

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



WATER QUALITY UPDATE
An Analysis of August 2013 Sampling Data

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

August 2013 Highlights

- MWRA achieved CT disinfection requirements for the month** at the Ware Disinfection Facility and the Carroll Water Treatment Plant achieving at least 99.9% *Giardia* inactivation at all times. CT results appear on Page 5. Two communities 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.com

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

Release Date: September 20, 2013

Water Quality Update

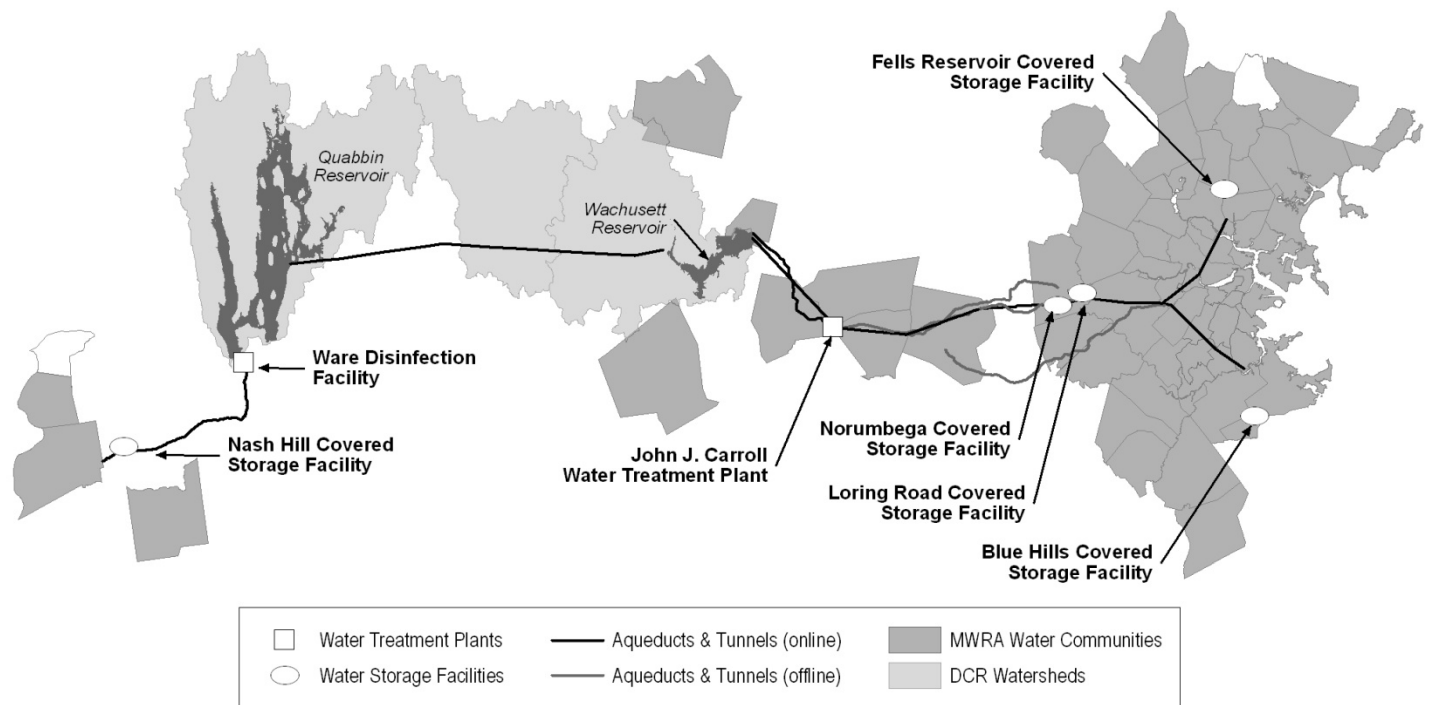
This is a monthly report containing information about the quality of water supplied by MWRA. It provides a more detailed review of water quality than the annual water quality report that is mailed each June to customers in our service area. The report is available at www.mwra.com.

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 and UV Results

August 2013

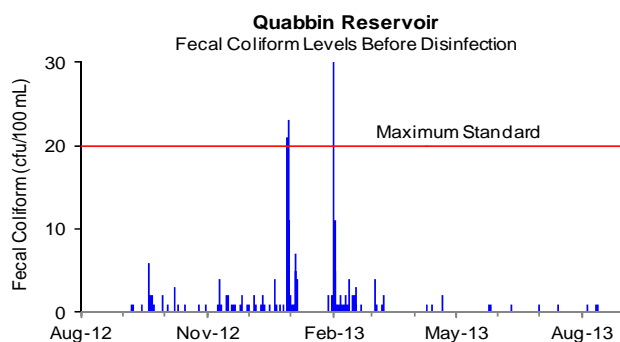
Source Water - Microbial Results

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 August. 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.**

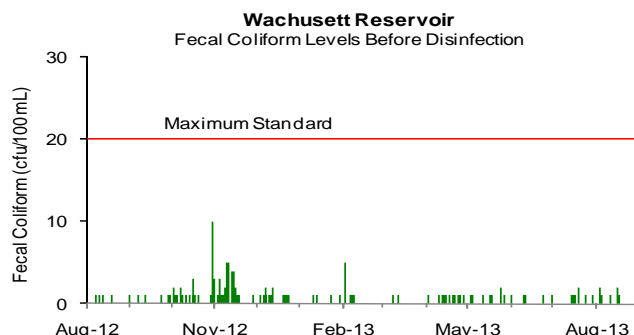


Sample Site: Wachusett Reservoir

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.

Seven of the 31 samples were positive during August. 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.**

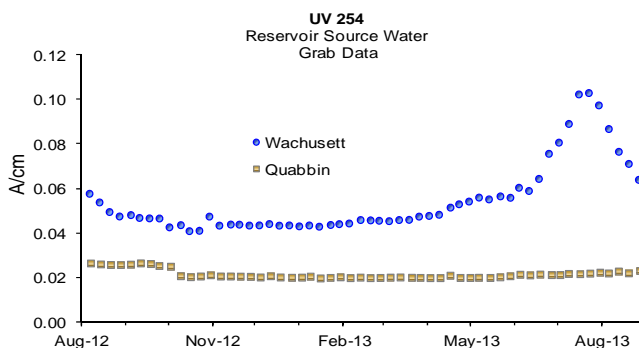


Source Water - UV Absorbance

UV Absorbance at 254nm wavelength (UV-254), is a measure of the amount and reactivity of natural organic material in source water. Higher UV-254 levels cause increased ozone and chlorine demand resulting in the need for higher ozone and chlorine doses, and can increase the level of disinfection by-products. UV-254 is impacted by tributary flows, water age, sunlight and other factors. Hurricanes can have a significant and long lasting impact.

Quabbin Reservoir UV-254 levels are currently around 0.023 A/cm.

Wachusett Reservoir UV-254 levels are currently around 0.064 A/cm.



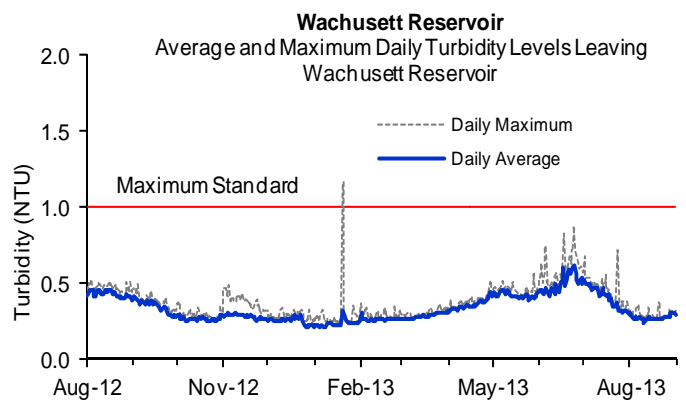
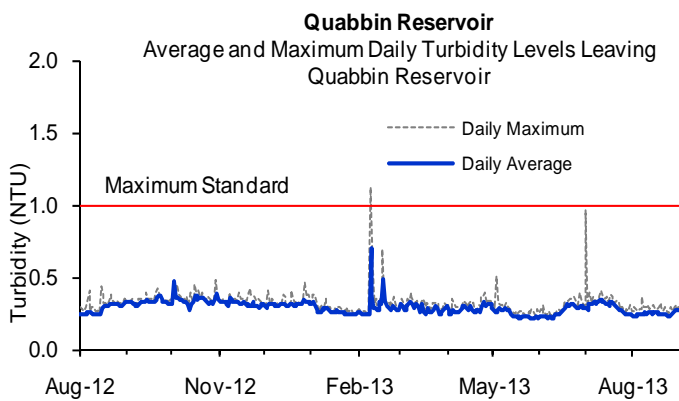
Source Water – Turbidity and Algae Results August 2013

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.

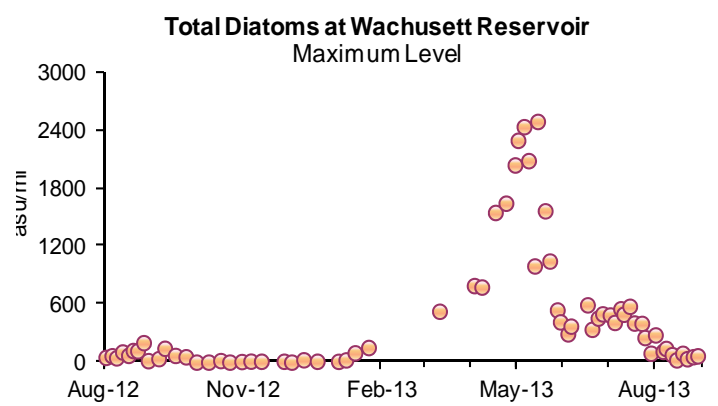
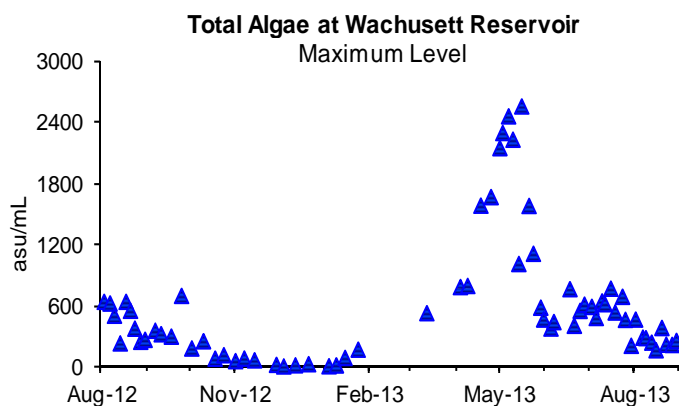


Source Water - Algae Levels

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 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.

No complaints which may be related to algae were reported during August from a local water department.



Treated Water – Disinfection Results

August 2013

Treated Water - Primary Disinfection

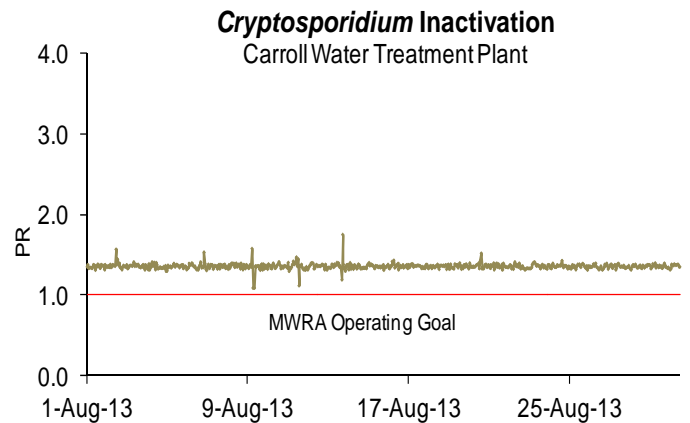
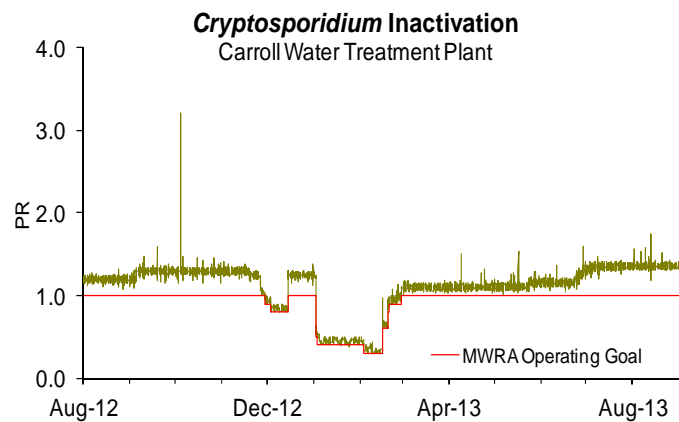
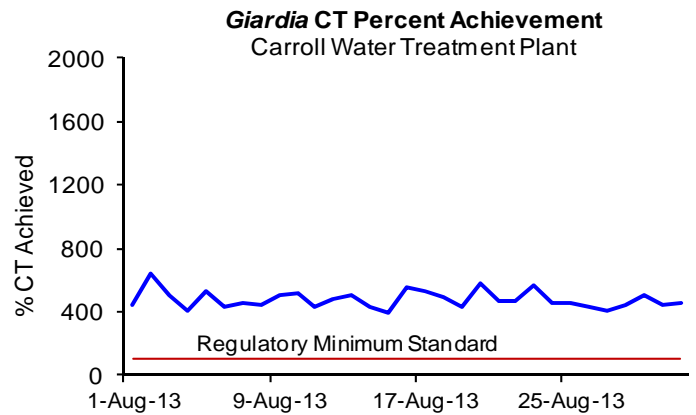
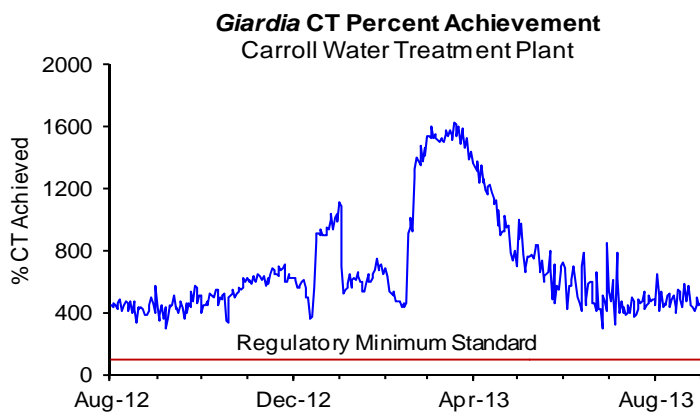
At the Carroll Water Treatment Plant (CWTP), MWRA reports on both regulatory required 99.9% inactivation for *Giardia* (reported as “CT”), and its voluntary operating goal of 99% inactivation for *Cryptosporidium* (reported as “PR”). MWRA reports daily CT inactivation rates at maximum flow, and meeting 100% of the required CT is the minimum allowed 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.

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:

- *Giardia* CT was maintained above 100% at all times the plant was providing water into the distribution system for August; MWRA’s operating goal to meet a *Cryptosporidium* PR of 1 was met at all times the plant was providing water into the distribution system for the month.

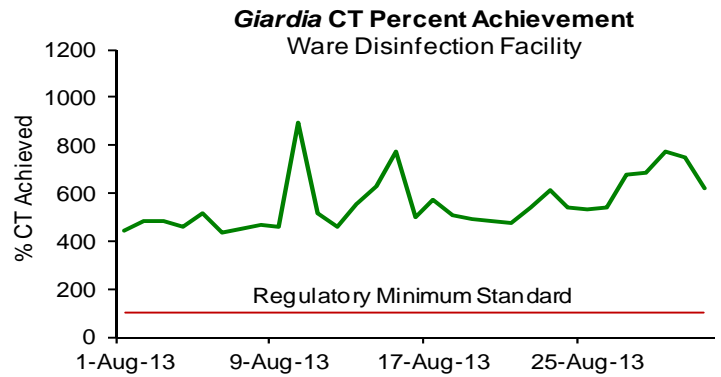
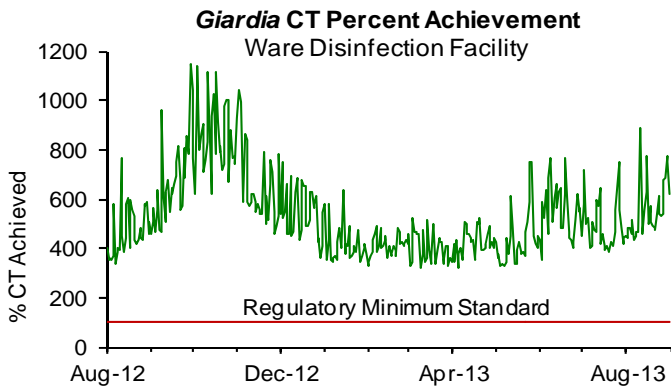
- Ozone dose at the CWTP varied between 2.0 to 3.1 mg/L for August.



Treated Water – Disinfection, pH and Alkalinity Results August 2013

Quabbin Reservoir at Ware Disinfection Facility (CVA Supply):

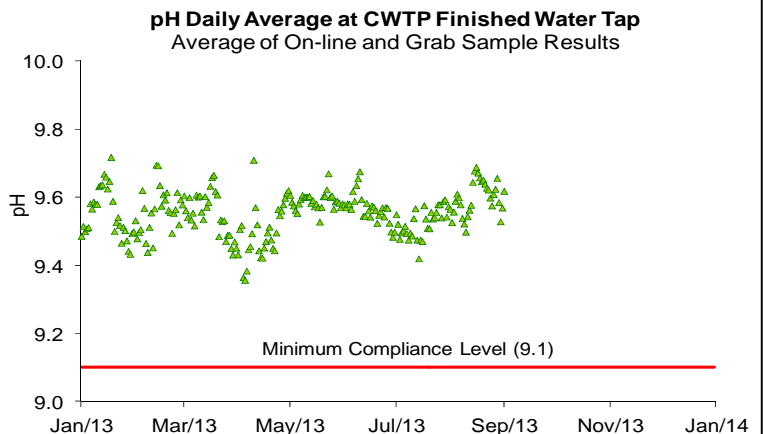
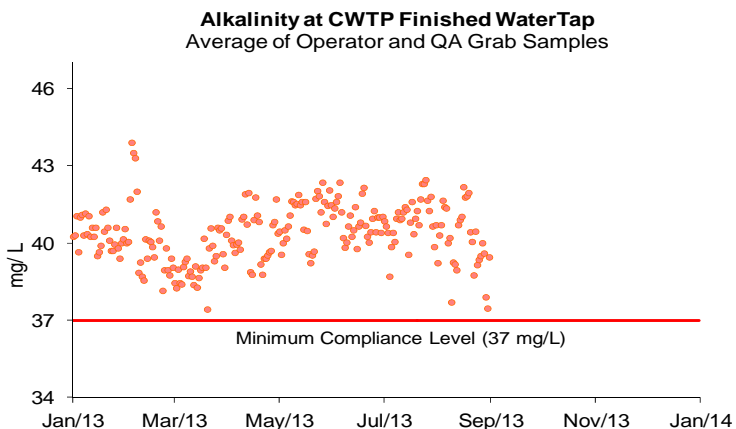
Giardia CT was maintained above 100% at all times the plant was providing water into the distribution system for August. The chlorine dose at Ware Disinfection Facility (WDF) is adjusted in order to achieve MWRA's seasonal (June 1 – October 31) target of ≥ 1.0 mg/L at Ludlow Monitoring Station. The chlorine dose at WDF varied between 1.6 and 1.7 mg/L for August.



Treated Water - 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.

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



Bacteria & Chlorine Residual Results for Communities in MWRA Testing Program August 2013

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.

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 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. 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 hundred and sixteen of the 2,077 community samples (5.6%) system-wide tested positive for total coliform during the month of August. One of the 641 MWRA samples (0.2%) tested positive for total coliform. No sample tested positive for *E.coli*. Bedford and Hanscom AFB had local water quality issues and violated the TCR for August. Only 7.8% of the samples had chlorine residuals lower than 0.2 mg/L.

	# Coliform Samples (a)	Total Coliform # (%) Positive	E.coli # Positive	Public Notification Required?	2013 Minimum Chlorine Residual (mg/L)	2012 Minimum Chlorine Residual (mg/L)	2013 Average Chlorine Residual (mg/L)	2012 Average Chlorine Residual (mg/L)
MWRA Sampling Locations (d)	641	1 (0.2%)	0	No	0.01	0.01	1.89	1.67
ARLINGTON	65	0 (0%)	0		0.01	0.01	1.06	0.97
BELMONT	32	0 (0%)	0		0.01	0.07	1.18	0.92
BOSTON	258	1 (0.4%)	0	No	0.09	0.25	1.82	1.85
BROOKLINE	68	0 (0%)	0		0.30	0.13	1.96	1.92
CHELSEA	56	1 (1.8%)	0	No	1.20	1.25	1.76	1.80
DEER ISLAND	16	0 (0%)	0		0.65	1.15	1.51	1.75
EVERETT	52	0 (0%)	0		0.24	0.95	1.00	1.05
FRAMINGHAM	72	0 (0%)	0		0.20	0.21	1.45	1.60
LEXINGTON	32	0 (0%)	0		0.34	0.52	1.62	1.44
LYNNFIELD	6	0 (0%)	0		0.55	0.41	1.30	1.22
MALDEN	72	0 (0%)	0		1.52	1.40	1.60	1.51
MARBLEHEAD	24	0 (0%)	0		0.21	0.19	1.84	1.42
MEDFORD	68	0 (0%)	0		0.48	0.39	1.64	1.65
MELROSE	36	0 (0%)	0		0.02	0.02	0.57	0.60
MILTON	32	0 (0%)	0		0.74	0.48	1.60	1.44
NAHANT	10	0 (0%)	0		0.08	0.09	0.75	1.24
NEWTON	92	0 (0%)	0		0.09	0.02	1.65	1.41
NORWOOD	33	0 (0%)	0		0.02	0.05	0.89	0.90
QUINCY	92	0 (0%)	0		0.03	0.07	0.87	1.17
READING	40	0 (0%)	0		0.02	0.02	0.88	1.03
REVERE	75	0 (0%)	0		0.37	0.99	1.29	1.58
SAUGUS	32	0 (0%)	0		0.87	0.45	1.59	1.17
SOMERVILLE	84	0 (0%)	0		1.08	1.01	1.75	1.58
SOUTHBOROUGH	10	0 (0%)	0		0.46	0.10	1.81	1.58
STONEHAM	35	0 (0%)	0		0.02	0.57	1.70	1.71
SWAMPSCOTT	18	0 (0%)	0		0.14	0.02	0.97	0.97
WALTHAM	72	0 (0%)	0		0.16	0.32	1.76	1.83
WATERTOWN	50	0 (0%)	0		0.35	0.38	1.92	1.63
WESTBORO HOSPITAL	5	0 (0%)	0		0.03	0.03	0.06	0.28
WESTON	16	0 (0%)	0		0.10	0.14	1.82	1.95
WINTHROP	24	0 (0%)	0		0.12	0.40	0.90	1.14
Total: Fully Served	1577	2 (0.1%)						
CVA & Partially Served (b)								
BEDFORD (e)	93	56 (60.2%)	0	Yes	0.06	0.02	0.64	0.46
HANSCOM AFB (f)	86	58 (67.4%)	0	Yes	0.02	0.04	0.48	0.68
MARLBORO	45	1 (2.2%)	0	No	0.16	0.41	2.23	1.86
NEEDHAM	41	0 (0%)	0		0.02	0.02	1.01	0.99
NORTHBORO	16	0 (0%)	0		0.08	0.01	1.57	1.19
WAKEFIELD	57	0 (0%)	0		0.05	0.20	1.07	1.05
WELLESLEY	36	0 (0%)	0		0.05	0.02	0.73	0.63
WILMINGTON	29	0 (0%)	0		0.06	0.10	1.30	1.43
WINCHESTER	20	0 (0%)	0		0.25	0.28	1.49	1.47
WOBURN	61	0 (0%)	0		0.01	0.01	1.08	1.07
SOUTH HADLEY FD1 (c)	16	0 (0%)	0		0.28	0.36	0.65	0.80
Total: CVA & Partially Served	500	116 (23.0%)						
Total: Community Samples	2077	118 (5.6%)						

(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 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.

(e) Sample collection period extended until September 7, 2013 by DEP.

(f) Sample collection period extended until September 15, 2013 by DEP.

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

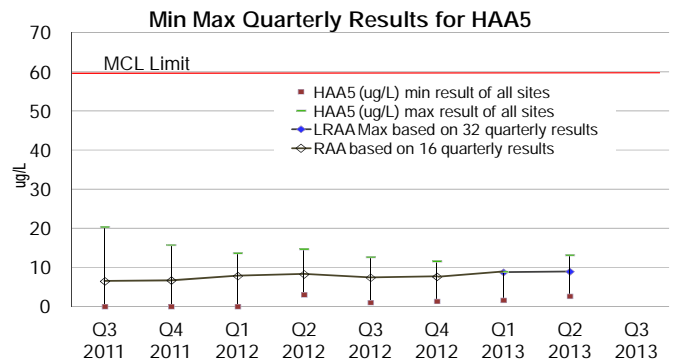
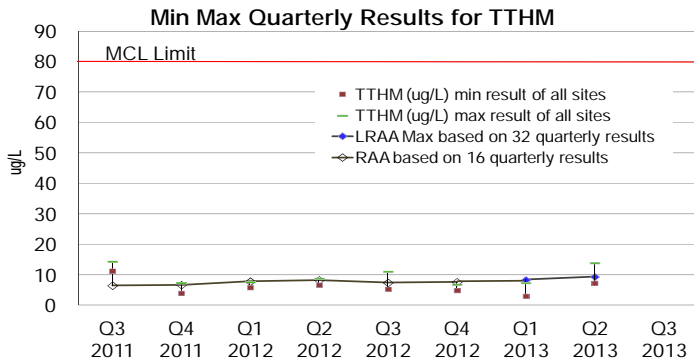
August 2013

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. For the MetroBoston system, effective Q2 2013, under the Stage 2 DBP Rule, compliance is based on a locational running annual average (LRAA). Sampling locations have increased from 16 to 32 each quarter. Data prior to May 2013 reports the running annual average, and after May 2013, the maximum LRAA is reported (in addition to min and max values). Partially served communities are responsible for their own compliance monitoring and reporting, and must be contacted directly for their results. For the CVA communities, Stage 2 DBP reporting begins in October 2013.

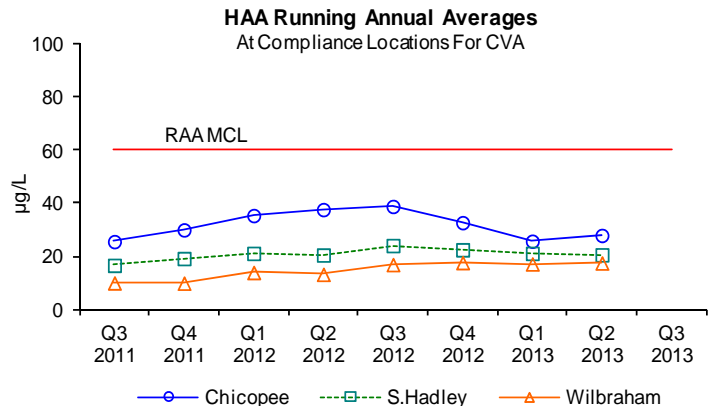
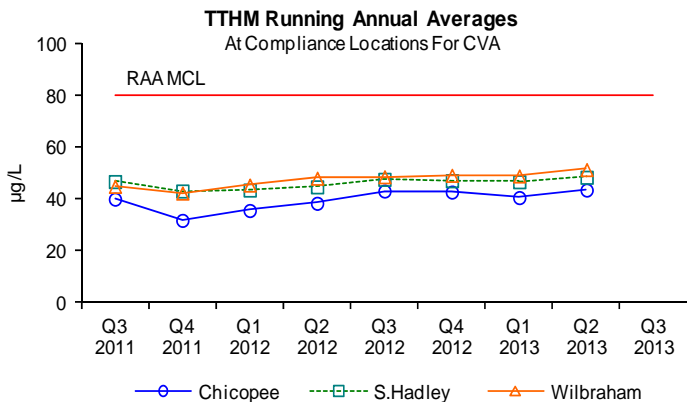
Bromate is tested monthly per DEP requirements for water systems that treat with ozone. Bromide in the raw water may be converted into bromate following ozonation. EPA's RAA Maximum Contaminant Level (MCL) standard for bromate is 10 µg/L.

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 Max LRAA in the first quarter for TTHMs = 9.4 µg/L; HAA5s = 8.9 µg/L. The current RAA for Bromate = 0.0 µg/L. CVA's DBP levels continue to be below current standards.

MetroBoston Disinfection By-Products



CVA Disinfection By-Products



MWRA Monthly Water Quality Analysis

August 2013

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 Standards
Metro-Boston →

Component	Quabbin Res. at Ware Disinfection Facility (Raw)	Ludlow Monitoring Station (Treated)	Carroll Water Treatment Plant Inlet (Raw)	Carroll Water TP Fin. Water Tap (Treated)	Health Standard	Aesthetics or Other Standards	Units	Method Reporting Limit
Alkalinity	3.2	4.0	7.1	40.7			MG/L	0.05
Aluminum	U	U	21.2	20.2		50-200 (c)	UG/L	15.0
Ammonia-N, Total	0.03	0.01	0.05	0.49			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	5.8	6.1	8.6	9.0	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	10.5	5.4	15.9	11.5			UG/L	5.0
Cadmium ⁽¹⁾	U	U	U	U	5 (b)		UG/L	0.5
Calcium	2040	2120	4740	4760			UG/L	50
Chloride	7.3	9.0	24.0	27.5		250 (c)	MG/L	0.5
Chlorine, Free		0.97			4 (b)(d)		MG/L	0.02
Chlorine, Total				2.8	4 (b)(d)		MG/L	0.02
Chromium, Total	U	U	U	U	100 (b)		UG/L	1.0
Coliform, Fecal, MF Method	U		U		20 (a)		CFU/100 mL	1
Coliform, Total, Colilert Method	111	U	86	U	100 (a) 0 (b)		MPN/100 mL	1
Copper **	U	U	U	U		1300 (e) 1000 (f)	UG/L	3.0
Cyanide	U	U	U	U	0.2 (b)		MG/L	0.01
Fluoride ⁽³⁾	U	U	U	1.04	4 (b)		MG/L	0.02
Hardness ⁽²⁾	7.1	7.3	15.4	15.5			MG/L	0.194
Iron **	9.8	8.4	36.4	43.1		300 (c)	UG/L	6.0
Lead	0.09	0.1	U	U		15 (e)	UG/L	0.05
Magnesium	496	495	870	876			UG/L	35
Manganese	2.76	2.32	6.13	6.86		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	0.059	0.061	10 (b)		MG/L	0.005
Nitrite	U	U	U	U	1 (b)		MG/L	0.005
Orthophosphate	U	U	0.004	0.007			MG/L	0.0025
pH	6.8	7.2	6.6	9.6			S.U.	
Potassium	427	478	913	883			UG/L	200
Selenium	U	U	U	U	50 (b)		UG/L	1.0
Silica (SiO2)	1680	1720	2660	3080			UG/L	200.0
Silver	U	U	U	U		100 (c)	UG/L	1.0
Sodium	5.3	6.5	15.6	34.7			MG/L	0.2
Specific Conductance	46	53	110	195			UMHO/cm	0.3
Standard Plate Count, HPC	39		110	1	500 (b)		CFU/mL	1
Sulfate (SO4)	4.3	4.3	6.4	6.7		250 (c)	MG/L	1.0
Thallium	U	U	U	U	2 (b)		UG/L	0.3
Total Dissolved Solids	32.0	40.0	74.0	110.0		500 (c)	MG/L	13
Total Organic Carbon	2.0	2.2	3.1	3.0			MG/L	0.3
Total Phosphorus	U	U	U	U			MG/L	0.05
UV-254	0.022	0.017	0.087	0.044			A/cm	0.000965
Zinc **	3.0	2.6	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. Fecal standard takes precedence when both fecal and total coliform are tested.
- (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) = Refers to 90th percentile Action Level.
- (f) = 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.
MPN = Most Probable Number
Bold Italics = Samples from August
Regular Font = Samples from July

Most results are based on single grab samples collected on August 5 and 6, 2013 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 hardness is characterized by the amount of dissolved minerals in the water, in particular calcium and magnesium. 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.