



**MONTHLY AIR QUALITY REPORT FOR
AUGUST 2012**

AOI COLOR SCALE

GOOD 0-50	MODERATE 51-100	UNHEALTHY FOR SENSITIVE GROUPS 101-150	UNHEALTHY 151-200
	VERY UNHEALTHY 201-300	HAZARDOUS 301-500	

Calendar of maximum AQI values & their corresponding color for August 2012*

*Preliminary data

SAMPLE POLLUTANT REPORTING BOX

1 (day of month)	O3	CO
	PM10	PM2.5

SUN			MON			TUES			WED			THU			FRI			SAT		
								1	77	07	2	90	08	3	90	07	4	111	07	
									24	23		41	36		33	32		33	31	
5	80	06	6	119	08	7	116	07	8	109	07	9	135	08	10	111	07	11	97	08
	72	40		126	73		54	36		70	37		61	27		53	38		133	58
	101	07		97	08		114	09		61	07		74	07		61	08		45	07
	59	44		78	61		151	75		93	68		42	34		17	28		13	18
12	61	07	13	101	08	14	50	07	15	46	08	16	44	08	17	47	09	18	49	08
	36	24		62	35		43	31		22	25		17	19		20	23		17	18
19	42	09	20	101	10	21	54	08	22	93	09	23	80	07	24	90	07	25		
	16	21		37	35		51	37		51	38		74	33		53	38			
26			27			28			29			30			31					

Calendar of High Pollution Advisories and Health Watches issued during August 2012

SUN			MON			TUE			WED			THU			FRI			SAT		
									1			2			3			4		
5			6			7		C	8			9		C	10		C	11		F
12			13		F	14			15		F	16			17			18		
19			20			21			22			23			24			25		
26			27		F	28			29		F	30			31					

LEGEND

HIGH POLLUTION ADVISORIES
A = PM-10 High Pollution Advisory
B = PM-2.5 High Pollution Advisory
C = Ozone High Pollution Advisory

HEALTH WATCHES
D = PM-10 Health Watch
E = PM-2.5 Health Watch
F = Ozone Health Watch

Calendar of Meteorological Conditions observed in Metro Phoenix during August 2012

SUN			MON			TUE			WED			THU			FRI			SAT		
									1			2		E	3			4		
5	A B		6	A B		7			8	A B		9		E	10			11		D
	D			E						D			E							
12		E	13	A B		14	A B		15	A B		16	A B		17	A B		18		B
				D E			D			E			D			A B				
19			20	A B		21	A B C		22	A B		23	A B C		24	A B		25		
	D			D E			D			D			A B C			A B				
26			27			28			29	B		30			31					
							D			E			D							

LEGEND

ELECTROMETEORS
A = Thunderstorm

HYDROMETEORS
B = Rain/Drizzle/Hail/Snow
C = Fog

LITHOMETEORS
D = Blowing Dust
E = Haze (vsby <10SM)
F = Smoke

Non-Ozone Exceedance days during AUGUST 2012-

Total=	<u>Date</u>	<u>Max AQI</u>	<u>Pollutant</u>	<u>Site/s</u>
3	8/06	126	PM-10	Buckeye
	8/11	133	PM-10	West Chandler
		103	PM-10	Higley
	8/14	151	PM-10	West Forty Third
		113	PM-10	Durango

Non-Ozone Health Watches issued during AUGUST 2012-

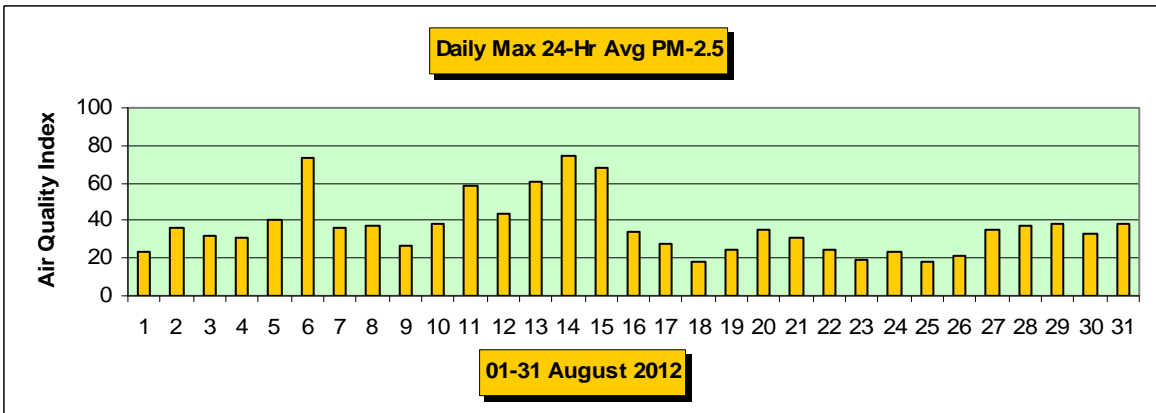
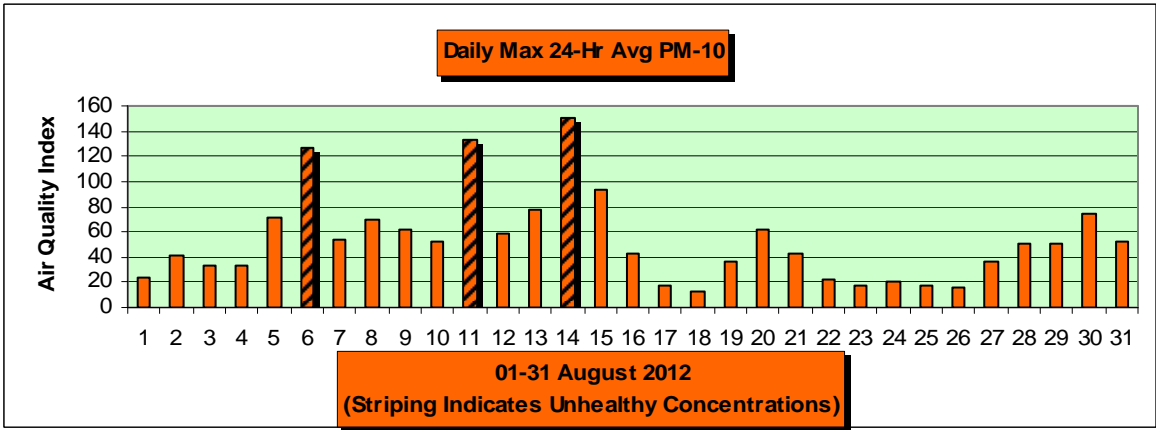
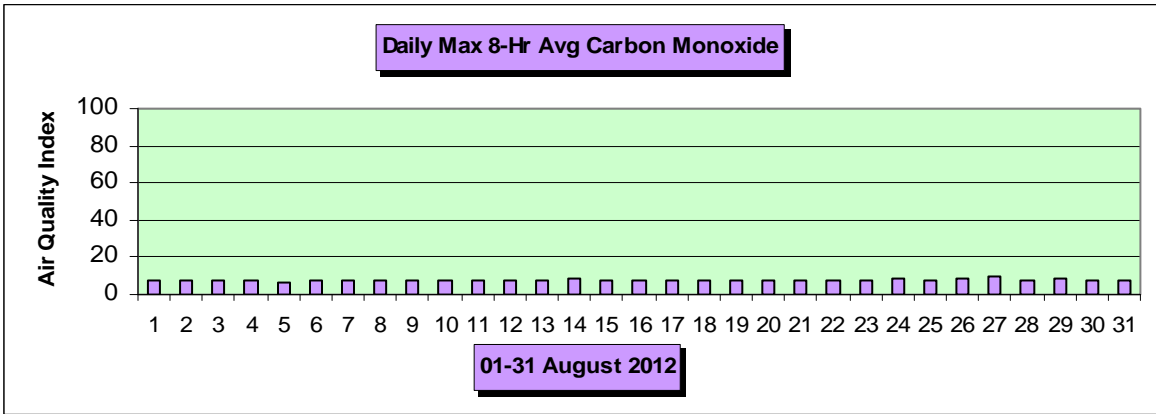
Total=	<u>Date</u>	<u>Max AQI</u>	<u>Pollutant</u>	<u>Site/s</u>
0				

Non-Ozone High Pollution Advisories issued during AUGUST 2012-

Total=	<u>Date</u>	<u>Max AQI</u>	<u>Pollutant</u>	<u>Site/s</u>
0				

Concentration Recap:

Days in the Good category:	7
Days in the Moderate category:	13
Days in the Unhealthy for Sensitive Groups category:	10
Days in the Unhealthy category:	1
Days in the Very Unhealthy category:	0
Days in the Hazardous category:	0
Total Forecast Days:	31



Narrative: August 2012 was a rather poor month for air quality in the Phoenix metro area due to the total number of days during which PM-10 (coarse particle) and O3 (ozone) exceedances occurred as well as the fact that on several days unhealthy levels of both pollutants were attained. This section will present information on the former and the following section will provide details on the latter.

The summer monsoon circulation pattern remained in full swing during August where local weather conditions were punctuated by occasional thunderstorms and strong outflow winds that helped generate large volumes of blowing dust. Unfortunately, PM-10 concentrations reached unhealthy levels during the episodes that occurred on the 6th, 11th, and 14th. Taking a closer look at the August 11 event reveals that the National Weather Service had issued a Dust Storm Warning (seen below) for much of the Phoenix metro area just before 5:00 p.m. after determining that a strong outflow boundary generated from a large complex of thunderstorms to the south was moving toward the Valley.

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PHOENIX AZ
447 PM MST SAT AUG 11 2012

GREATER PHOENIX AREA-
INCLUDING THE CITIES OF...BUCKEYE...MESA...PHOENIX
447 PM MST SAT AUG 11 2012

...DUST STORM WARNING IN EFFECT UNTIL 7 PM MST THIS EVENING...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A DUST STORM WARNING...WHICH IS IN EFFECT UNTIL 7 PM MST THIS EVENING.

- * AFFECTED AREA...PRIMARILY THE CENTRAL AND WEST PORTIONS OF THE GREATER PHOENIX METROPOLITAN AREA...INCLUDING AHWATUKEE...CHANDLER...AVONDALE...FIREBIRD LAKE...INTERSTATE 10
- * TIMING...AREAS OF DENSE BLOWING DUST WILL OVERSPREAD THE AREA FROM SOUTH TO NORTH BETWEEN 5 PM AND 7 PM.
- * WINDS...20 TO 30 MPH WITH GUSTS TO 40 MPH.
- * VISIBILITY...AS LOW AS ONE QUARTER MILE OR LESS.
- * IMPACTS...SUDDENLY REDUCED VISIBILITIES ON ROADWAYS WILL CREATE DANGEROUS DRIVING CONDITIONS. MULTI-CAR PILEUPS ARE MORE LIKELY DURING DUST STORM EVENTS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A DUST STORM WARNING IS ISSUED WHEN WINDS HAVE GENERATED LARGE AREAS OF BLOWING DUST OR BLOWING SAND THAT HAVE SUBSTANTIALLY REDUCED VISIBILITIES...TO 1/4 MILE OR LESS...RESULTING IN HAZARDOUS DRIVING CONDITIONS IN SOME AREAS. BE READY FOR A SUDDEN DROP IN VISIBILITY TO NEAR ZERO. USE EXTRA CAUTION AND SLOW DOWN WHILE DRIVING...AS OBJECTS ON AND NEAR ROADWAYS WILL BE SEEN ONLY AT CLOSE RANGE. IF YOU ENCOUNTER BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR FOOT OFF THE BRAKE PEDAL.

The following images are from the local VISNET camera array and show the arrival of the dust wall from two different vantage points. Figures 1 thru 4 taken looking south over the Phoenix downtown area show the rapid approach and arrival of the dust wall.

Figure 1



Figure 2



[Figure 3](#)



[Figure 4](#)



Figures 5 and 6 were taken looking northeast toward Camelback Mountain and show the rapid decrease in visibility that occurred over a span of only five minutes.

Figure 5



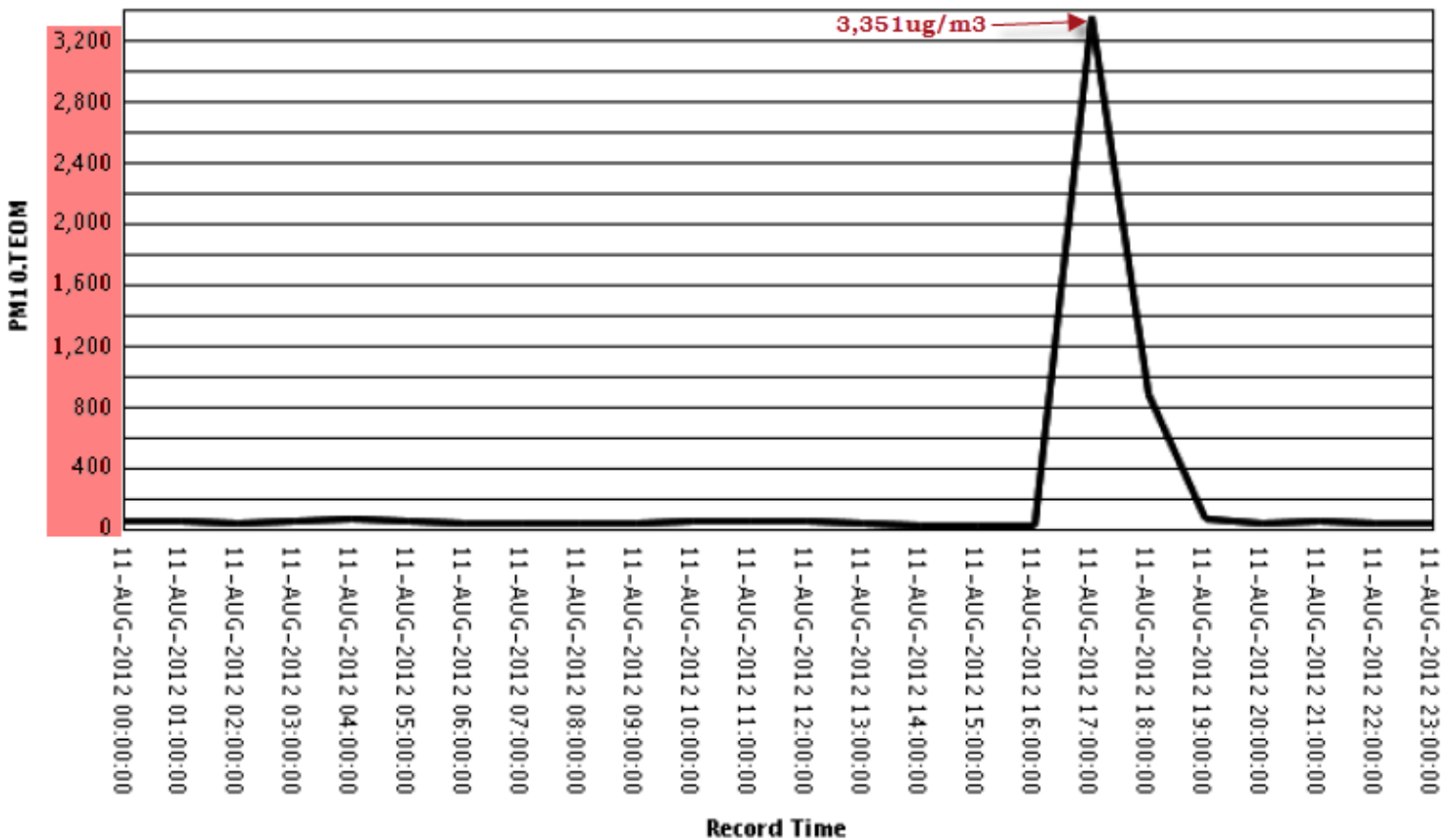
Figure 6



Equally dramatic changes also occurred in local weather conditions and air quality with the arrival of the dust wall. Wind gusts of up to 41 mph were registered and visibilities as low as one-half mile were recorded at local airports. As [Figure 7](#) – a PM-10 time series graph for the West Chandler monitoring site – shows, coarse particle concentrations there rose from 25ug/m³ at 4:00 p.m. to over 3,300ug/m³ at 5:00 p.m. This was one of two sites that exceeded the PM-10 standard on this day; the other was Higley where a peak hourly concentration of just over 1,500ug/m³ occurred.

[Figure 7](#)

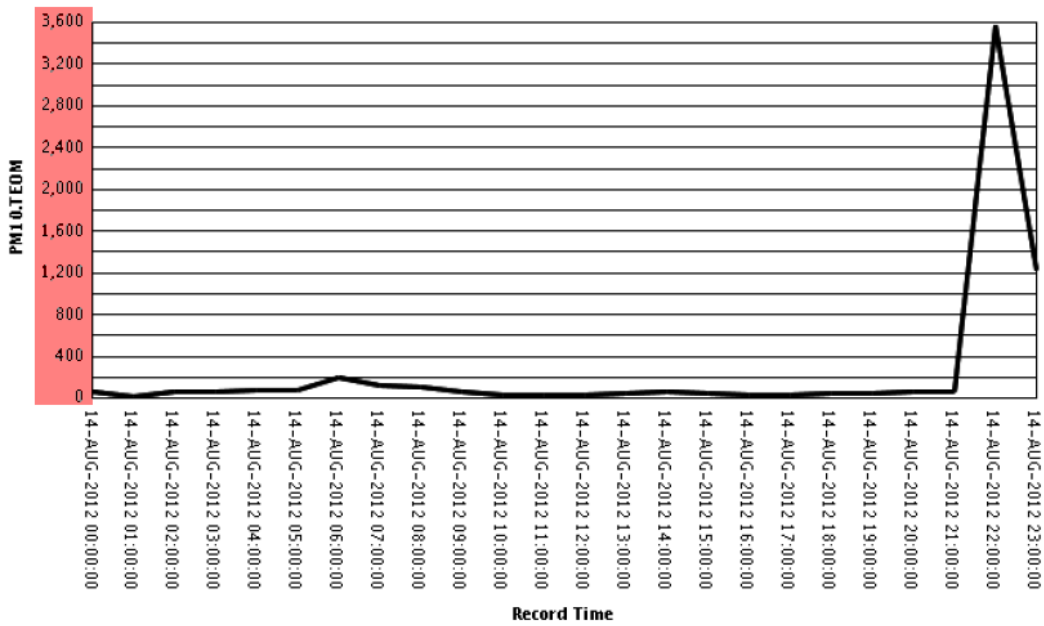
Name: WEST CHANDLER



An even stronger outflow boundary arrived during the late night hours on the 14th with wind gusts up to 44 mph and visibilities again as low as one-half mile. On this date two additional PM-10 exceedances occurred and the 24-hour average concentration at the West Forty Third monitoring site reached the Unhealthy range of the Air Quality Index. The max hourly concentration there was 3,574ug/m3 at 10:00 p.m. as shown on the time-series graph replicated in [Figure 8](#). The volume of residual dust that remained suspended over the Valley the following day was significant enough to lower visibilities to as low as 2 1/2 miles as can be seen in [Figures 9-11](#). Fortunately, rainfall received during subsequent monsoon activity was sufficient to suppress the dust enough to keep PM-10 levels below critical values during the remainder of the month. -Reith

[Figure 8](#)

Name: WEST FORTY THIRD



[Figure 9](#)



[Figure 10](#)



[Figure 11](#)



DETAILED OZONE SECTION

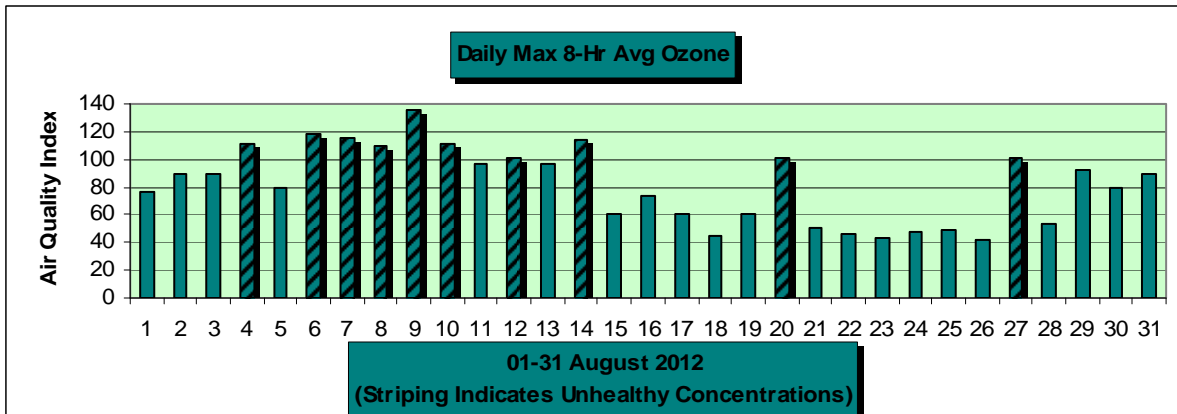
(Based on the 2008 EPA Revised 8-Hour Ozone Standard)

GOOD	MODERATE	UNHEALTHY FOR SENSITIVE GROUPS	UNHEALTHY
0-50	51-100	101-150	151-200

SUMMARY OF MAXIMUM 8-HR OZONE AQI VALUES FOR AUGUST 2012*

*Preliminary data

SUN		MON		TUES		WED		THU		FRI		SAT	
						1	77	2	90	3	90	4	111
5	80	6	119	7	116	8	109	9	135	10	111	11	97
12	101	13	97	14	114	15	61	16	74	17	61	18	45
19	61	20	101	21	50	22	46	23	44	24	47	25	49
26	42	27	101	28	54	29	93	30	80	31	90		



<u>8-hr Ozone exceedance days in AUG:</u>	Total=	<u>Date</u>	<u>Max ppb/AQI</u>	<u>Site/s</u>
	10	8/04	80/111	North Phoenix
			78/106	South Scottsdale
			77/104	Central Phoenix
		8/06	83/119	West Phoenix
			81/114	North Phoenix
			80/111	Phx Supersite
			78/106	Glendale
			78/106	South Scottsdale
		8/07	82/116	Queen Valley
			80/111	Apache Junction
			77/104	Pinnacle Peak
		8/08	79/109	Blue Point
			79/109	Pinnacle Peak
			78/106	Apache Junction
			78/106	Queen Valley
			76/101	Rio Verde
		8/09	89/135	North Phoenix
			84/122	Phx Supersite
			84/122	West Phoenix
			83/119	South Scottsdale
			82/116	Central Phoenix
			82/116	Pinnacle Peak
			81/114	Cave Creek
			78/106	Dysart
			77/104	Apache Junction
			77/104	Blue Point
			77/104	Humboldt Mtn.
			76/101	Rio Verde
		8/10	80/111	Humboldt Mtn.
			80/111	North Phoenix
			80/111	Pinnacle Peak
			78/106	West Phoenix
			77/104	South Scottsdale
			76/101	Cave Creek
		8/12	76/101	North Phoenix
		8/14	81/114	North Phoenix
		8/20	76/101	Pinnacle Peak
		8/27	76/101	West Phoenix
<u>Total number of exceedance days since APR 01:</u>	30			
<u>Total number of exceedance sites since APR 01:</u>	125			

<u>Ozone Health Watches in AUG:</u> (Forecast max value 72-75 ppb)	Total=	5	<u>Date</u>	<u>Max ppb/AQI</u>	<u>Site/s</u>
			8/08	79/109	Blue Point
			8/11	74/97	Pinnacle Peak
			8/13	74/97	South Phoenix
					Dysart
					North Phoenix
		8/27	76/101	West Phoenix	
		8/29	73/93	Blue Point	
				North Phoenix	

Ozone Health Watches since APR 01: Total= 33

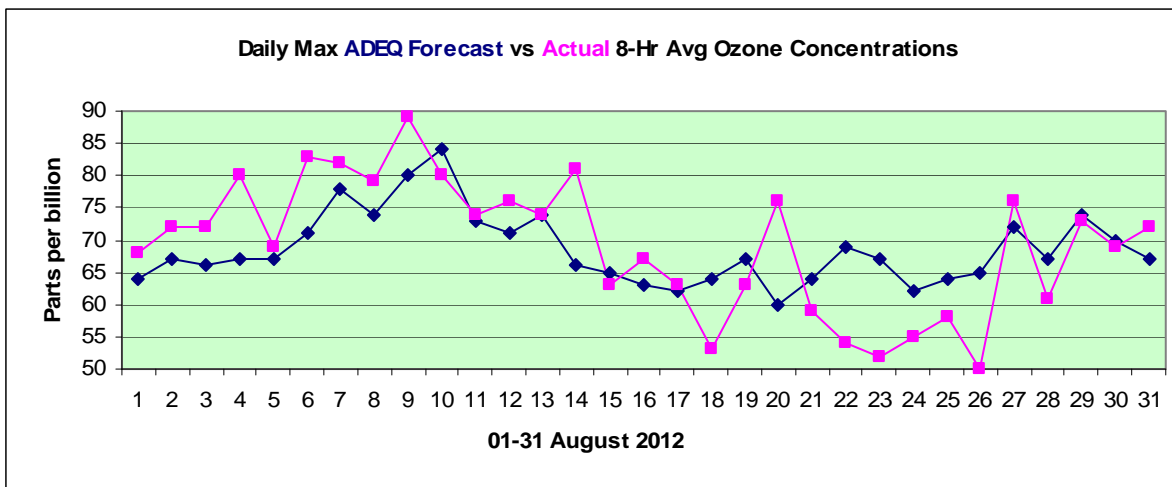
<u>High Pollution Advisories in AUG:</u> (Forecast max value 76+ppb)	Total=	3	<u>Date</u>	<u>Max ppb/AQI</u>	<u>Site/s</u>
			8/07	82/116	Queen Valley
			8/09	89/135	North Phoenix
			8/10	80/111	Humboldt Mtn.
				North Phoenix	
				Pinnacle Peak	

High Pollution Advisories since APR 01: Total= 8

<u>Concentration Recap:</u>	Days in the Good category:	7			
	Days in the Moderate category:	14			
	Days in the Unhealthy for Sensitive Groups category:	10			
	Days in the Unhealthy category:	0			
	Total Forecast Days:	31			
Maximum 8-Hr value:	<u>Date</u>	<u>Hour</u>	<u>Site</u>	<u>ppb/AQI</u>	<u>DOW</u>
	8/09	1100	North Phoenix	89/135	Thu
Maximum 1-Hr value:	<u>Date</u>	<u>Hour</u>	<u>Site</u>	<u>ppb/AQI</u>	<u>DOW</u>
	8/07	1500	Apache Junction	106/88	Tue
		1300	Queen Valley	106/88	Tue
	Average daily max 8-Hr concentration (ppb):	69.1			
	Deviation from the 1996-2011 average (ppb):	-0.7			

<u>AUG Climatology:</u> (Period 1996-2007 using 1997 85ppb standard & 2008-2011 using 76ppb standard)	Average number of 8-Hr exceedance days:	3.3
	Maximum number of 8-Hr exceedance days:	10 in 1998 & 2000
	Minimum number of 8-Hr exceedance days:	0 in 2002 2004 2007 2010
	Average daily max 8-Hr concentration (ppb):	69.8
	Record high max 8-Hr concentration (ppb):	100 on the 10th, 2001
	Record low max 8-Hr concentration (ppb):	41 on the 6th, 2007

<u>Forecast Verification:</u>	# of days maximum concentrations were over-forecast:	13
	# of days maximum concentrations were under-forecast:	17
	# of days maximum concentrations were correctly forecast:	1
	August average forecast accuracy (ppb):	+/-6.6
	August average forecast bias (ppb):	-0.5



Narrative: Although no local ozone “records” were set during August 2012, some noteworthy thresholds were attained. The total of 10 exceedance days were the most since 2000; the string of five consecutive exceedance days (6th thru the 10th) has only occurred during August on one other occasion since 1996 – from the 1st thru the 5th in 2000; the average daily max concentration of 69.1 parts per billion was the highest since 2003; and the peak concentration of 89ppb that was measured on the 9th was the highest since 2003. All of this was despite seven days during which highest ozone levels were in the good range of the Air Quality Index. Some possible contributing factors were record high temperatures (at Phoenix Sky Harbor Airport) on six days – including 116 degrees F on the 8th – and a nearly continuous monsoon weather pattern that frequently imparted a near-surface easterly wind component. Over the years this type of daytime wind component has been identified as the catalyst to high ozone levels in the Phoenix metro area due to its capacity to offset the usual afternoon heat and terrain-induced upslope (anabatic) westerly winds. When this occurs, the local ozone plume along with its precursors become trapped over the central Valley with high spikes in ozone concentrations the usual result. One such event that was highly illustrative of this ozone plume boundary movement occurred on the 14th. An informal analysis for that day was performed and has been reproduced below. –Reith

Preliminary data indicates that ozone concentrations in the Valley on Tuesday August 14 were once again quite high with even an exceedance at North Phoenix.

The ADEQ forecast for Tuesday was for ozone levels to drop from those of Monday due to the onset of afternoon westerly winds which tend to disperse the ozone plume.

So what happened?

The table below shows the hourly concentrations at a sample of monitoring sites between 3:00 and 6:00 p.m. on August 14 as well as the summary of reported winds at local airports for those hours.

Sites with concentrations in blue show an overall downward trend in ozone concentrations as the winds increased and out-transported ozone; these sites are located in the west and central portions of the metro area.

Those with concentrations in red show an overall upward trend as winds in-transported ozone; these sites are located in the eastern portion of the metro area.

This is a highly-instructive example of ozone transport in general and the Valley ozone plume movement in particular and also shows the considerable impact that even a modest wind component can have on local ozone concentrations.

The ozone concentration data from North Phoenix is the most revealing in that the hourly concentration dropped 26ppb between 4:00 and 5:00 p.m. – from 104ppb to 78ppb.

Unfortunately, the onset of winds did not begin soon enough to prevent an exceedance but probably prevented many others.

Figure 1

Hour	1500	1600	1700	1800
SITE	Ozone Concentration (parts per billion)			
Dysart	78	67	61	56
Glendale	87	72	55	60
West Phx	89	78	70	68
South Phx	87	78	71	67
Tempe	82	85	72	64
Scottsdale	84	93	82	73
North Phx	100	104	78	70
Chandler	75	71	73	70
Pinnacle Pk	73	80	92	83
Falcon F.	66	71	78	79
Blue Point	66	72	77	82
Fountain H	65	70	75	94
Rio Verde	61	66	73	89
Surface Winds (mph)	Mostly <10	S-W Gust to 18	S-NW Gust to 22	SW-W Gust to 18