Regional Water Quality NEWSLETTER

DATE: Report for August 2007

Samples Collected on August 6-7, 2007

From the Phoenix, Tempe, Peoria, CAP, SRP – ASU Regional Water Quality Partnership

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

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SUMMARY: EVALUATION AND RECOMMENDATIONS

1. Our Annual Regional Water Quality Workshop will be held on Friday September 21, 2007 from 8:30-11am in Downtown Phoenix (Phoenix City Hall Assembly Room C). Please RSVP if you plan to attend to: p.westerhoff@asu.edu and paul.zelenka@phoenix.gov by September 19th. A draft agenda is presented at the end of this newsletter.
2. MIB concentrations remain low this year. This is probably related to the constant use of Salt River water almost exclusively in the SRP canals this year, with only <15% of the flow coming from the CAP Canal, Verde River and/or groundwater pumping. In the past variable water quality due to blending from multiple sources may have stimulated release of MIB by algae within the canals.
3. DOC concentrations remain elevated in source waters and some utilities are adding powder activated carbon (PAC) to reduce disinfection byproduct formation.
4. A monitoring project by Deer Valley WTP has been tracking actinomycetes in raw water, because they potentially produce taste and odors that impact drinking water.

Table 1 Summary of WTP Operations

	Union Hills	24th Street WTP	N.Tempe J.G. Martinez	Deer Valley	Glendale Cholla WTP	Val Vista	South Tempe	Chandler WTP
Location	**CAP**	**Arizona Canal System**				**South Canal System**		
PAC Type and Dose	None	10 ppm Norit 20B	None	6.5 ppm PAC	None-uses GAC	10 ppm Norit 20B	None	
Copper Sulfate	None	None	None	none	none	0.25 ppm during daytime	None	
PreOxidation	None	None	None	None	1 ppm chlorine	None	None	
Alum Dose Alkalinity pH	7.5 ppm[1] 134 / 119 7.2	55 ppm 142 / 116 6.8	39 ppm 136 7.3	155/92 8.0 / 6.6	35 ppm 140 6.9	65 ppm 185 6.8	30 ppm 136 7.34	
Finished water DOC DOC removal[2]	2.7 mg/L 11%	3.0 mg/L 28%	3.5 mg/L 17%	2.9 mg/L 29%	3.0 mg/L 27%	2.8 mg/L 36%	3.6 mg/L 13%	
WTP plant comments				See Actino mycetes section				
Recommendations			Increasing alum dose would increase DOC removal				Increasing alum dose would increase DOC removal	

[1] **Ferric chloride instead of alum**

[2] Calculated based upon influent and filtered water DOC (note that DOC – not TOC – is used in this calculation)

Table 2 - Water Treatment Plants – September 10, 2007

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
24th Street WTP Inlet	**5.6**	**4.3**	**5.3**
24th Street WTP Treated	**3.4**	**3.1**	**3.9**
Deer Valley Inlet	**5.2**	**4.1**	**6.7**
Deer Valley WTP Treated	**4.2**	**3.4**	**6.5**
Val Vista Inlet	**4.8**	**4.1**	**<2.0**
Val Vista WTP Treated –East	**2.7**	**2.2**	**5.2**
Val Vista WTP Treated -West	**2.7**	**2.1**	**3.6**
Union Hills Inlet	**3.0**	**<2.0**	**4.2**
Union Hills Treated	**3.6**	**2.7**	**6.7**
Tempe North Inlet	**4.5**	**4.0**	**8.4**
Tempe North Plant Treated	**4.4**	**6.6**	**6.6**
Tempe South WTP	**4.0**	**2.6**	**5.6**
Tempe South Plant Treated	**4.3**	**4.9**	**4.3**
Tempe South Plant Treated (Lab)			
Glendale WTP Inlet	**4.7**	**3.2**	**12.3**
Glendale WTP Treated	**2.4**	**2.0**	**5.8**

Geosmin concentrations are higher exiting the Tempe WTPs compared to the raw water. There appears to be an in-plant source of MIB and geosmin.

While the City of Phoenix WTPs are adding PAC there is only a minimal reduction if MIB and Geosmin (a few ng/L). However, this represents a large percentage removal (~40%) which is consistent with previous bench-scale testing and modeling conducted by ASU.

Table 3 - Canal Sampling – September 10, 2007

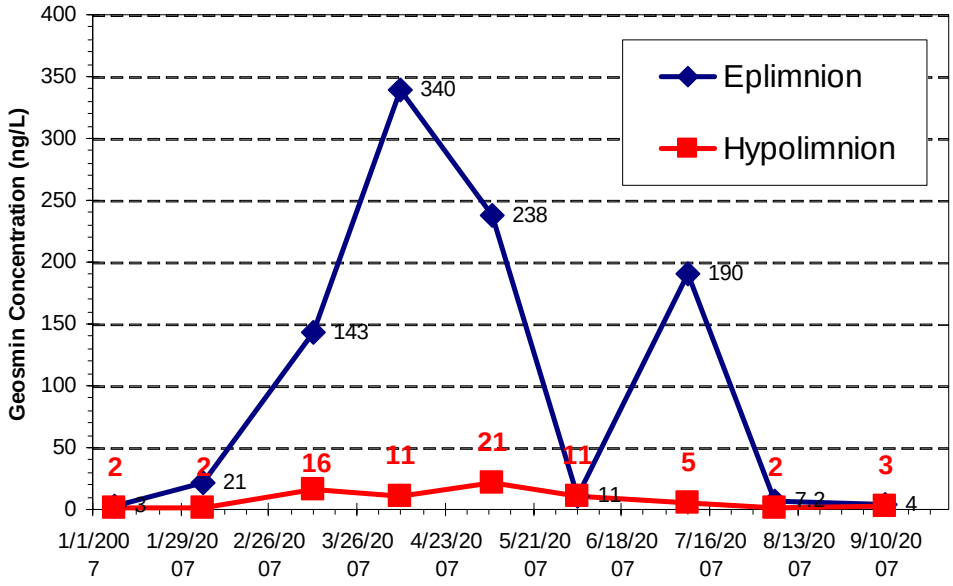
System	Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
CAP	Waddell Canal	**<2.0**	**<2.0**	**6.5**
	Union Hills Inlet	**3.0**	**<2.0**	**4.2**
	CAP Canal at Cross-connect	**5.2**	**2.9**	**5.7**
AZ Canal	Salt River @ Blue Pt Bridge	**4.2**	**4.2**	**5.8**
	Verde River @ Beeline	**7.5**	**3.1**	**4.0**
	AZ Canal above CAP Cross-connect			
	AZ Canal below CAP Cross-connect	**5.0**	**3.6**	**3.3**
	AZ Canal at Highway 87	**4.8**	**3.9**	**5.2**
	AZ Canal at Pima Rd.	**5.3**	**4.0**	**9.2**
	AZ Canal at 56th St.	**6.4**	**4.5**	**8.5**
	AZ Canal - Inlet to 24th Street WTP	**5.6**	**4.3**	**5.3**
	AZ Canal - Central Avenue	**5.3**	**4.8**	**6.9**
	AZ Canal - Inlet to Deer Valley WTP	**5.2**	**4.1**	**6.7**
	AZ Canal - Inlet to Glendale WTP	**4.7**	**3.2**	**12.3**
South and Tempe Canals	South Canal below CAP Cross-connect	**4.8**	**3.8**	**6.8**
	South Canal at Val Vista WTP	**4.8**	**4.1**	**<2.0**
	Head of the Tempe Canal	**5.2**	**4.2**	**5.6**
	Tempe Canal - Inlet to Tempe's South Plant	**4.0**	**2.6**	**5.6**
	Chandler WTP – Inlet			

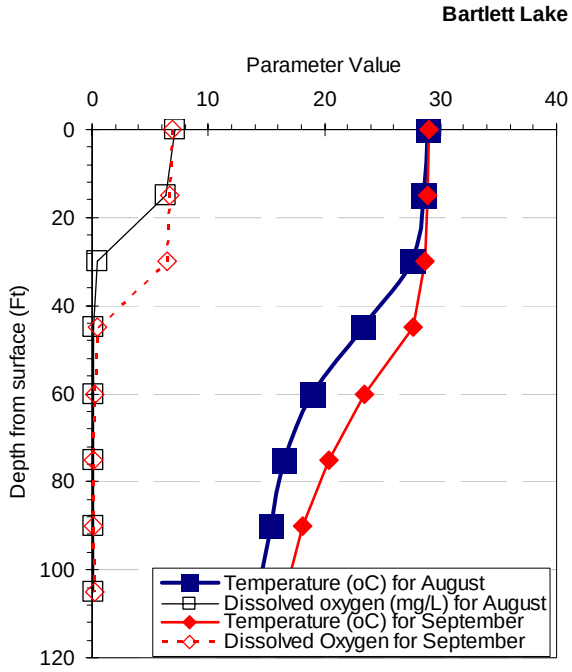
There does NOT appear to be any in-canal MIB or geosmin production this month. In previous years this was a significant issue, and will be discussed at next week's workshop.

Table 4 - Reservoir Samples – September 11, 2007

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant	Eplimnion	15.5	<2.0	<2.0
Lake Pleasant	Hypolimnion	<2.0	<2.0	<2.0
Verde River @ Beeline		7.5	3.1	4.0
Bartlett Reservoir	Epilimnion	16.3	2.4	3.2
Bartlett Reservoir	Epi-near dock	10.5	<2.0	<2.0
Bartlett Reservoir	Hypolimnion	14.5	<2.0	2.3
Salt River @ BluePt Bridge		4.2	4.2	5.8
Saguaro Lake	Epilimnion	12.7	3.7	3.0
Saguaro Lake	Epi - Duplicate	11.4	4.3	<2.0
Saguaro Lake	Epi-near doc	5.1	3.7	<2.0
Saguaro Lake	Hypolimnion	3.7	2.5	4.2
Verde River at Tangle	(29Aug07)	3.4	5.3	<2.0
Havasu	(5Sep07)	3.1	2.8	2.8

MIB is present in the SRP reservoirs. Geosmin concentrations have been very variable in Saguaro Lake this year (see plot below). It appears that rapid changes in geosmin occur over a time-span of less than one month in duration. Dr. Susan Neuer's group using remote sensing of algae will hopefully shed light on the dynamics of algae blooms in Saguaro Lake. She will give a talk at next weeks workshop on this topic.





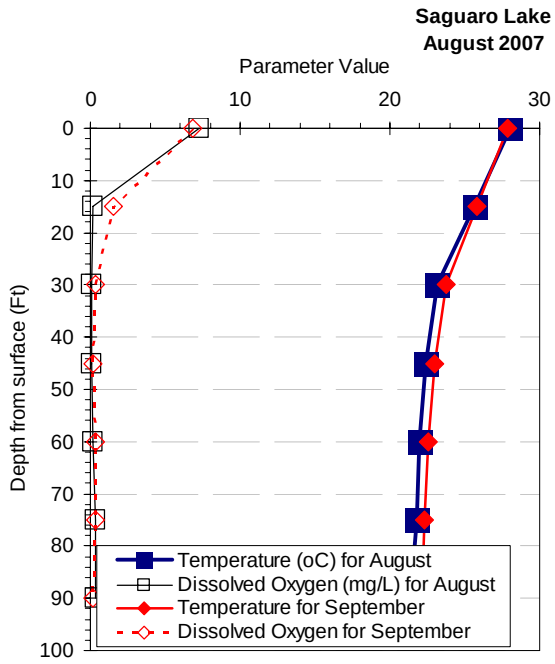


Table 5 - SRP/CAP OPERATIONS

Values in cfs, for September 10, 2007

System	SRP Diversions	CAP
Arizona Canal	801	283
South Canal	724	57
Pumping	188	0
Total	1525	340

SRP is releasing water from both Verde and Salt River Systems. Salt River release from Saguaro Lake: 1172 cfs; Verde River release from Bartlett Lake: 106 cfs.

Table 6 - Water Treatment Plants – September 10, 2007

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
24th Street WTP Inlet	**4.21**	**0.076**	**1.8**	**0.398**
24th Street WTP Treated	**3.03**	**0.044**	**1.5**	**0.336**
Deer Valley Inlet	**3.85**	**0.073**	**1.9**	**0.849**
Deer Valley WTP Treated	**2.89**	**0.036**	**1.2**	**0.743**
Val Vista Inlet	**4.37**	**0.086**	**1.97**	**0.383**
Val Vista WTP Treated –East	**2.81**	**0.032**	**1.14**	**0.312**
Val Vista WTP Treated -West	**2.81**	**0.030**	**1.07**	**0.309**
Union Hills Inlet	**3.02**	**0.048**	**1.59**	**0.444**
Union Hills Treated	**2.69**	**0.022**	**0.82**	**0.387**
Tempe North Inlet	**4.16**	**0.077**	**1.85**	**0.464**
Tempe North Plant Treated	**3.47**	**0.052**	**1.50**	**0.376**
Tempe South WTP	**4.10**	**0.099**	**2.41**	**0.631**
Tempe South Plant Treated	**3.55**	**0.059**	**1.66**	**0.702**
Glendale WTP Inlet	**4.09**	**0.081**	**2.0**	**0.562**
Glendale WTP Treated	**2.98**	**0.034**	**1.1**	**1.144**

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)

The 1.1 mgN/L of TDN for Glendale Treated water was confirmed by duplicate analysis and discussion with the City are underway.

Table 7 - Canal Sampling – September 10, 2007

System	Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
CAP	Waddell Canal	3.34	0.050	1.5	0.397
	Union Hills Inlet	3.02	0.048	1.59	0.444
	CAP Canal at Cross-connect	3.12	0.043	1.38	0.438
AZ Canal	Salt River @ Blue Pt Bridge	4.68	0.094	2.01	0.439
	Verde River @ Beeline	2.16	0.061	2.81	0.371
	AZ Canal above CAP Cross-connect				
	AZ Canal below CAP Cross-connect	3.92	0.069	1.76	0.421
	AZ Canal at Highway 87	4.08	0.074	1.81	0.414
	AZ Canal at Pima Rd.	4.02	0.075	1.87	0.414
	AZ Canal at 56th St.	4.05	0.086	2.12	0.442
	AZ Canal - Inlet to 24th Street WTP	4.21	0.076	1.81	0.398
	AZ Canal - Central Avenue	4.10	0.079	1.93	0.374
	AZ Canal - Inlet to Deer Valley WTP	3.85	0.073	1.90	0.849
	AZ Canal - Inlet to Glendale WTP	4.09	0.081	1.98	0.562
South and Tempe Canals	South Canal below CAP Cross-connect	4.31	0.089	2.06	0.367
	South Canal at Val Vista WTP	4.37	0.086	1.97	0.383
	Head of the Tempe Canal	4.34	0.087	2.00	0.399
	Tempe Canal - Inlet to Tempe's South Plant	4.10	0.099	2.41	0.631
	Chandler WTP – Inlet				

Table 8- Reservoir Samples – September 10, 2007

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Lake Pleasant	Eplimnion	3.55	0.041	1.15	0.385
Lake Pleasant	Hypolimnion	3.11	0.044	1.41	0.429
Verde River @ Beeline		2.16	0.061	2.81	0.371
Bartlett Reservoir	Epilimnion	3.26	0.075	2.30	0.366
Bartlett Reservoir	Epi-near dock				
Bartlett Reservoir	Hypolimnion	2.16	0.051	2.36	0.291
Salt River @ BluePt Bridge		4.68	0.094	2.01	0.439
Saguaro Lake	Epilimnion	5.38	0.096	1.78	0.460
Saguaro Lake	Epi - Duplicate	4.94	0.094	1.90	0.359
Saguaro Lake	Epi-near doc				
Saguaro Lake	Hypolimnion	4.87	0.093	1.91	0.529
Verde River at Tangle		1.93	0.058	3.01	0.229
Havasu		2.94	0.038	1.29	0.495

Actinomycetes

The ASU team has confirmed in past years that Actinomycetes can, but not all species, produce MIB or geosmin when present in water. For the past two years some City of Phoenix WTPs have been monitoring actinomycetes in source water and their basins as a way to monitor their presence and potential contribution to taste and odor. This month Deer Valley WTP noted "Higher than normal actinomycetes counts in the raw water, with geosmin/MIB odor coming from the plates." Representative data is presented below that indicate actinomycetes in raw water and a strong earthy-musty-moldy odor generated from the culturing plates.

The following data was provided by Edna Bienz / Deer Valley WTP – City of Phoenix

2007	Counts per mL		
date	raw	basin	comments
1/4/2007	1	1	
20-Feb	5	<1	
26-Feb	4	<1	
5-Mar	3	2	
7-May	6	<1	
14-May	8	<1	strong odor
29-May	3	1	
4-Jun	3	<1	
11-Jun	3	1	
18-Jun	3	<1	
25-Jun	8	<1	strong odor
2-Jul	4	<1	
9-Jul	2	<1	
16-Jul	4	<1	
24-Jul	2	<1	
30-Jul	4	<1	strong odor
6-Aug	36	<1	strong odor
13-Aug	13	<1	strong odor
20-Aug	17	<1	strong odor
27-Aug	9	4	strong odor
4-Sep	9	<1	

Draft Agenda for next week's workshop

Annual Regional Water Quality Workshop will be held on Friday September 21, 2007 from 8:30-11am in Downtown Phoenix (Phoenix City Hall Assembly Room C).

8:30 Refreshments

8:45am Introductions

9am Project overview Past, Present and Future (Westerhoff)

9:15 am Annual update of water quality (Westerhoff)

9:40 am Satellite Imaging of Algae in Reservoirs (Susanne Neuer) ?????

10 am In-plant Algae Identification (Sommerfeld)

10:30 DBP Precursors and Modeling

11 am Wrap-up