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Pinal County Air Quality Control District

2015 Ambient Monitoring Network 5-Year Assessment

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2015 draft
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Introduction

This document provides the Pinal County Air Quality Control District (PCAQCD) 5-year Monitoring Network Assessment. 40 Code of Federal Regulations (CFR) Part 58.10 (d) requires an air monitoring network assessment to be conducted on a 5-year cycle with the first due July 1, 2010. This evaluation assessed the air quality monitoring system consisting of State and Local Air Monitoring Stations (SLAMS) and Special Purpose Monitors (SPMs) operated under state and local authority. Pinal County is not required to operate National Core (NCore) or Photochemical Assessment Monitoring Station (PAMS) air monitoring sites.

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 are 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 concentration of each pollutant in the ambient air.

The criteria pollutants are particulate matter (PM) 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.*

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1.0 Background Information

1.1 Network Description – PM_{10}, $PM_{2.5}$, Ozone

A SLAMS network consists of ambient air monitoring sites that provide data to meet required monitoring objectives. All Pinal County air monitoring sites have the basic monitoring objective of NAAQS comparison. Monitoring sites 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 1.1 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 site type and the spatial scales that are generally most appropriate for each site type. Table 1.2 summarizes this relationship.

Table 1.2: Site Type and Scales

Site Type	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 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 Parts 50 and 53 define Federal Reference Methods (FRMs) and Federal Equivalent Methods (FEMs), 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

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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 FEMs for continuous PM_{10}, $PM_{2.5}$ and ozone. Pinal County Air Quality does not have approval for any ARMs.

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

Two types of $PM_{2.5}$ monitors are used throughout the monitoring network: 1) filter based medium volume monitors equipped with the appropriate size fractioning device (very sharp cut cyclone), and 2) Met One Beta Attenuation Monitors (BAMs) 1020 FEMs which measure $PM_{2.5}$ continuously.

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

ADEQ operates ozone (O_3) and reactive nitrogen oxide (NO_y) monitors at Queen Valley in Pinal County as a part of its PAMS network. There are currently no monitors in Pinal County that measure lead (Pb) although ADEQ and Maricopa County Air Quality Department (MCAQD) operate monitors in other portions of the state that measure lead. Refer to the State of Arizona and MCAQD Monitoring Network Plans for information on these criteria pollutants.

The SIP as it applies to Pinal County does not make any SLAMS designations. The West Pinal PM_{10} Nonattainment Area SIP which is currently being developed will identify several Pinal County site as design value monitors for PM_{10}. Those sites include Cowtown, Maricopa, Pinal County Housing, and Stanfield PM_{10} sites. This identification will require long term operation of the sites to demonstrate attainment with the NAAQS. In 2000 Pinal County Air Quality compiled its first annual network review which included SLAMS/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, "2015 Network Plan and 2014 Data Summary," the monitoring network meets the monitoring objectives defined in Appendix D to 40 CFR Part 58. Table 1.3 is a summary of SLAMS monitoring sites, and Table 1.4 lists the SPM site operated by Pinal County Air Quality. See Figure 1.1 for monitoring site locations and nonattainment areas in Pinal County.

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Table 1.3: SLAMS Summary

Site Name	AQS ID	Classification	Site Type	Site Scale	Pollutant
Apache Junction Fire Station	040213002	SLAMS	Population	Neighborhood	$PM_{2.5}$ PM_{10}
Apache Junction Maintenance Yard	040213001	SLAMS	Population	Neighborhood	O_3
Casa Grande Airport	040213003	SLAMS	Regional Transport	Regional	O_3
Casa Grande Downtown	040210001	SLAMS	Population	Neighborhood	$PM_{2.5}$ PM_{10}
Combs School	040213009	SLAMS	Population	Neighborhood	PM_{10}
Coolidge Maintenance Yard	040213004	SLAMS	Population	Neighborhood	PM_{10}
Cowtown Road	040213013	SLAMS	Highest Concentration / Source Impact	Middle	$PM_{2.5}$
Eloy County Complex	040213014	SLAMS	Population	Neighborhood	PM_{10}
City of Maricopa County Complex	040213010	SLAMS	Population	Neighborhood	PM_{10}
Pinal Air Park	040213007	SLAMS	Background Transport	Regional	PM_{10} O_3
Pinal County Housing Complex	040213011	SLAMS	Population	Neighborhood	PM_{10}
Stanfield County Complex	040213008	SLAMS	Population	Neighborhood	PM_{10}

Table 1.4: SPM Summary

Site Name	AQS ID	Classification	Site Type	Site Scale	Pollutant
Cowtown Road TEOM	040213013	SPM	Highest Concentration / Source Impact	Middle	PM_{10}

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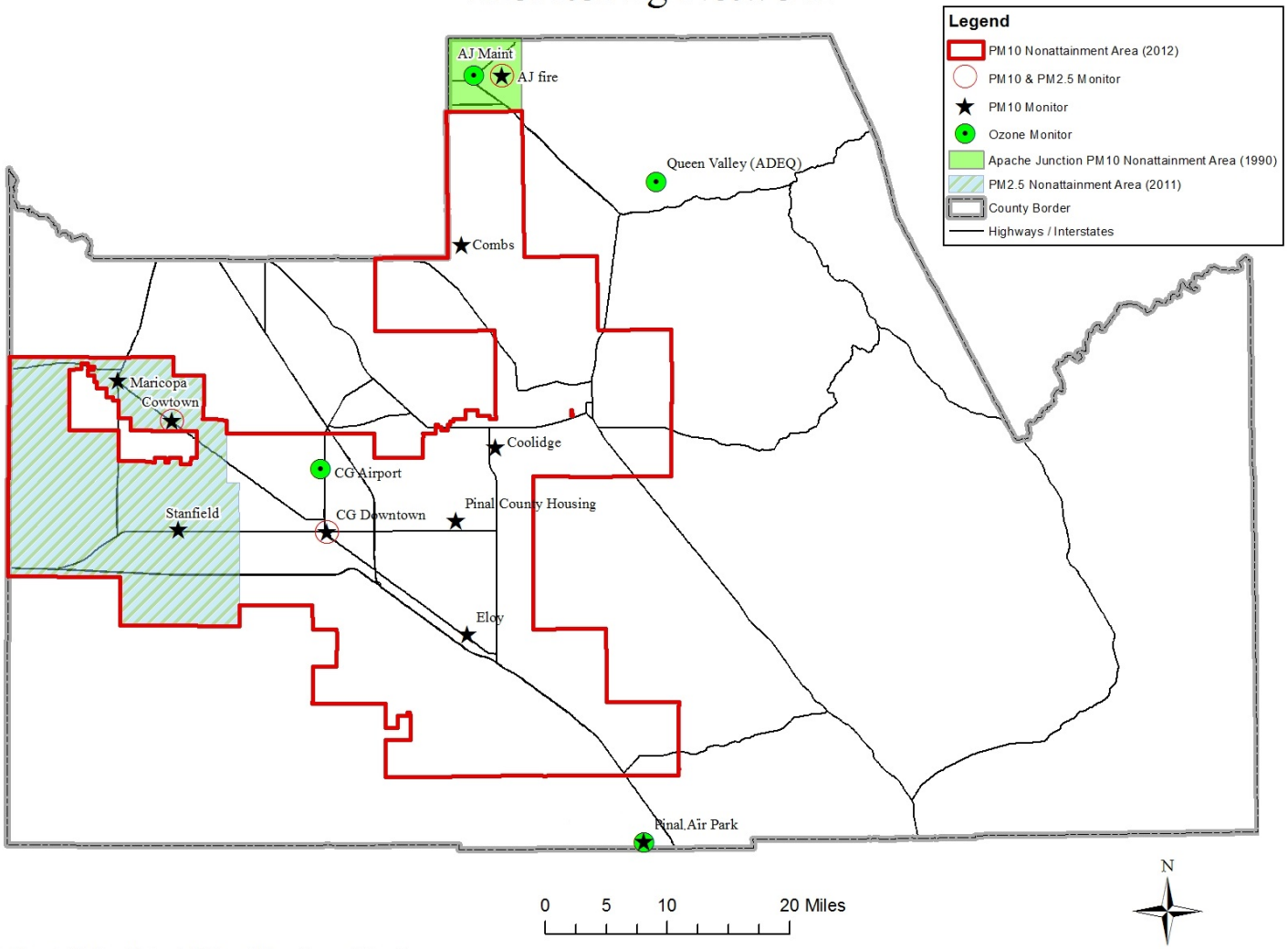
Figure 1.1 Pinal County Air Quality Control District Monitoring Network



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Date: 9/24/12

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 includes synoptic scale systems such as frontal passages, strong pressure gradients, Mesoscale Convective System (MCS)[2] and regional monsoon storms or microscale 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 US. 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 99th percentile of historical PM_{10} 24-hr average data.

Pressure gradient exceptional/natural events result from strong high pressure building over the western US 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 overwhelms the PM_{10} monitors.

The monsoon is a seasonal wind that takes place in the southwestern US 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 Pinal County. 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

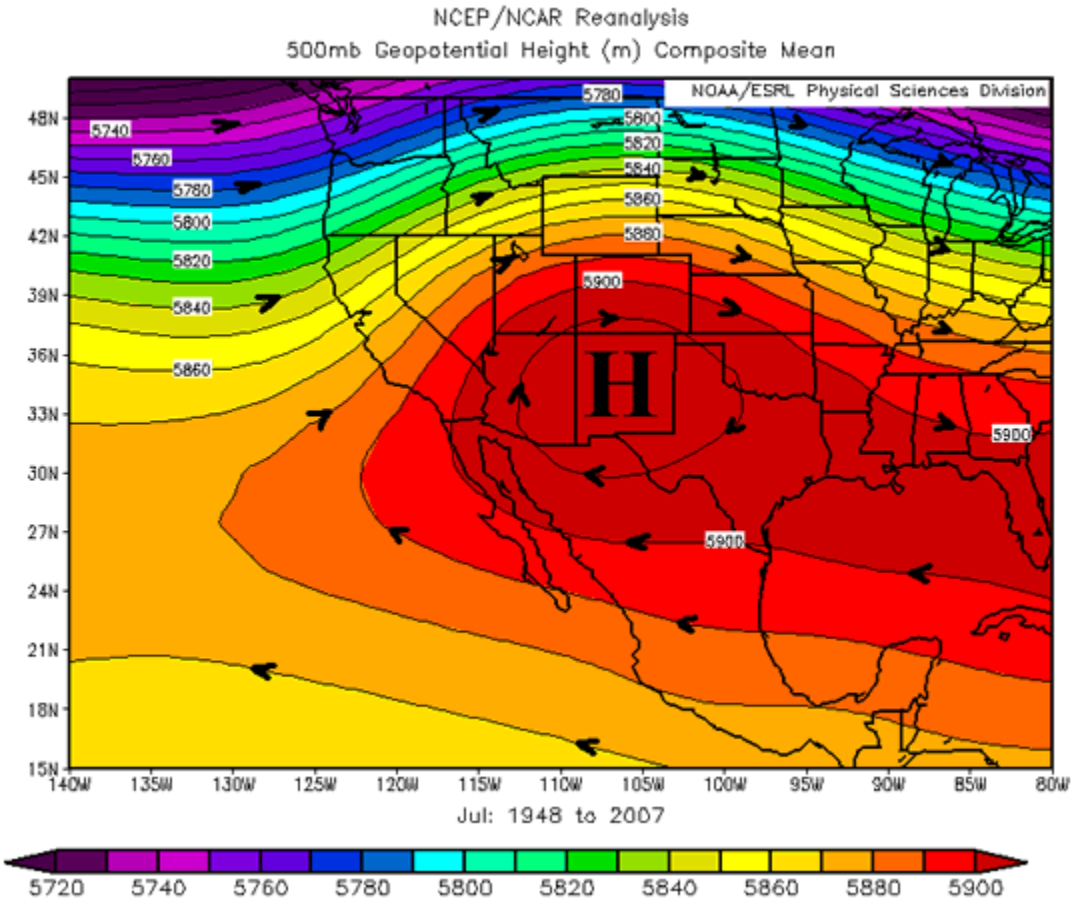

Figure 1.2: Typical Monsoon Setup (500 mb map)
Source: National Weather Service (http://www.wrh.noaa.gov/twc/monsoon/monsoon_NA.php)

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/high wind events in Pinal County are:

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

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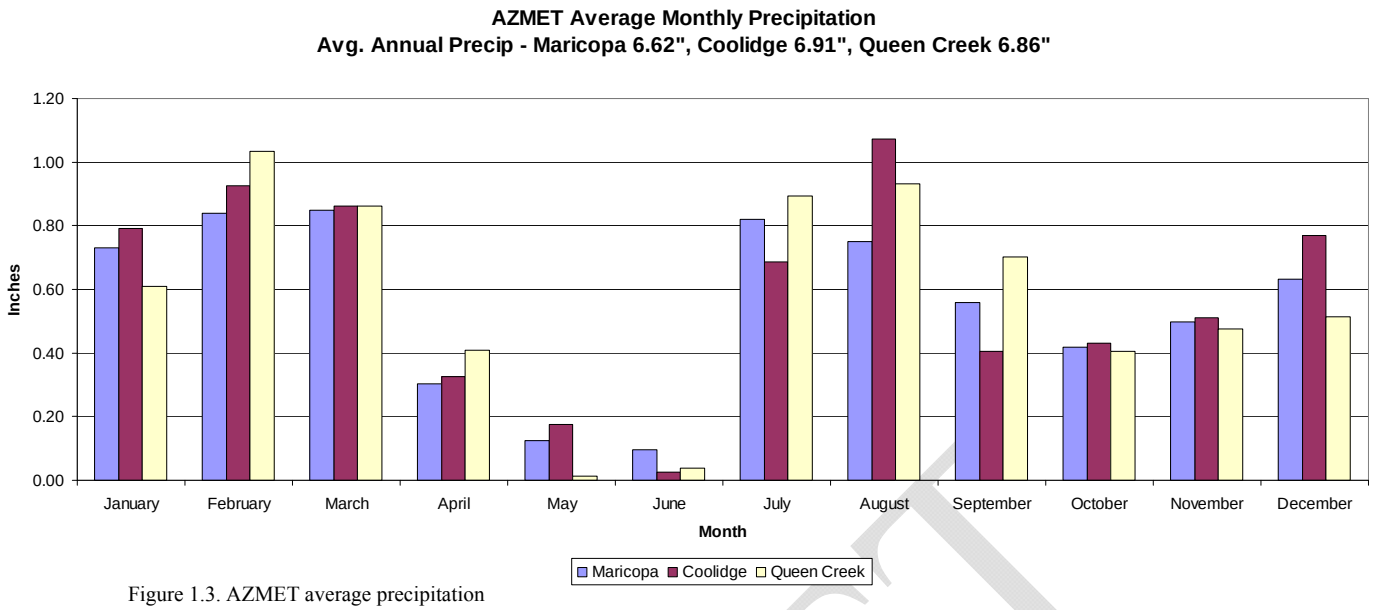

Figure 1.3. AZMET average precipitation
Source: The Arizona Meteorological Network (http://ag.arizona.edu/azmet/)
Period of record: Maricopa 1988-2008, Coolidge 1987-2008, Queen Creek 1995-2008

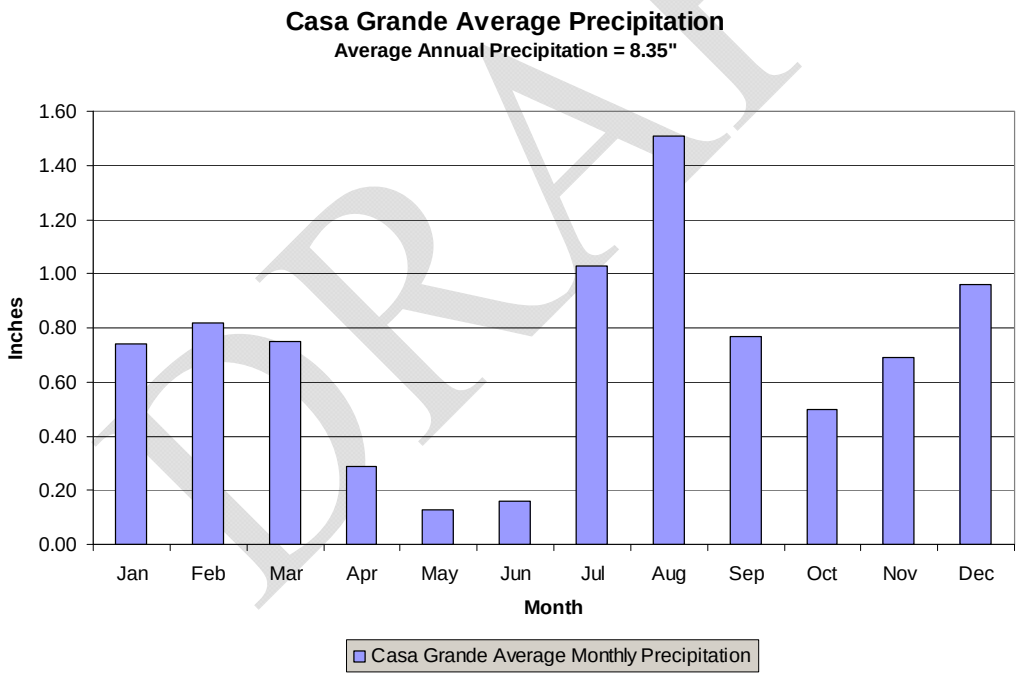

Figure 1.4 Casa Grande average precipitation (1898-2008)
Source: Western Regional Climate Center (http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?az1306)

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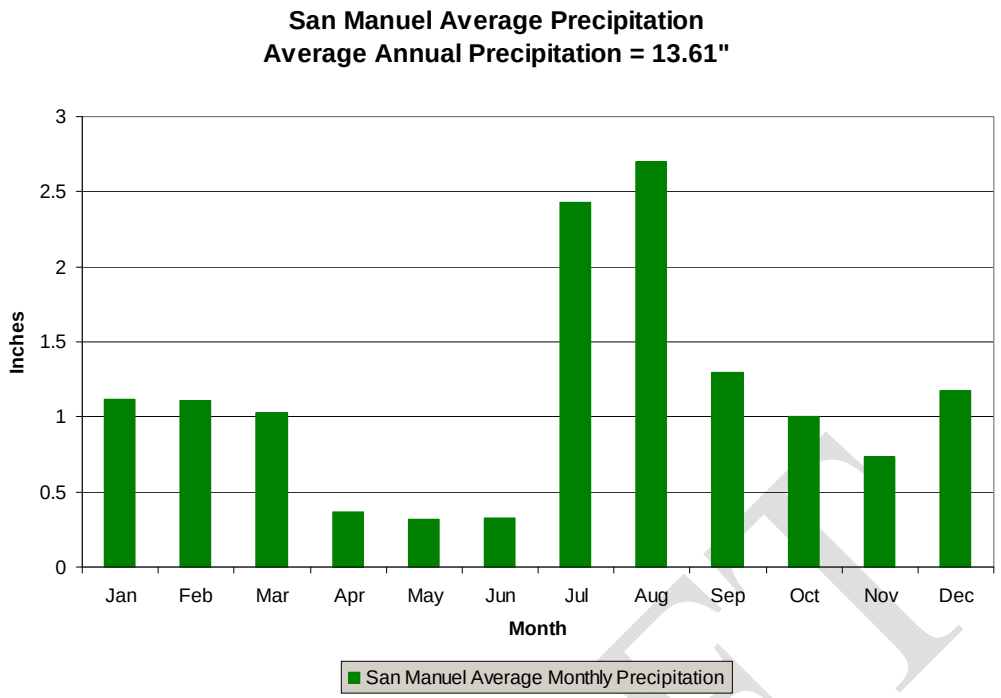

Figure 1.5 San Manuel average precipitation (1954-2008)
Source: Western Regional Climate Center (http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?az7530)

1.3 Geography

The geography 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.

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1.4 NAAQS Status

On February 3, 2011, the EPA issued final air quality designations for the 2006 24-hour $PM_{2.5}$ NAAQS for Pinal County. The designations became effective March 7, 2011.

EPA deferred final designations for these areas in November 2009 when the Agency designated all other areas of the country. EPA deferred action on Pinal County to evaluate the reasons for high fine particle concentrations measured by the violating monitor. The West Central Pinal County $PM_{2.5}$ nonattainment designation included a portion of the county (Figure 1.1) based upon air quality monitoring data from 2006-2008.

On May 22, 2012 the EPA Region 9 Administrator signed the West Pinal PM_{10} nonattainment designation. Based on 2009-2011 data, a significant portion of western Pinal County was included in this new nonattainment area (Figure 1.1). On May 31, 2012 the designation was officially published in the Federal Register.

Designations for the Pinal portions of the Gila River Indian Community, the Ak-Chin Indian Community, and the Florence Village and San Lucy Farms areas of the Tohono O'odham Nation were deferred until completion of the formal consultation process. EPA determined that the tribal areas were not contributing to violations of the PM_{10} standard in Pinal County and did not re-designate these areas.

On October 4, 2013, the EPA determined that the West Central Pinal County nonattainment area attained the 2006 24-hour fine particle ($PM_{2.5}$) NAAQS (78FR 54394). EPA's determination was based upon complete, quality assured, and certified ambient air monitoring data from 2010 – 2012, showing that the area had attained the 2006 24-hour $PM_{2.5}$ NAAQS.

Based on EPA's clean data determination, the requirements for this area to submit an attainment demonstration, together with Reasonably Available Control Measures (RACM), a Reasonable Further Progress (RFP) plan, contingency measures, and attainment deadlines were suspended for so long as the area continues to attain the 2006 24-hour $PM_{2.5}$ NAAQS. The clean data determination suspends most of the SIP planning requirements but does not re-designate areas as attainment.

ADEQ published a proposed revision to the SIP for the West Central Pinal County $PM_{2.5}$ nonattainment area in February of 2014. A public hearing was held on March 13, 2014. Even with elevated concentrations in 2013, the three year average remained below the standard at 32.4$\mu g/m^3$ and met the $PM_{2.5}$ 24-hour NAAQS. However, in 2014 the 98th percentile value increased to 36.8 $\mu g/m^3$ and the three year average of the 98th percentile value increased to 35.6 $\mu g/m^3$, which is above the NAAQS.

It was determined by EPA that the violating monitor in Pinal County is not eligible for comparison with the annual $PM_{2.5}$ NAAQS. Therefore, Pinal County currently has a designation of "unclassifiable/attainment" for the 1997 and 2012 annual $PM_{2.5}$ NAAQS.

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Eastern Pinal County also contains portions of the Hayden PM_{10} nonattainment area. ADEQ is responsible for the ambient air monitoring and SIP for this area, since Hayden is in Gila County and the nonattainment area is related to a source that is regulated by ADEQ.

The only portion of Pinal County included in the designated Phoenix 8-hour ozone nonattainment area is Township 1N, Range 8E and Township 1S, Range 8E (Sections 1 through 12).

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2.0 Data Evaluation

2.1 Ambient Trends

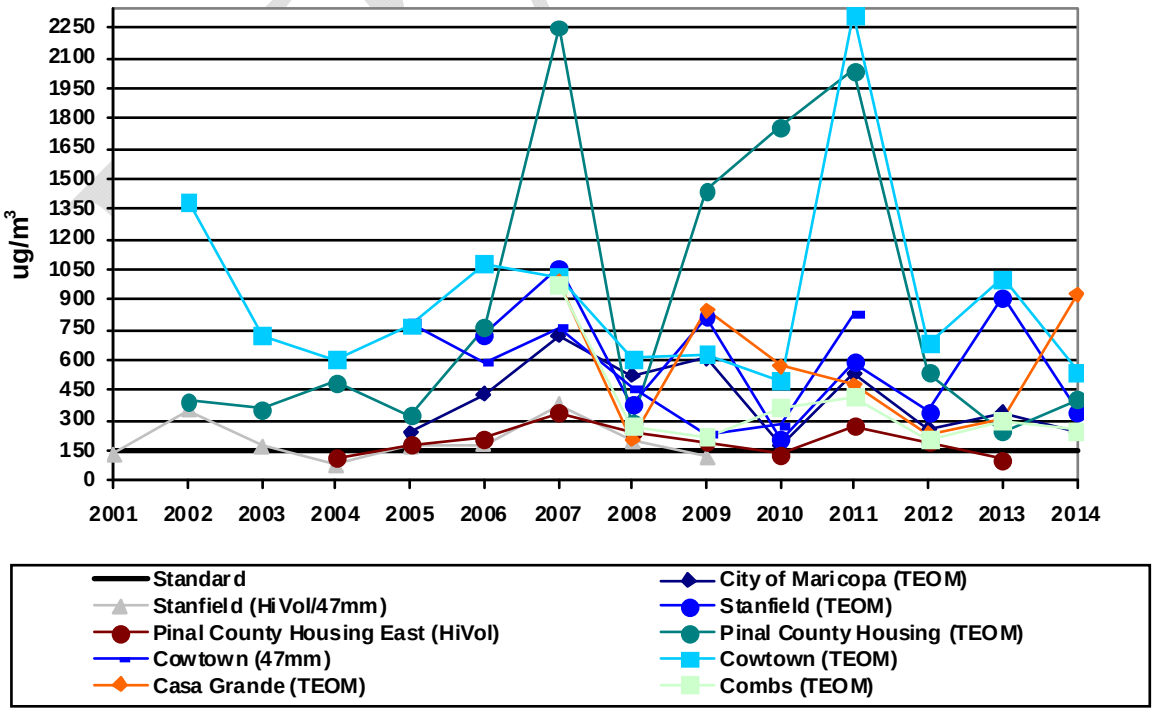
The following sections provide a brief summary of pollutant concentration trends over several years. The purpose of including this section is to illustrate air quality improvement or decline over time. This information is valuable in the overall assessment of the monitoring network and its ability to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

2.1.1 24-Hour PM_{10}

Figures 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 County Complex, City of Maricopa County Complex, Pinal County Housing Complex, Casa Grande Downtown, Combs School and Cowtown Road. Each of the sites has recorded 24-hour average concentrations in excess of the PM_{10} standard of 150 µg/m^3. Stanfield has the longest record. Note that days flagged as exceptional events by Pinal County were not removed from this data set.

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. The Apache Junction Fire Station and Casa Grande Downtown sites are

historically below the standard for the period of record. The first exception is July 8, 2011 at the Apache Junction Fire Station site. This was the first 24-hour PM_{10} exceedance ever recorded in Apache Junction and prompted the installation of a PM_{10} TEOM continuous monitor in August 2011.

Figure 2.2a: Maximum 24-Hour PM_{10} Concentration - Lowest Sites Group A

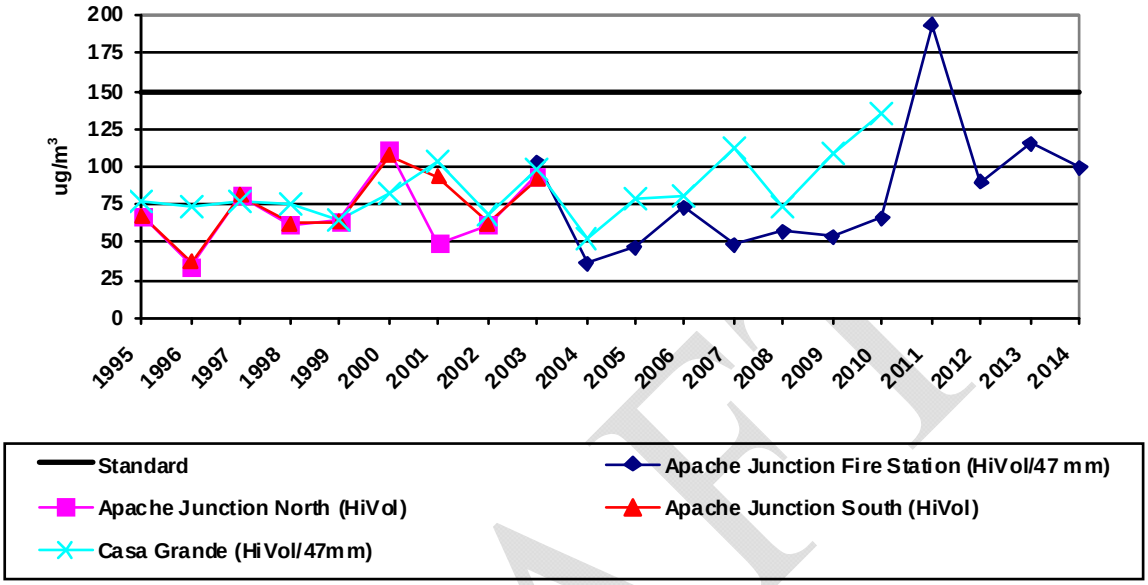
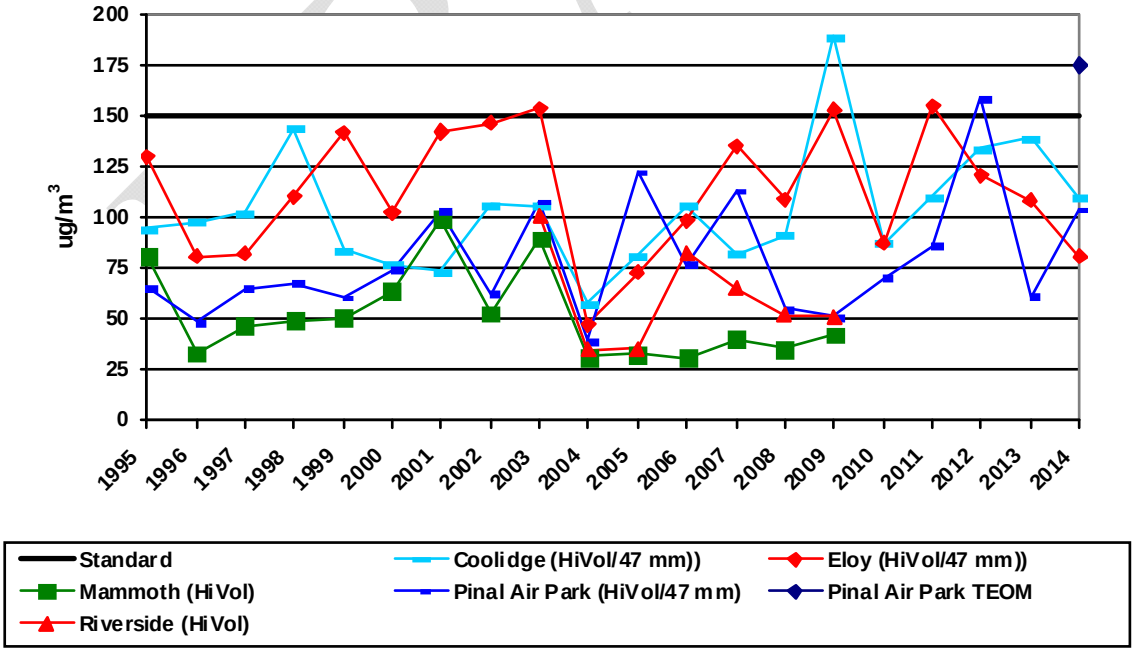


Figure 2.2b: Maximum 24-Hour PM_{10} Concentration - Lowest Sites Group B



Figures 2.3 and 2.4 illustrate different methods for discerning trends in 24-hour PM_{10} concentrations. The annual expected exceedance rate shown in Figure 2.3 is calculated based on the number of 24-hour concentrations collected by site for each year. For sites with continuous TEOM monitors, the expected exceedance rate is equal to the actual exceedance rate because concentrations are expected to be collected for each day of the year. For filter-based monitors that operate less than every day, the expected exceedance rate is calculated based on a ratio of the number of actual 24-hour periods collected to the maximum number of 24-hour periods in each year. To be in compliance with the NAAQS, the 3-year average of the annual expected exceedance rate must be ≤ 1.

The annual expected exceedance rate shows a better illustration of long-term trends than the maximum 24-hour PM_{10} concentrations for sites that often exceed the PM_{10} standard. Maximum 24-hour PM_{10} concentrations typically vary from year to year because they result from local sources or high wind events.

Figure 2.3 illustrates trends in the annual expected exceedance rate for 24-hour average PM_{10} values collected throughout Pinal County with continuous monitors. It is evident from the illustration that each of these sites has recorded 24-hour average concentrations in excess of the PM_{10} standard of 150 $\mu g/m^3$. Note that for 2007-2014 days flagged as exceptional events by Pinal County were not removed from the data set. The overall trend over time in annual expected exceedance rate is lower for each of the continuous monitoring sites.

Figure 2.3 Annual Expected Exceedance Rate – All Continuous Monitors

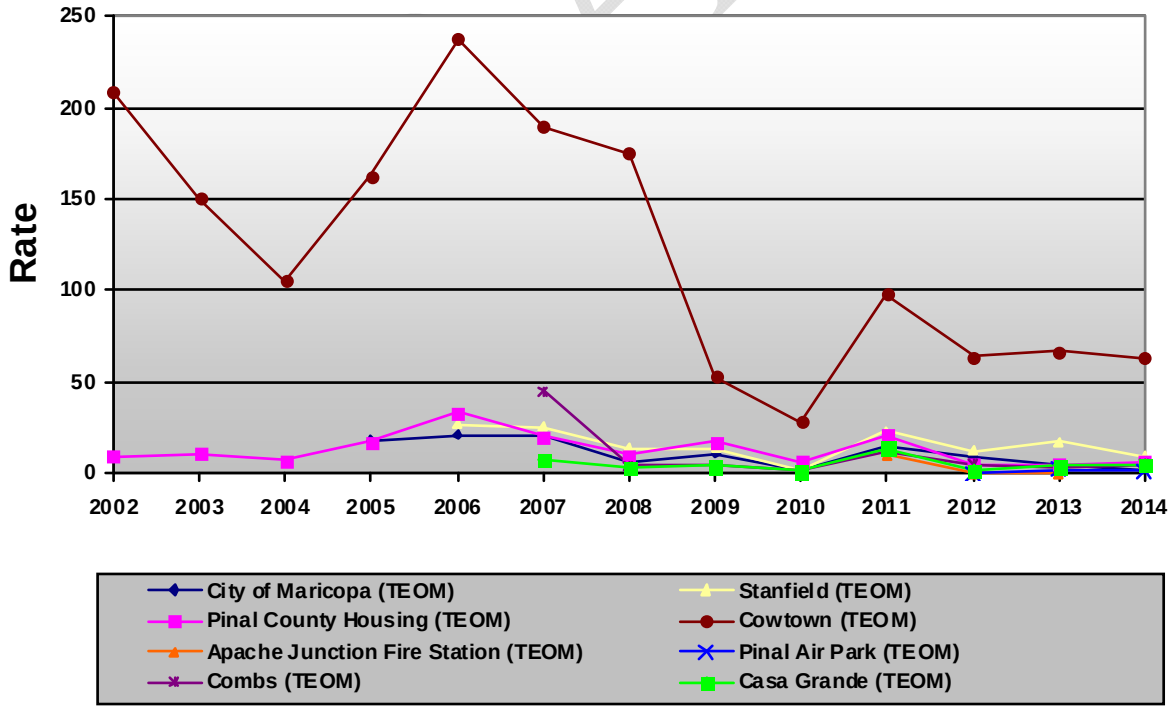
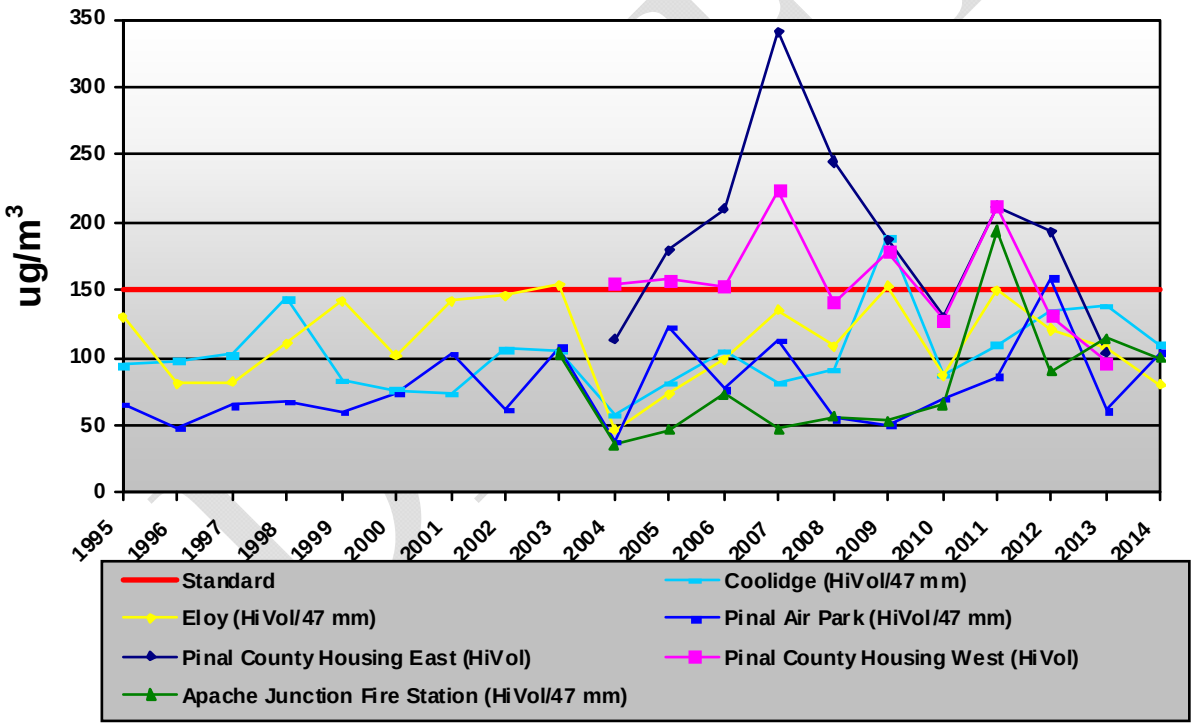


Figure 2.4 shows the maximum 24-hour concentration trends for Pinal County's filter based monitor sites. This graphic gives a better illustration of trends, since the annual expected exceedance rate would be equal to zero (0) for most years at these sites. Eloy County Complex, Coolidge Maintenance Yard, Apache Junction Fire Station, and Pinal Air Park have historically remained below the standard. In 2011 the first 24-hour PM_{10} exceedance ever recorded for the Apache Junction Fire Station site prompted the installation of a PM_{10} TEOM continuous monitor in August 2011 (TEOM was discontinued in 2014, reinstalled in 2015). In 2012 Pinal Air Park had the first exceedance ever recorded for the site which prompted the installation of a PM_{10} TEOM continuous monitor. In 2014 most sites had relatively similar readings to 2013. Apache Junction Fire Station, Coolidge Maintenance Yard, and Eloy County Complex decreased slightly while Pinal Air Park increased. Pinal County Housing Complex filter based monitors were no longer operating in 2014. For 2015, Coolidge Maintenance Yard and Eloy County Complex are the only remaining PM_{10} filter based sites. Both of these sites have an annual expected exceedance rate of zero for 2014.

Figure 2.4: Maximum 24-Hour PM_{10} Concentration - Filter Based Sites

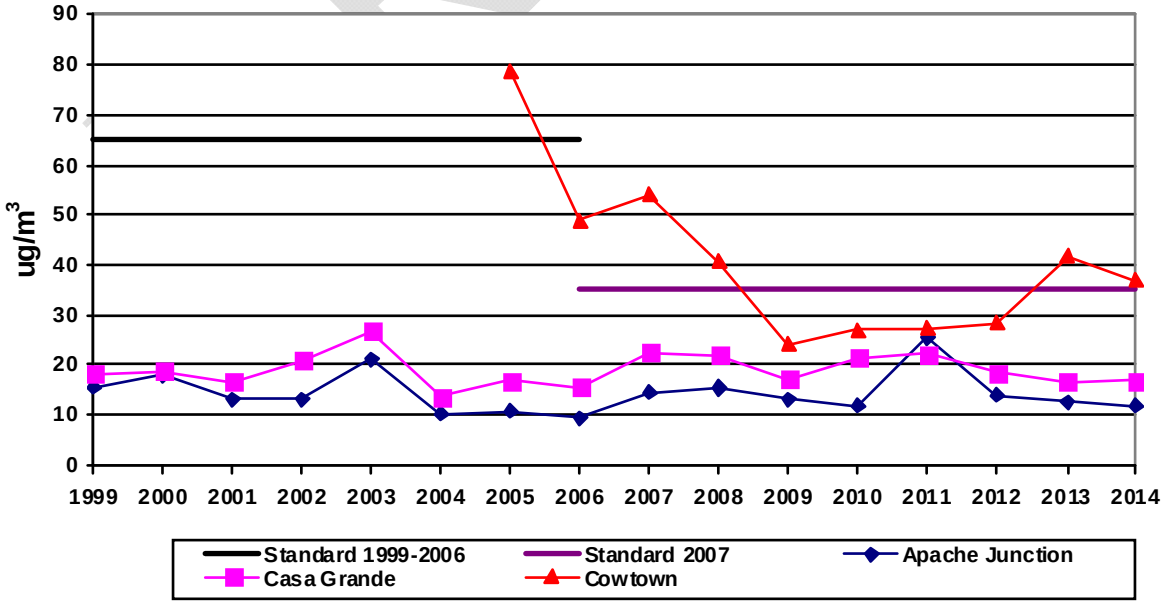


2.1.2 24-Hour $PM_{2.5}$

Figure 2.5 illustrates 98th percentile $PM_{2.5}$ values collected at Apache Junction Fire Station, Casa Grande Downtown, and Cowtown Road. It is evident from the illustration that the Apache Junction Fire Station and Casa Grande Downtown sites are below the standard over the period of record. Both sites show a historical concentration range between 9 and 27 µg/m^3. The significant increase in the Apache Junction Fire Station 2011 concentration is related to a series of exceptionally strong thunderstorms July 5th thru July 8th where the monitor recorded two consecutive run days above the standard. The Apache Junction Fire Station three year average of the 98th percentile value is still well below the standard at 12.8 µg/m^3. The 24-hour values at Casa Grande Downtown are typically higher than Apache Junction Fire Station by approximately 25%.

The Cowtown Road site shows values above 35 µg/m^3 for the first four years of operation followed by the 2009 24-hour 98th percentile value falling below 35 µg/m^3. The three year average of the 98th percentile value dropped from 61 µg/m^3 in 2007, to 40 µg/m^3 in 2009, to below the standard in 2010 at 31 µg/m^3 and remained below the standard at 27.5 µg/m^3 in 2012. In 2013 Apache Junction and Casa Grande concentrations continued to decline while the Cowtown Road site had its highest concentration since 2007. Some of the high values can be attributed to the numerous thunderstorm generated dust storms that impacted the county. Even with the elevated concentration in 2013, the three year average remained below the standard at 32.4 µg/m^3 and the met the $PM_{2.5}$ 24-hour NAAQS. However, in 2014 the 98th percentile value increased to 36.8 µg/m^3 and the three year average of the 98th percentile value increased to 35.6 µg/m^3 which is above the NAAQS.

Figure 2.5: Network-Wide 24-Hour Average $PM_{2.5}$ 98th Percentile Trends



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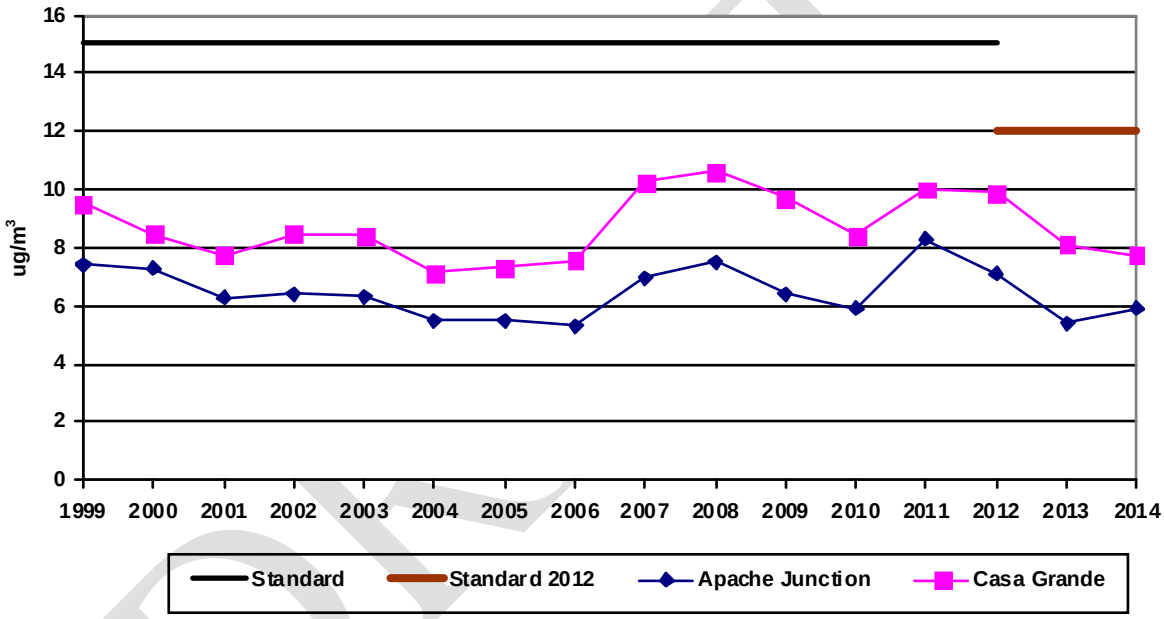
2.1.3 Annual $PM_{2.5}$

Figure 2.6 illustrates annual average $PM_{2.5}$ concentrations measured at Apache Junction Fire Station and Casa Grande Downtown. Both sites show concentrations with a range between 5 and 11 µg/m^3. Concentrations trended downward starting in 2008 with a low in 2010 which was associated with a rainy spring pattern. From 2010 the concentration trended upward in 2011 primarily due to dust outflows associated with an above average summer thunderstorm season. The 2012 to 2014 period has generally shown a slight downward trend. As was seen in the 24-hour averages, the values at Casa Grande Downtown are typically higher than Apache Junction Fire Station by approximately 25%. Both sites remain below the 2012 annual standard of 12 µg/m^3. Cowtown Road is not compared to the annual standard.

Figure 2.6: Network-Wide Annual Average $PM_{2.5}$ Trends



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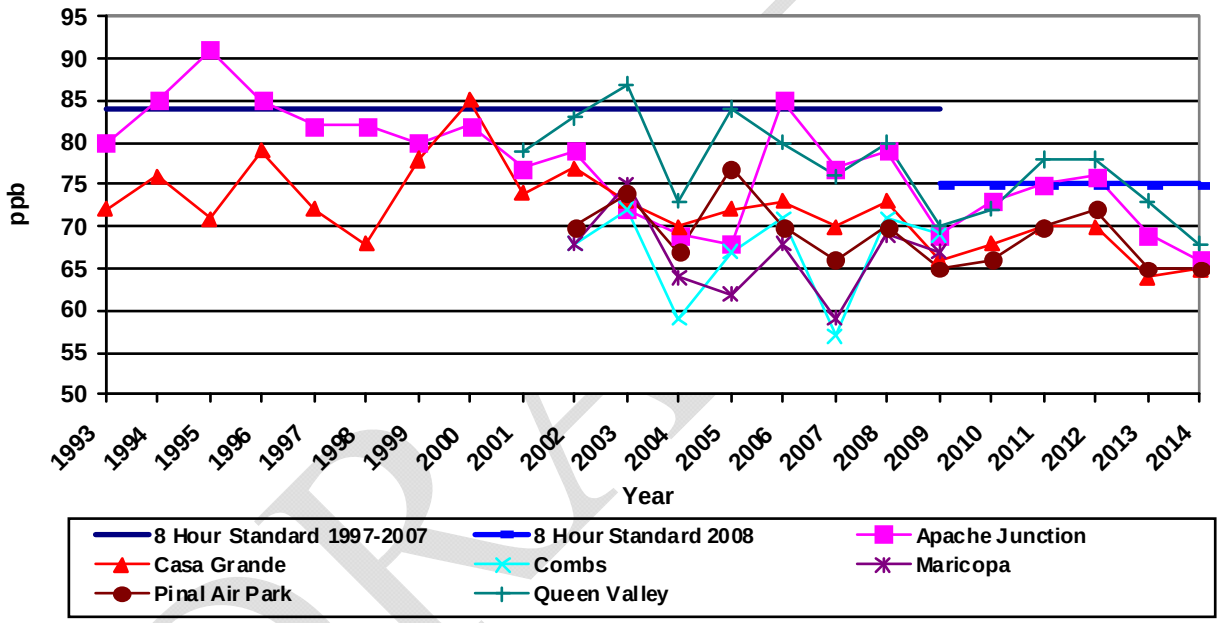
2.1.4 8-Hour Ozone

In general, the 8-hour average ozone concentrations have decreased over the long-term at the two sites with the greatest period of record, Apache Junction Maintenance Yard and Casa Grande Airport. Overall, 2009 was a low ozone year across all networks in Arizona.

Figure 2.7 shows the fourth highest 8-hour average recorded at Apache Junction Maintenance Yard, Casa Grande Airport, Queen Valley, and Pinal Air Park. Combs School and City of Maricopa County Complex ozone monitors were discontinued in 2011.

Figure 2.7 8-Hour Ozone Trends – 4th Highest Concentration



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2.2 Population

The Pinal County population figures for 2010 (Table 2.1) and estimates for 2014 (Table 2.2) are from the Office of Employment and Population Statistics, Arizona Department of Administration (ADOA). Population figures are provided for Pinal County incorporated and unincorporated places.

Table 2.1 Pinal County Places 2010 Population

Pinal County Place	Total Population
Apache Junction city	35,840
Arizona City CDP	10,475
Casa Grande city	48,571
Coolidge city	11,825
Dudleyville CDP	959
Eloy city	16,631
Florence town	25,536
Gold Canyon CDP	10,159
Kearny town	1,950
Mammoth town	1,426
Maricopa city	43,482
Oracle CDP	3,686
Picacho CDP	471
Queen Valley CDP	788
Red Rock CDP	2,169
Saddlebrooke CDP	9,614
San Manuel CDP	3,551
San Tan Valley CDP	81,321
Stanfield CDP	740
Superior town	2,837
Winkelman town	353

Table 2.2 Pinal County Places 2014 Population Estimates

Pinal County Place	Estimated 2014 Population	Change from 2010	% change from 2010
Apache Junction city	37,339	1,499	4%
Casa Grande city	50,821	2,250	5%
Coolidge city	12,027	202	2%
Eloy city	16,531	(100)	-1%
Florence town	26,828	1.292	5%
Kearny town	1,989	39	2%
Mammoth town	1,451	25	2%
Maricopa city	46,708	3,226	7%
Queen Creek	459	9	2%
Superior town	2,869	32	1%

Note – 2014 population estimate was not available for Pinal County Place San Tan Valley CDP

Map 2.1 illustrates the relationship between the ambient air monitoring network and populated areas in the County.

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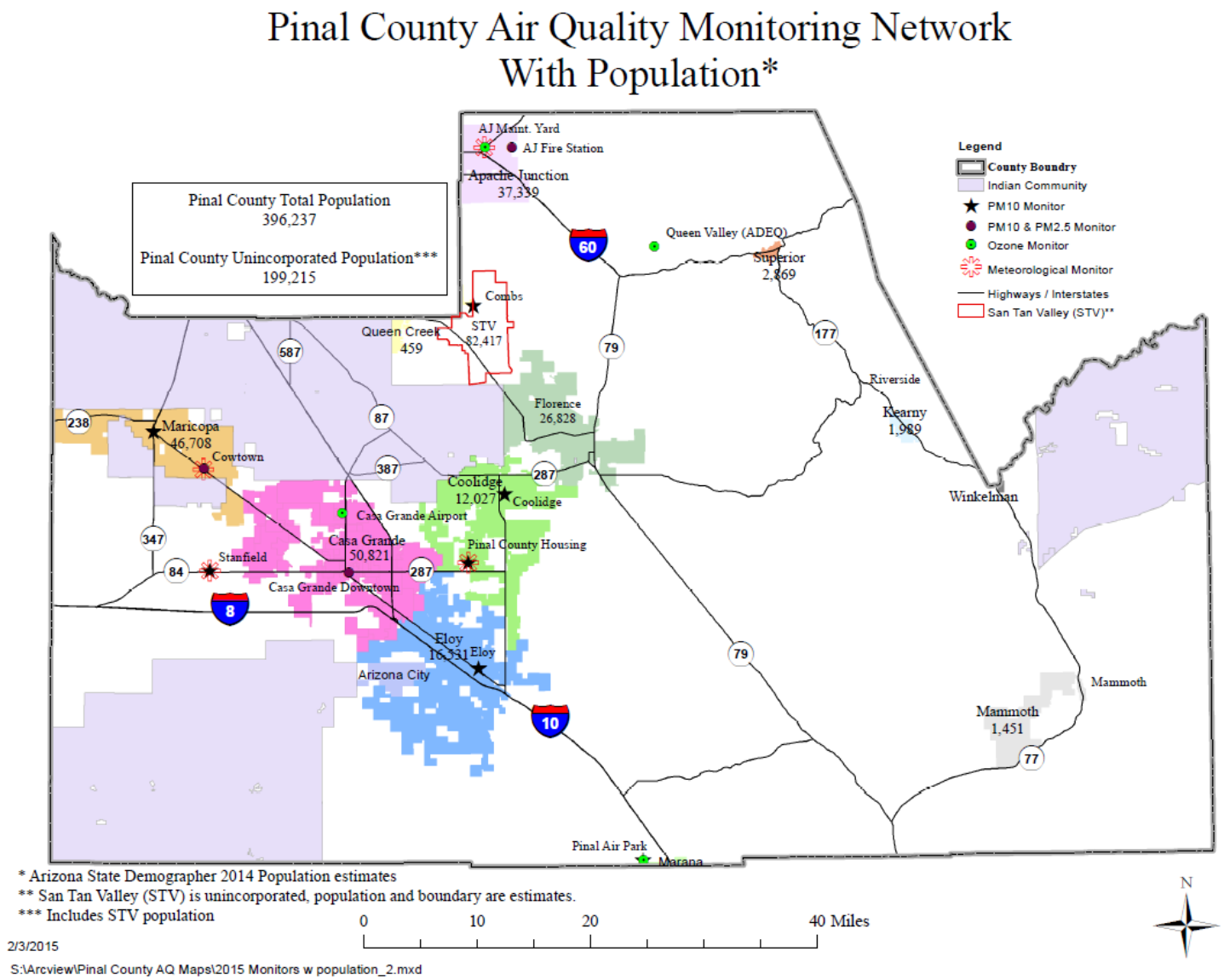
Map 2.1 Pinal County Places with Population & Monitoring Sites



2.3 Emissions

ADEQ and Pinal County developed a preliminary 2008 PM_{10} annual emissions inventory for the Western Pinal County PM_{10} nonattainment area. Emissions were calculated for two separate scenarios related to stagnation days with low winds and high wind days. Table 2.3, below, illustrates estimated annual PM_{10} emissions for both stagnation and high winds. Table 2.4 illustrates the subset of high wind PM_{10} emissions and related land types contributing to the wind-blown emissions.

Map 2.2 illustrates air monitoring locations relative to point sources permitted by Pinal County with emissions greater than 5 tons per year (tpy) of PM_{10}. A design day emission inventory was also developed for a subset of the air monitoring sites in the PM_{10} nonattainment area. The inventories represent a small scale area around each site and include the following sites; Combs School, Cowtown Road, City of Maricopa, Pinal County Housing, and Stanfield. Emission inventories for these inventories will be utilized in future network evaluations.

Table 2.3 Summary of the Preliminary 2008 Annual PM_{10} Emissions in the Western Pinal County Nonattainment Area

Source Category		PM_{10} Emissions	
		Tons/Year	% of Total
Agriculture	Harvesting	313	0.23
	Tilling	2,540	1.88
Concentrated Animal Feeding Operations		2,614	1.93
Paved Roads		1,139	0.84
Unpaved Roads		46,297	34.27
Fuel Combustion		28	0.02
Fires		20	0.01
Open Burning		14	0.01
Nonroad Vehicles		121	0.09
Railroad		86	0.06
Construction		5,553	4.11
Dairy		184	0.14
Permitted Sources		516	0.38
Sub-Total: Low Wind Emissions		59,426	43.98
Windblown Emissions		75,682	56.02
Total Emissions		135,108	100.00

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Table 2.4 Summary of the Preliminary 2008 Annual PM_{10} Emissions in the Western Pinal County Nonattainment Area on High Wind Days

Land Use ID	Land Use Category	Emissions (Tons/Year)	% of Total
A	Developed Urban Lands	201	0.27%
B	Developed Rural Lands (low density residential)	1,960	2.59%
D	Unpaved Roads	4,689	6.20%
E	Cleared Areas	399	0.53%
F	Residential Construction	1,335	1.76%
G	CAFOs and Dairies	723	0.96%
H	Desert Shrubland	38,277	50.58%
I	Agricultural Croplands	22,397	29.59%
J	Commercial Construction	624	0.82%
K	Other	4,244	5.61%
L	Site Development	835	1.10%
	Total Emissions	75,682	100%

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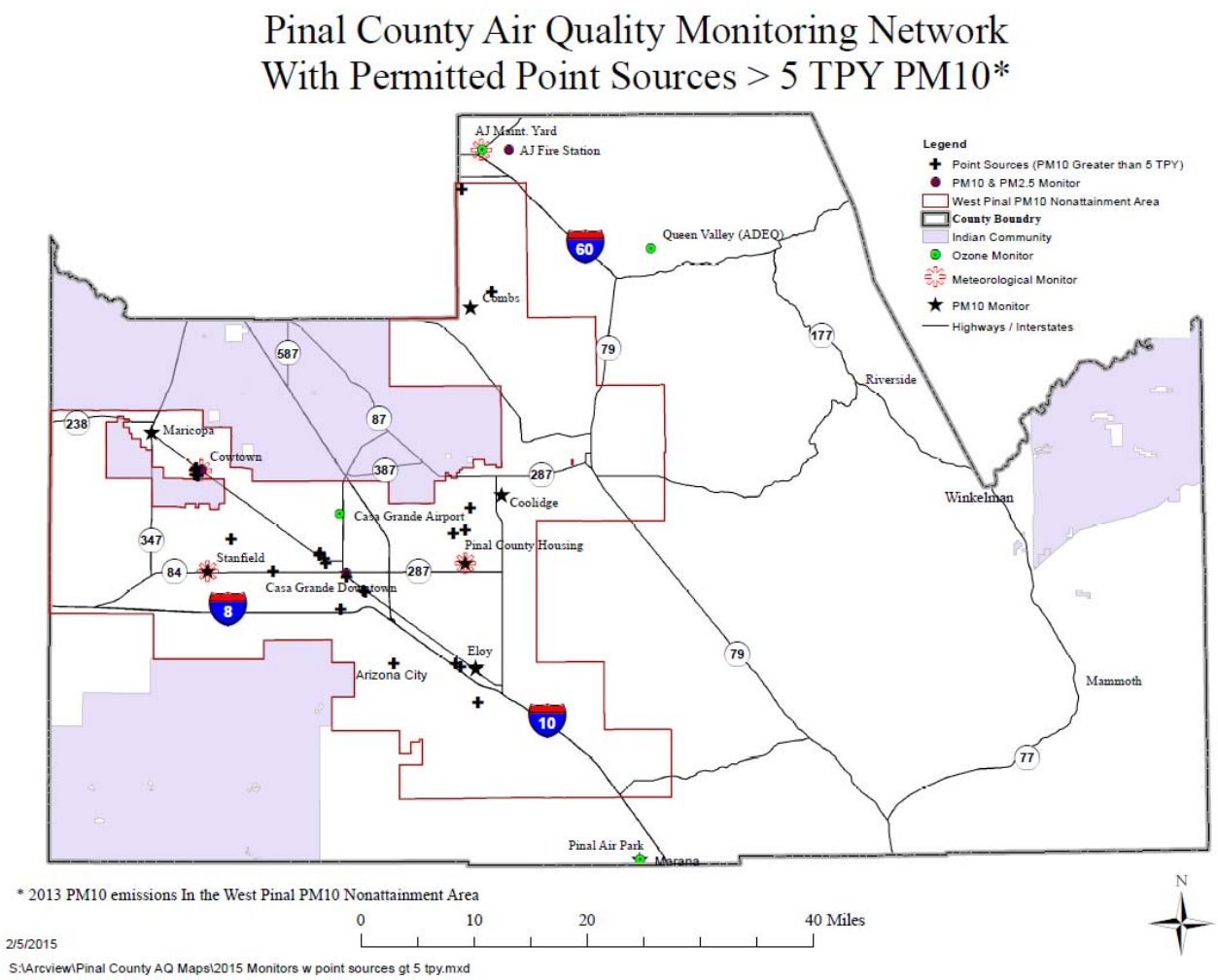
Map 2.2 Permitted Point Sources >5 TPY PM_{10} in Pinal County & Nearby Monitoring Sites



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 a non-attainment area, followed by whether the specific monitor is currently violating the NAAQS. A response of "Yes' to both removes the monitor from further consideration. The following seven sites and eight monitors pass through this screen to the next:

- Apache Junction Fire Station $PM_{2.5}$
- Apache Junction Maintenance Yard O_3
- Casa Grande Airport O_3
- Casa Grande Downtown $PM_{2.5}$
- Coolidge Maintenance Yard PM_{10}
- Eloy County Complex PM_{10}
- Pinal Air Park PM_{10}
- Pinal Air Park O_3

The second screen compares the three ozone monitoring sites which passed through from the previous screen to a maximum 8-hour ozone concentration of 0.06 ppm. The purpose of this screen is to ensure that ozone sites are maintained that approach the lowest potential limit of the 2015 revised 8-hour Ozone NAAQS. Since the remaining ozone sites are all have maximum concentrations above the screening value, all ozone sites are removed from further consideration and all ozone sites are retained.

The third screen asks if the five PM monitoring sites passed through from the previous screen are necessary to represent a populated area in the County, or if other sites adequately represent the air quality of the area. Additionally, $PM_{2.5}$ data are considered important for health impacts in populated areas. One PM_{10} site passed through this screen.

In the fourth and final screen the remaining site was evaluated against the need for definitive boundary conditions. In the case of Pinal Air Park TEOM 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 network are recommended. A detailed discussion follows.

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Current Site Evaluation – Decision Matrix

Table 3.1 Initial Screen – Non-Attainment Area Status and NAAQS Violation Status

Site Name	AQS ID	Classification	Scale	Site Type	Pollutant	Is the site within a Non-Attainment Area? Is the site currently violating the standard (including exceptional events)? (Yes to both removes site from additional evaluation)
Apache Junction Fire Station	40213002	SLAMS	Neighborhood	Population	$PM_{2.5}$	No / No
Apache Junction Fire Station TEOM	40213002	SLAMS	Neighborhood	Population	PM_{10}	Yes / Yes
Apache Junction Maintenance Yard	40213001	SLAMS	Neighborhood	Population	O_3	Yes / No
Casa Grande Airport	40213003	SLAMS	Regional	Population/Transport	O_3	No / No
Casa Grande Downtown	40210001	SLAMS	Neighborhood	Population	$PM_{2.5}$	No / No
Casa Grande Downtown TEOM	40210001	SLAMS	Neighborhood	Population	PM_{10}	Yes / Yes
Combs School TEOM	40213009	SLAMS	Neighborhood	Population	PM_{10}	Yes / Yes
Coolidge Maintenance Yard	40213004	SLAMS	Neighborhood	Population	PM_{10}	Yes / No
Cowtown Road	40213013	SLAMS	Middle	Highest Concentration / Source impact	$PM_{2.5}$	Yes / Yes
Cowtown Road TEOM	40213013	SPM	Middle	Highest Concentration / Source impact	PM_{10}	Yes / Yes
Eloy County Complex	40213014	SLAMS	Neighborhood	Population	PM_{10}	Yes / No
City of Maricopa County Complex TEOM	40213010	SLAMS	Neighborhood	Population	PM_{10}	Yes / Yes
Pinal Air Park TEOM	40213007	SLAMS	Regional	Background	PM_{10}	No / No
Pinal Air Park	40213007	SLAMS	Regional	Transport	O_3	No / No
Pinal County Housing Complex TEOM	40213011	SLAMS	Neighborhood	Population	PM_{10}	Yes / Yes
Stanfield County Complex TEOM	40213008	SLAMS	Neighborhood	Population	PM_{10}	Yes / Yes

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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)
Apache Junction Maintenance Yard	40213001	SLAMS	Neighborhood	Population	O_3	Yes
Casa Grande Airport	40213003	SLAMS	Neighborhood	Population	O_3	Yes
Pinal Air Park	40213007	SLAMS	Regional	Transport	O_3	Yes

Table 3.3 Second Screen Part 2 - Particulate Matter

Site Name	AQS ID	Classification	Scale	Objective	Pollutant	Is the site necessary to represent a specific population or is a nearby monitor adequate to represent the air quality in the area? (Yes will remove site from additional evaluation)
Apache Junction Fire Station	40213002	SLAMS	Neighborhood	Population	$PM_{2.5}$	Yes
Casa Grande Downtown	40210001	SLAMS	Neighborhood	Population	$PM_{2.5}$	Yes
Coolidge Maintenance Yard	40213004	SLAMS	Neighborhood	Population	PM_{10}	Yes
Eloy County Complex	40213006	SLAMS	Neighborhood	Population	PM_{10}	Yes
Pinal Air Park TEOM	40213007	SLAMS	Regional	Background	PM_{10}	No – not in a highly populated area

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 TEOM	40213007	SLAMS	Regional	Background	PM_{10}	Yes

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Potential New Site Evaluation

The evaluation of potential new monitoring sites or locations is shown in Tables 3.5 and 3.6. Population figures from the 2010 US Census and 2014 population projections were used in the evaluation (where available). They are further described in Section 2.3 of this document.

Table 3.5 is the initial screen and asks if the population of the incorporated area, unincorporated area or place is represented by an existing monitoring site. Map 2.1 illustrates 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.

There is a planned change in monitoring sites in 2015, involving the relocation of the Cowtown Road monitoring site due to site leasing issues. The current lease agreement allows Pinal County to use the Cowtown Road site property through January 20, 2016. As part of the relocation process, Pinal County Air Quality is monitoring PM_{10} and $PM_{2.5}$ at two temporary sites (Hidden Valley and White and Parker) to find a suitable replacement site. Pinal County is planning to collect and analyze concurrent data for a period of one year, through June 2015, in coordination with EPA Region 9.

Pinal County has use agreements in place at the Hidden Valley and White and Parker sites, and began data collection in June 2014. At the conclusion of the data collection an evaluation will be conducted to determine the appropriate replacement site for Cowtown Road. This is considered a replacement site and not a new site for the network.

Over the next 2 years the City of Maricopa site may potentially be impacted by the SR387 realignment construction project The site may need to be relocated when this due to this transportation project. Pinal County is currently evaluating alternative locations for this site.

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Table 3.5 Initial Screen Considering Place Population

City or Place Name	Population 2010 (or most recent)	Monitoring Site Representing Area	Is the area currently represented by air monitoring? (Yes will remove site from additional evaluation)
San Tan Valley CDP	81,321	Combs School	Yes
Casa Grande	48,571	Casa Grande Airport/Casa Grande Downtown	Yes
Maricopa	43,482	City of Maricopa County Complex	Yes
Apache Junction	35,840	Apache Junction Maintenance Yard/Apache Junction Fire Station	Yes
Florence	25,536		No
Eloy	16,631	Eloy County Complex, Pinal County Housing Complex	Yes
Coolidge	11,825	Coolidge Maintenance Yard	Yes
Arizona City CDP	10,475		No
Gold Canyon CDP	10,159	Apache Junction Sites & Queen Valley	Yes
Saddlebrook CDP	9,614		No
Goldfield & Environs	N/A (5,306 in 2007)	Apache Junction Sites & Queen Valley	Yes
Hidden Valley & Environs	N/A (4,956 in 2007)	City of Maricopa County Complex & Stanfield County Complex	Yes
San Manuel	3,551		Yes
Oracle & Environs	3,686		No
Superior	2,900		No
Kearny	2,007		Yes
Mammoth	1,470		No
Queen Valley & Environs	788	Queen Valley Site (ADEQ)	Yes
Dudleyville & Environs	959		No
Red River & Environs	N/A (1,332 in 2007)	Stanfield County Complex	Yes
Stanfield	740	Stanfield County Complex	Yes
Picacho	471	Eloy County Complex	Yes
Red Rock	169	Pinal Air Park	Yes
Queen Creek (Pinal County part)	N/A (366 in 2007)	Combs School	Yes
Winkelman (Pinal County part)	N/A (3 in 2007)	Hayden Jail (ADEQ)	Yes

CDP – Census Designated Place
Data from http://quickfacts.census.gov/qfd/states/04/0444410.html and http://www.city-data.com/county/Pinal_County-AZ.html

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Table 3.6 Pinal Places Without Representative Monitoring

Place Name	2010 Population
Florence	25,536
Arizona City CDP	10,475
Saddlebrook CDP	9,614
Oracle & Environs	3,686
Superior	2,900
Mammoth	1,470
Dudleyville & Environs	959

Although these places do not currently have air quality monitoring stations, Pinal County conducted air monitoring in the past in Mammoth and Riverside (near Dudleyville) and those areas did not exceed the NAAQS. Arizona City could be represented by the Eloy County Complex, Coolidge Maintenance Yard and Pinal County Housing Complex monitoring sites. There are no major sources operating near Saddlebrook and Oracle and no expected exceedances of the NAAQS in those areas near the Pinal/Pima County border. Concentrations for those areas are likely similar to those recorded at Pinal Air Park or locations in Pima County.

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3.2 Seven-Point Network Assessment

40 Code of Federal Regulations (CFR) Part 58.10 (d) requires an air monitoring network assessment to be conducted on a 5-year cycle with the first due July 1, 2010. As provided in the regulation the 5-year monitoring network 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 are 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 2015 Ambient Monitoring Network Plan and 2014 Data Summary."

1 – 40 CFR Part 58 Appendix D Compliance

EPA regulations require the agency to 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 2015 Ambient Monitoring Network Plan and 2014 Data Summary" wherein compliance with Appendix D is affirmed for all current sites.

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 PM sites may be needed in the future. However, only six areas of the county were determined to not have representative monitoring, and only Florence has a population above 20,000. There are no unique emissions sources in the Florence area, and the nearby Coolidge Maintenance Yard PM_{10} site is considered representative.

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 no sites can currently be terminated based upon the evaluation criteria. , The current Pinal County PM_{10} monitoring network consists of 10 monitoring sites, which is the maximum number of required SLAMS sites (6 to 10) under 40

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CFR Part 50. Upon completion and implementation of the PM10 SIP a more detailed evaluation of the PM10 monitoring network will be conducted. This will likely coincide with the next 5 year network assessment in 2020.

4 - New Technologies

The fourth point requires that we consider if new technologies are appropriate for incorporation into the ambient air monitoring network. New technology is definitely appropriate for the network. Specific instruments and products include: additional continuous PM_{10} and $PM_{2.5}$ instruments to replace filter-based where feasible; new ozone analyzers and standards; updated dataloggers and wireless communication devices; improved data collection and quality assurance applications; ambient database applications; and public reporting applications. Implementation of these items depends on future funding.

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. Currently $PM_{2.5}$ is measured at two of the four largest population centers in the county.

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

No sites are currently being proposed for closure.

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

Point seven requires the assessment to identify needed changes to $PM_{2.5}$ population oriented sites. Pinal County currently measures $PM_{2.5}$ in two of the four largest population centers in the County, and installation of continuous $PM_{2.5}$ monitors is planned for the future. Based on the current population and projected growth of the San Tan Valley area, Pinal County should continue to observe population trends and in the future evaluate the population representation of the county $PM_{2.5}$ network. This evaluation may suggest adding $PM_{2.5}$ in the San Tan Valley area (possibly the Combs School site) and removing an existing $PM_{2.5}$ population based site elsewhere in the network. This would ensure we maintain minimum monitoring requirements under 40 CFR Part 50. Such a change would be approached with caution considering the loss of long term trend data at existing sites. The pending relocation of the Cowtown Road site may potentially be within the City of Maricopa city limits (White and Parker site). If the White and Parker site is selected, we will gain $PM_{2.5}$ representation at one of the higher population centers in the County and also within the $PM_{2.5}$ non-attainment area.

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4.0 Conclusions

The process of developing and implementing this Pinal County Air Quality monitoring network evaluation lead to several conclusions regarding the current air monitoring network and potential changes in the future. Other considerations for future changes include site safety and leasing issues, potential new emissions sources, population projections, site proximity to proposed new freeways and increased traffic, and additional automation of PM monitoring for real time data reporting and forecasting. Monitoring equipment issues were identified, including the potential lack of parts and end of servicing for 1400AB TEOMs by the manufacturer, and the need to replace them with other continuous PM monitors.

A primary result of the evaluation was a conclusion of limited changes in the existing Pinal County Air Quality PM_{10}, $PM_{2.5}$, and ozone networks. Considering the evaluation process and status of the PM_{10} SIP, No changes to the network are being proposed. The criteria for the ozone portion of the decision matrix evaluation envisioned a tightened, but uncertain, ozone NAAQS standard to be implemented in the near future. The current ozone network adequately represents Pinal County.

This evaluation illustrates that 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 the required monitoring network design, the network provides pollutant concentrations for use in defining boundary conditions and long term trends, such as ozone and PM_{10} at the Pinal Air Park site which defines concentrations along the Pima/Pinal county boundary. Other network monitoring sites near Pinal County, operated by the Gila River Indian Community, Pima County, and Maricopa County, can be used for spatial analysis and long term trends analysis.

PAMS monitoring requirements for the Phoenix ozone non-attainment area are implemented by ADEQ, including the Queen Valley site located in Pinal County. Maricopa County operates the required N-Core and near-road monitoring sites for the Phoenix-Mesa-Scottsdale MSA and has two operational near-road sites as required by EPA rules.

The population evaluation identified several locations where future monitoring may be warranted. The result was based upon a review of population from the 2010 census and 2014 projections, and the spatial extent of the current network. When evaluating neighborhood scale PM 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 or relocate monitoring monitors should consider additional parameters such as emissions characteristics, pollutant transport and meteorology. A primary consideration will be adequate funding and resources to cover potential monitoring additions or changes. We will review any potential changes or additions in our next Annual Air Monitoring Network Plan.

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