersite Queen Valley South Phoenix	JLG Supersite South Phoenix
2004	JLG Supersite Queen Valley South Phoenix	JLG Supersite South Phoenix
2003	None	JLG Supersite Queen Valley South Phoenix
2002	JLG Supersite Queen Valley	JLG Supersite Queen Valley South Phoenix
2001	JLG Supersite Queen Valley	JLG Supersite Queen Valley
2000	JLG Supersite	JLG Supersite
1999	JLG Supersite	JLG 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, measuring metals, VOCs, and carbonyls every sixth day year round. Data from EPA's national monitoring activities establishes an estimate of national average concentrations for these air toxics compounds, allows EPA to evaluate the need for new NAAQS, and establishes associated limits. Data from sites in this network will be used

to identify long-term changes or trends in ambient air concentrations. By 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 JLG Supersite.

$PM_{2.5}$ Chemical Speciation Network (CSN)

The Speciation Trends Network (STN) was established to meet the regulatory requirements for monitoring $PM_{2.5}$ to determine the chemical composition of these particles. The STN is part of the larger CSN that includes IMPROVE sites. The network was established in 2000 with approximately 54 STN sites across the nation, as well as additional State and Local Air Monitoring Stations (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 $PM_{2.5}$. Locations are primarily in or near a larger MSA. ADEQ operates one STN speciation sampler at the JLG Supersite. Two IMPROVE samplers are also operated at the ADEQ JLG Supersite for the purpose of providing precision information for the IMPROVE network and to make comparisons between the speciation results from both programs. Pima Department of Environmental Quality (PDEQ) operates one STN speciation sampler at the Children's Park site.

Monitoring Methods

To ensure comparability of pollutants across the nation, EPA requires agencies to have a Quality Management Plan (QMP), which describes the procedures to be followed for all environmental monitoring projects. Each monitoring network or program must have a Quality Assurance Project Plan (QAPP) that contains the details of how the samplers are to be operated, maintained, and checked for precision and bias. Each monitoring network or program must also be independently audited per the EPA required frequencies and EPA itself must conduct Technical System Audits (TSA) periodically to ensure all parts of the quality system are in-place.

Criteria Pollutant Monitors - Ambient air is sampled continuously for the gaseous criteria pollutants (SO_2, O_3, NO_2, and CO). Analyzers for each pollutant produce hourly averages of the pollutant in ppm that are retrieved by a data collection system and stored in a database. Measurements of particulate matter (PM_{10} and $PM_{2.5}$) can also be made continuously (hourly) and are retrieved and stored in the same manner. Particulate matter (PM_{10}, $PM_{2.5}$, and Pb) are also collected by non-continuous monitors which use filters. The samplers collect a 24-hour sample, drawing ambient air through an inlet at a known flow rate onto a filter. The filters are weighed before and after the sample period to determine the difference in mass. The concentration is calculated by dividing the

mass weight by the product of the flow rate and the minutes of sampling time. To determine Pb and other chemicals in the particulate matter, the filter is subjected to chemical analysis. These individual samples are summarized into monthly, quarterly, and annual averages.

PAMS and Toxics Monitors – Monitoring methods for the identification of chemical compounds in air consist of two parts: (1) collection of the air sample and (2) a specific laboratory analysis to identify the chemicals of interest. Samplers draw air across cartridges or through special filter packs or fill canisters. Laboratories extract the samples from these media and process the air sample using gas chromatography and mass spectrometry.

Visibility Monitors - 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). Visibility monitoring methods are generally divided into three groups: optical, scene, and aerosol. 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 five digital camera systems reporting to the public via a Web site where camera views are given an index number to describe the visibility.

Optical and aerosol methods provide quantitative measurements of light extinction by measuring one or more of the four components of light extinction (B_{ext}):

- 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.

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.

B_{ag} is determined by continuously measuring 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 FRM or FEM NO_2 monitors are deployed to verify maintenance of the NAAQS throughout Arizona, including monitoring in Phoenix and Tucson. The National Park Service network monitors NO_2 at several parks in Arizona.
B_{sp} is determined by continuously measuring particle scattering variation directly using 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 Arizona Class I areas and urban haze networks during 1996.

B_{ap} is determined by continuously measuring the quantity of light transmitted through a filter tape utilizing an aethalometer. Aethalometer data collection began in December 1996 in Phoenix and February 1998 in Tucson. B_{ap} is also measured every three days using the PM sample filters collected in the Class I area networks.

Total optical B_{ext} can be 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. Optical measurements of visibility using transmissometers have been made continuously since 1993 in Tucson and since 1994 in Phoenix.

Annual Ambient Air Monitoring Network Plan

40 CFR Part 51 requires states to create, submit, and adopt SIPs to address the various issues and responsibilities involved with creating and implementing air quality programs. Part of the SIP must discuss the existence or establishment of air quality surveillance systems. 40 CFR 58 discusses the requirements for such systems. 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 Prevention of Significant Deterioration (PSD) 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

In December 2006, EPA expanded the requirements in the revisions to 40 CFR 58.10(a) for the annual network review. Each government agency operating a monitoring network is required to submit to EPA a detailed network plan by July 1 of each year. The plan must be available to the public for a 30-day comment period prior to submittal to EPA. This plan describes how the monitoring network meets EPA requirements in 40 CFR Part 58. 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 next 18 months. Network plans are posted on each agency's website for public comment. ADEQ's Network Monitoring Plans can be found at http://www.azdeq.gov/function/forms/reports.html.

Beginning in 2010, in addition to the annual network monitoring plan, each agency must submit an assessment of their air quality network to EPA every five years. This assessment should determine, at a minimum, if the network meets the required monitoring objectives, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The network assessment must consider the ability of existing and proposed sites to support air quality characterization or areas with relatively high populations of susceptible individuals, and, for any sites proposed for discontinuance, the effect on data users other than the agency itself. For $PM_{2.5}$, the assessment must also identify needed changes to population-oriented sites.

Monitoring Data

Introduction

The Environmental Protection Agency (EPA) has set National Ambient Air Quality Standards (NAAQS) for the criteria air pollutants monitored across the U.S.: 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 with aerodynamic diameter ≤ 2.5 microns ($PM_{2.5}$). These pollutants are monitored in Arizona by industry, county air pollution control agencies (Maricopa, Pinal, and Pima), the National Park Service, Forest Service, tribes (not reported in this document), and Arizona Department of Environmental Quality (ADEQ).

The Monitoring Data section contains information and data on the criteria pollutants and the visibility networks. The 2008 data measurements are in the data tables and 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) are 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 34. Visibility monitoring information for Class I areas and urban haze begins on Page 52.

Figure 2 – Top of ADEQ's JLG Supersite monitoring station.

Figure 3 – ADEQ's Vehicle Emissions Laboratory monitoring station.

Criteria Pollutants - 2008 Data

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 CO emissions come from on-road motor vehicles; a little less than half from off-road vehicles, construction equipment, and lawn and garden equipment; with the remainder from point and area sources. This pollutant has low background levels, with the highest concentrations next to busy streets, and elevated neighborhood concentrations in locations with significant amounts of emissions transported from upwind areas. Concentrations peak from November to January because emissions are highest in cold weather - automotive emissions of CO vary inversely with temperature - and because the surface layer of the atmosphere is most stable in wintertime. Hourly concentrations tend to be at their maximum during the morning rush hour and between 6 p.m. 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 emissions inspection program (beginning in 1976) and oxygenated fuels (beginning in 1989).

CO is monitored continuously with nondispersive infrared instruments that are deployed in urban neighborhoods and near busy roadways or intersections. In 2008, 14 monitors were operated in greater Phoenix and six monitors were operated in metropolitan Tucson. Table 5 presents the 2008 CO data in parts per million (ppm).

Table 5: 2008 Carbon Monoxide (in ppm) *(NAAQS one-hour 35 ppm, eight-hour 9 ppm)*						
Site Name	**One-Hour Average**		**Eight-Hour Average**		**Valid Data Recovery***	
	Max Value	**2nd High**	**Max Value**	**2nd High**	**No. of Obs.**	**%**
Maricopa County						
Buckeye [S]	0.7	0.7	0.5	0.5	4584	90
Central Phoenix	3.6	3.5	2.6	2.2	8397	96
Dysart [S]	1.5	1.4	1.0	1.0	5049	99
Glendale [S]	2.1	2.0	1.6	1.5	5060	99
Greenwood	3.0	3.0	2.7	2.4	8654	99
JLG Supersite	3.1	3.1	2.5	2.4	8688	99
Mesa [S]	1.7	1.7	1.4	1.3	5012	98
North Phoenix [S]	2.1	2.0	1.3	1.3	5038	99
South Phoenix [S]	3.7	3.2	2.2	2.0	5057	99
South Scottsdale [S]	2.0	2.0	1.5	1.4	4933	96
Tempe [S]	2.4	2.3	1.8	1.4	5027	98
West Chandler [S]	1.8	1.7	1.4	1.4	5043	99
West Indian School	3.9	3.6	2.8	2.8	8307	95
West Phoenix	4.7	4.5	3.1	3.0	8575	98
Pima County						
22nd St. & Alvernon	2.9	2.5	1.4	1.3	8696	99
22nd St. & Craycroft	2.6	2.1	1.1	1.1	8736	99
Cherry & Glenn [S]	2.5	2.5	1.9	1.5	4369	85
Children's Park	1.5	1.3	1.0	0.9	8157	93
Golf Links & Kolb [S]	2.0	1.8	1.3	1.2	4315	84
Tucson Downtown	2.2	1.8	1.3	1.0	8720	99

* **Valid Data Recovery** shows the number of valid observations and the percentage of the possible 8760 hourly samples during a non leap year and 8784 hourly samples during a leap year (always less than 100 percent due to mandatory quality assurance testing requiring the monitors to be offline for several hours at a time).

[S] Seasonal monitor. Maricopa County operational during January 1 to April 1 and September 1 to December 31; 5088 sampling hours in non leap years and 5112 sampling hours in leap years. Pima County seasonal monitors operated January 1 to April 30 and October 1 to December 31; 5088 sampling hours in non leap years and 5112 sampling hours in leap years.

Nitrogen Dioxide

NO_2 is a reddish-brown gas that is formed by the oxidation of nitric oxide (NO) - a byproduct of all combustion. Adverse health effects associated with NO_2 include risk of respiratory illness in children and vary depending on the level of NO_2 and exposure time. Short exposure to low levels may result in changes to airway responsiveness and decreased lung function in individuals with pre-existing conditions. Irreversible changes may occur to lungs due to long-term exposure to higher levels. This pollutant is of greater concern in its reduction of visibility (it causes five percent of the visibility reduction in Phoenix) and its contributory role in the photochemical formation of ground level O_3 and acid rain.

Combustion emissions of NO are 95 percent NO and five percent NO_2. Since NO is rapidly oxidized to NO_2, NO emissions serve as a surrogate for NO_2. In a recent Phoenix emissions inventory, the transportation sector dominated NO emissions with 58 percent of the emissions 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. NO and NO_2 concentrations are highest near major roadways. NO 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 NO are converted to NO_2 under relatively stable atmospheric conditions. Because NO reacts rapidly with O_3, nocturnal O_3 concentrations in cities are often reduced to near zero levels, while concentrations at background sites remain higher.

NO emissions have been reduced overtime using several different techniques. NO emissions from motor vehicles have been reduced through retardation of spark timing, lowering the compression ratio, exhaust gas recirculation systems, and three-way catalysts. Also, the vehicle inspection program's NO_x test for light-duty gasoline vehicles age 1981 and newer (in Phoenix only) has helped reduce emissions. Reformulated gasolines also decrease NO 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.

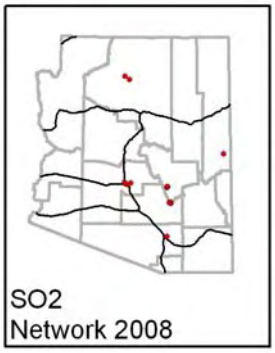
NO_2 is monitored continuously with chemiluminescence instruments, which also determine NO concentrations and NO_x (the sum of NO_2 and NO) concentrations. These instruments are located in urban neighborhoods where either the emissions are dense or where O_3 concentrations tend to be at their maximum. In addition, these monitors are located near major coal-fired electrical power plants. Nine monitors were operated in Arizona in 2008. Table 6 presents the NO_2 data available in 2008.

Table 6: 2008 Nitrogen Dioxide (in ppm) *(NAAQS Annual Mean 0.053 ppm)*				
Site Name	**Annual Average**	**Max Value**	**Valid Data Recovery ***	
		One-Hour Average	**No. of Obs.**	**%**
Apache County				
TEP - Springerville - Coyote Hills	0.0008	0.025	8696	99
Maricopa County				
Buckeye	0.0094	0.059	8253	94
Central Phoenix	0.0215	0.076	8443	96
Greenwood	0.0260	0.138	8332	95
JLG Supersite	0.0201	0.073	8217	94
South Scottsdale	0.0146	0.063	8323	95
West Phoenix	0.0186	0.065	7978	91
Pima County				
22nd St. & Craycroft	0.0134	0.054	8633	98
Children's Park	0.0111	0.049	8129	93

* **Valid Data Recovery** shows the number of valid observations and the percentage of the possible 8760 hourly samples during a non leap year and 8784 hourly samples during a leap year (always less than 100 percent due to mandatory quality assurance testing requiring the monitors to be offline for several hours at a time).

Sulfur Dioxide

Exposure to 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 constriction of airways 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. 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 is converted 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 0.0003 ppm to 0.0179 ppm, well within the annual standard of 0.03 ppm.

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 2008, nine 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 2008.

Table 7: 2008 Sulfur Dioxide (in ppm)
(Primary NAAQS Annual Average 0.030 ppm [80 µg/m^3], 24-hour Average 0.14 ppm [365 µg/m^3], Secondary NAAQS three-hour 0.5 ppm [1300 µg/m^3])

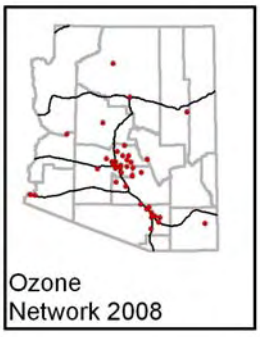
Site Name	Annual Average	Three-Hour Average		24-Hour Average		Valid Data Recovery *	
		Max Value	2nd High	Max Value	2nd High	No. of Obs.	%
Apache County							
TEP - Springerville - Coyote Hills	0.0003	0.016	0.013	0.005	0.004	8565	98
Gila County							
ASARCO - Globe Hwy.	0.0176	0.380	0.294	0.079	0.076	8784	100
ASARCO - Hayden - Garfield Ave.	0.0134	0.317	0.274	0.135	0.108	8784	100
ASARCO - Montgomery Ranch	0.0179	0.404	0.262	0.088	0.086	8783	99
FMMI - Miami - Jones Ranch	0.0060	0.149	0.145	0.054	0.046	8717	99
FMMI - Miami - Townsite	0.0040	0.105	0.090	0.024	0.021	8744	99
Hayden Old Jail, ADEQ	0.0112	0.184	0.169	0.049	0.048	7904	90
Hayden Old Jail, ASARCO	0.0088	0.191	0.147	0.040	0.037	8784	100
Miami Ridgeline, ADEQ	0.0045	0.089	0.082	0.032	0.026	8575	98
Maricopa County							
Central Phoenix	0.0017	0.007	0.006	0.004	0.004	8467	98
JLG Supersite	0.0025	0.008	0.008	0.005	0.004	8370	95
South Scottsdale	0.0013	0.006	0.005	0.005	0.004	8496	97
Pima County							
22nd St. & Craycroft	0.0012	0.014	0.007	0.004	0.003	8715	99
Pinal County							
ASARCO - Hayden Junction	0.0088	0.117	0.102	0.027	0.022	8783	99

* **Valid Data Recovery** shows the number of valid observations and the percentage of the possible 8760 hourly samples during a non leap year and 8784 hourly samples during a leap year (always less than 100 percent due to mandatory quality assurance testing requiring the monitors to be offline for several hours at a time).

Note: Sulfur dioxide conversion factor: ppm = (µg/m^3) / 2620.

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 (HC), and NO, 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 HC and NO 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 ppm to 0.4 ppm 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 bronchoconstrictive challenges. Animal studies suggest that O_3 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.


Ozone
Network 2008

O_3 is formed photochemically by the reaction of volatile organic carbon (VOC) and NO. High O_3 concentrations are a summer phenomenon caused when sunlight, biogenic emissions, and evaporative HC emissions peak. 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). NO_x 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. 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 O_3, VOC, and NO_x have been successfully implemented for years. NO_x and VOC from vehicular exhaust have been reduced through engine modifications and three-way catalytic converters. Evaporative HC 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 emissions inspection program, which tests all gasoline fueled vehicles for HC (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 HC 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 2008, 42 reporting O_3 monitors were in operation. Tables 8 and 9 present the 2008 Arizona O_3 data.

Table 8: 2008 Ozone (in ppm) One-Hour Averages
(NAAQS one-hour 0.12 ppm)

Site Name	Max Value	2nd High	3rd High	4th High	Valid Data Recovery*	
					No. of Days	%
Cochise County						
Chiricahua Entrance Station	0.079	0.077	0.075	0.073	362	99
Coconino County						
Flagstaff Middle School [S]	0.084	0.084	0.082	0.081	183	86
Grand Canyon NP - The Abyss	0.078	0.076	0.074	0.074	356	97
Gila County						
Tonto NM [S]	0.097	0.096	0.095	0.094	213	99
La Paz						
Alamo Lake [S]	0.087	0.082	0.081	0.081	178	83
Maricopa County						
Blue Point	0.089	0.088	0.088	0.087	356	97
Buckeye [S]	0.078	0.076	0.076	0.076	214	100
Cave Creek [S]	0.091	0.090	0.089	0.087	214	100
Central Phoenix	0.091	0.089	0.087	0.085	359	98
Dysart [S]	0.080	0.075	0.074	0.072	214	100
Falcon Field [S]	0.093	0.091	0.088	0.087	212	99
Fountain Hills	0.096	0.095	0.094	0.094	366	100
Glendale [S]	0.095	0.092	0.091	0.086	214	100
Humboldt Mountain [S]	0.086	0.086	0.083	0.083	214	100
JLG Supersite	0.098	0.098	0.092	0.089	360	98
North Phoenix	0.103	0.093	0.092	0.092	351	96
Pinnacle Peak	0.094	0.091	0.089	0.087	366	100
Rio Verde [S]	0.104	0.098	0.094	0.094	198	93

Table 8: 2008 Ozone (in ppm) One-Hour Averages *(NAAQS one-hour 0.12 ppm)*						
Site Name	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Valid Data Recovery***	
					No. of Days	**%**
South Phoenix	0.094	0.091	0.089	0.087	363	99
South Scottsdale	0.098	0.094	0.093	0.091	358	98
Tempe [S]	0.096	0.095	0.088	0.088	210	98
West Chandler [S]	0.099	0.098	0.094	0.091	211	99
West Phoenix	0.101	0.099	0.091	0.091	361	99
Navajo County						
Petrified Forest NP South	0.082	0.081	0.080	0.079	354	97
Pima County						
22nd & Craycroft	0.085	0.078	0.078	0.075	366	100
Children's Park	0.084	0.083	0.080	0.079	348	99
Coachline	0.080	0.078	0.077	0.076	366	100
Green Valley	0.069	0.069	0.068	0.068	366	100
Rose Elementary	0.077	0.075	0.075	0.072	366	100
Saguaro NP East	0.090	0.087	0.085	0.082	366	100
Tangerine	0.082	0.080	0.077	0.077	365	99
Tucson Downtown	0.078	0.074	0.074	0.074	366	100
Tucson Fairgrounds	0.084	0.082	0.081	0.078	361	99
Pinal County						
Apache Junction Maintenance Yard	0.098	0.094	0.092	0.091	364	99
Casa Grande Airport	0.082	0.080	0.080	0.079	361	99
Combs School [S ##]	0.093	0.092	0.086	0.085	214	100
Maricopa County Complex [S]	0.085	0.078	0.076	0.075	213	99
Pinal Air Park [S]	0.077	0.077	0.075	0.074	211	99
Queen Valley [S]	0.099	0.095	0.093	0.091	212	99
Yavapai County						
Prescott College AQD [S]	0.078	0.077	0.077	0.077	76	36
Yuma County						
Yuma Game & Fish [S]	0.097	0.093	0.091	0.085	200	93
Yuma Supersite [S]	0.098	0.093	0.092	0.089	177	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 is 365 in a non-leap year and 366 in a leap year.

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

Site also known as Queen Creek

Table 9: 2008 Ozone (in ppm) Eight-Hour Averages
(NAAQS eight-hour 0.075 ppm effective April, 2008)
Bold denotes the 4th highest value exceeds the eight-hour 0.075 ppm NAAQS.

Site Name	Max Value	2nd High	3rd High	4th High	No. of Daily Exceed-ances	Valid Data Recovery *	
						No. of Days	%
Cochise County							
Chiricahua Entrance Station	0.073	0.069	0.069	0.068	0	362	99
Coconino County							
Flagstaff Middle School [S]	**0.079**	**0.077**	**0.076**	0.074	3	183	86
Grand Canyon NP - The Abyss	0.073	0.071	0.071	0.071	0	354	97
Gila County							
Tonto NM [S]	**0.084**	**0.082**	**0.081**	**0.078**	11	213	99
La Paz							
Alamo Lake [S]	**0.083**	**0.078**	**0.077**	**0.076**	4	178	83
Maricopa County							
Blue Point	**0.076**	0.075	0.075	0.074	1	356	97
Buckeye [S]	0.071	0.071	0.070	0.068	0	213	99
Cave Creek [S]	**0.080**	**0.080**	**0.080**	**0.078**	8	214	100
Central Phoenix	**0.078**	0.075	0.072	0.072	1	355	97
Dysart [S]	0.074	0.067	0.066	0.066	0	213	99
Falcon Field [S]	**0.079**	**0.077**	**0.077**	0.075	3	210	98
Fountain Hills	**0.080**	**0.080**	**0.080**	**0.079**	7	366	100
Glendale [S]	**0.079**	**0.077**	**0.077**	0.074	3	214	100
Humboldt Mountain [S]	**0.080**	**0.078**	**0.078**	**0.077**	6	214	100
JLG Supersite	**0.079**	**0.079**	**0.079**	**0.078**	7	360	98
North Phoenix	**0.083**	**0.081**	**0.081**	**0.080**	9	349	95
Pinnacle Peak	**0.080**	**0.076**	0.073	0.073	2	364	99
Rio Verde [S]	**0.081**	**0.081**	**0.079**	**0.079**	7	196	92
South Phoenix	**0.079**	**0.077**	**0.076**	**0.076**	4	363	99
South Scottsdale	**0.079**	**0.078**	**0.077**	**0.076**	6	354	97
Tempe [S]	**0.082**	**0.082**	**0.078**	**0.078**	6	208	97
West Chandler [S]	**0.079**	**0.079**	**0.077**	**0.077**	5	210	98
West Phoenix	**0.081**	**0.081**	**0.080**	**0.078**	4	361	99
Navajo County							
Petrified Forest NP South	0.075	0.074	0.073	0.072	0	324	89
Pima County							
22nd & Craycroft	0.075	0.068	0.068	0.066	0	366	100
Children's Park	0.074	0.073	0.071	0.069	0	348	99
Coachline	0.073	0.070	0.070	0.068	0	366	100
Green Valley	0.066	0.064	0.064	0.064	0	366	100
Rose Elementary	0.071	0.070	0.066	0.065	0	366	100
Saguaro NP East	**0.080**	0.074	0.074	0.074	1	366	100
Tangerine	0.073	0.072	0.071	0.071	0	365	99
Tucson Downtown	0.067	0.066	0.066	0.065	0	366	100
Tucson Fairgrounds	**0.076**	0.072	0.072	0.072	1	357	98

Table 9: 2008 Ozone (in ppm) Eight-Hour Averages
(NAAQS eight-hour 0.075 ppm effective April, 2008)
Bold denotes the 4th highest value exceeds the eight-hour 0.075 ppm NAAQS.

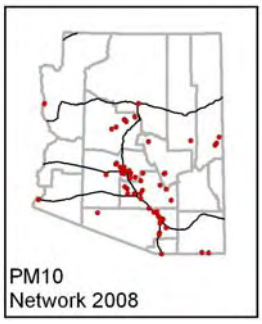
Site Name	Max Value	2nd High	3rd High	4th High	No. of Daily Exceed-ances	Valid Data Recovery *	
						No. of Days	%
Pinal County							
Apache Junction Maintenance Yard	**0.082**	**0.081**	**0.081**	**0.079**	7	364	99
Casa Grande Airport	**0.077**	**0.077**	0.074	0.073	2	361	99
Combs School [S ##]	0.074	0.072	0.071	0.071	0	214	100
Maricopa County Complex [S]	0.073	0.070	0.070	0.069	0	213	99
Pinal Air Park [S]	0.071	0.071	0.071	0.070	0	209	98
Queen Valley [S]	**0.085**	**0.082**	**0.082**	**0.080**	9	212	99
Yuma County							
Prescott College AQD [S]	0.071	0.071	0.071	0.069	0	31	14
Yuma County							
Yuma Game & Fish [S]	**0.084**	**0.083**	**0.081**	**0.076**	6	180	84
Yuma Supersite [S]	**0.084**	**0.083**	**0.079**	**0.077**	6	173	98

*** 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 is 365 in a non-leap year and 366 in a leap year.

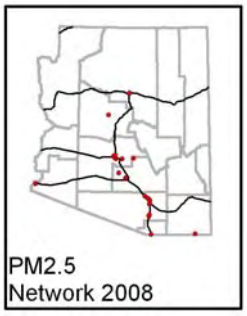
[S] Seasonal monitor, operational during April 1 to November 1; 214 scheduled sampling days in the season.

Site also known as Queen Creek

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. Coarse particulates (2.5 to 10 microns) are formed through mechanical processes such as the grinding of matter and the atomization of liquids. 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. 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. For example, secondary particulate nitrates and sulfates 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 VOCs.



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 inhaled and deposited in the upper parts of the respiratory system. Particles smaller than 2.5 microns are respired and enter the pulmonary tissues where the particles are deposited. 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 small reversible changes in pulmonary function in children. Acidic aerosols have been linked to the inability of the upper respiratory tract and pulmonary system to remove harmful particles.

Coarse particulate emissions are mostly geological and are dominated by dust from three activities: the constant grinding (re-entraining) of dust from paved roads, driving on unpaved roads, and earth moving associated with construction. Soil dust from these sources and others contribute more than 70 percent of the coarse particulates in Phoenix. 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. 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 ADEQ JLG Supersite, receptor modeling indicates gasoline and diesel engine exhaust account for more than 66 percent of the $PM_{2.5}$ emissions. Soil dust contributes another 10.5 percent.

$PM_{2.5}$ 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 micrograms per cubic meter ($\mu g/m^3$) 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 midmorning.

Controls to reduce particulates have been in place for decades, beginning in the 1960s with a Pima County ordinance that required watering to reduce dust from construction. Maricopa County's umbrella dust abatement rule, Rule 310, has been revised many times through the years and now regulates construction dust, trackout dust from construction sites, and dust from unpaved parking and vacant lots. Efforts to reduce dust resuspended from paved roads have concentrated on eliminating trackout from construction sites, curbing and stabilizing road shoulders, and investigating more efficient street sweepers. Secondary fine particulates have been reduced by vehicle emission controls, which reduce precursor gases. For example, reducing gaseous HC emissions 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 (AgBMP) to reduce particulate emissions from tilling and harvesting activities of cropland and non-cropland. In a recent PM_{10} State Implementation Plan (SIP), the Maricopa Association of Governments (MAG) committed to implement 77 new measures including enhanced enforcement of the county’s dust rules, implementation of AgBMP, 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 exposure, and measuring the volume of air sampled. The monitoring instruments are fitted with different aerodynamic devices to segregate particle size fractions. Particulates also can 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 2008 PM_{10} data reported in Table 10 represent 69 monitors throughout Arizona and two in Mexico, located in Agua Prieta and Nogales, Sonora. Data from collocated monitors are included 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 (FRM) monitors in anticipation of a new federal standard for fine particulates in 1999. Sixteen FRM 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. The data are reported in ambient conditions (local temperature and pressure) as required by EPA. Particulate data from the Interagency Monitoring of Protected Visual Environments (IMPROVE) program are not included. Effective December 16, 2006 the EPA changed the 24-hour $PM_{2.5}$ NAAQS from 65 $\mu g/m^3$ to 35 $\mu g/ m^3$. The EPA also eliminated the annual standard for PM_{10}, but retained the 24-hour standard of 150 $\mu g/m^3$.

Figure 4 – Nogales Post Office monitoring station.

Figure 5 – Yuma Courthouse monitoring station.

Table 10: 2008 PM_{10} Data (in µg/m^3)
(NAAQS 24-hour Average 150 µg/m^3)
Bold denotes an exceedances, defined as any daily value greater than 150 µg/m^3 after rounding to the nearest 10 µg/m^3.**

Site Name	Method	Annual Average	24-Hour Average		Valid Data Recovery *	
			Max Value	2nd High	No. of Days	%
Apache County						
TEP - Springerville - Coal Yard [1]	TEOM	23.6	**337**	**277**	8696	99
TEP - Springerville - Coyote Hills [1]	TEOM	11.4	52	44	8784	100
Cochise County						
Douglas Red Cross [4]	Partisol	35.7	97	92	59	97
Paul Spur Chemical Lime Plant (1) [4]	Partisol	35.6	**160**	70	58	95
Paul Spur Chemical Lime Plant (2) [4] #	Partisol	40.7	**254**	**156**	52	85
Coconino County						
Flagstaff Middle School [4]	Partisol	17.8	45	43	60	98
Gila County						
FMMI - Miami - Golf Course (1) [4] #	Dichot	18.0	46	38	42	69
FMMI - Miami - Golf Course (2) [4] #	Dichot	18.5	43	33	50	82
Hayden Old Jail, ADEQ [4]	Partisol	33.4	70	68	58	95
Miami Ridgeline, FMMI [4]	Dichot	13.3	42	29	57	93
Payson Well Site [4]	Partisol	21.8	43	39	59	97
Maricopa County						
Bethune Elementary School [4]	Partisol	44.2	111	110	59	97
Buckeye [1]	TEOM	43.2	**223**	**203**	365	100
Central Phoenix [1]	TEOM	35.3	133	116	358	98
Coyote Lakes [1]	TEOM	35.4	**186**	**167**	364	99
Durango Complex [1]	TEOM	48.2	**247**	**169**	362	99
Dysart [4]	Hi-Vol	25.1	75	66	61	100
Glendale [4]	Hi-Vol	26.5	80	49	60	98
Greenwood [1]	TEOM	42.6	133	123	366	100
Higley [1]	TEOM	40.2	133	118	360	98
JLG Supersite [4]	Partisol	30.4	102	65	56	92
JLG Supersite [1]	TEOM	28.5	101	79	361	99
Mesa [4]	Hi-Vol	22.4	71	50	59	97
North Phoenix [4]	Hi-Vol	25.1	88	49	59	97
South Phoenix [4]	TEOM	45.2	**230**	**161**	366	100
South Scottsdale [4]	Hi-Vol	25.1	92	51	60	98
West Chandler [4]	Hi-Vol	22.9	67	49	58	95
West Forty Third [1]	TEOM	56.9	**278**	**250**	365	100
West Phoenix [1]	TEOM	37.8	113	106	366	100
Mohave County						
Bullhead City [4]	Partisol	20.6	46	44	59	97
Pima County						
Ajo [4]	Partisol	26.7	56	50	59	97
Broadway & Swan [4]	Partisol	24.6	66	42	56	92

Table 10: 2008 PM_{10} Data (in µg/m^3)
(NAAQS 24-hour Average 150 µg/m^3)
Bold denotes an exceedances, defined as any daily value greater than 150 µg/m^3 after rounding to the nearest 10 µg/m^3.**

Site Name	Method	Annual Average	24-Hour Average		Valid Data Recovery *	
			Max Value	2nd High	No. of Days	%
Corona De Tucson [4]	Partisol	19.2	89	67	46	98
Geronimo [1]	TEOM	31.4	137	112	364	99
Green Valley [1]	BAM	20.5	115	97	366	100
Green Valley Fire Administration [1] #	BAM	15.5	149	66	272	90
Orange Grove [2]	Partisol	28.2	132	88	365	100
Prince Road [4]	Partisol	33.1	83	68	61	100
Rillito, ADEQ [4]	Partisol	40.8	104	77	60	98
Rillito, APCC [3]	Hi-Vol	27.4	119	66	108	89
Santa Clara [4]	Partisol	29.5	**173**	81	61	100
South Tucson [2]	Partisol	30.7	146	121	364	99
Tangerine [4]	Partisol	19.2	54	50	60	98
Pinal County						
Apache Junction Fire Station [4]	Hi-Vol	19.6	57	42	59	97
Casa Grande Downtown [4]	Hi-Vol	29.9	74	71	59	97
Casa Grande Downtown [1]	TEOM	45.0	**203**	**183**	364	99
Combs School [1]	TEOM	56.4	**270**	**195**	366	100
Coolidge Maintenance Yard [4]	Hi-Vol	33.5	91	63	60	98
Cowtown [4]	RAAS	145.3	**465**	**373**	60	98
Cowtown [1]	TEOM	160.5	**609**	**539**	357	98
Eloy County Complex [4]	Partisol	36.3	109	64	55	90
Mammoth County Complex [4]	Hi-Vol	14.6	35	32	59	97
Maricopa County Complex[1]	TEOM	58.6	**520**	**317**	359	98
Pinal Air Park [4]	Hi-Vol	25.8	55	53	61	100
Pinal County Housing Complex (1) [4]	Hi-Vol	43.1	141	124	59	97
Pinal County Housing Complex (2) [4]	Hi-Vol	47.5	**245**	117	61	100
Pinal County Housing Complex [1]	TEOM	63.3	**285**	**274**	356	97
Riverside Maintenance Yard [1]	Hi-Vol	20.9	52	44	58	95
Stanfield County Complex [4]	RAAS	61.0	**201**	**185**	61	100
Stanfield County Complex [1]	TEOM	67.8	**375**	**364**	363	99
Santa Cruz County						
Nogales Post Office [4]	Partisol	54.7	**155**	150	58	95
Nogales Post Office [1]	BAM	62.4	**234**	**217**	355	97
Yavapai County						
PCC Clarkdale - NW [4]	Dichot	15.3	37.3	36.1	60	99
PCC Clarkdale - SE [4]	Dichot	19.2	54.6	50.2	61	100
Prescott Valley [4]	Partisol	17.9	42	38	47	77
Yuma County						
Yuma Courthouse (1) [4]	Partisol	38.5	90	88	58	95
Yuma Courthouse (2) [4]	Partisol	38.6	92	82	61	100

Table 10: 2008 PM_{10} Data (in µg/m^3)
(NAAQS 24-hour Average 150 µg/m^3)
Bold denotes an exceedances, defined as any daily value greater than 150 µg/m^3 after rounding to the nearest 10 µg/m^3.**

Site Name	Method	Annual Average	24-Hour Average		Valid Data Recovery *	
			Max Value	2nd High	No. of Days	%
Yuma Courthouse [1]	TEOM	44.2	**386**	**252**	340	93
Mexico						
Agua Prieta Fire Station [4]	Dichot	49.4	91	88	58	95
Sonora Nogales Fire Station [4]	Dichot	58.3	127	126	60	98

***Valid data recovery** shows the number of valid observations and the percentage of scheduled samples that were valid. For continuous monitors (TEOM and BAM), the number of valid days is used for data recovery.

[1] Samples collected every hour - 8760 sample hours (365 days) in non leap years and 8784 sample hours (366 days) in leap years.
[2] Samples collected every day - 365 sample days in non leap years and 366 sample days in leap years.
[3] Samples collected every third day - 122 sample days in non leap years
[4] Samples collected every sixth day - 61 sample days in non leap years
[#]Indicates the data do not satisfy EPA's summary criteria, usually meaning less than 75 percent valid data recovery available.

(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.

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

Note: Exceedances due to Exceptional Events that have been concurred on by the EPA are excluded from the annual statistics.

Table 11: 2008 $PM_{2.5}$ Data (in µg/m^3) *(NAAQS Annual Average 15µg/m^3, 24-hour Average 35 µg/m^3)*						
Site Name	**Method**	**Annual Average**	**24-Hour Average**		**Valid Data Recovery ***	
			Max Value	**2nd High**	**No. of Days**	**%**
Cochise County						
Douglas Red Cross [4]	FRM	6.98	13.8	13.6	54	89
Coconino County						
Flagstaff Middle School [4] #	FRM	5.92	13.5	10.3	59	97
Maricopa County						
JLG Supersite [3]	FRM	8.88	28.2	19.4	115	94
Mesa [3]	FRM	8.45	24.0	16.4	115	94
South Phoenix [3]	FRM	10.93	24.4	23.5	116	95
West Phoenix (1) [3]	FRM	10.62	29.1	26.0	120	98
West Phoenix (2) [3]	FRM	9.93	26.6	20.4	29	24
Pima County						
Children's Park [3]	FRM	5.38	15.3	12.4	118	97
Orange Grove [2]	FRM	5.72	18.3	11.8	116	95
Pinal County						
Apache Junction Fire Station [3]	FRM	7.52	23.3	19.5	112	92
Casa Grande Downtown [3]	FRM	10.61	23.5	23.4	122	100
Cowtown [4]	FRM	19.63	41.7	40.7	57	93
Santa Cruz County						
Nogales Post Office (1) [4]	FRM	13.08	46.7	35.8	60	98
Nogales Post Office (2) [4]	FRM	13.31	46.9	36.8	59	97
Yavapai County						
Prescott Valley [4]	FRM	5.91	12.6	12.4	58	95
Yuma County						
Yuma Courthouse	FRM	9.93	23.0	21.1	60	98

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

[2] Samples collected every day - 365 sample days in non leap years and 366 sample days in leap years.
[3] Samples collected every third day - 122 sample days in non leap years.
[4] Samples collected every sixth day - 61 sample days in non leap years.

(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.

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

Criteria Pollutants – Compliance

Carbon Monoxide

There are two NAAQS for CO: a one-hour standard and an eight-hour standard (most critical for compliance). The one-hour standard is 35 ppm and the eight-hour standard is 9 ppm. According to 40 CFR part 50, 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 nonattainment (or monitoring) area by evaluating two calendar years of data from each site. The highest of the second-highest value in a two-year period must not exceed the standard of 35 ppm (greater than or equal to 35.5 ppm) for the one-hour standard or 9 ppm (greater than or equal to 9.5 ppm) for the eight-hour standard.

No exceedances of the one-hour or eight-hour standards were recorded in 2007 or 2008. The data are presented in Table 12 and Table 13.

Table 12: 2007-2008 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.

2007-2008 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: 2007-2008 One-Hour Carbon Monoxide Compliance (in ppm)

Site Name	2007		2008		Compliance Value
	Max Value	2nd High	Max Value	2nd High	
Maricopa County					
Buckeye [S]	3.9	1.6	0.7	0.7	1.6
Central Phoenix	4.1	4.0	3.6	3.5	4.0
Dysart [S]	1.8	1.7	1.5	1.4	1.7
Glendale [S]	4.3	3.3	2.1	2.0	3.3
Greenwood	4.6	4.6	3.0	3.0	4.6
JLG Supersite	4.6	4.3	3.1	3.1	4.3
Mesa [S]	3.9	2.5	1.7	1.7	2.5
North Phoenix [S]	3.4	3.0	2.1	2.0	3.0
South Phoenix [S]	4.9	4.3	3.7	3.2	4.3
South Scottsdale [S]	2.7	2.6	2.0	2.0	2.6
Tempe [S]	3.2	2.8	2.4	2.3	2.8
West Chandler [S]	2.7	2.4	1.8	1.7	2.4
West Indian School	6.2	5.7	3.9	3.6	5.7
West Phoenix	6.0	6.0	4.7	4.5	6.0
Pima County					
22nd St. & Alvernon	3.7	3.1	2.9	2.5	3.1
22nd St. & Craycroft	2.6	2.5	2.6	2.1	2.6

Table 12: 2007-2008 One-Hour Carbon Monoxide Compliance (in ppm)					
Site Name	**2007**		**2008**		**Compliance Value**
	Max Value	**2nd High**	**Max Value**	**2nd High**	
Cherry & Glenn [S]	2.8	2.7	2.5	2.5	2.7
Children's Park	1.9	1.8	1.5	1.3	1.8
Golf Links & Kolb [S]	2.5	2.1	2.0	1.8	2.1
Tucson Downtown	3.4	2.7	2.2	1.8	2.7

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

Table 13: 2007-2008 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.

2007-2008 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: 2007-2008 Eight-Hour Carbon Monoxide Compliance (in ppm)					
Site Name	**2007**		**2008**		**Compliance Value**
	Max Value	**2nd High**	**Max Value**	**2nd High**	
Maricopa County					
Buckeye [S]	1.0	0.8	0.5	0.5	0.8
Central Phoenix	2.9	2.9	2.6	2.2	2.9
Dysart [S]	1.3	1.3	1.0	1.0	1.3
Glendale [S]	1.8	1.6	1.6	1.5	1.6
Greenwood	4.0	3.0	2.7	2.4	3.0
JLG Supersite	3.1	2.9	2.5	2.4	2.9
Mesa [S]	2.0	2.0	1.4	1.3	2.0
North Phoenix [S]	1.7	1.6	1.3	1.3	1.6
South Phoenix [S]	3.1	2.3	2.2	2.0	2.3
South Scottsdale [S]	1.6	1.6	1.5	1.4	1.6
Tempe [S]	1.9	1.9	1.8	1.4	1.9
West Chandler [S]	1.6	1.5	1.4	1.4	1.5
West Indian School	5.0	3.9	2.8	2.8	3.9
West Phoenix	4.6	4.1	3.1	3.0	4.1
Pima County					
22nd St. & Alvernon	2.1	1.9	1.4	1.3	1.9
22nd St. & Craycroft	1.2	1.2	1.1	1.1	1.2
Cherry & Glenn [S]	1.9	1.5	1.9	1.5	1.9
Children's Park	1.1	1.0	1.0	0.9	1.0
Golf Links & Kolb [S]	1.3	1.3	1.3	1.2	1.3
Tucson Downtown	1.9	1.4	1.3	1.0	1.4

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

Nitrogen Dioxide

The NAAQS for NO_2 is 0.053 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 an Arizona power plant are 2 percent of the standard and in the urban areas, from 18 percent to 49 percent. All Arizona sites were in compliance with the NAAQS. Refer to Table 6 for the 2008 averages.

Table 14: 2008 Nitrogen Dioxide NAAQS Compliance Values by County

County	Annual Average	
	Exceedances	Violations
Maricopa	0	0
Pima	0	0
Yuma	0	0
Summary:9 of 9 monitors in compliance		

Sulfur Dioxide

There are three NAAQS for SO_2, two primary (annual and 24-hour block averages) and one secondary (three-hour block average). The annual average standard is 0.030 ppm (80 $\mu g/m^3$), not to 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. The 24-hour average is calculated from midnight to midnight (calendar day); 18 or more valid hours must be present for each calendar day. The maximum and second-highest 24-hour average is used to determine compliance with the standard. The annual average and 24-hour averages must be based on valid hourly data that are at least 75 percent complete in each calendar quarter.

The secondary three-hour standard is 0.5 ppm (1300 $\mu g/m^3$), 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 2008, the maximum concentration sites - all near copper smelters - comply with these standards; the concentrations ranging from 1 to 76 percent of the three-hour, three to 96 percent of the 24-hour and one to 60 percent of the annual average standards. The site near a power plant is close to background levels, with annual averages near 0.0003 ppm. See Table 7 for the 2008 averages.

Table 15: 2008 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:14 out of 14 monitors in compliance						

Ozone - One-hour

The NAAQS one-hour standard for O_3 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 2008.

Since 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 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 O_3 standard. Even though the one-hour standard was revoked on June 15, 2005, certain control measures developed and implemented for the one-hour standard 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 O_3 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 O_3 standard was 0.08 ppm (0.084 ppm for rounding) for a daily maximum eight-hour average. Then in 2008 the eight-hour standard was reviewed and changed to 0.075 ppm, effective June 2008. The eight-hour 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 (0.075 ppm as of June 2008). The data in Table 16 are for those sites in operation in 2006 to 2008 and have been evaluated based on the 0.075 ppm standard.

Table 16: 2006 to 2008 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 effective in 1997.

2006 to 2008 Eight-Hour Ozone 1997 NAAQS of 0.080 ppm Compliance Values by County				
County	Eight-Hour Exceedances *			Sites in Violation
	2006	2007	2008	
Cochise	0	0	0	0
Coconino	0	0	0	0
Gila	2	0	0	0
La Paz	0	0	0	0
Maricopa	17	1	0	0
Navajo	1	0	0	0
Pima	0	0	0	0
Pinal	5	0	1	0
Yavapai	--	--	0	--
Yuma	0	1	0	0
Summary:42 of 42 monitors in compliance for 2006 to 2008				

* Includes all eight-hour exceedances.

Table 16: 2006 to 2008 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 0.075 ppm effective in 2008.

2006 to 2008 Eight-Hour Ozone 2008 NAAQS of 0.075 ppm Compliance Values by County				
County	Eight-Hour Exceedances *			Sites in Violation
	2006	2007	2008	
Cochise	1	0	0	0
Coconino	1	0	3	0
Gila	17	6	11	1
La Paz	1	2	4	0
Maricopa	169	53	79	11
Navajo	1	0	0	0
Pima	13	0	2	0
Pinal	26	10	18	2
Yavapai	--	--	0	--
Yuma	1	3	12	0
Summary:26 of 42 monitors in compliance for 2006 to 2008				

* Includes all eight-hour exceedances.

Table 16: 2006 to 2008 Eight-Hour Ozone Compliance (in ppm)

Bold denotes exceedances and sites in violation of the 2008 NAAQS of 0.075 ppm.
Bold with grey background denotes exceedances of the 1997 NAAQS of 0.08 ppm.

Site Name	Fourth-Highest Value			Three-Year Average
	2006	2007	2008	
Cochise County				
Chiricahua Entrance Station	0.074	0.067	0.068	0.070
Coconino County				
Flagstaff Middle School [S] (opened 03/13/2008)	N/A	N/A	0.074	N/A
Grand Canyon NP - The Abyss	0.070	0.069	0.071	0.070
Gila County				
Tonto NM [S]	**0.081**	**0.076**	**0.078**	**0.078**
La Paz County				
Alamo Lake [S]	0.073	0.072	**0.076**	0.074
Maricopa County				
Blue Point	0.062	0.058	0.074	0.065
Buckeye [S]	0.067	0.064	0.068	0.066
Cave Creek [S]	**0.080**	**0.077**	**0.078**	**0.078**
Central Phoenix	**0.080**	0.070	0.072	0.074
Dysart [S]	0.072	0.065	0.066	0.068
Falcon Field [S]	**0.079**	0.073	0.075	**0.076**
Fountain Hills	**0.084**	0.074	0.079	**0.079**
Glendale [S]	**0.078**	0.071	0.074	0.074
Humboldt Mountain [S]	**0.079**	**0.078**	**0.077**	**0.078**
JLG Supersite	**0.076**	**0.076**	**0.078**	**0.077**
North Phoenix	**0.085**	**0.078**	**0.080**	**0.081**
Pinnacle Peak	**0.076**	0.075	0.073	0.075
Rio Verde [S]	**0.083**	**0.079**	**0.079**	**0.080**
South Phoenix	0.069	0.072	**0.076**	0.072
South Scottsdale	**0.080**	**0.077**	**0.076**	**0.078**
Tempe [S]	**0.079**	**0.076**	**0.078**	**0.078**
West Chandler [S]	**0.081**	0.072	**0.077**	**0.077**
West Phoenix	**0.082**	0.074	**0.078**	**0.078**
Navajo County				
Petrified Forest NP South	0.071	0.069	0.072	0.071
Pima County				
22nd St. & Craycroft	0.069	0.068	0.066	0.068
Children's Park	0.072	0.071	0.069	0.071
Coachline	0.071	0.064	0.068	0.068
Green Valley	0.070	0.065	0.064	0.066
Rose Elementary	0.067	0.069	0.065	0.067
Saguaro NP East	**0.076**	0.073	0.074	0.074
Tangerine	**0.076**	0.069	0.071	0.072
Tucson Downtown	0.073	0.067	0.065	0.068
Tucson Fairgrounds	0.068	0.071	0.072	0.070

Table 16: 2006 to 2008 Eight-Hour Ozone Compliance (in ppm)

Bold denotes exceedances and sites in violation of the 2008 NAAQS of 0.075 ppm.
Bold with grey background denotes exceedances of the 1997 NAAQS of 0.08 ppm.

Site Name	Fourth-Highest Value			Three-Year Average
	2006	2007	2008	
Pinal County				
Apache Junction Maintenance Yard	**0.084**	**0.077**	**0.079**	**0.080**
Casa Grande Airport	0.073	0.070	0.073	0.072
Combs School [S ##]	0.071	0.057	0.071	0.066
Maricopa County Complex [S]	0.068	0.059	0.069	0.065
Pinal Air Park [S]	0.070	0.066	0.070	0.069
Queen Valley [S]	**0.079**	**0.076**	**0.080**	**0.078**
Yavapai County				
Prescott College AQD [S] (opened 3/25/2008) - ADEQ	N/A	N/A	0.069	N/A
Yuma County				
Yuma Game & Fish [S]	0.073	0.074	**0.076**	0.074
Yuma Supersite [S] (opened 05/06/2008)	N/A	N/A	**0.077**	N/A

[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.

Site also known as Queen Creek

N/A - Data are 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 µg/m^3 was retained. The annual NAAQS statistics are included for historical purposes.

The annual standard is attained when, for a three-year period, the expected annual arithmetic mean concentration is less than or equal to 50 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. This mean is rounded to the nearest 1 µg/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 µg/m^3 for comparison with the standard to determine if it is an exceedance (i.e., a sample value of 154 µg/m^3 is not an exceedance because it rounds to 150 µg/m^3; a sample value of 155 µg/m^3 is an exceedance because it rounds to 160 µg/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 2006 to 2008 expected exceedance rates for the PM_{10} annual arithmetic means and maximum 24-hour average values.

Table 17: 2006 to 2008 Annual Average PM_{10} Compliance (in µg/m^3, Standard Conditions)

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

The expected annual arithmetic mean is rounded to the nearest 1 µg/m^3 for comparison to the standard.

Note: The Annual Average statistics are for historical purposes only.

2006 to 2008 PM_{10} Annual Average NAAQS Compliance Values, By County				
County	Sites with Exceedances			Sites in Violation
	2006	2007	2008	
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	7	6	0	4
Mohave	0	0	0	0
Navajo	0	0	0	0
Pima	0	0	0	0
Pinal	4	6	5	4
Santa Cruz	1	1	1	1
Yavapai	0	0	0	0
Yuma	0	1	0	0
Summary: 44 of 64 monitors in compliance				

Table 17: 2006 to 2008 Annual Average PM_{10} Compliance (in µg/m^3)
Bold denotes value above the standard.

Site Name	2006	2007	2008	Expected Annual Mean
Apache County				
TEP - Springerville - Coal Yard	19.0	26.9	23.6	23
TEP - Springerville - Coyote Hills	11.2	11.7	11.4	11
Cochise County				
Douglas Red Cross	30.9	28.2	35.7	32
Paul Spur Chemical Lime Plant	27.3	28.8	35.6	31
Coconino County				
Flagstaff Middle School	18.0	21.2	17.8	19
Sedona Post Office (closed 12/31/2007)	13.3	13.7	N/A	N/A
Gila County				
FMMI - Miami - Golf Course	20.4	23.0#	18.0#	N/A
Hayden Old Jail, ADEQ	33.4	34.4	33.4	34
Miami Ridgeline, FMMI	14.2	11.9	13.3	13
Payson Well Site	23.7	23.0	21.8	23
Graham County				
Safford (closed 12/31/2007)	22.6	22.3	N/A	N/A
Maricopa County				
Bethune Elementary School	**61.7**	**53.1**	44.2	**53**
Buckeye [E]	**53.0**	**52.5**	43.2	50
Central Phoenix [E]	42.0	42.4	35.3	40
Coyote Lakes (opened 4/2/2007)	N/A	47.8#	35.4	N/A
Durango Complex [E]	**69.0**	**59.5**	48.2	**59**
Dysart	32.3	35.9	25.1	31
Glendale	36.3#	34.1	26.5	N/A
Greenwood [E]	**51.7**	50.0	42.6	48
Higley [E]	**60.4**	**53.0**	40.2	**51**
JLG Supersite	35.4	34.1	30.4	33
JLG Supersite [E]	36.8	36.2	28.5	34
Mesa	30.5	32.3	22.4	28
North Phoenix	34.4	33.5	25.1	31
South Phoenix [E] - continuous monitor beginning 7/1/2007	**55.0**	**55.6**	45.2	**52**
South Scottsdale	32.9	30.6	25.1	30
West Chandler [E]	33.3	36.4	22.9	31
West Forty Third [E]	**79.8**	**71.8**	56.9	**70**
West Phoenix - continuous monitor beginning 1/1/2006	49.8	47.0	37.8	45
Mohave County				
Bullhead City	19.3	20.3	20.6	20
Navajo County				
Show Low (closed 12/31/2007)	15.5	16.0	N/A	N/A

Table 17: 2006 to 2008 Annual Average PM_{10} Compliance (in µg/m^3) **Bold** denotes value above the standard.				
Site Name	**2006**	**2007**	**2008**	**Expected Annual Mean**
Pima County				
Ajo	25.3	32.0#	26.7	N/A
Broadway & Swan	26.8	26.2	24.6	26
Corona de Tucson	22.6	17.1	19.2	20
Geronimo (opened 7/1/2007)	N/A	32.8#	31.4	N/A
Green Valley [E]	16.8	20.4	20.5	19
Green Valley Fire Administration [E] (opened 7/1/2007)	N/A	14.8#	15.5#	N/A
Orange Grove [E]	31.8	29.2	28.2	30
Prince Road	35.2	31.7	33.1	33
Rillito, ADEQ	39.7	40.7	40.8	40
Rillito, APCC (1-in-3 day schedule)	28.5	26.2	27.4	27
Santa Clara	35.5	28.4	29.5	31
South Tucson	34.3	31.4	30.7	32
Tangerine	22.9	22.0	19.2	21
Pinal County				
Apache Junction Fire Station	23.6	18.1	19.6	20
Casa Grande Downtown	35.9	35.3	29.9	34
Casa Grande Downtown [E] (opened March 2007)	N/A	**55.2#**	45.0	N/A
Combs School [E] (opened 3/20/2007)	N/A	**89.9#**	**56.4**	N/A
Coolidge Maintenance Yard	44.0	35.5	33.5	38
Cowtown (opened August 2005)	**220.1**	**167.5**	**145.3**	**178**
Cowtown [E]	**230.4**	**181.3**	**160.5**	**191**
Eloy County Complex	38.8	42.3	36.3	39
Mammoth County Complex	14.8	12.7	14.6	14
Maricopa County Complex [E]	**78.6**	**73.7**	**58.6**	**70**
Pinal Air Park	29.5	29.5	25.8	28
Pinal County Housing Complex	**64.3**	**56.0**	43.1	**54**
Pinal County Housing Complex [E]	**87.1**	**83.7**	**63.3**	**78**
Riverside Maintenance Yard [E]	23.3	23.6	20.9	23
Stanfield County Complex	**81.4**	**90.9**	**61.0**	**78**
Stanfield County Complex [E] (opened February 2006)	**82.6#**	**84.3**	**67.8**	N/A
Santa Cruz County				
Nogales Post Office	**64.0**	**52.1**	**54.7**	**57**
Nogales Post Office [E]	**82.3**	**65.0**	**62.4**	**70**
Yavapai County				
PCC Clarkdale - NW	15.3	14.0	15.3	15
PCC Clarkdale - SE	19.7	18.5	19.2	19
Prescott Valley	18.9#	21.5	17.9#	N/A

Table 17: 2006 to 2008 Annual Average PM_{10} Compliance (in µg/m^3) **Bold** denotes value above the standard.				
Site Name	**2006**	**2007**	**2008**	**Expected Annual Mean**
Yuma County				
Yuma Courthouse	40.1	45.7	38.5	41
Yuma Courthouse [E]	46.9	**51.9**	44.2	48
Mexico				
Agua Prieta Fire Station	**52.7**	46.8	49.4	50
Sonora Nogales Fire Station	**75.9**	**62.7**	**58.3**	**66**

# 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/continuous monitoring.

N/A - Data are not available

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 percent and 75 percent, data from the Secondary (POC 2) 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.'

Exceedances due to Exceptional Events that have been concurred on by the EPA are excluded from the annual statistics.

Table 18: 2006 to 2008 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.

2006 to 2008 PM_{10} Maximum 24-Hour Compliance Values, By County				
County	Sites with Exceedances			Sites in Violation
	2006	2007	2008	
Apache	1	1	1	1
Cochise	0	0	1	1
Coconino	0	0	0	0
Gila	0	0	0	0
Graham	0	0	0	0
Maricopa	5	8	5	5
Mohave	0	0	0	0
Navajo	0	0	0	0
Pima	0	1	1	2
Pinal	4	6	6	4
Santa Cruz	1	1	1	1
Yavapai	0	0	0	0
Yuma	1	1	1	1
Summary: 36 of 64 monitors in compliance				

Table 18: 2006 to 2008 Maximum 24-Hour Average PM_{10} Compliance (in µg/m^3)
Bold denotes value above the standard.

Site Name	2006		2007		2008		Three-Year Avg Exp. Rate of Exc.
	Max 24-Hr Avg	Exp. Exc.	Max 24-Hr Avg	Exp. Exc.	Max 24-Hr Avg	Exp. Exc.	
Apache County							
TEP - Springerville - Coal Yard	**298**	**3.0**	**914**	**5.0**	**337**	**7.0**	**5**
TEP - Springerville - Coyote Hills	56	0	49	0	52	0	0
Cochise County							
Douglas Red Cross	87	0	94	0	97	0	0
Paul Spur Chemical Lime Plant	76	0	87	0	**160**	**6.5**	**2.2**
Coconino County							
Flagstaff Middle School	37	0	56	0	45	0	0
Sedona Post Office (closed 12/31/2007)	36	0	33	0	N/A	N/A	N/A
Gila County							
FMMI - Miami - Golf Course	90	0	64#	0	46#	0	N/A
Hayden Old Jail, ADEQ	102	0	72	0	70	0	0
Miami Ridgeline, FMMI	106	0	51	0	42	0	0
Payson Well Site	66	0	62	0	43	0	0
Graham County							
Safford (closed 12/31/2007)	50	0	62	0	N/A	N/A	N/A
Maricopa County							
Bethune Elementary School	140	0	136	0	111	0	0
Buckeye [E]	**272**	**3.0**	**195**	**2.0**	**223**	**4.0**	**3.0**

Table 18: 2006 to 2008 Maximum 24-Hour Average PM_{10} Compliance (in µg/m^3) **Bold** denotes value above the standard.							
Site Name	**2006**		**2007**		**2008**		**Three-Year Avg Exp. Rate of Exc.**
	Max 24-Hr Avg	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	
Central Phoenix [E]	134	0	**267**	**1.0**	133	0	0.3
Coyote Lakes (opened 4/2/2007)	N/A	N/A	**313#**	**2.0**	**186**	**2.0**	N/A
Durango Complex [E]	**240**	**9.0**	**155**	**1.0**	**247**	**2.0**	**4.0**
Dysart	67	0	111	0	75	0	0
Glendale	60#	0	92	0	80	0	N/A
Greenwood [E]	**166**	**1.0**	124	0	133	0	0.3
Higley [E]	**170**	**2.1**	**230**	**5.1**	133	0	**2.4**
JLG Supersite	91	0	85	0	102	0	0
JLG Supersite [E]	148	0	**521**	**1.0**	101	0	0.3
Mesa	75	0	110	0	71	0	0
North Phoenix	79	0	78	0	88	0	0
South Phoenix [E] - continuous monitor beginning 7/1/2007	132	0	**171**	**7.5**	**230**	**2.0**	**3.2**
South Scottsdale	76	0	73	0	92	0	0
West Chandler [E]	77	0	104	0	67	0	0
West Forty Third [E]	**260**	**18.7**	**227**	**6.0**	**278**	**5.0**	**9.9**
West Phoenix [E]	147	0	124	0	113	0	0
Mohave County							
Bullhead City	72	0	52	0	46	0	0
Navajo County							
Show Low (closed 12/31/2007)	58	0	75	0	N/A	N/A	N/A
Pima County							
Ajo	54	0	124#	0	56	0	N/A
Broadway & Swan	60	0	80	0	66	0	0
Corona De Tucson	144	0	50	0	89	0	0
Geronimo (opened 7/1/2007)	N/A	N/A	104#	0	137	0	N/A
Green Valley	81	0	123	0	115	0	0
Green Valley Fire Administration [E] (opened 7/1/2007)	N/A	N/A	57#	0	149#	0	N/A
Orange Grove [E]	101	0	95	0	132	0	0
Prince Road	72	0	99	0	83	0	0
Rillito, ADEQ	122	0	**208**	**11.0**	104	0	**3.7**
Rillito, APCC (1-in-3 day schedule)	86	0	65	0	119	0	0
Santa Clara	104	0	92	0	**173**	**6.1**	**2.0**
South Tucson	109	0	97	0	146	0	0
Tangerine	104	0	88	0	54	0	0
Pinal County							
Apache Junction Fire Station	73	0	48	0	57	0	0

Table 18: 2006 to 2008 Maximum 24-Hour Average PM_{10} Compliance (in µg/m^3)
Bold denotes value above the standard.

Site Name	2006		2007		2008		Three-Year Avg Exp. Rate of Exc.
	Max 24-Hr Avg	Exp. Exc.	Max 24-Hr Avg	Exp. Exc.	Max 24-Hr Avg	Exp. Exc.	
Casa Grande Downtown	81	0	112	0	74	0	0
Casa Grande Downtown [E] (opened March 2007)	N/A	N/A	**983#**	**7.0**	**203**	**3.0**	N/A
Combs School (opened 3/20/2007)	N/A	N/A	**970#**	**44.6**	**270**	**4.0**	N/A
Coolidge Maintenance Yard	106	0	82	0	91	0	0
Cowtown (opened August 2005)	**606**	**278.2**	**759**	**166.2**	**465**	**145.5**	**196.6**
Cowtown [E]	**1079**	**243.1**	**1014**	**190.4**	**609**	**175.3**	**202.9**
Eloy County Complex	99	0	136	0	109	0	0
Mammoth County Complex	31	0	40	0	35	0	0
Maricopa County Complex [E]	**429**	**19**	**724**	**20.1**	**520**	**6.2**	**15.1**
Pinal Air Park	77	0	113	0	55	0	0
Pinal County Housing Complex	153	0	**224**	**6.5**	141	0	**2.2**
Pinal County Housing Complex [E]	**763**	**31**	**2253**	**19.5**	**285**	**10.3**	**20.3**
Riverside Maintenance Yard	83	0	65	0	52	0	0
Stanfield County Complex	**182**	**13.1**	**374**	**39.6**	**201**	**11.8**	**21.5**
Stanfield County Complex [E] (opened February 2006)	**727#**	**21**	**1062**	**25.2**	**375**	**14.2**	N/A
Santa Cruz County							
Nogales Post Office	**240**	**20.4**	**191**	**6.1**	**155**	**6.6**	**11**
Nogales Post Office [E]	**271**	**47.9**	**233**	**14.0**	**234**	**13.2**	**25**
Yavapai County							
PCC Clarkdale - NW	27	0	50	0	37.3	0	0
PCC Clarkdale - SE	38	0	52	0	54.6	0	0
Prescott Valley	56#	0	63	0	42#	0	N/A
Yuma County							
Yuma Courthouse	151	0	147	0	90	0	0
Yuma Courthouse [E]	**198**	**5.1**	**349**	**13.0**	**386**	**4.6**	**7.6**
Mexico							
Agua Prieta Fire Station	**159**	**11.7**	104	0	91	0	**3.9**
Sonora Nogales Fire Station	**195**	**14.1**	**170**	**12.3**	127	0	**8.8**

# 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/continuous monitoring.

N/A - Data are not available

Note: Exceedances due to Exceptional Events that have been concurred on by the EPA are excluded from the annual statistics.

Particulate Matter – $PM_{2.5}$

The NAAQS for particulate matter 2.5 microns and smaller in diameter ($PM_{2.5}$) are 15.0 µg/m^3 for the annual arithmetic mean concentration and 35 µg/m^3 for 24-hour average concentrations, which changed from 65 µg/m^3 on December 17, 2006. Appendix N Part 50 of the 40 CFR was used to assess the compliance of the monitors operating in Arizona during 2008.

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 yearly 98th percentile value is less than or equal to 35 µg/m^3. There must also be 75 percent data completeness for each year.

Please note that the data in Table 19 are from FRMs. In prior years, the dichot fine measurement was used as an approximate equivalent for $PM_{2.5}$, but the FRMs 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 tribal areas) be designated attainment/unclassifiable for the $PM_{2.5}$ NAAQS. A new request was submitted in December 2007 and approved in August 2008, designating nonattainment for Nogales – same area as PM_{10} nonattainment.

Table 19: 2006 to 2008 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

2006 to 2008 $PM_{2.5}$ Annual Average NAAQS Compliance Values, By County				
County	Sites with Exceedances			Sites in Violation
	2006	2007	2008	
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
Pinal	1	1	1	1
Santa Cruz	1	0	0	0
Summary: 10 of 14 federal reference monitors in compliance				

Table 19: 2006 to 2008 Annual Average $PM_{2.5}$ Compliance (in µg/m^3) Federal Reference Monitors ***Bold** denotes a value above the standard.*				
Site Name	**2006**	**2007**	**2008**	**Three-Year Average**
Cochise County				
Douglas Red Cross	6.78	7.69	6.98	7.15
Coconino County				
Flagstaff Middle School	6.61	8.00	5.92#	N/A
Gila County				
Payson Well Site (closed 12/31/2007)	9.04	9.38	N/A	N/A
Maricopa County				
JLG Supersite	10.22	9.48	8.88	9.53
Mesa	9.66	9.72	8.45	9.28
South Phoenix	12.69	12.27	10.93	11.96
West Phoenix	13.52	10.89	10.62	11.68
Pima County				
Children's Park	5.79	5.71	5.38	5.63
Orange Grove	5.80	5.84	5.72	5.79
Pinal County				
Apache Junction Fire Station	5.31	6.96	7.52	6.60
Casa Grande Downtown	7.55	10.25	10.61	9.47
Cowtown	**22.70**	**22.50**	**19.63**	**21.61**
Santa Cruz County				
Nogales Post Office	**15.59**	12.30	13.08	13.66
Yavapai County				
Prescott Valley (opened 1/1/2008)	N/A	N/A	5.91	N/A
Yuma County				
Yuma Courthouse (opened 1/1/2008)	N/A	N/A	9.93	N/A

# 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: 2006 to 2008 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 35 µg/m^3.

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

2006 to 2008 $PM_{2.5}$ 24-Hour Average NAAQS Compliance Values, By County				
County	Sites with Exceedances			Sites in Violation
	2006	2007	2008	
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
Pinal	1	1	1	1
Santa Cruz	1	0	1	1
Summary: 10 of 14 federal reference monitors in compliance				

Table 20. 2006 to 2008 24-Hour Average $PM_{2.5}$ Compliance (in µg/m^3)
Federal Reference Monitors only
Bold denotes a vale above the standard.

Site Name	98th Percentile Samples **			Three-Year Average
	2006	2007	2008	
Cochise County				
Douglas Red Cross [2]	14.0	32.2	13.6	20
Coconino County				
Flagstaff Middle School [2]	13.7	30.2	10.3	18
Gila County				
Payson Well Site [2] (closed 12/31/2007)	23.4	21.9	N/A	N/A
Maricopa County				
JLG Supersite [3]	24.6	23.5	17.8	22
Mesa (opened 4/28/2005) [3]	20.1	18.3	14.5	18
South Phoenix [3]	28.8	29.2	22.7	27
West Phoenix [3]	28.8	27.2	24.3	27
Pima County				
Children's Park [3]	12.1	12.0	11.7	12
Orange Grove [1]	11.2	13.6	11.7	12
Pinal County				
Apache Junction Fire Station [3]	9.3	14.6	15.4	13
Casa Grande Downtown [2]	15.4	22.4	22.0	20
Cowtown [2]	**48.9**	**53.9**	**40.7**	**48**
Santa Cruz County				
Nogales Post Office [2]	**56.2**	28.2	**35.8**	**40**
Yavapai County				
Prescott Valley (opened 1/1/2008)	N/A	N/A	12.4	N/A
Yuma County				
Yuma Courthouse (opened 1/1/2008)	N/A	N/A	21.1	N/A

** 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 non leap years

[2] Samples collected every sixth day - 61 sample days in non leap years.

[3] Samples collected every third day - 122 sample days in non leap years.

Visibility Data

Visibility monitoring is conducted using the following 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 tabulating 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.

Figure 6 – Pleasant Valley monitoring station.

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. An inverse megameter (Mm^{-1}) (units used by ADEQ) 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

ADEQ began a visibility monitoring program in 1997, in anticipation of the implementation of a federal regional haze rule. The program is directed at Class I areas in partnership with Arizona's federal land managers. Arizona's Class I areas are participating in the IMPROVE program, which consists of aerosol sampling only. The aerosol samplers collect 24-hour samples every third day and are analyzed to determine the content of the particulates collected. ADEQ added nephelometers for measuring light scattering at some of the sites. The nephelometers are continuous monitors, providing readings every five minutes which are averaged into hourly and 24-hour values. The continuous measurements provide insight into variation in visibility impairment with time as well as 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 2008. The data are summarized into three categories for all hours

(24 hours a day): the mean 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 Camp Raymond, Ike's Backbone, and Petrified Forest National Park in 2007, Tucson Mountain in 2002 to 2006, and Pleasant Valley in 2003.

Table 21: Visibility in Class I Areas (Nephelometer Data in Mm^{-1})

Site and Wilderness Area	Year	Mm^{-1} (24-hour Averages)		
		Mean of the Dirtiest 20% Sampled Hours	Mean of all Sampled Hours	Mean of the Cleanest 20% Sampled Hours
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
	2007	50	19	3
	2008	34	15	3
Chiricahua National Monument	2004	18	9	3
	2005	21	10	2
	2006	18	7	0
	2007	31	13	3
	2008	20	8	1
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
	2007	29	12	2
	2008	22	9	1
Hance Camp *Grand Canyon NP*	1998	23	10	2
	1999	21	9	2
	2000	20	8	1
	2001	22	9	1
	2002	20	9	2
	2003	26	11	2
	2004	19	9	2
	2005	25	10	1
	2006	21	9	2
	2007	24	11	2
	2008	21	9	1

Table 21: Visibility in Class I Areas (Nephelometer Data in Mm^{-1})				
Site and Wilderness Area	**Year**	**Mm^{-1} (24-hour Averages)**		
		Mean of the Dirtiest 20% Sampled Hours	**Mean of all Sampled Hours**	**Mean of the Cleanest 20% Sampled Hours**
Humboldt Mountain * *Mazatzal Wilderness and Pine Mountain Wilderness*	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
	2007	31	15	4
	2008	26	13	4
Indian Gardens *Grand Canyon NP*	2005	26	10	2
	2006	21	9	3
	2007	27	11	2
	2008	21	7	1
Mount Ord * *Mazatzal Wilderness*	1998	28	12	2
	1999	22	11	3
McFadden Peak * *Sierra Ancha Wilderness*	1998	24	10	1
	1999	18	7	0
Muleshoe Ranch * *Chiricahua National Monument Wilderness, Galiuro Wilderness, Chiricahua Forest Service Wilderness*	1998	24	11	4
	1999	20	11	3
	2000	22	11	3
	2001	24	12	4
	2002	25	12	4
	2003	25	11	3
	2004	20	8	1
	2005	21	10	4
Organ Pipe National Monument	2004	21	10	3
	2005	23	12	4
	2006	21	9	1
	2007	27	13	4
	2008	29	15	5
Petrified Forest National Park South	2004	20	9	3
	2005	24	11	3
	2006	23	9	1
	2007	39	17	4
	2008	17	8	1
Pleasant Valley Ranger Station	2001	28	14	5
	2002	27	13	3

Table 21: Visibility in Class I Areas (Nephelometer Data in Mm^{-1})				
Site and Wilderness Area	**Year**	**Mm^{-1} (24-hour Averages)**		
		Mean of the Dirtiest 20% Sampled Hours	**Mean of all Sampled Hours**	**Mean of the Cleanest 20% Sampled Hours**
Sierra Ancha Wilderness	2003	33	15	4
	2004	20	10	3
	2005	28	13	4
	2006	25	11	2
	2007	24	10	1
	2008	23	11	2
Rucker Canyon * *Chiricahua Wilderness*	1998	30	12	3
	1999	20	10	4
	2000	18	8	1
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
	2007	29	14	5
	2008	31	15	5

* Site Closed:
Humboldt Mountain closed in 2004; McFadden Peak closed in 2000; Mount Ord closed in 2000; Muleshoe Ranch closed in 2006; Rucker Canyon closed in 2001

Urban Haze

Besides the Class I areas, ADEQ also operates transmissometers and nephelometers in Phoenix and Tucson. Data from these instruments through 2008 are presented in Table 22. The data are separated into categories for all hours and for six-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 average visibility for the 20 percent of the sampled hours. As visual range in miles may be a more familiar unit, the values in Mm^{-1} in Table 22 can be converted to miles by the expression ($2431/b_{ext}$=Miles).

A few conversions are given here:

b_{ext} (Mm^{-1})	Miles	Comment
136	18	Highest in the Table
100	24	
50	48	
2	1216	Lowest in the Table

Table 22: Phoenix and Tucson Urban Haze Data (in Mm^{-1})

Site Name	Year	24-Hour Samples			5 a.m. to 11 a.m.		
		Mean of the Dirtiest 20% Sampled Hours	Mean of all Sampled Hours	Mean of the Cleanest 20% Sampled Hours	Mean of the Dirtiest 20% Sampled Hours	Mean of all Sampled Hours	Mean of the Cleanest 20% Sampled Hours
Mesa Transmissometer	2004	106	60	24	110	65	29
	2005	121	72	35	123	78	44
	2006	115	70	37	117	75	42
	2007	118	79	46	124	86	53
	2008	105	62	28	109	67	35
Phoenix Transmissometer	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
	2007	121	78	47	127	84	53
	2008	114	65	31	116	70	38

Table 22: Phoenix and Tucson Urban Haze Data (in Mm^{-1})							
Site Name	**Year**	**24-Hour Samples**			**5 a.m. to 11 a.m.**		
		Mean of the Dirtiest 20% Sampled Hours	**Mean of all Sampled Hours**	**Mean of the Cleanest 20% Sampled Hours**	**Mean of the Dirtiest 20% Sampled Hours**	**Mean of all Sampled Hours**	**Mean of the Cleanest 20% Sampled Hours**
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
	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
	2007	75	33	11	70	33	13
	2008	71	31	10	64	31	12
Phoenix Nephelometer (Dysart)	2004	46	22	7	52	27	9
	2005	41	20	8	41	23	10
	2006	44	21	6	49	25	9
	2007	37	18	5	37	20	7
	2008	41	19	5	43	21	6
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
	2007	48	21	5	58	27	7
	2008	49	22	6	57	28	8
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
	2007	55	26	9	53	27	11
	2008	52	24	8	49	25	10
Queen Valley Nephelometer	2004	26	11	2	25	10	2
	2005	32	15	5	31	15	5
	2006	25	12	3	22	11	3
	2007	28	15	5	27	14	5
	2008	39	17	4	38	17	4
Tucson Transmissometer	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

Table 22: Phoenix and Tucson Urban Haze Data (in Mm^{-1})							
Site Name	**Year**	**24-Hour Samples**			**5 a.m. to 11 a.m.**		
		Mean of the Dirtiest 20% Sampled Hours	**Mean of all Sampled Hours**	**Mean of the Cleanest 20% Sampled Hours**	**Mean of the Dirtiest 20% Sampled Hours**	**Mean of all Sampled Hours**	**Mean of the Cleanest 20% Sampled Hours**
	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
	2007	92	51	22	103	60	28
	2008	90	50	24	97	58	29
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
	2007	42	22	8	43	24	11
	2008	41	21	8	44	23	9
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
	2007	39	19	6	39	21	8
	2008	36	19	7	38	20	8
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
	2007	48	24	9	48	28	13
	2008	43	21	7	46	24	10

N/A - Data are not available

Accomplishments and Special Projects

Introduction

This section summarizes some of Arizona Department of Environmental Quality's (ADEQ) accomplishments and special projects during 2008 and 2009.

ADEQ is responsible for preparing and submitting documents to Environmental Protection Agency (EPA) which identify nonattainment areas, describe activities that will help the areas reach attainment, and document attainment status (see Nonattainment and Attainment Areas map in Appendix 4). The ADEQ Air Quality Division Planning Section is responsible for these activities, and some of their accomplishments during this period are described in this section.

Figure 7 – ADEQ's Phoenix JLG Supersite

In addition to ADEQ's statewide regulatory ambient air monitoring program, the ADEQ Air Quality Division Assessment Section conducts special monitoring projects 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 (NAAQS) 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 Arizona's air quality.

Tucson PM_{10} Second Limited Maintenance Plan (LMP)

Clean Air Act Section (CAA) 175A requires two 10-year Limited Maintenance Plans (LMP) after a NAAQS is achieved. The second plan is due at the end of the eighth year of the initial maintenance period. Pima Association of Governments (PAG) developed its second 10-year LMP for ADEQ adoption. It was submitted to EPA on July 10, 2008, and a supplement was submitted to EPA on June 22, 2009. The EPA Region 9 Acting Administrator signed a Notice of Proposed rulemaking to approve the LMP on October 14, 2009. A 30-day comment period will open in November 2009.

Miami PM_{10} Planning Area Limited Maintenance Plan (LMP) and Pending Redesignation

In 1987, EPA designated the combined Hayden/Miami area as a single Group I PM_{10} nonattainment area. Effective May 29, 2007, EPA finalized a boundary redesignation to divide the single Hayden/Miami PM_{10} nonattainment area into two separate PM_{10} nonattainment areas roughly along the ridgeline of the Pinal Mountains [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 operated by Freeport McMoRan Copper and Gold, Inc. (FMMI) (formerly Phelps Dodge Corporation). Monitoring data collected at these monitors has been certified by ADEQ as meeting EPA's quality assurance requirements and entered into the EPA Air Quality System (AQS) from 2003 to present. FMMI also made a written commitment to submit its Miami monitoring data 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 (RFP) requirements, an attainment demonstration, and nonattainment area contingency measures are not required.

The ADEQ Air Quality Division developed a 10-year LMP and submitted it to EPA with a Redesignation Request in June 2008. Meanwhile, an exceedance related to an exceptional event was identified, flagged, and documented. EPA's concurrence with the exceptional event and approval of redesignation are pending.

Five Percent Annual Reasonable Further Progress for Metropolitan Phoenix [Maricopa County-Apache Junction, Pinal County] Serious PM_{10} Nonattainment Area Plan Revision

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 (BACM) and Most Stringent Measures (MSM). Although the control measures address exceedances that occurred in the 32-square-mile Salt River sub-area of the Maricopa Serious PM_{10} Nonattainment Area, they apply to the entire Nonattainment Area. EPA did not approve the submitted attainment demonstration, however, because of continued PM_{10} exceedances.

In response to EPA's Finding of Failure to Attain the PM_{10} standard by December 31, 2006, for Metropolitan Phoenix, including Township 1 North, Range 8 East (including Apache Junction) in Pinal County [June 6, 2007; 72 FR 31183], ADEQ submitted a State Implementation Plan (SIP) Revision to EPA in December 2007. Supplemental information was submitted on June 4, 2008; January 21, 2009; and June 12, 2009. Maricopa County is historically the second serious PM_{10} nonattainment area in the nation subject to the five percent annual RFP requirement until attainment is achieved.

San Joaquin Valley was the first and has since been redesignated to attainment status by EPA; 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.

CAA Section 189(d) required submittal of a SIP revision to EPA by December 31, 2007, demonstrating attainment by a minimum of five percent annual reductions of the emission inventory in PM_{10} or PM_{10} precursor emissions until attainment is achieved. Control strategies and reporting requirements were developed by stakeholders through the Maricopa Association of Governments (MAG) committee process and the 2007 Arizona legislative session culminating in adoption of Senate Bill 1552 (Laws 2007, Chapter 292). Stakeholders included Pinal County, as one of its townships is in the planning area. ADEQ worked with MAG and Maricopa County Air Quality Department (MCAQD) to finalize the base case emissions inventory with improved Windblown Dust and Agricultural source category emissions estimates. ADEQ also 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. The submitted SIP revision demonstrates attainment for the years 2008 to 2010.

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 hospitality industry chimineas; 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.

Other important control strategies include: public education; 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 (HPA) are other important control strategies. ADEQ developed the following outreach materials and has posted them on the ADEQ web site: Fact Sheet about the New Off-Highway Vehicle Law, Map of Off-Highway Vehicle Areas with Restrictions, Training for Leaf Blower Operators, Pointers for Operating a Leaf Blower in English and Spanish, and Leaf Blower Frequently Asked Questions.

Tracking implementation of the control measures on standardized forms developed by MAG is the continuing responsibility of ADEQ and the other stakeholders to ensure attainment by the end of 2010. Implementation Reports for calendar year 2008 implementation were submitted to MAG by ADEQ, Maricopa County, and each municipality that made SIP commitments. Reports for calendar year 2009 will be submitted to MAG in 2010. Reports on control measure implementation and enforcement activities were submitted to the Joint Legislative Budget Committee by

jurisdictions pursuant to requirements in SB1552 on June 1 and December 1 in 2008 and 2009.

ADEQ continues to work with Maricopa and Pinal Counties to identify and document Exceptional Events for exemption from determinations of attainment status, pursuant to EPA's Exceptional Events Rule and ADEQ's policies. EPA has not acted on documentation submitted for 2008, delaying EPA action on the five percent plan.

Rillito PM_{10} Planning Area Limited Maintenance Plan and Pending Redesignation

The Rillito Group I Area was designated and classified as a moderate PM_{10} nonattainment area upon enactment of the 1990 CAA amendments, effective November 15, 1990. ADEQ submitted a moderate area PM_{10} plan for the Rillito area on November 14, 1991, which EPA found to be incomplete. On April 22, 1994, ADEQ submitted a revised PM_{10} plan for Rillito. Also EPA found the revised plan to be incomplete and did not take any further action on it. Effective October 10, 2006, EPA published a Clean Data Finding for the 1992 to 1994 data period and subsequent years [August 8, 2006; 71 FR 44920]. ADEQ developed a 10-year LMP and Redesignation Request and submitted it to EPA in June 2008, after a stakeholder meeting in the planning area. To qualify for the LMP option, an area should be attaining the NAAQS and the average PM_{10} design value (DV) for the area, based upon the most recent five years of air quality data at monitors in the area, should be less than 98 $\mu g/m^3$ for the 24-hour PM_{10} standard. If the area cannot meet this test, EPA offers another option to qualify for an LMP. To meet this qualification, the average DV of the site must be less than the area's site specific Critical Design Value (CDV). When that calculation was performed, this area's average DV (119 $\mu g/m^3$) was less than the CDV (142 $\mu g/m^3$), indicating that this area has a very low probability of exceeding the NAAQS in the future and qualified for the LMP option. Meanwhile an exceedance related to an exceptional event was identified, flagged, and documented. EPA's concurrence with the exceptional event and approval of redesignation are pending. Upon approval, ADEQ must annually demonstrate continued eligibility for the LMP option for this planning area.

Yuma PM_{10} Maintenance Plan, Pending Redesignation Request, and Exceptional Events Demonstrations

Yuma was designated nonattainment for PM_{10} in 1990. ADEQ developed a 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, ADEQ convened stakeholders to prepare an attainment demonstration and maintenance plan. EPA made a Clean Data Finding for 1998 to 2001 and subsequent years for Yuma on March 14, 2006 [71 FR 13021] that became effective May 16, 2006. As a result ADEQ was not required to meet RFP requirements, produce an attainment demonstration, or implement nonattainment contingency measures. ADEQ continued to work with the stakeholder group and submitted the Redesignation Request and 10-year Maintenance Plan to EPA on August 16, 2006. BACM for all significant sources of PM_{10} contributing to the PM_{10} concentrations in Yuma County included: 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. In addition, public education and outreach campaign was developed involving bilingual brochures, a public service announcement, and a video for the general public. Dust Control Action Forecasts are provided three days in advance by ADEQ to sources including: construction contractors, public works, and agricultural sources, notified by the Arizona Department of Agriculture (ADOA), to enable them to reschedule activities that would disturb soils or to add control measures.

Additional analyses were prepared by ADEQ to quantify the emission reductions from the implementation of AgBMP, which began in Yuma on August 1, 2005. This work was accomplished with the help of Yuma farmers, conservation agents, and ADOA personnel. In 2007, ADEQ adopted the Yuma AgBMP rule as a supplemental contingency measure in the Maintenance Plan to meet the requirements of CAA Section 175A(d).

EPA promulgated an Exceptional Events Rule to replace its Exceptional Events Policy and its Natural Events Policy. In 2007, EPA noted that 12 exceedances of the 24-hour PM_{10} standard had occurred at the BAM SPM in Yuma. Since the SPM had been in operation since November 2004, more than 24 months, EPA could consider its ambient monitoring data in its determinations of attainment of the NAAQS pursuant to EPA's latest monitoring rules [October 17, 2006. 71 FR 61302 revising Title 40 CFR § 58.20(c)]. ADEQ evaluated each of these 12 exceedances for data flagging pursuant to EPA's Exceptional Events Rule. ADEQ determined that all 12 events qualify for exception, scheduled a Natural Events Stakeholder meeting in Yuma on November 13, 2007, a 30-day public comment period beginning August 11, 2008, and submitted the documentation to EPA in September 2008. Upon concurrence, EPA would be able to complete the redesignation process; however, the 2008 demonstrations are currently part of a review backlog and EPA may require an update to the emissions inventory along with other technical revisions before acting on the submitted plan.

Nogales 2006 $PM_{2.5}$ NAAQS Designation

The Governor submitted $PM_{2.5}$ designation and boundary recommendations based on 2005-2007 monitoring data. The EPA Administrator signed the Notice of Final Rulemaking on October 8, 2009, for publication in the Federal Register. The clock will start ticking for development and submittal of a nonattainment area plan on the date of publication.

Pinal County 2006 $PM_{2.5}$ 24-Hour NAAQS Deferred Designation

EPA's Region 9 Acting Director sent a letter to Governor Brewer dated October 14, 2009, explaining that because 2006-2008 monitoring data show the Cowtown Road site monitor appears to violate the 2006 $PM_{2.5}$ NAAQS, the Governor and EPA need to review the initial recommendations for nonattainment areas. Analysis of nine factors

would be completed to inform the recommendation. Designation of this area is deferred so that EPA can collect and evaluate additional information, including relevant technical data for the ring of counties immediately surrounding Pinal County.

Pinal County 1997 $PM_{2.5}$ Annual NAAQS Nonattainment Designation

EPA's Region 9 Acting Director sent a letter to Governor Brewer dated October 14, 2009, explaining that 2006-2008 monitoring data show that Pinal County is violating the 1997 $PM_{2.5}$ NAAQS. EPA requested the Governor's recommendations for redesignation and planning area boundaries, including any nearby areas that may be contributing to violations in Pinal County, by February 14, 2010. Analysis of nine factors will be completed to inform the recommendation.

Pinal County 1997 PM_{10} 24-Hour NAAQS Nonattainment Designation

EPA's Region 9 Acting Director sent a letter to Governor Brewer dated October 14, 2009, explaining that 2006-2008 monitoring data show that Pinal County is violating the 1997 PM_{10} NAAQS. EPA requested the Governor's recommendations for redesignation and planning area boundaries, including any nearby areas that may be contributing to violations in Pinal County by February 14, 2010. Analysis of nine factors will be completed to inform the recommendation.

Maricopa County 1997 Eight-Hour O_3 NAAQS (0.08ppm) Nonattainment Area Plan and Maintenance Area Plan

MAG developed a plan that included Township 1 North, Range 8 East (including Apache Junction) in Pinal County and submitted it to ADEQ on June 12, 2007. ADEQ adopted and submitted it to EPA on June 14, 2007, with the understanding that it may 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). Quality assured monitoring data for 2005 to 2007 recorded no violations, demonstrating attainment of the ozone (O_3) NAAQS. MAG developed a Maintenance Plan and Redesignation Request through its committee process for adoption by ADEQ and submittal to EPA on March 24, 2009. EPA approval is pending.

Ajo PM_{10} Clean Data Finding, Maintenance Plan, and Redesignation Request

EPA made a Clean Data Finding for 2002 to 2004 for Ajo on February 8, 2006 [71 FR 6352] that became effective April 10, 2006. This finding eliminates otherwise applicable requirements for a RFP, an attainment demonstration, and nonattainment contingency measures. ADEQ has completed an emissions inventory and rollback modeling demonstration of continued attainment for the next 12 years. ADEQ will complete development of the Maintenance Plan for submittal to EPA with a Redesignation Request in 2009. Currently, the percentage contributions of emissions from mobile sources are being confirmed. If the percentage contribution of mobile

source emissions are high enough to warrant transportation conformity analysis, PAG would be called in to assist in developing a mobile sources budget before the plan can be released for public comment some time in 2010.

South Phoenix Health and Particulate Matter Study (SPHPMS)

The South Phoenix Health and Particulate Matter Study (SPHPMS)was a short-term special project to assess the impacts of particulate matter in the air and soil in the South Phoenix area. The area has mixed industrial and residential land use and has been the subject of some controversy relating to public health and to possible elevated levels of air pollution. Several entities were involved in the study: ADEQ Air Quality Division Air Assessment Section, Arizona State University (ASU), Maricopa County Health Department (MCHD), and the City of Phoenix's lead abatement group. Air quality measurements and soil samples were collected during a three month period (December 2008 through February 2009). The information gained from these measurements and samples help to answer the following questions:

Figure 8 – South Phoenix West Monitoring Site

1. What contributions do transportation and stationary sources make to local emission levels of particulate matter, including those with toxic components?
2. What are the local concentrations of lead (Pb) and other toxic metals that threaten childhood health?
3. What are the local concentrations of elemental carbon and organic carbon (primarily soot from diesel vehicles)?

The area of the study comprises about two square miles and a population of about 9,000. The area is bounded by Roeser Road on the south, 32nd Street and I-10 on the east, the Salt River on the north, and 16th Street on the west. Elevated Pb levels in the blood of children in this area and increased Pb poisoning have been found.[1] Dust and soil are significant outdoor contributors to Pb exposure. In addition, asthma rates in children within this area are among the highest in metropolitan Phoenix.[2] The fine particles in diesel exhaust are one of the principle asthma triggers in our air. In addition to air and soil sampling, health screenings of children and adults will be conducted with appropriate referrals and treatment. All the issues associated with outreach and diagnosis, referral, and treatment of patients will be handled by other agencies and partners on this project.

[1] Arizona's Childhood Lead Poisoning Targeted Screening Plan, ADHS, March 20, 2007
[2] Arizona Comprehensive Asthma Control Plan , ADHS, Nov. 8, 2005

The study area is located adjacent to freeways, major arterials, the airport, and numerous industrial operations which produce particulate emissions, including a high density of diesel exhaust. The area is subject to fugitive dust from industrial sources, paved roads, unpaved parking lots and alleys, and vacant lots. In addition, the area is adjacent to the Salt River, a predominately dry river, and lies at a lower elevation than the rest of the urban area. Particulate emissions occurring to the east, northeast, and southeast are transported by wind into this south-central area during the night, early morning, and mid-morning hours.

Furthermore, the study area was subject to two major industrial fires: the Quality Printed Circuits and the Central Garden and Supply fires (1992 and 2000, respectively). These fires produced toxic smoke and residual particulates that may remain in the topmost layer of the soil. These particulates may be associated with childhood respiratory ailments and an increase in frequency and severity of skin rashes, headaches, and blurred vision reported throughout this population.

Results of the study will be peer reviewed and released late in 2009 or early 2010.

Western Arizona/Sonora Border Air Quality Study (WASBAQS)

The purpose of this special study was to determine the sources and movement of air pollutants, as well as to 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, identified six phases to the study: identifying study requirements and collecting meteorological data; siting study for pollutant monitor locations; monitor deployment; data collection; air quality modeling; and health risk assessment. The monitoring data collection phase of the project was completed in April 2007. Meteorological data from seven sites and air quality data from three sites were collected. Data quality assurance procedures on all of the meteorological, gases, particulate matter, and four types of chemical data were completed in December 2008. An emissions inventory has been compiled and will be used in the air quality modeling and health risk assessment phases of the study.

Figure 9 – Mexico Supersite, Western Arizona/Sonora Border Air Quality Study

Regional Haze

Regional haze is caused by the emissions of air pollutants from a wide variety of sources located over a large geographic area. The haze obscures scenic vistas, which degrades our parks and wilderness areas and interferes with people's enjoyment and recreation in those areas. In 1977, the federal CAA set a goal to remedy any existing visibility impairment and prevent any future impairment from man-made pollution at 158 national parks and wilderness areas known as mandatory Federal Class I areas. The Regional Haze SIP submitted to EPA in December 2003, focused on four of the 12

national parks and wilderness areas in Arizona: Grand Canyon National Park, Petrified Forest National Park, Sycamore Canyon Wilderness, and Mount Baldy Wilderness. The 2003 Regional Haze SIP relied on a demonstration of how the state is implementing the recommendations of the Grand Canyon Visibility Transport Commission to satisfy reasonable progress toward the national visibility goal. Best Available Retrofit Technology (BART) determinations as well as other possible controls under consideration as long-term strategies for large stationary sources are still under analysis throughout the country. Therefore, the remaining eight Class I areas will be addressed in a SIP to be submitted to EPA by late 2009 or early 2010. Revisions to the Sulfur Dioxide (SO_2) Backstop Market Trading Program for stationary sources along with other updates to the 2003 SIP will be sent to EPA by the end of December 2009 or early January 2010. Western states developing SIPs under sections 309(g) and 308 of the Federal Regional Haze Rule will have assistance with the assessment and strategies portions of the SIP from the Western Regional Air Partnership (WRAP).

ADEQ has an expanded role regarding regional haze. Extensive fire regulations and policy were developed for the 2003 Regional Haze SIP and the now-certified Enhanced Smoke Management Plan will continue to be an important part of regional haze. ADEQ could be called on to perform emissions tracking and modeling necessary to determine specific conditions "in and near" Arizona Class I areas beyond what WRAP will provide. Through annually tracked emissions and permit requirements Arizona will continue to implement the SO_2 Milestones and Backstop Trading Program - a voluntary program for stationary sources emitting 100 tons or more per year of SO_2. Beginning in 2004 the annual SO_2 emissions for the stationary sources are reported to WRAP. Emissions are compiled into a regional Milestone Report for the participating western states and sent to EPA annually. Should a milestone, representing markers on a decreasing regional emissions cap be exceeded, the backstop trading program would be activated. Currently strategies for tracing NO_x emissions are more conventional than trading. Additional information on regional haze can be found at http://www.wrapair.org/SIPStatus/309/

EPA's Revisions to Eight-Hour O_3 Standard

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 O_3 standards was completed on July 18, 1997, at which time the eight-hour standard was set at the level of 0.08 parts per million (ppm). The average of the most recent three-year fourth-highest measurements was compared to 0.084 ppm to determine compliance with the standard. The secondary standard was set identical to the primary standard.

On March 12, 2008, EPA revised the eight-hour primary standard (for protection of public health) to 0.075 ppm. The secondary standard (for protection of public welfare) was made identical to the revised primary standard, 0.075 ppm, instead of the proposed new secondary standard (based on the W-126 O_3 exposure index). EPA selected the levels for the final standards after completing an extensive review of thousands of scientific studies on the impact of ground level O_3 on public health and the

environment. This newly available evidence identifies important new health endpoints associated with O_3 exposure, including mortality, increased asthma medication use, school absenteeism, and cardiac-related effects. Furthermore, studies of asthmatics indicate that they experience larger and more serious responses to O_3 that last longer than responses for healthy individuals. In addition, new scientific evidence since the last review of the O_3 NAAQS continues to show that repeated exposure to O_3 damages sensitive vegetation and trees, including those in forests and parks, leading to reduced growth and productivity, increased susceptibility to disease and pests, and damaged foliage.

States made recommendations to EPA by March 12, 2009, for areas to be designated attainment, nonattainment, and unclassifiable. ADEQ recommended an expanded Metropolitan Phoenix nonattainment area that added areas in Maricopa County to the west and southwest of the boundaries that now include power plants and extended the Pinal County portion to include an additional violating monitor. EPA is expected to issue final designations of attainment, nonattainment, and unclassifiable areas no later than March 12, 2010, unless there is insufficient information to make these designation decisions. In that case, EPA will to issue designations no later than March 12, 2011.

The Clean Air Act Scientific Advisory Committee (CASAC) had recommended a range of 0.060 to 0.070 ppm for the new primary standard and the W-126 secondary standard to Administrator Steven Johnson. New EPA Administrator Lisa Jackson announced a decision to reconsider the O_3 NAAQS rulemaking record, committing to a schedule of signing a Notice of Proposed Rulemaking (NPRM) in December 2009 and a Notice of Final Rulemaking (NFRM) in August 2010. EPA committed to a Notice of Proposed Rulemaking for the related Implementation Strategy in early 2010 and a Notice of Final Rulemaking for the strategy by the end of 2010. If the secondary NAAQS is the W-126 standard, it would offer further protection to ponderosa pine trees that are sensitive to O_3. States must submit a SIP outlining how they will reduce pollution to meet the standards by a date that EPA will establish in its promulgated designations. That date will be no later than three years after EPA's final designations.

The Governor will be required to submit revised designation and boundary recommendations, and if the revised NAAQS is more stringent than 0.075 ppm, additional monitors in additional planning areas may be in violation. Designations are expected to be promulgated in August 2011, and the nonattainment area plans would be due no later than December 2013. Related SIP revisions demonstrating that ADEQ has the "infrastructure" to carry out its responsibilities under the new NAAQS would be due in August 2013. States are required to meet the standards by deadlines that may vary based on the severity of the problem in the area; moderate areas would be required to attain the NAAQS by August 2017. EPA will issue a separate rule to address monitoring requirements necessary to implement the new standards. EPA proposed an O_3 monitoring network rule on July 16, 2009 [74 FR 34525] and plans to issue a final rule before the commencement of the 2011 O_3 monitoring season. ADEQ submitted comments on the NPRM through WESTAR.

EPA's Revisions to Lead (Pb) Standard

On October 15, 2008, EPA substantially strengthened the NAAQS for Pb. The revised standards are 10 percent of the previous standards and will improve health protection for at-risk groups, especially children. EPA has revised the level of the primary (health-based) standard from 1.5 $\mu g/m^3$, to 0.15 $\mu g/m^3$, measured as total suspended particles (TSP). EPA has revised the secondary (welfare-based) standard to be identical in all respects to the primary standard.

Scientific evidence about Pb and health has expanded dramatically since EPA issued the initial standard of 1.5 $\mu g/m^3$ in 1978. More than 6,000 new studies on Pb health effects, environmental effects, and Pb in the air have been published since 1990. Evidence from health studies shows that adverse effects occur at much lower levels of Pb in blood than previously believed. Children are particularly vulnerable to the effects of Pb. Exposures to low levels of Pb early in life have been linked to effects on IQ, learning, memory, and behavior. There is no known safe level of Pb in the body.

EPA has revised the averaging time and form of the Pb NAAQS. These are the air quality statistics that are compared to the level of the standards to determine whether an area meets or violates the standards. EPA changed the calculation method for the averaging time to use to a "rolling" three-month period with a maximum (not-to-be-exceeded) form, evaluated over a three-year period. This replaces the current approach of using calendar quarters. A rolling three-month average considers each of the 12 three-month periods associated with a given year, not just the four calendar quarters within that year.

EPA is redesigning the Pb monitoring network to assess compliance with the revised Pb standards. EPA will require state and local monitoring agencies to conduct monitoring taking into account Pb sources that are expected to, or have been shown to, exceed the standards such as general aviation airports. At a minimum, monitors must be placed in areas with sources of Pb emissions greater than or equal to one ton or more per year, to measure the maximum concentration. New EPA Administrator Lisa Jackson has announced a decision to reconsider the threshold for source monitoring, which had been proposed at 0.5 ton or more per year.

EPA also will require a monitor to be operated in each of the 101 urban areas with populations greater than 500,000 to gather information on the general population's exposure to Pb in air and ensure protection against sources of airborne dust containing Pb. EPA estimates that 236 new or relocated monitoring sites will be necessary nation-wide to satisfy these monitoring requirements. Approximately half of all newly required monitors are to be operational by January 1, 2010, with the other half of the monitors operational by January 1, 2011. Currently, no monitors in Arizona are designated for Pb data collection. The new NAAQS requires the use of high volume TSP monitors near sources, and low volume PM_{10} monitors in urban areas with populations greater than 500,000. TSP samplers capture particles with diameters greater than 10 microns and up to 40-50 microns. Unlike other Federal Reference Method (FRM) samplers, EPA has

not issued specific approvals for individual manufacturer versions of TSP samplers. Agencies must conduct their own assessments of TSP monitors to determine if the requirements described in the Code of Federal Regulations (CFR) are met. The new NAAQS also specifies an analysis method for the TSP filters that has allowed method detection limit. Agencies will need to determine if the laboratories they will use can meet this limit and may also need to submit an application for approval of the analysis method to EPA.

Governors are required to make recommendations for areas, including boundary recommendations, to be designated attainment, nonattainment, or unclassifiable by October 15, 2009. Arizona's recommendation is that the entire state be designated unclassifiable, with the exception of a Hayden Pb nonattainment area coincidental with the Hayden SO_2 nonattainment area boundary. If tribes choose to submit recommendations, they must also provide them to EPA by October 15, 2009. Final designations of all attainment, nonattainment, and unclassifiable areas will be effective no later than November 2010 for areas with existing monitoring networks and November 2011 for areas that require new monitors. EPA intends to complete initial designations as soon as possible, however, where data are sufficient from existing monitoring network. Pb "infrastructure" SIPs would be due in October 2011. States are required to submit a SIP outlining how they will reduce pollution to meet the standards no later than June 2012 or 2013, depending on the designation date. States are required to meet the standards no later than January 2015 or 2016, again depending on the designation date.

Nitrogen Dioxides (NO_2) NAAQS 2010 Revision

The current standard for nitrogen dioxide (NO_2) is an annual average of 0.053 ppm. On July 15, 2009 [74 FR 34404] EPA proposed retaining the current annual standard and supplementing it with a new short-term NO_2 standard based on the three-year average of the 99^{th} percentile (or 4^{th} highest) of one-hour daily maximum concentrations. CASAC concurs that the current standard does not protect against short-term exposure. CASAC firmly recommends that the upper end of the range not exceed 0.1 ppm. The level of the standard is proposed to be set within the range of 0.08 ppm to 0.1 ppm, but EPA solicited comments on a range from 0.065 ppm to 0.15 ppm. EPA has also proposed to establish a new near-roadway NO_2 monitoring network that would include monitors within 50 meters of major roadways. EPA has also proposed an alternative maximum area-wide NO_2 exposure concentration, to be measured away from roadways, in a range of 0.05 ppm to 0.075 ppm. A Consent Decree requires signature of a Notice of Final Rulemaking by January 22, 2010.

Important new epidemiologic studies have been considered that support a causal relationship between short-term NO_2 exposure and adverse effects on the respiratory system. About 400 NO_2 monitors report data to EPA's AQS. Since no NO_2 nonattainment areas existed in 2006 based on the existing NO_2 NAAQS, in its Consolidated Emission Reporting Rule revisions in 2006 [71 FR 61236] EPA removed specific minimum monitoring requirements of two monitoring sites per area with a

population of one million or more. Many studies show that indoor, personal and outdoor exposure to NO_2 is strongly associated with proximity to traffic or to traffic density. EPA plans to site monitors to measure peak roadway associated emissions. This exposure occurs while driving and to nearby residents. EPA has proposed allowing only FRM or Federal Equivalent Method (FEM) monitors capable of providing hourly averaged concentration data. EPA has proposed a two-tier monitoring network: neighborhood concentrations scale and peak concentrations scale (near roadway). New monitors would be physically established between July 1, 2011 and January 1, 2013.

Core Based Statistical Area (CBSA) population thresholds and annual average daily traffic (AADT) is important for siting near-roadway monitors. Two near-roadway monitors are proposed for CBSAs with a population at or greater than 2.5 million, such as metropolitan Phoenix, or with one or more road segments with AADT at or greater than 250,000. One near-roadway NO_2 monitor would be required in CBSAs with a population at or greater than 350,000. Neighborhood NO_2 monitors would be required for CBSAs with populations at or greater than one million.

ADEQ has begun reviewing information to determine the number of additional monitors that would be required and possible sites. The cost of each monitor is estimated at $107,900 and does not include data collection, maintenance costs, and site costs. Near roadway monitors present safety issues. The Governor would be required to submit recommended designations and boundaries in January 2011. An “infrastructure” SIP Revision would be due in January 2013, and a nonattainment area SIP would be due in August 2015. One option for near-roadway emissions would be a revised federal fuel standard.

Trends

Introduction

This section examines the degree to which air quality in Arizona's cities and counties has been improving or deteriorating during the years that data have been collected, quality assured, and recorded. Compliance with EPA's National Ambient Air Quality Standards (NAAQS) is a separate, though related, issue which was explored at length in a separate section of this report.

Figure 10 – Average Best & Average Worst Visibility Impairment in the Phoenix Area

The trends section is composed of information regarding carbon monoxide (CO), ozone (O_3), particulates (PM_{10} and $PM_{2.5}$), and visibility. Other criteria pollutants including nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb), are not included in the trends sections due to low concentrations. NO_2 and SO_2 are discussed in the data and compliance section of this report. Pb has been reduced to near background levels and is no longer of greatest concern for the trends section.

When examining trends in various pollutants throughout the state of Arizona, it is not only important to consider monitoring sites that contain a long monitoring record, but also those sites that contain a relatively complete dataset throughout their monitoring history. Combining the records of multiple sites within one geographic location could produce spurious trends over time. Only trends based on the same group of sites will prevent monitoring network changes from influencing the results. For the purpose of this section, certain criteria were used to determine whether a site is considered a 'trend' site. Generally speaking, a site was deemed a 'trend' site if the site contained a long history of monitoring data and those data contained high data completeness throughout the monitoring period. Because of the differences in the monitoring history of the various criteria pollutants, exact 'trend' site criteria may differ based on the pollutant being examined. These pollutant specific criteria used to assess trends are described in further detail in each pollutant's respective section.

Carbon Monoxide

Monitoring of CO throughout the state of Arizona contains the longest history of all the criteria pollutants. Most of this long-term monitoring was located in the highly urbanized areas of Phoenix and Tucson and several of these CO sites contain monitoring records dating back to the 1970s. Some of these monitoring sites are still in place today, which has resulted in a long record of CO data. For the examination of CO trends throughout Arizona, the period of record will include the years 1980 through 2008. Only monitoring sites that have met EPA's data completeness criteria for each year during this period of record were used to assess trends in CO. In the Phoenix metropolitan area, these sites include Central Phoenix, Glendale, Mesa, North Phoenix, South Phoenix, and West Indian School. In the Tucson metro area, these sites include Tucson Downtown, 22nd & Craycroft, and 22nd & Alvernon.

Among the criteria pollutants, improvements in CO concentrations have been the most dramatic. Figures 11 and 12 show a rather impressive decreasing trend in both Tucson and Phoenix. These trends are most prominent in the maximum value, an indication that localized areas with the worst CO problems (West Indian School in Phoenix and 22nd & Alvernon in Tucson) have rightfully received the greatest attention. Meanwhile, average CO concentrations in both Phoenix and Tucson have decreased by approximately 85 percent over the 29-year period. Most of the improvements in both cities 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. CO concentrations are so low now that both Phoenix and Tucson will soon start trace-level monitoring of CO as part of EPA's National Core (NCore) Multi-pollutant Monitoring Station program.

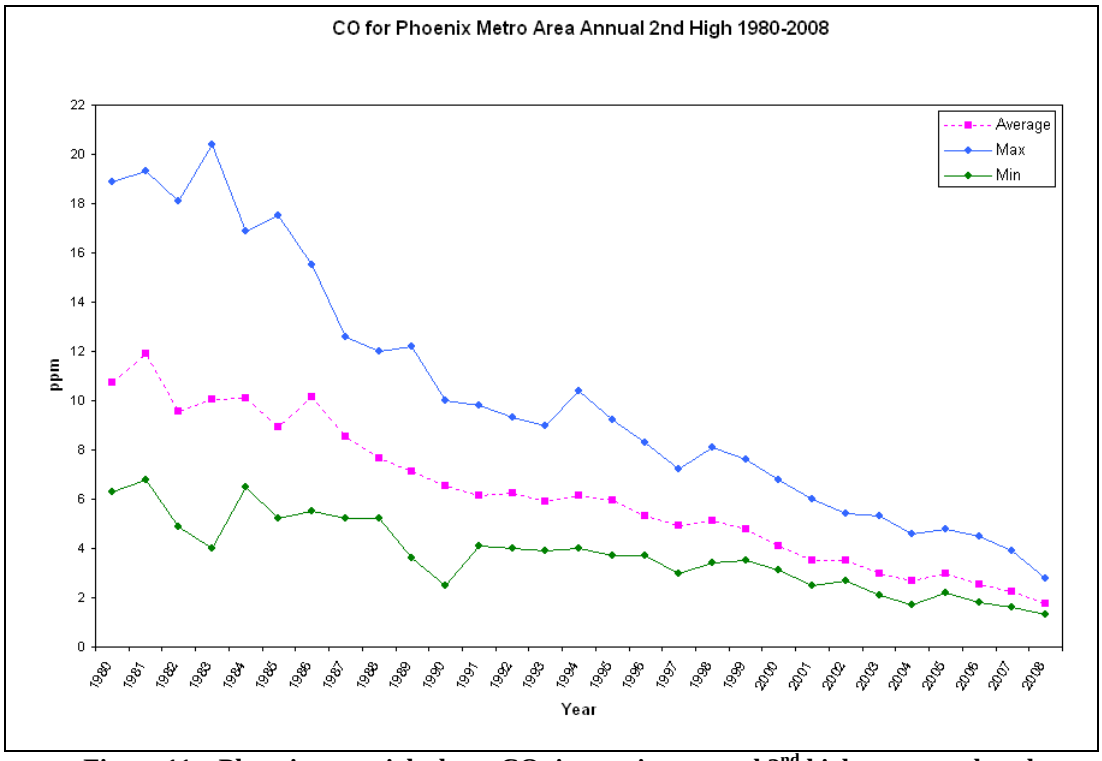


Figure 11 – Phoenix area eight-hour CO time series: annual 2nd high, expressed as the average, maximum, and minimum of six long-term sites

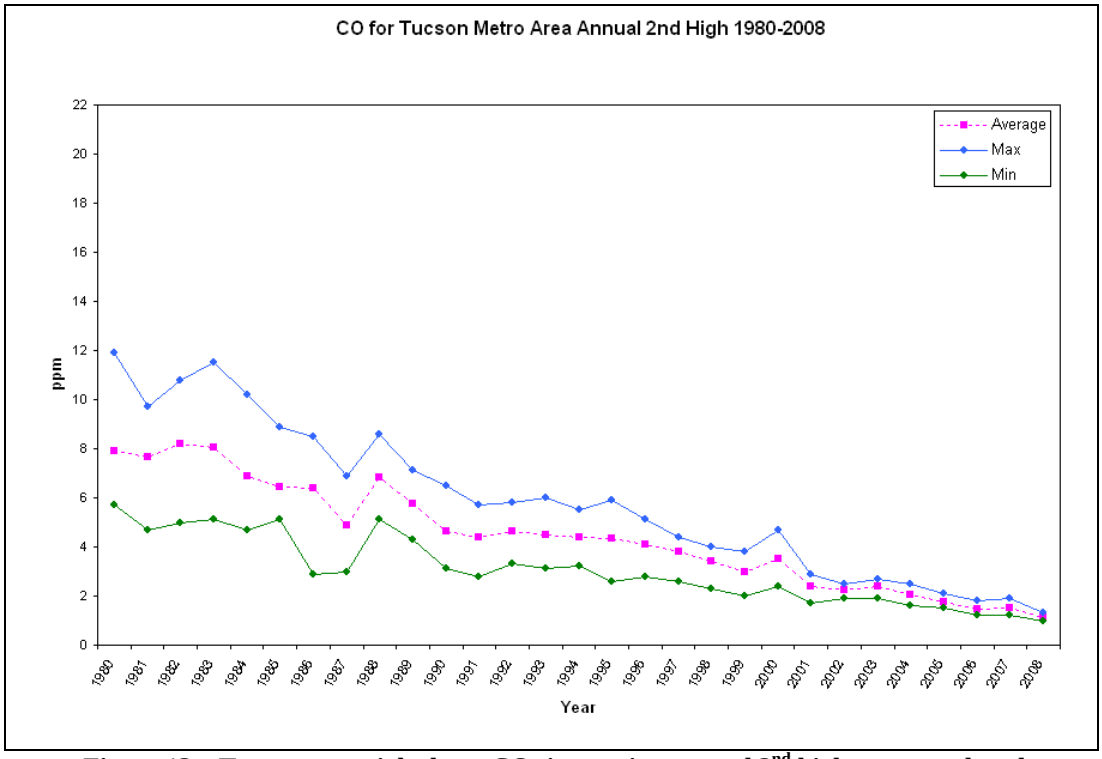


Figure 12 – Tucson area eight-hour CO time series: annual 2nd high, expressed as the average, maximum, and minimum of three long-term sites

Ozone

While O_3 monitoring throughout the state occurred at as many as 10 sites in the late 1970s, the number of sites with complete datasets at that time was as little as one (1975) and two (1977 and 1979). It was not until around 1990 that the number of sites meeting EPA's data completeness criteria approached 20 in the state of Arizona. For the examination of O_3 trends throughout Arizona, the period of record will include the years 1990 through 2008. Only those sites that met EPA's 75 percent quarterly data completeness criteria for the majority of this period were used as 'trend' sites. The statistic used to assess O_3 trends was the three-year average of the annual 4th high. In order to reduce the number of gaps in the time series, a three-year average was deemed valid if two valid annual 4th high values existed in the three-year time period. Using this method reduces the number of gaps in the time series as one missing annual 4th high value would otherwise result in the absence of three consecutive three-year averages.

Phoenix-
Six sites met the 'trend' site criteria for the Phoenix metropolitan area. These sites include Central Phoenix, Glendale, North Phoenix, Pinnacle Peak, South Scottsdale, and West Phoenix. Figure 13 illustrates the temporal variability of these long-term sites over the 1990 to 2008 period in the form of three-year averages of the annual 4th high. Along with the average of these six sites, the minimum and maximum values (of the three-year average of the annual 4th high) for each three-year period were also included to show any spatial variability that may exist across the Phoenix metro region. In general, the trend can be described as decreasing over the 1990 to 2008 period, with the majority of that decrease occurring from the mid to late 1990s to present. This trend is most prominent in the maximum value and the average, with the minimum value showing very little change over the 19-year period. When a best-fit linear trend is applied to the time series, the maximum value has decreased 0.005 parts per million (ppm) over the 19-year period; the average has decreased 0.003 ppm over the 19-year period, and the minimum value has virtually no change.

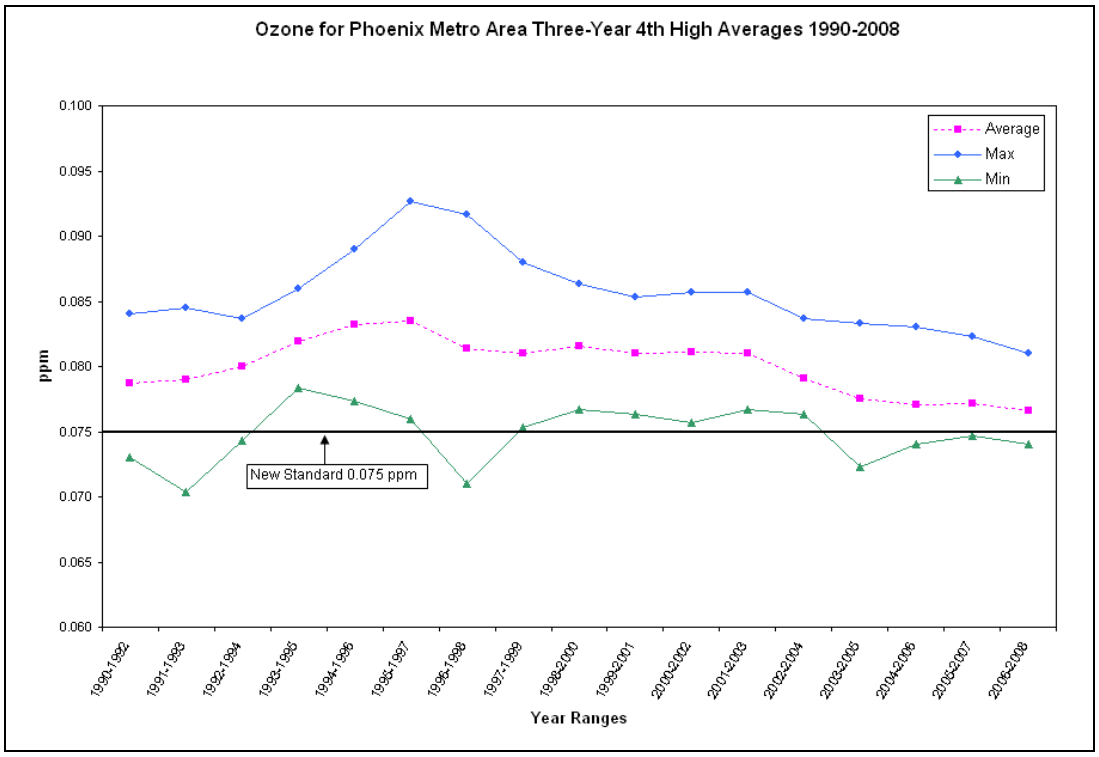


Figure 13 – Phoenix area eight-hour O_3 time series: three-year averages of the annual fourth-highest concentrations, expressed as the average, maximum, and minimum of six long-term sites

A shorter time period was examined to determine a more detailed depiction of the spatial variability within the Phoenix metropolitan area. Figure 14 shows regionally averaged O_3 concentrations for the period 2001 to 2008. This shorter time period allowed for the use of a greater number of O_3 monitors in calculating Phoenix metropolitan regional averages. The sites used for each region are included in Table 23.

Table 23: Sites used in the calculation of Phoenix Metropolitan regional averages

Northeast	Northwest	Southeast	Southwest
Cave Creek	Glendale	Falcon Field	Central Phoenix
Fountain Hills	JLG Supersite	Queen Valley	South Phoenix
Pinnacle Peak	North Phoenix	Tempe	
Rio Verde	West Phoenix	West Chandler	
South Scottsdale			

Figure 14 shows two important factors; (1) the recent decrease in O_3 concentrations has been generally consistent across all regions of the Phoenix metropolitan area and (2) an O_3 gradient is oriented on a southwest to northeast line across the area, with the northeast region having the highest O_3 concentrations. This pattern can most undoubtedly be explained by the diurnal wind pattern across the Phoenix metropolitan area as west/southwesterly, upslope flow during the afternoon transports O_3 and

potential precursors to the northeast. In relation to the O_3 NAAQS, it can be seen that the southwest region has recently fallen below the standard of 0.075 ppm; however, the other three regions remain above the standard.

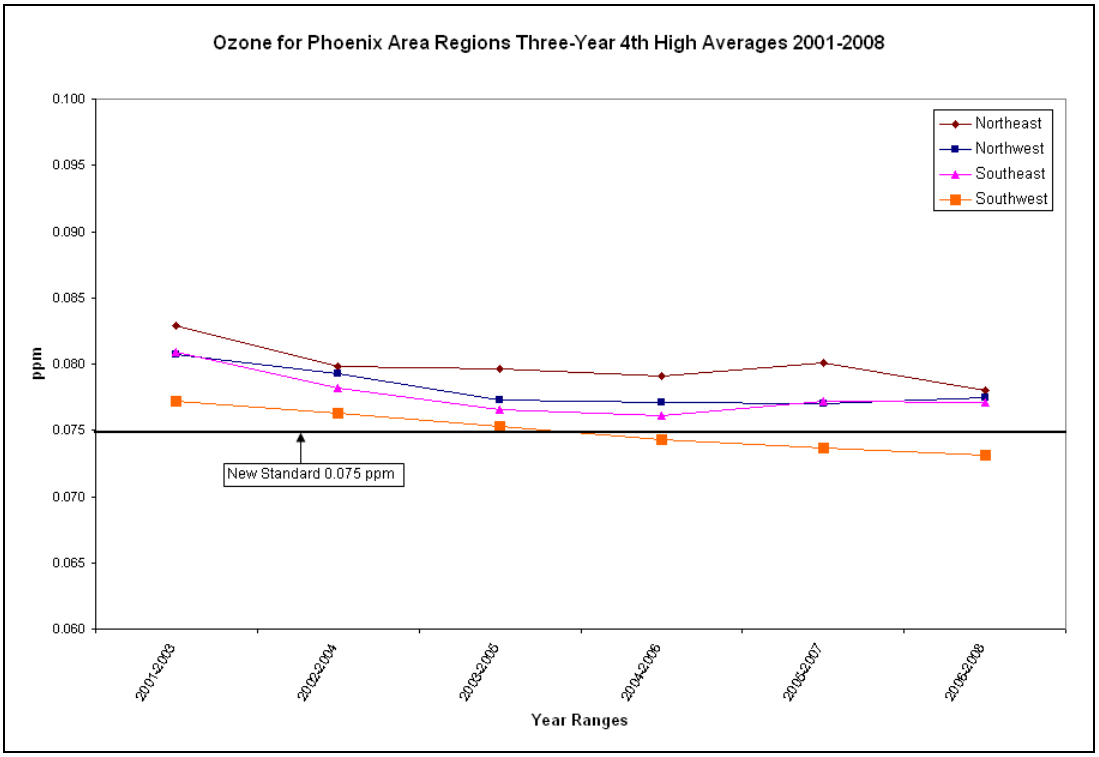


Figure 14 – Phoenix area eight-hour O_3 time series: three-year averages of the annual fourth-highest concentrations, expressed as spatial averages for four distinct regions

Tucson-

Five sites met the 'trend' site criteria for the Tucson metropolitan area. These sites include 22nd & Craycroft, Saguaro NP East, Tangerine, Tucson Downtown, and Tucson Fairgrounds. Figure 15 illustrates the temporal variability of these long-term sites over the 1990 to 2008 period in the form of three-year averages of the annual 4th high. Along with the average of these six sites, the minimum and maximum values (of the three-year average of the annual 4th high) for each three-year period were also included. In general, the trend can be described as decreasing over the 1990 to 2008 period, though the time series does contain some year to year variability. Trends are most prominent in the maximum value and the average, with the minimum value showing very little change over the 19-year period. When a best-fit linear trend is applied to the time series, the average and maximum value have both decreased 0.03 ppm over the 19-year period, while the minimum value has virtually no change.

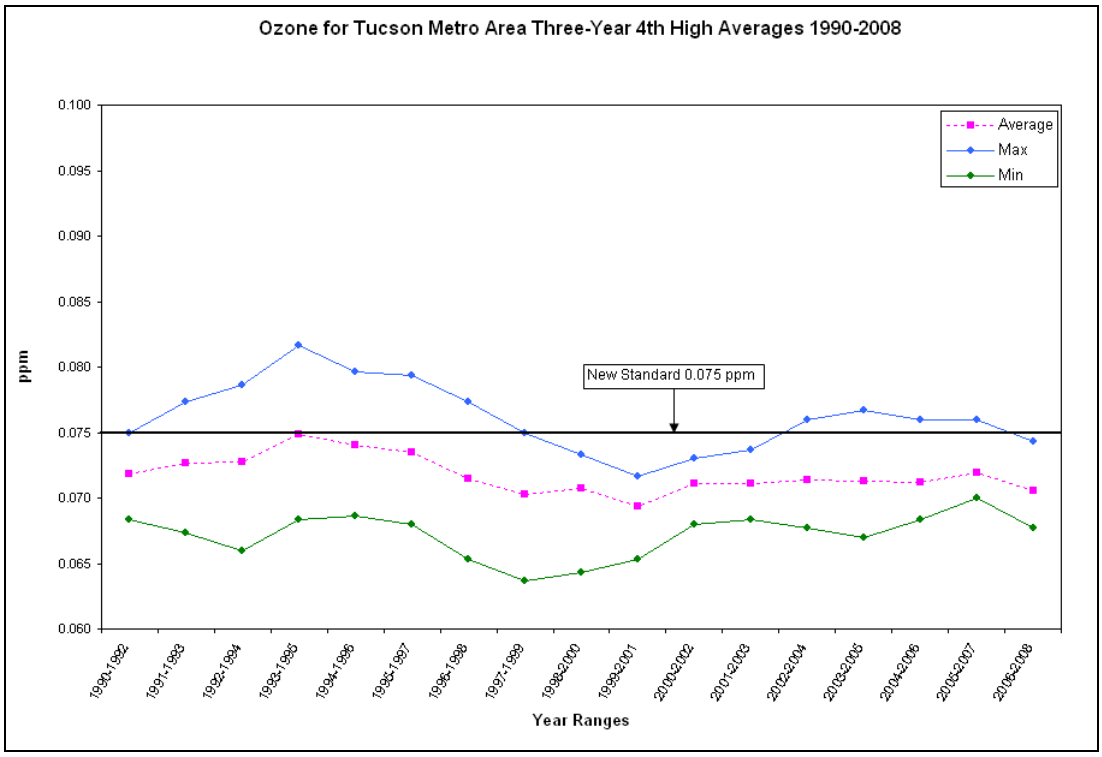


Figure 15 – Tucson area eight-hour O_3 time series: three-year averages of the annual fourth-highest concentrations, expressed as the average, maximum, and minimum of five long-term sites

Rural Sites-

Outside of the Phoenix and Tucson metropolitan areas, there were only two other O_3 sites that met the criteria for a 'trend' site. These two sites include: The Abyss at Grand Canyon National Park and the Entrance Station at Chiricahua National Monument. O_3 is of particular concern in rural areas due to its ability to degrade visibility and its harmful affects on vegetation. The secondary standard for O_3, which is identical in magnitude to that of the primary standard, is designed to protect visibility and vegetation as well as other items of public welfare. Figure 16 shows the temporal variability of these rural long-term sites over the 1990 to 2008 period in the form of three-year averages of the annual 4th high. In general, the trend can be described as slightly increasing over the 1990 to 2008 period. When a best-fit linear trend is applied to the time series, O_3 concentrations at Chiricahua Entrance Station have increased 3 ppb over the 19-year period, while The Abyss at Grand Canyon National Park has seen a 2 ppb increase over the 19-year period.

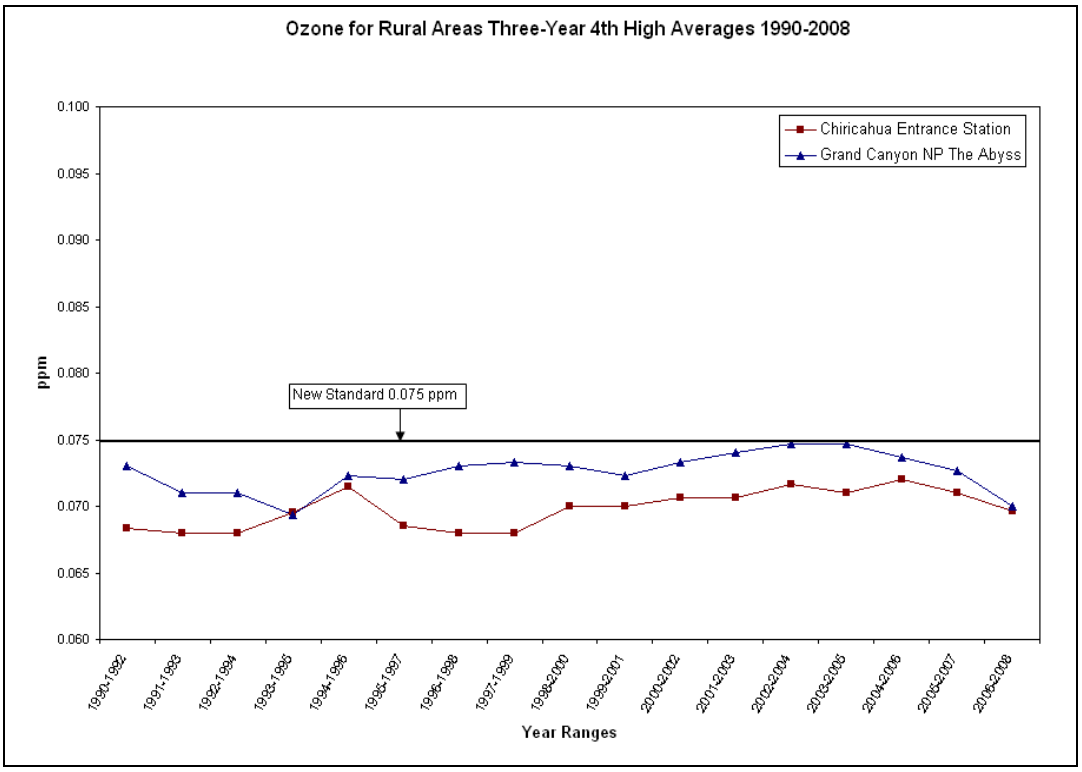


Figure 16 – Rural area eight-hour O_3 time series: three-year averages of the annual fourth-highest concentrations

With meteorology having a significant influence on O_3 concentrations in both urban and rural environments, in comparison with other gaseous pollutants, it becomes difficult to determine whether the temporal variability in O_3 concentrations are an artifact of these meteorological conditions or simply results of control measures that have been put in-place. It is likely that the variability can be related to both, but the degree to which each affects O_3 is unknown for the 1990 to 2008 period. Generally speaking, trends in O_3 throughout Arizona have been less significant than those seen in CO. In contrast to CO, changes in emissions of O_3 precursors would not be expected to produce proportional changes in O_3 concentrations due to the relatively high background level of O_3 and its photochemical formation from hydrocarbons (HC) and nitrogen oxides (NO).

Particulates

PM_{10}

The criteria used in designating 'trend' sites for PM_{10} differed from that of the gaseous pollutants of O_3 and CO due to differences in collection methods. Using EPA's 75 percent quarterly data completeness criteria for PM_{10} monitors would have resulted in a very small and incomplete dataset for trend assessment. This is due to the fact that PM_{10} monitoring occurs on a fairly infrequent basis (in comparison with the gaseous pollutants), with 24-hour filter based measurements taken once every 6^{th} day. The reduced number of samples collected each quarter allows for a greater likelihood of any one quarter failing the 75 percent completeness test. For this reason, a less stringent 80 percent annual completeness criterion was used. The majority of PM_{10} monitors in Arizona did not begin to meet this criterion until the late 1980s and early 1990s. As a result, the period of record for assessing PM_{10} trends in Arizona will be 1990 through 2008. The three-year average of the annual average was the statistic used to assess trends. While the annual PM_{10} NAAQS was revoked in 2006, annual averages are a useful statistic for trend analysis due to its limited variability from year to year. In order to reduce the number of gaps in the time series, a three-year average was deemed valid if two valid annual averages existed in the three-year time period. Using this method reduces the number of gaps in the time series as one missing annual average would otherwise result in the absence of three consecutive three-year averages.

Phoenix-

Six sites met the 'trend' site criteria for the Phoenix metropolitan area. These sites include Central Phoenix, Glendale, Mesa, North Phoenix, South Scottsdale, and West Phoenix. Figure 17 illustrates the temporal variability of these long-term sites over the 1990 to 2008 period in the form of three-year averages of the annual average. Along with the average of these six sites, the minimum and maximum values (of the three-year annual average) for each three-year period were also included to show any spatial variability that may exist across the Phoenix metro region. In general, the trend can be described as decreasing over the 1990 to 2008 period although the time series of the maximum value shows very little trend, or slightly increasing. When a best-fit linear trend is applied to the time series, the average and minimum value have decreased approximately 5 micrograms per cubic meter ($\mu g/m^3$) over the 19-year period, while the maximum value has increased 1 $\mu g/m^3$ over the 19-year period. This pattern could be an indication that while PM_{10} concentrations are improving across most areas of the Phoenix metropolitan area, there are localized areas that are not.

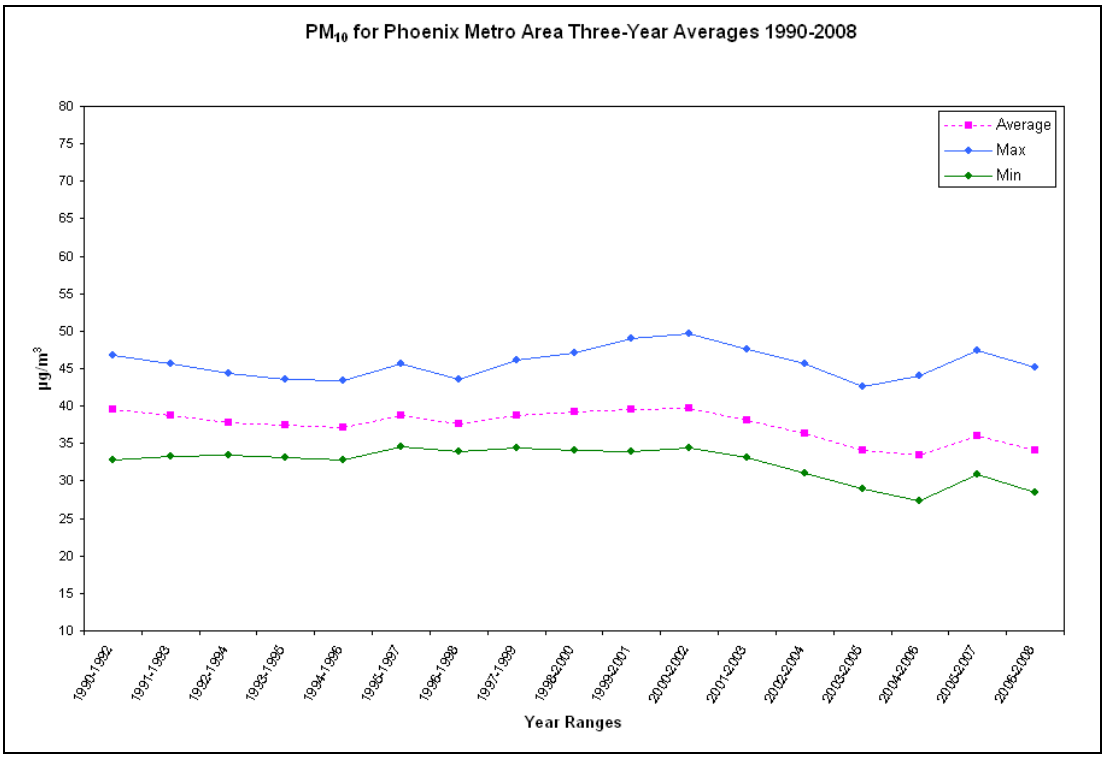


Figure 17 – Three-year averages of PM_{10} annual averages, expressed as the average, maximum, and minimum of six long-term sites in the Phoenix metropolitan area

To get an idea of the spatial variability of PM_{10} across Phoenix, Figure 18 was included to show the relative differences in the magnitude of PM_{10} annual averages at four sites. While the length of record varies for each site, the last eight years of data indicate that the sites generally correlate with one another, but contain noticeable differences in magnitude. The higher annual averages at South Phoenix and West Phoenix are likely a representation of the PM_{10} problems in the Salt River area. Unfortunately, shorter monitoring records at sites such as Durango Complex, South Phoenix, and West 43rd Avenue have not allowed for an accurate depiction of PM_{10} trends in this Salt River area.

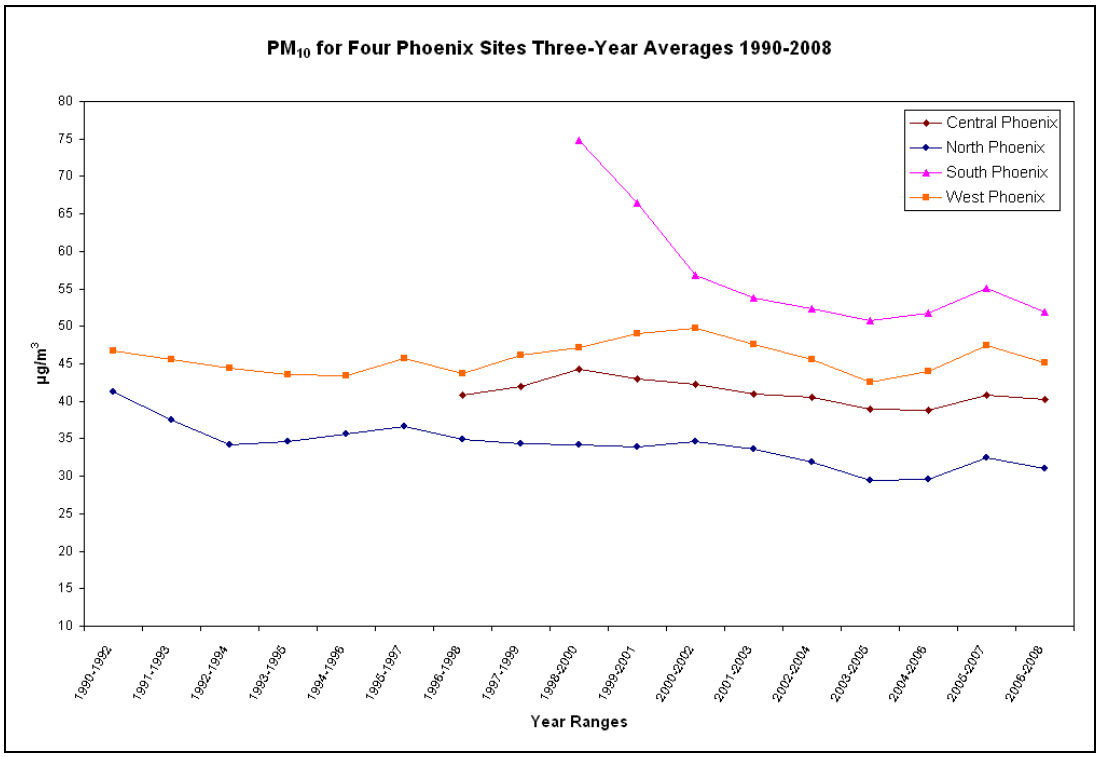


Figure 18 – Three-year averages of annual average PM_{10} at select Phoenix Metro area sites

Tucson-

Three sites met the 'trend' site criteria for the Tucson metropolitan area. These sites include Broadway & Swan, Corona de Tucson, and Prince Road. Figure 19 illustrates the temporal variability of these long-term sites over the 1990 to 2008 period in the form of three-year averages of the annual average. Along with the average of these six sites, the minimum and maximum values (of the three-year annual average) for each three-year period were also included. In general, the trend can be described as increasing over the 1990 to 2008 period. When a best-fit linear trend is applied to the time series, the average, maximum, and minimum values have increased 3.3 $\mu g/m^3$, 5.1 $\mu g/m^3$, and 6.1 $\mu g/m^3$ respectively, over the 19-year period. While the time series show a slight increasing trend across all long-term sites in Tucson, the annual averages are still well below the old annual PM_{10} NAAQS of 50 $\mu g/m^3$.

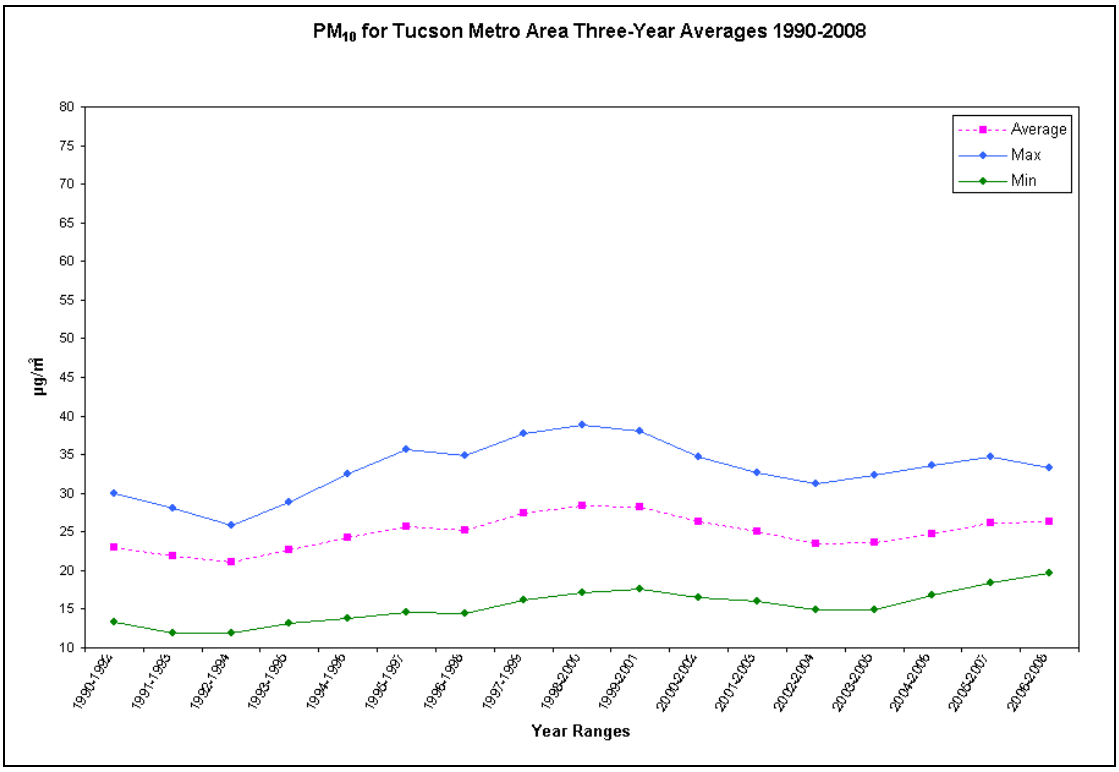


Figure 19 – Three-year averages of annual average PM_{10} at three Tucson metropolitan sites

Pinal County-

PM_{10} monitoring throughout Pinal County has increased substantially within that last four to five years. Unfortunately, the lack of long-term monitoring makes it difficult to assess the trends of PM_{10} in Pinal County. Despite a relatively short record of PM_{10} data within Pinal County, data from six sites were assessed for temporal variability for the time period 1998 to 2008. These sites include Casa Grande Downtown, Coolidge Maintenance Yard, Eloy County Complex, Mammoth County Complex, Pinal Air Park, and Stanfield County Complex. Figure 20 shows this variability in the form of three-year averages of the annual average. Along with the average of these six sites, the minimum and maximum values (of the three-year annual average) for each three-year period were also included to show any spatial variability that may exist across the county. In general, most long-term sites show little to no change over the shorter time period, as indicated by the 'average' plot in Figure 20. Most annual averages within the last few years are similar to those measured in the late 1990s. Meanwhile, the minimum value (Mammoth County Complex) has decreased while the maximum value (Stanfield County Complex) has significantly increased. More recent PM_{10} monitoring in Pinal County has indicated that there may be additional areas where PM_{10} concentrations are comparable to those measured at Stanfield County Complex during the last three to five years. For these most recent data, see the 'Monitoring Data' section of this Annual Report.

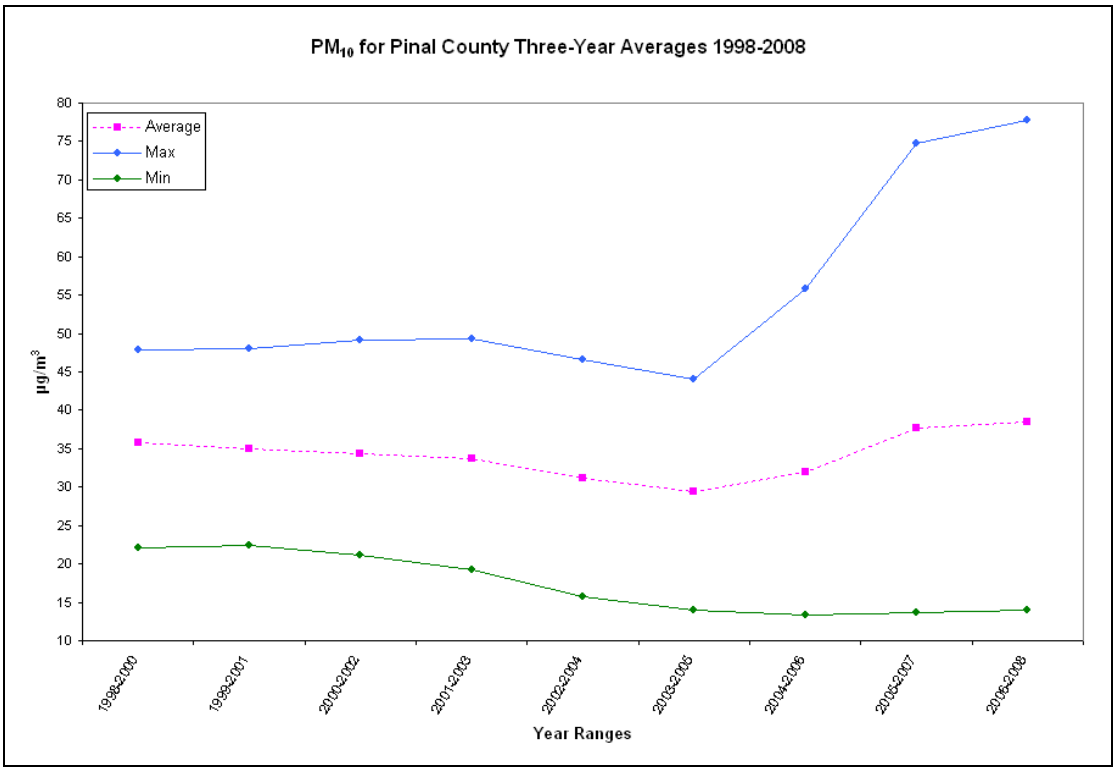


Figure 20 – Three-year averages of annual average PM_{10} at Pinal County at six sites

Other Sites in Arizona-

Throughout the rest of the state, Figure 21 presents three-year moving averages of the annual average at select sites for the period 1990 to 2008. Ajo, Hayden Old Jail, Nogales Post Office, Paul Spur Chemical Lime Plant, Payson Well Site, and Rillito were selected as 'trend' sites due to their long period of record and high data completeness results throughout their record. Despite a slightly shorter period of record with complete data, PM_{10} data from Ajo was also included as its temporal variability provides some useful information. The same 80 percent annual data completeness criterion mentioned above was used to determine a complete record. Nogales Post Office contains the highest long-term annual average, and while there is considerable year-to-year variability, a general increasing trend is apparent. PM_{10} concentrations in Nogales, AZ have proven to be difficult to control due to sources on the Mexican side of the border. When a best-fit linear trend is applied to the time series, PM_{10} concentrations at Nogales Post Office have increased 7.4 µg/m^3 over the 19-year period. Other locations showing slight increasing trends include Ajo with a 3.4 µg/m^3 increase over the 16-year period and Rillito with a 6.2 µg/m^3 increase over the 19-year period. While the time series at Ajo and Rillito show slight increasing trends, the annual averages are still well below the old annual PM_{10} NAAQS of 50 µg/m^3.

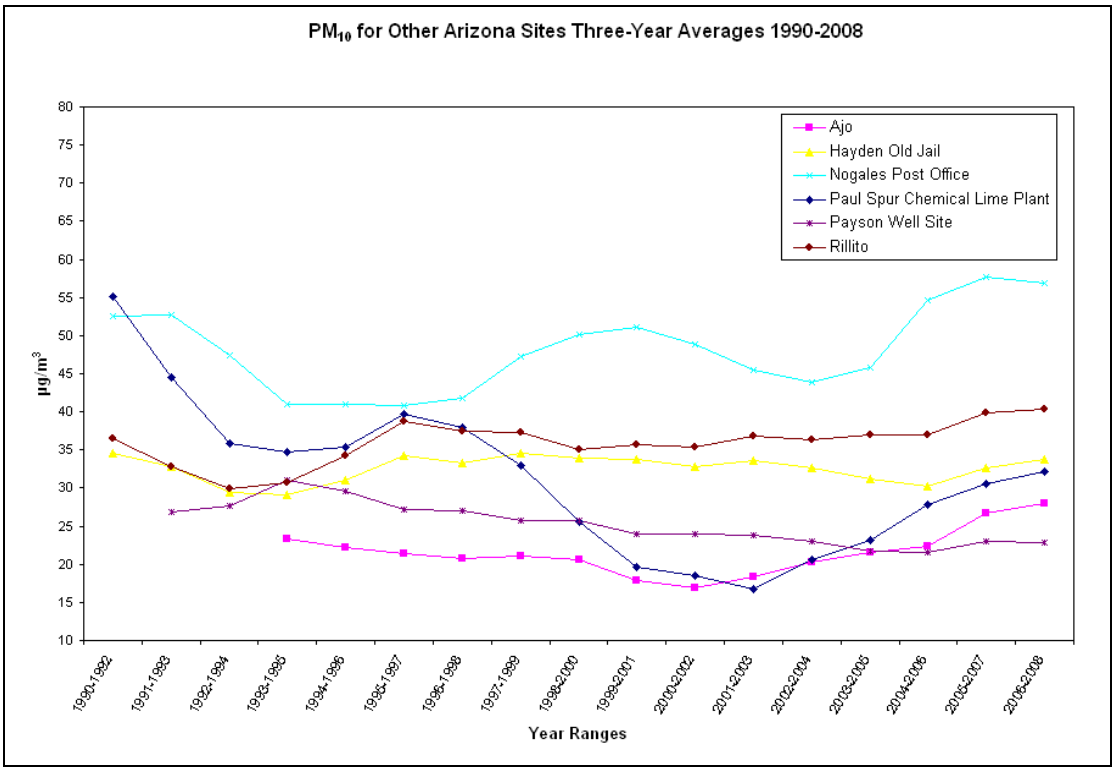


Figure 21 – Three-year averages of annual average PM_{10} at sites in six Arizona cities

The PM_{10} time series at Paul Spur Chemical Lime Plant is similar to that of Nogales Post Office in that it contains significant variability from year to year, but the trend is opposite in sign. When a best-fit linear trend is applied to the time series, PM_{10} concentrations at Paul Spur Chemical Lime Plant have decreased 23.6 µg/m^3 over the 19-year period. The Payson Well Site also shows a decreasing trend in PM_{10}, though this trend is fairly uniform and linear, equating to an 8.1 µg/m^3 decrease over the 19-year period. Lastly, the time series of annual averages at Hayden Old Jail has remained fairly constant throughout the time period with virtually no discernable trend.

$PM_{2.5}$

While the initial focus for measuring particulates in ambient air began with measurements of total suspended particulate (TSP) and PM_{10}, measurements of particles less than 2.5 microns in diameter have become increasingly important during the last decade. For the purpose of assessing the temporal variability in $PM_{2.5}$, only data from federal reference method (FRM) instruments were used. These FRM instruments were not widely used until the late 1990s when the $PM_{2.5}$ NAAQS was finalized. As a result, there is not a long monitoring history of $PM_{2.5}$ with FRM instruments. In an attempt to cover as broad a geographic area as possible, the time period used to asses the temporal variability of $PM_{2.5}$ in Arizona was 2001 to 2008. Additionally, the same 80 percent annual data completeness criterion used for PM_{10} was used in determining a complete dataset for $PM_{2.5}$ monitors.

With such a short record of $PM_{2.5}$ data throughout the state of Arizona, assessing trends in $PM_{2.5}$ becomes a difficult process. However, the temporal variability can be assessed during the brief period of record for some 'long-term' $PM_{2.5}$ sites. Additionally, their relative magnitude can be compared from one site to another. Figure 22 shows this temporal variability, in the form of three-year averages of the annual average, in six cities or towns around Arizona. For the larger metropolitan areas, the West Phoenix monitor was used to represent Phoenix and the Orange Grove monitor was used to represent Tucson. In general, annual $PM_{2.5}$ concentrations have not changed much over the eight-year period. Exceptions may include Casa Grande and Nogales which have both seen slight increases over the last three to six years. $PM_{2.5}$ concentrations at Tucson and Douglas have remained fairly constant over the eight year period, with minimal year-to-year variability. While all locations are below the annual $PM_{2.5}$ NAAQS of 15 $\mu g/m^3$, Figure 22 shows two distinct tiers of $PM_{2.5}$ concentrations. $PM_{2.5}$ annual averages at Nogales and Phoenix are nearly twice that of other Arizona locals. $PM_{2.5}$ will continue to be a pollutant of concern, and only until adequate amounts of data are collected can trends be assessed with any confidence.

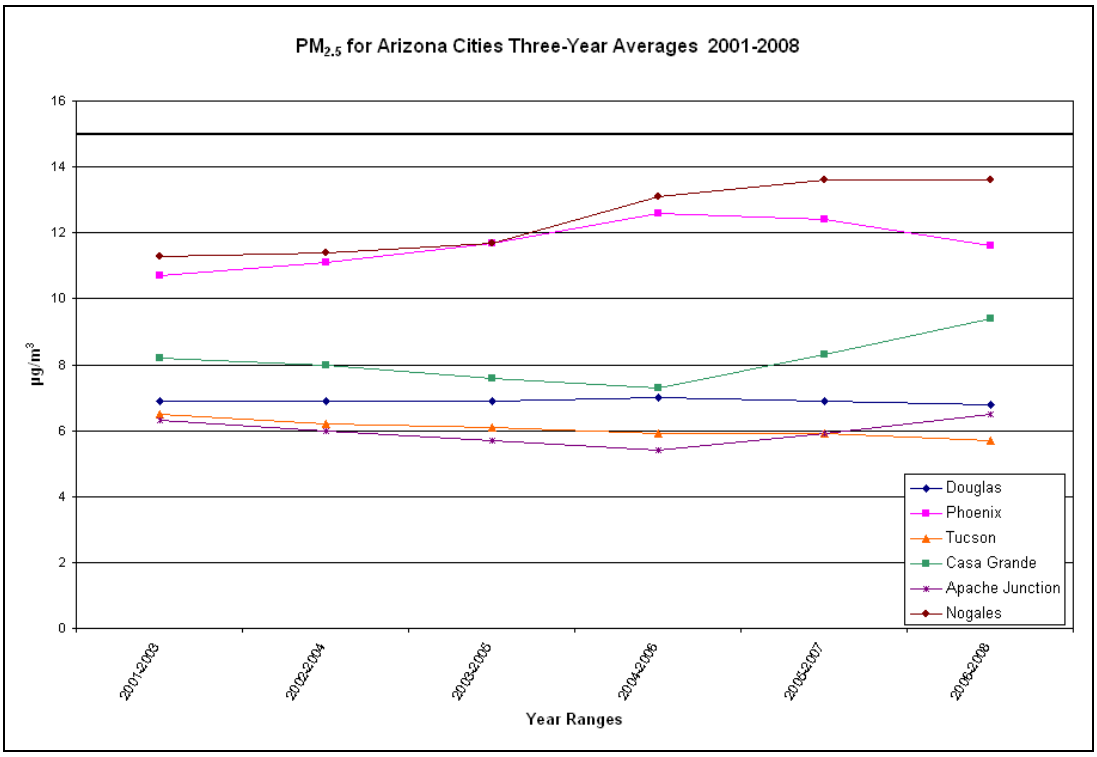


Figure 22 – Three-year averages of annual average $PM_{2.5}$ at six Arizona cities or towns for the period 2001 to 2008

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. The units of measurement are inverse megameters (Mm^{-1}): the higher the light extinction value in Mm^{-1}, the more visibility is reduced. In Figures 23 and 24, these light extinction data have been plotted as three-year averages and converted to the more practical units of Visual Range in miles.

In Phoenix, when taking into consideration all hours of the day, transmissometer data indicate a slight trend toward clearer air for the mean and dirtiest 20 percent categories with increases in visibility of approximately 4 miles and 2 miles, respectively (Figure 23). The cleanest 20 percent had the greatest change, with visibility increasing by approximately 13 miles over the 14-year period. The trends in morning hour visibility are very similar to visibility trends when all hours are taken into consideration. The mean and 20 percent dirtiest categories indicate a slight increasing trend in visibility of 2.5 miles and 1.5 miles, respectively. Meanwhile, the cleanest 20 percent category once again shows the greatest improvement, with visibility increasing approximately 6 miles over the 14-year period (Figure24).

Visibility in Tucson has improved over the length of record for both morning hours and all hours of the day. When taking into consideration all hours of the day, the dirtiest 20 percent saw an increase in visibility of 3 miles; the mean visibility increased by 8 miles; and the cleanest 20 percent increased by nearly 40 miles over the 16-year period (Figure 23). When only accounting for visibility during the morning hours, the dirtiest 20 percent saw an increase in visibility of 2 miles, the mean visibility increased 5 miles, and the cleanest 20 percent has increased 22 miles over the 16-year period (Figure 24).

Both Phoenix and Tucson are trending toward cleaner air over the 14-year and 16-year records. While both urban areas are showing improvements in visibility with time, Tucson has a greater trend toward cleaner air. For both Phoenix and Tucson, the visibility data indicate that the trend in morning hour visibility accounts for approximately half the trend in overall visibility; an indication that visibility during other parts of the day may be improving at a greater rate than during the morning hours.

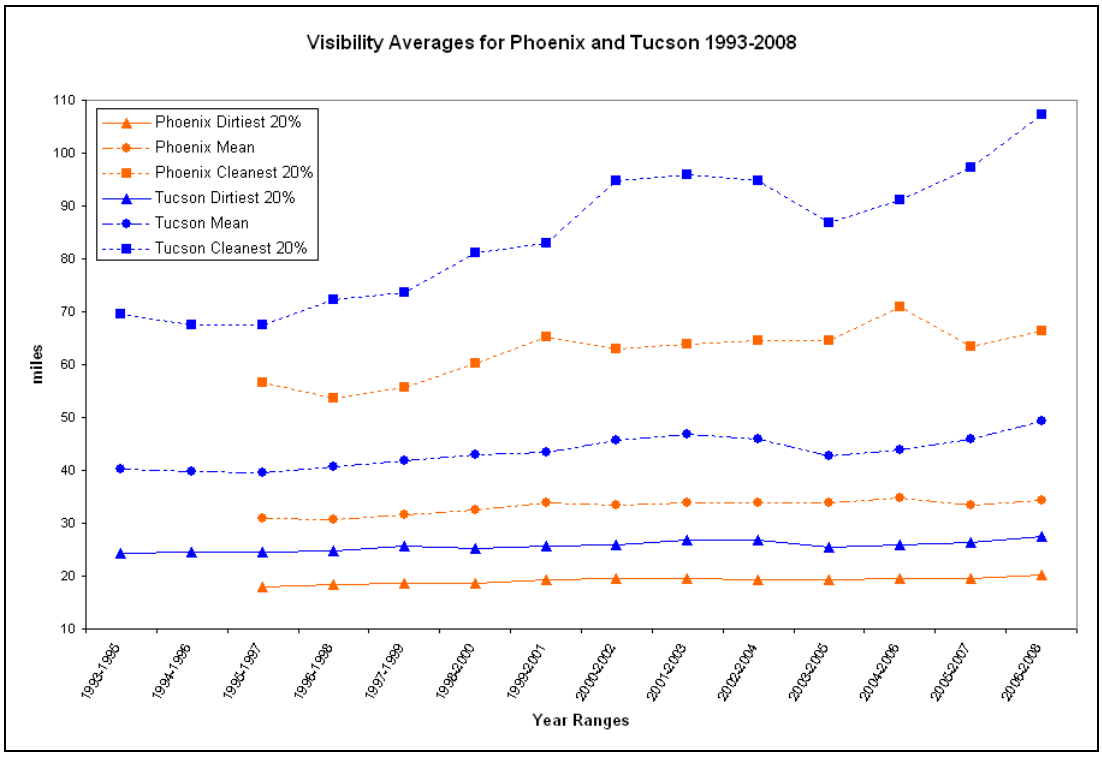


Figure 23 – Visibility trends for Phoenix and Tucson, for all hours

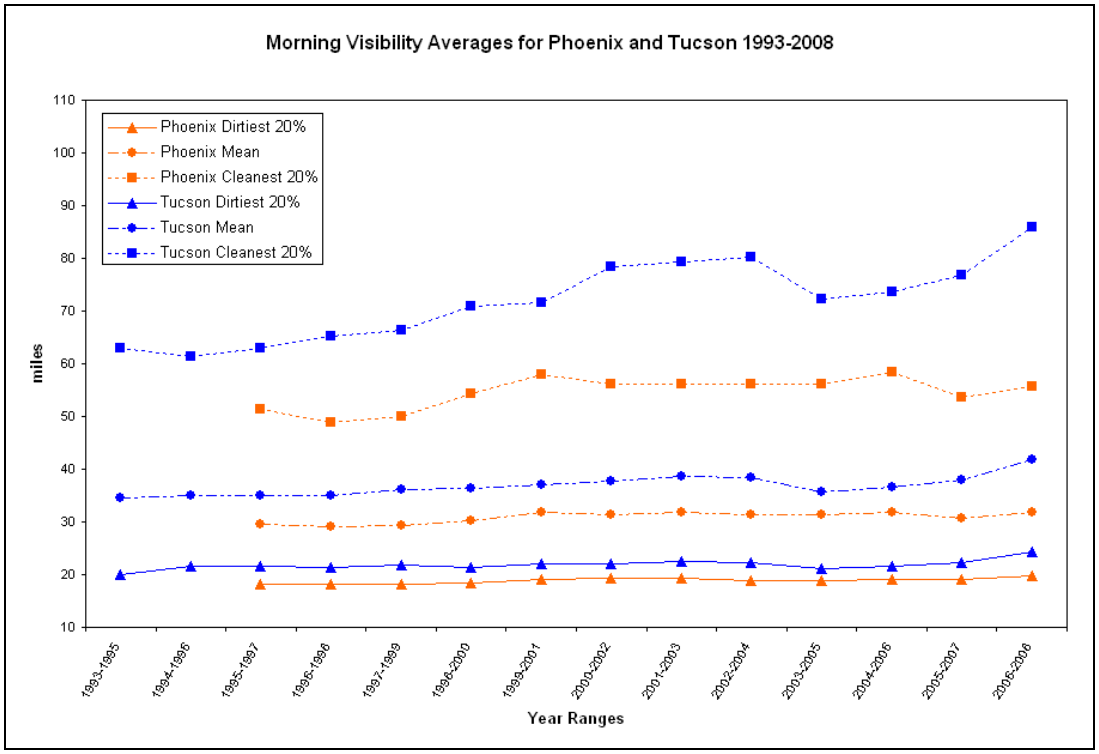


Figure 24 – Visibility trends for Phoenix and Tucson, from 5a.m. to 11a.m.

In some rural areas of the state, visibility is measured by nephelometers. Nephelometers differ from transmissometers in that the light extinction derived from nephelometers only accounts for extinction through light scattering, as opposed to transmissometers which take into account both light scattering and absorption by particles. Figures 25 and 26 show a visibility time series of three Class I areas with the longest length of record. Each site contains three categories of visibility data; dirtiest 20 percent, mean, and cleanest 20 percent. The Class I areas have extremely clean air for the cleanest 20 percent with the visibility range in miles being far greater than even the cleanest 3-year averages for urban areas. This concept is even true amongst the three Class I areas, as the areas away from urban environments, Camp Raymond and Hance Camp, have greater visibility in the cleanest 20 percent than Tucson Mountain (Figure 25).

For the mean and the dirtiest 20 percent categories, there is a consistent trend for all three Class I areas, which is a decrease in visibility over the 11-year period of record (Figure 26). Mean visibility has decreased by 19 percent at Camp Raymond, 13 percent at Hance Camp, and 20 percent at Tucson Mountain. The dirtiest 20 percent categories have visibility reductions of 28 percent at Camp Raymond, 11 percent at Hance Camp, and 21 percent at Tucson Mountain. While the cleanest 20 percent categories have greater year-to-year variability, there is an indication from the data that these Class I areas are experiencing a decrease in visibility on average and on the dirtiest days.

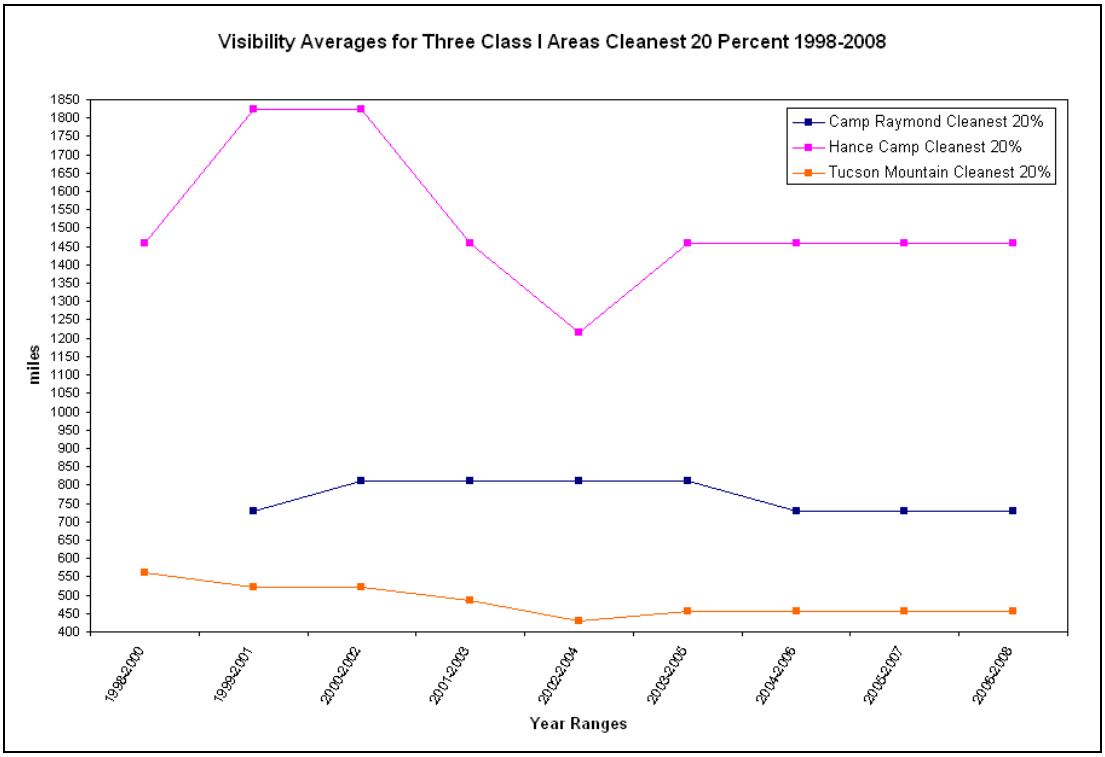


Figure 25 – Comparison of light scattering for cleanest 20 percent in three Class I areas with the longest length of record.

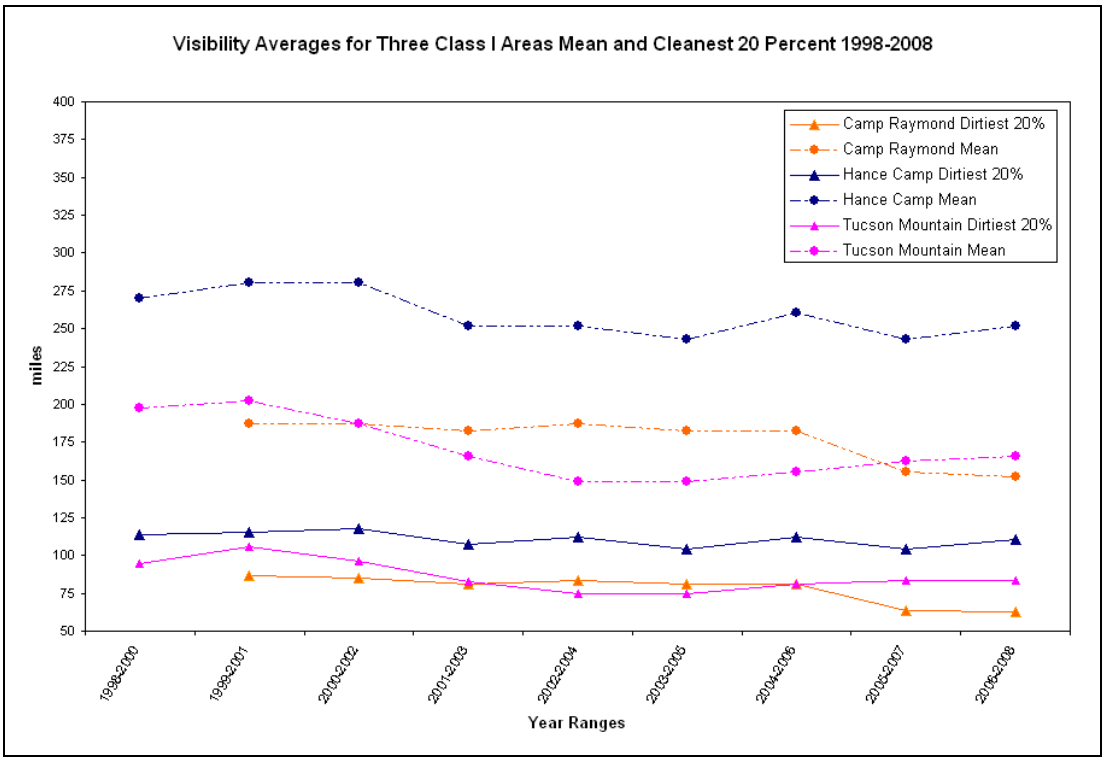


Figure 26 – Comparison of light scattering for the mean and dirtiest 20 percent in three Class I areas with the longest length of record.

Conclusion

Since monitoring of air pollutants began in the late 1960s in Arizona, considerable progress has been made in reducing airborne pollutants throughout the state. The most drastic change has occurred in CO concentrations in the highly urbanized areas of Tucson and Phoenix. CO concentrations, which regularly exceeded standards in neighborhoods and near busy intersections in Phoenix (and to a lesser extent in Tucson), are now well below the eight-hour CO NAAQS of 9 ppm. O_3 concentrations have shown slight decreasing trends in the metropolitan areas of Tucson and Phoenix, though a very slight increasing trend has been observed in some rural areas. In comparison with CO, O_3 concentrations may prove to be more difficult to curb due to its relatively high background levels. Trends in PM_{10} are quite variable and location dependent. Long-term trend sites in Phoenix show a slight decrease in PM_{10} concentrations for most areas, though there may be localized areas that are not improving. The Tucson metropolitan area on the other hand has seen a general increase in PM_{10} concentrations; however, the magnitude of these concentrations are significantly less than those in Phoenix. Monitoring of $PM_{2.5}$ is a fairly new program that began in the late 1990s. While there is not yet enough data to confidently assess trends in $PM_{2.5}$, the temporal variability of these fine particles appear to be relatively constant at their respected locations with Phoenix and Nogales, AZ having the greatest magnitudes. Lastly, measurements of visibility within the urban environments of

Phoenix and Tucson have shown considerable improvement over the last 2 decades. Meanwhile, visibility in certain Class I areas appear to be degrading with time. While certain locations have seen some deterioration in air quality with time, most locals have seen improvements. These improvements have resulted from the development of State Implementation Plans (SIP) through joint efforts between state and local air quality agencies in Arizona.

Appendix 1 – Site Index

Site Index – Current Ambient Air Monitoring Locations in Arizona									
Site Name and Address	**Lat. Long.**	**Elev. (meters)**	**Parameters Measured**	**Owner**	**Monitor Type**	**Measurement Scale**	**Monitoring Objective**	**AAAD ID Number**	**AQS ID Number**
Apache County									
Greer Water Treatment Plant (SR 260 & SR 373)	34.058 -109.440	2,503	Bscat, MET, IMPROVE	ADEQ, USFS	Class I	Regional	Visibility	16323	None
Petrified Forest NP (I-40 & Petrified Forest Rd.)	35.077 -109.769	1,766	IMPROVE	NPS	Class I	Regional	Visibility	16473	04-001-0012
Springerville (323 S. Mountain Ave.)	34.128 -109.289	2,125	PM_{10}	ADEQ	SPM	Neighborhood	Population	135133	None
TEP - Springerville - Coal Yard (Lower Coyote Rd.)	34.329 -109.156	2,125	PM_{10}, MET	TEP	SPM	Regional	Source Impact	16637	None
TEP - Springerville - Coyote Hills (Lower Coyote Rd.)	34.175 -109.231	2,285	NO_2, SO_2, PM_{10}, MET	TEP	SPM	Regional	Source Impact	16638	None
Cochise County									
Chiricahua Entrance Station (13063 E. Bonita Canyon Rd.)	32.009 -109.389	1,570	O_3, Bscat, MET, CASTNET, NADP, IMPROVE	ADEQ, EPA, NPS	Class I	Regional	Visibility	16679	04-003-8001
Douglas Red Cross (1445 E. 15th St.)	31.349 -109.539	1,231	PM_{10}, $PM_{2.5}$, IMPROVE	ADEQ	Urban Haze, SLAMS	Neighborhood/ Regional	Population/ Visibility	16503	04-003-1005
Paul Spur Chemical Lime Plant (SR 80 & Paul Spur Rd.)	31.365 -109.730	1,278	PM_{10}	ADEQ	SLAMS	Middle	Source Impact	16391	04-003-0011
Paul Spur Chemical Lime Plant South (S. of Stoneridge Rd.)	31.354 -109.737	1,287	MET	ADEQ	SPM	Middle	Source Impact	16392	None

Site Index – Current Ambient Air Monitoring Locations in Arizona									
Site Name and Address	**Lat. Long.**	**Elev. (meters)**	**Parameters Measured**	**Owner**	**Monitor Type**	**Measurement Scale**	**Monitoring Objective**	**AAAD ID Number**	**AQS ID Number**
Coconino County									
Flagstaff Middle School (755 N. Bonito St.)	35.206 -111.652	2,120	O_3, PM_{10}, $PM_{2.5}$	ADEQ	SLAMS	Neighborhood	Population	16707	04-005-1008
Grand Canyon NP - Hance Camp (South Rim, 2.5 miles W. of Village)	35.973 -111.984	2,235	SO_2, Bscat, MET, IMPROVE	NPS	Class I	Regional	Visibility	16682	None
Grand Canyon NP - Hopi Point Fire Tower (South Rim, N. of Village)	36.071 -112.155	2,152	NADP	NPS	Class I	Regional	Visibility	134455	None
Grand Canyon NP - In Canyon - Yavapai Museum (South Rim)	36.060 -112.117	2,177	SO_2, Visibility (camera)	NPS	Class I	Regional	Visibility	134456	None
Grand Canyon NP - Indian Gardens (South Rim, 4.5 miles from Bright Angel Trailhead)	36.078 -112.126	1,164	Bscat, MET, IMPROVE	NPS	Class I	Regional	Visibility	16683	None
Grand Canyon NP - The Abyss (South Rim, NW of Village)	36.059 -112.182	2,073	O_3, MET, CASTNET	NPS	Class I	Regional	Visibility	134458	04-005-8001
Ike's Backbone (Fossil Creek Rd. & Childs Rd.)	34.340 -111.682	1,303	Bscat, MET, IMPROVE	ADEQ, USFS	Class I	Regional	Visibility	16421	None
Sedona Post Office (190 W. Hwy. 89A)	34.866 -111.765	1,279	PM_{10}	ADEQ	SPM	Neighborhood	Population	16512	04-005-1010
Sycamore Canyon (Camp Kimball Rd.)	35.140 -111.969	2,046	Bscat, MET, NADP, IMPROVE	ADEQ, USFS	Class I	Regional	Visibility	16476	None
Gila County									
ASARCO - Globe Hwy.	33.002 -110.765	602	SO_2	ASARCO	SPM	Neighborhood	Source Impact	16593	None

Site Index – Current Ambient Air Monitoring Locations in Arizona									
Site Name and Address	**Lat. Long.**	**Elev. (meters)**	**Parameters Measured**	**Owner**	**Monitor Type**	**Measurement Scale**	**Monitoring Objective**	**AAAD ID Number**	**AQS ID Number**
ASARCO - Hayden - Garfield Ave.	33.002 -110.784	620	SO_2	ASARCO	SPM	Neighborhood	Source Impact	16590	None
ASARCO - Montgomery Ranch	33.012 -110.798	709	SO_2	ASARCO	SPM	Neighborhood	Source Impact	16591	None
FMMI - Miami - Golf Course	33.419 -110.829	1,000	PM_{10}	FMMI	SPM	Neighborhood	Source Impact	16629	04-007-8000
FMMI - Miami - Jones Ranch (Cherry Flats Rd.)	33.385 -110.867	1,242	SO_2	FMMI	SPM	Regional	Source Impact	16631	None
FMMI - Miami - Townsite (Sullivan St.)	33.397 -110.874	1,035	SO_2	FMMI	SPM	Regional	Source Impact	16632	None
Hayden Old Jail (Canyon Dr. & Kennecott Ave.)	33.006 -110.786	625	SO_2, PM_{10}	ADEQ, ASARCO	SLAMS, SPM	Neighborhood	Source Impact	16326	04-007-1001
Miami Ridgeline (4030 Linden St.)	33.399 -110.858	1,085	SO_2, PM_{10}	ADEQ, FMMI	SLAMS, SPM	Neighborhood/ Regional	Source Impact	16382	04-007-0009
Payson Well Site (204 W. Aero Dr.)	34.229 -111.329	1,501	PM_{10}, MET	ADEQ	SLAMS	Neighborhood	Population	16317	04-007-0008
Pleasant Valley Ranger Station (SR 288 & Old Cherry Rd.)	34.090 -110.941	1,587	Bscat, MET, IMPROVE	ADEQ, USFS	Class I	Regional	Visibility	16446	None
Tonto NM (S. of SR 188)	33.635 -111.109	786	O_3, IMPROVE	ADEQ, NPS	SLAMS	Regional	Transport/ Visibility	16447	04-007-0010
Graham County									
Oliver Knoll (NW of Safford)	33.074 -109.865	1,173	NADP	BLM	SPM	Regional	Population	134496	None
La Paz County									
Alamo Lake (Alamo Lake State Park)	34.243 -113.558	403	O_3	ADEQ	SLAMS	Regional	Transport	34961	04-012-8000

Site Index – Current Ambient Air Monitoring Locations in Arizona									
Site Name and Address	**Lat. Long.**	**Elev. (meters)**	**Parameters Measured**	**Owner**	**Monitor Type**	**Measurement Scale**	**Monitoring Objective**	**AAAD ID Number**	**AQS ID Number**
Maricopa County									
ADEQ Building (1110 W. Washington St.)	33.448 -112.087	329	Visibility (camera)	ADEQ	Urban Haze	Urban	Visibility	21737	None
Banner Mesa Medical Center (525 W. Brown Rd.)	33.433 -111.842	454	Visibility (camera), Bext	ADEQ	Urban Haze	Urban	Urban Haze/ Visibility	19489	None
Bethune Elementary School (1310 S. 15th Ave.)	33.434 -112.093	325	PM_{10}	ADEQ	SLAMS	Neighborhood	Population	17786	04-013-8006
Blue Point (Usery Pass Rd. & Bush Hwy.)	33.545 -111.609	480	O_3, MET	MCAQD	SLAMS	Urban	Maximum Concentration	16417	04-013-9702
Buckeye (26449 W. 100th Dr.)	33.370 -112.620	256	CO, NO_2, O_3, PM_{10}, MET	MCAQD	SLAMS	Neighborhood/ Urban	Population/ Source Impact	21525	04-013-4011
Cave Creek (37109 N. Lava Ln.)	33.821 -112.017	584	O_3, MET	MCAQD	SLAMS	Urban	Maximum Concentration	16368	04-013-4008
Central Phoenix (1645 E. Roosevelt St.)	33.457 -112.046	340	CO, NO_2, O_3, SO_2, PM_{10}, MET	MCAQD	SLAMS	Neighborhood	Maximum Concentration/ Population	16329	04-013-3002
Coyote Lakes (20010 N. Coyote Lakes Pkwy.)	33.666 -112.310	363	PM_{10}, MET	MCAQD	SPM	Middle	Source Impact	127530	04-013-4014
Durango Complex (2702 RC Esterbrook Blvd.)	33.426 -112.118	480	PM_{10}, $PM_{2.5}$, MET	MCAQD	SLAMS	Middle	Maximum Concentration	16375	04-013-9812
Dysart (16825 N. Dysart Rd.)	33.637 -112.339	357	CO, O_3, PM_{10}, Bscat, Met	ADEQ, MCAQD	SLAMS, Urban Haze	Neighborhood	Population	19550	04-013-4010
Estrella (15099 W. Casey Abbott Rd.)	33.383 -112.372	277	Bscat, MET	ADEQ	Urban Haze	Neighborhood	Population	16506	04-013-8005
Estrella Community College (3000 N. Dysart Rd.)	33.483 -112.350	305	Visibility (camera)	ADEQ	Urban Haze	Urban	Visibility	21736	None
Falcon Field (4530 E. McKellips Rd.)	33.452 -111.733	310	O_3, MET	MCAQD	SLAMS	Neighborhood	Population	16381	04-013-1010

Site Index – Current Ambient Air Monitoring Locations in Arizona									
Site Name and Address	**Lat. Long.**	**Elev. (meters)**	**Parameters Measured**	**Owner**	**Monitor Type**	**Measurement Scale**	**Monitoring Objective**	**AAAD ID Number**	**AQS ID Number**
Fountain Hills (16426 E. Palisades Blvd.)	33.611 -111.725	440	O_3, MET	MCAQD	SLAMS	Neighborhood	Maximum Concentration	16376	04-013-9704
Glendale (6000 W. Olive Ave.)	33.569 -112.191	357	CO, O_3, PM_{10}, MET	MCAQD	SLAMS	Neighborhood	Population	16378	04-013-2001
Greenwood (1128 N. 27th Ave.)	33.460 -112.117	338	CO, NO_2, PM_{10}, MET	MCAQD	SLAMS	Middle	Population	16372	04-013-3010
Higley (15400 S. Higley Rd.)	33.310 -111.722	396	PM_{10}, MET	MCAQD	SLAMS	Neighborhood	Population	16505	04-013-4006
Humboldt Mountain (Pine Mountain Wilderness)	33.982 -111.798	1,594	O_3, MET	MCAQD	SLAMS	Regional	Maximum Concentration	16416	04-013-9508
JLG Supersite (4530 N. 17th Ave.)	33.503 -112.095	354	CO, Trace CO, NO_x, NO_y, O_3, SO_2, Trace SO_2, VOC, Carbonyls, Hexavalent Chromium, SVOC, PM_{10}, Metals PM_{10}, $PM_{2.5}$, Speciated $PM_{2.5}$, Bscat, MET, IMPROVE	ADEQ	CSN, NATTS, NCore, PAMS, SLAMS, Urban Haze	Neighborhood	Population	16328	04-013-9997
Mesa (310 S. Brooks Cir.)	33.410 -111.865	372	CO, PM_{10}, $PM_{2.5}$, MET	MCAQD	SLAMS	Neighborhood	Population	16380	04-013-1003
Mesa City Building (55 N. Center St.)	33.415 -111.830	400	Bext, MET	ADEQ	Urban Haze	Urban	Urban Haze	19686	None
North Mountain Summit (North Mountain)	33.585 -112.072	625	Visibility (camera)	ADEQ	Urban Haze	Urban	Visibility	16480	None
North Phoenix (601 E. Butler Dr.)	33.560 -112.066	379	CO, O_3, PM_{10}, MET	MCAQD	SLAMS	Neighborhood	Population	16390	04-013-1004
Phoenix Transmissometer Receiver (3600 N. 2nd Ave.)	33.490 -112.076	337	Bext, MET	ADEQ	Urban Haze	Urban	Urban Haze	16829	None
Phoenix Transmissometer Transmitter (2000 W. Bethany Home Rd.)	33.525 -112.101	340	Bext	ADEQ	Urban Haze	Urban	Urban Haze	16330	None

Site Index – Current Ambient Air Monitoring Locations in Arizona									
Site Name and Address	**Lat. Long.**	**Elev. (meters)**	**Parameters Measured**	**Owner**	**Monitor Type**	**Measurement Scale**	**Monitoring Objective**	**AAAD ID Number**	**AQS ID Number**
Pinnacle Peak (25000 N. Windy Walk Dr.)	33.712 -111.852	800	O_3	MCAQD	SLAMS	Urban	Maximum Concentration	16406	04-013-2005
Rio Verde (25608 N. Forest Rd.)	33.718 -111.671	500	O_3	MCAQD	SLAMS	Urban	Maximum Concentration	16396	04-013-9706
Salt River Pima DOAS (8805 E. McKellips Rd.)	33.444 -111.891	365	Toxics	ADEQ	SPM	Middle	Transport	128640	None
South Phoenix (33 W. Tamarisk St.)	33.403 -112.075	330	CO, O_3, Toxics , PM_{10}, $PM_{2.5}$, MET	ADEQ, MCAQD	SLAMS	Neighborhood	Population	16377	04-013-4003
South Scottsdale (2857 N. Miller Rd.)	33.479 -111.917	374	CO, NO_2, O_3, SO_2, PM_{10}, MET	MCAQD	SLAMS	Neighborhood/ Urban	Population	16398	04-013-3003
Tempe (1525 S. College Ave.)	33.412 -111.934	360	CO, O_3, MET	MCAQD	SLAMS	Neighborhood	Population	16405	04-013-4005
Vehicle Emissions Laboratory (600 N. 40th St.)	33.455 -111.996	356	Bscat, MET	ADEQ	PAMS, SLAMS, SPM	Neighborhood	Population/ Visibility	16363	04-013-9998
West Chandler (275 S. Ellis Rd.)	33.298 -111.884	360	CO, O_3, PM_{10}, MET	MCAQD	SLAMS	Middle/ Neighborhood	Population	16478	04-013-4004
West Forty Third (3940 W. Broadway Rd.)	33.406 -112.144	314	PM_{10}, MET	MCAQD	SLAMS	Middle	Maximum Concentration	16659	04-013-4009
West Indian School (3315 W. Indian School Rd.)	33.494 -112.130	340	CO	MCAQD	SLAMS	Middle/ Neighborhood	Population	16393	04-013-0016
West Phoenix (3847 W. Earll Dr.)	33.483 -112.142	334	CO, NO_2, O_3, PM_{10}, $PM_{2.5}$, MET	MCAQD	SLAMS	Neighborhood	Maximum Concentration/ Population	16477	04-013-0019
Mohave County									
Bullhead City (990 Hwy. 95)	35.153 -114.566	156	PM_{10}	ADEQ	SLAMS	Neighborhood	Population	16365	04-015-1003
Meadview (Pierce Ferry Rd.)	36.019 -114.068	902	IMPROVE	ADEQ	Class I	Regional	Background	21298	None

Site Index – Current Ambient Air Monitoring Locations in Arizona									
Site Name and Address	**Lat. Long.**	**Elev. (meters)**	**Parameters Measured**	**Owner**	**Monitor Type**	**Measurement Scale**	**Monitoring Objective**	**AAAD ID Number**	**AQS ID Number**
Navajo County									
Petrified Forest NP South (Old SW Entrance on Old Route 180)	34.822 -109.891	1,723	O_3, Bsact, MET, CASTNET	ADEQ, NPS	Class I	Regional	Visibility	134093	04-017-0119
Show Low (561 E. Deuce of Clubs)	34.252 -110.036	1,924	PM_{10}	ADEQ	SPM	Neighborhood	Population	16603	04-017-0007
Pima County									
22nd St. & Alvernon (3895 E. 22nd St.)	32.207 -110.910	767	CO	PDEQ	SLAMS	Microscale	Maximum Concentration	16676	04-019-1014
22nd St. & Craycroft (1237 S. Beverly Ave.)	32.204 -110.878	787	CO, O_3, NO_2, SO_2, Bscat, MET	ADEQ, PDEQ	SLAMS, Urban Haze	Neighborhood/ Urban	Population/ Visibility	16410	04-019-1011
Ajo (1131 N. Well Rd.)	32.382 -112.857	515	PM_{10}, MET	ADEQ	SLAMS	Neighborhood	Population	16316	04-019-0001
Broadway & Swan (4625 E. Broadway Blvd.)	32.222 -110.893	772	PM_{10}	PDEQ	SPM	Neighborhood	Source Impact	16550	04-019-1023
Cherry & Glenn (2745 N. Cherry Ave.)	32.256 -110.948	732	CO	PDEQ	SPM	Neighborhood	Population	16675	04-019-1021
Children's Park (400 W. River Rd.)	32.295 -110.982	697	CO, NO_2, O_3, $PM_{2.5}$, Speciated $PM_{2.5}$, Bscat, MET	ADEQ, PDEQ	NCore, SLAMS, SPM, Urban Haze	Neighborhood/ Urban	Maximum Concentration/ Population/ Visibility	16551	04-019-1028
Coachline (9597 N. Coachline Blvd.)	32.380 -111.127	679	O_3, $PM_{2.5}$	PDEQ	SPM	Neighborhood	Population	21580	04-019-1034
Corona De Tucson (22001 S. Houghton Rd.)	32.004 -110.792	938	PM_{10}	PDEQ	SLAMS	Regional	Background	16677	04-019-0008
Geronimo (2498 N. Geronimo Ave.)	32.251 -110.965	747	PM_{10}, $PM_{2.5}$	PDEQ	SPM (For AQI Purposes Only)	Neighborhood	Population	16678	04-019-1113
Golf Links & Kolb (2601 S. Kolb Rd.)	32.191 -110.840	811	CO	PDEQ	SPM	Micorscale	Maximum Concentration	19531	04-019-1031
Green Valley (601 N. La Canada Dr.)	31.879 -110.996	887	O_3, PM_{10}, $PM_{2.5}$	PDEQ	SPM	Neighborhood	Population	16685	04-019-1030

Site Index – Current Ambient Air Monitoring Locations in Arizona									
Site Name and Address	**Lat. Long.**	**Elev. (meters)**	**Parameters Measured**	**Owner**	**Monitor Type**	**Measurement Scale**	**Monitoring Objective**	**AAAD ID Number**	**AQS ID Number**
Green Valley Fire Administration (1285 W. Camino Encanto)	31.827 -111.011	917	PM_{10}, $PM_{2.5}$, MET	ADEQ	SPM	Middle	Source Impact	128562	04-019-8031
Orange Grove (3401 W. Orange Grove Rd.)	32.322 -111.037	681	PM_{10}, $PM_{2.5}$	PDEQ	SLAMS	Neighborhood	Maximum Concentration/ Population	16510	04-019-0011
Organ Pipe Cactus NM (1 mile SSW of visitor center)	31.950 -112.801	505	Bscat, MET, NADP, IMPROVE	ADEQ, NPS	Class I	Regional	Background	16681	04-019-0005
Prince Road (1016 W. Prince Rd.)	32.272 -110.989	706	PM_{10}	PDEQ	SLAMS	Microscale	Source Impact	16597	04-019-1009
Rillito (8840 W. Robinson St.)	32.414 -111.154	626	PM_{10}, MET	ADEQ, APCC	SLAMS, SPM	Neighborhood	Source Impact	16499	04-019-0020
Rose Elementary (710 W. Michigan St.)	32.172 -110.980	728	O_3, $PM_{2.5}$	PDEQ	SPM	Neighborhood	Population	16670	04-019-1032
Saguaro NP East (3905 S. Old Spanish Trail)	32.174 -110.736	938	O_3, MET, IMPROVE	NPS, PDEQ	Class I, SPM	Neighborhood/ Regional	Maximum Concentration/ Visibility	16474	04-019-0021
Saguaro NP West (N. Sandario Rd. & W. Mile Wide Rd.)	32.248 -111.217	718	Bscat, MET, IMPROVE	ADEQ, NPS	Class I	Regional	Visibility	16475	None
Santa Clara (6910 S. Santa Clara Ave.)	32.125 -110.982	774	PM_{10}	PDEQ	SPM	Neighborhood	Population	16569	04-019-1026
South Tucson (1601 S. 6th Ave.)	32.201 -110.967	738	PM_{10}	PDEQ	SLAMS	Neighborhood	Population	16635	04-019-1001
Tangerine (12101 N. Camino de Oeste)	32.425 -111.063	804	O_3, PM_{10}	PDEQ	SPM	Urban	Background/ Maximum Concentration	16669	04-019-1018
Tucson Downtown (190 W. Pennington St.)	32.222 -110.974	721	CO, O_3	PDEQ	SPM	Neighborhood	Population	16671	04-019-0002
Tucson Fairgrounds (11330 S. Houghton Rd.)	32.047 -110.774	938	O_3	PDEQ	SPM	Urban	Background	16672	04-019-1020

Site Index – Current Ambient Air Monitoring Locations in Arizona									
Site Name and Address	**Lat. Long.**	**Elev. (meters)**	**Parameters Measured**	**Owner**	**Monitor Type**	**Measurement Scale**	**Monitoring Objective**	**AAAD ID Number**	**AQS ID Number**
Tucson Transmissometer Receiver (150 W. Congress St.)	32.221 -110.973	722	Bext, MET	ADEQ, PDEQ	Urban Haze	Urban	Urban Haze	16826	None
Tucson Transmissometer Transmitter (1501 N. Campbell Ave.)	32.240 -110.945	786	Bext	ADEQ, PDEQ	Urban Haze	Urban	Urban Haze	16655	None
Tucson - U of A Central (1100 N. Fremont Ave.)	32.240 -110.955	745	Bscat, MET	ADEQ	Urban Haze	Urban	Visibility	16662	04-019-1027
Pinal County									
Apache Junction Fire Station (3955 E. Superstition Blvd. TE)	33.420 -111.503	533	PM_{10}, $PM_{2.5}$	PCAQCD	SLAMS, SPM	Neighborhood	Population	16358	04-021-3002
Apache Junction Maintenance Yard (305 E. Superstition Blvd.)	33.421 -111.543	533	O_3, MET	PCAQCD	SLAMS	Neighborhood/ Urban	Population/ Transport	16589	04-021-3001
ASARCO - Hayden Junction (Hwy. 177)	33.011 -110.811	582	SO_2	ASARCO	SPM	Neighborhood	Source Impact	16592	None
Casa Grande Airport (660 W. Aero Dr.)	32.954 -111.762	430	O_3, MET	PCAQCD	SLAMS	Neighborhood/ Regional	Population/ Transport	16367	04-021-3003
Casa Grande Downtown (401 Marshall St.)	32.878 -111.752	420	PM_{10}, $PM_{2.5}$	PCAQCD	SLAMS, SPM	Neighborhood	Population	16588	04-021-0001
Combs School (301 E. Combs Rd.)	33.219 -111.560	359	O_3, PM_{10}	PCAQCD	SPM	Neighborhood/ Regional	Population/ Transport	16657	04-021-3009
Coolidge Maintenance Yard (212 E. Broadway Ave.)	32.978 -111.514	445	PM_{10}	PCAQCD	SLAMS	Neighborhood	Population	7446	04-021-3004
Cowtown Road (37580 W. Maricopa-Casa Grande Hwy.)	33.010 -111.972	370	PM_{10}, $PM_{2.5}$, MET	PCAQCD	SPM	Microscale	Population/ Source Impact	19347	04-021-3013
Eloy County Complex (801 N. Main St.)	32.757 -111.554	472	PM_{10}	PCAQCD	SLAMS	Neighborhood	Population	134673	04-021-3014

Site Index – Current Ambient Air Monitoring Locations in Arizona									
Site Name and Address	**Lat. Long.**	**Elev. (meters)**	**Parameters Measured**	**Owner**	**Monitor Type**	**Measurement Scale**	**Monitoring Objective**	**AAAD ID Number**	**AQS ID Number**
Mammoth County Complex (118 S. Catalina Ave.)	32.719 -110.642	890	PM_{10}	PCAQCD	SLAMS	Neighborhood	Background/ Population	16600	04-021-3006
Maricopa County Complex (44625 W. Garvey Rd.)	33.059 -112.047	359	O_3, PM_{10}	PCAQCD	SPM	Neighborhood/ Regional	Population/ Transport	16656	04-021-3010
Pinal Air Park (Water Well # 2, Pinal Air Park Rd.)	32.508 -111.308	581	O_3, PM_{10}	PCAQCD	SLAMS, SPM	Regional	Background/ Transport	16552	04-021-3007
Pinal County Housing Complex (970 N. Eleven Mile Corner Rd.)	32.891 -111.570	440	PM_{10}, MET	PCAQCD	SLAMS, SPM	Neighborhood	Population	18079	04-021-3011
Queen Valley (10 S. Queen Anne Dr.)	33.293 -111.285	668	NO_y, O_3, VOC, Bscat, MET, IMPROVE	ADEQ, PCAQCD	Class I, PAMS, SLAMS, SPM	Urban	Maximum Concentration/ Transport/ Visibility	16394	04-021-8001
Riverside Maintenance Yard (56964 E. Florence Kelvin Hwy.)	33.105 -110.974	540	PM_{10}	PCAQCD	SLAMS	Neighborhood	Source Impact	21429	04-021-3012
Stanfield County Complex (36697 W. Papago Dr.)	32.881 -111.961	395	PM_{10}	PCAQCD	SLAMS, SPM	Neighborhood	Population	16636	04-021-3008
Santa Cruz									
Nogales Post Office (300 N. Morley Ave.)	31.337 -110.936	1,176	PM_{10}, $PM_{2.5}$, MET	ADEQ	SLAMS, SPM	Neighborhood	Population	16511	04-023-0004
Yavapai County									
Cottonwood (199 S. 6th St.)	34.737 -112.021	1,010	PM_{10}	ADEQ	SPM	Neighborhood	Population	134096	None
Phoenix Cement Clarkdale - NW (#2) (NW of cement plant)	34.786 -112.090	1,234	PM_{10}, MET	PCC	SPM	Regional	Source Impact	16626	None

Site Index – Current Ambient Air Monitoring Locations in Arizona									
Site Name and Address	**Lat. Long.**	**Elev. (meters)**	**Parameters Measured**	**Owner**	**Monitor Type**	**Measurement Scale**	**Monitoring Objective**	**AAAD ID Number**	**AQS ID Number**
Phoenix Cement Clarkdale - SE (#1) (SE of CTI fly ash silo)	34.772 -112.073	1,141	PM_{10}, MET	PCC	SPM	Regional	Source Impact	16628	None
Prescott College AQD (330 Grove Ave.)	34.546 -112.476	1,591	O_3, PM_{10}	ADEQ	SPM	Neighborhood	Population	133011	04-025-8033
Prescott Valley (7601 E. Civic Cir.)	34.595 -112.331	1,556	PM_{10}, $PM_{2.5}$	ADEQ	SLAMS	Neighborhood	Population	18392	04-025-2002
Yuma County									
Yuma Agriculture Center Farm (6425 W. 8th St.)	32.713 -114.708	28	MET	ADEQ	SPM	Neighborhood	Population	128530	None
Yuma Courthouse (2440 W. 28th St.)	32.677 -114.648	40	PM_{10}, $PM_{2.5}$	ADEQ	SLAMS	Neighborhood	Population	17027	04-027-0004
Yuma Game & Fish (9140 E. 28th St.)	32.677 -114.475	60	O_3	ADEQ	SLAMS	Neighborhood	Population	18690	04-027-0006
Yuma Mesa (2186 W. County 15th St.)	32.611 -114.633	62	MET	ADEQ	SPM	Neighborhood	Population	19040	None
Yuma Supersite (2323 S. Arizona Ave.)	32.690 -114.614	60	O_3	ADEQ	SLAMS	Neighborhood	Population	113219	04-027-8011
Mexico									
Agua Prieta Fire Station (Calle 6 & Ave. 15)	31.328 -109.547	1,200	PM_{10}, MET	ADEQ	SPM	Neighborhood	Population	16361	80-026-1000
Sonora Nogales Fire Station (Diaz & Ave. Adolfo Lopez Mateos)	31.325 -110.944	1,202	PM_{10}	ADEQ	SPM	Neighborhood	Population	16399	80-026-0005

Information in the site index table is based on the best information available at the date of publication.

For specific site or monitor information please see ADEQ *Air Monitoring Network Plan: For the Year 2009*, Maricopa County AQD *2008 Air Monitoring Network Review*, Pima County DEQ *2008 Ambient Air Monitoring Network Assessment & Plan*, and Pinal County Air Quality Control District *2009 Ambient Monitor Network Plan and 2008 Data Summary*.

Appendix 2 – Acronyms and Abbreviations

AADT	Annual Average Daily Traffic
ADEQ	Arizona Department of Environmental Quality
ADOA	Arizona Department of Agriculture
AgBMP	Agricultural Best Management Practices
APCC	Arizona Portland Cement Company
AQS	Air Quality System
ASARCO	ASARCO LLC – U.S. operating subsidiary of Group Mexico
ASU	Arizona State University
B_{abs}	Light absorption
BACM	Best Available Control Measures
B_{ag}	Light absorption by gasses
BAM	Beta Attenuation Mass Monitor
B_{ap}	Light absorption by particles
BART	Best Available Retrofit Technology
B_{ext}	Light extinction
B_{scat}	Light scattering
B_{sg}	Light scattering by gasses
B_{sp}	Light scattering by particles
CAA	1990 Clean Air Act
CASAC	Clean Air Act Scientific Advisory Committee
CASTNET	Clean Air Status and Trends Network
CBSA	Core Based Statistical Area
CDV	Critical Design Value
CFR	Code of Federal Regulations
Class I	Federally designated park or wilderness area with mandated visibility protection
CO	Carbon monoxide
CSA	Combined Statistical Area
CSN	Chemical Speciation Network
Delta T	Difference between two levels of temperature measurements
DV	Design Value
EPA	U.S. Environmental Protection Agency
FEM	Federal Equivalent Method
FMMI	Freeport McMoRan Copper and Gold, Inc. – Miami
FRM	Federal Reference Method
HAP	Hazardous Air Pollutant
HC	Hydrocarbon
HPA	High Pollution Advisory

IMPROVE	Interagency Monitoring of Protected Visual Environments
km	Kilometer
LMP	Limited Maintenance Plan
m	Meter
MAG	Maricopa Association of Governments
MCAQD	Maricopa County Air Quality Department
MCHD	Maricopa County Health Department
MET	Meteorological measurements (wind, temperature, relative humidity)
Mm^{-1}	Inverse megameter
MSA	Metropolitan Statistical Area
MSM	Most Stringent Measures
NAAQS	National Ambient Air Quality Standards
NADP	National Atmospheric Deposition Program
NATA	National Air Toxics Assessment
NATTS	National Air Toxics Trends Site
NCore	National Core multi-pollutant monitoring stations
NFRM	Notice of Final Rulemaking
NM	National Monument
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_X	Sum of NO and NO_2
NPRM	Notice of Proposed Rulemaking
NPS	National Park Service
O_3	Ozone
PAG	Pima Association of Governments
PAMS	Photochemical Assessment Monitoring Station
Pb	Lead
PCAQCD	Pinal County Air Quality Control District
PCC	Phoenix Cement Company
PDEQ	Pima County Department of Environmental Quality
PM	Particulate Matter
PM_{10}	Particulate Matter $\leq$ 10 microns
$PM_{2.5}$	Particulate Matter $\leq$ 2.5 microns
PM_{coarse}	Particulate Matter between 2.5 and 10 microns
PM_{fine}	Particulate Matter in the region of 2.5 microns
ppm	Parts per million
Pressure	Barometric air pressure
PSD	Prevention of Significant Deterioration
QAPP	Quality Assurance Project Plan
QMP	Quality Management Plan

RASS	Reference Ambient Air Sampler
RFP	Reasonable Further Progress
RH	Relative Humidity
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Station
SO_2	Sulfur Dioxide
SPHPMS	South Phoenix Health and Particulate Matter Study
SPM	Special Purpose Monitor
STN	Speciation Trends Network
TEOM	Tapered Element Oscillating Microbalance
TEP	Tucson Electric Power Company
TSA	Technical System Audit
TSP	Total Suspended Particulates
U of A	University of Arizona
USFS	U.S. Forest Service
VOC	Volatile Organic Compounds
WASBAQS	Western Arizona/Sonora Border Air Quality Study
WESTAR	Western States Air Resources Council
Wind	Wind speed and direction
WRAP	Western Regional Air Partnership
$\mu g/m^3$	Micrograms per cubic meter

Appendix 3 – Related Web sites

Air Explorer (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 System database.

Air Info Now (www.airinfonow.com/)
This site provides information about air quality in the Tucson area, including real time pollutant readings from select monitoring sites and visibility camera images.

AirWeb: Protecting Air Quality (www.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.

American Lung Association (www.stateoftheair.org/)
This Web site provides information about air quality for the U.S. by state and county. There is summary information as well as a detailed report on the condition of air quality.

Arizona Department of Agriculture (ADOA) (www.azda.gov/ACT/AirQuality.htm)
ADOA information on best management practices for agriculture in regards to PM_{10} pollution.

Arizona Department of Environmental Quality (ADEQ) (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 (EPA) (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 will 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 of air-related information, and contact information for experts on specific issues regarding air and environment.

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

The Interagency Monitoring of Protected Visual Environments Project (IMPROVE) (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 their environmental monitoring programs.

Interagency Real Time Smoke Monitoring (www.satguard.com/usfs/default.asp)
This Web site provides real-time smoke concentration data (along with some other meteorological information) from portable smoke monitors around the United States. Historical data from past monitoring efforts are also available.

Maricopa County Air Quality Information (www.maricopa.gov/aq/)
The Maricopa County Air Quality Department's Web site has contains information about the County's air quality program, including current and historical data from the air quality monitoring network.

National Atmospheric Deposition Program (NADP) (nadp.sws.uiuc.edu/)
NADP is a nationwide network of monitoring sites collecting data on the chemistry of precipitation for geographical and temporal long-term trends.

National Oceanic and Atmospheric Administration (NOAA) - Air Quality (www.noaawatch.gov/themes/air_quality.php)
This Web site is general information from NOAA about air quality in the U.S. and the government's role in controlling air pollution.

National Oceanic and Atmospheric Administration (NOAA) Research - Weather and Air Quality (www.oar.noaa.gov/weather/)
NOAA provides information on research on all types of weather (hurricanes, tornadoes, thunderstorms, hazardous weather, etc.), weather related topics, and air quality.

National Park Service (NPS) (www.nature.nps.gov/air)
Information about the air quality and visibility programs run by NPS can be found on this Web site.

National Tribal Environmental Council (NETC) (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 (NWS) (www.nws.noaa.gov)
This Web site contains information about the NWS. There are links to the local NWS Offices' web pages in each state, which contain current and historical forecast and climatological data, along with much more information. The Phoenix office displays ADEQ's and Pinal County's High Pollution Advisories and Health Watches.

Natural Resources Conservation Service (www.az.nrcs.usda.gov/air.html)
U.S. Department of Agriculture gives information regarding air quality and links to helpful resources and information.

Pima County Department of Environmental Quality (PDEQ) (www.deq.co.pima.az.us)
The PCDEQ's Web site has information about air, water, and waste programs in Pima County.

Pinal County Air Quality Control District (PCAQCD)
(pinalcountyaz.gov/Departments/AirQuality/Pages/Home.aspx)
Current air quality information from the PCAQCD monitoring network can be found on this Web site.

Pollen Information (www.pollen.com)
This Web site gives the current pollen status by zip code nation wide.

Smog Blog (alg.umbc.edu/usaq/)
Staff at the University of Maryland, Baltimore write daily about U.S. Air Quality with archives going back to September 23, 2003. Links to other information and sites are also located on this site.

Visibility Information Exchange Web System (VIEWS) (vista.cira.colostate.edu/views/)
The VIEWS is an online exchange of visibility data, research, and ideas designed to support the Regional Haze Rule enacted by the EPA to reduce regional haze in national parks and wilderness areas.

Visibility Web Cameras (www.phoenixvis.net)
This page displays the views of Phoenix from ADEQ's network or cameras. Digital images from Web-based cameras are updated every 15 minutes. Links to other Arizona webcams are listed at this site too.

Weather Underground (www.wunderground.com/US/Region/US/AirQuality.html)
This Web site includes weather forecasts, air quality information, and weather history for cities and countries world wide.

Western Regional Air Partnership (WRAP) (www.wrapair.org)
WRAP is comprised of western states, tribes, and federal agencies with a focus on visibility in parks and wilderness areas in the western U.S.

Western States Air Resources Council (WESTAR) (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}, $PM_{2.5}$, SO_2, CO, and O_3.

O_3 Network
This map shows the location of O_3 monitors owned by ADEQ, private industry, county agencies, and the National Park Service.

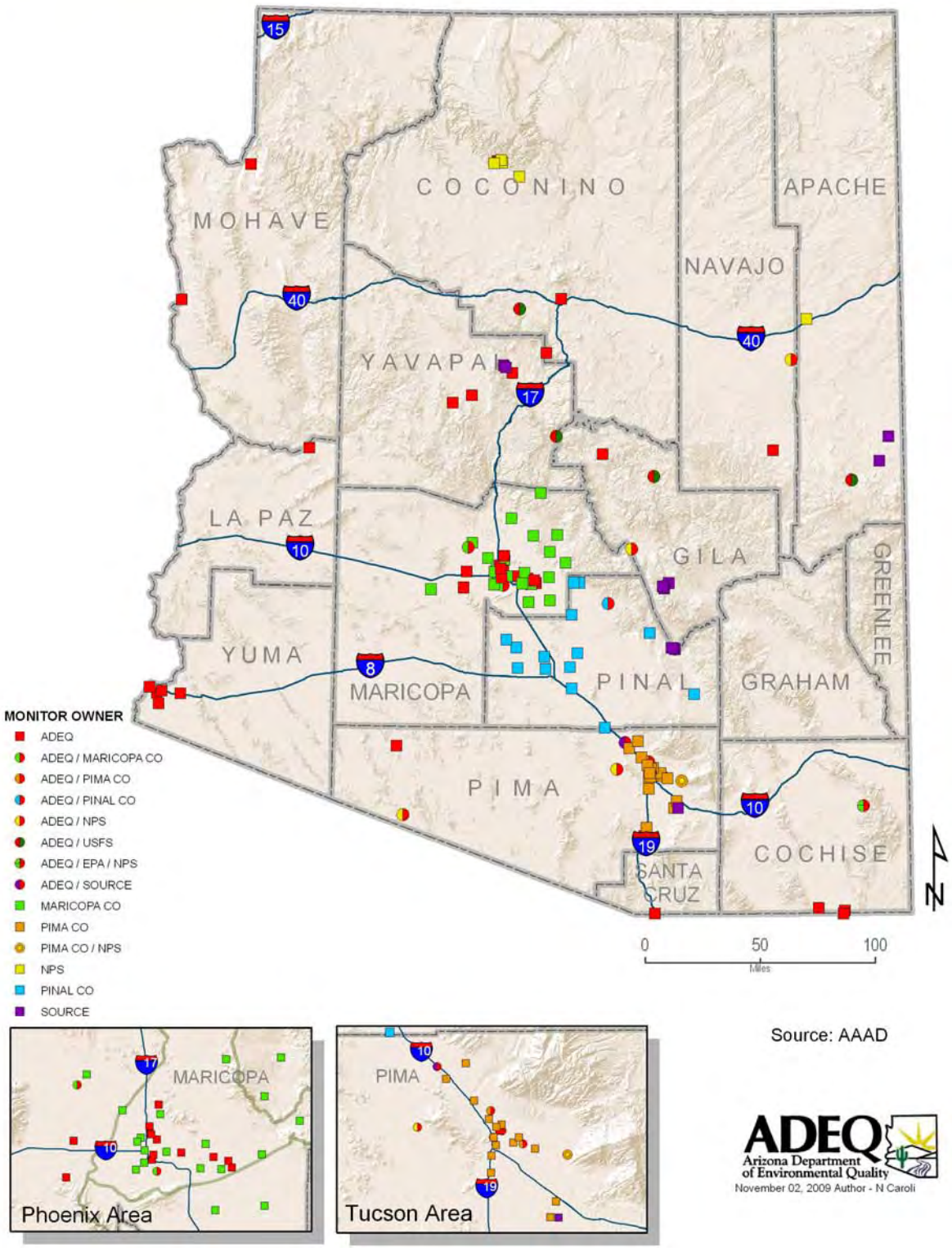
PM_{10} Network
The location of PM_{10} particulate monitors owned by ADEQ, private industry, and county agencies are shown on this map.

$PM_{2.5}$ Network
The location of $PM_{2.5}$ particulate monitors owned by ADEQ and county agencies are shown on this map.

SO_2 Network
This map shows the location of the SO_2 monitors owned by ADEQ, private industry, county agencies, and National Park Service.

Visibility Network
This map shows the location of nephelometers, transmissometers, and cameras owned by ADEQ, county agencies, U.S. Forest Service, and National Park Service.

AMBIENT AIR MONITORS

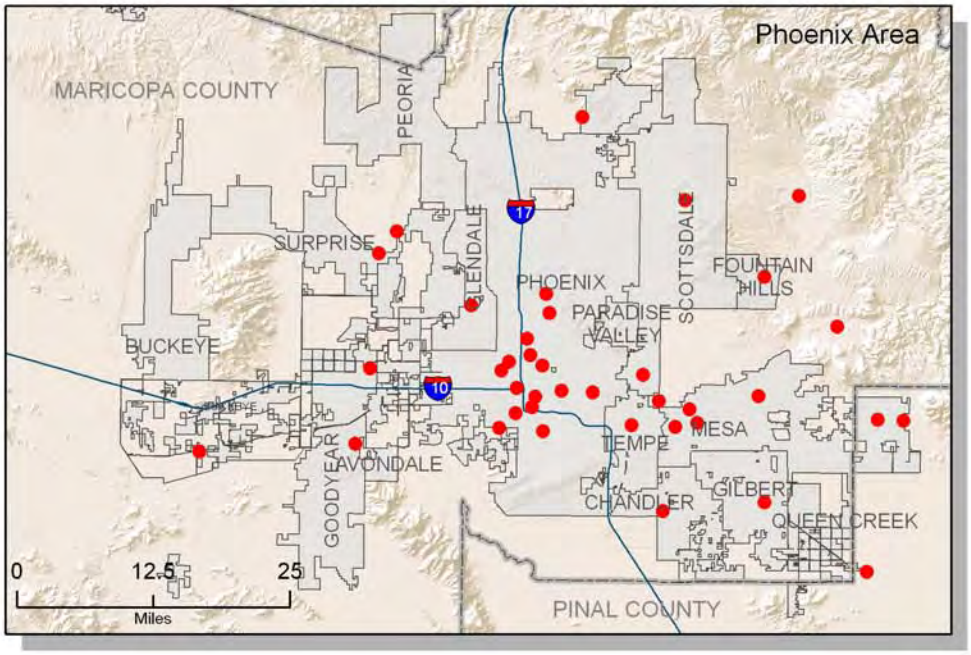


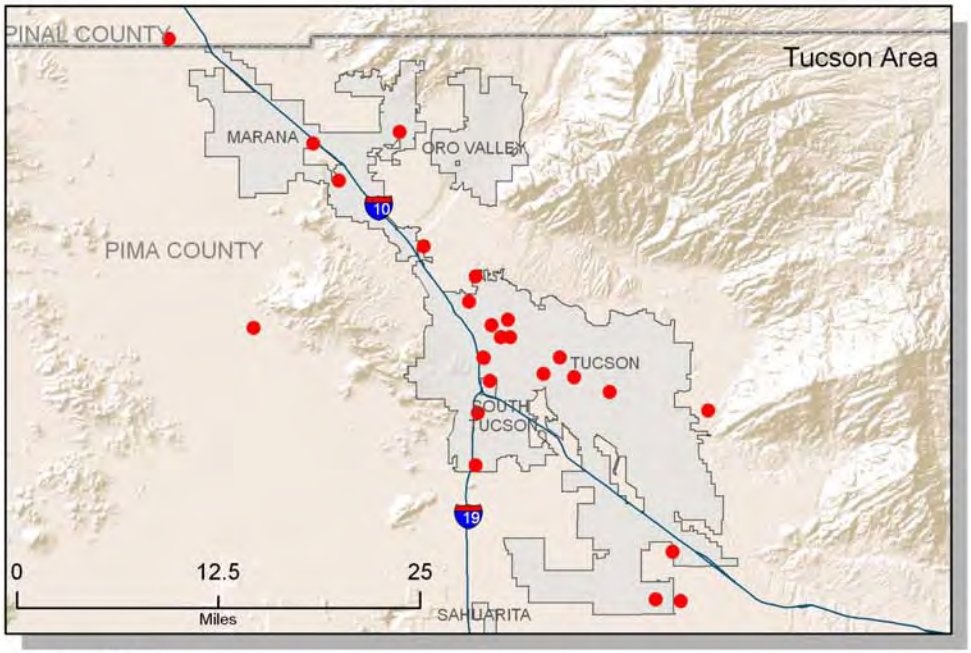
Source: AAAD

ADEQ Arizona Department of Environmental Quality

November 02, 2009 Author - N Caroli

CRITERIA POLLUTANT MONITORING





Source: AAAD

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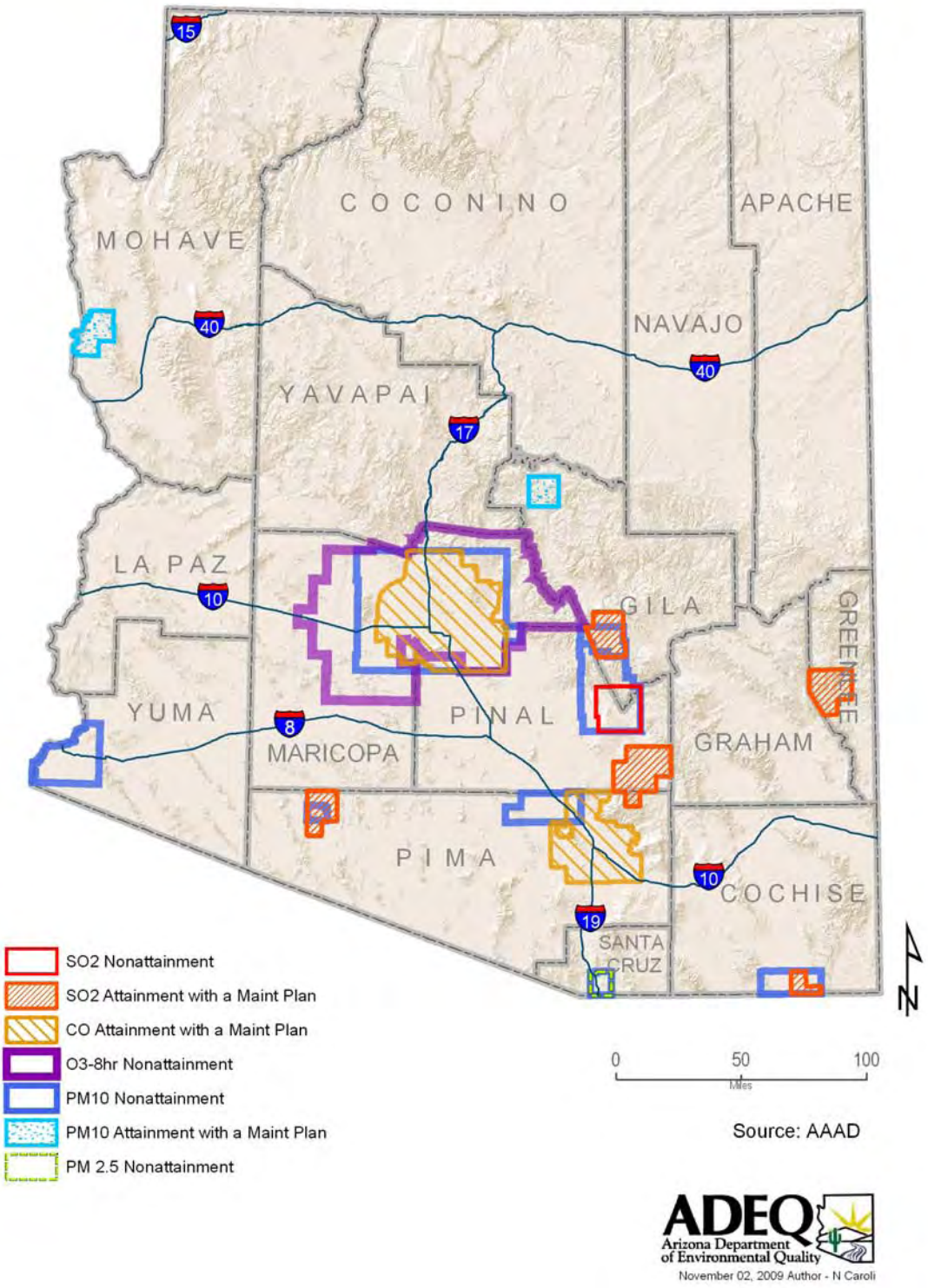
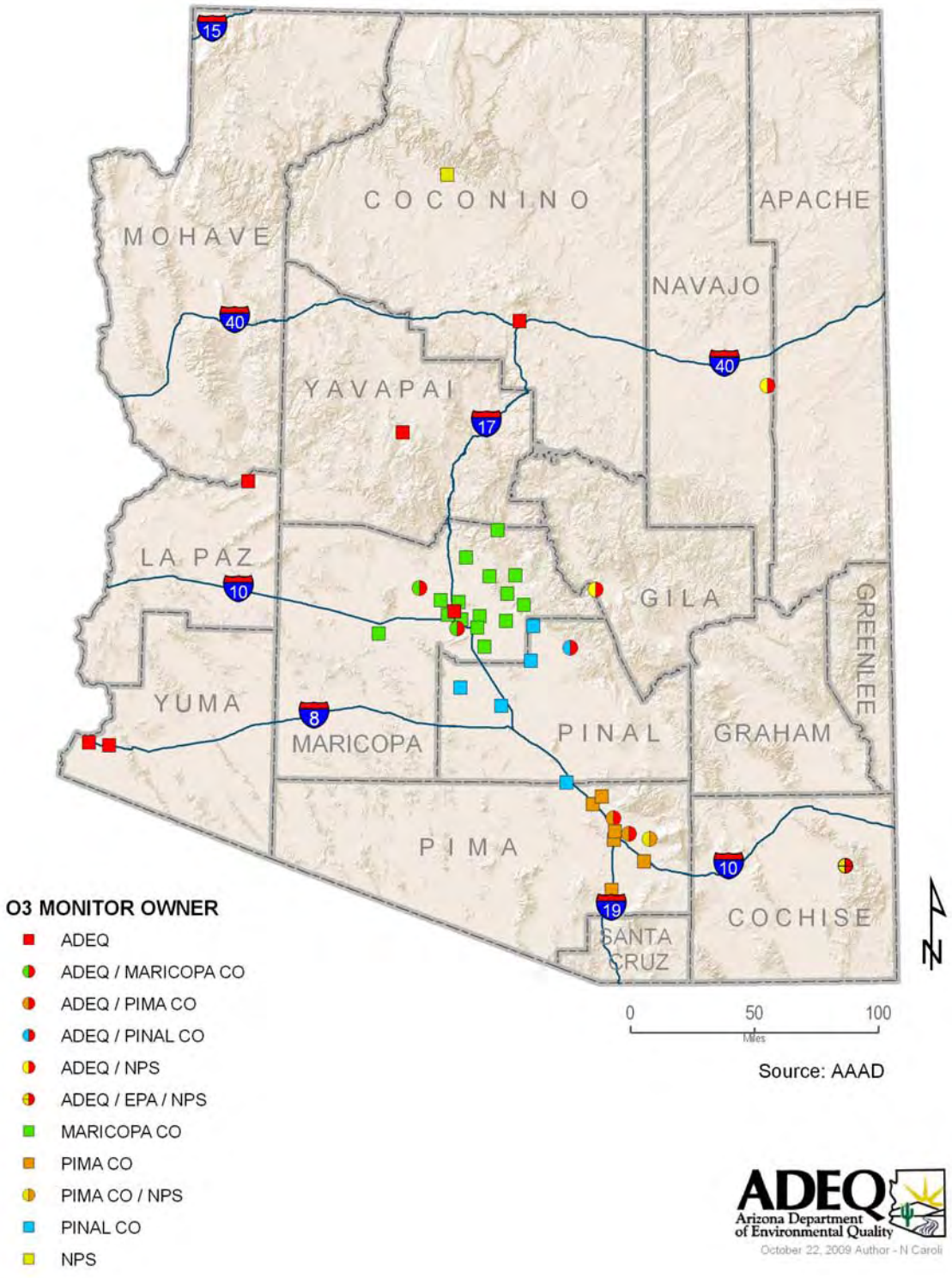
Nonattainment and Attainment Areas



O_3 Network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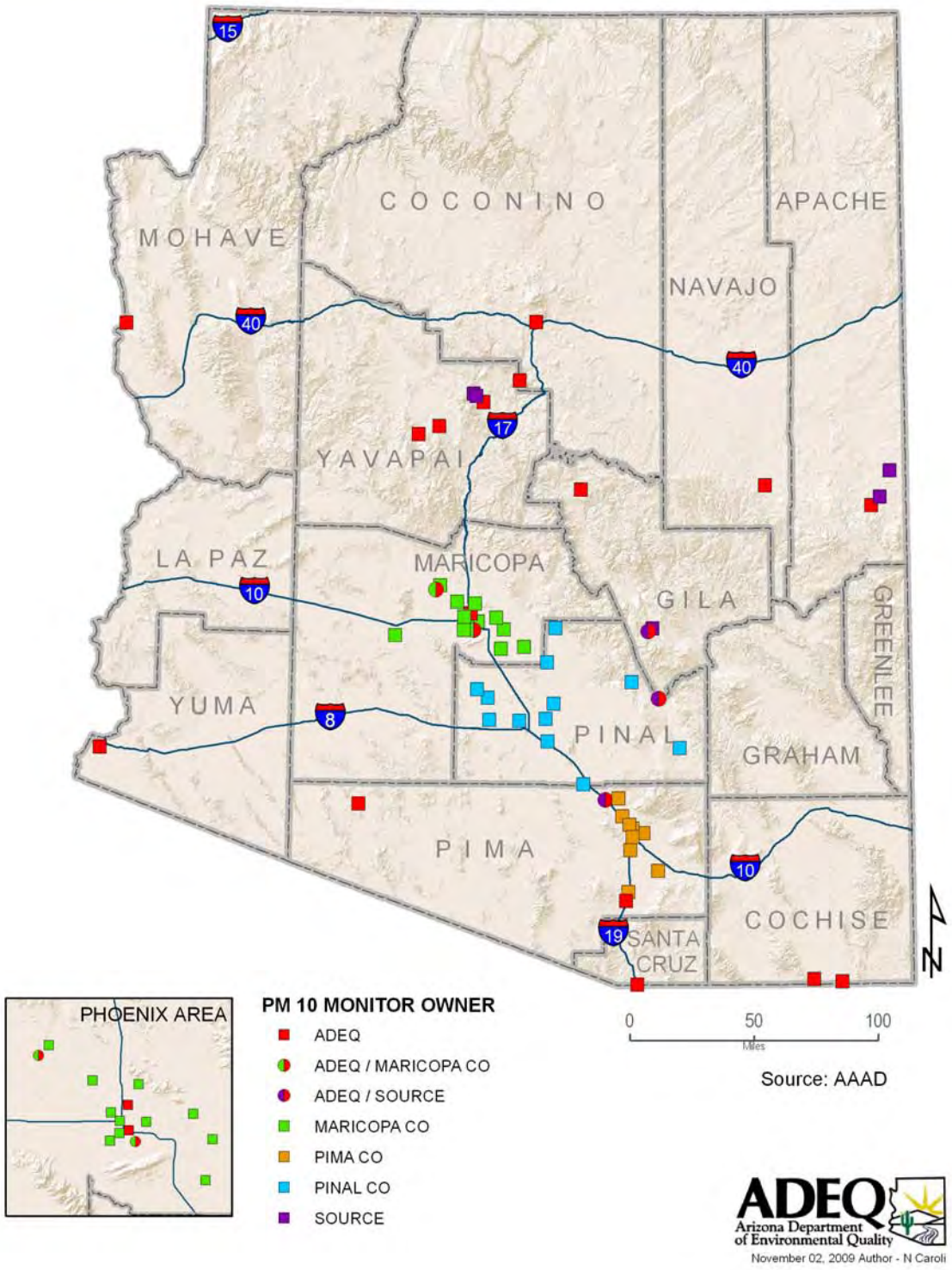
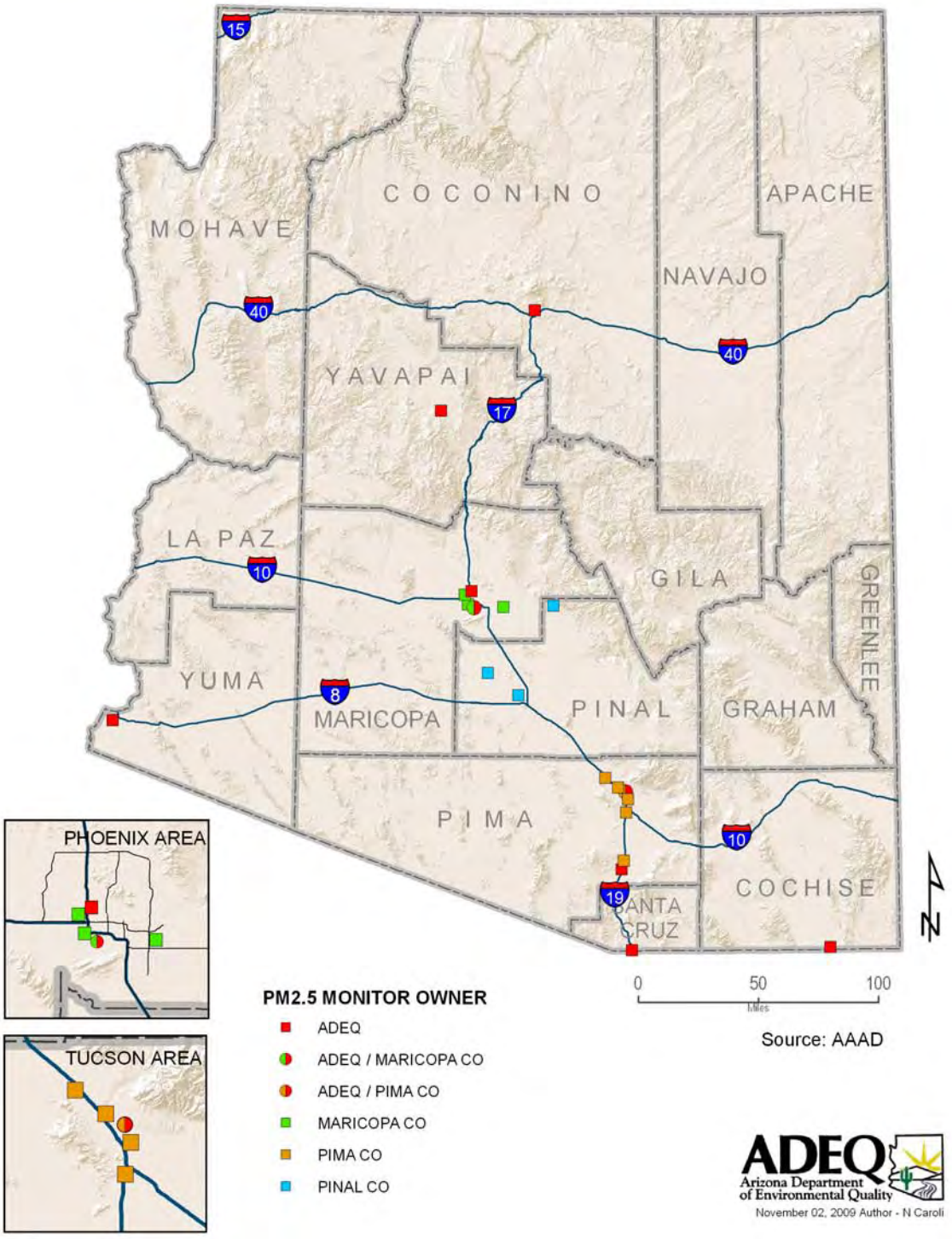
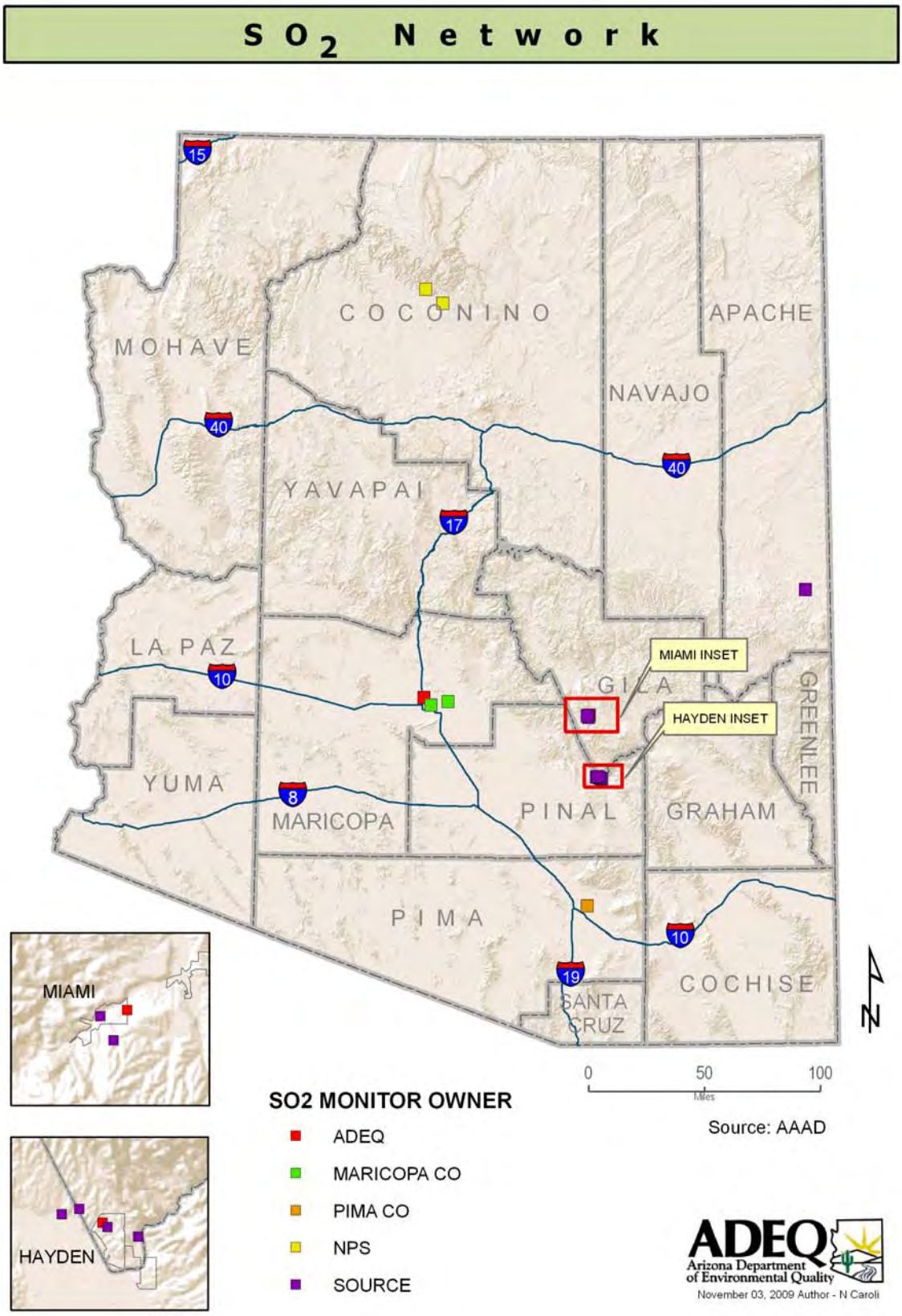
MOHAVE
NAVAJO
YAVAPAI
LA PAZ
GILA
GREENLEE
YUMA
MARICOPA
PINAL
GRAHAM
PIMA
COCHISE
SANTA CRUZ
15
40
17
10
8
19
0
50
100
Miles
N
O3 MONITOR OWNER
ADEQ
ADEQ / MARICOPA CO
ADEQ / PIMA CO
ADEQ / PINAL CO
ADEQ / NPS
ADEQ / EPA / NPS
MARICOPA CO
PIMA CO
PIMA CO / NPS
PINAL CO
NPS
Source: AAAD
ADEQ
Arizona Department of Environmental Quality
October 22, 2009 Author - N Caroli

PM 10 Network



$PM_{2.5}$ Network




SO2 Network
COCONINO
APACHE
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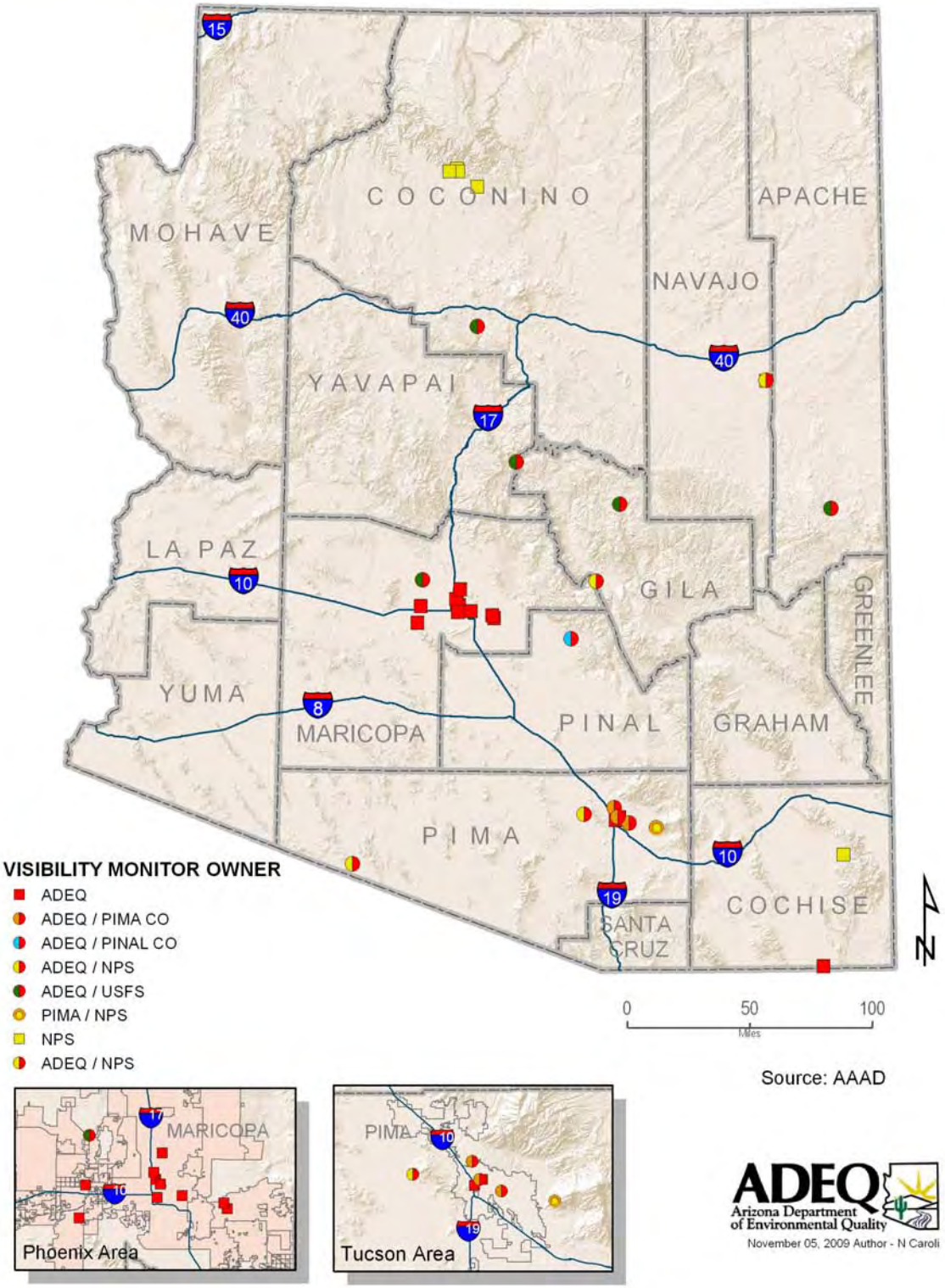
NAVAJO
YAVAPAI
LA PAZ
MIAMI INSET
HAYDEN INSET
GILA
GREENLEE
YUMA
MARICOPA
PINAL
GRAHAM
PIMA
COCHISE
SANTA CRUZ
MIAMI
HAYDEN
0
50
100
Miles
N
SO2 MONITOR OWNER
ADEQ
MARICOPA CO
PIMA CO
NPS
SOURCE
Source: AAAD
ADEQ
Arizona Department of Environmental Quality
November 03, 2009 Author - N Caroli

VISIBILITY NETWORK



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