REGIONAL WATER QUALITY NEWSLETTER

DATE: Report for October 2012 A Tempe, Glendale, Peoria, Chandler, CAP, SRP, Arizona American Water– ASU Regional Water Quality Partnership

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

SUMMARY: EVALUATION AND RECOMMENDATIONS

- 1. We had some MIB and Geosmin analysis challenges in October, but have fortunately solved them. MIB levels in the canals are in the mid-teens, above the odor threshold for drinking water. Water treatment plants using activated carbon have been able to control MIB, but otherwise consumers were impacted.
- 2. We did some synoptic sampling in the lower salt river (the stretch where people go "tubing" on the weekends). We are still analyzing personal care products, but demonstrate an interesting single particle ICP-MS method to potentially identify titanium from titanium dioxide in sunscreens.
- 3. Organics were measured, and our next quarterly sampling the Salt River reservoirs will be in November.

Quick Update of Water Supplies for October2012 (during day of sampling – October 1)

Source	Trend in supply	Discharge to water supply system	Flow into SRP Canal System	Dissolved organic carbon Concentration (mg/L) **
Salt River	Reservoirs at 55% full	883 cfs	575 cfs into Arizona	4.5 mg/L
Verde River	Reservoirs At 31% full	119 cfs	Canal 395 cfs into South Canal (90% Salt River Water)	2.7 mg/L
Colorado River	Lake Pleasant is 40% full (Lake Powell is 57% full)	Lake Pleasant releasing 1000 cfs into CAP canal	0 cfs of CAP water into Arizona Canal	3.5 mg/L
Groundwater	Generally increasing due to recharge	261 cfs pumping by SRP	261 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

*** On paper cities are receiving CAP water in the SRP canals, but as a method of "paying back" from the last drought for excess CAP deliveries – SRP is delivering wet water only from the Salt and Verde Rivers Data from the following websites:

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



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

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg- m)	TDN
Verde River	@ Beeline Hwy	2.8	0.06	2.1	0.0
Dartlatt Dagament	Epilimnion	3.0	0.06	2.1	0.0
	Hypolimnion	3.3	0.06	1.9	0.0
Salt River above Roosevelt	above Roosevelt				
	Epilimnion	4.6	0.07	1.6	0.0
Saguaro Lake	Epi - Duplicate	4.4	0.07	1.6	0.0
	Hypolimnion	4.3	0.07	1.6	0.0
Salt River	@ Blue PointBridge	3.9	0.07	1.7	0.0

Organic Matter in Canal

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg- m)	TDN
Waddell Canal	3.0	0.04	1.5	0.0
Anthem WTP Inlet	3.5	0.04	1.2	0.0
Union Hills Inlet	3.0	0.04	1.4	0.0
CAP Canal at Cross-connect		no flo	9W	
Salt River @ Blue Pt Bridge	3.9	0.07	1.7	0.0
Verde River @ Beeline	2.8	0.06	2.1	0.0
AZ Canal above CAP Cross-connect	3.9	0.07	1.8	0.0
AZ Canal below CAP Cross-connect	3.8	0.07	1.9	0.0
AZ Canal at Highway 87	4.6	0.07	1.6	0.0
AZ Canal at Pima Rd.	3.8	0.07	1.7	0.0
AZ Canal at 56th St.	3.9	0.07	1.7	0.0
AZ Canal - Central Avenue	0.3	0.07	23.0	0.0
AZ Canal - Inlet to Glendale WTP	3.4	0.07	1.9	0.0
AZ Canal - Inlet to GreenwayWTP	3.2	0.06	1.9	0.0
South Canal below CAP Cross-connect	3.8	0.07	1.8	0.0
Head of the Tempe Canal	3.2	0.06	1.9	0.0
Tempe Canal - Inlet to Tempe's South Plant	1.8	0.03	1.8	0.0
Head of the Consolidated Canal	3.5	0.06	1.7	0.0
Middle of the Consolidated Canal	2.7	0.05	1.9	0.0
Chandler WTP – Inlet	4.9	0.05	1.1	0.0

Organics at the Water Treatment Plants

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg- m)	TDN
Union Hills Inlet	3.0	0.04	1.4	0.0
Union Hills Treated	2.3	0.02	0.9	0.0
Tempe North Inlet	3.7	0.07	2.0	0.0
Tempe North Plant Treated	2.6	0.04	1.4	0.0
Tempe South Inlet	1.8	0.03	1.8	0.0
Tempe South Plant Treated	1.3	0.01	1.0	0.0
Greenway WTP Inlet	3.2	0.06	1.9	0.0
Greenway WTP Treated	2.2	0.02	0.8	0.0
Glendale WTP Inlet	3.4	0.07	1.9	0.0
Glendale WTP Treated	2.7	0.03	1.2	0.0
Anthem WTP Inlet	3.5	0.04	1.2	0.0
Anthem WTP Treated	2.8	0.04	1.3	0.0
Chandler WTP Inlet	4.9	0.05	1.1	0.0
Chandler WTP Treated	2.7	0.03	1.3	0.0

Table - Water Treatment Plants - October 1, 2012

DOC
cinoval (70)
24
29
27
21
30
22
22
45

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.

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Union Hills Inlet	2.1	<2.0	<2.0
Union Hills Treated	2.2	<2.0	<2.0
Tempe North Inlet	12.8	2.3	<2.0
Tempe North Plant Treated	26.4	4.0	<2.0
Tempe South WTP	4.6	2.3	<2.0
Tempe South Plant Treated	2.9	2.0	<2.0
Anthem Inlet	2.2	<2.0	<2.0
Anthem Treated	<2.0	<2.0	<2.0
Chandler Inlet	10.0	3.0	<2.0
Chandler Treated	7.3	2.3	<2.0
Greenway WTP Inlet	4.0	2.3	<2.0
Greenway WTP Treated	<2.0	<2.0	<2.0
Glendale WTP Inlet	10.2	2.8	<2.0
Glendale WTP Treated	3.4	<2.0	<2.0

Table - Water Treatment Plants - Oct 1, 2012

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ladie	-	water	Ireatment	Plants	-Oct 15,	2012

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitr al (ng/L)
Union Hills Inlet	2.2	<2.0	<2.0
Union Hills Treated	<2.0	<2.0	<2.0
Tempe North Inlet	27.8	3.6	<2.0
Tempe North Plant	13.4	2.0	<2.0
Tempe South WTP			
Tempe South Plant			
Anthem Inlet			
Anthem Treated			
Chandler Inlet			
Chandler Treated			
Greenway WTP Inlet	7.6	3.5	<2.0
Greenway WTP Treated	<2.0	<2.0	<2.0
Glendale WTP Inlet	8.4	2.7	<2.0
Glendale WTP Treated	3.0	<2.0	<2.0

System	Sample Description	MIB (ng/L)	Geosmin	Cyclocitral
			(ng/L)	(ng/L)
CAP	Waddell Canal	<2.0	<2.0	<2.0
	Union Hills Inlet	2.1	<2.0	<2.0
	CAP Canal at Cross-connect			
	Salt River @ Blue Pt Bridge	10.4	4.1	<2.0
	Verde River @ Beeline	44.4	5.2	<2.0
AZ	AZ Canal above CAP Cross- connect	31.6	4.5	<2.0
Canal	AZ Canal below CAP Cross- connect	33.9	4.3	<2.0
	AZ Canal at Highway 87	19.6	3.4	<2.0
	AZ Canal at Pima Rd.	30.2	4.7	<2.0
	AZ Canal at 56th St.	25.6	3.8	<2.0
	AZ Canal - Central Avenue	17.9	3.4	<2.0
	AZ Canal - Inlet to Glendale WTP	10.2	2.8	<2.0
	Head of the Consolidated Canal	19.0	3.8	<2.0
	Middle of the Consolidated Canal	15.4	2.9	<2.0
South	South Canal below CAP Cross- connect	33.2	4.4	<2.0
Tempe	Head of the Tempe Canal	19.3	3.8	<2.0
Canals	Tempe Canal - Inlet to Tempe's South Plant	4.6	2.3	<2.0
	Salt-Gila Mesa Turnout			

Table 3 - Canal Sampling – Oct 1, 2012

Table 4 - Reservoir Samples - Oct 2, 2012

Sample Description	Location	MIB	Geosmin	Cyclocitral
		(ng/L)	(ng/L)	(ng/L)
Lake Pleasant	Eplimnion			
Lake Pleasant	Hypolimnion			
Verde River @ Beeline		44.4	5.2	<2.0
Bartlett Reservoir	Epilimnion	13.8	5.2	<2.0
Bartlett Reservoir	Epi-near dock	17.9	6.1	<2.0
Bartlett Reservoir	Hypolimnion	20.3	6.2	<2.0
Salt River @ BluePt Bridge		10.4	4.1	<2.0
Saguaro Lake	Epilimnion	11.4	4.1	<2.0
Saguaro Lake	Epi - Duplicate	11.5	3.9	<2.0
Saguaro Lake	Epi-near dock	10.3	3.7	<2.0
Saguaro Lake	Hypolimnion	9.6	2.8	<2.0
Lake Havasu				
Lake Havasu				
Verde River at Tangle Creek		5.4	10.4	<2.0
Roosevelt at Salt River Inlet				

Special Sampling - Effect of Recreational Activities (Tubing) In Lower Salt River

On a Saturday in October we sampled throughout the day at a downstream location of where TUBERs use the lower Salt River Recreation area (between Saguaro Lake and Granite Reef). Previously we looked at pharmaceuticals and personal care products and found the following "pulse" of topically (skin) applied oxybenzone (sunscreen):



(c). PPCP/EDC detected over time in Salt River downstream of recreational site (July, 2009)

We repeated the sampling this year (PPCP data pending). We measured MIB and Geosmin to see if there would be daily variation in release from the reservoirs or in-channel production. As seen below, there appears to be only a slight increase in MIB levels between 930 am (~18 ng/) and 4 to 6 pm (1600-1800 hours) (24 ng/L).

Sample	MIB (ng/L)	Geosmin (ng/L)
SR 0930	17.3	4.6
SR 1000	18.1	3.8
SR 1100	20.0	4.2
SR 1200	22.6	4.3
SR 1300	8.4	2.6
SR 1400	22.3	4.5
SR 1500	22.4	4.5
SR 1600	22.0	3.7
SR 1600 Dup	25.5	4.4
SR 1700	22.3	4.3
SR1800	24.1	4.1
SR 1800 Dup	22.6	4.8

We also analyzed for the single-particle ICP-MS metals, using the technique we presented at our annual workshop in September. **The data shows that titanium "colloids" are present, and that the double in number in the afternoon.** We are trying to assess if this is just a change in turbidity, or if we are detecting TiO2 from sunscreen. As you recall – in this type of analysis pulses of Ti correlate with colloids. We think more broadly that this type of analysis may be helpful in other water treatment unit processes to better understand metals. For example – with lead and copper studies it is difficult to understand if "colloids" are released. Colloids fall into the size range between particulates and "dissolved". We saw an increase in the number of Ti-bearing colloids. This could be caused by 1) an increase in turbidity due to swimming activity or 2) release of Ti-bearing sunscreens. We are trying to demonstrate the later.





TiO₂-eq concentration in Salt River

