

# REGIONAL WATER QUALITY NEWSLETTER

DATE: Report for October 2009

Sampling conducted October 5 & 6, 2009

A Phoenix, Tempe, Glendale, 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. MIB is above 10 ng/L in SRP and CAP canals (range: 12 to 19 ng/L. This is a level if not removed is noticeable to consumers.
2. The lakes are destratified and high levels of MIB are present: 19 ng/L in Lake Pleasant, ~ 50 ng/L in Bartlett Lake and 20 to 50 ng/L in Saguaro Lake. We expect to see degradation of MIB in the lakes at a rate of about 1 ng/L/day. So we may have elevated MIB levels for about 1 month.
3. **Deer Valley WTP was *not* adding PAC, and no MIB removal was observed** compared to other WPTs where MIB was removed if PAC was added. Surprisingly, MIB levels at Union Hills WTP were low in the finished effluent even though PAC is typically not added there. Input from Union Hills Operators would be useful on their thoughts.
4. SRP has switched over to the Verde River (Bartlett Lake) earlier than normal (usually in mid-November). The Verde River has lower DOC than the Salt River, which is good for reducing THM production.
5. Pharmaceuticals continue to be an issue in the Colorado River, and the flu drug Tamiflu has been detected in wastewaters
6. Thank you everyone for a productive September workshop – our slides are on our website

**Table 1a Summary of WTP Operations August 3, 2009**

	Verde WTP	Union Hills	24 <sup>th</sup> Street WTP	N.Tempe J.G. Martinez	Deer Valley	Glendale Cholla WTP <sup>3</sup>	Peoria Greenway WTP	Val Vista	South Tempe
	Verde River	CAP Canal	Arizona Canal					South Canal	
PAC Type and Dose			Calgon WPH 15 ppm	Aqua Nuchar 20 ppm	None	No	Uses GAC caps		AquaNuchar 15 ppm
Copper Sulfate			0.5 ppm	No	No	No	No		No
PreOxidation			No	No	No	No	Ozone 1.8 mg/L		No
Alum Dose Alkalinity pH			50ppm 172/142 6.8	38 ppm 172 7.4	49 ppm 133 7.0	20 ppm 170 7.6	20 ppm 160 7.3		40 134 7.2
Finished water DOC DOC removal <sup>2</sup>		2.3 mg/L 22%	2.3 mg/L 43%	2.7 mg/L 32%	2.9 mg/L 26%	3.0 mg/L 30%	3.1 mg/L 15%	~ 2 mg/L 45%	2.1 mg/L 44%
Average turbidity over last 7 days			5-6 ntu	10 ntu	5 ntu	3.4	4.5		3
Notes from operators									
Recommendations	Deer Valley should add PAC if possible – because MIB levels in effluent are above 10 ng/L. Other WTPs adding PAC are maintaining MIB below 10 ng/L. Despite adding similar or more alum than upstream WTPs, Deer Valley has lower DOC removals – this may be evidence of some synergistic DOC removal by alum + PAC at the other plants too.								

<sup>1</sup> Ferric chloride instead of alum; plus ppm sulfuric acid

<sup>2</sup> Calculated based upon influent and filtered water DOC (note that DOC and not TOC is used in this calculation)

<sup>3</sup> Sample from finished water includes a blend of surface and ground water sources sometimes

**Chandler WTP: No PAC (uses GAC capped filters), 30 ppm Alum at pH 7.2 for coagulation**

**Table 1**  
**SRP/CAP OPERATIONS** - Values in cfs, for October 5, 2009

<b>System</b>	<b>SRP Diversions</b>	<b>CAP</b>
Arizona Canal	610	0
South Canal	574	0
Pumping	67	0
Total	1251	0

- **SRP is releasing water from both Verde and Salt River Systems.** Salt River release from Saguaro Lake: 452 cfs; Verde River release from Bartlett Lake: 925 cfs. This is a very Early release of Bartlett Lake water – usually the switch-over to Bartlett Lake occurs in mid-november.

<b>Table 2 - Water Treatment Plants – October 5, 2009</b>			
<b>Sample Description</b>	<b>MIB (ng/L)</b>	<b>Geosmin (ng/L)</b>	<b>Cyclocitral (ng/L)</b>
24 <sup>th</sup> Street WTP Inlet	11.1	12.4	<2.0
24 <sup>th</sup> Street WTP Treated	8.2	4.4	<2.0
Deer Valley Inlet	13.6	16.4	<2.0
Deer Valley WTP Treated	14.2	14.2	<2.0
Val Vista Inlet	14.4	4.5	<2.0
Val Vista WTP Treated –East	4.6	<2.0	<2.0
Val Vista WTP Treated -West	4.4	<2.0	<2.0
Union Hills Inlet	11.3	2.0	<2.0
Union Hills Treated	<2.0	<2.0	<2.0
Tempe North Inlet	15.5	13.1	<2.0
Tempe North Plant Treated	4.8	4.4	<2.0
Tempe South WTP	17.4	4.1	<2.0
Tempe South Plant Treated	5.5	<2.0	<2.0
Greenway WTP Inlet	14.8	6.6	<2.0
Greenway WTP Treated	<2.0	2.8	<2.0
Glendale WTP Inlet	13.4	11.9	<2.0
Glendale WTP Treated	<2.0	<2.0	<2.0
Glendale WTP Treated (Lab)			

MIB plus geosmin levels above 10 ng/L in finished water lead to noticeable earthy-musty odors by customers. Currently MIB+geosmin levels are near or slightly above 10 ng/L in several WTPs. However, treatment with PAC or GAC is bringing these levels down to less noticeable levels.

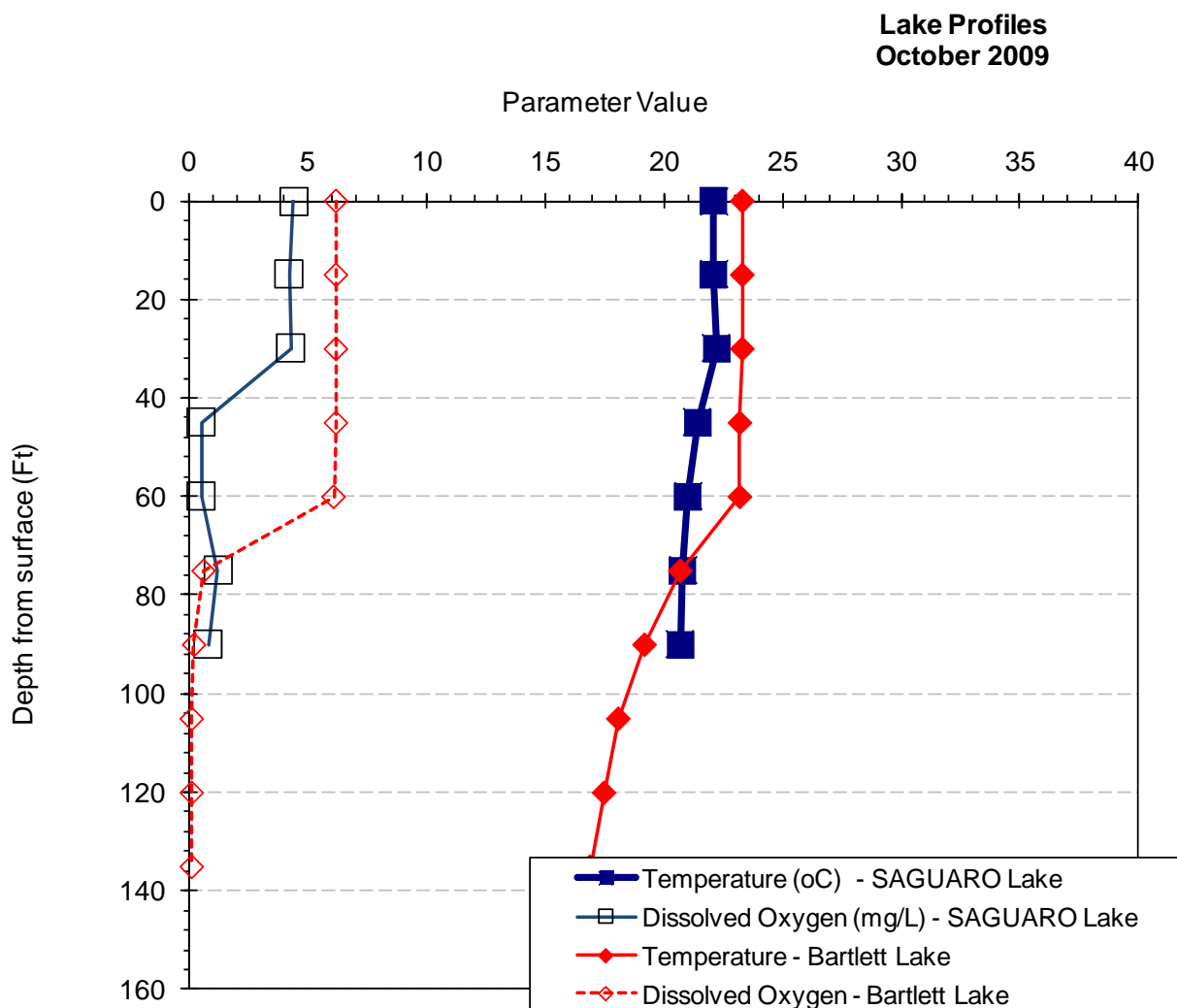
#### **All source waters now have MIB above 10 ng/L**

**Deer Valley WTP was *not* adding PAC, and no MIB removal was observed** compared to other WTPs where MIB was removed if PAC was added. Surprisingly, MIB levels at Union Hills WTP were low in the finished effluent even though PAC is typically not added there. Input from Union Hills Operators would be useful on their thoughts.

<b>Table 3 - Canal Sampling – October 5, 2009</b>				
<b>System</b>	<b>Sample Description</b>	<b>MIB (ng/L)</b>	<b>Geosmin (ng/L)</b>	<b>Cyclocitral (ng/L)</b>
CAP	Waddell Canal	10.4	2.2	<2.0
	Union Hills Inlet	11.3	2.0	<2.0
	CAP Canal at Cross-connect			
AZ Canal	Salt River @ Blue Pt Bridge	25.4	4.1	<2.0
	Verde River @ Beeline	10.6	3.1	<2.0
	AZ Canal above CAP Cross-connect			
	AZ Canal below CAP Cross-connect	13.8	4.4	<2.0
	AZ Canal at Highway 87	12.4	6.3	<2.0
	AZ Canal at Pima Rd.	18.5	14.1	<2.0
	AZ Canal at 56th St.	13.7	11.6	<2.0
	AZ Canal - Inlet to 24 <sup>th</sup> Street WTP	11.1	12.4	<2.0
	AZ Canal - Central Avenue	11.6	14.6	<2.0
	AZ Canal - Inlet to Deer Valley WTP	13.6	16.4	<2.0
	AZ Canal - Inlet to Glendale WTP	13.4	11.9	<2.0
South and Tempe Canals	South Canal below CAP Cross-connect	11.1	3.4	<2.0
	South Canal at Val Vista WTP	14.4	4.5	<2.0
	Head of the Tempe Canal	18.2	5.2	<2.0
	Tempe Canal - Inlet to Tempe's South Plant	17.4	4.1	<2.0

<b>Table 4 - Reservoir Samples – October 6, 2009</b>				
<b>Sample Description</b>	<b>Location</b>	<b>MIB (ng/L)</b>	<b>Geosmin (ng/L)</b>	<b>Cyclocitral (ng/L)</b>
Lake Pleasant (September09)	Eplimnion	<2.0	<2.0	<2.0
Lake Pleasant (September09)	Hypolimnion	18.9	<2.0	<2.0
Verde River @ Beeline		10.6	3.1	<2.0
Bartlett Reservoir	Epilimnion	46.1	2.5	<2.0
Bartlett Reservoir	Epi-near dock	40.7	2.2	<2.0
Bartlett Reservoir	Hypolimnion	49.4	2.7	<2.0
Salt River @ BluePt Bridge		25.4	4.1	<2.0
Saguaro Lake	Epilimnion	50.0	5.4	<2.0
Saguaro Lake	Epi - Duplicate	56.3	5.7	<2.0
Saguaro Lake	Epi-near dock	52.0	5.4	<2.0
Saguaro Lake	Hypolimnion	20.2	<2.0	<2.0
Verde River at Tangle Creek				

MIB and geosmin levels are now detectable in the reservoirs and rivers . The reservoirs are thermally destratified which means water mixes over the complete depth of the lake easily (e.g., wind action). There is rapid biodegradation occurring in the lakes as nutrients are being mixed with depth. This is apparent by the low dissolved oxygen deeper in the lake. As bacteria degrade organics they consume dissolved oxygen from the water. We have observed MIB to also biodegrade, at a rate of about 1 ng/L per day in the past.



## Organic Matter Status In the Treatment Plants

<b>Table 2 - Water Treatment Plants – October 05, 2009</b>						
<b>Sample Description</b>	<b>DOC (mg/L)</b>	<b>UV254 (1/cm)</b>	<b>SUVA (L/mg-m)</b>	<b>TDN</b>		<b>DOC removal (%)</b>
24 <sup>th</sup> Street WTP Inlet	3.94	0.095	2.40	0.29		
24 <sup>th</sup> Street WTP Treated	2.26	0.034	1.51	0.19		43
Deer Valley Inlet	3.94	0.099	2.52	0.29		
Deer Valley WTP Treated	2.91	0.051	1.73	0.28		26
Val Vista Inlet	3.91	0.095	2.44	0.38		
Val Vista WTP Treated –East	2.21	0.043	1.94	0.28		43
Val Vista WTP Treated -West	1.86	0.029	1.56	0.25		52
Union Hills Inlet	2.89	0.042	1.46	0.48		
Union Hills Treated	2.26	0.022	0.96	0.42		22
Tempe North Inlet	3.96	0.095	2.39	0.30		
Tempe North Plant Treated	2.70	0.049	1.80	0.24		32
Tempe South WTP	3.72	0.091	2.46	0.39		
Tempe South Plant Treated	2.09	0.031	1.48	0.24		44
Greenway WTP Inlet	3.72	0.094	2.53	0.97		
Greenway WTP Treated	3.14	0.030	0.95	1.47		15
Glendale WTP Inlet	4.24	0.102	2.41	0.33		
Glendale WTP Treated	2.96	0.057	1.93	0.45		30

**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)**

### Organic Matter Status In the Canals

<b>Sample Description</b>	<b>DOC (mg/L)</b>	<b>UV254 (1/cm)</b>	<b>SUVA (L/mg-m)</b>	<b>TDN</b>
Waddell Canal	3.04	0.044	1.43	0.54
Union Hills Inlet	2.89	0.042	1.46	0.48
CAP Canal at Cross-connect				
Salt River @ Blue Pt Bridge	4.80	0.099	2.07	0.39
Verde River @ Beeline	3.57	0.091	2.56	0.36
AZ Canal above CAP Cross-connect				
AZ Canal below CAP Cross-connect	3.83	0.094	2.44	0.35
AZ Canal at Highway 87	3.96	0.096	2.41	0.36
AZ Canal at Pima Rd.	3.93	0.095	2.41	0.32
AZ Canal at 56th St.	3.96	0.098	2.48	0.30
AZ Canal - Inlet to 24 <sup>th</sup> Street WTP	3.94	0.095	2.40	0.29
AZ Canal - Central Avenue	3.94	0.097	2.45	0.30
AZ Canal - Inlet to Deer Valley WTP	3.94	0.099	2.52	0.29
AZ Canal - Inlet to Glendale WTP	4.24	0.102	2.41	0.33
AZ Canal - Inlet to Greenway WTP	3.72	0.094	2.53	0.97
South Canal below CAP Cross-connect	3.82	0.094	2.46	0.36
South Canal at Val Vista WTP	3.91	0.095	2.44	0.38
Head of the Tempe Canal	3.78	0.094	2.48	0.35
Tempe Canal - Inlet to Tempe's South Plant	3.72	0.091	2.46	0.39



## Reservoirs

<b>Table 4 - Reservoir Samples – October 05, 2009</b>					
<b>Sample Description</b>	<b>Location</b>	<b>DOC (mg/L)</b>	<b>UV254 (1/cm)</b>	<b>SUVA (L/mg-m)</b>	<b>TDN</b>
Lake Pleasant	Epilimnion				
Lake Pleasant	Hypolimnion				
Verde River @ Beeline		<b>3.57</b>	<b>0.091</b>	<b>2.56</b>	<b>0.36</b>
Bartlett Reservoir	Epilimnion	<b>1.07</b>	<b>0.069</b>	<b>6.43</b>	<b>0.16</b>
Bartlett Reservoir	Epi-near dock				
Bartlett Reservoir	Hypolimnion	<b>2.87</b>	<b>0.068</b>	<b>2.35</b>	<b>0.54</b>
Salt River @ BluePt Bridge		<b>4.80</b>	<b>0.099</b>	<b>2.07</b>	<b>0.39</b>
Saguaro Lake	Epilimnion	<b>3.62</b>	<b>0.102</b>	<b>2.80</b>	<b>0.27</b>
Saguaro Lake	Epi - Duplicate	<b>3.67</b>	<b>0.100</b>	<b>2.72</b>	<b>0.28</b>
Saguaro Lake	Epi-near doc				
Saguaro Lake	Hypolimnion	<b>5.60</b>	<b>0.101</b>	<b>1.80</b>	<b>0.53</b>

- We are rerunning some of the lake TOC data because the values between Sept and Oct show significant variation, although UVA data did not change.

## **'Intersex' fish found in Colorado**

Study: Pollutants causing male bass to develop female sex organs

*This was sent by Tim Kacerek/CAP*

By DICK KAMP / Wick Communications Environmental Liaison  
Sunday, September 20, 2009 8:02 PM MST  
Lake Havasu News-Herald

Early studies indicate various pollutants, drugs, cosmetics and household products in the Colorado River can cause some male bass to have partially developed female organs inside.

This phenomenon of occasional female organ growth in males, is called "intersex."

A nationwide study of sexual fish aberrations by the U.S. Geological Survey found that 40 percent of smallmouth bass and one-third of largemouth bass sampled in the Colorado River were intersex. The Colorado River data were from 2003, and nationwide it covered the period 1995-2004.

The pollutants and various chemicals affect hormone activity in animals and humans are collectively called endocrine disruptors or endocrine active compounds.

The Colorado River Regional Sewage Coalition has been concerned with the presence of the endocrine disruptors, particularly because Colorado River water is consumed by millions in Arizona, Nevada and California.

One member of CRRSCO, Southern Nevada Water Authority, has been testing for chemicals in Lake Mead and Las Vegas drinking water. Monitoring has shown that levels of a number of endocrine disruptors exist in drinking water for Las Vegas at substantial percentages of levels that are detected in Lake Mead near the sewage outfall.

For example, the popular insect repellant DEET and the herbicide atrazine have been detected (at low unregulated levels in parts per trillion) when sampled in both the lake and potable Las Vegas drinking water.

SNWA also is assisting Lake Havasu City Water Resources Coordinator Doyle Wilson to sample for endocrine disruptors in Lake Havasu as well as in water supply wells and a huge sewage storage repository two miles from the lake constructed within the last two years. Doyle said that his principal concern with the USGS study is that the fish data are already dated.

Wilson added that CRRSCO is pinning some of its hopes for future monitoring of endocrine disruptors and many pollutants on the Lower Colorado River Protection Act, which was introduced July 31 by Rep. Raul Grijalva, D-Ariz. The bill would create and implement an EPA-overseen, long-term plan to protect water quality in the lower Colorado to prevent and eliminate pollution with continuous ecosystem monitoring.

Some of the highest intersex percentages were found in the southeastern U.S. At 111 sites nationwide, 3,080 fish were examined and all had contaminants in their bodies.

Forty percent of largemouth bass examined at Imperial Dam and at the Gila River in Hayden were intersex, and 70 percent of smallmouth bass in the upper Colorado in the Yampa River were intersex.

Among other species examined, the only intersex carp found nationwide was at Willow Beach, below Lake Mead. One intersex channel catfish was found in the lower Colorado basin in the Gila River at Phoenix, and one at each of three sites in the upper Colorado.

Lead author of the report, JoEllen Hincke, of the USGS Columbia Missouri Environmental Research Lab, said that the report “is the first synthesis of USGS efforts to measure contamination in water, fish and intersex occurrence.”

The U.S. Centers for Disease Control — and governments worldwide — have gathered substantial evidence that human health is affected by exposure to hormone-disrupting chemicals. Pregnant women and babies, particularly boys, are considered at highest potential risk but serious conditions affecting women such as infertility, ovarian damage and adult male hormonal disruption are considered to be likely impacts of the chemicals.

Wastewater discharges into sources of drinking water are one major pathway of contamination that may include bodily discharges of concentrations of chemicals or from pollutants themselves being discharged into surface and groundwater.

## **Tamiflu Detected in Sewage Discharges**

[http://www.sciencenews.org/view/generic/id/47971/title/Excreted\\_Tamiflu\\_found](http://www.sciencenews.org/view/generic/id/47971/title/Excreted_Tamiflu_found)

Oseltamivir Carboxylate – the Active Metabolite of  
Oseltamivir Phosphate (Tamiflu), Detected in Sewage  
Discharge and River Water in Japan

**Gopal C. Ghosh, Norihide Nakada,  
Naoyuki Yamashita, and Hiroaki Tanaka**

**BACKGROUND:** Oseltamivir phosphate (OP; Tamiflu) is a prodrug of the anti-influenza neuraminidase inhibitor oseltamivir carboxylate (OC), and has been developed for the treatment and prevention of both A and B strains of influenza. The recent increase in OP resistance in influenza A virus (H1N1) has raised questions about the widespread use of Tamiflu in seasonal epidemics and the potential ecotoxicological risk associated with its use in the event of a pandemic.

**METHODS:** We developed a successful analytical method based on solid-phase extraction followed by liquid chromatography – tandem mass spectrometry. Three sampling campaigns were conducted during the 2008–09 flu season in Kyoto City, Japan.

**RESULTS:** The highest concentration of OC detected in STP discharge was 293.3 ng/L from a conventional activated-sludge-based STP, but only 37.9 ng/L from an advanced STP with ozonation as a tertiary treatment. In the receiving river water samples, OC was detected in the range of 6.6 to 190 ng/L.

**CONCLUSION:** OC is present in STP effluent and river water only during the flu season. Ozonation as tertiary treatment in STP will substantially reduce the OC load in STP effluent during an influenza epidemic or pandemic.