

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 a May 2004 Sampling Data

MASSACHUSETTS WATER RESOURCES AUTHORITY  
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## MWRA WATER QUALITY UPDATE

### May 2004 Highlights

- On May 6, MWRA celebrated the successful completion of the MetroWest Water Supply Tunnel and the Norumbega Covered Storage facility (NCS). These projects are part of MWRA's Integrated Water Supply Improvement Program. MWRA engineers "topped-off" the new NCS facility by briefly overflowing the 115 million gallon tank into the old open reservoir. The event marked the culmination of over eight years of construction on the 17.6 mile long MetroWest Water Supply Tunnel and the storage tank in Weston. Water will now flow completely underground from the reservoirs to the customer's tap, providing for greatly improved security and protection of excellent water quality.
- MWRA achieved CT disinfection requirements for the month at the Ware Disinfection Facility (WDF), Wachusett Temporary Disinfection Facility (WTDF) and the Cosgrove Disinfection Facility (CDF). CT results appear on Page 5. The running annual averages for DBPs are higher this year as compared to last year, see Page 7. No community had samples which violated the Total Coliform Rule criteria. See Page 6.
- Perchlorate samples were collected at 3 locations in the MWRA system (Wachusett and Quabbin systems) on March 25, 2004. All results were undetectable at detection level of 0.5 ug/L.
- The [Annual Water Quality Report](#) is being delivered to almost 900,000 homes during June. Look for it, go to [MWRA.com](http://MWRA.com) or call for a copy.

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

Release Date: June 20, 2004

## Water Quality Update

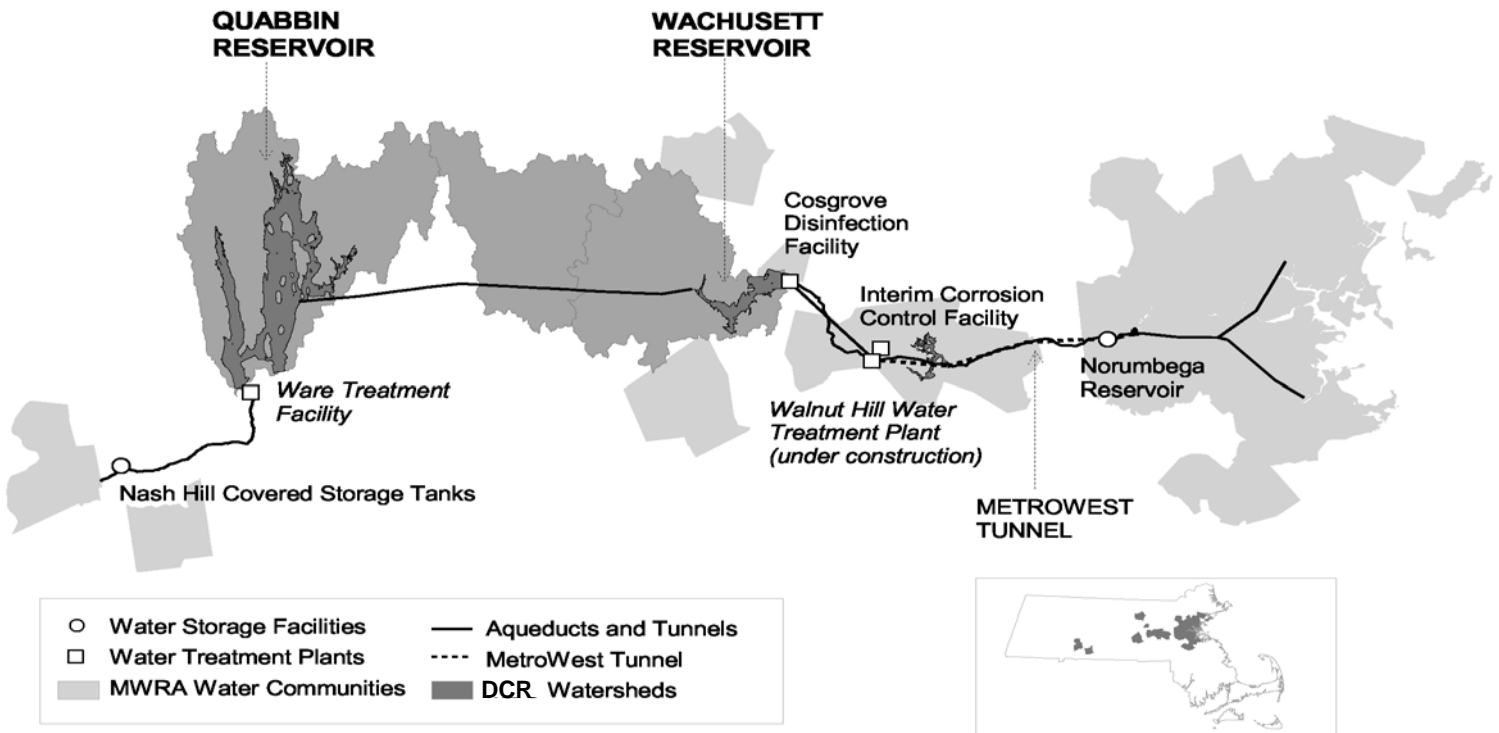
This is a monthly report containing information about the quality of water supplied by MWRA. It provides a more detailed review of water quality than the annual water quality report that is mailed each June to customers in our service area. The report is available at [www.mwra.com](http://www.mwra.com).

## 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

## May 2004

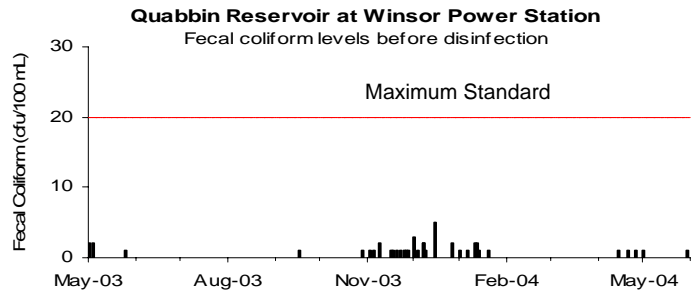
### Source Water - Microbial Results

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.

One of the 31 samples was positive during May. Colony count was in the single digits.

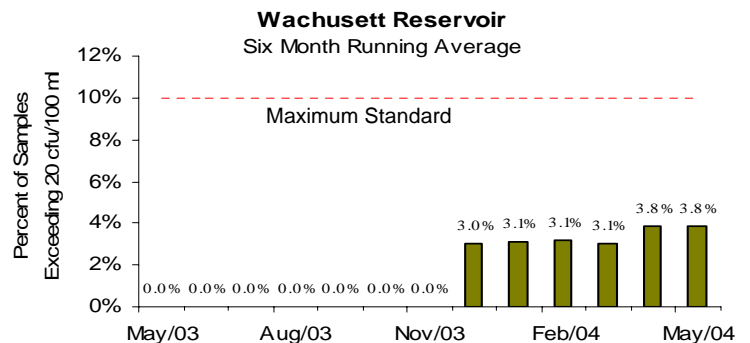
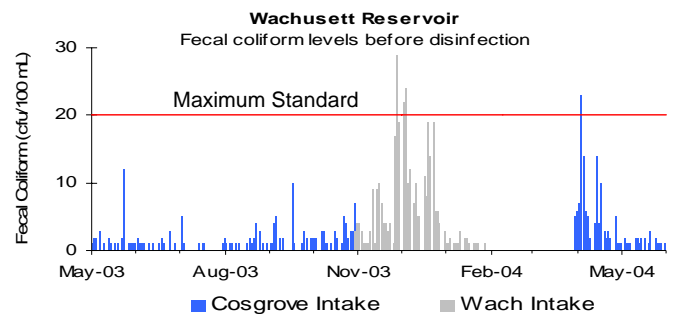


#### Sample Site: Wachusett Reservoir

Wachusett Reservoir water is sampled before it enters the MetroWest and Metropolitan Boston systems. Samples were collected at the Wachusett Intake from November 1, 2003 to March 16, 2004; samples before and after this period are taken at the Cosgrove Intake. For the current six-month period, 3.8% of the samples have exceeded a count of 20 cfu/100ml (5 samples have exceeded 20 cfu/100ml).

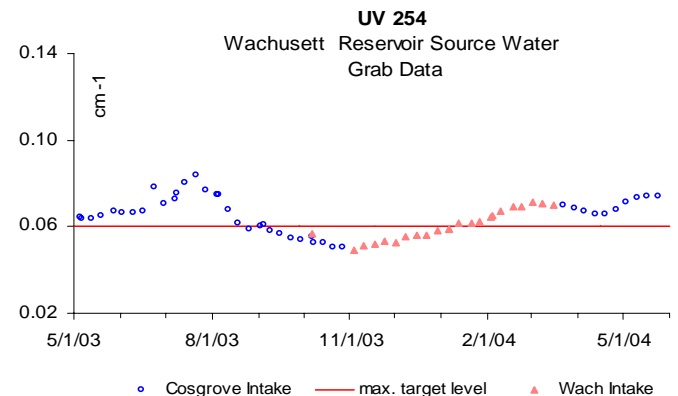
Fecal coliform levels tend to increase during the winter because, when water bodies near Wachusett ice over, waterfowl seek open water. Many roost at Wachusett, which tends to freeze later in the year than smaller ponds nearby.

Twenty of the 21 samples were positive during May. Colony counts were in the single digits.



#### UV

UV-254 is a surrogate measure of reactive organic matter and is a good predictor for DBP levels. It has remained above the Quabbin transfer trigger level of 0.06 A/cm since early January of 2004. Quabbin transfer was initiated on May 19.

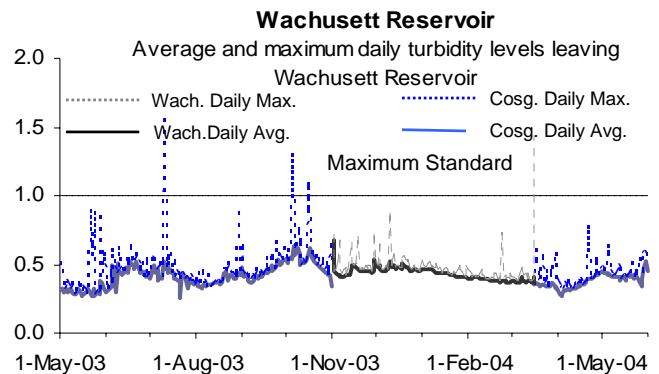
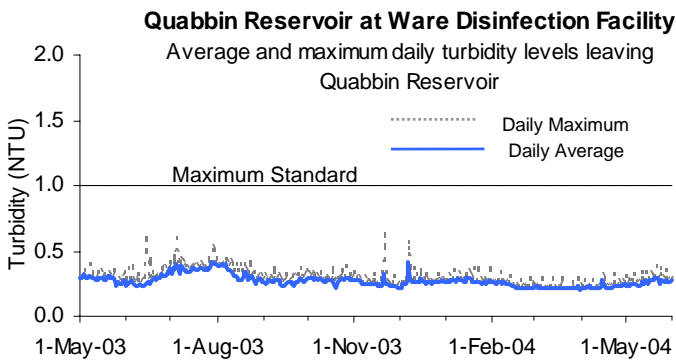


# Source Water – Turbidity and Algae Results May 2004

## 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.

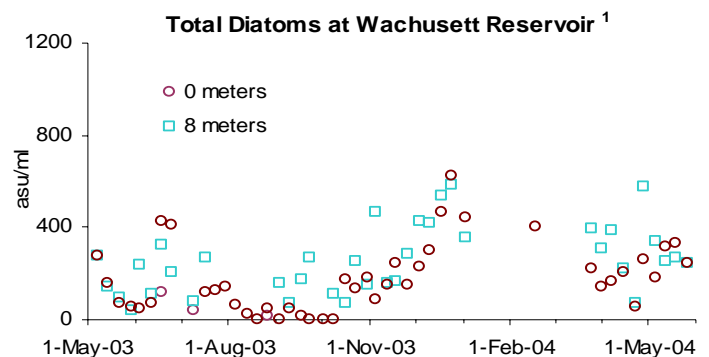
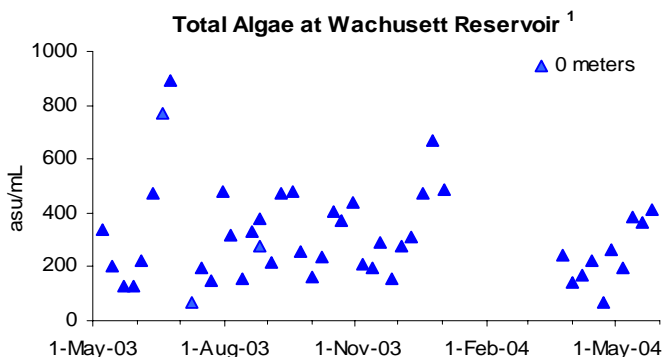
Samples for turbidity from Quabbin Reservoir are collected at the Ware Disinfection Facility before chlorination. Samples from Wachusett Reservoir were taken at Wachusett Intake before chlorination from November 1, 2003 to March 16, 2004; samples before and after this period are taken at the Cosgrove Intake. 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 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 reservoirs with copper sulfate, an algicide.

Of 13 complaints received during May from local water departments, only five 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

## May 2004

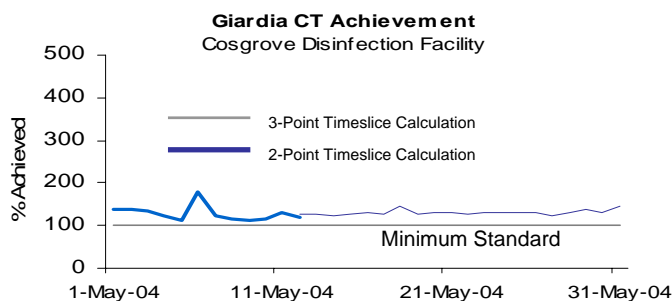
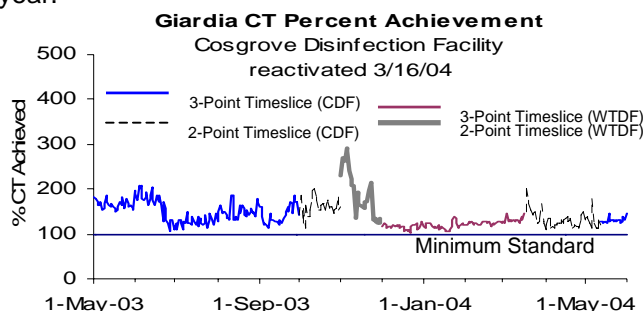
### Treated Water - Primary Disinfection

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.

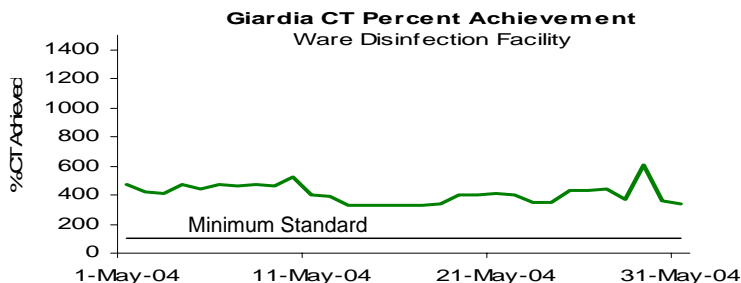
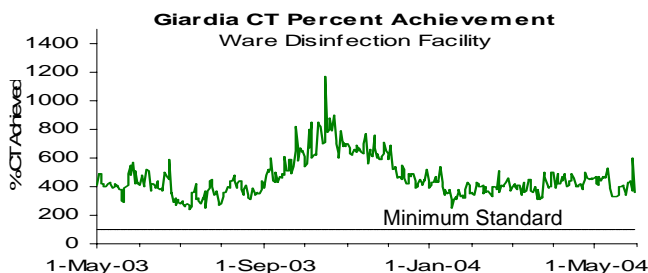
### Wachusett Reservoir - MetroBoston Supply:

Chlorine dose at the Cosgrove Disinfection Facility (CDF) was lowered to 1.6 mg/L from 1.7 mg/L on the 3<sup>rd</sup>. It was then raised to 1.7 mg/L on the 27<sup>th</sup>. The adjustments were made when the water temperature rose, which decreases the amount of chlorine needed to maintain CT Achieved. The chlorine dose was raised when the CT Achieved became a little low. Three-point timeslice reporting was initiated on the 12<sup>th</sup>. CT was met each day in May, as well as every day for the last year.



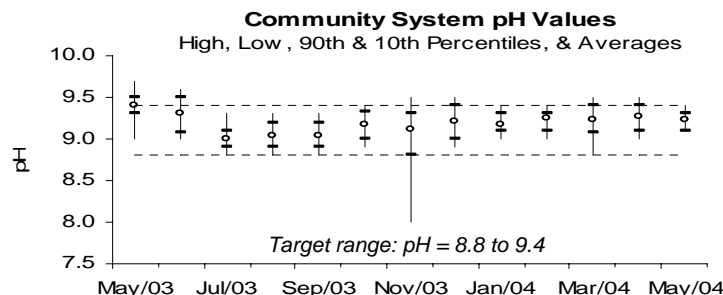
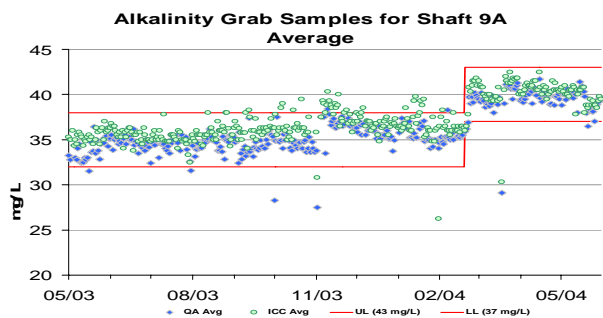
### Quabbin Reservoir at Ware Disinfection Facility (CVA Supply):

Chlorine dose remained at 1.3 mg/L. CT was met each day in May, 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 40 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 May, 100% of the samples were within the target range.



# Bacteria & Chlorine Residual Results for Communities in MWRA Testing Program May 2004

## 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. 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 1,673 community samples (0.00%) system-wide tested positive for confirmed total coliform during the month of May. No samples tested positive for *E. coli*. One of the 618 MWRA samples (0.16%) 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. 1.4% 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?	May 2004 Minimum Chlorine Residual (mg/L)	May 2003 Minimum Chlorine Residual (mg/L)	May 2004 Average Chlorine Residual (mg/L)	May 2003 Average Chlorine Residual (mg/L)
ARLINGTON	54	0 (0%)			0.05	0.01	0.84	0.86
BELMONT	32	0 (0%)			0.50	0.35	1.16	1.09
BOSTON	224	0 (0%)			0.64	0.86	1.35	1.32
BROOKLINE	68	0 (0%)			1.17	1.26	1.48	1.42
CHELSEA	32	0 (0%)			0.61	0.48	1.23	1.23
DEER ISLAND	16	0 (0%)			1.09	1.21	1.33	1.33
EVERETT	40	0 (0%)			0.45	0.51	0.99	0.92
FRAMINGHAM (c)	73	0 (0%)			0.42	0.71	1.25	1.40
LEXINGTON	36	0 (0%)			0.80	0.37	1.34	1.31
LYNNFIELD	6	0 (0%)			0.55	0.30	0.97	0.95
MALDEN	60	0 (0%)			0.74	0.78	0.95	0.98
MARBLEHEAD	24	0 (0%)			0.26	0.26	1.21	1.14
MARLBOROUGH (b)(c)	55	0 (0%)			0.49	0.74	1.03	1.09
MEDFORD	68	0 (0%)			0.35	0.25	1.22	1.01
MELROSE	36	0 (0%)			0.03	0.03	0.79	0.80
MILTON	32	0 (0%)			0.06	0.56	1.02	1.10
NAHANT	10	0 (0%)			0.38	0.30	0.86	0.97
NEEDHAM (b)	41	0 (0%)			0.05	0.18	0.49	0.92
NEWTON	88	0 (0%)			0.44	1.06	1.43	1.42
NORTHBOROUGH	16	0 (0%)			0.90	1.39	1.27	1.67
NORWOOD	36	0 (0%)			0.21	0.02	1.12	0.92
QUINCY	91	0 (0%)			0.14	0.39	1.21	1.20
REVERE	52	0 (0%)			0.58	0.42	1.31	1.27
SAUGUS	32	0 (0%)			1.19	1.19	1.30	1.35
SOMERVILLE	80	0 (0%)			0.00	0.05	1.04	1.05
SOUTHBOROUGH (c)	10	0 (0%)			0.17	0.31	0.84	1.08
STONEHAM	28	0 (0%)			0.17	0.77	1.39	1.29
SWAMPSCOTT	18	0 (0%)			1.04	1.17	1.28	1.26
WAKEFIELD (b)	44	0 (0%)			0.27	0.54	0.99	1.14
WALTHAM	68	0 (0%)			0.19	0.01	1.17	0.91
WATERTOWN	40	0 (0%)			0.48	0.34	1.11	1.06
WELLESLEY (b)	38	0 (0%)			0.11	0.05	0.65	0.44
WESTBORO HOSPITAL	5	0 (0%)			0.22	0.02	0.26	0.11
WESTON (c)	16	0 (0%)			0.17	0.33	0.84	1.52
WINCHESTER (b)	20	0 (0%)			0.05	0.07	0.77	0.71
WINTHROP	24	0 (0%)			0.43	0.62	1.22	1.16
WOBURN (b)	60	0 (0%)			0.21	0.13	0.93	0.75
Total:	1673	0 (0%)						
MASS. WATER RESOURCES AUTHORITY (d)	618	1 (.16%)		no	0.00	0.01	1.24	1.22

(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

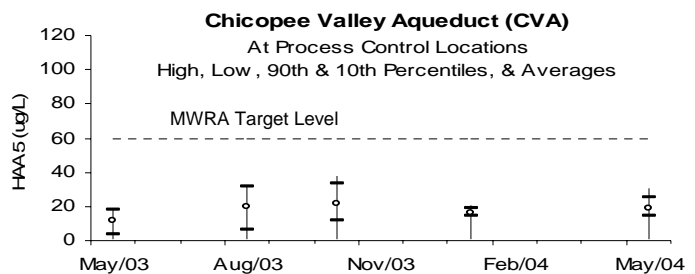
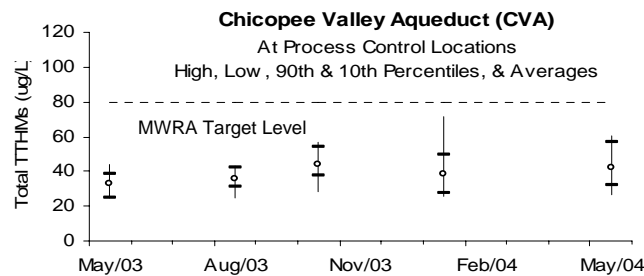
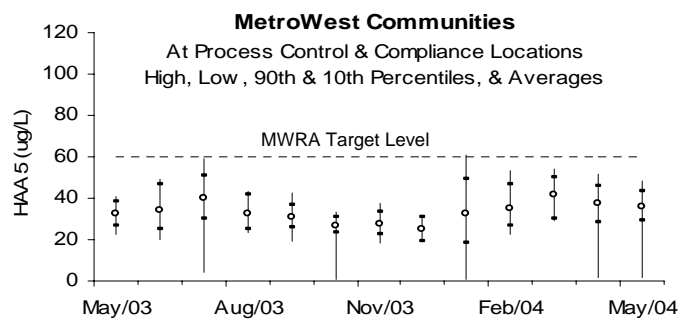
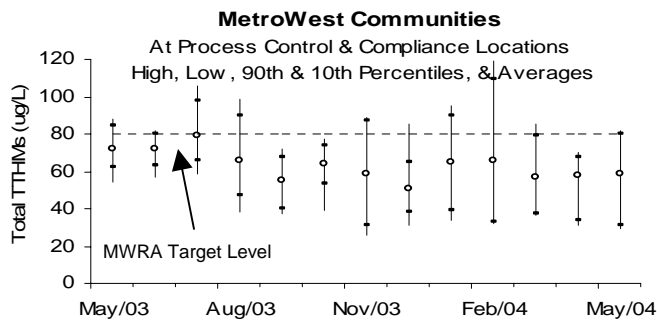
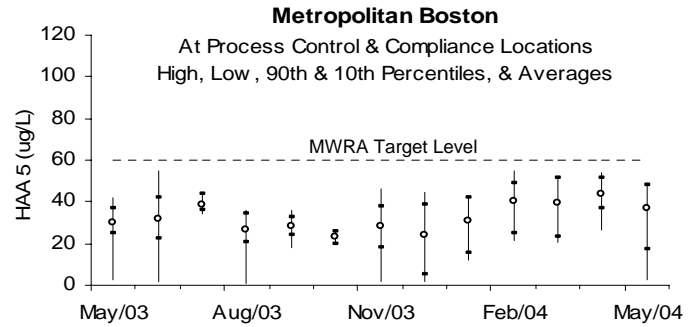
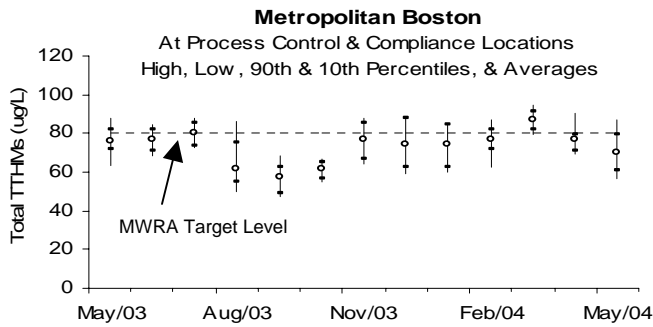
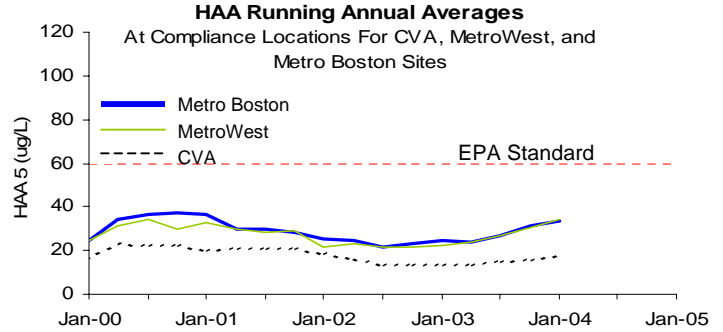
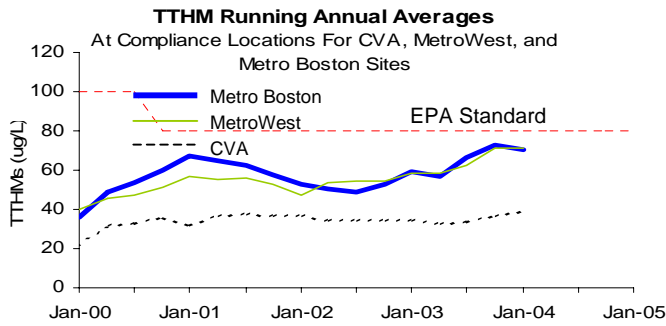
## May 2004

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 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.

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 TTHM levels at all process control sampling locations for the MetroWest and Metropolitan Boston communities are slightly lower than those of last year while the CVA is slightly higher. Average monthly HAA5 levels at all process control sampling locations for the MetroWest, CVA and Metropolitan Boston communities are higher than those of last year. The CVA system monitoring has been reduced from monthly to quarterly per DEP requirements. Transfers from the Quabbin Reservoir which has lower levels of organic material, to Wachusett Reservoir were started May 19<sup>th</sup>.

### TOTAL TRIHALOMETHANES

### HALOACETIC ACIDS



# MWRA Monthly Water Quality Analysis

## May 2004

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.

### CVA System | Metropolitan Boston | Standards

Component	Quabbin Reservoir at Ware Disinfection Facility (Raw)	Ludlow Monitoring Station (Treated)	Wachusett Reservoir at Cosgrove Intake (Raw)	ICC Marlboro (Treated)	Comm Ave., Newton (Treated)	Shaft 9A, Malden (Treated)	Standard	Units	Exceedance
Alkalinity	2.5	3.0	4.7	36.6	38.4	38.7		MG/L	
Aluminum	< 15.0	< 15.0	< 15.0	18.4	< 15.0	15.8	50-200 (d)	UG/L	NO
Ammonia-N	0.008	< 0.005	< 0.005	< 0.005	0.352	0.354		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	6.5	6.4	9.7	9.9	9.9	9.7	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	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	10 (a)	UG/L	NO
Bromide	10.3	3.2	17.9	5.7	4.3	3.2		UG/L	
Cadmium	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	5 (a)	UG/L	NO
Calcium	2210	2250	4610	4690	4860	4760		UG/L	
Chloride	7.3	8.4	25.7	27.4	27.7	28.7	250 (d)	MG/L	NO
Chlorine, Free	NS	0.66	NS	0.32	NS	NS		MG/L	
Chlorine, Total	NS	NS	NS	NS	1.53	1.57		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	2	NS	NS	NS	20 (b)	CFU/100 mL	NO
Coliform, Total, MF Method (e)	4	0	2	0	0	0	100 (b) 0 (c)	CFU/100 mL	NO
Copper **	< 0.9	< 0.1	< 0.1	3.3	< 0.9	2.1	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	0.07	0.09	0.04	1.02	1.02	1.03	4 (a)	MG/L	NO
Hardness	7.8	7.9	15.4	15.6	16	15.7		MG/L	
Iron **	9.6	8.3	26.5	37.2	33.8	32.0	300 (d)	UG/L	NO
Lead	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	15 (a)	UG/L	NO
Magnesium	544	539	952	956	946	924		UG/L	
Manganese	2.6	1.9	8.6	10.6	10.2	8.4	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	0.023	0.021	0.128	0.133	0.147	0.129	10 (a)	MG/L	NO
Nitrate+Nitrite - N	0.020	0.022	0.015	0.148	0.146	0.148			
Nitrite	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	1 (a)	MG/L	NO
Orthophosphate	0.003	0.003	0.006	0.014	0.015	0.015		MG/L	
pH	6.6	6.8	7.1	9.1	9.2	9.1		S.U.	
Potassium	485	455	1080	1110	1110	1140		UG/L	
Selenium	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	50 (a)	UG/L	NO
Silica (SiO2)	1560	1540	3240	3790	3810	3830		UG/L	
Silver	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	100 (d)	UG/L	NO
Sodium	4.7	5.5	14.8	30.8	32.8	31.9		MG/L	
Specific Conductance	47	52	127	194	197	198		UMHO/cm	
Standard Plate Count, HPC (48 Hrs @ 35C)	NS	NS	NS	79	3	3	500 (c)	CFU/mL	NO
Sulfate (SO4)	5.3	5.3	7.0	7.0	6.9	6.9		MG/L	
Thallium	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2 (a)	UG/L	NO
Total Dissolved Solids	37	38	81	117	111	118		MG/L	
Total Organic Carbon	1.7	1.8	2.7	2.5	3.0	2.6		MG/L	
Total Phosphorus	0.006	0.006	0.007	0.015	0.014	0.015		MG/L	
UV-254	0.022	0.018	0.071	0.056	0.063	0.064		A	
Zinc **	3.1	2.0	2.3	2.5	3.3	2.2	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

\*\* = Metal results may be elevated due to local plumbing at the sample tap.

**Italicized = Quarterly Samples**

Most results are based on single grab samples collected on May 2nd, 3rd and 10th, 2004 and analyzed by MWRA and contract laboratories. **Quarterly Samples are from April 2004.**

**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.