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WATER QUALITY UPDATE An Analysis of February 2015 Sampling Data

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



MWRA WATER QUALITY UPDATE

February 2015 Highlights

- **In February, MWRA met all regulatory targets for pathogen inactivation at Brutsch Water Treatment Facility and Carroll Water Treatment Plant**, achieving greater than 99% *Cryptosporidium* inactivation and 99.9% *Giardia* inactivation at all times. Less than 5% Off-Spec water was produced. See page 3.
- **Carroll Water Treatment Plant is undergoing winter maintenance.** During this period, half the plant is removed from service. Train A was removed from service on January 5 and will remain off-line for approximately eight weeks.
- **MWRA met all regulatory targets for the month.** No community violated the Total Coliform Rule criteria. See Page 4.
- **To reduce printing and postage costs and also to provide the most detailed version, starting in 2015 MWRA has switched to an electronic distribution of the report.** If you still receive the a printed copy of the report and would like to switch, please 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

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Release Date: March 20, 2015

Source Water – Microbial and UV Results

February 2015

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 William A. Brusch Water Treatment Facility raw water tap before being treated and entering the CVA system.

Six 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.**

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.

In the wintertime when smaller water bodies near Wachusett Reservoir freeze up, many waterfowl will roost in the main body of the reservoir - which freezes later. This increased bird activity tends to increase fecal coliform counts. DCR has an active bird harassment program to move the birds away from the intake area.

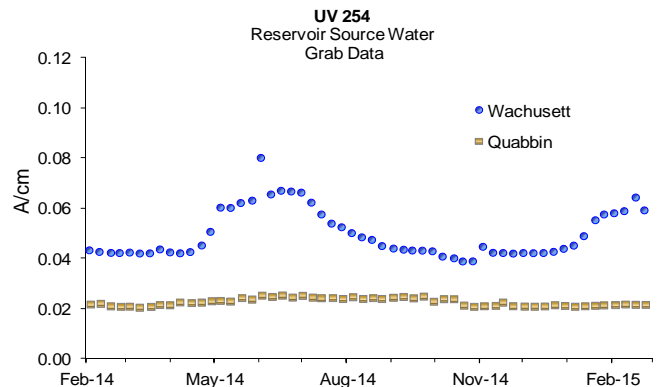
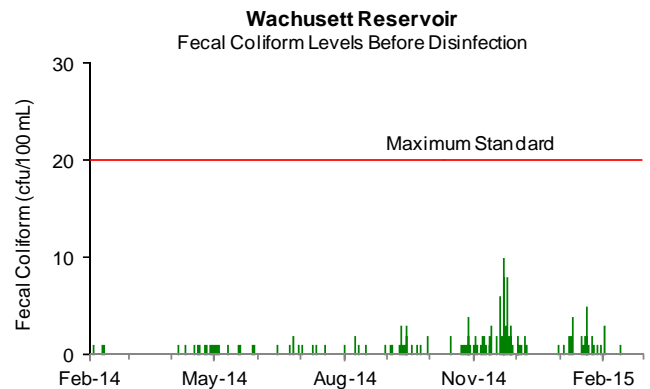
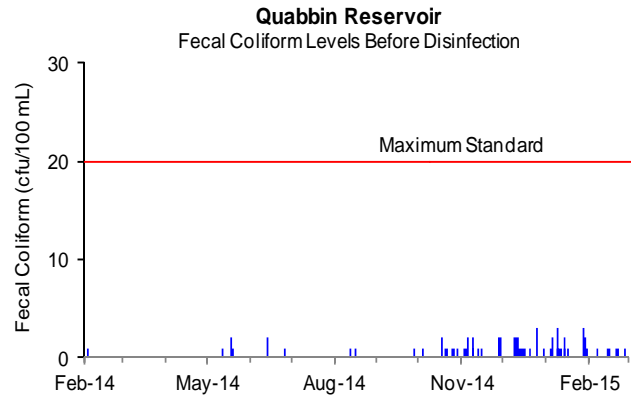
Two of the 28 samples were positive during February. None of the samples exceeded a count of 20 cfu/100mL. **For the current six-month period, 0.0% of the samples have exceeded a count of 20 cfu/100mL.**

Source Water - 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 0.021 A/cm.

Wachusett Reservoir UV-254 levels are currently around 0.059 A/cm.



Turbidity and Disinfection Results

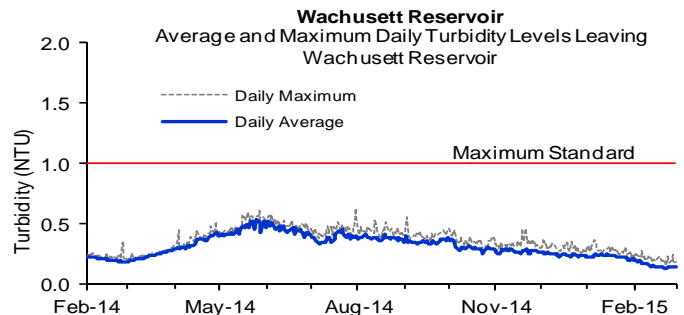
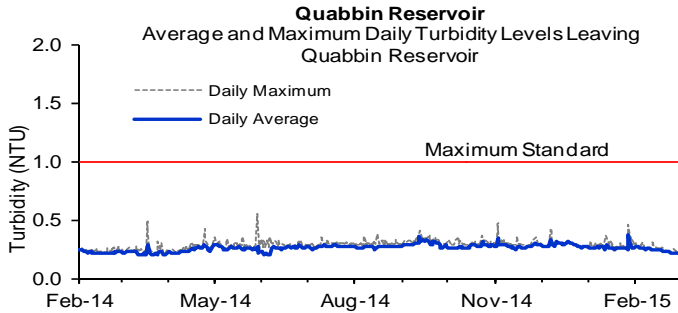
February 2015

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 disinfectant demand or may protect bacteria from disinfection effects, 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 only can be above 1 NTU if it does not interfere with effective disinfection.

Turbidity of Quabbin Reservoir water is monitored continuously at the William A. Brusch Water Treatment Facility (WABWTF) 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.



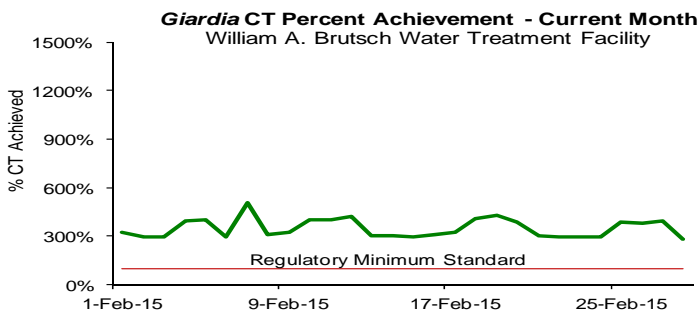
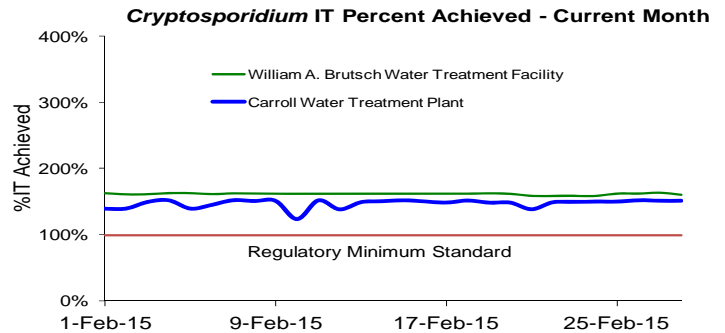
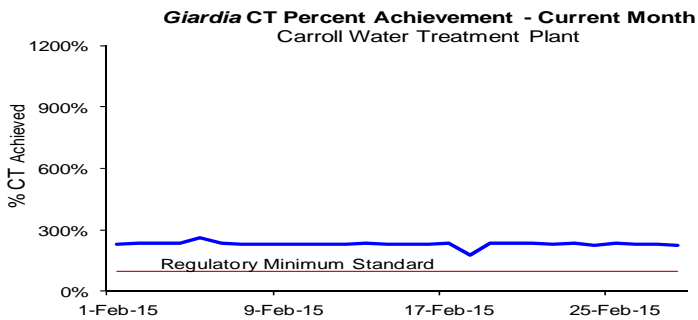
Treated Water - Primary Disinfection

At the Carroll Water Treatment Plant (CWTP), MWRA meets the required 99.9% (3-log) inactivation of *Giardia* using ozone (reported as CT: concentration of disinfectant x contact time) and the required 99% (2-log) inactivation of *Cryptosporidium* using UV (reported as IT: intensity of UV x time). MWRA calculates inactivation rates hourly and reports *Giardia* inactivation at maximum flow and *Cryptosporidium* inactivation at minimum UV dose. MWRA must meet 100% of required CT and IT.

CT achievement for *Giardia* assures CT achievement for viruses, which have a lower CT requirement. For *Cryptosporidium*, there is also an "off-spec" requirement. Off-spec water is water that has not reached the full required UV dose or if the UV reactor is operated outside its validated ranges. No more than 5% off-spec water is allowed in a month.

Wachusett Reservoir - MetroWest/MetroBoston Supply:

- Ozone dose at the CWTP varied between 1.5 to 1.8 mg/L for February.
- Giardia* CT was maintained above 100% at all times the plant was providing water into the distribution system for February.
- Cryptosporidium* IT was maintained above 100% during the month. Off-spec water was less than 5%.



Quabbin Reservoir (CVA Supply) at

William A. Brusch Water Treatment Facility (WABWTF):

- The chlorine dose at WABWTF is adjusted in order to achieve MWRA's seasonal target of >0.75 mg/L (November 01 – May 31) and >1.0 mg/L (June 1– October 31) at Ludlow Monitoring Station.
- The chlorine dose at WABWTF was 1.3 mg/L for February.
- Giardia* CT was maintained above 100% at all times the plant was providing water into the distribution system for February.
- Cryptosporidium* IT was maintained above 100% during the month. Off-spec water was less than 5%.

Bacteria & Chlorine Residual Results for Communities in MWRA Testing Program

February 2015

While all communities collect bacteria samples and chlorine residual data for the Total Coliform Rule (TCR), data from the 44 systems that use MWRA's Laboratory are reported below.

The MWRA TCR program has 142 sampling locations. These locations include sites along MWRA's transmission system, water storage tanks and pumping stations, as well as a subset of the community TCR locations.

The TCR requires that no more than 5% of all samples in a month may be total coliform positive (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.

Highlight

Three of the 1,965 community samples (0.15%) system-wide tested positive for total coliform during the month of February. One of the 585 MWRA samples (0.17%) tested positive for total coliform. No community violated the TCR for February. Hanscom AFB did not violate the TCR since only one sample was positive in their system which collects fewer than 40 samples/ month. No sample tested positive for *E.coli*. Only 3.2% of the samples had chlorine residuals lower than 0.2 mg/L.

		# Coliform Samples (a)	Total Coliform # (%) Positive	E.coli # Positive	Public Notification Required?	Chlorine Residuals (mg/L)					
						2015 Minimum	2014 Minimum	2015 Average	2014 Average	2015 % <0.2	2014 % <0.2
MWRA	MWRA Locations	86	0 (0%)	0		1.81	1.91	2.13	2.22	0%	0%
	Shared Community/MWRA sites	499	1 (0.20%)	0	No	0.07	0.10	1.92	1.86	0%	0%
	Total: MWRA	585	1 (0.17%)	0	No	0.07	0.10	1.95	1.92	0%	0%
Fully Served	ARLINGTON	51	0 (0%)	0		0.07	0.03	1.60	1.59	10%	12%
	BELMONT	32	0 (0%)	0		1.45	1.18	1.98	2.08	0%	0%
	BOSTON	240	0 (0%)	0		1.82	1.25	2.06	1.92	0%	0%
	BROOKLINE	68	0 (0%)	0		0.64	1.41	1.89	2.06	0%	0%
	CHELSEA	52	0 (0%)	0		1.20	1.20	1.98	1.78	0%	0%
	DEER ISLAND	16	0 (0%)	0		1.73	1.95	1.83	2.04	0%	0%
	EVERETT	52	0 (0%)	0		0.86	0.98	1.11	1.17	0%	0%
	FRAMINGHAM	75	1 (1.33%)	0	No	0.77	0.74	1.98	2.16	0%	0%
	LEXINGTON	36	0 (0%)	0		1.52	1.81	2.00	2.30	0%	0%
	LYNNFIELD	6	0 (0%)	0		0.62	0.56	1.34	1.37	0%	0%
	MALDEN	71	0 (0%)	0		1.05	0.62	1.99	1.73	0%	0%
	MARBLEHEAD	24	0 (0%)	0		0.26	0.22	1.81	1.69	0%	0%
	MEDFORD	69	0 (0%)	0		1.14	1.04	1.84	1.83	0%	0%
	MELROSE	36	0 (0%)	0		0.29	0.02	1.64	1.04	0%	22%
	MILTON	32	0 (0%)	0		1.26	1.34	2.01	1.79	0%	0%
	NAHANT	10	0 (0%)	0		1.14	0.30	1.72	1.45	0%	0%
	NEWTON	90	0 (0%)	0		0.53	0.70	2.01	1.99	0%	0%
	NORTHBORO	16	0 (0%)	0		0.80	0.48	1.81	1.53	0%	0%
	NORWOOD	33	0 (0%)	0		0.14	0.07	1.80	1.84	6%	3%
	QUINCY	91	0 (0%)	0		0.16	0.29	1.78	1.80	1%	0%
	READING	40	0 (0%)	0		0.57	0.03	1.59	1.61	0%	3%
	REVERE	60	0 (0%)	0		1.26	1.49	2.04	1.99	0%	0%
	SAUGUS	32	0 (0%)	0		1.41	1.37	1.84	1.87	0%	0%
	SOMERVILLE	83	0 (0%)	0		1.01	1.07	1.70	1.76	0%	0%
	SOUTHBOROUGH	10	0 (0%)	0		0.78	0.43	1.88	1.76	0%	0%
	STONEHAM	28	0 (0%)	0		1.20	1.47	1.85	1.93	0%	0%
	SWAMPSCOTT	18	0 (0%)	0		1.48	1.37	1.79	1.84	0%	0%
	WALTHAM	75	1 (1.33%)	0	No	1.44	1.63	1.99	2.17	0%	0%
	WATERTOWN	40	0 (0%)	0		1.66	1.03	1.97	1.84	0%	0%
	WESTBORO HOSPITAL	5	0 (0%)	0		0.05	0.08	0.48	0.34	80%	80%
	WESTON	16	0 (0%)	0		0.13	0.99	2.12	2.11	6%	0%
	WINTHROP	24	0 (0%)	0		0.25	0.36	1.89	1.88	0%	0%
		Total: Fully Served	1531	2 (0.13%)							
CVA & Partially Served	BEDFORD	19	0 (0%)	0		0.96	0.20	1.62	1.04	0%	0%
	CANTON	29	0 (0%)	0		0.02	0.09	0.82	0.65	14%	13%
	HANSCOM AFB	12	1 (8.33%)	0	No	0.52	1.15	1.59	1.77	0%	0%
	MARLBORO	42	0 (0%)	0		0.71	1.12	1.94	2.35	0%	0%
	NEEDHAM	41	0 (0%)	0		0.10	0.09	0.58	0.62	7%	5%
	PEABODY	72	0 (0%)	0		0.10	0.05	1.14	0.95	30%	44%
	WAKEFIELD	48	0 (0%)	0		0.64	0.62	1.56	1.46	0%	0%
	WELLESLEY	38	0 (0%)	0		0.12	0.12	0.89	0.62	5%	8%
	WILMINGTON	29	0 (0%)	0		1.42	1.21	1.97	1.96	0%	0%
	WINCHESTER	28	0 (0%)	0		0.26	0.23	1.08	1.08	0%	0%
	WOBURN	60	0 (0%)	0		0.44	0.12	1.32	0.88	0%	3%
	SOUTH HADLEY FD1	16	0 (0%)	0		0.27	0.27	0.54	0.51	0%	0%
		Total: CVA & Partially Served	434	1 (0.23%)							
	Total: Community Samples	1965	3 (0.15%)								

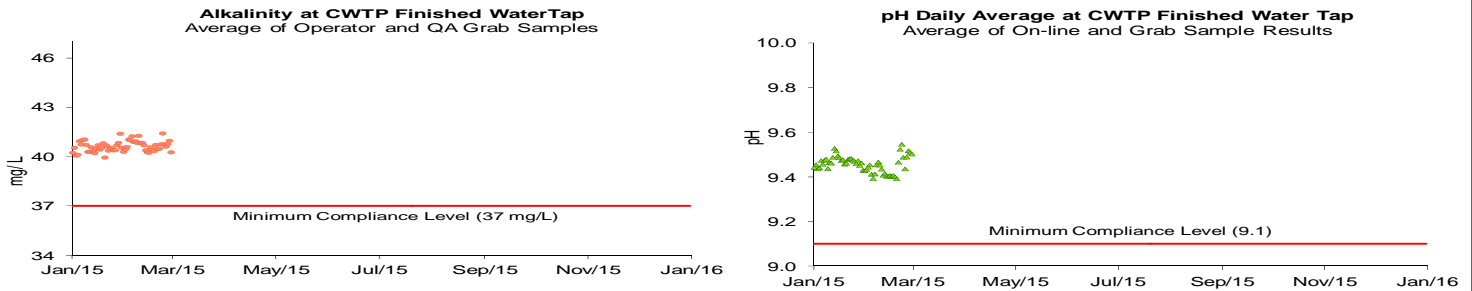
(a) The number of samples collected depends on the population served and the number of repeat samples required.
 (b) These communities are partially supplied, and may mix their chlorinated supply with MWRA chloraminated supply.
 (c) Part of the Chicopee Valley Aqueduct System. Free chlorine system.

Treated Water - pH and Alkalinity and Disinfection By-Product (DBP) Levels in Communities February 2015

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



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

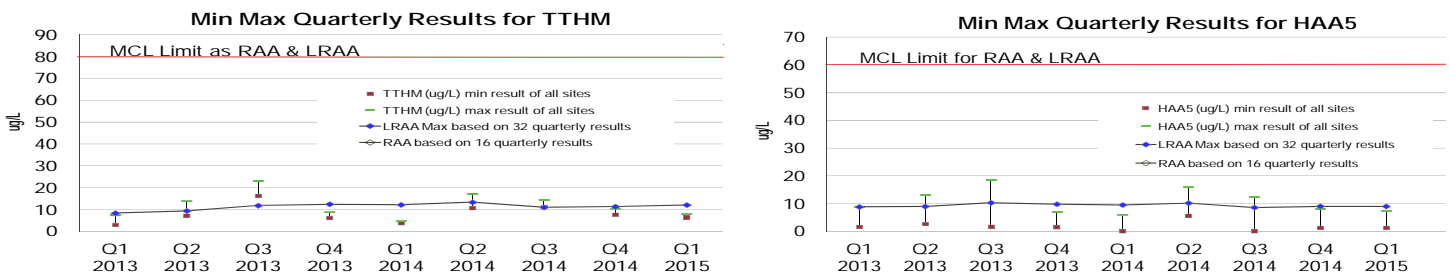
Total Trihalomethanes (TTHMs) and Haloacetic Acids (HAA5s) are by-products of disinfection treatment with chlorine. TTHMs and HAA5s are of concern due to their potential adverse health effects at high levels. EPA's running annual average (RAA) standard is 80 µg/L for TTHMs and 60 µg/L for HAA5s. For the MetroBoston system, effective Q2 2013, under the Stage 2 DBP Rule, compliance is based on locational running annual averages (LRAA). Sampling locations have increased from 16 to 32 each quarter. Data prior to Q1 2013 reports the running annual average, and since Q1 2013, the maximum LRAA is reported (in addition to min and max values). For the CVA communities, effective Q3 2013, under the Stage 2 DBP Rule, compliance is based on a LRAA for each community. Sampling locations have increased from 12 to 14 each quarter. Prior to Q3 2013, the running annual average is reported, and since Q3 2013, the maximum LRAA is reported (in addition to min and max values). The chart below combines all three CVA communities data.

Partially served and CVA communities are responsible for their own compliance monitoring and reporting, and must be contacted directly for their individual results.

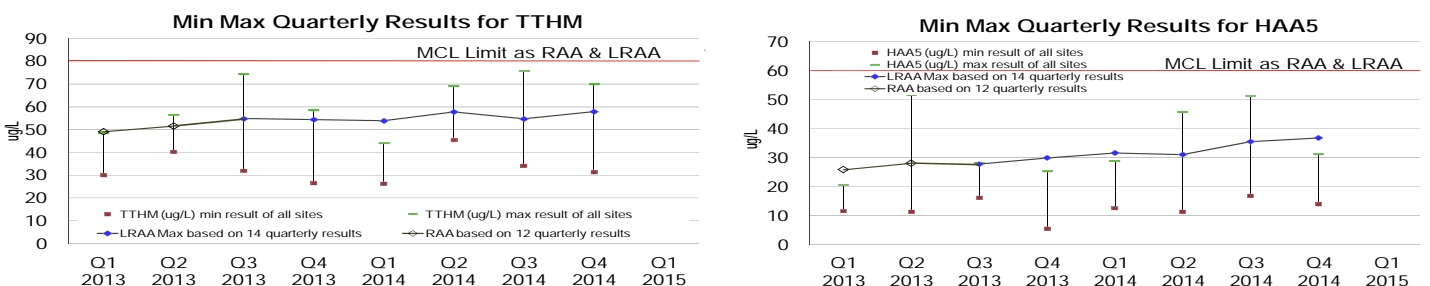
Bromate is tested monthly per DEP requirements for water systems that treat with ozone. Bromide in the raw water may be converted into bromate following ozonation. EPA's RAA Maximum Contaminant Level (MCL) standard for bromate is 10 µg/L.

The LRAA 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 = 12.1 µg/L; HAA5s = 9.0 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

February 2015

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 regular font 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 (William A. Brutsch Water Treatment Facility) and finished water after all treatment (Ludlow Monitoring Station). See www.mwra.com for additional information on other parameters which are monitored less frequently. All samples are analyzed by MWRA and contract laboratories.

CVA System Wachusett System
Metro-Boston Standards

Component	Brutsch Water Treatment 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	3.3	4.2	6.3	40.4			MG/L	0.05
Aluminum	U	U	U	U		50-200 (c)	UG/L	15.0
Ammonia-N, Total	0.01	U	0.01	0.38			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	6.1	7.9	7.9	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	10.1	5.5	13.9	10.6			UG/L	5.0
Cadmium (1)	U	U	U	U	5 (b)		UG/L	0.5
Calcium	2030	2060	3880	4030			UG/L	50
Chloride	7.6	9.0	21.5	23.5		250 (c)	MG/L	0.5
Chlorine, Free		0.81			4 (b)(d)		MG/L	0.02
Chlorine, Total				2.41	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	1	U	2	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	0.98	4 (b)		MG/L	0.02
Hardness (2)	7.2	7.3	12.9	13.6			MG/L	0.194
Iron **	11.2	13.1	13.2	14.7		300 (c)	UG/L	6.0
Lead	0.05	0.06	U	U		15 (e)	UG/L	0.05
Magnesium	522	527	777	848			UG/L	35
Manganese	3.60	2.07	6.01	5.86		50 (c) 300 (g)	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	0.007	0.007	0.036	0.039	10 (b)		MG/L	0.005
Nitrite	U	U	U	0.005	1 (b)		MG/L	0.005
Orthophosphate	0.008	0.006	0.008	0.009			MG/L	0.0025
pH	6.8	7.1	7.0	9.6			S.U.	
Potassium	479	486	830	875			UG/L	200
Selenium	U	U	U	U	50 (b)		UG/L	1.0
Silica (SiO2)	2050	1990	2340	2800			UG/L	200.0
Silver	U	U	U	U		100 (c)	UG/L	1.0
Sodium	5.1	6.1	13.1	32.0			MG/L	0.2
Specific Conductance	46	51	112	192			UMHO/cm	0.3
Standard Plate Count, HPC	2		11	U	500 (b)		CFU/mL	1
Sulfate (SO4)	4.3	4.4	5.9	6.2		250 (c)	MG/L	1.0
Thallium	U	U	U	U	2 (b)		UG/L	0.3
Total Dissolved Solids	31.0	43.0	57.0	97.0		500 (c)	MG/L	13
Total Organic Carbon	1.7	1.8	2.4	2.4			MG/L	0.3
Total Phosphorus	U	U	U	U			MG/L	0.05
UV-254	0.021	0.016	0.058	0.038			A/cm	0.000965
Zinc **	2.0	1.7	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. Lead results will vary at your home dependent on household plumbing.
 (f) = Refers to a single sample, secondary MCL.
 (g) = DEP Advisory Level, reference www.mass.gov/eea/docs/dep/water/drinking/alpha/i-thru-z/mangfactsheet.pdf

U = Less than method reporting limit
 MCL = Maximum Contaminant Level
 [Grey Box] = Not Applicable
 S.U. = Standard Units

CFU = Colony Forming Unit
 NTU = Nephelometric Turbidity Unit
 MG/L = milligrams per liter = parts per million
 UG/L = micrograms per liter = parts per billion

MPN = Most Probable Number
 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 February
 Regular Font = Quarterly results from January samples

Samples listed are monthly samples taken from single grab samples on February 2 and 3, 2015.

- NOTES:**
- 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.
 - 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.
 - Fluoride dose is 1.0 mg/L with a desired range of 0.8 to 1.2 mg/L.