Maricopa County
Air Quality Department

2010 Air Monitoring Network Review

Prepared by the
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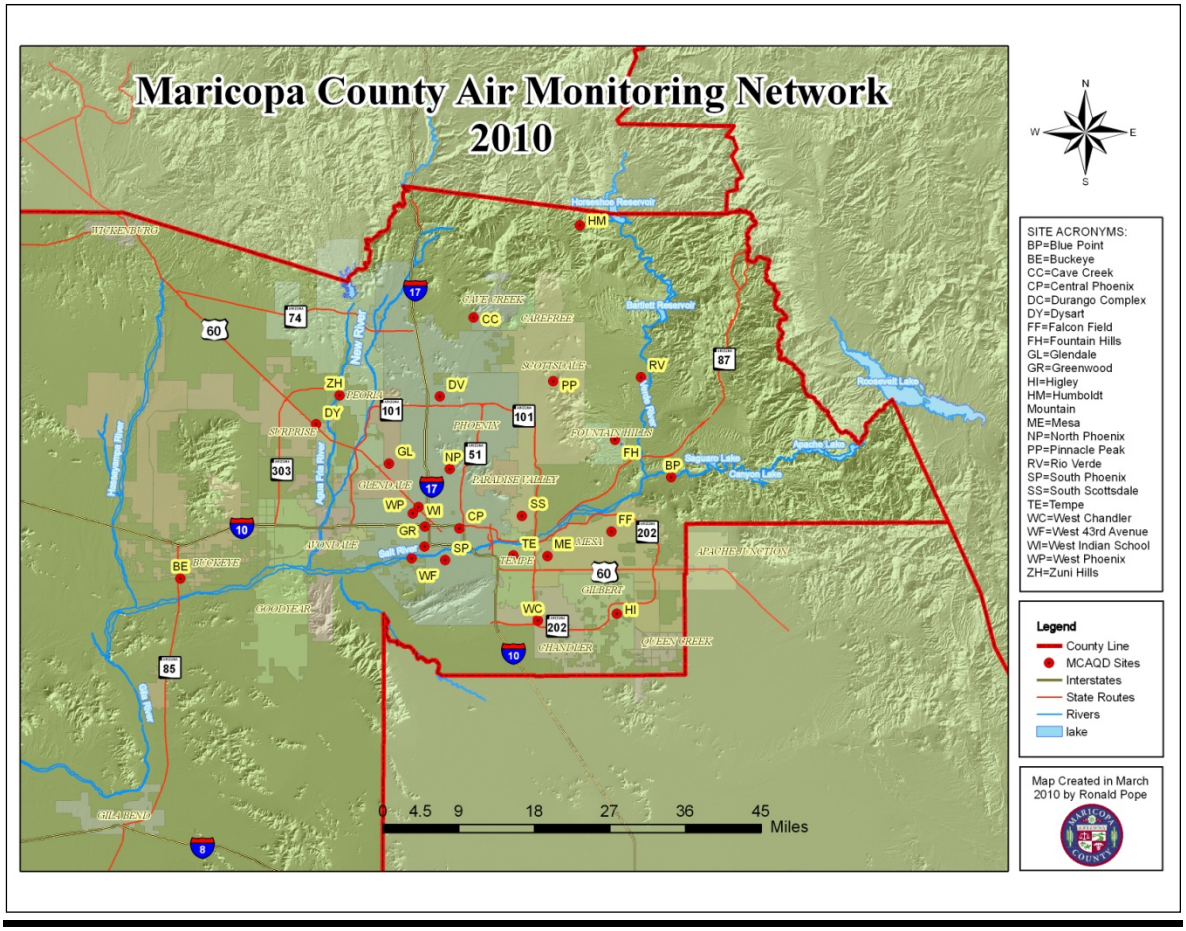

Acknowledgements

In 2010, the Maricopa County Air Quality Department's Air Monitoring Division maintained 25 ambient air monitoring sites throughout Maricopa County. New events happening during the year included the roll-out of our Mobile Air Monitoring Program. The department took possession of its mobile monitoring vehicle and equipment in February 2009 and started to ramp-up the program by conducting training, fine-tuning the equipment, and finally by conducting several monitoring special projects. The Air Monitoring Division now operates with a full staff with some technicians pulling double duty in both ambient monitoring and mobile monitoring.

The department would especially like to thank all of its air monitoring staff for the excellent job they do in maintaining Maricopa County's air monitoring network. They are Ben Davis, Larry Seals, Del Hawkins, Gary Ensminger, Robert Dyer, Ronald Pope, John Neff, Tom Shorb, Dale Foster, Chris Hernandez, Hugh Tom, Charles Miller, Alex Herrera, Dan Speigelberg, Tom Dubishar, Michael Gardner and Reynaldo Santillano.

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2009 Maricopa County Air Quality Department Air Monitoring Division staff

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ABSTRACT

This 2010 Annual Air Monitoring Network Review is respectfully submitted by the Maricopa County Air Quality Department[1] (MCAQD) to the United States Environmental Protection Agency (US EPA) Region 9. The Air Monitoring Network Review evaluates the adequacy of the ambient air monitoring network with respect to the monitoring objectives and spatial scales. This annual assessment is required by 40 CFR Part 58, Subpart B. Network changes, special projects, and 3-year data summaries are included in the review. This network review is also preliminary to our annual data certification with the US EPA and helps us assess the quality of our data before submitting for data certification. This network review has the secondary purpose of informing the public of the criteria air pollutants that can affect their health, how MCAQD monitors these criteria pollutants, and what the actual readings are so that our citizens can make informed decisions regarding their lifestyles.

[1] The functions of the former Air Quality Division of the Maricopa County Environmental Services Department (MCESD) were transferred to the newly-created Air Quality Department in November 2004.

DEFINITION OF TERMS

ADEQ: Arizona Department of Environmental Quality.

AQI: Air Quality Index. An index that is applicable to all pollutants which show the concentration of pollutant relative to its respective standard. When the AQI reaches 100 the concentration has exceeded the NAAQS.

AQS: Environmental Protection Agency's Air Quality System

Attainment: This refers to the NAAQS used to comply with the federal Clean Air Act. After several years of no violations of the NAAQS, the EPA can classify the area as in attainment for that pollutant.

AWT: Average Weekday Traffic count.

CFR: Code of Federal Regulations.

Class I: Federally designated park or wilderness area with mandated visibility protection.

CO: Carbon monoxide.

Continuous monitoring: A method of monitoring air pollutants that is continually measuring the quantity of the pollutant, either gaseous or particulate. Continuous monitors can be used to obtain real-time or short-term averages of pollutants.

Criteria Pollutants: Six pollutants (CO, Lead, NO_2, O_3, Particulates, and SO_2) that have NAAQS established by the US EPA.

Delta T: Difference between two levels of temperature measurements. Delta T is measured in the MCAQD network at heights of 2 and 10 meters. A higher temperature at the upper level indicates a temperature inversion.

Design Value: A design value is a statistic that describes the air quality status of a given area relative to the level of the NAAQS. For a concentration-based standard, the air quality design value is simply the standard-related test statistic. The design value of a pollutant monitoring network is the highest sample value in the network used to compare to the NAAQS; e.g. the 24-hour $PM_{2.5}$ design value for the network is the monitor with the highest 3-year average of the 98^{th} percentile.

EPA: U. S. Environmental Protection Agency.

Exceptional Events: An uncontrollable event caused by natural sources of pollution or an event that is not expected to recur at a given location. The ADEQ makes the determination of which events to classify as exceptional; they then petition the EPA for acceptance of the classification. If the EPA accepts the petition, the measured pollution event will not be used in determination of compliance with the NAAQS.

FDMS-TEOM: Filter Dynamics Measurement System-Tapered Element Oscillating Microbalance. A continuous particulate measuring instrument used by MCAQD to measure $PM_{2.5}$.

FEM: Federal Equivalency Method. An official method, i.e. equipment and procedure, of monitoring air pollution that has been determined to produce results similar to the Federal Reference Method (FRM).

Filter-based Monitor A method of monitoring particulate pollution that involves exposing a pre-weighed filter to a specific flow volume of air to capture the particulates in the air. The filters are then post-weighed to determine the weight of particulates per volume, e.g. $\mu g/m^3$. Filter-based monitors used by MCAQD are all FRM monitors.

FRM: Federal Reference Method. An official method, i.e. equipment and procedure, of monitoring air pollution that has been tested and determined to produce results that accurately measure air pollution with acceptable precision. These methods are the baseline that all other methods, e.g. Federal Equivalency Methods (FEM), refer to.

HAPs Hazardous air pollutants. An air-born chemical that has been listed in the federal Clean Air Act and has an associated standard or process requirement determined for it.

MAG: Maricopa Association of Governments

MCAQD: Maricopa County Air Quality Department.

µg/m^3:	Microgram per cubic meter.
MSA:	Metropolitan Statistical Area. A geographical area designated by the federal government based on the concept of a core area with a large population nucleus, plus adjacent communities having a high degree of economic and social integration with that core. The MCAQD operates within the Phoenix-Mesa MSA which includes portions of Maricopa and Pinal County.
NAAQS:	National Ambient Air Quality Standards. A health and welfare-based standard that is set by the US EPA to qualify allowable levels of criteria pollutants.
NCORE:	National Core Multi-Pollutant Site. A national network of multi-pollutant monitoring sites used to represent the nation as a whole. There are currently ~75 NCORE sites (1-3 per state plus Washington DC, Virgin Islands, and Puerto Rico) located in both urban and rural areas.
NO_2:	Nitrogen dioxide.
NO_X:	Nitrogen oxides. Sum of nitric oxide (NO), NO_2, and other nitrogen-containing compounds.
O_3:	Ozone.
Pb:	Lead.
PM:	Particulate matter. Material suspended in the air in the form of minute solid particles or liquid droplets.
$PM_{2.5}$:	Particulate matter of 2.5 Microns in diameter or smaller
PM_{10}:	Particulate matter of 10 Microns in diameter or smaller.
PPB:	Parts per billion.
PPM:	Parts per million.
Primary Standard:	One portion of the NAAQS. These standards are designed to protect the public health.
Secondary Standard:	One portion of the NAAQS. These standards are designed to protect the public health.
SIP:	State Implementation Plan. SIPs are a collection of state and local regulations and plans to achieve healthy air quality under the Clean Air Act.
SLAMS:	State and Local Air Monitoring Station. The SLAMS consist of a network of approximately 5,000 monitoring stations nationwide whose size and distribution is largely determined by the needs of State and local air pollution control agencies to meet their respective State implementation plan (SIP) requirements. Other types of monitoring stations include NCORE (national core) and SPM (special purpose) monitors. Maricopa County does not currently operate any NCORE sites and only operates one SPM site.
SO_2:	Sulfur dioxide.
SPM:	Special purpose monitor. Special Purpose Monitoring Stations provide for special studies needed by the State and local agencies to support State implementation plans and other air program activities. The SPMs are not permanently established and can be adjusted easily to accommodate changing needs and priorities.
SSI:	Size Selective Inlet. SSI High Volume Samplers are filter-based instruments used by MCAQD to measure PM_{10}.
TEOM	Tapered Element Oscillating Microbalance. A continuous particulate measuring instrument used by MCAQD to measure PM_{10}.
VOC:	Volatile organic compounds. VOCs are chemical compounds that can easily vaporize and enter the atmosphere. There are many natural and artificial sources of VOCs; solvents and gasoline make up some of the largest artificial sources. VOCs will react with NO_x in the presence of sunlight to create ground-level ozone pollution.

CRITERIA POLLUTANT INFORMATION

Abstract of Pollutants

Certain air pollutants, called "criteria air pollutants," are common throughout the United States. These pollutants can cause health problems, harm the environment, and cause property damage. These criteria pollutants are so named since the US EPA has regulations, called the National Ambient Air Quality Standards (NAAQS), on allowable levels of these substances using health-based criteria. One set of limits, called "primary standards," protect health, while another set of "secondary standards", are designed to protect property and the environment. The US EPA names the following pollutants as criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulates (PM_{10} & $PM_{2.5}$), and sulfur dioxide (SO_2). MCAQD operates monitors for the following criteria pollutants: carbon monoxide, ozone, particulates, nitrogen dioxide, and sulfur dioxide. In addition, the department began to monitor for lead in July 2010 to meet new federal requirements. Lead hasn't been monitored in Maricopa County since 1997.

Causes and Characteristics of Pollutants

Carbon Monoxide:
CO is the most widely distributed and most commonly occurring air pollutant. Total emissions of CO to the atmosphere exceed all other pollutants combined, on a weight basis. Fortunately, CO does not persist in the atmosphere, but is quickly converted to carbon dioxide (CO_2). CO can reach dangerous levels in localized areas or hotspots such as heavily traveled intersections or city streets. In addition, CO has been implicated in ozone formation. Most people are familiar with CO and are aware that automobiles produce this deadly odorless and colorless gas. In Maricopa County, more than 70% of all anthropogenic CO comes from motor vehicle emissions. In fact, this gas is produced almost anytime something is burned. All substances that are living (plants, animals) or that were once living (wood, coal, oil, gasoline) are composed of carbon compounds. If these substances are burned in the presence of sufficient oxygen, the carbon is converted to CO_2 gas. If, as is often the case, not enough oxygen is present, carbon monoxide gas is produced.

Carbon monoxide's danger lies in the extremely strong affinity that hemoglobin has for it. Hemoglobin, the special oxygen-transporting material in the red blood cell, has approximately 200 times stronger affinity for CO than for oxygen. Therefore, if both CO and O_2 are present the bonding between the CO and hemoglobin will prevent the O_2 from exchanging within a person's body. This puts a heavy burden on people with heart disease and can aggravate angina, but even healthy people can suffer from harmful side effects from CO.

In 2010 Maricopa County achieved its 14^{th} consecutive year of compliance with the eight-hour CO standard.

Lead:
Lead is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been motor vehicles (such as cars and trucks) and industrial sources. Due to the phase out of leaded gasoline, metals processing is the major source of lead emissions to the air today. The highest levels of lead in air are generally found near lead smelters. General aviation airports are also a significant source of lead, as general aviation fuel still contains lead additives. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers. In the early 1970s, EPA set national regulations to gradually reduce the lead content in gasoline. In 1975, unleaded gasoline was introduced for motor vehicles equipped with catalytic converters. EPA banned the use of leaded gasoline in highway vehicles in December 1995. Primarily as a result of EPA's regulatory efforts to remove lead from gasoline, levels of lead in the air have decreased by 94 percent between 1980 and 1999.

Following the removal of lead from automotive fuel, levels of airborne lead in Maricopa County were drastically reduced. Because concentrations were consistently below national levels, Maricopa County was

allowed to discontinue ambient air monitoring for lead in 1997. However, recent changes in the lead monitoring regulations have brought the need to resume monitoring activities in Maricopa County. In July 2010, MCAQD opened a new lead monitoring site at Deer Valley airport. Deer Valley airport is the busiest general aviation airport in the county, and thus the largest expected source of lead emissions. Results from the first six months of monitoring have shown that ambient levels of lead are still well below the air quality standard, even with the much more stringent regulations.

Nitrogen Dioxide:
NO_2 belongs to a family of highly reactive gases called nitrogen oxides. These gases are formed when fuel is burned at high temperatures, and are emitted primarily from automobile exhaust and power plants. Exposure to nitrogen dioxide can irritate the lungs and lower resistance to respiratory infections, particularly in people with existing respiratory illness such as asthma. Maricopa County is currently in attainment status for NO_2.

Ozone:
O_3 is a naturally occurring compound in which three oxygen atoms combine together. This is an unstable combination, and ozone is continually going through a natural cycle of being formed and then converting back to the more stable "normal" double oxygen compound (O_2). The cycle occurs fairly rapidly. In the stratosphere (six miles and more above the earth), naturally occurring ozone has a beneficial effect of screening out harmful ultraviolet light from the sun. However, ground-level ozone is a pollutant and is a component of the regional smog that affects the valley. Ozone is not directly emitted into the air, but rather forms in a complex reaction that involves heat, sunlight, and a "soup" of toxic pollutants, especially volatile organic compounds (VOCs). Some of the most common sources of VOCs are gasoline vapors, chemical solvents, and combustion products of fuels and consumer products. Ozone is created by sunlight acting on nitrates (NO_X) and VOCs from motor vehicles and stationary sources, and can be carried hundreds of miles from their origins. Ozone affects the respiratory system in people and animals, and also affects the growth of plants.

Maricopa County is currently in non-attainment for Ozone pollution, although the number of violations of the standard had been decreasing in recent years. However, in February 2008, the EPA lowered the NAAQS for ozone from 0.08 ppm to 0.075 ppm. Many of the ozone monitoring sites were in borderline compliance with the older standard and now are exceeding the new standard. Strategies will have to be developed to lower ambient ozone levels into compliance with the new standard, improving air quality for all.

Particulate Matter:
Particulate matter is the term for solid or liquid particles found in the air. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. While some particles are large or dark enough to be seen as soot or smoke, others can only be seen through an electron microscope. In 1987 the EPA replaced the Total Suspended Particulates (TSP) air quality standard with a standard for PM_{10} (particles measuring ten microns or less). Health research studies have found that PM_{10} has the ability to reach the lower regions of the respiratory tract, and thus can affect the respiratory system in both humans and animals. Particulates with high acid levels can cause damage to man-made materials and reduce visibility.

The size of particles is directly linked to their potential for causing health problems. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. EPA groups particle pollution into two categories:

- "Coarse particles," such as those found near roadways and dusty industries, range in size from 2.5 to 10 microns in diameter.
- "Fine particles," such as those found in smoke and haze, have diameters smaller than 2.5 microns. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air.

Maricopa County is currently in non-attainment for PM_{10} (although we are in attainment for $PM_{2.5}$), nor have we met the requirements set forth in our State Implementation Plan (SIP). As a result of this, the EPA is implementing a 5% reduction of emissions plan, including the possibility of sanctions. This plan, which is required by the Clean Air Act, will continue until Maricopa County can bring the particulate matter pollution into compliance.

Sulfur Dioxide:
SO_2 is emitted (in gaseous form) largely from burning high-sulfur coal, oil, and diesel fuel. Because this gas is usually found in association with particulate pollution, as SO_2 is the precursor for fine sulfate particles, separating the health effects of these two pollutants is difficult. Together SO_2 and $PM_{2.5}$ make up a major portion of the pollutant load in many cities, acting separately and in concert to threaten public health. SO_2 contributes to respiratory illness, particularly in children and the elderly, and aggravates existing heart and lung diseases. SO_2 contributes to the formation of acid rain, and it contributes to the formation of atmospheric particles that cause visibility impairment, most noticeably in national parks. SO_2 and the pollutants formed from SO_2, such as sulfate particles, can be transported over long distances and deposited far from the point of origin. This means that problems with SO_2 are not confined to areas where it is emitted.

Maricopa County is in attainment for Sulfur Dioxide.

National Ambient Air Quality Standards

The EPA Office of Air Quality Planning and Standards (OAQPS) manages programs to improve air quality in areas where the current quality is unacceptable and to prevent deterioration in areas where the air is relatively free of contamination. To accomplish this task, OAQPS establishes the National Ambient Air Quality Standard (NAAQS) for each of the criteria pollutants (see Table 1).

There are two types of standards. Primary standards protect against adverse health effects; secondary standards protect against welfare effects, such as damage to farm crops and vegetation and/or damage to buildings. Because different pollutants have different effects, the NAAQS are also different. Some pollutants have standards for both long-term and short-term averaging times. The short-term standards are designed to protect against acute, or short-term, health effects, while the long-term standards are established to protect against chronic health effects. Table 1 lists the NAAQS for the six criteria pollutants.

Table 1 National Ambient Air Quality Standards

Pollutant	Primary Standards	Averaging Times	Secondary Standard
Carbon Monoxide	9 ppm	8-hour[a]	None
	35 ppm	1-hour[a]	None
Lead	0.15 µg/m^3	Rolling 3-Month Average	Same as Primary
	1.5 µg/m^3	Quarterly Average	Same as Primary
Nitrogen Dioxide	0.053 ppm	Annual (Arithmetic Mean)	Same as Primary
	100 ppb	1-hour[b]	
PM_{10}	150 µg /m^3	24-hour[c]	Same as Primary
$PM_{2.5}$	15 µg/m^3	Annual[d] (Arithmetic Mean)	Same as Primary
	35 µg/m^3	24-hour[e]	Same as Primary
Ozone	0.075 ppm	8-hour[f]	Same as Primary
Sulfur Oxides	0.03 ppm	Annual (Arithmetic Mean)	-------
	0.14 ppm	24-hour[a]	-------
	75 ppb	1-hour[g]	-------
		3-hour[a]	0.5 ppm

[a] Not to be exceeded more than once per year.

[b] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb.

[c] Not to be exceeded more than once per year on average over 3 years.

[d] To attain this standard, the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15 µg/m^3.

[e] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3.

[f] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm.

[g] To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

Abstract of MARICOPA COUNTY AIR QUALITY DEPARTMENT Pollution Monitoring Strategies

MCAQD monitors for these criteria pollutants by maintaining twenty-five ambient air-monitoring sites throughout Maricopa County. The dates that the sites were established range from 1961 (Central Phoenix) to 2009 (Zuni Hills). Land use patterns around these sites vary from heavy populated urban areas to sparsely populated rural settings. Site elevations range from 845 feet above sea level (Buckeye) to 5190 feet above sea level at the top of Humboldt Mountain. Not all pollutants are measured at all sites; some sites measure most of the pollutants, while others only measure one or two pollutants.

The following section will detail how the department designs its air monitoring network to obtain representative samples of these air pollutants. Following this will be details of the results obtained from our 2010 sampling season.

NETWORK DESIGN

Purpose and Objective of the Network

The purpose of the ambient air monitoring network is to assess the extent of air pollution, ensure compliance with national legislation, evaluate control options, and provide data for air quality modeling. In general, six basic monitoring objectives and five measuring scales are used to determine the network design (see Table 2 and Table 3). Additional considerations such as availability of power, accessibility to site, security, geographic location, and fiscal and personnel resources are also addressed in determining the feasibility of the network design.

Table 2 Site Monitoring Objectives

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 from populated areas, with regards to the secondary standards (such as visibility impairment and effects on vegetation).
6. Determine the welfare-related impacts in more rural and remote areas.

To establish or evaluate a site, one must link its monitoring objectives to the physical location of the site. This can be done by matching the spatial scale, which represents the sample of air around the monitor where pollutant concentrations are reasonably uniform, with the most appropriate monitoring objective. Thus, spatial scale represents the physical dimensions of the air parcel around the monitor, and monitoring objective represents the overall purpose of the monitor. Combining the proper spatial scale with the monitoring objective explains why air monitoring sites are located in particular areas.

Table 3 Spatial Measurement Scales

Scale	Defined parameter (radius)
Micro Scale	0 to 100 meters
Middle Scale	100 to 500 meters
Neighborhood Scale	0.5 to 4 kilometers
Urban Scale	4 to 50 kilometers
Regional Scale	10 to 100s of kilometers

Since it is physically and fiscally impossible to monitor air quality in every location, representative samples must be obtained. The optimal locations for obtaining these samples are determined by using the monitoring objectives and the spatial measurement scales described above. For example, there might be numerous locations where the highest concentration of carbon monoxide may occur. Using these principles, only one or two sites will be established to represent all of the high-concentration areas. The same reasoning can be used for different types of pollutants. This does not mean that the number of monitoring sites is fixed. To the contrary, the network must be dynamic enough to maintain a current representative sample of the air quality.

Overview of the Maricopa County Air Quality Department's Air Monitoring Network

The Phoenix Metropolitan Area has a population of over 3.9 million people (2008 US Census estimate). The EPA has mandated a minimum number of monitors required to properly represent this population. MCAQD has designed its network, using the concepts of scale and objective mentioned previously, to meet and in most cases exceed these EPA requirements (see "Required General Information on Monitoring Network" in Appendix II).

Altogether, the department operated a network of 25 monitoring sites in 2010. The following image details the location of these sites and gives the abbreviation symbols used by Maricopa County. Table 4 and Table 5, which follows, gives the AQS code assigned to each site and details which criteria pollutant is monitored at which site along with the monitor designation, respectively. Table 6 and Table 7 give more specific information about the location of the sites and the types and numbers of monitors at each site, respectively.

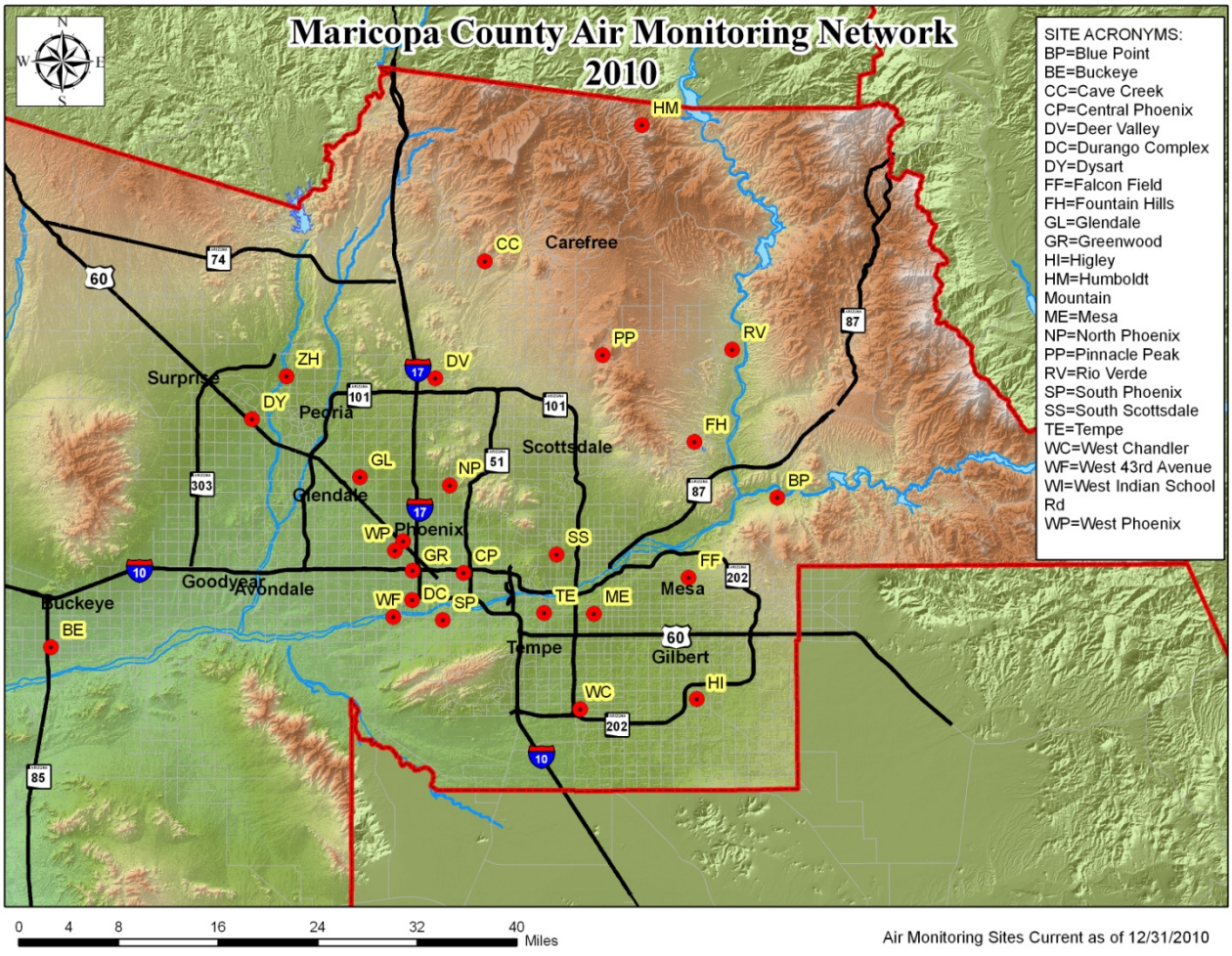

Figure 1 Maricopa County Air Monitoring Sites for 2010

Table 4 Maricopa County Ambient Air Monitoring Sites for 2010

Site Name	Site Abbr.	AQS Code
Blue Point	BP	04-013-9702
Buckeye	BE	04-013-4011
Cave Creek	CC	04-013-4008
Central Phoenix	CP	04-013-3002
Deer Valley	DV	04-013-4018
Durango Complex	DC	04-013-9812
Dysart	DY	04-013-4010
Falcon Field	FF	04-013-1010
Fountain Hills	FH	04-013-9704
Glendale	GL	04-013-2001
Greenwood	GR	04-013-3010
Higley	HI	04-013-4006
Humboldt Mountain	HM	04-013-9508

Site Name	Site Abbr.	AQS Code
Mesa	ME	04-013-1003
North Phoenix	NP	04-013-1004
Pinnacle Peak	PP	04-013-2005
Rio Verde	RV	04-013-9706
South Phoenix	SP	04-013-4003
South Scottsdale	SS	04-013-3003
Tempe	TE	04-013-4005
West Chandler	WC	04-013-4004
West 43rd Ave.	WF	04-013-4009
W. Indian School Rd.	WI	04-013-0016
West Phoenix	WP	04-013-0019
Mesa	ME	04-013-1003
Zuni Hills	ZH	04-013-4016

Table 5 Criteria Pollutants Monitored, by Site and Network

Site	CO	Pb	O_3	$PM_{2.5}$	PM_{10}	NO_2	SO_2
Blue Point			SLAMS				
Buckeye	SLAMS		SLAMS		SLAMS	SLAMS	
Cave Creek			SLAMS				
Central Phoenix	SLAMS		SLAMS		SLAMS	SLAMS	SLAMS
Deer Valley		SLAMS					
Durango Complex				SLAMS	SLAMS		
Dysart	SLAMS		SLAMS		SLAMS		
Falcon Field			SLAMS				
Fountain Hills			SLAMS				
Glendale	SLAMS		SLAMS		SLAMS		
Greenwood	SLAMS				SLAMS	SLAMS	
Higley					SLAMS		
Humboldt Mountain			SLAMS				
Mesa	SLAMS			SLAMS	SLAMS		
North Phoenix	SLAMS		SLAMS		SLAMS		
Pinnacle Peak			SLAMS				
Rio Verde			SLAMS				
South Phoenix	SLAMS		SLAMS	SLAMS	SLAMS		
South Scottsdale	SLAMS		SLAMS		SLAMS	SLAMS	SLAMS
Tempe	SLAMS		SLAMS				
West Chandler	SLAMS		SLAMS		SLAMS		
West 43rd Ave.					SLAMS		
W. Indian School Rd.	SLAMS						
West Phoenix	SLAMS		SLAMS	SLAMS	SLAMS	SLAMS	
Zuni Hills					SPM		

SLAMS=State and Local Monitoring Station; SPM=Special Purpose Monitoring Station

Table 6 Site Location

Site	Latitude	Longitude	Site Location	AQS Code
BP	33.54549	-111.60925	Usery Pass & Bush Highway	04-013-9702
BE	33.37005	-112.62070	MC85 & HWY 85	04-013-4001
CC	33.82169	-112.01739	32nd St. & Carefree Highway	04-013-4008
CP	33.45793	-112.04601	19th St & Roosevelt	04-013-3002
DV	33.684627	-112.08635	10th Ave. & Deer Valley Rd.	04-013-4018
DC	33.42650	-112.11814	27th Ave. & Durango St.	04-013-9812
DY	33.63713	-112.34184	Bell Rd. & Dysart Rd.	04-013-4010
FF	33.45223	-111.73331	McKellips & Greenfield	04-013-1010
FH	33.61103	-111.72529	Palisades & Fountain Hills Blvd.	04-013-9704
GL	33.56936	-112.19153	59th Ave & W. Olive	04-013-2001
GR	33.46093	-112.11748	27th Ave. & Interstate 10	04-013-3010
HI	33.31074	-111.72255	Higley Rd. & Chandler Blvd	04-013-4006
HM	33.98280	-111.79870	Top of Humboldt Mountain	04-013-9508
ME	33.41045	-111.86507	Broadway Rd. & Alma School Rd.	04-013-1003
NP	33.56033	-112.06626	7th Street & Dunlap Avenue	04-013-1004
PP	33.71231	-111.85272	Pima Rd & Pinnacle Peak	04-013-2005
RV	33.71881	-111.67183	Forest Rd & Del Ray Ave.	04-013-9706
SP	33.40316	-112.07533	Central Ave. & Broadway	04-013-4003
SS	33.47968	-111.91721	Scottsdale Rd. & Thomas Rd.	04-013-3003
TE	33.4124	-111.93473	College Ave. & Apache Blvd.	04-013-4005
WC	33.29898	-111.88431	Ellis St. & Frye Rd.	04-013-4004
WF	33.40642	-112.14434	43rd Ave. & Broadway Rd.	04-013-4009
WI	33.49462	-112.13098	33rd Ave. & Indian School Rd.	04-013-0016
WP	33.48385	-112.14257	39th Ave. & Earll Dr.	04-013-0019
ZH	33.686738	-112.294171	109th Ave & Deer Valley Rd.	04-013-4016

Table 7 Site Instrument Setup

AIR MONITORING NETWORK OPERATIONS																			
Sites	Wind	O3		CO		NOX	SO2	Press	Delta Temp	Temp	RH	Room Temp	Rain	PM-2.5 Cont.	PM-10 Cont.	PM-2.5 Filter	PM-10 Filter	Lead Filter	#Active Instruments
BE	1	1	*	1	*	1		1		1	1	1			1				9
BP	1	1								1		1							4
CC	1	1	*							1	1	1	1						6
CP	1	1		1		1	1	1		1		1			1				9
DV																		2	2
DC	1							1		1	1	1		1	1				7
DY	1	1	*	1	*			1		1	1	1			1				8
FF	1	1	*							1	1	1							5
FH	1	1						1		1	1	1							6
GL	1	1	*	1	*			1		1	1	1			1				8
GR	1			1		1		1		1		1			1				7
HI	1							1	1	1		1			1				6
HM		1	*							1	1	1							4
ME	1			1	*			1		1	1	1				1	1		8
NP	1	1		1	*			1	1	1		1					1		8
PP	1	1										1							3
RV		1	*									1							2
SP	1	1		1	*			1		1	1	1		1	1	1			10
SS	1	1		1	*	1	1	1		1	1	1					2		11
TE	1	1		1	*				1	1		1	1						7
WC	1	1	*	1	*			1		1	1	1			1				8
WF	1							1	1	1		1			1				6
WI	1			1								1							3
WP	1	1		1		1		1	1	1		1		1	1	2			12
ZH	1									1		1			1				4
Active Instr.	22	17		13		5	2	15	5	21	12	24	2	3	12	4	4	2	**163**

* = Instruments operate seasonally. Seasonal ozone monitoring was discontinued in October 2010; all ozone monitors will run 12 months from this time forward.

Chart Current as of 12/31/10

Total # of Sites: 25

2010 SUMMARY OF NETWORK RESULTS AND REQUIRED INFORMATION

Data Completeness

Before any data set can be considered valid it must first pass a data recovery test that consists of determining the ratio of actual samples to scheduled samples by quarter. This ratio must be greater than 75% for a data set to pass the first validity test. After all validation tests have been passed, the data can be used to determine compliance with the NAAQS.

The following is a summary of the annual data completeness for all criteria pollutants (Table 8). Note that CO, O_3, NO_2, and SO_2 samples are all from continuous monitors and are therefore hourly-averaged samples. PM monitors are either continuous, and therefore hourly-averaged, or filter-based and daily-averaged. Filters are sampled for 24 hours every 3rd day ($PM_{2.5}$) or every 6th day (PM_{10}).

Table 8 2010 Criteria Pollutant Data Completeness

	Number of Actual Samples	Number of Scheduled Samples	Data Completeness (Actual/Schedule)
Carbon Monoxide	74960	76416	98.1%
Lead	42	46	91.3%
Nitrogen Dioxide	41639	43800	95.1%
Ozone	114881	116304	98.8%
$PM_{2.5}$ (1 in 3 day)	390	396	98.5%
$PM_{2.5}$ (continuous)	16256	17640	92.2%
PM_{10} (1 in 6 day)	180	183	98.4%
PM_{10} (continuous)	103365	105120	98.3%
Sulfur Dioxide	17101	17520	97.6%
Total	**368814**	**377425**	**97.7%**

Table 9 displays the official data completeness score as reported from the EPA's AQS database. This score only includes criteria pollutants that are entered into AQS and is reflective of appropriate sampling schedules. Maricopa County Air Quality considers this score the 'official' data completeness number.

Table 9 2010 AQS Data Completeness

AQS Data Completeness for Maricopa County Air Quality	**97.5%**

Criteria Pollutant Summary

Carbon Monoxide (CO)

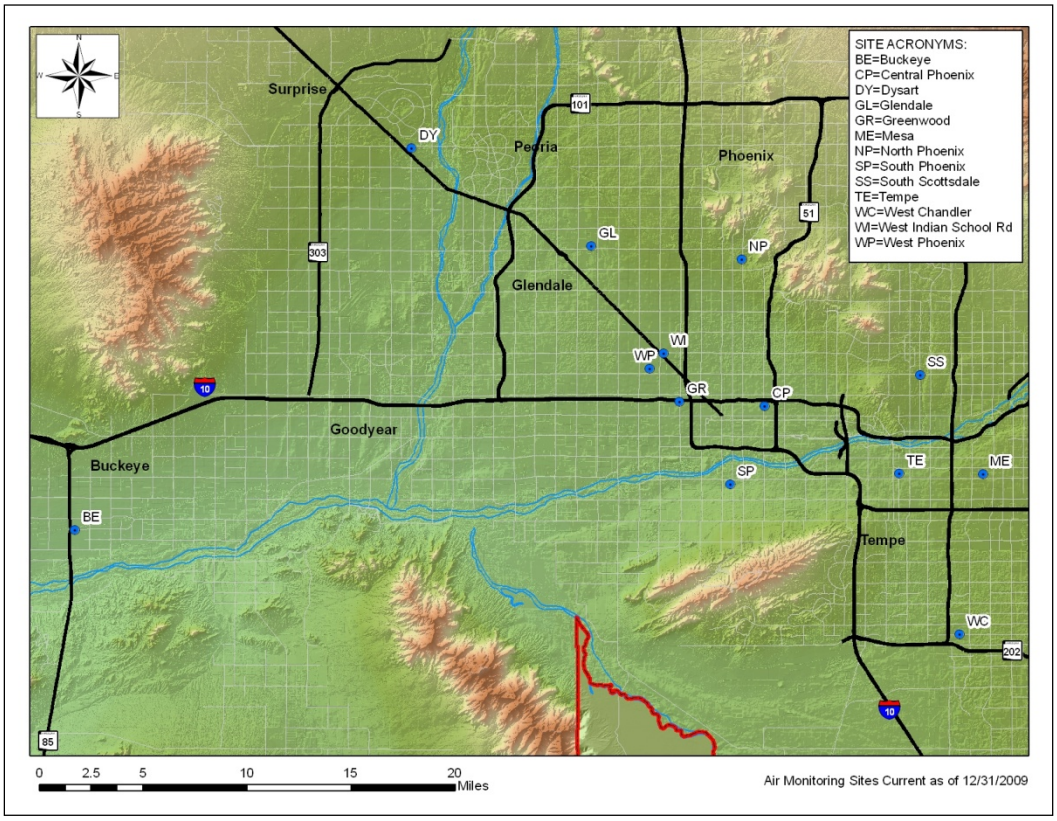

Figure 2 2010 Carbon Monoxide Monitoring Sites

During 2010, thirteen CO monitors were reported as operational to the US EPA Air Quality System (AQS) (Figure 2). All CO monitors are classified as SLAMS (Table 5).

In June 2010, MCAQD was required to close the West Indian school site as the City of Phoenix Fire Department closed the building housing the site. Due to the close proximity of the West Phoenix CO monitor, it was decided to close West Indian School and allow West Phoenix to assume representation of the area. Proper documentation was submitted to the EPA, which agreed with the decision to close the site.

There are two primary standards for CO, the 8-hour average and the 1-hour average. The 8-hour primary standard is 9 ppm and the 1-hour primary standard is 35 ppm. A violation of the standard is any two exceedances in a calendar year. For calendar year 2010, no exceedances of the CO 1-hour or 8-hour standards were recorded at any MCAQD monitoring sites (see Table 10).

Table 10 2010 1-hour and 8-hour Average Carbon Monoxide Summary

Site	CO 1-hour Average Max. (PPM); Date: Hour	CO 1-hour Average 2nd High (PPM); Date: Hour	Number of Samples	CO 8-hour Average Max. (PPM); Date: Hour	CO 8-hour Average 2nd High (PPM); Date: Hour	Number of Exceedances of 1/8-Hour average
Buckeye	**1.9;** 11/17:19	**1.3;** 11/13:07	5043	**0.6;** 01/07:22	**0.6;** 11/17:21	0
C. Phoenix	**3.2;** 12/01:07	**3.2;** 12/24:23	8677	**2.4;** 12/04:01	**2.2;** 12/25:02	0
Dysart	**2.0;** 02/24:20	**1.8;** 02/24:22	5018	**0.9;** 02/24:22	**0.6;** 02/25:04	0
Glendale	**9.0;** 09/06:11	**8.9;** 09/06:10	5014	**3.0;** 09/06:13	**1.5;** 09/06:10	0
Greenwood	**4.3;** 12/25:03	**3.9;** 12/25:02	8623	**3.0;** 12/25:04	**2.3;** 01/01:05	0
Mesa	**2.0;** 11/27:22	**2.0;** 11/27:23	4600	**1.4;** 11/28:02	**1.4;** 12/05:01	0
N. Phoenix	**2.9;** 12/28:08	**2.4;** 12/03:18	5020	**1.7;** 12/03:23	**1.6;** 12/10:00	0
S. Phoenix	**4.4;** 01/01:00	**4.3;** 01/01:01	5039	**3.1;** 01/01:05	**3.1;** 12/25:04	0
South Scottsdale	**2.1;** 12/02:19	**2.0;** 12/14:19	5008	**1.6;** 12/03:00	**1.6;** 12/04:01	0
Tempe	**3.4;** 09/04:19	**2.4;** 12/03:22	4942	**1.9;** 12/04:01	**1.6;** 11/28:02	0
West Chandler	**2.0;** 12/03:20	**2.0;** 12/03:21	5038	**1.9;** 12/04:02	**1.6;** 12/03:01	0
W. Indian School	**3.7**; 01/08:08	**3.3**; 01/08:07	4300	**2.3;** 01/08:00	**2.3;** 01/10:01	0
W. Phoenix	**4.3;** 01/12:07	**4.2;** 01/12:08	8638	**3.3;** 12/03:01	**3.2;** 12/04:02	0

Note: this table is read as the bold number representing the data followed by the date and time, e.g. **0.7**; 01/10:18 is read as: 0.7 PPM on January 10 in the 6 o'clock PM (18:00) hour.

Lead (Pb)

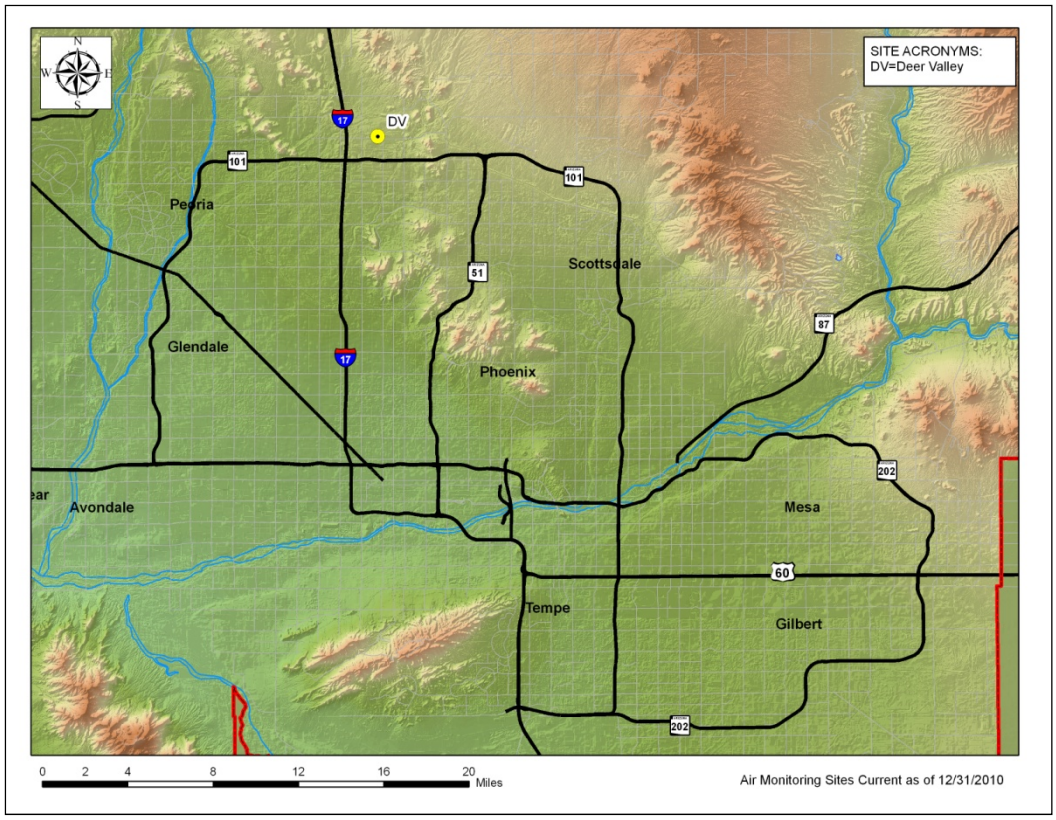

Figure 3 2010 Lead Monitoring Sites

Following the introduction of unleaded gasoline in the early 1990's, ambient air concentrations of lead fell to such a low level that Maricopa County was given permission to discontinue monitoring for this pollutant. However, the lead NAAQS was drastically lowered by a new regulation in 2008, and this caused concern to begin monitoring for this pollutant again to ensure that the new standard is being met.

In July of 2010 a new lead monitoring site was opened near the Deer Valley airport in north Phoenix. Deer Valley Airport, as one of the busiest general aviation airports in the region, is assumed to be the largest point source of lead within Maricopa County.

The new lead NAAQS have two primary standards, a rolling three-month average and a quarterly average. The three month average is violated by an exceedance of 0.15 $\mu g/m^3$ and the quarterly average is violated by an exceedance of 1.5$\mu g/m^3$.

Table 11 2010 Sulfur Dioxide Summary

Site	24-hour Max. ($\mu g/m^3$); Date: Hour	24-hour 2nd High ($\mu g/m^3$); Date: Hour	Max. Quarterly Average ($\mu g/m^3$)	Number of Samples
Deer Valley	**0.066;** 12/04:00	**0.051;** 09/17:21	**.0274**; 4th Qtr	29

Note: this table is read as the bold number representing the data followed by the date and time, e.g. **0.024**; 06/30:05 is read as: 0.024 PPM on June 30 in the 5 o'clock AM (05:00) hour.

Nitrogen Dioxide (NO_2)

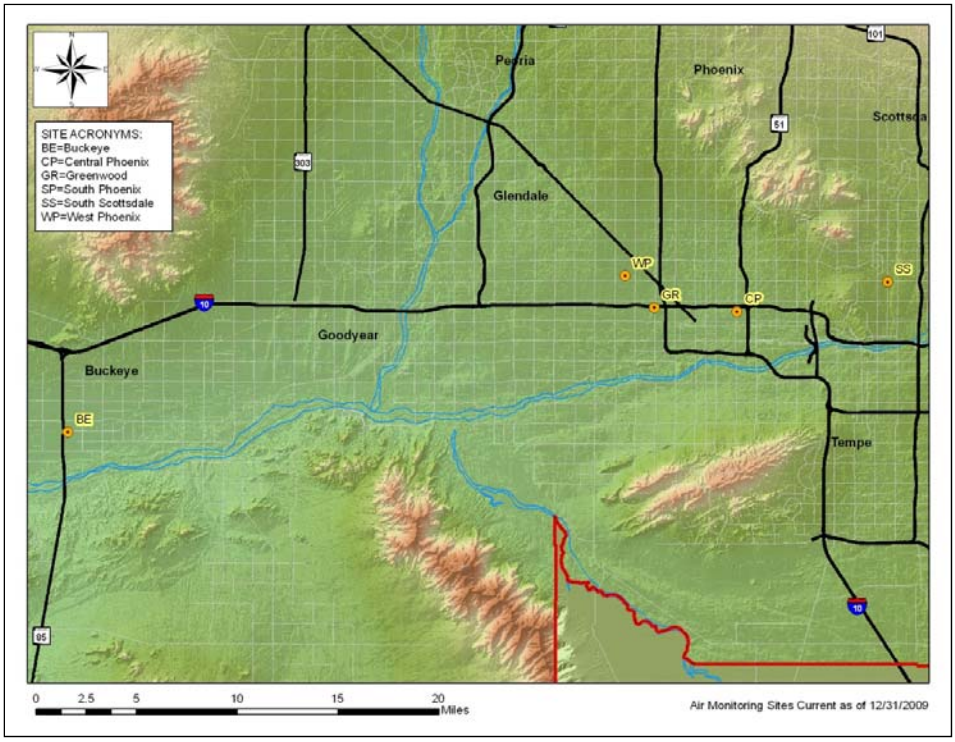

Figure 4 2010 Nitrogen Dioxide Monitoring Sites

All parts of Maricopa County are in attainment for nitrogen dioxide. During 2010, five NO_2 monitors were operational and were reported in AQS (Figure 4**).** All NO_2 monitors are designated as SLAMS (see Table 5).

Compliance with the NO_2 standard is achieved when the annual arithmetic mean concentration in a calendar year is less than or equal to 53 ppb. A new hourly standard for NO_2 began in 2010; this regulation states that the 3-year average of the 98th percentile cannot exceed 100 ppb. For calendar year 2010, no exceedances of the NO_2 annual or 1-hour standard were recorded at Maricopa County monitoring sites (Error! Reference source not found.).

Table 12 2010 Nitrogen Dioxide Summary

Site	NO_2 Avg. 1-hour Max. (PPB); Date: Hour	NO_2. 1-hour 98th Percentile (PPB)	3-Year Avg. of 98th Percentile (PPB)	# of 1-hour Samples	Annual Average (PPB)
Buckeye	**45.0;** 01/26:06	35.0	38.3	8339	7.6
Central Phoenix	**69.0;** 09/30:19	59.0	64.0	8435	18.8
Greenwood	**79.0;** 01/04:07	68.0	70.3	8340	24.5
South Scottsdale	**66.0;** 09/30:19	53.0	54.0	8154	13.9
West Phoenix	**67.0;** 01/12:08	55.0	56.7	8371	17.7

Note: this table is read as the bold number representing the data followed by the date and time, e.g. **0.041**; 11/10:17 is read as: 0.041 PPM on November 10 in the 5 o'clock PM (17:00) hour.

Ozone (O_3)

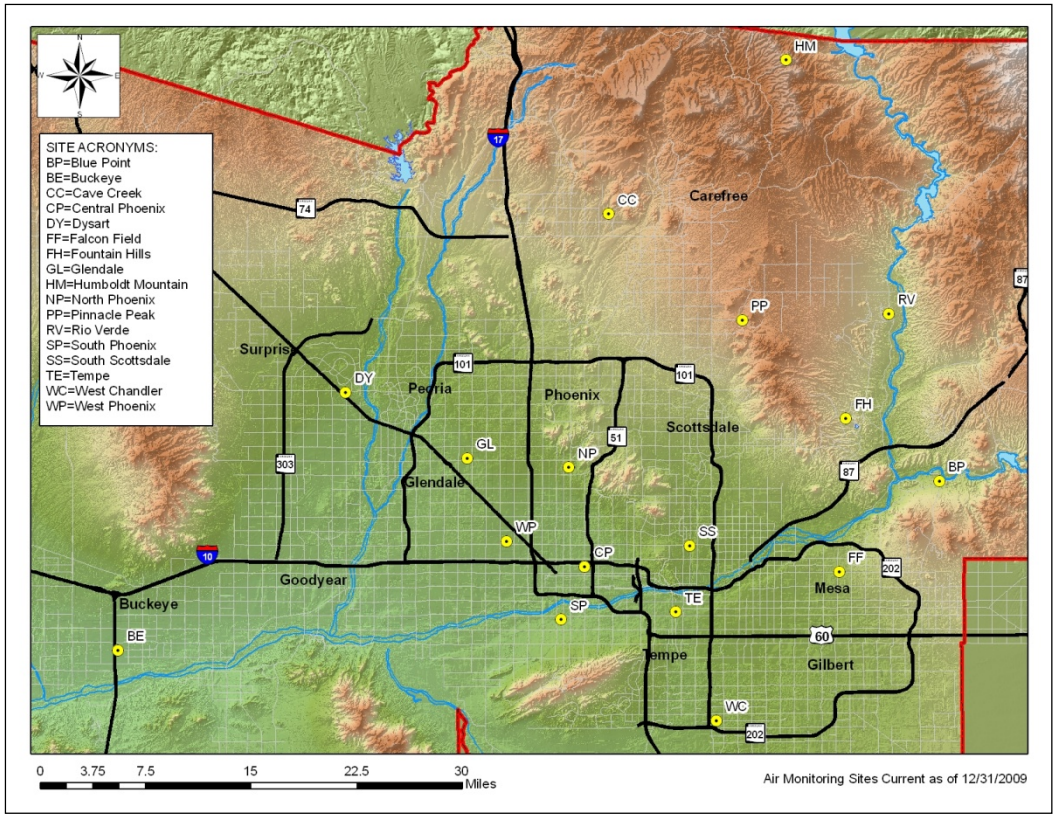

Figure 5 2010 Ozone Monitoring Sites

During 2010, seventeen ozone monitors were reported as operational in AQS (Figure 5). All of the ozone monitors are classified as SLAMS (Table 5). The 1-hour average ozone standard was revoked by the EPA on June 15, 2005, and has been replaced by the 8-hour average standard for compliance purposes.

On March 12, 2008, the EPA lowered the eight-hour ozone NAAQS from 0.080 to 0.075 ppm. Compliance with the standard is determined by averaging the 4th highest eight-hour average over a three-year period. This three-year average must be less than or equal to 0.075 ppm.

There were 31 exceedances of the eight hour primary standard for ozone in 2010. Table 13 presents the 2010 data summary for eight-hour ozone at department monitoring sites. Also in 2010, there was one violation of the eight-hour primary standard (the 8-hour average NAAQS for ozone is violated when the three-year average of the fourth high is greater than 0.075 ppm (Table 14).

Table 13 2010 8-hour Average Ozone Summary

Site	8-hour max. (PPM); Date: Hour	2nd High (PPM); Date: Hour	3rd High (PPM); Date: Hour	4th High (PPM); Date: Hour	Number of Days ≥ 0.075
Blue Point	**.076;** 05/27:12	**.072;** 06/22:12	**.068;** 05/26:11	**.068;** 09/30:11	1
Buckeye	**.066;** 06/29:09	**.066;** 07/24:11	**.065;** 06/23:10	**.064;** 06/24:09	0
Cave Creek	**.078;** 06/22:12	.074; 06/23:12	**.074;** 09/29:11	**.074;** 09/30:11	1
Central Phoenix	**.078;** 06/29:11	**.077;** 06/23:10	**.075;** 08/22:12	**.072;** 06/22:11	2
Dysart	**.082;** 06/29:09	**.075;** 05/16:11	**.073;** 09/03:11	**.071;** 06/22:11	1
Falcon Field	**.074;** 06/23:11	**.073;** 06/24:11	**.072;** 06/22:11	**.070;** 09/30:11	0
Fountain Hills	**.081;** 06/22:11	**.078;** 05/27:11	**.078;** 06/23:11	**.074;** 09/29:12	3
Glendale	**.083;** 06/29:12	**.077;** 06/23:10	**.077;** 09/03:12	**.074;** 06/22:11	3
Humboldt Mt.	**.074;** 06/22:14	**.071;** 06/23:03	**.070;** 04/14:21	**.070;** 04/15:00	0
North Phoenix	**.085;** 06/23:10	**.084;** 06/29:12	**.081;** 06/24:10	**.079;** 06/22:11	6
Pinnacle Peak	**.080;** 06/22:12	**.079;** 09/29:10	**.079;** 09/30:12	**.077;** 06/23:12	4
Rio Verde	**.078;** 06/22:12	**.073;** 06/23:12	**.072;** 05/26:12	**.071;** 06/15:11	1
South Phoenix	**.076;** 06/23:10	**.075;** 06/24:11	**.075;** 06/29:11	**.074;** 08/23:10	1
South Scottsdale	**.084;** 06/23:10	**.078;** 06/22:11	**.078;** 06/29:11	**.076;** 06/24:10	4
Tempe	**.075;** 06/23:10	**.072;** 06/22:11	**.068;** 05/15:11	**.068;** 06/29:11	0
West Chandler	**.083;** 06/23:10	**.076;** 05/15:11	**.075;** 06/24:10	**.074;** 05/27:11	2
West Phoenix	**.082;** 06/29:11	**.078;** 06/23:11	**.075;** 06/22:11	**.075;** 06/28:11	2

Note: this table is read as the bold number representing the data followed by the date and time, e.g. **0.073**; 4/30:12 is read as: 0.073 PPM on April 30 in the 12 o'clock PM (12:00) hour.

Table 14 3 Year Average of 8-Hour Ozone

Site	2008 4th High (PPM)	2009 4th High (PPM)	2010 4th High (PPM)	3 Yr. Avg. of 4th High (PPM)*
Blue Point	0.074	0.069	.068	0.070
Buckeye	0.068	0.062	.064	0.065
Cave Creek	0.078	0.070	.074	0.074
Central Phoenix	0.072	0.069	.072	0.071
Dysart	0.066	0.069	.071	0.069
Falcon Field	0.075	0.065	.070	0.070
Fountain Hills	0.079	0.069	.074	0.074
Glendale	0.074	0.068	.074	0.072
Humboldt Mt.	0.077	0.067	.070	0.071
North Phoenix	0.080	0.072	.079	0.077#
Pinnacle Peak	0.073	0.070	.077	0.073
Rio Verde	0.079	0.068	.071	0.073
South Phoenix	0.076	0.067	.074	0.072
South Scottsdale	0.076	0.072	.076	0.075
Tempe	0.078	0.067	.068	0.071
West Chandler	0.077	0.070	.074	0.074
West Phoenix	0.078	0.068	.075	0.074

*Note that this average value has been truncated (not rounded) to the third significant digit.
#Indicates violation of the NAAQS.

Particulate Matter <=10 Microns (PM_{10})

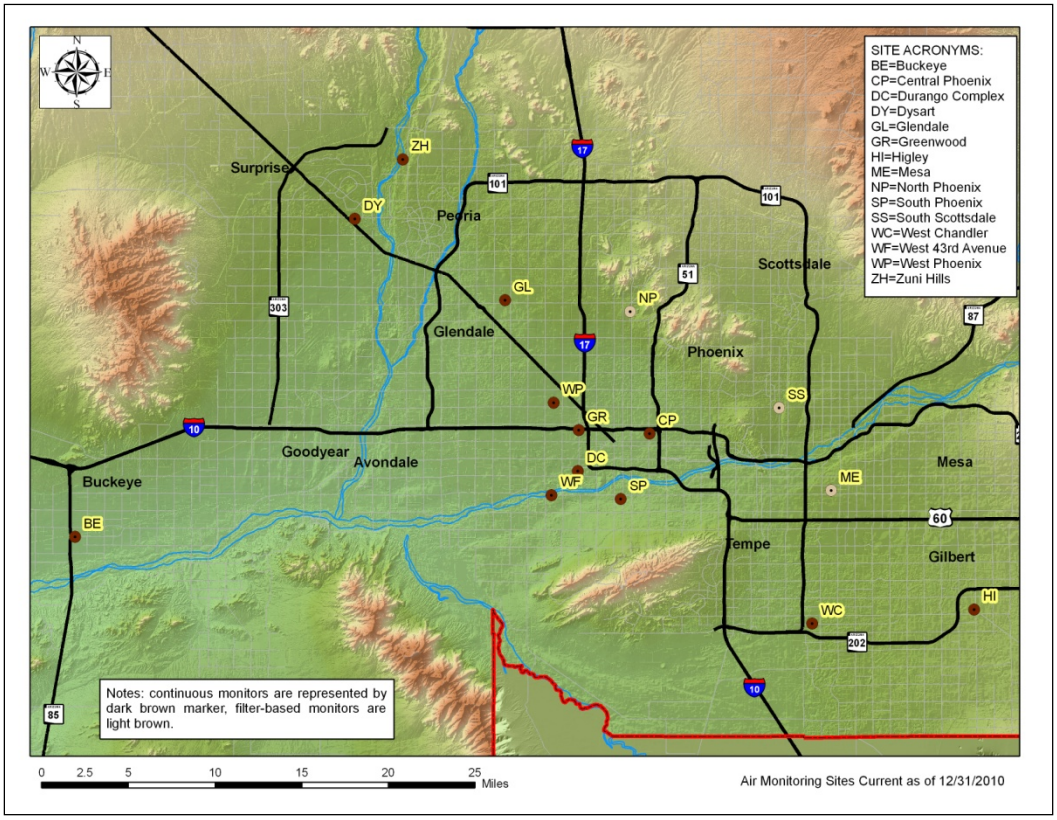

Figure 6 2010 PM_{10} Monitoring Sites (includes continuous and non-continuous sites)

During 2010, fifteen PM_{10} monitors were reported as operational in AQS (Figure 6). All PM_{10} monitors are classified as SLAMS; except for Zuni Hills which is classified as a Special Purpose (SP) monitor (Table 5). Note that twelve of these PM_{10} sites operate continuous monitors which collect hourly-averaged data; the other three are non-continuous filter-based monitors which collect 24-hour averaged data on a 1-in-6 day schedule.

The 24-hour Primary standard for PM_{10} is 150 µg/m^3 (155 µg/m^3 with mathematical rounding). This standard is violated when the expected number of exceedance for the calendar year is more than one. A formula, as detailed in 40 CFR 50, is used to determine the expected number of exceedances. The formula takes into account the number of days sampling occurred and the number of valid samples collected. A 3-year average of these estimated days is then used to determine compliance. On December 18, 2006 new monitoring rules from the EPA revoked the PM_{10} annual primary standard, although the annual average is still displayed below for informational purposes (Table 15).

For calendar year 2010, there was only one site that exceeded the PM_{10} 24-hour standard, which is down from ten exceedances in 2009, and there were six sites that violated the PM_{10} 24-hour standard (described in Table 24 and Table 25).

Table 15 2010 PM_{10} Summary

Site Name	24-hr Average Max ($\mu g/m^3$)	24-hr Average 2nd High ($\mu g/m^3$)	Number of 24-hour NAAQS Exceedances	Expected Exceedances	Annual Average ($\mu g/m^3$)	#Exceptional Events	Number of Samples
Buckeye (continuous)	113	107	0	0	34.1	0	8692
Central Phoenix (continuous)	106	63	0	0	27.4	0	8693
Durango Complex (continuous)	111	106	0	0	36.2	0	8412
Dysart (continuous)	81	63	0	0	21.5	0	8697
Glendale (continuous)	92	62	0	0	22.9	0	8648
Greenwood (continuous)	158*	135	1	1.045	34.9	0	8630
Higley (continuous)	83	80	0	0	30.1	0	8607
Mesa	86	39	0	0	17.4	0	58
North Phoenix	44	39	0	0	19.3	0	61
South Phoenix (continuous)	120	112	0	0	35.0	0	8678
South Scottsdale	37	29	0	0	17.4	0	61
West Chandler (continuous)	76	71	0	0	23.3	0	8593
West 43rd Ave (continuous)	112	107	0	0	39.4	0	8412
West Phoenix (continuous)	86	86	0	0	29.8	0	8675
Zuni Hills (continuous)	70	51	0	0	20.7	0	8628

*Indicates an exceedance of the standard.

Note that some data have the potential for being classified as exceptional events (see Definition of Terms for explanation of exceptional events). In accordance with the EPA's exceptional events policy, once approved these data are not used in determining compliance with the NAAQS. Values in Table 15 are from official AQS reports as of the date of publishing this review; exceptional events that have not yet been approved by the EPA will not affect these values until they are approved. The process of approving exceptional events can take over a year after the exceedance day, so some values in Table 15 could change upon EPA approval of an exceptional event petition. At the time of publishing this review, no exceedances have been petitioned for exceptional event status. Note that the ADEQ takes the lead in the determination and petitioning of exceptional events.

On July 2, 2002 (67 FR 44369), EPA found the state implementation plan (SIP) for the Metropolitan Phoenix (Maricopa County), Arizona serious PM_{10} non-attainment area to be inadequate to attain the 24-hour particulate (PM_{10}) air quality standard at the Salt River monitoring site. Under authority from the Clean Air Act, EPA has required a SIP revision to be submitted by the State of Arizona to correct the inadequacy. In 2004 the Arizona Department of Environmental Quality submitted a SIP addressing the inadequacies in the Salt River Area to the EPA. As of December 31, 2010, Maricopa County has not come into compliance with the NAAQS for PM_{10}. As a result of this, the EPA is requiring a 5% plan which began in 2008. This required Maricopa County to submit an approved plan to reduce the annual PM_{10} emissions of Maricopa County by 5% until the standard is met. Failure to comply with this plan or to meet the NAAQS for PM_{10} will result in further 5% reductions annually, and could result in sanctions from the EPA.

Particulate Matter <=2.5 Microns ($PM_{2.5}$)

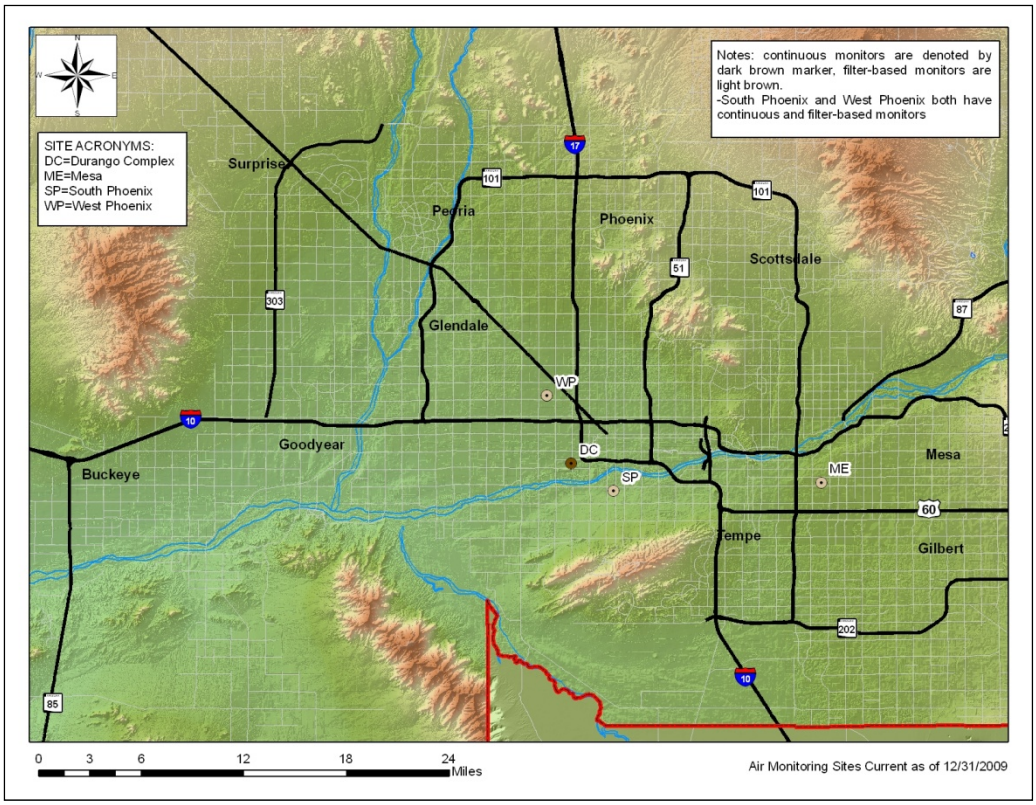

Figure 7 2010 $PM_{2.5}$ Monitoring Sites (continuous and non-continuous)

Currently MCAQD operates collocated filter-based compliance $PM_{2.5}$ monitors at the West Phoenix site and single filter-based monitors at the Mesa and South Phoenix site (Figure 7). These compliance PM2.5 monitors all use sample filters and are non-continuous in nature. On July 1, 2007, the department took over weighing the sample filters, a process that was previously done by the ADEQ. All filters are processed and weighed in our internal laboratory. In addition to the filter-based monitors, the department operates three continuous $PM_{2.5}$ monitors at the Durango, South Phoenix, and West Phoenix sites. These continuous monitors have recently been reclassified as Federal Equivalency Methods (FEM), so their data are applicable to comparison with the national standards. All monitors are identified as SLAMS (Table 5).

Note that the $PM_{2.5}$ network is much smaller than the PM_{10} network. The reason for this is that historically more concern and resources have been given to PM_{10}, since Maricopa County is not in attainment for this pollutant (Maricopa County is currently in attainment for $PM_{2.5}$). According to federal regulations, Maricopa County does operate slightly more than the required minimum number of $PM_{2.5}$ monitors for the MSA (see Appendix II). The Air Monitoring Division continually assesses if the existing network adequately represents the air quality ($PM_{2.5}$) in Maricopa County. One result from these ongoing assessments has been the addition of the continuous $PM_{2.5}$ monitors. There are also plans expand the $PM_{2.5}$ network in 2011 by adding a new monitoring site in the North Phoenix area.

On December 18, 2006, the EPA implemented new primary standards for $PM_{2.5}$. These new rules changed the 24-hour average standard from 65 μg/m3 to 35 μg/m3. The annual average standard of 15 $\mu g/m^3$ remains unchanged. Compliance with the 24-hour standard is determined by taking the 3-year average of the 98th percentile at each monitoring site. Compliance with the Annual standard is determined by taking the 3-year average of the spatially averaged annual means. In 2010, there were seven exceedances of the 24-hour standard at FRM or FEM

monitors at three different sites, though two of the exceedances from the filter-based monitors coincide with continuous monitors that were operating at the same site. There were no violations of the 24-hour standard or the annual standard. Data is summarized in Table 16 and Table 17. Averages used for determining compliance with the NAAQS are shown in Table 18 and Table 19.

Table 16 2010 $PM_{2.5}$ Summary (FRM Filter-based Monitors)

Site Name	24-hr Avg. Max ($\mu g/m^3$)	24-hr Avg. 2nd High ($\mu g/m^3$)	98th Percentile Value	Annual Avg. ($\mu g/m^3$)	Number of Samples
Mesa	14.0	11.9	11.8	6.25	120
South Phoenix	63.4*	24.1	24.0	9.23	121
West Phoenix	53.3*	21.8	21.6	8.36	121

*Indicates an exceedance of the standard.

Table 17 2010 $PM_{2.5}$ Data Summary (FEM Continuous Monitors)

Site Name	1-hr Avg. Max ($\mu g/m^3$)	1-hr Avg. 2nd High ($\mu g/m^3$)	98th Percentile Value	Annual Avg. ($\mu g/m^3$)	Number of Samples
Durango Complex (continuous)	64.1*	27.2	24.3	10.16#	5770
South Phoenix (continuous)	82.6*	50.3*	24.4	7.98#	4914
West Phoenix (continuous)	55.3*	43.5*	22.0	7.60#	5572

*Indicates an exceedance of the standard.

#The continuous FEM $PM_{2.5}$ monitors were started up in July 2010 and do not constitute a 75% data completeness rate for 2010 annual averages.

Table 18 2010 $PM_{2.5}$ 3-Year Averages of 98th Percentile (FRM Monitors)

Site Name	2008 98th Percentile Value	2009 98th Percentile Value	2010 98th Percentile Value	98th Percentile 3-Year Average
Mesa	14.5	17.2	11.8	14.5
South Phoenix	10.9	34.5	24.0	23.1
West Phoenix	10.6	29.4	21.6	20.5

Table 19 2010 $PM_{2.5}$ 3-Year Averages of Annual Means (FRM Monitors)

Site Name	2008 Annual Mean	2009 Annual Mean	2010 Annual Mean	3-Year Average of the Annual Mean
Mesa	8.50	7.30	6.25	7.35
South Phoenix	10.90	11.00	9.23	10.38
West Phoenix	10.60	10.36	8.36	9.77

Sulfur Dioxide (SO_2)

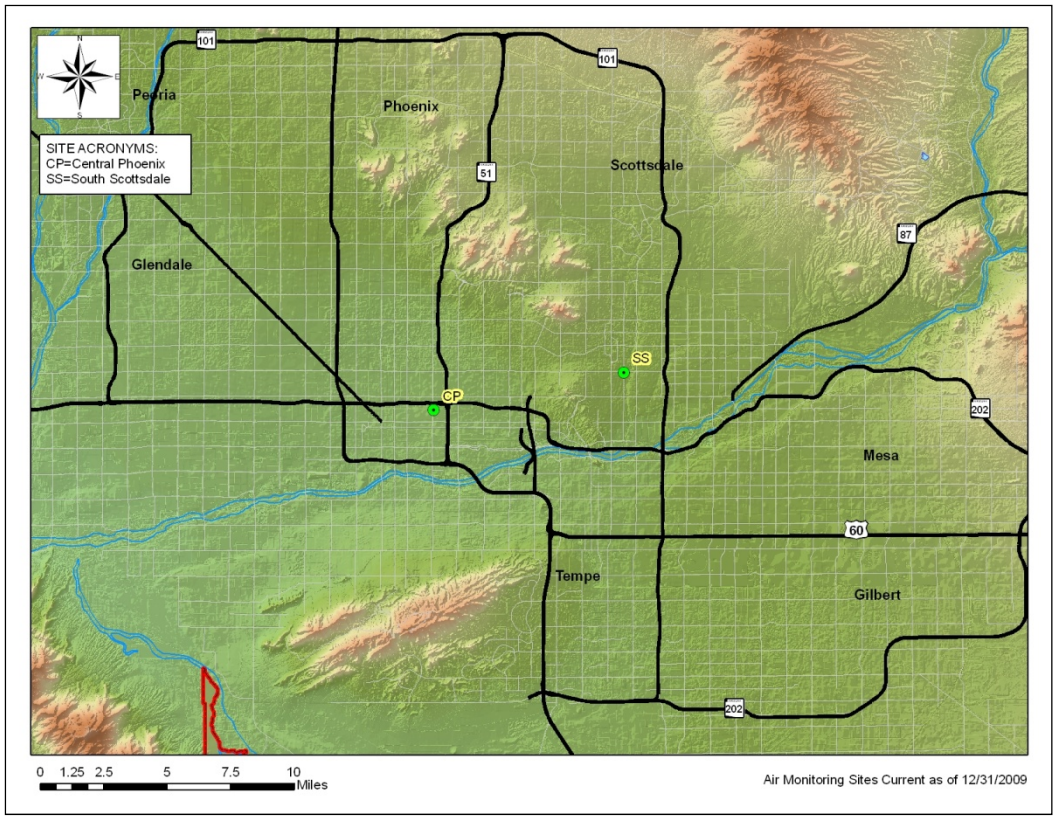

Figure 8 2010 Sulfur Dioxide Monitoring Sites

Maricopa County is in attainment for SO_2. During 2010, two SO_2 monitors were operational and were reported in AQS (Figure 8). Both of these monitors were designated SLAMS (see Table 5).

Sulfur Dioxide has an Annual and 24-hour average primary standard, plus a new 1-hour standard. There is also a 3-hour average secondary standard. A violation of the primary standard occurs when the annual mean exceeds 30 ppb, a 24-hour average of 140 ppb is exceeded more than once per calendar year, or the 3-year average of the 99th percentile of the daily maximum 1-hour average exceeds 75 ppb. A violation of the 3-hour average secondary standard occurs when a 3-hour average of 500 ppb is exceeded more than once per year. For calendar year 2008, no exceedances of the SO_2 Annual, 24-hour, or 3-hour standard were recorded at Maricopa County monitoring sites (see Table 20).

Table 20 2010 Sulfur Dioxide Summary

Site	1-hour Max. (PPB); Date: Hour	1-hour 2nd High (PPB); Date: Hour	3-hour Max. (PPB); Date: Hour	3-hour 2nd High (PPB); Date: Hour	24-hour Max. (PPB); Date: Hour	24-hour 2nd High (PPB); Date: Hour	Annual Avg. (PPB)	Number of Samples
Central Phoenix	**12;** 12/01:07	**10;** 01/07:21	**10;** 12/02:23	**10;** 12/03:23	**5;** 01/07:00	**5;** 12/01:00	2	8475
South Scottsdale	**14;** 09/03:10	**11;** 11/14:10	**9;** 09/03:11	**6;** 07/11:08	**3;** 12/02:00	**3;** 12/06:00	1	8626

Note: this table is read as the bold number representing the data followed by the date and time, e.g. **10**; 06/30:05 is read as: 10 PPB on June 30 in the 5 o'clock AM (05:00) hour.

2010 NAAQS Exceedance and Violation Summary

The following is a summary of the number, types and dates of exceedances and violations of the NAAQS for 2010 (Table 21).

Table 21 2010 NAAQS Exceedances and Violations Summary

Carbon Monoxide	No exceedances or violations of the 1-hr or 8-hr NAAQS standard were logged.
Nitrogen Dioxide	No exceedances or violations of NAAQS were logged.
Ozone	There were 10 unique days when at least one monitor exceeded the standard. There were 31 individual exceedances of the 8-hour standard which occurred at 13 different sites. There was one violation of the 8-hour standard.
PM_{10}	There was one unique day when at least one monitor exceeded the standard and one individual exceedance of the 24-hour standard.
$PM_{2.5}$	There were two unique days when at least 1 FRM or FEM monitor exceeded the standard. There were five individual exceedances of the 24-hour standard which took place at three different sites. There were no violations of the 24-hour or annual standards.
Sulfur Dioxide	No exceedances or violations of NAAQS were logged.

2010 Ozone Exceedance and Violation Details

Table 22 details the dates and values for exceedances of the 8-hour ozone standard**.** The standard is 0.075 ppm for an eight hour average. Table 23 details violations of the 8-hour ozone standard. Violations are calculated with a three-year average of the fourth-highest annual 8-hour value, if this three-year average is greater than 0.075 ppm than the site violates the standard.

Table 22 2010 Ozone 8-hour Average Exceedance Details

Site	Date	Value (ppm)
Blue Point	5/27/10	0.076
Cave Creek	6/22/10	0.078
Central Phoenix	6/23/10	0.077
	6/29/10	0.078
Dysart	6/29/10	0.082
Fountain Hills	5/27/10	0.078
	6/22/10	0.081
	6/23/10	0.078
Glendale	6/23/10	0.077
	6/29/10	0.083
	9/3/10	0.077
North Phoenix	5/15/10	0.076
	6/22/10	0.079
	6/23/10	0.085
	6/24/10	0.081
	6/28/10	0.078
	6/29/10	0.084
Pinnacle Peak	6/22/10	0.080
	6/23/10	0.077
	9/29/10	0.079
	9/30/10	0.079

Rio Verde	6/22/10	0.078
South Phoenix	6/23/10	0.076
South Scottsdale	6/22/10	0.078
	6/23/10	0.080
	6/24/10	0.076
	6/29/10	0.078
West Chandler	5/15/10	0.076
	6/23/10	0.083
West Phoenix	6/23/10	0.078
	6/29/10	0.082

Table 23 2010 Ozone Violations

Site	Value (ppm)
North Phoenix	0.077

2010 Exceedances of the 24-Hour PM_{10} Standard

Table 24 details the site and date of exceedances of the 24-hour PM_{10} standard. Note that this table includes all exceedances, even those that will be or are in the process of being classified as exceptional events (at the time of publishing this report no exceedances have been petitioned to be classified as exceptional, though this could change in the future). Exceptional events are not used in calculating compliance with the NAAQS.

Table 24 2010 PM_{10} 24-hour Average Exceedance Details

Site	Date	Value ($\mu g/m^3$)
Greenwood	10/15/10	159.3

2010 Violations of the 24-Hour PM_{10} Standard

The 24hr NAAQS for particulates is violated when the rate of expected occurrence of exceedances (samples greater than or equal to 155 µg/m^3) is greater than one over three consecutive years (Table 25) (40 CFR Part 50.6 (a)).

Table 25 Violations of the 24-hr PM_{10} Standard

Site	2008		2009		2010		Rate of Expected Exceedances
	24-hr Max. (µg/m^3)	Expected Exceedances	24-hr Max. (µg/m^3)	Expected Exceedances	24-hr Max. (µg/m^3)	Expected Exceedances	
Buckeye	223‡	4.022	439‡	3.022	113	0	2.3
Central Phoenix	133	0	153	0	106	0	0
Durango Complex	247‡	2	277‡	3	111	0	1.7
Dysart	75	0	227‡	1	81	0	0.3
Glendale	80	0	196	5.412	92	0	1.8
Greenwood	133	0	229‡	1.011	158	1.045	0.7
Higley	132	0	275‡	2.136	83	0	0.7
Mesa	71	0	87	0	86	0	0.0
North Phoenix	87	0	69	0	44	0	0.0
South Phoenix	230‡	2	250‡	3	120	0	1.7
South Scottsdale	91	0	135	0	37	0	0.0
West Chandler	66	0	220‡	6.412	76	0	2.1
West 43rd Avenue	278‡	5.011	317‡	7	112	0	4.0
West Phoenix	113	0	210	1.022	86	0	0.3
Zuni Hills	N/A	N/A	27#	0#	70	0	**N/A#**

■ Indicates violation of the standard.
# Indicates <75% data available.
‡ Indicates Exceptional Events occurred at this site. The listed value is the highest official AQS reading at time of publication.

Exceptional Events

Table 25 lists the official records in AQS (at time of publication) for exceedances and violations. However, as was previously noted on page 27, some of these 2008-2010 exceedance days could be petitioned to be classified as exceptional events and a request made to the EPA to remove them from official consideration as compliance data. EPA approval of these requests can take over a year. At the time of this publication there have not been any petitions for the classification of 2010 PM_{10} exceedances as exceptional.

2010 Exceedances of the 24-Hour $PM_{2.5}$ Standard

The 24-hour NAAQS for $PM_{2.5}$ is 35 $\mu g/m^3$; if the 24-hour block average (midnight-to-midnight) surpasses this value than it is counted as an exceedance. The 24-hour standard is violated when the three year average of the 98^{th} percentile exceeds 35 $\mu g/m^3$. There were no violations in 2010.

Table 26 2010 PM2.5 Exceedances

Site	Date	Value (ppm)	Method
Durango	12/25/10	64.1	Continuous FEM
South Phoenix	12/24/10	50.3	Continuous FEM
	12/25/10	82.6	Continuous FEM
	12/25/10	63.4	Filter-based FRM
West Phoenix	12/24/10	50.3	Continuous FEM
	12/25/10	43.5	Continuous FEM
	12/25/10	53.3	Filter-based FRM

Pollution Trends

The following charts depict the most recent three-year trends (2008-2010) for each criteria pollutant. See Table 4 for explanations of site abbreviations.

Carbon Monoxide

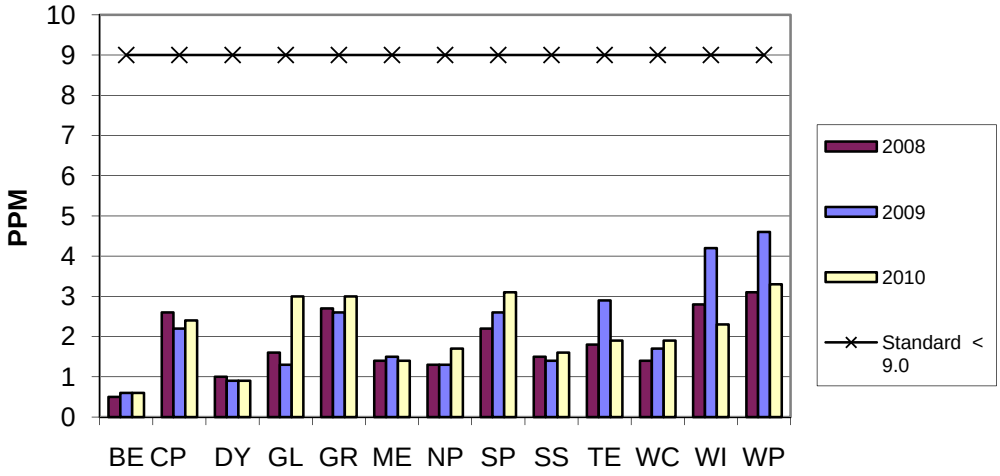

Chart 1 2008-2010 8-hr Avg. Carbon Monoxide Maximum Values

Nitrogen Dioxide

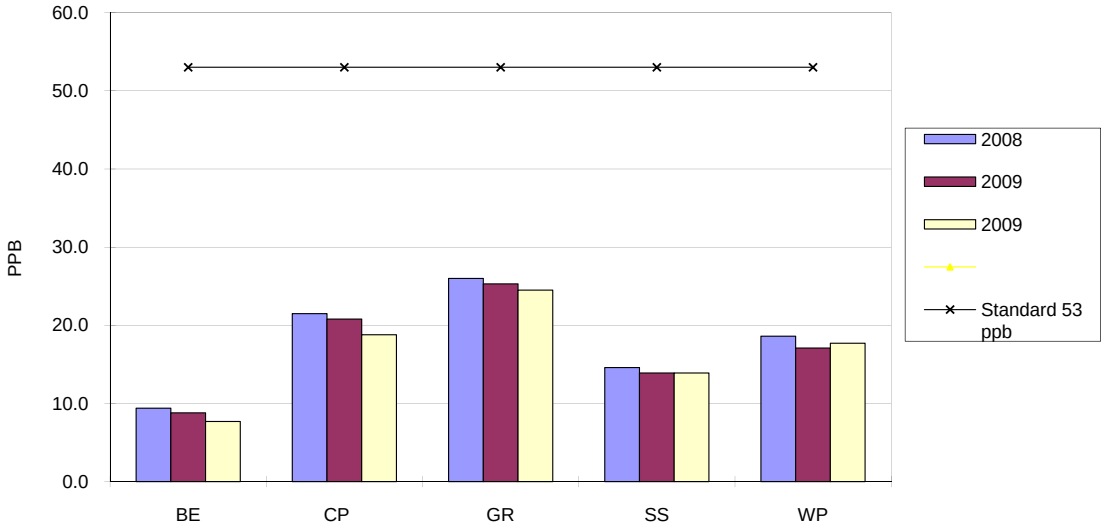

Chart 2 2008-2010 Nitrogen Dioxide Annual Average Readings

Ozone

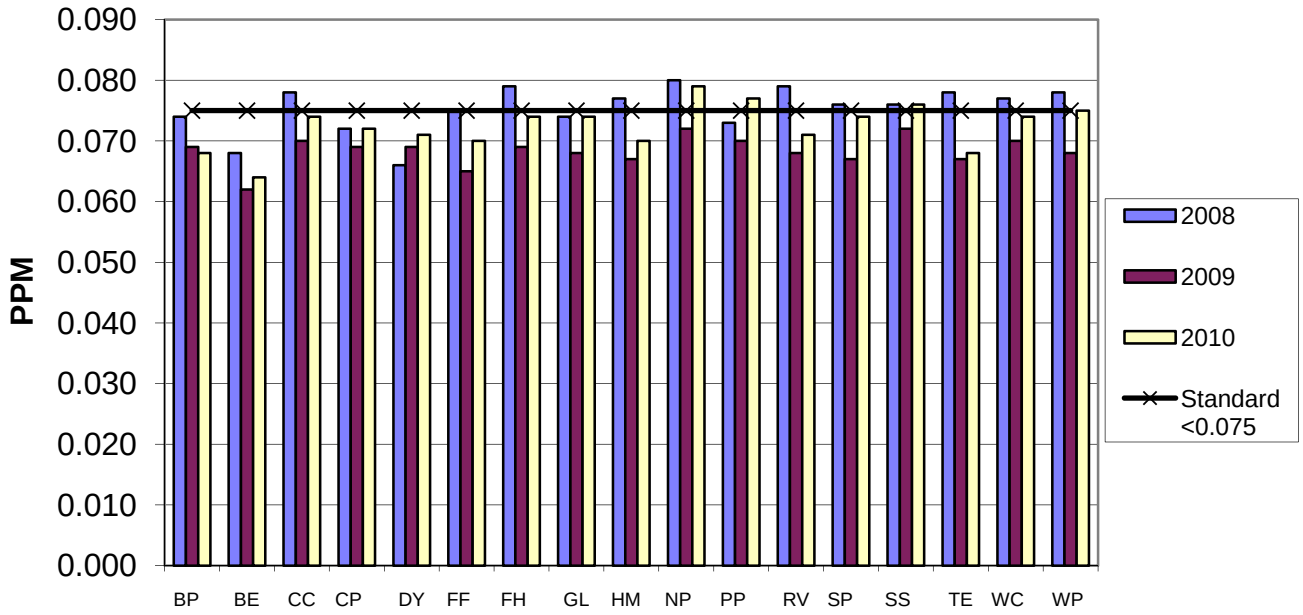

Chart 3 2008-2010 Ozone 4th High 8-hr Average

Particulates

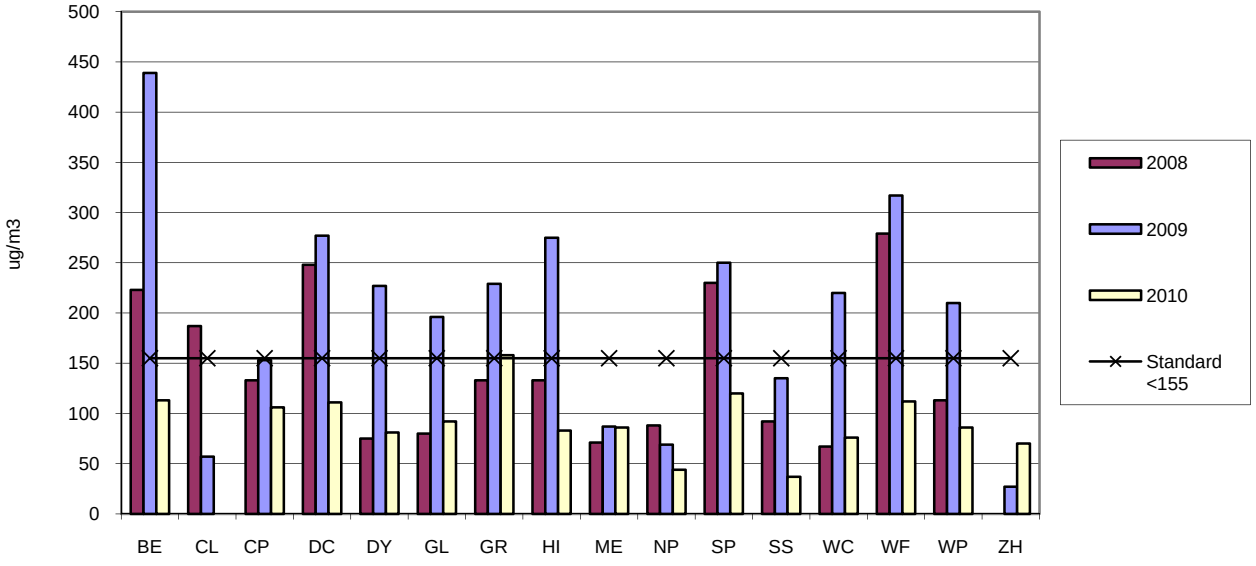

Chart 4 2008-2010 PM_{10} 24-hr Average Maximum Values

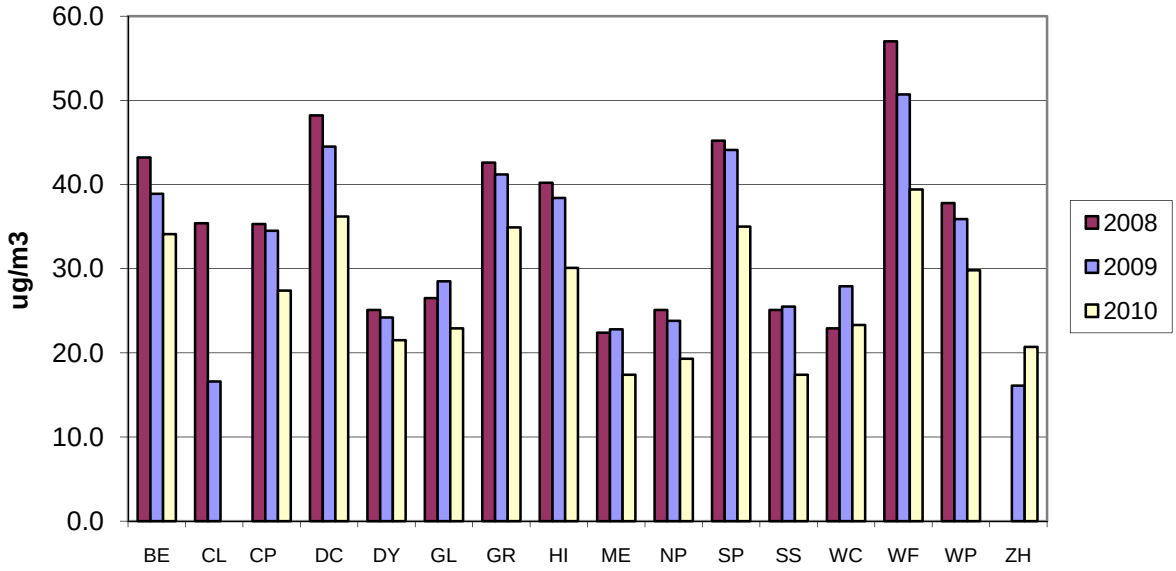

Chart 5 2008-2010 PM_{10} Annual Average

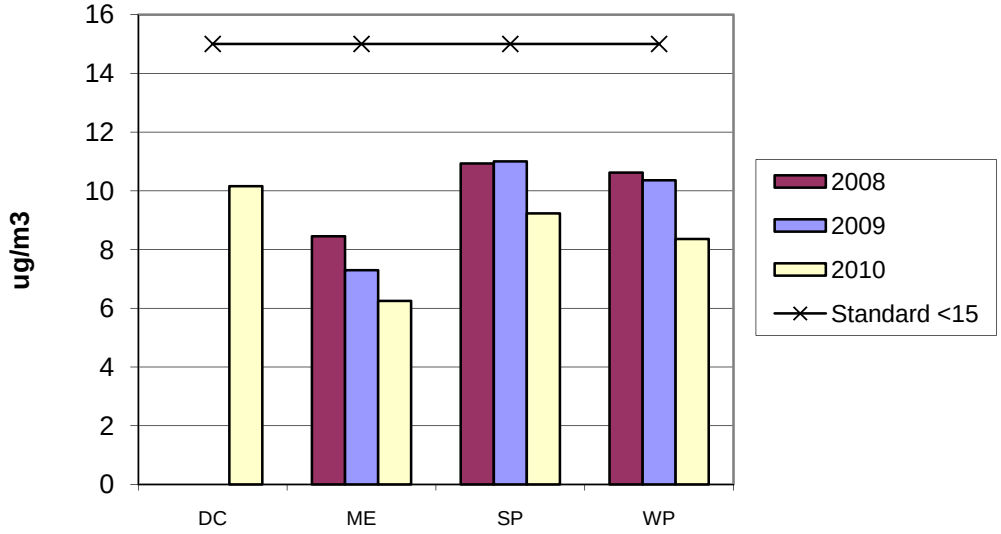

Chart 6 2008-2010 $PM_{2.5}$ Annual Average

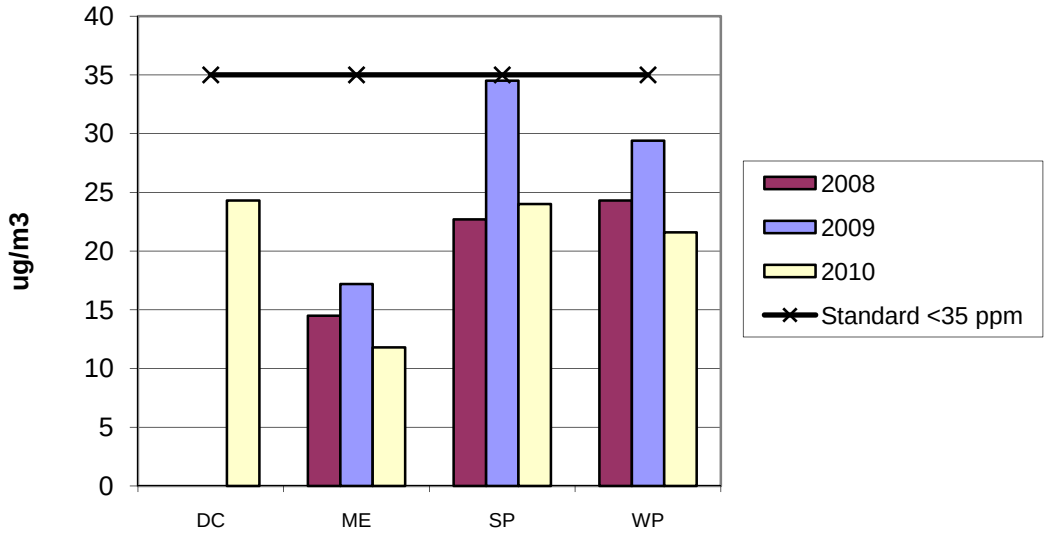

Chart 7 2008-2010 $PM_{2.5}$ 98th Percentile

Sulfur Dioxide

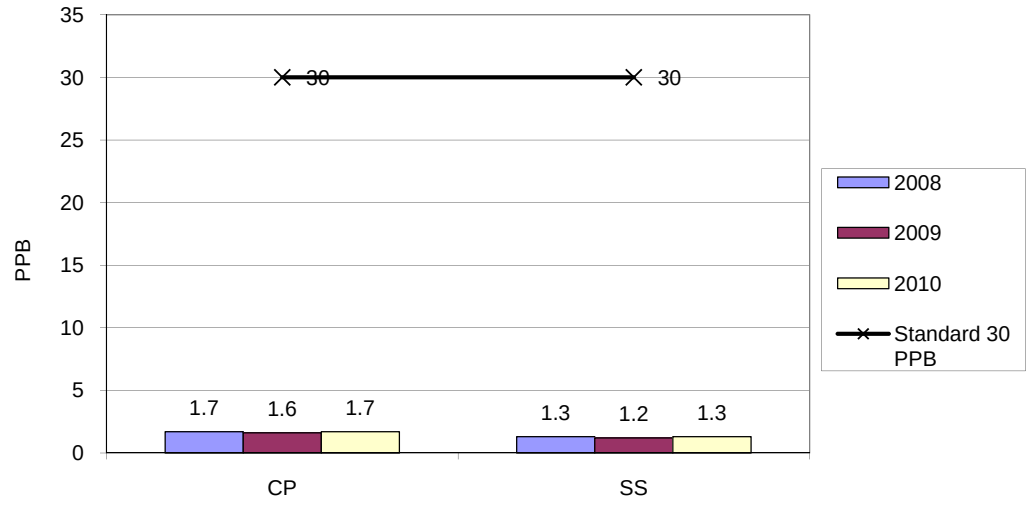

Chart 8 2008-2010 Sulfur Dioxide Annual Average

Special Projects and Network Changes

Air quality issues such as the SIP, natural events policy, and permits for new sources are diverse and controversial subjects for the citizens of Maricopa County. Since no policies can be made without high-quality monitoring data, MCAQD's Air Monitoring Division strives to provide the most reliable and relevant air monitoring data to the public. The following is a list of projects and changes that have occurred during the year 2010.

Seasonal Monitors

The department continues to run some of its carbon monoxide (CO) monitors and ozone (O_3) monitors on a seasonal basis (Table 27), though there have been changes in the seasonal operation of O_3 monitors (see below). Having part of the network operating seasonally allows the county to upgrade instruments, perform preventive maintenance, extend the life expectancy of the instruments, reduce replacement costs, and better utilize its QA and QC resources on the remaining instruments. During the off-season the number of CO and O_3 monitors operating still exceeds the minimum EPA requirements.

Table 27 Seasonal Monitors

Seasonal Carbon Monoxide Monitors (Operational Sept. 1 – Apr. 1)	Seasonal Ozone Monitors (Operational Apr. 1 – Nov. 1)
Buckeye	Buckeye
Dysart	Cave Creek
Glendale	Dysart
Mesa	Falcon Field
North Phoenix	Glendale
South Phoenix	Humboldt Mountain
South Scottsdale	Rio Verde
Tempe	Tempe
West Chandler	West Chandler

MCAQD has decided to return all O_3 monitors to full-year service; this change took place in November 2010 and all O_3 monitors in the network operated during November and December 2011. The new lower NAAQS for O_3, and the anticipation that the standard would be lowered even further in the near future, prompted the department to switch to full-year monitoring to ensure that any possible exceedances will be recorded.

The Consideration of Additional Sites/Monitors

The department continues to evaluate the PM_{10} network for possible additional sites for determining the impact on ambient pollution levels of significant sources or source categories. The significant sources would include industry and agriculture. The allocation of both financial and personnel resources continue to remain significant obstacles to the establishment of new monitoring sites.

New Sites

MCAQD opened a new SLAMS lead monitoring site in the north Phoenix area that was named Deer Valley (04-013-4018). This site is detailed in the lead monitoring section below.

MCAQD also completed a 5-year assessment of the monitoring network in 2010. This assessment identified several different areas that would benefit from the addition of a new monitoring site. It also identified several existing monitors that would be more beneficial if they were moved to another existing site.

Based off of the results of the Network Assessment, it has been decided to open a new monitoring site in the North Phoenix/Deer Valley area. This site will contain O_3, PM_{10}, and $PM_{2.5}$ monitors. MCAQD is also planning on opening a new site in Avondale to close a gap of monitoring coverage in the west valley area. The temporary Avondale site from the Salt River Characterization study is being strongly considered as being made this permanent site. It is anticipated that this site will contain O_3 and PM_{10} monitors.

Closed Sites/Monitors

In July 2010 the West Indian School Road site was permanently closed. This site, which monitored CO and wind parameters, was located within a City of Phoenix Fire Department training center. The City of Phoenix sold the building and MCAQD was required to move all equipment out before the end of June 2010. After discussion of whether to close the site permanently or move it to another location, it was decided that nearby CO sites (West Phoenix (04-013-0019), and the ADEQ's JLG Supersite (04-013-9998)) adequately represented the area, so the site was closed. Proper documentation regarding closing the site was sent to the EPA, which agreed with our assessment and decision.

The South Scottsdale SO_2 monitor was also closed at the end of December 2010. This monitor was moved to the existing Durango Complex site and began operating in January 2011. The five-year network assessment identified the South Scottsdale SO_2 monitor as being ineffective, so it was decided to move it to the Durango area which has a larger concentration of SO_2 sources.

Lead Monitoring

In conjunction with the recent strengthening of the lead NAAQS, EPA is improving the existing national lead monitoring network by requiring monitors to be placed in areas with sources such as industrial facilities that emit one ton or more per year (tpy) of lead and in urban areas with more than 500,000 people. In 1997, the EPA allowed MCAQD to stop monitoring for airborne lead because the data showed values were far below the standard. With the new more stringent standard, the department will once again monitor for airborne lead. MCAQD located a new lead monitoring site at the Deer Valley airport in North Phoenix, which was chosen because federal emissions inventories have indicated that the Deer Valley Airport emits more than one tpy of lead. This is due to the lead contained in the general aviation fuel (Deer Valley is a general aviation airport). The site began operation in July 2010 and has two co-located filter-based lead monitors which operate on a 1-in-6 day schedule.

Other Network Changes/Special Projects/Comments

- **Salt River Characterization Study**

  MCAQD is participating in a joint PM_{10} assessment project with the Maricopa Association of Governments (MAG) and the Arizona Department of Environmental Quality (ADEQ). This project will seek to identify the source of PM_{10} emissions within the Salt River area of the southwest valley. MCAQD setup several monitoring sites beginning early in 2010. Table 28 gives information on these sites, while Figure 9 displays a map of these monitoring sites in the southwest valley. These temporary sites are expected to operate until mid-2011.

Table 28 List of Temporary Monitoring Sites in the Salt River Characterization Study

Site#	Site Name	Location	Date Installed	Installed Monitors
1	43rd & Broadway	4740 S. 43rd Ave, Phoenix	4/1/2010	PM_{10}
2	51st Avenue	51st Avenue & Roeser, Phoenix	5/12/2010	PM_{10}, Wind Speed and Direction
3	67th Avenue	67th Avenue & Southern	5/7/2010	PM_{10}
4	Avondale	Avondale Blvd & Gila River, Avondale	5/4/2010	PM_{10}, Wind Speed and Direction
5	Arlington	9410 S. 355th Avenue, Arlington	2/17/2010	PM_{10}

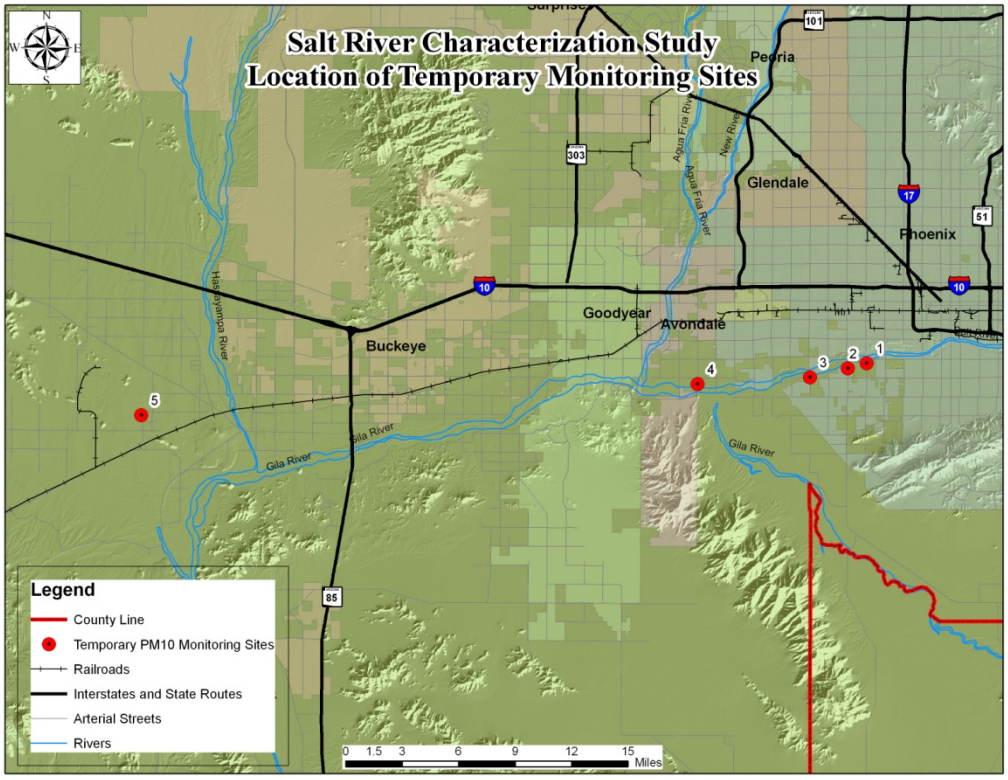

Figure 9 Map of temporary monitoring sites in the Salt River Characterization study.

- **Air Quality Forecasting**

ADEQ, in conjunction with the MCAQD, has developed a year-round air quality forecasting capability for the Phoenix metropolitan area. ADEQ takes the lead on air quality forecasting and issuing of High Pollution Advisories, while the MCAQD provides monitoring data and designates No-Burn Days.

- **Air Monitoring Website**

The department is continuing its distribution of air monitoring data to the public by posting one-hour continuous data on the Internet (see "Maricopa County Interactive Pollution Map" section below). Additionally, the department participates in the EPA Ozone Mapping AIRNow website (see ADDITIONAL COMMENTS). The corresponding websites are as follows:

Maricopa County Air Quality Dept: http://aqwww.maricopa.gov/AirMonitoring/SitePollutionMap.aspx
AIRNow: http://www.epa.gov/airnow

Mobile Monitoring Program

The department received approval in late 2006 from the Maricopa County Board of Supervisors to start a Mobile Monitoring program. This program enables the department to do more source-specific air monitoring (as opposed to the ambient monitoring that we have historically performed); the ability to track down sources of air pollutants; the ability to collect and analyze hazardous air-pollutant (HAP) samples; and the ability to perform stack testing of permitted sources. The program is useful for collecting and analyzing scientific data for various projects, including assisting our compliance division in the enforcement of air pollution control regulations.

The equipment for this program includes a vehicle outfitted with air monitoring and analytical equipment. Monitoring and sampling equipment consists of various meteorological, criteria pollutant, and HAP monitors, as well as stack testing equipment. Analytical equipment includes a portable Gas-Chromatograph/Mass Spectrometer (GCMS) and geographical positioning systems. Air monitoring equipment has also been placed in a mobile trailer that can be quickly moved to areas to operate independently. We also have the ability to use geographical information systems to build geo-referenced models of sampled pollutants.

In late 2008, the department hired an engineer to operate the vehicle and GCMS. The vehicle was delivered to MCAQD in February 2009. MCAQD has since developed quality control procedures for the Mobile Monitoring program and we spent much of 2010 assisting our compliance division with complaint investigations, performing educational outreach, and assisting in the development of the Salt River characterization study.

ADDITIONAL COMMENTS

Arizona Department of Environmental Quality Network

The ADEQ operates its own monitoring network within the State of Arizona, including some sites within Maricopa County. In addition to these state-run sites, ADEQ also utilizes several MCAQD sites to operate their own monitoring equipment. The ADEQ does a variety of ambient pollution, air toxics, visibility, and meteorological monitoring. One of the main sites in Maricopa County that is operated by ADEQ is the JLG Supersite in central Phoenix. The Supersite is a National Core multi-pollutant monitoring station (NCore) and is part of the national monitoring network (MCAQD's monitors, on the other hand, are part of the State and Local Air Monitoring network (SLAMS)).

For more information about the state's network or the NCore JLG Supersite consult the ADEQ's Annual Network Plan on their website at:
http://www.azdeq.gov/function/forms/reports.html.

EPA Ozone Mapping

The AIRNow website (http://www.epa.gov/airnow) provides real-time air pollution (ozone and $PM_{2.5}$) maps for major metropolitan areas around the United States, including the Phoenix Metropolitan Area. MCAQD has participated in the program since 2001.

MCAQD, in cooperation with ADEQ and the Pinal County Air Pollution Control District, has expanded the area that the maps cover. This area now includes sites as far east as Queen Creek, as far south as Casa Grande, and as far west as Palo Verde.

This website can be used as a tool for which the public can plan their daily activities and limit their exposure to air pollution. Eight-hour average peak ozone concentration maps and real-time eight-hour ozone animation maps are provided. Colors on the map indicate different concentrations of ozone pollution. The one-hour average values are given in parts per billion. The eight-hour averages are converted into Air Quality Index (AQI) numbers. The AQI is based on the NAAQS. The index was developed to convert pollution measurements into a common index that the general public can more easily understand.

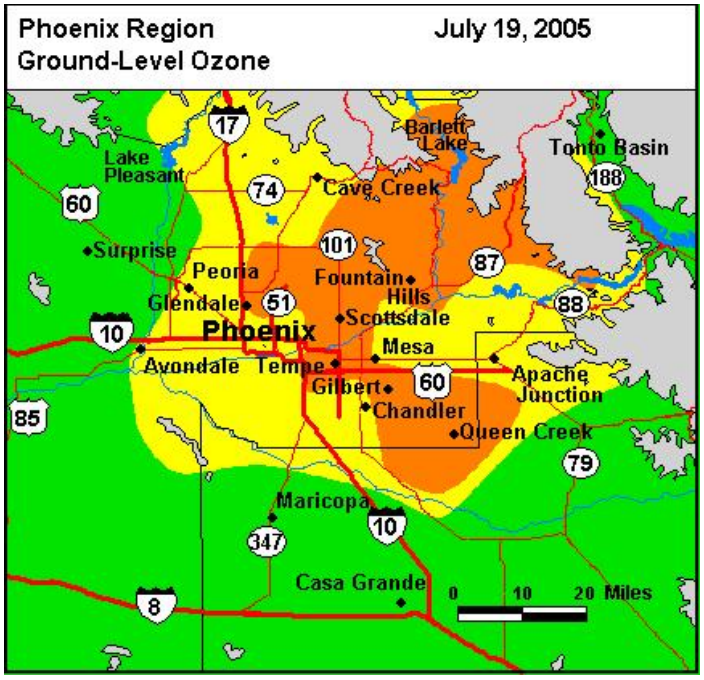

Figure 10 EPA AIRNow Website

Different colors on the map correspond to different categories of air quality and health impacts (Table 29).

Table 29 Air Quality Index

Index	Color Designation	Air Quality	Health Impact
0 – 50	Green	Good	No harmful effects expected.
51 – 100	Yellow	Moderate	Unusually sensitive people should consider limiting prolonged outdoor exertion.
101 – 150	Orange	Unhealthy for Sensitive Groups	Active children & adults, people with respiratory disease (i.e., asthma) should limit prolonged outdoor exertion.
151 – 200	Red	Unhealthy	Everyone should observe caution. Avoid prolonged outdoor exertion.
201 – 300	Purple	Very Unhealthy	Avoid all outdoor exertion. Use extreme caution outdoors
301 – 500	Maroon	Hazardous	Everyone should avoid all outdoor exertion.

The animated map is updated every hour from 8am to 8pm seven days a week. Updates to the site will be made during the ozone season (April through October).

Maricopa County's Interactive Pollution Map

In the spirit of our mission statement of "Protecting our most vital natural resource", MCAQD brought real-time pollution data to the Internet in late 2006. All of the department's continuous data are available to the public through an interactive map (Figure 11). The air pollutants that are available include CO, Ozone, NO_2, SO_2, and Particulates. Wind Speed and Direction information is also available. Seasonal monitors are noted on the website and the data display will inform the user which monitors are currently active. Data can be accessed at the web address:
http://aqwww.maricopa.gov/AirMonitoring/SitePollutionMap.aspx.

Data are displayed using actual readings, as well as AQI numbers. Relevant rolling averages are also displayed. In addition, a trend chart is provided so that the previous 24-hours can be detailed. On a separate page, a 30-day pollution history is displayed for each site.

One of the major problems in providing "real-time" pollution data to a public medium is providing quality data. The data available on the Internet goes through an automated quality assurance check program before it is released; however, some invalid data can slip through. Normal quality assurance checks take between one and three months. Consequently, information provided at this site should be used for informational purposes only and should not be relied on for comparison with NAAQS.

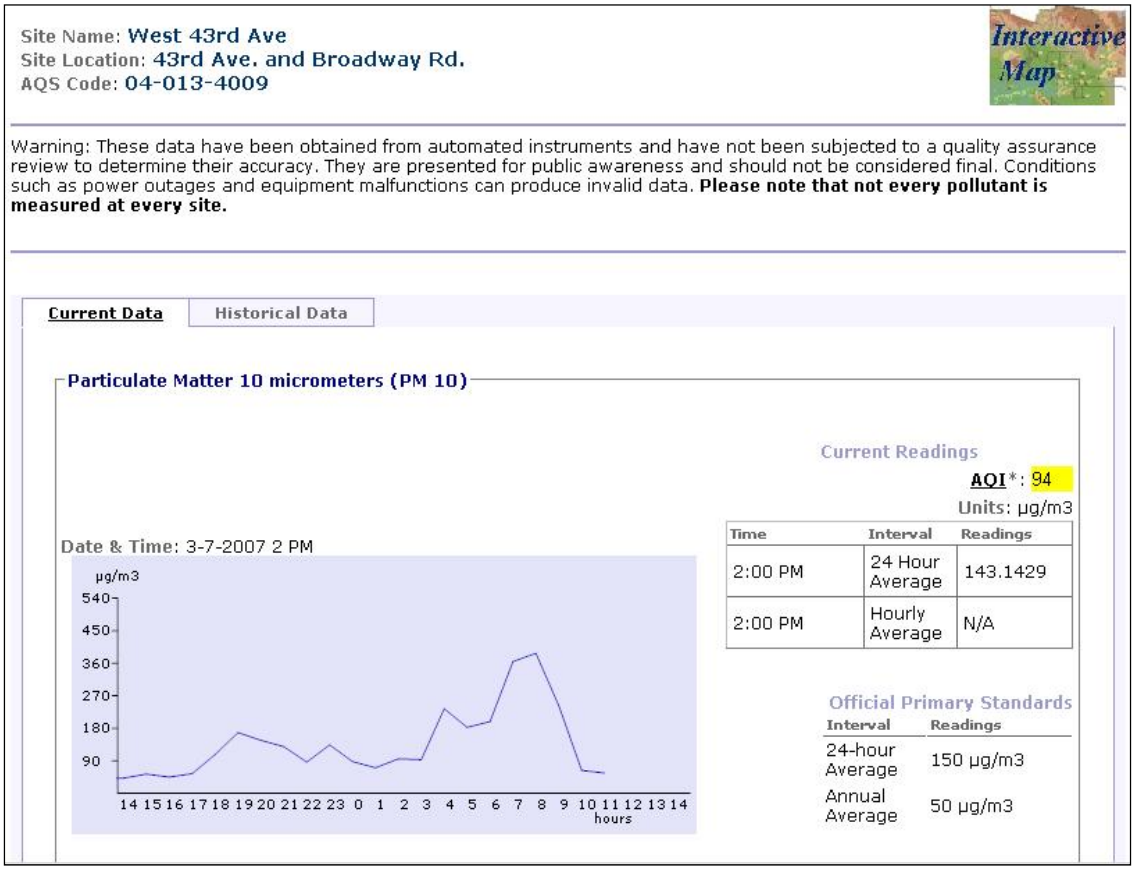

Figure 11 Interactive Website Data Trends Page

REFERENCES

1. Code of Federal Regulations, Chapter 40, Part 50 and 58, 1997

2. EPA's AirData (AQS) information: http://www.epa.gov/air/data/index.html

3. EPA's NAAQS Info: http://www.epa.gov/air/criteria.html

4. SIP Information: http://www.adeq.state.az.us/environ/air/plan/index.html

5. EPA's Air Program Information: http://www.epa.gov/rgytgrnj/programs/artd/air/quality/quality.htm

6. Maricopa County Air Quality Department Air Monitoring Map: http://aqwww.maricopa.gov/AirMonitoring/SitePollutionMap.aspx.

7. AIRNow: http://airnow.gov/

8. Criteria Pollutant Information: http://www.epa.gov/air/urbanair/6poll.html

9. Maricopa County Air Quality Department Prior Network Reviews: http://www.maricopa.gov/aq/divisions/monitoring/network.aspx.