Regional Water Quality NEWSLETTER

DATE: Report for July 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: July 9-10, 2012

SUMMARY: EVALUATION AND RECOMMENDATIONS

1. MIB levels are starting to increase in Bartlett Reservoir and Saguaro Lake.
2. Geosmin is being produced in the lower AZ canal, up to levels of 20 to 30 ng/L. However, Glendale and Peoria WTPs are effectively reducing the levels to < 10 ng/L.
3. We investigate the continuing story about unique sources of turbidity in the CAP canal, corresponding to changes in pumping/release regimes at Lake Pleasant to dust storms.
4. We continue quarterly sampling of the Salt River to monitor effects of the Wallow fire. Our last sampling was May 2012 and our next will be August 2012.
5. Streamflows and reservoir levels are below normal for this time of year – and we are entering drought conditions which could affect how we use different water supplies.

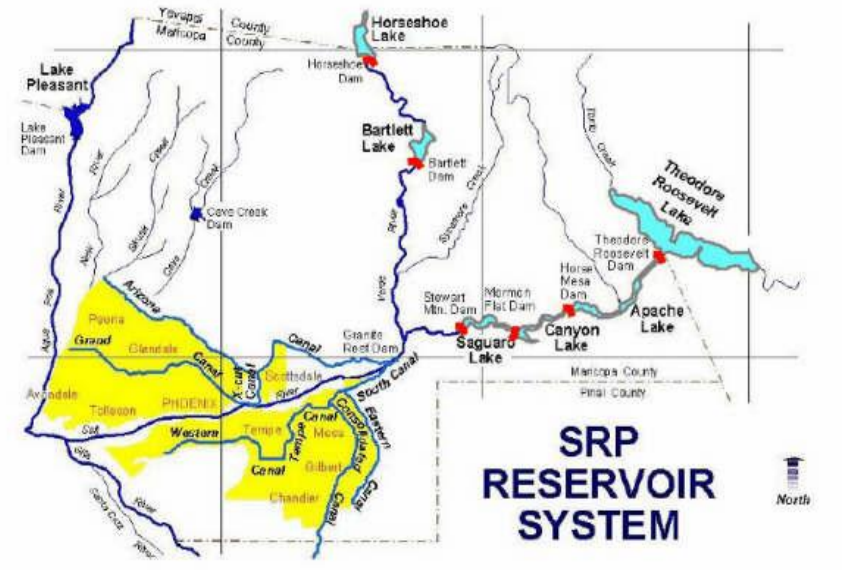
HOLD THE DATE FOR OUR ANNUAL Regional water quality workshop – Friday September 7th (830am-11:30am) at the SRP Pera Club.

Quick Update of Water Supplies for July 2012
(during day of sampling – July 9)

Source	Trend in supply	Discharge to water supply system	Flow into SRP Canal System	Dissolved organic carbon Concentration (mg/L) **
Salt River	Reservoirs at 62% full	1285 cfs	741 cfs into **Arizona Canal**	4.5 mg/L
Verde River	Reservoirs At 27% full	110 cfs	606 cfs into **South Canal (92% Salt River Water)**	3.2 mg/L
Colorado River	Lake Pleasant is 73% full (Lake Powell is 62% full)	Lake Pleasant releasing 2157 cfs into CAP canal	0 cfs of **CAP water** into Arizona Canal	3.0 mg/L
Groundwater	Generally increasing due to recharge	248 cfs pumping by SRP	455 cfs **Groundwater Pumping** into SRP Canals	0.5 to 1 mg/L

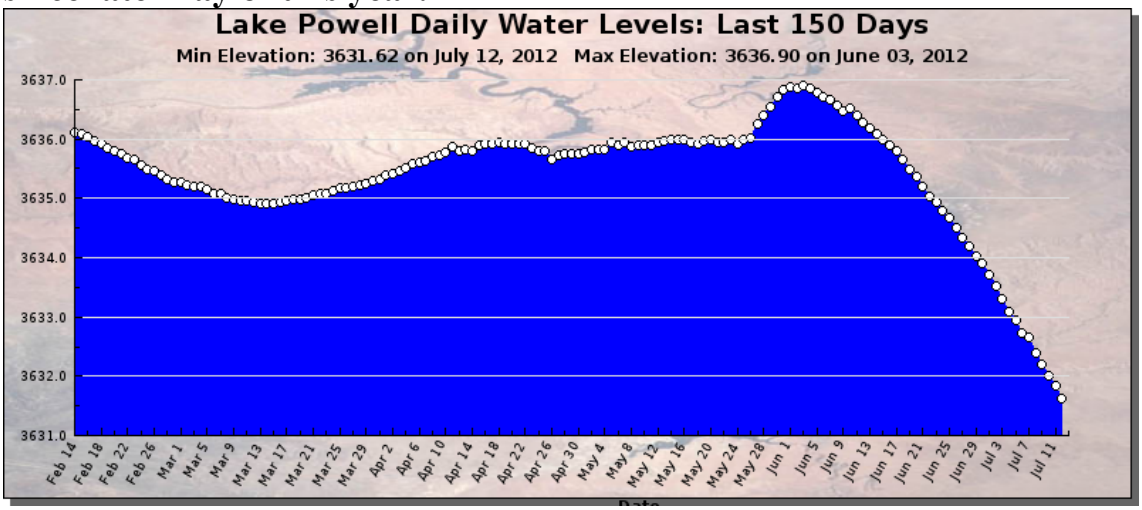
*Concentration of these taste and odor compounds in the upper [lower] levels of the terminal reservoir (Saguaro Lake on the Salt River; Bartlett Lake on the Verde River; Lake Pleasant on the CAP system
**Concentration of DOC in the terminal reservoir
Data from the following websites:

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

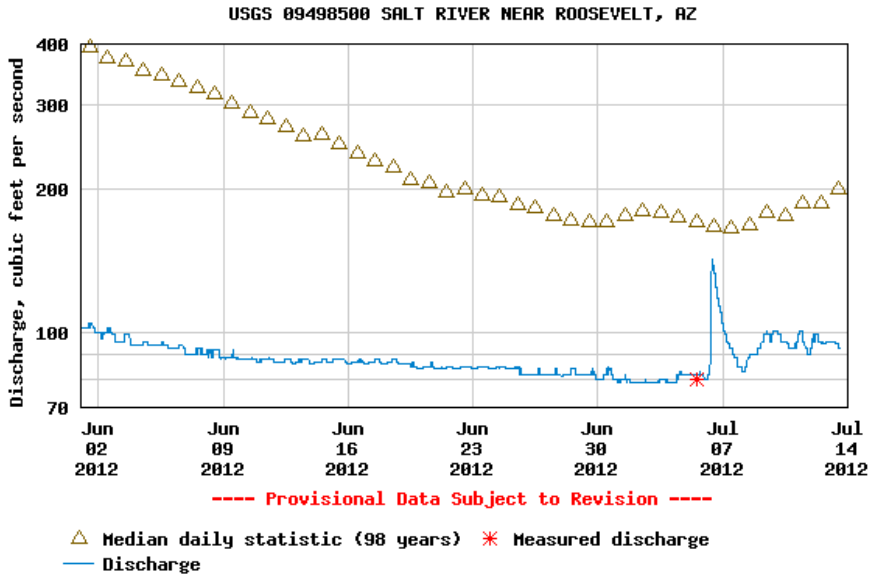


Local Hydrologic Conditions

Lake Powell is a major source of water for the CAP canal, and due to low snowpack in the Rocky Mountains this year _ the lake water elevation has dropped by around five feet since late May of this year.



Streamflow in the Salt River above Roosevelt Lake has been far below average this year (see below). Average flow is in the triangle shapes and the blue line is data for this year.

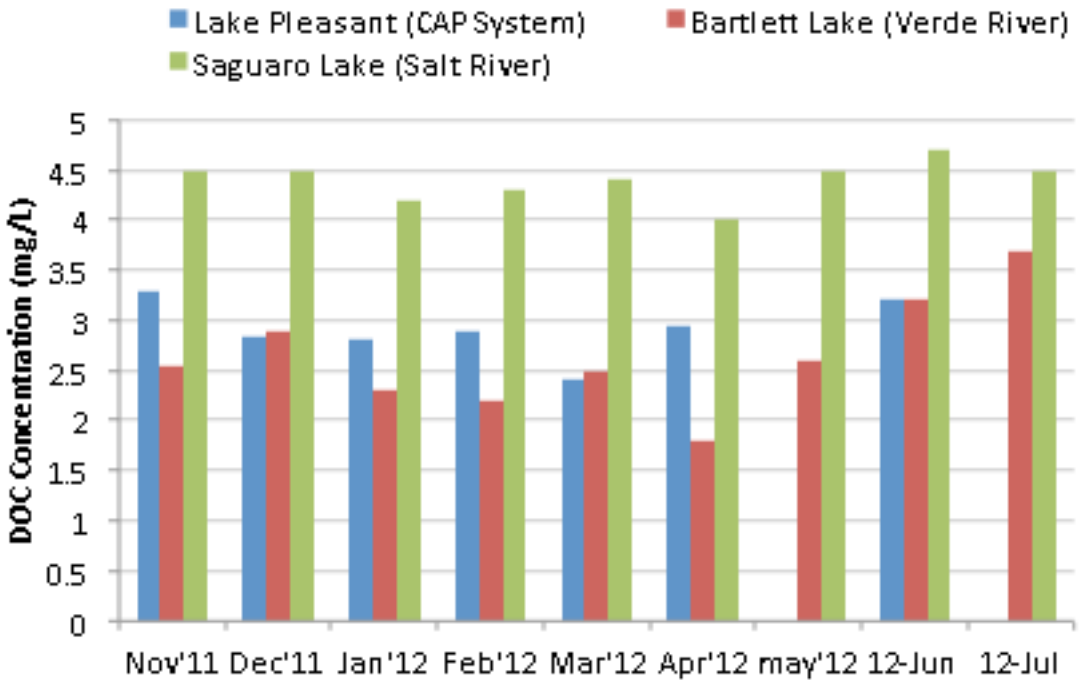


Dissolved Organic Carbon In Reservoirs and Treatment Plants

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 – July 2012

DOC levels in Bartlett Lake have been slowly increasing as the result of algae production and release of algae soluble microbial products. Right now with little outflow from Bartlett Lake is behaving as a giant bathtub reactor.



Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Lake Pleasant (June)	Epilimnion	3.1	0.05	1.5	0.4
	Hypolimnion	3.6	0.04	1.1	0.2
Verde River	@ Beeline Hwy	1.8	0.05	2.6	0.3
Bartlett Reservoir	Epilimnion	3.7	0.05	1.4	0.3
	Epi-near dock	not available			
	Hypolimnion	3.7	0.05	1.3	0.4
Salt River	@ Blue Point Bridge	3.7	0.07	1.8	0.2
Saguaro Lake	Epilimnion	4.2	0.07	1.7	0.3
	Epi - Duplicate	4.5	0.07	1.6	0.3
	Epi-near dock	4.8	0.07	1.5	0.3
	Hypolimnion	4.0	0.07	1.7	0.3
Verde River	@ Tangle	1.1	0.03	2.9	0.1
Havasu (June)		3.0	0.1	1.7	0.5
Salt River above Roosevelt	above Roosevelt	1.9	0.05	2.6	0.2

Organic Matter in Canal

July 2012

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Waddell Canal	not available			
Anthem WTP Inlet	not available			
Union Hills Inlet	2.6	0.0	1.4	0.4
CAP Canal at Cross-connect	not available			
Salt River @ Blue Pt Bridge	3.7	0.07	1.8	0.2
Verde River @ Beeline	1.8	0.05	2.6	0.3
AZ Canal above CAP Cross-connect	3.5	0.07	1.9	0.2
AZ Canal below CAP Cross-connect	3.7	0.07	1.8	0.2
AZ Canal at Highway 87	4.4	0.07	1.6	0.3
AZ Canal at Pima Rd.	3.8	0.07	1.8	0.2
AZ Canal at 56th St.	3.6	0.07	1.9	0.3
AZ Canal - Central Avenue	3.7	0.07	1.8	0.3
AZ Canal - Inlet to Glendale WTP	3.7	0.07	1.8	0.4
AZ Canal - Inlet to GreenwayWTP	3.8	0.07	1.7	0.3
South Canal below CAP Cross-connect	3.6	0.07	1.9	0.2
Head of the Tempe Canal	3.1	0.06	1.8	0.5
Tempe Canal - Inlet to Tempe's South Plant	1.9	0.03	1.8	1.5
Head of the Consolidated Canal	3.1	0.05	1.8	0.5
Middle of the Consolidated Canal	2.8	0.05	1.7	1.4
Chandler WTP – Inlet	2.5	0.04	1.7	1.3

Organics at the Water Treatment Plants

Table 2 - Water Treatment Plants – July 9, 2012

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN	DOC removal (%)
Union Hills Inlet	2.6	0.04	1.4	0.4	
Union Hills Treated	2.4	0.02	0.8	0.3	6
Tempe North Inlet	3.7	0.07	1.8	0.3	
Tempe North Plant Treated	3.2	0.05	1.5	0.2	12
Tempe South Inlet	1.9	0.03	1.8	1.5	
Tempe South Plant Treated	1.2	0.02	1.4	1.4	36
Greenway WTP Inlet	3.8	0.07	1.7	0.3	
Greenway WTP Treated	3.1	0.03	1.0	0.4	18
Glendale WTP Inlet	3.7	0.07	1.8	0.4	
Glendale WTP Treated	2.4	0.04	1.5	0.3	37
Anthem WTP Inlet	not available				
Anthem WTP Treated	4.2	0.04	1.0	0.4	
Chandler WTP Inlet	2.5	0.04	1.7	1.3	
Chandler WTP Treated	2.2	0.04	1.6	1.5	12

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.

Last Newsletter we started to examine turbidity trends over time. We have now expanded this analysis.

- **Figure A** – shows simply that water temperature varies seasonally, as does pumping from Lake Pleasant. However, when you focus on specific dates, ratehr than the overall trends it becomes clear that in 2010 and summer of 2011 there are a few weeks where the water temperature drops by 5 C at Santan and is indicating a change in water release/pumping schedules.
- **Figure B** – shows seasonal turbidity trends at Santan WTP. Here the trends show that in "shoulder" periods as Lake Pleasant changes from filling to releasing water that a period of elevated turbidity at Santan WTP intake occurs.
- **Figure C** – we plotted data from Figure B to look at changes in flow and if that causes a change in turbidty at Santan WTP. Overall – the analysis suggests that it is small changes in flow, which sometimes impacts turbidity changes. Therefore, flow changes alone do not appear to cause the turbidity, as much as where the flows are coming from.
- **Figure D** – shows photographs of sediment in the CAP canal above the Santan pumping station (forebay) that is periodically removed. This confirms that fine sediments accumulate, and that changes in the pumping operations of this plant could impact downstream turbidity levels.

We are also exploring comments from Scottsdale WTP operators that for a day or two after dust storms, there is little change in CAP water turbidity, but it becomes very difficult to coagulate and they have shorter filter run times. This suggests that airborne dust is getting into the CAP canal and could be one source of difficult to treat turbidity.

We will continue exploring these unique sources of turbidity. Ideas and thoughts or data are welcome. Please send them to p.westerhoff@asu.edu.

Figure A

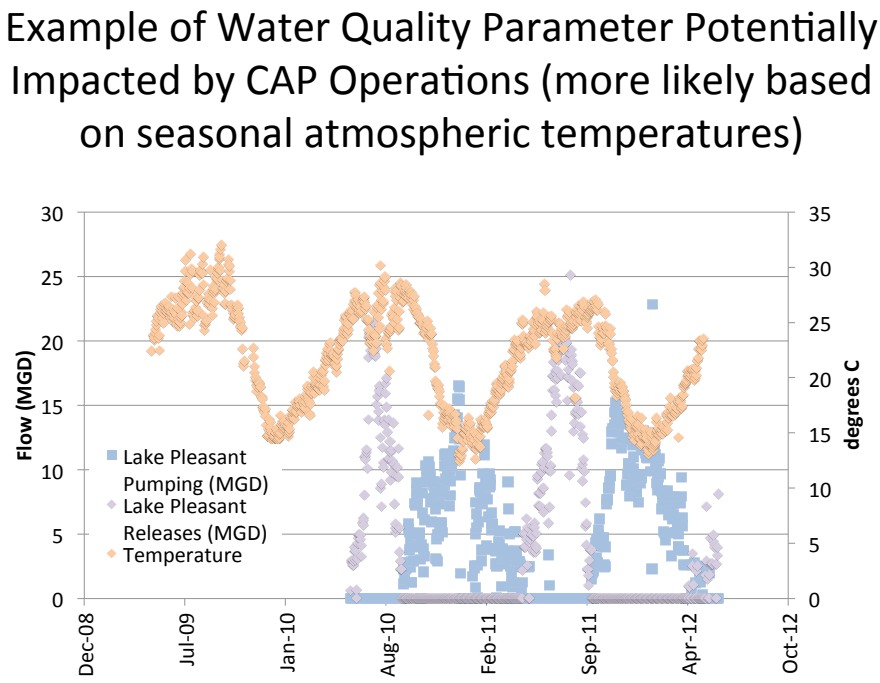


Figure B

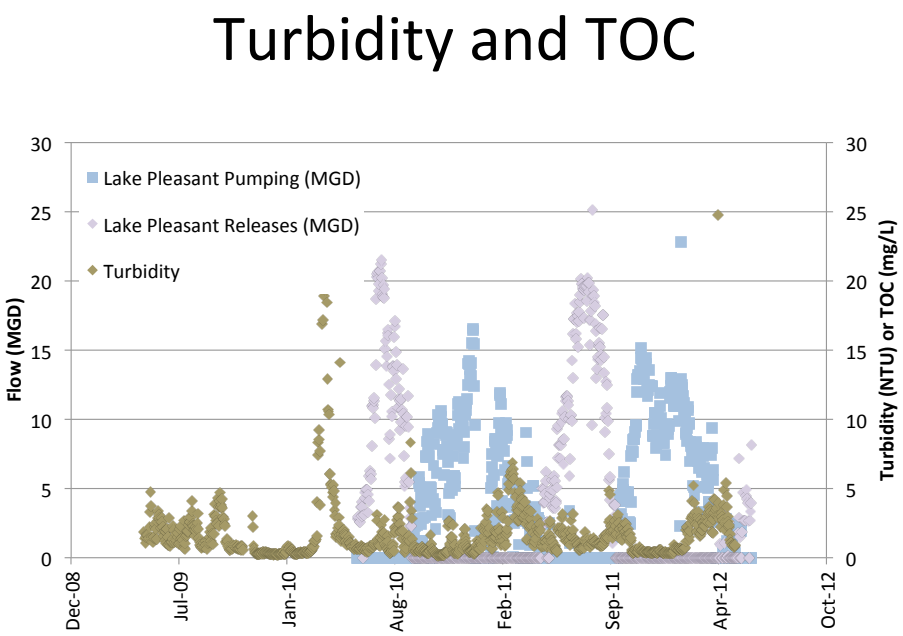
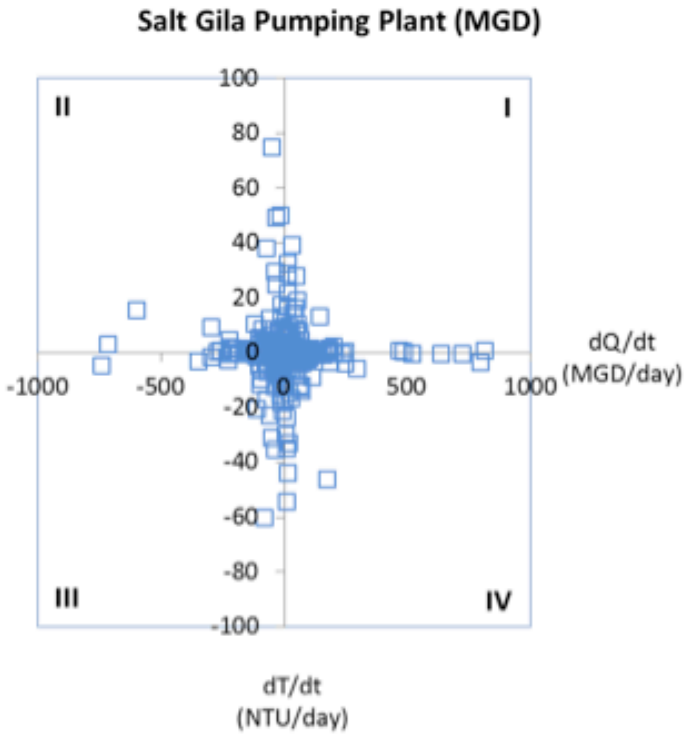


Figure C


Salt Gila Pumping Plant (MGD)
II
I
III
IV
100
80
60
40
20
0
-20
-40
-60
-80
-100
-1000
-500
0
500
1000
dQ/dt
(MGD/day)
dT/dt
(NTU/day)

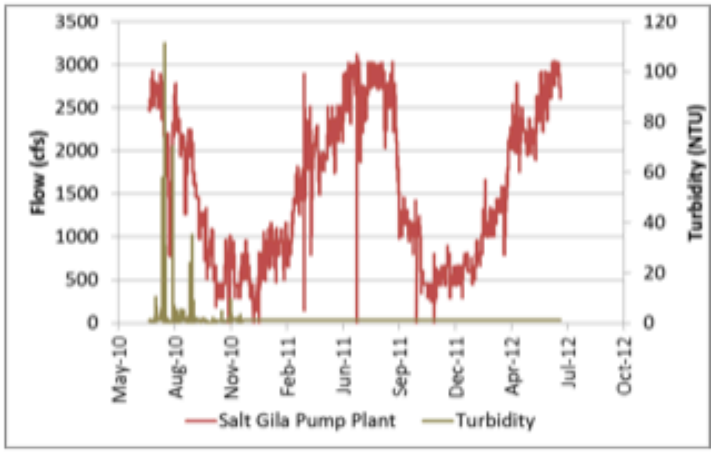

3500
3000
2500
2000
1500
1000
500
0
Flow (cfs)
120
100
80
60
40
20
0
Turbidity (NTU)
May-10
Aug-10
Nov-10
Feb-11
Jun-11
Sep-11
Dec-11
Apr-12
Jul-12
Oct-12
Salt Gila Pump Plant
Turbidity

Figure D

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 July 2012

- MIB levels in the CAP system are low (< 2 ng/L)
- MIB levels in Saguaro lake have increased over the past month from ~6 ng/L in June to ~30 ng/L in July. This is typical as sunlight and warm water produce algae that release MIB and Geosmin in the upper layers of the lake. Deeper in the lake, where water is withdrawn into the Salt River and SRP canals, MIB levels remain below 10 ng/L. This will gradually increase over the summer. The same is happening in Bartlett Lake.
- There is no production of MIB in the Canals, but **Geosmin is being produced at elevated levels in the lower Arizona Canal – with Glendale having levels above 15 ng/L – which is noticable. Fortunately their treatmen is able to reduce the levels to < 2 ng/L**. Peoria also has high levels of geosmin from the Arizona Canal, which is also being controlled to less than 10 ng/L.

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Havasu (Jun 2012)		**<2**	**3.1**	**<2**
Lake Pleasant (Jun 2012)	Eplimnion	**<2**	**2.1**	**<2**
	Hypolimnion	**<2**	**2.2**	**<2**
Verde River	@ Beeline	**21.0**	**9.9**	**<2**
	@ Tangle Creek	**6.3**	**3.7**	**<2**
Bartlett Reservoir	Epilimnion	**53.7**	**6.0**	**<2**
	Epi-near dock	**not available**		
	Hypolimnion	**<2**	**2.1**	**<2**
Roosevelt at Salt River Inlet		**not available**		
Saguaro Lake	Epilimnion	**31.4**	**3.9**	**<2**
	Epi - Duplicate	**32.6**	**3.8**	**<2**
	Epi-near dock	**20.2**	**4.1**	**<2**
	Hypolimnion	**4.3**	**2.8**	**<2**
Salt River @ BluePt Bridge		**6.3**	**3.5**	**<2**

Table 3 - Canal Sampling –July 9, 2012

System	Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
CAP	Waddell Canal	**not available**		
	Union Hills Inlet	**2.1**	**<2**	**<2**
	CAP Canal at Cross-connect	**offline**		
AZ Canal	Salt River @ Blue Pt Bridge	**6.3**	**3.5**	**<2**
	Verde River @ Beeline	**21.0**	**9.9**	**<2**
	AZ Canal above CAP Cross-connect	**6.3**	**3.6**	**<2**
	AZ Canal below CAP Cross-connect	**6.1**	**3.6**	**<2**
	AZ Canal at Highway 87	**5.6**	**3.6**	**<2**
	AZ Canal at Pima Rd.	**6.3**	**4.2**	**<2**
	AZ Canal at 56th St.	**6.5**	**3.6**	**<2**
	AZ Canal - Central Avenue	**6.4**	**6.0**	**<2**
	AZ Canal - Inlet to Glendale WTP	**5.4**	**16.9**	**<2**
	Head of the Consolidated Canal	**4.9**	**3.2**	**<2**
	Middle of the Consolidated Canal	**5.5**	**3.8**	**<2**
South Tempe Canals	South Canal below CAP Cross-connect	**6.8**	**3.5**	**<2**
	Head of the Tempe Canal	**4.4**	**3.4**	**<2**
	Tempe Canal - Inlet to Tempe's South Plant	**4.6**	**3.6**	**<2**

Table 2 - Water Treatment Plants – July 9, 2012

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Union Hills Inlet	**2.1**	**<2**	**<2**
Union Hills Treated	**<2**	**<2**	**<2**
Tempe North Inlet	**6.9**	**4.9**	**<2**
Tempe North Plant Treated	**5.7**	**4.1**	**<2**
Tempe South WTP	**4.6**	**3.6**	**<2**
Tempe South Plant Treated	**2.0**	**<2**	**<2**
Anthem Inlet	**not available**		
Anthem Treated	**<2**	**<2**	**<2**
Chandler Inlet	**2.2**	**3.0**	**<2**
Chandler Treated	**3.8**	**4.2**	**<2**
Greenway WTP Inlet	**5.8**	**22.0**	**<2**
Greenway WTP Treated	**3.2**	**9.7**	**<2**
Glendale WTP Inlet	**5.4**	**16.9**	**<2**
Glendale WTP Treated	**<2**	**<2**	**<2**