

# REGIONAL WATER QUALITY NEWSLETTER

DATE: Report for May 2012

A Tempe, Glendale, Peoria, Chandler, CAP, SRP, Arizona American Water– ASU Regional Water Quality Partnership

<http://enpub.fulton.asu.edu/pwest/tasteandodor.htm>

Sampling dates: May 7-8, 2012

## SUMMARY: EVALUATION AND RECOMMENDATIONS

1. Total inflow in the Salt and Verde River systems in may 2012 is only 41% of average, in response to the fairly dry winter. The SRP reservoirs are at 65% of full capacity, compared with 86% for the same time last year. On the Colorado River System Lake Power is 64% full, and inflow has been less than historical flow averages.
2. DOC levels in all the Salt River lakes, from Roosevelt to Saguaro Lakes, are ~ 4 to 4.5 mg/L. DOC levels are lower in the Verde River (2.5 mg/L) and CAP system (~3 mg/L).
3. We are beginning to study how pumping regimes in the CAP system affects DOC and turbidity levels for WTP intakes on the east side the Valley. Preliminary data are included.
4. The Sunflow Fire has the potential to contribute DOC to the Verde River, and our initial understanding of the hydrology in this area is discussed.
5. Taste and odor causing compounds (MIB and Geosmin) remain at low concentrations throughout most of the canal system (< 10 ng/L).

**HOLD THE DATE FOR OUR ANNUAL Regional water quality workshop – Friday September 7th (830am-11:30am) at the SRP Pera Club.**

## Quick Update of Water Supplies for May 2012 (during day of sampling – May 7)

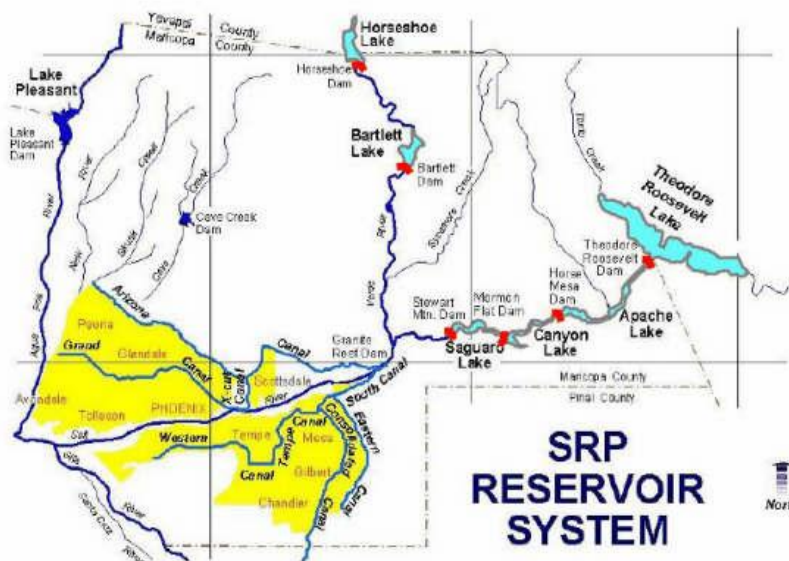
Source	Trend in supply	Discharge to water supply system	Flow into SRP Canal System	Dissolved organic carbon Concentration (mg/L) **
Salt River	Reservoirs at 70% full	1067 cfs	648 cfs into <b>Arizona Canal</b> 551 cfs into <b>South Canal (91% Salt River Water)</b>	4.5 mg/L
Verde River	Reservoirs At 30% full	105 cfs		2.5 mg/L
Colorado River	Lake Pleasant is 91% full (Lake Powell is 64% full)	Lake Pleasant releasing 405 cfs into CAP canal	4 cfs of <b>CAP water</b> into Arizona Canal	3.0 mg/L
Groundwater	Generally increasing due to recharge	248 cfs pumping by SRP	248 cfs <b>Groundwater Pumping</b> into SRP Canals	0.5 to 1 mg/L

\*Concentration of these taste and odor compounds in the upper [lower] levels of the terminal reservoir (Saguaro Lake on the Salt River; Bartlett Lake on the Verde River; Lake Pleasant on the CAP system)

\*\*Concentration of DOC in the terminal reservoir

Data from the following websites:

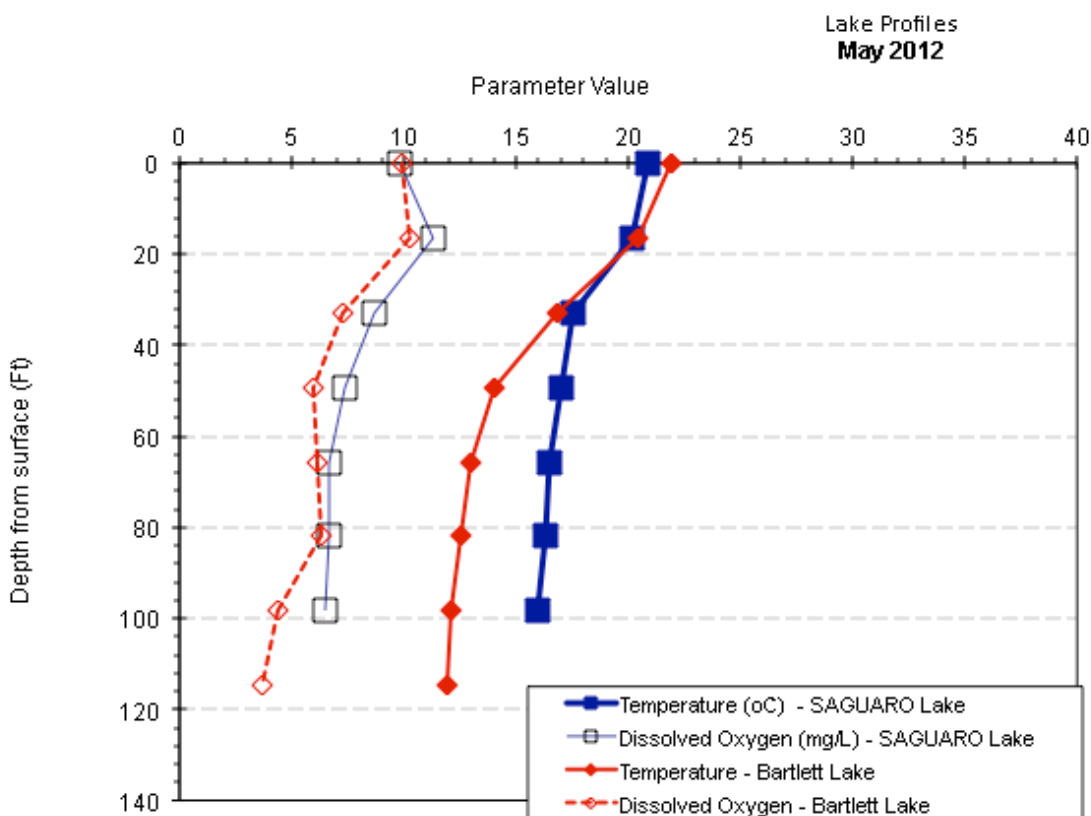
- <http://www.srpwater.com/dwr/>
- <http://www.cap-az.com/Operations/LakePleasantOps.aspx>
- <http://lakepowell.water-data.com/>



## Lake Stratification

As the sunlight warms lake water, the lighter (less dense) warm water “floats” on top of the colder water (more dense) which stratifies the lake thermally into upper (epilimnion) and lower (hypolimnion) regions. It is about this time of year when the lakes start to thermally stratify as shown below. Bartlett lake is showing a greater thermal stratification currently than Saguaro lake, which is typical because of the way SRP operates Saguaro lake. Over the next month we will see a sharp thermal stratification at about 30 feet below the water surface, which will essentially prevent mixing of the epilimnion and hypolimnion waters.

As a consequence of thermal stratification, dissolved oxygen from the atmosphere really only mixes in the upper lay (epilimnion) of the lake. Lower dissolved oxygen deeper in the lake occurs due to microbial activity of dissolved and particulate organic matter settling from the upper layer. As microbes consume these organics, they also consume oxygen (electron acceptor) and produce carbon dioxide. This is a major source of DOC degradation in the lakes.



## Dissolved Organic Carbon In Reservoirs and Treatment Plants

DOC = Dissolved organic carbon

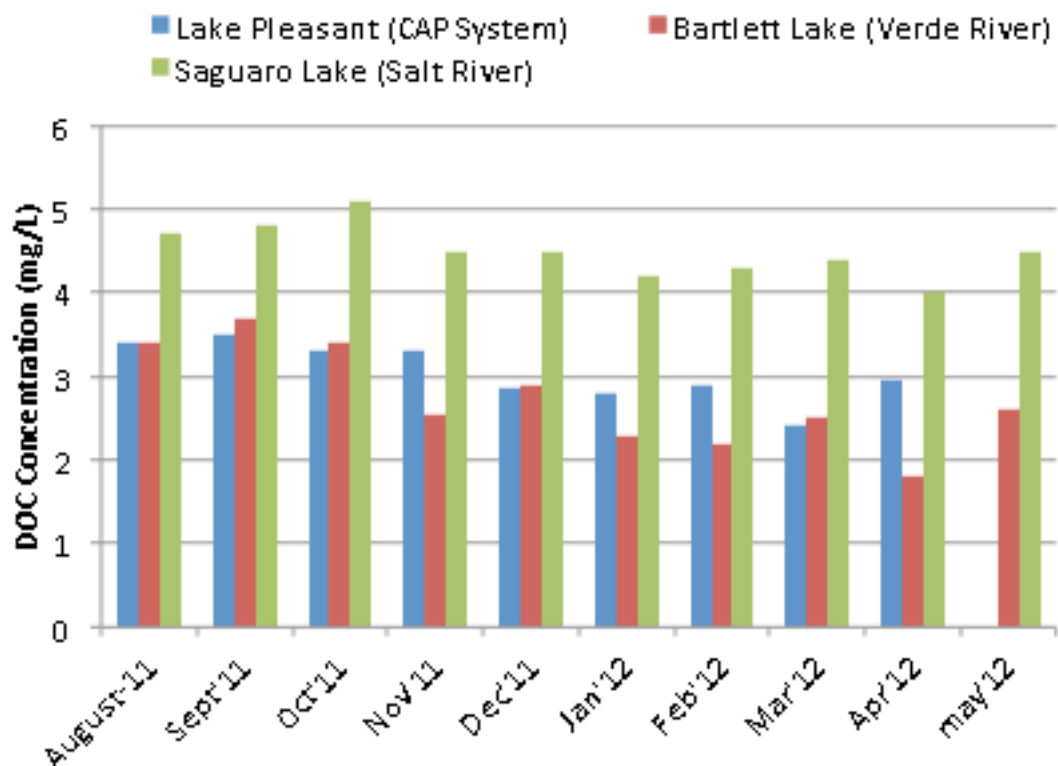
UV254 = ultraviolet absorbance at 254 nm (an indicator of aromatic carbon content)

SUVA = UV254/DOC

TDN = Total dissolved nitrogen (mgN/L)

### Reservoir Samples – May 2012

Since the small amount of runoff in late 2011, the DOC levels in Bartlett lake have slowly been decreasing.



Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Lake Pleasant	Epilimnion	2.8	0.04	1.5	0.4
	Hypolimnion	3.1	0.04	1.4	0.3
Verde River	@ Beeline Hwy	1.5	0.03	2.1	0.3
Bartlett Reservoir	Epilimnion	4.4	0.07	1.5	0.3
	Epi-near dock	1.8	0.04	2.2	0.2
	Hypolimnion	2.6	0.06	2.5	0.2
Salt River	@ Blue Point Bridge	3.9	0.07	1.9	0.2
Saguaro Lake	Epilimnion	4.5	0.08	1.7	0.4
	Epi - Duplicate	4.8	0.08	1.6	0.4
	Epi-near dock	4.8	0.08	1.6	0.4
	Hypolimnion	4.0	0.07	1.9	0.3
Verde River	@ Tangle	1.4	0.03	2.1	0.1
Havas		2.8	0.05	1.8	0.6
Salt River above Roosevelt	above Roosevelt	2.1	0.06	3.1	0.2

**Organic Matter in Canal**

May 2012

**Rivers and Canals – May 07, 2012**

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Waddell Canal	Not Available			
Anthem WTP Inlet	2.7	0.05	1.8	0.5
Union Hills Inlet	3.0	0.05	1.5	0.5
CAP Canal at Cross-connect	Not Available			
Salt River @ Blue Pt Bridge	3.9	0.07	1.9	0.2
Verde River @ Beeline	1.5	0.03	2.1	0.3
AZ Canal above CAP Cross-connect	4.0	0.07	1.7	0.2
AZ Canal below CAP Cross-connect	3.6	0.07	1.9	0.3
AZ Canal at Highway 87	4.2	0.07	1.6	0.2
AZ Canal at Pima Rd.	3.9	0.07	1.8	0.5
AZ Canal at 56th St.	3.8	0.07	1.9	0.6
AZ Canal - Central Avenue	3.9	0.07	1.8	0.6
AZ Canal - Inlet to Glendale WTP	3.9	0.07	1.8	0.4
AZ Canal - Inlet to GreenwayWTP	3.9	0.07	1.7	0.9
South Canal below CAP Cross-connect	3.7	0.07	1.8	0.2
Head of the Tempe Canal	3.7	0.06	1.6	0.4
Tempe Canal - Inlet to Tempe's South Plant	3.3	0.05	1.5	0.6
Head of the Consolidated Canal	3.2	0.06	1.8	0.4
Middle of the Consolidated Canal	2.8	0.05	1.8	1.0
Chandler WTP – Inlet	2.8	0.06	2.0	1.0

## Organics at the Water Treatment Plants

**Table - Water Treatment Plants – May 07, 2012**

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN	DOC removal (%)
Union Hills Inlet	3.0	0.05	1.5	0.5	19
Union Hills Treated	2.4	0.03	0.5	0.0	
Tempe North Inlet	5.5	0.06	1.1	0.5	31
Tempe North Plant Treated	3.8	0.04	1.0	0.6	
Tempe South Inlet	3.3	0.05	1.5	0.6	0
Tempe South Plant Treated	3.3	0.03	0.8	0.6	
Greenway WTP Inlet	3.9	0.07	1.7	0.9	10
Greenway WTP Treated	3.5	0.03	0.8	0.4	
Glendale WTP Inlet	3.9	0.07	1.8	0.4	47
Glendale WTP Treated	2.1	0.02	0.9	0.3	
Anthem WTP Inlet	2.7	0.05	1.8	0.5	9
Anthem WTP Treated	2.5	0.05	1.8	0.5	
Chandler WTP Inlet	2.8	0.06	2.0	1.0	13
Chandler WTP Treated	2.4	0.04	1.6	1.1	

## 2<sup>nd</sup> Quarter Results from Sampling of Salt River Reservoirs

We are sampling Roosevelt (Ros), Apache (Apa), Canyon (Can) and Saguaro (Sag) lakes quarterly for organic matter parameters to understand the potential impacts of the Wallow fire. More detailed characterization of this data will come next month. In general the DOC levels in all the lakes are similar (average = 4.3 mg/L). There are no “high DOC regions”. MIB levels are detectable in all the reservoirs.

### Organic Matter in Salt River Lakes – May 16 sampling

Reservoir	Site	Location	DOC (mg/L)	TDN (mg/L)	UV254 (1/cm)	SUVA
Roosevelt	NA	Dock	4.7	0.4	0.1	1.5
Apache	1					
	1	hypo	4.0	0.4	0.1	1.7
	2	epi	4.1	0.3	0.1	1.7
	2	hypo	3.8	0.4	0.1	1.8
Canyon	1	epi	4.5	0.5	0.1	1.7
	1					
	2	epi	3.9	0.4	0.1	1.8
	2	hypo	3.8	0.4	0.1	1.8
Saguaro	1	epi	4.5	0.4	0.1	1.7
	1	epi-dup	4.8	0.4	0.1	1.6
	1	hypo	4.0	0.3	0.1	1.9
	NA	Dock	4.8	0.4	0.1	1.6

### T&O in Salt River Lakes – May 16 sampling

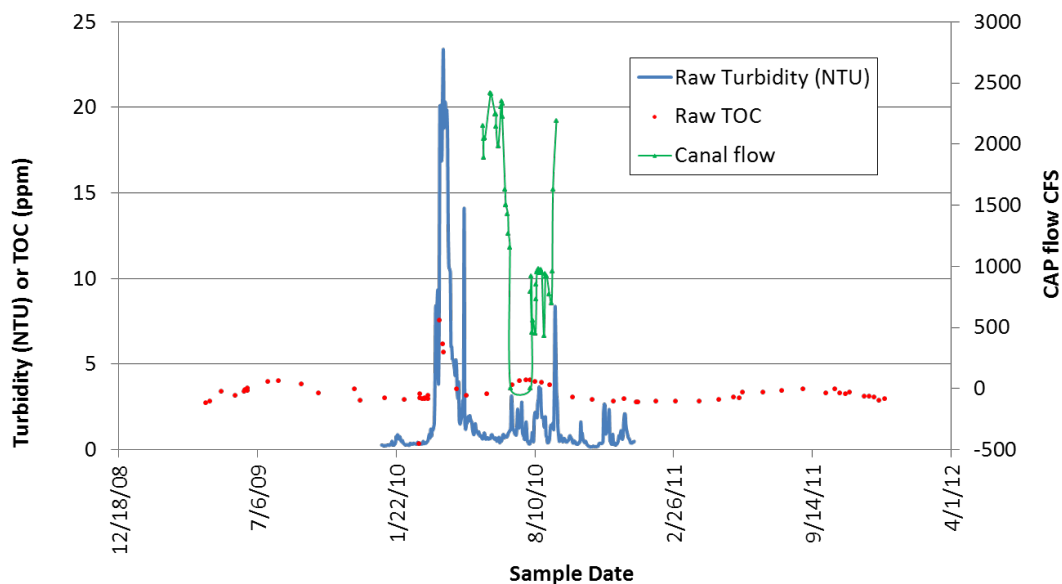
Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Apache	1A	4.5	4.2	<2.0
	2A	4.5	4.2	<2.0
Lake Canyon	1A	2.9	<2.0	<2.0
	2A	2.2	<2.0	<2.0
Lake Roosevelt	1A	3.9	4.7	<2.0

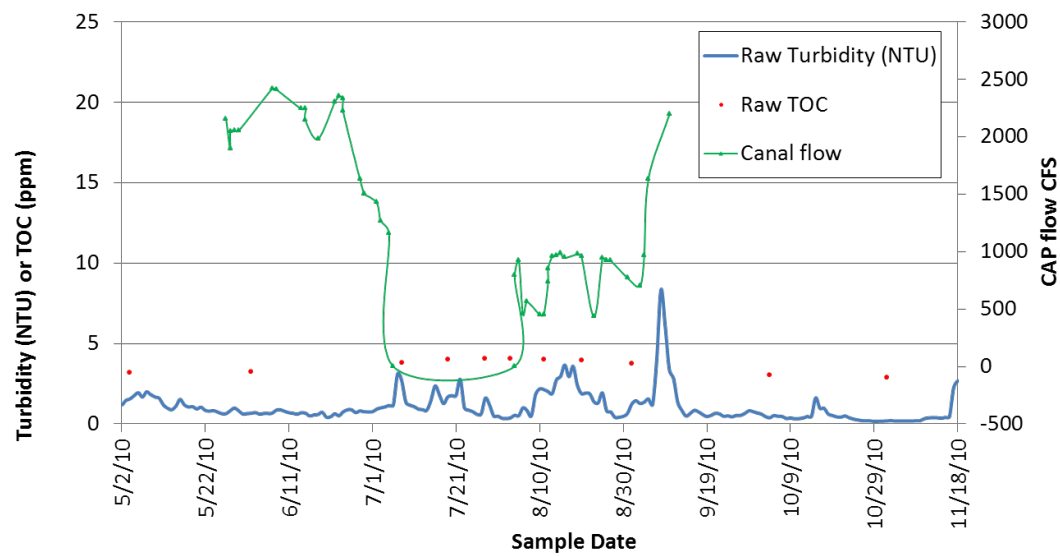


## New CAP Water Quality Concern

In 2010-11 a new WTP (Santan WTP) began operating using CAP water, which is operated/owned by Town of Gilbert and Chandler. It is located downstream of the Mesa WTP on the CAP canal, downstream of the Salt-Gila CAP pumping station. Water from the CAP canal is piped 14 miles to the WTP. Operational problems have been reported, such as spikes in turbidity and TOC – sometimes with daily time changes. CAP and Chandler have asked for help to understand the problem and determine if it is associated with CAP operations or to identify other potential factors.

The first step includes historic data collection, which then we will follow-up as needed with additional field sampling. CAP and the Santan WTP have agreed to collect samples as needed and deliver them to our sampling team.





## Taste and Odor

MIB, Geosmin and Cyclocitral are compounds naturally produced by algae in our reservoirs and canals, usually when the water is warmer and algae are growing/decaying more rapidly. They are non toxic, but detectable to consumers of water because of their earthy-musty-moldy odor. The human nose can detect these in drinking water because the compounds are semi-volatile. Since compounds are more volatile from warmer water, these tend to be more noticable in the summer and fall. The human nose can detect roughly 10 ng/L of these compounds. Our team collects samples from the water sources and raw/treated WTP samples. We usually present all the data when concentrations start to exceed 5 ng/L. Here we summarize the occurrence during the cooler months:

### OBSERVATIONS FOR MAY 2012

- MIB levels were below 2 ng/L everywhere in APRIL 2012, except Saguaro Lake which had 3 to 4 ng/L.
- MIB and geosmin levels are < 2 ng/L in the CAP system, but starting to increase in the Salt and Verde River reservoirs. Consequently, WTPs served by SRP water have roughly 5 to 7 ng/L of MIB + Geosmin. These low levels are being knocked down to < 2 ng/L within most WTPs.

### Reservoir Samples – May 7, 2012

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant (April 2012)	Eplimnion	<2.0	<2.0	<2.0
Lake Pleasant (May 2012)	Eplimnion	<2.0	<2.0	<2.0
Lake Pleasant (April 2012)	Hypolimnion	<2.0	<2.0	<2.0
Lake Pleasant (May 2012)	Hypolimnion	<2.0	<2.0	<2.0
Verde River @ Beeline		7.4	6.9	<2.0
Bartlett Reservoir	Epilimnion	8.5	5.6	<2.0
Bartlett Reservoir	Epi-near dock	6.2	5.0	<2.0
Bartlett Reservoir	Hypolimnion	<2.0	<2.0	<2.0
Salt River @ BluePt Bridge		<2.0	2.1	<2.0
Saguaro Lake	Epilimnion	4.9	3.4	<2.0
Saguaro Lake	Epi - Duplicate	5.0	3.1	<2.0
Saguaro Lake	Epi-near dock	4.7	3.2	<2.0
Saguaro Lake	Hypolimnion	2.5	2.1	<2.0
Lake Havasu (April 2012)		<2.0	<2.0	<2.0
Lake Havasu (May 2012)		<2.0	2.0	<2.0
Verde River at Tangle Creek				
Roosevelt at Salt River Inlet		<2.0	<2.0	<2.0

## Canal Sampling –May 7, 2012

System	Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
CAP	Waddell Canal	2.4	<2.0	<2.0
	Union Hills Inlet			
	CAP Canal at Cross-connect			
AZ Canal	Salt River @ Blue Pt Bridge	<2.0	2.1	<2.0
	Verde River @ Beeline	7.4	6.9	<2.0
	AZ Canal above CAP Cross-connect	2.6	2.7	<2.0
	AZ Canal below CAP Cross-connect	2.6	3.0	<2.0
	AZ Canal at Highway 87	2.4	3.2	<2.0
	AZ Canal at Pima Rd.	2.5	3.0	<2.0
	AZ Canal at 56th St.	2.2	3.1	<2.0
	AZ Canal - Central Avenue	2.2	2.9	<2.0
	AZ Canal - Inlet to Glendale WTP	2.2	4.0	<2.0
	Head of the Consolidated Canal	<2.0	2.2	<2.0
	Middle of the Consolidated Canal	<2.0	<2.0	<2.0
South Tempe Canals	South Canal below CAP Cross-connect	2.2	2.6	<2.0
	Head of the Tempe Canal	<2.0	<2.0	<2.0
	Tempe Canal - Inlet to Tempe's South Plant	<2.0	2.1	<2.0

## Water Treatment Plants – May 7, 2012

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Union Hills Inlet	2.4	<2.0	<2.0
Union Hills Treated	<2.0	<2.0	<2.0
Tempe North Inlet	<2.0	2.4	<2.0
Tempe North Plant Treated	<2.0	2.1	<2.0
Tempe South WTP	<2.0	2.1	<2.0
Tempe South Plant Treated	<2.0	<2.0	<2.0
Anthem Inlet	<2.0	<2.0	<2.0
Anthem Treated	<2.0	<2.0	<2.0
Chandler Inlet	<2.0	<2.0	<2.0
Chandler Treated	<2.0	2.1	<2.0
Greenway WTP Inlet	<2.0	2.1	<2.0
Greenway WTP Treated	<2.0	2.1	<2.0
Glendale WTP Inlet	2.2	4.0	<2.0
Glendale WTP Treated	<2.0	<2.0	<2.0

## Sunflower Forest Fire – Will it Impact Drinking Water?

The Sunflower forest fire has burned 15,000 to 20,000 acres near Mt Ord on the north side of the Beeline highway (highway 87) as shown in the map below. On the next page shows a Googlemap with our best guess of runoff from this area. There are several mountain ranges in the area, but it appears that water from the burn area will flow towards the Verde River, and unlikely to flow into Bartlett Lake. Instead, it appears runoff from this area will eventually reach Sycamore creek, and then potentially enter the Verde River some 20+ miles downstream near Fountain Hills. Therefore, if we have a heavy monsoon there is a possibility of pulse of fire runoff water directly entering the lower Verde River which would impact drinking water plants. While this could occur, much of the water would likely infiltrate into Sycamore creek channel sediments along the way. We will be watching for rainfall runoff from this drainage as the monsoons approach this summer.

