

2010
Air Quality Summary Report
For
Pima County, Arizona



Pima County Department of Environmental Quality
33 North Stone Avenue
Tucson, Arizona 85701
AQ- 376

2010 Air Quality Summary Report

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List of Abbreviations / Acronyms

ADEQ	Arizona Department of Environmental Quality
AQI	Air Quality Index, an index used to report air pollutant concentrations and associated health effects to the public.
CO	The chemical symbol for carbon monoxide, one of the criteria air pollutants.
EPA	United States Environmental Protection Agency
FRM	Federal Reference Method
NAAQS	National Ambient Air Quality Standards, the levels of pollutant concentration which are established to protect human health and welfare. Currently, there are six principal pollutants, which are called “criteria” air pollutants, with established levels.
NO₂	The chemical symbol for nitrogen dioxide, one of the criteria air pollutants.
NO_x	Total oxides of nitrogen (NO + NO₂)
O₃	The chemical symbol for ozone, one of the criteria air pollutants.
Pb	The chemical symbol for lead, one of the criteria air pollutants.
PDEQ	Pima County Department of Environmental Quality
PM₁₀	Particulate Matter with an aerodynamic diameter of 10 micrometers or less, one of the criteria air pollutants.
PM_{2.5}	Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers, one of the criteria air pollutants.
ppm	Parts per million, a unit of concentration, commonly used to express gaseous concentrations.
ppb	Parts per billion, a unit of concentration 1000 ppb = 1 ppm. Used to express gaseous concentrations.
SLAMS	State and Local Air Monitoring Stations
SO₂	The chemical symbol for sulfur dioxide, one of the criteria air pollutants.
SP	Special Purpose site
TSP	Total Suspended Particulates. A former criteria air pollutant which was replaced by PM₁₀.
µg/m³	Micrograms per cubic meter, a metric unit used to express concentration.
VOC	Volatile Organic Compound

**Pima County Department of Environmental Quality
2010 Air Quality Summary**

Table 1

Map No.	Location of Monitoring Stations	Carbon Monoxide (CO) ppm		Ozone ppm	Particulate Matter (PM ₁₀) µg/m ³	Particulate Matter (PM _{2.5}) µg/m ³		Lead µg/m ³		Nitrogen Dioxide (NO ₂) ppm		Sulfur Dioxide (SO ₂) ppm
		Max Conc. 1 Hr	Max Conc. 8 Hr	4 th Highest Conc. 8 Hr	Max Conc. 24 Hr	Max Conc. 24 Hr	Arith. Annual Mean	Rolling 3 month average	Quarterly average	Arith. Annual Mean	Max Conc. 1 Hr	Max Conc. 1 Hr
	<i>NAAQS</i>	<i>35 ppm</i>	<i>9 ppm</i>	<i>0.075 ppm</i>	<i>150 µg/m³</i>	<i>35 µg/m³</i>	<i>15 µg/m³</i>	<i>0.15 µg/m³</i>	<i>1.5 µg/m³</i>	<i>53 ppb</i>	<i>100 ppb</i>	<i>75 ppb</i>
2	22 nd & Craycroft	2.0	1.1	.066						11.6	63.7	14.0
3	22 nd & Alvernon	2.5	1.1									
4	Geronimo				67	29.0	9.5					
5	South Tucson				79							
6	Prince Road				72							
7	Broadway & Swan				33							
8	Corona de Tucson				31							
9	Santa Clara				56							
10	Green Valley			.066	57	10.2	3.8					
11	Children's Park NCore	1.2	0.8	.066		13.5	5.0			10.0	45.0	3.0
12	Orange Grove				64	15.7	5.2					
13	Tangerine			.069	58							
14	Rose Elementary			.068		22.4	5.4					
15	Coachline			.063		18.2	5.1					
16	Cherry & Glenn	2.1	1.4									
17	Fairgrounds			.069								
18	Saquaro National Park East			.068								
23	Golf Links & Kolb	2.8	1.4									

Introduction



Pima County Department of Environmental Quality monitors ambient (outdoor) air pollutants throughout eastern Pima County, including the Tucson metropolitan area and Green Valley. There are six principal pollutants, called “criteria” pollutants that are monitored in accordance with the National Ambient Air Quality Standards (NAAQS) set by the Environmental Protection Agency (EPA) to comply with the Federal Clean Air Act.

At this time, there are five air pollutants monitored by PDEQ which are: carbon monoxide (CO), ozone (O₃), particulate matter (PM₁₀, PM_{2.5}), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂). Lead will be monitored in 2012 in Pima County. Locations of these monitors (page 14) are based on emission source distribution and population exposure (40 CFR, Part 58, App. D). Table 2, page 7, includes a description of the criteria pollutants and the potential health effects.

The EPA periodically reviews the standards and makes revisions accordingly. Recent changes currently affecting Pima County and known future NAAQS and regulatory requirement revisions are listed on page 9.

**Table 2
Criteria Pollutants**

Pollutant	Description	Sources	Other Information	Health Effects
Carbon Monoxide (CO)	A colorless, odorless gas formed from the combustion of carbon compounds	Major source is motor vehicles; Minor sources are aircraft, trains, and burning of vegetation (wood)	Plants, animals, coal, gasoline, oil and wood (all living or once living organisms) contain carbon compounds. When they are burned in the presence of oxygen the carbon will be converted to carbon dioxide gas (CO ₂). When there is not enough oxygen present to form CO ₂ then CO will form instead.	Carbon monoxide enters the bloodstream and reduces the delivery of oxygen to the body's organs and tissues. Can cause fatigue in healthy people and chest pains at low concentrations.
Ozone (O₃)	A gas formed when volatile organic compounds (VOCs) and NOx react in the presence of heat and sunlight; at ground level, ozone is harmful to living things; key ingredient for smog	A compound not emitted directly from a source; the sources of volatile organic compounds and nitrogen oxides which cause the formation of ozone are primarily from vehicle exhaust and industrial processes	Stratospheric ozone occurs naturally and is a protective layer, providing a filter for the damaging ultraviolet light emitted by the sun.	Ozone can irritate the respiratory system and reduce lung function, causing wheezing and coughing and breathing difficulties.
Particulate Matter (PM)	Particulate matter (PM ₁₀) are particles less than 10 microns in size. Particulate matter (PM _{2.5}) are particles less than 2.5 microns in size.	Major sources: vehicle exhaust, especially diesel fuels, road dust from traffic and unpaved roadways; Minor sources: construction activities, agricultural activities, industrial processes and combustion sources such as wood burning	Particulate matter is a term for solid or liquid particles found in the air. It plays a large part in visibility with larger particles, seen as soot or smoke, to smaller particles, involved in light scattering or absorption, causing urban haze.	PM _{2.5} has an impact on human health because of its ability to penetrate deep into the respiratory system. PM _{2.5} can affect lung and heart function.
Nitrogen Dioxide (NO₂)	A highly reactive gas that is formed primarily when fuel is burned at high temperatures.	Major sources: automobile exhaust; Minor sources: industry, power plants and from the oxidation of NO in the atmosphere	A precursor to the formation of ozone (smog); can cause a reduction in visibility	NO ₂ can irritate the respiratory system and reduce lung function.
Sulfur Dioxide (SO₂)	A pungent gas	Major sources: coal burning and copper smelters; burning of diesel fuel	SO ₂ gas can combine with water vapor and oxygen to form sulfuric acid (H ₂ SO ₄), which is a very corrosive chemical that can damage buildings, plants and aquatic life.	SO ₂ can irritate the respiratory system and reduce lung function.
Lead (Pb)	A metal that can be poisonous if ingested or inhaled	Major sources: leaded gasoline; battery manufacturing and recycling		Lead can accumulate in the blood, bones and tissues causing neurological disorders and can damage organs.

Table 3 below lists the Primary and Secondary NAAQS for each pollutant in terms of pollutant level and averaging time used to evaluate compliance with the standard. The primary standard is intended to protect public health, in particular, the health of the most susceptible individuals, such as children, elderly and those with respiratory illnesses. The secondary standard is to protect against damage to crops and vegetation, decreased visibility, and harm to animals and ecosystems. The averaging times, such as a 24-hour average or an annual average, protect the population from adverse health effects associated with peak short term exposure or long term exposure to these air pollutants.

An exceedance of the standard occurs when a recorded pollutant concentration is greater than the standard level concentration. A violation of the standard is when the recorded pollutant levels exceed the standard the number of times indicated in the NAAQS.

**Table 3
National Ambient Air Quality Standards (NAAQS)**

Pollutant	Primary (Health Related)		Secondary (Welfare Related)	
	Type of Average	Standard Level Concentration ^a	Type of Average	Standard Level Concentration
CO	1-Hour ^b	35 ppm (40 µg/m ³)	No Secondary Standard	
	8-Hour ^b	9 ppm (10 µg/m ³)	No Secondary Standard	
O ₃	8-Hour ^c	0.075 ppm	Same as Primary	
PM ₁₀	24-Hour ^d	150 µg/m ³	Same as Primary	
PM _{2.5}	Annual Arithmetic Mean ^e	15 µg/m ³	Same as Primary	
	24-Hour ^e	35 µg/m ³	Same as Primary	
NO ₂	Annual Arithmetic Mean	53 ppb	Same as Primary	
	1-Hour ^f	100 ppb	None	
SO ₂	1-Hour ^g	75 ppb	None	
Pb	Quarterly Average	1.5 µg/m ³	Same as Primary	
	Rolling 3-month Average	0.15 µg/m ³	Same as Primary	

a Parenthetical value is an approximately equivalent concentration (40 CFR, Part 50).

b Not to be exceeded more than once per year.

c The standard is met when the three year average of the annual fourth highest daily maximum concentration is less than or equal to 0.075ppm (effective May 27, 2008).

d The 24-hour standard is met when the expected number of exceedances in a year averaged over three years is less than or equal to one (App. K). The annual standard was revoked December 17, 2006.

e The 24-hour standard is met when the three year average of the 98th percentile value is less than or equal to 35 µg/m³(effective December 17, 2006). The annual standard is met when the annual average of the quarterly concentrations is less than or equal to 15 µg/m³, when averaged over 3 years.

f The 1- hour standard is met when the three year average of the 98th percentile of the daily maximum 1- hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010)

g The 1 –hour standard is met when the three year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb. (effective June 2, 2010)

Reference: [Http://www.epa.gov/air/criteria.html](http://www.epa.gov/air/criteria.html)

EPA's Revisions to the NAAQS and Regulatory Requirements

- ❖ On October 15, 2008, EPA strengthened the lead standard. Pima County will be required to perform area monitoring at the Children's Park location. Lead monitoring will begin January 2012.
- ❖ Primary NO₂ NAAQS - final ruling April 12, 2010; Schedule under development
O₃ NAAQS- reconsideration proposal December, 2009; final ruling anticipated July 2011.
Secondary NO₂ and SO₂ NAAQS- proposal July 12, 2011
Primary CO NAAQS –final ruling anticipated August 12, 2011.
Particulate Matter NAAQS- proposal in 2011
Primary SO₂ NAAQS - final ruling August 23, 2010; Schedule under development

Tucson Area Topography, Meteorology

Topography

Pima County is located in the southern part of Arizona with an area approximately 9,200 square miles. About 95% of the population resides in eastern Pima County. The 2010 Census population count for Pima County is 980, 263 with the city of Tucson population at 520,116. The Tucson basin, located in eastern Pima County, has an elevation between 2,000 and 3,000 feet with several mountain ranges surrounding it with elevations exceeding 9,000 feet in the Santa Catalina, Santa Rita and Rincon ranges.

Meteorology

The Tucson basin has abundant sunshine. The summer season is hot and runs from May through September. Tucson has mild winter temperatures and low rainfall averaging about twelve inches per year.

Wind direction is affected by the topography of the area, as well as the change of season and time of day. Air flows generally tend to be downvalley (from the southeast) at night and early morning hours, reversing to the upvalley direction (from the northwest) during the day.

The summer monsoon occurs in the months of June, July and August with the conditions having a yearly variability both in intensity and timing. The monsoon brings high relative humidity, cloud cover, wind events and frequent, often severe, thunderstorms.

Higher levels of pollution can occur in the winter when the air is calmest. Under these conditions, especially during winter mornings, pollutants become trapped by temperature inversions. The temperature inversions begin after the sun goes down and the air closest to the ground is cooled rapidly by heat radiating out through the clear dry air of the desert. As the sun

rises in the morning, the upper air is heated rapidly and becomes warmer than the air closest to the ground. This traps the cold air next to the ground and holds it there until the sun is able to heat the ground and slowly raise the temperature of the trapped air. Once heated, the trapped air is able to rise and mix with the layers of air above and disperse the built up pollutants. These conditions, often referred to as temperature inversions, are common during the winter, and are less severe in the summer months.

Tucson Area Status of Criteria Pollutants

Carbon Monoxide

Carbon monoxide concentrations have declined in the past three decades. This has been attributed mostly to the use of cleaner burning oxygenated fuels, fuel efficient computer controlled vehicles, locally adopted Clean Air and Travel Reduction Programs and various local traffic control measures. The levels of CO remain around 20% of the standard but with population growth and increased number of cars on the roads, higher CO levels may be measured in the future.

The Tucson area generally has higher CO readings in the winter months due to stagnant air conditions in the colder mornings, as demonstrated by **Figure 4** in the seasonal trends section (page 20). The CO cannot mix due to stagnant air and tends to build up, especially near congested intersections.

There were no exceedances of the NAAQS for carbon monoxide in 2010. The national health standard for ambient CO specifies the 1-hour level at 35 ppm and the 8-hour level at 9 ppm. These levels cannot be exceeded more than once per year without incurring a violation of the NAAQS. The highest 1-hour reading in 2010 was 2.8 ppm at the Golf Links & Kolb location. The highest 8-hour reading was 1.4 ppm at the Cherry & Glenn, and Golf Links & Kolb locations.

PDEQ monitors CO at five locations. **Table 6** (page 16) lists all the CO sites in the network and the maximum concentrations.

Ozone

Ground level ozone concentrations have remained relatively steady. On March 12, 2008, EPA strengthened the ground level ozone standard, effective May 27, 2008. The primary standard of 0.08 ppm has been lowered to 0.075 ppm, keeping the form of the standard as the three year average of the fourth highest daily maximum eight hour average ozone concentration.

Ground level ozone concentrations are the highest in the summer months due to the intense sunlight and heat, as demonstrated by **Figure 5** in the seasonal trends section (page 20). Oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) are the “precursor” pollutants that react in the presence of sunlight to form ozone. In the Tucson area, ozone levels generally decline after sunset as the photochemical reactions cease. The highest ozone levels generally are not found near major intersections. Instead they are found when precursor pollutants are released and travel, due to wind or simple dispersion, away from the area of concentration before reacting with sunlight to form ozone. The Saguaro National Park East site generally records the highest ozone levels.

There were no violations of the NAAQS for ozone in 2010. Pima County Department of Environmental Quality will issue an ozone advisory to the media to protect very sensitive members of our population when the predicted ozone levels are elevated. There were two ozone advisories issued in 2010.

The highest 4th highest 8-hour average ozone level in 2010 was 0.069 ppm at the Tangerine and Fairgrounds locations. **Table 7** (page 16) lists the maximum concentrations for ozone and the locations of the eight PDEQ ozone monitors.

Particulate Matter (PM₁₀, PM_{2.5})

PM₁₀ is particulate matter with an aerodynamic diameter of 10 microns or less and PM_{2.5} is particulate matter with an aerodynamic diameter of 2.5 microns or less. Particulate matter is a health concern because when inhaled, the particles are able to pass through the body’s protective filtration system and enter the lungs.

Particulate matter concentrations are often higher near unpaved roads, during localized activities such as construction, during extended dry periods, and when strong winds are present. Pima County violated the PM₁₀ standard in 1999 with four recorded exceedances of the standard at the Orange Grove location. High winds and unusually long periods without rain are considered factors contributing to the high particulate readings for that year. A Natural Events Action Plan (NEAP) was submitted to ADEQ and EPA and the resulting ordinance was adopted December 3, 2002. This plan included measures to minimize contributing controllable sources using the Best Available Control Measures (BACM), increased enforcement and education to help protect public health and welfare on days with high levels of PM₁₀.

Pima County currently follows the Exceptional Events Rule instituted by EPA on November 21, 2008 for exceedances of the standard.

Table 4
Pima County Exceedances 1990- 2010

Date of Exceedance	Location	Exceptional Event Designation
3-7-1999	OG,ST	High Winds, Drought
10-20-1999	OG	High Winds, Drought
12-3-1999	OG,ST	High Winds, Drought
12-23-1999	OG	High Winds, Drought
7-09-2002	OG,ST	None
7-10-2002	ST	None
7-11-2003	OG	Fire , Santa Catalina Mt. Range
10-27-2008	SC	High Winds
7-22-2009	OG, ST, GER	High Winds

Pima County will issue a particulate matter advisory to the public when there are elevated levels recorded. No advisories were issued in 2010.

The 24-hour NAAQS for PM₁₀ is 150 micrograms per cubic meter (µg/m³). The highest level recorded in Pima County in 2010 was 79 µg/m³ at the South Tucson location. The second highest level recorded in Pima County was 72 µg/m³ at the Prince Road location. **Table 8** (page 17) lists the nine PM₁₀ sites in the network and their maximum concentrations.

Particulate matter 2.5 microns or smaller (PM_{2.5}) travels deeper into the lungs and can be more harmful than PM₁₀. It can also be composed of toxic substances such as metals and organic compounds. PM_{2.5} has been linked to health problems including respiratory and heart problems, and can also contribute to poor visibility and urban haze. There have been no exceedances of the NAAQS for PM_{2.5} since monitoring began in 1999. The 24-hour NAAQS for PM_{2.5} is 35 µg/m³. The highest 24-hour PM_{2.5} concentration in 2010 in Pima County was 29.0 µg/m³ at the Geronimo location. **Table 9** (page 17) lists the six PM_{2.5} sites in the network and their maximum concentrations.

Nitrogen Dioxide and Sulfur Dioxide

The other criteria pollutants measured by PDEQ are nitrogen dioxide and sulfur dioxide. No significant changes in the levels of these two pollutants have been seen in the past 20 years.

Nitrogen dioxide is measured at the Children’s Park and 22nd Street & Craycroft locations. Nitrogen dioxide levels remain low during the summer but act as a precursor to ozone formation. Most noticeable during wintertime temperature inversions, NO₂ is a contributing factor to urban haze, the “brown cloud” that limits visibility in the Tucson basin. Motor vehicles are a major source of NO₂ in Pima County.

There were no exceedances of the NO₂ standard which averages about 30% of the standard. **Table 20** (page 18) contains the nitrogen dioxide information for 2010.

Sulfur dioxide is measured at the 22nd Street & Craycroft location and Children’s Park NCore location. Tucson has no significant sources of SO₂ and the levels continue to be extremely low

with averages at around 7% of the standard. **Table 11** (page 18) contains the sulfur dioxide information for 2010.

Lead

Lead sampling and analysis was discontinued at the end of March, 1997, in Pima County. The Environmental Protection Agency regulations allowed for the cessation of ambient lead monitoring in most areas of the country, except in areas with stationary sources of lead. Most urban areas have seen a dramatic decrease in ambient lead levels since the phase out and ban of lead in gasoline.

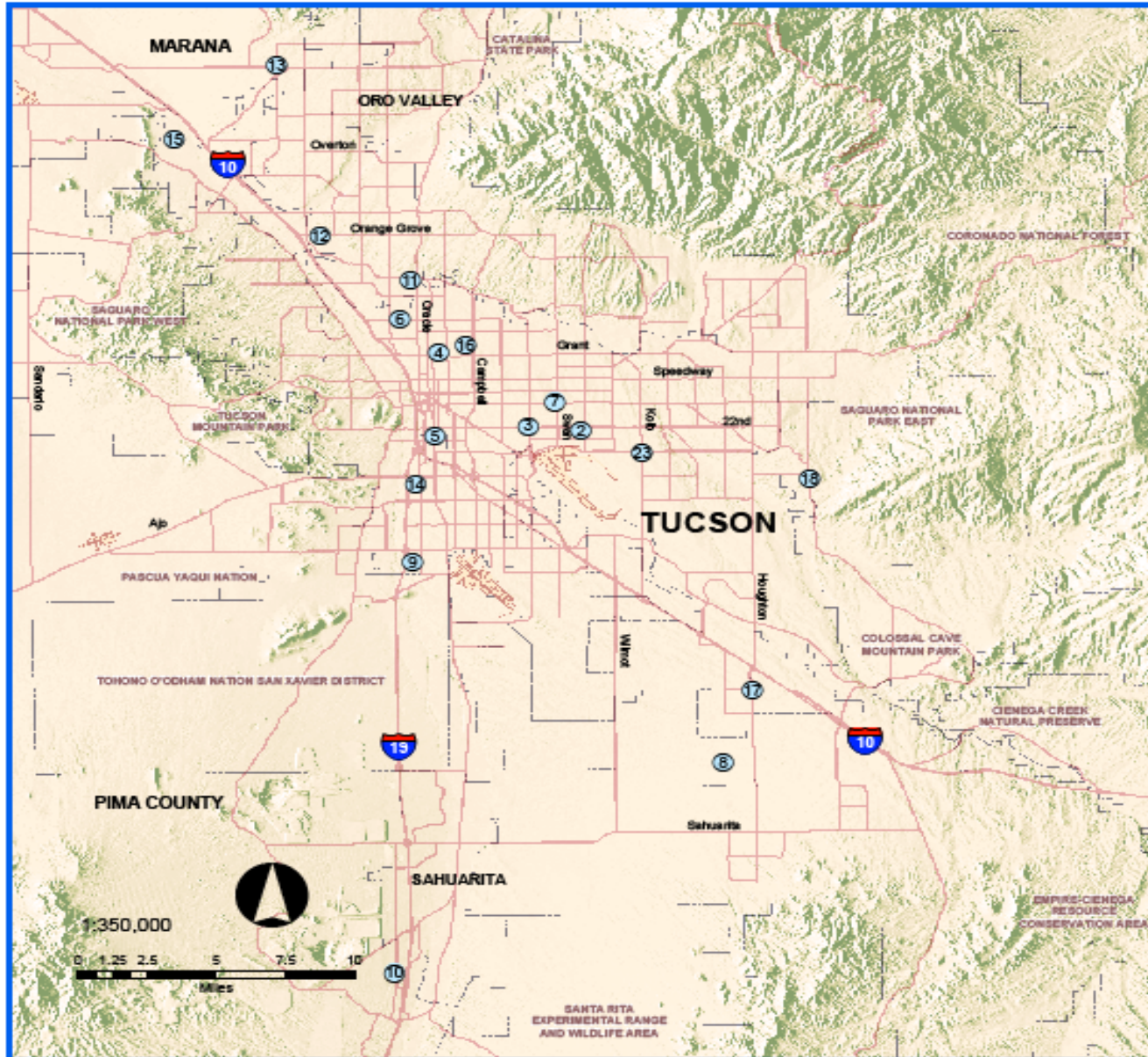
On October 15, 2008, EPA strengthened the lead standard. Research and technology has shown that adverse health effects occur at much lower levels of lead in blood than previously thought. Children are particularly vulnerable to the effects of lead. The primary standard of 1.5 ug/m^3 has been lowered to 0.15 ug/m^3 , measured as total suspended particles (TSP). The secondary standard is identical to the primary standard. According to the 2005 National Air Emissions Inventory (NEI) from EPA, Pima County has no sources of lead of one ton or more, so Pima County will only be required to perform area monitoring at the Children's Park location. Monitoring is anticipated to commence prior to January 2012.

Air Quality Monitoring Locations and Map



Table 5

Site Map #	Site Name	Address	Pollutant
2	22 nd & Craycroft	1237 S. Beverly	CO, O ₃ , SO ₂ , NO ₂
3	22 nd & Alvernon	3895 E. 22 nd	CO
4	Geronimo	2498 N. Geronimo	PM _{2.5} , PM ₁₀
5	South Tucson	1601 S. 6 th Ave.	PM ₁₀
6	Prince Road	1016 W. Prince Rd.	PM ₁₀
7	Broadway & Swan	4625 E. Broadway	PM ₁₀
8	Corona de Tucson	22000 S. Houghton Rd.	PM ₁₀
9	Santa Clara School	6910 S. Santa Clara Ave.	PM ₁₀
10	Green Valley	601 N. La Canada Dr.	O ₃ , PM ₁₀ , PM _{2.5}
11	Children's Park NCore	400 W. River Rd.	CO, O ₃ , SO ₂ , NO ₂ , PM _{2.5}
12	Orange Grove	3401 W. Orange Grove Rd.	PM ₁₀ , PM _{2.5}
13	Tangerine	12101 N. Camino de Oeste	O ₃ , PM ₁₀
14	Rose Elementary	710 W. Michigan Street	O ₃ , PM _{2.5}
15	Coachline	9597 N. Coachline Blvd.	O ₃ , PM _{2.5}
16	Cherry & Glenn	2745 N. Cherry	CO
17	Fairgrounds	11330 S. Houghton Rd.	O ₃
18	Saguaro National Park, East	3905 S. Old Spanish Tr.	O ₃
23	Golf Links & Kolb	2601 S. Kolb Rd.	CO

Pima County Monitoring Sites



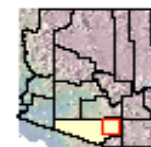
- 2 - 22nd / Craycroft
- 3 - 22nd / Alvernon
- 4 - Geronimo
- 5 - South Tucson
- 6 - Prince Road
- 7 - Broadway / Swan
- 8 - Corona de Tucson
- 9 - Santa Clara
- 10 - Green Valley
- 11 - Children's Park
- 12 - Orange Grove
- 13 - Tangerine
- 14 - Rose Elementary
- 15 - Coachline
- 16 - Cherry / Glenn
- 17 - Fairgrounds
- 18 - Saguaro National Park East
- 23 - Golf Links / Kolb

-  Monitoring Sites
-  Major Streets

Revised: April 2010

Comments

All information is provided as is, with all faults, and without warranty of any kind, expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.



Prepared By
Pima County Department
of
Environmental Quality

Data Summary

Table 6
Carbon Monoxide Summary Values¹ for 2010

Site	Map No.	Site Type	Annual Mean	Max 1-Hr Value ²	Max 8-Hr Value ³	% Data Recovery ⁴
22 nd / Craycroft	2	SLAMS	0.28	2.0	1.1	99
22 nd / Alvernon	3	SLAMS	0.34	2.5	1.1	99
Children's Park NCore	11	NCore	0.27	1.2	0.8	99
Cherry / Glenn ⁵	16	SP ⁶	0.40	2.1	1.4	99
Golf Links / Kolb ⁵	23	SP ⁶	0.40	2.8	1.4	98

1. Measured in parts per million (ppm)
2. National Ambient Air Quality Standard one hour average for carbon monoxide is 35 ppm
3. National Ambient Air Quality Standard eight hour average for carbon monoxide is 9 ppm
4. Percent data recovery rounded to the nearest whole number.
5. Seasonal monitor, no sampling from 04/01/2010 through 09/30/2010.
6. Special Purpose site

Table 7
Ozone Summary Values¹ for 2010

Site	Map No.	Site Type	Annual Mean	Max 1-Hr Value	4 th Max 8-Hr Value ²	% Data Recovery ³
22 nd / Craycroft	2	SLAMS	.029	.076	.066	100
Green Valley	10	SP ⁴	.035	.077	.066	99
Children's Park NCore	11	NCore	.028	.082	.066	99
Tangerine	13	SP ⁴	.038	.076	.069	100
Rose Elementary	14	SP ⁴	.027	.075	.068	99
Coachline	15	SP ⁴	.025	.072	.063	99
Fairgrounds	17	SP ⁴	.034	.079	.069	99
Saguaro National Park, East	18	SLAMS	.041	.082	.068	99

1. Measured in parts per million (ppm)
2. National Ambient Air Quality Standard three year average of the 4th highest eight hour average for ozone is 0.075 ppm
3. Percent data recovery rounded to the nearest whole number.
4. Special Purpose site.

Table 8
Particulate Matter (PM₁₀) Summary Values¹ for 2010

Site	Map No.	Site Type	Annual Average	Max 24-Hr Value ²	2 nd Max 24-Hr Value	% Data Recovery ⁴
South Tucson	5	SLAMS	26.1	79	66	100
Prince Road	6	SLAMS	30.1	72	58	100
Broadway / Swan	7	SP ³	18.7 ^A	33	33	84
Corona de Tucson	8	SLAMS	13.1	31	29	97
Santa Clara	9	SP ³	22.4	56	50	100
Green Valley	10	SP ³	14.5	57	32	99
Orange Grove	12	SLAMS	22.6	64	57	100
Geronimo	4	SP ³	25.0	67	66	100
Tangerine	13	SP ³	16.2	58	35	97

1. Measured in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)
2. National Ambient Air Quality Standard 24-hour average for particulate matter (PM₁₀) is 150 $\mu\text{g}/\text{m}^3$
3. Special Purpose site
4. Percent data recovery rounded to the nearest whole number
- A. Average based on limited number of samples.

Table 9
Particulate Matter (PM_{2.5}) Summary Values¹ for 2010

Site	Map No.	Site Type	Annual Average ²	Max 24-Hr Value ³	2 nd Max 24-Hr Value	% Data Recovery ⁵
Geronimo	4	SP ⁴	9.5	29.0	21.0	99
Green Valley	10	SP ⁴	3.8	10.2	9.4	99
Children's Park NCore	11	NCore	5.0	13.5	13.2	99
Orange Grove	12	SLAMS	5.2	15.7	13.3	97
Rose Elementary	14	SP ⁴	5.4	22.4	13.5	100
Coachline	15	SP ⁴	5.1	18.2	16.9	100

1. Measured in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)
2. National Ambient Air Quality Standard annual average for particulate matter (PM_{2.5}) is 15 $\mu\text{g}/\text{m}^3$
3. National Ambient Air Quality Standard 24-hour average for particulate matter (PM_{2.5}) is 35 $\mu\text{g}/\text{m}^3$
4. Special Purpose site
5. Percent data recovery rounded to the nearest whole number

Table 10
Nitrogen Dioxide Summary Values¹ for 2010

Site	Map No.	Site Type	Annual Average ²	Max 1-Hr Value ³	2 nd Max 1-Hr Value	% Data Recovery ⁴
22nd & Craycroft	2	SLAMS	11.6	63.7	58.3	99
Children's Park NCore	11	NCore	10.0	45.0	43.1	97

1. Measured in parts per billion (ppb)
2. National Ambient Air Quality Standard annual mean for nitrogen dioxide is 53 ppb
3. National Ambient Air Quality Standard 1-hour average for nitrogen dioxide is 100 ppb
4. Percent data recovery rounded to the nearest whole number.

Table 11
Sulfur Dioxide Summary Values¹ for 2010

Site	Map No.	Site Type	Annual Average	Max 1-Hr Value ²	2 nd Max 1-Hr Value	% Data Recovery ³
22nd & Craycroft	2	SLAMS	0.53	14.0	11.0	99
Children's Park NCore	11	NCore	0.22^A	3.0	2.7	96

1. Measured in parts per billion (ppb)
2. National Ambient Air Quality Standard 1-hour average for sulfur dioxide is 75 ppb
3. Percent data recovery rounded to the nearest whole number.
- A. Average based on limited number of samples. Sampling began October 1, 2010.

Air Quality Trends

Daily Trends

Figure 2 illustrates how the carbon monoxide concentrations follow the traffic flow. The rush hour traffic becomes more congested and slower moving, causing higher concentrations of carbon monoxide to build up and be recorded at the monitor site.

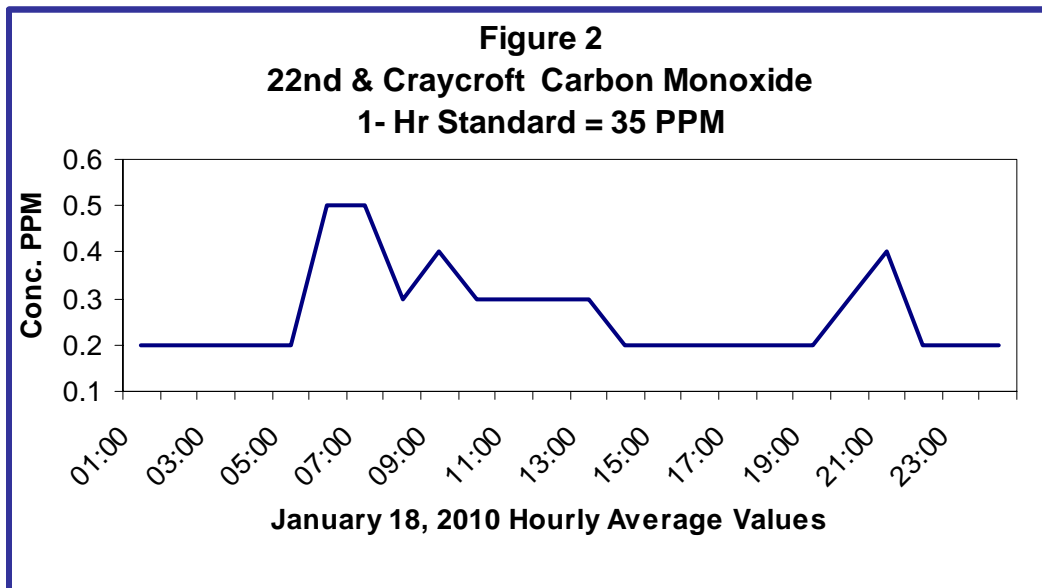
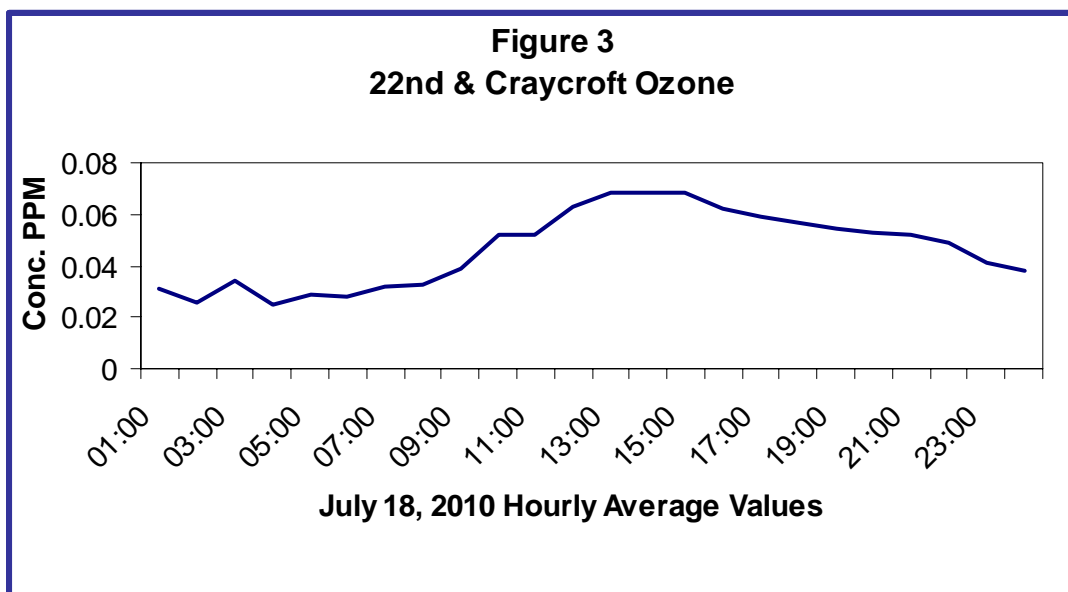


Figure 3 shows the diurnal cycle of ozone in the Tucson area. As the sun begins to react on the VOCs and NO_2 , ozone formation increases. This increase continues through the day, as long as there is sunlight, or until either the VOCs or the NO_2 are exhausted. Once this point is reached, the levels begin to drop. At night the VOC and NO_2 concentrations may increase but, without the sun to act on them, ozone will not be produced.



Seasonal Trends

Figure 4 –The “Carbon Monoxide Season” occurs during the months of October through March. The winter months have higher carbon monoxide levels due to the stable air conditions that occur, inhibiting mixing in the atmosphere. The accumulation of carbon monoxide tends to be higher at congested intersections due to the direct emission of the pollutant from automobiles.

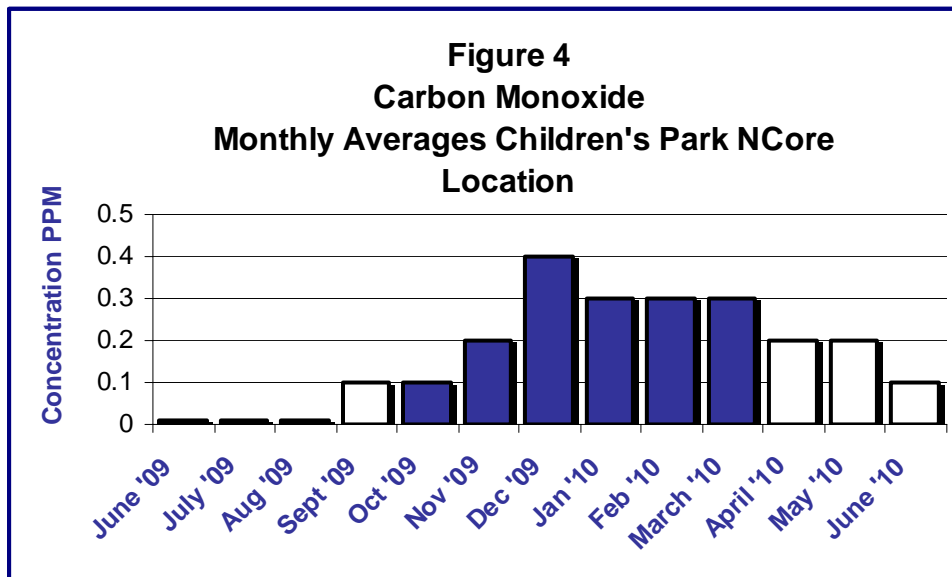
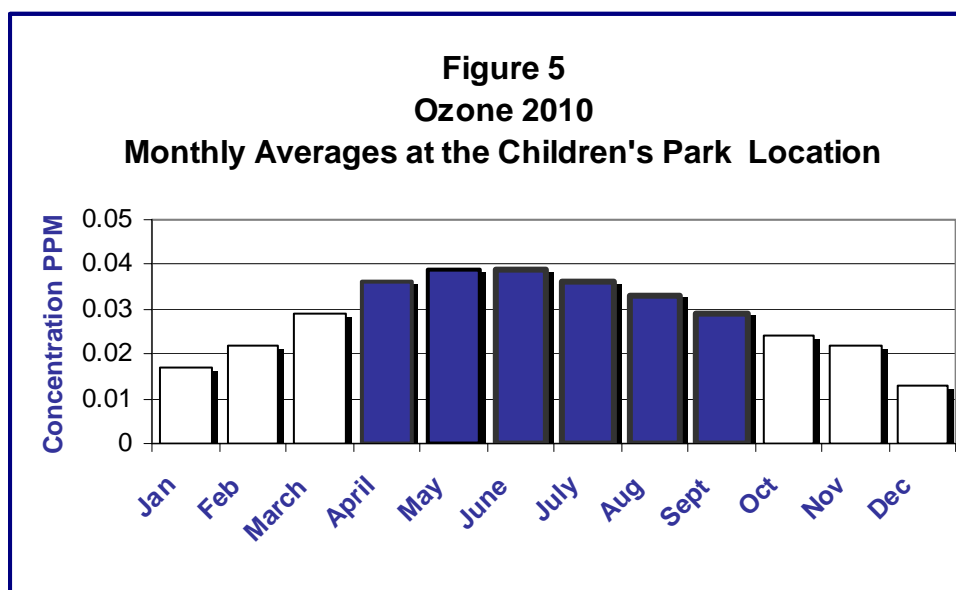


Figure 5 – The “Ozone Season” occurs during the months of April through September. Ozone levels increase in the summer months due to long sunny days, higher temperatures and emissions of oxides of nitrogen and volatile organic compounds. The photochemical reactions that take place between the emissions, sunlight and heat form ozone.

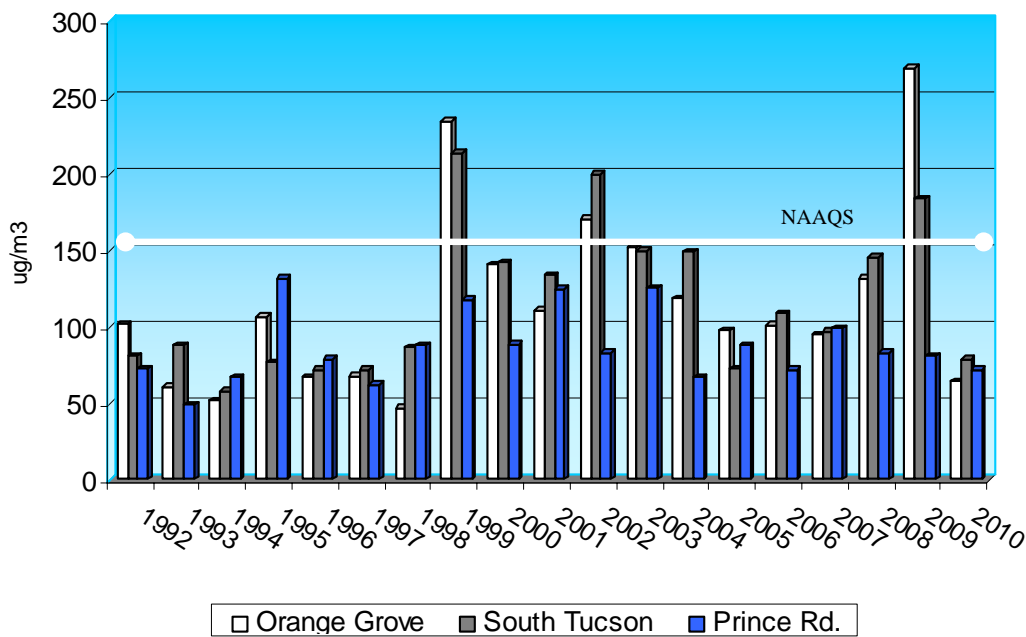


Historical Trends

Particulate (PM₁₀) levels (**Figure 6**) can be dependent on localized conditions. In 1999, the Tucson area suffered from major drought conditions and several very high wind days, which contributed to the higher than normal particulate readings during that year. In 2003, a fire in the Santa Catalina Mountain Range contributed to the elevated readings that year and in 2009 the elevated readings were on high wind days.

Figure 6
Particulate Matter PM₁₀ 1992-2010
Highest 24- Hour Averages

24-Hour Standard - 150 ug/m³ not to be exceeded more than once per year on average over 3 years.



Fine particulate (PM_{2.5}) monitoring began in 1999 at the Orange Grove and Children's Park locations and at four other sites in 2001. Pima County's 24-hour concentrations remain low but there are often peaks during activities such as fireworks displays and fireplace usage, especially during New Years Eve and cold evenings. **Figure 7** (next page) illustrates the particulate matter (PM_{2.5}) levels from 1999 to 2010.

Figure 7

PM_{2.5} 98th Percentile Values 1999- 2010

Pm_{2.5} 24-hour standard: 3 year average of the 98th percentile value is <= 35 ug/m³.

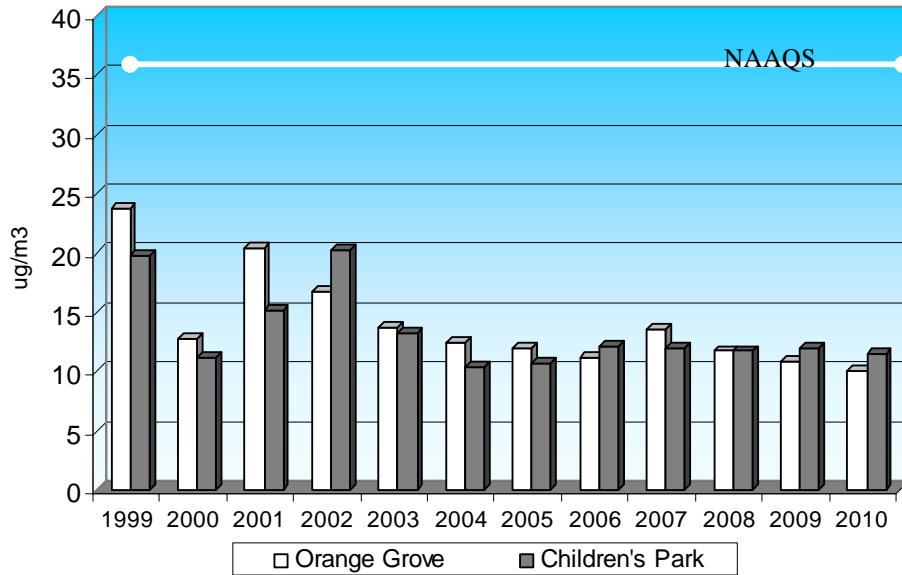


Figure 8

Sulfur Dioxide 1995-2010

99th Percentile Concentration

SO₂ 1- Hr standard: 3 year average of the 99th percentile value is <= 75 ppb

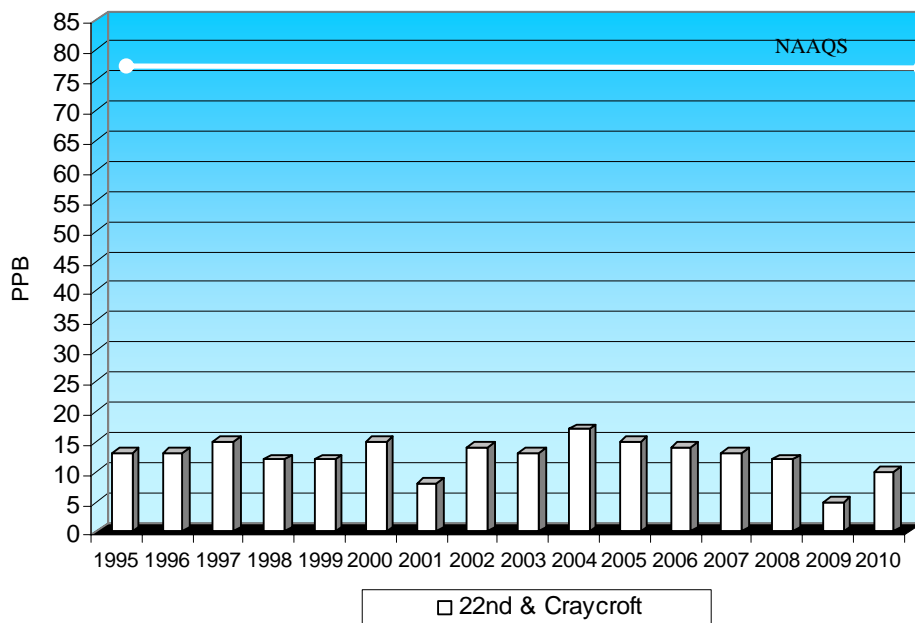


Figure 9
Carbon Monoxide 1995-2010
Highest 8-Hour Average Concentration
 CO 8-Hour NAAQS = 9 ppm

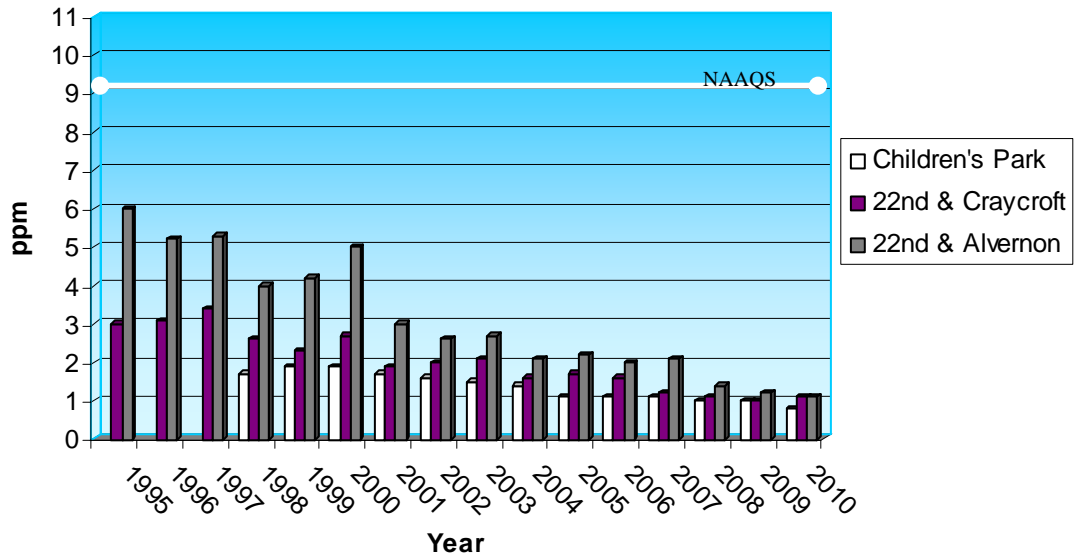


Figure 10
Nitrogen Dioxide 1995-2010
Annual Average Concentration
 NO₂ Annual Average NAAQS = 0.053 ppm

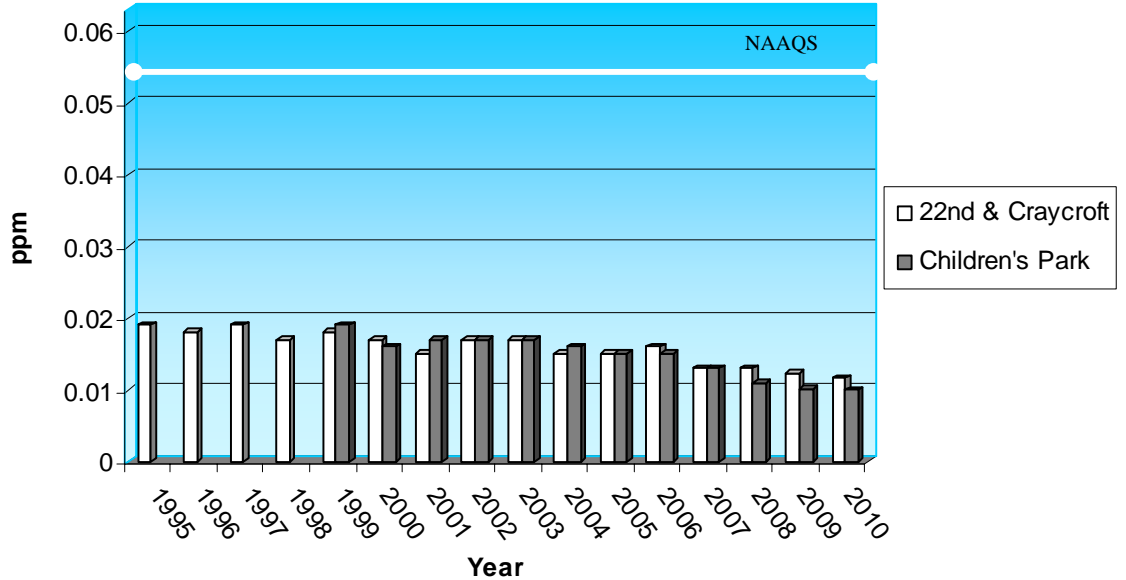
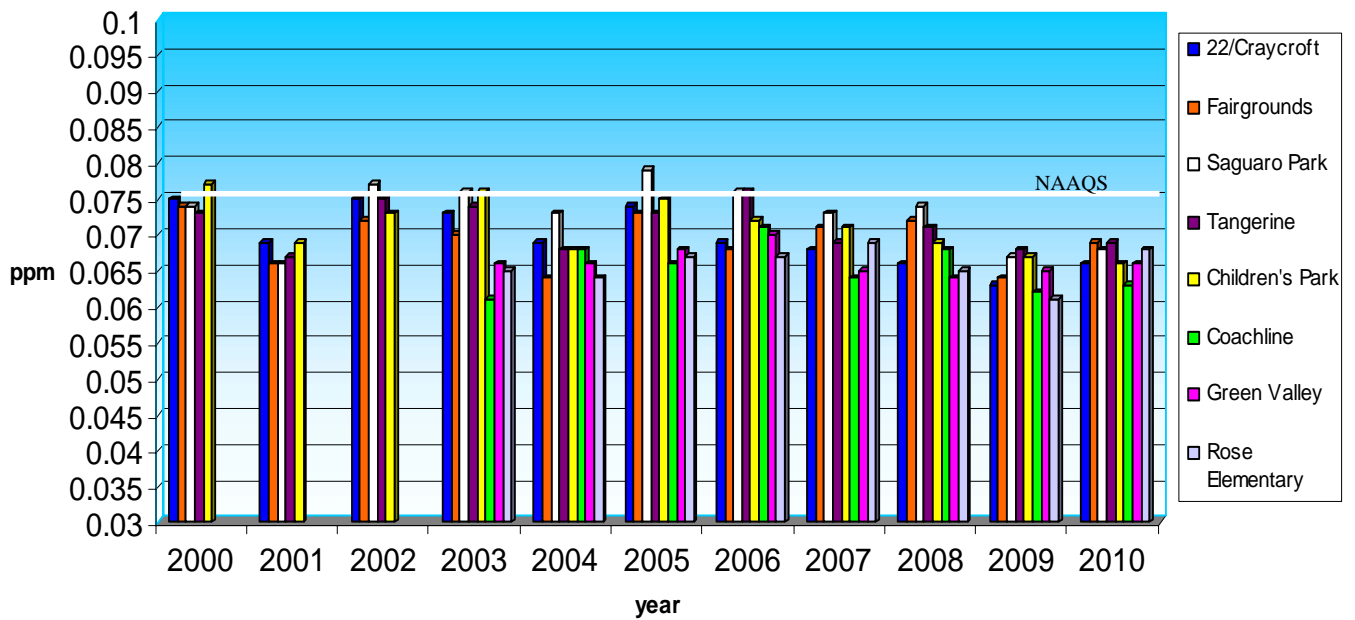


Figure 11 below illustrates the 4th highest 8-hour average ozone concentration for the past 8 years. Ozone levels have remained relatively steady with the 8-hour average concentrations bordering the current 8-hour ozone NAAQS.

Figure 11
Ozone 4th Highest 8-Hour Average 2000- 2010
 Ozone standard: 3 Year average of the 4th Highest 8-Hour average concentration.
 Not to exceed 0.075ppm.



Air Quality Index

The Air Quality Index (AQI) is the uniform procedure by which daily air pollution levels are reported to the public. AQI levels are set by the Environmental Protection Agency in accordance with section 319 of the Federal Clean Air Act.

Air quality information is collected by the Pima County Department of Environmental Quality monitors located throughout Eastern Pima County. The monitors collect concentration information in parts per million for gases and micrograms per cubic meter for particulates. The level of pollution in the air and the related health effects are relayed to the public using the Air Quality Index. If a pollutant such as ozone has an AQI value of 59, the corresponding qualitative descriptor would be MODERATE. The AQI value of 100 generally corresponds to the National Ambient Air Quality Standard for the pollutant. AQI values below 100 are considered satisfactory while numbers above 100 are considered to be unhealthy. Pages 26 and 27, (Tables 12 & 13) contain the breakpoint levels for each pollutant and its corresponding qualitative descriptor, health effects statement, and cautionary statement.

The AQI is the highest value for the pollutant in a 24-hour period. The highest 8-hour average for ozone and CO, and the highest 24-hour average for PM₁₀ and PM_{2.5} are reported twice daily at 9 AM and at 3 PM, Monday through Friday. The report is provided by fax or Email to the local media and updated on the web site, www.deq.pima.gov and www.airinfnow.org. Figure 12 shows the 2010 AQI percentage of Good, Moderate and Unhealthy for Sensitive Group days for each pollutant.

Figure 12

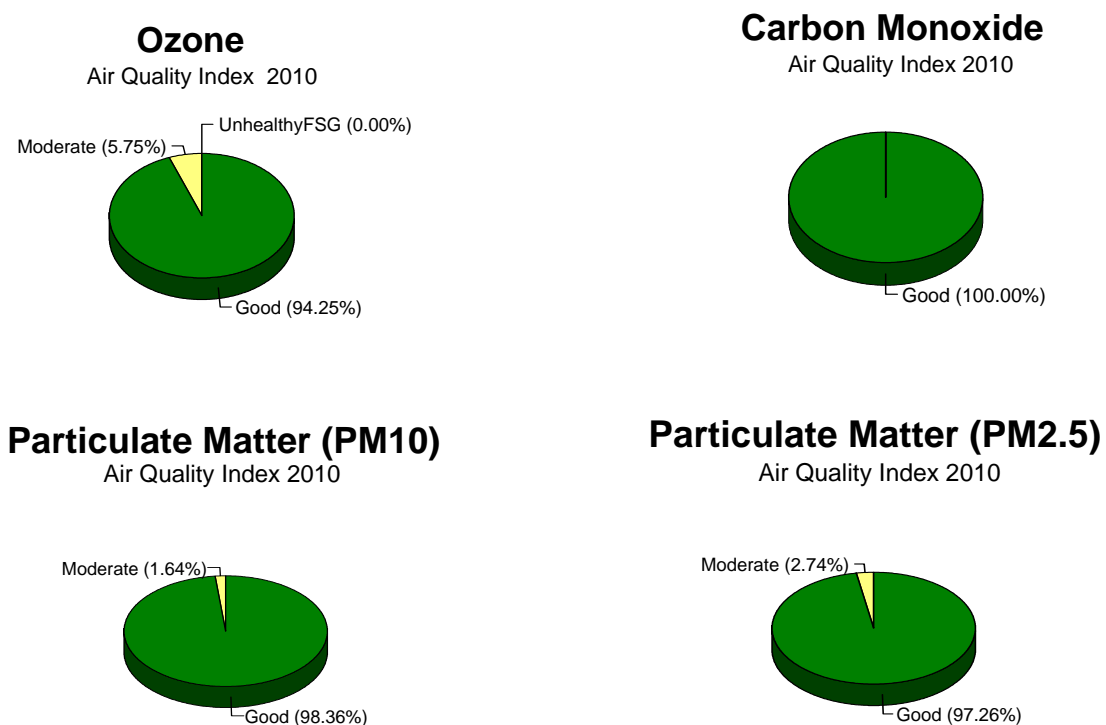


Table 12
AQI Reporting Table

AQI Category	Ozone			Carbon Monoxide		
	8-hour			8-hour		
	Concentration	Health Effects Statement	Cautionary Statement	Concentration	Health Effects Statement	Cautionary Statement
Good 0-50	0.00-0.059 ppm			0.0-4.4 ppm		
Moderate 51-100	0.060-0.075 ppm	Unusually sensitive individuals may experience respiratory symptoms.	Unusually sensitive people should consider limiting prolonged outdoor exertion.	4.5-9.4 ppm		
Unhealthy for Sensitive Groups 101-150	0.076-0.095 ppm	Increased likelihood of respiratory symptoms and breathing discomfort in active children and adults and people with respiratory disease, such as asthma.	Active children, adults and people with respiratory disease should limit outdoor exertion.	9.5-12.4 ppm	Increased likelihood of reduced exercise tolerance due to increased cardiovascular symptoms in people with cardiovascular disease.	People with cardiovascular disease should limit heavy exertion and avoid sources of CO, such as heavy traffic.
Unhealthy 151-200	0.096-0.115 ppm	Greater likelihood of respiratory symptoms and breathing difficulty in active children and adults and people with respiratory disease; possible respiratory effects in general population.	Active children, adults and people with respiratory disease should avoid prolonged outdoor exertion; everyone else, especially children, should limit prolonged outdoor exertion.	12.5-15.4 ppm	Reduced exercise tolerance due to increased cardiovascular symptoms in people with cardiovascular disease.	People with cardiovascular disease should limit moderate exertion and avoid sources of CO, such as heavy traffic.
Very Unhealthy 201-300	0.116-0.374 ppm	Increased severe symptoms and impaired breathing likely in sensitive groups; increased likelihood of respiratory effects in general population.	Active children, adults and people with respiratory disease should avoid all outdoor exertion; everyone else, especially children, should limit outdoor exertion.	15.5-30.4 ppm	Significant aggravation of cardiovascular symptoms in people with cardiovascular disease.	People with cardiovascular disease should avoid exertion and avoid sources of CO, such as heavy traffic.
Hazardous 301-500	0.375-above ppm	Severe respiratory effects and impaired breathing likely in active children, adults and people with respiratory disease; increased severe respiratory effects likely in general population.	Everyone should avoid all outdoor exertion.	30.5-above ppm	Serious aggravation of cardiovascular symptoms in people with cardiovascular disease; impairment of strenuous activities in general population.	People with cardiovascular disease should avoid exertion and avoid sources of CO, such as heavy traffic; everyone else should limit heavy exertion.

Table 13
AQI Reporting Table

AQI Category	Particulate Matter (24-hour)					
	PM _{2.5}			PM ₁₀		
	Concentration	Health Effects Statement	Cautionary Statement	Concentration	Health Effects Statement	Cautionary Statement
Good 0-50	0.0-15.4 µg/m ³			0-54 µg/m ³		
Moderate 51-100	15.5-40.4 µg/m ³			55-154 µg/m ³		
Unhealthy for Sensitive Groups 101-150	40.5-65.4 µg/m ³	Increased likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly.	People with respiratory or heart disease, the elderly and children should limit prolonged exertion.	155-254 µg/m ³	Increased likelihood of respiratory symptoms and aggravation of lung disease, such as asthma.	People with respiratory disease, such as asthma, should limit outdoor exertion.
Unhealthy 151-200	65.5-150.4 µg/m ³	Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.	People with respiratory or heart disease, the elderly and children should limit prolonged exertion; everyone else should limit prolonged exertion.	255-354 µg/m ³	Increased respiratory symptoms and aggravation of lung disease; possible respiratory effects in general population.	People with respiratory disease should avoid moderate or heavy exertion; everyone else, should limit prolonged exertion.
Very Unhealthy 201-300	150.5-250.4 µg/m ³	Significant increase in respiratory symptoms in children and adults, aggravation of heart and lung disease and premature mortality in persons with cardiopulmonary disease and the elderly.	People with respiratory or heart disease, the elderly and children should avoid any outdoor exertion; everyone else should limit prolonged exertion.	355-424 µg/m ³	Significant increase in respiratory symptoms, and aggravation of lung disease.	People with respiratory disease should avoid moderate or heavy exertion; everyone else, especially children and elderly, should avoid prolonged exertion.
Hazardous 301-500	250.5-above µg/m ³	Serious aggravation of heart and lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; serious risk of respiratory effects in general population.	Everyone should avoid any outdoor exertion; people with respiratory and heart disease, the elderly, and children should remain indoors.	425-above µg/m ³	Serious risk of respiratory symptoms and aggravation of lung disease; respiratory effects likely in general population.	Everyone should avoid any outdoor exertion; people with respiratory or heart disease, the elderly and children should remain indoors.

Technical Operations Division



Pima County Department of Environmental Quality, Technical Operations Division personnel. From left: Wayne Byrd, Deborah Jentoft, Mark Rogers, Jim McDonnell, Ted Gould, Tom Coffin, and Mike Draper.

The Technical Operations Division of the Pima County Department of Environmental Quality (PDEQ) is committed to producing and disseminating reliable and accurate air quality information to the public. The Technical Operations Division maintains all aspects of the air quality network which includes: site selection and installation of all monitoring equipment; maintenance of all monitoring equipment; quality control and quality assurance; data acquisition and analysis; reporting to the public via web pages and to the Environmental Protection Agency's AQS database (EPA web site <http://www.epa.gov>). The division is also responsible for operating a filter weigh lab for particulate matter and conducting special projects. Pima County is among the top agencies in Region IX for the percent of data recovery each quarter. Digital photos located at www.airinfnow.org web site.

Clean air day. Good levels were recorded on this day.



Dirty air day. High particulate readings were recorded on this day.



The PDEQ *monitoring lab* contains a filter weigh lab, which is required for gravimetric analysis of PM_{2.5} filters and must be maintained within specific temperature and humidity ranges, as promulgated by the EPA (40 CFR 50, Appendix L). PDEQ processes all the filters from the PM_{2.5} and PM₁₀ networks in the weigh lab, except for the PM_{2.5} speciation filters.

Pima County DEQ conducts *special projects* and one project is establishing a National Core Monitoring Station (NCore) for the Tucson metropolitan area to monitor trace pollutants for analysis and modeling on a local as well as national scale. The new NCore site will be located at the current Children's Park location and will be up and running with all new equipment in place during the 2011 calendar year.

In addition, PDEQ has been operating a PM_{2.5} speciation monitor at the Children's Park location which will be incorporated into the NCore project. The speciation monitor samples for total mass, forty-eight elements, cations, nitrate, sulfate, organic and elemental carbon. The filters are sent to the Research Triangle Institute for analysis and reporting.

The Visibility and Urban Haze program was discontinued in Pima County due to lack of funding for the program from Arizona Department of Environmental Quality. The program was discontinued October 8, 2010.

Air Quality Information - Web Sites & Phone Numbers

www.deq.pima.gov Pima County Department of Environmental Quality web site; real time air quality data reporting; historical air quality data, daily AQI reports, up to the hour pollution report information for each monitoring site and site photographs.

www.airinfonow.org Real time air quality data reporting on the internet; displays current digital photos taken from the roof of the Pima County administration building to track visibility; a dynamic ozone map generated by hourly ozone readings; available in both English and Spanish.

<http://www.epa.gov/airnow/>. Environmental Protection Agency web site; air quality information.

<http://www.pagnet.org> Pima Association of Governments; air quality information.

Phone # (520) 882-4AIR: a call in system for up to the hour air quality information; available in both English and Spanish.

Phone# (520) 243-7400: Pima County Department of Environmental Quality front desk.

