Pinal County Air Quality Control District

2010 Ambient Monitoring Network
5 Year Assessment

July 1, 2010 – Final

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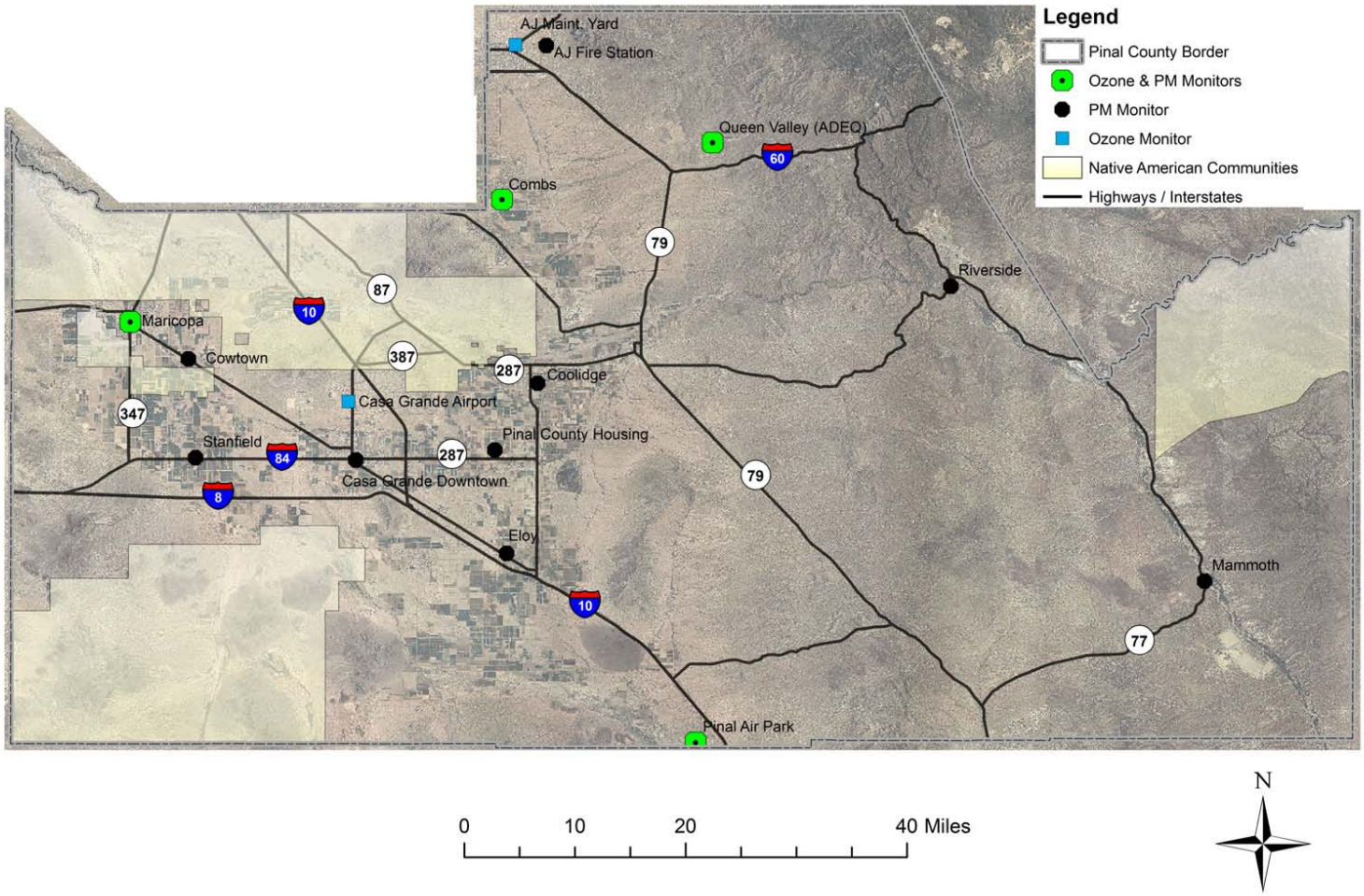
Pinal County Air Quality Control District
Ambient Air Quality Monitoring Network



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Introduction

This document provides two distinct products: 1) a description of the Pinal County Air Quality monitoring system in the form of an Monitoring Network Assessment.

40 Code of Federal Regulations (CFR) Part 58.10 (d) requires a monitoring network assessment to be conducted on a 5 year cycle with the first due July 1, 2010. This evaluation will assess the air quality surveillance system consisting of State and Local Air Monitoring Stations (SLAMS) and Special Purpose Monitors (SPM) operated under state and local authority.

As provided in the regulation the monitoring assessment must address the following:

1. Document that the network meets the monitoring objectives defined in appendix D to 40 CFR Part 58.
2. Evaluate the need for new monitoring sites.
3. Evaluate if existing sites no longer needed and can be terminated.
4. Determine if new technologies are appropriate for incorporation into the ambient air monitoring network.
5. Consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma).
6. For any sites that are being proposed for discontinuance, consider the effect on data users other than the agency itself, such as nearby States and Tribes or health effects studies.
7. For $PM_{2.5}$, the assessment also must identify needed changes to population-oriented sites.

Pinal County Air Quality operates air quality monitors that record ambient concentrations of several criteria pollutants. Criteria pollutants are those that the United States Environmental Protection Agency (EPA) has defined as a potential risk to health, and correspondingly defined a National Ambient Air Quality Standard (NAAQS).[1] The standards are intended to protect public health and welfare by setting limits on the allowable level of each pollutant in the ambient air.

The criteria pollutants are particulate matter less than or equal to 10 microns (PM_{10}), particulate matter less than or equal to 2.5 microns ($PM_{2.5}$), ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and lead (Pb).

[1] See Clean Air Act ("CAA") §§ 108,109, and 40 CFR §50.1 *et seq.*

1.0 Background Information

1.1 Network Description - PM10, PM2.5, Ozone

A State and Local Air Monitoring Station (SLAMS) network consists of monitoring stations that provide data to meet these monitoring objectives. Monitoring stations generally correspond to a spatial scale identified in 40 CFR Part 58 Appendix D. Spatial scale of representativeness is described in terms of the physical dimension of the air parcel nearest to a monitoring station throughout which actual pollutant concentrations are reasonably similar. Table 2.1 lists these spatial scales.

Table 1.1: Spatial Scales

Spatial Scale	Dimension
Microscale	Several meters up to 100 meters
Middle scale	100 meters up to 0.5 kilometers
Neighborhood Scale	0.5 kilometers to 4.0 kilometers
Urban Scale	4 kilometers to 50 kilometers
Regional Scale	Tens to hundreds of kilometers

40 CFR Part 58 Appendix D also describes the relationship between the monitoring objectives and the spatial scales that are generally most appropriate for each objective. Table 2.2 summarizes this relationship.

Table 1.2: Monitoring Objectives

Monitoring Objective	Appropriate Siting Scales
Highest Concentration	Micro, Middle, Neighborhood (Sometimes urban)
Population	Neighborhood, Urban
Source Impact	Micro, Middle, Neighborhood
General / Background	Neighborhood, Urban, Regional
Regional Transport	Urban / Regional
Welfare-related impact	Urban / Regional

A Special Purpose Monitor (SPM) is a monitor that is included in an agency's monitoring network, but not part of the SLAMS network. SPMs are generally used to monitor specific sources, although any of the above siting scales may be appropriate. In December 2006 the EPA revised 40 CFR 58.20 indicating that where a SPM operates for more than 24 months all data collected may be eligible for comparison to the relevant NAAQS.

40 CFR Part 50 and 53 define Federal Reference Methods (FRM) and Federal Equivalent Methods (FEM), which provide precise methodology for quantifying ambient concentrations of air pollutants. FRMs are monitoring methods that are associated with the NAAQS for the pollutant described in the appendices to 40 CFR 50 and determined by EPA to be FRMs. FEMs are alternative monitoring methods that have been

designated by EPA as obtaining "equivalent" results when compared to the FRM, as determined by 40 CFR 53. An additional option for air monitoring agencies is the Approved Regional Method (ARM). This designation requires the applying agency to conduct specific field testing and evaluation demonstrating that the method meets Class III precision and accuracy requirements listed in Subpart C of 40 CFR Part 53.

Pinal County Air Quality uses FRMs to collect filter based PM_{10} and $PM_{2.5}$ samples and Automated Equivalent Methods (FEMs) for continuous PM_{10} and ozone.

Three types of PM_{10} monitors are used throughout the monitoring network: 1) filter-based high-volume sampler, 2) filter based medium volume sampler, and 3) Tapered Element Oscillating Microbalance (TEOM) which measures PM_{10} continuously.

Two types of $PM_{2.5}$ monitors are used throughout the monitoring network: 1) filter based medium volume sampler equipped with the appropriate size fractioning device, and 2) federal equivalent method FDMS TEOM (Filter Dynamic Measurement System) which measure $PM_{2.5}$ continuously (data are not currently reported due to know operational issues with the instrument – the manufacturer is working to correct the problems).

The Arizona Department of Environmental Quality (ADEQ) operated a sulfur dioxide (SO_2) analyzer in San Manuel, Pinal County until December of 2007. The San Manuel site was discontinued as proposed in the SIP and Network Plan and subsequent attainment finding by EPA for the area. ADEQ retains authority to monitor copper smelters in Arizona.

ADEQ operates ozone and trace level nitrogen oxide (NO_x) analyzers at Queen Valley as a part of its PAMS network. There are currently no monitors in Pinal County that measure lead (Pb) although ADEQ operates samplers in other portions of the state that measure lead. Refer to the State of Arizona Monitoring Network Plan for information on these criteria pollutants.

The State Implementation Plan (SIP) as it applies to Pinal County does not make any SLAMS designations. In 2000 Pinal County compiled its first annual network review which included SLAM/SPM site designations. The past annual network reviews have been submitted to both ADEQ and EPA for comment.

As described in the Pinal County document entitled, “2010 Network Plan and 2009 Data Summary”, the monitoring network meets the monitoring objectives defined in appendix D to 40 CFR Part 58.

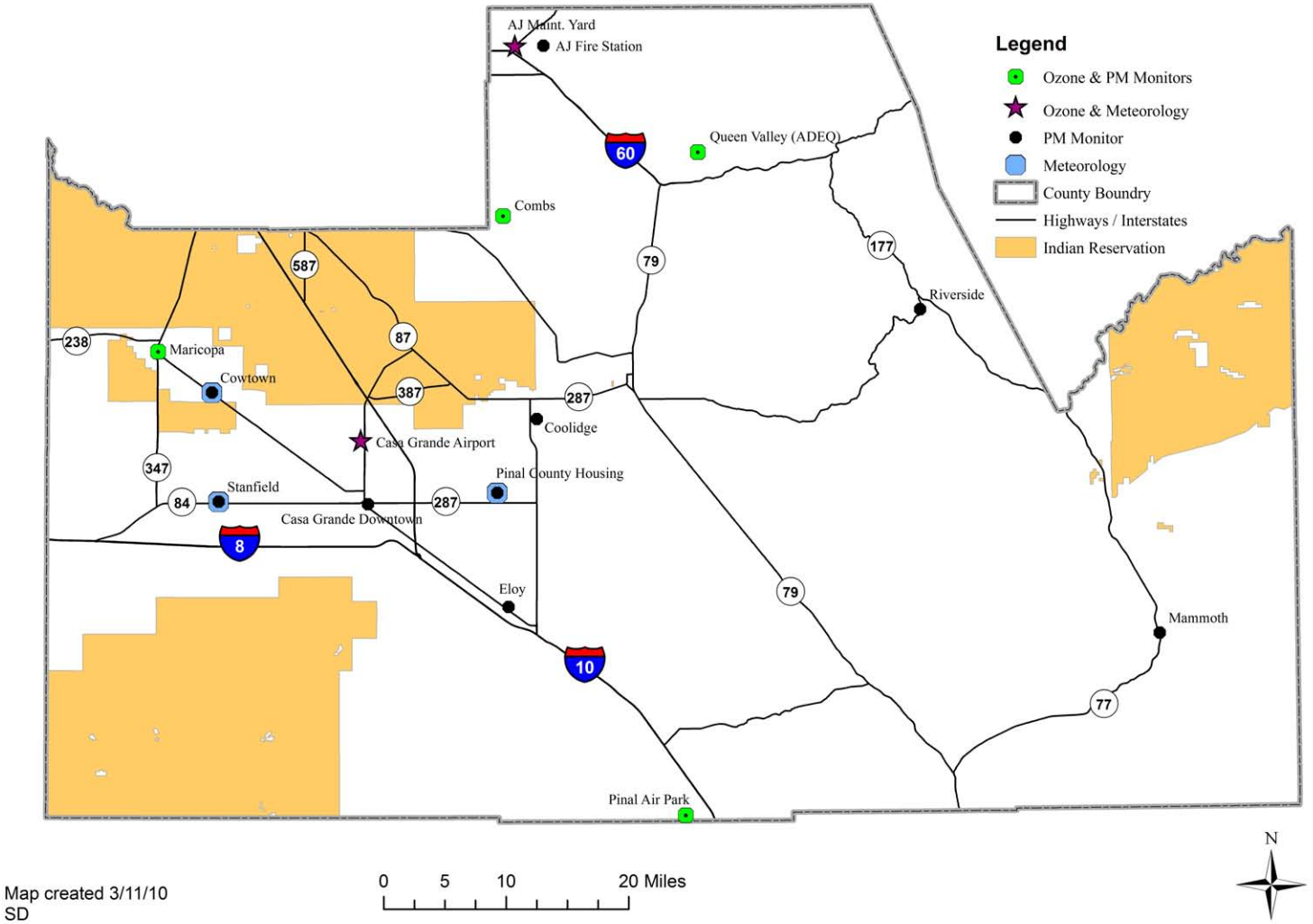
Table 1.3: SLAMS Summary

Site Name	AQS ID	Classification	Scale	Objective	Pollutant
Apache Junction Fire Station	040213002	SLAMS	Neighborhood	Population	$PM_{2.5}$
Apache Junction Fire Station	040213002	SLAMS	Neighborhood	Population	PM_{10}
Apache Junction Maint.Yard	040213001	SLAMS	Neighborhood	Population	O_3
Casa Grande Airport	040213003	SLAMS	Neighborhood	Population	O_3
Casa Grande Downtown	040210001	SLAMS	Neighborhood	Population	$PM_{2.5}$
Casa Grande Downtown	040210001	SLAMS	Neighborhood	Population	PM_{10}
Coolidge Maintenance Yard	040213004	SLAMS	Neighborhood	Population	PM_{10}
Eloy County Complex	040213014	SLAMS	Neighborhood	Population	PM_{10}
Mammoth County Complex	040213006	SLAMS	Neighborhood	Population/ Background	PM_{10}
Pinal Air Park	040213007	SLAMS	Regional	Background	PM_{10}
Pinal County Housing Complex (HiVol)	040213011	SLAMS	Neighborhood	Population	PM_{10}
Riverside Maintenance Yard	040213012	SLAMS	Neighborhood	SourceImpact	PM_{10}
Stanfield County Complex TEOM	040213008	SLAMS	Neighborhood	Population	PM_{10}

Table 1.4: SPM Summary

Site Name	AQS ID	Classification	Scale	Objective	Pollutant
Casa Grande Downtown TEOM	040210001	SPM	Neighborhood	Population	PM_{10}
Combs School	040213009	SPM	Neighborhood	Population	O_3
Combs School TEOM	040213009	SPM	Neighborhood	Population	PM_{10}
Cowtown Road TEOM	040213013	SPM	Microscale	SourceImpact	PM_{10}
Cowtown Road	040213013	SPM	Microscale	SourceImpact	PM_{10}
Cowtown Road	040213013	SPM	Microscale	SourceImpact	$PM_{2.5}$
County Complex Maricopa	040213010	SPM	Neighborhood	Population	O_3
County Complex Maricopa TEOM	040213010	SPM	Neighborhood	Population	PM_{10}
Pinal Air Park	040213007	SPM	Regional	Transport	O_3
Pinal County Housing Complex TEOM	040213011	SPM	Neighborhood	Population	PM_{10}

Pinal County Air Quality Monitoring Network



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1.2 Climatology

Central Arizona experiences periods of significant winds associated with frontal passages, troughs of low pressure, summer monsoon storms and occasional strong pressure gradients.

The meteorology associated with winds in Pinal County range from synoptic scale systems such as Frontal passages, strong pressure gradients, Mesoscale Convective System (MCS)[2] and regional monsoon storms to micro scale storm cells that form locally.

The frontal passages are typically associated with strong Pacific Northwest low pressure systems that develop over the northern Pacific Ocean and move southeast into the western United States. Strong winds in advance of the cold fronts can reach speeds over 30 mph which cause significant areas of blowing dust in central Arizona. Additionally the duration of the strong, gusty winds can last up to 8 hours which contribute to elevated hourly PM_{10} concentrations. The hourly PM_{10} concentrations associated with frontal passages may not match the monsoon PM_{10} concentrations in intensity however their temporal duration can create 24-hr PM_{10} concentrations which reach the 99^{th} percentile of historical PM_{10} 24-hr average data.

Pressure gradient exceptional/natural events result from strong high pressure building over the western United States and low pressure to the east. As the high pressure builds a pressure differential is created causing strong winds over Arizona. The result is blowing dust developing locally in addition to transported dust from neighboring areas surrounding Pinal County. Also, similar to frontal passages, duration of strong, gusty winds can last several hours. The combination of the long duration of transported dust and locally derived dust overwhelm the PM_{10} monitors.

The monsoon is a seasonal wind that takes place in the southwestern United States and Northern Mexico during the summer months. The typical diurnal winds in central Arizona are ‘drainage’ in nature, easterly winds originating from the mountains in the morning switch to westerly winds in the afternoon due to the heating of the desert floor. However during the monsoon, winds will shift to an easterly to southeasterly direction. This is due to a ridge of high pressure that sets up over the ‘four corners’ area (Figure 1.2). The result is an influx of atmospheric moisture from the south and east and storm development. The storm development can be synoptic in nature as large lines of storms form either over the Mogollon Rim or Northern Mexico/Southern Arizona and move into the valley. Additionally, monsoon storms can be local in nature with the formation of localized monsoon supported storm cells. Either monsoon setup can pack significant winds (reaching gusts over 60 mph!) that cause dust storms to develop and transport dust tens to hundreds of miles (a.k.a. Haboob) and have similar dust causing effects as frontal passages, and strong pressure gradients.

[2] http://www.weather.gov/glossary/index.php?letter=m

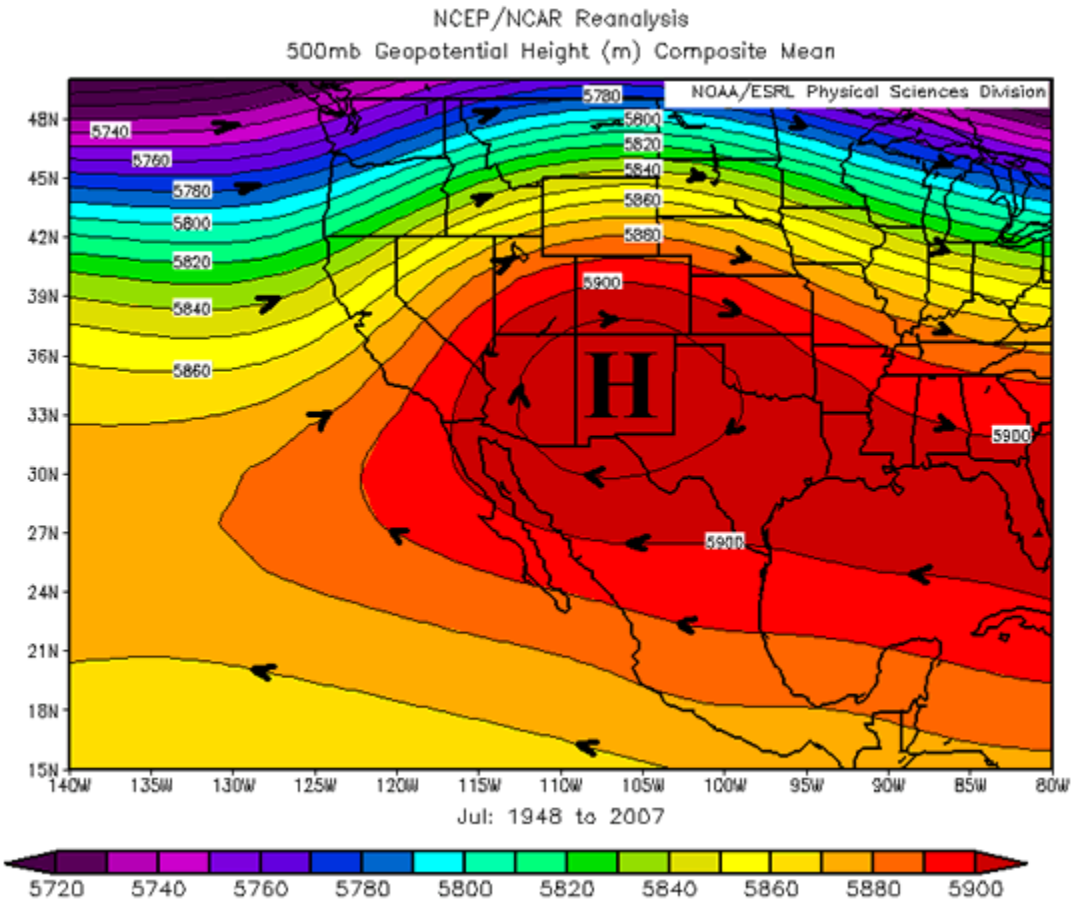


Figure 1.2: Typical Monsoon Setup (500 mb map)
Source:National Weather Service (http://www.wrh.noaa.gov/twc/monsoon/monsoon_NA.php)

The monsoon "season", as defined by the National Weather Service, starts on June 15th and lasts through September 30th. The large scale Haboobs that form are frequent at the beginning of the monsoon and subside as the Monsoon progresses and measurable rainfall occurs.

The typical times of year that each meteorological setup results in exceptional/natural events in Pinal County are (see three graphs below of 2006 through 2008 PM10 exceedances by type and month):

- Frontal passage – Spring (March-April)
- Strong pressure gradients – Fall (September-November)
- Monsoon – Summer (May-September)

The Pinal County climate is arid. The average annual rainfall increases from the west to east (see Figures 1.3 and 1.4). The driest time period of the year for the county is April through June followed by September through November. The two meteorological regimes which are enhanced by the lack of precipitation are frontal passages (especially in April) and Monsoon.

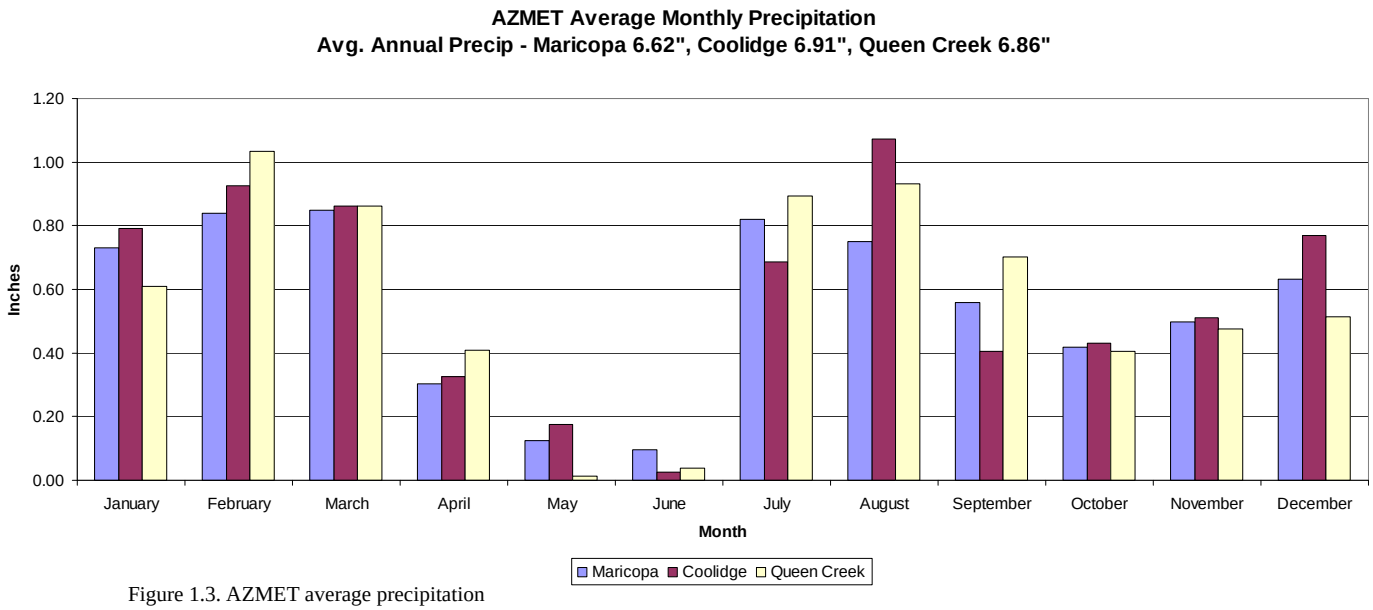


Figure 1.3. AZMET average precipitation
Source: The Arizona Meteorological Network (http://ag.arizona.edu/azmet/)
Period of record: Maricopa 1988-2008, Coolidge 1987-2008, Queen Creek 1995-2008

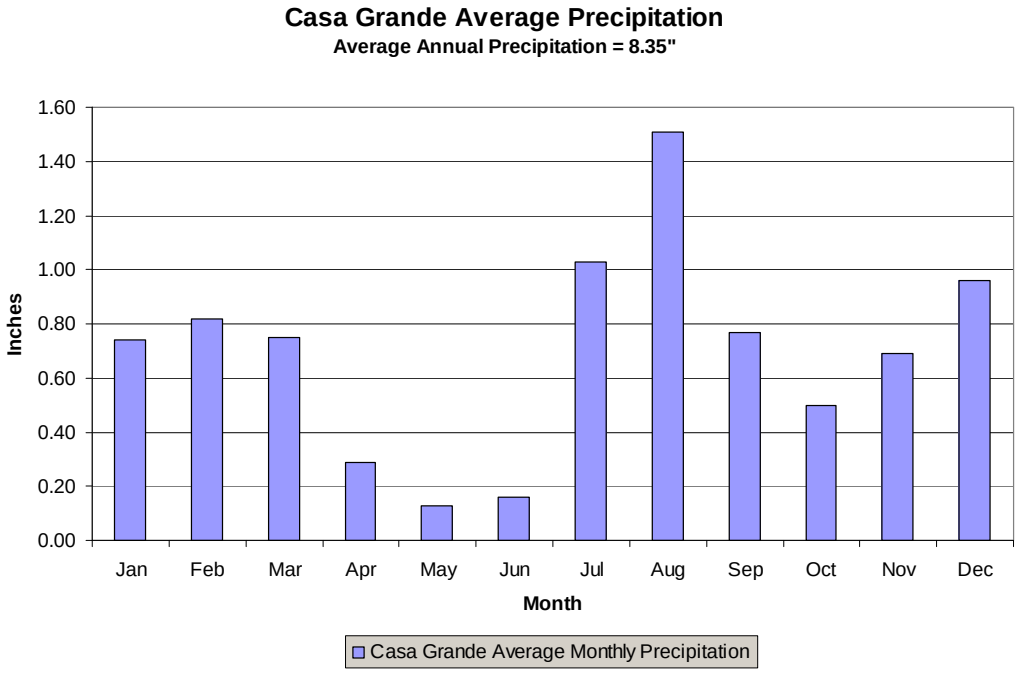


Figure 1.4 Casa Grande average precipitation (1898-2008)
Source: Western Regional Climate Center (http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?az1306)

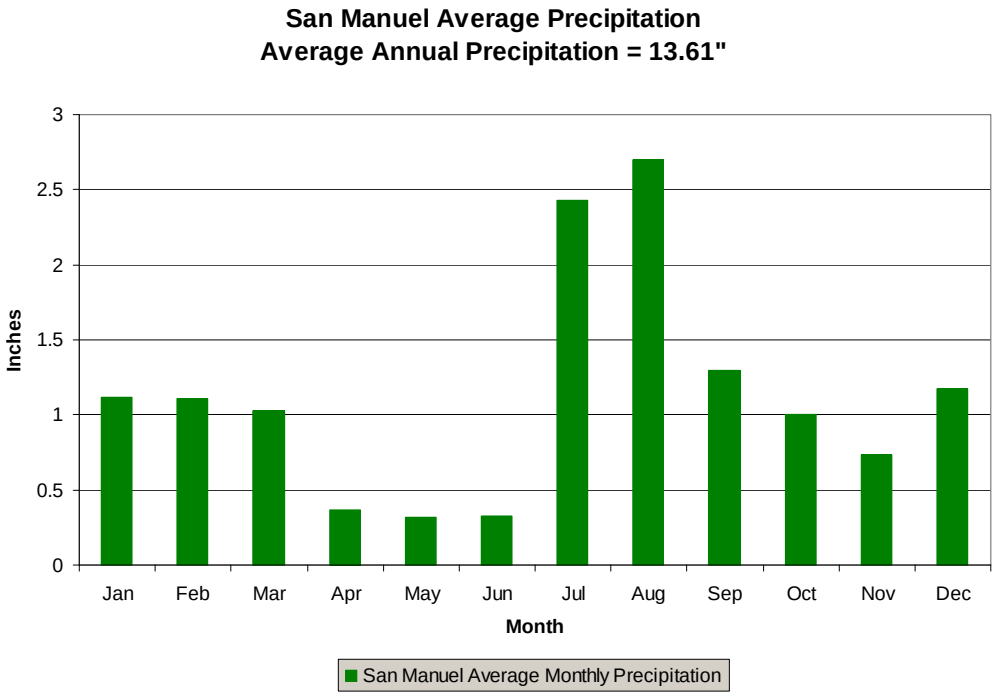


Figure 1.5 San Manuel average precipitation (1954-2008)
Source: Western Regional Climate Center (http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?az7530)

1.3 Geography

The topography of Pinal County can best be described as a broad basin, low in elevation, surrounded in each direction by mountain ranges. Open-ended valleys characterize the topography of western Pinal County. The area does not have geographical or topographical barriers limiting air-pollution transport within its airshed. The elevation of the basin area of Pinal County is approximately 1,000 feet above sea level.

The mountain ranges that surround the basin area create complex mountain-valley wind patterns. The Estrella Mountains in the northwest portion of the County reach 4,125 feet in elevation and provide a buffer between Pinal and Maricopa Counties. In the northern portion of Pinal County, the Superstition and San Tan Mountains rise to a height of 5,036 and 3,054 feet, respectively. Near the western border of the County, the Table Top Mountains reach 3,392 feet in elevation. To the south, the Black Mountains reach 5,577 feet. The Pinal Mountains in western Gila County, near Pinal County's eastern border, reach 7,848 feet in elevation.

1.4 NAAQS Status

On May 20, 2020 the U.S. Environmental Protection Agency (EPA) notified Pinal County of its intent to designate a portion of Pinal County as "nonattainment" for the 2006 24-hour fine particle ($PM_{2.5}$) national ambient air quality standard (NAAQS), and provide the status of the redesignation actions for the 1997 annual $PM_{2.5}$ and 1987 24-hour coarse particle (PM_{10}) standards.

Designation for the 2006 24-hour $PM_{2.5}$ NAAQS:

EPA finalized designations for the 2006 24-hour $PM_{2.5}$ NAAQS for most areas in October 2009 but, air quality monitoring data collected from 2006-2008 indicated that Pinal County was newly violating the standard. EPA completed an evaluation and described its intent to designate a portion of Pinal County as "nonattainment'. The remaining State lands in Pinal County were proposed to be classified as "unclassifiable/attainment." EPA intends to make a final designation decisions for the 2006 24-hour $PM_{2.5}$ NAAQS in August 2010.

Redesignation for the 1997 annual $PM_{2.5}$ NAAQS:

It was determined that the violating monitor in Pinal County is not eligible for comparison with the annual $PM_{2.5}$ NAAQS. Therefore, Pinal County will retain a designation of "unclassifiable/attainment" for the 1997 annual $PM_{2.5}$ NAAQS.

Redesignation for the 1987 24-hour PM_{10} NAAQS:

At the time this document was prepared, EPA was reviewing documentation submitted by ADEQ and Pinal County which recommended a nonattainment area boundary.

2.0 Evaluation Data

2.1 Ambient Trends

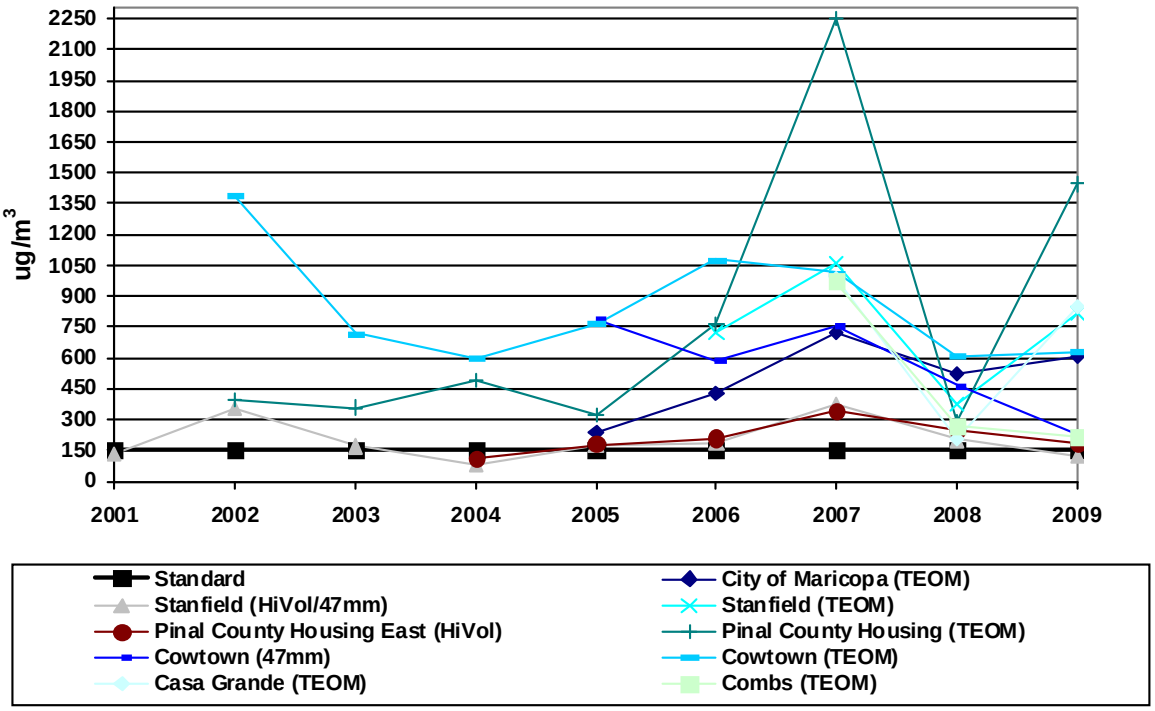
The following sections provide a brief summary of pollutant data trends over several years. The purpose of including this section is to illustrate air quality improvement or decline over time. This information is valuable in the overall assessment of the monitoring network and its ability to represent population exposure.

2.1.1 24-Hour PM_{10}

Figure 2-1, 2-2a, and 2-2b illustrate maximum 24-hour average PM_{10} values collected throughout Pinal County. To better illustrate the range in concentrations the figures are separated into two categories, highest and lowest concentration sites. Maximum PM_{10} concentrations typically vary from year to year because they result from local sources or high wind events.

Figure 2-1 shows trends at the highest concentration sites; Stanfield, City of Maricopa, Pinal County Housing, and Cowtown. It is evident from the illustration that the each of the sites has recorded 24-hour average concentrations in excess of the PM_{10} standard of 150µg/m^3. In this figure Stanfield has the longest record and a general trend towards higher concentrations over time, particularly in recent years. Note that for 2007-2009 days flagged as exceptional event by Pinal County were not removed from the data set. The events are pending concurrence from EPA Region IX.

Figure 2-1: Maximum 24-Hour PM_{10} Concentration at Highest Sites



Figures 2-2a and 2-2b show 24-hour trends for sites with concentrations less than the standard. Apache Junction and the Casa Grande filter based data, shown in figure 2-2a, are below the standard for the period of record. Eloy and Mammoth filter based data, shown in figure 2-2b, show rather large reductions in 2004.

Figure 2-2a: Maximum 24-Hour PM_{10} Concentration - Lowest Sites Group A

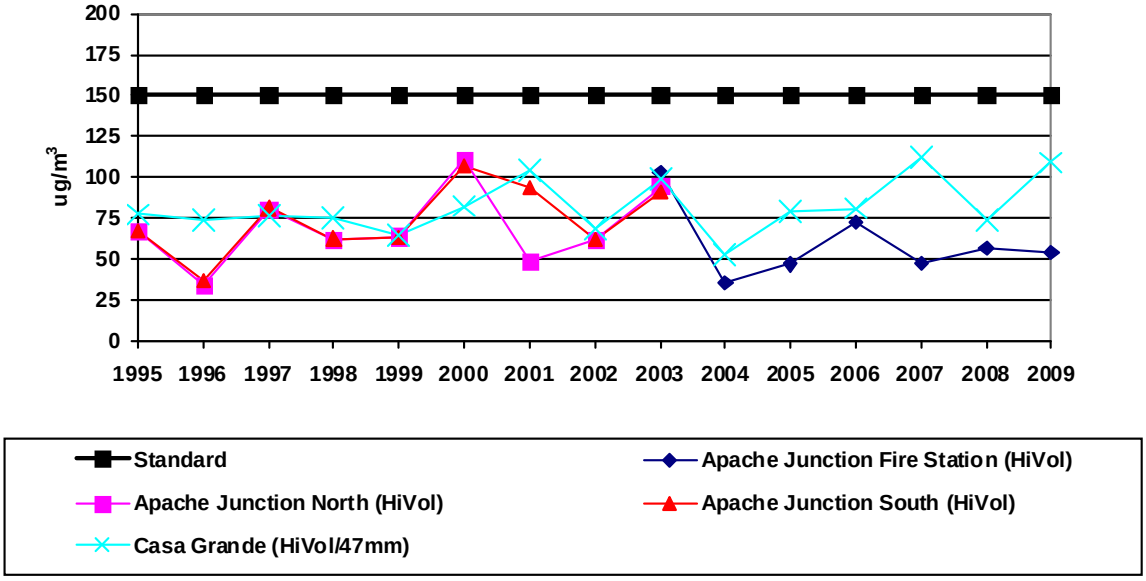
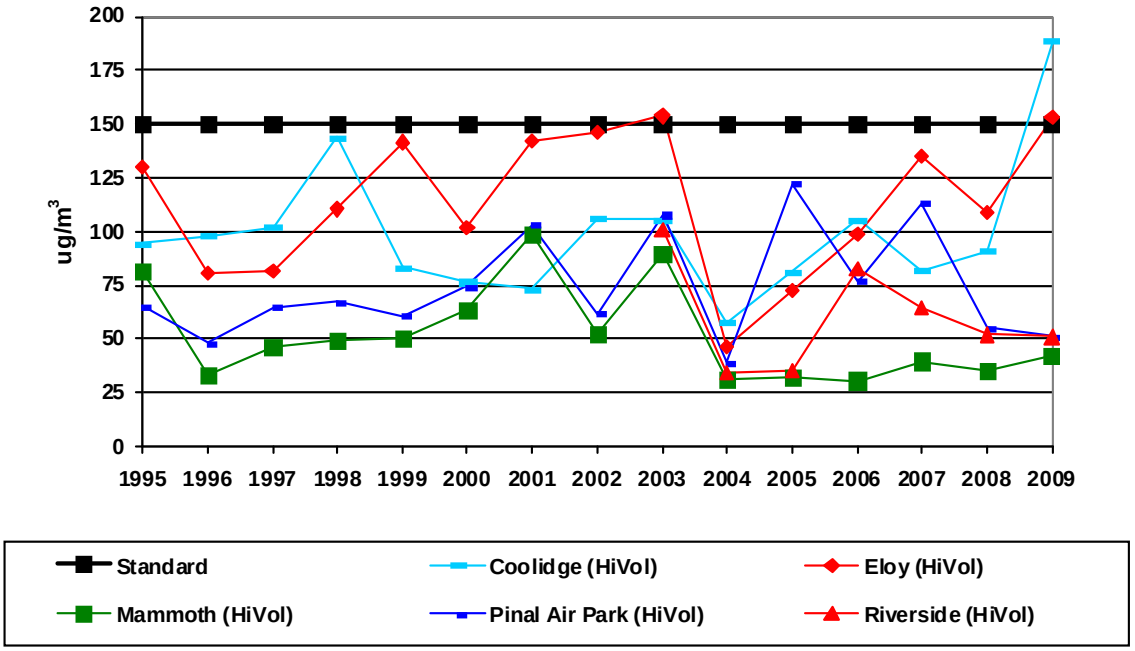


Figure 2.2b: Maximum 24-Hour PM_{10} Concentration - Lowest Sites Group B

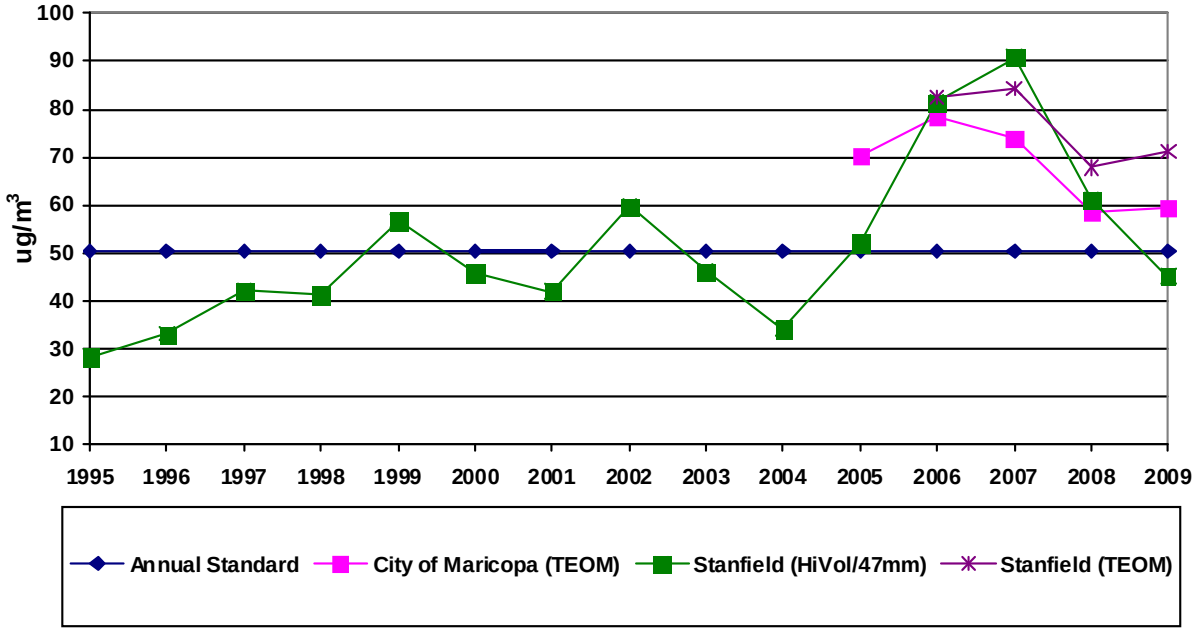


2.1.2 Annual PM_{10}

Figure 2-3, 2-4a, and 2-4b illustrate annual average PM_{10} values collected throughout Pinal County. To better illustrate the range in concentrations the figures are separated into regional categories, Western sites, Central and Southern sites, and Eastern sites. Annual averages are no longer comparable to a Federal standard, but offer a valuable measure for trend analysis. Before being revoked the annual standard was 50µg/m^3.

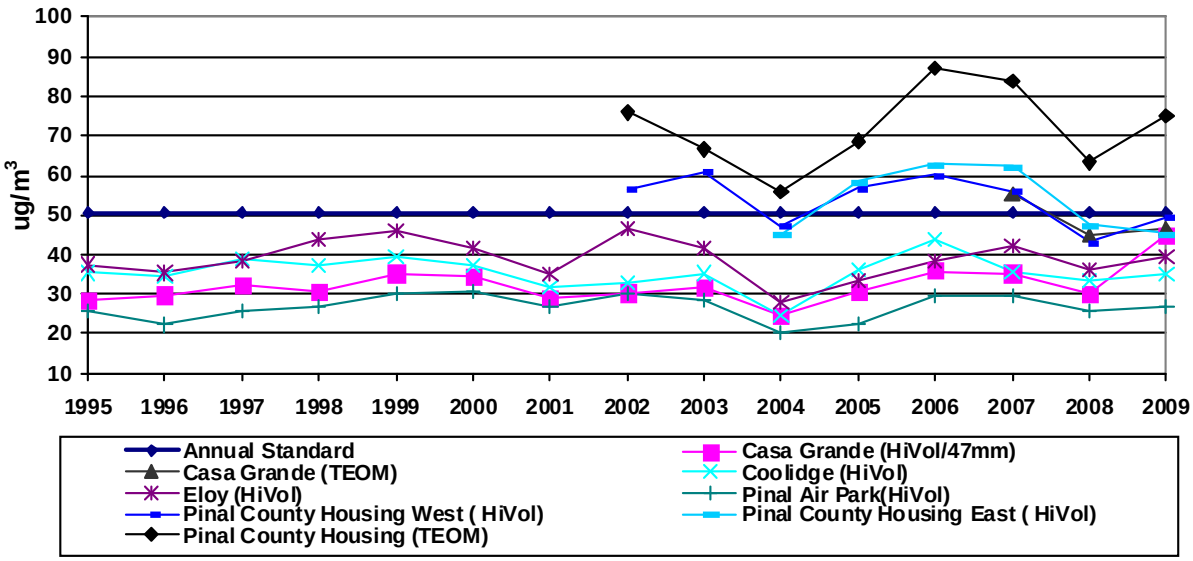
Figure 2-3 shows trends at the highest western sites; Stanfield and City of Maricopa. Of these sites Stanfield has the longest data record. Although the collection method changed in 2006, the increasing trend at Stanfield is evident. Annual averages in the mid-1990s were between 30 and 40µg/m^3 compared to values ranging from 80 to 90µg/m^3 in 2006 and 2007. Overall, the trend during 2009 showed little change from 2008. Annual averages at Maricopa are comparable to Stanfield, but lack a longer term record.

Figure 2-3: Annual PM_{10} Average at Western Sites



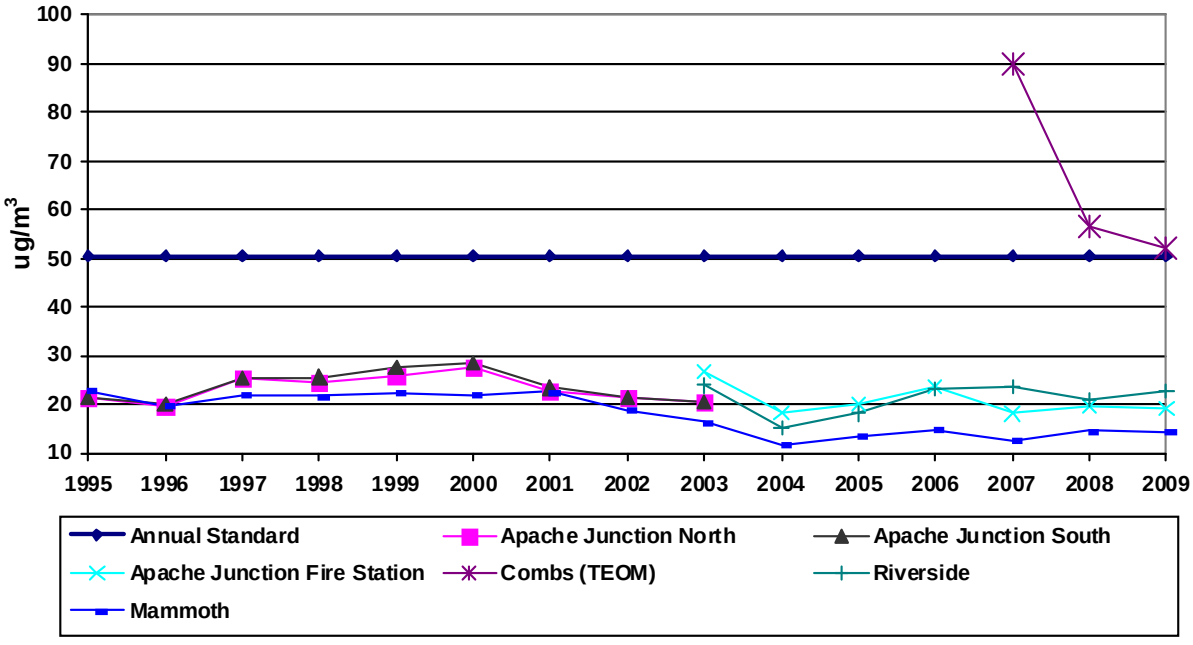
The Central and Southern sites, shown in Figure 2-4, include Casa Grande, Coolidge, Eloy, Pinal County Housing, and Pinal Air Park. Among these sites Pinal County Housing records the highest concentrations, above the revoked annual standard. All sites in this group show a generally increasing trend from a rather low year in 2004 through 2007. In 2009 a slight increase in annual average is observed across all monitors.

Figure 2-4: Annual PM_{10} Average at Central and Southern Sites



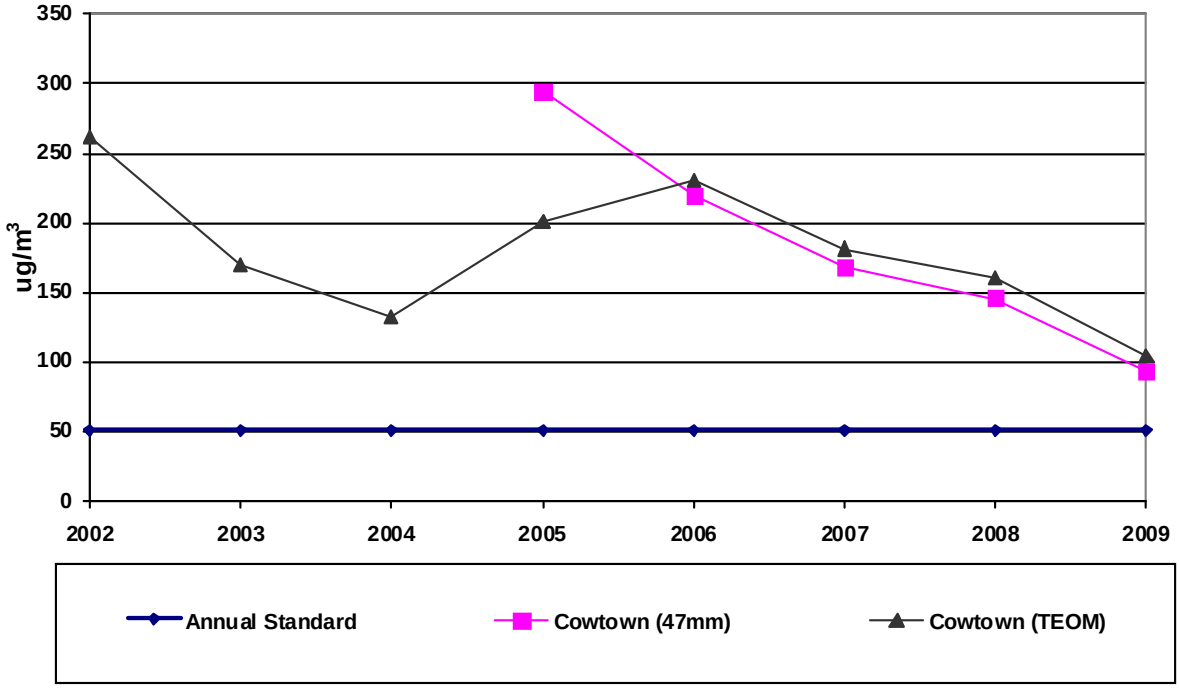
The Eastern sites, shown in Figure 2-5, include Apache Junction, Combs, Mammoth and Riverside. PM_{10} measurement at Combs was added during the spring of 2007 so only a partial year of data is available. Values at Combs have decreased each of the last two years but still above 50µg/m^3. Apache Junction, Mammoth and Riverside are all well below the revoked annual standard. A longer term trend is apparent with Mammoth showing decreasing values since 2000.

Figure 2-5: Annual PM_{10} Average at Northern and Eastern Sites



Because the values at Cowtown are a factor of 2 to 3 higher than other sites, the site is shown alone in Figure 2-6. Annual concentrations are 4 to 5 times higher than the revoked standard. The 5 year trend at Cowtown shows a slight decrease in 2004 followed by a gradual increase in 2005 and 2006. The 2007 – 2009 averages show a steady decrease in concentration.

Figure 2-6: Annual PM_{10} Average at Cowtown

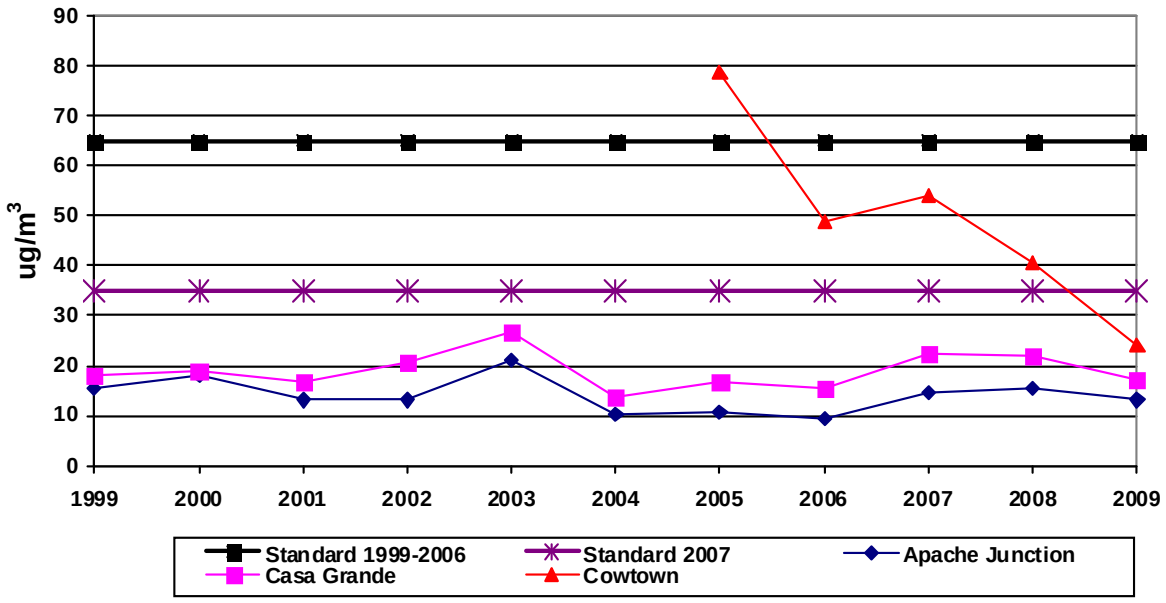


2.1.3 24-Hour $PM_{2.5}$

Figure 2-7 illustrates 98th percentile $PM_{2.5}$ values collected at Apache Junction, Casa Grande, and Cowtown. It is evident from the illustration that the Apache Junction and Casa Grande sites are below the standard over the period of record. Both sites show a concentration general range between 15 and 20µg/m^3 with the exception of 2003 when values were slightly higher. A slight increase is also apparent in 2007. The 2009 values are slightly lower than 2008. The 24-Hour values at Casa Grande are typically higher than Apache Junction by approximately 25%.

The Cowtown site shows values above 35µg/m^3 for the first 3 years it has been in operation but in 2009 the 24-hour value fell below 35µg/m^3. The three year average of the 98th percentile value dropped from 60µg/m^3 in 2007, to 40 in µg/m^3 in 2009. The site violates the $PM_{2.5}$ 24-hour NAAQS even after the decrease in concentration.

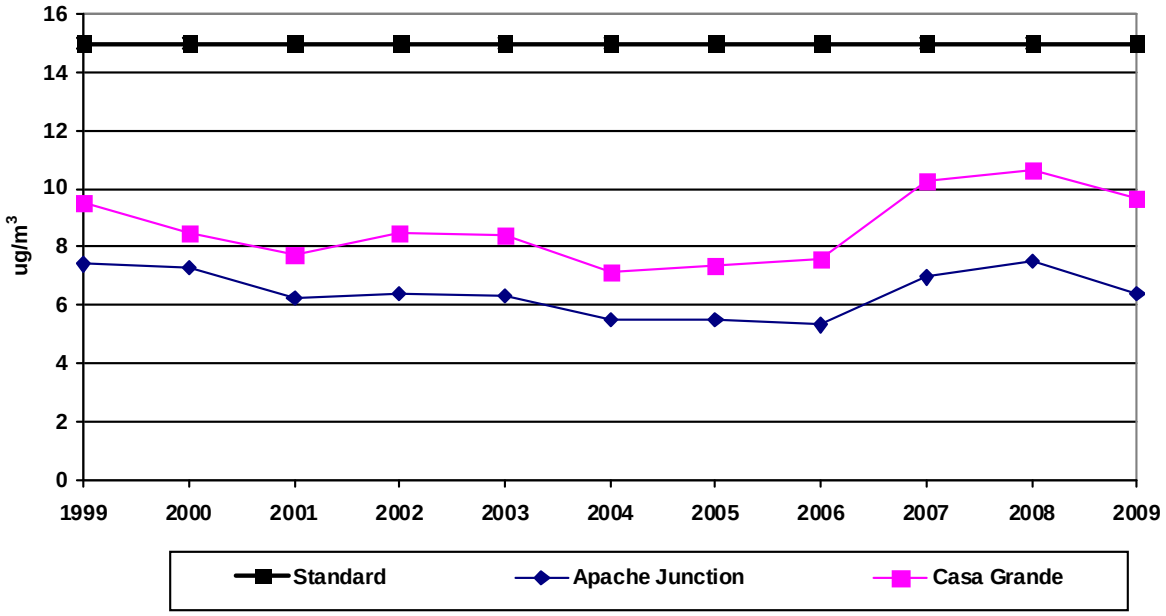
Figure 2-7: Network-Wide 24-Hour Average $PM_{2.5}$ Trends



2.1.4 PM2.5 Annual

Figure 2-8 illustrates annual average $PM_{2.5}$ values collected at Apache Junction and Casa Grande. Both sites show concentrations with a range between 5 and 10µg/m^3 with the exception of 2003 when values were slightly higher. A slight decrease is apparent in 2009. As with seen in the 24-Hour averages, the values at Casa Grande are typically higher than Apache Junction by approximately 25%. Cowtown is not compared to the annual standard.

Figure 2-8: Network-Wide Annual Average $PM_{2.5}$ Trends

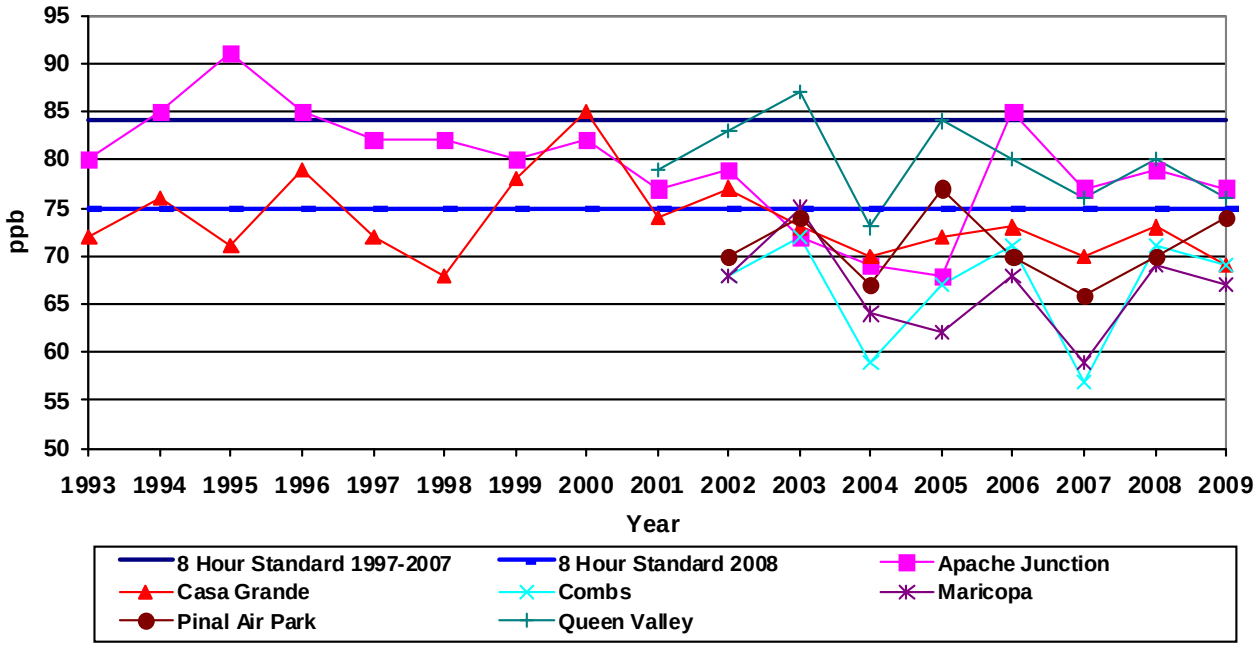


2.1.5 8-Hour Ozone

Daily maximum 8-hour averages remain elevated at Apache Junction and Queen Valley. In general, the 8-hour average ozone concentrations have decreased over time at the two long term sites, Apache Junction and Casa Grande. With the exception of Pinal Air park all sites show a decrease from 2008 to 2009 which is also reflected in the 1-hour average concentrations. Overall, 2009 was a low ozone year across all networks in Arizona.

Figure 2-9 shows the fourth highest eight-hour average recorded at Apache Junction, Casa Grande, Queen Valley, Combs, Maricopa, and Pinal Air Park.

Figure 2-9 Eight-Hour Ozone Trends – 4th Highest Concentration



2.2 Population

The population estimates in Tables 2.4, 2.5 and 2.6 were made by the Central Arizona Association of Governments (CAAG) in a 2008 draft analysis. Population figures are provided for incorporated jurisdictions, unincorporated communities, and place names. Between July 1, 2000 and July 1, 2007 the county population increased by 185,525, nearly doubling in 7 years.

Maps 2.1 and 2.2 relate the ambient air monitoring network to populated areas in the County.

Table 2.4

Total Population, Pinal Incorporated Cities & Towns
July 1, 2000 through July 1, 2007

Area	2000	2001	2002	2003	2004	2005	2006	2007
Pinal County Total	**183,423**	**187,373**	**196,168**	**206,571**	**226,736**	**258,483**	**296,531**	**325,925**
Apache Junction (part)	31,746	32,554	33,461	34,649	34,985	35,407	36,067	36,805
Casa Grande	25,387	27,152	28,971	31,394	33,815	36,179	38,502	41,869
Coolidge	7,808	7,984	8,129	8,201	8,322	8,799	10,217	11,590
Eloy	10,375	10,424	10,600	10,759	10,944	11,347	11,456	13,945
Florence	19,803	19,860	17,174	19,822	19,938	22,760	23,507	24,476
Kearny	2,249	2,249	2,249	2,252	2,252	2,254	2,275	2,280
Mammoth	1,762	1,762	1,762	1,762	1,765	1,770	1,780	1,782
Maricopa	-	-	-	-	7,396	13,991	26,299	33,923
Queen Creek (part)	119	119	133	197	359	362	366	366
Superior	3,254	3,258	3,265	3,276	3,298	3,318	3,367	3,367
Winkelman (part)	3	3	3	3	3	3	3	3
Uninc. Pinal County	80,918	82,009	90,423	94,257	103,660	122,293	142,693	156,301
Indian Communities	*9,253*	*9,253*	*9,253*	*9,253*	*9,253*	*9,253*	*9,253*	*9,253*
Balance of Unincorporated	*71,665*	*72,756*	*81,170*	*85,004*	*94,407*	*113,040*	*133,440*	*147,048*

Source: Central Arizona Association of Governments

Table 2.5

Total Population, Pinal County Unicorporated Communities
July 1, 2000 through July 1, 2007

Area	2000	2001	2002	2003	2004	2005	2006	2007
Pinal County Total	**183,423**	**187,373**	**196,168**	**206,571**	**226,736**	**258,483**	**296,531**	**325,925**
Incorporated Places	***102,505***	***105,364***	***105,746***	***112,314***	***123,076***	***136,189***	***153,838***	***170,405***
Unincorporated County	80,918	82,009	90,423	94,257	103,660	122,293	142,693	156,301
Indian Communities	*9,253*	*9,253*	*9,253*	*9,253*	*9,253*	*9,253*	*9,253*	*9,253*
Balance of Unincorporated County	*71,665*	*72,756*	*81,170*	*85,004*	*94,407*	*113,040*	*133,440*	*147,048*
Total of Unincorporated Communities	44,193	45,483	51,994	56,845	73,174	90,037	103,357	107,487
Arizona City & Environs	4,591	4,967	6,292	6,784	8,255	9,594	11,556	12,238
Dudleyville & Environs	1,330	1,337	1,349	1,351	1,360	1,360	1,367	1,372
Gold Canyon & Environs	7,259	7,470	8,949	9,147	11,847	12,860	13,473	13,664
Goldfield & Environs	4,581	4,627	4,755	4,818	5,051	5,182	5,258	5,306
Hidden Valley & Environs	3,695	3,882	4,088	4,356	4,574	4,787	4,908	4,956
Oracle & Environs	3,893	3,914	4,012	4,042	4,128	4,233	4,296	4,324
Picacho & Environs	572	582	585	599	605	616	622	626
Queen Valley & Environs	845	859	893	903	926	980	1,259	1,388
Red River & Environs	1,112	1,153	1,187	1,223	1,245	1,296	1,318	1,332
Red Rock & Environs	314	316	331	340	347	361	390	392
Saddlebrooke & Environs	4,925	4,976	5,992	6,358	8,467	9,548	10,364	10,557
San Manuel & Environs	4,623	4,626	4,630	4,642	4,661	4,672	4,689	4,691
SanTan & Environs	5,811	6,132	8,280	11,628	21,045	33,886	43,183	45,965
Stanfield & Environs	643	643	650	655	662	662	674	676

Source: Central Arizona Association of Governments

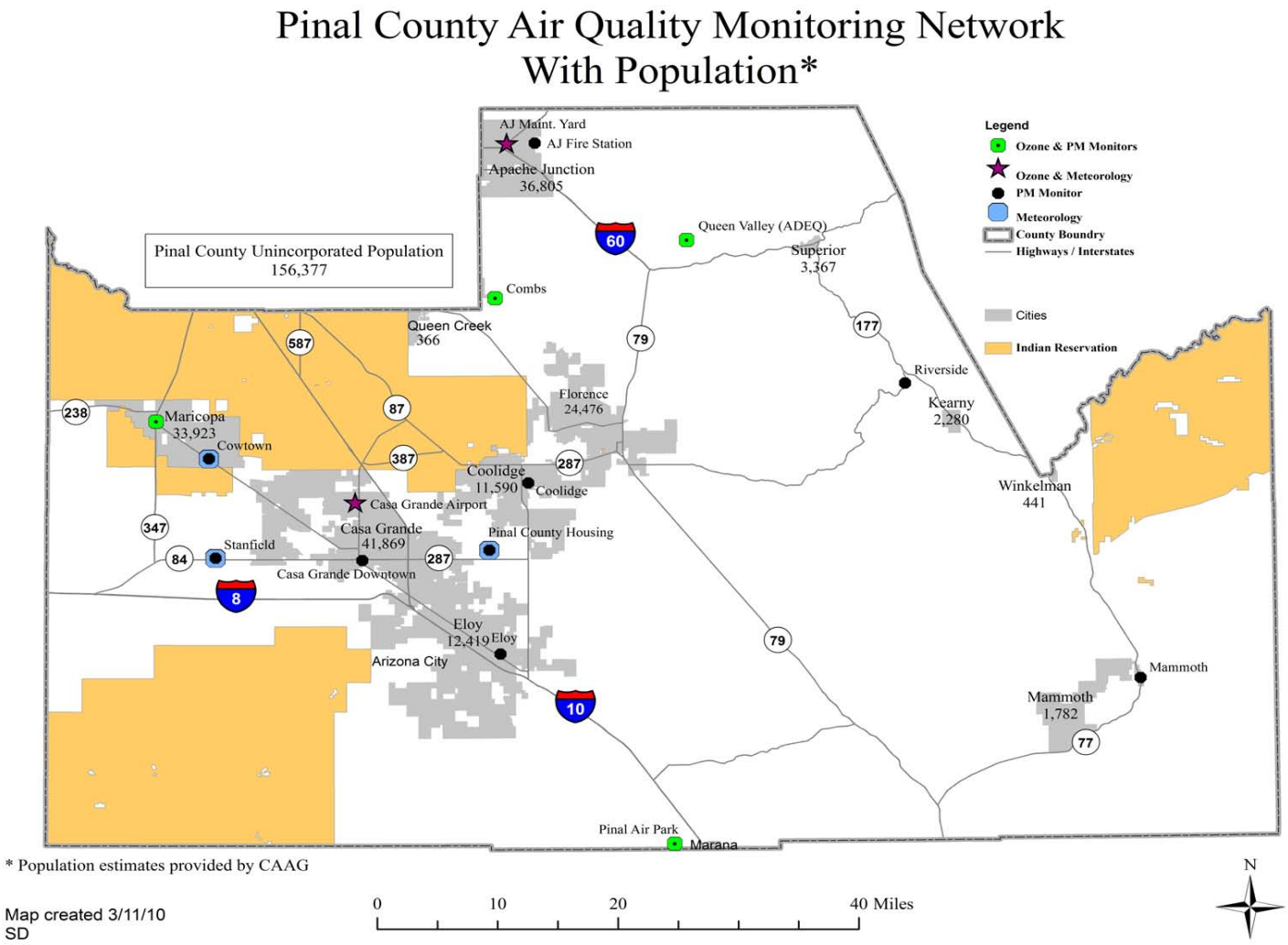
Table 2.6

Total Population, All Pinal County Places

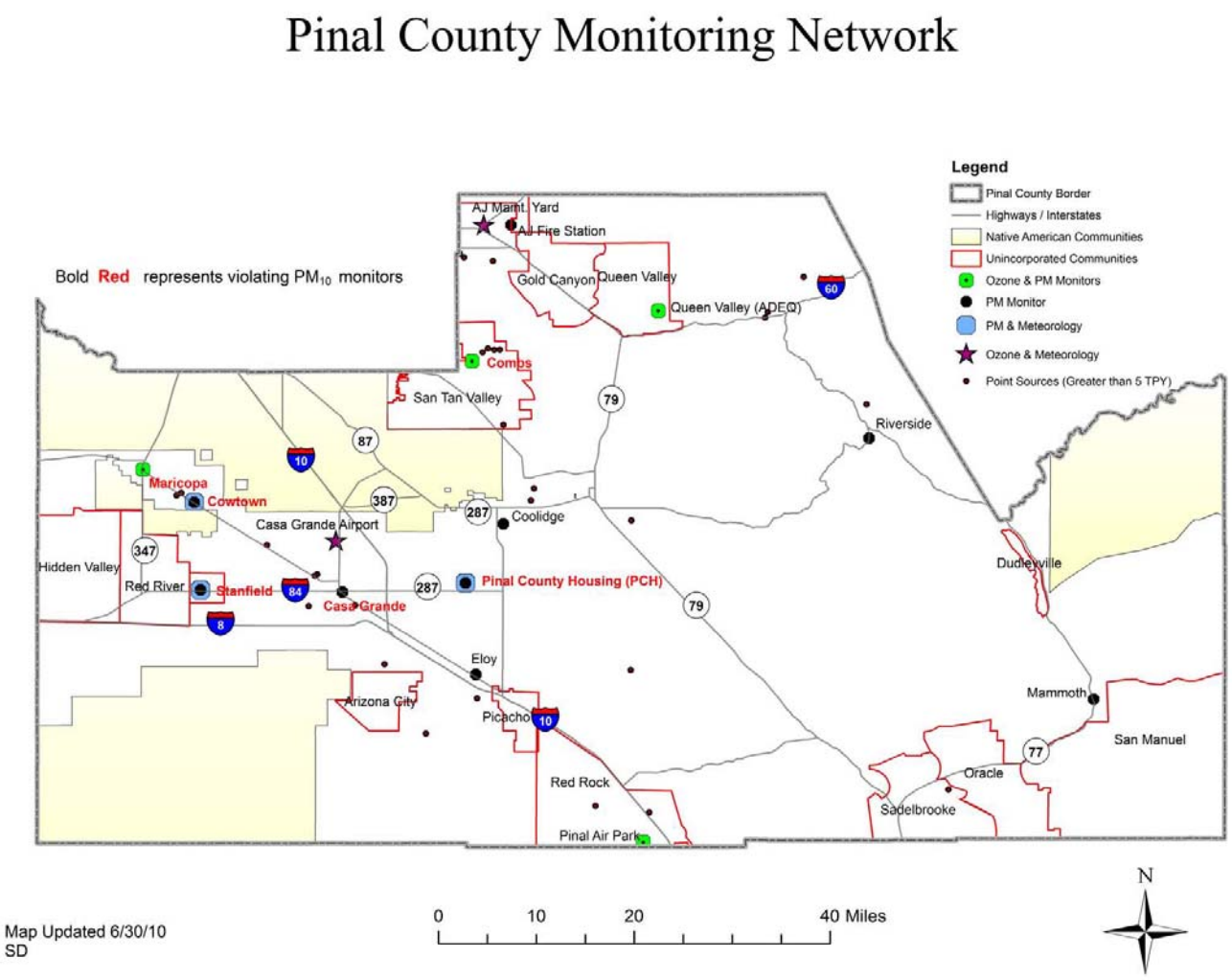
Area	2000	2007	Change	% Change	% of Total
Pinal County Places	**147,738**	**277,892**	**130,154**	**88.1%**	**100.0%**
San Tan & Environs	5,811	45,965	40,155	691.0%	16.5%
Casa Grande	25,387	41,869	16,482	64.9%	15.1%
Apache Junction (part)	31,746	36,805	5,059	15.9%	13.2%
Maricopa	1,040	33,923	32,883	3162%	12.2%
Florence	19,803	24,476	4,673	23.6%	8.8%
Eloy	10,375	13,945	3,570	34.4%	5.0%
Gold Canyon & Environs	7,259	13,664	6,405	88.2%	4.9%
Arizona City & Environs	4,591	12,238	7,647	166.6%	4.4%
Coolidge	7,808	11,590	3,782	48.4%	4.2%
Saddlebrooke & Environs	4,925	10,557	5,633	114.4%	3.8%
Goldfield & Environs	4,581	5,306	725	15.8%	1.9%
Hidden Valley & Environs	3,695	4,956	1,261	34.1%	1.8%
San Manuel & Environs	4,623	4,691	68	1.5%	1.7%
Oracle & Environs	3,893	4,324	431	11.1%	1.6%
Superior	3,254	3,367	113	3.5%	1.2%
Kearny	2,249	2,280	31	1.4%	0.8%
Mammoth	1,762	1,782	20	1.1%	0.6%
Queen Valley & Environs	845	1,388	543	64.3%	0.5%
Dudleyville & Environs	1,330	1,372	42	3.2%	0.5%
Red River & Environs	1,112	1,332	220	19.8%	0.5%
Stanfield & Environs	643	676	33	5.1%	0.2%
Picacho & Environs	572	626	54	9.5%	0.2%
Red Rock & Environs	314	392	78	24.8%	0.1%
Queen Creek (part)	119	366	247	207.7%	0.1%
Winkelman (part)	3	3	-	0.0%	0.0%

Source: Central Arizona Association of Governments

Map 2.1 Incorporated Cities with Population & Monitoring Sites



Map 2.2 Population Places & Monitoring Sites



2.3 Emissions

The Arizona Department of Environmental Quality, with input from Pinal County, developed and presented a preliminary PM_{10} emission inventory for all of Pinal County in the document entitled "Arizona Air Quality Designations; Technical Support Document, Boundary Recommendation for the Pinal County 24-hour PM_{10} Nonattainment Area", dated March 15, 2010. A summary of the inventory in provided in Table 2.5. The inventory contains estimates for each category in tons per year. An analysis of the methodologies used to calculate emissions for each category can be found in the referenced document. Note that the area of indicated high PM_{10} emissions east of the Downtown Casa Grande site was found to be erroneously high and was corrected in the base inventory. At the date of this report the base file required to correct the map was unavailable.

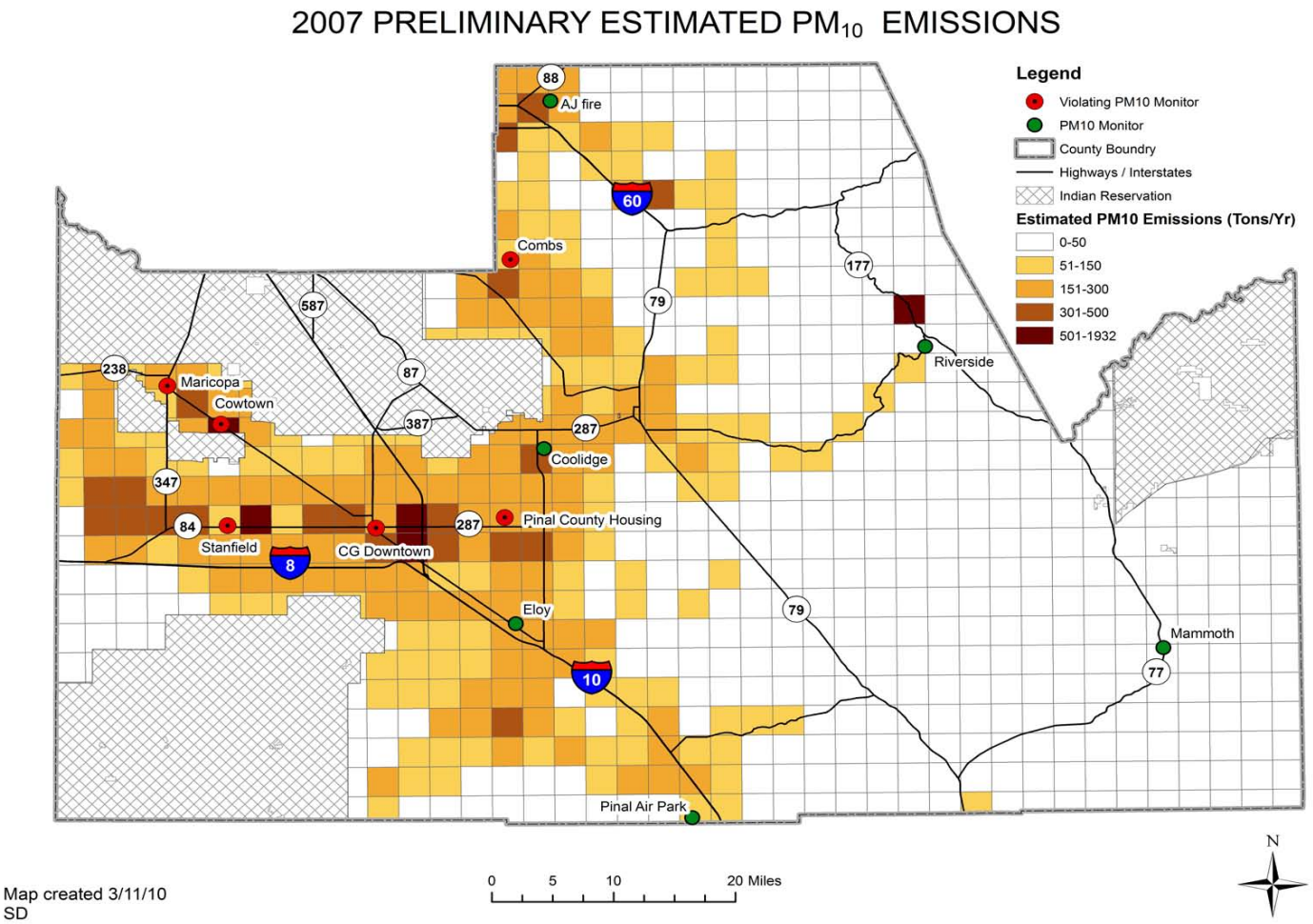
Map 2.3 on the following page provides spatially distributed PM_{10} emissions for all sources in Pinal County and includes an overlay of Pinal County operated air monitoring sites. The map also includes a distinction between violating and non-violating monitors.

Map 2.4 illustrates air monitoring locations relative to point sources permitted by Pinal County with emissions greater that 5 tons per year.

Table 2.5
Pinal County Preliminary 2007 PM_{10} Emissions Inventory

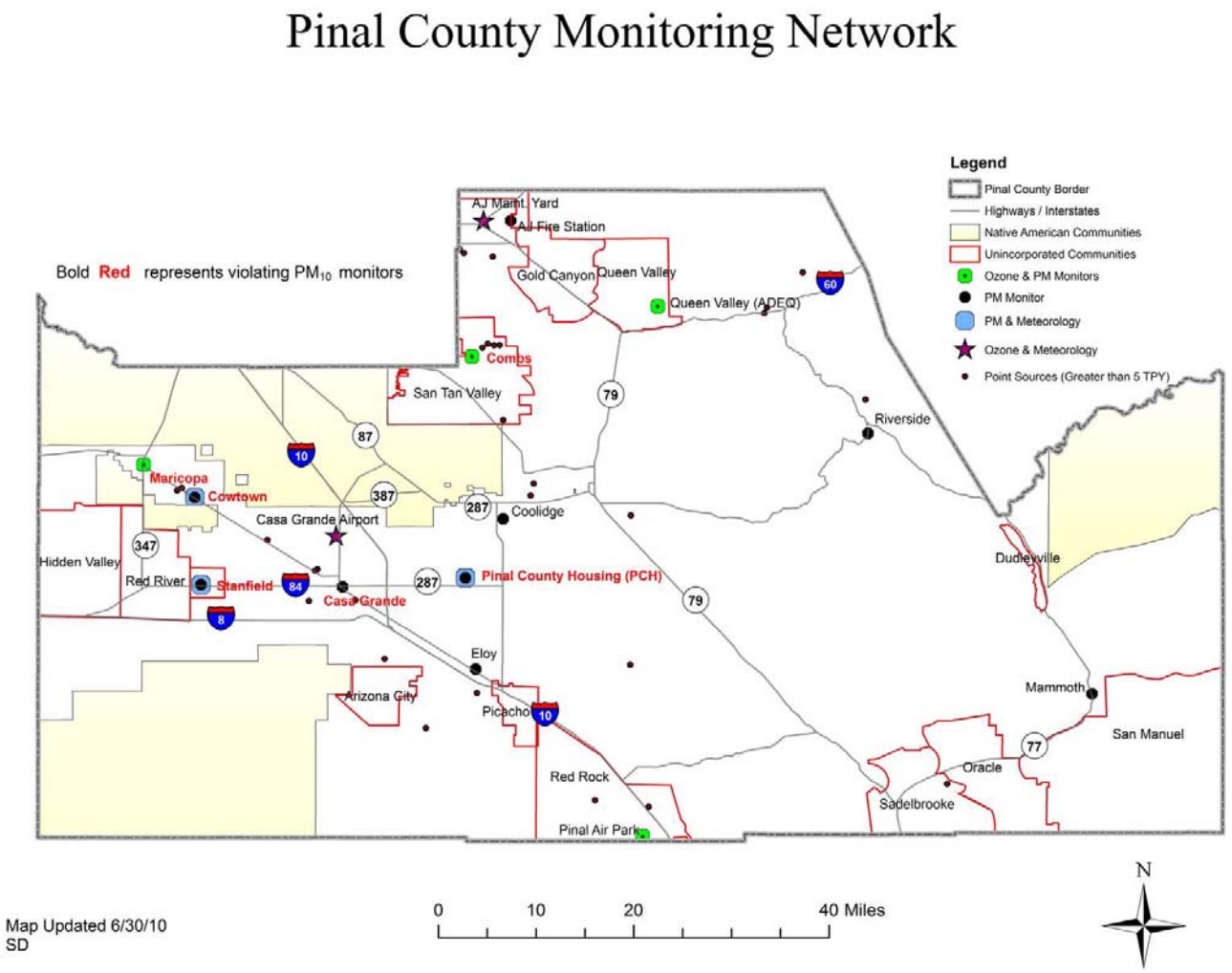
Emission Categories	Tons per Year
Onroad	42,130
Tilling, Harvesting, and Agriculture	2,538
Stationary Industrial Sources	2,342
Concentrated Animal Feeding Operations	2,045
Construction Emissions	1,757
Portable Industrial Sources	38
Off-highway Vehicles	23

Map 2.3 2007 Preliminary PM10 Emissions & Monitoring Sites



2.4 Point Sources

Map 2.4 Permitted Point Sources >5 TPY in Pinal County & Nearby Monitoring Sites



3.0 Network Evaluation

3.1 Decision Matrix

To evaluate the ambient air monitoring network a decision matrix was utilized. A decision matrix ranks or compares air monitoring sites to a set of criteria. Two separate evaluations were done. The first evaluation reviewed the need and value of the current monitoring locations against a set of criteria and the second considered potential new areas to consider air monitoring. The criteria used in this evaluation are described below.

The evaluation of the current monitoring network is shown in Tables 3.1 through 3.4. Table 3.1 is the initial screen and asks if the monitoring site is located in an existing non-attainment area or if a non-attainment designation has been proposed (or is anticipated) for the area. A response of "Yes' removes the site from further evaluation. Eight sites pass through this screen to the next; four ozone sites, two $PM_{2.5}$ sites, and two PM_{10} sites.

The second screen compares the four ozone monitoring site passed through from the previous screen to a maximum 8-hour ozone concentration of 0.06ppm. The purpose of this screen is to ensure that ozone sites are maintained that approach what has been discussed as a possible NAAQS level for ozone. All ozone sites are maintained after this screen.

The third screen asks if the four particulate monitoring sites passed through from the previous screen are necessary to represent a populated area in the County. The purpose of this screen is to ensure that particulate matter sites are maintained, even if located in an area not designated as non-attainment. This is necessary to provide information to individuals or institutions that have become accustomed. Additionally, $PM_{2.5}$ data are important for health evaluations. One PM_{10} site passed through this screen.

In the fourth and final screen the remaining site evaluated against the need for definitive boundary conditions. In the case of Pinal Air Park the PM_{10} concentrations there will be of value in future NAAQS attainment considerations.

The conclusion of this evaluation is that no changes to the current network are warranted.

The evaluation of potential new monitoring sites or locations is shown in Tables 3.5 and 3.6. Population figures from the Central Arizona Association of Governments (CAAG) were used in the evaluation. They are further described in Section 2.3 of this document.

Table 3.5 is the initial screen and asks if the populated incorporated area, unincorporated area, or place is represented by an existing monitoring site. Maps 2.1 and 2.2 illustrate the spatial relationship between the populated areas and air monitoring sites. A response of "Yes' removes the site from further evaluation. Six areas pass through this screen. The results of this screen will be evaluated further to determine if future monitoring is warranted in these areas.

Current Site Evaluation – Decision Matrix

Table 3.1 Initial Screen – NAAQS Attainment

Site Name	AQS ID	Classification	Scale	Objective	Pollutant	Is the Site within a Proposed or Existing Non-Attainment Area? (Yes will removed site from additional evaluation)
Apache Junction Fire Station	40213002	SLAMS	Neighborhood	Population	PM2.5	No
Apache Junction Fire Station	40213002	SLAMS	Neighborhood	Population	PM10	Yes
Apache Junction Maint.Yard	40213001	SLAMS	Neighborhood	Population	O3	Yes
Casa Grande Airport	40213003	SLAMS	Neighborhood	Population	O3	No
Casa Grande Downtown	40210001	SLAMS	Neighborhood	Population	PM2.5	No
Casa Grande Downtown	40210001	SLAMS	Neighborhood	Population	PM10	Yes
Casa Grande Downtown TEOM	40210001	SPM	Neighborhood	Population	PM10	Yes
Combs School	40213009	SPM	Neighborhood	Population	O3	No
Combs School TEOM	40213009	SPM	Neighborhood	Population	PM10	Yes
Coolidge Maintenance Yard	40213004	SLAMS	Neighborhood	Population	PM10	Yes
County Complex Maricopa	40213010	SPM	Neighborhood	Population	O3	No
County Complex Maricopa TEOM	40213010	SPM	Neighborhood	Population	PM10	Yes
Cowtown Road	40213013	SPM	Microscale	Source impact	PM10	Yes
Cowtown Road	40213013	SPM	Microscale	Source impact	PM2.5	Yes
Cowtown Road TEOM	40213013	SPM	Microscale	Source impact	PM10	Yes
Eloy City Complex	40213014	SLAMS	Neighborhood	Population	PM10	Yes
Mammoth County Complex	40213006	SLAMS	Neighborhood	Population/background	PM10	No
Pinal Air Park	40213007	SLAMS	Regional	Background	PM10	No
Pinal Air Park	40213007	SPM	Regional	Transport	O3	No
Pinal County Housing Complex (HiVol)	40213011	SLAMS	Neighborhood	Population	PM10	Yes
Pinal County Housing Complex TEOM	40213011	SPM	Neighborhood	Population	PM10	Yes
Riverside Maintenance Yard	40213012	SLAMS	Neighborhood	Source impact	PM10	Yes
Stanfield County Complex TEOM	40213008	SLAMS	Neighborhood	Population	PM10	Yes

Table 3.2 Second Screen Part 1 -Ozone

Site Name	AQS ID	Classification	Scale	Objective	Pollutant	Is the ozone concentration above 0.06ppm? (Yes will remove site from additional evaluation)
Casa Grande Airport	40213003	SLAMS	Neighborhood	Population	O3	Yes
Combs School	40213009	SPM	Neighborhood	Population	O3	Yes
County Complex Maricopa	40213010	SPM	Neighborhood	Population	O3	Yes
Pinal Air Park	40213007	SPM	Regional	Transport	O3	Yes

Table 3.3 Second Screen Part 2 - Particulate Matter

Site Name	AQS ID	Classification	Scale	Objective	Pollutant	Does the site represent a specific population? (Yes will remove site from additional evaluation)
Apache Junction Fire Station	40213002	SLAMS	Neighborhood	Population	PM2.5	Yes
Casa Grande Downtown	40210001	SLAMS	Neighborhood	Population	PM2.5	Yes
Mammoth County Complex	40213006	SLAMS	Neighborhood	Population/background	PM10	Yes
Pinal Air Park	40213007	SLAMS	Regional	Background	PM10	No

Table 3.4 Third Screen – Boundary Monitoring

Site Name	AQS ID	Classification	Scale	Objective	Pollutant	Does the site represent a specific boundary concentrations required for other analysis? (Yes will remove site from additional evaluation)
Pinal Air Park	40213007	SLAMS	Regional	Background	PM10	Yes

Potential New Site Evaluation

Table 3.5 Initial Screen Considering Place Population

Place Name	Population	Monitoring Site Representing Area	Is the Area currently represented by air monitoring? (Yes will removed site from additional evaluation)
San Tan & Environs	45,965	Combs School	Yes
Casa Grande	41,869	Casa Grande Airport/Casa Grande Downtown	Yes
Apache Junction (part)	36,805	Apache Junction Maintenance Yard/Apache Junction Fire Station	Yes
Maricopa	33,923	Maricopa County Complex	Yes
Florence	24,476		No
Eloy	13,945	Eloy County Complex	Yes
Gold Canyon & Environs	13,664	Apache Junction Sites & Queen Valley	Yes
Arizona City & Environs	12,238		No
Coolidge	11,590	Coolidge Maintenance Yard	Yes
Saddlebrooks & Environs	10,557		No
Goldfield & Environs	5,306	Apache Junction Sites & Queen Valley	Yes
Hidden Valley & Environs	4,956	Maricopa County Complex & Stanfield	Yes
San Manuel & Environs	4,691	Mammoth County Complex	Yes
Oracle & Environs	4,324		No
Superior	3,367		No
Kearny	2,280	Riverside	Yes
Mammoth	1,782	Mammoth County Complex	Yes
Queen Valley & Environs	1,388	Queen Valley Site (ADEQ)	Yes
Dudleyville & Environs	1,372		No
Red River & Environs	1,332	Stanfield County Complex	Yes
Stanfield & Environs	676	Stanfield County Complex	Yes
Picacho & Environs	626	Eloy County Complex	Yes
Red Rock & Environs	392	Pinal Air Park	Yes
Queen Creek (part)	366	Combs School	Yes
Winkelman (part)	3	Hayden Jail (ADEQ)	Yes

Table 3.6 Pinal Places Without Representative Monitoring

Place Name	Population
Florence	24,476
Arizona City & Environs	12,238
Saddlebrooks & Environs	10,557
Oracle & Environs	4,324
Superior	3,367
Dudleyville & Environs	1,372

3.2 7-Point Assessment

40 Code of Federal Regulations (CFR) Part 58.10 (d) requires an annual monitoring network assessment to be conducted on a 5 year cycle with the first due July 1, 2010.
As provided in the regulation the annual monitoring assessment must address the following:

1. Document that the network meets the monitoring objectives defined in appendix D to 40 CFR Part 58.
2. Evaluate the need for new monitoring sites.
3. Evaluate if existing sites no longer needed and can be terminated.
4. Determine if new technologies are appropriate for incorporation into the ambient air monitoring network.
5. Consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma).
6. For any sites that are being proposed for discontinuance, consider the effect on data users other than the agency itself, such as nearby States and Tribes or health effects studies.
7. For $PM_{2.5}$, the assessment also must identify needed changes to population-oriented sites.

In the following sections an item by item review of the seven points will be addressed utilizing information provide in this document and the "Pinal county 2010 Ambient Monitoring Network Plan and 2009 Data Summary".

1 - CFR Part 58 Appendix D Compliance

Federal code referenced above requires the agency document that the network meets the monitoring objectives defined in Appendix D to 40 CFR Part 58. The reader is referred to the "Pinal County 2010 Ambient Monitoring Network Plan and 2009 Data Summary" wherein compliance with Appendix D is affirmed.

2 - Evaluation of the need for new monitoring sites

Point number two requires evaluation of the need for new monitoring sites. This evaluation was conducted using a decision matrix and is described in Section 3.1. The initial indication from this evaluation is that additional sites may be needed in the future. The topic will be reviewed as resources and funding allow.

3 - Evaluation of sites that can be terminated

Point number three requires evaluation of the possibility for existing sites to be terminated. This evaluation was conducted using a decision matrix and is described in Section 3.1. The indication from this evaluation is that termination of current sites is not warranted at this time.

4 - New Technologies

The fourth point requires that we consider if new technologies are appropriate for incorporation into the ambient air monitoring network. Considering the age of our monitoring equipment, new technology is appropriate for our network. Specific instruments and products include: continuous PM_{10} and $PM_{2.5}$ instruments, up to date ozone analyzers, replacement of older high volume samplers with newer instrumentation, state of the art dataloggers, progression to wireless communication devices at monitoring sites, improved data collection and quality assurance applications, ambient database applications, and public reporting applications. These items depend on future funding sources.

5 - Consideration of Network to Represent Susceptible Individuals

Point number five requires consideration of the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals. Table 3.5 demonstrates that a substantial portion of the County population is represented by an air monitoring site. Additionally, $PM_{2.5}$, a pollutant important for evaluating asthma effects, is measured at the two or the three largest population centers in the county.

6 - Effect of Closed Site(s) on Data Users

For any sites that are being proposed for discontinuance, point six requires we consider the effect on data users other than the agency itself, such as nearby States and Tribes or health effects studies. No sites are proposed to be discontinued.

7 - Assessment Changes Needed to $PM_{2.5}$ Population-Oriented Sites

Lastly, point seven requires for $PM_{2.5}$, the assessment also must identify needed changes to population-oriented sites. The network currently measures $PM_{2.5}$ in the two of the three larges population centers in the County, therefore, no changes are warranted for population oriented sites.

4.0 Conclusion

The process of developing and implementing this network evaluation lead to several conclusions regarding the current air monitoring network and potential changes in the future.

A primary result of the evaluation was a clear limitation to changes in the existing PM_{10}, $PM_{2.5}$, and ozone networks. For the particulate pollutants this result was driven by uncertainty in pending non-attainment designations in Pinal County and uncertain boundary definitions. The criteria developed for the ozone portion of the decision matrix evaluation envisioned a tightened, but uncertain, ozone NAAQS standard to be implemented in the near future. In both cases removing or relocating sites would not be prudent until these issues are resolved.

The evaluation illustrates the spatial coverage of the network is well designed to represent a large portion of the County's population centers and various emission areas. In addition to meeting rule required monitoring network design, the network provides pollutant concentrations for use in defining boundary conditions and long term trends. An example is PM_{10} at the Pinal Air Park monitoring site which defines concentration along the Pima/Pinal boundary as well as the Rillito areas. Other sites, such as the Mammoth County Complex, provide useful pollutant concentrations outside the highest emissions areas which can be used for long term trends analysis.

The population evaluation identified several locations where future monitoring may be warranted. The result was based upon a review of population and spatial extent of the current network. When evaluating neighborhood scale particulate matter exposure we observed that population and emissions are generally coincident, although there are a few exceptions. In addition to population and spatial representation a decision to add monitoring sites will consider additional parameters such as emissions characteristics, pollutant transport and meteorology. A primary consideration will be adequate funding and resources to cover potential additions. We will review these results further and include any potential changes or additions in our next Annual Air Monitoring Network Plan.