

Massachusetts Water Resources Authority



Combined Sewer Overflow Control Plan



Alewife Wetland, Cambridge

Annual Progress Report 2013

March 2014

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The constructed Alewife Stormwater Wetland, completed by the City of Cambridge and MWRA in April 2013, is intended to provide peak flow attenuation and wetlands treatment for the stormwater flows that will be removed from the combined sewer system by the CAM004 sewer separation project, now in construction. The wetland also provides ecological, recreational and educational benefits intended by the Department of Conservation and Recreation's Alewife Reservation Master Plan.

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INTRODUCTION

The Massachusetts Water Resources Authority (MWRA) files this Combined Sewer Overflow Annual Progress Report for 2013 in compliance with Schedule Seven of the Federal District Court's Boston Harbor Case (U.S. v. M.D.C, et al., No. 85-0489-RGS). Schedule Seven requires annual and quarterly reports on the progress of MWRA's approved plan to control combined sewer overflows ("CSO") to surface waters in the metropolitan Boston area (the "Long-Term Control Plan"). The reports describe the progress of work to implement the Long-Term Control Plan relative to milestones in the Court-ordered schedule.

This Annual Report reviews key CSO control accomplishments and design and construction progress in calendar year 2013 and in the quarterly period December 17, 2013, to March 14, 2014, and discusses issues that may affect MWRA's ability to complete the CSO projects on schedule. Like previous annual CSO reports, it also presents updated information on the scope, goals, benefits and costs of the Long-Term Control Plan and its projects, as well as information on plan-wide progress to date and benefits achieved, including reductions in CSO discharges and impacts. In addition, it presents updated general water quality conditions in Boston Harbor and other area waters affected by CSOs.

The Long-Term Control Plan as mandated by the Federal Court comprises 35 wastewater system improvement projects to bring CSO discharges at 84 outfalls in the metropolitan Boston area into compliance with the Federal Clean Water Act and Massachusetts Surface Water Quality Standards. Design and construction milestones for each of the 35 projects are set forth in Schedule Seven. Figure 1 on pages 2-3 maps the locations of the 35 projects and presents the general implementation status of each project. Figure 2 on page 4 summarizes the scope, schedule and predicted benefits of the system-wide Long-Term Control Plan. The court order also requires MWRA to achieve specific, numerical long-term levels of control at each of the CSO outfalls. For certain outfalls, such as the outlet of the Dorchester Brook Conduit to Fort Point Channel (Outfall BOS070) and the Charles River Basin outfalls related to MWRA's Cottage Farm CSO Facility (outfalls MWR201, CAM005, CAM007, CAM009 and CAM011), MWRA member communities with CSOs (Boston Water and Sewer Commission and the cities of Cambridge, Chelsea and Somerville (the "CSO communities")) are implementing system improvements that supplement the 35 stipulated projects with the goal of meeting the required long-term levels of control. These are also discussed in this report.

2. CSO CONTROL PROGRESS

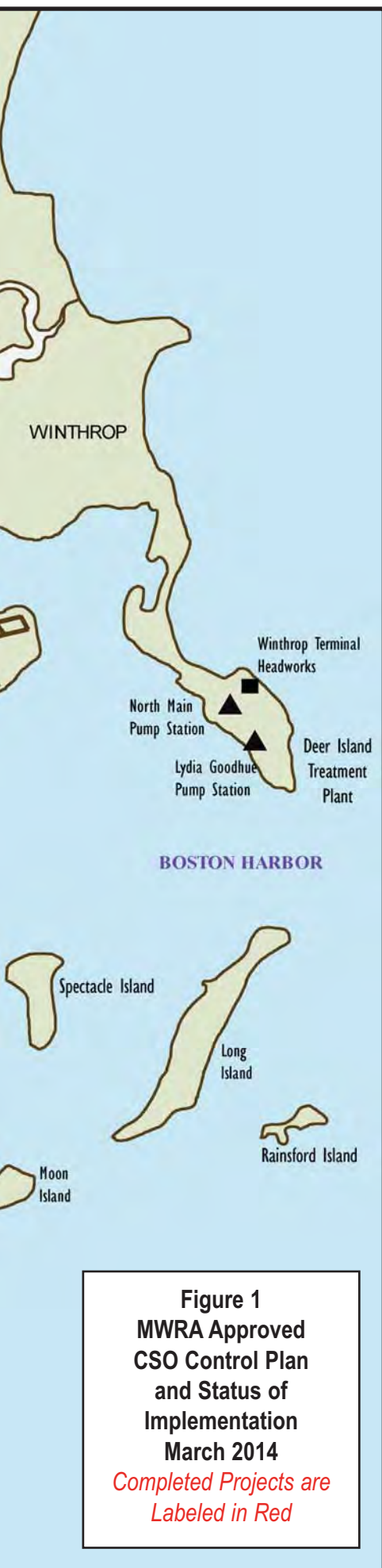
2.1 Progress Highlights and Accomplishments

In 2013, MWRA and its CSO communities continued to implement the Long-Term Control Plan and comply with the Federal Court ordered obligations defined in Schedule Seven and in the March 15, 2006, Second Stipulation of the United States and the Massachusetts Water Resources Authority on Responsibility and Legal Liability for Combined Sewer Overflows, as amended by the Federal District Court on May 7, 2008¹ (the "Second CSO Stipulation"). MWRA spent \$26.3 million in 2013 to implement CSO projects and fund the eligible CSO work of BWSC, the Town of Brookline and the City of Cambridge. Of this total spending amount, \$25.3 million (96%) was for construction related activities. MWRA and the CSO communities achieved the following CSO control milestones and progress in 2013:

- **Substantial completion and beneficial use of the CAM004 stormwater outfall and wetland basin by the City of Cambridge in April 2013, in compliance with Schedule Seven.** On October 15, 2013, Cambridge hosted a dedication of the constructed wetland attended by U.S. District Court Judge Richard G. Stearns, Massachusetts Secretary of Energy and Environmental Affairs Richard K. Sullivan, Jr.,

¹ The amendment revised the level of control for the Prison Point CSO Facility in accordance with MWRA's letter report, "Proposed Modification of Long-Term Level of Control for the Prison Point CSO Facility, April 2008."





Projects Completed

Complete⁽¹⁾

Somerville Baffle Manhole Separation	1996
Chelsea Trunk Sewer Replacement	2000
Cottage Farm CSO Facility Upgrade	2000
Hydraulic Relief at CAM005 (Cambridge)	2000
Hydraulic Relief at BOS017 (Charlestown)	2000
MWRA Floatables/Outfall Closing Projects	2000
Neponset River Sewer Separation	2000
Constitution Beach Sewer Separation	2000
Chelsea Branch Sewer Relief	2001
CHE008 Floatables Control and Outfall Repair	2001
Prison Point CSO Facility Upgrade	2001
Somerville Marginal CSO Facility Upgrade	2001
Commercial Point CSO Facility Upgrade	2001
Fox Point CSO Facility Upgrade	2001
Pleasure Bay Storm Drain Improvements	2006
Stony Brook Sewer Separation	2006
Charlestown BOS019 Storage Conduit	2007
South Dorchester Bay Sewer Separation	2007
Fort Point Channel Sewer Separation & System Optimization	2007
Union Park Detention/Treatment Facility	2007
Regionwide Floatables Controls	2007
Prison Point Facility Optimization	2008
Morrissey Boulevard Storm Drain	2009
Cottage Farm Brookline Connection and Inflow Controls	2009
Bulfinch Triangle Sewer Separation	2010
East Boston Branch Sewer Relief	2010
Alewife Interceptor Connection Relief / Floatables Controls*	2010
CAM400 Common Manhole Separation*	2011
North Dorchester Bay Storage Tunnel and Related Facilities	2011
Brookline Sewer Separation	2013
CAM004 Outfall and Wetland Basin*	2013
SOM01A Interceptor Connection Relief/Floatables Controls*	2013

In Construction⁽²⁾

Reserved Channel Sewer Separation	2015
CAM004 Sewer Separation *	2015

In Design

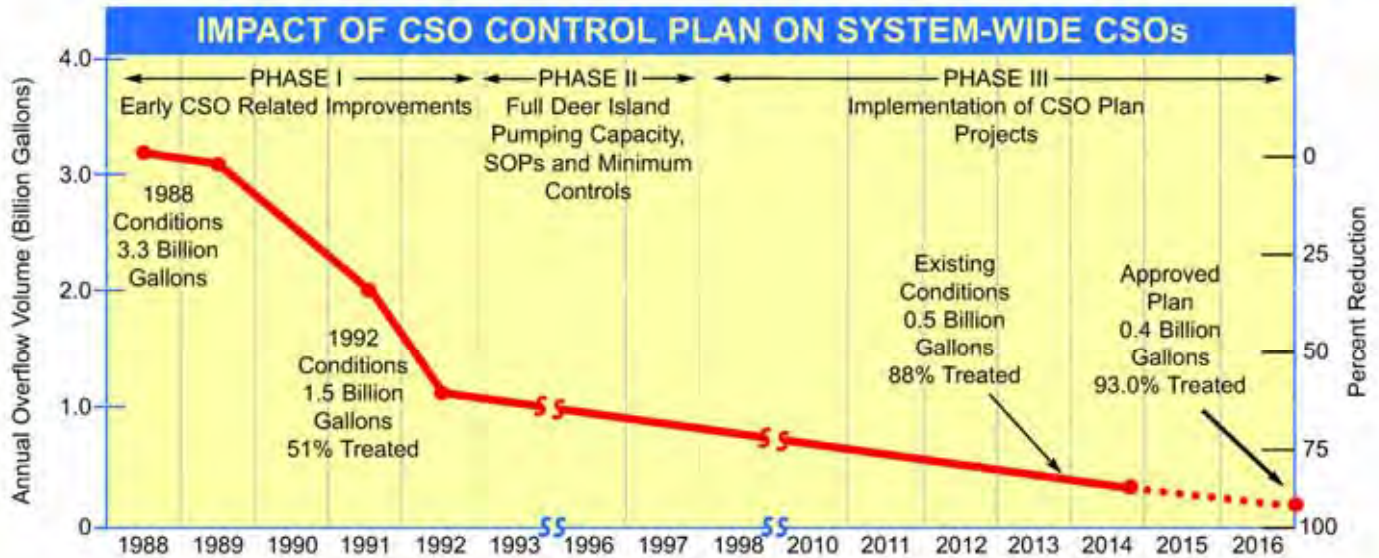
MWR003 Gate and Rindge Ave. Siphon Relief *	2015
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(1) Actual or Scheduled construction completion

(2) For each project, at least one construction contract is completed or underway

** Part of Alewife Brook CSO Control Plan*

FIGURE 2: Approved Long-Term CSO Control Plan and Benefits



BENEFITS

- 84 CSO Outfalls: 34 Closed
46 Reduced to a Minimal Number of CSO Discharges per year
4 Treated
- Eliminates or Reduces CSO Activations to Achieve a Level of CSO Control Consistent with Water Quality Standards
- Treats More Frequent Discharges
- Controls Floatable Materials at remaining active CSO Outfalls

CSO CONTROL PROJECTS
Sewer Separation
Existing CSO Treatment Facility Upgrades
New CSO Treatment Facility
CSO Consolidation /Storage Conduits
Relief Sewers
Localized Hydraulic Relief
Outfall Repairs
Region Wide Floatables Controls
System Optimization

PROGRAM SCHEDULE	
Final CSO Conceptual Plan	Dec 1994
Final Facilities Plan and EIR	Jul 1997
Final Approved Plan	Apr 2006
Design and Construction	1995 - 2015
Assessment Phase	2018 - 2020

COSTS
Planning, Design & Construction
\$893.8 Million
Net Annual O&M
\$1.5 Million

Department of Conservation and Recreation Commissioner Jack Murray, Cambridge Mayor Henrietta Davis, City Manager Richard Rossi and Department of Public Works Commissioner Owen O’Riordan, MWRA Board member Joel A. Barrera, MWRA Advisory Board Executive Director Joseph Favaloro, MWRA Executive Director Fred Laskey, and other state and local officials. In their statements at the dedication, Judge Stearns and others highlighted the technical merits of the wetland in support of the sewer separation work for Alewife Brook CSO control, as well as the wetland’s wide-ranging ecological, recreational and educational benefits.



Judge Stearns, City Manager Rossi, DPW Commissioner O’Riordan, Mayor Davis, Executive Director Laskey, Secretary Sullivan, Mr. Barrera and DCR Commissioner Murray at the Alewife Wetland Dedication, October 15, 2013

The dedication ceremony was held at the newly constructed public education amphitheater that has a commanding view of the wetland. The project will provide storage, detention and wetlands treatment of the stormwater flows that will be removed from the combined sewer system with the CAM004 sewer separation project.

The Alewife stormwater wetland was the cover story in the January/February 2014 issue of *Government Engineering* (“Great Swamp Controls CSOs”), and earned a National Recognition Award in the American Council of Engineering Companies’ 2014 Engineering Excellence Awards competition.

- **Completion of the \$26.7 million Brookline sewer separation project in April 2013, ahead of the July 2013 completion milestone in Schedule Seven.** The project, managed by the Town of Brookline, has removed large volumes of stormwater from the Brookline sewer system tributary to MWRA’s Charles River Valley Sewer, with the intent of lowering CSO discharges from MWRA’s Cottage Farm facility.



Removal of the overflow plate in Outfall MWR010 completed the Brookline Sewer Separation project



Final pavement restoration following completion of the Brookline Sewer Separation project

- **Substantial completion of the \$292,000 MWRA construction contract for the Interceptor Connection Relief and Floatables Control at Outfall SOM01A project in December 2013, ahead of the June 2014 milestone in Schedule Seven.** The project has provided floatables control at Outfall SOM01A and allows for an increase in the capacity of the connection from the City of Somerville's Tannery Brook Conduit to MWRA's interceptor system lowering of CSO discharges at Outfall SOM01A when stormwater flows are removed from the interceptor system with the CAM004 sewer separation project (December 2015).



Floatables control underflow baffle installed behind the existing SOM01A overflow weir

- **Continued progress with design of the Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief project, part of MWRA's CSO control plan for Alewife Brook.** MWRA received the 100% design submission from its engineering consultant in December 2013, is reviewing the preliminary construction contract drawings and specifications, and plans to advertise the estimated \$1.9 million contract for construction bids this spring. MWRA plans to issue the notice to proceed with construction by August 2014, in compliance with Schedule Seven. The project, which is intended to provide floatables control and adequate sewer system relief at Outfall MWR003 in extreme storms to compensate for the closing of nearby Outfall CAM004, will be the last of the 35 projects in the Long-Term Control Plan to move into construction.
- **Continued progress with construction of Cambridge's three major sewer separation contracts to complete the CAM004 sewer separation project, the core of MWRA's Alewife Brook CSO control plan.** Cambridge has nearly completed the sewer and storm drain installations in the \$16.3 million Contract 8A (Huron A) area and will focus on surface restoration work during 2014. Cambridge issued the notice to proceed with the \$30.0 million Contract 8B (Huron B area) and is now 10% complete. In February 2014, Cambridge issued a Notice to Proceed for the \$24.2 million Contract 9 (Concord Ave Area) sewer separation contract. Once completed, the project will remove large volumes of stormwater from the Cambridge and MWRA sewer systems, reduce CSO discharges to Alewife Brook, and allow Cambridge to close Outfall CAM004. All work is on schedule for completion by December 2015, in compliance with Schedule Seven despite increases in cost to MWRA and Cambridge and significant construction management complexities across all three contracts, including multiple crews working simultaneously, associated traffic controls and the need for extensive relocation of public and private utilities.



Installation of Drain Vault #1, Vassal Lane and Standish Street, CAM004 Sewer Separation Contract 8A

- **Continued progress with BWSC's design and construction contracts for the \$65.1 million Reserved Channel sewer separation project.** In December 2013, BWSC advertised the last two of nine construction contracts to complete the project: Contract 5 (sewer cleaning and lining) and Contract 6 (downspout disconnections). Four of the nine BWSC construction contracts, including two major sewer separation contracts, are substantially complete. Three contracts are well underway, including major sewer separation contracts 3B and 4, which are 90% complete and 75% complete, respectively. The project remains on schedule for completion in December 2015, in compliance with Schedule Seven.



**Installation of 42-inch drain on East Second Street
Reserved Channel Sewer Separation Contract 3B**



**Installation of 36-inch drain on E Street
Reserved Channel Sewer Separation Contract 4**

With the work described above, MWRA and the CSO communities installed 28,358 linear feet (5.4 miles) of new storm drain and sanitary sewer in the communities of Boston, Brookline and Cambridge in 2013. Since 1996, when construction efforts began, approximately 450,000 linear feet (85 miles) of new storm drain and sanitary sewer have been installed under the Long-Term Control plan.

To date, MWRA and the CSO communities have completed 32 of the 35 projects in the Long-Term Control Plan, with the three projects completed last year. Two of the remaining three projects – Reserved Channel sewer separation and CAM004 sewer separation – are well into construction. The final project – Control Gate and Floatables Control at Outfall MWR003 and Rindge Avenue Siphon Relief – will move into construction later this year.

Since the beginning of MWRA's CSO control planning efforts in the late 1980's, MWRA and the CSO communities have eliminated or virtually eliminated (i.e., 25-year storm level of control) CSO discharges at 37 of the 84 outfalls addressed in the Long-Term Control Plan, more than the number of outfalls recommended for closure in MWRA's plan. No additional CSO outfalls were closed or were scheduled to be closed in 2013. MWRA and the CSO communities have closed all but one of the 34 outfalls recommended for closure in the Long-Term Control Plan. The remaining outfall, Outfall CAM004 to Alewife Brook, is scheduled to be closed by the City of Cambridge with its completion of the CAM004 sewer separation project in December 2015.

2.2 Court Schedule Compliance and Compliance Risks

MWRA and the CSO communities met all five of the calendar year 2013 milestones in Schedule Seven. MWRA filed the CSO Annual Progress Report for 2012 on March 14, 2013, and the City of Cambridge achieved substantial completion and beneficial use of the CAM004 stormwater outfall and detention basin on April 25, 2013, and the Town of Brookline completed the Brookline sewer separation project on April 26, 2013, ahead of the July 2013 milestone. MWRA issued the notice to proceed with construction of the interceptor connection relief and floatables control at Outfall SOM01A project on August 30, 2013, ahead of

the September 2013 milestone. (On December 27, 2013, MWRA reached substantial completion of the SOM01A project, ahead of the June 2014 milestone.) The July 2013 milestone for completion of construction of the Bulfinch triangle sewer separation project was met by BWSC three years earlier, on July 13, 2010.

Schedule Seven includes several future construction commencement or completion milestones and requires the last of the projects to be completed by December 2015. Design of MWRA's last Alewife Brook project, at Outfall MWR003, is on schedule for commencement of construction by the August 2014 milestone, and MWRA also expects to meet the respective October 2015 construction completion milestone. BWSC's Reserved Channel sewer separation project and Cambridge's CAM004 sewer separation project are on schedule to meet their December 2015 construction completion milestones.

There continue to be schedule risks with the three remaining projects. MWRA's project at Outfall MWR003 is part of a set of completed and ongoing Alewife Brook projects that individually and together are altering flow makeup and optimizing flow conveyance in MWRA's and Cambridge's sewer systems to attain long-term levels of CSO control, reduce sewer system surcharging, maintain service to the tributary communities of Arlington, Belmont, Cambridge and Somerville, and avoid increasing flood conditions in Alewife Brook. MWRA and the City of Cambridge continue to evaluate the expected hydraulic conditions, as design and permitting of the MWR003 project proceed.

The Reserved Channel and CAM004 sewer separation projects continue to carry the typical risks associated with subsurface pipe installations in old, well-developed urban areas. Both projects have encountered and may continue to encounter unforeseen subsurface conditions, including utility locations that differ from best available plans. Cambridge's CAM004 work also carries the additional risk previously reported by the City that the work is complicated by the necessity of having simultaneous contracts underway, each with multiple crews in areas with difficult traffic management requirements. Cambridge continues to coordinate with various private utilities, especially NStar Gas, for the extensive, necessary relocation of utilities in advance of the sewer separation work across all three contract areas. Also, as reported previously, landfill disposal of excess soil materials seems to be manageable for the foreseeable future, potential for future shortages of in-state landfill space and attendant for out of state disposal at higher disposal cost.

2.3 Ongoing Design and Construction Progress

Alewife Brook CSO Control Plan

The Alewife Brook CSO control plan is intended to minimize CSO discharges to the Alewife Brook by separating combined sewer systems in parts of Cambridge control and by upgrading hydraulic capacities at local connections to the MWRA interceptors. The plan also includes a stormwater outfall and constructed wetland to accommodate the separated stormwater flows, prevent any increase in flooding along Alewife Brook, and provide a level of stormwater treatment.

The plan comprises six component projects (Table 1, next page), each with its own design and construction milestones in Schedule Seven (Table 2, next page). The City of Cambridge manages the design and construction work for four of the six projects with MWRA funding pursuant to a Memorandum of Understanding and Financial Assistance Agreement. Project locations are shown in Figure 3 and Figure 4 on pages 10 and 11.

Together, these projects are predicted to reduce annual CSO volume to the Alewife Brook by 85% in a typical year, from 50 million gallons in 1997 to 7.3 million gallons. CSO activations in a typical year will be reduced from 63 in 1997 to seven. MWRA hydraulic model and water quality model simulations predict that the recommended control levels will comply with Class B (fishing and swimming) water quality criteria 98.5 percent of the time.

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CAM004 Stormwater Outfall and Wetland Basin

The City of Cambridge achieved beneficial use of the CAM004 stormwater outfall and wetland basin project on April 25, 2013, in compliance with Schedule Seven. Stormwater flows to the basin (Figure 5 on page 12) are presently limited to flows from an area along the stormwater outfall that was separated by Cambridge in 1998 - 2002 as part of early construction contracts for the CAM004 sewer separation project. Much more

Table 1: Alewife Brook CSO Control Plan - Project Components

Project	Cambridge Contract	Benefit
CAM004 Stormwater Outfall and Wetland Basin	12	Convey stormwater flows to wetland system for attenuation and treatment.
CAM004 Sewer Separation ⁽¹⁾	8A, 8B, 9	Remove large quantities of stormwater from the sewer system; eliminate CSO at Outfall CAM004.
CAM400 Manhole Separation	4/13	Remove stormwater from the sewer system; eliminate CSO at Outfall CAM400.
Interceptor Connection Relief and Floatables Control at CAM002 and CAM401B and Floatables Control at CAM001		Upgrade connections between Cambridge and MWRA systems to provide relief; add floatables control.
Control Gate/Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief	MWRA Contracts	Optimize hydraulic conveyance; minimize overflows while controlling system flooding in large storms; provide floatables control.
Interconnection Relief and Floatables Control at Outfall SOM01A		Upgrade connection to MWRA system and provide floatables control.

⁽¹⁾ Also includes initial construction contracts completed by Cambridge in 2002

Table 2: Alewife Brook Project Schedules and Court Milestones

Alewife Brook CSO Project	Commence Design		Commence Construction		Complete Construction	
	Court Milestone	Project Schedule	Court Milestone	Project Schedule	Court Milestone	Project Schedule
Managed by City of Cambridge						
CAM004 Stormwater Outfall and Wetland Basin			Apr 11	Apr 11	Apr 13	Apr 13
CAM004 Sewer Separation	Jan 97	Jan 97	Jul 98	Jul 98	Dec 15	Dec 15
			Sep 12	Sep 12		
Interceptor Connection Relief and Floatables Control at CAM002 and CAM401B and Floatables Control at CAM001	Jul 06	Oct 08*	Jan 10	Jan 10	Oct 10	Oct 10
CAM400 Manhole Separation	Jul 06	Oct 08*	Jan 10	Jan 10	Mar 11	Mar 11
Managed by MWRA						
Control Gate/Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief	Apr 12	Apr 12	Aug 14	Aug 14	Oct 15	Oct 15
Interceptor Connection Relief and Floatables Control at Outfall SOM01A	Apr 12	Apr 12	Sep 13	Aug 13	Jun 14	Dec 13

* Project schedules were revised several years ago due to citizens' appeals of the wetlands permit for Contract 12.

Figure 3
Alewife Brook CSO Control Plan (1 of 2)

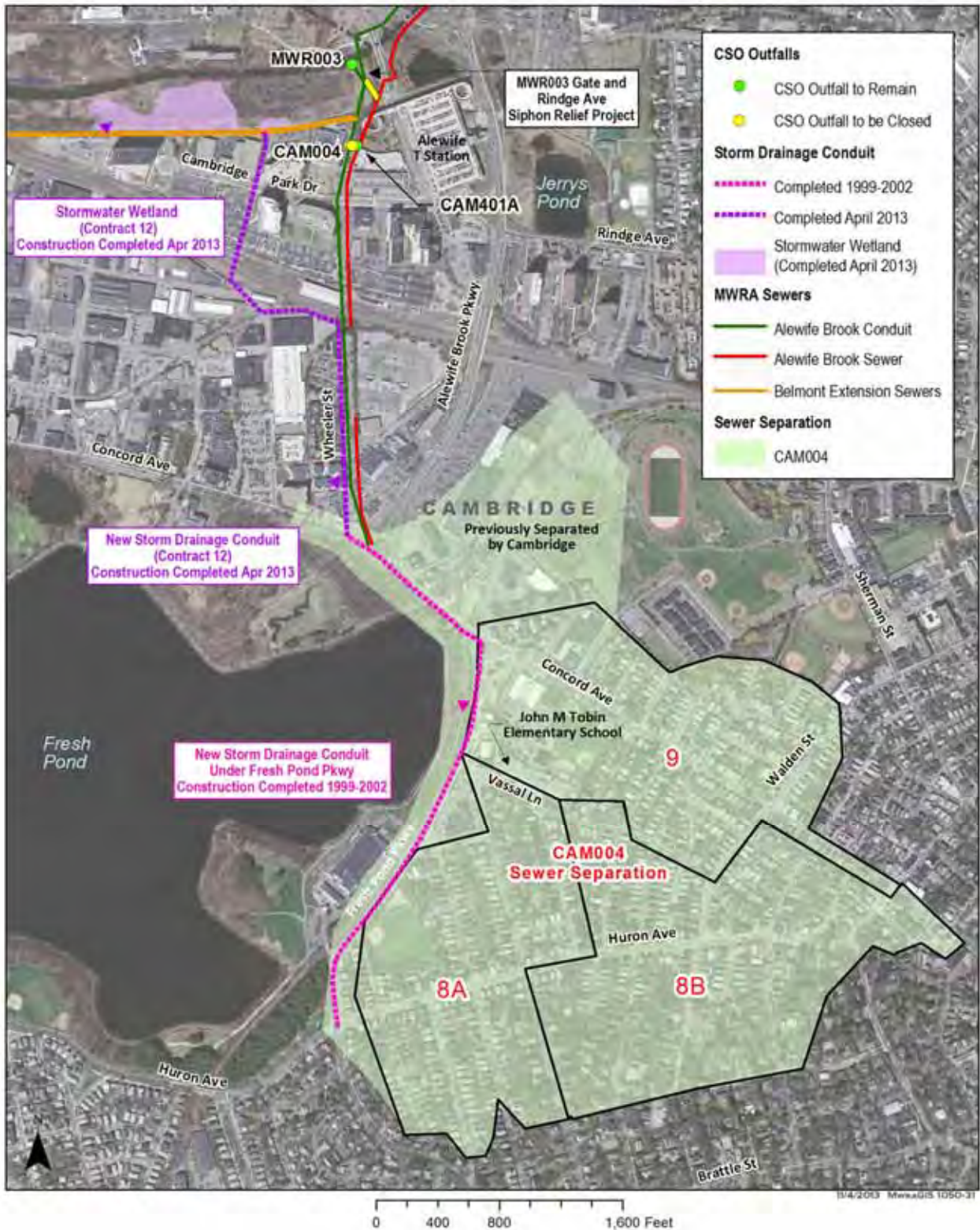


Figure 4
Alewife Brook CSO Control Plan (2 of 2)



Figure 5
 Rendering of Alewife Wetland Basin



stormwater will be directed to the basin with completion of the ongoing CAM004 sewer separation contracts. MWRA provided \$14.8 million to Cambridge for planning, design and construction of the outfall and wetland basin, including a \$5.5 million share of the construction contract. The City of Cambridge's share of the construction contract cost was \$12.5 million, which includes the cost of amenities for the Alewife Brook Reservation required by the Department of Conservation and Recreation (DCR).

The CAM004 stormwater outfall and wetland basin are intended to deliver the separated stormwater flows to the Little River and downstream Alewife Brook without causing an increase in flood levels or pollutant loadings. The project included the construction of a 4-foot by 8-foot box culvert storm drain to convey the separated stormwater to a new 3.4-acre wetland in DCR's Alewife Reservation (see the wetland rendering, Figure 5, on the preceding page). The wetland basin provides 10.3 acre-feet of detention storage of the stormwater flows and attenuation of stormwater flow rate to the Little River and Alewife Brook. The basin will also provide a level of removal of pollutants associated with urban stormwater by natural treatment processes in the constructed wetland system.



Portion of main wetland basin and boardwalk system



"Oxbow," a meandering extension of the Little River



Stormwater outfall and basin "Forebay"



Wetland Dedication on October 15, 2013

In addition to these CSO related functional objectives, the design of the basin incorporates other "green infrastructure" attributes that are intended to provide or enhance plant and wildlife habitat, natural flood control, wetlands treatment, and recreational and educational amenities consistent with DCR's Alewife Reservation Greenway Master Plan. Restoration of surfaces surrounding the basin, including the portion of the new MassDOT bike path from Somerville to Belmont that was temporarily relocated to nearby streets during construction and the DCR park enhancements, were completed in September 2013.

Long-term maintenance responsibilities are defined in a Memorandum of Agreement between DCR and the City of Cambridge by which Cambridge is responsible for maintaining the main wetland basin, the open water Oxbow, the Forebay, the vegetated swale between the Forebay and the main basin, and City owned utilities on the property. Cambridge also agrees to implement Best Management Practices (BMPs) within the upstream stormwater collection and delivery system. DCR is responsible for managing and maintaining all other recreational and reservation amenities and educational components.

CAM004 Sewer Separation

The City of Cambridge also made substantial progress with design and construction of the three remaining construction contracts to complete the CAM004 sewer separation project – Cambridge contracts 8A (Huron A), 8B (Huron B) and 9 (Concord Ave). The three contracts will separate combined sewers upstream of Outfall CAM004 in the Huron Avenue and Concord Avenue neighborhoods, encompassing a 211-acre area east of Fresh Pond Parkway (see Figure 3 on page 10).

As reported last year, the City of Cambridge notified MWRA in the fall of 2012 that new information gained from its design of the CAM004 sewer separation project had caused it to be concerned that all of the necessary street-by-street storm drain and sanitary sewer installation and utility relocation work within its three construction contracts (Contract 8A, 8B and 9) might not be feasible to complete by the December 2015 milestone in Schedule Seven. Specifically, Cambridge raised the concerns that it might not be possible to manage the many construction crews that would need to perform simultaneous work to meet the schedule and that heavy construction occurring simultaneously on Huron Avenue (Contract 8B) and on Concord Avenue (Contract 9) would cause serious regional traffic impacts. In avoiding these impacts, Cambridge estimated that the work could require up to two years additional time.

Following meetings with MWRA, Cambridge agreed to expedite the designs of contracts 8B and 9, including commencing design of Contract 9 by January 2013, one year earlier than it had proposed, and commencing construction of Contract 9 by January 2014. Cambridge accomplished both, and it continues to meet the challenges with aggressive scheduling actions intended to maintain compliance with Schedule Seven. These actions include early coordination with private utilities and the sequencing of construction activities within and across contracts 8B and 9 to avoid simultaneous disruptions to traffic on Huron and Concord avenues. It is important to note that Cambridge's current schedule carries considerable risk should problems such as unforeseen utility conflicts or severe weather arise during construction.

Cambridge issued the notice to proceed with construction of the \$16.3 million Contract 8A in September 2012, in compliance with Schedule Seven, and the contract is approximately 70% complete. Contract 8A includes the installation of approximately 13,500 linear feet of sanitary sewer and storm drain pipe up to 54-inch diameter and 7,200 linear feet of smaller diameter drain pipe for building, catch basin and other connections in a 68-acre area immediately east of Fresh Pond Parkway, from Fresh Pond to Brattle Street. The contract also includes the installation of three large storm drain vaults on Vassal Lane, 45 new or replacement catch basins with hoods and 6-foot sumps, work on private property of 58 buildings within the project area to remove roof runoff and sump



**Contract 8A Drain Vault #2
Vassal Lane and Lakeview Avenue**

pump discharges from the sewer system, and 6,700 linear feet of replacement water main ranging from 6-inch to 12-inch diameter.

Subsurface work associated with sewer separation construction is nearing completion on all streets in the Contract 8A area. Cambridge's contractor recently completed the Lexington Avenue/Huron Avenue intersection crossing, the relining of a sewer in Lexington Avenue, and the construction and connection of a special drainage structure on Vassal Lane. Cambridge's contractor still needs to complete the sewer and storm drain installations in Larch Road. The contractor has completed base pavement on Lexington Avenue, Lakeview Avenue and Grozier Road, and will continue this work on remaining streets through 2014. Throughout Contract 8A, utility coordination and relocations have gone well and are not expected to be a factor in completing the contract work. The sewer separation work of Contract 8A is scheduled to be substantially complete in May 2014, and surface restoration work will continue through December 2014.

On September 19, 2013, Cambridge issued the notice to proceed with the \$30 million Contract 8B. Work is planned in Huron Avenue and several intersecting streets to separate combined sewers in an 83-acre area east of the Contract 8A work area, extending as far east and north as Concord Avenue and as far south as Brattle Street. Contract 8B includes 21,000 linear feet of new sanitary sewers and storm drains from 8-inch to 30-inch diameter, 1,700 linear feet of trenchless pipe rehabilitation, and approximately 13,230 linear feet of ductile iron water main pipe from 4-inch to 24-inch diameter.

Work to date on Contract 8B has focused on layout, test pits, contract required submittals and preparation of the work area. The contractor removed old rail tracks in Huron Avenue and pruned and protected trees in advance of storm drain and sewer installation. NStar has completed relocations of its gas lines along Huron Avenue and Vassal Lane ahead of the sewer and storm drain installations. Work is presently underway with sewer and drain construction on Fayerweather Street and additional crews have been added for work on Reservoir Street and Appleton Street. Coordination with utility companies is underway and could have an effect on the contract schedule, particularly for gas relocations needed in advance of sewer and drain installation work. Because winter conditions will limit NStar's gas line relocations, Cambridge and its contractor will, if necessary, adjust the schedule of sewer and drain work to avoid conflicts with the gas main(s) to the extent possible. Contract 8B is 10% complete and is anticipated to be substantially complete in September 2015.



Contract 8B rail track removal along Huron Avenue

Cambridge issued the Notice to Proceed for the \$24.2 million Contract 9 on February 11, 2014. Contract 9 includes the installation 19,640 linear feet of new sanitary sewers and storm drains from 6-inch to 48-inch diameter, 4,070 linear feet of trenchless pipe rehabilitation, approximately 10,360 linear feet of ductile iron water main pipe from 4-inch to 20-inch diameter, and 800 linear feet of 20-inch water pipe trenchless rehabilitation in Concord Avenue and several intersecting streets to separate combined sewers in a 60-acre area north of Contracts 8A and 8B and extending from Fresh Pond Parkway in the west to the intersection of Concord Avenue and Huron Avenue in the east. Contract 9 is scheduled to be substantially complete in December 2015.

A small portion of the originally planned Contract 9 work, on Concord Lane, a short private way serving commercial properties, was not included in the contract. Only recently was Cambridge able to gain right of entry from the private property owner for site and utility investigations needed to support design of sewer separation in this area. Cambridge continues to negotiate with the property owner for entry to perform soil borings and for eventual construction. Cambridge may bid the Concord Lane work as a separate (fourth) construction contract, which it expects can be completed within the court schedule.

Cambridge has also included “Green Infrastructure” in all three contracts for stormwater quality improvement and quantity control. The Green infrastructure consist of porous pavement, “biobasins” with overflow connections to the storm drain system, and new street trees. The biobasins are planted areas that function as part of the stormwater system by intercepting and detaining street runoff to capture some of the sediments, provide a level of removal of other pollutants such as phosphorus and nitrogen, and potentially reduce the rate and volume of stormwater runoff to the drainage system, which will ultimately be conveyed to the new stormwater wetland in the Alewife Reservation before discharging to the Little River.

Cambridge plans to substantially complete the CAM004 sewer separation project by December 2015 in compliance with Schedule Seven. MWRA’s cost share has increased by \$27 million, to \$93 million, over the past year due to increases in the amount of work and in unit costs. Long-term cost and schedule concerns remain with regard to limited in-state landfill space for soil disposal, though there appears to be adequate landfill accommodation for the CAM004 work that will be performed over the next year with the recent opening of additional in-state landfills. Cambridge will continue to monitor the issue for impacts to the CAM004 project costs and schedule.

Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief

MWRA has completed the 100% design plans for the Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief project (the “MWR003 project”) and is working to obtain all necessary permits and approvals for construction to commence by August 2014, in compliance with Schedule Seven. The project has an estimated construction cost of \$1.9 million and will be the last of the six projects in MWRA’s Alewife Brook CSO plan and the last of the 35 projects in MWRA’s regional long-term CSO control plan to proceed into construction.

The MWR003 project, shown in Figure 6 on the next page, will upgrade the overflow hydraulic capacity at Outfall MWR003, which discharges to the Alewife Brook. Increasing the overflow capacity is necessary to provide adequate system relief in extreme storms and allows for the planned closing of Cambridge’s nearby Outfall CAM004 and the lowering of CSO discharges at other Alewife Brook outfalls as recommended in The Long-Term Control Plan. The design recommendations include replacing the existing static overflow weir at MWR003 with an automated weir gate that in its lowered position will provide a higher overflow capacity when needed to mitigate system flooding; increasing the hydraulic capacity of MWRA’s Rindge Avenue Siphon, which delivers overflows to the outfall, by replacing the existing 30-inch pipe with a 48-inch pipe; and installing an underflow baffle to provide floatables control.

MWRA is seeking a wetlands order of conditions from the Cambridge Conservation Commission and a construction permit from DCR, which has control of the Alewife Brook Reservation where the project is located. MWRA has met with the Conservation Commission’s administrator at the project site to review the project impacts in advance of filing a Notice of Intent for the wetlands permit. MWRA has also met with DCR to review the project and to discuss the requirements of a DCR construction permit and right of entry agreement. MWRA submitted the construction permit application to DCR in early March 2014.

MWRA is coordinating with NStar and Verizon for the provision of electric power and data communications, respectively, associated with the operation of the automated weir gate. The design plans

call for the installation of two aboveground cabinets for the purpose of housing the power and communications controls in a manner accessible to MWRA for long-term operational adjustments and maintenance. In addition, MWRA is coordinating with the City of Cambridge to review the plans and the hydraulic conditions in the city's and MWRA's sewer systems that MWRA predicts will exist with the recommended MWR003 project improvements and all other elements of the Alewife Brook CSO control plan in place.

Figure 6: Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Ave. Siphon Relief



With this project, MWRA has the related objective of optimizing the hydraulic performance of MWRA's Alewife Brook interceptors under future conditions with all of the Alewife CSO projects in place. MWRA's interceptor system includes two parallel sewers that generally follow the alignment of Alewife Brook from their downstream ends at MWRA's Alewife Brook Pumping station, located next to DCR's Dilboey Field and the Somerville/Medford line, to their upstream ends in the vicinity of the Fresh Pond Rotary in Cambridge and at the Belmont town line. The Alewife Brook Sewer was constructed in 1893 primarily to serve portions of Arlington, Cambridge and Somerville. In 1949, the Alewife Brook Conduit was constructed primarily to extend sewer service to Belmont and increase the hydraulic capacity of the Alewife system. The two interceptors are interconnected at a few locations, generally further downstream, and both interceptors share the overflow at Outfall MWR003, located behind the MBTA Alewife Station.

The MWR003 Project is part of a set of completed and ongoing Alewife Brook CSO projects that individually and together are altering flow make-up and optimizing flow conveyance in MWRA's and Cambridge's sewer systems to be able to attain long-term levels of CSO control, reduce sewer system surcharging, maintain service to the tributary communities of Arlington, Belmont, Cambridge and Somerville, and avoid increasing flood conditions in Alewife Brook. MWRA and the City of Cambridge continue to evaluate and reevaluate the expected hydraulic conditions, even as construction proceeds and projects are completed.

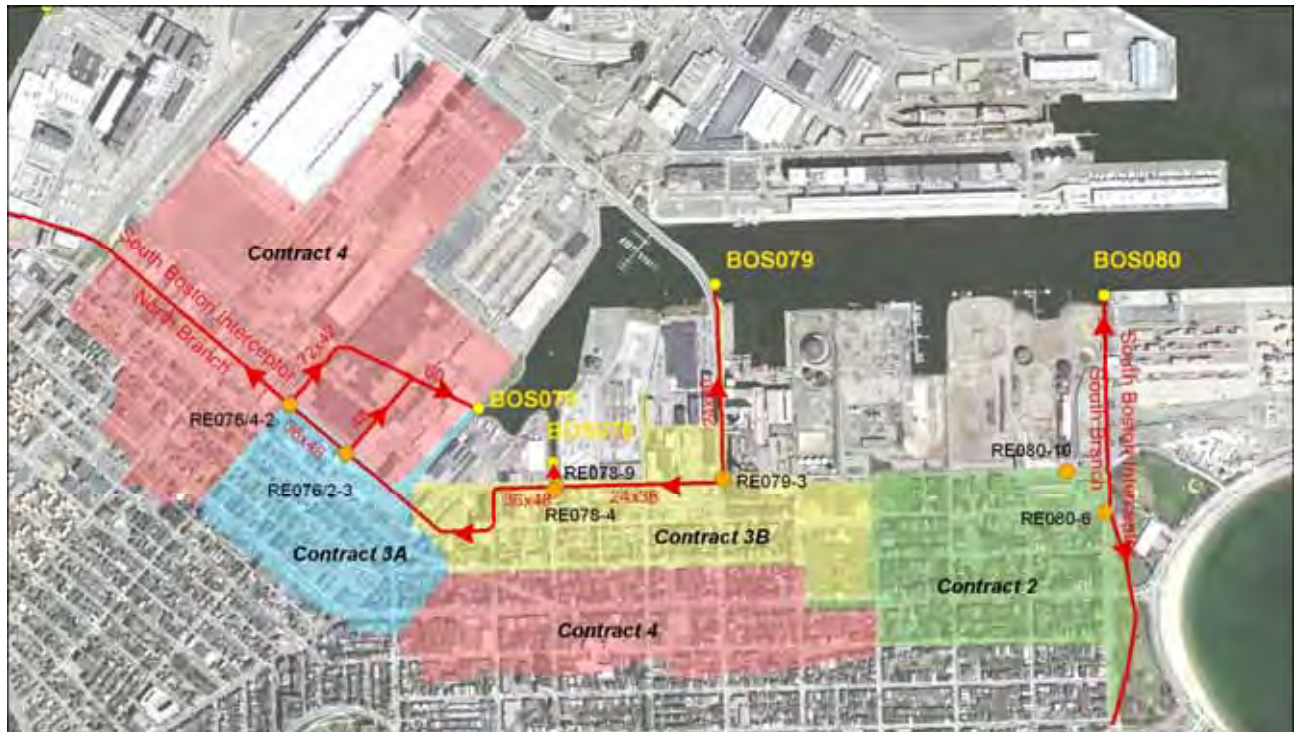
Reserved Channel Sewer Separation

	<u>Court Milestone</u>	<u>Project Schedule</u>
Commence Design	July 2006	July 2006
Commence Construction	May 2009	May 2009
Complete Construction	December 2015	December 2015

The \$65.1 million Reserved Channel Sewer Separation project (Figure 7) is intended to minimize CSO discharges and impacts to the Reserved Channel by separating combined sewer systems in a portion of South Boston tributary to CSO outfalls BOS076, BOS078, BOS079 and BOS080. Implementation of the approved sewer separation plan will reduce the number of CSO activations to the Reserved Channel from 37 events to three events in a typical year and reduce total annual CSO volume to the Reserved Channel from 28 million gallons to 1.5 million gallons, a 95% reduction by volume. The work includes the installation of approximately 42,100 linear feet of new storm drain, along with an additional 6,500 linear feet of minor drain primarily to connect catch basins to the new storm drains. The work also includes the installation or rehabilitation of 17,300 linear feet of sanitary sewer. To remove enough stormwater inflow from the sewer system and attain the long-term level of CSO control, many building downspout connections and parking lot drains will also be disconnected from the sewer and tied into the new storm drains. The project also includes rehabilitating and/or upgrading the four CSO outfalls to ensure they have the capacity to deliver the separated stormwater flows, as well as remaining, infrequent CSO flows, to the Reserved Channel for the long term.

The project area encompasses approximately 365 acres of South Boston that comprise the drainage areas tributary to the four Reserved Channel outfalls. This area is an urban mix of residential properties and extensive commercial, industrial and recreational land uses primarily along or close to the channel. East First Street is the primary roadway through the project area and is characterized by heavily congested utilities and truck traffic primarily associated with transportation of containers from Conley Terminal.

Figure 7: Reserved Channel Sewer Separation Contracts



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BWSC proposes nine, phased construction contracts for this project, including four sewer separation contracts (BWSC Contracts 2, 3A, 3B, and 4), an outfalls rehabilitation contract (BWSC Contract 1), a sewer cleaning and lining contract (BWSC Contract 5), a building downspout disconnections contract (BWSC Contract 6), and two final paving contracts (BWSC Contracts 7 and 8). As reported last year, BWSC has completed four of the nine contracts: the \$4.0 million Contract 1, \$6.9 million Contract 2, \$11.9 million Contract 3A, and \$1.4 million Contract 7.

Construction Contracts		% Complete	Construction Dates
Contract 1	Outfall Rehabilitation	100%	2010-2011
Contract 2	Sewer Separation	100%	2009-2011
Contract 3A	Sewer Separation	100%	2010-2012
Contract 3B	Sewer Separation	90%	2011-2014
Contract 4	Sewer Separation	75%	2012-2014
Contract 5	Sewer Cleaning/Lining		2013-2014
Contract 6	Building Downspout Disconnections		2013-2014
Contract 7	Paving	100%	2010-2012
Contract 8	Paving	35%	2012-2016

Contract 1 involved the rehabilitation of the four Reserved Channel CSO outfalls to accommodate the stormwater flows being removed from the sewer system, provide for the long-term structural integrity of the outfall, and provide protection to the Reserved Channel shoreline at each discharge location.

Contract 2 involved the installation of 8,402 linear feet of storm drain, approximately 3,960 linear feet of minor drain (up to 8-inch diameter), and 3,401 linear feet of sanitary sewer to separate combined sewers in a 55-acre area of South Boston approximately bounded by East First Street, Farragut Road, East Fourth Street and N Street. The work removed stormwater from the local sewers tributary to the upstream end of BWSC's South Boston Interceptor, South Branch ("SBI-SB"), with the benefits of 1) reducing CSO overflows to the Reserved Channel at Outfall BOS080 and 2) reducing surcharging within the SBI-SB and 3) reducing CSO discharges from the SBI-SB to the North Dorchester Bay CSO storage tunnel.

Contract 3A involved sewer separation in a 33-acre area tributary to Outfall BOS076 bounded approximately by West First Street, G Street, West Broadway and E Street. It included the installation of 8,686 linear feet of storm drain, 4,536 linear feet of sanitary sewer, 9,798 linear feet of replacement water main to avoid conflicts with the planned storm drains, and 22 new storm drain catch basins, as well as the reconnection of 76 existing catch basins from the existing sewer system to the new storm drains.

Contract 7 involved approximately 22,000 square yards of permanent trench repair and pavement and more than 14,200 linear feet of pavement markings.

BWSC has continued to make substantial progress with design and construction activities on a schedule that calls for completion of all work by December 2015, in compliance with Schedule Seven. The following describes the progress of ongoing or recently awarded construction contracts.

- BWSC continues to make progress with construction of the \$11.9 million Contract 3B for sewer separation in a 66-acre area of South Boston approximately bounded by East First Street, N Street, East Third Street and Dorchester Street, and including Elkins Street and Summer Street to the edge of the Reserved Channel. Contract 3B includes 10,730 linear feet of new storm drain and 4,240 linear feet of new sanitary sewer to separate the combined sewers in a 66-acre area tributary to outfalls BOS078 and

BOS079, as well as 10,900 linear feet of replacement water main to remove conflicts with the planned storm drains. Fourteen new catch basins will be installed, and 120 existing catch basins will be disconnected from the sewer system and reconnected to new storm drains. Remaining construction activities include installing drains on East Third St between K St. and L St.; Summer St. between East Third St. and East Broadway St.; East Second St. between K St. and M St.; M St. between East Second St. and East First St.; and East First St. between Summer St. and M Street. Contract 3B is approximately 90% complete, and BWSC expects to attain substantial completion of this contract in October 2014.



**Installation of 48-inch drain on K Street
Reserved Channel Contract 3B**



**Construction of drain manhole at K and E. 2nd streets
Reserved Channel Contract 3B**

- BWSC continues to make progress with construction of the \$10.0 million Contract 4 for sewer separation in two areas totaling 182 acres tributary to outfalls BOS076, BOS078 and BOS079. One of the two areas lies south of the Reserved Channel and is approximately bounded by G Street, East Third Street, N Street, Emerson Street and East Fourth Street. The second area lies west of the Reserved Channel, close to the Boston Convention and Exposition Center (“BCEC”), and is approximately bounded by the Reserved Channel, West Broadway, G Street and the BCEC. Remaining construction activities include installing drains on K St. between East Third St and East Broadway. Sewer and drain work will be completed on K St. between East Broadway and East Fourth St.; Emerson St. between K St and East Broadways; I St. between East Fourth St. and East Fifth St.; and L St. between East Third St. and East Fourth Street. Contract 4 is approximately 75% complete, and BWSC expects to attain substantial completion of this contract in August 2015.



**Installation of 30-inch drain on I Street
Reserved Channel Contract 4**

- BWSC issued the notice to proceed with construction of the \$6.8 million Contract 8 on October 1, 2012. Contract 8 is the second of two pavement restoration contracts that follow the work of the various sewer separation contracts (contracts 3A, 3B and 4) as sections of work are completed. Paving work in the Contract 3A area is complete. Overall, Contract 8 is approximately 35% complete and will continue to follow the sewer separation work of Contracts 3B and 4 through April 2016.
- BWSC awarded the \$661,442 Contract 6 on January 29, 2014. Contract 6 involves the disconnection of building downspout in the Reserved Channel area. BWSC expects to be substantially complete with this contract by October 2015.

- BWSC awarded the \$4.8 million Contract 5 (the last Reserved Channel contract) on February 24, 2014. Contract 5 is for the rehabilitation of sewers in the Reserved Channel area. BWSC expects to be substantially complete with this contract by November 2015.

All construction activities for the Reserved Channel sewer separation project are on schedule for project completion in December 2015, in compliance with Schedule Seven.

2.4 Other CSO Control Improvements

In addition to the ongoing work to complete the remaining three of 35 projects in the Long-Term Control Plan, MWRA and the CSO communities are performing related work to help bring CSO discharges into compliance with the approved long-term levels of control, further improve system wet-weather performance, and/or gain additional CSO control. Some of the recent work is described below.

BWSC South Dorchester Bay Inflow Removal

BWSC continues to pursue additional stormwater removal (i.e. disconnection of previously undocumented sources of inflow) in sewer systems tributary to BWSC's Dorchester Interceptor. These stormwater removal investigations and related construction efforts follow BWSC's substantial completion of the \$119.0 million South Dorchester Bay Sewer Separation project in 2007. The sewer separation project eliminated CSO discharges to the Commercial Point and Fox Point CSO treatment facilities and the beaches of South Dorchester Bay, allowing MWRA to decommission the two facilities in November 2007. The purpose of the ongoing work is to mitigate the remaining risks of sewer system surcharging in large storms as a result of the closing of all CSO regulators that previously provided hydraulic relief to the Dorchester Interceptor.

BWSC Lower Dorchester Brook Sewer Separation

BWSC completed the \$6.5 million construction contract for Lower Dorchester Brook sewer improvements in 2012. The project, which is not included in Schedule Seven, relocated CSO regulator RE-070/11-2 and separated combined sewers in a portion of the South Bay area associated with BWSC's Lower Dorchester Brook Sewer ("LDDBS"). The work was partially funded by MWRA and was intended to lower CSO discharges to BWSC's Dorchester Brook Conduit and help attain the level of CSO control in MWRA's long-term control plan for Fort Point Channel. As part of the studies that led BWSC to recommend this project, BWSC proposed to separate sewers in additional areas tributary to its Boston Main Interceptor, including areas along Massachusetts Avenue. Sewer separation construction is underway in these areas, as well as in other areas of the City of Boston.

City of Cambridge Sewer Separation Program

The City of Cambridge continues with its decades-long program of separating the combined sewer systems that can contribute to CSO overflows to the Charles River. Construction of roadway improvements along Western Avenue is underway and includes the installation of a major new storm drain in Western Avenue and area sewer separation that will reduce stormwater flows to MWRA's North Charles Metropolitan Sewer, which overflows to the Cottage CSO facility.

Cambridge has also coordinated its CSO regulator reconfiguration efforts at Outfall CAM017 at Binney Street and Land Boulevard with major redevelopment work along Binney Street. Cambridge has replaced the fixer were at Outfall CAM017 with a series of bending weirs designed to meet the long-term levels of control while providing system relief and flood control in extreme storms. The redevelopment work includes the construction of a large storm drain along Binney Street and area-wide sewer separation that will remove

stormwater flows from MWRA's Cambridge Marginal Conduit and Prison Point CSO facility. These projects will help meet long-term levels of CSO control at MWRA's Cottage Farm and Prison Point treatment facilities and at related untreated outfalls, including CAM017.

City of Chelsea Sewer Separation Program

The City of Chelsea continues with its program of sewer separation to reduce stormwater flows to the city and MWRA sewer systems that can overflow to the Chelsea Creek. Work in the lower Broadway area of Chelsea is scheduled over the next year and is intended to allow the closing of Outfall CHE002. Elimination of Outfall CHE002 was not included in the LTCP and is an additional improvement undertaken by the City of Chelsea. Chelsea is also undertaking sewer separation in a large area along Spruce Street. This project, scheduled to begin construction in 2014, is anticipated to remove over 10 million gallons per day of stormwater flow from the City and MWRA sewer systems (based on 1 year/6 hour storm).

City of Somerville CSO Metering Program

The City of Somerville recently installed a long-term flow meter in the Tannery Brook Conduit ("TBC") at Outfall SOM01A and is completing a one year metering program at four upstream locations where its combined sewer systems can overflow to the TBC. The TBC is a major storm drain that carries storm flows mixed with smaller amounts of sanitary sewage and combined sewer overflow to MWRA's sewer system along Alewife Brook. In large storms, the TBC can overflow to the Alewife Brook at Outfall SOM01A. Data from these meters will help the City to quantify the frequency and volume of CSO flows that enter the TBC and the frequency and volume of stormwater and CSO discharges to Alewife Brook.

2.5 MWRA CSO Spending in 2013

MWRA spent \$26.3 million in 2013 to implement the CSO projects and fund the eligible CSO work of BWSC, Cambridge and Brookline. Of this amount, \$25.3 million (96%) was for construction and construction-related activities.

Capital Spending by MWRA on CSO Control in 2013

Construction:	\$20.7 million
Engineering Services During Construction:	4.7 million
<i>Subtotal Construction Related:</i>	<i>\$25.4 million</i>
Design:	0.9 million
<hr/>	
Total CSO Capital Spending in 2013:	\$26.3 million

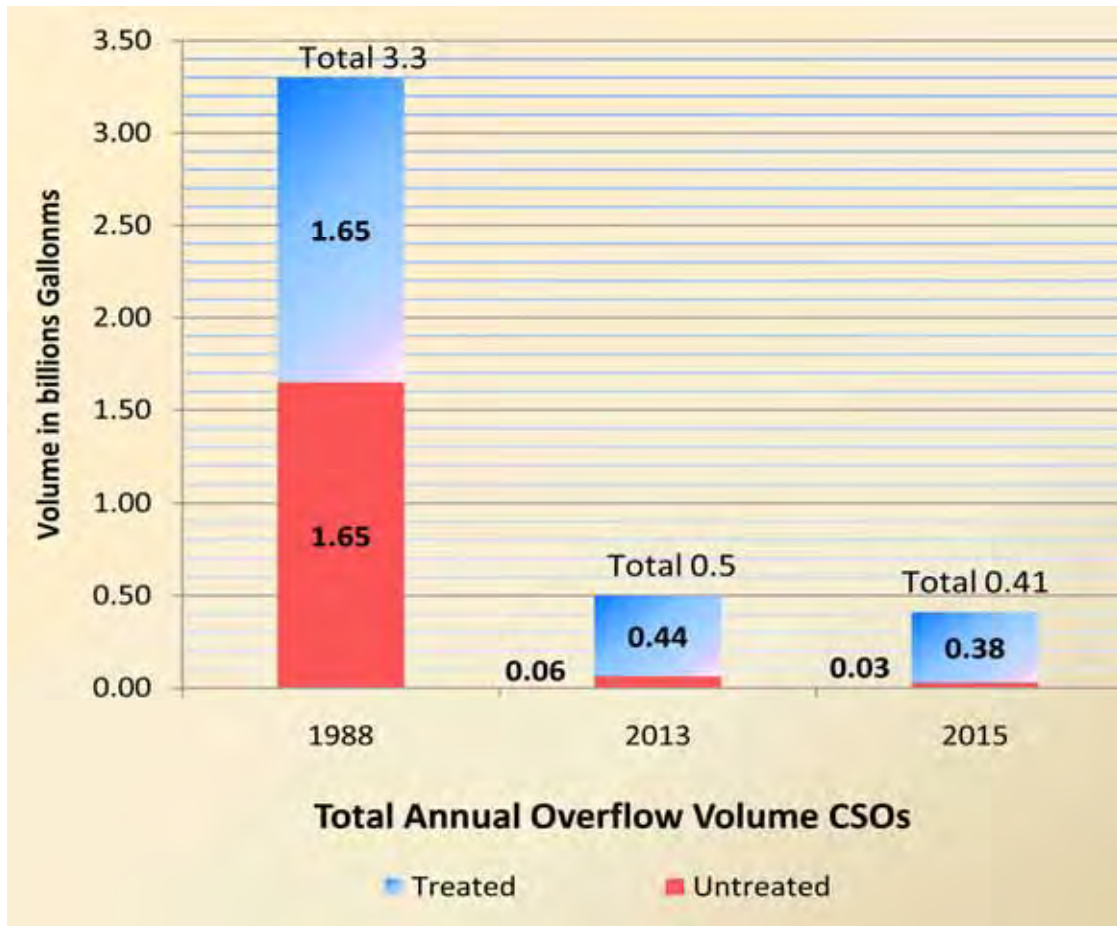
Spending in 2013 brought MWRA's total capital expenditure for the CSO control program to \$844.3 million, 94% of the \$893.8 million CSO budget in the Proposed FY15 Capital Improvement Program (CIP). With only three of the 35 projects not yet complete, CSO program activity and spending will continue to slowly wind down from the highest calendar year spending of \$128.1 million in 2008. The Proposed FY15 CIP estimates fiscal year spending on CSO control of \$31.7 million in FY14 (July 1, 2013 thru June 30, 2014), \$19.1 million in FY15, and \$3.7 million in FY16 when the last of the CSO projects is scheduled to be completed.

3. STATUS OF PLAN IMPLEMENTATION AND BENEFITS ACHIEVED

3.1 Completed Work and Level of CSO Control

With the cooperation of its CSO communities, MWRA has completed 32 of the 35 CSO projects. Two of the three remaining projects are well into construction, and the last project is scheduled to move into construction in August 2014. Since 1987, when MWRA assumed responsibility for developing and implementing a regional CSO control plan, improvements to MWRA’s wastewater transport and treatment systems have produced huge reductions in CSO discharges and dramatic improvement in water quality in many areas. These wastewater system improvements included MWRA’s \$3.8 billion investment in the new Deer Island Treatment Plant and associated conveyance systems and the 32 CSO projects now complete. As shown in Figure 8, estimated average annual volume of CSO discharge has dropped from 3.3 billion gallons in 1988 to 0.50 billion gallons today (an 85% reduction), with 88% of the current discharge volume receiving treatment at MWRA’s four long-term CSO facilities, at Cottage Farm, Prison Point, Somerville Marginal and Union Park. Figure 9 on page 25 shows this reduction for each receiving water segment. See Figure 10 on page 25 for an identification of the water segments currently or formerly affected by CSO.

Figure 8: Region-wide CSO Reduction and Goal



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Table 3: Status of CSO Project Implementation – March 2013

MWRA CONTRACT	CSO PROJECTS IN SCHEDULE SEVEN	IN DESIGN	IN CONSTRUCTION	COMPLETE
MWRA Managed Projects				
N. Dorchester Bay Tunnel	N. Dorchester Bay CSO Storage Tunnel and Related Facilities			X
N. Dorchester Bay Facilities				
Pleasure Bay Storm Drain Improvements				X
Hydraulic Relief Projects	CAM005 Relief			X
	BOS017 Relief			X
East Boston Branch Sewer Relief				X
BOS019 CSO Storage Conduit				X
Chelsea Relief Sewers	Chelsea Trunk Sewer Relief			X
	Chelsea Branch Sewer Relief			X
	CHE008 Outfall Repairs			X
Union Park Detention/Treatment Facility				X
CSO Facility Upgrades and MWRA Floatables	Cottage Farm Upgrade			X
	Prison Point Upgrade			X
	Commercial Point Upgrade			X
	Fox Point Upgrade			X
	Somerville-Marginal Upgrade			X
MWRA Floatables and Outfall Closings				X
Brookline Connection and Cottage Farm Overflow Interconnection and Gate				X
Optimization Study of Prison Point CSO Facility				X
Community Managed Projects				
South Dorchester Bay Sewer Separation				X
Stony Brook Sewer Separation				X
Neponset River Sewer Separation				X
Constitution Beach Sewer Separation				X
Fort Point Channel Sewer Separation and System Optimization				X
Morrissey Boulevard Storm Drain				X
Reserved Channel Sewer Separation			X	
Bulfinch Triangle Sewer Separation				X
Brookline Sewer Separation				X
Somerville Baffle Manhole Separation				X
Cambridge/Alewife Brook Sewer Separation	CAM004 Outfall and Wetland Basin			X
	CAM004 Sewer Separation	X	X	
	CAM400 Manhole Separation			X
	Interceptor Connection Relief/Floatables at CAM001, CAM002, and CAM401B			X
	MWR003 Gate and Rindge Ave. Siphon Relief	X		
Interceptor Connection Relief/Floatables at SOM01A				X
Region-wide Floatables Control and Outfall Closings				X

Figure 9: CSO Volume Reduction by Receiving Water

Predicted Typical Year CSO Discharge Volumes 1988-2015

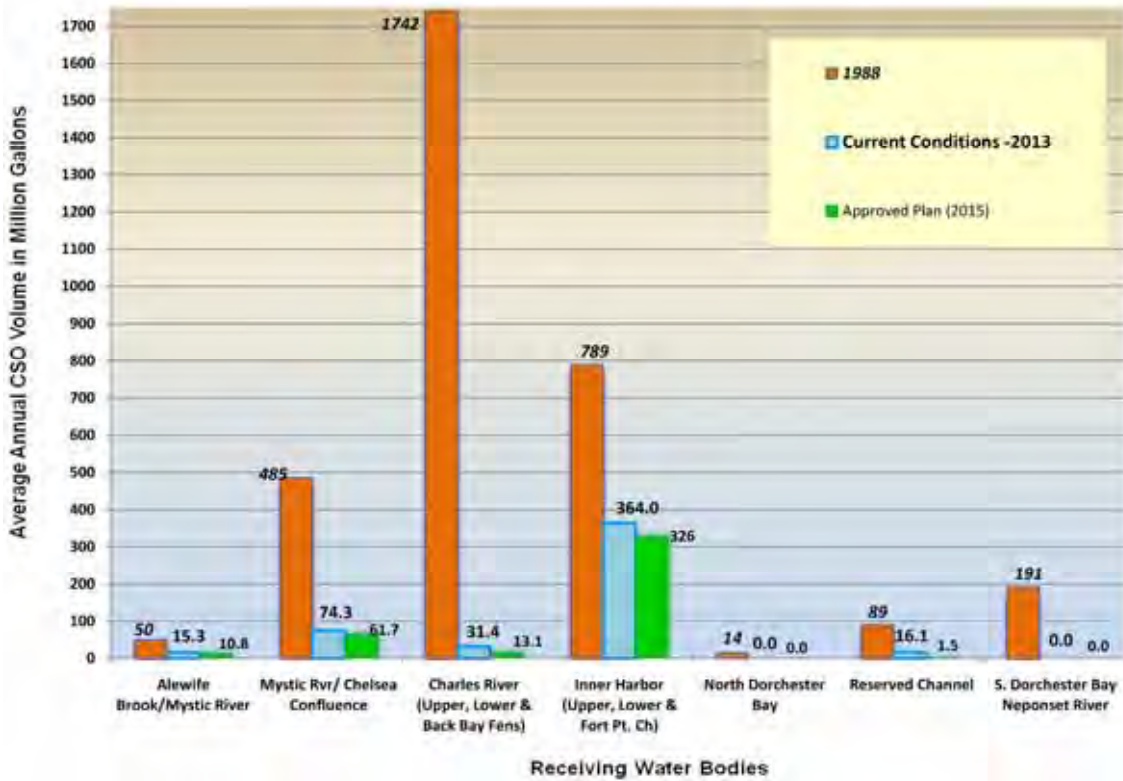


Figure 10: Boston Harbor and its Tributaries



CSO discharges have been eliminated or virtually eliminated (i.e. 25-year storm level of control) at 37 of the 84 outfalls addressed in the Long-Term Control Plan. These 37 outfalls include four outfalls – two City of Cambridge outfalls and two BWSC outfalls - that the Long-Term Control Plan had assumed would remain active. The City of Cambridge closed Charles River Basin outfalls CAM009 and CAM011 in 2007 on an interim basis and continues to evaluate hydraulic conditions before making a decision to keep them closed permanently. BWSC permanently closed East Boston/Inner Harbor outfalls BOS006 and BOS007 several years ago. The Long-Term Control Plan calls for the closing of one CSO outfall not yet closed, Alewife Brook Outfall CAM004, which is scheduled to be closed with completion of the CAM004 sewer separation project in December 2015.

3.2 Water Quality Improvement

MWRA's major improvements to its collection and treatment systems and its completed CSO control projects have been joined by community efforts to control pollutant loadings in separate urban stormwater discharges. Together, these programs have the potential to effect significant water quality improvement that in turn will enhance environmental conditions and promote safe public use. The benefits of these complementary pollution control programs are most evident in the Charles River. Tremendous water quality improvement has been observed and measured in the Charles River Basin, where average annual CSO discharge has been drastically cut from about 1.7 billion gallons in 1988 to 31 million gallons today, a greater than 98% reduction. Approximately 86% of this remaining overflow is treated at MWRA's Cottage Farm CSO facility.

These improvements are the result of major wastewater system projects, most notably the new Deer Island Wastewater Treatment Plant and related conveyance and pumping systems, as well as the CSO control projects completed to date. MWRA and the CSO communities along the Charles River completed a set of improvements in the late 1980s that eliminated dry weather sewage overflows at CSO outfalls. They also completed a set of system optimization projects in the mid-1990s that maximized the existing system's hydraulic performance and lowered CSO discharges. MWRA and the communities have also completed seven CSO control projects along the Charles River: Cottage Farm Facility Upgrade (2000), CAM005 Hydraulic Relief (2000), Independent Floatables Controls and Outfall Closings Project (2001), Stony Brook Sewer Separation (2006), Cottage Farm Brookline Connection and Inflow Controls (2009), Bulfinch Triangle Sewer Separation (2010) and Brookline Sewer Separation (2013).

In the same period, communities along the Charles River have continued programs aimed at reducing pollution in separate stormwater discharges, including identifying and removing illicit sewer connections or cross connections to their storm drain systems. The CSO and stormwater related improvements, together with sanitary sewer overflow control programs in upstream communities (above the Watertown Dam), have resulted in significant and steady water quality improvement to the Charles River Basin during dry and wet weather conditions, as shown in Figure 11 on the page 28.

For the Mystic River, Figure 12 on page 29 shows that the Mystic mainstem and Mystic River mouth have the best water quality, meeting state swimming standards in dry weather. In light rain, the Mystic mainstem and Mystic River mouth meet water quality standards most of the time. Bacterial water quality in the Upper Mystic is also good, with the majority of locations meeting bacteria standards in dry or damp weather and light rain. While conditions worsen in heavy rain events, these events and conditions are less frequent than dry or damp weather and light rain.

Bacteria counts in Alewife Brook, where major CSO control work will be underway through 2015, consistently fail to meet state swimming standards in wet and dry weather, and water quality is particularly poor after heavy rain. Alewife Brook's influence on downstream water quality conditions in the Mystic mainstem is limited.

Figure 13 on page 30 shows similar water quality (i.e. average bacteria concentration) improvement over time in the Neponset River. CSO discharges were eliminated in 2000 with completion of the Neponset River sewer separation project. Prior to the project, CSO flows were discharged at two BWSC outfalls in the Granite Street area. Water quality data show improvement after 2000 in the Granite Avenue area, but also in the stretch of the river immediately upstream. Average bacteria level continues to meet water quality standards at the mouth of the Neponset River, where there is considerable dilution with the waters of South Dorchester Bay.

Improvement in the quality of Boston Inner Harbor waters is also seen in the changes to *Enterococcus* bacteria counts over the period 1989 to 2010, shown in Figure 14 on page 31. Improvement was greatest in the Upper Inner Harbor and in Chelsea Creek, which had more serious wet weather pollution problems. Bacteria data in Figure 14 on page 31 indicate that water quality conditions improved greatly with the significant increase in wastewater transport and treatment capacity (delivery to the Deer Island Treatment Plant) in the period 1989 to 1991. This increase in delivery capacity greatly reduced CSO discharges at most outfalls. Since then, wet-weather water quality continues to improve in Boston Harbor and its tributary rivers, but at a slower pace due in part to diminishing returns on wastewater pollution investments and the dominance of other sources of pollution, including urban stormwater.

South Boston Beaches

The results of water quality sampling along the beaches of South Boston (Figure 15 on page 32) show markedly improved conditions following start-up operation of the CSO storage tunnel on May 4, 2011, just prior to the 2011 swimming season. The number of days that daily sample results showed a violation of the bacteria standard at one or more beaches in South Boston plummeted from a seasonal average of 17 for years 2008, 2009 and 2010, before the storage tunnel was placed into operation, to 4 in 2011, 3 in 2012, and 3 in 2013.

In the past year, the storage tunnel captured approximately 220 million gallons of CSO and separate stormwater and prevented any CSO or stormwater discharge to the beaches. Since start-up in May 2011, the storage tunnel has captured 550 million gallons of CSO and stormwater, and there has been no discharge of CSO to the beaches, one discharge of stormwater to the beaches during Hurricane Irene in August 2011, and two diversions of stormwater away from South Boston to Savin Hill Cove.

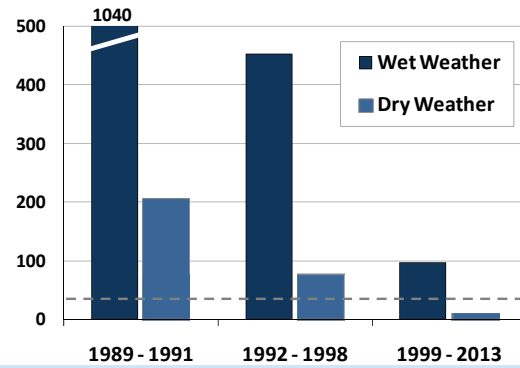
During the swimming season (approximately 85 days from early June to early September), the Massachusetts Department of Conservation and Recreation performs daily water quality sampling at five locations along the South Boston beaches (McCormack Bathhouse, I Street, M Street, City Point and Pleasure Bay), and an exceedance of the bacteria standard triggers a site-specific beach posting. While a South Boston beach may be posted due to an elevated bacteria count at one sampling location, simultaneous samples at the other South Boston beaches may meet bacteria limits, allowing those beaches to remain open for safe swimming.

Water quality conditions at all of the South Boston beaches were excellent in 2013. Daily water quality samples collected in the 2013 swimming season met the swimming standard 100% of the time at City Point Beach and 99% of the time at McCormack Bathhouse and I Street Beach (together, "Carson Beach"), at M Street Beach and at Pleasure Bay Beach. The causes of the few remaining bacteria exceedances are unknown (overland runoff, bird and dog feces, and boat or other illicit discharges are just a few of the possible suspects), but the high counts can no longer be attributed to the CSO and stormwater outfalls.

Figure 11
Change in Lower Charles River Water Quality Over Time
Enterococcus bacteria counts, 1989 - 2013

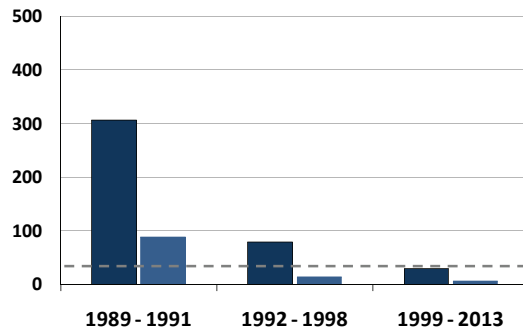
Upper Basin

Watertown Dam to upstream of Cottage Farm



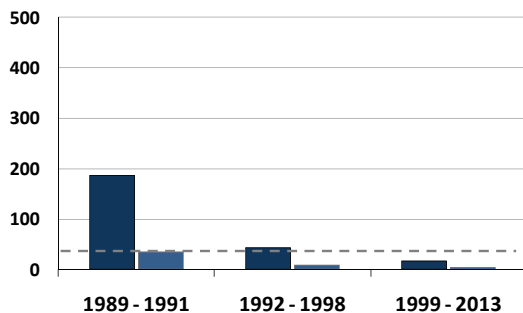
Mid-Basin

Cottage Farm to Science Museum



Downstream of Basin

Science Museum to New Charles Dam

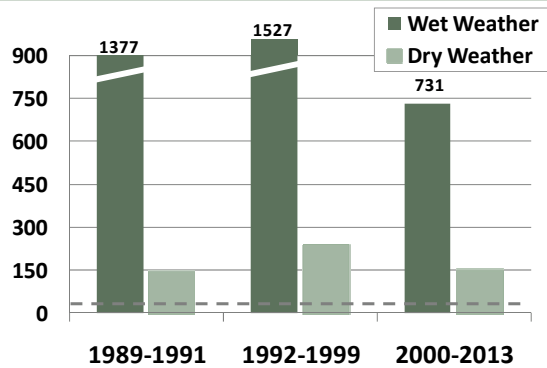


Dotted lines are *Enterococcus* swimming standard for freshwater, 33 cfu/100 mL. Column values are *Enterococcus* geometric means. Dry weather is no rain for day of sampling and two previous days; wet weather is >0.5 inches rainfall within two previous sampling days. Other weather conditions are excluded. Results for MWRA stations 001 - 012, 144 and 145, grouped by region.

Figure 12
Change in Mystic River Water Quality Over Time
Enterococcus bacteria counts, 1989 – 2013. Note changes in scale.

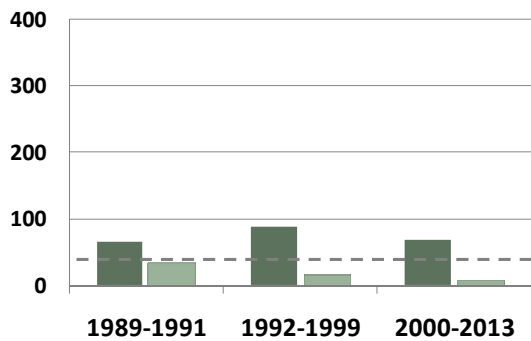
Alewife Brook

Downstream of Little River to Mystic confluence



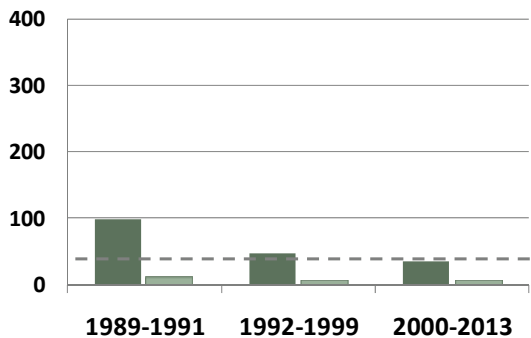
Mystic Mainstem

Downstream of Mystic Lakes to upstream of Amelia Earhart Dam



Mystic River mouth (marine)

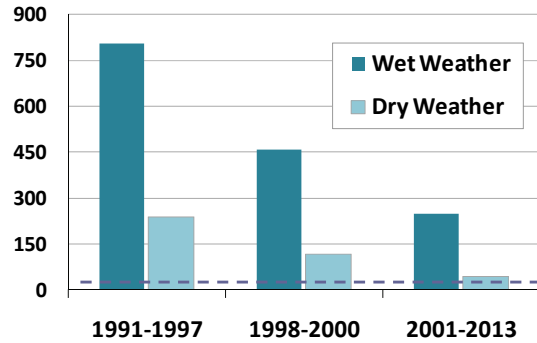
Downstream of Amelia Earhart dam to Tobin Bridge



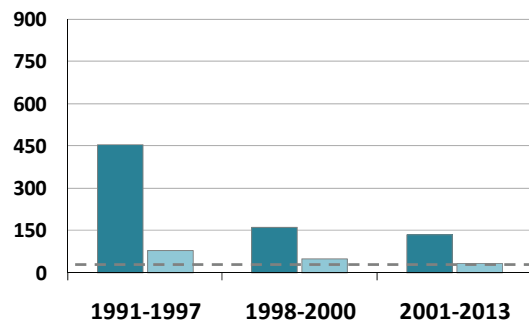
Dotted lines are *Enterococcus* swimming standard: 33 cfu/100 mL in freshwater and 35 cfu/100 mL in marine water. Column values are *Enterococcus* geometric means. Dry weather is no rain for day of sampling and two previous days; wet weather is >0.5 inches rainfall within two previous sampling days. Other weather conditions are excluded. Results for MWRA stations 137, 069, 052, 167, 059, 176, 177, 056, 057, 083, 070, 172, 074, and 174, grouped by region.

Figure 13
Change in Neponset River Water Quality Over Time
Enterococcus bacteria counts, 1991 - 2013

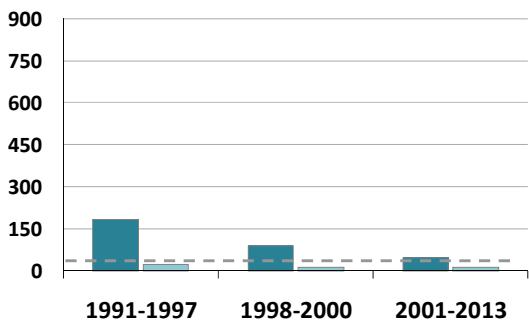
Neponset River, Lower Mills
 Baker Dam, Milton



Neponset River, Granite Ave.
 Near BOS-095 in Dorchester (closed in 2000)



Neponset River mouth
 Dorchester Yacht Club

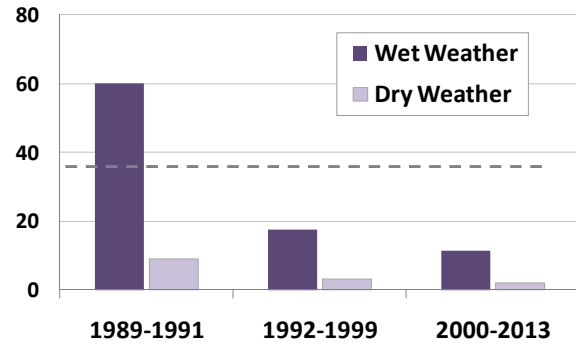


Dotted lines are *Enterococcus* swimming standard for marine water, 35 cfu/100 mL. Column values are *Enterococcus* geometric means. Dry weather is no rain for day of sampling and two previous days; wet weather is >0.5 inches rainfall within two previous sampling days. Other weather conditions are excluded. Results for MWRA stations 055, 054, and 042.

Figure 14
Change in Inner Harbor Water Quality Over Time
Enterococcus bacteria counts, 1989 - 2013

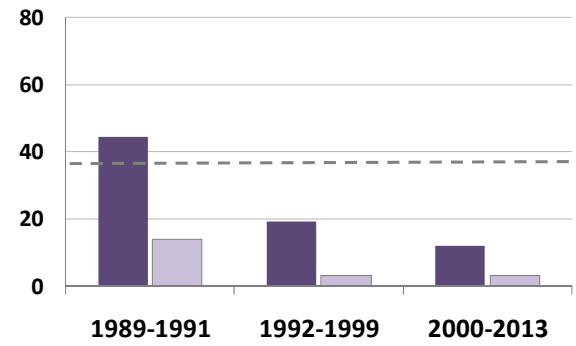
Chelsea Creek

Chelsea Creek Headworks to Mystic Confluence



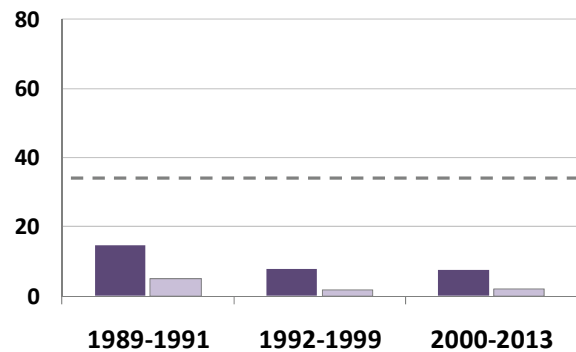
Upper Inner Harbor

Charlestown Navy Yard/Coast Guard Station



Lower Inner Harbor

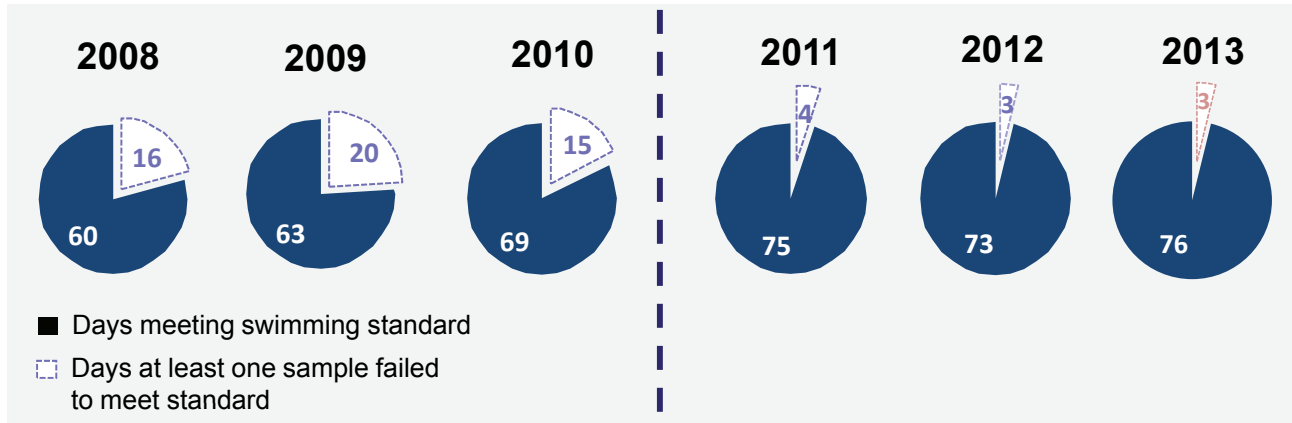
Between Falcon Terminal and Logan Airport



Dotted lines are *Enterococcus* swimming standard for marine water, 35 cfu/100 mL. Column values are *Enterococcus* geometric means. Dry weather is no rain for day of sampling and two previous days; wet weather is >0.5 inches rainfall within two previous sampling days. Other weather conditions are excluded. Results for MWRA stations O15, O27; O14, 138, O19; O22 and O24, grouped by region.

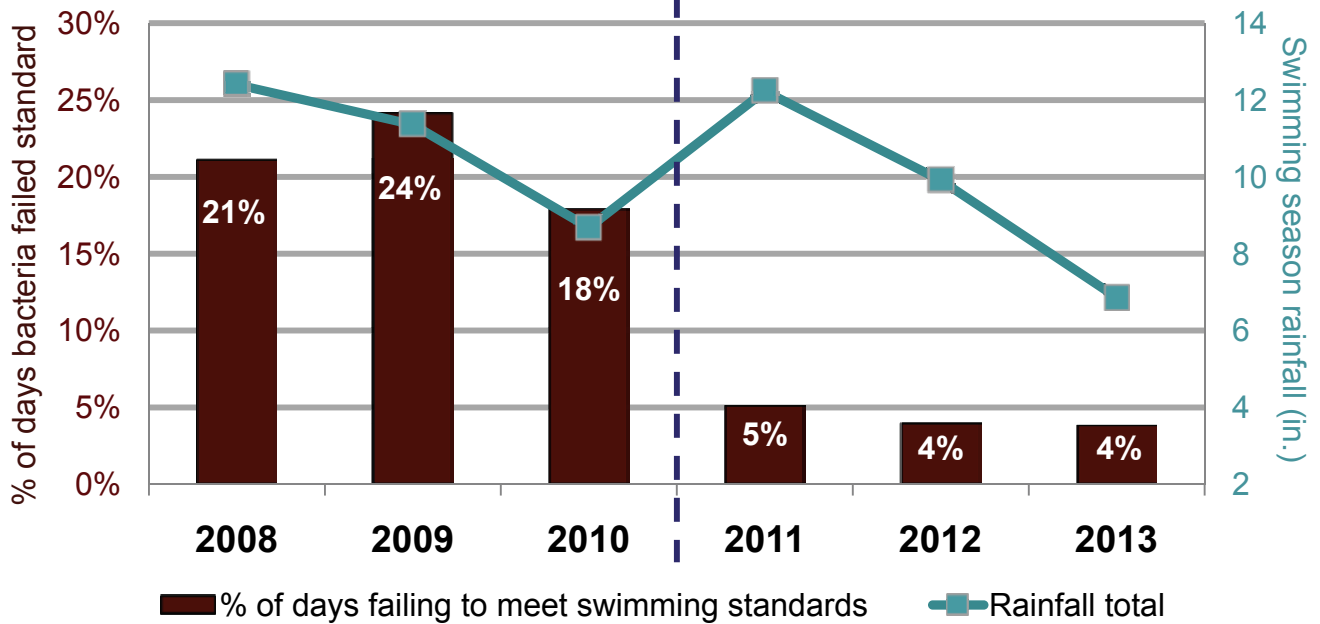
Figure 15
Water Quality Improvements at South Boston Beaches

More beach days were suitable for swimming after 2010



Fewer high-bacteria beach days after 2010

**TUNNEL START-UP
 MAY 2011**



Results from DCR swimming seasons for the years 2008–2013, including daily bacteria samples that meet or failed to meet the posting limit of 104 cfu/100 mL *Enterococcus*. Rainfall totals limited to beach monitoring season only, from Logan NWS rain gauge.

4. REGULATORY AND COURT SCHEDULE COMPLIANCE ACTIVITY

4.1 Regulatory Compliance Activities

In 2013, MWRA continued to respond to the CSO-related requirements and conditions in its NPDES Permit and in the CSO variances for the Alewife Brook/Upper Mystic River and the Lower Charles River Basin (see Section 5.1 for more information about the CSO variances). In 2013, DEP issued three-year extensions to the Alewife Brook/Upper Mystic River Variance (to September 1, 2016) and the Lower Charles River/Charles Basin Variance (to October 1, 2016). Examples of MWRA's compliance with the permit and variance requirements include:

- By April 15th each year, in compliance with the Alewife Brook/Upper Mystic River variance, MWRA and the cities of Cambridge and Somerville issue a joint CSO press release that is also distributed to watershed advocacy groups, local health agents, and the owners of property in the Alewife Brook flood plain. The press release includes updated information describing CSOs, potential health risks of exposure to CSO discharges, locations of CSO discharges, and the status of MWRA's CSO abatement program for the Alewife Brook.
- In compliance with the Lower Charles River Basin variance, MWRA issues notice of each CSO discharge at the Cottage Farm facility to local regulatory agencies, health agents, community rowing and boat houses within 24 hours of the start of discharge. While MWRA has reduced the average annual frequency of Cottage Farm facility discharges from approximately 22 times per year in 1997 to approximately 5 times per year today, Cottage Farm remains the most active CSO outfall on the Charles River and, therefore, an appropriate indicator of CSO discharges from other outfalls.
- In compliance with the Alewife Brook/Upper Mystic River variance, the City of Cambridge issues notice of CSO discharge to the Alewife Brook within 24 hours of a discharge, as measured by a city meter at the most active outfall (CAM401B).
- MWRA continued to conduct its harbor and river water quality sampling and testing program in all waters affected by CSO, collected water quality data throughout the year, and reported the results to EPA and DEP.
- By April 30th each year, MWRA reports its estimates of CSO discharge at every active outfall for all storms in the previous calendar year (see Section 4.2).

4.2 Annual CSO Discharge Reporting and Performance Tracking

In compliance with its NPDES permit and the CSO variances for the Charles River and Alewife Brook/Upper Mystic River, each year MWRA performs a review of facility operation records, meter data and other system performance indicators, updates its collection system hydraulic model, and produces estimates of CSO activations and discharge volume at all active outfalls during the previous calendar year. MWRA submitted the CSO discharge estimates for calendar year 2012 to EPA and DEP on April 30, 2013. The 2012 discharge report included estimates of the number of activations and discharge duration and volume for each of the outfalls that were potentially active that year. MWRA has commenced the model updates for the calendar year 2013 discharge estimates and plans to model the 2013 storms and report the CSO discharge estimates by April 30, 2014.

MWRA incorporates completed sewer system improvements, such as completed CSO projects, other significant system or operational changes and any other new information about system conditions into the

model. Information from facility records is used to configure the facility operational assumptions in the model for each modeled storm event. Meter data and other system performance indicators are used to compare measured conditions to the model results for selected storms. Where field measurement of overflows exists, such as at MWRA's four CSO treatment facilities, activation and volume records are compared to the model results. From a comparison of the data to the model predictions, MWRA is able to gain an assurance of the model's accuracy prior to modeling all of the actual storms in the previous calendar year.

For 2012, MWRA modeled each of the 100 rainfall events that year, as recorded at MWRA, community and USGS rainfall gages. Data from MWRA and community rainfall gages are used to create geographical rainfall inputs to the model. The discharge estimates reported to EPA and DEP are from the model predictions, except at CSO treatment facilities, where MWRA uses measurements from the facility records in lieu of the model predictions. The report includes the number of CSO activations and the total discharge volume for the year at each outfall.

In addition to modeling all of the actual rainfall events for the previous calendar year, MWRA also models the "Typical Year" with the updated model conditions. This allows MWRA to compare the updated system performance against the levels of control in the Long-Term Control Plan and to track progress toward the CSO control goals, which are based on the Typical Year that was approved by EPA and DEP for CSO performance measurement. To be able to understand and explain the estimated discharges for each calendar year, which can vary greatly from Typical Year predictions, MWRA performs a detailed review of the storms to be able to compare the characteristics of the year's actual storms to the characteristics of the storms in the Typical Year.

Updates to MWRA's collection system model from 2012 conditions to 2013 conditions will include as-built plans for the completed Brookline sewer separation project and the completed Reserved Channel sewer separation project Contract 3A. MWRA also plans to incorporate as-built plans for sewer separation work by BWSC that removed large volumes of stormwater from the East Boston collection system tributary to Outfall BOS004 and for CSO regulator work by the City of Cambridge at Outfall CAM017 in the Lower Charles River Basin, where Cambridge replaced a static overflow weir with bending weirs.

4.3 Compliance with Remaining Court Milestones

Schedule Seven in the Federal Court Order includes five 10 CSO milestones in 2014 and beyond. The last CSO milestone date in the Federal Court Order is December 2020, and the last project construction completion milestone is December 2015. Table 4 on the next page lists the remaining milestones and summarizes MWRA's plans for compliance.

5. LONG-TERM CONTROL PLAN AND UPDATED COST

5.1 Regulatory Background

Long-Term Control Plan Approval

In 1987, through a stipulation entered in the Boston Harbor Case (U.S. v. M.D.C., et al., No. 85-0489 MA), MWRA accepted responsibility for developing a control plan to address the discharges from all CSOs hydraulically connected to the MWRA sewer system, including outfalls owned by its member communities. Under a Court-ordered schedule, MWRA recommended a CSO Conceptual Plan in 1994 that included 25 site-specific CSO projects located in Boston, Cambridge, Chelsea and Somerville. The CSO Conceptual Plan was later refined in the 1997 Facilities Plan/EIR.

Massachusetts Water Resources Authority
 Combined Sewer Overflow Control Plan
 Annual Progress Report 2013

**Table 4:
 Remaining Schedule Seven Milestones**

Milestone	Milestone Description	Project Schedule
2014		
Mar 2014	Submit Annual Report	MWRA plans to file the Annual Report for 2013 with the Court on March 15, 2014, and plans to file annual reports by March 15 each year through 2016.
Jun 2014	<i>MWRA to complete construction of interceptor connection relief and floatables control at outfall SOM01A.</i>	MWRA completed this project in December 2013.
Aug 2014	<i>MWRA to commence construction of control gate and floatables control at outfall MWR003 and MWRA Rindge Avenue Siphon relief.</i>	MWRA's design services are on schedule for commencement of construction by August 2014.
2015		
Mar 2015	Submit Annual Report	See Mar 2014
Oct 2015	<i>MWRA to complete construction of control gate and floatables control at outfall MWR003 and MWRA Rindge Avenue Siphon relief.</i>	MWRA's construction schedule calls for substantial completion by October 2015.
Dec 2015	<i>MWRA, in cooperation with Cambridge, to complete construction of CAM004 sewer separation.</i>	The three remaining construction contracts are underway. The City of Cambridge is making every effort during construction to be able to attain substantial completion of all three construction contracts by December 2015.
	<i>MWRA, in cooperation with BWSC, to complete construction of Reserved Channel sewer separation.</i>	BWSC plans to complete the last of nine construction contracts for this project by December 2015. Four construction contracts are substantially complete, and three are well underway. BWSC recently issued notices to proceed with construction of the remaining two contracts.
Beyond 2015		
Mar 2016	Submit Annual Report	See Mar 2014
Jan 2018	<i>MWRA to commence three-year performance assessment of its Long-Term CSO Control Plan. The assessment shall include post-construction monitoring in accordance with EPA's Combined Sewer Overflow (CSO) Policy, 59 Fed. Reg. 18688 (Apr. 19, 1994).</i>	MWRA's Capital Improvement Program includes a three-year performance assessment of its Long-Term Control Plan beginning in January 2018.
Dec 2020	<i>MWRA to submit results of its three-year performance assessment of its Long-Term CSO Control Plan to the EPA and DEP. MWRA to demonstrate that it has achieved compliance with the levels of control (including as to frequency of CSO activation and as to volume of discharge) specified in its Long-Term CSO Control Plan.</i>	MWRA's Capital Improvement Program includes preparation of a report on the results of a three-year performance assessment of its Long-Term Control Plan, to be submitted to EPA and DEP by December 2020.

In March 2006, MWRA reached an agreement with the United States and DEP on the scope and schedule for additional CSO projects, which was filed with the Court as part of a joint motion to amend the Court Schedule. In April 2006, the Court allowed the joint motion and issued an Order with a new schedule. As a result, MWRA's Long-Term Control Plan now includes 35 projects. Under the Order, MWRA has until 2020 to complete the remaining CSO work and subsequent system performance assessment which will be used to verify that the Long-Term Control Plan goals are achieved.

The United States and MWRA also agreed to withdraw their February 27, 1987 Stipulation of the United States and the Massachusetts Water Resources Authority on Responsibility and Legal Liability for Combined Sewer Overflows and replace it with a second CSO stipulation that would require MWRA to implement the CSO requirements set forth in the Court Schedule and to meet the levels of control described in MWRA's Long-Term Control Plan. The documents that recommend MWRA's Long-Term Control Plan, including the 1997 Final CSO Facilities Plan/EIR as amended by subsequent notices of project change and supplemental plans, are identified in the March 15, 2006 Second Stipulation of the United States and the Massachusetts Water Resources Authority on Responsibility and Legal Liability For Combined Sewer Overflows, amended on May 7, 2008.

Variations to Water Quality Standards

On August 29, 2013, DEP issued Final Determinations to extend the CSO-related variances to the water quality standards for Alewife Brook/Upper Mystic River and the Lower Charles River/Charles River Basin. The variance extensions have three-year terms to September 1, 2016 and October 1, 2016, respectively. The variances apply only to the permitted CSO outfalls to these receiving waters and do not otherwise modify Class B water quality standards. In accordance with the variances, CSO discharges from permitted outfalls are not required to meet effluent limits based on the Class B criteria when flow in the collection system exceeds the system's conveyance capacity as a result of precipitation or snow melt. Through its continued implementation of the Nine Minimum Controls, MWRA maintains the conveyance capacity of its collection system and has improved the handling of wet weather flows through system optimization efforts, most recently through improvements to the operation of influent gates at the Prison Point and Cottage Farm CSO treatment facilities implemented in the last few years. The variances require continued implementation of CSO long term control measures consistent with MWRA's Long-Term Control Plan.

The 2013-16 variance extensions acknowledge that it would not be feasible to fully attain the Class B bacteria criteria and associated recreational uses for these receiving waters within that three-year period. The agreement reached by EPA, DEP and MWRA in March 2006 included planned re-issuances of three-year variance extensions to 2020. This agreement was based in part on the determination that implementation of controls necessary for full attainment of the Class B bacteria criteria and associated use would result in substantial and widespread economic and social impact. MWRA expects that DEP will reissue and EPA will approve the variance extensions through 2020 in accordance with the agreement. At that time, with information MWRA is required to provide to verify the level of CSO control attained by MWRA's completed Long-Term Control Plan, MWRA expects that DEP will assess the feasibility of attaining Class B uses and may make long-term water quality standards determinations for these receiving waters.

5.2 Scope, Benefits and Cost of the Approved Plan

The approved Long-Term Control Plan for each receiving water segment is identified in Table 5 on the next page. The CSO control costs by receiving water segment and the total plan cost of \$893.8 million (in December 2014 dollars)² are from MWRA's Proposed FY15 CIP.

² MWRA's Proposed FY15 CIP anticipates a total spending for CSO control of \$897.8 million, including escalation to the midpoint of construction and contingency, to complete the plan on schedule.

Massachusetts Water Resources Authority
 Combined Sewer Overflow Control Plan
 Annual Progress Report 2013

**Table 5:
 Long-Term CSO Control and Cost by Receiving Water Segment**

Receiving Water	CSO Discharge Goals (typical rainfall year)		Projects ⁽¹⁾	Capital Cost ⁽²⁾ (\$ million)
	Activations	Volume (million gallons)		
Alewife Brook/Upper Mystic River	7 untreated and 3 treated @ Somerville Marginal	7.3 3.5	<ul style="list-style-type: none"> • Cambridge/Alewife Sewer Separation • MWR003 Gate and Rindge Siphon Relief • Interceptor Connections/Floatables • Connection/Floatables Control at Outfall SOM01A • Somerville Baffle Manhole Separation • Cambridge Floatables Control (portion) 	97.2
Mystic River/Chelsea Creek Confluence and Chelsea Creek	4 untreated and 39 treated @ Somerville Marginal	0.6 60.6	<ul style="list-style-type: none"> • Somerville Marginal CSO Facility Upgrade • Hydraulic Relief at BOS017 • Chelsea Trunk Sewer Replacement • Chelsea Branch Sewer Relief • CHE008 Outfall Repairs • East Boston Branch Sewer Relief (portion) 	78
Charles River (including Stony Brook and Back Bay Fens)	3 untreated and 2 treated @ Cottage Farm	6.8 6.3	<ul style="list-style-type: none"> • Cottage Farm CSO Facility Upgrade • Stony Brook Sewer Separation • Hydraulic Relief at CAM005 • Cottage Farm Brookline Connection and Inflow Controls • Charles R. Interceptor Gate Controls (study only) • Brookline Sewer Separation <ul style="list-style-type: none"> • Bulfinch Triangle Sewer Separation • MWRA Outfall Closings and Floatables Control • Cambridge Floatables Control (portion) 	91.8
Inner Harbor	6 untreated and 17 treated @ Prison Point	9.1 243.0	<ul style="list-style-type: none"> • Prison Point CSO Facility Upgrade • Prison Point Optimization • BOS019 Storage Conduit • East Boston Branch Sewer Relief (portion) 	61.6
Fort Point Channel	3 untreated and 17 treated @ Union Park	2.5 71.4	<ul style="list-style-type: none"> • Union Park Treatment Facility • BOS072-073 Sewer Separation and System Optimization • BWSC Floatables Control • Lower Dorchester Brook Sewer Modifications 	62.5
Constitution Beach	Eliminate		<ul style="list-style-type: none"> • Constitution Beach Sewer Separation 	3.8
North Dorchester Bay	Eliminate		<ul style="list-style-type: none"> • N. Dorchester Bay Storage Tunnel and Related Facilities • Pleasure Bay Storm Drain Improvements • Morrissey Blvd Storm Drain 	254.4. ⁽³⁾
Reserved Channel	3 untreated	1.5	<ul style="list-style-type: none"> • Reserved Channel Sewer Separation 	65.1
South Dorchester Bay	Eliminate		<ul style="list-style-type: none"> • Fox Point CSO Facility Upgrade (interim improvement) • Commercial Pt. CSO Facility Upgrade (interim improvement) • South Dorchester Bay Sewer Separation 	126.7
Neponset River	Eliminate		<ul style="list-style-type: none"> • Neponset River Sewer Separation 	2.4
Regional			<ul style="list-style-type: none"> • Planning, Technical Support and Land Acquisition 	50.3
TOTAL Treated		413.3 384.8		\$893.8

(1) Floatables controls are recommended at remaining outfalls and are included in the listed projects and capital budgets.

(2) From MWRA's Proposed FY15 Capital Improvement Program.

(3) Not including approximately \$9 million for land, easements and permits, carried in the budget for "Planning, Technical Support and Land Acquisition."

MWRA's Long-Term Control Plan is predicted to reduce annual CSO discharge volume in the typical year from 3.3 billion gallons in 1988 to 0.4 billion gallons in 2015, an 88% reduction. Of the remaining discharge volume, 93% will receive treatment at MWRA's four CSO facilities: Cottage Farm, Prison Point, Somerville Marginal and Union Park. The overall performance goals of this approved plan measured as average annual volume of CSO discharge to each receiving water segment are presented in Table 5 on page 37 and in Figure 9 on page 25. The Long-Term Control Plan also calls for closing 34 of the 84 CSO outfalls addressed in the plan (33 of these are now closed and four other outfalls have been closed by BWSC and the City of Cambridge).

Schedule Seven requires MWRA to undertake a three-year, system-wide performance assessment commencing in January 2018 to verify attainment of the level of CSO control at every outfall in accordance with the plan and in compliance with water quality standards. Schedule Seven also requires MWRA to submit a report on the results of the performance assessment by December 2020. It is at that time that EPA and DEP propose to make final decisions regarding water quality standards for the Charles River and Alewife Brook. If additional CSO control beyond the levels of control in MWRA's long-term plan is deemed by EPA and DEP to be warranted at any outfall, remediation will be the individual responsibility of the respective discharge permittee: MWRA, BWSC, Cambridge or Somerville.

The total CSO program cost has increased from \$867.0 million in the 2012 Annual Report (Proposed FY14 CIP) to \$893.8 million in the 2013 Annual Report (Proposed FY15 CIP), an increase of \$26.8 million (3.1%). While the cost estimates for several projects increased or decreased slightly, the cost estimate for the City of Cambridge-implemented projects, primarily the CAM004 sewer separation project, increased by \$27.4 million due to increases in construction quantities and unit costs. With the recent award of the last Cambridge construction contract (Contract 9), MWRA has greater assurance of the cost to complete the Cambridge CSO projects, though there remains cost risk relative to unforeseen subsurface conditions including utility conflicts, site-specific traffic management needs affecting the cost of police details, and soil handling and disposal.

MWRA anticipates from information it has received from BWSC that MWRA's share of the Reserved Channel sewer separation project will increase by approximately \$3.5 million, from \$65.1 million in the Proposed FY15 CIP to about \$68.5 million. The cost increase is related to an increase in the amount of storm drain installation within two BWSC contract areas where construction is underway – contracts 3B and 4 – as well as additional engineering during construction due to unforeseen utility conflicts.

The approvals MWRA secured from EPA and DEP in 2006 on the revised Long-Term Control Plan, along with the associated changes to the Court Order, provide MWRA more certainty of the scope of its CSO obligations and related capital program revenue need, borrowing calculations, and determination of future rate increases. However, the remaining projects will continue to carry cost and schedule risk until they are completed. This is in part due to the engineering complexities that are faced in the historical and densely urban areas and waterfront environments in which they must be constructed. Subsurface conditions, including soil and groundwater characteristics, soil and groundwater contamination, utilities and other subsurface obstructions, and traffic management, are the key contributors to a continuing level of risk during construction.

5.3 Project Schedules

Most of the CSO projects are complete, and the remaining projects are on schedules intended to meet the milestones set forth in Schedule Seven. Table 6 on the next page presents MWRA's and the CSO communities' schedules for implementing the 35 projects in the Long-Term Control Plan. For more information about ongoing project progress and project schedules relative to the remaining milestones in Schedule Seven, see the project reports in Section 2.3.

**Table 6
CSO Project Cost and Schedules**

Project		Cost ⁽¹⁾ (\$million)	Commence Design	Commence Construction	Complete Construction
North Dorchester Bay Storage Tunnel and Related Facilities		218.4	Aug-97	Aug-06	May-11
Pleasure Bay Storm Drain Improvements		3.2	Sep-04	Sep-05	Mar-06
Hydraulic Relief Projects	CAM005 Relief	2.3	Aug-97	Jul-99	May-00
	BOS017 Relief			Jul-99	Aug-00
East Boston Branch Sewer Relief		85.6	Mar-00	Mar-03	Jul-10
BOS019 CSO Storage Conduit		14.3	Jul-02	Mar-05	Mar-07
Chelsea Relief Sewers	Chelsea Trunk Sewer Relief	29.8	Jun-97	Sep-99	Aug-00
	Chelsea Branch Sewer Relief			Dec-99	Jun-01
	CHE008 Outfall Repairs			Dec-99	Jun-01
Union Park Detention and Treatment Facility		49.6	Dec-99	Mar-03	Apr-07
CSO Facility Upgrades and MWRA Floatables Control	Cottage Farm Facility Upgrade	22.4	Jun-96	Mar-98	Jan-00
	Prison Point Facility Upgrade			May-99	Sep-01
	Commercial Point Facility Upgrade			Nov-99	Sep-01
	Fox Point Facility Upgrade			Nov-99	Sep-01
	Somerville-Marginal Fac. Upgrade			Nov-99	Sep-01
	MWRA Floatables and Closings			Mar-99	Mar-00
Cottage Farm Brookline Connection & Inflow Controls		3.0	Sep-06	Jun-08	Jun-09
Charles River Interceptor Gate Controls (Design)		0.7	Jan-08	⁽²⁾	⁽²⁾
Prison Point CSO Facility Optimization			Mar-06	Mar-07	Apr-08
South Dorchester Bay Sewer Separation		119.0	Jun-96	Apr-99	Jun-07
Stony Brook Sewer Separation		44.3	Jul-98	Jul-00	Sep-06
Neponset River Sewer Separation		2.4		Apr-96	Jun-00
Constitution Beach Sewer Separation		3.8	Jan-97	Apr-99	Oct-00
Fort Point Channel Conduit Sewer Separation		12.0	Jul-02	Mar-05	Mar-07
Morrissey Boulevard Storm Drain		32.8	Jun-05	Dec-06	Jul-09
Reserved Channel Sewer Separation		65.1	Jul-06	May-09	Dec-15
Bulfinch Triangle Sewer Separation		9.9	Nov-06	Sep-08	Jul-10
Brookline Sewer Separation		26.7	Nov-06	Nov-08	Jul-13
Somerville Baffle Manhole Separation ⁽³⁾				Apr-96	Dec-96
Cambridge / Alewife Brook Sewer Separation	CAM004 Outfall and Wetland Basin-92.4	15.6		Apr-11	Apr-13
	CAM004 Sewer Separation	70.4	Jan-97	Sep 12	Dec-15
	CAM400 Manhole Separation	4.8	Oct-08	Jan 10	Mar-11
	Interceptor Connection Relief/Floatables	2.9	Oct-08	Jan 10	Oct-10
	SOM01A Connection with Floatables	0.8	Apr-12	Sep-13	Dec-13
	MWR003 Gate and Rindge Ave. Siphon	3.0	Apr-12	Aug-14	Oct-15
Region-wide Floatables Control and Outfall Closings		0.9	Sep-96	Mar-99	Dec-07
Planning & Support		50.3			
Total Cost		893.8			

⁽¹⁾ From MWRA **Proposed FY15** Capital Improvement Program.

⁽²⁾ Construction of this project was deleted from the CSO Plan and Schedule Seven in April 2011.

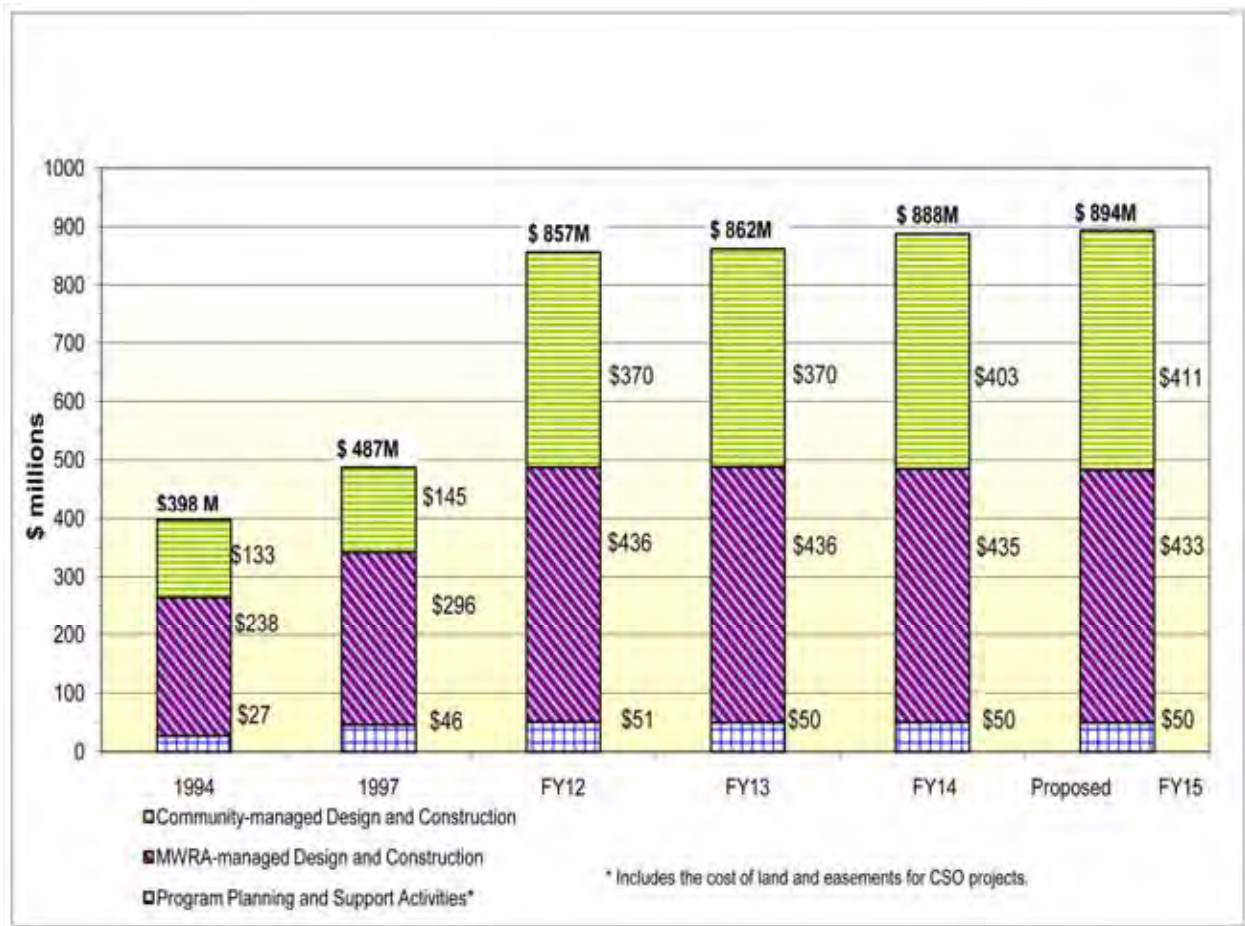
⁽³⁾ Costs in "Planning & Support," below.

5.4 Capital Budget and Spending Projections

As shown in Figure 16, the total cost of the CSO plan (planning, design and construction) rose from \$398 million when MWRA issued the Final CSO Conceptual Plan in 1994, to \$487 million when EPA and DEP approved the Final CSO Facilities Plan and Environmental Impact Report in 1997, to \$894 million in MWRA's Proposed FY15 CIP (December 2014 dollars). With escalation of the CIP budget estimate to the mid-point of construction and contingency, MWRA projects in its Proposed FY15 CIP that it will spend a total \$898 million to complete the plan on its current schedule. As shown in Figure 17 on page 41, MWRA's annual spending on CSO control peaked in FY08 at \$110.5 million and will continue to wind down as the few remaining CSO projects are completed.

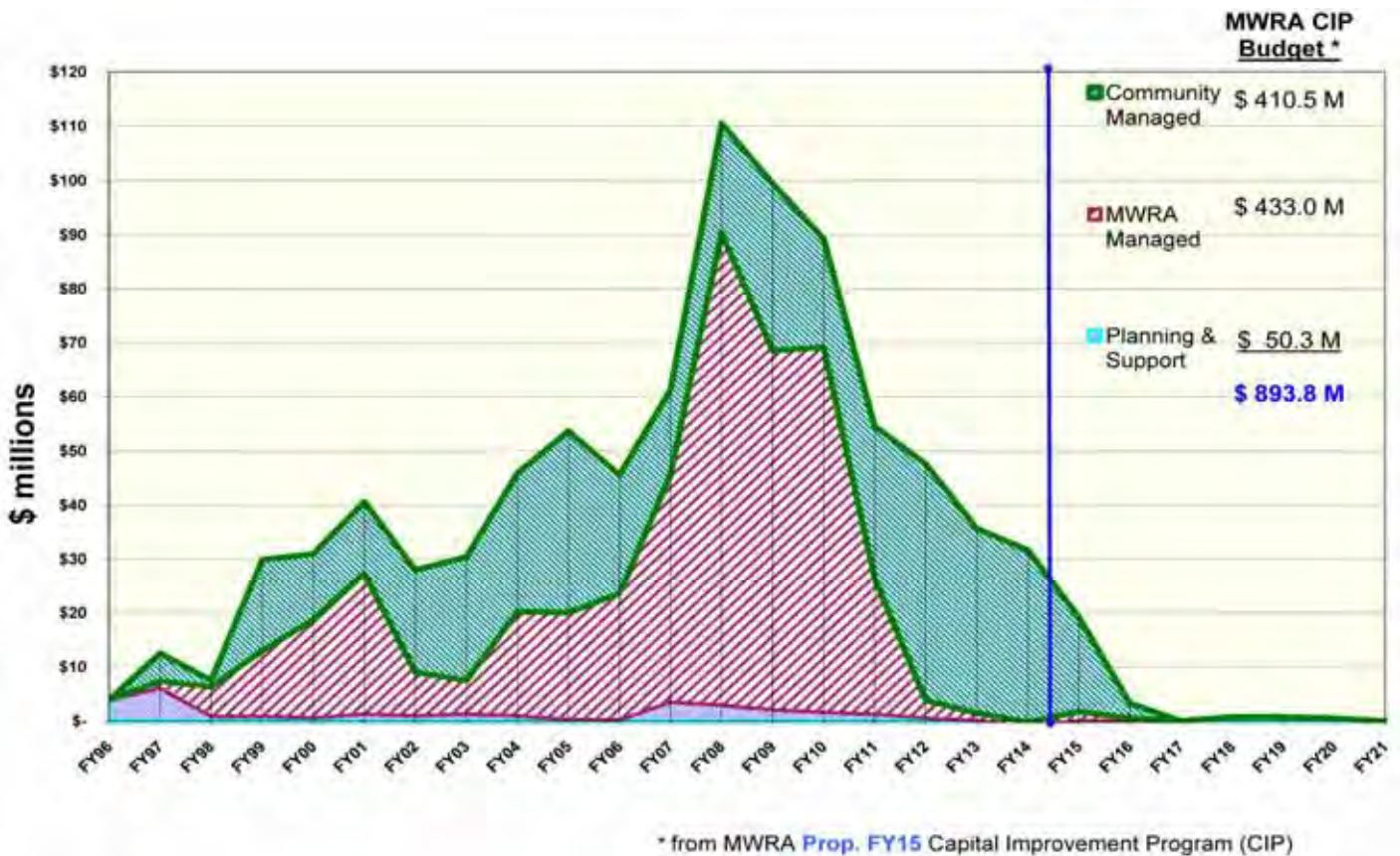
MWRA met the qualification requirements for federal stimulus funding for four CSO Program contracts: North Dorchester Bay pumping station and force main, North Dorchester Bay ventilation building, East Boston Branch Sewer Relief Contract 3, and Reserved Channel Sewer Separation Contract 2. The federal stimulus funding is provided to MWRA through the State Revolving Fund (SRF) program, which is administered by the Massachusetts Pollution Abatement Trust and DEP. With the stimulus funding, MWRA received \$13.8 million in forgiveness of the principle on the SRF loans for these four construction contracts.

Figure 16: MWRA CSO Capital Budget History





CSO spending is scheduled to continue through FY21, when MWRA will complete a sewer system performance assessment verifying attainment of the long-term levels of CSO control. CSO spending will be minor after December 2015 when the last two CSO projects, BWSC's Reserved Channel sewer separation and Cambridge's Alewife Brook CAM004 sewer separation, are scheduled to be complete.

Figure 17: MWRA CSO Program Capital Spending




6. COMPLETED CSO PROJECTS


1. SOMERVILLE BAFFLE MANHOLE SEPARATION		
	<p>Receiving Water: Alewife Brook, Upper Mystic River</p> <p>Completed: 1996</p> <p>Capital Cost: \$400,000</p> <p>Description: Separated common manholes connecting local sewer and storm drain systems. City of Somerville performed design and construction with MWRA financial assistance.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Eliminated CSO discharges at three City of Somerville outfalls.</p> <p>CSO Outfalls: SOM001, SOM006, SOM007</p> <p>Frequency of Discharge (typical year): Before project: 2 With project: Eliminated</p> <p>Annual Discharge Volume (typical year): Before project: 0.04 million gallons With project: Eliminated</p> <p>CSO Reduction by Volume: 100%</p>


2. CONSTITUTION BEACH SEWER SEPARATION		
 <p style="font-size: small;">MWRA decommissioned its Constitution Beach CSO Facility after CSO flows were eliminated by BWSC sewer separation.</p>	<p>Receiving Water: Boston Harbor/Constitution Beach</p> <p>Completed: 2000</p> <p>Capital Cost: \$3,769,000</p> <p>Description: Installed 14,000 linear feet of storm drain to separate the combined sewer system, remove stormwater flows from area sewers, and eliminate CSO discharges to Constitution Beach, allowing MWRA to decommission the Constitution Beach CSO treatment facility.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Eliminated CSO discharges to Constitution Beach to comply with Class B water quality standards.</p> <p>CSO Outfalls: MWR207(BOS002)</p> <p>Frequency of Discharge (typical year): Before project: 16 (treated) With project: Eliminated</p> <p>Annual Discharge Volume (typical year): Before project: 1.35 million gallons With project: Eliminated</p> <p>CSO Reduction by Volume: 100%</p>

Completed CSO Projects (continued)


3. HYDRAULIC RELIEF AT OUTFALL CAM005 4. HYDRAULIC RELIEF AT OUTFALL BOS017		
	<p>Receiving Water: CAM005: Upper Charles River Basin BOS017: Mystic River/Chelsea Creek Confluence</p> <p>Completed: 2000</p> <p>Capital Cost: \$2,295,000</p> <p>Description: CAM005: In Cambridge, relieved the 40-foot long, 24-inch diameter dry weather connection between the CAM005 regulator and MWRA's North Charles Metropolitan Sewer with a 54-inch additional connection. BOS017: In Charlestown, installed 190 feet of 36-inch diameter pipe in Sullivan Square to divert two local (BWSC) combined sewers to a direct connection with MWRA's Cambridge Branch Sewer. In addition, eliminated a 10-foot long restriction between the Charlestown and Cambridge Branch Sewers, adjacent to Sullivan Square.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Minimized CSO discharges to meet B(cso) water quality standards (>95% compliance with Class B).</p> <p>CSO Outfalls: CAM005, BOS017</p> <p>CAM005: Frequency of Discharge (typical year): Before project: 11 With project: 3 Annual Discharge Volume (typical year): Before project: 3.8 million gallons With project: 0.84 million gallons CSO Reduction by Volume: 78%</p> <p>BOS017: Frequency of Discharge (typical year): Before project: 18 With project: 1 Annual Discharge Volume (typical year): Before project: 2.5 million gallons With project: 0.02 million gallons CSO Reduction by Volume: 99%</p>


Completed CSO Projects (continued)

5. NEPONSET RIVER SEWER SEPARATION		
	<p>Receiving Water: Neponset River</p> <p>Completed: 2000</p> <p>Capital Cost: \$2,445,000</p> <p>Description: Installed 8,000 linear feet of storm drain to separate the combined sewer system, remove stormwater flows from area sewers, and close CSO regulators, eliminating CSO discharges at the two remaining CSO outfalls to the Neponset River.</p>	<p>CSO Control</p>
	<p>Water Quality Benefit: Eliminated CSO discharges to Neponset River to comply with Class B water quality standards and protect South Dorchester Bay beaches (Tenean Beach).</p> <p>CSO Outfalls: BOS093, BOS095</p> <p>Frequency of Discharge (typical year): Before project: 17 With project: Eliminated</p> <p>Annual Discharge Volume (typical year): Before project: 5.8 million gallons With project: Eliminated</p> <p>CSO Reduction by Volume: 100%</p>	


6. CHELSEA TRUNK SEWER REPLACEMENT 7. CHELSEA BRANCH SEWER RELIEF 8. CHE008 OUTFALL REPAIRS		
	<p>Receiving Water: Mystic River/Chelsea Creek Confluence Chelsea Creek</p> <p>Completed: 2000-2001</p> <p>Capital Cost: \$29,778,000</p> <p>Description: Replaced 18-inch diameter city-owned trunk sewer with 30-inch pipe, relieved MWRA's Chelsea Branch and Revere Extension Sewers with 48-inch to 66-inch diameter pipe, rehabilitated Outfall CHE008, and installed underflow baffles for floatables control at all outfalls.</p>	<p>CSO Control</p>
	<p>Water Quality Benefit: Minimized CSO discharges to meet B(cso) water quality standards (>95% compliance with Class B).</p> <p>CSO Outfalls: CHE002, CHE003, CHE004, CHE008</p> <p>Frequency of Discharge (typical year): Before project: 8 With project: 4</p> <p>Annual Discharge Volume (typical year): Before project: 9.0 million gallons With project: 0.6 million gallons</p> <p>CSO Reduction by Volume: 93%</p>	


Completed CSO Projects (continued)

<p>9. UPGRADE COTTAGE FARM CSO FACILITY 10. UPGRADE PRISON POINT CSO FACILITY 11. UPGRADE SOMERVILLE MARGINAL CSO FACILITY 12. UPGRADE FOX POINT CSO FACILITY 13. UPGRADE COMMERCIAL POINT CSO FACILITY</p>		
	<p>Receiving Water: Lower Charles River Basin Upper Inner Harbor Upper Mystic River Mystic River/Chelsea Creek Confluence South Dorchester Bay</p> <p>Completed: 2001</p> <p>Capital Cost: \$22,261,000</p> <p>Description: Upgraded chlorine disinfection systems, added dechlorination systems, process control and safety improvements.</p>	<p>CSO Control</p>
		<p>Water Quality Benefit: Upgrade treatment to meet water quality standards criteria, including residual chlorine limits.</p> <p>CSO Outfalls: MWR201 (Cottage Farm Facility) MWR203 (Prison Point Facility) MWR205, MWR205A(SOM007A) (Somerville Marginal Facility) MWR209(BOS088/BOS089) (Fox Point Facility) MWR211(BOS090) (Commercial Point Facility)</p> <p>These projects improved treatment performance, with no effect on discharge frequency or volume.</p>


<p>14. PLEASURE BAY STORM DRAIN IMPROVEMENTS</p>		
	<p>Receiving Water: North Dorchester Bay</p> <p>Completed: 2006</p> <p>Capital Cost: \$3,195,000</p> <p>Description (cont): Constructed a new storm drain system to relocate stormwater discharge from Pleasure Bay to Reserved Channel.</p>	<p>CSO Control</p>
		<p>Water Quality Benefit: Eliminated storm water discharges to Pleasure Bay Beach.</p>


Completed CSO Projects (continued)

15. STONY BROOK SEWER SEPARATION		
	<p>Receiving Water: Lower Charles River Basin</p> <p>Completed: 2006</p> <p>Capital Cost: \$44,333,000</p> <p>Description: Installed a total of 107,175 linear feet of storm drain and sanitary sewer to remove stormwater from local sewers serving a 609-acre area in Jamaica Plain, Mission Hill and Roxbury, and disconnected an already-separated storm drain system serving an adjacent 548-acre area from the sewer system.</p>	CSO Control
	<p>Water Quality Benefit: Minimizes CSO discharges to meet B(cso) water quality standards (>95% compliance with Class B).</p> <p>CSO Outfalls: MWR023 (Stony Brook Conduit)</p> <p>Frequency of Discharge (typical year): Before project: 22 With project: 2</p> <p>Annual Discharge Volume (typical year): Before project: 44.5 million gallons With project: 0.13 million gallons</p> <p>CSO Reduction by Volume: 99.7%</p>	


16. SOUTH DORCHESTER BAY SEWER SEPARATION		
	<p>Receiving Water: South Dorchester Bay</p> <p>Completed: 2007</p> <p>Capital Cost: \$118,999,000</p> <p>Description: Installed a total of 150,000 linear feet of storm drain and sanitary sewer to remove stormwater from local sewers serving a 1,750-acre area in Dorchester. Closed all CSO regulators, allowing MWRA to decommission its Fox Point and Commercial Point CSO facilities.</p>	CSO Control
	<p>Water Quality Benefit: Eliminated CSO discharges to Savin Hill, Malibu and Tenean beaches, in compliance with Class B water quality standards.</p> <p>CSO Outfalls: MWR209 (BOS088/BOS089) MWR211 (BOS090)</p> <p>Frequency of Discharge (typical year): Before project: 20 (treated) With project: Eliminated</p> <p>Annual Discharge Volume (typical year): Before project: 30 million gallons With project: Eliminated</p> <p>CSO Reduction by Volume: 100%</p>	


Completed CSO Projects (continued)

17. FORT POINT CHANNEL SEWER SEPARATION		
	<p>Receiving Water: Fort Point Channel</p> <p>Completed: 2007</p> <p>Capital Cost: \$12,007,000</p> <p>Description: Installed 4,260 feet of storm drain and 4,300 feet of sanitary sewer to remove stormwater from local sewers serving 55 acres in the Fort Point Channel area. Raised overflow weirs at outfalls BOS072 and BOS073. Replaced tide gates and installed underflow baffles for floatables control at both outfalls.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Minimizes CSO discharges to meet B(cso) water quality standards (>95% compliance with Class B).</p> <p>CSO Outfalls: BOS072, BOS073</p> <p>Frequency of Discharge (typical year): Before project: 9 With project: 0</p> <p>Annual Discharge Volume (typical year): Before project: 3.0 million gallons With project: 0.0</p> <p>CSO Reduction by Volume: 100%</p>


18. REGIONWIDE FLOATABLES CONTROL 19. MWRA FLOATABLES CONTROL AND OUTFALL CLOSING PROJECTS		
	<p>Receiving Water: Region-wide</p> <p>Completed: 2007</p> <p>Capital Cost: \$1,216,000</p> <p>Description: Installed underflow baffles for floatables controls and closed several regulators and outfalls.</p> <p>In March 2000, MWRA closed Outfalls MWR021 and MWR022 to CSO discharges.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Complies with EPA Policy Nine Minimum Controls requirement to control solid and floatable material. Eliminated CSO discharges at certain outfalls.</p> <p>CSO Outfalls: Various outfalls system-wide.</p> <p>CSO Control: The floatables controls do not affect CSO discharge frequency or volume.</p>


Completed CSO Projects (continued)

20. UNION PARK DETENTION/TREATMENT FACILITY		
	<p>Receiving Water: Fort Point Channel</p> <p>Completed: 2007</p> <p>Capital Cost: \$49,583,000</p> <p>Description: Added CSO treatment facility to existing BWSC Union Park Pumping Station with fine screens, chlorine disinfection, dechlorination, and 2 million gallons of detention storage.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Provides treatment of Union Park pumping station discharges to Fort Point Channel to meet Class B water quality criteria, including residual chlorine limits, and lowers discharge frequency and volume with on-site detention basins.</p> <p>CSO Outfall: BOS 070</p> <p>Frequency of Discharge (typical year): Before project: 25 (untreated) With project: 17 (treated)</p> <p>Annual Discharge Volume (typical year): Before project: 132.0 million gallons With project: 71.4 million gallons/year</p> <p>CSO Reduction by Volume: 46%</p>


21. BOS019 CSO STORAGE CONDUIT		
	<p>Receiving Water: Upper Inner Harbor (Little Mystic Channel)</p> <p>Completed: 2007</p> <p>Capital Cost: \$14,288,000</p> <p>Description: Installed twin-barrel 10'x17' box conduit to provide 670,000 gallons of off-line storage, between Chelsea St. and the Mystic Tobin Bridge, Charlestown. Included above-ground dewatering pump station.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Minimizes CSO discharges to meet B(cso) water quality standards (>95% compliance with Class B).</p> <p>CSO Outfall: BOS019</p> <p>Frequency of Discharge (typical year): Before project: 13 With project: 2</p> <p>Annual Discharge Volume (typical year): Before project: 4.4 million gallons With project: 0.6 million gallons</p> <p>CSO Reduction by Volume: 86%</p>


Completed CSO Projects (continued)

22. PRISON POINT CSO FACILITY OPTIMIZATION		
	<p>Receiving Water: Upper Inner Harbor</p> <p>Completed: 2008</p> <p>Capital Cost: \$50,000</p> <p>Description: Minimizes treated CSO discharges to the Inner Harbor by optimizing the operation of existing facility gates and pumps to maximize in-system storage and convey more flow to Deer Island</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Reduces treated CSO discharges to Upper Inner Harbor.</p> <p>CSO Outfall: MWR203 (Prison Point Facility)</p> <p>Frequency of Discharge (typical year): Before project: 30 (treated) With project: 17 (treated)</p> <p>Annual Discharge Volume (typical year): Before project: 335 million gallons With project: 243 million gallons</p> <p>CSO Reduction by Volume: 27% (with Bulfinch Triangle Sewer Separation)</p>


23. COTTAGE FARM BROOKLINE CONNECTION AND INFLOW CONTROLS		
	<p>Receiving Water: Lower Charles River Basin</p> <p>Completed: 2009</p> <p>Capital Cost: \$3,000,000</p> <p>Description: Optimizes the combined conveyance capacity of the two MWRA sewers that carry flows across the Charles River by interconnecting overflow chambers outside the Cottage Farm CSO facility; increases this conveyance capacity by bringing into service a parallel, previously unutilized 54-inch diameter sewer (the "Brookline Connection").</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Minimizes treated CSO discharges from the Cottage Farm CSO Facility to the Lower Charles River Basin.</p> <p>CSO Outfall: MWR201 (Cottage Farm Facility)</p> <p>Frequency of discharges (typical year): Before project: 7 (treated) With project: 7 (treated)</p> <p>Annual Discharge Volume (typical year): Before project: 44.5 million gallons With project: 24.0 million gallons</p> <p>CSO Reduction by Volume: 46%</p>


Completed CSO Projects (continued)

24. MORRISSEY BOULEVARD STORM DRAIN		
	<p>Receiving Water: North Dorchester Bay</p> <p>Completed: 2009</p> <p>Capital Cost: \$32,815,000</p> <p>Description: Installed 2,800 linear feet of 12-foot by 12-foot and 8-foot by 8-foot box conduit for stormwater conveyance, with gated connection to North Dorchester Bay CSO Storage Tunnel at upstream end, new outfall to Savin Hill Cove, and pollution prevention measures.</p>	<p>CSO Control</p>
	<p>Water Quality Benefit: Maximizes level of stormwater control along the South Boston beaches by redirecting some stormwater to Savin Hill Cove in large storms.</p>	


25. EAST BOSTON BRANCH SEWER RELIEF		
	<p>Receiving Water: Boston Harbor and Chelsea Creek</p> <p>Completed: 2010</p> <p>Capital Cost: \$85,638,000</p> <p>Description: Upgraded MWRA's 115-year-old interceptor system serving most of East Boston, using a combination of construction methods: microtunneling, pipe-bursting, open-cut excavation and pipe relining.</p>	<p>CSO Control</p>
	<p>Water Quality Benefit: Minimizes CSO discharges to meet B(cso) water quality standards (>95% compliance with Class B).</p> <p>CSO Outfalls: BOS003, BOS004, BOS005, BOS009, BOS010, BOS012, BOS013, BOS014 (BOS006 and BOS007 closed by BWSC)</p> <p>Frequency of discharges (typical year): Before project: 31 With project: 6</p> <p>Annual Discharge Volume (typical year): Before project: 41.0 million gallons With project: 8.6 million gallons</p> <p>CSO Reduction by Volume: 79%</p>	


Completed CSO Projects (continued)

26. BULFINCH TRIANGLE SEWER SEPARATION		
	<p>Receiving Water: Boston Inner Harbor and Lower Charles River Basin</p> <p>Completed: 2010</p> <p>Capital Cost: \$9,944,000</p> <p>Description: Installed a total of 5,290 feet of storm drain and sanitary sewer to remove stormwater from local sewers in a 14-acre area of Bulfinch Triangle/North Station, allowing already-separated storm drains serving an additional 47-acre area of Government Center to be removed from the sewer system, as well. Closed Outfall BOS049 to CSO discharges.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Reduces treated CSO discharges from the Prison Point CSO Facility to Boston Upper Inner Harbor. Eliminated CSO discharges at Outfall BOS049 to Lower Charles River Basin.</p> <p>CSO Outfalls: MWR203 (Prison Point Facility) and BOS049</p> <p>Frequency of discharges (typical year): MWR203 before project: 18 (treated) MWR203 with project: 17 (treated)</p> <p>Annual Discharge Volume (typical year): MWR203 before project: 282 mil. gals. MWR203 with project: 243 mil. gals.</p> <p>CSO Reduction by Volume Prison Point Facility: 14% BOS049: 100%</p>

27. INTERCEPTOR CONNECTION RELIEF AND FLOATABLES CONTROL AT CAM002 AND CAM401B AND FLOATABLES CONTROL AT CAM001		
 <p style="font-size: small;">CAM 002A & B inlet structure-baffle is visible in front of CAM 002A outlet with a steel plate (temporary condition) bolted on the left hand wall on the CAM 002B outlet.</p>	<p>Receiving Water: Alewife Brook</p> <p>Completed: 2010</p> <p>Capital Cost: \$3,500,000</p> <p>Description: Upgraded the hydraulic capacities of City of Cambridge connections to MWRA interceptors and installed underflow baffles for floatables control.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Together with other Alewife Brook CSO projects (not yet complete), minimizes CSO discharges and their impacts to meet “fishable/swimmable” criteria 98% of the time.</p> <p>CSO Outfalls: CAM002, CAM401B, CAM001</p>

Completed CSO Projects (continued)

28. CAM400 COMMON MANHOLE SEPARATION		
 <p>The map shows the CAM400 area in Arlington, Massachusetts. It highlights several 30-inch CSO locations with yellow circles and shows the locations of separated manholes with blue squares. A legend indicates that blue squares represent 'Separated Manhole'. The map also shows the Alewife Brook Parkway, Massachusetts Avenue, and Whittemore Avenue.</p>	<p>Receiving Water: Alewife Brook</p> <p>Completed: March 2011</p> <p>Capital Cost: \$3,300,000</p> <p>Description: Replaced common storm drain and sewer manholes with separate manholes and associated piping in the local, mostly residential streets bounded by Alewife Brook Parkway, Massachusetts Avenue, Magoun Street and Whittemore Avenue, as well as a portion of the WR Grace property off Whittemore Avenue</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Eliminated CSO discharges to Alewife Brook at Outfall CAM400.</p> <p>CSO Outfalls: CAM400</p> <p>Frequency of Discharge (typical year) Before project: 8 After project: 0</p> <p>Annual Discharge Volume (typical year) Before project: 0.63 million gallon After project: 0</p> <p>CSO Reduction by Volume: 100%</p>

29. NORTH DORCHESTER BAY STORAGE TUNNEL & RELATED FACILITIES		
 <p>The aerial map shows the North Dorchester Bay area. It highlights the 10,832-ft., 17-ft. diameter soft-ground tunnel, drop shafts, and CSO and stormwater diversion structures along outfalls BOS081-BOS087. Callouts on the map include: '15 High Pump Station for Tunnel (Completed)', 'Secondary Pump Station for BOS082, BOS084, BOS086', '17-ft. Soft Ground Tunnel (Completed Jan. 2011)', 'Stormwater Diversion (Completed Jan. 2011)', and 'Morrissey Blvd Storm Drain (Completed Jan. 2011)'. A small 'A' is in the bottom left corner of the map.</p>	<p>Receiving Water: North Dorchester Bay</p> <p>Capital Cost: \$237,241,000 (not including the cost of Morrissey Boulevard storm drain (Project 24))</p> <p>Completed: May 2011</p> <p>Description: Constructed a 10,832-ft., 17-ft. diameter soft-ground tunnel, drop shafts and CSO and stormwater diversion structures along outfalls BOS081-BOS087; 15-mgd tunnel dewatering pump station at Massport's Conley Terminal; 24-inch force main; and below-ground tunnel ventilation and odor control facility at the upstream end of the tunnel. Eliminated outfalls BOS083 and BOS087.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Eliminated CSO and separate stormwater discharges up to the 25-year storm and 5-year storm, respectively.</p> <p>CSO Outfalls: BOS081 BOS083 BOS085 BOS087 BOS082 BOS084 BOS086</p> <p>Frequency of Discharge (typical year) CSO: Before project: 17 After project: 0 Stormwater: Before project: 93 After project: 0</p> <p>Annual Discharge Volume (typical year) CSO: Before project: 8.6 million gals After project: 0 Stormwater: Before project: 144 million gals After project: 0</p> <p>CSO Reduction by Volume: 100% Stormwater Reduction by Volume: 100%</p>

30. Brookline Sewer Separation



Receiving Water:
 Lower Charles River Basin

Capital Cost:
 \$26,652,000

Completed: April 2013

Description:
Total area separated: >70 acres
Construction contracts:
 Brookline Phase I : \$1.4 M
 Nov 2008 - Jan 2010
 5,658 lf of storm drain

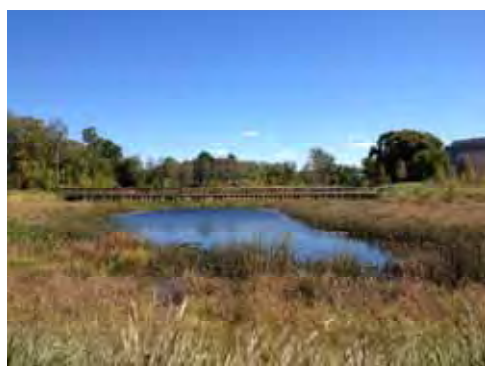
Brookline Phase II: \$17.0 M
 Jan 2011 - April 2013
 3,790 lf of storm drain
 1,290 lf of sewer (open trench)
 4,550 lf of sewer (microtunneling)

MWRA Outfall Cleaning: \$1.1 M
 Apr 2012 – Aug

CSO Control

Water Quality Benefit:
 Supports the attainment of long term CSO control at the Cottage Farm CSO facility.

31. CAM004 Stormwater Outfall and Wetland Basin



Receiving Water:
 Alewife Brook

Capital Cost:
 \$15,503,000


Completed: April 2013

Description:
 Constructed a new f-foot by 8-foot box culvert storm drain to convey the separated stormwater to a new 3.4 acre wetland in the Alewife Brook Reservation. The wetland will provide 10.3 acre-feet of detention storage of stormwater flows and the attenuation of stormwater flow rate to the Little River and Alewife Brook.

CSO Control

Water Quality Benefit:
 Supports the CSO benefits of CAM004 Sewer Separation by mitigating the potential impacts of separated stormwater discharges on flood levels and pollutant concentration in the Little River and Alewife Brook.

32. SOM01A Interceptor Connection Relief/Floatables Controls

 <p>A technical map showing the project location. A blue line represents the sewer connection between the City of Somerville's Tannery Brook Conduit and MWRA's interceptor system. The map includes labels for 'Alewife Brook', 'Tannery Brook Conduit', and 'MWRA Interceptor System'. A scale bar at the bottom right indicates 'SCALE IN FEET'.</p>	<p>Receiving Water: Alewife Brook</p> <p>Capital Cost: \$0.8 M</p> <p>Completed: December 2013</p> <p>Description: Upgraded the size of the local sewer connection between City of Somerville's Tannery Brook Conduit and MWRA's interceptor system and installed an underflow baffle to control the discharge of floatable materials.</p>	<p style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Reduces CSO discharges to the Alewife Brook and provides floatables control for remaining discharges at the City of Somerville's Outfall SOM01A.</p>
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One of several interpretive markers in the public access areas surrounding the new Alewife Reservation Stormwater Wetland

-The End-