Regional Water Quality NEWSLETTER

DATE: Report for August 14, 2006
Samples Collected on August 16, 2006
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. Surprisingly – geosmin concentrations in Saguaro Lake have dropped by an order of magnitude from the 100's to < 100 ng/L. Biodegradation must have been responsible for this change. It now appears that MIB concentrations are increasing in Bartlett Lake and are in excess of 90 ng/L.
2. MIB and geosmin levels are in the 8 to 15 ng/L range in canal waters – and there is a gradual increase in T&O compounds along the Arizona Canal. We will monitor this potential gradient in T&O levels over the next month to determine if canal treatment is appropriate. This is the first month with higher CAP water entering the Arizona Canal and the change in water chemistry, along with reduced flowrates in the canal may be responsible for the partial T&O gradient (production of T&O in the canal) being observed currently.
3. DOC concentrations remain high in the Salt River, but quite low in the Verde River system – and some of the high WTP influent may be due to recent rains.
4. As SRP begins to shifts from Salt River water to Verde River water the DBP levels should decrease later this fall, but may result in elevated MIB levels at WTPs.
5. **Mark your calendar: Regional Water Quality Workshop on September 15th. If you want to attend – PLEASE RSVP to p.westerhoff@asu.edu (**Pass this invitation along to others)

Table 1 Summary of WTP Operations

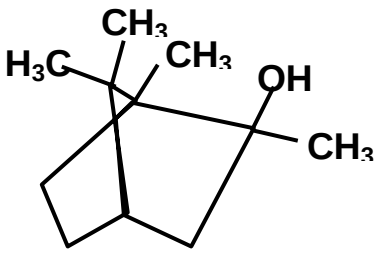
	Union Hills	24th Street WTP	N.Tempe J.G. Martinez	Deer Valley	Greenway WTP	Val Vista	South Tempe	Chandler WTP
Location	**CAP**	**Arizona Canal System**				**South Canal System**		
PAC Type and Dose		10 ppm chaning to 15 ppm at 1:30pm Norit 20B	28.4 ppm Calgon WPH-C	No	--	10 ppm Norit 20B		
Copper Sulfate		No	No	No	No	0.25 ppm		
PreOxidation		No	No	No	Ozone = 2 mg/L	Adding to top of filters		
Alum Dose (ppm) Alkalinity (ppm) pH		55-60 144 (6.8)	36 148 7.8	55 143(86) 7.9(6.6)	25 151 7.05	60 (106) (6.8)		
WTP Comments		No odor problems noticed		Some musty odors perceived		Feeding carbon for TOC control		
Raw water DOC % DOC removal[2]	34%	31%	24%	30%	37%	35%/42%	27%	
Process recommendations	Deer Valley WTP: No T&O is being removed – recommend starting to feed PAC Other WTPs are adding PAC/GAC and removing T&O							

[1] Ferric chloride instead of alum

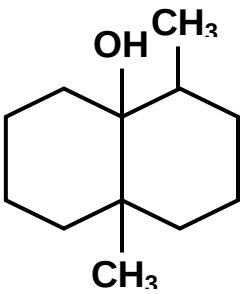
[2] Calculated based upon influent and filtered water DOC

MONITORING RESULTS

Why measure and report MIB and Geosmin data?
Methyliosoborneol (MIB) and geosmin are naturally occurring organic chemicals. They are produced by algae (some cyanobacteria) and actinomycetes (something like fungi) which grow in our lakes, rivers, canals, and uncovered water treatment plants; actinomycetes also grow in water distribution systems pipes and storage tanks. Because these are common taste and odor compounds in drinking water. They are noticeable in drinking water to consumers at concentrations of 10 ng/L – causing earthy/musty taste and odors. Their chemical structures are shown below.

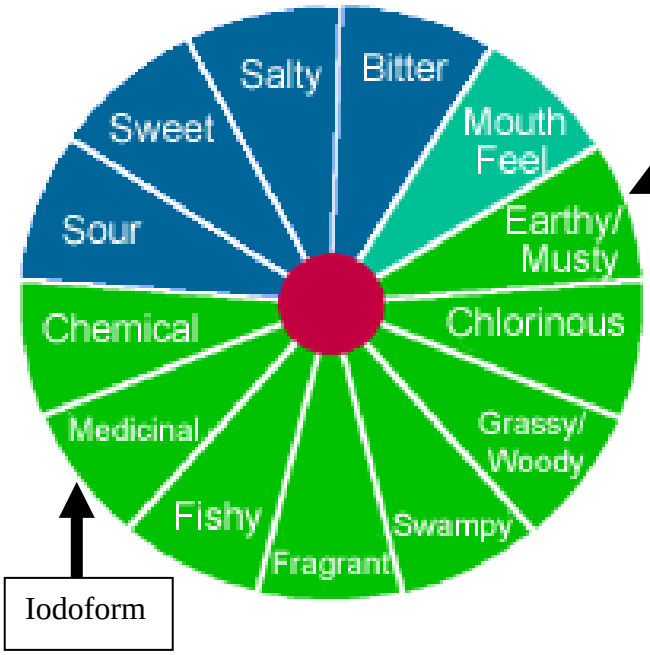


2-Methylisoborneol



Geosmin

Other taste and odors (T&O) will occur and have been characterized based upon a T&O wheel (proposed by Mel Suffet and others):



MIB and Geosmin cause earthy/musty odors/taste. Cyclocitral also causes similar odors.

Iodoform

Table 2 - Water Treatment Plants – Aug 15, 2006

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
24th Street WTP Inlet	**8.5**	**13.1**	**2.7**
24th Street WTP Treated	**6.3**	**6.4**	**3.7**
Deer Valley Inlet	**14.3**	**14.7**	**<2.0**
Deer Valley WTP Treated	**11.7**	**9.2**	**5.4**
Val Vista Inlet	**11.7**	**9.9**	**6.0**
Val Vista WTP Treated –East	**9.3**	**6.7**	**7.6**
Val Vista WTP Treated -West	**6.0**	**5.7**	**7.8**
Union Hills Inlet	**<2.0**	**8.2**	**5.7**
Union Hills Treated	**<2.0**	**7.7**	**<2.0**
Tempe North Inlet	**10.5**	**15.0**	**6.4**
Tempe North Plant Treated	**9.6**	**6.1**	**<2.0**
Tempe South WTP	**7.7**	**6.1**	**<2.0**
Tempe South Plant Treated	**5.1**	**2.9**	**<2.0**
Tempe South Plant Filter Effluent	**5.4**	**3.3**	**<2.0**
Tempe South Plant Sed Effluent (Lab)	**4.0**	**3.8**	**<2.0**
Chandler WTP Inlet	**6.8**	**9.7**	**9.8**
Chandler WTP Treated	**4.1**	**4.1**	**<2.0**
Greenway WTP Inlet	**13.8**	**11.3**	**<2.0**
Greenway WTP Treated	**7.2**	**4.8**	**4.1**
Greenway WTP Filter Effluent	**<2.0**	**<2.0**	**<2.0**

Table 3 - Canal Sampling – Aug 15, 2006

System	Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
CAP	Waddell Canal	**<2.0**	**2.2**	**<2.0**
	Union Hills Inlet	**<2.0**	**8.2**	**5.7**
	CAP Canal at Cross-connect			
AZ Canal	Salt River @ Blue Pt Bridge	**19.4**	**8.7**	**9.5**
	Verde River @ Beeline	**19.3**	**4.6**	**5.8**
	AZ Canal above CAP Cross-connect	**<2.0**	**22.1**	**4.8**
	AZ Canal below CAP Cross-connect	**13.2**	**12.1**	**10.4**
	AZ Canal at Highway 87	**13.8**	**10.6**	**4.6**
	AZ Canal at Pima Rd.	**9.5**	**9.6**	**3.5**
	AZ Canal at 56th St.	**8.9**	**13.0**	**11.1**
	AZ Canal - Inlet to 24th Street WTP	**8.5**	**13.1**	**2.7**
	AZ Canal - Central Avenue	**11.7**	**15.5**	**3.3**
	AZ Canal - Inlet to Deer Valley WTP	**14.3**	**14.7**	**<2.0**
	AZ Canal - Inlet to Greenway WTP	**13.8**	**11.3**	**<2.0**
South and Tempe Canals	South Canal below CAP Cross-connect	**15.2**	**9.4**	**7.1**
	South Canal at Val Vista WTP	**11.7**	**9.9**	**6.0**
	Head of the Tempe Canal	**10.4**	**15.3**	**15.6**
	Tempe Canal - Inlet to Tempe's South Plant	**7.7**	**6.1**	**<2.0**
	Chandler WTP – Inlet	**6.8**	**9.7**	**9.8**

Table 4 - Reservoir Samples – Aug 15, 2006

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant	Eplimnion	**6.5**	**<2.0**	**<2.0**
Lake Pleasant	Hypolimnion	**36.7**	**<2.0**	**5.1**
Verde River @ Beeline		**19.3**	**4.6**	**5.8**
Bartlett Reservoir	Epilimnion	**77.8**	**3.0**	**<2.0**
Bartlett Reservoir	Epi-near dock	**108.6**	**<2.0**	**<2.0**
Bartlett Reservoir	Hypolimnion	**15.2**	**<2.0**	**<2.0**
Salt River @ BluePt Bridge		**19.4**	**8.7**	**9.5**
Saguaro Lake	Epilimnion	**31.1**	**16.7**	**8.6**
Saguaro Lake	Epi - Duplicate	**31.2**	**19.5**	**8.0**
Saguaro Lake	Epi-near doc	**15.4**	**20.9**	**9.4**
Saguaro Lake	Hypolimnion	**15.4**	**5.6**	**<2.0**
Verde River at Tangle		**9.9**	**10.2**	**11.4**
Havasu		**2.2**	**2.6**	**<2.0**

Discussion of T&O Data

Surprisingly – geosmin concentrations in Saguaro Lake have dropped by an order of magnitude from the 100's to < 100 ng/L. Biodegradation must have been responsible for this change.

It now appears that MIB concentrations are increasing in Bartlett Lake and are in excess of 90 ng/L.

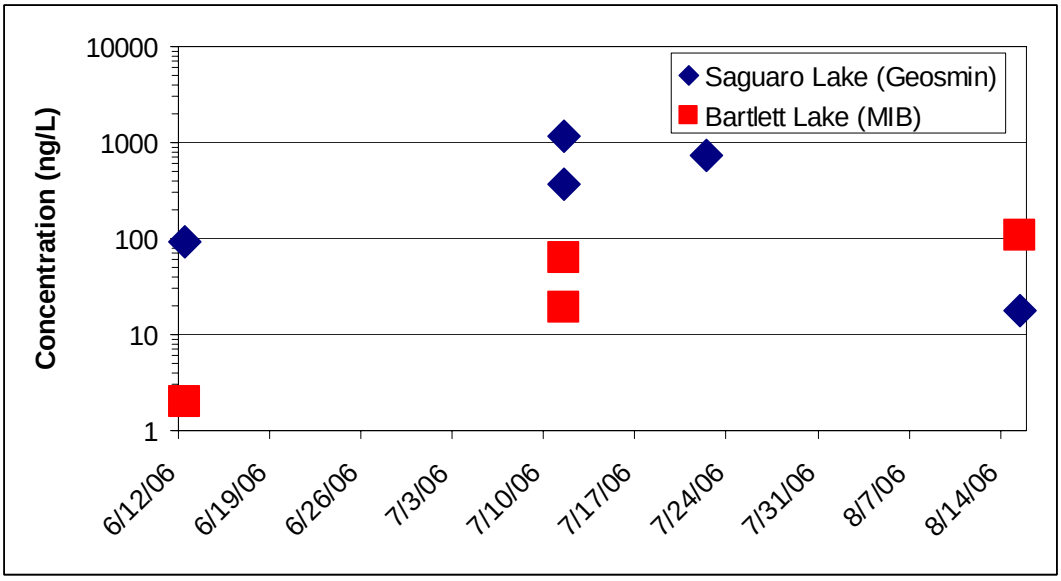


Table 5 - SRP/CAP OPERATIONS

Values in cfs, for August 14, 2006

System	SRP Diversions	CAP
Arizona Canal	688	200
South Canal	580	210
Pumping	101	0
Total	1369	410

SRP is releasing water from both Verde and Salt River Systems. Salt River release from Saguaro Lake: 759 cfs; Verde River release from Bartlett Lake: 100 cfs.

ORGANIC MATTER DATA

Table 5 - Water Treatment Plants – August 15, 2006

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA
24th Street WTP Inlet	5.11	0.0905	1.8
24th Street WTP Treated	3.55	0.0441	1.2
Deer Valley Inlet	5.45	0.1142	2.1
Deer Valley WTP Treated	3.81	0.0509	1.3
Val Vista Inlet	4.84	0.0895	1.8
Val Vista WTP Treated –East	3.13	0.0320	1.0
Val Vista WTP Treated -West	2.80	0.0280	1.0
Union Hills Inlet	4.91	0.0583	1.2
Union Hills Treated	3.26	0.0282	0.9
Tempe North Inlet	4.82	0.0934	1.9
Tempe North Plant Treated	3.64	0.0461	1.3
Tempe South WTP	4.66	0.0822	1.8
Tempe South Plant Treated	3.39	0.0426	1.3
Tempe South Plant Treated (Lab sample)	3.43	0.0462	1.3
Tempe South Plant Filter Effluent (Lab sample)	3.39	0.0326	1.0
Chandler WTP Inlet			
Chandler WTP Treated			
Greenway WTP Inlet	6.21	0.1542	2.5
Greenway WTP Treated	3.89	0.0385	1.0

System	Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA
CAP	Waddell Canal	3.68	0.0584	1.6
	Union Hills Inlet	4.91	0.0583	1.2
	CAP Canal at Cross-connect			
AZ Canal	Salt River @ Blue Pt Bridge	5.23	0.1094	2.1
	Verde River @ Beeline	2.74	0.0859	3.1
	AZ Canal above CAP Cross-connect	4.20	0.0494	1.2
	AZ Canal below CAP Cross-connect	5.05	0.0982	1.9
	AZ Canal at Highway 87	4.96	0.0962	1.9
	AZ Canal at Pima Rd.	4.53	0.0956	2.1
	AZ Canal at 56th St.	4.94	0.0908	1.8
	AZ Canal - Inlet to 24th Street WTP	5.11	0.0905	1.8
	AZ Canal - Central Avenue	4.63	0.1156	2.5
	AZ Canal - Inlet to Deer Valley WTP	5.45	0.1142	2.1
	AZ Canal - Inlet to Greenway WTP	6.21	0.1542	2.5
South and Tempe Canals	South Canal below CAP Cross-connect	5.18	0.1054	2.0
	South Canal at Val Vista WTP	4.84	0.0895	1.8
	Head of the Tempe Canal	4.16	0.0895	2.1
	Tempe Canal - Inlet to Tempe's South Plant	4.66	0.0822	1.8
	Chandler WTP – Inlet			

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA
Lake Pleasant	Eplimnion	4.05	0.0538	1.3
Lake Pleasant	Hypolimnion	3.87	0.0467	1.2
Verde River @ Beeline		2.74	0.0859	3.1
Bartlett Reservoir	Epilimnion	2.70	0.0352	1.3
Bartlett Reservoir	Epi-near dock			
Bartlett Reservoir	Hypolimnion	1.86	0.0499	2.7
Salt River @ BluePt Bridge		5.23	0.1094	2.1
Saguaro Lake	Epilimnion	6.14	0.1056	1.7
Saguaro Lake	Epi - Duplicate	5.96	0.1043	1.8
Saguaro Lake	Epi-near doc			
Saguaro Lake	Hypolimnion	5.36	0.1056	2.0
Verde River at Tangle		1.54	0.0376	2.4
Havasu		15.71	0.0447	0.3

Havasu datapoint is questionable

ADDITIONAL INFORMATION

I. Outcome of a recent DBP conference focusing on health effects

Research is confirming that THMs form bladder cancer. Research is less certain that THMs result in reproductive health effects. Iodinated DBPs and nitrogenous DBPs are among the toxic and efforts should be made to measure these DBPs.

II. Iodinated THMs form Medicinal Taste/Odor in finished water

An Odor Intensity of 1 (indicative that compound can be noticed) for iodoform (CHI_3) occurs at 0.5 μg/L.

Iodide (I^-) is naturally occurring – probably at levels of 2 to 20 μg/L in central Arizona – but good data is not available – DO YOU HAVE ANY DATA ON IODIDE? If so – please email data to p.westerhoff@asu.edu .

During chlorination (HOCl) the following reactions occur and produce Iodate and/or iodoform:

$I^- + HOCl \rightarrow HOI + Cl^-$
$HOI + HOCl \rightarrow IO_3^-$
$HOI + TOC \rightarrow CHI_3$

III. Is bottled water safe?

We have begun an investigation of bottled water. A recent publication suggests that antimony (Sb) leaches from PET plastic that is used in nearly all bottled water. The reported levels were 0.1 to 0.5 μg/L; **the MCL for antimony is 6 μg/L**. Antimony is used as a catalyst in making PET plastics.

ASU measured 14 bottled waters purchased in the metro-Phoenix region and also found 0.1 to 0.5 μg/L of antimony.

Then ASU took the bottled water and heated the water and exposed it to UV light. In both cases antimony levels increased.

Test Conditions	**Antimony level**
Control (room temperature / dark)	0.4 ppb
Hold at 80 C for 48 hours	**12 ppb**
Expose to UV lamp for 2 hours	4 ppb

We understand that 80 C is hot – but so are our cars and garages. We are now conducting tests at 40 C and 60C. Additional tests in sunlight in Arizona are also underway.

IV. Preliminary agenda for September 15th

If you want to attend – PLEASE RSVP to p.westerhoff@asu.edu
Pass this invitation along to others

REGIONAL WATER QUALITY WORKSHOP: ALGAE ASSOCIATED ISSUES

FRIDAY SEPTEMBER 15, 2006

Time: 8:30 am to 11 am
Location: Historic City Hall - Subcommittee Room (2nd Floor)
17 S. 2nd Avenue (2nd Avenue and Washington)

Purpose: Provide a forum to review and discuss on-going regional water quality issues, in particular algae-associated issues.

MEETING SCHEDULE

8:30 Introductions

8:45 Overview of T&O issues for 2006

9:15 T&O control by PAC and GAC

9:30 DOC and DBP Issues for 2006

10am break

10:15 Emerging Sensors & Probes:
- Culprit Algae
- Arsenic
- DBPs

10:45 Discussion on locating Water Quality Sensors – Let's get this done

10:50 Future directions & discussion

11:00 Meeting adjournment