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 5th.
2. MIB plus geosmin is above 10 ng/L in the SRP canal system, but < 4 ng/L in the CAP system.
3. MIB and 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.
4. MIB concentrations exiting Saguaro Lake are 11 ng/L and 5 ng/L exiting Bartlett Lake and < 2n/gL in the CAP canal. There does NOT appear to be any in-canal MIB or geosmin production this month.
5. Good News – the City of Glendale, AZ will be joining our team. ASU will start sampling at the Cholla Plant on the Arizona Canal starting in September 2007.
6. Modeling of disinfection byproduct (DBP) precursor removal and associated water quality parameters has been successful over the past year, and some example data is included. This model will be demonstrated at the September 21st workshop.

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**		
Finished water DOC DOC removal[2]	2.37 mg/L 20%	2.91 mg/L 33%	3.51 mg/L 21%	2.97 mg/L 30%	2.66 mg/L 35%	2.8 mg/L 30%	3.2 mg/L 16%	
Recommend-ations								

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

Table 2 - Water Treatment Plants – August 6, 2007

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
24th Street WTP Inlet	**7.1**	**<2.0**	**6.1**
24th Street WTP Treated	**8.1**	**<2.0**	**<2.0**
Deer Valley Inlet	**6.1**	**5.4**	**2.8**
Deer Valley WTP Treated	**4.4**	**2.3**	**<2.0**
Val Vista Inlet	**8.1**	**2.7**	**2.1**
Val Vista WTP Treated –East	**7.4**	**<2.0**	**<2.0**
Val Vista WTP Treated -West	**3.7**	**<2.0**	**<2.0**
Union Hills Inlet	**<2.0**	**<2.0**	**<2.0**
Union Hills Treated	**<2.0**	**<2.0**	**<2.0**
Tempe North Inlet	**7.8**	**3.8**	**4.6**
Tempe North Plant Treated	**9.3**	**5.1**	**2.9**
Tempe South WTP	**5.1**	**2.1**	**<2.0**
Tempe South Plant Treated	**10.5**	**4.3**	**<2.0**
Greenway WTP Inlet	**5.1**	**4.0**	**<2.0**
Greenway WTP Treated	**<2.0**	**<2.0**	**<2.0**

MIB and 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.

Table 3 - Canal Sampling – August 6, 2007

System	Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
CAP	Waddell Canal	**<2.0**	**<2.0**	**<2.0**
	Union Hills Inlet	**<2.0**	**<2.0**	**<2.0**
	CAP Canal at Cross-connect	**<2.0**	**<2.0**	**2.4**
AZ Canal	Salt River @ Blue Pt Bridge	**11.3**	**2.0**	**7.4**
	Verde River @ Beeline	**5.2**	**2.0**	**7.9**
	AZ Canal above CAP Cross-connect	**8.4**	**3.8**	**5.6**
	AZ Canal below CAP Cross-connect	**7.7**	**2.6**	**4.8**
	AZ Canal at Highway 87	**7.3**	**2.5**	**4.2**
	AZ Canal at Pima Rd.	**8.4**	**3.6**	**2.6**
	AZ Canal at 56th St.	**10.7**	**<2.0**	**3.3**
	AZ Canal - Inlet to 24th Street WTP	**7.1**	**<2.0**	**6.1**
	AZ Canal - Central Avenue	**10.4**	**3.1**	**2.3**
	AZ Canal - Inlet to Deer Valley WTP	**6.1**	**5.4**	**2.8**
	AZ Canal - Inlet to Greenway WTP	**4.1**	**4.0**	**<2.0**
South and Tempe Canals	South Canal below CAP Cross-connect	**9.2**	**<2.0**	**5.5**
	South Canal at Val Vista WTP	**8.1**	**2.7**	**2.1**
	Head of the Tempe Canal	**8.3**	**2.8**	**4.0**
	Tempe Canal - Inlet to Tempe's South Plant	**5.1**	**2.1**	**<2.0**
	Chandler WTP – Inlet			

MIB concentrations exiting Saguaro Lake are 11 ng/L and 5 ng/L exiting Bartlett Lake and < 2n/gL in the CAP canal. There does NOT appear to be any in-canal MIB or geosmin production this month.

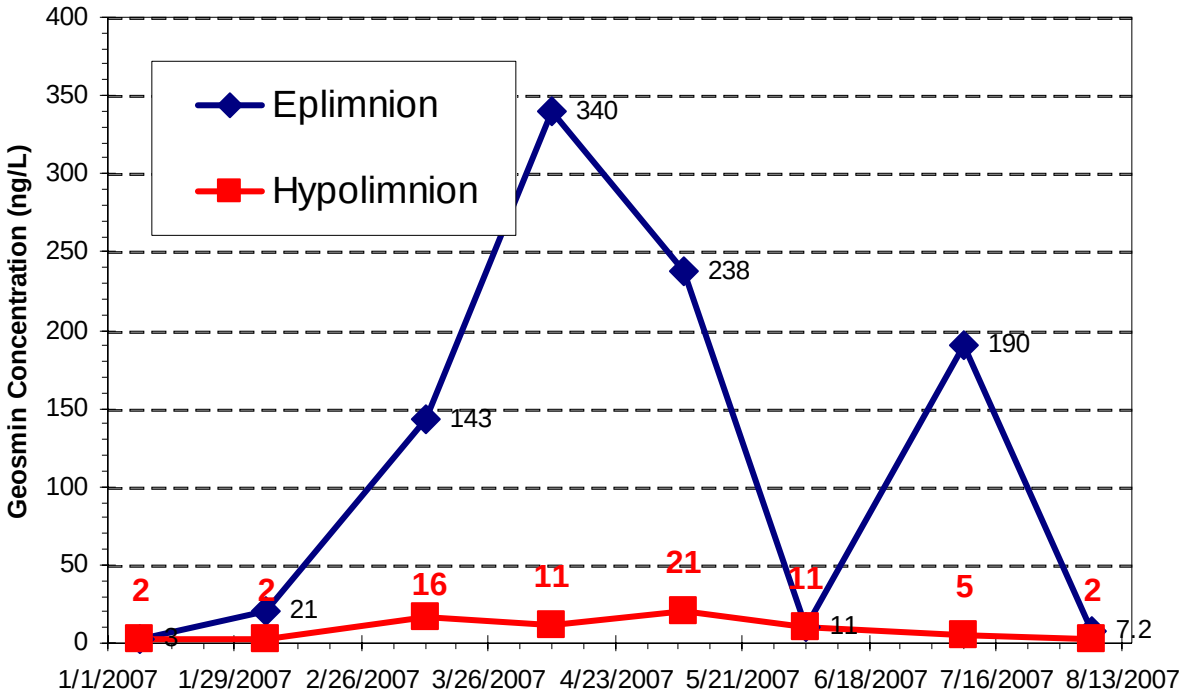
MIB and geosmin concentrations decreased at the downstream end of the Arizona canal. The SRP website was down so it is unclear if this is due to dilution of MIB from pumping groundwater or a net loss of MIB.

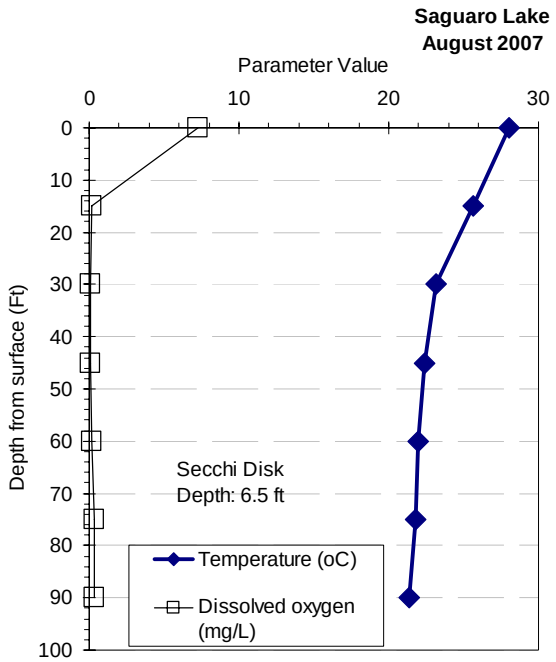
Table 4 - Reservoir Samples – August 7, 2007

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant	Eplimnion	5.5	<2.0	6.0
Lake Pleasant	Hypolimnion	<2.0	<2.0	<2.0
Verde River @ Beeline		5.2	2.0	7.9
Bartlett Reservoir	Epilimnion	17.5	<2.0	<2.0
Bartlett Reservoir	Epi-near dock	22.4	2.0	<2.0
Bartlett Reservoir	Hypolimnion	5.3	<2.0	<2.0
Salt River @ BluePt Bridge		11.3	2.0	7.4
Saguaro Lake	Epilimnion	15.7	7.3	8.5
Saguaro Lake	Epi - Duplicate	19.4	8.1	7.2
Saguaro Lake	Epi-near doc	15.2	6.1	8.5
Saguaro Lake	Hypolimnion	11.2	<2.0	<2.0
Verde River at Tangle		6.3	2.5	2.4
Havasu				

MIB is present in the SRP reservoirs and starting to impact the SRP canal.

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. Future work by Susan Neuer's group using remote sensing of algae will hopefully shed light on the dynamics of algae blooms in Saguaro Lake.





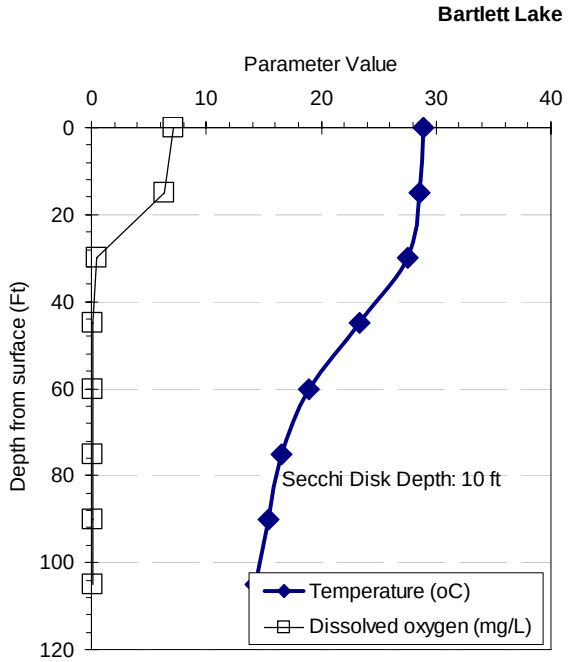


Table 5 - SRP/CAP OPERATIONS
Values in cfs, for August 6, 2007

System	SRP Diversions	CAP
Arizona Canal	801	64
South Canal	488	44
Pumping	238	0
Total	1527	112

SRP is releasing water from both Verde and Salt River Systems. Salt River release from Saguaro Lake: 1119 cfs; Verde River release from Bartlett Lake: 105 cfs.

Table 6 - Water Treatment Plants – August 8, 2007

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
24th Street WTP Inlet	4.33	0.101	2.3	0.527
24th Street WTP Treated	2.91	0.043	1.5	0.495
Deer Valley Inlet	4.23	0.104	2.5	0.635
Deer Valley WTP Treated	2.97	0.043	1.5	0.590
Val Vista Inlet	4.08	0.095	2.32	0.446
Val Vista WTP Treated –East	2.84	0.042	1.47	0.400
Val Vista WTP Treated -West	2.81	0.037	1.33	0.404
Union Hills Inlet	2.98	0.045	1.52	0.491
Union Hills Treated	2.37	0.023	0.96	0.442
Tempe North Inlet	4.47	0.101	2.27	0.538
Tempe North Plant Treated	3.51	0.056	1.60	0.495
Tempe South WTP	3.85	0.094	2.43	0.634
Tempe South Plant Treated	3.24	0.060	1.86	0.659
Greenway WTP Inlet	4.09	0.095	2.3	0.746
Greenway WTP Treated	2.66	0.022	0.8	0.700

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)

Table 7 - Canal Sampling – August 8, 2007

System	Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
CAP	Waddell Canal	2.99	0.045	1.5	0.515
	Union Hills Inlet	2.98	0.045	1.52	0.491
	CAP Canal at Cross-connect	2.92	0.045	1.53	0.452
AZ Canal	Salt River @ Blue Pt Bridge	4.49	0.098	2.18	0.446
	Verde River @ Beeline	2.23	0.072	3.22	0.424
	AZ Canal above CAP Cross-connect	4.49	0.111	2.48	0.446
	AZ Canal below CAP Cross-connect	4.28	0.098	2.29	0.453
	AZ Canal at Highway 87	4.41	0.094	2.12	0.461
	AZ Canal at Pima Rd.	4.39	0.094	2.14	0.493
	AZ Canal at 56th St.	4.54	0.097	2.14	0.510
	AZ Canal - Inlet to 24th Street WTP	4.33	0.101	2.33	0.527
	AZ Canal - Central Avenue	4.39	0.099	2.26	0.563
	AZ Canal - Inlet to Deer Valley WTP	4.23	0.104	2.46	0.635
	AZ Canal - Inlet to Greenway WTP	4.09	0.095	2.31	0.746
South and Tempe Canals	South Canal below CAP Cross-connect	4.17	0.100	2.40	0.423
	South Canal at Val Vista WTP	4.08	0.095	2.32	0.446
	Head of the Tempe Canal	4.13	0.102	2.46	0.480
	Tempe Canal - Inlet to Tempe's South Plant	3.85	0.094	2.43	0.634
	Chandler WTP – Inlet				

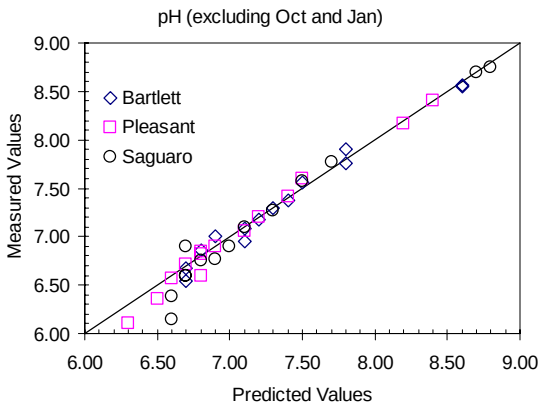
Table 8 - Reservoir Samples – August 8, 2007

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Lake Pleasant	Eplimnion	3.83	0.039	1.02	0.280
Lake Pleasant	Hypolimnio	3.60	0.045	1.24	0.261
Verde River @ Beeline		2.23	0.072	3.22	0.424
Bartlett Reservoir	Epilimnion	2.74	0.049	1.80	0.299
Bartlett Reservoir	Epi-near dock				
Bartlett Reservoir	Hypolimnio	1.80	0.039	2.15	0.207
Salt River @ BluePt Bridge		4.49	0.098	2.18	0.446
Saguaro Lake	Epilimnion	5.10	0.090	1.77	0.342
Saguaro Lake	Epi - Duplicate	5.81	0.093	1.60	0.342
Saguaro Lake	Epi-near doc				
Saguaro Lake	Hypolimnio	4.56	0.092	2.01	0.511
Verde River at Tangle		3.21	0.116	3.61	0.421
Havasu					

Modeling Jar Test Results for SRP Lake Water

Over the past year SRP reservoir water was collected and subjected to jar tests using different alum dosages to simulate DOC and DBP precursor removal at full-scale water treatment plants. These experimental conditions were also modeled using the computer software from the USEPA (WTP.exe). The conclusions are:

- The model accurately predicts changes in DOC, UVA, chlorine demand, THM formation (SDS conditions), pH and alkalinity (see plots on next page).
- As a result given a minimum amount of data on reservoir quality (TOC, pH, alkalinity, bromide, UVA254 and temperature) the model can be used to determine the ability of local WTPs to meet DBP regulatory compliance.
- This model will be demonstrated at our September 20th Workshop.


pH (excluding Oct and Jan)
Bartlett
Pleasant
Saguaro
Measured Values
Predicted Values
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8.50
8.00
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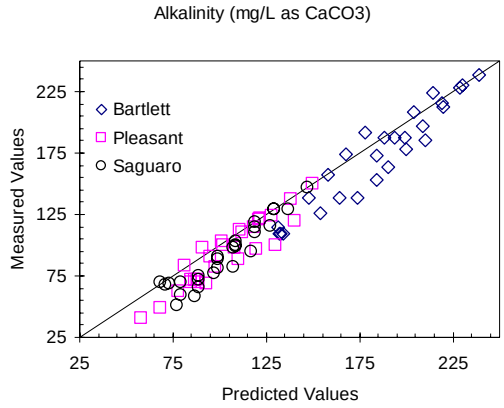
Alkalinity (mg/L as CaCO3)
Bartlett
Pleasant
Saguaro
Measured Values
Predicted Values
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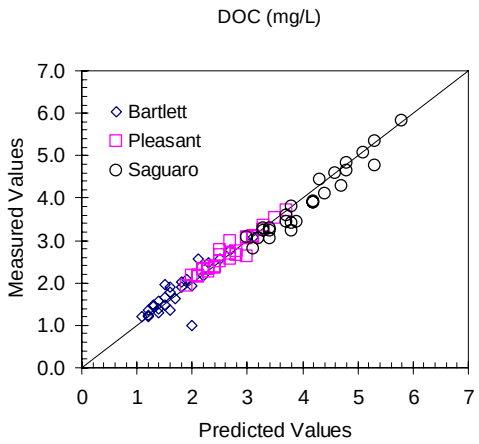
125
75
25
25
75
125
175
225


DOC (mg/L)
Bartlett
Pleasant
Saguaro
Measured Values
Predicted Values
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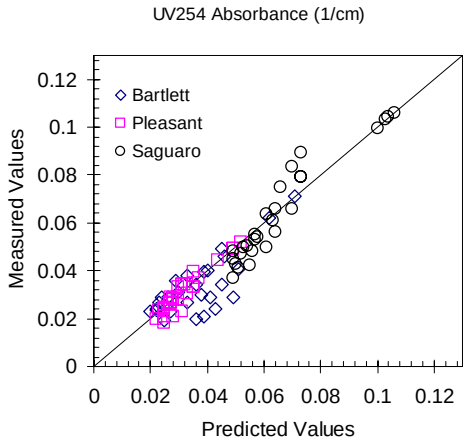
3.0
2.0
1.0
0.0
0
1
2
3
4
5
6
7


UV254 Absorbance (1/cm)
Bartlett
Pleasant
Saguaro
Measured Values
Predicted Values
0.12
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0.08
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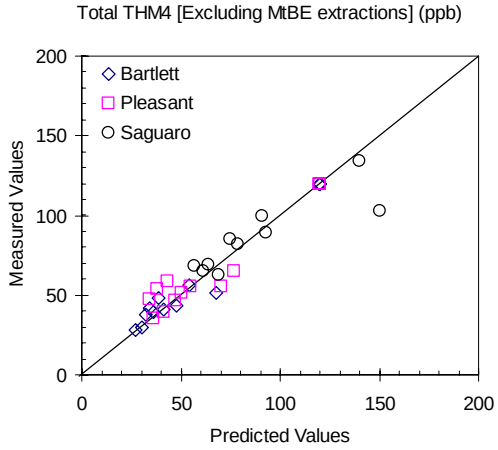
0.02
0
0
0.02
0.04
0.06
0.08
0.1
0.12


Total THM4 [Excluding MtBE extractions] (ppb)
Bartlett
Pleasant
Saguaro
Measured Values
Predicted Values
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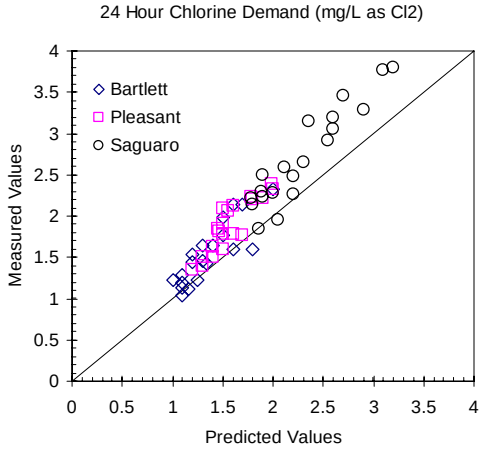
150
100
50
0
0
50
100
150
200


24 Hour Chlorine Demand (mg/L as Cl2)
Bartlett
Pleasant
Saguaro
Measured Values
Predicted Values
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
3.5
4