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

WATER QUALITY UPDATE

An Analysis of February 2005 Sampling Data

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

MWRA WATER QUALITY UPDATE

February 2005 Highlights

•**MWRA achieved CT disinfection requirements for the month** at the Ware Disinfection Facility (WDF) 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, but still within standards. See page 7. No community violated the Total Coliform Rule criteria. See Page 6.

•**Wellesley reported a 131 discolored water complaints in February**. Reversal of flow occurred in the town's distribution system during the cleaning of one of their wells and this caused the discoloration of the water.

•**Marblehead reported 110 discolored water complaints on the 23rd** when a 10 inch water main broke on Atlantic Avenue. The main was repaired the same day.

•**Annual Review of *Giardia* and *Cryptosporidium***. See Page 9.

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

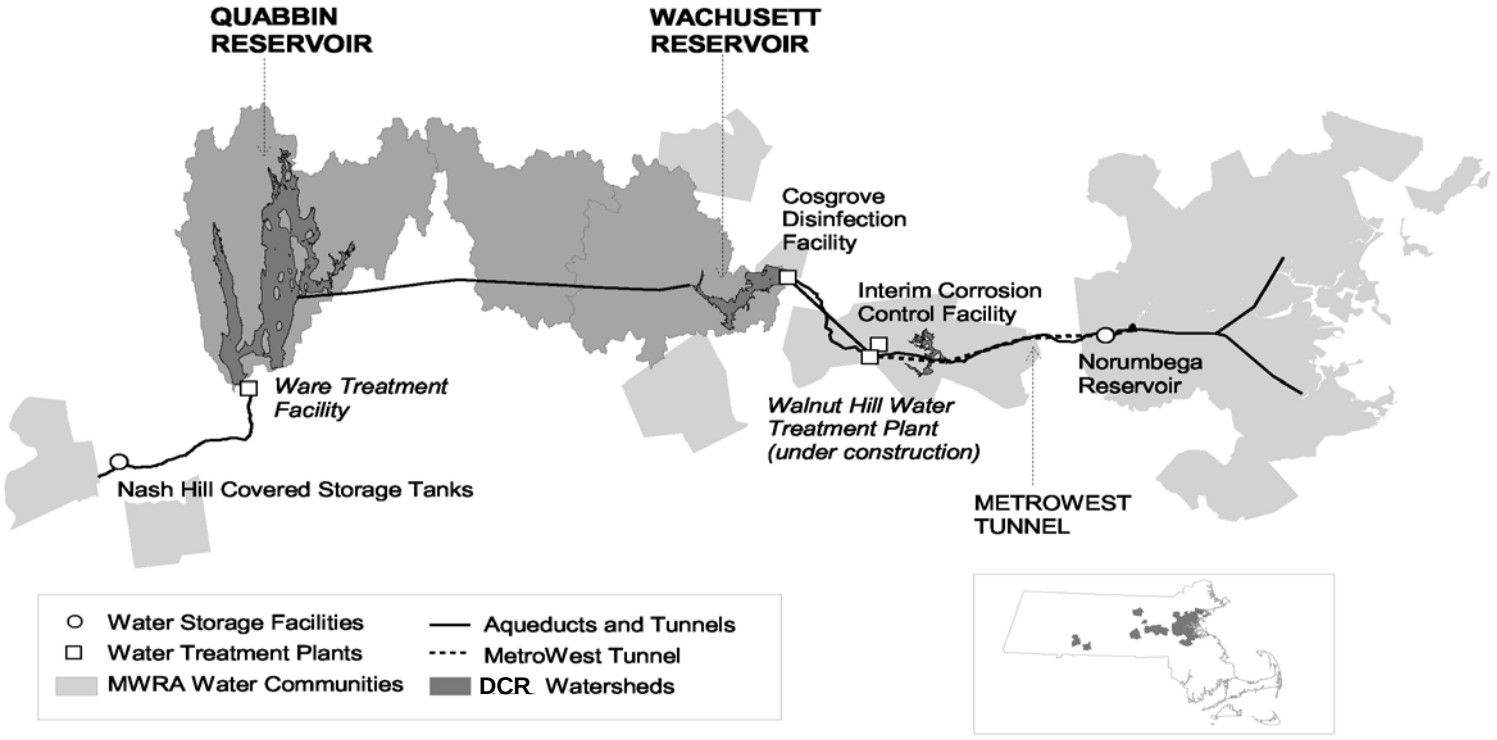
Release Date: March 20, 2005

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.

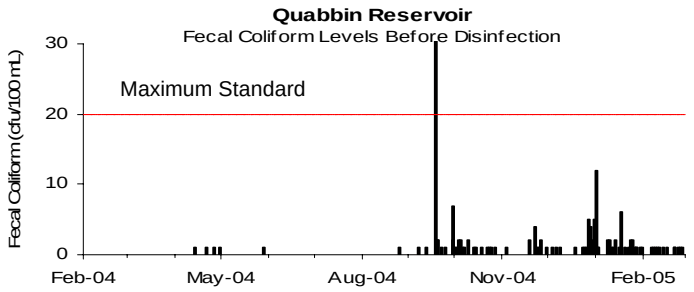
Source Water – Microbial Results
February 2005

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 any six-month period have more than 20 fecal coliforms per 100ml.

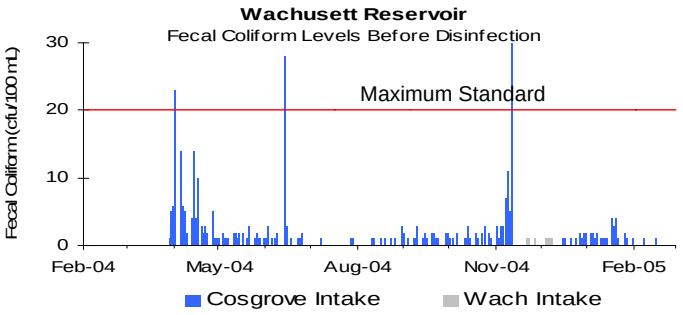
Sample Site: Quabbin Reservoir

Quabbin Reservoir water is sampled at the Ware Disinfection Facility (WDF) raw water tap before entering the CVA system as of July 13th. Prior data was sampled at Winsor Dam. MWRA met the six-month running average standard for fecal coliform continuously at this location over the last year. The reservoir froze over on January 29th.



Twelve of the 28 samples were positive during February. None of the samples exceeded a count of 20 cfu/100ml.

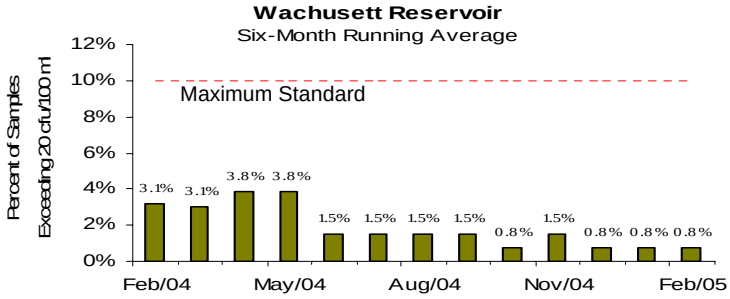
For the current six-month period, 0.6% of the samples have exceeded a count of 20 cfu/ 100ml (One of the samples exceeded 20 cfu/100ml).



Sample Site: Wachusett Reservoir

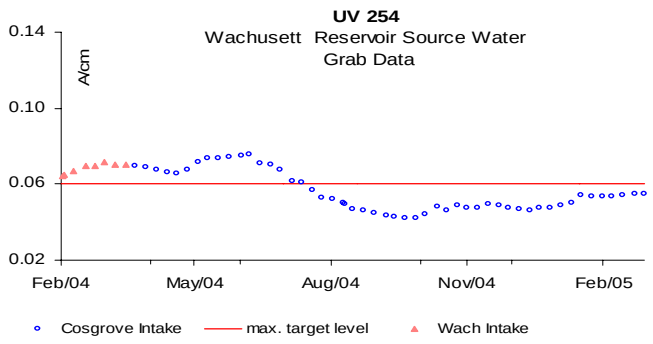
Wachusett Reservoir water is sampled before it enters the MetroWest and Metropolitan Boston systems at the Cosgrove Intake.

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. DCR's bird harassment program to move the birds away from the intake area is over for the season as the reservoir froze over on January 19th.



Two of the 20 samples were positive during February. Colony counts were in the single digits.

For the current six-month period, 0.8% of the samples have exceeded a count of 20 cfu/100ml (One of the samples exceeded 20 cfu/100ml).



UV

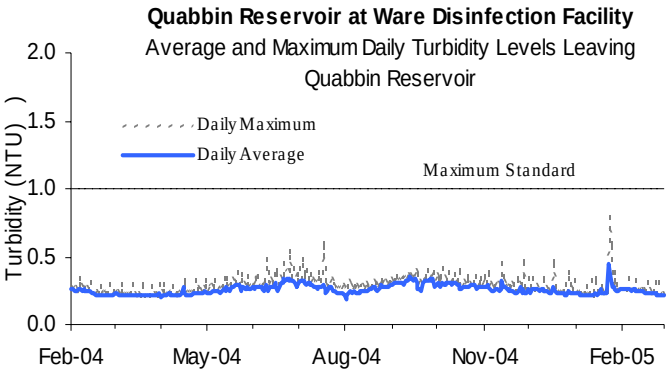
UV-254 is a surrogate measure of reactive organic matter and is a good predictor for DBP levels. Levels are currently around 0.055 A/cm.

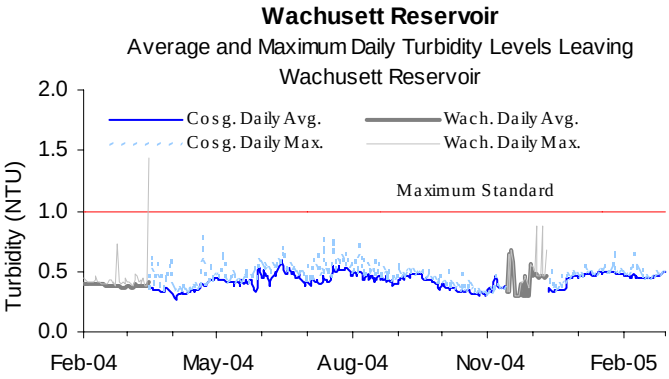
Source Water – Turbidity and Algae Results
February 2005

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 Wachusett Intake before chlorination from November 1, 2003 to March 16, 2004, October 26, 2004 and November 13, 2004 to December 10, 2004. Otherwise, samples were taken at the Cosgrove Intake before chlorination. 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.



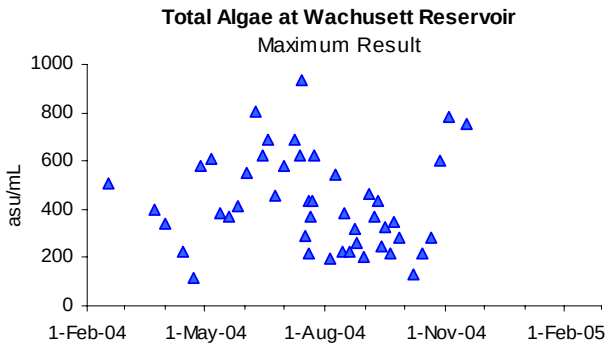


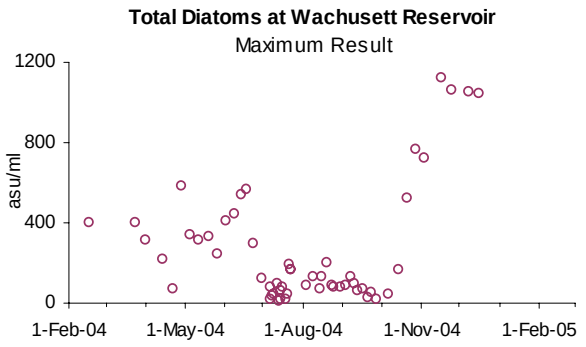
Source Water – Algae Results

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.

The Wachusett Reservoir has frozen at the intake area as of January 19 and samples cannot be collected. The last sampling was performed on January 13. The DCR will attempt to collect samples as soon as enough melting occurs to produce open water near the intake area.

Of the 260 water quality complaints received during February from local water departments, one concerned taste and odor that may be due to algae.





Treated Water – Disinfection and pH Results
February 2005

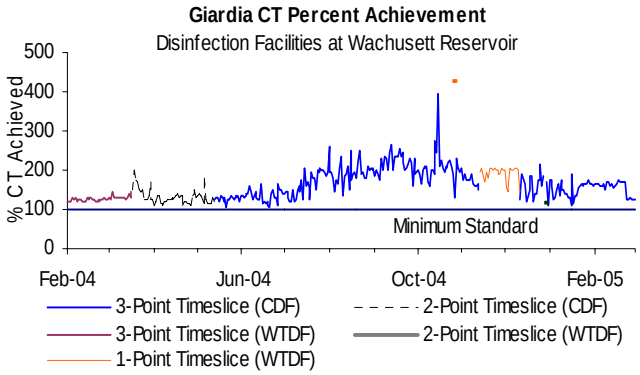
Treated Water - Primary Disinfection

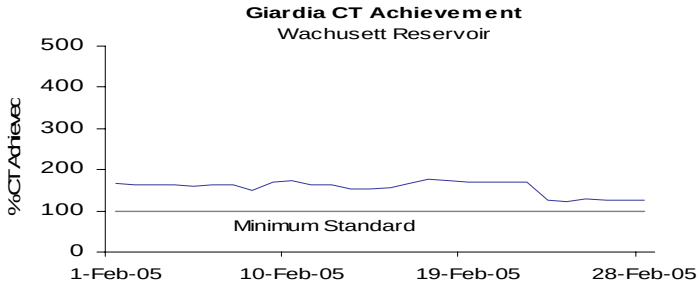
MWRA provides disinfection adequate to achieve EPA's requirement of 99.9% inactivation of *Giardia* cysts and 99.99% inactivation of viruses in drinking water using a calculation based on three sample points that DEP approved in June, 1999. Depending on the number of sample points that are providing accurate information, CT may be reported on one, two or three points.

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:

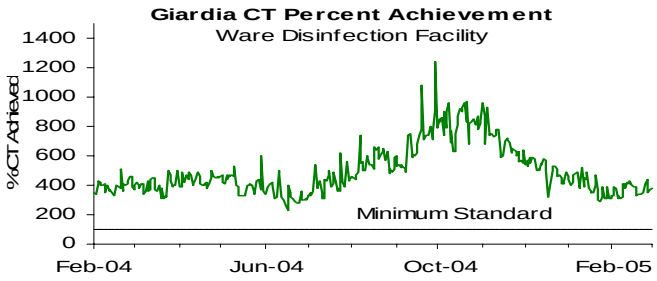
Chlorine dose at the Cosgrove Disinfection Facility (CDF) varied between 2.1 to 2.3 mg/L. CT was met each day in February, as well as every day for the last year.

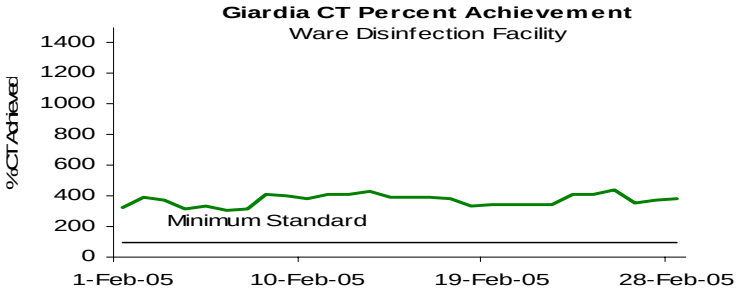




Quabbin Reservoir at Ware Disinfection Facility (CVA Supply):

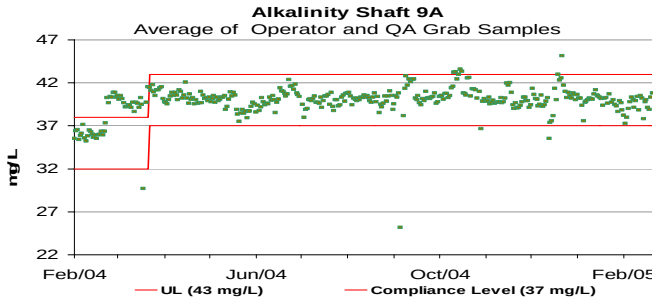
Chlorine dose remained at 1.3 mg/L. CT was met each day in February, as well as every day for the last year.

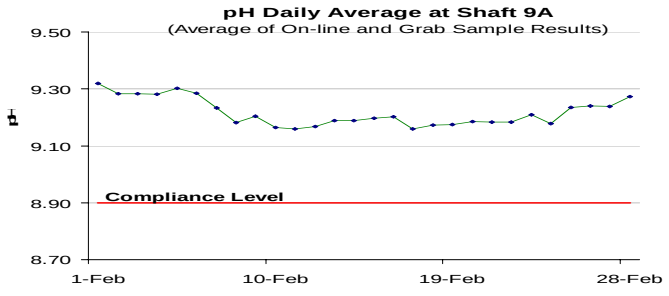




Treated Water – pH and Alkalinity Compliance

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, as per DEP requirements, samples from Shaft 9A and 27 community taps have a minimum compliance level of 8.9 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 February, no sample results were below these levels. Quality Assurance and operator staff test pH and alkalinity daily at Shaft 9A.





Bacteria & Chlorine Residual Results for Communities in MWRA Testing Program
February 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 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 1,695 community samples (0.0%) system-wide tested positive for confirmed total coliform during the month of February. One of the 616 MWRA samples (0.16%) 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. 1.2% 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?	February 2005 Minimum Chlorine Residual (mg/L)	February 2004 Minimum Chlorine Residual (mg/L)	February 2005 Average Chlorine Residual (mg/L)	February 2004 Average Chlorine Residual (mg/L)
ARLINGTON	52	0 (0%)			0.24	0.02	1.12	1.05
BELMONT	32	0 (0%)			0.40	0.97	1.31	1.51
BOSTON	224	0 (0%)			0.20	0.97	1.53	1.64
BROOKLINE	68	0 (0%)			1.17	1.09	1.65	1.68
CHELSEA	32	0 (0%)			0.58	1.24	1.46	1.61
DEER ISLAND	16	0 (0%)			1.23	0.83	1.48	1.52
EVERETT	40	0 (0%)			0.94	0.00	1.17	0.67
FRAMINGHAM (c)	72	0 (0%)			0.12	0.21	1.23	1.19
LEXINGTON	45	0 (0%)			1.08	0.83	1.55	1.62
LYNNFIELD	7	0 (0%)			1.00	0.65	1.46	1.17
MALDEN	60	0 (0%)			0.81	0.91	0.99	1.08
MARBLEHEAD	24	0 (0%)			0.33	0.22	1.35	1.38
MARLBOROUGH (b)(c)	52	0 (0%)			0.27	0.82	1.09	1.14
MEDFORD	68	0 (0%)			0.38	0.80	1.30	1.49
MELROSE	36	0 (0%)			0.02	0.04	0.90	0.74
MILTON	32	0 (0%)			0.89	0.28	1.22	1.20
NAHANT	10	0 (0%)			0.10	0.09	0.89	1.09
NEEDHAM (b)	41	0 (0%)			0.04	0.03	0.24	0.25
NEWTON	88	0 (0%)			0.48	0.92	1.59	1.71
NORTHBOROUGH	16	0 (0%)			0.30	1.10	1.49	1.45
NORWOOD	36	0 (0%)			0.11	0.09	1.24	1.39
QUINCY	105	0 (0%)			0.15	0.48	1.38	1.50
REVERE	52	0 (0%)			0.38	0.66	1.44	1.50
SAUGUS	32	0 (0%)			1.46	1.21	1.54	1.55
SOMERVILLE	79	0 (0%)			0.30	0.09	1.47	1.29
SOUTHBOROUGH (c)	10	0 (0%)			0.19	0.05	0.95	1.06
STONEHAM	28	0 (0%)			1.01	0.58	1.47	1.61
SWAMPSCOTT	18	0 (0%)			0.83	0.93	1.38	1.25
WAKEFIELD (b)	44	0 (0%)			0.43	0.59	1.17	1.20
WALTHAM	68	0 (0%)			0.04	0.34	1.24	1.45
WATERTOWN	40	0 (0%)			0.22	0.80	1.16	1.41
WELLESLEY (b)	38	0 (0%)			0.11	0.21	0.50	0.48
WESTBORO HOSPITAL	5	0 (0%)			0.05	0.44	0.75	1.14
WESTON (c)	16	0 (0%)			0.94	0.38	1.57	1.24
WINCHESTER (b)	20	0 (0%)			0.25	0.07	1.00	0.63
WINTHROP	29	0 (0%)			1.08	1.40	1.57	1.60
WOBURN (b)	60	0 (0%)			0.06	0.10	0.70	0.72
Total:	1695	0 (0%)						
MASS. WATER RESOURCES AUTHORITY (d)	616	1 (0.16%)		no	0.04	0.00	1.43	1.47

(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.

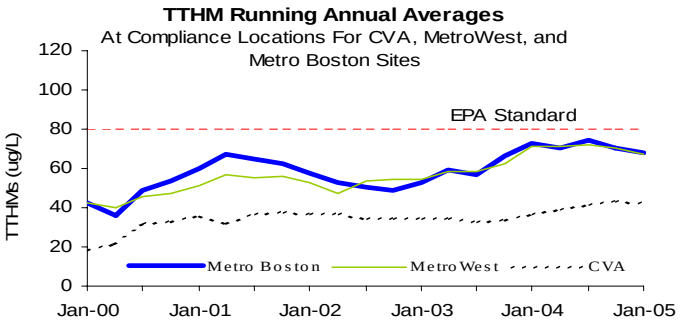
(d) MWRA sampling program includes a subset of community TCR sites as well as sites along the transmission system, tanks and pumping stations.

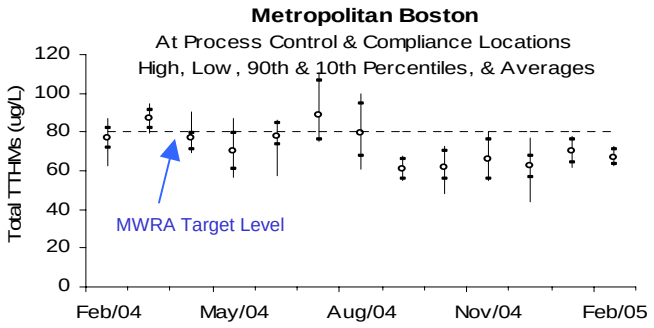
Treated Water - Disinfection By-Product (DBP) Levels in Communities
February 2005

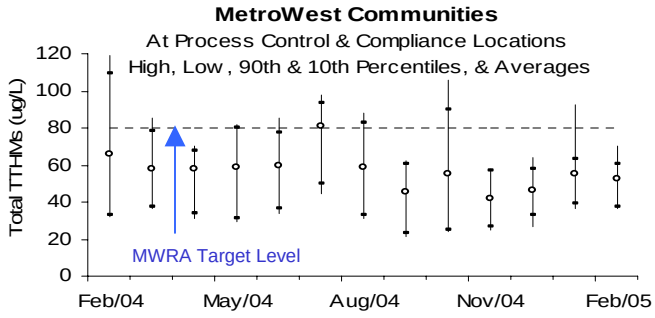
Total Trihalomethanes (TTHMs) and Haloacetic Acids (HAAs) are by-products of disinfection treatment with chlorine. Chlorination levels, the presence of organic precursors, pH levels, the contact time of water with chlorine used for disinfection, and temperature all affect TTHM and HAA levels. DBPs are 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. 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 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.

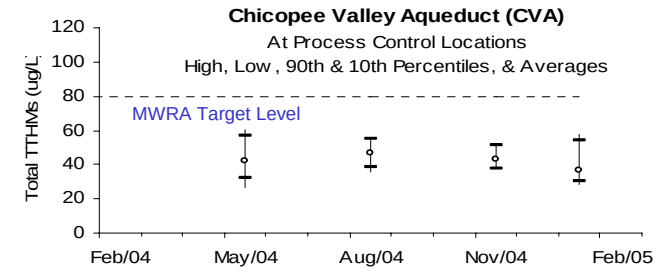
The running annual average for TTHMs and HAA5s at compliance locations, represented in the top two graphs below, remained below current standards.

TOTAL TRIHALOMETHANES

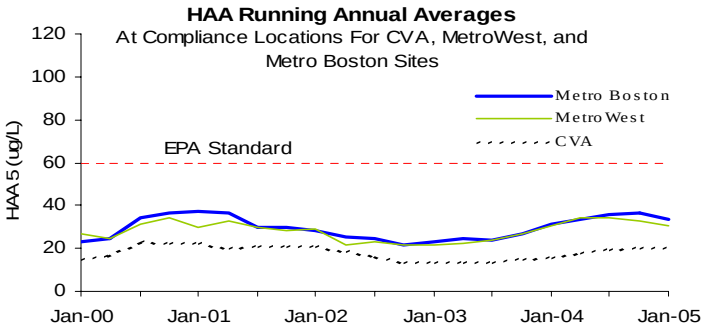


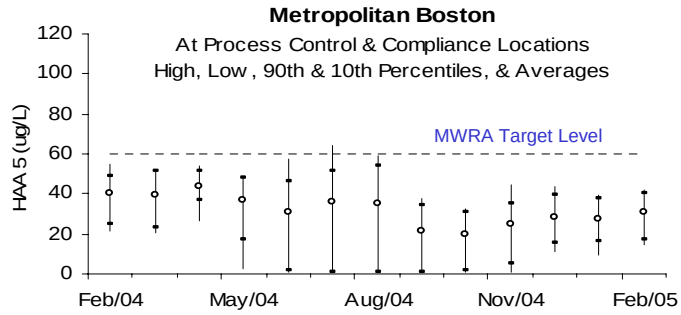


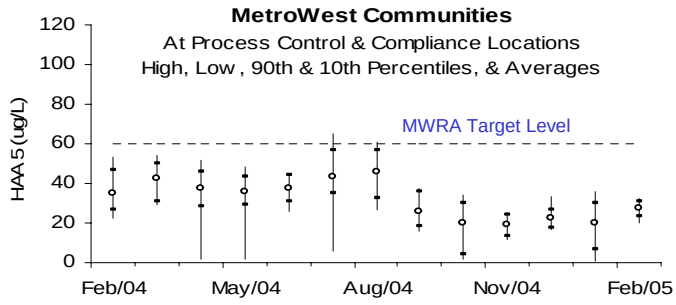


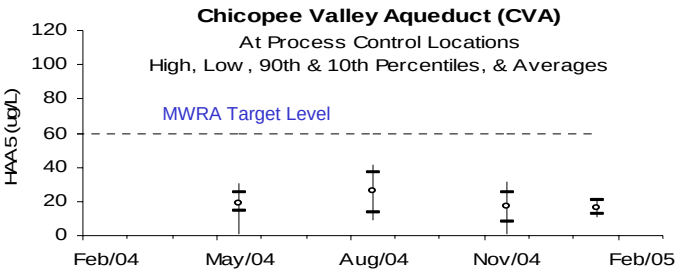


HALOACETIC ACIDS









MWRA Monthly Water Quality Analysis
February 2005

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 parameters indicated in bold is quarterly, as they either (1) have minimal variability or (2) are always below detection levels.

	CVA System		Metropolitan Boston →				Standards →		
Component	**Quabbin Reservoir at Ware**	**Ludlow Monitoring Station**	**Wachusett Reservoir at Cosgrove**	**ICC Marlboro (Treated)**	**Comm Ave., Newton (Treated)**	**Shaft 9A, Malden (Treated)**	**Standard**	**Units**	**Exceedance**
Alkalinity	2.7	3.3	5.1	37.4	38.5	38.6		MG/L	
Aluminum	***< 15.0***	***< 15.0***	***< 15.0***	***< 15.0***	***< 15.0***	***< 15.0***	50-200 (e)	UG/L	NO
Ammonia-N	< 0.01	< 0.01	0.01	0.01	0.23	0.23		MG/L	
Antimony	***< 1.0***	***< 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***	***< 1.0***	50 (a)	UG/L	NO
Barium	***7.4***	***7.1***	9.4	9.4	9.6	9.4	2000 (a)	UG/L	NO
Beryllium	***< 0.3***	***< 0.3***	***< 0.3***	***< 0.3***	***< 0.3***	***< 0.3***	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	5.7	15.7	9.1	7.0	7.1		UG/L	
Cadmium	***< 0.5***	***< 0.5***	***< 0.5***	***< 0.5***	***< 0.5***	***< 0.5***	5 (a)	UG/L	NO
Calcium	***2430***	***2460***	4610	4630	4750	4700		UG/L	
Chloride	7.8	***8.9***	23.1	23.8	23.9	23.8	250 (e)	MG/L	NO
Chlorine, Free	NS	0.83	NS	0.99	NS	NS	4 (c)(d)	MG/L	NO
Chlorine, Total	NS	NS	NS	NS	1.8	1.7	4 (c)(d)	MG/L	NO
Chromium	***< 1.0***	***< 1.0***	***< 1.0***	***< 1.0***	***< 1.0***	***< 1.0***	100 (a)	UG/L	NO
Coliform, Fecal, MF Method	0	NS	1	NS	NS	NS	20 (b)	CFU/100 mL	NO
Coliform, Total, MF Method (h)	1	0	0	0	0	0	100 (b) 0 (c)	CFU/100 mL	NO
Copper **	< 3.0	< 3.0	***< 3.0***	***3.4***	***< 3.0***	***3.2***	1300 (f) 1000 (g)	UG/L	NO
Cyanide	***< 0.01***	***< 0.01***	***< 0.01***	***< 0.01***	***< 0.01***	***< 0.01***	0.2 (a)	MG/L	NO
Fluoride	***0.05***	***0.10***	0.10	0.96	0.96	0.97	4 (a)	MG/L	NO
Hardness	***8.3***	***8.3***	15.2	15.3	15.6	15.4		MG/L	
Iron **	11.5	11.5	***15.1***	24.3	29.8	23.8	300 (e)	UG/L	NO
Lead	***< 1.2***	***< 1.2***	***< 1.2***	***< 1.2***	***< 1.2***	***< 1.2***	15 (a)	UG/L	NO
Magnesium	***546***	***524***	902	907	904	898		UG/L	
Manganese	***3.8***	***3.8***	7.2	6.6	7.0	7.5	50 (e)	UG/L	NO
Mercury	***< 0.010***	***< 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***	***< 5.0***		UG/L	
Nitrate-N	***< 0.014***	***0.015***	***0.076***	***0.076***	0.087	***0.077***	10 (a)	MG/L	NO
Nitrate/Nitrite	0.014	0.017	0.078	0.083	0.125	0.099			
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***	***0.009***	***0.012***	***0.011***		MG/L	
pH	6.8	7.5	7.2	9.0	9.0	9.0		S.U.	
Potassium	***525***	***527***	910	919	931	927		UG/L	
Selenium	***< 1.0***	***< 1.0***	***< 1.0***	***< 1.0***	***< 1.0***	***< 1.0***	50 (a)	UG/L	NO
Silica (SiO2)	***1680***	***1750***	2330	2890	2830	2830		UG/L	
Silver	***< 1.0***	***< 1.0***	***< 1.0***	***< 1.0***	***< 1.0***	***< 1.0***	100 (e)	UG/L	NO
Sodium	***4.7***	***5.7***	13.8	32.0	32.6	32.8		MG/L	
Specific Conductance	50	55	112	184	***186***	***185***		UMHO/cm	
Standard Plate Count, HPC (48 Hrs @ 35C)	NS	NS	14	2	2	0	500 (c)	CFU/mL	NO
Sulfate (SO4)	***5.1***	***5.1***	6.6	6.6	6.7	6.7	250 (e)	MG/L	
Thallium	***< 1.0***	***< 1.0***	***< 1.0***	***< 1.0***	***< 1.0***	***< 1.0***	2 (a)	UG/L	NO
Total Dissolved Solids	< 25	< 25	30	97	76	91	500 (d)	MG/L	
Total Organic Carbon	1.9	***1.5***	2.3	2.3	2.4	2.3		MG/L	
Total Phosphorus	< 0.005	< 0.005	0.006	0.012	0.011	0.011		MG/L	
UV-254	0.022	0.017	0.054	0.039	0.049	0.049		A	
Zinc **	***2.8***	***1.9***	< 1.5	< 1.5	< 1.5	< 1.5	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 February 7 and 10, 2005 and analyzed by MWRA and contract laboratories. ***Quarterly Samples are from January 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.

Samples at Cosgrove and CVA Intakes

Even though testing for *Giardia* and *Cryptosporidium* is not required by EPA or the DEP, MWRA has been monitoring for them in source waters since 1994. EPA does set inactivation requirements for *Giardia*, while requirements for *Cryptosporidium* are still being developed. *Giardia* and *Cryptosporidium* sampling was initiated in 1994 (monthly samples at Shaft 4, later moved to Cosgrove Intake). In mid-January 1999, sampling was increased to weekly at Cosgrove Intake. Biweekly sampling is conducted at the CVA Intake.

Giardia and *Cryptosporidium* results are reported as number of cysts per 100 L. Until March 2004, MWRA used the EPA-approved method, ASTM D19 (ICR) with 100 L samples. Under this method, identifications were grouped into 2 categories: presumed (no internal structures identified) and confirmed (one or more internal structures identified). From July 1997 to March 2004, no samples confirmed positive for *Giardia*, and no samples were presumptive or confirmed positive for *Cryptosporidium*. In April 2004, MWRA began testing samples using the newly approved EPA Method 1623 with 50 L samples, which is about twice as sensitive as ICR method (3 to 4 times the recovery rate with half the volume.) Under the new method, identifications are grouped into 3 categories: empty (no internal structures), amorphous structure (structure not consistent with a normal organism), and one or more internal structures. The results for 2004 using both ICR and 1623 are listed below.

Table 1 – Cosgrove Intake: *Cryptosporidium* Results (oocysts/100L) for MetroBoston: January 2004 – December 2004

Number of Samples	Number of Positive Samples	Total Number of Oocysts Detected	# with One or More Internal Structures	Average (oocysts/100L)	Range of Detects (oocysts/100L)
52	1	1	1	0.03	2

Table 2 – Cosgrove Intake: *Giardia* Results (cysts/100L) for MetroBoston: January 2004 – December 2004

Number of Samples	Number of Positive Samples	Total Number of Cysts Detected	# with One or More Internal Structures	Average (cysts/100L)	Range of Detects (cysts/100L)
52	5	8	1	0.2	2 -4

Table 3 – CVA Intake: *Cryptosporidium* Results (oocysts/100L) for Chicopee Valley Aqueduct: January 2004 – December 2004

Number of Samples	Number of Positive Samples	Total Number of Oocysts Detected	# with One or More Internal Structures	Average (oocysts/100L)	Range of Detects (oocysts/100L)
26	0	0	0	0	-

Table 4 – CVA Intake: *Giardia* Results (cysts/100L) for Chicopee Valley Aqueduct: January 2004 – December 2004

Number of Samples	Number of Positive Samples	Total Number of Cysts Detected	# with One or More Internal Structures	Average (cysts/100L)	Range of Detects (cysts/100L)
26	1	2	1	0.1	4

Note: A complete record of results can be found on the MWRA website at *www.mwra.com*.

Research Efforts

MWRA is currently engaged in a voluntary, joint research effort with Tufts University looking at levels of *Cryptosporidium* and *Giardia* in drinking water using a high volume sample (1000 liters). This monitoring is part of a larger multi-city study looking at levels of *Cryptosporidium* exposure in the population and potentially related levels in drinking and recreational waters. Since the routine, EPA-approved ICR method previously used by the MWRA had few detects, no statistical comparisons of human exposure to drinking water were possible. As a result, MWRA and Tufts decided to use a more sensitive method to determine the variability, if any, of levels of *Cryptosporidium* and *Giardia*.

The research monitoring uses a weekly composite sample (some water each day for the entire week) of 1,000 liters at Shaft 9A, a site within the water system that is representative of water delivered to customers in the MetroBoston system. The water is then evaluated using a test method basically the same as Method 1623. All *Cryptosporidium* oocysts and *Giardia* cysts, both confirmed and empty, are counted. This method, using a large sample volume, is more than 20 times more sensitive than the present sampling protocol with Method 1623 now used by MWRA, and at least 40 times as sensitive as the previous ICR method.

The data collected so far is generally consistent with MWRA's past data. As was expected, the much higher sample volumes and the more sensitive testing have yielded some positive samples; all but one of the positives has been below the nominal detection limit of Method 1623 (1-oocyst/50 liters), and the overall average for all samples since 2001 is 0.04 oocyst/100 liters. Tufts has also tested for *Giardia* using the same testing method as above, with the overall average is 0.01 cyst/100 liters since 2002.

Table 5 - Research Sampling - *Cryptosporidium* Results: January 2004 – December 2004

Number of Samples	Number of Positive Samples	Total Number of Oocysts Detected	# with One or More Internal Structures	Average (oocysts/100L)	Range of Detects (oocysts/100L)
50	6	7	0	0.01	0.1 - 0.2

Table 6 - Research Sampling - *Giardia* Results: January 2004 – December 2004

Number of Samples	Number of Positive Samples	Total Number of Cysts Detected	# with One or More Internal Structures	Average (cysts/100L)	Range of Detects (cysts/100L)
50	4	6	0	0.01	0.1 - 0.2

Testing Limitations and Response Protocol

It is important to note that *Cryptosporidium* and *Giardia* monitoring has significant limitations. The tests do not clearly distinguish between live and dead cysts, cannot determine if an organism is in fact infectious to humans, and the infectious dose of various strains of *Cryptosporidium* is not well understood. Nonetheless, in 1996, MWRA adopted a trigger level of 10 oocysts per 100 liters (recommended by Rose and Haas, leading researchers in pathogen and risk/health analysis) above which notification and other actions would be undertaken. Total number of positives, both confirmed and empty, are included in this trigger level. No special actions are required for levels below this level. Even with the new, more sensitive testing method, the average level found is well below the 10-oocyst per 100 liter trigger level. Furthermore, MWRA's current treatment is capable of inactivating (killing) at least 99.9% of any *Giardia* which may be present and viable. MWRA's new ozone plant under construction at Walnut Hill is designed to inactivate *Cryptosporidium,* as well as *Giardia*.