Regional Water Quality NEWSLETTER

DATE: Report for June 2009
Sampling conducted June 1 and 2 2009
A Phoenix, Tempe, Glendale, Peoria, CAP, SRP – ASU Regional Water Quality Partnership

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

DISTRIBUTION: Ronald.Feathers@chandleraz.gov; ACTarvers@FTMCDOWELL.ORG; mary.reker@phoenix.gov; knghiem@csaei.com; Kandis.Knight@asu.edu; gary_moore@tempe.gov; sandra_dewittie@tempe.gov; kspooner@citlink.net; bardizzone@carollo.com; wtrask@mwdh2o.com; jnafsey@mwdh2o.com; JJWilliams@GLENDALEAZ.com; raghunatha.komaragiri@phoenix.gov; mxerxis@scottsdaleaz.gov; mnguyen@ndep.nv.gov; RussellGRhodes@MissouriState.edu; paul.kinshella@phoenix.gov; brian.fayle@phoenix.gov; paul.zelenka@phoenix.gov; patricia.puryear@phoenix.gov; Wontae.Lee@hdrinc.com; kjacobs@ag.arizona.edu; k.kruger@asu.edu; addotson@gmail.com; Hye.Moon@asu.edu; Pedram.Shafieian@asu.edu; Daisuke.Minakata@asu.edu; Billt@gilbert.az.us; Braden.Allenby@asu.edu; Rittmann@asu.edu; Jeffrey.Stuck@amwater.com; nina.miller@amwater.com; wayne.janis@asu.edu; jim.holway@asu.edu; gober@asu.edu; rscott@glendaleaz.com; safischer@fs.fed.us; aimee.conroy@phoenix.gov; alan.martindale@cityofmesa.org; allison.shepherd@phoenix.gov; AGhosh@PIRNIE.COM; antoniot@ci.gilbert.az.us; arrw716@earthlink.net; awirtz@fs.fed.us; bakerenv@earthlink.net; bardizzone@carollo.com; bhenning@cap-az.com; btalabi@scottsdaleaz.gov; bkmoorhe@srpnet.com; BobCarlson@scwater.com; bonnie.smith@phoenix.gov; Bradley_fuller@tempe.gov; brian.fayle@phoenix.gov; brian.k.watson@phoenix.gov; carl.meyer@phoenix.gov; carlos.padilla@phoenix.gov; cseidel@dswa.net; chennemann@carollo.com; chris.rounseville@phoenix.gov; christenson.kara@epa.gov; cwilson@scottsdaleaz.gov; D'Ann.O'Bannon@phoenix.gov; diwanski@goodyearaz.gov; davev@peoriaaz.com; dempster@asu.edu; dlopez@fs.fed.us; dorothyo@peoriaaz.com; drcrosby@cap-az.com; dwalker@Ag.arizona.edu; dxprigge@srpnet.com; edna.bienz@phoenix.gov; erin.pysell@phoenix.gov; mario_esparza_soto@hotmail.com; francisco.gonzalez@phoenix.gov; frank.blanco@phoenix.gov; gjloomis@fs.fed.us; GMaseeh@PIRNIE.COM; Gregg.Elliott@srpnet.com; goelliot@srpnet.com; grant_osburn@tempe.gov; Greg.Ramon@Phoenix.Gov; gtday@amwater.com; GThelin@carollo.com; guy.carpenter@hdrinc.com; huqiang@asu.edu; jdoller@carollo.com; jeffrey.van.hoy@phoenix.gov; jennifer.calles@phoenix.gov; jjwilliams@glendaleaz.com; JohnRK@PeoriaAz.Com; josh_berdeaux@msn.com; kremmel@ci.glendale.az.us; laxman.devkota@phoenix.gov; Linda.Bezy-Botma@peoriaaz.gov; lroberts@buckeyeaz.gov; luis.manriquez@phoenix.gov; Marisa.Masles@asu.edu; mark.roye@phoenix.gov; matthew.rexing@cityofmesa.org; maureen.hymel@phoenix.gov; mdehaan@dswa.net; Mdew1@mail.ci.tucson.az.us; mhelton@scottsdaleaz.gov; Michael_Bershad@tempe.gov; Milton.Sommerfeld@asu.edu; MURPHYSP@wattsind.com; nicholas.silides@cityofmesa.org; nicoleta.buliga@phoenix.gov; ANUNEZ@SCOTTSDALEAZ.GOV; paul.burchfield@phoenix.gov; paulwestcott@appliedbiochemists.com; pdent@cap-az.com; pfenner@fs.fed.us; Randy.Gottler@phoenix.gov; raymond.schultz@phoenix.gov; robert.hollander@phoenix.gov; robert_eck@ci.mesa.az.us; ron.jennings@phoenix.gov; rsgooch@srpnet.com; rscott@glendaleaz.com; rcarpenter@glendaleaz.com; sgrendahl@SCOTTSDALEAZ.GOV; shan.miller@phoenix.gov; sherman_mccutcheon@tempe.gov; SRot@ci.glendale.az.us; srottas@cap-az.com; sacquafredda@dswa.net; steven.schoen@phoenix.gov; susan.potter@phoenix.gov; tara_ford@tempe.gov; terrance.piekarz@phoenix.gov; tgillogly@carollo.com; THockett@GLENDALEAZ.com; thomas.martin@phoenix.gov; thomasdempster@hotmail.com; tjeffer1@ci.tucson.az.us; tkacerek@cap-az.com; tom.doyle@phoenix.gov; Tom_Hartman@tempe.gov; troy.hayes@phoenix.gov; vlee@carollo.com; waerma@bv.com; walid.alsmadi@phoenix.gov; warrens@sgm-inc.com; wes.taylor@phoenix.gov; wtaylor@mwdh2o.com; William.Hughes@cityofmesa.org; swilson@scottsdaleaz.gov; Youngll.Kim@asu.edu; yu.chu.hsu@phoenix.gov; LindaW@PeoriaAz.Com; Yongsheng.Chen@asu.edu; keli@asu.edu; jcritt@asu.edu; uiyer@glendaleaz.com; Michael.Helton@amwater.com; Kim.Caggiano@cityofmesa.org; Keith.Greenberg@amwater.com; harry.brown@AMwater.com; mnguyen@ndep.nv.gov; bzachman@dswa.net; hdurbin@dswa.net;paul.zelenka@phoenix.gov; agrochowski@cap-az.com; bradley_fuller@tempe.gov; JBryck@PIRNIE.COM; Susanne.Neuer@asu.edu; Mohan.Seetharam@asu.edu; Chao-An.Chiu@asu.edu; susan.michael@peoriaaz.gov; tammy.perkins@phoenix.gov; ZChowdhury@PIRNIE.COM; Shari.Lange@phoenix.gov; nmegonnell@calgoncarbon-us.com; Cynthia.Bain@peoriaaz.gov; Ryan.Rhoades@CH2M.com; jim.kudlinski@srpnet.com; Gambatese.Jason@epamail.epa.gov; charolotte.jones@phoenix.gov; Graham.Symmonds@gwresources.com; scott.lee@gwresources.com; dswilliams@dswa.net; kowolf@srpnet.com; allison.shepherd@phoenix.gov; grant_osburn@tempe.gov; michael_bershad@tempe.gov; thomas.martin@phoenix.gov; carl.meyer@phoenix.gov; ben.hill@phoenix.gov; Ray.Schultz@phoenix.gov; *mdhubble@srpnet.com;* paul.zelenka@phoenix.gov; tom.doyle@phoenix.gov; bradley_fuller@tempe.gov; RScott@GLENDALEAZ.com; chris.rounseville@phoenix.gov; Norman_Clark@tempe.gov; Stephen.Bontrager@peoriaaz.gov; steve.lutringer@amwater.com; kmckinne@amwater.com; anupa.jain@chandleraz.gov; chris.kincaid@chandleraz.gov; jackie.strong@chandleraz.gov; larry.duffy@chandleraz.gov; lori.mccallum@chandleraz.gov; nancy.milan@chandleraz.gov; robert.goff@chandleraz.gov; victoria.sharp@chandleraz.gov; wendy.chambers@chandleraz.gov; wes.cannon@chandleraz.gov; JJWilliams@GLENDALEAZ.com; mgross@carollo.com; JYoung@mail.maricopa.gov; kim.eberenz@gwresources.com; CHe@carollo.com; PChao@carollo.com; Tom.Sands@srpnet.com; jamohler@asu.edu; John.Woolschlager@asu.edu; Craig_Caggiano@tempe.gov; kobrickjd@cdm.com; Calkins.John@azdeq.gov; ekaupanger@mail.maricopa.gov; CMeyer@carollo.com; AnnDenise.Taylor@SRPMIC-nsn.gov; greg.robinson@phoenix.gov; lsjohnso@srpnet.com; ; gnbrusse@srpnet.com; Pierre.Herckes@asu.edu; Rolf.Halden@asu.edu; ptarran@asu.edu; aramarui@dswa.net; macler.bruce@epa.gov; Amy.Miguel@srpmic-nsn.gov; meyerdw@bv.com; greg.ramon@phoenix.gov; yuchu.hsu@phoenix.gov; rwyatt@glendaleaz.com; pete@kroopnick.com; brooke.mayer@asu.edu; tony.mardam@hdrinc.com; Philip_Brown@Tempe.gov; paul.mally@amwater.com; michael.kennedy@mesaaz.gov; terri.baack@phoenix.gov; landrews@glendaleaz.com; cynthia.seelhammer@phoenix.gov; catherine.webster@phoenix.gov; mshapiro@cap-az.com; jperkins@scottsdaleaz.gov; melinda.jacobson@phoenix.gov

If you wish to receive the *Newsletter* and are not on our list, send your email address to Dr. Paul Westerhoff (p.westerhoff@asu.edu) get a free "subscription".

SUMMARY: EVALUATION AND RECOMMENDATIONS

1. MIB levels are increasing to ~ 8 ng/L in Bartlett Lake on the Verde River. MIB levels in Saguaro Lake throughout the water column are 2 to 5 ng/L, but geosmin levels are up to 10 ng/L. Our prediction is that by the end of June, MIB or Geosmin levels will be around 10 ng/L in the SRP system. Continued usage of 15 ppm of Powder activated carbon by several utilities for DBP control, should adequately maintain MIB and Geosmin in finished water to less than 10 ng/L (a typical consumer odor threshold).
2. Lake Pleasant and CAP water have no detectable MIB or Geosmin.
3. ASU receives a new AWWA project to study early warning systems for T&O at water treatment plants.
4. DBP precursors (organics and bromide) & chlorine demand in the Salt River system were evaluated.
5. SEC-TOC results from the Salt River Lakes are shown below. While the size distribution of DOC is similar below 2000 daltons between the reservoirs, a significant difference exists among the reservoirs for larger molecular weight organics, which are typical of algal and bacterial cell fragments. We have termed these biogenic colloids in the past. These form DBPs and are not easily removed during conventional treatment.

Table 1 Summary of WTP Operations

	Verde WTP	Union Hills	24th Street WTP	N.Tempe J.G. Martinez	Deer Valley	Glendale Cholla WTP [3]	Peoria Greenway WTP	Val Vista	South Tempe
	Verde River	CAP Canal	Arizona Canal					South Canal	
PAC Type and Dose		None	15 ppm Calgon		15 ppm PAC	None			15 ppm Aqua Nuchar
Copper Sulfate		None	0.3 ppm		None	None			None
PreOxidation		None	None		None	None			None
Alum Dose Alkalinity pH		10 ppm[1] 118 7.3	28 159/145 7.6		50 ppm 114 6.9	40 ppm 157 8.4			20 ppm 146 7.6
Finished water DOC DOC removal[2]		2.2 mg/L 24%	3.6 mg/L 17%		2.7 mg/L 39%	2.6 mg/L 39%	2.6 mg/L	2.9 (East) 3.5 (West)	3.2 mg/L 23%
Average turbidity over last 7 days		1 ntu	9-15 ntu		10-20 ntu				4 ntu
Recommendations									

[1] Ferric chloride instead of alum; plus ppm sulfuric acid
[2] Calculated based upon influent and filtered water DOC (note that DOC – not TOC – is used in this calculation)
[3] Sample from finished water includes a blend of surface and ground water sources

ASU Gets New AWWA Taste and Odor Project

Title: **Feasibility Study for Early Warning Systems for Algae-induced Tastes and Odors**, funded by the AWWA Technical and Education Committee.

Team: **Susanne Neuer** and Phil Tarrant, ASU, as well as graduate students in the Neuer Lab.

The objective of the project is to test a new particle identification technology (FlowCAM) and its ability to detect and identify algal species which may be the causative agent for taste and odor events. Ultimately the FlowCam is thought to serve as an on-site early warning tool as part of a T&O management strategy. The Flow Cam initial testing which is to begin in August 2009 will be carried out in the lab using single strain algal cultures and will be followed by field testing on samples collected at various locations in the reservoirs, canals and water treatment plant inlets. The results obtained on species present and their abundances will be compared to the occurrence of T&O events which are monitored by Paul Westerhoff's group at ASU.

Contact Susanne if you want to participate:

Susanne Neuer
Associate Professor
School of Life Sciences
Arizona State University
Tempe, AZ 85287
Tel: 480 727 7254, Fax: 480 965 2519
susanne.neuer@asu.edu
http://www.public.asu.edu/~sneuer/

Table 1
SRP/CAP OPERATIONS - Values in cfs, for May 4, 2009

System	SRP Diversions	CAP
Arizona Canal	647	0
South Canal	496	0
Pumping	87	0
Total	1230	0

- **SRP is releasing water from both Verde and Salt River Systems**. Salt River release from Saguaro Lake: 730 cfs; it is unusual to be releasing Salt River water this time of year. Verde River release from Bartlett Lake: 763 cfs.

- SRP is changing the source water during May. In late April SRP canals contained roughly 50% Verde River water plus 50% Salt River water. The Verde will continue to be ramped up to around 1200 to 1300 cfs (depending on water order demands) and the Salt will be reduced to no less than minimum generation plus 100 cfs or so until mid to late May 2009.

Table 2 - Water Treatment Plants – June 1, 2009

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
24th Street WTP Inlet	<2.0	2.4	<2.0
24th Street WTP Treated	<2.0	<2.0	<2.0
Deer Valley Inlet	<2.0	2.9	<2.0
Deer Valley WTP Treated	<2.0	<2.0	<2.0
Val Vista Inlet	<2.0	2.4	<2.0
Val Vista WTP Treated –East	<2.0	<2.0	<2.0
Val Vista WTP Treated -West	<2.0	<2.0	<2.0
Union Hills Inlet	2.2	<2.0	<2.0
Union Hills Treated	2.1	<2.0	<2.0
Tempe North Inlet			
Tempe North Plant Treated			
Tempe South WTP	2.1	<2.0	<2.0
Tempe South Plant Treated	<2.0	<2.0	<2.0
Greenway WTP Inlet	2.5	<2.0	<2.0
Greenway WTP Treated	<2.0	<2.0	<2.0
Glendale WTP Inlet	<2.0	2.7	<2.0
Glendale WTP Treated	<2.0	<2.0	2.0
Glendale WTP Treated (Lab)			

Table 3 - Canal Sampling – June 1, 2009

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

Table 4 - Reservoir Samples – June 2, 2009

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant (5/09)	Eplimnion	<2.0	<2.0	<2.0
Lake Pleasant (5/09)	Hypolimnion	<2.0	<2.0	<2.0
Verde River @ Beeline		<2.0	<2.0	<2.0
Bartlett Reservoir	Epilimnion	8.5	<2.0	<2.0
Bartlett Reservoir	Epi-near dock	7.5	<2.0	<2.0
Bartlett Reservoir	Hypolimnion	<2.0	<2.0	<2.0
Salt River @ BluePt Bridge		<2.0	2.2	<2.0
Saguaro Lake	Epilimnion	2.6	2.2	<2.0
Saguaro Lake	Epi - Duplicate	2.1	2.4	<2.0
Saguaro Lake	Epi-near dock	4.7	10.7	<2.0
Saguaro Lake	Hypolimnion	5.2	10.2	<2.0
Verde River at Tangle Creek (April 29, 2009)		<2.0	3.0	<2.0
Verde River at Tangle Creek (May 27, 2009)		<2.0	2.9	<2.0
Havasu (5/09)		<2.0	<2.0	<2.0

MIB levels are increasing to ~ 8 ng/L in Bartlett Lake on the Verde River. MIB levels in Saguaro Lake throughout the water column are 2 to 5 ng/L, but geosmin levels are up to 10 ng/L. MIB and geosmin levels are detectable, but right around 2 ng/L in the SRP canal system. Our prediction is that by the end of June, MIB or Geosmin levels will be around 10 ng/L in the SRP system. Continued usage of 15 ppm of Powder activated carbon (PAC) by several utilities for DBP control, should adequately maintain MIB and Geosmin in finished water to less than 10 ng/L (a typical consumer odor threshold).

Lake Pleasant and CAP water have no detectable MIB or Geosmin.

Organic Matter Status In the Treatment Plants

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN		DOC removal (%)
24th Street WTP Inlet	4.34	0.103	2.38	0.31		
24th Street WTP Treated	3.58	0.069	1.92	0.29		17
Deer Valley Inlet	4.40	0.105	2.38	0.29		
Deer Valley WTP Treated	2.70	0.041	1.52	0.53		39
Val Vista Inlet	4.17	0.102	2.45	0.27		
Val Vista WTP Treated –East	2.89	0.050	1.73	0.24		31
Val Vista WTP Treated -West	3.45	0.075	2.17	0.26		17
Union Hills Inlet	2.91	0.045	1.54	0.63		
Union Hills Treated	2.20	0.023	1.04	0.54		24
Tempe North Inlet						
Tempe North Plant Treated						
Tempe South WTP	4.19	0.100	2.38	0.30		
Tempe South Plant Treated	3.24	0.061	1.89	0.26		23
Greenway WTP Inlet	2.70	0.030	1.11	0.73		
Greenway WTP Treated	2.57	0.025	0.98	0.67		5
Glendale WTP Inlet	4.34	0.103	2.37	0.56		
Glendale WTP Treated	2.64	0.044	1.65	0.38		39

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

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Waddell Canal	**2.98**	**0.046**	**1.53**	**0.48**
Union Hills Inlet	**2.91**	**0.045**	**1.54**	**0.63**
CAP Canal at Cross-connect				
Salt River @ Blue Pt Bridge	**4.95**	**0.112**	**2.25**	**0.32**
Verde River @ Beeline	**3.44**	**0.092**	**2.68**	**0.30**
AZ Canal above CAP Cross-connect	**4.24**	**0.102**	**2.40**	**0.29**
AZ Canal below CAP Cross-connect	**4.29**	**0.102**	**2.38**	**0.29**
AZ Canal at Highway 87	**4.26**	**0.102**	**2.39**	**0.23**
AZ Canal at Pima Rd.	**4.36**	**0.105**	**2.40**	**0.24**
AZ Canal at 56th St.	**4.31**	**0.104**	**2.41**	**0.28**
AZ Canal - Inlet to 24th Street WTP	**4.34**	**0.103**	**2.38**	**0.31**
AZ Canal - Central Avenue	**4.34**	**0.104**	**2.39**	**0.26**
AZ Canal - Inlet to Deer Valley WTP	**4.40**	**0.105**	**2.38**	**0.29**
AZ Canal - Inlet to Glendale WTP	**4.34**	**0.103**	**2.37**	**0.56**
AZ Canal - Inlet to Greenway WTP	**2.70**	**0.030**	**1.11**	**0.73**
South Canal below CAP Cross-connect	**4.71**	**0.102**	**2.16**	**0.31**
South Canal at Val Vista WTP	**4.17**	**0.102**	**2.45**	**0.27**
Head of the Tempe Canal	**4.29**	**0.104**	**2.42**	**0.28**
Tempe Canal - Inlet to Tempe's South Plant	**4.19**	**0.100**	**2.38**	**0.30**
Chandler WTP – Inlet				

Reservoir Samples – June 01, 2009

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Lake Pleasant	Eplimnion				
Lake Pleasant	Hypolimnion				
Verde River @ Beeline		**3.44**	**0.092**	**2.68**	**0.30**
Bartlett Reservoir	Epilimnion	**4.02**	**0.091**	**2.27**	**0.29**
Bartlett Reservoir	Epi-near dock				
Bartlett Reservoir	Hypolimnion	**3.88**	**0.099**	**2.56**	**0.32**
Salt River @ BluePt Bridge		**4.95**	**0.112**	**2.25**	**0.32**
Saguaro Lake	Epilimnion	**6.37**	**0.117**	**1.84**	**0.82**
Saguaro Lake	Epi - Duplicate	**5.31**	**0.113**	**2.13**	**0.52**
Saguaro Lake	Epi-near doc				
Saguaro Lake	Hypolimnion	**5.37**	**0.108**	**2.00**	**0.42**
Verde River at Tangle	May-09	**1.34**	**0.042**	**3.12**	**0.26**
Havasu	May-09	**2.73**	**0.044**	**1.59**	**0.70**

Data from Salt River Reservoirs - Contribution towards DBP Formation

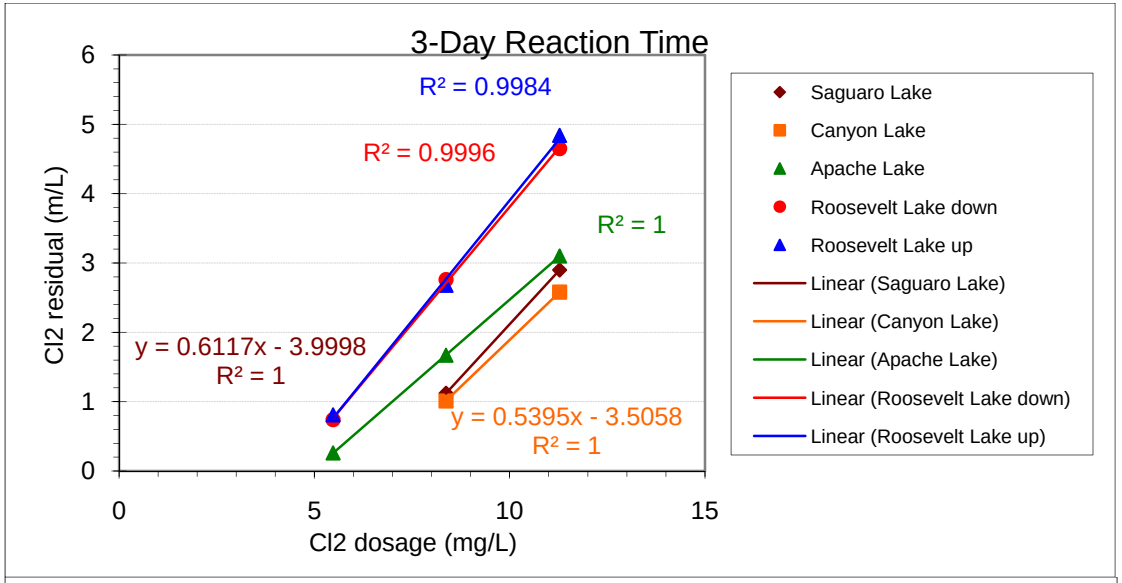
The data below is for May 2009 (sites are located on next page)

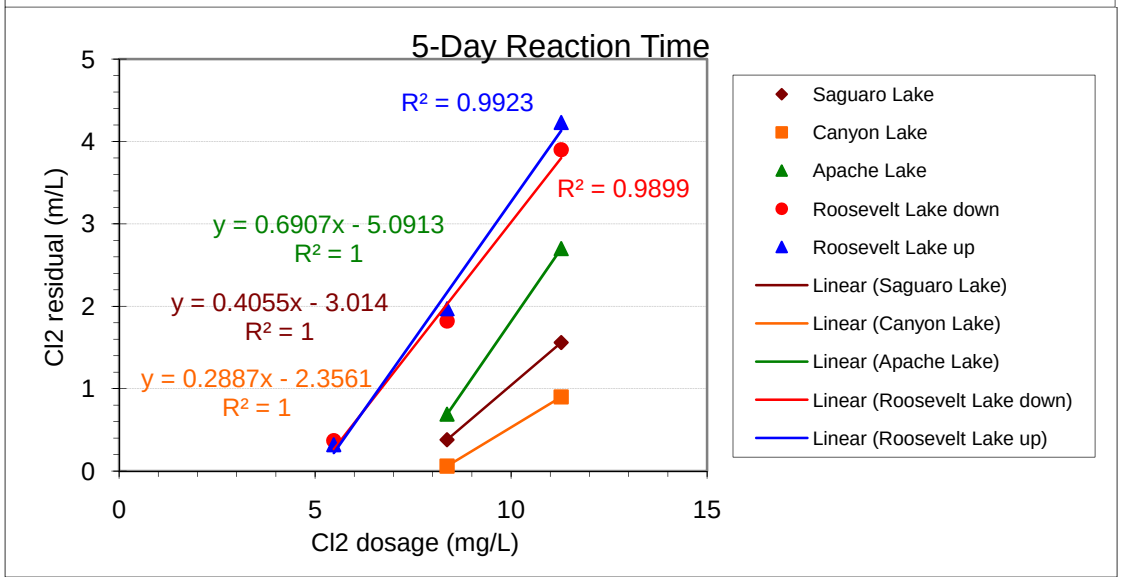
	pH	Temp (C)	Cond. (mS)	Turbidity (NTU)	Bromide (mg/L)	DOC (mg-C/L)	TDN (mg-N/L)	UV254 (cm^{-1})	SUVA (m^{-1} $(mg/L)^{-1}$)
Saguaro Lake	8.58	23.0	1.097	4	0.089	5.15	0.36	0.114	2.2
Canyon Lake	8.65	21.3	1.089	6	0.095	4.86	0.33	0.113	2.3
Apache Lake	8.58	20.7	1.094	4	0.090 0.090	4.74	0.33	0.111	2.3
Roosevelt Lake down	8.46	23.5	0.971	3	0.080	4.24	0.30	0.096	2.3
Roosevelt Lake up	8.5	23.2	0.950	3	0.075	4.22	0.29	0.092	2.2

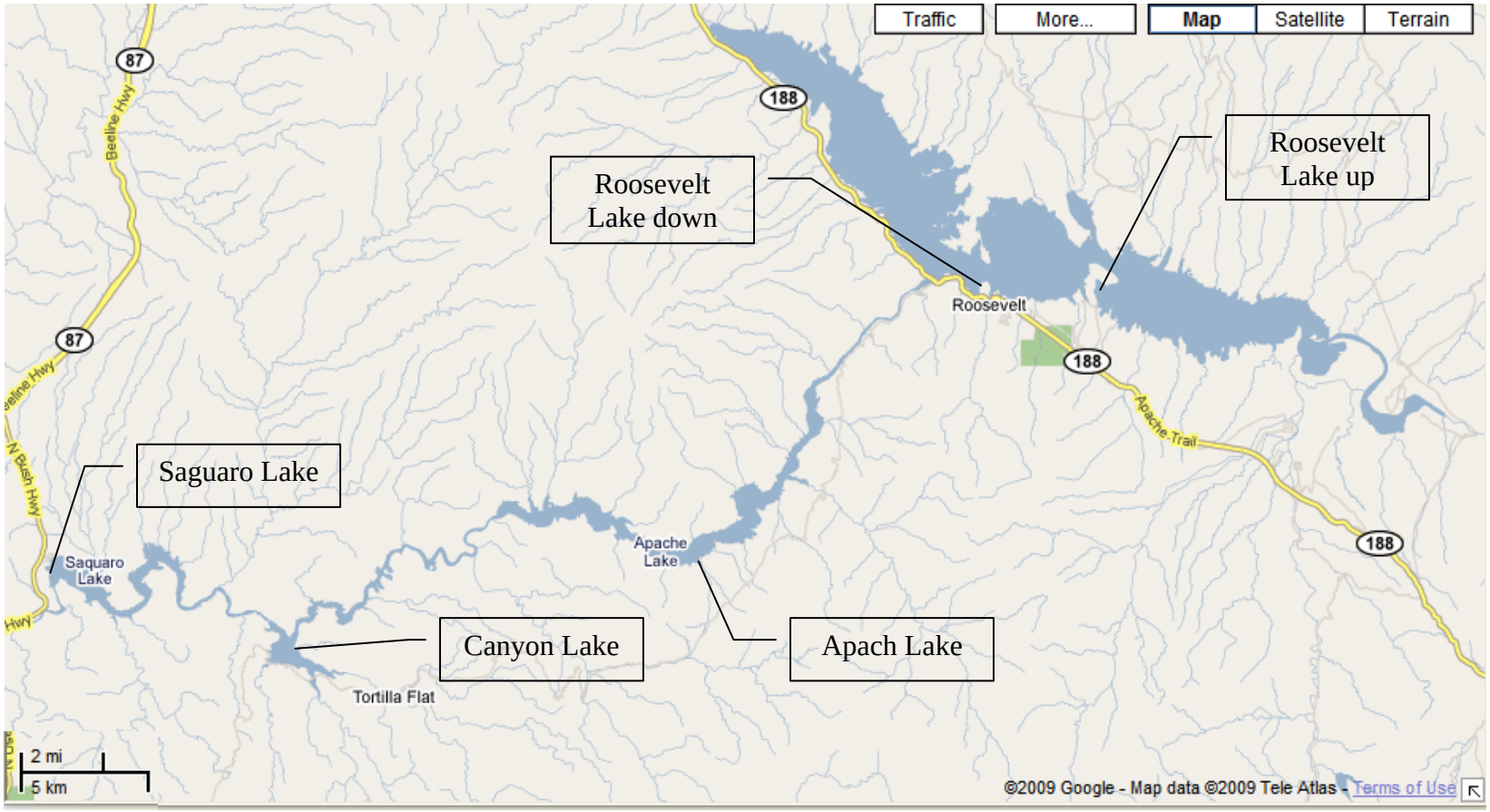
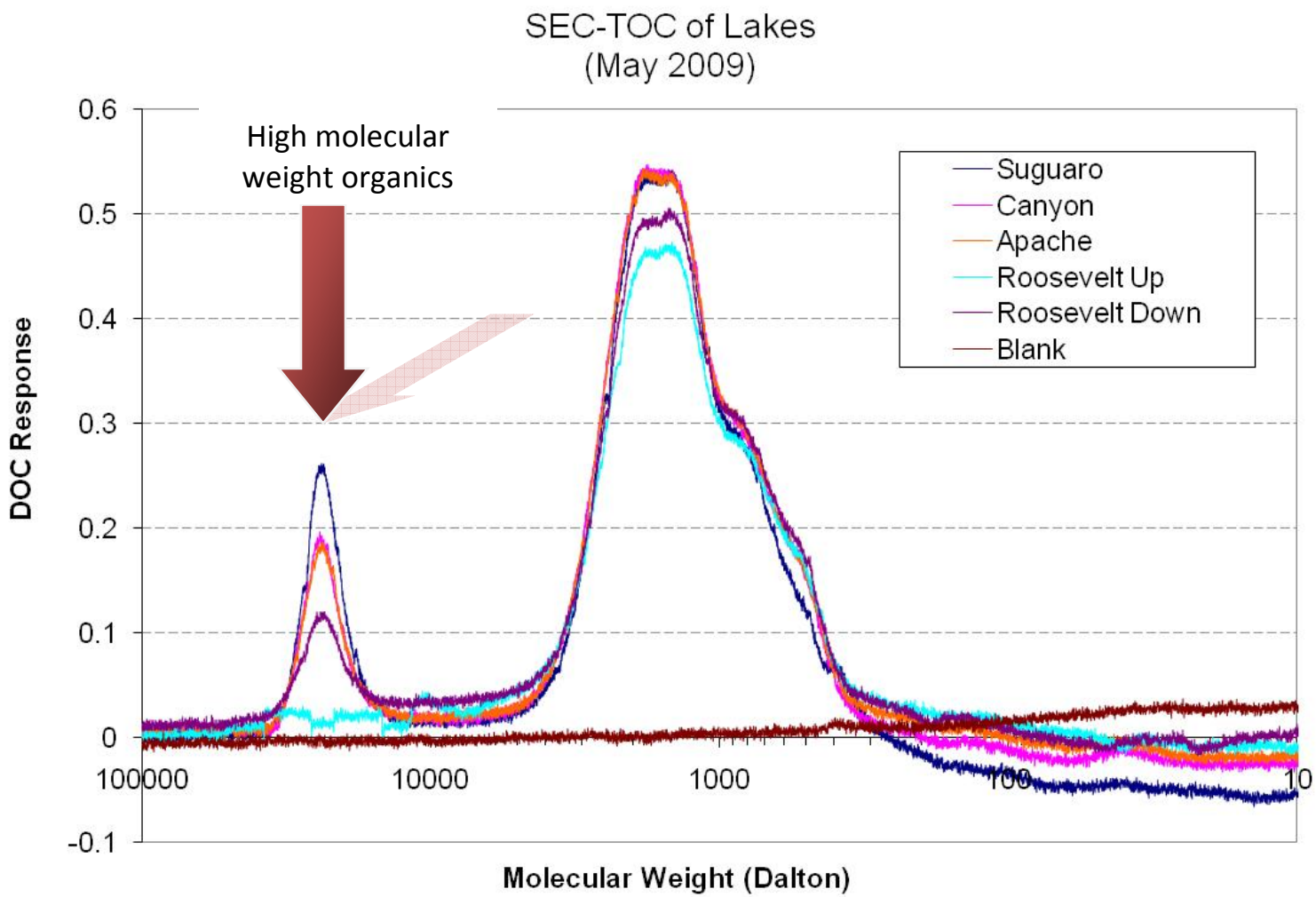
Data provided by Allison Shepherd; Chemist I; 24th St. WTP Lab

On past projects we have found good correlations between chlorine demand and THM formation. Higher chlorine demand equate to greater THM formation. Below are the results of chlorination experiments with the above water samples. Graphs of the chlorine demand as a function of different applied chlorine dosages are shown on the next page. There are always higher chlorine dosages for longer reaction times in order to achieve the same final chlorine residual, in this case 1 mg Cl2/L – a typical residual chlorine level. Saguaro Lake has the higher DOC, and accordingly the highest chlorine demand to achieve 1 mgCl2/L after 3 days.

	chlorine demand ($mgCl_2/L$) for 1 mg/L residual	
	3 day incubation	**5 day incubation**
Saguaro Lake	8.17	9.90
Canyon Lake	8.35	11.62
Apache Lake	6.99	8.82
Roosevelt Lake down	5.83	6.69
Roosevelt Lake up	5.82	6.64


3-Day Reaction Time
R² = 0.9984
R² = 0.9996
R² = 1
y = 0.6117x - 3.9998
R² = 1
y = 0.5395x - 3.5058
R² = 1
Cl2 residual (m/L)
Cl2 dosage (mg/L)
0
1
2
3
4
5
6
0
5
10
15
Saguaro Lake
Canyon Lake
Apache Lake
Roosevelt Lake down
Roosevelt Lake up
Linear (Saguaro Lake)
Linear (Canyon Lake)
Linear (Apache Lake)
Linear (Roosevelt Lake down)
Linear (Roosevelt Lake up)


5-Day Reaction Time
R² = 0.9923
R² = 0.9899
y = 0.6907x - 5.0913
R² = 1
y = 0.4055x - 3.014
R² = 1
y = 0.2887x - 2.3561
R² = 1
Cl2 residual (m/L)
Cl2 dosage (mg/L)
0
1
2
3
4
5
0
5
10
15
Saguaro Lake
Canyon Lake
Apache Lake
Roosevelt Lake down
Roosevelt Lake up
Linear (Saguaro Lake)
Linear (Canyon Lake)
Linear (Apache Lake)
Linear (Roosevelt Lake down)
Linear (Roosevelt Lake up)


Traffic
More...
Map
Satellite
Terrain
87
Beeline Hwy
188
Roosevelt Lake down
Roosevelt Lake up
Roosevelt
Apache Trail
Saguaro Lake
Saquaro Lake
Apache Lake
Canyon Lake
Apach Lake
Tortilla Flat
2 mi
5 km
©2009 Google - Map data ©2009 Tele Atlas - Terms of Use

SEC-TOC results from the Salt River Lakes are shown below. While the size distribution of DOC is similar below 2000 daltons between the reservoirs, a significant difference exists among the reservoirs for larger molecular weight organics, which are typical of algal and bacterial cell fragments. We have termed these biogenic colloids in the past. These form DBPs and are not easily removed during conventional treatment.