

Massachusetts Water Resources Authority



Combined Sewer Overflow Control Plan



Annual Progress Report 2014

March 2015

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Thirty-two of the 35 projects in MWRA's approved Long-Term CSO Control Plan are complete and are performing as intended. The three remaining projects are well into construction and will be complete by December 2015, in compliance with respective milestones in the Federal District Court's Schedule Seven. They are (clockwise, from upper left): Reserved Channel Sewer Separation managed by Boston Water and Sewer Commission; Gate, Siphon Relief and Floatables Control at Outfall MWR003 managed by MWRA; and CAM004 Sewer Separation managed by City of Cambridge.

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INTRODUCTION

The Massachusetts Water Resources Authority (MWRA) files this Combined Sewer Overflow Annual Progress Report for 2014 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 2014 and in the quarterly period December 16, 2014, to March 13, 2015, and discusses known issues that have the potential to affect MWRA’s ability to complete the CSO projects on schedule. Like previous annual CSO reports, it also presents information on the scope, goals, benefits and updated 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, the Annual Report 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 implementation status of each project. Figure 2 on page 4 summarizes the scope, schedule and predicted benefits of the 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 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. These are also discussed in this report.

2. CSO CONTROL PROGRESS

2.1 2014 Progress Highlights and Accomplishments

In 2014, 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 \$22.1 million in 2014 to implement CSO projects and fund the eligible CSO work by BWSC and the City of Cambridge. Nearly all of this spending was for construction related activities. MWRA and the CSO communities achieved the following CSO control milestones and progress in 2014:

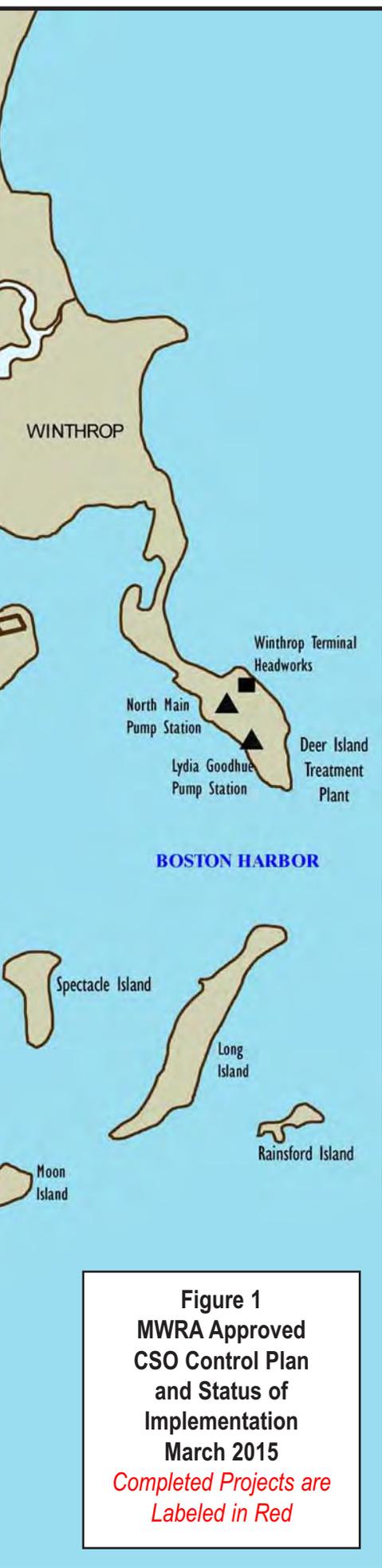
- **Commencement of construction of the Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief project.** On August 28, 2014, in advance of the corresponding milestone in Schedule Seven, MWRA issued the Notice to Proceed with the construction of the \$2.7 million contract for the Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon

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.”



LEGEND

- CSO Outfall Closed
- CSO Outfall to be Closed
- CSO Outfall w/25-year Storm Control
- CSO Outfall to Remain
- ▲ Existing Pump Station
- ◆ Existing CSO Treatment Facility
- Existing Headworks
- Existing Conduit/Pipeline/Connection
- Decommissioned CSO Facility
- Conduit/Pipeline/Connection Project
- Sewer Separation Area



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 |
| MWR003 Gate and Rindge Ave. Siphon Relief * | 2015 |

In Design

Design is complete for all projects

* 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
 \$898.3 Million
 Net Annual O&M
 \$1.5 Million

Relief project, which is the last of the 35 CSO projects to enter into construction. With the commencement of construction of this project, all of the 35 projects are complete or in construction. The project is located adjacent to the MBTA Alewife Station in Cambridge and is one of six projects in the plan to control CSO discharges to Alewife Brook. The contract completion date is October 2015, in compliance with Schedule Seven, and construction is 40% complete as of February 2015.



**Installation of Steel Sheet Piling for Excavation Support
48-inch Rindge Ave. Siphon at Outfall MWR003**



**Storm Drain Manhole, Concord Avenue
CAM004 Sewer Separation Contract 9**

- **Continued progress with construction of the \$71.8 million CAM004 Sewer Separation project.** The City of Cambridge attained substantial completion of the CSO related work in the \$17.8 million Contract 8A (Huron A), 77% completion of the CSO related work in the \$31.2 million Contract 8B (Huron B) and 58% completion of the CSO related work in the \$24.4 million Contract 9. In December 2014, Cambridge advertised the construction contract for sewer separation along Concord Lane, the last of the sewer separation contracts for this project. Cambridge expects to issue the Notice to Proceed soon and complete all CSO related work by December 2015 in compliance with Schedule Seven. The CAM004 sewer separation project will reduce CSO discharges to the Alewife Brook and close Outfall CAM004.
- **Continued progress with construction of the \$72.6 million Reserved Channel Sewer Separation project, including recent substantial completion of one major sewer separation contracts and anticipated substantial completion of another in early 2015.** BWSC attained substantial completion of the \$13.7 million Contract 3B in November 2014 and anticipates substantial completion of the \$13.9 million Contract 4 in March 2015. Contract 8, which provides for final paving as each stretch of sewer separation is completed, is 50% complete. In 2014, BWSC also issued notices to proceed for the last two construction contracts for this project: the \$4.8 million Contract 5 for cleaning and lining of the BWSC sewers in the Reserved Channel area and the \$211,000 Contract 6 for disconnection of downspouts from the sewer system in the project area. BWSC previously completed the other four construction contracts, including two major sewer separation contracts, and is on schedule to complete the project by December 2015, in compliance with Schedule Seven.



**Installation of 48-inch Drain on E. Third Street
Reserved Channel Sewer Separation Contract 3B**

With the work described above, MWRA and the CSO communities installed 47,554 linear feet (9 miles) of new storm drain and sanitary sewer in the communities of Boston and Cambridge in 2014. Since 1996, when CSO construction efforts began, approximately 497,500 linear feet (94.2 miles) of new storm drain and sanitary sewer have been installed under the Long-Term Control plan.

MWRA and the CSO communities have completed 32 of the 35 projects in the Long-Term Control Plan. The remaining three projects – Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief; CAM004 Sewer Separation; and Reserved Channel Sewer Separation – are well into construction and are on schedules for completion by December 2015 and in compliance with their respective milestones in Schedule Seven.

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 38 of the 84 outfalls addressed in the Long-Term Control Plan, more than the number of outfalls recommended for closure in the plan and one more than reported last year. On December 4, 2014, the City of Chelsea permanently closed Outfall CHE002 to CSO discharges following the City's completion of a sewer separation project that was outside the scope of the Long-Term Control Plan. The outfall now serves as a city stormwater discharge. Four outfalls were previously closed by BWSC and the City of Cambridge – East Boston outfalls BOS006 and BOS007 to Boston Inner Harbor and Cambridge outfalls CAM009 and CAM011 to the Charles River Basin – also through efforts outside the scope of the Long-Term Control Plan. Of the 34 outfalls recommended for closure in the Long-Term Control Plan, only Outfall CAM004 to Alewife Brook remains active, and Cambridge plans to close this outfall with completion of the CAM004 Sewer separation project in December 2015.

2.2 Court Schedule Compliance and Compliance Risks

MWRA met all three of the calendar year 2014 milestones in Schedule Seven. MWRA filed the CSO Annual Progress Report for 2013 on March 14, 2014; achieved substantial completion of the Interceptor Connection Relief and Floatables Controls at Outfall SOM01A project on December 27, 2013, ahead of the of the June 2014 milestone; and issued notice to proceed for construction of the Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief project on August 28, 2014, ahead of the September 2014 milestone.

Schedule Seven calls for the last of the CSO projects to be completed by December 2015 and includes three completion milestones in 2015 for the ongoing construction projects noted above. MWRA's Alewife Brook project at Outfall MWR003 is on schedule for completion by the October 2015 milestone. Cambridge's CAM004 sewer separation project and BWSC's Reserved Channel sewer separation project are on schedule for completion by the December 2015 milestones.

All three projects are subject to the risks commonly associated with the construction of major subsurface infrastructure projects in dense urban areas, including but not limited to unforeseen subsurface conditions and traffic impact mitigation. All three projects involve work in areas with congested utilities, and the two sewer separation projects have required extensive utility relocations and been subject to work and cost increases due to utility conflicts discovered during construction that were not anticipated during design. Weather conditions, especially winter conditions, have also affected production rates.

The risks are especially significant for the CAM004 sewer separation project, due to the potential for greater traffic and utility conflicts, the number of contracts and work locations simultaneously underway, and the amount of work that must be accomplished by December 2015. Furthermore, Cambridge has reported that remaining work activities of contracts 8B, 9 and Concord Lane are on the critical path, with no float time. The City of Cambridge and MWRA are jointly monitoring monthly construction progress on all contracts in an attempt to ensure that the work remains on schedule. This is particularly important for Contract 8B, for which Cambridge issued, and MWRA authorized, a costly construction change order in the fall of 2014 for a recovery schedule due to delays caused by Winter 2014 conditions and delays in the relocation of private utilities by others.

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 primarily by separating combined sewer systems in parts of Cambridge and by upgrading hydraulic capacities at local sewer 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), each with its own design and construction milestones in Schedule Seven (Table 2 on page 8). 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 figures 3 and 4 on pages 9 and 10.

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% of the time.

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 and Concord Lane | 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.

CAM004 Sewer Separation

Cambridge has continued to make substantial progress with the three remaining construction contracts previously reported – contracts 8A (Huron A), 8B (Huron B), and 9 (Concord) – as well as substantial progress with design and construction of a fourth, new contract, “Concord Lane,” to complete the CAM004 sewer separation project. The four contracts involve the separation of combined sewers upstream of Outfall CAM004 in a 211-acre area in the Huron Avenue and Concord Avenue neighborhoods east of Fresh Pond Parkway (see Figure 3 on page 9).

Cambridge issued the Notice to Proceed with construction of the \$17.8 million Contract 8A in September 2012, in compliance with Schedule Seven, and attained substantial completion of the sewer separation work of this contract for CSO control in the spring of 2014. Contract 8A includes the installation of approximately 20,700 linear feet of sanitary sewers and storm drains up to 54-inch diameter along Huron Avenue and several intersecting streets in a 68-acre area immediately east of Fresh Pond Parkway. 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 pump discharges from the sewer system, and 6,700 linear feet of replacement water main ranging from 6-inch to 12-inch diameter. Surface restoration work and environmental improvements in Contract 8A, including porous pavements, stormwater bio-basins, and trees and other plantings, will continue through June 2015.

Cambridge issued the Notice to Proceed with the \$31.2 million Contract 8B in September 2013 and has attained 77% completion of the contract’s sewer separation work for CSO control. 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 along Huron Avenue and several intersecting streets in an 83-acre area east of Contract 8A.

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

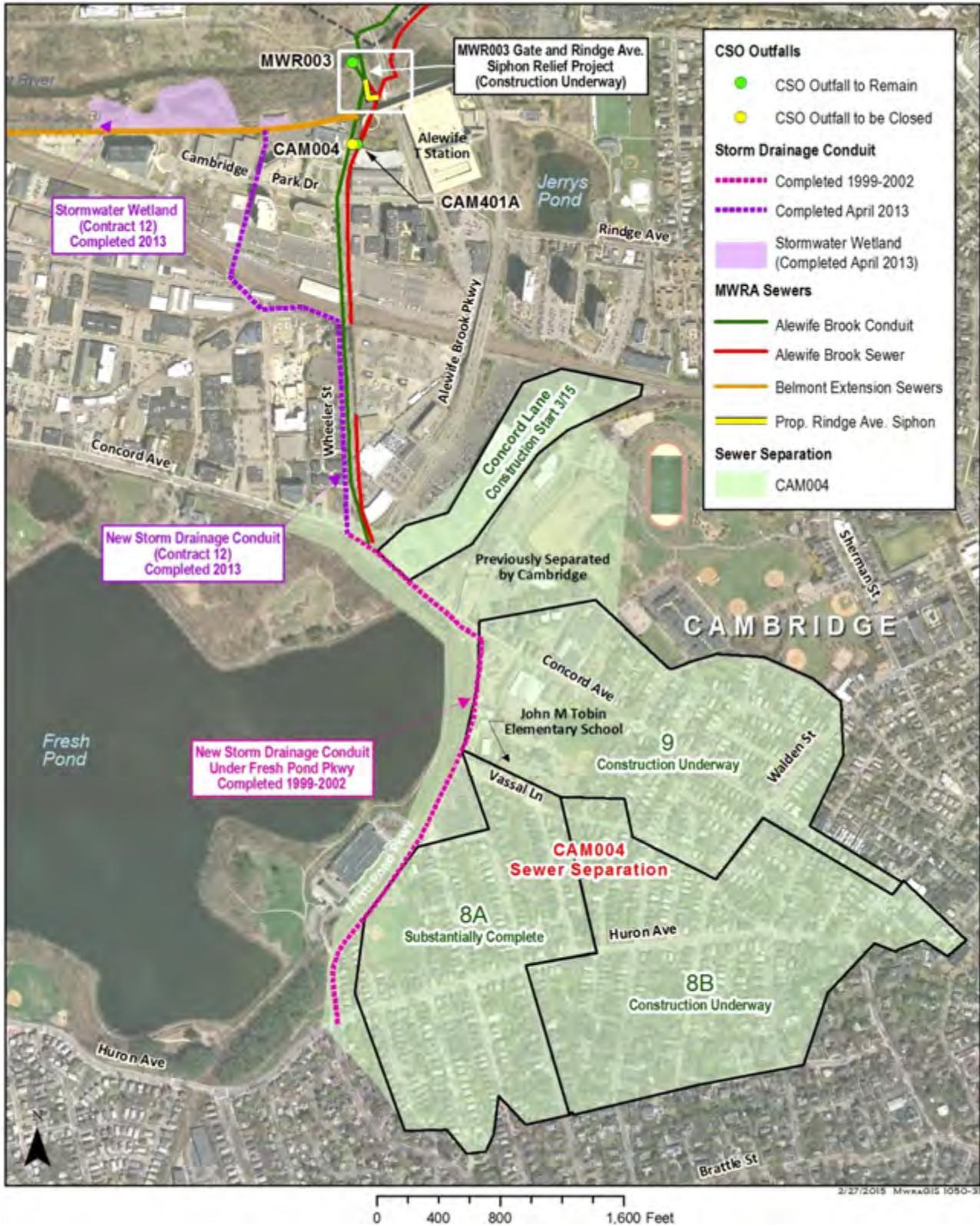
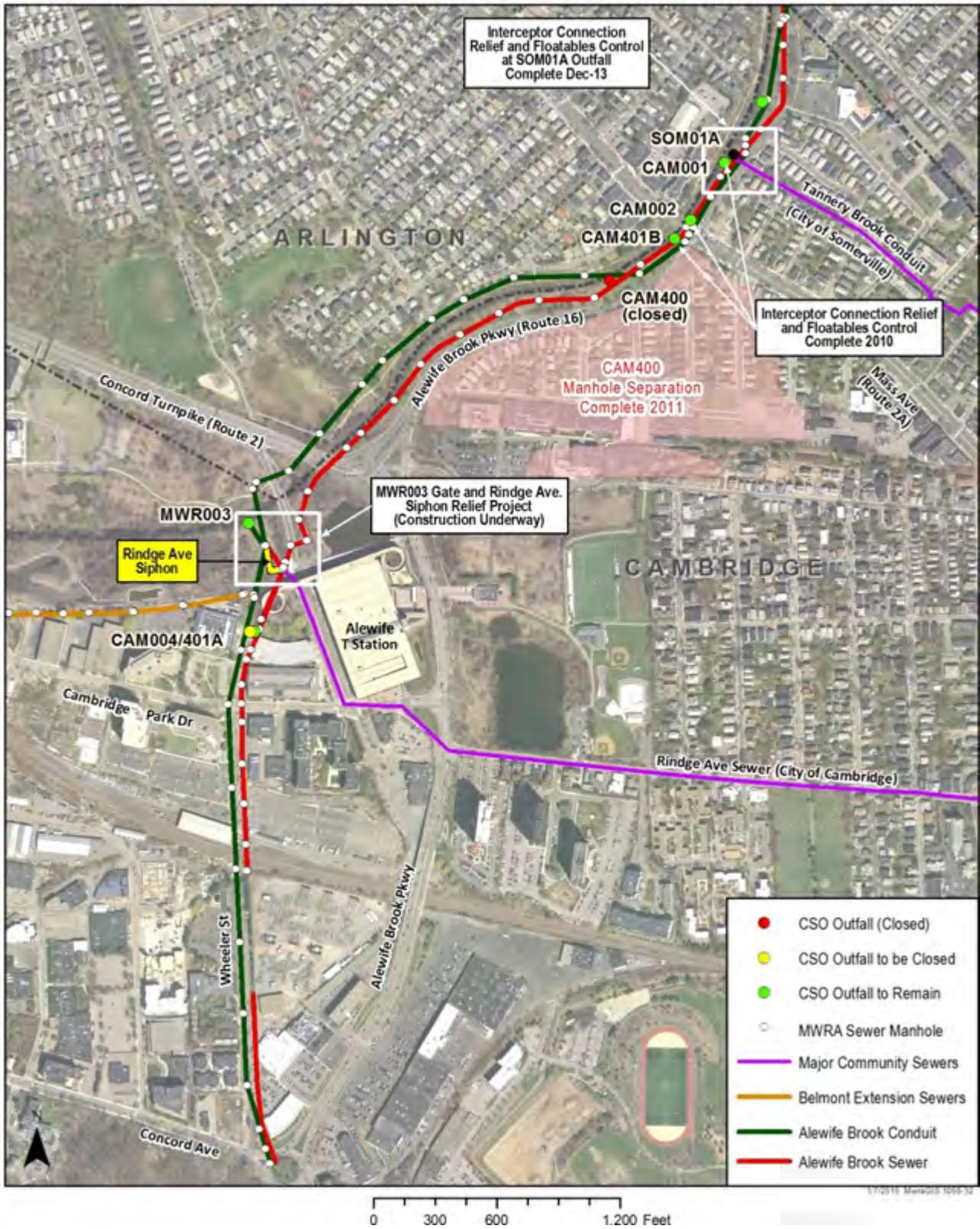


Figure 4
Alewife Brook CSO Control Plan (2 of 2)



The contractor has completed sewer and/or drain installations on Blakeslee, Chilton, Fayerweather, Gurney, Reservoir, Saville and Walden streets, Appleton, Dunstable and Granville roads, Lincoln and Vassal lanes and Royal Avenue. The contractor continues to install sewers and/or drains on Huron and Manassas avenues and Appleton and Hutchinson streets.



**Reservoir Street 18-inch Sewer Installation
CAM004 Sewer Separation Contract 8B**



**Blakeslee Street Drain Installation Under Water Main
CAM004 Sewer Separation Contract 8B**

Severe winter weather in late 2013 and early 2014 and utility relocation delays compromised the contractor's original schedule and led to the need for a recovery schedule. The contractor's recovery schedule and related cost increases were approved by Cambridge and MWRA in the fall of 2014, and the contractor has since been able to meet the recovery schedule. The new schedule re-sequences the remaining work to allow the contractor to complete Contract 8B's CSO related "Milestone 1" work (primarily sewer and drain installations) by the original contract milestone of September 20, 2015, and extends the contract term by 103 days, shifting non-CSO related Milestone 2 work (primarily surface restoration) from September 2016 to December 2016.

The CSO-related work of Contract 8B must be complete by September 2015 to allow a 3-month window for the Contract 9 contractor to complete subsequent, related sewer and storm drain work by December 2015 in compliance with Schedule Seven. Eversource (NStar) Gas has completed the necessary gas line relocations in the Contract 8B area. While Cambridge believes that the contractor's ongoing progress allows for attainment of Milestone 1 by September 2015 and completion of the CAM004 sewer separation project by the Schedule Seven milestone, the contract schedule has no float, and Cambridge and MWRA are paying close attention to constructed facilities progress against contract time in reviewing the contractor's monthly reports.

Cambridge issued the Notice of Proceed with the \$24.4 million Contract 9 on February 11, 2014 and has attained 58% completion of the sewer separation work for CSO control. 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, 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 along Concord Avenue and several intersecting streets in a 60-acre area north of Contracts 8A and 8B.

The contractor has completed sewer and/or drain installations on Copley, Fayerweather, Saville and Walden streets, Corporal Burns Road and Concord Avenue. The installation of sewers and/or drains remains to be completed on Bay State Road, and Alpine, Birch, Chilton, Fern, Field, Garden, Hazel and Ivy streets. Eversource (NStar) has completed the relocation of gas lines on most streets in the Contract 9 area, with only Garden and Walden streets remaining.



**Sheeting for Drain MH on Concord Avenue
Cambridge Sewer Separation Contract 9**



**Concord Avenue Drain Installation
Cambridge Sewer Separation Contract 9**

Cambridge expects Contract 9 to be substantially complete by December 2015, in compliance with Schedule Seven, contingent upon continuing with effective implementation of the Contract 8B recovery schedule. Contract 9 calls for surface restoration work to continue through August 2016.

Cambridge was unable to include in Contract 9 the originally planned sewer separation work along Concord Lane, a short private way serving commercial properties in the Fresh Pond Mall, because Cambridge initially was unable to secure right of entry (ROE) onto the property for design investigations and construction. Negotiations between the property owner and Cambridge eventually led to a series of executed ROE's, including ROE#1 for site surveys and ROE#2 for soil borings and installation of groundwater observation wells during the summer of 2014. The completion of these investigations in turn allowed Cambridge to complete final design of the work on Concord Lane and advertise a new contract for construction bids on December 10, 2014. Cambridge opened bids on January 15 and expects to award the Concord Lane contract to the lowest responsible bidder in March. The property owner, Cambridge and the contractor have since executed ROE#3, which allows access for construction. Cambridge expects to complete the Concord Lane construction and all other CSO-related work of the CAM004 sewer separation project and close Outfall CAM004 by the December 2015 milestone in Schedule Seven.

Green Infrastructure for Environmental Protection and Improvement

Cambridge has included "Green Infrastructure" in the various CAM004 sewer separation contracts. The Green Infrastructure technologies 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, in part by allowing some infiltration to groundwater. Remaining runoff will be collected and conveyed to the new stormwater wetland in the Alewife Reservation for further detention and natural treatment before draining to the Little River.

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

MWRA issued the Notice to Proceed for the \$2.7 million construction contract for the Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Avenue Siphon Relief project (the "MWR003 project") on August 28, 2014, ahead of the September 2014 milestone in Schedule Seven. This is the last of the six projects in MWRA's Alewife Brook CSO plan and last of the 35 projects in MWRA's regional Long-Term Control Plan to proceed into construction.

The MWR003 project, shown in Figure 5, 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 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.

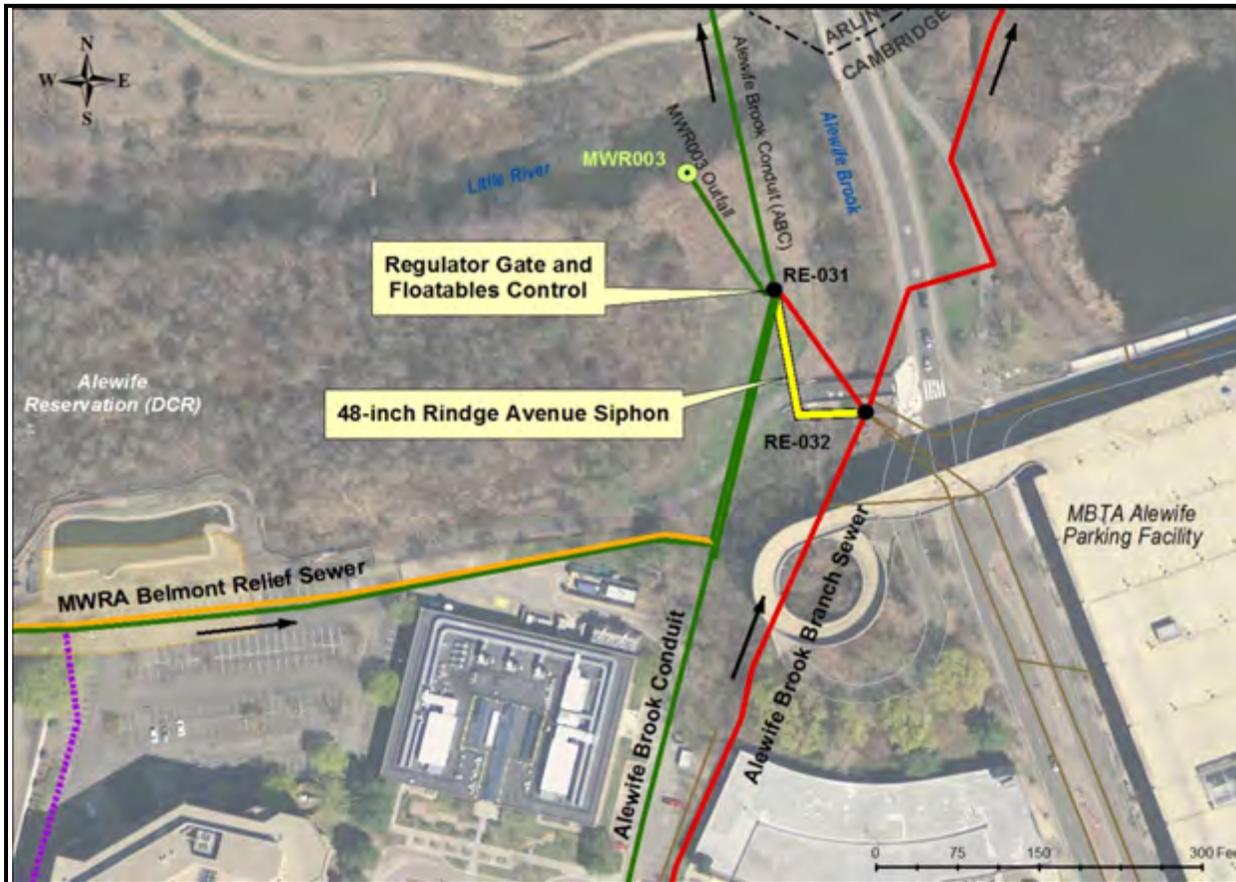


Figure 5: Control Gate and Floatables Control at Outfall MWR003 and MWRA Rindge Ave. Siphon Relief

Work to date on the contract began with installation of environmental controls and the construction of a temporary access bridge over the narrow Alewife Brook, to be able to move equipment between the construction areas on each side of the brook. In addition, the contractor has completed installation of the 48-inch diameter replacement siphon, in-place abandonment (concrete filling) of the original 30-inch diameter siphon pipe, and removal of a section of a former 30-inch diameter sewer under Alewife Brook that was abandoned many years ago. The contractor delivered and set up three temporary pumps and piping to enable by-passing of overflows between CSO regulator structures RE032 (suction side) and RE031 (discharge side) until the new 48-inch siphon is tested and brought into service, which the contractor expects to complete soon. In addition, the contractor has begun major structural modifications to structures RE031 and RE032 and has manufactured the concrete rebar mats that will seat a proposed Eversource (NStar) electric transformer and MWRA electrical load center and instrumentation cabinet that will power and control the new automated gate. The construction contract is 40% complete.



48-Inch Replacement Siphon at Outfall MWR003



**Modifications to CSO Regulator
 Structure RE031 at Outfall MWR003**

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 Brook 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 Dilboy Field and the Somerville/Medford line, to their respective upstream ends at the Fresh Pond Rotary in Cambridge and 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 projects, including the CAM004 sewer separation project and the improvements at Outfall SOM01A that MWRA completed in December 2013, 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 worsening flooding conditions along the Alewife Brook. MWRA and the City of Cambridge continue to evaluate the expected hydraulic conditions, even as construction proceeds.

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 |

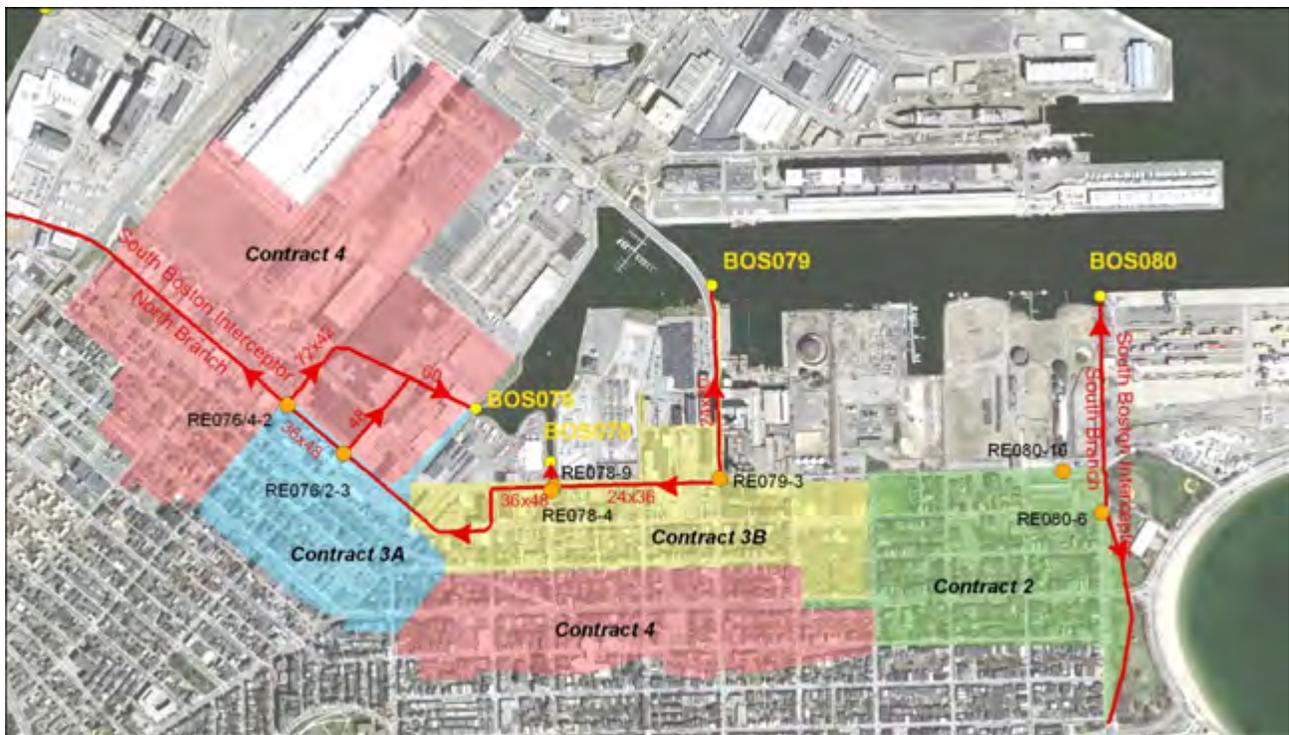
The \$72.6 million Reserved Channel sewer separation project (Figure 6 on page 15) is intended to minimize CSO discharges and impacts to the Reserved Channel by separating combined sewer systems in a portion of South Boston tributary to CSO outfalls BOS076, BOS078, BOS079 and BOS080. Implementation of 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. The work includes the installation of approximately 42,100 linear feet of new storm drain, along with an additional 6,500 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 rehabilitation and upgrade of the four CSO outfalls to ensure they have adequate 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.

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 downspout disconnection 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: \$4.1 million Contract 1; \$5.9 million Contract 2; \$11.8 million Contract 3A; and \$1.2 million Contract 7.

Figure 6: Reserved Channel Sewer Separation Contracts



Contract 1 involved the rehabilitation of the four Reserved Channel CSO outfalls to accommodate the stormwater flows being removed from the sewer system, provide the outfalls long-term structural integrity, 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 12-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.

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| 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 | 100% | 2011-2014 |
| Contract 4 | Sewer Separation | 95% | 2012-2015 |
| Contract 5 | Sewer Cleaning/Lining | On-going | 2014-2015 |
| Contract 6 | Downspout Disconnections | On-going | 2015 |
| Contract 7 | Paving | 100% | 2010-2012 |
| Contract 8 | Paving | 50% | 2012-2015 |

The Contract 2 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, 2) reducing surcharging within the SBI-SB, and 3) reducing CSO discharges from the SBI-SB, which are now captured by 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 the final paving of approximately 22,000 square yards of permanent pavement for permanent trench repair and more than 20,200 linear feet of pavement markings.

In 2014 and early 2015, BWSC continued to make substantial progress with construction activities on schedules that have culminated in the substantial completion, or near completion, of the last two major sewer separation contracts, Contract 3B and Contract 4. Remaining work involves the completion of punch list items for these contracts and continuing work to complete contracts for cleaning and lining of remaining older sewers, disconnection of roof drains from the sewer system, and final paving.

- In November 2014, BWSC attained substantial completion of the \$13.7 million Contract 3B. The contract separated combined sewers in a 66-acre area of South Boston tributary to outfalls BOS078 and BOS079 and 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 included 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 pipe to avoid conflicts with the planned sewers and storm drains. Fourteen new catch basins were installed, and 120 existing catch basins were disconnected from the sewer system and reconnected to new storm drains.
- BWSC expects to attain substantial completion of the \$13.9 million Contract 4 in March 2015. The contract has separated combined sewers 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. Contract 4 includes 12,200 linear feet of new storm drain, 1,700 linear feet of replacement sanitary sewer pipe, 9,700 linear feet of replacement water pipe, 104 new manholes, one new catch basin, and 5,400 linear feet of minor drain pipe.



**48-inch Storm Drain Installation on E. Third Street
Reserved Channel Sewer Separation Contract 3B**



**18-inch Sewer Installation on E. Third Street
Reserved Channel Sewer Separation Contract 3B**



**48-inch Storm Drain Installation on L Street
Reserved Channel Sewer Separation Contract 4**



**12-inch Storm Drain Installation on East Broadway
Reserved Channel Sewer Separation Contract 4**

- The \$4.9 million Contract 8 is the second of two pavement restoration contracts that have followed the work of the various sewer separation contracts as sections of work were completed. Contract is approximately 50% complete. While paving is suspended during the winter months, the contract will resume in the spring of 2015 to continue to restore streets affected by the work of contracts 3B and 4 and, to a lesser extent, Contract 5. BWSC expects that the paving work of Contract 8 will be complete by August 2015, earlier than originally scheduled.
- Contract 5 is funded solely by BWSC and includes pipe cleaning and lining services to rehabilitate some older sewers in the Reserved Channel project area that will remain in service for the long term. While providing sewer system reliability, Contract 5 does not directly contribute to the CSO control objectives of the Reserved Channel project. BWSC awarded Contract 5 on February 24, 2014, work is underway, and BWSC expects the contract to be substantially complete by November 2015.

- Contract 6 includes the disconnection of roof drain downspouts from the sewer system in the Reserved Channel project area. BWSC originally awarded Contract 6 on January 29, 2014, in the amount of \$661,442. Subsequently, some of the downspout disconnections were performed under sewer separation contracts 3B and 4, and BWSC reassessed its remaining downspout disconnection needs. BWSC revised the scope of work of Contract 6, reduced the contract amount to \$211,000, and issued the Notice to Proceed to the contractor on December 8, 2014. The contractor commenced the work in January 2015, and BWSC expects the contract to be substantially complete by October 2015.

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 and Schedule Seven, MWRA and the CSO communities have performed 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 submitted a final report on sources of inflow/infiltration in the sewer systems tributary to the Dorchester Interceptor to MWRA in December 2014. The stormwater inflow 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 purpose of the inflow removal 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. 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.

BWSC's final report identifies the areas of highest remaining stormwater inflow and evaluates options for providing additional removal of inflow and/or upgrading sewer system hydraulic or storage capacity in certain areas. MWRA has long included a total of \$5.4 million in its Capital Improvement Program for investigations and construction to improve the performance of the Dorchester sewers following the closing of the CSOs. BWSC and MWRA continue to discuss and evaluate the results of BWSC's investigations to determine how best to relieve the system. Meanwhile, BWSC continues with a construction contract to remove some of the remaining inflow sources from its sewer system. The contract amount is \$562,261, of which \$204,000 is eligible for MWRA funding.

BWSC Sewer Separation Program

BWSC has been separating combined sewer systems beyond the sewer separation areas recommended in the court-approved Long-Term Control Plan and incorporated in Schedule Seven. BWSC substantially completed sewer separation projects along Massachusetts Avenue in Dorchester and Roxbury in September 2013 and in the area of West Broadway and A Street in South Boston in December 2014. BWSC is currently separating sewers in the Dudley Square area of Roxbury and expects this work to be substantially complete this year. These projects are expected to reduce CSO overflows to the Fort Point Channel.

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 tributary area sewer separation that will reduce stormwater flows to MWRA's North Charles Metropolitan Sewer, which can overflow to MWRA's Cottage CSO facility in large storms.

In addition, Cambridge has coordinated its CSO overflow regulator modifications at Outfall CAM017 at Binney Street and Land Boulevard with the major private redevelopment work now underway along Binney Street. 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 Cambridge's Binney Street Overflow Conduit and MWRA's Cambridge Marginal Conduit and Prison Point CSO facility. Stormwater flows removed from the sewer system will be redirected to the Lower Charles River Basin through Outfall CAM017 downstream of the CSO regulator, reducing burdens on the sewer system, untreated discharges at Outfall CAM017 and treated discharges from the Prison Point facility to Boston Inner Harbor.

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 and help control CSO discharges to the Chelsea Creek. On December 4, 2014, Chelsea permanently closed Outfall CHE002 after completing sewer separation in tributary areas along Broadway (see Figure 7 on page 20). Outfall CHE002 formerly discharged to the Mystic River/Chelsea Creek confluence in the vicinity of the Chelsea Yacht Club, immediately south of the Mystic Tobin Bridge. CHE002 remains in operation as a stormwater outfall. Elimination of CHE002 was not included in the approved Long-Term Control Plan. It is the fifth outfall to be closed in recent years beyond the recommended outfall closings in the CSO plan, the others being Charles River outfalls CAM009 and CAM011 closed by the City of Cambridge in 2007 and East Boston Inner Harbor outfalls BOS006 and BOS007 closed by BWSC in 2008.

In 2014, the City of Chelsea also commenced a construction contract to separate combined sewers in a large area along Spruce Street. Chelsea expects this project will reduce stormwater flow rate to the city and MWRA sewer systems by more than 10 million gallons per day based on a 1 year, 6 hour storm.

2.5 MWRA CSO Spending in 2014 and Beyond

MWRA spent \$22.1 million in 2014 to implement the CSO projects and fund the eligible CSO work of MWRA, BWSC, Cambridge and Brookline. All of this cost funded construction activity, except for a small amount of design spending related to Cambridge's Concord Lane sewer separation contract and completion of design for MWRA's project at Outfall MWR003.

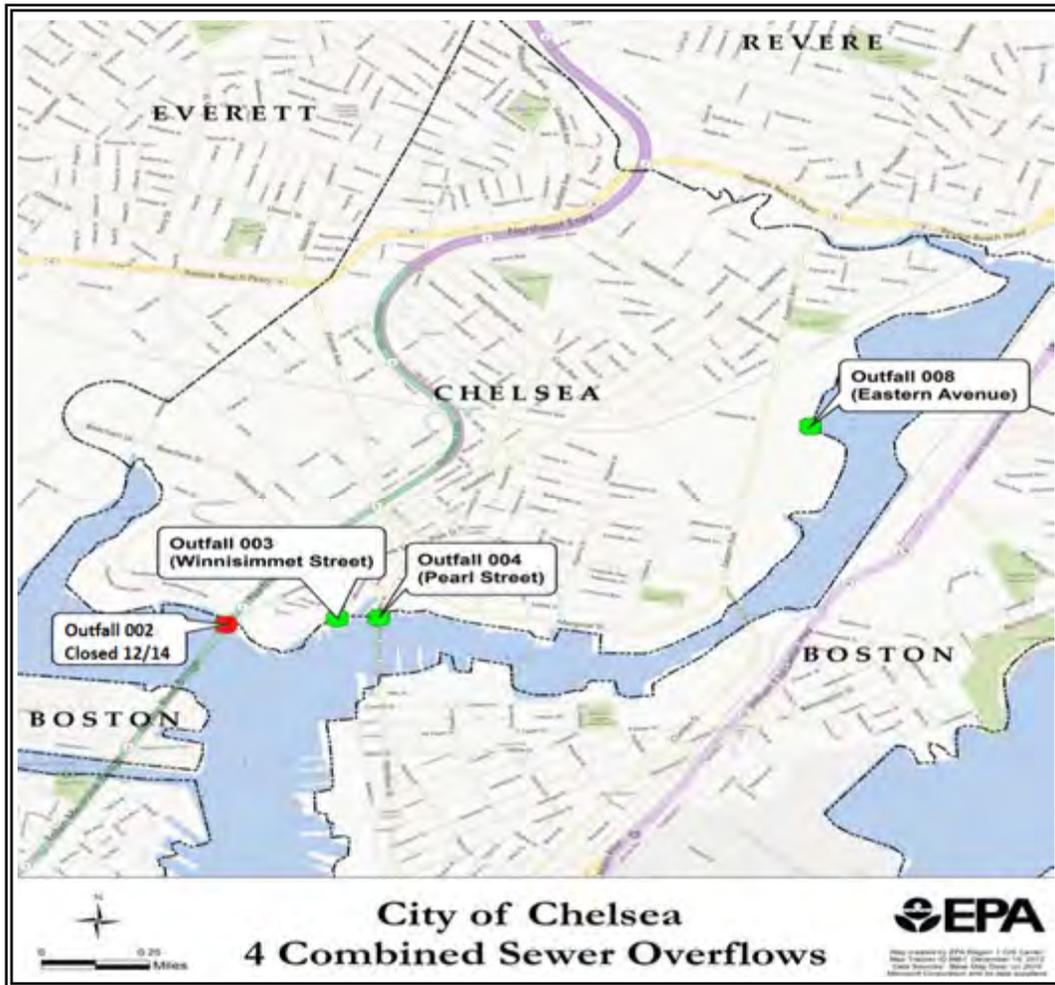
Spending in 2014 brought MWRA's total capital expenditure for the CSO Control Program to \$866.4 million, 96% of the \$898.3 million CSO budget in MWRA's Proposed FY16 Capital Improvement Program (CIP). With only three of the 35 projects not yet complete and those three projects now well into construction, CSO program activity and spending will continue to wind down from the highest calendar year spending of \$128.1 million in 2008. The Proposed FY16 CIP estimates fiscal year spending on CSO control of \$23.7 million in FY15 (July 1, 2014 thru June 30, 2015), \$13.8 million in FY16 (including the completion of all three projects by December 2015), and \$4.1 million in FY17 when the last CSO-related activity eligible for MWRA funding, primarily surface restoration work, is scheduled to be completed. MWRA has included funds in its CIP beyond FY17 for the court-mandated three-year verification assessment which Schedule Seven requires MWRA to commence by January 2018. Schedule Seven requires MWRA to submit a report on the results of the assessment by December 2020.

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 (see Table 3 on page 21), as reported in last year's Annual Progress Report. 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

Figure 7: City of Chelsea Closes Outfall CHE002



Map of City of Chelsea's four permitted CSO outfalls. The City closed Outfall CHE002 to CSO discharges in December 2014.



Brick and mortar bulkhead of high outlet overflow in CSO regulator CHE002-3.



Outfall pipe below high tide water elevation of Mystic River/Chelsea Creek Confluence is now a stormwater outlet.

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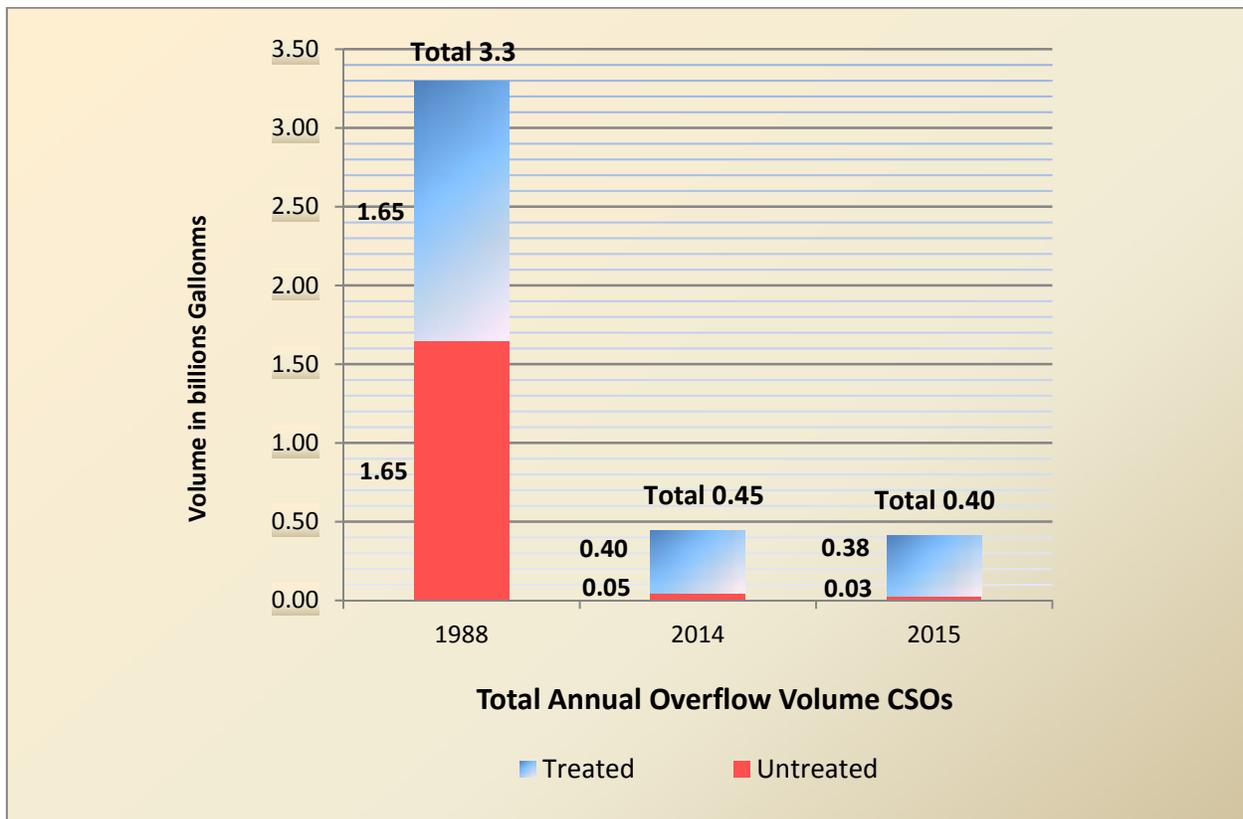
Table 3: Status of CSO Project Implementation, March 2015

| 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 | |
| | CAM400 Manhole Separation | | | X |
| | Interceptor Connection Relief/Floatables Control at CAM001, CAM002, and CAM401B | | | X |
| | MWR003 Gate and Rindge Avenue Siphon Relief | | X | |
| | Interceptor Connection Relief/Floatables at SOM01A | | | X |
| Region-wide Floatables Control and Outfall Closings | | | | X |

in Boston Harbor and tributary waters. The completed wastewater system improvements include MWRA’s \$3.8 billion investment in the new Deer Island Treatment Plant and associated conveyance systems, as well as 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 0.45 billion gallons today, an 86% reduction, with 89% of the current average annual discharge volume receiving treatment at MWRA’s four long-term CSO facilities at Cottage Farm, Prison Point, Somerville Marginal and Union Park. These new estimates are from MWRA’s InfoWorks collection system model simulations of end-of-year 2013 system conditions that were reported to the United States Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (DEP) on April 30, 2014, in compliance with conditions in the CSO variances for the Lower Charles River/Charles Basin and the Alewife Brook/Upper Mystic River (see Section 4.2). The current estimate of remaining average annual discharge volume (0.45 billion gallons) is 50 million gallons less than last year’s estimate (0.50 billion gallons) primarily due to the completion of the Brookline sewer separation project in April 2013 and the effect it had in reducing treated discharges to the Charles River Basin at the Cottage Farm facility. Figure 9 on page 23 shows CSO reduction for each receiving water segment. See Figure 10 on page 23 for an identification of the waters currently or formerly affected by CSO.

Figure 8: Region-wide CSO Reduction and Goal



CSO discharges have been eliminated or virtually eliminated (i.e. 25-year storm level of control) at 38 of the 84 outfalls addressed in the Long-Term Control Plan (see Figure 1 on pages 2-3). These 38 outfalls include five outfalls – two City of Cambridge outfalls, two BWSC outfalls and one City of Chelsea outfall - 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 City of Chelsea closed Mystic River/Chelsea Creek Confluence outfall

Figure 9: CSO Volume Reduction by Receiving Water

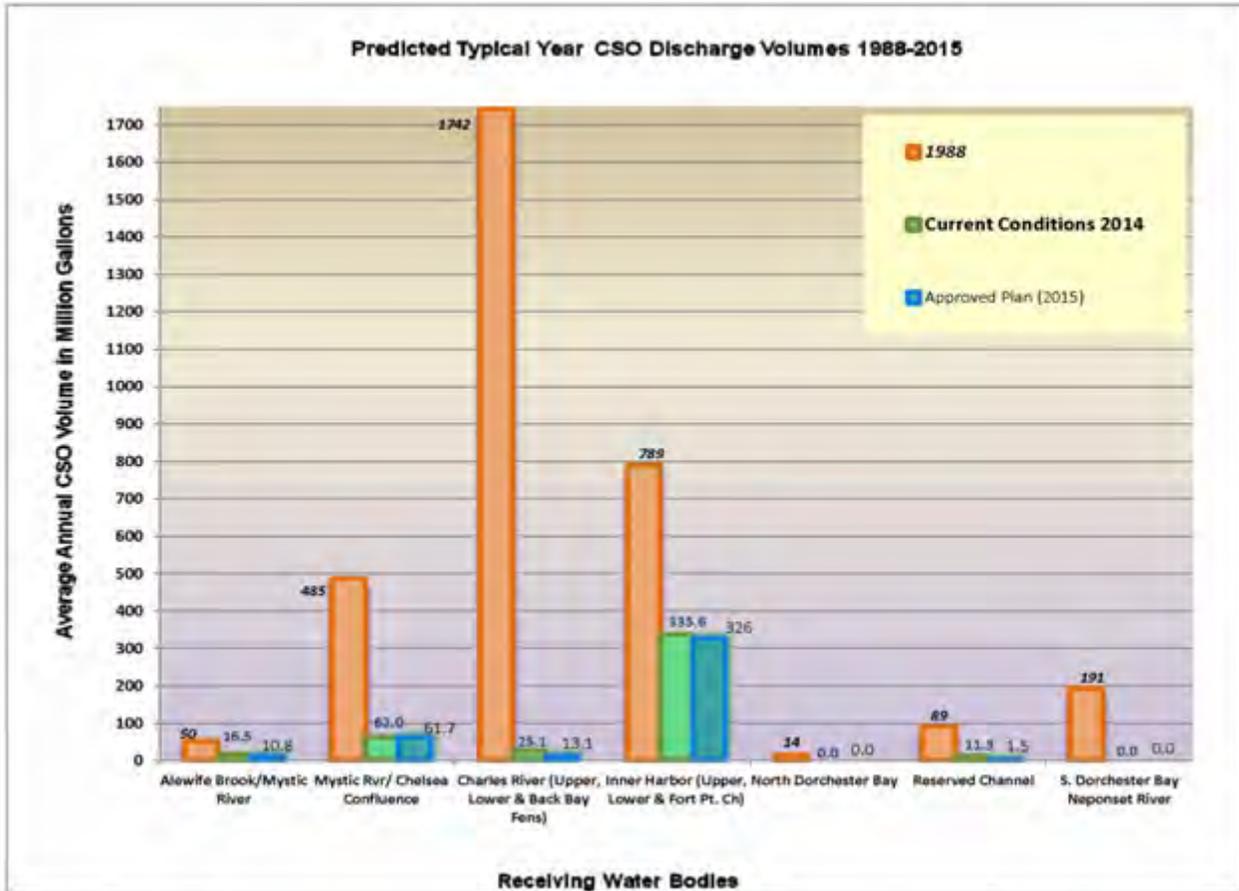


Figure 10: Boston Harbor and its Tributaries



CHE002 in December 2014. The Long-Term Control Plan calls for closing one additional CSO outfall, 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 23 million gallons today, a greater than 98% reduction. Approximately 80% 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 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 wastewater system's hydraulic performance and lowered CSO discharges. MWRA and the communities have also completed six 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 to storm drains. The CSO and stormwater related improvements have contributed to significant and steady water quality improvement in the Charles River Basin during dry and wet weather conditions, as shown in Figure 11 on page 25.

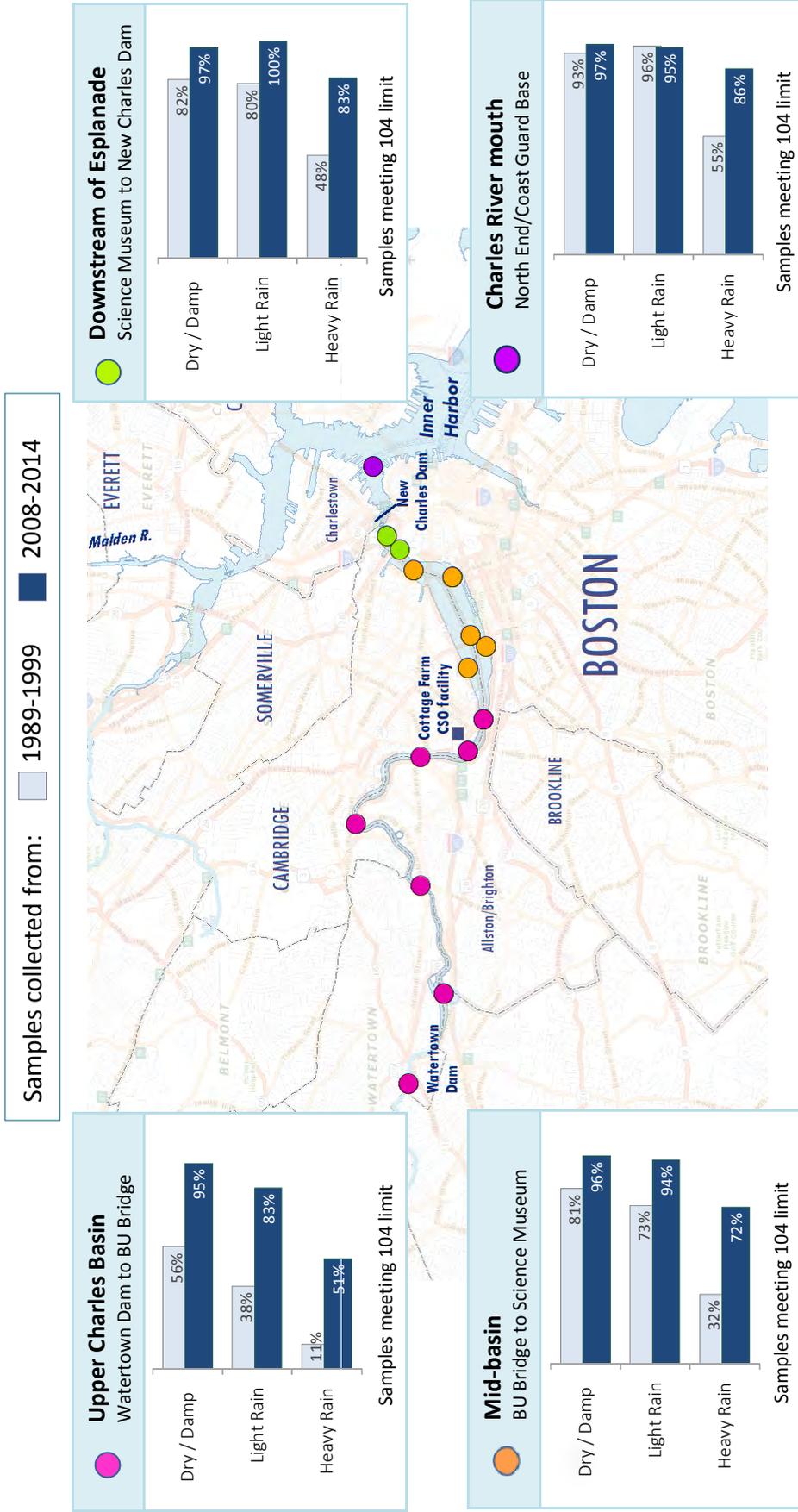
In the Mystic River, Figure 12 on page 26 shows improvement in all areas of the Mystic after 2008, with the Lower Mystic and Mystic River mouth having the best water quality. These areas meet water quality limits most of the time, with more than 90% of bacteria samples meeting the *Enterococcus* swimming standards of 104 cfu/100mL in all weather conditions for 2008 through 2014. Bacterial water quality in the Upper Mystic is also good, with bacteria meeting limits more than 90% of the time, in all but heavy rain. While conditions worsen in heavy rain events, these rainfall conditions are relatively infrequent.

Bacteria counts in Alewife Brook - where major CSO control work will be underway through 2015 - frequently fail to meet swimming limits in wet weather, and water quality is particularly poor after heavy rain. However, Alewife Brook's influence on downstream water quality conditions in the Mystic main stem is limited, with bacterial conditions downstream showing little influence from Alewife Brook.

Figure 13 on page 27 shows improvement in water quality over time in the Neponset River, though the magnitude of improvements varies by river segment, with upstream locations showing the most significant change, particularly at the Baker Dam. 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 Ave. and Lower Neponset area. Water quality data show improvement after 1999 downstream of these former CSOs, and also further upstream at the Baker Dam, which shows improvement in dry as well as wet weather conditions. Bacteria levels generally meet swimming standards at the mouth of the Neponset River in all but heavy rainfall conditions, where there is considerable dilution with the water of South Dorchester Bay.

Figure 11
Change in Lower Charles River Water Quality Over Time

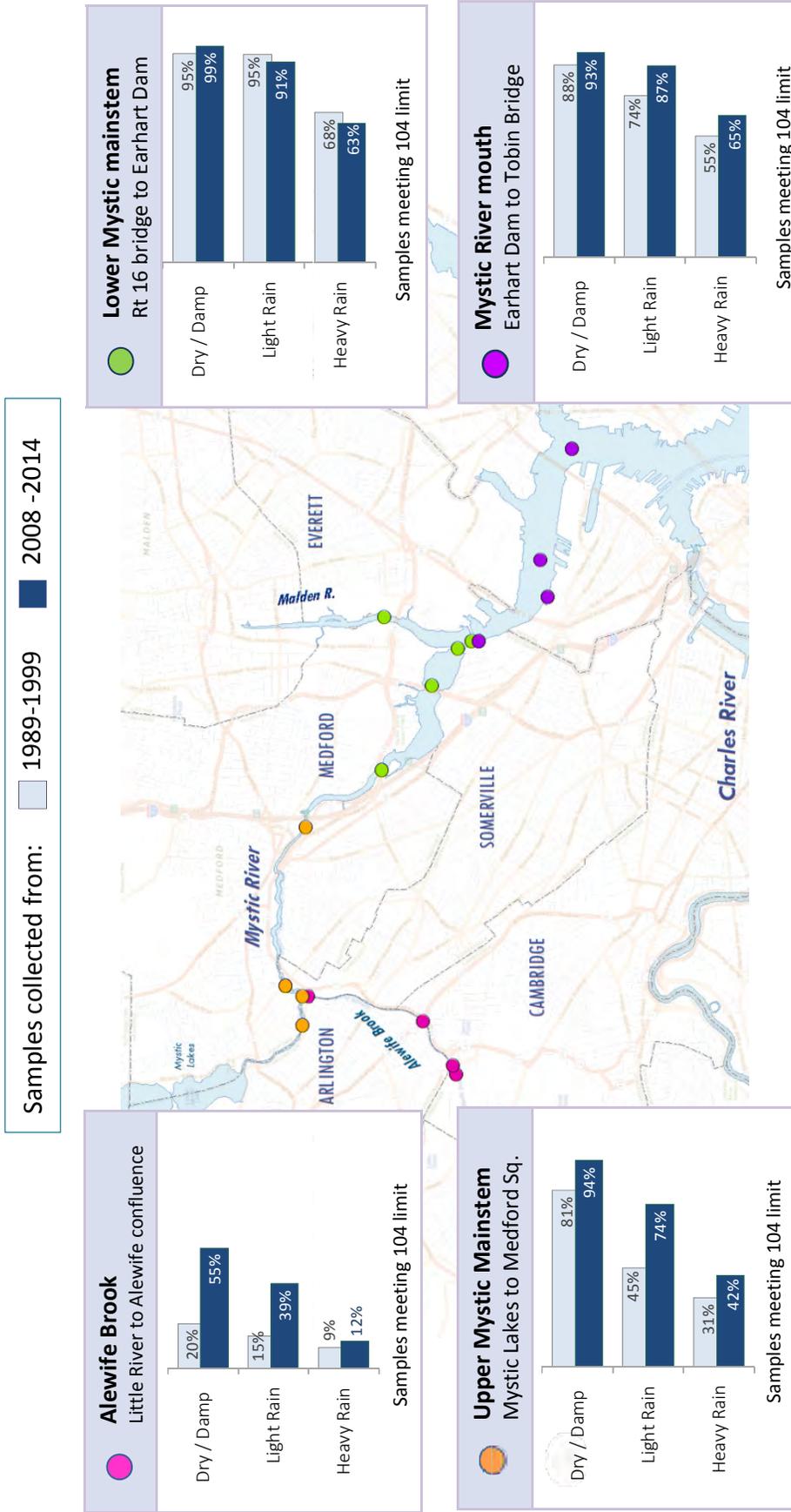
Graphs show the percent of samples meeting the *Enterococcus* bacteria limit for swimming, 104 counts/100mL, by river reach.



Dots are MWRA sampling locations. State swimming standards for *Enterococcus* single sample limit is 104 cfu/100 mL. Rainfall: Heavy Rain is at least 0.5 inches of rain in previous 48 hours; Light Rain is between 0.1 and 0.5 inches of rainfall in previous 48 hours. 2008 – 2014 period is considered current conditions, following substantial completion of infrastructure improvements. Data from intervening years (2000 – 2007) are excluded.

Figure 12
Change in Mystic River Water Quality Over Time

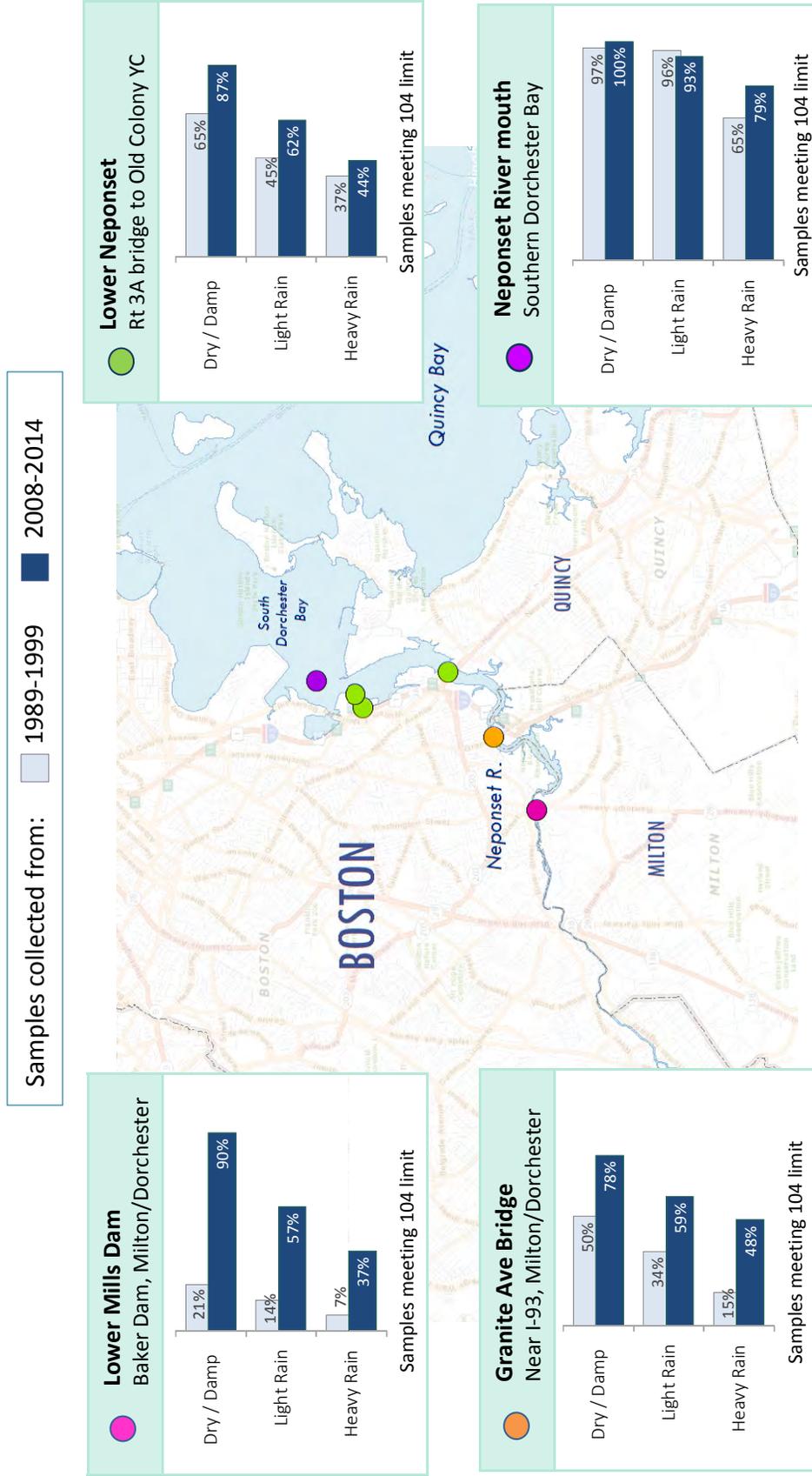
Graphs show the percent of samples meeting the *Enterococcus* bacteria limit for swimming, 104 counts/100mL, by river reach.



Dots are MWRA sampling locations. State swimming standards for *Enterococcus* single sample limit is 104 cfu/100 mL. Rainfall: Heavy Rain is at least 0.5 inches of rain in previous 48 hours; Light Rain is between 0.1 and 0.5 inches of rainfall in previous 48 hours. 2008 – 2014 period is considered current conditions, following substantial completion of infrastructure improvements. Data from intervening years (2000 – 2007) are excluded.

Figure 13
Change in Lower Neponset River Water Quality Over Time

Graphs show the percent of samples meeting the *Enterococcus* bacteria limit for swimming, 104 counts/100mL, by river reach.



Dots are MWRA sampling locations. State swimming standards for *Enterococcus* single sample limit is 104 cfu/100 mL. Rainfall: Heavy Rain is at least 0.5 inches of rain in previous 48 hours; Light Rain is between 0.1 and 0.5 inches of rainfall in previous 48 hours. 2008 – 2014 period is considered current conditions, following substantial completion of infrastructure improvements. Data from intervening years (2000 – 2007) are excluded.

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 29. Improvement was greatest in the Upper Inner Harbor and in Chelsea Creek, which had more serious wet weather pollution problems. Bacteria data presented in Figure 14 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.

As shown in Figure 15 on page 30, wet weather water quality conditions in Boston Harbor and its tributary rivers improved after the significant increase in wastewater transport and treatment capacity in the early 1990's. Since then, wet weather conditions have continued to improve with implementation of the CSO projects. By 2008, MWRA and the CSO communities had completed many of the CSO control projects that further reduced or eliminated discharges at most CSO outfalls, including outfalls to the Charles River, Mystic River and Chelsea Creek. In the same period, community efforts to control urban stormwater pollution were underway, and these efforts have continued.

South Boston Beaches

The results of water quality sampling along the beaches of South Boston (Figure 16 on page 31) show significantly improved conditions following start-up operation of the CSO storage tunnel in May 2011, just prior to the 2011 swimming season. Water quality along the beaches was excellent during the 2014 swimming season, with 100% of the Department of Conservation and Recreation's sampling results meeting bacteria limits for swimming.

The fraction of days failing to meet the bacteria limit at one or more beaches in South Boston dropped from an average of 18% in the five years prior to the tunnel opening to an average of 4% in the years following its opening. The few remaining water quality violations and related beach closings are not CSO related (there has been no CSO discharge since May 2011), and may be caused by environmental factors such as near-field overland stormwater runoff contaminated with pet waste or bird droppings.

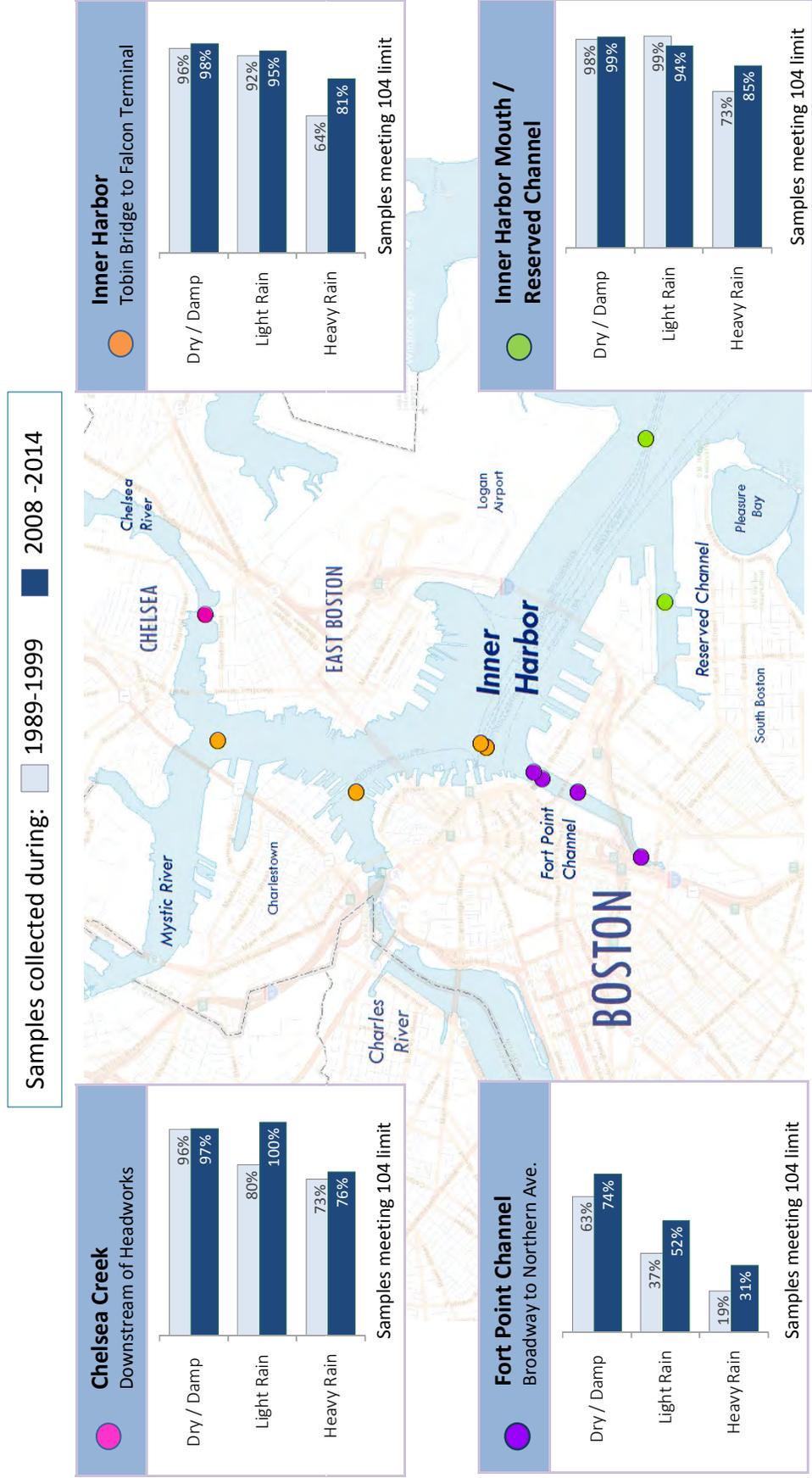
During 2014, the storage tunnel captured approximately 203 million gallons of CSO and separate stormwater and prevented any CSO or stormwater discharge to the beaches in approximately 97 rainfall events. Since start-up in May 2011, the storage tunnel has captured 753 million gallons of CSO and stormwater, and there has been no discharge of CSO to the beaches, two discharges of stormwater to the beaches (during Hurricane Irene in August 2011 and a portion of the storm of December 9, 2014), and two transfers of stormwater to Savin Hill Cove.



Edward J. McCormack Boathouse, Carson Beach, South Boston

Figure 14
Change in Inner Harbor Water Quality Over Time

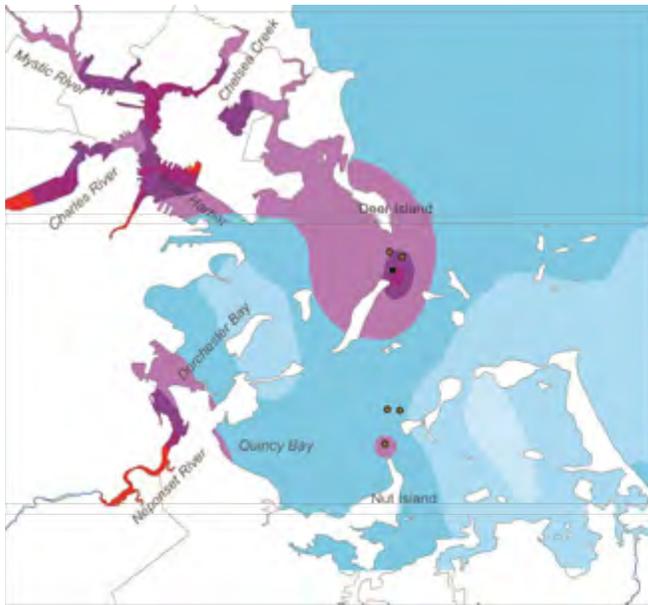
Graphs show the percent of samples meeting the *Enterococcus* bacteria limit for swimming, 104 counts/100mL.



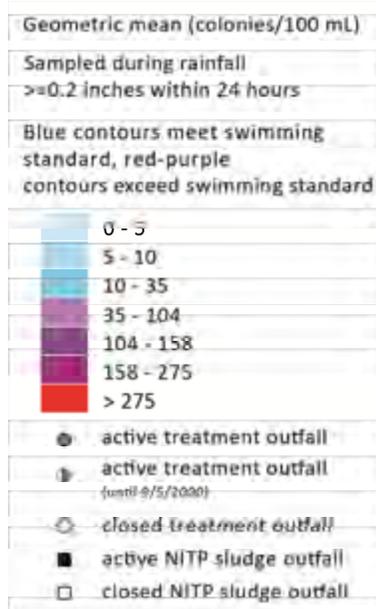
Dots are MWRA sampling locations. State swimming standards for *Enterococcus* single sample limit is 104 cfu/100 mL. Rainfall: Heavy Rain is at least 0.5 inches of rain in previous 48 hours; Light Rain is between 0.1 and 0.5 inches of rainfall in previous 48 hours. 2008 – 2014 period is considered current conditions, following substantial completion of infrastructure improvements. Data from intervening years (2000 – 2007) are excluded.

Figure 15:
Changes in Boston Harbor *Enterococcus* Bacteria in Wet Weather

Prior to Boston Harbor projects (1989-1991)



Most Boston Harbor projects complete (post-2007)



Contours show the geometric means of *Enterococcus* bacteria samples collected when more than 0.2 inches of rain fell in the previous day. Blue areas meet the EPA geometric mean standard for *Enterococcus* (35 cfu/100 mL) and red-purple areas exceed the standard.

1989-1991

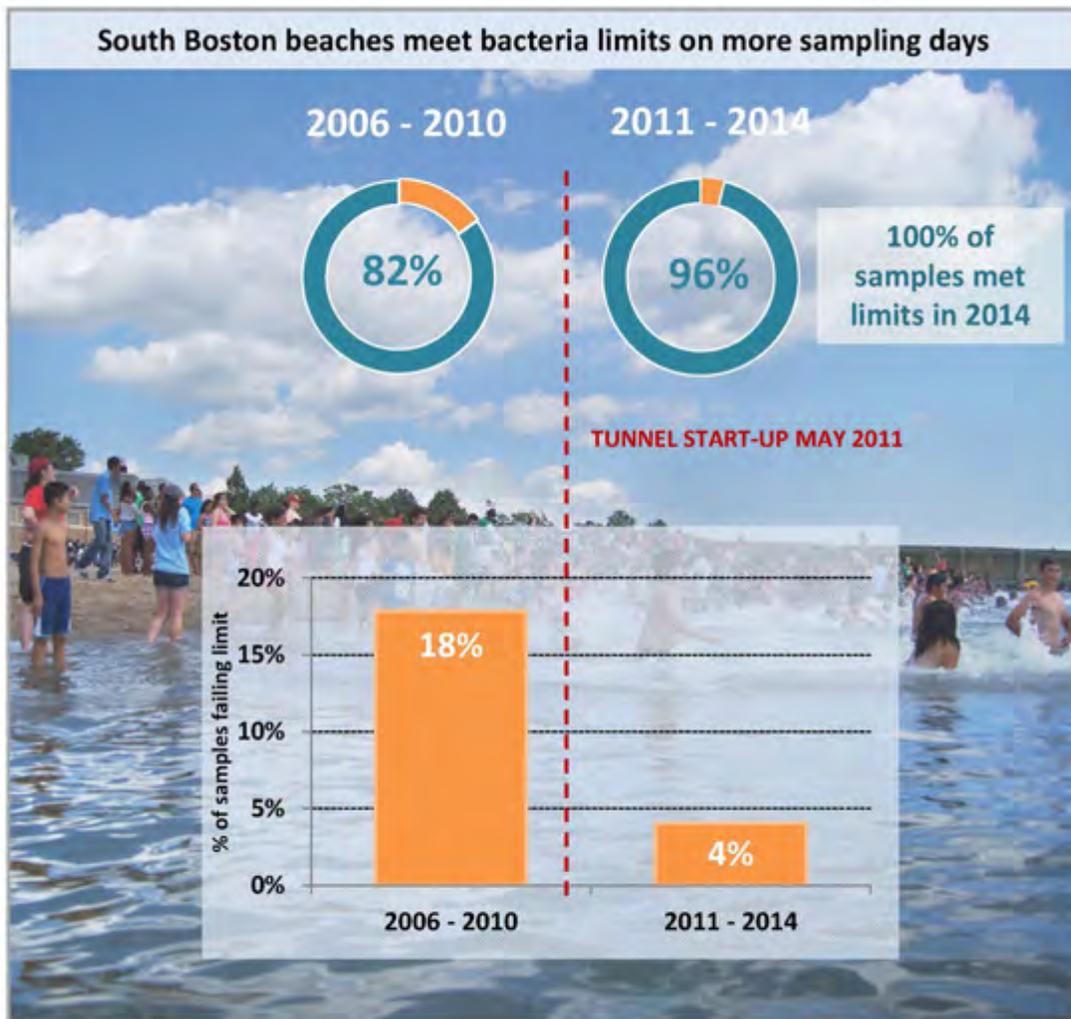
This period precedes major improvements to upgrade MWRA's Deer Island treatment plant, including the closure of harbor treatment plant outfalls, and CSO controls. The period includes the final year that wastewater sludge was released to Boston Harbor (1991).

Harbor areas affected by the discharge of sewage and sludge from the old Deer Island and Nut Island treatment plants, as well as tributary rivers affected by CSO failed to meet the water quality standard in wet weather.

Post-2007

Data from these years reflect the effects of CSO upgrades, the ending of sludge discharges, improved treatment capacity and start of second treatment at the Deer Island Treatment Plant. This period also follows the ending of treatment plant discharges to the Harbor with startup of the Massachusetts Bay outfall in 2000.

Figure 16: Water Quality Improvements at South Boston Beaches



Results from DCR swimming seasons for 2006 through 2010 and 2011 through 2014 were used to calculate the fraction of bacteria samples that met the posting limit of 104 cfu/100 mL Enterococcus. Pleasure Bay had no CSO discharges and is excluded.

4. REGULATORY AND COURT SCHEDULE COMPLIANCE ACTIVITY

4.1 Regulatory Compliance Activities

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, subsequently approved by EPA in July of 2014. The variance extensions have three-year terms through 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 operations of influent gates at 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 and compliance with other requirements referenced herein.

The 2013-2016 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 an understanding that DEP would reissue 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 (i.e. elimination of CSO) 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 reassess the feasibility of attaining Class B uses and may make long-term water quality standards determinations for these receiving waters.

In 2014, 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. Examples of MWRA's compliance responses to 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 for 1997 sewer system conditions to 5 times per year with current system conditions, Cottage Farm remains the most active CSO outfall on the Charles River and, therefore, an appropriate indicator of CSO impacts from other, untreated, 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, collect water quality data throughout the year, and report 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 2013 to EPA and DEP on April 30, 2014. The 2013 discharge report included estimates of the number of activations and discharge duration and volume per storm for each of the outfalls that were potentially active that year. MWRA has commenced the model updates for the calendar year 2014 discharge estimates and plans to model the 2014 storms and report the CSO discharge estimates by April 30, 2015.

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, allowing MWRA to verify the model's accuracy prior to modeling the actual storms in the previous calendar year.

For 2013, MWRA modeled each of the 97 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 based on the model predictions, except at CSO treatment facilities, where MWRA uses measurements from the facility records in lieu of the model predictions.

In addition to modeling all of the actual rainfall events for the previous calendar year, MWRA also models the "Typical Year" rainfall with end-of-year updated system 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 rainfall that was approved by EPA and DEP for CSO performance goals and 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 and comparison of the characteristics of the year's actual storms to the characteristics of the storms in the Typical Year.

For the 2014 CSO discharge report that MWRA will submit to EPA and DEP by April 30, 2015, updates to MWRA's collection system model from end-of-year 2013 conditions to end-of-year 2014 conditions will incorporate the stormwater inflow removal resulting from BWSC's completion of Reserved Channel sewer separation Contract 3B, the City of Chelsea's closure of Outfall CHE002, and the City of Cambridge's removal of a 10-inch orifice plate that temporarily restricted the capacity of the upgraded dry weather flow connection at Outfall CAM401B. MWRA will also incorporate any significant modifications or adjustments to the configuration or operation of the new bending weirs at Outfall CAM017 by the City of Cambridge since it installed the weirs in 2013.

4.3 Compliance with Remaining Court Milestones

Schedule Seven in the Federal Court Order includes four CSO milestones in 2015 and three CSO milestones in 2016 and beyond and the last CSO milestone date in the Federal Court Order is December 2020. The last project construction completion milestone is December 2015. Table 4 on page 34 lists the remaining milestones and summarizes MWRA's plans for compliance.

5. LONG-TERM CONTROL PLAN AND UPDATED COST

5.1 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.

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.

Table 4: Remaining Schedule Seven Milestones

| Milestone | Project Schedule |
|--|--|
| Mar 2015 <i>MWRA to submit annual report which describes progress in planning, design, and construction of each CSO project, and identifies any issues which may interfere with timely completion of any project.</i> | MWRA plans to file the Annual Report for 2014 with the Court on March 13, 2015. |
| 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> <i>MWRA, in cooperation with BWSC, to complete construction of Reserved Channel sewer separation.</i> | <p>The four remaining construction contracts are underway. The City of Cambridge is making every effort during construction to be able to attain substantial completion of all construction contracts by December 2015.</p> <p>BWSC plans to complete the last of nine construction contracts for this project by December 2015. Five construction contracts are substantially complete, and the remaining four are well underway.</p> |
| Mar 2016 Submit Annual Report | MWRA plans to file the Annual Report for 2015 (the last required Annual Report) by March 15, 2016. |
| 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. |

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.

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 page 36. The CSO control costs by receiving water segment and the total plan cost of \$898.3 million (in December 2015 dollars)² are from MWRA's Proposed FY16 CIP.

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 remaining CSO activations and annual discharge volume to each receiving water segment are presented in Table 5 on page 36 and in Figure 9 on page 23. 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 five additional outfalls have been closed by BWSC and the cities of Cambridge and Chelsea).

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 MWRA demonstrates attainment of the levels of CSO control in its approved Long-Term Control Plan, it will have met its responsibility with respect to the implementation of CSO controls for the community owned CSO outfalls hydraulically connected to its sewer system. Thereafter, 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 i.e. MWRA, BWSC, Cambridge, Chelsea and Somerville.

The total CSO program cost has increased from \$893.8 million in the 2013 Annual Report (Proposed FY15 CIP) to \$898.3 million in this 2014 Annual Report (Proposed FY16 CIP), an increase of \$4.5 million (0.5%). While the cost estimates for several projects increased or decreased slightly, the Town of Brookline's final cost estimate for the Brookline sewer separation project decreased by \$1.2 million and BWSC's cost estimate to complete the Reserved Channel sewer separation project increased by \$5.5 million primarily due to unforeseen subsurface conditions and new information providing opportunities for higher stormwater inflow removal (with additional storm drain and sewer construction).

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, as well as traffic management, are 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 page 37 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.

² MWRA's Proposed FY16 CIP anticipates a total spending for CSO control of \$901.0 million, including escalation to the midpoint of construction and contingency, to complete the plan on schedule.

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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) | 97.6 |
| 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) | 89.1 |
| 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 | 62.4 |
| Constitution Beach | Eliminate | | <ul style="list-style-type: none"> • Constitution Beach Sewer Separation | 3.7 |
| 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 | 253.9 ⁽³⁾ |
| Reserved Channel | 3 untreated | 1.5 | <ul style="list-style-type: none"> • Reserved Channel Sewer Separation | 72.6 |
| 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 | 126.5 |
| Neponset River | Eliminate | | <ul style="list-style-type: none"> • Neponset River Sewer Separation | 2.5 |
| Regional | | | <ul style="list-style-type: none"> • Planning, Technical Support and Land Acquisition | 50.3 |
| TOTAL Treated | | 413.3 384.8 | | \$898.3 |

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

(2) From MWRA's Proposed FY16 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"

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Table 6: CSO Project Cost and Schedules

Shading indicates completed project.

| 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 | | 118.9 | Jun-96 | Apr-99 | Jun-07 |
| Stony Brook Sewer Separation | | 44.2 | Jul-98 | Jul-00 | Sep-06 |
| Neponset River Sewer Separation | | 2.5 | | Apr-96 | Jun-00 |
| Constitution Beach Sewer Separation | | 3.7 | Jan-97 | Apr-99 | Oct-00 |
| Fort Point Channel Conduit Sewer Separation | | 11.9 | Jul-02 | Mar-05 | Mar-07 |
| Morrissey Boulevard Storm Drain | | 32.3 | Jun-05 | Dec-06 | Jul-09 |
| Reserved Channel Sewer Separation | | 72.6 | Jul-06 | May-09 | Dec-15 |
| Bulfinch Triangle Sewer Separation | | 9.1 | Nov-06 | Sep-08 | Jul-10 |
| Brookline Sewer Separation | | 24.9 | 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 | 13.8 | | Apr-11 | Apr-13 |
| | CAM004 Sewer Separation | 71.8 | 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 | | 3.7 | 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 | | 898.3 | | | |

⁽¹⁾ From MWRA Proposed FY16 Capital Improvement Program.

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

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

5.4 Capital Budget and Spending Projections

As shown in Figure 17, the total cost of the Long-Term Control 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 FY16 CIP (December 2015 dollars). With escalation of the CIP budget estimate to the mid-point of construction and contingency, MWRA projects in its Proposed FY16 CIP that it will spend a total \$901 million to complete the plan on its current schedule. As shown in Figure 18 on page 39, 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.

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 levels will drop 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 Capital Budget History

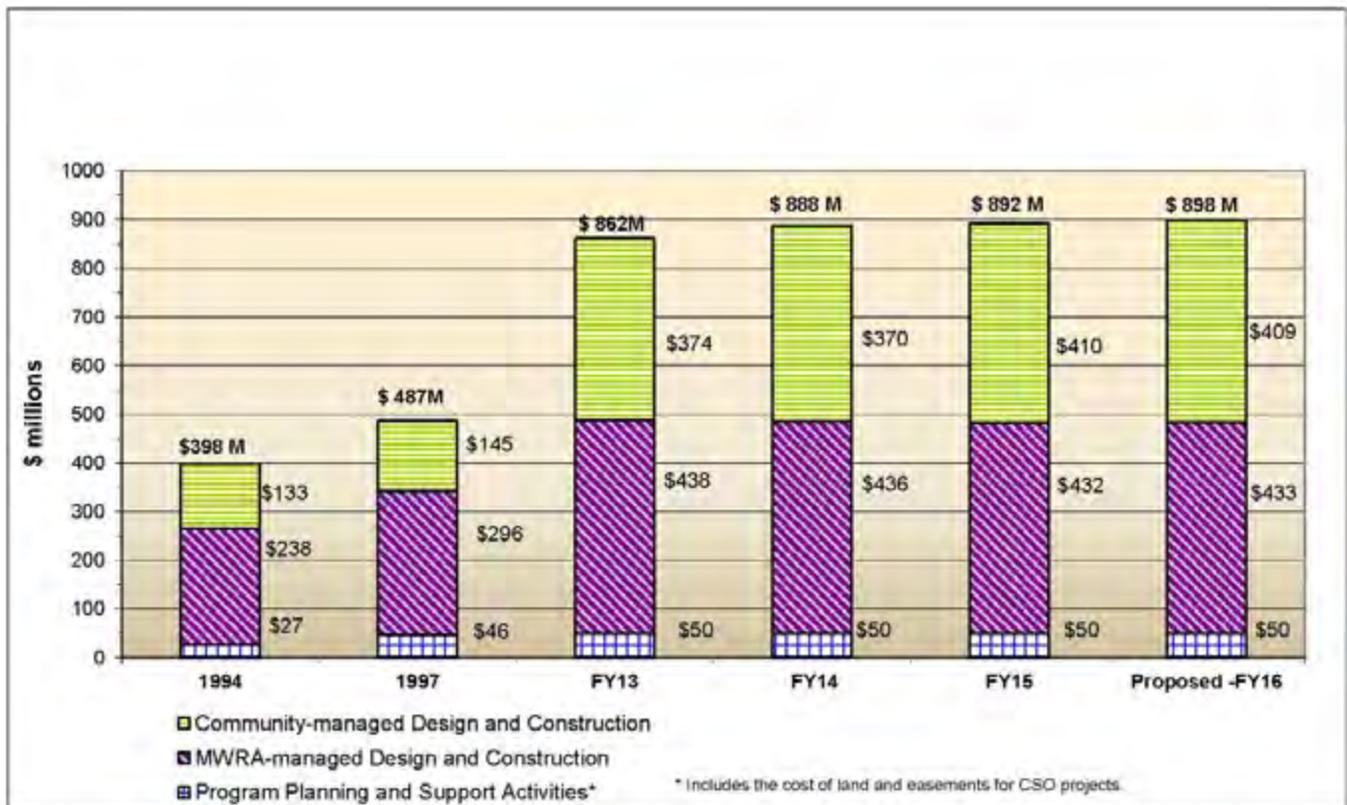
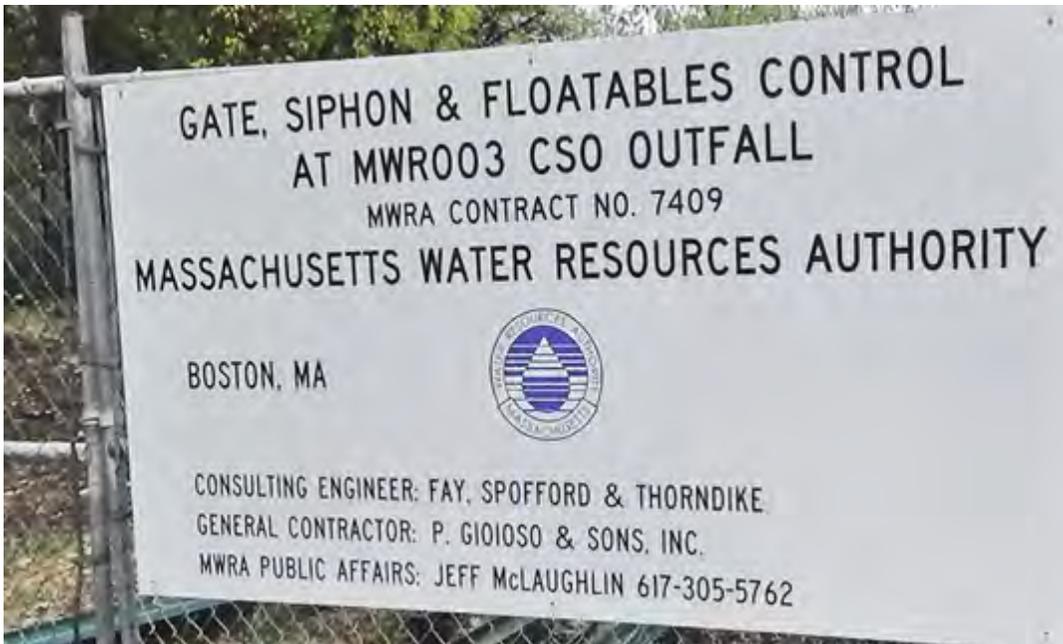
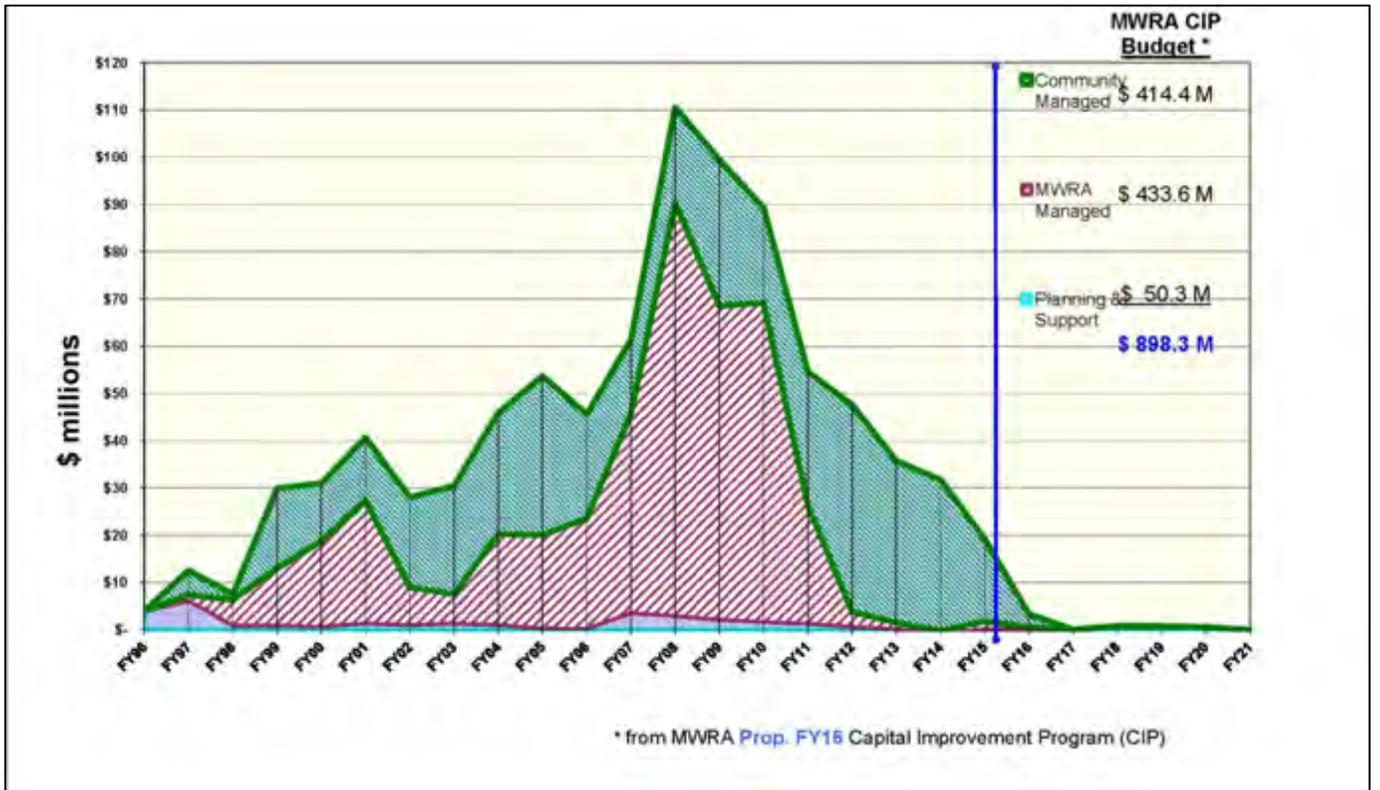


Figure 18: MWRA CSO Program Capital Spending



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: \$3,731,000</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**



Receiving Water:
 CAM005: Upper Charles River Basin
 BOS017: Mystic River/Chelsea Creek Confluence

Completed:
 2000

Capital Cost:
 \$2,295,000

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.

CSO Control

Water Quality Benefit:
 Minimized CSO discharges to meet B(cso) water quality standards (>95% compliance with Class B).

CSO Outfalls:
 CAM005, BOS017

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%

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%

Completed CSO Projects (continued)

| 5. NEPONSET RIVER SEWER SEPARATION | | |
|---|---|---------------------------|
|  | <p>Receiving Water: Neponset River</p> <p>Completed: 2000</p> <p>Capital Cost: \$2,549,000</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: \$29,779,000</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: \$22,385,000</p> <p>Description: Upgraded chlorine disinfection systems, added dechlorination systems, process control and safety improvements.</p> | <p style="text-align: center;">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 style="text-align: center;">CSO Control</p> <p>Water Quality Benefit: Eliminated storm water discharges to Pleasure Bay Beach.</p> |

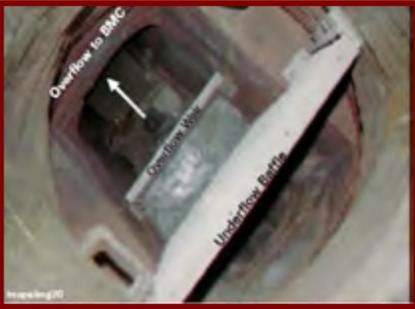
Completed CSO Projects (continued)

| 15. STONY BROOK SEWER SEPARATION | | |
|--|---|--------------------|
|  | <p>Receiving Water: Lower Charles River Basin</p> <p>Completed: 2006</p> <p>Capital Cost: \$44,246,000</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: \$118,800,000</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: \$11,917,000</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: \$32,339,000</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 style="text-align: center;">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> |

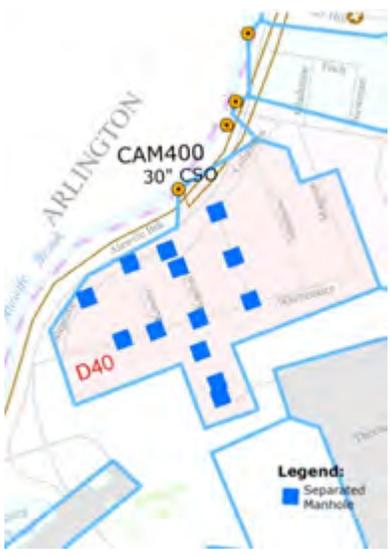
| 25. EAST BOSTON BRANCH SEWER RELIEF | | |
|--|---|--|
|  | <p>Receiving Water: Boston Harbor and Chelsea Creek</p> <p>Completed: 2010</p> <p>Capital Cost: \$85,637,000</p> <p>Description: Upgraded MWRA's 115-year-old interceptor system serving most of East Boston, using a combination of construction methods: micro-tunneling, pipe-bursting, open-cut excavation and pipe relining.</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: 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: \$9,054,000</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>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: \$2,904,569</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>Receiving Water: Alewife Brook</p> <p>Completed: March 2011</p> <p>Capital Cost: \$4,776,000</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>Receiving Water: North Dorchester Bay</p> <p>Capital Cost: \$218,405,000 (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> |

Completed CSO Projects (continued)

30. Brookline Sewer Separation



Receiving Water:
 Lower Charles River Basin

Capital Cost:
 \$24,889,000

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: \$15.8 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:
 \$13,825,000

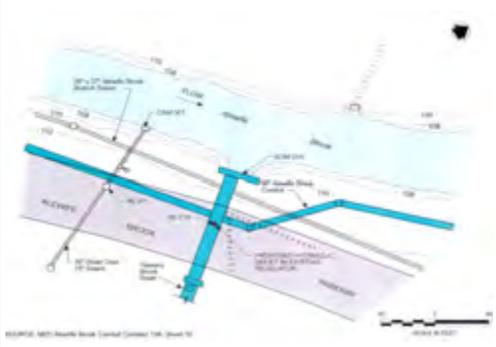
Completed: April 2013

Description:
 Constructed a new 4-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

Completed CSO Projects (continued)

| 32. SOM01A Interceptor Connection Relief/Floatables Controls | | |
|---|--|--|
|  | <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:</p> <p>Reduces CSO discharges to the Alewife Brook and provides floatables control for remaining discharges at the City of Somerville's Outfall SOM01A.</p> |



-The End-