



# MASSACHUSETTS WATER RESOURCES AUTHORITY

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August 23, 2013

Mr. Stephen Perkins, Director  
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US EPA, Region 1  
5 Post Office Square, Suite 100  
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Ms. Ann Lowery  
Bureau of Resource Protection  
Department of Environmental Protection  
1 Winter Street  
Boston, MA 02108

RE: Massachusetts Water Resources Authority Permit Number MA0103284

Dear Mr. Perkins and Ms. Lowery:

In compliance with the requirements of MWRA's NPDES Permit MA0103284 - Part I, Item 10.c (page 14 of 32), please find enclosed: Summary Report of MWRA's Demand Management Program for Fiscal Year 2013.

Should you require additional information, please contact Carl H. Leone, Senior Program Manager, Community Support Program at (617) 788-4356.

Sincerely,

Michael J. Hornbrook  
Chief Operating Officer

cc: MassDEP, NERO  
MassDEP, Boston  
MassDEP, Worcester  
MassDEP, SERO  
Kevin Brander, MassDEP, NERO  
Grace Bigornia-Vitale, Sr. Program Manager, MWRA NPDES Compliance  
Carl H. Leone, Sr. Program Manager, MWRA Community Support Program

# Summary Report of MWRA Demand Management Program Fiscal Year 2013

This report is organized into four sections, as follows:

1. Summary
2. Background and Long Range Water Supply Program
3. Ongoing Demand Management Programs and Detailed Activities during Fiscal Year 2013
4. Demand Management Plans for Fiscal Year 2014

## 1. Summary

This report has been prepared to meet the requirements of the Massachusetts Water Resources Authority's (MWRA) NPDES Permit MA0103284 - Part I, Item 10.c (page 14 of 32). The purpose of the demand management section (including water conservation) in MWRA's NPDES permit is to help maintain the dry day wastewater flow to the Deer Island Wastewater Treatment Plant below the 436 million gallons per day (mgd) permit limit. MWRA's wastewater flow is derived from three flow components: sanitary flow, groundwater infiltration, and stormwater inflow. The demand management program will help reduce the sanitary component of wastewater flow as well as provide benefits to the water system and source watersheds. Information on reduction of infiltration and inflow is provided in the MWRA Annual Infiltration and Inflow Reduction Report for Fiscal Year 2013 (submitted under separate cover letter).

MWRA has maintained the 365 calendar day running average dry day wastewater flow well below the 436 mgd limit and well below the 415 mgd trigger (see NPDES Permit Part I, Item 10.a and 10.b). For fiscal year 2013 (ending June 30, 2013), the 365-calendar day running average dry day flow to the Deer Island Wastewater Treatment Plant was 271.7 mgd; dry day flow has averaged about 312 mgd over the last ten years (see Table 1). The dry day flow is reported monthly by MWRA as part of the NPDES Operational Performance Summary.

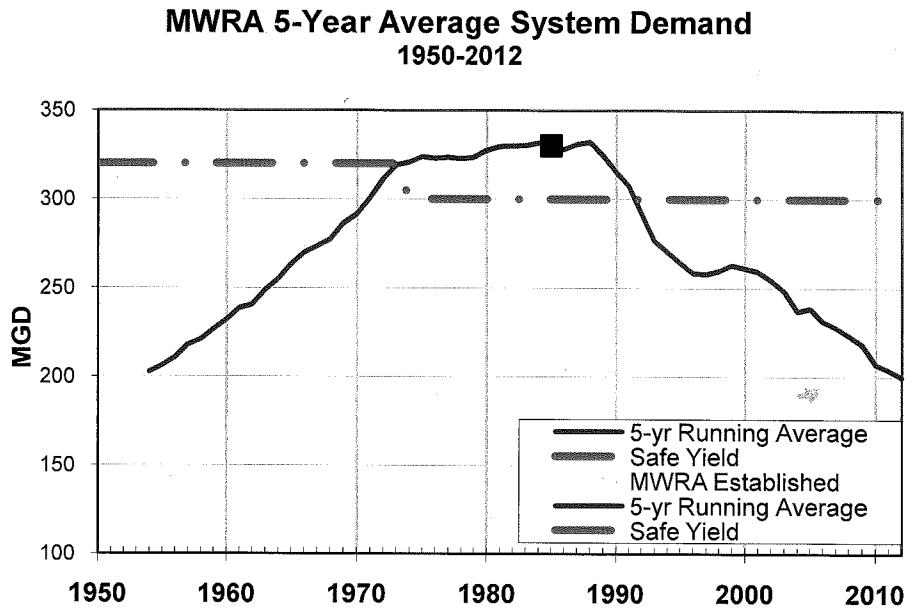
Table 1 – History of 365-Calendar Day Running Average Dry Day Wastewater Flow

Fiscal Year	Running dry day flow (mgd)
2004	320.9
2005	344.5
2006	323.1
2007	331.8
2008	286.2
2009	310.0
2010	341.5
2011	283.1
2012	304.3
2013	271.7
Ten Year Average	312

MWRA continues to implement effective water demand management policies and programs for the MWRA-owned distribution system, as well as member community-owned distribution systems. The following bullets provide an overview of actions take during FY13. Background information and details on each program are provided in other sections of this report.

- Leak detection survey of 140 miles of MWRA distribution main and subsequent leak repairs, saving approximately 0.16 mgd of water;
- Leak detection survey of 3,836 miles of member community distribution main in 24 communities, and subsequent leak repairs, saving approximately 5.3 mgd of water;
- \$37 million in interest-free loans to fund 36 local community water system rehabilitation projects, providing 32 miles of new water main and 3 miles of cleaned and lined water main;
- Distribution of approximately 11,700 water saving fixtures (low-flow showerheads and faucet aerators), installation instructions and leak detection tablets are distributed with the low-flow fixtures;
- Distribution of over 111,000 pieces of water conservation literature; and
- 406 classroom presentations reaching over 11,000 students in the service area.

The continued effectiveness of MWRA’s conservation efforts over the past year is demonstrated by the fact that baseline water demand (water withdrawal from MWRA reservoirs) continues to remain stable or decline and is comfortably below the system’s safe yield of 300 mgd as shown on Figure 1.



**Figure 1 – MWRA Reservoir Withdrawals**

For calendar year 2012, water demand was 200 mgd. Table 2 provides data on water use and wastewater generation over the most recent ten-year period (calendar year data). The data on “water demand” represents total water withdrawals from MWRA reservoirs. The data on “wholesale water sales” represents water sold by MWRA to all 50 fully and partially supplied communities (a population of about 2.3 million). “Total wastewater generation” data represents the total flow to the Deer Island Treatment Facility from all 43-member sewer communities (a sewer population of about 2.1 million). The “dry day wastewater generation” data represents flow to the Deer Island Treatment Facility during only dry days as defined in MWRA’s NPDES Permit.

Table 2 – MWRA Total Water Demand and Wastewater Generation

Calendar Year	Water Demand (Withdrawals)	Wholesale Water Sales	Total Wastewater Generation	Dry Day Wastewater Generation
2003	222 mgd*	214 mgd	382 mgd	333 mgd
2004	216 mgd*	208 mgd	356 mgd	327 mgd
2005	225 mgd*	213 mgd	403 mgd	342 mgd
2006	212 mgd	201 mgd	380 mgd	322 mgd
2007	220 mgd	209 mgd	330 mgd	300 mgd
2008	206 mgd	200 mgd	380 mgd	317 mgd
2009	194 mgd	188 mgd	355 mgd	320 mgd
2010	204 mgd	195 mgd	358 mgd	310 mgd
2011	195 mgd	188 mgd	379 mgd	328 mgd
2012	200 mgd	189 mgd	292 mgd	268 mgd
10 Year Average	209 mgd	201 mgd	362 mgd	317 mgd

\* Total withdrawals do not include an additional demand associated with Carroll Water Treatment Plant start up and testing activities. For calendar year 2003, 2,710 MG (annual average 7.4 mgd); calendar year 2004, 1,326 MG (annual average 3.6 mgd); calendar year 2005, 12,264 MG (annual average 33.6 mgd).

Considerable additional data on MWRA demand management and water conservation programs can be found on MWRA’s website at [www.mwra.com](http://www.mwra.com).

## 2. Background and Long Range Water Supply Program

The MWRA, an independent public authority, was established through legislation in 1985 to provide wholesale water and sewer services to 2.5 million people in 61 cities and towns. Some of the Authority’s goals, purposes and objectives relate directly to water demand management efforts, including:

- Efficient and economical operation of water delivery;
- Programs for leak detection for member communities; and,
- Repair, replacement, rehabilitation, modernization and extension of the delivery of water within the service area of the Authority.

From its inception, MWRA has made demand management/water conservation a high priority. In 1985, MWRA inherited a water system that had been exceeding its safe yield of 300 mgd for almost twenty years. In response to increasing water demand during the 60s, 70s and 80s, several water supply studies were undertaken by MWRA’s predecessor agency, the Metropolitan District Commission (MDC). These studies, collectively called the Long Range Water Supply Study-EIR 2020, projected the need for 70 mgd of additional supply by 2020 above a base demand of 340 mgd.

The studies identified a series of supply development options including diversion of a portion of the Connecticut River flow. Demand management options were also examined. In 1986, the MWRA Board of Directors, through a series of water policy decisions, opted to aggressively pursue demand management strategies rather than pursue options for increasing water supply. This commitment to demand management resulted in the implementation of a highly successful water conservation program that has been a role model for water conservation efforts both nationally and globally.

### Long Range Water Supply Program

Following the commitment by the Board of Directors in 1986 to demand management, MWRA in 1987 developed and launched its Long Range Water Supply Program (LRWSP). The LRWSP included 30 different recommendations to be completed over the next decade at a cost of tens of millions of dollars. The demand management components of the LRWSP were meant to reduce water use and water losses throughout the service area. During a three-year trial program from 1987-1989, MWRA, along with its member communities, initiated demand management efforts that reduced average demand from 326 mgd in 1987 to 285 mgd in 1990 (see Figure 1). This reduction put average demand below the water system's safe yield of 300 mgd for the first time in over 20 years. With this success, the demand management components of the LRWSP were continued beyond the trial program. A detailed discussion of the demand management activities developed from the LRWSP, covering the 1991 through 2000 period, was provided in the Fiscal Year 2000 MWRA Demand Management Report (available at [www.mwra.state.ma.us/harbor/enquad/pdf/ms-061.pdf](http://www.mwra.state.ma.us/harbor/enquad/pdf/ms-061.pdf)).

### Drought Management Plan

In addition to long range planning, the need for a short term drought management plan was made clear after two years of below average precipitation and overuse of the Quabbin-Ware-Wachusett system led to a potential drought warning in the 1988-1989 period. The MWRA Drought Management Plan was submitted to the Massachusetts Department of Environmental Protection in 1989. Shortly thereafter, precipitation returned to normal and the reservoirs rose back to normal. In spring 2000, MWRA was involved in the Massachusetts Drought Management Task Force's development of a state drought response plan. The plan outlines agency responsibilities during drought and sets drought stage triggers based on hydrologic conditions. The plan is regionally flexible; for example, small water systems may need water use restrictions during a short-term drought while the MWRA service area would avoid restrictions due to the large storage volumes in Wachusett and Quabbin Reservoirs. Only a long-term drought more severe than the 1960's drought of record would lead to restrictions in the MWRA service area. The plan also retains responsibilities for MWRA's direct lines of communication with member communities and customers during a drought.

## **3. Ongoing MWRA Demand Management Programs and Activities During Fiscal Year 2013**

### Planning and Policies

In January 2007, MWRA completed an updated Water System Master Plan which is intended to serve as the framework for annual capital planning and budgeting decisions (Master Plan web link: <http://www.mwra.com/02org/html/masterplan.htm>). As part of this effort, staff documented supply

and demand characteristics of the system to confirm that the 300 mgd safe yield of the MWRA water system is sufficient to meet future demand for water both within the service area and additional demand outside the service area as may be approved. Staff used the following conservative demand planning scenario to arrive at this conclusion: continuation of current base demand in the existing MWRA service area (230 mgd, based on 5-year average demand in FY2004); projected increased demand from population and employment growth through 2030 within the existing MWRA service area (13 mgd); approximately 5 mgd from new communities that were actively pursuing admission or increased withdrawals from MWRA in 2007; an allowance for the potential additional demand for MWRA water from partially served communities (planning assumption is up to 18 mgd); and potential additional demand for MWRA water from as many as 22 communities not currently or actively pursuing MWRA admission but within proximity to the service area and that may have or face future water deficits (up to 10 mgd). The conservative planning scenario represents a potential future demand of 276 mgd, well below the system safe yield of 300 mgd.

MWRA is in the process of updating the Water System Master Plan with a completion target of fall 2013. Since the 2006 Master Plan, demand has continued to drop; the 5-year running average for 2012 was 200 mgd, 30 mgd less than the 2004 average. MWRA continues to work with potential new communities with a combined demand of as much as 9 mgd. An update of the water demand planning analysis will be fully detailed in the 2013 Water System Master Plan.

MWRA has adopted Policies that establish stringent controls and a rigorous approval process for entities seeking admission to the MWRA water system or to use MWRA water on an emergency basis. These policies include:

- **OP.05, Emergency Water Supply Withdrawals.** This policy applies to communities outside MWRA's water service area that are seeking water on an emergency basis. The MWRA may approve emergency withdrawals for no more than six months at a time.
- **OP.09, Water Connections Serving Property Partially Located in a Non-MWRA Community,** also referred to as the "Water Straddle" policy. This policy applies to all parties seeking to obtain water for a location, building, or structure situated entirely outside the MWRA water service area but located on a parcel of land, under single ownership, and which is subject to an integrated plan for use or development, that is partly inside the MWRA's water service area.
- **OP.10, Admission of New Community to MWRA Water System.** This policy applies to communities seeking admission to the MWRA water system, and to state, county, institutional, and federal facilities seeking MWRA water for a location outside MWRA's water service area, as defined in MWRA's Enabling Act.

Demand management is also an important component of regulations for MWRA's Continuation of Contract Water Supply (360 CMR 11.00) that is applicable to 25 communities that purchase water from the Authority under a cooperative contract basis. In addition, all communities that purchase water from MWRA are required to complete a leak detection survey and perform follow-up leak repairs of their entire distribution system at least once every two years (360 CMR 12.00).

### MWRA Capital Projects from the Water Master Plan

Total water system needs identified for the FY07- 48 Water System Master Plan timeframe are approximately \$1.1 billion (in 2007 dollars). All of the projects identified in the Water System Master Plan were prioritized. The prioritized list is used to develop the MWRA's Capital Improvement Program (CIP) which is updated annually. MWRA's Water System Master Plan is being updated (fall 2013).

### Leak Detection and Repair of MWRA Distribution System

The MWRA annual leak detection and repair program (initially established during 1988 to 1990) is performed by MWRA personnel. All MWRA water distribution pipes (284 miles) are surveyed on a regular maintenance schedule for leaks with repairs made promptly. During FY13, a total of 139.9 miles of MWRA-owned distribution main were surveyed for leaks. A total of 13 leaks were detected and repaired, accounting for approximately 0.16 mgd of water savings. Table 3 shows the history of the last ten years of leak detection on MWRA distribution system.

Table 3 – Leak Detection on MWRA Distribution System

Period	Miles Surveyed	Number of leaks	Estimated leakage-mgd
FY04	184	16	0.5
FY05	227	19	0.6
FY06	270	10	0.6
FY07	258	16	0.4
FY08	272	3	0.2
FY09	263	7	0.4
FY10	283	6	0.15
FY11	241	7	.07
FY12	277	14	0.28
FY13	140	13	0.16
10 Year Average	242	11	0.3

In addition to the above referenced estimated leakage in the MWRA distribution system, the MWRA is overhauling the Hultman Aqueduct which had numerous leaks contributing to the loss of about 400,000 gallons of water per day. It had been in continuous service to Metro Boston residents for more than 60 years. Repairs could not be performed as long as the Hultman remained the only major water line for Boston. Following completion of construction in 2003, MWRA started up the MetroWest Water Supply Tunnel, a new water transmission line that mirrors the route of the Hultman Aqueduct. The Hultman was taken off-line and rehabilitated. Work was substantially completed in June 2013, and the old aqueduct and the new tunnel can now be used interchangeably. If one line needs repair, the other will be activated, with little or no interruption to service.

## Leak Detection and Repair of Member Community Distribution Systems

To help communities identify leaks in their local distribution systems, a program providing a free one-time leak detection survey was established during 1988 to 1990. Based on the success of the initial program, MWRA developed leak detection regulations (360 CMR 12.00) that went into effect in July 1991. Communities that purchase water from MWRA are required to complete a leak detection survey of their entire distribution system at least once every two years. Communities can accomplish the survey in one of three ways: (1) using their own crews, (2) hiring their own contractor, or (3) using MWRA's task order leak detection services contract. Leak detection/repair work is generally cost effective as the value of the saved water often far exceeds the cost of the leak detection/repair work. During FY13, a total of 3,836 miles of local water pipeline were surveyed for leaks. A total of 460 leaks were detected and repaired in 24 community distribution systems, accounting for 5.3 mgd of water savings. Table 4 shows the history of the last twenty-two years of leak detection on community pipes.

Table 4 - Leak Detection on Community Pipes

Period	Miles Surveyed	Number of leaks	Estimated leakage-mgd
FY92 & FY93	6227	1988	24.8
FY94 & FY95	5924	1134	14.1
FY96 & FY97	6013	1527	17.8
FY98 & FY99	5924	1257	12.4
FY00 & FY01	6650	928	9.3
FY02 & FY03	6198	1032	8.6
FY04 & FY05	6753	968	13.2
FY06 & FY07	6871	833	8.5
FY08 & FY09	7879	987	10.8
FY10 & FY11	7219	722	10.3
FY12 & FY13	7677	923	9.4
22 Year Average	3333	559	6.3

## Rehabilitation and Replacement of Member Community Distribution Systems

MWRA implemented the pilot Water Infrastructure Rehabilitation Financial Assistance Program in 1997-1999. This program provided \$30 million in 25 percent grants and 75 percent interest-free loans to member water communities for water system rehabilitation projects. Local projects implemented through this program resulted in the replacement of over 22,000 water meters and rehabilitation or replacement of over 80 miles of distribution pipeline. Water loss from both pipeline and valve leakage was reduced.

In November 1999, MWRA approved an initial \$250 million for the Local Pipeline and Water System Assistance Program established with the primary objective of improving water quality in community-owned distribution systems. In future years an additional \$6 million was added to the



program to fund loans for new MWRA water communities. In June 2010, an additional \$210 million in ten year loan funds was added to the program. This interest-free loan program funds replacement and/or cleaning/lining of unlined water mains, as well as, other water system upgrades. A secondary benefit of the program is the reduction of water pipeline leakage. Quarterly funding distribution under the Local Pipeline and Water System Assistance Program began in August 2000 (FY01). Through thirteen years of the program, \$263.0 million has been distributed to thirty-eight communities to fund 305 local projects. These projects have provided for a total of 288 miles of new lined water pipe and 160 miles of cleaning and lining of existing water pipe. Table 5 shows the history of the Pilot and Local Pipeline and Water System Assistance Programs.

Table 5 – Summary of Pilot and Local Pipeline and Water System Assistance Programs

Period	\$ Distributed	Projects Funded	Miles of New Pipe	Miles of Rehabilitated Pipe
FY98/99	\$30 million	85	42	39
FY01	\$17 million	32	18	22
FY02	\$16 million	19	22	6
FY03	\$16 million	18	16	9
FY04	\$19 million	22	24	4
FY05	\$20 million	24	17	15
FY06	\$17 million	17	7	4
FY07	\$26 million	25	18	14
FY08	\$10 million	19	13	12
FY09	\$23 million	18	15	12
FY10	\$22 million	21	18	7
FY11	\$18 million	23	13	9
FY12	\$22 million	31	33	4
FY13	\$37 million	36	32	3
TOTAL	\$293 million	390	288	160

### Water Metering and Monitoring

Continued annual routine calibration and maintenance of the revenue meters allows MWRA to track water use and accurately charge its wholesale customer communities. MWRA analyzes nighttime low flow data and historical trends from the revenue meters to help member communities identify potential water leakage in local systems. During FY13, MWRA continued its ongoing program for operation and maintenance of the water metering system. All meters received routine calibration on a regular schedule.

### Residential and Municipal Water Conservation

MWRA continues to provide low-flow device kits to member communities, housing authorities, development corporations, and individual retail customers at no cost. The low-flow device kits include: 2.0 gallon per minute (gpm) showerheads, 1.5 gpm kitchen and bathroom faucet aerators, fixture installation instructions, and toilet leak detection dye tablets. MWRA also maintains its

water conservation hotline (617-242-SAVE). During FY13, a total of 11,701 water saving fixtures (4,117 showerheads, 7,584 faucet aerators) were distributed to MWRA households and member community water departments.

### Public Education Outreach

MWRA continues to provide public education material to communities and individual customers at no cost. Member communities are encouraged to distribute the water conservation information to retail customers. The primary information targeted for retail customers is indoor and outdoor water conservation brochures printed/folded to be used by member communities as bill inserts. MWRA also provides the brochures directly to retail customers, watershed associations, environmental groups, etc. to fulfill e-mail and telephone requests.

During FY13, MWRA sent letters and follow-up e-mails to all water and sewer member communities highlighting the Authority's bill insert educational brochures on indoor and outdoor water conservation, and outlining the availability (at no cost) of the water conservation kits. All member communities participated in this outreach program. In all, 111,664 pieces of printed materials were distributed.

During FY13, MWRA continued its participation in the US EPA WaterSense program to help consumers save water for future generations and reduce costs on their utility bills. WaterSense aims to decrease indoor and outdoor water use through water-efficient products and simple water-saving practices. The program encourages customers to look for WaterSense labeled products, which have been independently certified for efficiency and performance, and promotes water-saving techniques that reduce stress on water systems and the environment.

During FY13, MWRA continued to include water conservation information in the Annual Drinking Water Quality Report. This report is mailed to every household in the MWRA service area, a distribution of more than 800,000. The Annual Water Quality Report also carries the EPA WaterSense Partner logo.

### School Education

MWRA continues to promote water conservation awareness for young people. The ongoing School Education program is designed to provide a science-based curriculum using a four step process: educational curriculum development, conducting classroom presentations, wide-spread teacher training and continual follow-up, and support to educators including distribution of thousands of coloring books, bookmarks and water conservation guides. Educational materials have been designed for students from the elementary level to the high school level. During FY13 (2012/2013) school year, MWRA's School Educational outreach program (including water conservation information) made 406 classroom presentations reaching 11,273 students in pre-kindergarten through college level classes in 44 communities. Although Boston is considered to be one community, presentations were conducted in different parts of the city including, Allston, Dorchester, East Boston, Fenway, Mattapan, South Boston, and West Roxbury. In addition to classroom presentations, the MWRA again held a Poster/Writing/Video Contest. There were more than 4,000 entries total – 2,635 posters, 1,316 writing entries, and 78 videos. The contest topic was "The Benefits of Tap Water Over Bottled Water".

## Industrial, Commercial, and Institutional Audits and New Technologies

MWRA has found that conservation initiatives for industrial, commercial, and institutional water users are widely available through private consulting firms. MWRA has developed and offers at no cost a 52-page Guide to Water Management that contains detailed information to help local facility managers reduce overall water use. In addition, detailed fact sheets on industrial, commercial, and institutional water users are available on MWRA's web site at <http://www.mwra.com/04water/html/indust.htm>. These include specifics on hospitals, schools, colleges and athletic facilities; restaurants; and commercial buildings.

## Water Supply Citizens Advisory Committee

MWRA's 1986 decision to aggressively pursue water conservation rather than look for additional sources of water was strongly advocated by the Water Supply Citizens Advisory Committee (WSCAC). This unique citizen's group was formed in 1977 to review a proposed Connecticut River diversion plan to supply water to the metropolitan Boston area. From its beginning, the group has been a strong supporter of water conservation measures and helped formulate the water conservation language in MWRA's Enabling Act legislation. In 1986, WSCAC encouraged MWRA to pursue demand management rather than look for new water supplies. During the late 1980's and early 1990's, the citizen's group promoted trigger and drought management planning. With its long commitment to the water supply system, WSCAC continues to provide independent citizen input on MWRA's policies and programs, while voicing public support of source protection and conservation. During FY13, the Water Supply Citizens Advisory Committee has continued to support MWRA's water conservation efforts. The committee has been active providing review and input on water system expansion issues. A one-year contract for continuation of WSCAC was authorized by the MWRA Board of Directors on June 5, 2013.

## Other Activities

In addition to the activities outlined above, MWRA staff provided assistance to outside agencies in the area of water conservation. The MWRA assisted Lasell College, Green and Grow Workforce Development Program, and the Harvard Kent School in establishing water conservation programs. In celebration of Earth Day, MWRA provided water conservation fixtures and literature to: many MWRA communities and the Department of Conservation and Recreation for an event at Wachusett Reservoir. MWRA provided water conservation fixtures and literature to various environmental and educational groups including: Cambridge's Home Energy Efficiency Team and Neponset River Watershed Association.

## **4. Demand Management Plans for Fiscal Year 2014**

During FY14, MWRA plans to continue its demand management efforts at a similar level as FY13. MWRA's long-range planning, leak detection, system rehabilitation, water conservation and educational outreach programs have long been established as essential components of demand management. The Community Support Program will continue to work with both water and sewer member communities to foster water conservation activities and help minimize wastewater flow.