

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

WATER QUALITY UPDATE An Analysis of December 2005 Sampling Data

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



MWRA WATER QUALITY UPDATE

December 2005 Highlights

- **MWRA achieved CT disinfection requirements for the month** at the Ware Disinfection Facility (WDF) and the Carroll Water Treatment Plant (CWTP). CT results appear on Page 5 and 6. No community violated the Total Coliform Rule criteria. See Page 7.
- **MWRA continues to provide appropriate corrosion control**, as no sample results have been below pH and alkalinity target levels for the past 6 months. See Page 6.
- **Disinfection by-products (TTHMs and HAA5s) continue to be at all time lows.** See Page 8.
- **Both the Quabbin and Wachusett Reservoirs are full**, with water levels very high for the winter.
- **Water quality complaints are at an all time low!** Only two complaints were reported for December.
- We are **continually** updating the report:

Let us know what you think **(617) 242-5323**

Let us know if you have any ideas or comments.

Call **(617) 242-5323** or email Joshua.Das@mwra.state.ma.us

Release Date: January 20, 2006

Water Quality Update

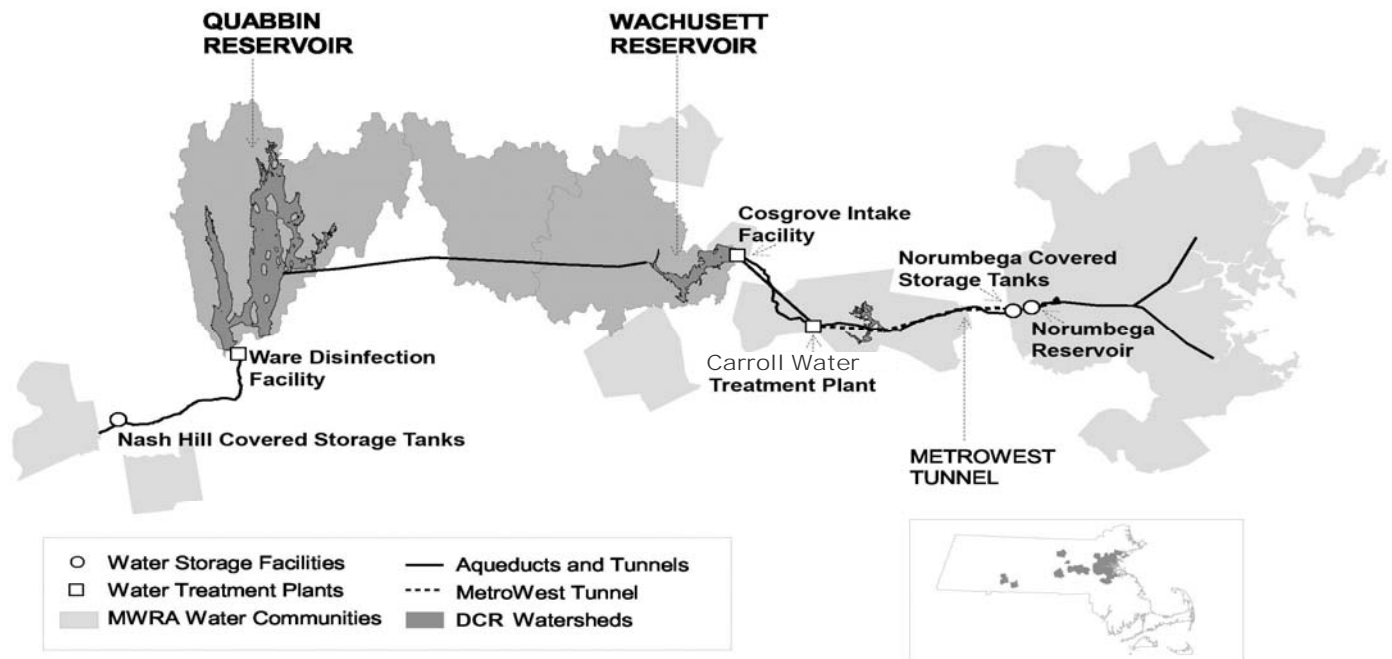
This is a monthly report containing information about the quality of water supplied by MWRA. It provides a more detailed review of water quality than the annual water quality report that is mailed each June to customers in our service area. The report is available at www.mwra.com.

The Water System

MWRA provides about 250 million gallons of water each day to 46 cities and towns in Massachusetts. 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 1500 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

December 2005

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. 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 supplies requires that no more than 10% of source water samples prior to disinfection over a six-month period 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. MWRA met the six-month running average standard for fecal coliform continuously at this location over the last year.

Twelve of the 31 samples were positive during December. 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 before it enters the MetroWest and Metropolitan Boston systems at the Carroll Water Treatment Plant raw water tap in Marlborough.

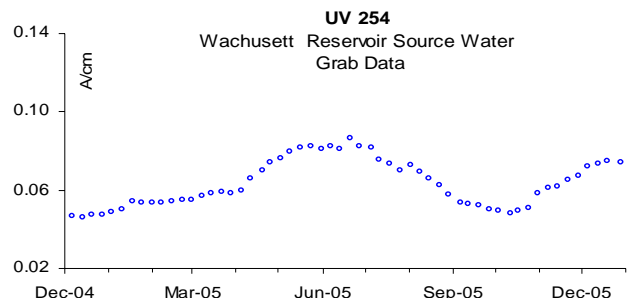
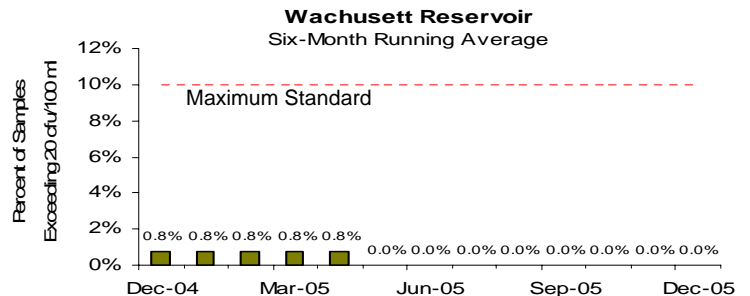
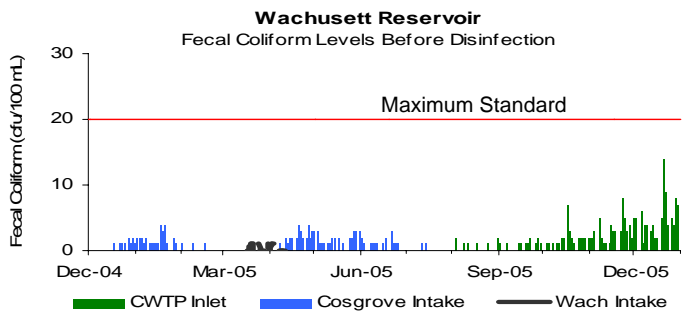
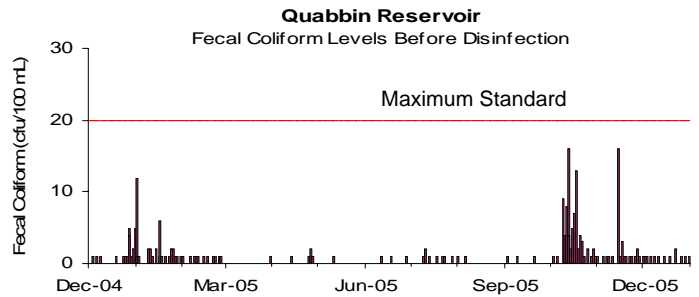
Fecal coliform levels tend to increase during the winter because, when water bodies near Wachusett ice over, waterfowl seek open water. Many roost at Wachusett, which tends to freeze later in the year than smaller ponds nearby. The DCR has an active bird harassment program to move the birds away from the intake area.

All twenty-two of the 22 samples were positive during December. 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.

Absorbance (UV)

Absorbance, measured as UV-254, is a surrogate measure of reactive organic matter. Regulated DBP levels have dropped to very low levels with Carroll Water Treatment Plant coming on-line. But UV-254 levels remain useful for estimating ozone dosage and serving as a trigger for Quabbin transfer consideration. Levels are currently around 0.074 A/cm.

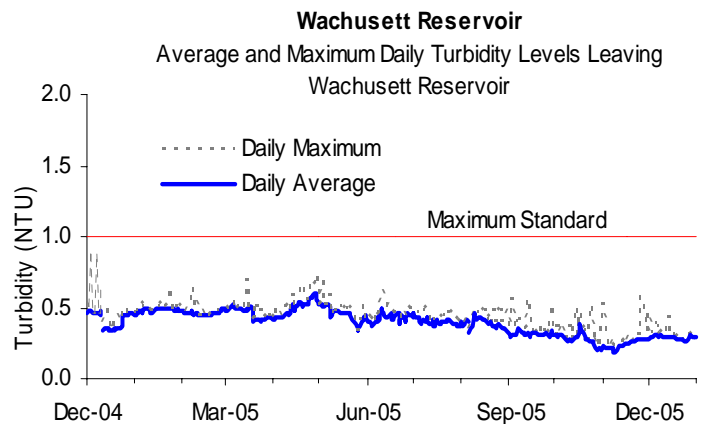
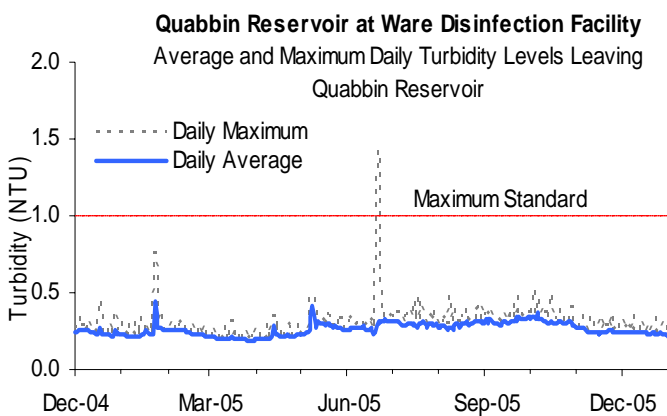


Source Water – Turbidity and Algae Results December 2005

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.

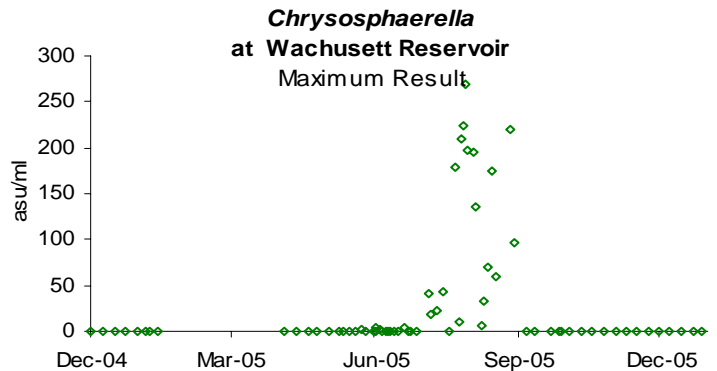
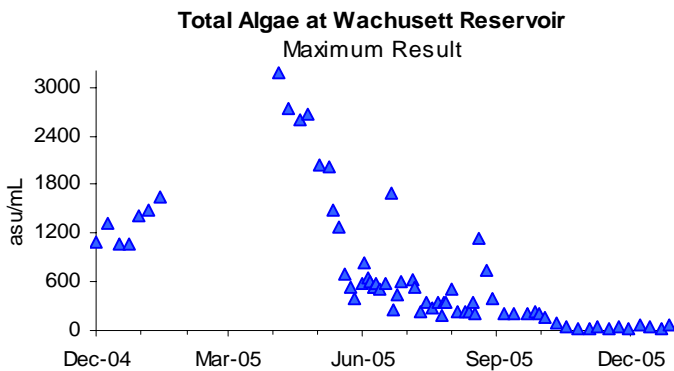
Samples for turbidity from Quabbin Reservoir are collected at the Ware Disinfection Facility before chlorination. Samples from Wachusett Reservoir are taken at the Carroll Water Treatment Plant inlet (raw water line) before treatment. The Massachusetts Department of Environmental Protection standard for source water turbidity for unfiltered water supply systems is a maximum of 1.0 NTU; the EPA standard is a maximum of 5.0 NTU. Maximum turbidity results at Quabbin and Wachusett were within DEP standards for the month.



Source Water – Algae Results

Algal levels in reservoirs 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. Most taste and odor complaints at the tap are 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 blooms, MWRA may treat the reservoir with copper sulfate, an algaecide.

Of the 2 water quality complaints received during December from local water departments, one concerned taste and odor that may be due to the algae.



Treated Water – Disinfection, pH and Alkalinity Results

December 2005

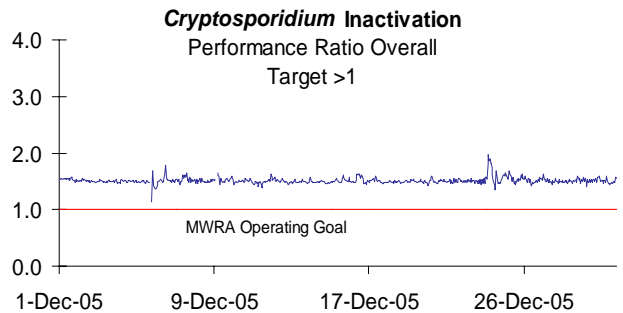
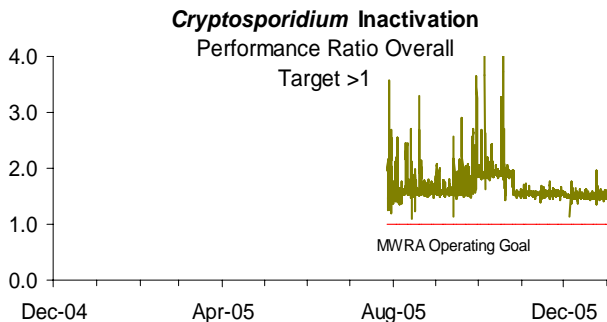
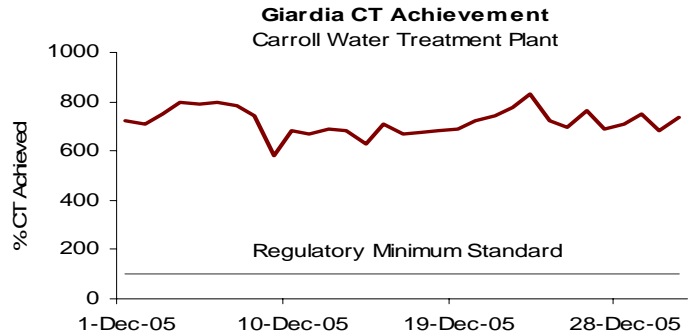
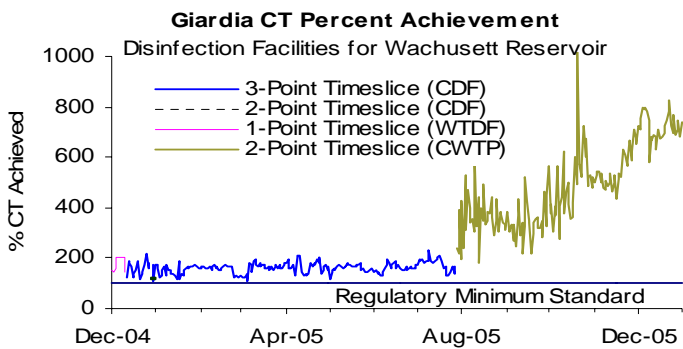
Treated Water - Primary Disinfection

With the activation of the Carroll Water Treatment Plant, MWRA now reports on both regulatory required 99.9% inactivation for Giardia, and our voluntary operating goal of 99% inactivation for Cryptosporidium. 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. MWRA calculates hourly CT inactivation rates and reports daily CT inactivation rates at maximum flow, as specified by EPA regulations.

Wachusett Reservoir – MetroWest and MetroBoston Supply:

The new ozone treatment provides inactivation for Cryptosporidium, and this is reported as Performance Ratio (PR) to avoid confusion with the regulatory requirements. A PR of 1 demonstrates inactivation of 99% of Cryptosporidium based on site specific data. PR was maintained above 1 at all times the plant was providing water into the distribution system.

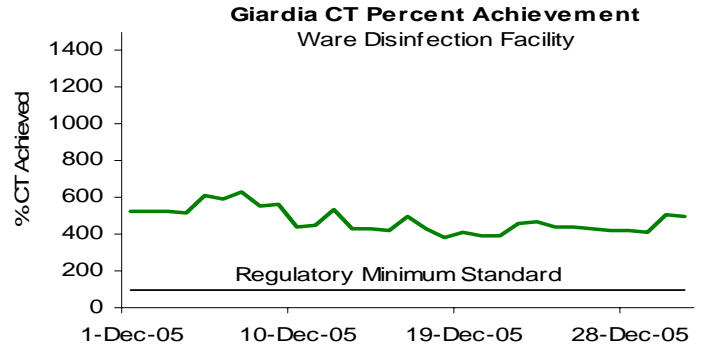
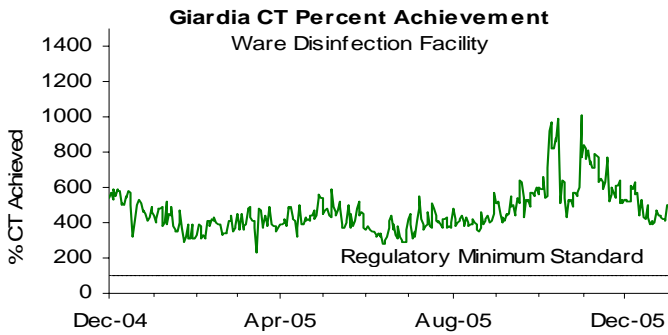
Ozone dose at Carroll Water Treatment Plant (CWTP) varied between 2.9 to 3.5 mg/L for December. CT calculation for Giardia is more conservative at the CWTP than used previously at Cosgrove; subsequently more inactivation occurs than is being reported. Compliance with the Giardia standard is expressed as percent CT achieved: 100% is the minimum allowed. CT was met each day in December, as well as every day for the last year.



Treated Water – Disinfection, pH and Alkalinity Results continued December 2005

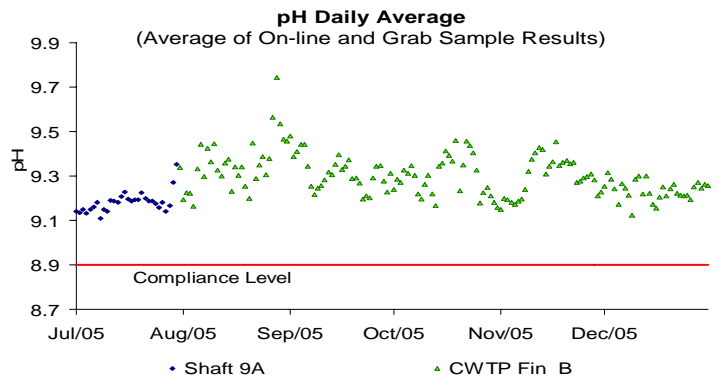
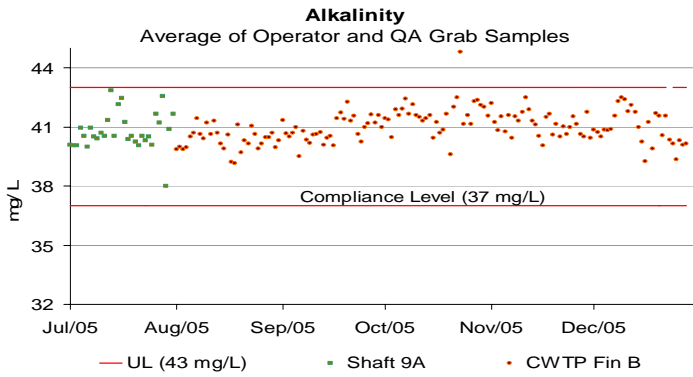
Quabbin Reservoir at Ware Disinfection Facility (CVA Supply):

Chlorine dose remained at 1.3 mg/L. CT was met each day in December, as well as every day for the last year.



pH and Alkalinity Compliance:

MWRA adjusts the alkalinity and pH of Wachusett water to reduce its corrosivity in order to minimize the leaching of lead and copper from service lines and home plumbing systems into the water. MWRA's target for distribution system pH is 9.1 and alkalinity is 40 mg/l. Beginning January 1, 2005, per DEP requirements, daily samples from Shaft 9A have a minimum compliance level of 8.9 for pH and 37 mg/L for alkalinity. Beginning July 28, 2005, the compliance monitoring location was changed to the Carroll Water Treatment Plant Fin B site. In addition, quarterly samples from 27 distribution system taps have a minimum compliance level of 8.8 for pH and 37 mg/L for alkalinity. For no more than nine days in a six-month period may results be below these levels. In December, no sample results were below the target levels nor were any during the prior 6 months. Quality Assurance and operator staff test pH and alkalinity daily at Carroll Water Treatment Plant Fin B. Distribution system samples were collected on December 13, 2005. Distribution system sample pH ranged from 9.0 to 9.4 and alkalinity ranged from 40 to 43 mg/L. In December, no sample results were below the target levels nor were any during the prior 6 months.



Bacteria & Chlorine Residual Results for Communities in MWRA Testing Program December 2005

While all communities collect bacteria samples for the Total Coliform Rule (TCR), 37 systems (including Deer Island and Westboro State Hospital) use the 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 9 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 141 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 the MWRA transmission system, water storage tanks and pumping stations.

The Safe Drinking Water Act (SDWA) 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 indicates likely bacterial 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. MWRA considers a disinfectant residual of 0.2 mg/L a minimum target level at all points in the distribution system.

Highlights

None of the 1,737 community samples (0%) system-wide tested positive for confirmed total coliform during the month of December. None of the 656 MWRA samples (0%) tested positive for confirmed total coliform. No samples tested positive for *E. coli*. All thirty-seven systems that submitted chlorine residual data maintained an average disinfectant residual of at least 0.2 mg/L. 2.8% of the system samples had a disinfectant residual 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?	December 2005 Minimum Chlorine Residual (mg/L)	December 2004 Minimum Chlorine Residual (mg/L)	December 2005 Average Chlorine Residual (mg/L)	December 2004 Average Chlorine Residual (mg/L)
ARLINGTON	61	0 (0%)			0.01	0.03	1.04	1.09
BELMONT	32	0 (0%)			0.06	0.35	1.01	1.28
BOSTON	237	0 (0%)			0.75	0.14	1.76	1.54
BROOKLINE	68	0 (0%)			0.63	1.11	1.69	1.69
CHELSEA	40	0 (0%)			0.35	0.37	1.64	1.49
DEER ISLAND	16	0 (0%)			1.28	1.44	1.71	1.60
EVERETT	40	0 (0%)			0.41	0.86	0.80	1.21
FRAMINGHAM	72	0 (0%)			0.03	0.07	1.28	1.25
LEXINGTON	36	0 (0%)			1.05	0.93	1.78	1.57
LYNNFIELD	6	0 (0%)			0.20	0.31	0.77	0.76
MALDEN	60	0 (0%)			0.97	0.81	1.12	0.98
MARBLEHEAD	24	0 (0%)			0.21	0.18	1.47	1.36
MARLBOROUGH (b)	52	0 (0%)			0.35	0.15	1.28	1.06
MEDFORD	68	0 (0%)			0.20	0.25	1.40	1.34
MELROSE	36	0 (0%)			0.01	0.02	0.61	0.65
MILTON	32	0 (0%)			0.55	0.88	1.25	1.22
NAHANT	10	0 (0%)			0.02	0.08	1.02	0.68
NEEDHAM (b)	41	0 (0%)			0.67	0.02	1.70	0.21
NEWTON	88	0 (0%)			0.10	0.34	1.49	1.53
NORTHBOROUGH	16	0 (0%)			0.07	0.10	1.22	1.44
NORWOOD	36	0 (0%)			0.00	0.02	1.11	1.25
QUINCY	92	0 (0%)			0.03	0.05	1.43	1.39
REVERE	65	0 (0%)			1.01	0.45	1.57	1.44
SAUGUS	32	0 (0%)			1.53	1.31	1.62	1.46
SOMERVILLE	80	0 (0%)			0.14	0.13	1.60	1.31
SOUTHBOROUGH	10	0 (0%)			0.15	0.11	0.99	0.64
STONEHAM	35	0 (0%)			0.48	0.76	1.41	1.53
SWAMPSCOTT	18	0 (0%)			0.07	0.50	0.98	1.30
WAKEFIELD (b)	55	0 (0%)			0.33	0.51	1.20	1.30
WALTHAM	68	0 (0%)			0.02	0.05	1.22	1.23
WATERTOWN	50	0 (0%)			0.05	0.48	0.90	1.27
WELLESLEY (b)	36	0 (0%)			0.03	0.05	0.57	0.61
WESTBORO HOSPITAL	5	0 (0%)			1.57	0.26	2.34	0.67
WESTON	16	0 (0%)			0.05	0.70	1.37	1.63
WINCHESTER (b)	20	0 (0%)			0.04	0.09	0.60	0.92
WINTHROP	24	0 (0%)			0.12	0.58	1.47	1.50
WOBURN (b)	60	0 (0%)			0.02	0.05	0.68	0.59
Total:	1737	0 (0%)						
MASS. WATER RESOURCES AUTHORITY (c)	656	0 (0%)			0.01	0.03	1.58	1.42

(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) 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.

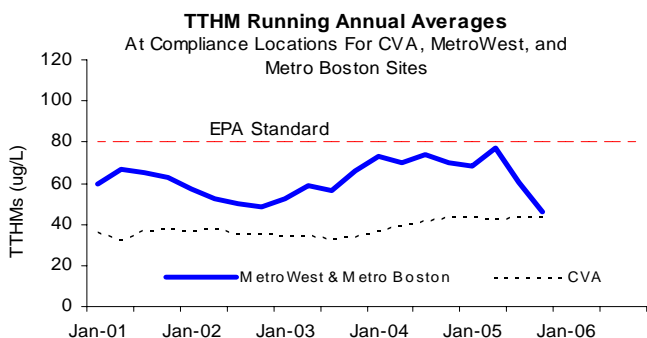
Treated Water - Disinfection By-Product (DBP) Levels in Communities

December 2005

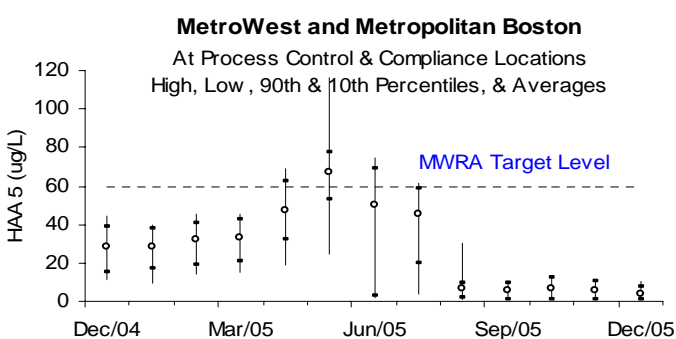
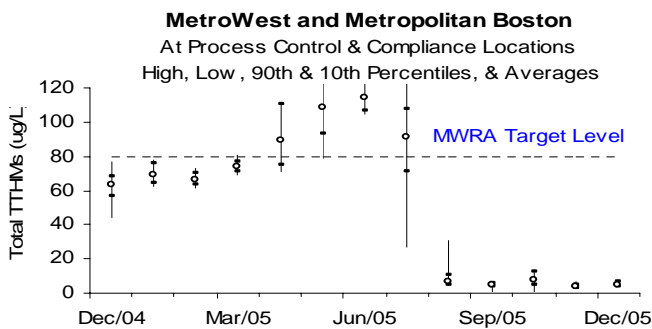
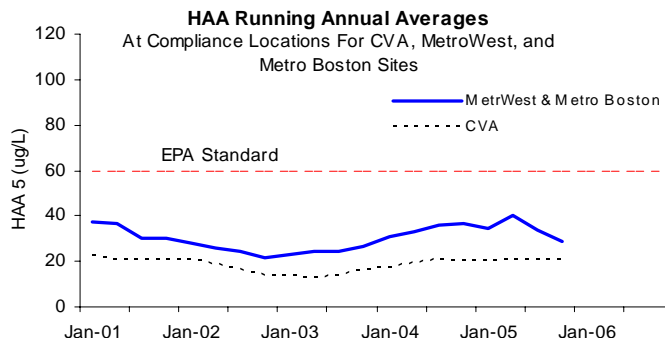
Total Trihalomethanes (TTHMs) and Haloacetic Acids (HAAs) are by-products of disinfection treatment with chlorine. Chlorination levels, the presence of organic precursors, pH levels, the contact time of water with chlorine used for disinfection, and temperature all affect TTHM and HAA levels. DBPs are of concern due to their potential adverse health effects at high levels. EPA's running annual average standards are 80 ug/L for TTHMs and 60 ug/L for HAA5. The DEP has approved consolidating MetroWest and Metropolitan Boston programs since MWRA now provides fully treated water to both. This was implemented July 2005. DEP requires that compliance samples be collected quarterly. MWRA samples more frequently at some locations. **Metro Boston numbers from the fully-served communities are used for compliance purposes.** Individual CVA and partially served communities are responsible for their own compliance monitoring and reporting, and must be contacted directly for their results.

The running annual average for TTHMs and HAA5s at compliance locations, represented in the top two graphs below, remained below current standards. HAA5 and TTHM levels at all sampling locations for the MetroWest and Metropolitan Boston communities have declined dramatically since August 2005 following activation of the Carroll Water Treatment Plant which uses ozone, rather than chlorine, for primary disinfection.

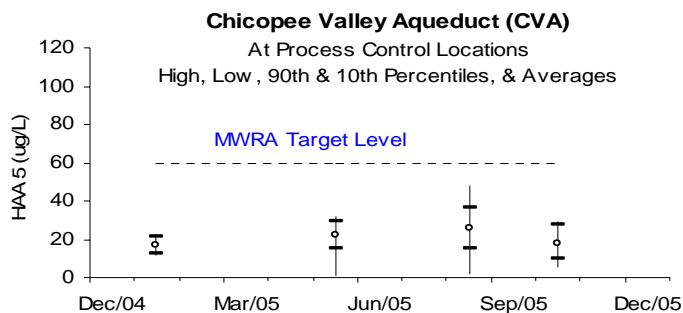
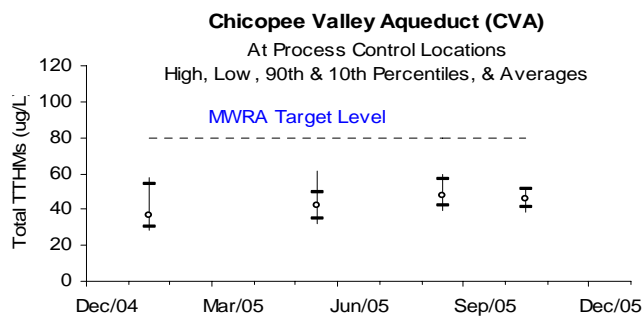
TOTAL TRIHALOMETHANES



HALOACETIC ACIDS



Beginning July 2005, MetroWest data was combined with Metropolitan data. This is represented in the above two graphs.



MWRA Monthly Water Quality Analysis

December 2005

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), and a location at an endpoint in the main transmission system (Shaft 9A, Malden). The CWTP Finished water tap replaces the former locations ICC, Marlboro and Comm. Ave., Newton which represented intermediate treatment points. All treatment has now been consolidated at the new CWTP.

Component	CVA System		Wachusett System			Standards		
	Quabbin Res. at Ware Disinfection Facility (Raw)	Ludlow Monitoring Station (Treated)	Carroll Water TP Inlet (Raw) ¹	Carroll Water TP Fin. Water Tap (Treated) ¹	Shaft 9A, Malden (Treated)	Standard	Units	Exceedance
Alkalinity	2.7	3.4	5.7	40.5	40.3		MG/L	
Aluminum	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	50-200 (e)	UG/L	NO
Ammonia-N	0.01	< 0.01	< 0.01	0.34	0.29		MG/L	
Antimony	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	6 (a)	UG/L	NO
Arsenic	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	50 (a)	UG/L	NO
Barium	7.1	7.4	10.0	10.2	9.9	2000 (a)	UG/L	NO
Beryllium	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	4 (a)	UG/L	NO
Bromate	< 2.5	< 2.5	< 2.5	4.9	4.9	10 (a)	UG/L	NO
Bromide	9.7	5.5	17.7	18.4	18.1		UG/L	
Cadmium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	5 (a)	UG/L	NO
Calcium	2120	2210	4390	4400	4520		UG/L	
Chloride	8.0	9.4	25.0	27.3	25.1	250 (e)	MG/L	NO
Chlorine, Free	NS	0.74	NS	0.0	0.1	4 (c)(d)	MG/L	NO
Chlorine, Total	NS	NS	NS	2.6	2.0	4 (c)(d)	MG/L	NO
Chromium	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	100 (a)	UG/L	NO
Coliform, Fecal, MF Method	0	NS	6	NS	NS	20 (b)	CFU/100 mL	NO
Coliform, Total, MF Method (h)	0	0	18	0	0	100 (b) 0 (c)	CFU/100 mL	NO
Copper **	< 3.0	< 3.0	6.0	7.5	8.4	1300 (f) 1000 (g)	UG/L	NO
Cyanide	< 0.01	< 0.01	< 0.01	< 0.01	0.14*	0.2 (a)	MG/L	NO
Fluoride	0.05	0.08	0.08	0.98	0.93	4 (a)	MG/L	NO
Hardness	7.4	7.7	14.5	14.5	14.8		MG/L	
Iron **	13.4	14.4	24.8	24.8	22.0	300 (e)	UG/L	NO
Lead	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	15 (a)	UG/L	NO
Magnesium	517	525	864	859	865		UG/L	
Manganese	4.5	3.9	30.9	30.3	25.2	50 (e)	UG/L	NO
Mercury	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	2 (a)	UG/L	NO
Nickel	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0		UG/L	
Nitrate-N	< 0.005	< 0.005	0.089	0.094	0.091	10 (a)	MG/L	NO
Nitrite	< 0.005	< 0.005	< 0.005	0.006	0.006	1 (a)	MG/L	NO
Orthophosphate	< 0.005	< 0.005	< 0.005	0.012	0.008		MG/L	
pH	6.9	6.9	7.2	9.3	9.3		S.U.	
Potassium	500	492	934	911	934		UG/L	
Selenium	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	50 (a)	UG/L	NO
Silica (SiO2)	1860	1870	2440	2940	2880		UG/L	
Silver	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	100 (e)	UG/L	NO
Sodium	5.3	6.3	15.0	33.0	33.4		MG/L	
Specific Conductance	49	54	121	198	190		UMHO/cm	
Standard Plate Count, HPC (48 Hrs @ 35C)	NS	NS	44	9	0	500 (c)	CFU/mL	NO
Sulfate (SO4)	4.9	4.9	7.0	8.6	8.9	250 (e)	MG/L	
Thallium	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2 (a)	UG/L	NO
Total Dissolved Solids	31.0	28.0	59.0	101	104.0	500 (d)	MG/L	
Total Organic Carbon	1.8	2.0	2.5	2.4	2.4		MG/L	
Total Phosphorus	0.005	< 0.005	0.006	0.011	0.007		MG/L	
UV-254	0.026	0.020	0.072	0.030	0.030		A	
Zinc **	2.4	4.0	< 1.5	< 1.5	3.4	5000 (e)	UG/L	NO

- (a) = Primary MCL standard (health related). DEP "Drinking Water Regulations", 310CMR 22.00.
- (b) = Primary MCL standard (health related), applies to source (raw) water only. DEP "Drinking Water Regulations", 310CMR 22.00.
- (c) = Primary MCL standard (health related). DEP "Drinking Water Regulations", 310CMR 22.00. Applies to samples of treated water downstream of Wachusett and Quabbin Reservoirs.
- (d) = Maximum Residual Disinfectant Level. DEP "Drinking Water Regulations", 310CMR 22.00.
- (e) = Secondary MCL standard (aesthetic related). DEP "Drinking Water Regulations", 310CMR 22.00.
- (f) - Refers to 90th percentile Action Level
- (g) - Refers to a single sample, secondary MCL
- (h) - Confirmed results only are reported

MCL = Maximum Contaminant Level
 CFU = Colony Forming Unit
 S.U. = Standard Units
 UG/L = micrograms per liter = parts per billion

NS = No sample
 NTU = Nephelometric Turbidity Unit
 MG/L = milligrams per liter = parts per million
 < = less than method detection limit

HPC = Heterotrophic Plate Count
 Inv Res = Invalid sample result
 ** = Metal results may be elevated due to local plumbing at the sample tap.
Bold Italics = Quarterly Samples

Most results are based on single grab samples collected on December 5, 27 and 28, 2005 and analyzed by MWRA and contract laboratories. Quarterly Samples are from October or November 2005.

NOTE: 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 and not report them in the EPA-regulated annual Consumer Confidence Report.

*MWRA is investigating the cyanide result.