

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

## WATER QUALITY UPDATE An Analysis of December 2003 Sampling Data

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



## MWRA WATER QUALITY UPDATE

### December 2003 Highlights

- **MWRA achieved CT disinfection requirements for the month** at both Ware Disinfection Facility (WDF) and Wachusett Temporary Disinfection Facility (WTDF). Chlorine dose at WTDF remained at 2.2 mg/L. Dose at Norumbega was raised to 1.5 mg/L from 1.8 mg/L on the 1st. The running annual averages for DBPs are higher this year as compared to last year. CT results appear on Page 5. No MWRA community had any positive samples for the Total Coliform Rule. See Page 6. DBP results appear on Page 7.
- **Source water fecal coliform levels were higher in early December** due to short-term difficulties in moving water fowl away from the intake area. Levels were reduced later in the month.
- **Winthrop reported 2 no water and 2 yellow water complaints on the 10<sup>th</sup>**. The complaints were the result of a local main break on Winthrop Shore Drive. MWRA staff are assisting the town with repairs.

Let us know what you think [\(617\) 242-5323](tel:6172425323)

**Release Date: January 20, 2004**

## Water Quality Update

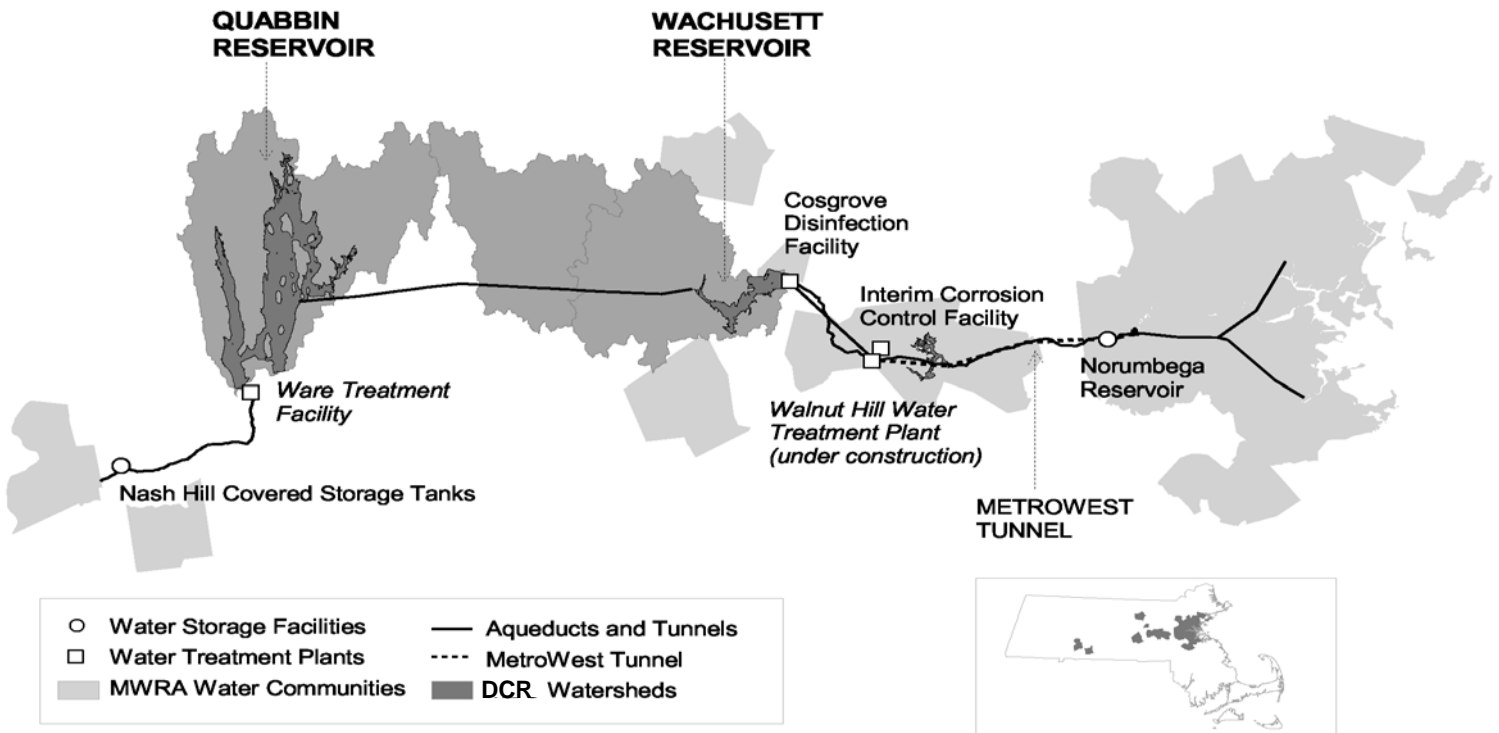
This is a monthly report containing information about the quality of water supplied by MWRA. It provides a more detailed review of water quality than the annual water quality report that is mailed each June to customers in our service area. The report is available at [www.mwra.com](http://www.mwra.com).

## 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 2003

### 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 is a subclass of the coliform group which 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 any six-month period have over 20 fecal coliforms per 100ml.

#### Sample Site: Quabbin Reservoir

Quabbin Reservoir water is sampled at Winsor Dam before entering the CVA system. MWRA met the six-month running average standard for fecal coliform continuously at this location over the last year.

Eight of the 30 samples were positive during December. Colony counts were in the single digits.

#### Sample Site: Wachusett Reservoir

Wachusett Reservoir water is sampled at Wachusett Intake before entering the MetroWest and Metropolitan Boston systems as of November 1<sup>st</sup>. MWRA met the six-month running average standard for fecal coliform continuously at the Cosgrove Intake over the last year.

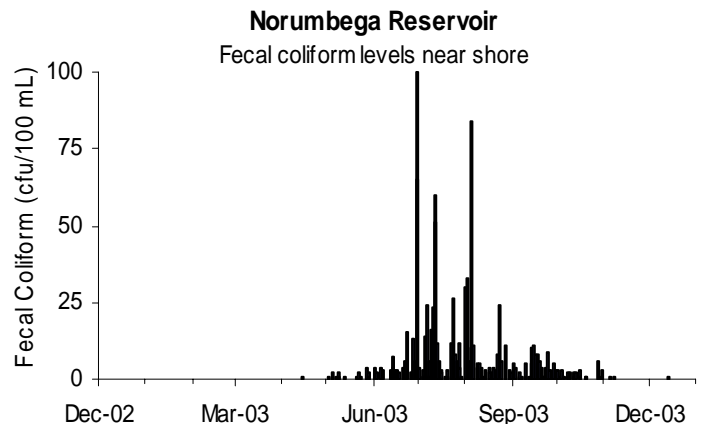
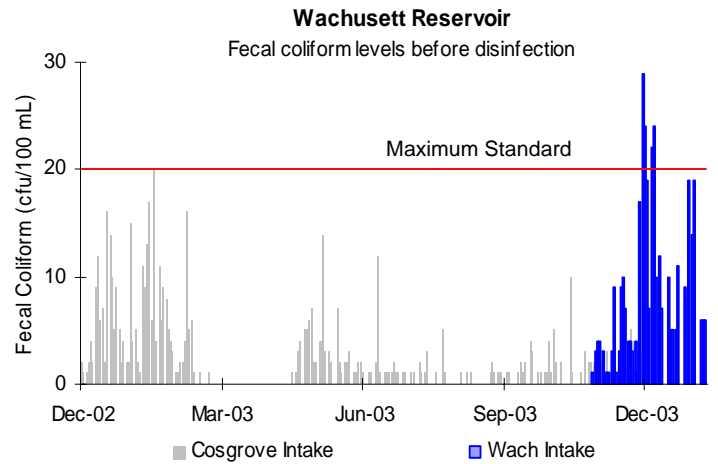
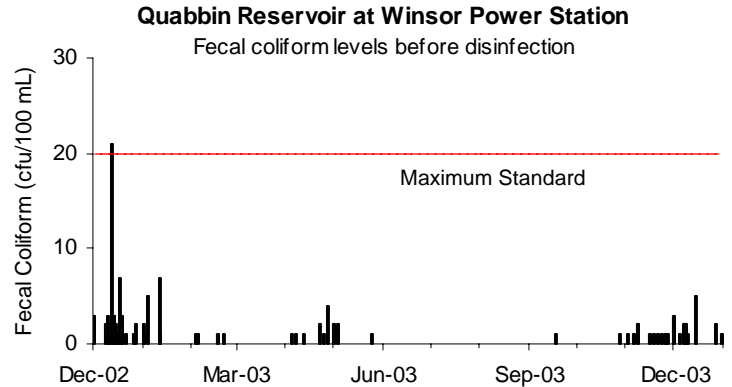
Fecal coliform levels tend to increase during the winter, because, when water bodies near Wachusett ice over, waterfowl seek open water. Many roost at Wachusett, which tends to freeze later in the year than smaller ponds nearby. The DCR has an active bird harassment program to move the birds away from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

All of the 23 samples were positive during December, and four samples were above the standard of 20 cfu/100ml. No more than 10% of samples may exceed 20 in a 6 month period. In the current 6-month period, 4 samples have exceeded the limit of 20 fecal coliform/100 mL (approx. 3%).

#### Sample Site: Norumbega Reservoir

Norumbega Reservoir in Weston receives flows from Wachusett for temporary storage each day during low demand hours, which are then discharged during high demand. Norumbega water is sampled from the shore near the gatehouse before disinfection. Coliform levels are elevated periodically, partly because samples collected from the shore of this small reservoir are more susceptible to local disturbances. Covered storage is scheduled to replace this open reservoir in 2004.

One of the 31 samples from water taken along the shore were positive for fecal coliform during December. Seasonally, coliform levels tend to increase due to rain, warm temperatures, wind direction, and birds.

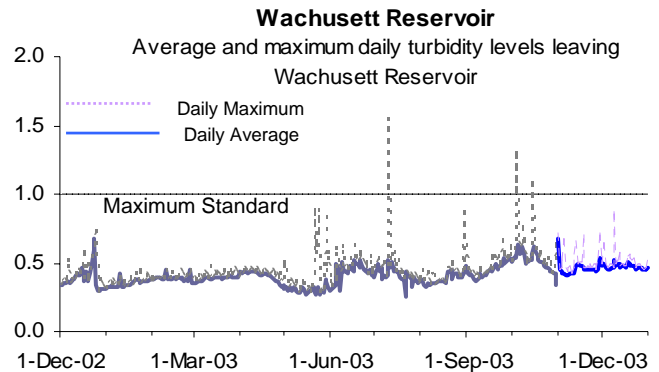
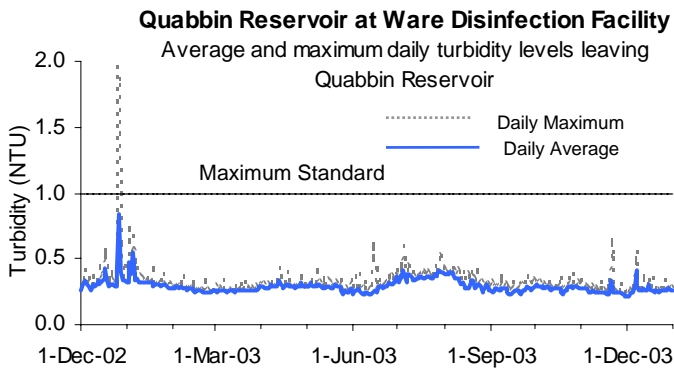


# Source Water – Turbidity and Algae Results December 2003

## 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.

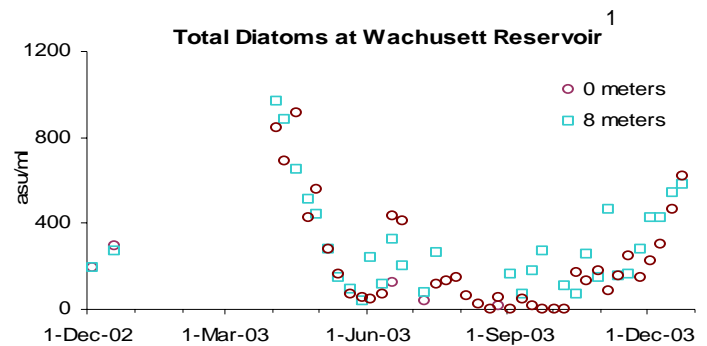
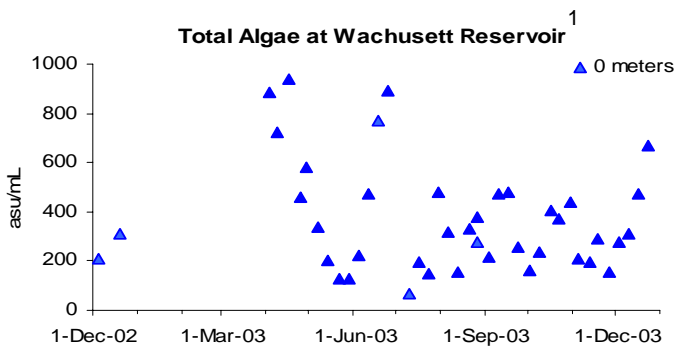
Samples for turbidity from Quabbin Reservoir are collected at the Ware Disinfection Facility before chlorination. Samples from Wachusett Reservoir are taken at Wachusett Intake before chlorination as of November 1<sup>st</sup>. The Massachusetts Department of Environmental Protection standard for source 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 Reservoir 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 alga blooms, MWRA may treat the reservoirs with copper sulfate, an algacide.

Of 23 complaints received during December from local water departments, two concerned taste and odor that may be due to algae.



1. Algae samples collected between 0 to 3 meters represent the same area of water column and are generally equivalent. These samples will be shown in the graphs as 0 meters.

# Treated Water – Disinfection and pH Results

December 2003

## Treated Water - Primary Disinfection

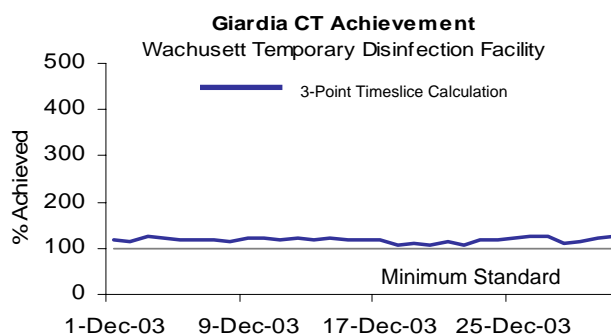
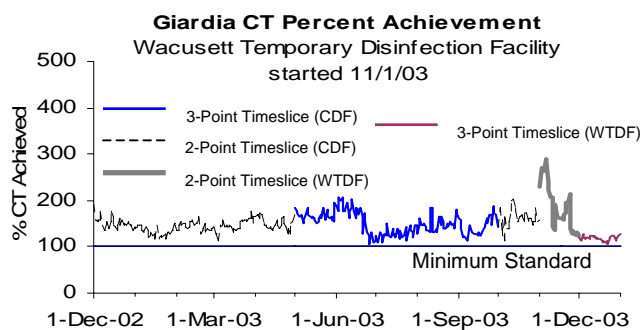
MWRA provides disinfection adequate to achieve EPA's requirement of 99.9% inactivation of *Giardia* cysts and 99.99% inactivation of viruses in drinking water using a calculation based on three sample points that DEP approved in June, 1999. The two-point timeslice, three-point timeslice, or integrated methods are alternative calculation methods which can also be used to comply with CT regulations.

CT achievement for *Giardia* assures CT achievement for viruses, which have a lower CT requirement. The concentration (C) of the disinfectant in the water over time (T) yields a measure of the effectiveness of disinfection, CT. The required CT varies with disinfectant type, water temperature, pH, and other factors. MWRA calculates daily CT inactivation rates at maximum flow, as specified by EPA regulations.

### Wachusett Reservoir - MetroBoston Supply:

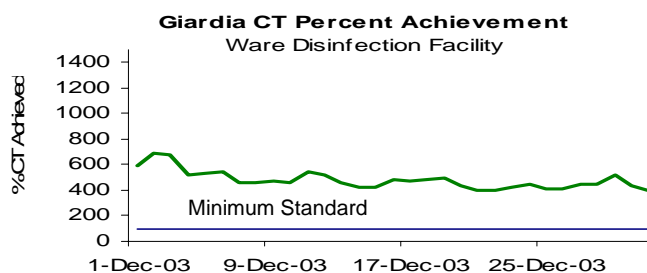
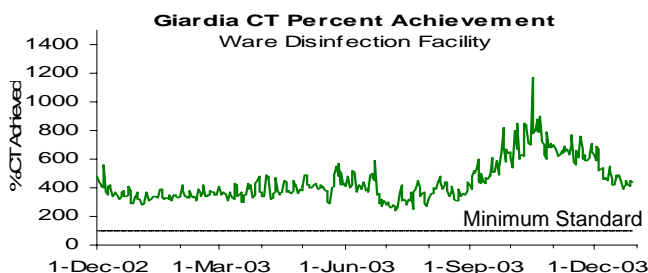
On November 1, 2003, the Cosgrove Disinfection Facility (CDF) was shut down and the Wachusett Temporary Disinfection Facility (WTDF) was activated using the two-point timeslice method. The three-point timeslice was initiated December 1<sup>st</sup>.

Chlorine dose remained at 2.2 mg/L. CT was met each day in December, as well as every day for the last year.



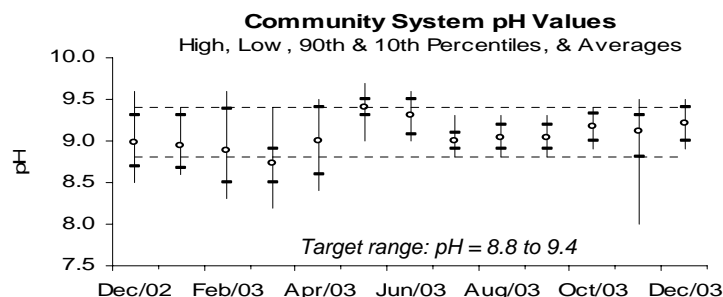
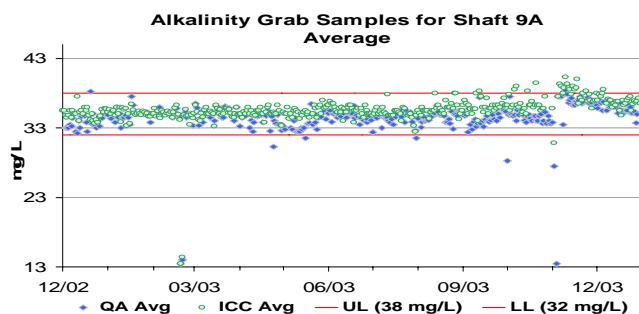
### Quabbin Reservoir at Ware Disinfection Facility (CVA Supply):

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



## Treated Water – pH and Alkalinity Results

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 35 mg/L. MWRA's goal is to have 80% of distribution system pH samples fall between 8.8 and 9.4. MWRA staff collects and analyzes samples for pH from 28 community locations on a biweekly schedule to measure pH levels. In December, 93% of the samples were within the target range.



# Bacteria & Chlorine Residual Results for Communities in MWRA Testing Program December 2003

## Background

While all communities collect bacteria samples for the Total Coliform Rule (TCR), 36 cities and towns (including Westboro State Hospital) use the MWRA Laboratory for Total Coliform Rule compliance testing. These communities collect samples for bacteriological analysis and measure water temperature and chlorine residual at the time of collection. Cambridge conducts their own monitoring. The other 9 MWRA customer communities have their samples tested elsewhere and these towns should be contacted directly for their monthly results.

There are 144 sampling locations for which the MWRA is required to report TCR results. This includes a subset of the community TCR locations as well as sites along the MWRA transmission system, water storage tanks and pumping stations.

The SDWA requires that no more than 5% of all samples may be total coliform positive in a month (or that no more than 1 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 1933 community samples (0.0% system-wide) tested positive for confirmed total coliform during the month of December. No samples tested positive for *E. coli*. One of the 751 MWRA samples (0.13%) tested positive for confirmed total coliform. No samples tested positive for *E. coli*. No towns failed the TCR rule for the month.

All thirty-six communities that submitted chlorine residual data maintained an average disinfectant residual of at least 0.2 mg/L. 2.7% of the community 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 2003 Minimum Chlorine Residual (mg/L)	December 2002 Minimum Chlorine Residual (mg/L)	December 2003 Average Chlorine Residual (mg/L)	December 2002 Average Chlorine Residual (mg/L)
ARLINGTON	69	0 (0%)			0.05	0.03	0.79	0.97
BELMONT	40	0 (0%)			0.08	0.14	0.92	0.95
BOSTON	260	0 (0%)			0.34	0.77	1.38	1.44
BROOKLINE	85	0 (0%)			0.75	1.15	1.42	1.55
CHELSEA	39	0 (0%)			0.51	0.54	1.32	1.34
EVERETT	50	0 (0%)			0.42	0.01	0.81	0.92
FRAMINGHAM (c)	73	0 (0%)			0.21	0.55	1.24	1.47
LEXINGTON	45	0 (0%)			0.09	0.34	1.23	1.38
LYNNFIELD	6	0 (0%)			0.38	0.23	0.82	1.01
MALDEN	75	0 (0%)			0.74	0.07	0.95	1.02
MARBLEHEAD	24	0 (0%)			0.14	0.24	1.00	1.19
MARLBOROUGH (b)(c)	52	0 (0%)			0.48	0.62	1.18	1.24
MEDFORD	85	0 (0%)			0.24	0.12	1.03	0.94
MELROSE	45	0 (0%)			0.01	0.02	0.34	0.72
MILTON	32	0 (0%)			0.06	0.75	0.96	1.19
NAHANT	10	0 (0%)			0.06	0.08	0.80	1.01
NEEDHAM (b)	50	0 (0%)			0.02	0.07	0.35	0.99
NEWTON	88	0 (0%)			0.22	1.02	1.34	1.43
NORTHBOROUGH	15	0 (0%)			0.45	0.96	1.34	1.79
NORWOOD	36	0 (0%)			0.01	0.01	0.90	1.07
QUINCY	115	0 (0%)			0.12	0.11	1.17	1.25
REVERE	65	0 (0%)			0.40	0.31	1.36	1.34
SAUGUS	40	0 (0%)			1.11	1.32	1.32	1.45
SOMERVILLE	100	0 (0%)			0.03	0.13	1.12	1.26
SOUTHBOROUGH (c)	10	0 (0%)			0.06	0.11	0.74	1.09
STONEHAM	35	0 (0%)			0.54	1.06	1.34	1.43
SWAMPSCOTT	18	0 (0%)			0.45	0.63	0.79	1.28
WAKEFIELD (b)	55	0 (0%)			0.25	0.16	0.90	1.11
WALTHAM	85	0 (0%)			0.02	0.01	0.85	0.78
WATERTOWN	50	0 (0%)			0.30	0.04	0.80	1.00
WELLESLEY (b)	36	0 (0%)			0.17	0.07	0.39	0.46
WESTBORO HOSPITAL	5	0 (0%)			0.10	0.10	0.40	1.46
WESTON (c)	16	0 (0%)			0.19	0.62	0.40	1.20
WINCHESTER (b)	25	0 (0%)			0.03	0.08	0.47	0.50
WINTHROP	24	0 (0%)			0.34	0.53	1.24	1.34
WOBURN (b)	75	0 (0%)			0.07	0.05	0.61	0.60
Total:	1933	0 (0%)						
MASS. WATER RESOURCES AUTHORITY (d)	751	1 (0.13%)		no	0.02	0.01	1.22	1.30

(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) These communities locally chloraminate.

(d) MWRA sampling program includes a subset of community TCR sites as well as sites along the transmission system, tanks and pumping stations.

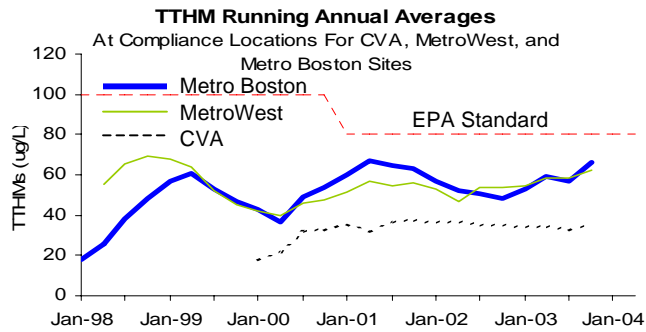
# Treated Water - Disinfection By-Product (DBP) Levels in Communities

## December 2003

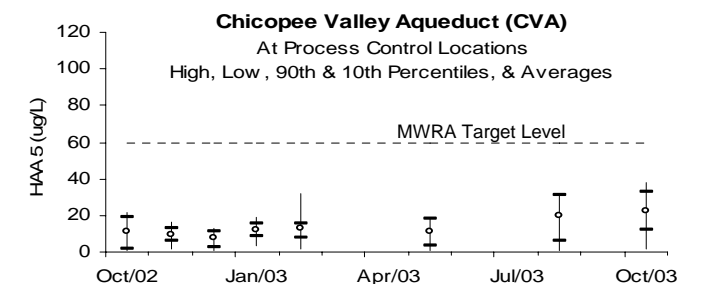
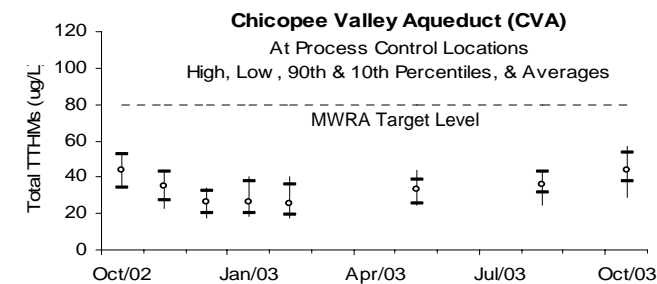
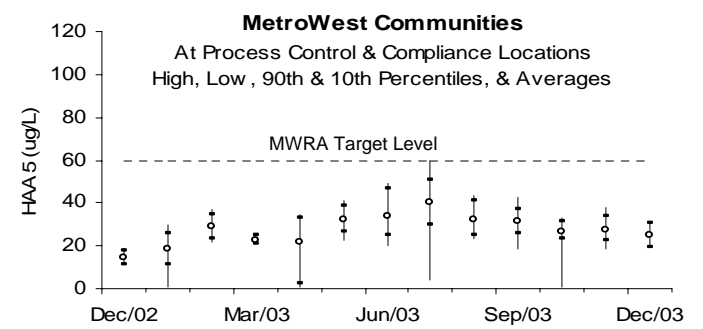
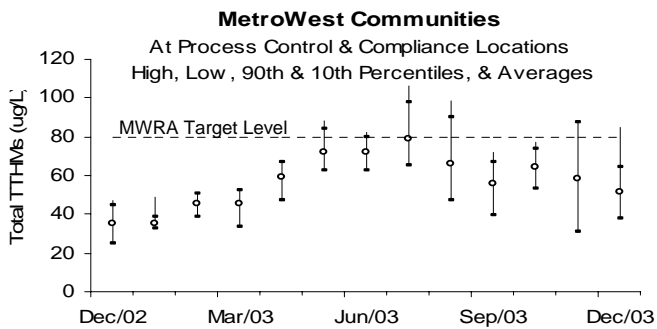
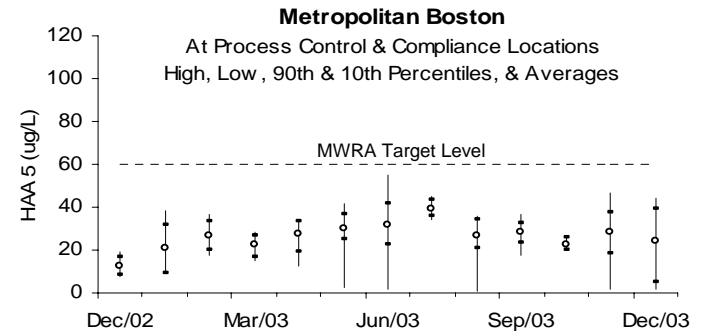
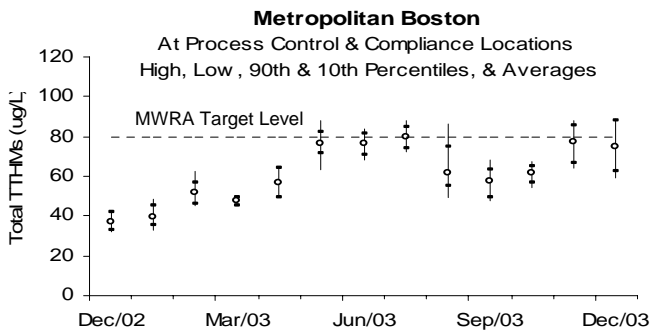
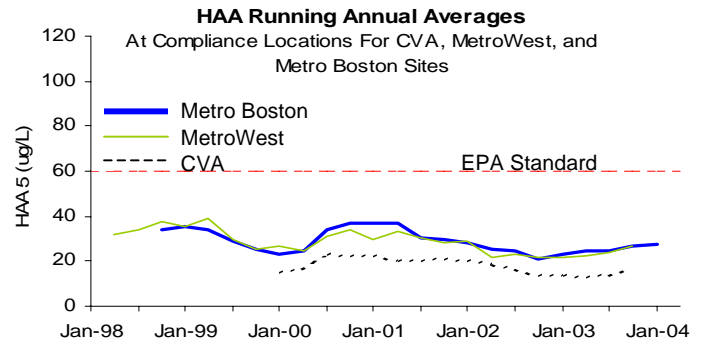
Total Trihalomethanes (TTHMs) and Haloacetic Acids (HAAs) are by-products of disinfection treatment with chlorine. Chlorination levels, the presence of organic precursors, pH levels, the contact time of water with chlorine used for disinfection, and temperature all affect TTHM and HAA levels. DBPs are of concern due to their potential adverse health effects at high levels. The EPA running annual average standards are 80 ug/L for TTHMs and 60 ug/L for HAA 5. DEP requires that compliance samples be collected quarterly. MWRA samples weekly at some locations, monthly and quarterly at others. **Metro Boston numbers are used for compliance purposes;** results presented below from CVA and MetroWest sampling sites enable MWRA staff to monitor control of MWRA treatment processes. Individual CVA and MetroWest communities are responsible for their own compliance monitoring and reporting. They must be contacted directly for their results.

The running annual average for TTHMs and HAA5s at compliance locations, represented in the graphs at the top of the page, remained below current standards. Average monthly HAA5 and TTHM levels at all process control sampling locations for the MetroWest and Metropolitan Boston communities are higher than those of last year, primarily due to higher chlorine doses required with the Wachusett Temporary Disinfection Facility. The CVA system monitoring has been reduced from monthly to quarterly per DEP requirements.

### TOTAL TRIHALOMETHANES



### HALOACETIC ACIDS





# MWRA Monthly Water Quality Analysis

## December 2003

This page provides information on water quality at six locations in the MWRA transmission system. Results reflect a "snapshot" in time and may not represent typical conditions. Elevated levels of a particular parameter may occur from time to time. MWRA staff review these numbers carefully and follow-up unusual results by re-analyzing samples, collecting new samples, or auditing sample sites. More rigorous daily or weekly monitoring of select parameters at these and other locations provides a better overall picture of water quality and is reported for some parameters elsewhere in this document. Monitoring for a number of parameters in this table will be reduced to quarterly, if they either (1) have minimal variability or (2) are always below detection levels.

Component	CVA System		Metropolitan Boston				I Standards		
	Quabbin Reservoir at Ware Disinfection Facility (Raw)	Ludlow Monitoring Station (Treated)	Wachusett Reservoir at Wachusett Intake* (Raw)	ICC Marlboro (Treated)	Comm Ave., Newton (Treated)	Shaft 9A, Malden (Treated)	Standard	Units	Exceedance
Alkalinity	3.0	3.2	5.3	35.5	36.2	36.6		MG/L	
Aluminum	< 10.0	< 10.0	< 10.0	< 10.0	10.4	11.4	50-200 (d)	UG/L	NO
Ammonia-N	0.008	< 0.005	0.010	< 0.005	0.228	0.226		MG/L	
Antimony	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	6 (a)	UG/L	NO
Arsenic	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	50 (a)	UG/L	NO
Barium	5.9	6.2	10.2	10.3	11.7	10.0	2000 (a)	UG/L	NO
Beryllium	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	4 (a)	UG/L	NO
Bromate	< 2.5	3.0	< 3.4	< 2.5	< 2.5	< 2.5	10 (a)	UG/L	NO
Bromide	11.2	6.6	16.2	8.4	5.6	5.3		UG/L	
Cadmium	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	5 (a)	UG/L	NO
Calcium	2240	2290	4820	4860	5380	4980		UG/L	
Chloride	7.0	8.6	24.0	26.0	28.1	28.0	250 (d)	MG/L	NO
Chlorine, Free	NS	0.76	NS	0.71	NS	NS		MG/L	
Chlorine, Total	NS	NS	NS	NS	1.33	1.55		MG/L	
Chromium	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	100 (a)	UG/L	NO
Coliform, Fecal, MF Method	0	NS	17	NS	NS	NS	20 (b)	CFU/100 mL	NO
Coliform, Total, MF Method (e)	0	0	60	0	0	0	100 (b) 0 (c)	CFU/100 mL	NO
Copper **	< 0.9	1.0	2.7	3.2	2.7	6.2	1300 (a)	UG/L	NO
Cyanide	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.2 (a)	MG/L	NO
Fluoride	0.06	0.07	0.04	1.00	1.06	1.04	4 (a)	MG/L	NO
Hardness	7.8	7.9	15.9	15.9	17.3	16.2		MG/L	
Iron **	12.0	12.5	26.3	28.6	29.6	27.9	300 (d)	UG/L	NO
Lead	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	15 (a)	UG/L	NO
Magnesium	540	533	928	919	944	921		UG/L	
Manganese	2.6	2.2	11.3	12.0	15.2	13.1	50 (d)	UG/L	NO
Mercury	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	2 (a)	UG/L	NO
Nickel	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		UG/L	
Nitrate-N	0.005	0.005	0.034	0.029	0.080	0.027	10 (a)	MG/L	NO
Nitrate+Nitrite - N	0.0178	0.019	0.075	0.079	0.087	0.079			
Nitrite	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	1 (a)	MG/L	NO
Orthophosphate	< 0.003	0.003	0.004	0.008	0.007	0.007		MG/L	
pH	6.5	6.7	7.1	9.2	9.0	9.0		S.U.	
Potassium	506	510	964	978	970	986		UG/L	
Selenium	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	50 (a)	UG/L	NO
Silica (SiO2)	1070	1070	2210	2700	2850	2720		UG/L	
Silver	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	100 (d)	UG/L	NO
Sodium	4.5	5.8	13.8	29.3	30.0	30.0		MG/L	
Specific Conductance	46	52	113	180	NS	188		UMHO/cm	
Standard Plate Count, HPC (48 Hrs @ 35C)	NS	NS	66	26	3	2	500 (c)	CFU/mL	NO
Sulfate (SO4)	5.2	5.2	6.8	6.8	6.8	6.8		MG/L	
Thallium	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2 (a)	UG/L	NO
Total Dissolved Solids	26	38	75	109	110	99		MG/L	
Total Organic Carbon	1.6	1.7	2.1	2.0	2.1	2.1		MG/L	
Total Phosphorus	0.005	< 0.005	< 0.005	0.222	0.021	0.021		MG/L	
UV-254	0.021	0.017	0.052	0.041	0.045	0.046		A	
Zinc **	1.7	2.5	1.1	1.5	2.0	1.4	5000 (d)	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) = Secondary MCL standard (aesthetic related). DEP "Drinking Water Regulations", 310CMR 22.00.

(e) - 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

\*=Quarterly results are from the Cosgrove Intake

\*\* = 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 1st and 2nd of 2003 and analyzed by MWRA and contract laboratories. **Quarterly Samples are from October 2003.**

**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.