

August 29, 2007

Ms. Linda Murphy  
Director, Office of Ecosystem Protection  
U.S. Environmental Protection Agency New England  
P.O. Box 8127  
Boston, MA 02114

Mr. Glenn Haas  
Director  
Division of Watershed Management  
Department of Environmental Protection  
One Winter Street  
Boston, MA 02108

RE: Massachusetts Water Resources Authority Permit Number MA0103284

Dear Ms. Murphy and Mr. Haas:

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 2007.

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: MA DEP, NERO  
MA DEP, Boston  
MA DEP, Worcester  
MA DEP, SERO  
Richard Chretien, MA DEP  
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 2007

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 2007
4. Demand Management Plans for Fiscal Year 2008

## 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 provides benefits to the water system and watershed. Information on reduction of infiltration and inflow is provided in the MWRA Annual Infiltration and Inflow Reduction Report for Fiscal Year 2007 (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 2007 (ending June 30, 2007), the 365-calendar day running average dry day flow to the Deer Island Wastewater Treatment Plant was 331.8 mgd; dry day flow has averaged about 324 mgd over the last eight years (see Table 1). The dry day flow is reported monthly by MWRA as part of the NPDES Operational Performance Summary.

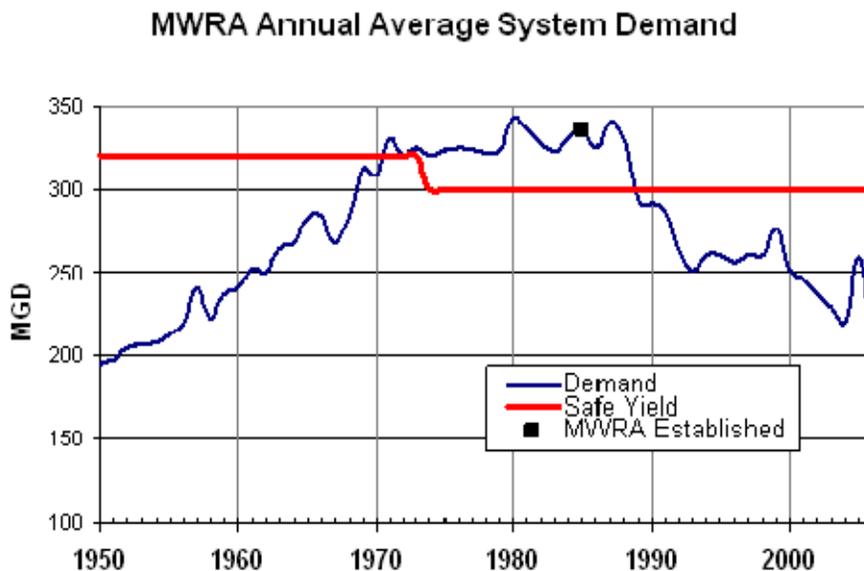
Table 1 – History of 365-Calendar Day Running Average Dry Day Wastewater Flow

Fiscal Year	Running dry day flow (mgd)
2000	323.8
2001	323.5
2002	293.5
2003	330.4
2004	320.9
2005	344.5
2006	323.1
2007	331.8
Eight Year Average	324

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 FY07. Background information and details on each program are provided in other sections of this report.

- Leak detection survey of 258 miles of MWRA distribution main and subsequent leak repairs, saving approximately 0.35 mgd of water;
- Leak detection survey of 3,442 miles of member community distribution main in 16 communities, and subsequent leak repairs, saving approximately 6.0 mgd of water;
- \$26 million in interest-free loans to fund 25 local community water pipeline rehabilitation projects, providing 18 miles of new water main and 14 miles of cleaned and lined water main;
- Distribution of over 8,000 water saving fixtures (low-flow showerheads and faucet aerators), installation instructions and leak detection tablets are distributed with the low-flow fixtures;
- Distribution of approximately 230,000 pieces of water conservation literature; and
- 380 classroom presentations reaching more than 10,000 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 (for additional detail, see notes under Table 2).



**Figure 1 – MWRA Reservoir Withdrawals**

For calendar year 2006, water demand was 211.6 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 provided 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 sewered population of about 2.0 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
1996	256 mgd	222 mgd	426 mgd	N/A
1997	258 mgd	226 mgd	353 mgd	N/A
1998	260 mgd	231 mgd	412 mgd	N/A
1999	276 mgd *	245 mgd*	344 mgd	307 mgd
2000	252 mgd *	229 mgd*	362 mgd	331 mgd
2001	247 mgd *	229 mgd*	346 mgd	305 mgd
2002	237 mgd	219 mgd	340 mgd	309 mgd
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

\* Total withdrawals and water sales included an additional (temporary) demand from Cambridge while it rebuilt its own water treatment plant. For calendar year 1999, 15 mgd; calendar year 2000, 14 mgd; and calendar year 2001, 6 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 reviewed and approved by 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 affecting Wachusett and Quabbin Reservoirs would lead to significant 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 2007**

### 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. 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 actively pursuing admission or increased withdrawals from MWRA; 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 30 mgd.

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 24 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 of their entire distribution system at least once every two years (360 CMR 12.00).

#### Leak Detection and Repair of MWRA Distribution System

The MWRA annual leak detection and repair program 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 FY07, a total of 258 miles of MWRA-owned distribution main were surveyed for leaks. A total of 16 leaks were detected and repaired, accounting for approximately 0.35 mgd of water savings.

#### MWRA Capital Projects from the 2007 Water Master Plan

Total water system needs identified for the FY07- 48 Master Plan timeframe are approximately \$1.1 billion (in current dollars) including projects already in the CIP. The Master Plan is based on the following major assumptions and findings:

- 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.
- There is adequate treatment plant capacity, and generally adequate transmission capacity under normal operations to meet MWRA system needs under the demand planning scenario. Distribution capacity is generally adequate with the exception of a few weak spots addressed in either the Master Plan or existing CIP.
- MWRA's transmission system lacks redundancy in some key areas; a proposed redundancy study will identify potential solutions and help to prioritize major expenditures.
- Areas within the distribution system without adequate redundancy were targeted in the Master Plan and initial studies are now underway to address these deficiencies. These studies are focused on the Northern Intermediate High and Southern Extra High pressure zones.
- MWRA falls short of its goal of distribution storage sufficient to meet one day of demand. The Master Plan recommends addressing the system's highest risk areas. Again, initial focus is on the Northern Intermediate High and Southern Extra High pressure zones for opportunities to increase distribution storage in these areas.
- No new design and construction funds are included to address the impacts of potential changes in federal or state regulations. The FY08 CIP already includes funds to meet the requirements of the Long Term 2 Enhanced Surface Water Treatment Rule.
- Continuation of MWRA's ongoing program to systematically replace old, cast iron water mains is recommended for continued water quality improvements. This work is also consistent with EPA's anticipated direction on distribution system regulation. To date, MWRA has lined 38 miles of old cast iron main with approximately 90 additional miles of main identified for rehabilitation or replacement in either the CIP or 2007 Master Plan.

All of the projects identified in the Master Plan were prioritized and, as a result, much of the work noted above has been incorporated into the Final FY08 CIP and MWRA anticipates an ongoing process to review and update this information.

#### 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 FY07, a total of 3,442 miles of local water pipeline were surveyed for leaks. A total of 542 leaks were detected and repaired in 16 community distribution systems,

accounting for 6.0 mgd of water savings. Table 3 shows the history of the last sixteen years of leak detection on community pipes.

Table 3 - Leak Detection on Community Pipes

Period	Miles Surveyed	Number of leaks	Estimated leakage-mgd
7/91-6/93	6227	1988	24.75
7/93-6/95	5924	1134	14.12
7/95-6/97	6013	1527	17.78
7/97-6/99	5924	1257	12.44
7/99-6/01	6650	928	9.25
7/01-6/03	6198	1032	8.62
7/03-6/05	6753	968	13.19
7/05-6/07	6871	833	8.51

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 the, \$255 million Local Pipeline Assistance Program (LPAP) established with the primary objective of improving water quality in community-owned distribution systems. This interest-free loan program primarily funds replacement and/or cleaning/lining of unlined watermains. A secondary benefit of the program is the reduction of water pipeline leakage. Quarterly funding distribution under the Local Pipeline Assistance Program began in August 2000 (FY01). Through seven years of the program, \$130 million has been distributed to twenty-nine communities to fund 157 local projects. These projects have provided for a total of 122 miles of new lined water pipe and 74 miles of cleaning and lining of existing water pipe. Table 4 shows the history of the Pilot and Local Pipeline Assistance Programs.

Table 4 – Summary of Pilot and LPAP 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
TOTAL	\$160 million	242	164	113

### 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 FY07, MWRA continued its ongoing program for operation and maintenance of the water metering system. All meters received routine calibration on a regular schedule.

### Residential 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: 2.5 gallon per minute (gpm) showerheads, 1.5 gpm bathroom faucet aerators, 2.2 gpm kitchen faucet aerators, fixture installation instructions, and leak detection dye tablets. MWRA also maintains its water conservation hotline (617-242-SAVE). During FY07, a total of 8,138 water saving fixtures (2,453 showerheads, 5,685 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 (usually distributed as a bill insert). 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 Lawn and Garden Posters, as well as, informational bill stuffers on lead risks in your home.

During FY07, MWRA sent letters to all water and sewer member communities highlighting the Authority's bill insert brochures on indoor and outdoor water conservation, and outlining the availability (at no cost) of the water conservation kits. Over sixty percent of the member communities took advantage of this offer. In all, 230,000 pieces of printed materials were distributed.

### 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, testing, wide-spread teacher training and continual follow-up, and support to educators. Educational materials have been designed for students from the elementary level to the high school level. During the FY07 (2006/2007) school year, MWRA's School Educational outreach program (including water conservation information) made 380 classroom presentations reaching more than 10,000 students in pre-kindergarten through college level classes in 32 communities. In addition to classroom presentations, the MWRA again held a Poster/Writing Contest. More than 2,000 posters and writing entries were submitted. The poster contest topic for all three writing categories (grades K-2; grades 3-5 and grades 6-8) was water use and conservation.

## 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 at 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.

During FY07, MWRA provided its industrial, commercial, institutional water conservation information to DEP's Toxics Use Reduction Act program and MWRA staff assisted in review of DEP's new water conservation guidance to help implement the Resource Conservation Planning provisions of the revised Toxics Use Reduction Act (TURA) statute.

## 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. It 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 took a lead role promoting 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 FY07, the Water Supply Citizens Advisory Committee has continued to strongly support MWRA's water conservation efforts. The committee has been active providing review and input on water system expansion issues. A new two-year contract for continuation of WSCAC was authorized by the MWRA Board of Directors on June 6, 2007.

## Other Activities

In addition to the activities outlined above, MWRA staff have provided assistance to outside agencies in the area of water conservation. In celebration of Earth Day, MWRA provided water conservation fixtures and literature for EPA's Green Expo. Also, staff provided water conservation fixtures and literature to promote water conservation for: Celebrate Milton Day and Boston's West End Civic Association Festival.

## **4. Demand Management Plans for Fiscal Year 2008**

During FY08, MWRA plans to continue its demand management efforts at a similar level as FY07. The Authority's long-range planning, leak detection, system rehabilitation, water conservation and educational outreach programs have long been established as essential components of demand management. MWRA's Community Support Program will continue to work with both water and sewer member communities to foster water conservation activities and help minimize wastewater flow.

New for FY08, the MWRA has submitted two applications under the 2008 DEP Water Conservation Grant Program. The DEP's Water Conservation Program provides grant funds to assist public water systems and municipalities in addressing drinking water losses through water conservation programs, water audits, leak detection surveys, some diagnostic equipment and training, and rebates for low flow fixtures and retrofit kits. Federal and/or state funds provide monies for this grant program in support of the Mass Water Resources Commission, MassDEP's watershed management policies and water conservation initiatives, and the EOEEA's Water Policy.

The first application requests a \$40,000 grant to fund a direct incentive program to promote water retail customers to purchase/install 1.6 gallon per flush (low flow) toilets and/or rain barrels for outdoor water use. The rebate program is intended to augment MWRA's existing public outreach and water conservation program.

The second application requests a \$40,000 grant to fund a community water audit pilot program to balance the volume of water purchased from MWRA (wholesale purchase) with the volume billed (retail sales) and account for the remainder of non-billed water volume. The community water audit pilot project is intended to augment MWRA's existing water community support programs including: the community leak detection services task-order contract (communities are billed one year after MWRA pays contractor for services) and the \$255 million Local Pipeline Assistance Program (10-year, interest-free loans to repair/replace unlined water pipe).