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

WATER QUALITY UPDATE

An Analysis of March 2012 Sampling Data

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

March 2012 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.

•**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**?

•**MWRA reduced the length of the printed copy of the Monthly Water Quality Update to reduce printing and postage costs.** A longer more detailed version will continue to be posted on the MWRA web site. You can help us save paper and money by requesting an electronic copy of the Update – call (617) 242-5323 or email *Joshua.Das@mwra.state.ma.us*

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*

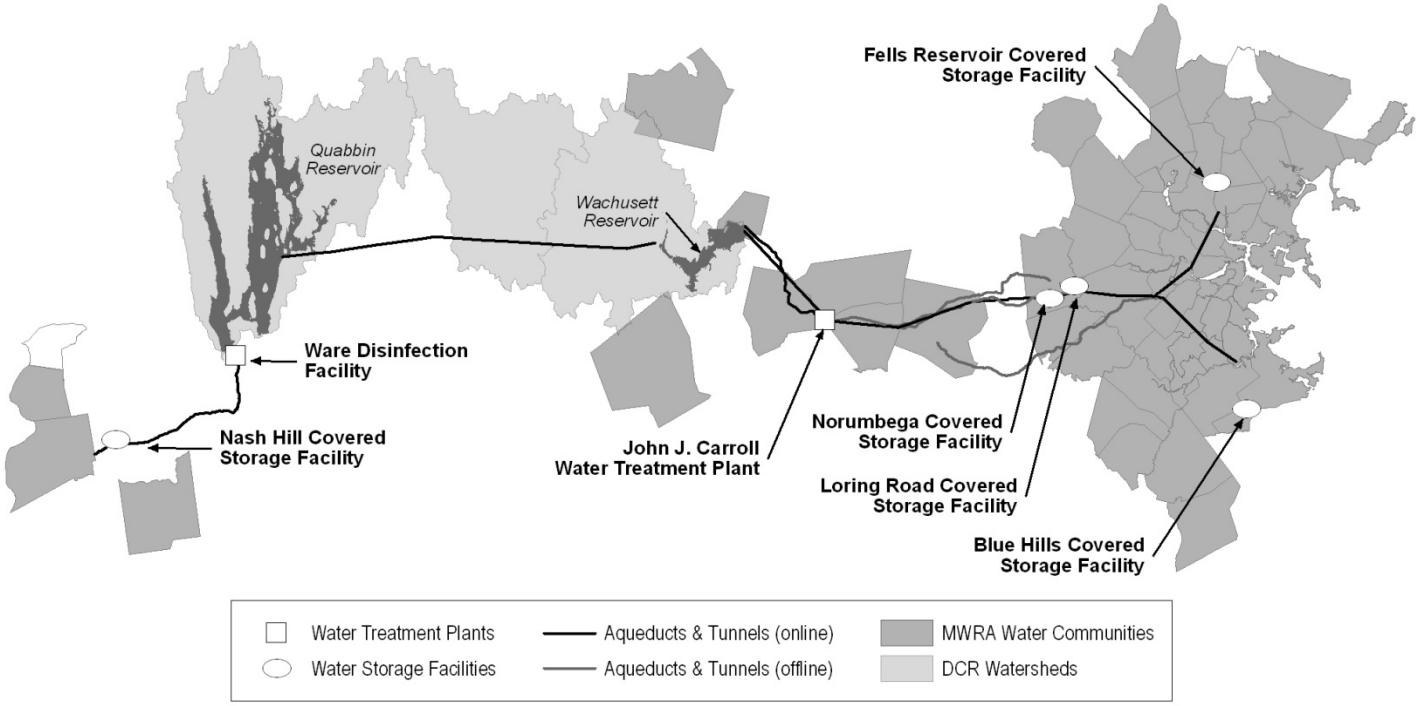
Release Date: April 20, 2012

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 51 communities, 45 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.

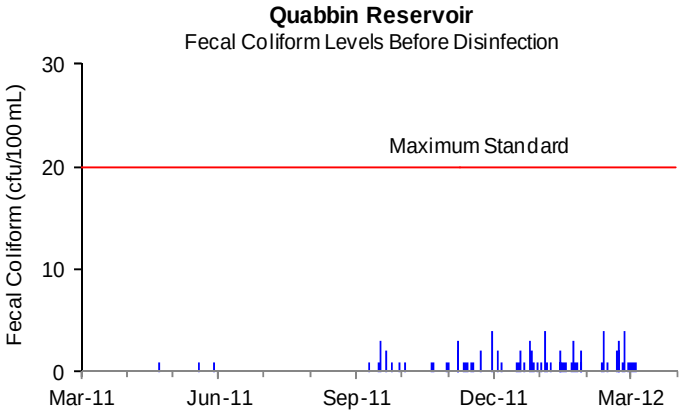
Source Water – Microbial Results
March 2012

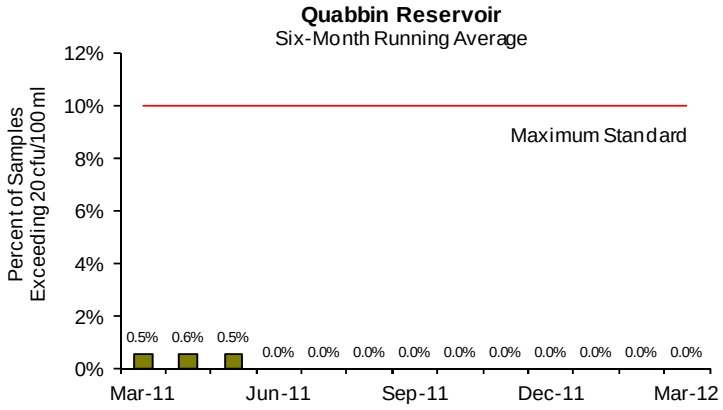
Source Water - Microbial Results

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 being treated and entering the CVA system.

Four of the 31 samples were positive during March. 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.

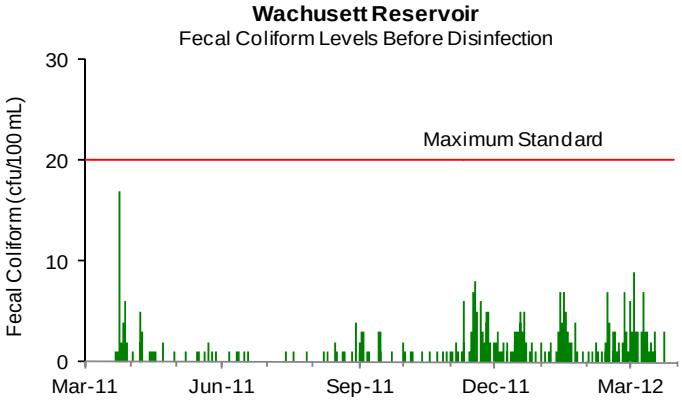


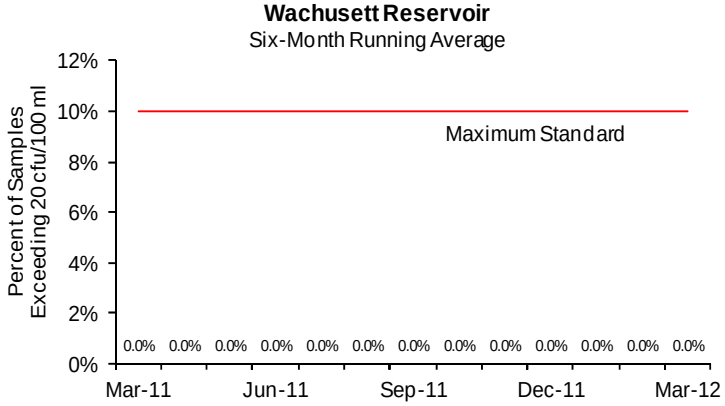


Sample Site: Wachusett Reservoir
Wachusett Reservoir water is sampled at the CWTP raw water tap in Marlborough before being treated and entering the MetroWest/Metropolitan Boston systems.

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.

Sixteen of the 31 samples were positive during March. 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.





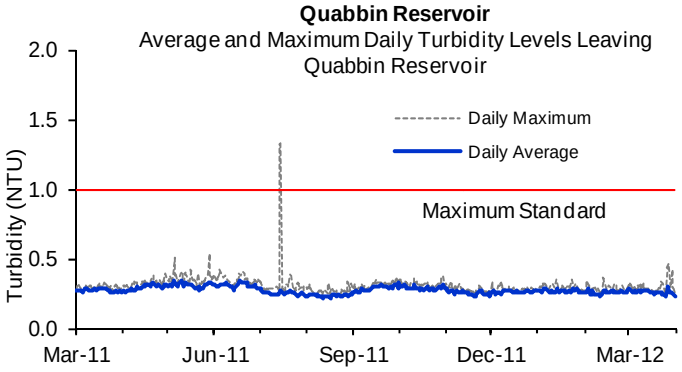
Source Water – Turbidity and Algae Results
March 2012

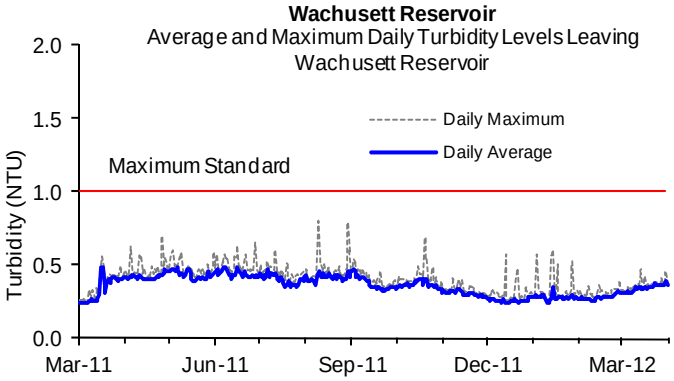
Source Water – Turbidity Results

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.

There are two standards for turbidity: all water must be below 5 NTU (Nephelometric Turbidity Units), and water can only be above 1 NTU if it does not interfere with effective disinfection.

Turbidity of Quabbin Reservoir water is monitored continuously at the Ware Disinfection Facility (WDF) before chlorination. Turbidity of Wachusett Reservoir is monitored continuously at the Carroll Water Treatment Plant (CWTP) before ozonation. Maximum turbidity results at Quabbin and Wachusett were within standards for the month.



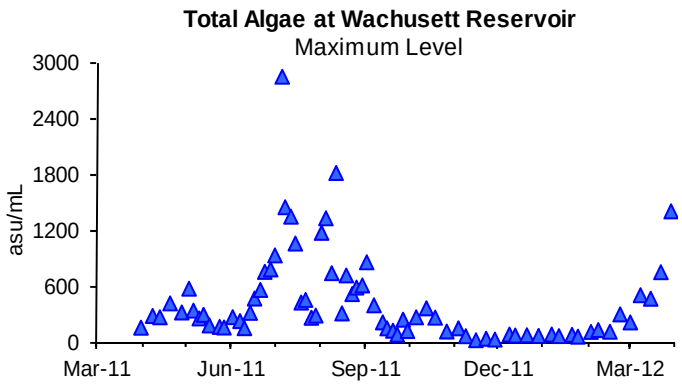


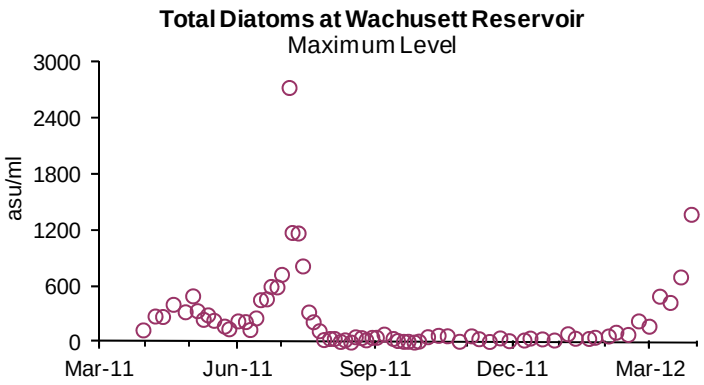
Source Water – Algae Levels

Algae 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 algaecide. 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.

No complaints related to algae were reported during March from local water departments.





Treated Water – Disinfection Results
March 2012

Treated Water - Primary Disinfection

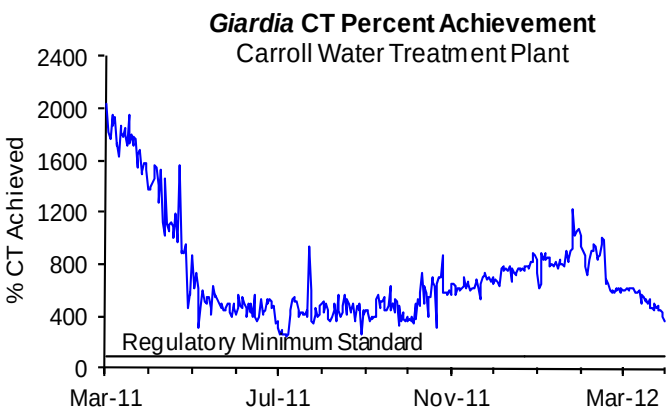
At the Carroll Water Treatment Plant (CWTP), MWRA reports on both regulatory required 99.9% inactivation for *Giardia* (reported as "CT"), and its voluntary operating goal of 99% inactivation for *Cryptosporidium* (reported as "PR"). MWRA calculates hourly CT inactivation rates and reports daily CT inactivation 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.

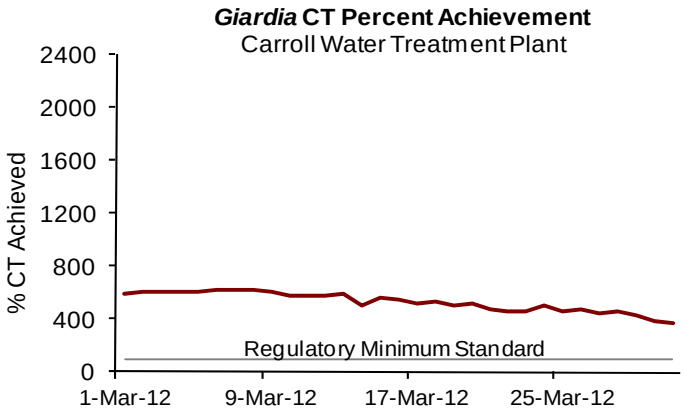
Compliance with the *Giardia* standard is expressed as percent of required CT achieved; 100% is the minimum allowed. To avoid confusion with the regulatory requirements, inactivation of *Cryptosporidium* is reported as Performance Ratio (PR). A PR of 1 demonstrates inactivation of 99% of *Cryptosporidium* based on site-specific data. A PR of 0.5 indicates 90% inactivation.

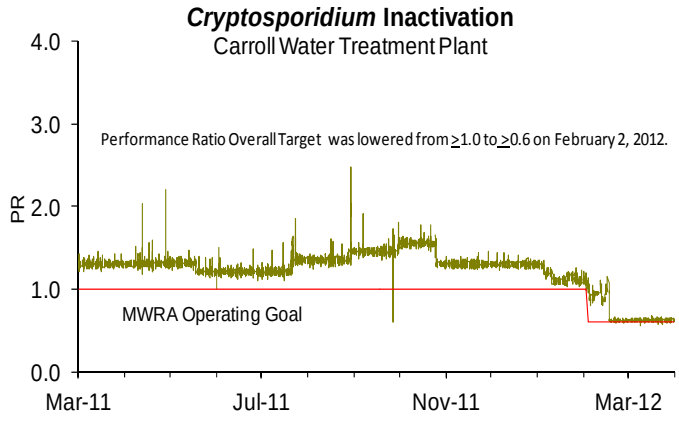
Wachusett Reservoir – MetroWest/MetroBoston Supply:

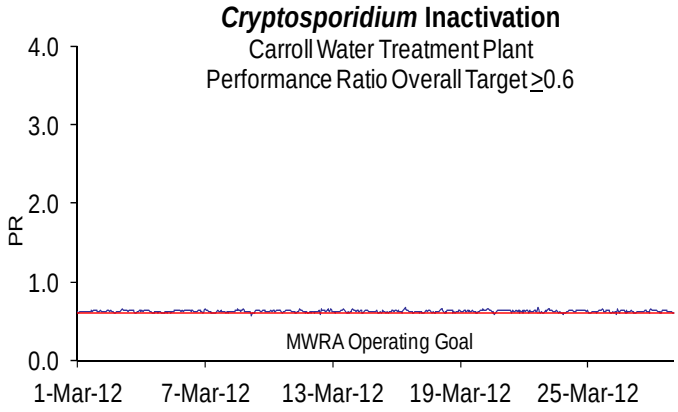
- Ozone dose at the CWTP varied between 3.0 to 4.2 mg/L for March.
- *Giardia* CT was maintained above 100% at all times the plant was providing water into the distribution system for March.

*MWRA will not be able to fully meet our voluntary *Cryptosporidium* inactivation target during the UV construction project. The reduced disinfection target was initiated when Train B was shut down on 2/2/2012. This change in treatment was reviewed and approved by the Massachusetts Department of Environmental Protection as part of its permitting for this project. The lowest PR achieved for the month of March was 0.6, which provides 93.7% *Cryptosporidium* inactivation.



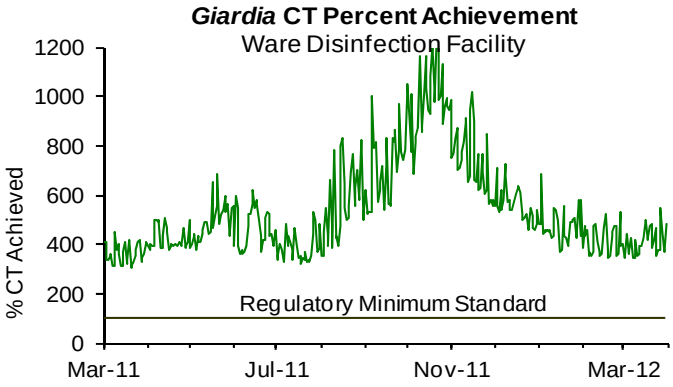


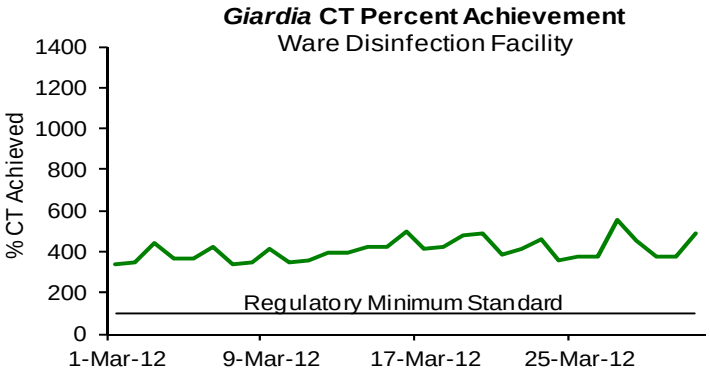




Treated Water – Disinfection, pH and Alkalinity Results
March 2012

Quabbin Reservoir at Ware Disinfection Facility (CVA Supply):
Giardia CT was maintained above 100% at all times the plant was providing water into the distribution system for March. The chlorine dose at Ware Disinfection Facility (WDF) is adjusted in order to achieve MWRA's target of ≥0.75 mg/L at Ludlow Monitoring Station. The chlorine dose at WDF was 1.4 mg/L for March.

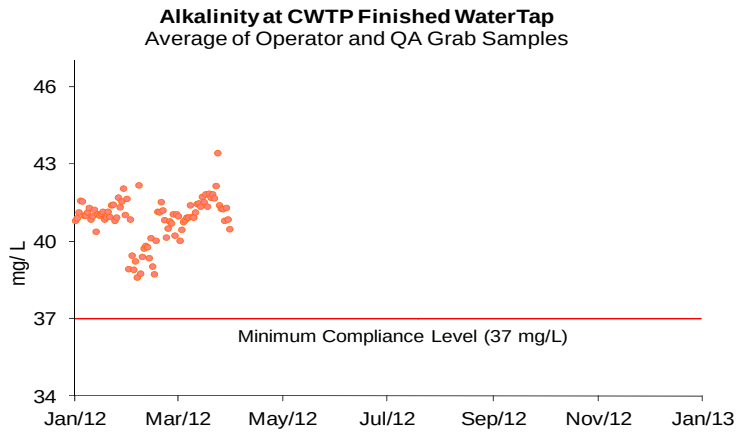


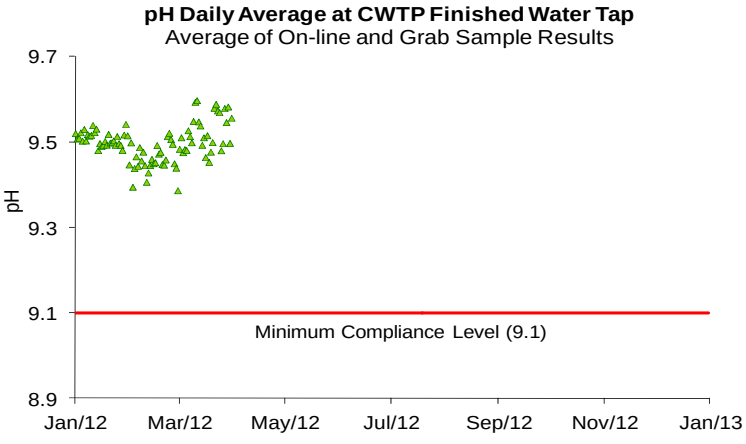


pH and Alkalinity Compliance:

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. When CWTP undergoes winter maintenance, samples are collected at the CWTP Fin A sampling tap. Distribution system samples are collected in March, June, September, and December. Distribution system samples were collected on March 14 and 15, 2012. Distribution system sample pH ranged from 9.2 to 9.6 and alkalinity ranged from 41 to 43 mg/L.

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





Bacteria & Chlorine Residual Results for Communities in MWRA Testing Program
March 2012

While all communities collect bacteria samples for the Total Coliform Rule (TCR), 42 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 139 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

Three of the 1,906 community samples (0.11%) system-wide tested positive for confirmed total coliform during the month of March. One of the 600 MWRA samples (0.17%) tested positive for confirmed total coliform. No sample tested positive for *E.coli*. All 42 systems that submitted chlorine residual data maintained an average disinfectant residual of at least 0.2 mg/L. Only 3.6% of the samples had results lower than 0.2 mg/L.

TCR results by Community

Town	Samples Tested for Coliform (a)	Total Coliform # (%) Positive	*E.coli* % Positive	Public Notification Required?	March 2012 Minimum Chlorine Residual (mg/L)	March 2011 Minimum Chlorine Residual (mg/L)	March 2012 Average Chlorine Residual (mg/L)	March 2011 Average Chlorine Residual (mg/L)
ARLINGTON	70	0 (0%)	0.0%		0.34	0.11	1.66	1.88
BEDFORD	20	0 (0%)	0.0%		0.04	-	0.64	-
BELMONT	32	0 (0%)	0.0%		1.05	1.3	1.69	1.84
BOSTON	260	1 (0.38%)	0.0%	No	1.03	1.61	1.93	2.12
BROOKLINE	68	0 (0%)	0.0%		0.01	0.08	1.84	1.92
CHELSEA	52	0 (0%)	0.0%		1.25	1.47	1.75	1.83
DEER ISLAND	19	0 (0%)	0.0%		1.76	1.92	1.89	2.06
EVERETT	40	0 (0%)	0.0%		1.01	0.01	1.13	1.04
FRAMINGHAM	74	0 (0%)	0.0%		0.24	0.56	1.78	1.95
HANSCOM AFB (Bedford) (b)	9	0 (0%)	0.0%		0.06	0.21	1.01	1.59
LEXINGTON	36	0 (0%)	0.0%		1.40	1.19	1.93	2.02
LYNNFIELD	6	0 (0%)	0.0%		1.40	0.60	1.89	1.36
MALDEN	60	0 (0%)	0.0%		1.36	1.29	1.47	1.38
MARBLEHEAD	24	0 (0%)	0.0%		0.12	0.37	1.42	1.75
MARLBOROUGH (b)	42	0 (0%)	0.0%		1.09	1.35	1.81	1.97
MEDFORD	68	0 (0%)	0.0%		0.98	1.12	1.77	1.86
MELROSE	36	0 (0%)	0.0%		0.02	0.04	0.86	1.21
MILTON	32	0 (0%)	0.0%		1.21	1.36	1.62	1.86
NAHANT	10	0 (0%)	0.0%		0.09	0.09	1.33	1.41
NEEDHAM (b)	41	0 (0%)	0.0%		0.09	0.08	0.64	0.70
NEWTON	92	0 (0%)	0.0%		0.99	0.68	1.83	1.86
NORTHBOROUGH (b)	16	0 (0%)	0.0%		0.29	0.24	1.35	1.06
NORWOOD	36	0 (0%)	0.0%		0.08	0.56	1.49	1.71
QUINCY	92	0 (0%)	0.0%		0.37	0.43	1.76	1.77
READING	40	0 (0%)	0.0%		0.01	1.03	1.48	1.79
REVERE	74	0 (0%)	0.0%		1.02	1.41	1.79	1.86
SAUGUS	32	0 (0%)	0.0%		1.41	1.61	1.79	1.91
SOMERVILLE	88	0 (0%)	0.0%		1.18	1.64	1.91	2.29
SOUTH HADLEY FD1 (c)	16	0 (0%)	0.0%		0.06	0.05	0.49	0.43
SOUTHBOROUGH	10	0 (0%)	0.0%		0.38	1.03	1.85	1.98
STONEHAM	28	0 (0%)	0.0%		0.85	1.64	1.82	1.99
SWAMPSCOTT	16	0 (0%)	0.0%		0.87	1.20	1.68	1.75
WAKEFIELD (b)	48	0 (0%)	0.0%		0.35	0.63	1.27	1.51
WALTHAM	76	1 (1.32%)	0.0%	No	0.34	1.26	1.80	1.97
WATERTOWN	50	0 (0%)	0.0%		1.47	1.01	1.91	1.98
WELLESLEY (b)	36	0 (0%)	0.0%		0.03	0.08	0.75	0.60
WESTBORO HOSPITAL	5	0 (0%)	0.0%		0.06	0.55	0.09	1.18
WESTON	16	0 (0%)	0.0%		1.69	1.30	2.00	1.92
WILMINGTON (b)	31	0 (0%)	0.0%		1.69	1.58	2.07	1.96
WINCHESTER (b)	20	0 (0%)	0.0%		0.15	0.23	0.77	0.87
WINTHROP	25	0 (0%)	0.0%		0.44	0.41	1.20	1.17
WOBURN (b)	60	1 (1.67%)	0.0%	No	0.11	0.16	0.80	1.02
Total:	1906	3 (0.11%)	0.0%					
MASS. WATER RESOURCES AUTHORITY (d,e)	600	1 (0.17%)	0.0%	No	0.04	0.03	1.75	1.94

(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.

(e) MWRA total coliform and chlorine residual results include data from 125 community pipe locations as described above. In most cases these community results are accurately indicative of MWRA water as it enters the community system; however, some are clearly strongly influenced by local pipe conditions. Residuals in the MWRA system are typically between 1.0 and 2.8 mg/L.

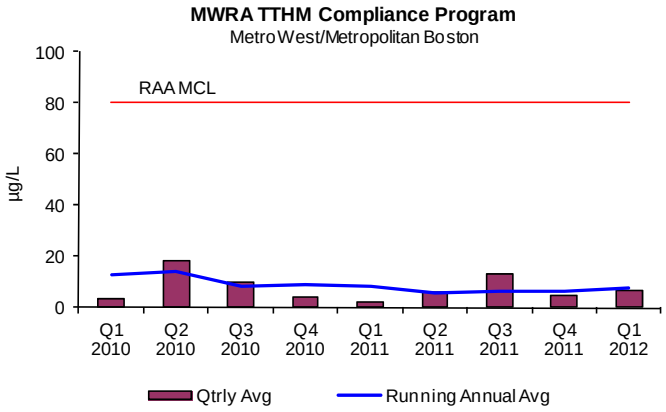
Treated Water - Disinfection By-Product (DBP) Levels in Communities
March 2012

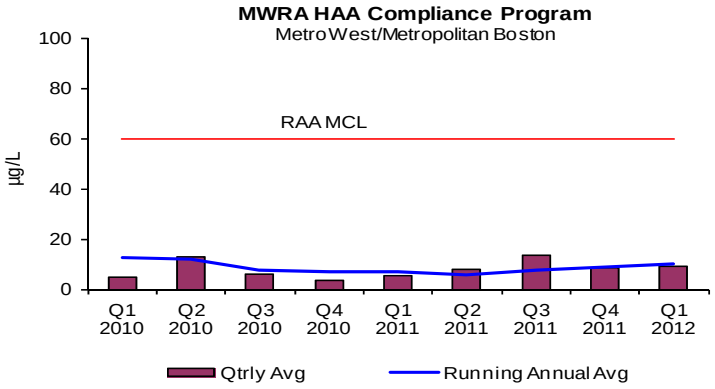
Total Trihalomethanes (TTHMs) and Haloacetic Acids (HAA5s) are by-products of disinfection treatment with chlorine. TTHMs and HAA5s are of concern due to their potential adverse health effects at high levels. EPA's running annual average (RAA) standard is 80 µg/L for TTHMs and 60 µg/L for HAA5s. The 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.

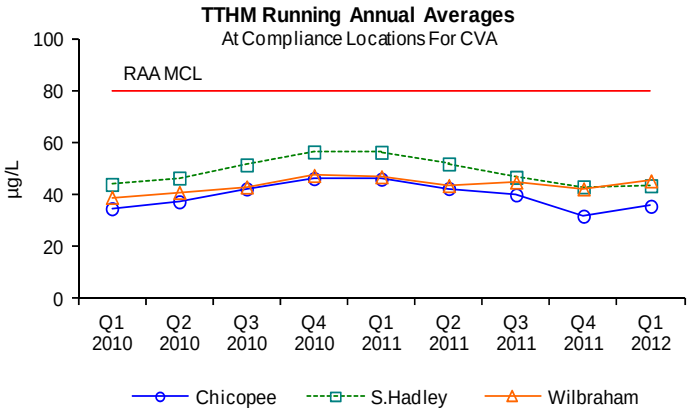
Absorbance, measured as UV-254, is one measurement of the amount and reactivity of natural organic material in source water. After Hurricane Irene, UV-254 measurements in Wachusett Reservoir rose sharply due to the action of the storm and increased tributary flows. The higher UV-254 levels caused increased ozone and chlorine demand resulting in the need for higher ozone and chlorine doses. There were no impacts on regulatory compliance.

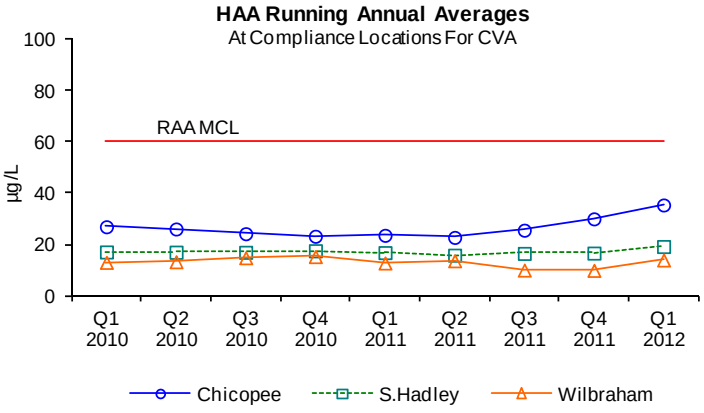
Bromate is tested monthly per DEP requirements for water systems that treat with ozone. Bromide in the raw water may be converted into bromate following ozonation. EPA's RAA Maximum Contaminant Level (MCL) standard for bromate is 10 µg/L.

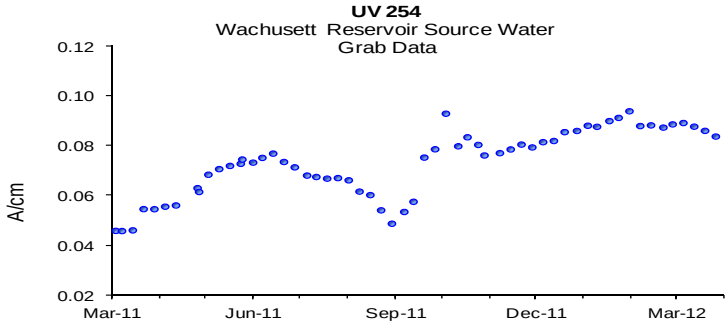
The RAA for TTHMs and HAA5s for MWRA's Compliance Program (represented as the line in the top two graphs below) remain below current standards. The RAA for TTHMs =7.8 µg/L; HAA5s = 9.7 µg/L. CVA's DBP levels continue to be below current standards. UV-254 levels are currently around 0.08 A/cm. The current RAA for Bromate = 0.0 µg/L.











MWRA Monthly Water Quality Analysis
March 2012

This page provides information on water quality at four 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) and finished water leaving the treatment plant (CWTP Finished water tap). The "CVA System" locations represent raw water from the Quabbin Reservoir (WDF) and finished water after all treatment (LMS). See www.mwra.com for additional information on other parameters which are monitored less frequently.

	CVA System		Wachusett System Metro-Boston		Standards			
Component	**Quabbin Res. at Ware Disinfection Facility (Raw)**	**Ludlow Monitoring Station (Treated)**	**Carroll Water Treatment Plant Inlet (Raw)**	**Carroll Water TP Fin. Water Tap B (Treated)**	**Health Standard**	**Aesthetics or Other Standards**	**Units**	**Method Reporting Limit**
Alkalinity	***2.9***	***3.5***	***6.8***	***40.5***			MG/L	0.05
Aluminum	U	U	15.3	15.9		50-200 (c)	UG/L	15.0
Ammonia-N, Total	2.80	U	***0.01***	***0.41***			MG/L	0.005
Antimony	U	U	U	U	6 (b)		UG/L	0.4
Arsenic	U	U	U	U	10 (b)		UG/L	1.0
Barium	6.2	6.3	9.0	8.7	2000 (b)		UG/L	2.0
Beryllium	U	U	U	U	4 (b)		UG/L	0.3
Bromate	***U***	***U***	***U***	***U***	10 (b)		UG/L	5.0
Bromide	***10.4***	***6.2***	***16.4***	***14.7***			UG/L	5.0
Cadmium [1]	U	U	U	U	5 (b)		UG/L	0.5
Calcium	2000	2110	***4730***	***4730***			UG/L	20
Chloride	7.5	9.1	***21.8***	***24.3***		250 (c)	MG/L	0.5
Chlorine, Free		***0.88***			4 (b)(d)		MG/L	0.02
Chlorine, Total				***2.7***	4 (b)(d)		MG/L	0.02
Chromium, Total [5]	U	U	U	U	100 (b)		UG/L	1.0
Coliform, Fecal, MF Method	***U***		***3***		20 (a)		CFU/100 mL	1
Coliform, Total, MF Method [e]	***3***	***U***	***9***	***U***	100 (a) 0 (b)		CFU/100 mL	1
Copper **	U	U	***U***	***U***		1300 (f) 1000 (g)	UG/L	3.0
Cyanide	U	U	U	***U***	0.2 (b)		MG/L	0.01
Fluoride [3]	U	U	U	***0.90***	4 (b)		MG/L	0.02
Hardness [2]	7.0	7.2	14.4	14.4			MG/L	0.194
Iron **	12.4	11.4	***38.4***	***39.5***		300 (c)	UG/L	6.0
Lead	0.08	0.09	U	U		15 (f)	UG/L	0.05
Magnesium	486	462	807	822			UG/L	35
Manganese	4.49	3.30	***6.8***	***6.9***		50 (c)	UG/L	0.1
Mercury [1]	U	U	U	U	2 (b)		UG/L	0.05
Nickel	U	U	U	U			UG/L	0.5
Nitrate-N	U	U	0.097	0.113	10 (b)		MG/L	0.005
Nitrite	U	U	U	U	1 (b)		MG/L	0.005
Orthophosphate	0.006	0.006	***0.010***	***0.013***			MG/L	0.0025
pH	***6.8***	***7.1***	***7.1***	***9.5***			S.U.	
Potassium	548	554	1090	1080			UG/L	200
Selenium	U	U	U	U	50 (b)		UG/L	1.0
Silica (SiO2)	1880	1790	***3660***	***4260***			UG/L	200.0
Silver	U	U	U	2.0		100 (c)	UG/L	1.0
Sodium	5.0	6.1	***14.4***	***33.5***			MG/L	0.2
Specific Conductance	***46***	***51***	***116***	***197***			UMHO/cm	0.3
Standard Plate Count, HPC	***4***		***17***	***U***	500 (b)		CFU/mL	1
Sulfate (SO4)	4.3	4.4	***6.6***	***9.7***		250 (c)	MG/L	1.0
Thallium	U	U	U	U	2 (b)		UG/L	0.3
Total Dissolved Solids	29.0	34.0	70.0	103.0		500 (c)	MG/L	13
Total Organic Carbon	1.8	1.9	2.5	***2.8***			MG/L	0.3
Total Phosphorus	U	U	U	U			MG/L	0.05
UV-254	***0.024***	0.018	***0.089***	***0.044***			A/cm	0.000965
Zinc **	3.1	3.9	U	U		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. Most based on annual average.

(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. Based on annual average.

(e) = Confirmed results only are reported.

(f) = Refers to 90th percentile Action Level.

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

U = Less than method reporting limit
MCL = Maximum Contaminant Level
= Not Applicable
CFU = Colony Forming Unit
S.U. = Standard Units

UG/L = micrograms per liter = parts per billion
MG/L = milligrams per liter = parts per million
NTU = Nephelometric Turbidity Unit
HPC = Heterotrophic Plate Count (48 Hrs @ 35 °C)
** = Metal results may be elevated due to local plumbing at the sample tap.

Bold Italics = Samples from March
Regular Font = Samples from January

Most results are based on single grab samples collected on March 5 and 6, 2012 and analyzed by MWRA and contract laboratories.

NOTES:

(1) Due to MWRA lab equipment having higher sensitivity, MWRA's tests for several parameters are more sensitive than the EPA-set levels of detection and reporting. For example, the EPA minimum detection limit for cadmium is 1 ug/L and 0.2 ug/L for mercury, and MWRA lab tests and reports at lower than these detection limits.

(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.

(3) Fluoride dose is 1.0 mg/L with a desired range of 0.8 to 1.2 mg/L.