Regional Water Quality NEWSLETTER

DATE: Report for February 13-14, 2006
Samples Collected on February 16, 2006
From the Phoenix, Tempe, Peoria, CAP, SRP – ASU Regional Water Quality Partnership

PLEASE NOTE THE WEBADDRESS HAS CHANGED FOR OUR PROJECT:
http://enpub.fulton.asu.edu/pwest/tasteandodor.htm

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SUMMARY: EVALUATION AND RECOMMENDATIONS

1. The reservoirs are not yet thermally stratified
2. MIB and geosmin concentrations are low throughout the water supply system
3. This year we are including DOC data and a section on predicting relative DBP trends – comments are welcome: tell us what you would like to see.
4. A final section evaluates how T&O can be produced in water distribution systems.
5. Thanks to everyone's interest and continued involvement funding has been approved from all participating agencies through all or at least part of 2006 already.

Table 1 Summary of WTP Operations

	Union Hills	56th Street WTP	North Tempe	Deer Valley	Peoria WTP	Val Vista	South Tempe	Chandler WTP
Location	**CAP**	**Arizona Canal System**				**South Canal system**		
PAC Type and Dose	No	No		No		Norit 20b 2.55ppm to remove old PAC	No	
Copper Sulfate	No	No		No		No	No	
PreOxidation	No	No		No		2.25 ppm Cl2 24/7	1.2 ppm NaOCl	
Alum Dose Alkalinity pH	15 ppm 137 ppm 7.5	35 ppm 220 7.0		10/25 ppm 212/162ppm 7.00		38 ppm 202 ppm 8.1	26.1 ppm 212 ppm 8.11	
WTP Comments	No T&O complaints	No T&O complaints		No T&O complaints		No T&O complaints	No T&O complaints	
Process Recomendations			Off-line until April		Plant is off-line until Feb 15th			

Jennifer Calles/City of Phoenix stated that they City received ~ 60 complaints in January. It was unclear if these were all T&O related, and if so how many were earthy-musty, or if it was associated with changes in water quality due to canal shutdowns/maintanence.

MONITORING RESULTS

Table 2 - Water Treatment Plants – February 13, 2006

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
24th Street WTP Inlet	**3.0**	**2.9**	**<2.0**
24th Street WTP Treated	**2.4**	**3.2**	**<2.0**
Deer Valley Inlet	**2.5**	**2.9**	**<2.0**
Deer Valley WTP Treated	**3.0**	**3.7**	**<2.0**
Val Vista Inlet	**<2.0**	**3.4**	**<2.0**
Val Vista WTP Treated –East	**<2.0**	**3.4**	**<2.0**
Val Vista WTP Treated -West			
Union Hills Inlet	**<2.0**	**2.3**	**<2.0**
Union Hills Treated	**<2.0**	**2.9**	**<2.0**
Tempe North Inlet			
Tempe North Plant Treated			
Tempe South WTP	**2.1**	**2.6**	**<2.0**
Tempe South Plant Treated	**2.4**	**3.2**	**<2.0**
Chandler WTP Inlet	**<2.0**	**<2.0**	**<2.0**
Chandler WTP Treated	**<2.0**	**<2.0**	**<2.0**
Greenway WTP Inlet			
Greenway WTP Treated			

Table 3 - Canal Sampling – February 13, 2006

System	Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
CAP	Waddell Canal	**<2.0**	**2.5**	**<2.0**
	Union Hills Inlet	**<2.0**	**2.3**	**<2.0**
	CAP Canal at Cross-connect	**2.8**	**2.8**	**<2.0**
AZ Canal	Salt River @ Blue Pt Bridge	**2.7**	**3.5**	**<2.0**
	Verde River @ Beeline	**2.6**	**3.0**	**<2.0**
	AZ Canal above CAP Cross-connect			
	AZ Canal below CAP Cross-connect	**3.0**	**3.1**	**<2.0**
	AZ Canal at Highway 87	**<2.0**	**3.4**	**<2.0**
	AZ Canal at Pima Rd.	**<2.0**	**3.4**	**<2.0**
	AZ Canal at 56th St.	**2.1**	**3.7**	**<2.0**
	AZ Canal - Inlet to 24th Street WTP	**3.0**	**2.9**	**<2.0**
	AZ Canal - Central Avenue	**<2.0**	**3.3**	**<2.0**
	AZ Canal - Inlet to Deer Valley WTP	**2.5**	**2.9**	**<2.0**
	AZ Canal - Inlet to Greenway WTP	**3.0**	**3.7**	**<2.0**
South and Tempe Canals	South Canal below CAP Cross-connect	**3.0**	**3.1**	**<2.0**
	South Canal at Val Vista WTP	**2.0**	**2.7**	**<2.0**
	Head of the Tempe Canal	**2.2**	**2.4**	**<2.0**
	Tempe Canal - Inlet to Tempe's South Plant	**2.1**	**2.6**	**<2.0**
	Chandler WTP – Inlet	**<2.0**	**<2.0**	**<2.0**

Table 4 - Reservoir Samples – February 14, 2006

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant (January)	Eplimnion	**2.2**	**2.2**	**<2.0**
Lake Pleasant	Hypolimnio	**2.7**	**<2.0**	**<2.0**
Lake Pleasant (February)	Eplimnion	**<2.0**	**<2.0**	**<2.0**
Lake Pleasant	Hypolimnio	**2.1**	**<2.0**	**<2.0**
Verde River @ Beeline		**2.7**	**3.5**	**<2.0**
Bartlett Reservoir	Epilimnion	**<2.0**	**2.8**	**<2.0**
Bartlett Reservoir	Epi-near dock	**<2.0**	**3.1**	**<2.0**
Bartlett Reservoir	Hypolimnio	**<2.0**	**2.3**	**<2.0**
Salt River @ BluePt Bridge		**2.7**	**3.5**	**<2.0**
Saguaro Lake	Epilimnion	**<2.0**	**2.9**	**<2.0**
Saguaro Lake	Epi - Duplicate	**<2.0**	**3.0**	**<2.0**
Saguaro Lake	Epi-near doc	**<2.0**	**3.1**	**<2.0**
Saguaro Lake	Hypolimnio	**<2.0**	**4.7**	**<2.0**
Verde River at Tangle (January)		**4.2**	**3.5**	**<2.0**
Havasu (January)		**<2.0**	**2.7**	**<2.0**
Havasu (February)		**<2.0**	**3.8**	**<2.0**

Table 5 - SRP/CAP OPERATIONS

Values in cfs, for February 13, 2006

System	SRP Diversions	CAP
Arizona Canal	348	0
South Canal	379	0
Pumping	59	0
Total	786	0

SRP is releasing water from both Verde and Salt River Systems. Salt River release from Saguaro Lake: 8 cfs; Verde River release from Bartlett Lake: 817 cfs. Horseshoe Lake is at 0% capacity.

New Section- Understanding and Monitoring for DBPs

Once a month we will try to expand on our current monitoring data and understanding of DBP predictions. DOC and UVA254 data for select sites are presented below. As a tool we are starting to calibrate a "representative" WTP using a EPA tool (WTP.exe). Any comments you have will be incorporated into next months version.

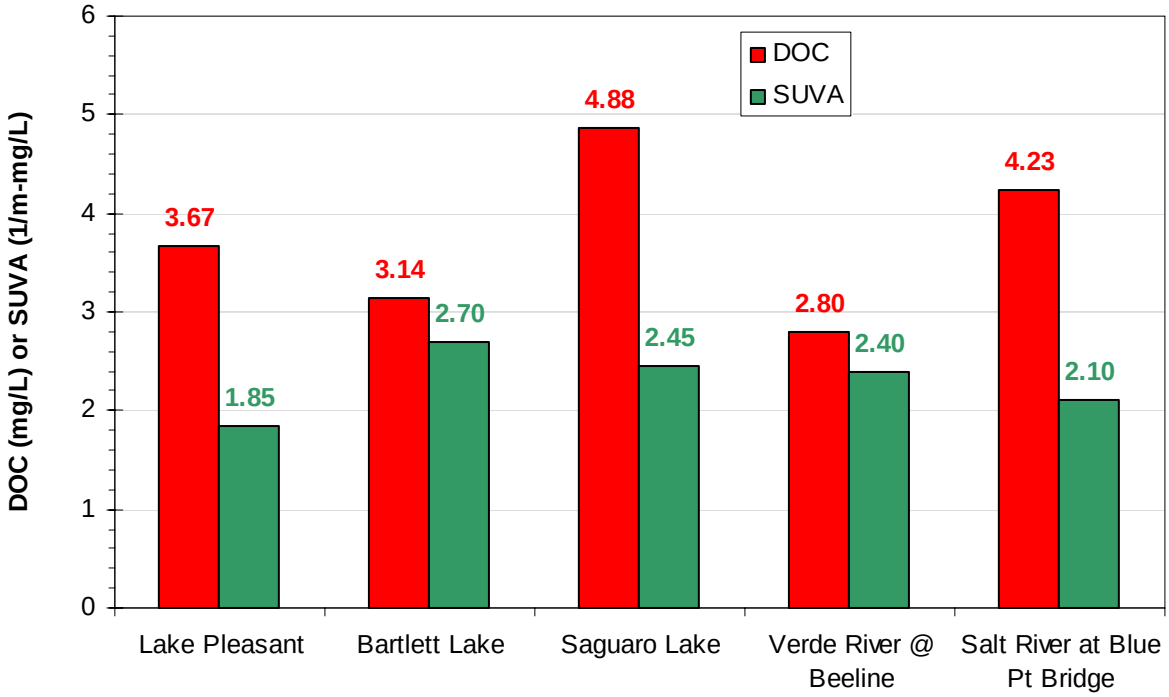
Water Quality Summary for Raw, Finished, and Distributed Water
At Plant Flow (10.0 MGD) and Influent Temperature (12.0 C)

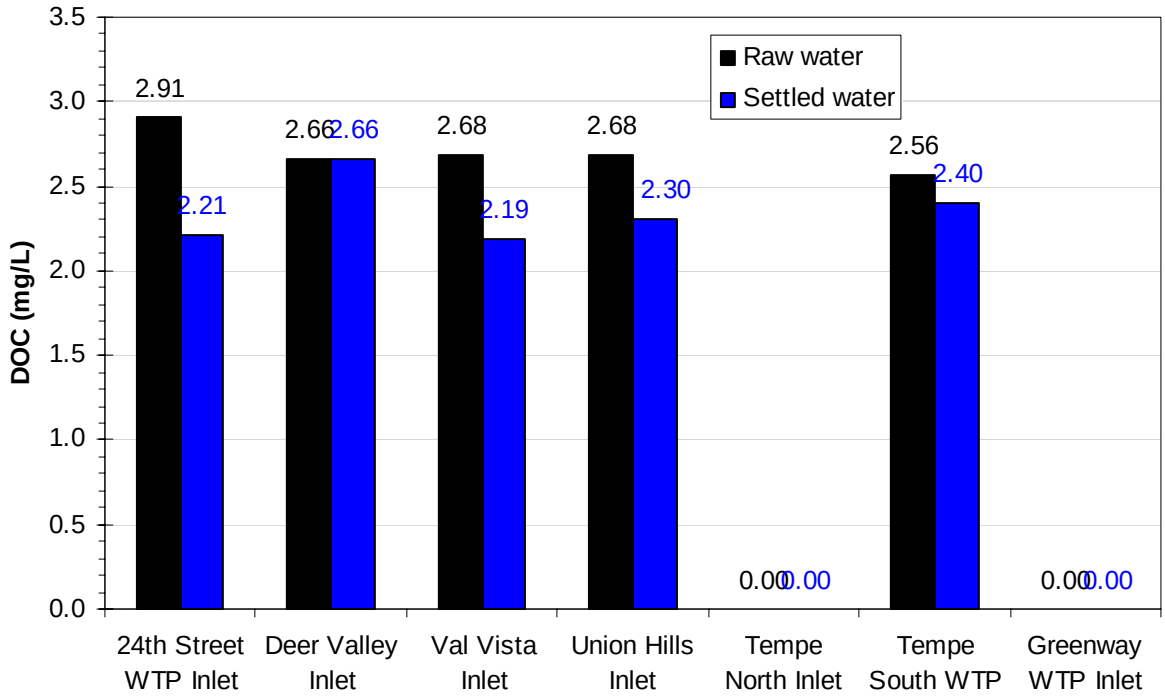
Parameter	Units	Raw Water	Effluent	Avg. Tap	End of Sys
pH	(-)	8.0	7.3	7.3	7.3
Alkalinity	(mg/L as CaCO3)	200	181	181	181
TOC	(mg/L)	3.0	2.5	2.5	2.5
UV	(1/cm)	0.060	0.029	0.029	0.029
(T)SUVA	(1/cm)	2.0	1.1	1.1	1.1
Ca Hardness	(mg/L as CaCO3)	100	100	100	100
Mg Hardness	(mg/L as CaCO3)	20	20	20	20
Ammonia-N	(mg/L)	0.01	0.00	0.00	0.00
Bromide	(ug/L)	100	77	65	49
Free Cl2 Res.	(mg/L as Cl2)	0.0	3.1	2.3	1.0
Chloramine Res.	(mg/L as Cl2)	0.0	0.0	0.0	0.0
TTHMs	(ug/L)	0	39	58	83
HAA5	(ug/L)	0	38	46	55
HAA6	(ug/L)	0	46	56	67
HAA9	(ug/L)	0	52	70	93
TOX	(ug/L)	0	185	240	302
Bromate	(ug/L)	0	0	0	0
Chlorite	(mg/L)	0.0	0.0	0.0	0.0
TOC Removal	(percent)		15		

Predicted Water Quality Profile
At Plant Flow (10.0 MGD) and Influent Temperature (12.0 C)

Location	pH (-)	TOC (mg/L)	UVA (1/cm)	(T)SUVA (L/mg-m)	Cl2 (mg/L)	NH2Cl (mg/L)	Residence Time Process (hrs)	Residence Time Cum. (hrs)
Influent	8.0	3.0	0.060	2.0	0.0	0.0	0.00	0.00
Chlorine (Gas)	7.8	3.0	0.042	1.4	2.1	0.0	0.00	0.00
Alum	7.4	3.0	0.042	1.4	2.1	0.0	0.00	0.00
Rapid Mix	7.4	2.5	0.029	1.1	1.8	0.0	0.02	0.02
Flocculation	7.4	2.5	0.029	1.1	1.7	0.0	0.10	0.11
Settling Basin	7.4	2.5	0.029	1.1	1.6	0.0	0.40	0.51
Filtration	7.4	2.5	0.029	1.1	1.6	0.0	0.07	0.58
Ammonia	7.4	2.5	0.029	1.1	1.6	0.0	0.00	0.58
Chlorine (Gas)	7.3	2.5	0.029	1.1	4.1	0.0	0.00	0.58
Contact Tank	7.3	2.5	0.029	1.1	3.1	0.0	2.40	2.98
WTP Effluent	7.3	2.5	0.029	1.1	3.1	0.0	0.00	2.98
Average Tap	7.3	2.5	0.029	1.1	2.3	0.0	24.00	26.98
End of System	7.3	2.5	0.029	1.1	1.0	0.0	168.00	170.98

Here is this months DOC and specific ultraviolet absorbance (SUVA) data:



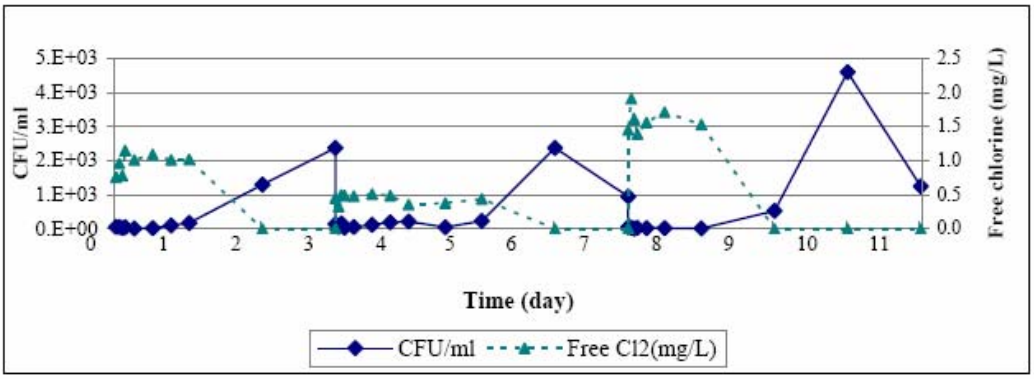


MIB Production in Water Distribution Systems (from Actinomycetes)

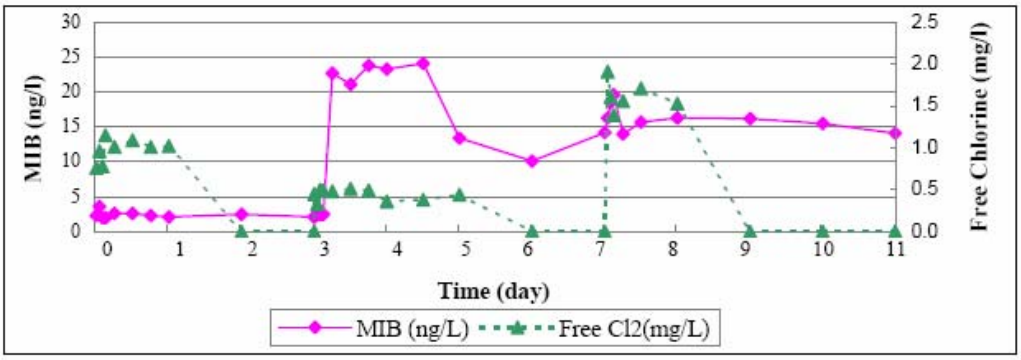
ASU and Phoenix are preparing an AwwaRF final report that in part looks at MIB production in distribution systems (after leaving the WTP). Experiments were conducted in a lab-setup continuous flow pipeloop system at ASU. The system receives City of Tempe tap water and has two parallel systems (1 PVC and 1 cast iron). Actinomyctes were spiked into the system, to simulate intrusion of soil or other events. Some representative and interesting data is included that may shed light onto how we treat T&O events that we think are caused by biofilms in the distribution system.

Figures A &B are for cast-iron pipeloops and C&D are for PVC pipe-loops. Chlorine was cycled in on-off modes for a few days to simulate parts of distribution systems with low chlorine residual. In the cast iron system the loss of chlorine resulted in an increase of actinomycetes in the flowing water. Subsequent chlorine addition reduced the number of actinomycetes in the flowing water, but increased MIB concentrations by 20 ng/L. So the chlorine inactivated the actinomycete, and as a consequence caused them to release MIB. The same pattern was observed in the PVC pipeloop.

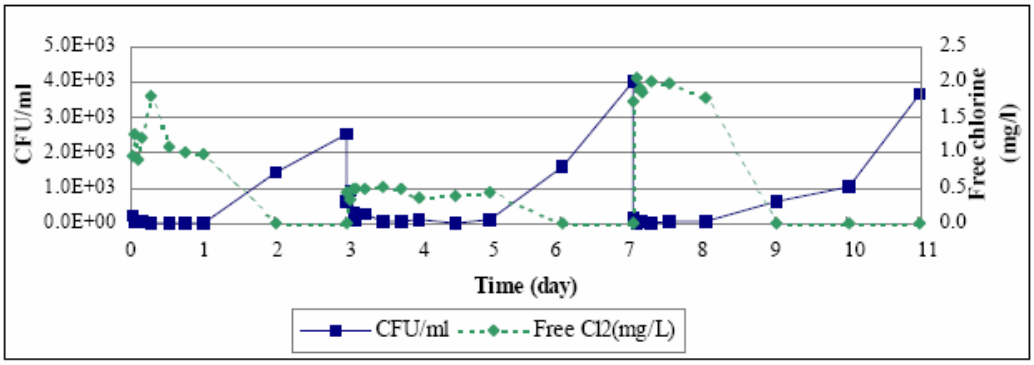
What does this mean? If a utility has parts of a water distribution system with low chlorine residuals, cycles of chlorine-no chlorine exposure can be causing actinomcyetes in the biofilm and flowing water to proliferate and then release MIB when they become inactivated. This can lead to sudden spikes in MIB, which may not be present when cities collect samples from houses of customers that file complaints.



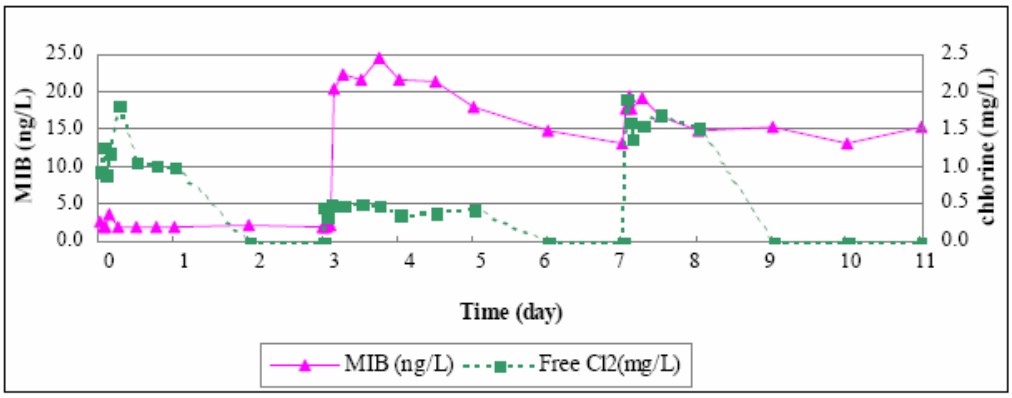
A. Concentrations of actinomycetes in flowing water in cast-iron during chlorination and rechlorination



B. Concentrations of MIB in flowing water in cast-iron during chlorination and rechlorination



C. Concentrations of actinomycetes in flowing water in PVC during chlorination and rechlorination



D. Concentrations of MIB in flowing water in PVC during chlorination and rechlorination