

MASSACHUSETTS WATER RESOURCES AUTHORITY
100 First Avenue, Charlestown Navy Yard, Boston, MA 02129



WATER QUALITY UPDATE
An Analysis of February 2009 Sampling Data

For more information, please contact MWRA at (617) 242-5323, or visit www.mwra.com.

February 2009 Highlights

- MWRA achieved CT disinfection requirements for the month** at the Ware Disinfection Facility and the Carroll Water Treatment Plant. CT results appear on Page 5. No community violated the Total Coliform Rule criteria. See Page 7.
- Carroll Water Treatment Plant is undergoing winter maintenance.** During this period, half the plant is removed from service. Train A was off-line from November 4, 2008 through December 22, 2008. Train B was off-line from service December 29, 2008 through February 18, 2009. All scheduled maintenance was successfully completed.
- The Ware Disinfection Facility had a turbidity spike at the Quabbin Reservoir on the 9th.** Total coliform samples were negative for this period of time; required disinfection levels (CT) were met at all times; and chlorine residuals downstream were maintained. There was no disruption of treatment effectiveness and thus this was not a violation. See page 4.
- Annual Review of *Giardia* and *Cryptosporidium* testing.** See page 10.
- Did you know** that MWRA's web site has an archive of Monthly Water Quality Updates from 2001 onward at <http://www.mwra.com/monthly/wqupdate/qual3wq.htm>?

We are continually updating the report. Let us know what you think (617) 242-5323
Call (617) 242-5323 or email Joshua.Das@mwra.state.ma.us

Release Date: March 20, 2009

Water Quality Update

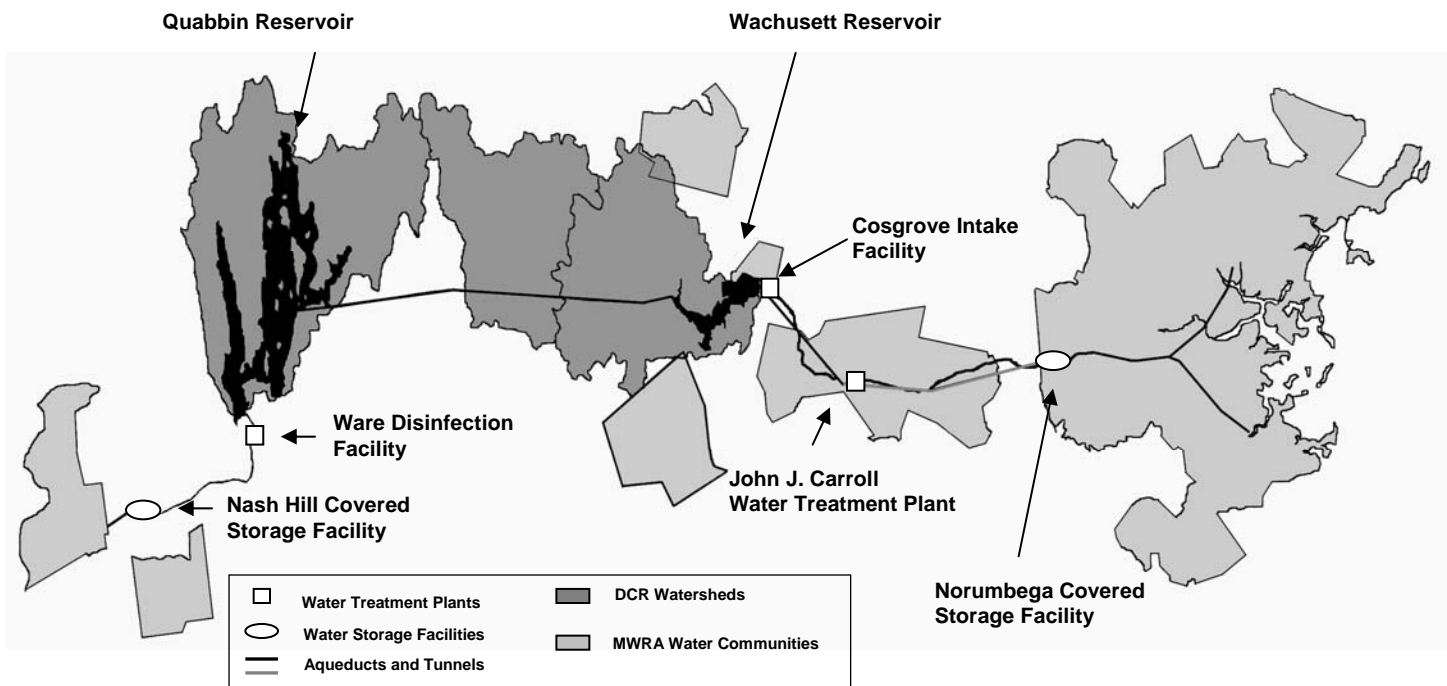
This is a monthly report containing information about the quality of water supplied by MWRA. It provides a more detailed review of water quality than the annual water quality report that is mailed each June to customers in our service area. The report is available at www.mwra.com.

The Water System

The MWRA supplies wholesale water to local water departments in 50 communities, 44 in greater Boston and MetroWest, three in Western Massachusetts, and as a back-up supply for three others. Each municipality is responsible for distributing the water within its own community. More than two million people are served by the MWRA water supply system.

Quabbin Reservoir is the primary source of water for our system and one of the country's largest water supply impoundments, with a capacity of 412 billion gallons. Quabbin water represents source water for the Chicopee Valley Aqueduct (CVA) system. Water is transferred from Quabbin Reservoir to the 65 billion gallon Wachusett Reservoir in Clinton via the Quabbin Aqueduct. Wachusett water represents source water for MetroWest and Metropolitan Boston communities. The watershed areas of the Quabbin and Wachusett Reservoirs total 401 square miles. The Department of Conservation and Recreation (DCR), which manages the watersheds, and MWRA are committed to protection of the water supply through aggressive watershed protection as the first line of defense against water contamination. Three-quarters of the watersheds are protected lands and over 80% are either forest or wetlands.

The map below indicates the location of reservoirs, treatment facilities, and service communities.



Indicators of Water Quality

Tests are conducted on water sampled at the source reservoirs (source or "raw water") and also on water after treatment ("treated water"). MWRA routinely uses six general indicators of water quality: microbial, corrosiveness, disinfection by-products, turbidity and algae, disinfectant residual, and mineral analysis. Testing frequencies vary by parameter.

The Federal Safe Drinking Water Act (SDWA) sets standards for source and treated water quality. The standards relate to coliform, turbidity, watershed protection, disinfection and disinfection by-products, over 120 potential chemical contaminants, and waterborne disease outbreaks. MWRA monitors for these parameters on schedules ranging from daily to annually.

Customer communities must also meet certain standards under the SDWA concerning distribution of treated drinking water. The Total Coliform Rule (TCR) helps to alert communities to possible microbial contamination as well as the adequacy of residual disinfection within the local distribution system. MWRA tests over 2000 samples per month. Under the SDWA, a violation of the TCR occurs when greater than 5% of the samples in a community are positive for total coliform during a month.

Source Water – Microbial Results

February 2009

Source Water - Microbial Results

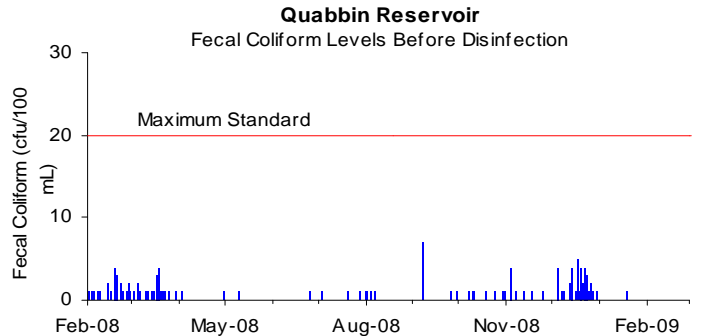
Total coliform bacteria are monitored in both source and treated water to provide an indication of overall bacteriological activity. Most coliforms are harmless. However, fecal coliform, a subclass of the coliform group, are identified by their growth at temperatures comparable to those in the intestinal tract of mammals. They act as indicators of possible fecal contamination. The Surface Water Treatment Rule for unfiltered water supplies allows for no more than 10% of source water samples prior to disinfection over any six-month period to have more than 20 fecal coliforms per 100ml.

Sample Site: Quabbin Reservoir

Quabbin Reservoir water is sampled at the Ware Disinfection Facility (WDF) raw water tap before entering the CVA system.

None of the 28 samples were positive during February.

For the current six-month period, 0.0% of the samples have exceeded a count of 20 cfu/100ml.



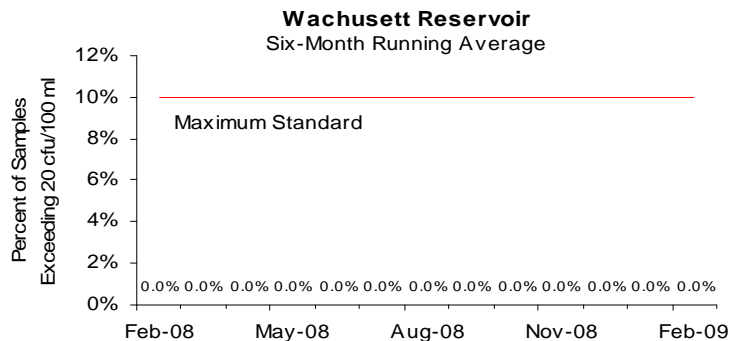
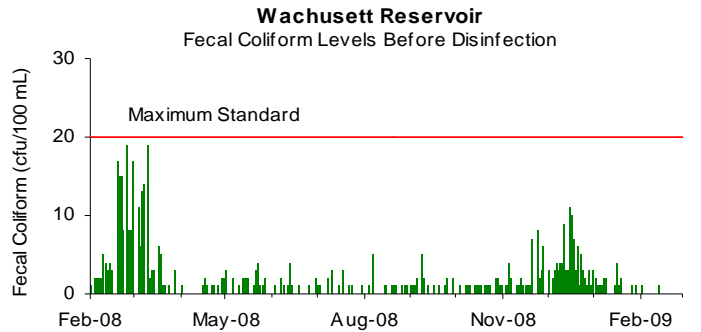
Sample Site: Wachusett Reservoir

Wachusett Reservoir water is sampled at the CWTP raw water tap in Marlborough before it enters the MetroWest/Metropolitan Boston systems.

Fecal coliform levels tend to increase during the winter because, when water bodies near Wachusett ice over, waterfowl seek open water. Many roost at Wachusett, which tends to freeze later in the year than smaller ponds nearby.

Two of the 28 samples were positive during February. None of the samples exceeded a count of 20 cfu/100ml.

For the current six-month period, 0.0% of the samples have exceeded a count of 20 cfu/100ml.



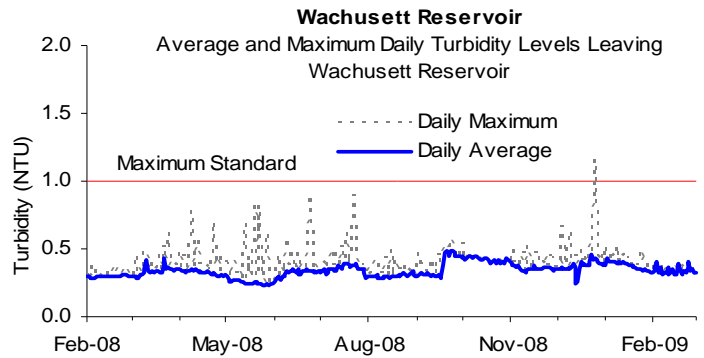
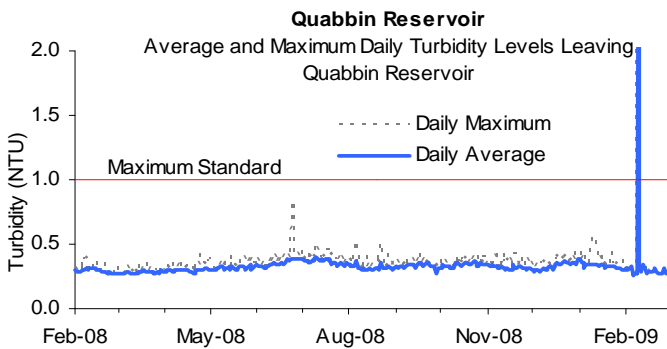
Source Water – Turbidity and Algae Results February 2009

Source Water – Turbidity Results

Turbidity is a measure of suspended and colloidal particles including clay, silt, organic and inorganic matter, algae and microorganisms. The effects of turbidity depend on the nature of the matter that causes the turbidity. High levels of particulate matter may have a higher chlorine demand or may protect bacteria from the disinfectant effects of chlorine, thereby interfering with the disinfectant residual throughout the distribution system.

Turbidity of Quabbin Reservoir water is monitored continuously using on-line analyzers at the Ware Disinfection Facility before chlorination. Turbidity of Wachusett Reservoir is monitored continuously at the Carroll Water Treatment Plant before ozonation. The Massachusetts Department of Environmental Protection (DEP) standard for source water turbidity for unfiltered water supply systems is a maximum of 1.0 NTU; EPA's standard is a maximum of 5.0 NTU. Maximum turbidity results at Wachusett were within DEP standards for the month.

•A valve operation at the Winsor Power Station stirred up pipe sediment and caused Quabbin Reservoir water being delivered to the WDF to exceed the DEP standard on February 9. The maximum turbidity reached 4.92 NTU. Turbidity levels were over 1 NTU for a duration of 45 minutes. The chlorine dose was temporarily raised during this event from 1.3 mg/L to 1.9 mg/L. Required disinfection levels as measured by CT were met at all times. Daily total coliform results downstream were coliform free, and required disinfection residuals were maintained, therefore as there was no disruption of treatment effectiveness, this is not a violation.

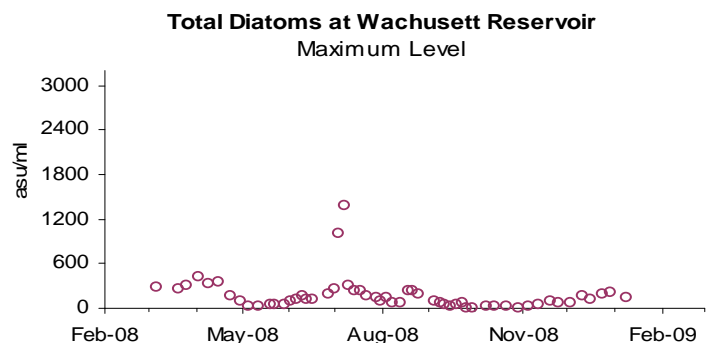
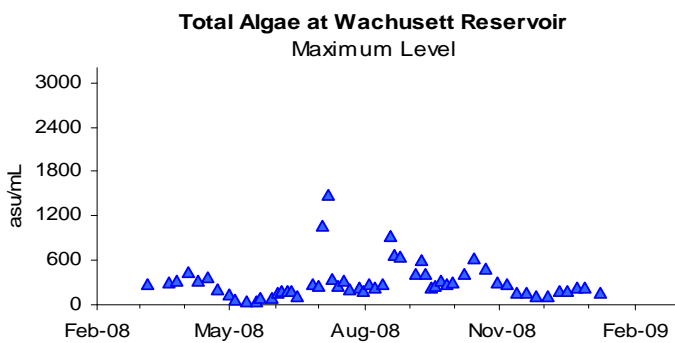


Source Water – Algae Levels

Algal levels in Wachusett Reservoir are monitored by DCR and MWRA. These results, along with taste and odor complaints, are used to make decisions on source water treatment for algae control.

Taste and odor complaints at the tap may be due to algae, which originate in source reservoirs, typically in trace amounts. Occasionally, a particular species grows rapidly, increasing its concentration in water. When *Synura*, *Anabaena*, or other nuisance algae bloom, MWRA may treat the reservoir with copper sulfate, an algacide. During the winter and spring, diatom numbers may increase. While not a taste and odor concern, consumers using filters may notice more frequent changing of the filters is needed.

There have been no samples since January 8, 2009 as significant ice cover on the reservoir prevents safe algae sampling.



Treated Water – Disinfection Results February 2009

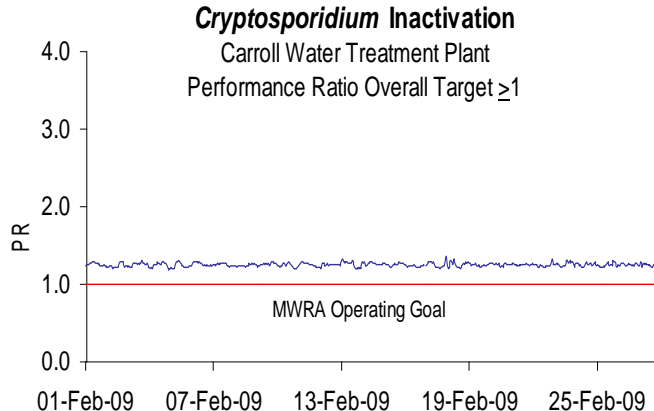
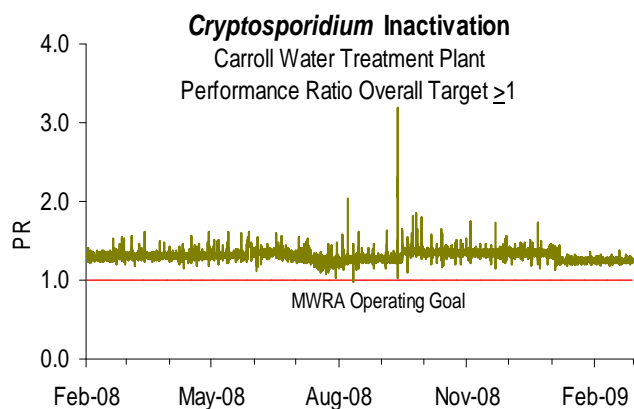
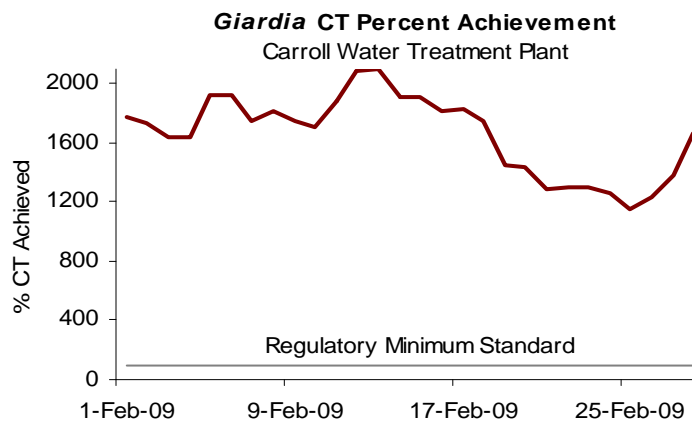
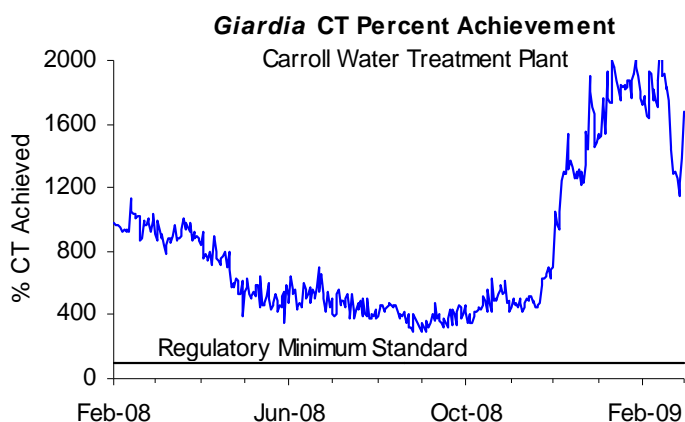
Treated Water - Primary Disinfection

With the activation of the Carroll Water Treatment Plant (CWTP), MWRA now reports on both regulatory required 99.9% inactivation for *Giardia* (reported as “CT”), and its voluntary operating goal of 99% inactivation for *Cryptosporidium* (reported as “PR”). MWRA calculates hourly CT inactivation rates and reports daily CT inactivation rates at maximum flow, as specified by EPA regulations. The concentration (C) of the disinfectant over time (T) yields a measure of the effectiveness of disinfection. CT achievement for *Giardia* assures CT achievement for viruses, which have a lower CT requirement. The required CT for ozonated water varies with water temperature.

Compliance with the *Giardia* standard is expressed as percent of required CT achieved; 100% is the minimum allowed. To avoid confusion with the regulatory requirements, inactivation of *Cryptosporidium* is reported as Performance Ratio (PR). A PR of 1 demonstrates inactivation of 99% of *Cryptosporidium* based on site-specific data.

Wachusett Reservoir – MetroWest/MetroBoston Supply:

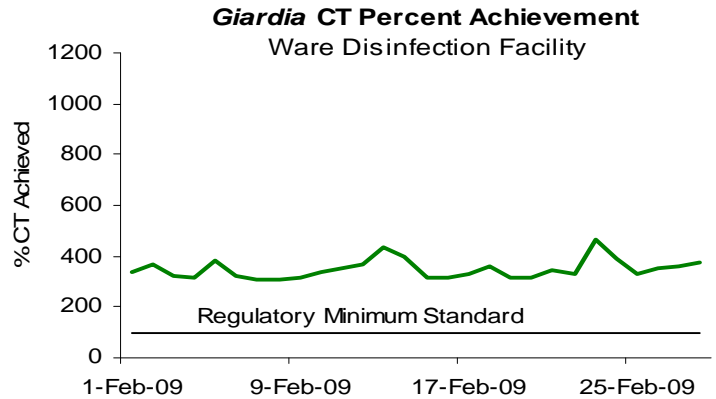
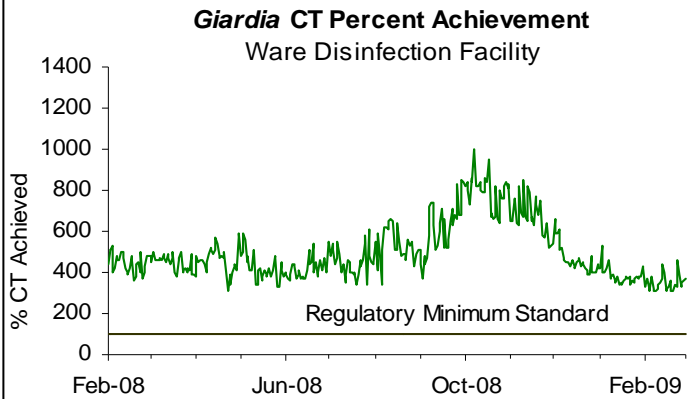
- CT was maintained above 100% at all times the plant was providing water into the distribution system for February; PR was maintained above 1.
- Ozone dose at the CWTP varied between 3.0 to 4.3 mg/L for February.



Treated Water – Disinfection, pH and Alkalinity Results February 2009

Quabbin Reservoir at Ware Disinfection Facility (CVA Supply):

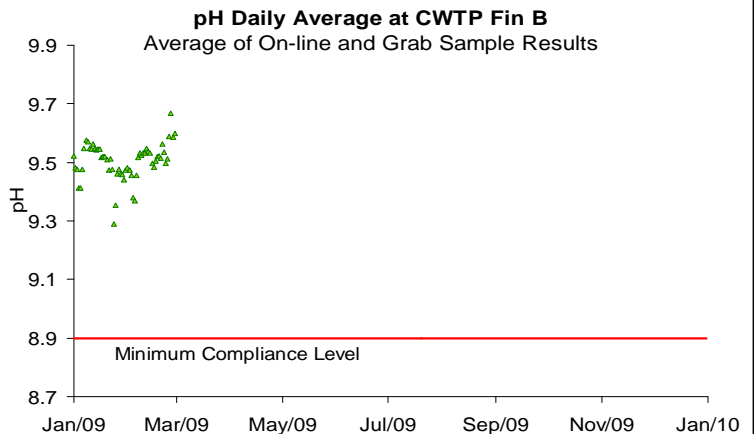
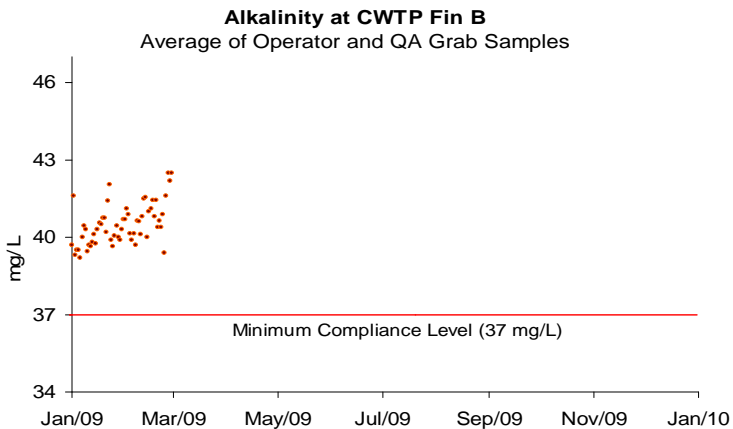
CT was maintained above 100% at all times the plant was providing water into the distribution system for February. Chlorine dose remained at 1.3 mg/L.



pH and Alkalinity Compliance:

MWRA adjusts the alkalinity and pH of Wachusett water to reduce its corrosivity which minimizes the leaching of lead and copper from service lines and home plumbing systems into the water. MWRA's target for distribution system pH is 9.3; the target for alkalinity is 40 mg/l. Per DEP requirements, samples from the CWTP Fin B tap have a minimum compliance level of 9.1 for pH and 37 mg/L for alkalinity. Samples from 27 distribution system taps have a minimum compliance level of 9.0 for pH and 37 mg/L for alkalinity. Results must not be below this level for more than 9 days in a six-month period. MWRA tests finished water pH and alkalinity daily at the CWTP Fin B sampling tap. Distribution system samples are collected in March, June, September, and December.

In February and over the past six-months, no sample results were below the target levels.



Bacteria & Chlorine Residual Results for Communities in MWRA Testing Program

February 2009

While all communities collect bacteria samples for the Total Coliform Rule (TCR), 40 systems (including Deer Island and Westboro State Hospital) use MWRA's Laboratory for TCR compliance testing. These systems collect samples for bacteriological analysis and measure water temperature and chlorine residual at the time of collection. The other 10 MWRA customer communities (including Lynn's GE plant) have their samples tested elsewhere and these towns should be contacted directly for their monthly results.

There are 136 sampling locations for which MWRA is required to report TCR results. These locations include a subset of the community TCR locations, as well as sites along MWRA's transmission system, water storage tanks and pumping stations.

The TCR requires that no more than 5% of all samples may be total coliform positive in a month (or that no more than one sample be positive when less than 40 samples are collected each month). Public notification is required if this standard is exceeded.

Escherichia coli (*E.coli*) is a specific coliform species that is almost always present in fecal material and whose presence likely indicates potential contamination of fecal origin. If *E.coli* are detected in a drinking water sample, this is considered evidence of a critical public health concern. Additional testing is conducted immediately and joint corrective action by DEP, MWRA, and the community is undertaken. Public notification is required if follow-up tests confirm the presence of *E.coli* or total coliform. A disinfectant residual is intended to maintain the sanitary integrity of the water; MWRA considers a residual of 0.2 mg/L a minimum target level at all points in the distribution system.

Highlights

One of the 1,760 community samples (0.06%) system-wide tested positive for confirmed total coliform during the month of February. None of the 581 MWRA samples (0.0%) tested positive for confirmed total coliform. No sample tested positive for *E.coli*. All 40 systems that submitted chlorine residual data maintained an average disinfectant residual of at least 0.2 mg/L. Only 2.1% of the samples had results lower than 0.2 mg/L.

TCR results by Community								
Town	Samples Tested for Coliform (a)	Total Coliform # (%) Positive	<i>E.coli</i> % Positive	Public Notification Required?	February 2009 Minimum Chlorine Residual (mg/L)	February 2008 Minimum Chlorine Residual (mg/L)	February 2009 Average Chlorine Residual (mg/L)	February 2008 Average Chlorine Residual (mg/L)
ARLINGTON	55	0 (0%)	0.0%		0.04	1.04	1.68	1.64
BELMONT	32	0 (0%)	0.0%		0.62	1.30	1.91	1.71
BOSTON	224	0 (0%)	0.0%		1.63	0.00	2.07	1.84
BROOKLINE	68	0 (0%)	0.0%		1.44	1.01	2.03	1.76
CHELSEA	40	0 (0%)	0.0%		0.84	0.15	1.88	1.52
DEER ISLAND	16	0 (0%)	0.0%		1.90	1.60	2.07	1.83
EVERETT	40	0 (0%)	0.0%		1.01	1.01	1.10	1.10
FRAMINGHAM	72	0 (0%)	0.0%		0.62	0.36	2.09	1.66
HANSCOM AFB (Bedford) (b)	9	0 (0%)	0.0%		1.49	-	1.91	-
LEXINGTON	36	0 (0%)	0.0%		1.34	1.32	2.15	2.18
LYNNFIELD	6	0 (0%)	0.0%		0.90	0.50	1.69	1.30
MALDEN	60	0 (0%)	0.0%		1.20	1.17	1.27	1.24
MARBLEHEAD	24	0 (0%)	0.0%		0.63	0.43	1.76	1.62
MARLBOROUGH (b)	52	0 (0%)	0.0%		0.50	1.20	1.63	1.89
MEDFORD	68	0 (0%)	0.0%		0.28	0.67	1.99	1.75
MELROSE	36	0 (0%)	0.0%		0.02	0.07	0.76	1.03
MILTON	32	0 (0%)	0.0%		1.34	1.40	1.73	1.69
NAHANT	10	0 (0%)	0.0%		0.09	0.09	1.46	1.36
NEEDHAM (b)	41	0 (0%)	0.0%		0.08	0.05	0.39	0.44
NEWTON	97	1 (1.03%)	0.0%	No	0.85	0.86	1.88	2.00
NORTHBOROUGH	16	0 (0%)	0.0%		0.60	0.40	1.92	1.57
NORWOOD	36	0 (0%)	0.0%		0.21	0.71	1.72	1.58
QUINCY	91	0 (0%)	0.0%		0.67	0.58	1.98	1.75
READING	40	0 (0%)	0.0%		1.44	1.34	1.92	1.67
REVERE	52	0 (0%)	0.0%		1.11	1.10	1.93	1.86
SAUGUS	32	0 (0%)	0.0%		1.70	1.55	1.98	1.74
SOMERVILLE	85	0 (0%)	0.0%		0.00	0.60	1.96	2.30
SOUTH HADLEY FD1 (c)	16	0 (0%)	0.0%		0.38	0.07	0.03	0.44
SOUTHBOROUGH	10	0 (0%)	0.0%		0.26	0.18	1.36	1.05
STONEHAM	28	0 (0%)	0.0%		1.10	1.39	1.82	1.70
SWAMPSCOTT	18	0 (0%)	0.0%		1.46	1.28	1.86	1.54
WAKEFIELD (b)	44	0 (0%)	0.0%		0.59	0.32	1.55	1.30
WALTHAM	72	0 (0%)	0.0%		1.29	0.64	2.03	1.67
WATERTOWN	40	0 (0%)	0.0%		0.90	0.60	2.02	1.57
WELLESLEY (b)	36	0 (0%)	0.0%		0.05	0.15	0.66	0.72
WESTBORO HOSPITAL	6	0 (0%)	0.0%		1.51	1.34	2.27	1.50
WESTON	16	0 (0%)	0.0%		0.91	1.43	1.85	1.65
WINCHESTER (b)	20	0 (0%)	0.0%		0.19	0.15	0.83	0.94
WINTHROP	24	0 (0%)	0.0%		0.48	1.16	1.75	1.80
WOBURN (b)	60	0 (0%)	0.0%		0.06	0.07	0.70	0.87
Total:	1760	1 (0.06%)	0.0%					
MASS. WATER RESOURCES AUTHORITY (d)	581	0 (0%)	0.0%		0.02	0.15	1.86	1.71

(a) The number of samples collected depends on the population served and the number of repeat samples required.

(b) These communities are partially supplied, and may mix their chlorinated supply with MWRA chloraminated supply.

(c) Part of the Chicopee Valley Aqueduct System. Free chlorine system.

(d) MWRA sampling program includes a subset of community TCR sites as well as sites along the transmission system, tanks and pumping stations. Some MWRA TCR sites which are entry points to the community had low chlorine residuals due to various reasons.

Treated Water - Disinfection By-Product (DBP) Levels in Communities

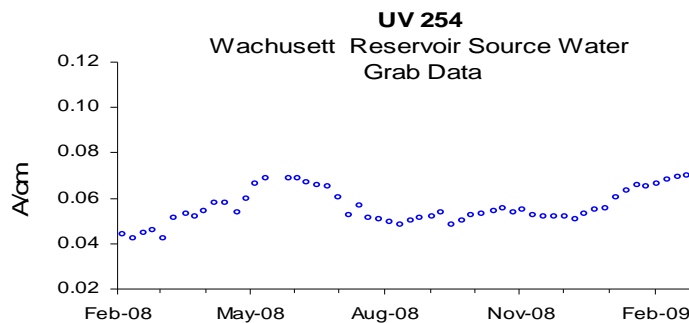
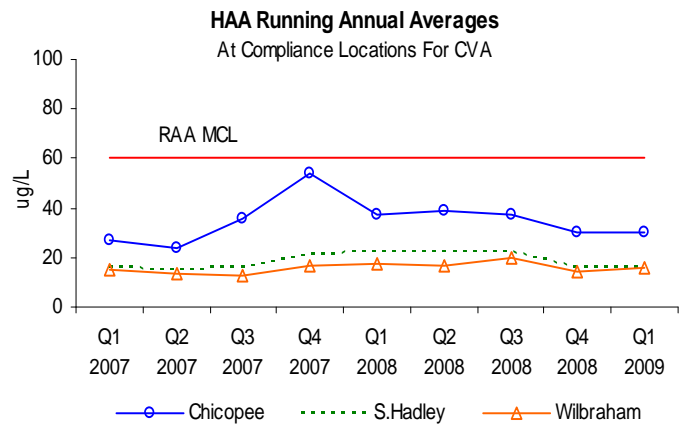
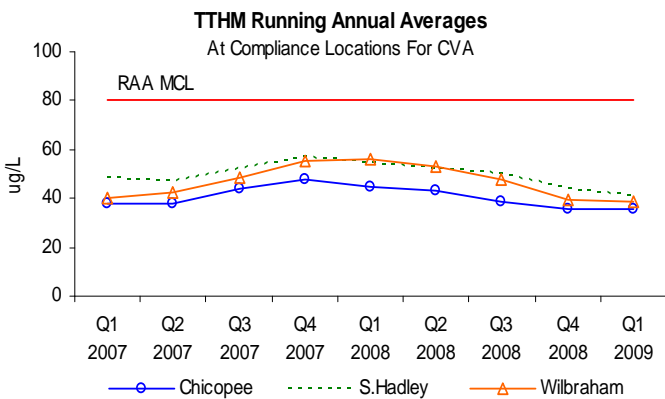
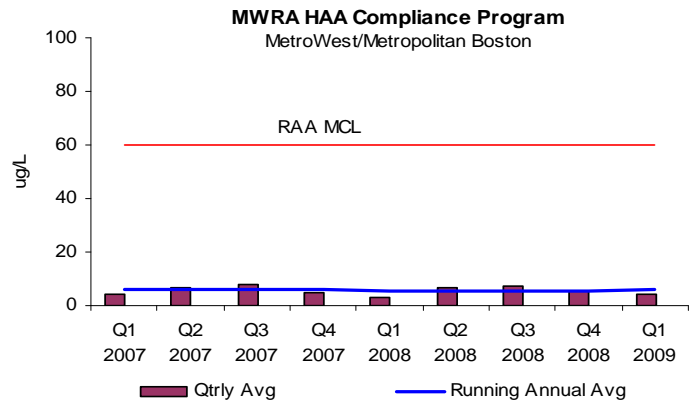
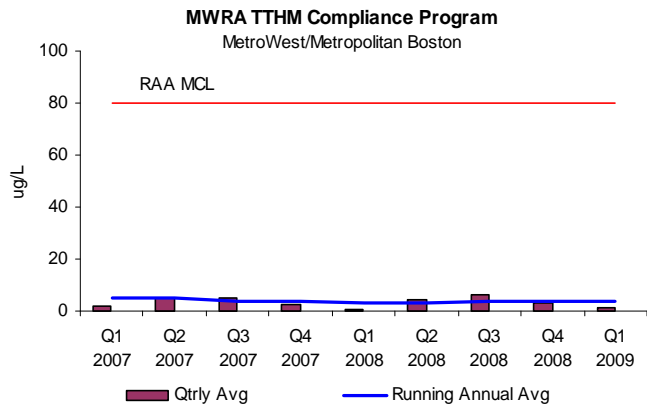
February 2009

Total Trihalomethanes (TTHMs) and Haloacetic Acids (HAA5s) are by-products of disinfection treatment with chlorine. TTHMs and HAA5s are of concern due to their potential adverse health effects at high levels. EPA's running annual average (RAA) standard is 80 ug/L for TTHMs and 60 ug/L for HAA5s. The switch from chlorine to ozone for primary disinfection and the consolidation of treatment has lowered DBP formation and results are now more uniform. DEP requires that compliance samples be collected quarterly. Partially served communities are responsible for their own compliance monitoring and reporting and must be contacted directly for their results.

Absorbance, measured as UV-254, is a surrogate measure of reactive organic matter. Regulated DBPs have dropped to very low levels with the CWTP coming on-line. However, UV-254 levels remain useful for estimating ozone dosage and serving as a trigger for Quabbin transfer consideration.

Bromate is tested monthly per DEP requirements for water systems that treat with ozone. Bromide in the raw water may be converted into bromate following ozonation. EPA's RAA MCL standard for bromate is 10 ug/L.

The RAA for TTHMs and HAA5s for MWRA's Compliance Program (represented as the line in the top two graphs below) remained below current standards. TTHM levels at all sampling locations for the MetroWest/Metropolitan Boston communities have declined dramatically since August 2005 following activation of the CWTP. The RAA for TTHMs = 3.7 ug/L; HAA5s = 4.5 ug/L. CVA's DBP levels continue to be below current standards. UV-254 levels are currently around 0.07 A/cm. The current RAA for Bromate = 0.0 ug/L.



MWRA Monthly Water Quality Analysis

February 2009

This page provides information on water quality at five locations in the MWRA transmission system. Results reflect a "snapshot" in time and may not represent typical conditions. Monitoring for parameters indicated in bold is quarterly as they either have minimal variability or are always below detection limits. The "Wachusett System" locations represent: raw water from the Wachusett Reservoir (CWTP inlet), finished water leaving the treatment plant (CWTP Finished water tap).

Component	CVA System		Wachusett System		Standards		Method Detection Limit
	Quabbin Res. at Ware Disinfection Facility (Raw)	Ludlow Monitoring Station (Treated)	Carroll Water Treatment Plant Inlet (Raw) ¹	Carroll Water TP Fin. Water Tap B (Treated) ¹	Standard	Units	
Alkalinity	2.5	3.3	5.9	39.8		MG/L	0.05
Aluminum	ND	ND	16.8	17.4	50-200 (c)	UG/L	15.0
Ammonia-N, Total	0.01	0.01	0.02	0.41		MG/L	0.005
Antimony	ND	ND	ND	ND	6 (b)	UG/L	1.0
Arsenic	ND	ND	ND	ND	10 (b)	UG/L	1.0
Barium	6.9	6.7	9.7	9.5	2000 (b)	UG/L	2.0
Beryllium	ND	ND	ND	ND	4 (b)	UG/L	0.3
Bromate	ND	ND	ND	ND	10 (b)	UG/L	5.0
Bromide	6.1	6.2	17.0	18.0		UG/L	5.0
Cadmium ⁽¹⁾	ND	ND	ND	ND	5 (b)	UG/L	0.5
Calcium	2120	2170	4810	4820		UG/L	20
Chloride	7.4	8.5	25.3	27.2	250 (c)	MG/L	0.5
Chlorine, Free	NA	0.85	NA	0.04	4 (b)(d)	MG/L	0.02
Chlorine, Total	NA	NA	NA	2.5	4 (b)(d)	MG/L	0.02
Chromium	ND	ND	ND	ND	100 (a)	UG/L	1.0
Coliform, Fecal, MF Method	ND	NA	ND	NA	20 (a)	CFU/100 mL	1
Coliform, Total, MF Method ^(e)	1	ND	2	ND	100 (a) 0 (b)	CFU/100 mL	1
Copper **	3.3	ND	ND	ND	1300 (f) 1000 (g)	UG/L	3.0
Cyanide	ND	ND	ND	ND	0.2 (b)	MG/L	0.01
Fluoride	0.04	0.04	0.05	1.00	4 (b)	MG/L	0.02
Hardness ⁽²⁾	7.5	7.6	15.6	15.6		MG/L	0.194
Iron **	17.5	14.7	27.0	26.9	300 (c)	UG/L	6.0
Lead	ND	ND	ND	ND	15 (f)	UG/L	1.2
Magnesium	533	531	935	930		UG/L	35
Manganese	6.8	4.5	5.3	4.8	50 (c)	UG/L	1
Mercury ⁽¹⁾	ND	ND	ND	ND	2 (b)	UG/L	0.01
Nickel	5.3	ND	ND	ND		UG/L	5.0
Nitrate-N	0.015	0.015	0.093	0.106	10 (b)	MG/L	0.005
Nitrite	ND	ND	ND	ND	1 (b)	MG/L	0.005
Orthophosphate	0.003	0.005	0.006	0.010		MG/L	0.0025
pH	6.7	6.9	7.1	9.5		S.U.	
Potassium	533	544	987	992		UG/L	200
Selenium	ND	ND	ND	ND	50 (b)	UG/L	1.0
Silica (SiO2)	1870	1890	3150	3440		UG/L	200.0
Silver	ND	ND	ND	ND	100 (c)	UG/L	1.0
Sodium	5.1	6.1	14.9	34.2		MG/L	0.2
Specific Conductance	48	53	122	205		UMHO/cm	0.3
Standard Plate Count, HPC	NA	NA	23	ND	500 (b)	CFU/mL	1
Sulfate (SO4)	4.7	4.7	6.7	9.8	250 (c)	MG/L	1.0
Thallium	ND	ND	ND	ND	2 (b)	UG/L	1.0
Total Dissolved Solids	44.0	45.0	84.0	124.0	500 (c)	MG/L	13
Total Organic Carbon	1.7	1.7	2.5	2.4		MG/L	0.3
Total Phosphorus	0.01	0.01	0.01	ND		MG/L	0.005
UV-254	0.025	0.018	0.072	0.042		A/cm	0.000965
Zinc **	4.6	ND	ND	ND	5000 (c)	UG/L	1.5

(a) = Primary MCL standard (health related), applies to source (raw) water only. DEP "Drinking Water Regulations", 310CMR 22.00.

(b) = Primary MCL standard (health related). DEP "Drinking Water Regulations", 310CMR 22.00. Applies to samples of treated water downstream of Wachusett and Quabbin Reservoirs.

(c) = Secondary MCL standard (aesthetic related). DEP "Drinking Water Regulations", 310CMR 22.00.

(d) = Maximum Residual Disinfectant Level. DEP "Drinking Water Regulations", 310CMR 22.00.

(e) = Confirmed results only are reported

(f) = Refers to 90th percentile Action Level

(g) = Refers to a single sample, secondary MCL

MCL = Maximum Contaminant Level

CFU = Colony Forming Unit

S.U. = Standard Units

UG/L = micrograms per liter = parts per billion

MG/L = milligrams per liter = parts per million

NA = Not Applicable

NTU = Nephelometric Turbidity Unit

HPC = Heterotrophic Plate Count (48 Hrs @ 35 °C)

Bold Italics = Samples from February

Regular Font = Samples from January

Most results are based on single grab samples collected on February 2, 3 and 4, 2009 and analyzed by MWRA and contract laboratories.

NOTES:

(1) MWRA tests for cadmium and mercury are more sensitive than the EPA-set levels of detection and reporting. For cadmium any level below 1.0 ug/L and for mercury any level below 0.2 ug/L are under the EPA minimum detection limits. MWRA will continue to report any result below these detection limits here in the monthly report but will follow EPA reporting requirements

(2) MWRA water is considered soft. Water is measured by hardness - which is the amount of dissolved minerals in the water. MWRA water has a hardness of about 15-20 mg/l or about 1 grain/gallon (1 grain/gallon = 17.1 mg/L). For comparison, hard water would have greater than 75 mg/l hardness.

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Samples at Cosgrove and CVA Intakes

Even though testing for *Giardia* and *Cryptosporidium* was not required by EPA until 2006, MWRA has been monitoring for them in source waters since 1994. EPA does set inactivation requirements for *Giardia*, while requirements for *Cryptosporidium* will not come into effect until 2014. MWRA provides disinfection for both *Giardia* and *Cryptosporidium*. *Giardia* and *Cryptosporidium* sampling was initiated in 1994 (monthly samples at Shaft 4, later moved to Cosgrove Intake). In mid-January 1999, sampling was increased to weekly at Cosgrove Intake. Starting on April 1, 2008, sampling was moved to Carroll Water Treatment Plant Inlet. Biweekly sampling is conducted at the CVA Intake.

Giardia and *Cryptosporidium* results are reported as number of cysts per 100 L. Until March 2004, MWRA used the EPA-approved method, ASTM D19 (ICR) with 100 L samples. Under this method, identifications were grouped into 2 categories: presumed (no internal structures identified) and confirmed (one or more internal structures identified). From July 1997 to March 2004, no samples confirmed positive for *Giardia*, and no samples were presumptive or confirmed positive for *Cryptosporidium*. In April 2004, MWRA began testing samples using the newly approved EPA Method 1623 with 50 L samples, which is about twice as sensitive as the ICR method (3 to 4 times the recovery rate with half the volume.) Under the new method, identifications are grouped into 3 categories: empty (no internal structures), amorphous structure (structure not consistent with a normal organism), and one or more internal structures. The results for 2008 using Method 1623 are listed below.

Wachusett: *Cryptosporidium* Results for MetroBoston: Jan 2008 – Dec 2008

53 Samples Collected

Number of Positive Samples	Total Number of Oocysts Detected	Empty Oocysts	# with Amorphous Structure	# with One or More Internal Structures	Average (oocysts/100L)	Range of Detects (oocysts/100L)
1	1	1	0	0	0.037/100L	1

Wachusett: *Giardia* Results for MetroBoston: Jan 2008 – Dec 2008

53 Samples Collected

Number of Positive Samples	Total Number of Cysts Detected	Empty Cysts	# with Amorphous Structure	# with One or More Internal Structures	Average (cysts/100L)	Range of Detects (cysts/100L)
23	48	44	3	1	1.83/100L	1 - 11

CVA Intake: *Cryptosporidium* Results for Chicopee Valley Aqueduct: Jan 2008 – Dec 2008

26 Samples Collected

Number of Positive Samples	Total Number of Oocysts Detected	Empty Oocysts	# with Amorphous Structure	# with One or More Internal Structures	Average (oocysts/100L)	Range of Detects (oocysts/100L)
2	2	2	0	0	0.15/100L	1

CVA Intake: *Giardia* Results for Chicopee Valley Aqueduct: Jan 2008 – Dec 2008

26 Samples Collected

Number of Positive Samples	Total Number of Cysts Detected	Empty Cysts	# with Amorphous Structure	# with One or More Internal Structures	Average (oocysts/100L)	Range of Detects (cysts/100L)
2	4	4	0	0	0.31/100L	1 - 3

Note: A complete record of results can be found on the MWRA website at www.mwra.com.

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Research Efforts

MWRA is currently engaged in a voluntary, joint research effort with Tufts University looking at levels of *Cryptosporidium* and *Giardia* in drinking water using a high volume sample (1000 liters). This monitoring is part of a larger multi-city study looking at levels of *Cryptosporidium* exposure in the population and potentially related levels in drinking and recreational waters. Since the routine, EPA-approved ICR method previously used by the MWRA had few detects, no statistical comparisons of human exposure to drinking water were possible. As a result, MWRA and Tufts decided to use a more sensitive method to determine the variability, if any, of levels of *Cryptosporidium* and *Giardia*.

The research monitoring started using a weekly composite sample (some water each day for the entire week) of 1,000 liters at Shaft 9A, a site within the water system that is representative of water delivered to customers in the MetroBoston system. In 2008, bi-weekly composite samples of 2,000 liters were used.¹ The water is then evaluated using a test method basically the same as Method 1623. All *Cryptosporidium* oocysts and *Giardia* cysts, both confirmed and empty, are counted. This method, using a large sample volume, is more than 20 times more sensitive than the present sampling protocol with Method 1623 now used by MWRA, and at least 40 times as sensitive as the previous ICR method.

The data collected so far is generally consistent with MWRA's past data. As was expected, the much higher sample volumes and the more sensitive testing have yielded some positive samples; all but one of the positives has been below the nominal detection limit of Method 1623 (1-oocyst/50 liters), and the overall average for all samples since 2001 is 0.033 oocysts/100 liters. Tufts has also tested for *Giardia* using the same testing method as above, and the overall average is 0.022 cysts/100 liters since 2002.

Research Sampling - *Cryptosporidium* Results: Feb 28, 2008 – Dec 26, 2008

Number of Positive Samples	Total Number of Oocysts Detected	Empty Oocysts	# with Amorphous Structure	# with One or More Internal Structures	Average (oocysts/100L)	Range of Detects (oocysts/100 L)
3	3	3	0	0	0.008/100L	0.05

Research Sampling - *Giardia* Results: Feb 28, 2008 – Dec 26, 2008

Number of Positive Samples	Total Number of Cysts Detected	Empty Cysts	# with Amorphous Structure	# with One or More Internal Structures	Average (cysts/100L)	Range of Detects (cysts/100L)
1	1	0	1	0	0.003/100L	0.05

Testing Limitations and Response Protocol

It is important to note that *Cryptosporidium* and *Giardia* monitoring has significant limitations. The tests do not clearly distinguish between live and dead cysts, cannot determine if an organism is in fact infectious to humans, and the infectious dose of various strains of *Cryptosporidium* is not well understood. Nonetheless, in 1996, MWRA adopted a trigger level of 10 oocysts per 100 liters (recommended by Rose and Haas, leading researchers in pathogen and risk/health analysis) above which notification and other actions would be undertaken. Total number of positives, both confirmed and empty, are included in this trigger level. No special actions are required for levels below this level. Even with the new, more sensitive testing method, the average level found is well below the 10-oocyst per 100 liter trigger level. Furthermore, MWRA's new treatment with ozone at the Carroll Treatment Plant is capable of inactivating (killing) at least 99.9% of any *Giardia* and at least 99% of any *Cryptosporidium* which may be present and viable.

¹ The new 2008 contract with Tufts was not finalized until late February, so there were only 20 samples for the year.